INFORMATION RESPONSES
LOWER CHURCHILL PROJECT
CEAA REFERENCE NO.07-05-26178

JOINT REVIEW PANEL

Volume 4
IR# JRP.105 to JRP.145

October 2009

nalcor energy
LOWER CHURCHILL PROJECT

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IR# JRP.105

Mitigation Measures (Harlequin Duck)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Subject - Mitigation Measures (Harlequin Duck)

References:

EIS Volume IA, Section 2.5.15 (Harlequin Duck – Species of Concern)

EIS Volume IIB, Section 5.14.13 (Residual Environmental Effects -Harlequin Duck)

Environment Canada. 2007. Management Plan for the Harlequin Duck (*Histrionicus histrionicus*) Eastern Population, in Atlantic Canada and Québec. Species at Risk Act Management Plan Series. Environment Canada. Ottawa. vii + 32 pp

Canadian Environmental Assessment Agency. 1994. Determining whether a project is likely to cause significant environmental effects. 16p. Accessed: http://www.ceaaacee. gc.ca/Content/D/A/C/DACB19EE-468E-422F-8EF6-29A6D84695FC/Adverse-Environmental-Effects_e.pdf

Related Comments / Information Requests:

CEAR # 173 (Environment Canada)
CEAR # 180 (D. Steele -Memorial University of Newfoundland, Natural History)
CEAR # 206 (K. Lethbridge)

Rationale:

The EIS Guidelines require the Proponent to consider the significance of residual adverse environmental effects. The Agency's 1994 guidance on "Determining whether a project is likely to cause significant adverse environmental effects" instructs Proponents to consider the changes to the environment that pose a threat to rare or endangered species. The EIS Guidelines require the Proponent to identify and discuss the proposed mitigation measures that are technically and economically feasible and that would mitigate the significant adverse effects of the Project and enhance beneficial effects, including the **interaction of these measures with existing environmental management plans** (emphasis added).

Although the EIS acknowledges that the Harlequin Duck is listed on Schedule 1 Species of Concern federally and has Vulnerable status provincially, at present, the EIS does not reference the Management Plan for the Harlequin Duck eastern population (Environment Canada, 2007) (management plan) or discuss how it would be incorporated into any project-specific mitigation for the Harlequin Duck in the Churchill River valley. It does however refer to a Recovery Plan which is no longer in use as of 2001(CEAR # 173 – Environment Canada).

The EIS states that the literature only describes three nest sites in Labrador, all in varied habitat. However the EIS goes on to state that relatively large concentrations of breeding individuals are known particularly at Fig River, where 10 nesting pairs (on average) occupy an 8 km section of the river. It describes other concentrations that occur at the Minipi Lake outlet and along Cache River north of the Trans Labrador Highway. The EIS further indicates that breeding density overall is "low" but provides no indication as to what "normal" breeding density is for this species of concern (p.2-171).

Although one of the goals of the final Harlequin Duck management plan (May 2007) is to "[d]etermine if present known habitat is sufficient to maintain a viable and sustainable Harlequin Duck population in eastern North America" (implying that this has not yet been established), the EIS concludes that project-related and cumulative environmental effects on Harlequin Duck are 'not significant' (p. 5-99, 5-121) stating that "at most, a few undiscovered breeding sites are likely to be lost to the reservoir (p.5-120). Given the "not significant"

determination, by definition the Proponent is stating that a sustainable population can be maintained in the assessment area; this appears in contradiction to information presented in the management plan.

Additionally, the management plan states that "habitat data, both in regard to preferred parameters and available baseline habitat information, is limited or not available". The EIS indicates that for Harlequin Duck, primary, secondary and tertiary habitats follow specific and localized biophysical parameters indistinguishable at the scale of mapping available for the area" (p. 2-173) and that changes to habitat are common on breeding grounds, where disturbance to rivers may cause traditionally used areas to become unsuitable (p. 2-174)

The Canadian Wildlife Service has indicated that Harlequin Ducks are creatures of habit and tend to be very faithful to their moulting, wintering and staging areas, returning there year after year. Changes in the hydrology of the Lower Churchill may cause these areas to be lost, forcing Harlequin Ducks to opt to move to other locations that may alter the choice for breeding sites. As a result, if they select a new staging area then there is a possibility of them not returning to their breeding rivers.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

a. **a detailed description of proposed mitigation for Harlequin Duck;**

Response:

As noted in Section 5.11.1.15 of Volume IIB of the EIS:

> *Loss of breeding habitat to the Project will be minimal, given that all known breeding sites are above the projected level of the reservoirs. Additionally, a management plan to reduce the possibility of incidental take (loss or disturbance to active nests) regarding active nest sites of this migratory species will be designed and implemented.*
>
> *Ashkui will remain at the confluences of tributaries where Harlequin Duck is known to breed. Other ashkui on the river will no longer be available, so this will represent a change in distribution for individuals that previously staged at these locations on the lower Churchill River. However, since all known breeding territories are above the level of the proposed reservoir, such changes will likely be minimal. In addition, the duration of the staging period is usually brief since the fast-moving streams used for nesting also tend to be open early in spring; therefore, Harlequin Duck will be able to adapt relatively easily to changes in the hydrology of the lower Churchill River.*

The overall result of the effects analysis indicated that the environmental effect on Harlequin Duck during construction, and operation and maintenance is considered not significant. Table IIB-A-25 and Table 7-1 of Volume IIB of the EIS outlines proposed effects management measures for Harlequin Duck. Given the nature of interactions and the results of the analysis of effects of the Project on Harlequin Duck, effects management will be achieved through standard mitigation to be included in the Environmental Protection Plan and by the use of Best Management Techniques as referenced in Table IIB-A-25. These practices would include, for example, the prohibition of hunting by Project personnel, temporal and spatial avoidance of sensitive habitat, proper handling of fuels to avoid spills and the provision of a minimum of 20 m buffer zone (no clearing) in areas adjacent to potential Harlequin Duck breeding habitat.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

b. a discussion of how the Harlequin Duck eastern population management plan would be considered and incorporated into any project-specific mitigation measures;

Response:

The following points from the Harlequin Duck Eastern Population Management Plan (Management Plan) (Environment Canada 2007) are relevant to hydroelectric development of the lower Churchill River and were considered during the assessment process and during the development of proposed mitigation measures:

- Objectives
  - Identify and clarify possible threats to the Eastern Harlequin Duck population.
- Population Management
  - Survey and monitor the breeding population
  - Limit hunting
- Habitat Management
  - Determine where they breed
  - Conduct a comprehensive threat assessment
  - Complete impact assessments of hydroelectric development
  - Ensure management and mitigation of hydroelectric development impacts
- Communication Action
  - Develop and promote codes of practice and standards related to environmental assessment.
- Evaluation requires
  - Monitoring of survey effort and results
  - Mitigation of threats to the population

The Management Plan makes specific reference to the effects of hydroelectric development and specifically the development on the upper Churchill River that created the Smallwood Reservoir. In terms of this Project, effects are predicted as likely not significant as known breeding areas will not be affected by its footprint in the lower Churchill River watershed. A major emphasis of the plan is the need for predevelopment surveys to identify birds, their specific locations and potential threats. Extensive baseline research for this species in the lower Churchill River watershed and elsewhere in Labrador has been undertaken (Section 2.4.15.1 in Volume IIA). Contribution to continued surveys and monitoring will be supported in coordination with the Institute for Environmental Monitoring and Research (IEMR) (www.iemr.org), and further coordination would ensure that such work and findings are integrated into recovery and monitoring efforts.

Reference:

Environment Canada. 2007. Management Plan for the Harlequin Duck (*Histrionicus histrionicus*) eastern population in Atlantic Canada and Quebec. *Species at Risk Act* Management Plan Series. Environment Canada. Ottawa. vii + 32 pp.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

c. **a discussion of the distance between known breeding sites and the current and new shorelines after inundation and any relevant data to support the statement that breeding habitat will remain unchanged (i.e. fast flowing current etc. will still exist);**

Response:

Harlequin Duck do not breed along the lower Churchill River per se, and sections of tributary rivers predicted to be inundated by creation of the reservoirs of the Lower Churchill Hydroelectric Project are downstream (> 5 km) of river reaches used for breeding. Therefore, there is no mitigation required or proposed for effects on breeding habitat for Harlequin Ducks related to inundation by the proposed reservoirs.

The proposed Project has potential to interact with Harlequin Ducks during spring staging, breeding pairs (transmission corridor) and late brood rearing (pre-fledging). The Harlequin Duck breeds along the upper reaches of many of the tributaries of the lower Churchill River in Labrador. Overall, the densities of breeding pairs are low compared to other areas in Labrador (Trimper et al. 2008) although certain river sections support concentrations, such as Fig River and Minipi River. The highest densities on these rivers are reported in the upper reaches of rivers and brooks, particularly at or near large lake outlets.

Reference:

Trimper, P.G., P. Thomas and T.E. Chubbs. 2008. Harlequin Ducks in Labrador. Waterbirds 31 (Special Publication 2): 32-43.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

d. the theory or rationale behind the "high" level of certainty in the significance determination given the uncertainty expressed in both the EIS and the management plans, and Canadian Wildlife Service with respect to baseline habitat information and impacts;

Response:

The high level of certainty in the significance determination in the EIS is based on the knowledge of this species of waterfowl and the lack of spatial overlap between breeding areas and the Project footprint. The lower Churchill River and tributaries have been monitored regularly for Harlequin Duck since first being detected there in 1991 (Goudie 1991, Bateman 1992, Lidster 1992, Jacques Whitford 1996a, 1996b, 1997, 1998, AGRA and Harlequin Enterprises 1999; LGL Limited 2008, Trimper et al. 2008). Harlequin Duck have been recorded staging in spring on this river and breeding on the upper reaches of various tributaries. All documentation of pairs of Harlequin Duck assumed to be associated with breeding sites in the lower Churchill River watershed for the past two decades are substantially upstream (i.e., > 5 km) of anticipated inundation levels of the proposed reservoir (approximately 125 m ASL). Therefore, there is a high level of certainty in predicting the likely environmental effects as not significant.

There were extensive studies of the ecology of Harlequin Duck at Fig River, a large tributary emptying into the head of Winokapau Lake that ascertained that broods of Harlequin Ducks remained localized, and fledged by early to mid-September.

References:

AGRA Earth & Environmental and Harlequin Enterprises. 1999. Churchill River Power Project: LHP98-01 Waterfowl, Final Report. Unpublished report prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Bateman, M.C. 1992. Harlequin Duck Survey on Selected Rivers on the Lower Churchill River Watershed – June 1992. Unpublished report, Canadian Wildlife Service, Atlantic region, Sackville, NB.

Goudie, R.I. 1991. Status Report of the Harlequin Duck (eastern population) *(Histrionicus histrionicus*). Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

Jacques Whitford. 1996a. 1995 Raptor/Harlequin Duck Monitoring Program. Jacques Whitford Environment Limited Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON. 55 pp. + appendices.

Jacques Whitford. 1996b. 1996 Raptor/Harlequin Duck Monitoring Program. Jacques Whitford Environment Limited Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON. 48 pp. + appendices.

Jacques Whitford. 1997. Distribution of Breeding Harlequin Duck within the Low Level Training Area of Labrador and Northeastern Quebec, 1995 and 1996. Jacques Whitford Environment Limited Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON. 15 pp.

Jacques Whitford. 1998. Distribution of Breeding Harlequin Duck within the Low Level Training Area of Labrador and Northeastern Quebec, 1997. Jacques Whitford Environment Limited Report prepared for PMO Goose Bay, National Defence Headquarters, Ottawa, ON. 17 pp. + appendices.

LGL Limited. 2008. Waterfowl in the Lower Churchill River Area. Report prepared for Minaskuat Inc. and Newfoundland and Labrador Hydro, Lower Churchill Hydroelectric Generation Project. St. John's, NL.

Lidster, W. 1992. Aerial survey for Harlequin Ducks and Other waterfowl within the Churchill Falls (Labrador) Co. Biting Fly Treatment Area, June 9-10, 1992. Unpublished Report Prepared for Churchill Falls (Labrador) Corporation.

Trimper, P.G., P. Thomas and T.E. Chubbs. 2008. Harlequin Ducks in Labrador. Waterbirds 31 (Special Publication 2): 32-43.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

e. **the theory or rationale to support the determination that the population of Harlequin Ducks in the assessment area is sustainable (and the impacts not significant); and**

Response:

The Terrestrial Environment Assessment Area of the EIS encompasses parts of the breeding range of the eastern seaboard-wintering population and Greenland-wintering population of Harlequin Duck. The updated status review recommended the recognition of these two populations (Thomas and Robert 2001) but the resulting re-listing designation to 'species of concern' treated both groups as part of the same population.

Overall, there has been a continued increase in Harlequin Duck numbers wintering along the eastern seaboard since cessation of hunting in 1990, and it was the historical declines in this area that supported the 'endangered' status in 1990 when the population wintering there was estimated at about 650 individuals and declining (Goudie 1991). The recovery goal of 3,000 individuals in this group may in fact have now been achieved. An update of the 'The Management Plan for the Harlequin Duck (*Histrionicus histrionicus*) Eastern Population, in Atlantic Canada and Quebec' (Environment Canada 2007) is anticipated, and will hopefully provide updated population estimates. In general, the recovery trend of the eastern Harlequin Duck supports the study team's determination of a viable (sustainable) population.

Indicated pairs of Harlequin Ducks along tributaries of the lower Churchill River have been monitored through 2008 and 2009 as part of the effects monitoring program supported by the IEMR (www.iemr.org). The 2009 surveys represent the fourth year of a project originally designed by the Canadian Wildlife Service to assess the population trend of the Harlequin Duck in Labrador while also measuring any population level effects that may be a result of low-level aircraft training activity. These data generally support the hypothesis that the breeding population is stable or increasing since the baseline was collected there in 2006 because on a regional basis, total numbers of Harlequin Duck observed in 2009 were the highest recorded since the initial 2005 surveys (Jones and Goudie 2009). This is consistent with a sustainable breeding population.

Discussions related to the effects of the Project being not significant are provided in parts (c) and (d) of this IR.

References:

Environment Canada. 2007. Management Plan for the Harlequin Duck (*Histrionicus histrionicus*) Eastern Population in Atlantic Canada and Quebec. Species at Risk Act Management Plan Series. Environment Canada. Ottawa. Vii + 32pp.

Goudie, R.I. 1991. Status Report of the Harlequin Duck (eastern population) *(Histrionicus histrionicus*). Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

Jones, C. and R.I. Goudie. 2009. Harlequin Duck Population Surveys in Labrador and Northern Newfoundland: Field Report to Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL. LGL Report SA933, 13 pp.

Thomas, P.W. and M. Robert. 2001. Updated COSEWIC Status Report: Eastern North American Harlequin Duck *(Histrionicus histrionicus*). Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.105**

Information Requested:

The proponent is asked to provide:

f. a discussion of how the precautionary principle was applied for Harlequin Duck.

Response:

The precautionary principle (refer to IR# JRP.19) was applied in all aspects of the environmental assessment, including for Harlequin Duck. As Harlequin Duck are only breeding in the upper reaches of tributaries of the lower Churchill River within the watershed (i.e., above the level of inundation), it is unlikely that breeding sites would be lost as a result of the Project. The study team reported that there were no known breeding sites in the proposed inundation area and that there is a low level of interaction at staging areas in spring, resulting in the prediction that the Project would result in not significant environmental effects. Regardless, Nalcor Energy (Nalcor) proposed mitigation measures that would benefit this species (refer to part (a) above), as a precaution.

The evidence for extensive staging on the lower Churchill River in spring is equivocal for Harlequin Duck in contrast to other sea ducks, such as Surf Scoters. This is likely due to the fact that the fast-moving rivers selected by breeding pairs are generally ice-free when pairs migrate north from wintering range. Pairs may migrate directly from coastal to breeding habitats (Brodeur et al. 2002). Nevertheless, the study team has adopted the precautionary approach by assuming that in some years of protracted ice cover and delayed spring thaws, the lower Churchill River may provide staging habitat for Harlequin Duck.

In spring, Harlequin Duck may select alternative ashkui sites as a result of reservoir construction and anticipated protracted ice cover that may reduce the open water normally available along the lower Churchill River. There is uncertainty as to where these sites are located and if they are suitable for this species. The EIS makes a conservative and precautionary assumption that this effect is likely to be adverse, and recommends a Follow-up and Monitoring Program of waterfowl use of ashkui in spring (Table 7-1 in Volume IIB).

Reference:

Brodeur, S., J.-P. L. Savard, M. Robert, P. Laporte, P. Lamothe, R.D. Titman, S. Marchaud, S. Gilliland and G. Fitzgerald. 2002. Harlequin Duck (*Histrionicus histrionicus*) population structure in eastern Neararctic. Journal of Avian Biology 33(2): 127-137.

IR# JRP.106

Mitigation of Impacts on Local Businesses and Communities

Requesting Organization – Joint Review Panel **Information Request No.: JRP.106**

Subject - Socioeconomic Effects of the Project on Local Population

References:

EIS Guidelines, Section 4.6.1 (Mitigation)

ETS Volume III Section *3.7.5.2* (Contracting Policy and Practice)

Related Comments / Information Requests:

CEAR # 203 (Hydro-Québec)

Rationale:

Section 4.6.1 (p.37) of the Guidelines states that the "Mitigation measures shall be described for the construction, operation and maintenance phases and shall include: ... (j) Mitigation measures which would be taken to reduce or offset adverse effects on local businesses most directly affected by the Project".

In Section *3.7.5.2* (p.3-32) of Volume III, the Proponent refers to certain potential adverse effects of the Project on local businesses whose workers could be attracted by the jobs involved in building the lower Churchill River facilities and consequently leave their present jobs.

Requesting Organization –Joint Review Panel **Information Request No.: JRP.106**

Information Requested:

The Proponent is asked to describe the proposed mitigation measures it will adopt to:

a. minimize the adverse effects (i.e. loss of employees) on local businesses; and

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Response:

Potential socio-economic issues concerning local businesses, such as loss of employees to the Project, have been an important consideration in Project design and planning. Enabling local businesses to take advantage of the opportunities the Project will bring is a key part of supplier development and has been a part of early planning. Consultation has occurred and will continue to occur with various business organizations in the Upper Lake Melville area, amongst others, such as the Chamber of Commerce and the Innu Business Development Centre. This consultation will enable all local businesses to be aware of opportunities and expectations, to be able to express concerns and have issues discussed, and subsequently can take advantage of those opportunities and mitigate the issues. Volume III, section 3.6.5 and Socio-economic Component Study 5 (Newfoundland and Labrador Hydro 2009) clearly communicates the employment data for the Project to enable planning by local businesses.

Nalcor Energy (Nalcor) will work to address this concern with the following measures:

- Nalcor has and will continue to engage in dialogue with local government, businesses, contractors and training institutions, sharing information concerning the Project's anticipated employment requirements and opportunities. This will include information on the number and timing of positions, and the education, training and experience required. This information will permit local employers to initiate measures to retain their skilled employees. It will also permit the identification of gaps in supply and demand of workers so that training organizations can take appropriate action.
- Nalcor will support training initiatives in areas where skill shortages exist. This will assist in keeping local supply and demand in balance by engaging the local untapped labour pool. This training will enable local workers to more easily obtain employment in the Labrador economy.
- The Project will recruit workers from the entire province of Newfoundland and Labrador and not just adjacent to the Project bearing in mind that those qualified and experienced workers adjacent to the resource will receive first consideration for employment. Workers will also be recruited from outside the Province if a skill shortage prevents the hiring of local labour.

Reference:

Newfoundland and Labrador Hydro. 2009. The Lower Churchill Project Forcasted Labour Resource Requirements by National Occupation Classification for Generation Project. Prepared for the Lower Churchill Hydroelectric Generation Project.

Requesting Organization –Joint Review Panel **Information Request No.: JRP.106**

Information Requested:

The Proponent is asked to describe the proposed mitigation measures it will adopt to:

b. reduce the potential risk of a 'boom and bust' phenomenon adversely affecting the region's communities.

Response:

Nalcor has taken this phenomenon into consideration in its EIS (Volume III, Chapter 3).

In general, the length of activity of Project construction minimizes the prospect of a bust because there will be more time to plan, and more opportunity to capitalize on the benefits created by the Project (education, creation of industry, transferable skills, ability to seek other lines of business or markets outside of the region to best use any new infrastructure).

The Project clearly will bring an opportunity to the local economy from a business opportunity perspective as outlined in Volume III, Section 3.7 of the EIS. Through early communication and planning as discussed in part (a) of this IR the opportunity can be optimized and the "bust" minimized.

Nalcor is aware of this concern and has worked to address this with the following measures:

- The provision of high-quality accommodations camps at the Muskrat Falls and Gull Island sites will prevent large numbers of construction workers seeking accommodations, and requiring catering, recreation, retail and other services, in Happy Valley-Goose Bay. Minimizing this increase in the use of services will help to dampen any potential adverse effects from an employment 'boom' during the construction phase by lowering the need for increased infrastructure and services. Upon the completion of construction it will also help to minimize the 'bust' effects as local companies need to adjust to reduced demand and hence an excess of infrastructure and labour capacity. The experience of other projects, such as the Hibernia GBS platform construction on the Isthmus of Avalon, is that self-contained work camps avoid such 'boom and bust' consequences for local communities.

- Nalcor's Contracting and Purchasing policy will include recognition of supplier capabilities in Labrador, as well as the entire Province. Much of the local business opportunity will consist of smaller subcontracts that are not direct to Nalcor, and will fit the current capabilities of local business. This will reduce the need for local companies to augment the capacity of their facilities in order to undertake Project work, thus reducing the likelihood they will have excess capacity after the construction phase is complete.

- At the same time, the Project may offer some businesses the opportunity to expand or modify their capacity and the services they offer. Data collected as part of the follow-up to the Hibernia platform construction project illustrate that some companies will recognize and act on such opportunities (Community Resource Services Ltd. 1996). Case studies of companies on the Isthmus of Avalon included examples of firms that recognized that the project offered short-term benefits for the duration of the project and expanded their capacity solely to meet those opportunities. Other companies used the project as a means of diversifying their business into new areas that were perceived to be sustainable after the project was completed; similar opportunities and responses are expected with the Project.

Reference:

Community Resource Services Ltd. 1996. Socio-economic impacts of the Hibernia Construction Project (5 Volumes). Report prepared for the Hibernia Management and Development Company, St. John's, NL.

IR# JRP.107

Fish Habitat Compensation

Requesting Organization – Joint Review Panel **Information Request No.: JRP.107**

Subject - Fish Habitat Compensation

References:

EIS Guidelines Section 4.6.1(c) (Fish Habitat Compensation Strategies) & Section 4.6.4 Monitoring and Follow-up Programs)

EIS Volume IIA, Section 4.10.2 (Habitat Compensation Concepts)

EIS Volume IIA, Section 4.17 (Aquatic Environment — Monitoring and Follow-up)

Related Comments / Information Requests:

CEAR # 170 (Fisheries and Oceans Canada)
CEAR # 198 (G. Davis)
CEAR # 203 (Hydro-Québec)

Rationale:

As part of the requirement to identify and discuss mitigation measures under Section 4.6.1(c) of the EIS Guidelines, the Proponent is required to describe fish habitat compensation strategies.

As per Section 4.6.4 of the EIS Guidelines, the Proponent was also required to describe the environmental monitoring and follow-up programs related to fish habitat compensation and explain how the public is involved, in their design and implementation. These elements of the EIS Guidelines are relevant to the assessment of the environmental effects of the Project to ensure that any impacts to fish habitat are mitigated, through fish habitat compensation and monitoring programs, as per DFO's Policy for the Management of Fish Habitat.

While the EIS does present compensation options to address the destruction of fish habitat resulting from the footprints of the Gull Island and Muskrat Falls dams, it fails to:

- address all of the potentially adverse effects (i.e. harmful alteration and resultant loss of productive capacity) associated with the inundation and operation of future reservoirs;
- address monitoring requirements associated with the creation and utilization of compensatory fish habitat; and
- describe the process through which the public will be involved in the design and implementation of various fish habitat compensation measures.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.107**

Information Requested:

With regards to the Fish Habitat Compensation Strategy, the Proponent is asked to identify and describe:

a. **additional compensation options that are adequate to address fish habitat loss and alteration associated with the construction and operation of the Project;**

Response:

The Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is regulated under the *Fisheries Act*. The potential for a HADD as a result of an undertaking typically triggers assessment under the CEAA as a Section 35(2) *Fisheries Act* Authorization may be required. In most cases, issuance of an Authorization is conditional on developing habitat compensation and monitoring (i.e. mitigation under CEAA) to ensure that there will be no net loss in the productive capacity of fish habitat. Release from the CEAA process is typically contingent on the development of a Fish Habitat Compensation Strategy which provides a description of compensation options, including their applicability and feasibility. The subsequent Fish Habitat Compensation Plan generally begins in concert with strategy development but is not required for release under the CEAA. The final Fish Habitat Compensation Plan, with all the details regarding final design, construction and monitoring, is required prior to issuance of the Authorization. In turn, the Authorization is required prior to any project activities that would cause the HADD.

Discussions and consultations have been ongoing with DFO and the public since the submission of the EIS and HADD determination for the purpose of achieving a mutually agreeable, scientifically defensible approach to compensation. A Fish Habitat Compensation Strategy Framework has been developed by Nalcor Energy (Nalcor) with ongoing input and participation by DFO. The Framework outlines the approach and rationale to be taken with respect to Fish Habitat Compensation as planning continues. The Fish Habitat Compensation Strategy Framework is appended to this response.

The Compensation Strategy and Planning process is ongoing. Field validation of parameters used in model results presented in the EIS will be completed prior to final Plan submission. It is anticipated that a final Compensation Strategy will be completed prior to Panel Hearings.

As part of the compensation process, the Fish Habitat Compensation Strategy Framework provides additional compensation options being considered (Section 4.2 of the Framework, Attachment A).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.107**

Information Requested:

With regards to the Fish Habitat Compensation Strategy, the Proponent is asked to identify and describe:

b. the monitoring of compensatory fish habitat, which should include fish species assemblages and diversity, reservoir productivity (primary and fish), sediment transport/loading, etc. how an adaptive management approach will be utilized in assessing the future reservoirs;

c. how an adaptive management approach will be utilized in assessing the future reservoirs; and

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Response:

Section 4.2 of the Compensation Strategy and Plan will outline the standard monitoring requirements associated with any constructed compensation works in terms of structural integrity and utilization to ensure they remain stable and that they are being utilized. Section 4.3 of the Compensation Strategy and Plan will outline anticipated monitoring for an acceptable and successful Fish Habitat Compensation Plan. It also outlines how an Adaptive Management Approach will be utilized in assessing the future reservoirs and how unanticipated conditions will be addressed (Attachment A).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.107**

Information Requested:

With regards to the Fish Habitat Compensation Strategy, the Proponent is asked to identify and describe:

d. how public input will be incorporated into the development of the proposed compensation options.

Response:

The compensation options and adaptive management approach outlined in the Fish Habitat Compensation Strategy Framework has been presented to the public in a series of three Technical Workshops (in St. John's and Goose Bay) as well as one-on-one information sessions. These workshops were used to describe the HADD/Compensation process and to present and discuss compensation options. Input from these preliminary consultations has been incorporated into the Fish Habitat Compensation Strategy Framework (Attachment A). Additional workshops are anticipated as the planning process continues. Section 5.0 of the Fish Habitat Compensation Strategy Framework (Attachment A) outlines how the public will be consulted throughout the Compensation Planning process towards the finalization of the Compensation Plan.

INFORMATION RESPONSES
LOWER CHURCHILL PROJECT
CEAA REFERENCE NO.07-05-26178

JOINT REVIEW PANEL

Attachment A

Habitat Compensation Strategy and Planning Strategy Briefing

IR# JRP.107

October 2009

nalcor energy
LOWER CHURCHILL PROJECT

Doc. No. 09-9/2532

Lower Churchill Hydroelectric Generation Project

Habitat Compensation Strategy and Planning

Strategy Briefing

February 23, 2009

nalcor energy
LOWER CHURCHILL PROJECT

Lower Churchill Hydroelectric Generation Project
Habitat Compensation Strategy and Planning
Strategy Briefing
February 23, 2009

Preamble

The Lower Churchill Hydroelectric Generation Project has been under consideration since the construction of the Churchill Falls Generating Station in 1971. Since that time, baseline studies have been conducted to characterize and quantify the aquatic habitat within and near the project footprint. Studies have intensified since 1998, not only for habitat characterization and species utilization, but also for post-project predictions on habitat stability and utilization once the project is completed, particularly within the reservoirs. Habitat quantification has been completed and a Harmful Alteration, Disruption or Destruction (HADD) determination provided by the Department of Fisheries and Oceans (DFO). The size of both the project and the HADD has necessitated the formation of a Fish Habitat Compensation Strategy that incorporates an adaptive management approach. The approach includes extensive quantitative and qualitative analysis, modelling, monitoring and research to ensure that reservoir stabilization occurs as predicted. It also includes physical compensation works to allow for more rapid stabilization and increased utilization of important habitat types within the lower Churchill River drainage. Physical works will also augment/enhance post-project habitat.

The following briefly describes the work and effort over the last decade by all parties in dealing with the challenges of the project and, more importantly, a framework for the Fish Habitat Compensation Strategy currently being completed.

1.0 Introduction

Nalcor Energy is the proponent for the Lower Churchill Hydroelectric Generation Project. Nalcor Energy, formerly Newfoundland and Labrador Hydro ("Hydro"), was formed as the new provincial energy corporation. Historically, Hydro's mandate was to deliver reliable, least cost-energy to residents and industry in Newfoundland and Labrador. However, in 2007 the province released the Newfoundland and Labrador Energy Plan which included the creation of a new provincial energy corporation, which is a holding company for Hydro. On December 11, 2008, the province announced the new name and corporate identity of the province's energy corporation, Nalcor Energy (Nalcor). Nalcor is a crown corporation and has an expanded mandate which includes providing electrical power and energy outside the province.

Nalcor is currently proposing to develop hydroelectric generating facilities with interconnecting transmission lines on the lower section of the Churchill River, Labrador (Figure 1.1). Development of the hydroelectric potential of the Churchill River began in 1960 with the construction of the Twin Falls power plant.

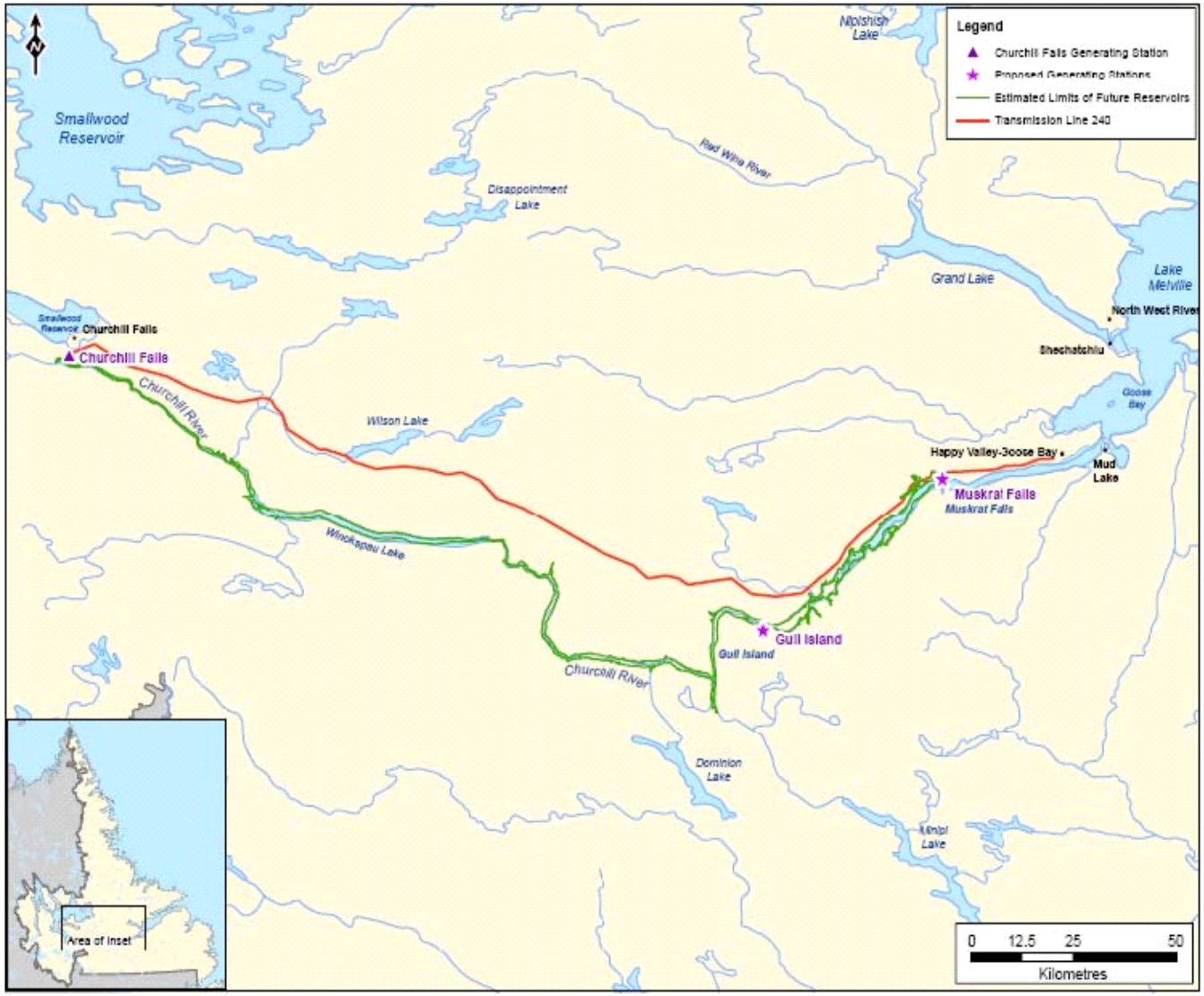


Figure 1.1 The lower Churchill River and proposed Muskrat and Gull facility locations.

This plant was built to provide power to the iron ore mines at Labrador City and Wabush. Twin Falls was decommissioned in 1974 with the full commissioning of the Churchill Falls Generating Station (also referred to as the Upper Churchill Project). The 5,225 MW (upgraded to 5,428 MW in 1985) Churchill Falls Generating Station is one of the largest underground powerhouses in the world. In total, the site captures about two-thirds of the hydroelectric potential of the Churchill River. Consequently, most of the flow in the Churchill River has been regulated since the Churchill Falls Generating Station started operation in 1971.

The Lower Churchill Hydroelectric Generation Project ("the Project") involves tapping the remaining hydroelectric potential of the Churchill River at Gull Island and Muskrat Falls (Figure 1.1). Generation facilities with a combined capacity of approximately 2,800 MW will be installed at Gull Island and Muskrat Falls. Interconnecting transmission lines will be installed between these generating sites and the Upper Churchill Falls Generating Station. Gull Island and Muskrat Falls are approximately 100 km and 30 km southwest of Happy Valley-Goose Bay, respectively. The project will result in the creation of two reservoirs with a combined surface area of 301km^2. The total area to be inundated will be 126 km^2, representing a 72 percent increase in the existing waterbody surface area.

The nine-year construction period is scheduled to begin at Gull Island once approvals are received. Construction at Muskrat Falls will be initiated approximately three years following the start of the construction of Gull Island.

The Project is undergoing an environmental assessment in accordance with regulatory requirements and in compliance with Nalcor/Hydro policy.

The *Fisheries Act* Challenges

The construction of large dams in Canada often involves the inundation of existing fish habitat and the creation of reservoirs, which can result in the alteration of fish habitat. The footprints of these dams can also destroy fish habitat if placed directly within productive fish habitat. Hydrological changes, (*i.e*., the changes in water depths and velocities) will result from development of the lower Churchill River which will alter the existing fish habitat and its utilization by resident fish species due to potential changes in such habitat characteristics as water quality, sediment transport and riverbed movements (including bank stability, slumping and sand bar movements), thermal dynamics and processes of ice formation and break-out.

The Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is prohibited under Section 35 of the *Fisheries Act* unless authorized by DFO to do so. In most cases issuance of a Fisheries Act Authorization is conditional on developing habitat compensation and monitoring to ensure that there will be no net loss in the productive capacity of fish habitat. It is the proponent's responsibility to provide DFO with sufficient information so that staff can assess the quality and quantity of fish habitat potentially impacted by the proposed project. If necessary, the information can also be used to provide a base for developing a compensation plan (DFO 2004).

DFO's *Policy for the Management of Fish Habitat* (DFO 1986) provides a comprehensive framework for the conservation, restoration, and development of fish habitats (Gosse et al. 1998). While not a statutory requirement to be met at all costs, the Policy applies to habitats supporting fish stocks or populations that sustain commercial, recreational, or subsistence fisheries (Gosse et al. 1998). The overall guiding principle of the Policy is a no net loss of productive capacity of habitats (DFO 1986). Discussions with DFO began in 1999 on the challenges in quantifying and determining the net change in productive capacity of habitat due to the proposed Project to achieve a no net loss. It was determined that, for the scale of the proposed development for the lower Churchill River and the species assemblage, an appropriate quantification methodology capable of determining if a HADD would occur was not available. With this in mind, Hydro initiated the development of a scientifically defensible habitat quantification methodology in 1999 that would reasonably allow the incorporation of both pre- and post-Project habitat species utilization within the system such that the overall net change in habitat and its utilization could be addressed.

In order to adequately describe the existing aquatic habitat of the lower Churchill River and its use by resident species, Hydro began extensive biological investigations in 1998. Sampling was conducted over three years (1998-2000) in order to capture as much information as possible regarding the characterization of existing habitat and its utilization by the various life-cycle stages present. Baseline data collected since 1974 was reviewed and also incorporated into the development of the methodology where appropriate (see Riche 1965; Beak 1978; Bruce *et al.* 1975; Beak 1980; De Graaf 1980; FEARO 1980; Ryan 1980; Lower Churchill Development Corporation 1980; Northland Associates Ltd. 1980; JWEL 1999a; 1999b; AGRA 1999; 2000; JWEL 2000; AMEC 2001).

An initial methodology document was submitted to DFO in November 2001, which outlined the rationale, framework and incorporation of sample data in determining the overall Habitat Utilization Indices for each habitat type (AMEC 2001). This submission also outlined how the pre-and post-Project habitat could be compared to determine the overall net change in habitat and its utilization, although predictions of the future reservoir conditions were limited. The 2001 methodology was presented and published at the 2004 World Fisheries Congress (McCarthy et al. 2008) and was incorporated into DFO's riverine habitat quantification method (McCarthy et al. 2007).

In 2006, attention was focussed on aquatic system predictions and how the proposed reservoirs would develop and stabilize. Extensive habitat modelling was subsequently completed for various aspects of the post-Project habitat including bank stability, sediment transport, ice dynamics, water quality and mercury evolution (see AMEC 2007a, 2008; Hatch 2007; Minaskuat 2007; Tetra Tech 2008; NHC 2008). Past projects and research on existing reservoirs in Labrador and Quebec were also reviewed in order to assist in establishing a best-estimate of reservoir formation and stabilization. Fish utilization of the existing habitats was also sampled again in 2006 to confirm the results of previous programs (1998-2000) and to ensure that species utilization was not cyclic or highly variable. Results showed that the data collected remained valid in describing the habitat and its use by fish (AMEC 2007a).

A final habitat quantification document describing both the existing and predicted post-impoundment habitat and fish species response was completed and submitted to DFO in December 2007 (AMEC - Sikumiut 2007). This quantification document used model results available at the time (most still in draft form) as well as available literature to describe the pre- and post-Project habitat and described how post-Project habitat could assist in achieving a no net loss in productive capacity. During its final development, the methodology was presented in October of 2007 at a national DFO Technical Workshop on "Methods of Measuring Productive Capacity in Canada" (Smokorowski and Derbowka 2007). The methodology was presented, reviewed and assessed with the conclusion by workshop participants that the methodology is valid for providing a measure of net change in productive capacity as it quantifies existing fish habitat within the Churchill River and can make predictions re: future habitat once the reservoirs have stabilized.

HADD Determination

In May 2008, DFO presented its HADD determination. The determination identified a total of 5,135.91 hectares of fish habitat that will be harmfully altered or destroyed, summarized as follows:

- Destruction of 26.03 ha or riverine fast velocity habitat resulting from the footprint of the Gull Island dam;
- Destruction of 7.30 ha of riverine fast velocity habitat resulting from the footprint of the Muskrat Falls dam;
- Harmful alteration of 1,264.06 ha of riverine intermediate velocity habitat within the Churchill River Main Stem due to inundation/reservoir creation;
- Harmful alteration of 3,549.65 ha of riverine fast velocity habitat within the Churchill River Main Stem due to inundation/reservoir creation;
- Harmful alteration of 30.07 ha of riverine intermediate velocity habitat within the Churchill River Tributaries due to inundation/reservoir creation;
- Harmful alteration of 19.97 ha of riverine fast velocity habitat within the Churchill River Tributaries due to inundation/reservoir creation;
- Harmful alteration of 25.85 ha of riverine habitat within streams of the Churchill River due to inundation/reservoir creation; and
- Harmful alteration of 212.98 ha of lacustrine littoral habitat within the Churchill River Main Stem due to inundation/reservoir creation.

At the time of the determination, Hydro considered it to be excessive given the future habitat and utilization predictions of post-project habitats. However, it is recognized that future predictions submitted to DFO were based on the information available, which did not include final model results of important post-reservoir parameters such as total suspended sediment (TSS), bank stability and nutrient loading, which were being completed at the time. Due to the remaining uncertainty of future habitat utilization within newly formed reservoirs, DFO considered any harmfully altered fish habitat (in this case, existing intermediate and fast velocity habitat within the footprint of the reservoirs to be created) to constitute the HADD of fish habitat. As such, DFO did not recognize the potential future use of the reservoir as a means of reducing the size of the HADD. While DFO recognizes that the post-project habitat will be utilized, they

considered the determination to be precautionary. As a result, the determination represents a scenario whereby there would be no utilization of future habitat by resident species, no mitigation nor compensation. However, clarification regarding the HADD by DFO indicates that the description of them as harmful alterations reflects the uncertainty of the post-habitat characterization/stabilization of future habitats and does not exclude the potential for future habitats to be utilized by resident fish species and that this habitat, and its utilization, can be incorporated into the Compensation Plan.

Compensation Strategy Framework

In late September 2008, Hydro began discussions with DFO for the purpose of achieving a mutually agreeable, scientifically defensible approach to compensation which incorporates the DFO HADD determination as well as recognition of post-project habitat utilization. With clarification as to the nature of the HADD received and viable compensation options reviewed, a Fish Habitat Compensation Strategy Framework has been developed by Hydro with ongoing input and participation by DFO. The following is a brief outline of the Strategy Framework for successfully meeting the requirements of a Section 35(2) *Fisheries Act* Authorization. The Strategy Framework below has been laid out as an annotated Table of Contents which assists in presenting not only the information to be included by the order of presentation as well.

Lower Churchill Development
Fish Habitat Compensation Strategy Framework

Annotated Table of Contents

1.0 INTRODUCTION

The introduction will provide general background on the project and the Fish Habitat Compensation Framework.

1.1 Rationale and Approach

This section will provide an overview of the Fisheries Act and Compensation requirements. It will also describe the challenges associated with the scale of the project, species and existing methods of habitat quantification. It will lead the way for a description of the quantification method used for the project.

2.0 HABITAT QUANTIFICATION

This section will describe how the habitat quantification method was developed for the Project. It will describe the key tasks associated with the method including relevant data collection, description of existing habitat, description of existing habitat use by resident species, summary of how the habitat is predicted to change with the Project, and a summary of how the resident species are predicted to use the post-project habitat.

3.0 HADD DETERMINATION

The HADD determination will be presented in this section. It will provide a detailed breakdown/description of the habitat types included in the HADD as well as the rationale for their inclusion. This section will also describe the precautionary approach to the determination (i.e. no uncertainty associated with the habitat losses/alterations, rather, any inherent uncertainty associated with potential fish utilization of the altered habitat from the creation of the reservoir will be addressed through the compensation program).

It will be very clear on where the HADD units are and what is included. For example, it will break out the various determinations ("destroyed" and "harmful") and explain each. This section has to be very clear on where the units are located and what each represents.)

4.0 COMPENSATION APPROACH

This section will provide a discussion regarding fishery management/social objectives and the reasoning for adopting a multi species, risk management approach. For example, it will describe the results of user preference surveys as well as predictions regarding the species that will do relatively well over those that will not.

The Strategy will be presented and each approach will be described in relation to the Hierarchy of Compensation Options. The Compensation Program will follow a three-tiered approach as noted below.

4.1 Tier 1 – Post Impoundment Fish Utilization

This section will describe the predicted future habitat within the reservoirs (eg. characterization and quality) and will provide in-depth habitat analysis of the post impoundment environment as well as modelling results.

A description of the predicted response to habitat change by species will also be presented. This section will describe the model results used in predicting post-project habitat and use and will describe the certainty of the predictions. This section will also identify the Habitat Equivalent Units of the post-project habitat and how these are applied against the HADD.

DFO's potential recognition of reduced velocity and flooded areas as contributing towards compensation will require further detailed quantitative and qualitative analysis of post-impoundment habitat (eg. water quality, depths and substrates), and how resident species would use these areas. In addition, any predictions regarding utilization of reservoir habitat would require validation through an intensive long-term monitoring program – see below.

4.2 Tier 2 - Physical Compensation Works

Emphasis will be focused on the long term maintenance of fish populations within the reservoir with priorities being placed on implementing compensation/enhancement efforts on susceptible and/or socially important species/life-cycle stages. The section will outline biological criteria for susceptible species/life stages so that the habitat to be constructed can be put in context.

Potential Fish Habitat Compensation Options to be considered/described include:

- ***Gull Island Plateau*** *(creation of spawning and rearing habitat);*
- ***Creation/enhancement (both constructed and passive) of littoral habitat*** *within the post-project lacustrine habitat – approximately 150 km of littoral shoreline;*
- ***Creation/enhancement of delta*** *areas in the tributaries (potential river sites – Metchin River, Elizabeth River, Edwards Brook, Pinus River, Minipi, Beaver Brook);*
- ***Enhance Spawning Shoals*** *near the Pinus River and islands just downstream of Gull Island Dam;*
- ***Restoration of riverine*** *habitat above the Churchill Falls Tailrace;*
- ***Enhancement*** *of upstream habitat within flooded tributaries (i.e. creating spawning/rearing habitat);*
- ***Additional stream creation*** *within areas around some of the above noted potential delta areas;*
- ***Enhancement of habitat*** *downriver of Muskrat Falls.*

Also included in this section will be a description of standard compensation monitoring requirements to ensure structures remain stable and that they are being utilized.

4.3 Tier 3 – Adaptive Management Program

This section will describe the adaptive management approach and how it will allow negative issues related to the reservoir and its use to be identified and corrected before they reach predetermined cautionary-critical levels. In order for an adaptive management program to be effective, especially in terms of explaining unforeseen departures from predicted outcomes, an ecosystem approach encompassing appropriate physico-chemical variables will be adopted. If future cautionary-critical level situations regarding fish populations arise, an understanding of how they have evolved will be needed so a remedy can be quickly reached.

The approach will be one of "continual improvement" in that it will have a predicted series of post-project outcomes related to measured parameters and species habitat use (eg. positive, neutral, negative). Monitoring programs will be established to confirm/dispute these predictions and results may trigger actions outlined in the plan. Results confirming neutral predictions will not trigger changes to the plan. Results that indicate a failure to meet predetermined cautionary-critical levels will trigger timely investigations into possible mitigations. The outcome of these investigations will guide modification of the actions to be taken under the compensation plan so as to achieve overall objectives related to productivity of fish habitat. Conversely, positive results which indicate that predictions are exceeded will allow for compensation and or monitoring activities to be modified or reduced if appropriate.

4.3.1 Management Monitoring Program

An adaptive management approach will be based on an intensive monitoring program that would determine whether the predictions being forwarded by Nalcor concerning post-project parameters and habitat utilization are accurate. Standard compensation monitoring programs will be inadequate to address the complexity and numerous core issues associated with the creation and use of post-project habitats (eg. species assemblage and maintenance of species diversity, reservoir productivity (primary and fish), oligotrophication, sediment transport/loading).

The monitoring program will include the following cycle of actions:

1. *Monitoring of predicted post-project habitat formation/stabilization and utilization by resident fish species;*
2. *Monitoring of appropriate physico-chemical variables to measure potential reservoir-level biological and ecological linkages associated with reservoir development and stabilization;*
3. *a cyclic standardized review of monitoring results compared against predetermined caution/critical level values;*
4. *directed research initiatives on reservoir dynamics and processes related to caution/critical level values; and*
5. *Review of monitoring/research results and, if necessary, implementation of additional mitigation measures.*

4.3.2 Directed Research on Reservoir Dynamics and Processes

While the above approach brings a level of certainty to the success of the compensation efforts, there still remains a residual possibility that an unanticipated situation could occur that may negatively affect a species or assemblage or that predicted conditions were significantly inaccurate. While the Adaptive Monitoring Program will be designed to detect a possible situation before it becomes critical, it does not address what could be done to correct it.

As such, caution/critical parameter levels identified in the Adaptive Management Program (eg. from action #3 above) will trigger directed research on reservoir dynamics and processes related to those parameters as well as possible mitigation measures that can be implemented. This dedicated research will be an integral component of the adaptive management approach and will ensure management decisions and applied mitigations are made based on credible scientific practices.

5.0 Public Consultation

This section will describe the Public Consultation process associated with the Strategy. While typical public consultation associated with Compensation Planning occurs at the final acceptance of a Plan by the proponent and DFO, it is envisioned that additional consultation should be completed in this situation to ensure that the outlined approach is reviewed by the public and their initial comments received.

It is currently planned that the accepted strategy framework will require public input/display to measure the degree of understanding and acceptance of the process and the direction the strategy is going in terms of compensation options. This will allow both Nalcor and DFO to address any concerns prior to expending excess effort on planning. Once the strategy is accepted and a Plan developed, further public consultation will be required as per the typical compensation planning process.

Nalcor will implement a public consultation program with respect to the Fish Habitat Compensation Strategy Framework and will include the following:

- *Consultation with aboriginal and nearby communities;*
- *Contact with outfitters and others whose operations utilize the local freshwater resources;*
- *Contact with sport fishing and environmental organizations in the local area;*
- *Inclusion of material provided at public meetings; and*
- *An offer to nearby communities to attend consultation meetings on the proposed compensation strategy.*

REFERENCES

AGRA. 1999. Fish and Fish Habitat, Churchill River Power Project (LHP98-07). Prepared for Labrador Hydro Project, St. John's, NF.

AGRA 2000. Freshwater Fish Mercury Sampling, Churchill River, Labrador (LHP99-07). Prepared for Labrador Hydro Project, St. John's, NF.

AMEC. 2001. Churchill River Power Project: A Proposed Framework for HADD Determination (LHP00-07). Prepared for Labrador Hydro Project, St. John's, NF.

AMEC Earth & Environmental Limited. 2007a. Lower Churchill Hydroelectric Development Fish and Fish Habitat Baseline Study: catch-based Utilization Index Validation and Additional Habitat Surveys. Prepared for Labrador Hydro Project, St. John's, NF ii + 54 pp. + Appendices

AMEC-Sikumiut 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. viii + 129 pp. + Appendices

AMEC. 2008. Bank Stability Study for the Proposed Lower Churchill Hydroelectric Generation Project: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Beak Consultants. 1978. Lower Churchill River biophysical study. Abstract Report for: Newfoundland and Labrador Hydro 2 v + atlas (2 v.)

Beak. 1980. Fisheries Resources of Tributaries of the Lower Churchill River. Prepared by Beak Consultants Limited for the Lower Churchill Development Corporation, St. John's, NF.

Bruce, W.J.; Morry, C.J.; Rowe, L.W.; Wiseman, R.J. 1975. An overview of fisheries problems associated with the proposed Lower Churchill hydroelectric development, Gull Island, Labrador. Fisheries and Marine Service. Newfoundland Region; Lower Churchill Hydroelectric Project. Internal report series (Canada. Fisheries and Marine Service. Newfoundland Region); NEW/I-75-2. 1 v.

DeGraaf, D. A. 1980. Aquatic monitoring of selected streams with respect to potential disturbance resulting from Lower Churchill Development transmission lines: baseline studies summer 1979. Other Title: Lower Churchill development: stream monitoring surveys, 1979. St. John's, Nfld.: Atlantic Biological Services Ltd., 1980, 102 p.

DFO (Department of Fisheries and Oceans). 2004. Informal Requirements for the Development of a Compensation Strategy and Plan. Marine Environment and Habitat Management Division, September 2004.

FEARO (Federal Environmental Assessment Review Office).1980. Lower Churchill Hydroelectric Project. Report of Environmental Assessment Panel.

Gosse, M.M., A.S. Power, D.E. Hyslop and S.L. Pierce. 1998, Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans, St. John's, NF. X + 105pp., 2 appendices.

Hatch Ltd. 2007. Ice Dynamics Study Draft Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. v + xx pp, plus xx appendices.

JWEL (Jacques Whitford Environment Limited). 2000. Fish Migration and Habitat Use of the Churchill River (LHP98-03). Prepared for Labrador Hydro Project, St. John's, NF.

JWEL (Jacques Whitford Environment Limited). 1999a. Benthic Invertebrate Study of the Churchill River , Prepared for Newfoundland and Labrador Hydro, St. John's, NL. iv + 69 pp, plus 4 appendices.

JWEL (Jacques Whitford Environment Limited). 1999b. Primary Productivity and Plankton Biomass. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. v + 70 pp, plus 7 appendices

Lower Churchill Development Corporation. 1980. Environmental Impact Statement. Prepared for the Federal Environmental Assessment and Review Office for the Proposed Gull Island and Muskrat Falls Hydroelectric Generation Projects. Vol. I.

McCarthy, J.H., C.G.J. Grant and D.A. Scruton. (2007 Draft). Standard Methods Guide for the Classification and Quantification of Fish Habitat in Rivers of Newfoundland and Labrador.

McCarthy, J.H., L.J. LeDrew and B.R. LeDrew. 2008. A Framework for Aquatic Habitat Classification and Quantification for Large Northern Ecosystems: Application to the Proposed Churchill River Power Project, Churchill River, Labrador, Canada. Pages 587-603 In: American Fisheries Society Symposium, 2006, Proceedings of the 4th World Fisheries Congress, May 2-6, 2004, Vancouver, British Columbia, Canada.

Minaskuat Limited Partnership. 2008. Water and Sediment Modelling in the Lower Churchiull River, Lower Churchill Hydroelectric generation Project. Prepared for Newfoundland and Labrador Hydro Report No. MIN0338.22.

Northland Associates Ltd. 1980. Biophysical Assessment of the Proposed Lower Churchill Transmission Line. Volumes I and II.

Northwest Hydraulic Consultants (NHC). 2008. Lower Churchill Hydroelectric Generation Project Sedimentation and Morphodynamics Study – Final Report. AMEC Earth & Environmental, Newfoundland and Labrador Hydro, February 2008.

Riche, Lester G. 1965. A Preliminary Biological Survey of the Naskaupi, Kenamu and Lower Churchill Rivers, Fish Culture Development Branch, Newfoundland Area.

Ryan, P.M. 1980. Fishes of the Lower Churchill River, Labrador. Fisheries and Marine Service Technical Report No. 922.

Smokorowski, K.E. and Derbowka, D. 2007. Draft: Methods of Measuring Productive Capacity in Canada: Summaries for review at a national workshop, October 15-16, 2007. Can. Tech. Rep. Fish. Aquatict. Sci. iii + 146 p + Appendices.

Tetra Tech Inc. 2008. Lower Churchill Hydroelectric Generation Project Environmental Baseline Report: Assessment of the Potential for Increase Mercury Concentrations. Prepared for: AMEC Earth & Environmental, St. John's, NL. iii + 51 pp.

IR# JRP.108

Communities (Mitigation and Compensation)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.108**

Subject - Communities (Mitigation and Compensation)

References:

EIS Guidelines, Section 4.6.1 (Mitigation)

EIS, Volume IA, Section 4.4.5 (Traffic)

EIS, Volume III, Section 4.5.5 (Socio-economic Effects Analysis and Effects Management)

Related Comments / Information Requests:

CEAR # 162 (Captain Alex Saunders)
CEAR # 174 (V. Kerby)
CEAR # 178 (Town of Happy Valley-Goose Bay)
CEAR # 180 (D. Steele, Memorial University of Newfoundland, Natural History)
CEAR # 183 (Central Labrador Environmental Action Network)
CEAR # 184 (Sierra Club Atlantic)
CEAR # 185 (S. Pottle - Memorial University of Newfoundland, Faculty Submission)

Rationale:

The EIS Guidelines require the Proponent to identify "mitigation measures which would reduce or offset adverse effects on communities affected by the Project;" (p.37) and that the Proponent shall describe "…in general terms …. (b) [a]ny Compensation arrangements for local, public or private providers whose burdens and costs are increased or who incur losses as a result of the Project." (p.38).

The EIS indicates that the Project will have some impact on the Upper Lake Melville area, for example reduction in the life-expectancy of the Happy Valley – Goose Bay landfill, increased passenger traffic at the airport, increased congestion on roads in the area, added demand to the regional healthcare facilities and potentially other socio-economic impacts arising from increased labour demands, demands for housing and other negative impacts (volume III – p.4-17 to 4-20). The EIS indicates that these impacts will not be significant. The primary mitigation strategy to manage these impacts is the use of work camps removed from HVGB and surrounding communities, consultation and liaison with various municipal and other stakeholders, and a suggestion that responsible companies/organizations will respond to the increased demands as part of their normal business mandate. However, there is no indication in the EIS if the Proponent plans to offer any grants or other financial compensation to the affected Communities.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.108**

Subject - Communities (Mitigation and Compensation)

Information Requested:

The Proponent is asked to explain whether it proposes to provide any financial or other compensation to the municipalities and other service providers at the community level in the Project area (Happy Valley-Goose Bay, Northwest River and Sheshatshiu and Mud Lake), and if so, under what circumstances.

Response:

Based on the assessment of effects of the Project to communities in the EIS, Nalcor Energy (Nalcor) has not identified any areas where compensation to municipalities and other community service providers would be required.

While the potential for increased demand for municipal services exists, the businesses and residents that create those demands are taxpayers of the affected municipalities.

Since municipalities and community service providers are funded by the Government of Newfoundland and Labrador, any requirements for funding as a result of the Project would be coordinated with Government, and the determination of whether funding would be provided by Government will ultimately be made by Government. In addition to providing operating funding for community organizations, Government has provided or committed funding for the following initiatives (Table 1), as a minimum, throughout Labrador since 2003.

Table 1 Initiative Funding

Initiative	Department	Funding ($M)
Northern Strategic Plan	Labrador and Aboriginal Affairs	430.0
Trans Labrador Highway	Transportation and Works	359.8
Hospital – Lab West	Health and Community Services	59.0
College of North Atlantic - Lab West	Education	22.0
Long-term Care Facility	Health and Community Services	20.0
College of North Atlantic - HVGB	Education	5.5
Lawrence O'Brien Auditorium	Municipal Affairs	4.0
Francophone School	Education	2.3
Labrador Grenfell Health Admin Bldg	Health and Community Services	3.7
	Total	**906.3**

IR# JRP.109

Loss of Cabins (Compensation)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.109**

Subject - Loss of Cabins (Compensation)

References:

EIS Guidelines, Section 4.6.1.1 (Compensation)

EIS Volume II, Section 2.8.16.3 (Innu Camp Locations)

EIS, Volume III, Section 5.6.2 (Residual Environmental Effects and Significance)

Related Comments / Information Requests:

CEAA #199 (S. Davis)
CEAR # 203 (Hydro-Québec)

Rationale:

The EIS Guidelines require the Proponent to describe, in general terms, proposed compensation programs and arrangements for losses relating to property and use.

The EIS states that "[t]welve of the 22 cabins identified along the lower Churchill River will be **permanently affected** by reservoir preparation and impounding. Nalcor Energy has notified cabin owners at an early stage in the Project planning process of the potential effects of the Project on these cabins." (p. 5-34) (emphasis added)

In addition, the EIS identifies that "[b]etween 1990 and 2002, 43 camps were established along the TLH and Esker Road… Sheshatshiu Innu make frequent trips along the Churchill Road and in the Grand Lake area to harvest fish and hunt migratory waterfowl and large and small game (p.2- 83).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.109**

Information Requested:

The Proponent is asked to clarify whether:

a. **the 22 cabins identified by the Proponent as being permanently affected are subject to either a Recreational Cottage Licence or Recreational Cottage grant as issued by the Newfoundland and Labrador Department of Environment and Conservation (Lands Division);**

Response:

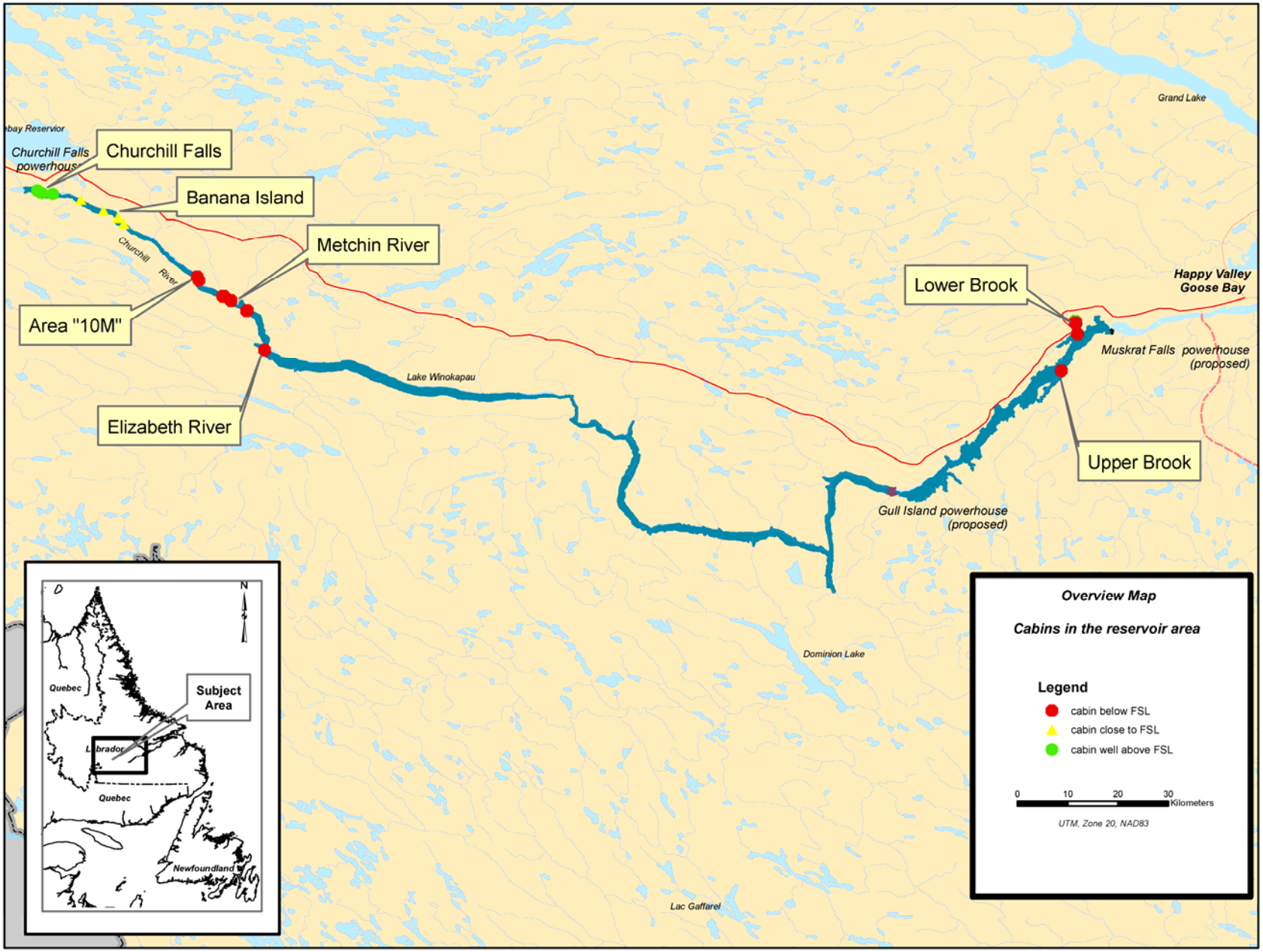
As indicated in Section 5.5.5.1, Volume III of the EIS (page 5-14), only 12 of the identified cabins will be permanently affected. Nalcor Energy (Nalcor) has been advised by the Province that 10 of these 12 cabins are subject to a License to Occupy, and that none of the cabins are subject to a Recreational Cottage License or Recreational Cottage Grant.

Nalcor understands that all of the authorizations relating to the affected cabins either expire prior to reservoir creation or may be terminated within 30 days notice by the Minister of Environment and Conservation.

As a historical reference, the Government of Newfoundland and Labrador committed not to permit development that would interfere with the construction of the Project in the *Lower Churchill Development Act*, RSNL 1990 Ch. L-27, Appendix, Sections 6.2 to 6.3.

The identified cabins in the Project area are shown in Figure 1.

Figure 1 Cabins in the Reservoir Area



Requesting Organization – Joint Review Panel **Information Request No.: JRP.109**

Information Requested:

The Proponent is asked to clarify whether:

b. compensation will be offered to cabin users that suffer permanent loss of cabin use due to the Project. If so, describe, in general terms, the planned compensation programs and arrangements; and

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Response:

Nalcor is not aware of any occupancy rights granted to cabin users that would be interfered with by the Project. In the event that there are any existing valid occupancy rights that are likely to be affected by the Project, these will be considered on a case by case basis by Nalcor.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.109**

Information Requested:

The Proponent is asked to clarify whether:

c. **the Proponent has determined (for the 10 other cabins located within the Assessment Area, which are not likely to be permanently affected) if these cabin users may be temporarily affected at any point during the construction and operation & maintenance phases. If so, describe the potential for temporary disturbances.**

Response:

The 10 cabins in the Project area that will not be permanently inundated may be affected temporarily during construction and the operation and maintenance phases as follows:

1. Normal construction activity such as tree cutting, equipment movement, and blasting and transportation of rock will cause noise levels to be louder than normal and traffic levels to be greater than typical. The net affect on cabin owners will depend on their proximity to the construction site and the coincidental timing of their usage of their cabins with Project construction activities. IR# JRP.87 addresses the noise impacts on areas of interest, including cabins.
2. Inundation will result in the loss of rapids and other fast flowing areas of the river, which will affect visual aesthetics as described in Section 5.5.5.2 (Volume III) of the EIS. Depending on the location of the cabin and proximity to the river, the viewshed of cabin owners could be affected. The potential effects to navigation and snowmobile use are addressed in IR# JRP. 34, IR# JRP.36, IR# JRP.71 and IR# JRP.72. Downstream of the Muskrat Falls facility, the Project is expected to have little to no effect on current flow conditions in terms of magnitude and timing.

IR# JRP.110

Trapping (Compensation)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Subject - Trapping (Compensation)

References:

EIS Guidelines, Section 4.6.1.1 (Compensation)

EIS, Volume III, Section 5.5.5 (Environmental Effects Analysis and Effects Management – Construction) and Section 5.6.2 (Residual Environmental Effects and Significance)

Related Comments / Information Requests:

CEAR #180 (R.Gibson & D. Steele)
CEAR # 203 (Hydro-Québec)

Rationale:

The EIS states that "[l]oss of any established trap lines as a result of reservoir inundation will be permanent and localized to the areas of the reservoir. Trappers will be compensated by Nalcor Energy if they can demonstrate continuous and successional use." (p. 5-34).

The EIS Guidelines require the Proponent to describe, in general terms, proposed compensation programs and arrangements for losses relating to "access, harvests, added harvesting efforts and costs that may be incurred by users of the land and its resources (e.g. tourism operators, trappers, subsistence hunters)" (p. 38). The EIS Guidelines also require that the Proponent make a comparison with compensation programs for other projects and other resource development activities.

With regards to the details of the compensation program, the EIS mentions that it "will be developed as the Project proceeds." (Volume III, p. 5-11)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

a. **provide detailed information on the planned trapping compensation program, including when it will be fully developed and operational;**

Response:

The Trapping Compensation Program (TCP) will be finalized and in place prior to commencing construction.

The TCP will be consistent with the following principles:

- respect for Aboriginal and non-Aboriginal traditional land use;
- commitment to meaningful consultation;
- avoidance of impacts, where possible; and
- fair and equitable treatment of trappers affected by the Project.

In general, the TCP is likely to be consistent with the following framework:

- trappers and their activities that may be affected by the Project will be identified through Nalcor Energy's (Nalcor's) consultation program and through the provision of information by trappers to Nalcor, including providing Nalcor with an understanding of the trapper's continuous and successional use of the area for trapping activities (i.e., historic, persistent and current use of the Project area for trapping activities for at least ten years prior to start of Project construction);
- providing information to identified trappers regarding Nalcor's TCP and the appropriate contact people within Nalcor;
- Nalcor will provide information to identified trappers about Project-related activities, including the provision of maps, so that the feasibility of avoiding or mitigating its potential effects on trapping activities can be determined;
- in the event an actual or future loss is identified by a trapper, the trapper must demonstrate this loss to Nalcor in a standardized form, including providing evidence such as pictures;
- if a loss is demonstrated, compensation will be paid to the trapper by Nalcor, including reimbursement in kind, or cash payment;
- compensable losses may include:
    - Present and future loss of income;
    - Cost of temporary and permanent relocation;
    - Loss or damage to property or equipment used in trapping;
- compensation will be based on current market values, and will be finalized in consultation with trappers; and
- Nalcor will endeavour to settle the compensation claim promptly in a manner mutually agreeable among parties.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

b. explain the criteria to be used to determine applicability of the program;

Response:

Please see the above response to part (a) of this IR.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

c. **explain how this compensation program would compare with other compensation programs of a similar nature;**

Response:

While final details of the TCP are not available now, and the finalized TCP will be specific to the Project, the TCP may draw upon experience from other examples such as that employed by Manitoba Hydro (1975), the Petroleum Industry in British Columbia (2006) or industrial activity in general in Alberta (2008).

References:

BC Trappers Association and Canadian Association of Petroleum Producers. 2006. BC Registered Trapper and Petroleum Industry Agreement on Notification and Compensation. Accessed on internet on 8 July 2009 (https://www.cagc.ca/_files/news/20070115084957.pdf)

Government of Alberta. 2008. 2008-2009 Alberta Guide to Trapping Regulations. Edmonton, AB. Accessed on internet on 10 August 2009 (http://www.albertaregulations.ca/trappingregs/additional-info.htm#compensation)

Manitoba Hydro. 1975. Northern Flood Agreement. Office of the Arbitrator, Winnipeg, MN. Accessed on internet on 14 July 2009 (http://www.nfa-arb.org/agmnt/sched_d)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

d. explain how "continuous and successional use" would be determined and defined;

Response:

Please see the above response to part (a) of this IR. Examples of documented activity could include one or more of the following:

- receipts from sales at fur auctions in Canada over this period;
- affidavits from Conservation Officers or others familiar with the activity of the trapper; and/or
- personal journals, records or other documentation of such activity.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

e. **explain how the Proponent would proceed with compensation if there are disagreements over demonstrations of "continuous and successional use"; and**

Response:

All claims in advance of the Project or as a result of damage that occurs as a result of the Project, are to be submitted directly to Nalcor. If the issue cannot be resolved satisfactorily, the trapper and Nalcor may agree to resolve the claim with the assistance of a mutually acceptable, impartial third party or parties, who will facilitate negotiations such as a mediator or arbitrator.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.110**

Information Requested:

The Proponent is asked to:

f. describe proposed dispute resolution mechanisms.

Response:

Please see the above response to part (e) of this information request.

IR# JRP.111

Rehabilitation Programs

Requesting Organization – Joint Review Panel **Information Request No.: JRP.111**

Subject - Rehabilitation Programs

References:

EIS Guidelines, Section 4.6.3 (Rehabilitation)

EIS Volume IA, Sections 4.4.1 (Construction – Gull Island), 4.4.2 (Construction – Muskrat Falls), 4.6.1 (Construction Site Restoration)

Related Comments / Information Requests:

IRs # JRP. 40, 114

Rationale:

The EIS Guidelines require that a plan of proposed rehabilitation measures should be submitted to address areas disturbed by temporary activities (e.g., access roads, off-loading facilities, construction camp(s), land clearing prior to inundation). The plan should discuss the rationale, objectives and procedures for proposed rehabilitation measures. A schedule for carrying out the work (e.g., seasonal requirements) shall be included in the plan. Appropriate materials (e.g., plant species, soils) shall be indicated.

Some information is provided on restoration and rehabilitation work for the construction site in the EIS, but the level of detail is insufficient to understand the suitability of proposed measures.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.111**

Information Requested:

The Proponent is asked to provide:

a. **the rationale, objectives, and procedures for completing the proposed site restoration and rehabilitation programs;**

Response:

The overall rationale of completing the proposed site restoration and rehabilitation programs is to mitigate the effects of construction activities, to reduce erosion, and to safeguard the aesthetic appeal of the landscape.

The objectives of the proposed Project Construction Restoration Plan will be to:

1. Achieve final site stabilization;
2. Enable future landscaping to flourish; and
3. To meet or exceed regulatory requirements (i.e. conditions of permits) and industry best practice.

The emphasis on site restoration and rehabilitation will be to begin early in the Project; detailed site-specific rehabilitation plans, including associated procedures, will be developed during the detailed design phase. Each area of the construction site will require careful consideration of the landscape within which the work is taking place. Areas will be priotized in terms of need and importance and the level of rehabiliation and restoration will be modified accordingly.

Issues that will be considered include:

- safety;
- the natural features of the area - vegetation, soil, hydrology;
- wildlife habitat considerations;
- riparian habitat considerations;
- the altitude and exposure and its effect on revegetation;
- the availability of materials and implications of importing material;
- land use and its effect on success of restoration techniques; and
- overall cost of rehabiliation and restoration measures.

Once these factors have been considered the plan will be developed and will include the information provided in Table 1.

Table 1 Site Rehabilitation Plan Outline

Section	Information
Introduction	Provides a brief introduction and a description of the area that the restoration site rehabilitation plan applies to
Responsible Party	Identifies key project personnel, including any financial and monitoring personnel necessary to ensure restoration success, as well as any personnel that will need to be notified
Baseline Information	Describes the historical and current conditions of the site (vegetation types and cover percentages, wildlife, hydrology, land use, soil, etc.) as well as the area and extent of the restoration site and surrounding landscape and resources. Photos showing the pre-construction and historical conditions will be provided if possible
Goals and Objectives	Lists the restoration goals and objectives that describe the extent of the mitigation and restoration of the site necessary to restore lost function, by resource type (e.g. hydrology, wetlands, wildlife, vegetation, soils, erosion control, grading, storm water management, etc.)
Design Criteria	Lists the criteria that will be used to asses whether the restoration goals have been met based on the performance standards that support the goals and objectives discussed above (survival rates and distribution, exposed soil percentages, soil movements, stream bank stability)
Work Plan	Explains what areas are to be restored, and the boundaries of the sites providing maps, plans, and/or figures as necessary. Discusses the timing and sequence of the restoration effort. A. Materials: Lists the materials and amounts that will be used, such as topsoil (salvaged, imported, compost), fertilizers, mulch, supplemental water sources if needed, and any other miscellaneous items (river rock, course woody debris, matting, etc.) B. Tree Replacement and Revegetation: Lists all of the native seeding, shrubs, and trees that are to be planted, if applicable. Include preparation activities for planting (marking and clearing of existing vegetation, grading, appropriate slope ratio), timing of seeding and planting, ratio of plants/seeding per acre, and measures taken to ensure the success of plantings (noxious weed control plan, fencing, stakes, browsing barriers, etc.). Provides a plan sheet indicating what areas will be seeded, planted, graded, etc. C. Exotic Invasive Species Control: Provides a plan on how exotic invasive vegetation will be controlled. Include what plants will be targeted, how they will be controlled (manual removal, spot treatment, types and amounts of herbicides, application methods, etc.) D. Riparian Area Restoration: Discusses the measures that will be taken to restore riparian areas, including areas and timing of disturbances, restoration of stream banks (soil, slope, pattern, profile, vegetation, etc.) placement of course woody debris, river rock, and erosion control measures.
Monitoring and Maintenance Plan	Outlines a site visitation schedule for five years or longer along with who will be responsible for the monitoring activities. For each visit, discusses how the site will be monitored/ documented to evaluate the sites progress (photos, surveying, etc.) Discusses what actions will be taken and by whom, if landscape features are found to be failing, and/or plants are not surviving.

Drawings will also be prepared which will include a plan view showing restoration and rehabilitation locations.

The development of the plan will be done in conjunction with stakeholders and with the appropriate regulators. Following finalization the plan will be submitted to the appropriate regulator for review and comment. Site rehabiliation and restoration plans will then be included in tender packages for prospective bidders upfront, prior to the start of construction.

On some sites there may be little natural material available. Nutrient poor soils and a shorter growing season may also slow down and reduce the rate of recovery. In these cases it may be necessary to import seed, mulches or geotextiles to artificially improve the process for key areas.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.111**

Information Requested:

The Proponent is asked to provide:

b. a schedule for carrying out the work; and

Response:

As indicated in Section 4.4.1.1, Volume IA of the Environmental Impact Statement (EIS), p 4-33, restoration will be completed as soon as a location or area is no longer needed, or construction has been completed at a site.

Once all area selections are finalized, and the schedule of work at each construction area has been developed in detail, a detailed schedule for carrying out the work will be developed in accordance with regulatory requirements and will also consider industry best practice for implementation of site restoration and rehabilitation.

The site-specific rehabilitation and restoration plan will indicate timing of the restoration works for each area to be restored. Under the current Project schedule, restoration and rehabilitation for the Gull Island construction site is scheduled to begin in Year 7 and will be completed in Year 8. Restoration and rehabilitation for the Muskrat Falls construction site is scheduled to begin in Year 9 and will be completed in Year 10.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.111**

Information Requested:

The Proponent is asked to provide:

c. **evidence, for each type of restoration or rehabilitation, of the proposed method's effectiveness by supplying examples from previous or on-going projects.**

Response:

Specific restoration or rehabilitation approaches will be developed in consultation with regulatory requirements and industry best practice. The basic approaches used for restoration and rehabilitation include:

- removing overburden and organic material for re-use;
- re-grading areas to control erosion and establish suitable drainage;
- replacing the overburden and organic material to produce conditions for re-growth; and
- encouraging natural re-vegetation, or re-planting with suitable vegetation.

These approaches have been and are currently being used on a broad variety of construction activities. Nalcor Energy (Nalcor) is highly confident that a plan developed in consultation with appropriate regulatory authorities and best practices will accomplish its intended goals.

With respect to Nalcor's activities, Newfoundland and Labrador Hydro, a subsidiary of Nalcor, has developed and rehabilitated construction areas associated with a number of recent hydroelectric developments, including:

- Hinds Lake, completed in 1980;
- Upper Salmon, completed in 1983;
- Cat Arm, completed in 1984; and
- Granite Canal completed in 2003.

The experience at these sites has provided the following major learnings:

- the natural regeneration of vegetation at Upper Salmon occurred at a slower rate than expected; and
- the re-vegetation of the areas in the vicinity of the fish compensation facility at Granite Canal has proven to be very effective, and the program was very effective at establishing riparian vegetation.

The lessons learned from these past rehabilitation programs, and programs carried out by other proponents will be incorporated into the rehabilitation plan for the Project.

IR# JRP.112

General Question on Monitoring and Follow-up

Requesting Organization – Joint Review Panel **Information Request No.: JRP.112**

Subject - General Question on Monitoring and Follow-up

References:

EIS Guidelines Section 4.6.4 (Monitoring and Follow-up Programs) EIS Volume IA, Section 9.10 (9.10 Monitoring and Follow-up for Valued Environmental Components)

EIS Volume IIA, Sections 3.12 (Atmospheric Environment – Monitoring and Follow-up) & Section 4.17 (Aquatic Environment – Monitoring and Follow-up)

EIS Volume IIB, Sections 5.16 (Terrestrial Environment – Monitoring and Follow-up) & 7.3 (Terrestrial Environment – Conclusions and Sustainability – Monitoring and Follow-up)

EIS Volume III, Sections 3.9 (Economy, Employment and Business – Monitoring and Followup), Section 4.9 (Communities – Monitoring and Follow-up), Section 5.7 (Land and Resource Use – Monitoring and Follow-up), Section 6.7 (Cultural Heritage Resources – Monitoring and Follow-up), Section 8.3 (Socio-economic Conclusions and Sustainability – Monitoring and Follow-up)

Related Comments / Information Requests:

CEAR # 170 (Fisheries and Oceans Canada)
CEAR # 171 (Health Canada)
CEAR # 173 (Environment Canada)
CEAR # 183 (Central Labrador Environmental Action Network)
CEAR # 184 (Sierra Club Atlantic)
CEAR # 199 (S. Davis)
CEAR # 202 (Natural Resources Canada)
CEAR # 203 (Hydro-Québec)
CEAR # 205 (Government of Newfoundland and Labrador – Water Resources Management Division)

Rationale:

The EIS Guidelines (Section 4.6.4) require the Proponent to describe the environmental and socio-economic monitoring and follow-up programs to be incorporated into construction, operation and maintenance activities.

In Volume IA (Section 9.10) Nalcor states that "the description of the proposed monitoring and follow-up programs [in the EIS] includes a general discussion of program elements to the level of detail allowed at the time of writing the EIS. At this stage of Project planning, the information is described at an overview level. It is anticipated that prior to Project construction and as a condition of Project approval, Nalcor Energy will be required to submit fully detailed monitoring plans for review to appropriate agencies".

A number of intervenors have indicated that there is a lack of information on future monitoring and follow-up programs for a number of Project components including, <u>but not limited to</u>:

- formation and stabilization of Gull Island and Muskrat Falls reservoirs;
- bank erosion;
- reservoir-triggered seismicity;
- hydrological regime, including flushing rate of reservoirs and downstream areas;
- water quality and quantity;

- primary and secondary productivity of reservoirs;
- future habitat utilization within reservoirs, including the type of community structure anticipated (i.e. species composition and abundance);
- mortality due to entrainment;
- mercury bioaccumulation;
- mercury levels in fish and fish-eating wildlife;
- sediment dynamics;
- infrastructure downstream of Muskrat Falls;
- riparian habitat; and
- ashkuis.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.112**

Information Requested:

The Proponent is asked to provide table(s) that summarize all proposed monitoring and follow-up programs and include general schedules over the course of construction and operation.

In addition, for each proposed monitoring and follow-up program, the Proponent is asked to provide to the extent possible:

a. **monitoring objectives;**

b. **proposed thresholds at which to initiate monitoring;**

c. **proposed frequency, duration and geographic extent of monitoring;**

d. **sampling design, including methodology, frequency, duration and geographic extent of monitoring and justification for the extent;**

e. **the role the Proponent sees itself playing in the monitoring program;**

f. **reporting mechanisms;**

g. **procedures to assess the effectiveness of monitoring and follow-up programs; mitigation measures and recovery programs;**

h. **procedures to assess the effectiveness of monitoring and follow-up programs, mitigation measures and recovery programs for areas disturbed by the Project;**

i. **adaptability of the Project and application of adaptive management to refine or modify the design and implementation of management plans, mitigation measures and Project operations where necessary;**

j. **criteria the Proponent would apply to determine that adaptive management measures are necessary given follow-up and monitoring results;**

k. **examples of adaptive management measures that could be applied for VECs/KIs in order to refine and optimize monitoring and mitigation measures;**

l. **approaches and methods for monitoring the cumulative effects of the Project with existing and future developments in the Project area; and**

m. **experience gained from previous and existing monitoring programs.**

Response:

This response addresses the information requested above in sections and subsections that, to the extent practical, follow the order of the questions asked. However, because of the difference in Monitoring and Follow-up, the two terms and related discussion have been separated to avoid confusion.

In addition, Nalcor Energy (Nalcor) will have Environmental Inspectors (Environmental Monitors) on-site during the construction, to supervise, and as appropriate, provide environmental advice on the activities being conducted so that the commitments made in the EIS are followed. This could include overseeing activities such

as the clearing of timber within the reservoirs, the dam sites, and the transmission line right-of-way, or completion of mitigation (e.g., riparian habitat).

Final details of Monitoring and Follow-up relating to the Lower Churchill Project will be developed prior to construction and will incorporate the results of the Joint Review Panel hearing process. In accordance with s. 11 of the *Canadian Environmental Assessment Act*, environmental assessment "is to be conducted as early as is practicable in the planning stages of the project and before irrevocable decisions are made." This means that some detailed information concerning a project may not be available during the environmental assessment phase, including the finalization of proposed monitoring and follow-up programs. Monitoring (regulatory compliance) requirements will be finalized in consultation with the appropriate regulatory bodies (e.g., Department of Fisheries and Oceans Canada) and Follow-up programs will be finalized prior to construction and will incorporate the results of the Joint Review Panel hearing process. This response provides the Joint Review Panel with the strategy that Nalcor will use in the development, finalization and the implementation of the proposed Monitoring and Follow-up.

The strategy uses the following definitions when dealing with 'monitoring' and 'follow-up', consistent with the EIS Guidelines 4.6.4 .

> *Monitoring - programs that determine whether the Project is implemented as proposed, and that mitigation and compensation measures to minimize the Project's environmental effects are implemented and effective (i.e., compliance). These programs are generally set at the time of the Project's authorization and the requirements pertain to the relevant laws and regulations.*
>
> *Follow-up – The Act defines "follow-up program" as a program for:*
>
> 1. *verifying the accuracy of the environmental assessment of a project, and*
> 2. *determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.*

In addition, Nalcor will have Environmental Inspectors (sometimes referred to as Environmental Monitors) on-site during the construction, to supervise, and as appropriate, provide real-time environmental advice on the activities being conducted so that the commitments made in the EIS are followed. This could include overseeing activities such as the clearing of timber within the reservoirs, dam sites, and the transmission line right-of-way, or completion of mitigation (e.g., creation of wetland habitat).

MONITORING

Monitoring plans will be developed under the guidance of the regulatory instruments applicable to the Project, and Nalcor will work with the appropriate regulators in the development, finalization and implementation of these plans. Examples of Monitoring would include:

- monitoring of effluent at the camp and sites as per the *Environmental Control Water and Sewer Regulations* under the *Water Resources Act*;
- The *Fisheries Act* s.35(2) authorization from the federal Department of Fisheries and Oceans Canada (DFO) will require monitoring as a condition of the authorization. The Compensation Plan will include a detailed monitoring program with criteria and timelines, and establish location(s) during reservoir preparation that will enhance freshwater fish habitat. Monitoring is expected to include bank stability and ice, including timing of formation/melt out, and area covered.

Objective

The objectives of the Monitoring will be to collect required data, using accepted approaches and methods, to ensure legislated compliance.

Thresholds for Monitoring Program Initiation

Monitoring Programs will be started and undertaken as outlined by the applicable legislation, permit or authorization.

Sampling Design, Frequency, Duration and Geographic Extent

All Monitoring Programs will provide a detailed methodology for the sampling consistent with applicable legislative requirements or guidelines, and the terms of applicable permits or authorizations. This could include, for example:

1. A detailed description of the sample locations, replicates, timing, frequency, quality control and quality assurance, etc;
2. Where applicable, a detailed description of the sample handling (e.g., collection procedure and chain-of-custody) and analysis to be conducted;
3. References to accepted methods in the published literature;
4. Statistical considerations in the sampling design;
5. Statistical considerations for data analysis following collection; and
6. A rationale for the choices used in the design.

For example, the Fish Habitat Compensation Plan is being developed in consultation with DFO, so that there is agreement on the approaches, methods and report structure, including sampling design, frequency, duration and geographic extent. The Project's Fish Habitat Compensation Plan will ultimately be submitted for approval to DFO.

Nalcor's Role in Monitoring

As appropriate, Nalcor will be responsible for managing, conducting and reporting, as it relates to the Monitoring, as well as implementation of efforts to address deficiencies noted during the Monitoring. Nalcor's responsibility for monitoring of Project effects on social services and infrastructure is discussed in response to IR# JRP.108. Nalcor will administer and coordinate all undertakings with respect to Monitoring and Follow-up with an Environmental Effects Monitoring Plan (EEMP).

Reporting Mechanisms for Monitoring

Monitoring reports will be generated consistent with applicable legislative requirements or guidelines, and the terms of applicable permits or authorizations.

Procedures to Assess the Effectiveness of Monitoring Programs

The effectiveness of Monitoring Programs will be assessed during the reporting phase. At that time, any deficiencies or limitations would be noted, and addressed as appropriate. This is an integral part of the Adaptive Management Process (Section 4 below) for the Project. In the unlikely event that Monitoring is found to be inadequate or inappropriate, corrective measures would be undertaken (e.g., additional sampling undertaken, duration of the program extended), as appropriate.

Adaptability of the Project and Application of Adaptive Management to Refine or Modify the Design and Implementation of Management Plans, Mitigation Measures and Project Operations where Necessary

The Adaptive Management Process for the Lower Churchill Project is outlined in Section 4 below. This process will provide for the analysis of the data collected during the Monitoring, and the implementation of changes to Project operations and mitigation measures, to the extent practical, where issues (e.g., mitigation is not functioning as predicted) are identified.

Criteria the Proponent Would Apply to Determine that Adaptive Management Measures are Necessary Given Monitoring Results

During monitoring, observations of data that exceed regulatory compliance criteria would initiate appropriate measures and responses through the Adaptive Management Process, and would include the appropriate regulatory notification.

Examples of Adaptive Management Measures for VECs / KIs

If Monitoring revealed a lack of compliance, measures taken would be specific to the VEC/KI. An example of the application of the Adaptive Management Process as discussed below in Section 4 for KIs as it relates to Monitoring is provided in Table 1.

Table 1 Adaptive Management Process

KI	Prediction	Potential Adaptive Management Measures if Prediction Wrong	Timeframe for Response
Fish Habitat	No net loss of productive fish habitat	Sample Action Increase the amount of fish habitat being created or increase the quality of the habitat being created, as appropriate	Action would be undertaken as soon as practical, after the Monitoring indicated that the prediction was incorrect

Approaches to Monitoring Cumulative Effects of the Project

Nalcor will keep informed (e.g., monitor Project and regulatory websites) of other projects considered in its cumulative effects assessment. Nalcor's approach to cumulative effects would be to manage their own Project responsibly, in relation to commitments and regulatory compliance, as it is not responsible for other projects that might overlap temporally and spatially with theirs.

Experience Gained from Previous and Existing Monitoring

Nalcor has recent experience in Monitoring, with respect to their Fish Habitat Compensation Plan for their Granite Canal. Nalcor worked with DFO to finalize the plan and conduct Monitoring to verify the success of the mitigation (e.g., brook trout habitat). The Monitoring proved that the mitigation, as designed and implemented was a success, with Nalcor receiving the National Hydro Power Association, "Outstanding Stewardship of American Rivers, 2005" award for their work. The experience and lessons learned (e.g., work with regulators, finalize the plan early) by successfully completing the Granite Canal project have been, and will be applied by Nalcor to this Project.

FOLLOW-UP PROGRAMS

A Follow-up Program is a study, designed and implemented for a specific biophyscial, social or economic component of the EIS, where Follow-up has been committed to by Nalcor. Elements of a Follow-up Program will be reviewed during the environmental assessment process and the requirements for Follow-up will be consistent with the recommendations of the Joint Review Panel. As such, it is not possible at this time to

present the details of the individual Follow-up Programs for review. The strategy provided in the following subsections outlines what the Follow-up Programs would typically contain, the general structure of the Follow-up Programs, how the Follow-up Programs will be reviewed, and the use of the resultant data.

Objective

As stated in the EIS, and consistent with the *Canadian Environmental Assessment Act*, the objective of a Follow-up Program will be to verify the accuracy of the assessment predictions and the effectiveness of proposed mitigation measures, and as appropriate, *implement adaptive management measures to refine and optimize mitigation and follow-up monitoring.* Each follow-up plan will have its own objectives specific to the plan.

Thresholds for Follow-up Program Initiation

Follow-up Programs will be undertaken in a timely fashion, considering the verification required. For example, surveys of new or altered habitat types (e.g., riparian habitat) for wildlife would likely incorporate adequate time to allow habitat establishment following inundation or mitigation generation (e.g., appropriate plant growth). Other Follow-up Programs would be expected to begin immediately following inundation, such as bank stability studies.

Sampling Design, Frequency, Duration and Geographic Extent

All Follow-up Programs will provide a detailed methodology for the sampling, as it is applicable to the specific program (i.e., environmental, social). This could include, for example:

1. A detailed description of the sample locations, replicates, timing, frequency, quality control and quality assurance, etc;
2. Where applicable, a detailed description of the sample handling (e.g., collection procedure and chain-of-custody) and analysis to be conducted;
3. References to accepted methods in the published literature;
4. Statistical considerations in the sampling design;
5. Statistical considerations for data analysis following collection; and
6. A rationale for the choices used in the design.

For example, if a Follow-up Program is related to verifying that new habitat is being used by beaver colonies, the frequency would relate to how often the new habitat would be surveyed, the geographic location of survey plots or transects, and the duration of the program. The duration of the Follow-up Program will be as long as needed to verify the effectiveness of mitigation measures and accuracy of predictions made in the EIS, but are expected to have a finite life span.

Nalcor's role in the Follow-up

As appropriate, Nalcor will be responsible for managing, conducting and reporting, as it relates to the follow-up, as well as implementation of efforts to address deficiencies noted during the Follow-up. Nalcor's responsibility for monitoring of Project effects on social services and infrastructure is discussed in response to IR# JRP.108. Nalcor will administer and coordinate all undertakings with respect to Follow-up with the EEMP.

Reporting Mechanisms for Follow-up

Reports will be compiled at the frequency outlined in the Follow-up Program design. The primary use of data collected during the Follow-up Programs is to inform the Adaptive Management Process (Section 4 below).

Where there is public or regulatory interest in the information, a distribution list and report frequency, will be presented in the Follow-up Plan.

Procedures to assess the effectiveness of Follow-up

The effectiveness of Follow-up Programs will be assessed during the reporting phase. At that time, any deficiencies or limitations would be noted, and addressed as appropriate. This is an integral part of the Adaptive Management Process (Section 4 below) for the Project. Where a Follow-up Program is found to be inadequate or inappropriate (e.g., not generating appropriate data), corrective measures would be undertaken (e.g., additional sampling undertaken, duration of the program extended), as appropriate.

Adaptability of the Project and Application of Adaptive Management to Refine or Modify the Design and Implementation of Management Plans, Mitigation Measures and Project Operations Where Necessary

The Adaptive Management Process for the Lower Churchill Project is outlined below in Section 4. This process will provide for the analysis of the data collected during the Follow-up Programs, and the implementation of changes to Project operations and mitigation measures, to the extent practical, where issues are identified (e.g., mitigation is not functioning as predicted).

Criteria the Proponent Would Apply to Determine that Adaptive Management Measures are Necessary Given Follow-up Results

The objective of each Follow-up Program would be to test the accuracy of the predictions made in the EIS for a given biophysical, social, or economic component that would be tested by analysis of the data collected, and verify the effectiveness of mitigation measures. The criteria for action through the Adaptive Management Process would be developed specific to a given program. This could include criteria such as "the habitat is being used by the target Key Indicator species"; the need for adaptation of the mitigation would occur if the criteria were not met. In general, if Project effects are not as predicted, adaptive management measures will be implemented to refine and optimize relevant mitigation and monitoring.

Examples of Adaptive Management Measures for VECs / KIs

If Follow-up Programs identified that predictions in the EIS were not correct, the associated adaptive management measures would be specific to the VEC/KI. Two examples of the application of the Adaptive Management Process (see Section 4 below) to KIs are provided in Table 2.

Table 2 Adaptive Management Process

KI	Prediction	Potential Adaptive Management Measures if Prediction Wrong	Timeframe for Response
Employment	The effects prediction is that the Project will make a positive substantial contribution to provincial employment particularly from capital expenditures in the construction phase	Sample Action - Increase recruitment efforts in Newfoundland and Labrador - Change Training to better match position requirements	Action would be undertaken as soon as practical, after the Follow-up indicated that the prediction was incorrect
Wetland Sparrows	The prediction is that Wetland Sparrows will use wetland habitat created for mitigation	Sample Action: - Sample other habitat along the reservoir to see if it is being used - Create additional habitat for Wetland Sparrows in the vicinity of the Project	Action would be undertaken as soon as practical, after the Follow-up indicated that the prediction was incorrect

Experience Gained from Previous and Existing Follow-up Programs.

Nalcor has recent experience in Follow-up Programs related to their Granite Canal, where, for example, a Follow-up Program was undertaken to study the effects of that project on caribou. The experience and lessons learned (e.g., finalize the plan early) by successfully completing the Granite Canal project have been, and will be applied by Nalcor to this Project.

List of Follow-up Programs

Based on the information gathered to-date and the findings of the environmental assessment, the proposed Follow-up Programs are presented in Table 3, as summarized from Table 7-3, Page 7-8 in Volume IIB, and Table 8-3, Page 8-7, Volume III of the EIS.

Table 3 Proposed Follow-up Programs

VEC/KI (Issue)	Overview of Proposed Follow-up Program	Area/ Location	Pre-Construction	Construction	Operation
Aquatic Environment - Ashkui (Location of formation and use by waterfowl)	Aerial surveys of river and surrounding locations Temporal use of traditional ashkui locations	Lower Churchill River	X	X	X
Aquatic Environment – entrainment	Nalcor will collect data on entrainment	Both Muskrat Falls and Gull Island facilities			X
Atmospheric Environment – GHG (Levels of emissions of GHGs from reservoirs)	The program will monitor points along the river, above and below the dams at Gull Island and Muskrat Falls, throughout each reservoir, and downstream from each tailrace and active spillway	Above and below the dams at Gull Island and Muskrat Falls, throughout each reservoir, and downstream from each tailrace and active spillway	X	X	X
Black Bear (incidental take of black bear during construction)	Re-deploy GPS/VHF collars on bears in the river valley Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project	Study Area	X	X	X
Beaver (success of relocation)	Periodic surveys will be conducted in preestablished block to verify presence/absence of Beaver colonies. Survey for active Beaver colonies near the areas to be flooded. Live trap and relocate animals to suitable alternative habitat prior to impounding. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project	Study Area		X	X
Marten (population reduction)	Trapping data will be accessed for comparison with pre-Project trapping data	Study Area		X	X
Porcupine (population reduction)	Transect surveys for winter tracks will be conducted to confirm presence/ absence Trapping data will be accessed and assessed for comparison with pre-Project trapping data Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project	Study Area		X	X

VEC/KI (Issue)	Overview of Proposed Follow-up Program	Area/ Location	Pre-Construction	Construction	Operation
Caribou (Effects on endangered RWM Herd)	Continue role on the Labrador Woodland Caribou Recovery Team regarding the RWM Herd and support telemetry work with the wildlife division; interact with other stakeholders and management efforts, especially for RWM Herd	Entire Project Area	X	X	X
Economy, Employment and Business (distribution of business expenditures)	Measure proportion of Project expenditures made within Province and Labrador. Project expenditures by amount, type, location and type of contractor (e.g., Aboriginal/non-Aboriginal). Data collected and compiled by Nalcor Energy and reported to government on quarterly basis	Newfoundland and Labrador		X	X
Economy, Employment and Business (distribution of employment benefits)	Measure proportion of Project employment involving residents of Province and Labrador. Project employment by number employed, location of primary residence, occupational category, gender, Aboriginal status. Data collected and compiled by Nalcor Energy and reported to government on quarterly basis	Newfoundland and Labrador		X	X
Economy, Employment and Business (distribution of employment benefits)	Understand effectiveness of employment policies. Reasons for quitting Project employment; Nalcor Energy exit surveys	Newfoundland and Labrador		X	X
Communities (Project impacts on community infrastructure)	Provide government and community agencies with information to facilitate their planning regarding the provision of physical infrastructure and services; Project activities and plans(employment, traffic volumes, heavy loads, solid waste); activities and plans communicated on a quarterly basis	Newfoundland and Labrador		X	X
Communities (distribution of employment benefits)	Understand employment challenges; reasons for quitting Project Employment; Nalcor Energy exit surveys	Newfoundland and Labrador		X	X
Communities (changes in content of mercury in human population)	Establish baseline exposure of humans to mercury; data collected by Nalcor Energy prior to Project commencement	Newfoundland and Labrador	X	X	X
Communities (changes in fish consumption restrictions because of mercury content)	Monitor mercury levels in fish as Project proceeds; data collected and compiled by Nalcor Energy on an annual basis for the first 10 years following impoundment, frequency thereafter determined by results	Newfoundland and Labrador		X	X
Land and Resource Use (changes in land use patterns)	Provide government and community agencies with information to facilitate their planning regarding land and resource use; activities and plans communicated on a quarterly basis	Newfoundland and Labrador		X	X
Land and Resource Use (access to Mud Lake community)	Establish and communicate ice conditions during formation and break up; seasonal ice testing	Below Muskrat Falls and in Reservoirs			X
Land and Resource Use (reduction on the culturally sensitive plant species)	Areas of relocated Canada Yew plants will be evaluated	Islands within and areas adjacent to the reservoirs		X	X

VEC/KI (Issue)	Overview of Proposed Follow-up Program	Area/ Location	Pre-Construction	Construction	Operation
Cultural and Heritage Resources (disturbance of existing sites)	Identify any additional Historic and Archaeological Resources; pre-construction Stage I HROA and route of any permanent access roads	Project Components	X		
Wetland Sparrows (reduction in song bird populations by Project)	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project.	Study Area		X	X
Moose (changes in moose populations numbers or distribution)	Winter aerial and ground and/or GPS telemetry surveys of key Moose wintering areas and locations where habitat will be removed. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project.	Study Area	X	X	X
Osprey (success of relocated osprey nests)	A survey for active Osprey nests (and other raptors) will be completed within 800 m of the proposed construction zone (mitigation for active raptor nests will be determined in consultation with the NLDEC Wildlife Division).	Study Area	X	X	X
Ruffed Grouse (change in population because of change in habitat)	Surveys of forest avifauna will be carried out at key intervals during construction, and operation and maintenance Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project.	Muskrat Falls Area	X	X	X
Wetland Sparrows (Changes in habitat will affect population)	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project.	Affected areas and in areas proposed for wetland enhancement and creation	X	X	X

CONTINUOUS IMPROVEMENT AND ADAPTIVE MANAGEMENT

Continual improvement is one of the tenet's of Nalcor's Environmental Policy and Guiding Principles as presented in Section 1.1.2 of Volume IA of the EIS. There are many ways to achieve continual improvement, one of which is the concept of adaptive management.

The Operational Policy Statement issued by the CEA Agency entitled "Adaptive Management Measures Under the *Canadian Environmental Assessment Act*" defines adaptive management as a "planned and systematic process for continuously improving environmental management practices by learning about their outcomes. Adaptive Management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project."

Nalcor's approach to adaptive management is consistent with this definition and involves a systematic approach that builds on trial and error utilizing feedback loops to facilitate learning from experience and to adjust practices to address evolving issues and conditions. This is illustrated in Figure 1 below. Adaptive management will include quantifying management and scientific uncertainties and sensitivities, predicting ranges of potential changes, and developing testable management options and scenarios. It includes planning for and managing those changes to reduce management risks or to take advantage of potential new opportunities that may present themselves.

Nalcor's Adaptive Management strategy includes:

1. Design of a conceptual model based on local conditions.
2. Develop management plan (goals, objectives, and activities).
3. Develop monitoring and/or follow-up programs.
4. Implement management and monitoring/follow-up programs.
5. Analyze data and communicate results.
6. Use results to evaluate the attainment of goals and objectives.
7. If necessary, adapt.
8. Conduct iterations of process until goals and objectives are met.

Adaptive management will be a key element of any monitoring and follow-up program undertaken by Nalcor for the Project.

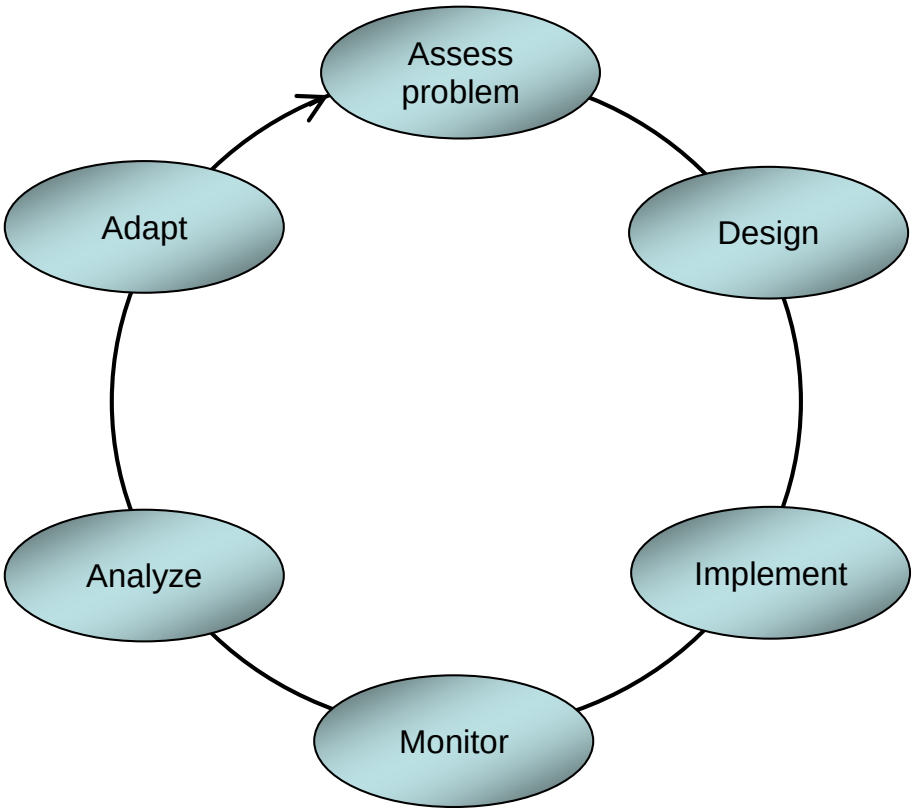

Figure 1 Adaptive Management Process

IR# JRP.113

Land and Resource Use Monitoring

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Subject - Land and Resource Use Monitoring

References:

EIS Guidelines, Section 4.6.4 (Monitoring and Follow-up Programs)

EIS, Volume III, Section 5.5.7 (Identification of Cumulative Environmental Effects)

Related Comments / Information Requests:

CEAR # 173 (Environment Canada)

Rationale:

The EIS states that:

> Monitoring and managing changes in the distribution and intensity of Land and Resource Use is the responsibility of the provincial and federal government departments and agencies that administer and manage land and resource use activities. Nalcor Energy will provide **Project-related information** on a quarterly basis to government resource management authorities. (Vol. III, p. 5-37) (emphasis added).

Also:

> The results of follow-up and monitoring programs will be used to verify environmental effects predictions, and measure the efficacy of effects management measures for fish and wildlife. Accordingly, **adaptive management measures will be undertaken pending the results of these programs**, in consideration of land and resource use patterns and will be used to refine and optimize related monitoring and mitigation measures, if needed." (Vol. III, p. 5-37) (emphasis added).

With regards specifically to management and mitigation of cumulative effects on Land and Resource Use, the EIS states that:

> As stated above, the need for additional management and mitigation of this environmental effect will likely only become apparent as patterns of land use adapt to the new access routes, and any potential issues (i.e., areas that may become subject to overuse) become apparent. If such issues do arise, provincial regulations and adaptive management strategies related to hunting, fishing and trapping would likely be able to mitigate these environmental effects. (…) As an active Proponent in the Assessment Area, Nalcor Energy will be able to contribute to regional planning/management initiatives for environmental effects monitoring, **proportional to the nature and level of Project environmental effects**.(Vol. III, p. 5-32) (emphasis added).

The EIS Guidelines require the Proponent to describe, with respect to monitoring programs: "[t]he sampling design, methodology, selection of the subjects and indicators to be monitored, and their selection criteria" and "[r]eporting and response mechanisms, including criteria for initiating a response and procedures" (p. 39)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

a. **explain how the Proponent would ensure that the responsibility for monitoring land and resource use changes between the construction and operation and maintenance phases happens in an appropriate manner between itself and government authorities;**

Response:

As indicated in the EIS, monitoring Land and Resource Use is the responsibility of the applicable provincial and federal agencies. This government responsibility extends through construction and into the operation and maintenance phase, and Nalcor Energy (Nalcor) does not envision sharing this responsibility with the federal and provincial governments.

Nalcor has committed to provide Project-related information in order to assist the responsible authorities to carry out their responsibility, but the nature and extent of this information would be based on the requirements of the responsible government agencies.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

b. provide further details on the type and nature of information that would be provided to government resource management authorities related to changes in distribution and intensity of Land and Resource Use as a result of the Project and whether this information would be made public;

Response:

As Nalcor does not see itself responsible for monitoring land and resource use, it is not currently contemplating the collection of information in support of this activity. Nalcor will provide government and community agencies with Project information to facilitate their planning, on a quarterly basis.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

c. **describe the adaptive management measures the Proponent would implement if unanticipated Project-related effects on distribution and intensity of Land and Resource Use occur;**

Response:

The adaptive management process to be used to address unanticipated Project related effects is outlined in IR# JRP.112. The process is based on monitoring and follow-up plans with specific objectives. Until Nalcor decides a follow-up plan is required or is directed to prepare one under specific legislative authority, it is not possible to describe adaptive management measures to be applied to a specific problem. However, the process described in IR# JRP.112 outlines the adaptive management process that would be developed and implemented through consultation with the regulatory agencies.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

d. describe the criteria the Proponent would apply to determine that adaptive management measures are necessary;

Response:

The adaptive management process is based on a specifically designed plan with defined objectives. The plan would also describe the parameters that would be evaluated in analyzing the data collected during the follow-up activity. The analysis would also determine whether or not an action would be necessary to address the problem under study. Also, please refer to the response to IR# JRP.112.

Each follow-up study is unique; therefore any criteria or follow-up activity would be unique to the particular issue.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

e. **provide examples of adaptive management measures that could be applied in order to refine and optimize monitoring and mitigation measures with respect to the distribution and intensity of Land and Resource Use; and**

Response:

Because Nalcor sees little direct involvement in the monitoring and follow-up programs for land and resource use, examples of adaptive management measures are difficult to provide. Nalcor does provide examples of adaptive management measures that might be applied in relation to other follow-up programs in the response to IR# JRP.112S.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.113**

Information Requested:

The proponent is asked to:

f. **describe how the Proponent would determine what contribution it will make to regional planning/management initiatives on cumulative effects monitoring.**

Response:

Nalcor's contribution to regional planning and management initiatives on cumulative effects would be developed on a case-by-case basis and would be guided by the results of follow-up monitoring plans on specific topics.

IR# JRP.114

Environmental Protection Plans

Requesting Organization – Joint Review Panel **Information Request No.: JRP.114**

Subject - Environmental Protection Plans

References:

EIS Guidelines, Section 4.10 (Environmental Protection Plans)

Related Comments / Information Requests:

CEAR # 183 (Central Labrador Environmental Action Network)
CEAR # 200 (Grand Riverkeeper Labrador Inc.)

IRs # JRP.40, 111

Rationale:

The EIS refers to standard mitigations and adherence to environmental regulations/guidelines that would be incorporated in environmental Protection Plans (EPPs) for the various Project sites. These are to be prepared later at the time of construction (see for example Volume IIA, Section 4.3.1, p. 4-3). While this approach may be acceptable for "standard practice" elements of EPPs, the EIS needs to describe non-standard, site specific mitigation measures contained in EPPs so they can be assessed.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.114**

Information Requested:

The Proponent is asked to provide a list of the sites and activities for which non-standard mitigation measures will be applied and addressed and identify which EPP will describe these unique measures (e.g. reservoir preparation, riparian areas, ashkuis).

Response:

Several sites and activities will require non-standard mitigation measures. These sites and the EPP which will describe these unique measures are summarized in Table 1. For example, mitigation measures have been identified for ashkuis in association with fish habitat enhancement at the deltas of tributaries to the lower Churchill River (refer to IR# JRP.48). Ashkuis (open areas on the river during winter) are predicted to occur along the new shoreline where the lower Churchill River is met by a tributary. The influence of water temperature and velocity in the formation of ashkui (IR# JRP.48 and Figures 5-4 to 5-7 in Volume IIB) will also be considered during the fish habitat mitigation.

Table 1 Summary of Sites and Activities Requiring Non-Standard Mitigation Measures and Related EPP

Site	**EPP**
Riparian	The Reservoir Preparation Plan will include provisions to maintain a band of riparian vegetation, approximately 30 m in width at areas near the previous occurrence of such vegetation. Provisions for these areas will also be included in the site-specific EPP for reservoir preparation
Canada Yew Sites	Consideration for sites where Canada Yew will be transplanted (through the relocation of plants and/or introduction of cuttings) from existing plants will be included in the Reservoir Preparation Plan. A specific relocation plan for Canada Yew will also be developed
Rock Knoll at Muskrat Falls	Measures to reduce interaction with the rock knoll at the Muskrat Falls Site and to educate Project staff on the cultural significance of the rock knoll will be outlined in the General EPP for the Muskrat Falls construction site
Activity	**EPP**
Riparian Marsh	The formation of riparian marsh wetland will be encouraged at selected locations in the watershed. Such measures will be outlined in a rehabilitation plan. Rehabilitation works will be covered in a separate EPP
Deciduous Forest	Conditions for the establishment of deciduous hardwood forest will be created at selected locations adjacent to the Muskrat Falls Reservoir. Such measures will be outlined in the Reservoir Preparation EPP
Impoundment	A specific EPP will be developed for Impoundment and will include measures to mitigate downstream effects due to reduced flow and upstream effects due to inundation.
Reservoir Preparation	A specific EPP will be developed for Reservoir Preparation and will include consideration for various measures to reduce interactions with terrestrial and aquatic components of the environment and measures to reduce negative socio-economic effects, i.e., affects on land and resource use
Fish Habitat Compensation	The Authorization required under Section 35(2) of the *Fisheries Act* mitigates harmful alterations, disruptions or destruction of fish habitat. This project will have a large and comprehensive plan in place. While the approach to compensation is standard and understood, the options outlined in every plan are different. This Plan will also need to be incorporated into a lengthy construction schedule. The options within the Fish Habitat Compensation Strategy/Framework are outlined in IR# JRP.107

IR# JRP.115

Socio-Economic Effects of the Project on Local Populations

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Subject – Socio-Economic Effects of the Project on Local Populations

References:

EIS Guidelines, Section 4.4.4.7 (Economy, Employment and Business)

EIS Guidelines, Section 4.6.1 (Mitigation)

ETS Guidelines, Section 4.5.1 (Environmental Effects)

Related Comments/Information Requests:

CEAR # 185 (S. Pottle - Memorial University of Newfoundland)
CEAR # 205 (Government of Newfoundland and Labrador - Women's Policy Office)

Rationale:

Section 4.5.1 of the EIS Guidelines requires that the assessment of the beneficial and adverse effects of the Project on the socio-economic environment shall consider "how the project may affect various segments of the local populations (e.g., youth, elders, men, women, Aboriginal groups, harvesters, and existing workforce including professionals).

The EIS does not adequately address these requirements. There is no discussion in the EIS of the overall effect of the Project on women or other groups as described in the Guidelines.

Section 4.4.4.7 requires the Proponent to describe "relevant economy, employment and business elements in the study areas of the VECs, including the following: (f) employment equity and diversity, including under-represented groups (e.g., Women, persons with disabilities, Aboriginal groups). As well, section 4.6.1 requires the Proponent to "describe a human resources plan that includes a description of **objectives and strategies** (emphasis added) to address labour force availability, skilled trades recruitment, diversity in recruitment, training and employment equity. The plan should also minimally **identify employment objectives and targets** (emphasis added) for women and other labour force groups if applicable."

Objectives and strategies for women's employment are not described, nor are employment objectives and targets for women identified. As well, persons with disabilities are not included in either the description or in respect of employment objectives and targets.

General Indications of potential mitigation strategies to encourage and support women's employment are provided but the likelihood of success of these strategies is not described.

It is acknowledged that the Proponent intends to develop an industrial benefits agreement with Innu Nation but there is no information provided on the likely contents of such an agreement.

The Government of Newfoundland and Labrador has advised that the Proponent should review and consider the provincial policy requirements respecting commitments to women.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

a. **describe relevant economy, employment and business elements in the study areas of the VECs relating to employment equity and diversity for under-represented groups (women, persons with disabilities, Aboriginal groups);**

Response:

Consistent with Section 4.4.4.7 of the EIS Guidelines, Economy, Employment, and Business was identified as one of the socio-economic Valued Environmental Components (VECs) for this Project. Economy, Employment and Business were then broken out and assessed as three separate Key Indicators (KIs) within this VEC. Potential issues related to employment equity and diversity for under-represented groups (women, persons with disabilities and Aboriginal groups) are considered and assessed within the context of this VEC.

The Assessment Area for this VEC is the Upper Lake Melville area as this is where most Project activity interactions will occur. The Upper Lake Melville area encompasses the communities of Happy Valley-Goose Bay, North West River, Sheshatshiu and Mud Lake. Depending on the nature of the effects being assessed, socio-economic effects on Economy, Employment and Business were also assessed based on the Province as a whole, and Labrador.

The EIS, Volume III, Section 2.4 of the EIS provides a description of existing conditions within the Assessment Area for Employment and Business. In response to this IR, the text below supplements the information presented in the EIS as specifically related to employment equity and under-represented groups, including:

- current status/trends in employment equity and under-represented groups in the Assessment Area; and
- existing services and programs available to help facilitate employment equity and diversity in the Assessment Area

Current Status/Trends

Table 1 indicates percentage of female participation in various occupations for the Province, Labrador and for Upper Lake Melville (Statistics Canada 2007).

Table 1 Percentage of Female Participation in the Workforce

Occupation	Percent Female NL	Percent Female Lab	Percent Female ULM
A Management Occupations	41	40	48
B Business, Finance and Administration	75	80	34
C Natural and Applied Sciences and Related Occupations	17	16	81
D Health Occupations	80	87	13
E Occupations in Social Science, Education, Government service and Religion	64	71	81
F Occupations in Art, Culture Recreation and Sport	59	61	67
G Sales and Service Occupations	66	69	60
H Trades, Transport and Equipment Operators and Related Occupations	5	7	60
I Occupations Unique to Primary Industry	18	15	4
J Occupations Unique to Processing, Manufacturing and Utilities	44	41	21

Of the total experienced labour force 15 years of age and over, both Upper Lake Melville and the Province share the same overall female participation rate of 48 percent (Statistics Canada 2007). However, Table 1 illustrates that there are some regional differences when considered by occupation including Business, Finance and Administration, Natural and Applied Sciences and Related Occupations, Health Occupations, and Trades, Transport and Equipment Operators and Related Occupations.

Table 2 provides a breakdown of Aboriginal participation rates in the workforce as compared to non-Aboriginal participation(Statistics Canada 2007). Table 3 provides the percentage of total labour force held by Aboriginals by occupation (Statistics Canada 2007). These data demonstrate that labour participation rates by Aboriginal peoples in Upper Lake Melville is slightly higher than for Labrador and the Province as a whole, consistent with trends in labour participation for non-Aboriginals (i.e., Upper Lake Melville is higher than for Labrador and the Province). The percentage of the total labour force held by Aboriginals in Labrador and Upper Lake Melville is predictably higher than that for the Province for all occupation categories. For the majority of occupations categories, the percentage of the labour force held by Aboriginals was higher for Upper Lake Melville than for Labrador as a whole, with the exception of Occupations in Art, Culture Recreation and Sport and Occupations Unique to Processing, Manufacturing and Utilities.

Table 2 Participation Rates of Aboriginal People versus Non-Aboriginal People

	NL		Labrador		ULM	
	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal	Aboriginal	Non-Aboriginal
Total Population Over 15	18,050	404,335	7,195	13,620	2,975	4,070
Labour force	10,975	237,710	4,555	9,785	2,030	3,075
Participation Rate	61	59	63	72	68	76

Table 3 Percentage of Total Labour Force Held by Aboriginal People by Occupation

Occupation	Percent Aboriginal NL	Percent Aboriginal Lab	Percent Aboriginal ULM
A Management Occupations	3.4	24	27
B Business, Finance and Administration	3.5	29	35
C Natural and Applied Sciences and Related Occupations	3.7	23	34
D Health Occupations	3.0	21	28
E Occupations in Social Science, Education, Government service and Religion	4.5	36	39
F Occupations in Art, Culture Recreation and Sport	4.2	39	20
G Sales and Service Occupations	4.9	35	43
H Trades, Transport and Equipment Operators and Related Occupations	4.9	29	49
I Occupations Unique to Primary Industry	5.5	37	66
J Occupations Unique to Processing, Manufacturing and Utilities	4.5	49	38

While the labour market for the Assessment Area shares many of the same trends with the rest of the province and country, it is anticipated that retention and recruitment may become an issue as Labrador begins to compete with the island portion of the Province and the country for the same skilled trades, transport and equipment labour force that is dominant in the employment profile of the area. The Northern Strategic Plan for Labrador (Government of Newfoundland and Labrador 2007) notes that continuing to increase participation among under-represented groups will be critical to meeting future labour demands.

Challenges which are likely to affect employment participation rates in the Assessment Area for women and under-represented groups include: housing availability and rental costs, lack of licensed child care spaces, and other challenges in gaining employment, training and support.

It should be noted that data regarding percentage employment rates by persons with disabilities is not available through Statistics Canada, although it is assumed that participation rates are a concern both in the Province and in the Assessment Area.

Available Services and Programs

There are a number of existing organizations functioning within the Assessment Area which facilitate and support employment equity and under-represented groups, among other broader objectives. Examples include:

- Department of Human Resources Labour and Employment (HRLE) Career Work Center. This service center is open to the public for those involved with job search and for those in the early stages of business development. There is particular emphasis on support and programs to help individuals who are on Income Support Assistance to secure employment. One example of such a program is the Wage Subsidy for persons with disabilities.
- The Labrador Friendship Center is a hub of services and programs sponsored by various levels of government. The Linkages Program is directed to supporting youth enter the labour force and the STEPS program is geared to older workers.

- The Melville Community Employment program is a service specific to individuals with intellectual disability. The program offers a range of services from job search to job coach. The greatest challenge is the stigma and getting employers to engage with the program.
- Women in Resource Development Corporation, in collaboration with the College of the North Atlantic (CONA) offers a 24-week Orientation to Trades and Technology (OTT) program specifically geared to introducing women to the skilled trades.

In addition, there are a number of broader federal and provincial programs and services that are accessible to residents in the Assessment Area to support and facilitate employment equity and opportunities for under-represented groups. A list of such programs is provided in Table 4. Employment diversity is referred in Section 3.6.5, Volume III of the EIS. Nalcor's Project Diversity Plan is described in the responses to parts (c) and (d) of this IR.

Table 4 Existing Programs and Services

Title	Description	Offered By
Programs and Strategies for Women		
Women in Business Initiative: Business Management Training Allowance	Program provides financial assistance to women business owners wishing to undertake business management training	Atlantic Canada Opportunities Agency (ACOA)
Woman Entrepreneur	A 25 million dollar fund to provide quasi – equity financing for women entrepreneurs looking to expand their business	Business Development Bank of Canada
Aboriginal Women's Program	Provides two types of support to Aboriginal women's organizations: operational support for national women's organizations; and funding for specific activities that are in keeping with the objectives of the program	Canadian Heritage
Orientation to Trades and Technology	A 24-week program designed to give women practical experience of natural resource based industries. OTT also raises the awareness that challenging, high-paying jobs in the natural resource industries are available and attainable for women	College of the North Atlantic in collaboration with Women in Resource Development Corporation (WRDC)
GETT Camps	Girls Exploring Trades and Technology. A GETT camp is a week-long day camp for girls just out of grades 6 and 7 that offers girls the opportunity to design, build and race soap box derby style go-karts. Along the way, girls meet and observe successful women working in trades, technology, math and science occupations, learn technical skills and grow self-confidence	WRDC
Techsploration	The goal of Techsploration is to increase the number of women working in science, trades, technical and technology related occupations by assisting young women from diverse backgrounds to explore a wide range of career options in these fields	WRDC
The Women's Community Fund	Addresses the economic and social situation of women through the support of projects that support women	Status of Women Canada
Women's Partnership Fund	Provides support for projects that encourage action to bring about the advancement of women across Canada	Status of Women Canada

Title	Description	Offered By
Women's Program	The goal of the program is to achieve the full participation of women in the economic, social and cultural life of Canada	Status of Women Canada
Office to Advance Women in Apprenticeship	Creates and enhances employment for women apprentices	Province of Newfoundland
Programs and Strategies for Aboriginal Peoples		
BDC Growth Capital for Aboriginal Business	Financing tailored to Aboriginal businesses on or off reserve land. Finance assets, and intangibles	Business Development Bank of Canada
Aboriginal Capacity development	Helps First Nations work toward self-sufficiency in housing through the acquisition of knowledge, skills, training, and other resources	Canada Mortgage and Housing Corp.
Aboriginal Women's Program	Provides two types of support to Aboriginal women's organizations: operational support for national women's organizations; and funding for specific activities that are in keeping with the objectives of the program	Canadian Heritage
Aboriginal Workforce Participation Initiative	Dedicated to increasing the participation of Aboriginal people in the labour market	Indian and Northern Affairs Canada (INAC)
Education Programs	The Government of Canada is dedicated to ensuring that Aboriginal peoples enjoy the same education opportunities as other Canadians	INAC
Aboriginal Skills and Employment Partnership	Mandate is to provide Aboriginal people with the skills they need to participate in economic opportunities across Canada	Human Resources and Skills Development Canada (HRSDC)
Aboriginal Human Resource Development Agreement (AHRDA)	The mandate of AHRDA is to Support the government's Aboriginal agenda by ensuring that Human Resources and Skills Development's relationship and investments are consistent with the government's policy, and reflect individual, institutional, and organizational Aboriginal aspirations, particularly in regard to full workplace and social participation	HRSDC
Guiding Circles	An interactive, flexible, and fun holistic career development program designed to guide individuals toward career paths	Aboriginal Human Resource Council
Programs and Strategies for Persons with Disabilities		
Disability vocational rehabilitation plan	Designed to help people who receive a Canada pension plan disability benefit return to work	HRSDC
Employability assistance for people with disabilities	A multilateral framework to ensure that people with disabilities can participate in the labour force	HRSDC
Opportunities fund for persons with disabilities	To assist persons with disabilities to prepare for and obtain employment as well as develop the skills needed to maintain that employment	HRSDC
Employability assistance for persons with disabilities	Designed to assist individuals with a disability to acquire the skills, experience and support necessary to successfully prepare for, enter, or remain in the workforce	Human Resources Labour and Employment
Wage Subsidy For Graduates with disabilities	Individuals with disabilities who have successfully completed a post secondary program of a minimum duration of one year and are currently unemployed or underemployed	Human Resources Labour and Employment

References:

Personal Communications:

Baikie Pottle, K. NLOWE, HVGB, September 8, 2009.

Broomfield, S. Human Resources and Employment Career Work Center, HVGB, September 8, 2009.

Pardy, T. Melville Community Employment, HVGB, September 8, 2009.

Literature Cited:

Canadian Subsidy Directory 2009. National Library of Canada. ISBN 2-922870-05-7

Government of Newfoundland and Labrador. 2007. A Northern Strategic Plan for Labrador. Retrieved September 8, 2009 from http://www.laa.gov.nl.ca/laa/nspl/status.pdf.

Statistics Canada. 2007. 2006 Community Profiles. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13 2007. http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E

Vale Inco. Various Dates. Annual Social Responsibility Report. Retrieved from http://www.valeinco.com/development/reports/social/2004/commitment/partnering.

Women in Resource Development Committee. 2005. At A Snail's Pace: The Presence of Women in Trades, Technology, and Operations in Newfoundland and Labrador. St. John's, NL: Retrieved from http://www.wrdc.nf.ca/pdf/SnailsPaceReport.pdf.

Women in Resource Development Corporation Website. www.wrdc.nf. ca

Women's Policy Office. 2007.Planning for Gender Equitable Employment . Government of Newfoundland and Labrador.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

b. describe existing programs and strategies to increase participation of these under-represented groups;

Response:

A description of existing programs and services available within the Assessment Area to increase participation of under-represented groups is provided in Table 4 of IR# JRP.115a.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

c. **identify barriers to employment on the proposed Project that may be experienced by women, persons with disabilities, and Aboriginal groups;**

Response:

The nature and location of Project construction are important factors in identifying the potential for Project-specific barriers to employment by under-represented groups.

The construction of the Project will be comprised mostly of civil work with approximately 68 percent of the labour force employed in trades, transport, equipment operators and related trades. The worksite will be remote and a substantial component of work will take place outside the main Project construction area (e.g., reservoir clearing and transmission line work between Gull Island and Churchill Falls will require accommodations in temporary camps or other arrangements).

Over the past 18 months, Nalcor Energy (Nalcor) has consulted with women's organizations, Aboriginal groups and community advocacy groups regarding potential barriers to employment on the Project. These organizations have included the Women in Resource Development Committee, Woman's Policy Office, Innu Nation, Labrador Metis Association, the Nunatsiavut Government, among others. All comments and concerns have been and continue to be documented in Nalcor's consultation database. This database along with additional sources included in the reference list have been used in developing Table 5, which outlines potential barriers to employment. Nalcor will continue to consult with and share information with these organizations.

Nalcor is committed to developing a Project Diversity Plan and the identification of potential barriers is considered a key step in this development. Specific programs and policies to be developed by Nalcor as part of its Project Diversity Plan will be designed to specifically address these potential barriers where feasible, and will incorporate follow-up monitoring and feedback mechanisms to determine requirements for adaptive management.

Table 5 Potential Barriers to Employment

Barrier	Women	Aboriginal Peoples	Persons with Disabilities
Child/Dependant Care	√	√	√
Lack Of Support/Encouragement			
Lack of Mentoring Programs	√	√	√
Lack of Home Support	√	√	√
Lack of Workplace Support	√	√	√
Lack of financial support and financial management skill	√	√	√
Employment Opportunities and Training			
Suitable Employment Opportunities	√	√	√

Barrier	Women	Aboriginal Peoples	Persons with Disabilities
Suitable training Opportunities	√	√	√
Finding Employment from remote locations		√	
Relocation for employment	√	√	√
Adequate Housing Support			
Affordable housing	√	√	√
Inaccessible buildings			√
Systemic Discrimination			
Discriminatory attitudes entrenched in policies and practices	√	√	√
A tendency to screen out certain groups of people	√	√	√
Communication Barriers			
Language Barriers		√	√
Reluctance to communicate with other workers	√	√	√
Exclusionary language	√	√	√
Physical Barriers			
Adequate workspace accommodations	√	√	√
Accommodative tools	√		√
Inaccessible buildings			√
Availability of adequate washrooms/facilities	√		√
Educational Barriers			
Inaccessible training locations	√	√	√
Language/ communication Barriers		√	√
Prerequisites	√	√	√
Lack of Funding for Preparatory training	√	√	√
Weak Career Planning and Counseling	√	√	√
Lack of awareness of the range of employment	√	√	√
Difficulty approaching employers	√	√	√
Union Membership	√	√	√
Discriminatory workplace practices			
Sexual/Gender Discrimination	√		
Racial Discrimination		√	

References:

Canadian Apprenticeship Forum. January 2004. Accessing and Completing: Apprenticeship Training in Canada – Perceptions of Barriers.

Canadian Apprenticeship Forum. 2009. Workplace Accommodations for Persons with Disabilities in the Skilled Trades: A Preliminary Investigation.

Canadian Council on Rehabilitation and Work. Creating a Successful 'Skills Training Partnership. Employment Program for People with Disabilities.

Electricity Sector Council. 2009. Aboriginal Symposium Findings on Aboriginal Engagement Initiatives Project.

Government of Newfoundland and Labrador. Department of Education. 2004. The Apprenticeship Experience: 2003 Survey of Registered Apprentices of Newfoundland and Labrador.

Women in Resource Development Committee. 2005. At a Snail's Pace: The presence of women in trades, technology and operations in Newfoundland and Labrador.

Women's Policy Office. 2007. Planning for Gender Equitable Employment. Government of Newfoundland and Labrador.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

d. describe objectives and strategies to address diversity in recruitment, training and employment equity for the Project, including employment objectives and targets for women;

Response:

As stated in the EIS, Volume IA, Section 3.2.1, a diverse workforce is a planned feature of the Project. Nalcor will encourage Aboriginal people, women, visible minorities and persons with disabilities to participate in the Project. To this end, a Project Diversity Plan will be prepared and implemented. Nalcor's commitments to employment diversity are further described in EIS Volume III, Section 3.6.5.

Since submission of the EIS, Nalcor has continued to make progress on the development of the Project Diversity Plan through consultation and communication with interested parties/organizations and identification of potential Project-specific barriers. It is intended that the Project Diversity Plan will be in place by March 2010 and will outline specific initiatives regarding recruitment and retention of under-represented groups. The Plan will also detail policies and programs that will be implemented to support a respectful and diverse workplace. Support of and implementation of this Project Diversity Plan will be a requirement of all contractors on the Project.

Some preliminary objectives and strategies have been identified and are presented below as they relate to recruitment, training and employment equity. These will continue to be developed as Project planning proceeds.

Recruitment

Any collective agreements negotiated by Nalcor relating to the Project will be cognizant of Nalcor's commitment to diversity and equity. Job descriptions will be reviewed to reflect commitments to diversity and advertisements will state that "we are an equal opportunities employer thereby encouraging applications from women, persons with disabilities and Aboriginal peoples."

To aid in recruitment, Nalcor is developing relationships with training institutions and agencies that advocate for women and under-represented groups, such as Women in Resource Development Corporation (WRDC), the Office for Women in Apprenticeship, and Innu Nation. Nalcor has also participated in Women in Resource Development's Techsploration Program, encouraging young women to explore occupations in the technology sector.

Training

It is an objective of Nalcor that labour and skill requirements for the Project are communicated well in advance of Project startup. Due to the low levels of women and persons from under-represented groups currently in the main occupational categories required by the Project, training will be a key component in meeting employment targets. Nalcor has presented its labour force requirements to the provincial government, training institutes, labour organizations, and groups advocating for employment equity and diversity. Nalcor will continue to meet with these groups and to support initiatives to encourage participation of women and under-represented groups.

It is a further objective of Nalcor to work with organizations in developing training plans that will ultimately aid in meeting Nalcor's equity and diversity employment targets. Nalcor is currently partnering with Innu Nation, Nunasaviut Government and the Labrador Metis Nation to develop and implement a training strategy to support Aboriginal participation for the Project. A proposal has been submitted to the federal government's Aboriginal Skills and Employment Partnership Program. A response from the federal government on this proposal is expected during fall 2009.

This training plan has specific initiatives for Aboriginal women. There will be an on-site training program for new workers as well as an apprenticeship program. These programs will be sensitive to the needs of women. Details of this program will be developed closer to the commencement of construction. Nalcor also sits on the steering committee of the Electrical Sector Council's task force focused on increasing Aboriginal participation in the Energy Sector.

Nalcor also intends to hold discussions with community groups in the Assessment Area representing people with disabilities. The purpose of these discussions will be to identify and discuss additional opportunities for optimizing participation of persons with disabilities in the Project workforce.

Employment

As stated above, it is Nalcor's objective to employ a diverse labour force. With this objective in mind, the following strategies will be applied:

- procedures and policies will be in place for the Project with regard to harassment and respectful workplaces;
- gender, cultural and diversity sensitivity will be part of all new hire orientations and accommodations services will be designed with the understanding that the workforce will be a diverse one; and
- Nalcor recognizes that a barrier to women's participation in the labour force on a remote site is the balance of work and family life. Accordingly, Nalcor will seek to facilitate flexibility in work schedules to accommodate family life for all employees. However, there will be periods of time, and particularly during construction, where there will be limited flexibility in this respect and potential employees will be made aware of this prior to hiring.

Nalcor will aim to match or exceed the female participation levels achieved by other major projects under construction in the Province. The initiatives that Nalcor will undertake in order to achieve those targets will be included the Project's Diversity Plan.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

e. **describe the likely contents of an impact benefits agreement with Innu Nation and how it might address participation by members of Innu Nation in the Project through employment or business;**

Response:

Nalcor and Innu Nation are currently involved in the negotiation of an Impact and Benefits Agreement (IBA). According to the terms of confidentiality agreements entered into by Nalcor and Innu Nation, information relating to both the details of IBA negotiations and the contents of any IBA concluded between the parties is to be treated as strictly confidential and subject to disclosure only with the consent of the parties.

Certain aspects of the IBA respecting the participation of the members of Innu Nation in the Project have been made public by the release of the Tshash Petapen Agreement ("Tshash Petapen") entered into between the Project, Energy Corporation of Newfoundland and Labrador (now Nalcor) and Innu Nation on September 26, 2008.

The Tshash Petapen Agreement may be downloaded from
http://www.releases.gov.nl.ca/releases/2008/exec/ 0926n07.htm.

For additional information on pre-employment training, please refer to the response to IR# JRP.133.

Reference:

Tshash Petapen Agreement, September 26, 2008.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

f. describe strategies to encourage the participation of members of other Aboriginal groups;

Response:

Nalcor has partnered with the three Aboriginal groups in Labrador to develop a training plan that will support Aboriginal participation in the Project. A proposal has been submitted to the federal government's Aboriginal Skills and Employment Partnership Program. A response from the federal government on this proposal is expected during fall 2009.

Additionally, Nalcor sits on the steering committee of the Aboriginal engagement project of the Electricity Sector Council. Involvement with these initiatives has enabled Nalcor to work with Aboriginal people to discuss best practices to optimize Aboriginal involvement. Some of the strategies discussed to date include:

- early commencement of training;
- community based training;
- participation in Aboriginal career information session;
- explicit communication about the needs of new hires;
- communication of Project goals for job readiness;
- clarification of expected results;
- building partnerships with entire community;
- tailoring recruitment tactics to community;
- engaging labour unions early regarding Aboriginal commitments and expectations;
- consideration for the full employment life cycle from pre-employment training, the recruitment, to selection, to retention;
- utilization of on site Aboriginal employment coordinators;
- cultural awareness as part of all new hire considerations; and
- support for the Aboriginal cultural experience through high levels of awareness and respect.

These strategies will inform the development of Nalcor's plans, objectives and targets in achieving employment diversity.

For additional information on pre-employment training, please refer to the response to IR# JRP.133.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

g. describe experience gained from previous large developments in Labrador with respect to employment equity and diversity, and the implications for the probable success of proposed strategies; and

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Response:

Nalcor places a high priority on learning from the experiences of other developments, proponents and sectors applicable to this Project. In support of this priority, Nalcor maintains an internal register of lessons learned that is populated on a regular basis based on information collected from consultations, meetings, etc.

Lessons learned with respect to employment equity and diversity from previous large developments in Labrador including Voisey's Bay Mine/Mill, Trans Labrador Highway, and western Labrador mining developments are described in Table 6. The table also addresses how these past experiences have informed Nalcor Energy's proposed strategies and their likelihood of success.

Table 6 Employment Equity and Diversity – Lessons Learned

Lesson Learned	Proposed Nalcor Strategy and Implications for Success
Community Based Training (pre-construction and pre-operation) facilitates participation of under-represented groups such as Aboriginal people, women and persons with disabilities • Vale Inco Newfoundland and Labrador (VINL) created training opportunities in Natuashish, using the community owned heavy equipment, to train heavy equipment operators. Participation was good and led to employment on the Mine and Mill site for Innu, as well as the training of Innu who chose to work in the community • Women in Resource Development Corporation (WRDC), in collaboration with the College of the North Atlantic (CONA) has delivered the women in Operations Trades and Technology Program (OTT). This 24 week program is specific for women and introduces then to the spectrum of careers in operations, trades and technology. After introduction to the various trades a significant number of participants have gone on to complete trade specific training • CONA, at the Lab West Campus, developed a Mining and Mineral Processing program specific to multi-skilled mine workers. The availability of training programs, with a clear opportunity for future employment, was very successful in terms of enrollment. The programs were advertised as open to females and males. Women's participation has steadily increased and they have been very successful in completion of the program and in obtaining employment. The "training" setting provided an opportunity for males and females to work together in areas where women had previously been under-represented. The training setting experience helped reduce barriers in the workplace setting of the mine	Nalcor has committed to encouraging pre-construction training initiatives (EIS, Volume III, Table 8-1) and is proposing to support community-based training in the Assessment Area through collaborative initiatives with community-based groups and educational institutions, and community-based interest groups such as the WRDC. In advance of start up, Nalcor is also committed to communication about Project goals and the labour and skill requirements for the Project to training institutions and government agencies. Based on previous experience, this is expected to • encourage participation in training from a diverse group which in turn will result in increased labour availability and participation of under-represented groups • facilitate the continued development of a Labrador-based workforce to meet Nalcor Energy's construction needs and hiring targets for under-represented groups • assist Nalcor Energy in promoting employment and business opportunities, follow-up monitoring success, and providing corrective action in employment equity matters • set the standard of a diverse workforce. Training settings provide an opportunity for the definition of the future workforce as inclusive of under-represented groups

Lesson Learned	Proposed Nalcor Strategy and Implications for Success
Value of the **Aboriginal coordinator position:** • For the Voisey's Bay Mine/Mill Project having an individual dedicated to each Aboriginal group was beneficial in overcoming language and cultural barriers, thus providing a clearer path to employment • The presence of the Aboriginal coordinator on site helped workers adjust to the remote work site, the expectations of the work environment and the change in lifestyle of being away from home for extended periods	Nalcor has committed to establishing an on-site Innu Liaison position (EIS, Volume III, Table 8-1). Based on experience from the Voisey's Bay Mine/Mill, the creation of this position will help with retention of Aboriginal workers, maintenance of a stable workforce and early problem identification, all of which support Nalcor Energy's commitment to equity employment and a safe and productive work site.
Importance of investing in **building relationships with Aboriginal peoples**: • VINL creates opportunities to host visits for elders from both the Innu Nation and Nunatsiavut at the Mine and Mill site. The elders have an opportunity to assess what is happening with the land and resources, to visit with community members and to gain a deeper understanding of what life is like for community members when they are working on site. The employer pays attention to "relationships" and efforts are made to have the elders meet with Aboriginal employees at their work station. The increased familiarity with the site and the kind of work has contributed to greater understanding and awareness. It also helped create a recognition of Innu and Inuit as mine and mill workers • VINL also creates opportunities to host visits to the Mine and Mill Site for high school students from North Coast communities. The visits are very well received and help students understand the various kinds of jobs available on site. It also encourages students to finish their high school education and begin to imagine what kind of career they would like to pursue	Nalcor is committed to continuing to build positive relationships with the Aboriginal people of Labrador. The more formal process will happen though the negotiation of an Impact and Benefits Agreement. More informally, but as important, will be the creation of opportunities for elders and youth to learn about the Project and the opportunities it presents. Nalcor recognizes the importance of building partnerships with the entire community and the need to nurture relationships with Aboriginal people of Labrador. Based on lessons learned, a sustained commitment to building Aboriginal relations is expected to assist in enhancing the potential positive effects of the Project on Aboriginal communities while also identifying and working to resolve potential adverse effects.
The **Adjacency principal** influences the hiring for major projects and this practice is closely observed by people from adjacent communities • VBNC developed an Adjacency Principle to address hiring preferences among local interests and parties. During Voisey's Bay construction, more than 4,500 individuals were employed, of whom more than 1,100 were Labradorians of Aboriginal descent. In 2005, in the final phase of construction, 1,920 persons were involved, 87 percent of whom were residents of the Province and 25 percent were of Aboriginal descent. Aboriginal companies also benefitted from construction contracts. In 2004, contracts totaling $4.9 million were awarded to Aboriginal companies • Information on the socio-economic effects of the construction of the TLH Phase II indicates that some Innu felt that local businesses did benefit economically from the project and that work on highway construction was available if they wanted it (Russo and Stanley 2002). Others disagreed, saying that construction companies brought in too many of their own workers to do jobs that could have been filled by local residents	Nalcor has committed in the EIS (Volume III, Table 8-1) to develop a contracting policy that provides companies within the Province with full and fair opportunities to compete on the supply of goods and services, as well as increasing the opportunity for local employment, and particularly for Innu. It ie expected that this will enable individuals to remove themselves from social assistance, build individual and community self-esteem, and acquire the financial resources needed to sustain traditional lifestyle activities. Nalcor has also committed to giving first consideration for construction employment to qualified, experienced personnel adjacent to the resource. This will be further supported by Nalcor's commitment to communication of Project goals for career readiness, pre-development training initiatives, and participation in Aboriginal career information sessions. Experience from previous Projects indicates that implementing these strategies will serve to increase Aboriginal participation in and benefits from the Project.

Lesson Learned	Proposed Nalcor Strategy and Implications for Success
Importance of establishing **tools for monitoring** commitments • VBNC developed a database for workforce recruitment which aided in adherence to the adjacency principle, monitoring of equity and diversity commitments • As part of VINL's social and economic monitoring commitment, the Community Monitoring reporting process, of reporting back to communities on a yearly basis, has provided a clear and consistent flow of communication that is valued by communities	Nalcor has committed to monitoring Project employment by number employed, location of primary residence, occupational category, gender, Aboriginal status, and Project expenditures to businesses by amount, location and type (e.g., sector, Aboriginal/non-Aboriginal (EIS, Volume III, Table 8-3). Results will be reported to government on a quarterly basis. Nalcor will also conduct exit surveys for employees. Follow-up monitoring will collect data concerning recruitment and retention of under-represented groups which will assist Nalcor in evaluating success in meeting employment equity and diversity targets. This information will also aid in identifying areas where mitigation can be refined and optimized through adaptive management.
Targeted programs toward employment equity and diversity have been successful in achieving employment equity and diversity • Examples include the Employee of the Future, Mining Technician Program offered by Colege of the North Atlantic in Lab West and the Women in Resource Development Corporation's OTT program offered at various College of the North Atlantic Campuses across the province • VINL, at both the Voisey's Bay Site and the Demonstration Hydromet site in Argentia were intentional about increasing the number of women working on the site. They exceeded their targets. The Voisey's Bay Mine and Mill site has almost 50 percent Aboriginal workers, the highest achieved by any natural resource initiative in Canada • The VINL Employee Survey reported that female workers had fewer opportunities for advancement than male workers	Nalcor is committed to developing a Project Diversity Plan, which will outline specific initiatives regarding recruitment and retention of under-represented groups. The Plan will also detail policies and programs that will be implemented to support a respectful and diverse workplace. In support of this Plan, Nalcor is developing relationships with training institutions and agencies that advocate for women. This will encourage and facilitate the recruitment of female applicants. Gender employment targets will attempt to address numbers and diversity in order to create opportunities for women in different levels and types of employment and not clustered in service positions. Past project experience indicates that well-developed programs for achieving employment equity and diversity are expected to be successful.
Healthy work environments are supported by **mandatory training and clear policies and procedures** related to harassment, gender sensitivity, cultural awareness and unique features of the Project work site • Inuit workers on site at Voisey's Bay reported increased self esteem and confidence from being affirmed for doing a good job. Supervisory relationships provide opportunities for affirmation as well as correction. For new workers in the field, particularly those from under-represented groups who do not have extensive experience on the job, support and affirmation are important • Company policy and actions that support workers in returning home in times of emergency are highly valued and serve to increase the comfort level of workers who are away from their families for weeks at a time • The VINL Employee Survey reported significant lifestyle changes resulted from the economic impact of good paying jobs. Many of the lifestyle changes were positive and some were negative	Nalcor has committed to the following (EIS, Volume III, Table 8-1) • establishing an on-site Innu Liaison position • providing access to an Employee Assistance Program • establishing a workplace improvement committee • maintaining a work environment that facilitates the achievement of career goals • increasing Innu employee retention rates by providing cultural sensitivity training to all employees so as to reduce work-related stress in a cross-cultural work environment (EIS, Volume III, Section 4.7.5.1) As Project planning proceeds, Nalcor will further develop training requirements and policies that reflect lessons learned and support Nalcor's commitment to employment equity and diversity. This will help support a healthy and respectful workplace and positively affect recruitment and retention of under-represented groups for the Project. For example, Nalcor will encourage regular employee feedback from supervisors on work performance in order to help promote job satisfaction and support retention of workers.

References:

Personal Communications:

Dalton, S. College of the North Atlantic. 2006.

Literature Cited:

Russo Garrido, S and J. Stanley. 2002. Labrador road study: Local knowledge on the social and environmental impacts of the newly constructed Trans Labrador Highway in southeastern Labrador. In: Occasional Paper for Coasts Under Stress, The Impact of Social and Environmental Restructuring on Environmental and Human Health in Canada.

Sikumiut Environmental Management Ltd. 2008. Inuit Beneficiary Detailed Employee Survey Report. Prepared for Vale Inco.

Sikumiut Environmental Management Ltd. Socio-economic Monitoring and Reporting Program. Annual Reports. Prepared for Vale Inco.

Sikumiut Environmental Management Ltd. Construction Phase Effects and Study Community Profiles. Prepared for Vale Inco.

Vale Inco. 2007. Impact and Benefits Agreement Report, 2007

Vale Inco. Various Dates. Annual Social Responsibility Report. Retrieved from http://www.valeinco.com/development/reports/social/2004/commitment/partnering.

Women in Resource Development Committee. 2005. At a Snail's Pace: The presence of women in trades, technology and operations in Newfoundland and Labrador.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.115**

Information Requested:

The Proponent is asked to:

h. discuss the overall effects of the Project on the groups identified in the Guidelines (4.5.1), describe proposed mitigation measures, and assess predicted residual effects and summarize this information in a table.

Response:

The EIS addresses the requirement of the EIS Guidelines to consider how the Project may affect various segments of the local populations through the following approach:

- A range of Valued Environmental Components (VECs) and Key Indicators (KIs) were identified and assessed in relation to potential Project-related socio-economic effects.
- VECs/KIs selected (refer to list in Table 7) are inclusive of those aspects of the socio-economic environment in the Assessment Area that are of importance to all of the segments of the local populations identified in the EIS Guidelines and others that were not mentioned (e.g., local business people, recreational and commercial land and resource users).
- The assessment of VECs and KIs considers a range of issues applicable to all segments of the local populations. For instance, the Social Infrastructure and Services KI considered policing, education, and housing and accommodations. The Land and Resource Use VEC considers the potential for the Project to affect any identified uses of land and resources by residents of Labrador for cultural, traditional, commercial, recreational and subsistence purposes.
- The environmental assessment for each VEC/KI particularly highlights those segments of the population that may be more vulnerable to potential Project-related effects. For instance, within the Land and Resource Use VEC and the Cultural Heritage Resources VEC, the potential for Project-related socio-economic effects on the Labrador Innu are highlighted, as well as potential effects on other harvesters. Within the Community Health KI, the potential for Project-related socio-economic effects on the Labrador Innu is discussed, as well as vulnerable segments of the society including children and families and those suffering from mental health issues and/or addictions. In these cases, specific mitigation measures are identified to address these segments of the population (see Table 7 for examples).

The above approach is consistent with standard environmental assessment methods (i.e., the various elements of the socio-economic environment that are valued by stakeholders and that may be affected by a Project are selected as VECs). Focusing an environmental assessment on population segments is challenging because the population can be segmented in many and various ways depending on the issue being considered, and individuals within the Assessment Area can fall within a variety of these segments (e.g., a man can be part of an Aboriginal group, a harvester, recreational land user, business owner and part of the existing workforce).

Additionally, each segment of the population can be exposed to a range of potential Project effects. For instance, a person in the Assessment Area could be affected by opportunities for employment and business, but could also be affected by a reduction in quality and capacity of physical, social and health infrastructure and services, and loss of access to land and resource for recreational, commercial or subsistence purposes. By

focusing on those aspects of the socio-economic environment that may be affected by the Project, it ensures that all potential effects of the Project are carefully identified and assessed in a comprehensive manner for all population segments.

The EIS concludes for all VECS and KIs that any adverse residual socio-economic effects will likely be not significant. In many cases, the predicted residual socio-economic effects are positive. These predictions are applicable to all segments of the local populations, particularly as each VEC and/or KI assessment focused on those segments of the populations most at risk from potential adverse effects.

Table 7 summarizes the assessment of the socio-economic effects of the Project and demonstrates how this is applicable to the population segments identified in the EIS Guidelines. The referenced effects management measures are also presented in Table 8-1 of Vol. III of the EIS. Some of these proposed effects measures are specific to segments of the population that may be affected by the Project, such as supporting Innu Nation to develop an Innu Training Plan. This measure will help to optimize benefits of the Project for the Labrador Innu and various subsets within the Labrador Innu population (e.g., Innu women and youth). Other measures will serve to mitigate potential Project-related environmental effects on all segments of the local population. For example, establishing high-quality self-contained accommodations complexes at the construction sites to reduce the potential for adverse effects on the physical and social infrastructure of the Upper Lake Melville area.

Table 7 Applicability of Socio-economic Effects Analyses to Segments of the Population

VEC/KI	Applicability to Identified Segments of the Population		Comments	Proposed Effects Management Measures	Residual Socio-Economic Effects Prediction
Economy, Employment and Business: Economy	Youth	✓	The positive effects related to Project expenditures and employment on the economy of the Province, Labrador and the Assessment Area will result in direct positive effects for the population in general and is therefore considered applicable to all of the identified population segments	• Develop and adopt an Industrial Benefits Strategy • apply measures negotiated in IBA, • develop Project Diversity Plan • support Innu Nation to develop an Innu Training Plan • include Newfoundland and Labrador benefits as selection factors in awarding Project contracts • hire an Innu Employment Training Coordinator and an on-site Innu Liaison position • provide Project employment and training information in Innu-aimun • provide Employee Assistance Program • establish workplace improvement committee • require contractors to draw labour from qualified local sources • establish collective agreements with relevant labour organizations • provide Project employment requirements and opportunities to local, regional and provincial groups and organizations • develop a human resources plan for women's employment • advance gender diversity on the Project • provide competitive wages and benefits and respectful work environment • encourage preconstruction training initiatives • work with contractors for adequate workplace training and to implement apprenticeship programs • offer technical expertise and assist in coordination of training	Positive and Significant for Construction, and Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters	✓			
	Existing workforce including professionals	✓			
Economy, Employment and Business: Employment	Youth	✓	The assessment of Project effects on employment is applicable to youth, men, women, Aboriginal groups and the existing workforce. A particular focus of this assessment was in identifying mitigation to optimize benefits for those segments of the population that may otherwise benefit less from the Project than other segments of the population including Aboriginal groups, women and peoples with disabilities. The assessment considers how youth can receive education and training necessary to benefit from the Project in the future. The issue of how Project employment will affect harvesters is specifically assessed in the Land and Resource Use VEC		Positive and Significant for Construction, and Operation and Maintenance
	Elders				
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters				
	Existing workforce including professionals	✓			
Economy, Employment and Business: Business	Youth		Although not identified in the EIS Guidelines as a population segment, a particular focus of this assessment was on optimizing benefits to local businesses, with a particular focus on Aboriginal businesses		Positive and Significant for Construction, and Operation and Maintenance
	Elders				
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters				
	Existing workforce including	✓			

Table 7 Applicability of Socio-economic Effects Analyses to Segments of the Population

VEC/KI	Applicability to Identified Segments of the Population		Comments	Proposed Effects Management Measures	Residual Socio-Economic Effects Prediction
	professionals			• establish a Labrador Business Opportunities Committee and a full-time coordinator position in Labrador • encourage journeypersons to participate in post-journeyperson training • provide on-the-job training opportunities during the construction phase • maintain a labour demand profile in support of identifying gaps, and make available to training/education agencies and institutions • participate in activities to raise profile of the skilled trades • contribute to student achievement awards; provide work term placement opportunities • develop a contracting policy to provides companies within the Province with full and fair opportunities • organize supplier information sessions in the Province with an emphasis on Labrador • develop inventory of provinical supplier capabilities • communicate and educate suppliers on the qualification and bidding process	
Communities: Physical Infrastructure and Services	Youth	✓	The EIS assesses potential Project-related effects on the ability to deliver physical infrastructure and services, which include transportation, power, communications; water, sewer and waste; industrial and commercial real estate; and municipal planning and services. These services are required by and applicable to all segments of the local population and the assessment considers potential effects on local residents, municipal and provincial governments, and other commercial and industrial users of the infrastructure	• develop a Project-wide safety culture to achieve world class safety performance • liaise with relevant government agencies, and relevant transportation, health, education and other community and regional agencies • maintain a community information centre in Happy Valley-Goose Bay • establish high-quality self-contained accommodations complexes at the construction sites to insulate the Upper Lake Melville area from potential adverse	Positive and Significant for Construction and Positive and Not Significant for Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters	✓			
	Existing workforce including professionals	✓			

Table 7 Applicability of Socio-economic Effects Analyses to Segments of the Population

VEC/KI	Applicability to Identified Segments of the Population		Comments	Proposed Effects Management Measures	Residual Socio-Economic Effects Prediction
Communities: Social Infrastructure and Services	Youth	✓	The EIS assesses potential Project-related effects on the ability to deliver social infrastructure and services, which include security (policing and fire protection); education; and housing and accommodation. While these services are required by and applicable to all segments of the local population, the assessment focuses on security and well-being of women and families in relation to a transient workforce, workers who may be at risk for substance abuse or gambling problems, children and youth with respect to education infrastructure and services and immigrant workers who may temporarily become a segment of the local population. Potential effects on harvesters related to rotational work schedules is addressed in the Land and Resource Use VEC	community effects • accommodations complexes to be self-contained with respect to water supply, sewage systems and communications • provide on-site paramedic and emergency response facilities and services at accommodations complexes • restrict non-worker access to accommodations complexes • provide all employees with cultural sensitivity training • promote healthy lifestyles through workplace programs • adopt a zero tolerance policy towards alcohol and other drug abuse • control the availability of alcohol in accommodations complexes • provide basic counselling service and workplace referrals • provide access to an Employee Assistance Program that may include stress management counseling, using community-based Aboriginal counselors • provide, where feasible, flexible work schedules to accommodate work and family life balance • adopt a SHERP to reduce the likelihood of accidents • work with relevant government agencies in their determination of the requirements for and the extent of fish consumption advisories	Adverse and Not Significant for Construction and Neutral and Not Significant for Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters				
	Existing workforce including professionals	✓			
Communities: Health	Youth	✓	The EIS assesses the potential for Project-related changes in the status of community health determinants which include: income, employment and social status; health services; personal health practices and coping skills; healthy child development; social environment and social support networks; and physical environments. While these are applicable to all segments of the local population, the EIS focuses on Aboriginal employees and their families, who may face substantial changes in lifestyle as a result of Project employment, peoples (and associated families) that may require mental health, addictions and counselling services, women and children that may		Adverse and Not Significant for Construction and Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters	✓			
	Existing workforce including professionals	✓			

Table 7 Applicability of Socio-economic Effects Analyses to Segments of the Population

VEC/KI	Applicability to Identified Segments of the Population		Comments	Proposed Effects Management Measures	Residual Socio-Economic Effects Prediction
			rely on child, youth and family protection services, and teenagers and issues relate to pregnancies and STDs. The assessment also considers overall effects on the preservation of Innu culture and language and traditional lifestyle		
Land and Resource Use	Youth	✓	It is known that most if not all segments of the local population engage in various land and resource uses that may be affected by the Project. The assessment considered commercial and domestic woodcutters; Aboriginal land and resource users; non-Aboriginal land and resource users; recreational and commercial trappers, fishers and hunters; boaters; recreational cabin owners; those who use recreational vehicles in the Assessment Area, those who pick berries or collect plants, and residents of Mud Lake who cross the river in winter on snowmobile A particular focus of the assessment was the potential for Project employment to alter resource activities of both Aboriginal and non-Aboriginal Project employees	• restrict access to Project roads and work areas during construction • remove stream crossings along access roads as construction and reservoir preparation is completed • implement a compensation program for flooded trap lines to trappers with demonstrated continuous and successional use (please refer to the response to IR# JRP.110) • prepare reservoirs through clearing of timber and removal of vegetation to reduce adverse aesthetic effects • clear riparian zone around the perimeter of the reservoir to enable access to the shoreline and/or reservoir and enable safe navigation of the reservoir • clear riparian zone to provide habitat for furbearers and other hunted/trapped game • establish new boat launches to replace access points lost due to the Project • maintain access to portage routes at Gull Island and Muskrat Falls • develop snowmobile trails equal to the amount inundated • work with guides so that boat traffic and guided tours can continue with minimal interruption • no harvesting policy for Project employees, and firearms will be prohibited on-site	Adverse and Not Significant for Construction, and Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters	✓			
	Existing workforce including professionals	✓			

Table 7 Applicability of Socio-economic Effects Analyses to Segments of the Population

VEC/KI	Applicability to Identified Segments of the Population		Comments	Proposed Effects Management Measures	Residual Socio-Economic Effects Prediction
				• subject to reasonable Project requirements, provide flexibility in work schedules and rotations, job-sharing and leave provisions to enable employees to engage in traditional activities • provide country foods at the accommodation complexes, where reasonable and commercially available • notify commercial and other users about planned Project activities • apply measures required as part of an IBA, now under negotiation between Nalcor and Innu Nation • monitor ice conditions and issue public advisories on the condition of ice • relocate and re-establish Canada yew, where inundated, above the FSL	
Cultural Heritage Resources	Youth	✓	While protection of cultural heritage resources is likely a priority and benefit to all segments of the local population, the EIS acknowledges that the sites potentially affected in the Assessment Area are of particular importance to the Labrador Innu	• implement systematic data recovery • obtain additional field recording • implement systematic field recording • conduct subsurface sampling • develop a Historic and Archaeological Resources Response plan to be applied if Historic and Archaeological Resources are discovered • consult with local stakeholders to determine the level of mitigation for historic tilts	Adverse and Not Significant for Construction, and Operation and Maintenance
	Elders	✓			
	Men	✓			
	Women	✓			
	Aboriginal groups	✓			
	Harvesters	✓			
	Existing workforce including professionals	✓			

IR# JRP.116

Determination of Significance

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Subject - Determination of Significance

References:

EIS Guidelines, Section 2.3 (Aboriginal Traditional and Community Knowledge), Section 2.5 (Precautionary Principles); Section 3.1 Study Strategy and Methodology, 4.4.2 Study Areas, 4.4.4 Description of the Existing Environment, 4.5 (Environmental Effects) & Section 4.7 (Residual Effects and Determination of Significance) & Section 4.8 (Consultation with Aboriginal Groups)

EIS Volume IA, Section 9.0 (Environmental Assessment Approach and Methods); Section 9.1.3.11 (Ecological Land Classification) & Section 9.3.2 (Ecological Boundaries)

EIS Volume IIA, Section 4.1 (Environmental Assessment Boundaries), Section 4.2 (Ecological Land Classification) & 4.5 (Criteria for Describing Environmental Effects – Aquatic Environment Key Indicator)

EIS Volume IIB, Section 5.5 (Criteria for Describing Environmental Effects – Terrestrial Environment Key Indicators), Section 5.6 (Determination of Significance) & Section 7.4.2.2 Biological Diversity

EIS Volume III, Section 3.5.3 (Determination of Significance – Economy), Section 3.6.3 (Determination of Significance – Employment), Section 3.7.3 (Determination of Significance – Business) & Section 4.3 (Selection of Key Indicators)

Canadian Environmental Assessment Agency. 1994. Determining whether a project is likely to cause significant environmental effects. 16p. Accessed online at http://www.ceaa-acee.gc.ca/Content/D/A/C/DACB19EE-468E-422F-8EF6-29A6D84695FC/Adverse-Environmental-Effects_e.pdf, last accessed on July 17, 2009.

Related Comments / Information Requested:

CEAR # 214 (Innu Nation)
CEAR # 216 (Labrador Metis Nation)

IR # JRP.4 & JRP.47

Rationale:

In JRP.4 (a), the Proponent was asked to provide theory or rationale as to how threshold values for measuring Magnitude were selected for both the Aquatic and Terrestrial Environment VECs and in JRP.4(d) the Proponent was asked to explain the theory or rationale for selecting "sustainable population" as a measure of significance for terrestrial Key Indicator species other than Caribou and how the Proponent defines it. The following questions are in addition to JRP.4 and to JRP.47.

Environmental Effects Criteria and Significance Determinations:

The Canadian Environmental Assessment Agency's 1994 guidance on *Determining whether a project is likely to cause significant adverse environmental effects* states that the most common way of determining whether a project's environmental effects are adverse is to compare the quality of the existing environment with the predicted quality of the environment once the project is in place. This is what the Proponent has done in selecting measurable parameters for each VEC or KI as appropriate. In considering the significance of impacts, the most common approach is to use these measurable parameters in combination with criteria for describing environmental effects, i.e. nature, magnitude, duration, geographical extent, frequency, reversibility, and

certainty of knowledge to derive an assessment of significance. Although the EIS presents assessments of both the measurable parameters and the criteria for describing environmental effects for each VEC/KI the EIS does not provide any clear indication or rationale connecting the criteria assessment and the significance determination.

For instance, it is unclear how the Proponent moves from specific ratings for each project activity or physical work on wetland sparrow (Volume IIB, Table B-A23) to a summary criteria rating (Volume IIB, p.5-40), to a general significance statement for each phase of the project (e.g. construction and operation) (Volume IIB, p.5-97).

Input from Aboriginal Groups:

The EIS Guidelines require the Proponent to demonstrate its understanding of the interests, values, concerns, contemporary and historic activities, Aboriginal traditional knowledge and important issues facing Aboriginal groups, and indicate how these will be considered in planning and carrying out the Project (Section 4.8). How this has been done with respect to significance determinations is not evident in the EIS.

Degree to which effects are reversible:

The EIS uses a reversible/not reversible criterion that has no degree of flexibility with respect to the extent of reversibility. As long as an effect is partly reversible at some point in the future, it is considered "not significant" in the EIS. The EIS does not justify why a more detailed analysis in order to predict, mitigate and evaluate potential residual environmental effects of partly reversible impacts is not required.

Temporal Boundaries:

Section 4.4.4 of the EIS Guidelines requires that for each VEC, the Proponent should consider and justify how far back in time and how far into the future the environmental assessment should be conducted and identify any deficiencies in information, and how these deficiencies will be addressed. The EIS does not appear to meet this requirement, For example, while temporal boundaries are discussed, the EIS includes no justification of the length of time baseline information needs to be collected in order to draw defensible conclusions regarding environmental effects or to develop environmental effects monitoring programs. While this is a problem with many of the component studies, it is of particular relevance to wildlife and socio-economic studies, where data gaps appear to be more substantial.

Technical boundaries are discussed in the EIS in very general terms, with no specific limitations of the baseline data discussed in relation to each VEC, as requested by the Guidelines.

Spatial Boundaries:

The EIS indicates that spatial ecological boundaries are determined by the distribution and movement patterns of biophysical components (e.g. seasonal migrations of various fish and wildlife species) or physical elements (e.g. watersheds) (Volume I Section 9.3.2). [Except for caribou] "the area that was assessed for environmental effects on the individuals of each KI (key indicator) species was the watershed" (Volume II Section 7.4.2.2). Innu Nation has indicated that the "ecological" boundaries as set out in the EIS, do not appear to have been followed and the Churchill River watershed was not used as the study area for any terrestrial VEC or KI. They argue instead that the upper portion of the watershed appears to have been omitted from the study area in order to study only the lower watershed.

While this separation has some merit in the case of fish species, Innu Nation states that it is not inclusive of the landscape necessary to predict the environmental effects of the Project on many of the VECs, as required by the Guidelines. No rationale is provided in the EIS for the use of the lower Churchill watershed as the study area.

Ecological Land Classification:

The EIS Guidelines specify that each study area should be inclusive of the landscape necessary to predict the environmental effects of the Project on each VEC and explain that the delineation of the study areas is crucial to scope the extent of the environmental assessment. The rationale used to delineate the boundaries of the study areas is to be provided in the EIS (Section 4.4).

For all KIs, except caribou, the Assessment Area coincides with the lower Churchill River watershed, which comprises 25,214 km^2. The EIS later clarifies that:

> (t)he description of terrestrial environment in the following sections is based on several sources. Delineation of habitat types is based on an ELC, in which the landscape and associated vegetation communities (ecotypes) of the lower Churchill River valley were mapped. To examine the area of the proposed reservoirs, an area 2 km on either side of the Churchill River, from Churchill Falls to Lake Melville, was mapped at a scale of 1:20,000 (Volume IIA, p. 2-71).

The EIS implies that the boundaries for the ecological land classification, upon which the entirety of the terrestrial effects assessment are based, are set at distance of 2 km from the future reservoir shores and transmission corridors. The EIS does not explain the ecological or cultural basis of the ELC boundaries or the limitations that result from the use of such a limited data set.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

a. **the specific criteria, or evaluation matrix that was applied in order to move from specific environmental effects evaluation of each VEC/KI of <u>each</u> project activity or physical work to a general environmental effects evaluation for a project phase;**

Response:

Consistent with the EIS guidelines (Section 4.5.1), the interactions for each relevant Project activity or physical work are characterized in Appendices IIA-A, IIB-A and IIIB of the EIS for each Project – KI interaction. These environmental effects were assessed using the following criteria, as appropriate:

- Nature
- Magnitude
- Geographic extent
- Timing
- Duration
- Frequency
- Reversibility
- Ecological or social context
- Certainty
- Biological diversity
- Environmental protection goals and objectives (for species of special concern)

The interactions for each environmental effect are characterized in detail (e.g., Site Preparation and Construction of Site Buildings) using these criteria, which are then considered in the evaluation of each environmental effect (e.g., Change in Habitat) for each Project phase (Construction, Operation and Maintenance) within the environmental effects assessment for each KI or VEC (Sections 3.7 to 3.9, 4.7 to 4.14 of Volume IIA; Sections 5.7 to 5.13 of Volume IIB; Sections 3.2 to 3.7, 4.2 to 4.7, 5.2 to 5.5, 6.2 to 6.5 of Volume III). This comprehensive environmental effects analysis considered a wide range of information that informed the nature of environmental effects and their consequences (i.e., likely residual effects after the application of mitigation measures), which was then used to determine their significance (Barnes et al. 2000).

In evaluating the environmental effects, the study team considered the following factors:

- the existing baseline conditions of the VEC/KI;
- existing knowledge about the KI, including such factors as the sensitivity of the VEC/KI to the predicted environmental effect;
- the nature of Project-environment interactions by activity and phase as characterized by the criteria indicated above;
- the nature and effectiveness of proposed mitigation; and
- the extent to which the Project affects the VEC/KI as described by the measureable parameters.

All of these factors were considered, as appropriate and applicable, to determine whether the combined environmental effects were of a nature and extent that would exceed the threshold established for the determination of significance (e.g., sustainable populations). Specifically, the criteria used to characterize the interactions (i.e., nature, magnitude, geographic extent, timing, frequency, duration, reversibility, ecological or social context, level and degree of certainty of knowledge) were evaluated, in combination with these factors to provide an informed and comprehensive assessment of likely Project-related environmental effects. The rationale for selecting threshold values for magnitude is described in IR# JRP.4(a) (please note that "…Moderate Magnitude of less than 5% in this environmental assessment" should read "…Low Magnitude of less than 5% in this environmental assessment").

An evaluation matrix to move from specific environmental effects evaluation of each Project activity to a general environmental effects evaluation for a Project phase was not used. As described in Section 9.8, Volume IA of the EIS, residual environmental effects of the Project are described for each Project phase based on definitions of significance developed specifically for each VEC or KI. This enabled the assessment to be specifically tailored for each VEC/KI to provide the most likely and reliable prediction of residual Project-related environmental effects (i.e., after the application of mitigation). This meant that in certain instances only some of the criteria outlined in the EIS Guidelines were directly relied upon for determining significance of residual Project-related environmental effects.

For example, the significance of environmental effects to the George River Caribou Herd is based on whether a sustainable population will remain in the Assessment Area (i.e., the lower Churchill River watershed) after the Project has been completed and is operational. The nature and extent of the environmental effects are described in terms of the relevant criteria, but there is no one criterion or combination of criteria that are exclusively relied upon for a determination of significance. For this KI, the criteria of magnitude, geographic extent, reversibility and ecological context are key in determining whether a sustainable population will remain in the Assessment Area. Duration and frequency of effects are not key to the definition because the primary effect (loss or alteration of habitat) is not informed by these criteria. This is so, because if the habitat is lost or altered as a result of reservoir creation, it happens once (frequency) and is considered permanent (duration). However, these latter criteria are used to describe each Project-KI interaction to provide a thorough evaluation. Other factors like the status of the population (existing baseline conditions) and existing knowledge about the interaction, including the sensitivity of caribou to the predicted environmental effects, were also important considerations. As a result, the significance determination for this KI is based on a holistic evaluation of all necessary and relevant information, with the sustainability of the population as the ultimate determining factor. Overall, the study team determined that the environmental effects of the project would not affect the sustainability of the George River Caribou Herd in the Assessment Area. Please refer to part (b) of this response for additional information on significance determination for this and all VEC/KIs evaluated for the Project EIS.

Reference:

Barnes, J.L., M. Stephenson and L.H. Davey. 2000. An integrated approach to cumulative environmental effects assessment, meeting requirements of the *Canadian Environmental Assessment Act*. In: Proceedings of the 27th Annual Toxicity Workshop: October 1-4, 2000, St. John's, NL. Canadian Technical Report of Fisheries and Aquatic Sciences, 2331.

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Information Requested:

The Proponent is asked to provide:

b. the specific criteria or evaluation matrix that was used to assess the environmental effects evaluation for each VEC/KI in order to make a significance determination. In the response, the Proponent should be precise about how the environmental effects criteria directly relate to the significance determination and describe the relationship for each VEC/KI as appropriate. For instance, how do the magnitude, nature, geographic extent, duration/frequency, reversibility, and ecological context criteria translate into an assessment of whether or not a sustainable population will be maintained in the Assessment Area for a given terrestrial KI;

Response:

As shown in Table 1 provided below, the definition of significance for the Terrestrial Environment KIs (with the exception of caribou) relies on a determination of whether sustainable populations will persist within the Assessment Area during the operation and maintenance phase. This is a conservative evaluation because the Assessment Area is limited to the lower Churchill River valley, whereas these populations extend regionally (i.e., well outside of the Assessment Area) and beyond. The definition and determination of significance is also provided for the other KIs in Table 1.

As required by the EIS guidelines (Section 4.5.1) and as recommended by CEA Agency guidance (The Responsible Authority's Guide 1994), the EIS describes predicted environmental effects in the context of the following criteria or parameters (as appropriate), while also considering the factors outlined above in response to part (a) of this information request:

- Nature;
- Magnitude (qualitative and quantitative);
- Geographic (spatial) extent;
- Timing, duration and frequency;
- Degree to which environmental effects are reversible or mitigable;
- Ecological context; and
- Cultural heritage and social context.

These criteria provide an understanding of the nature of each environmental effect, although as explained above in response to part (a) of this information request, not all were necessarily key to determining significance.

Table 1 provides further description of the specific manner in which these criteria informed the determination of the significance of environmental effects. Where existing standards or guidelines were available, they provide the basis for determining the significance of an environmental effect. For example, for the Atmospheric Environment VEC (Air Quality KI) the significance definition relies on federal and provincial air quality standards, and for the Cultural Heritage Resources VEC (Historic and Archaeological Resources KI) the significance definition relies on provisions contained the Newfoundland and Labrador *Historic Resources Act* (1985). For the other VECs and/or KIs, and in the absence of standards and/or guidelines, significance definitions have been developed that

are specific to this Project and appropriate for both the VEC/KI under assessment given the nature of the predicted Project-related environmental effects.

Table 1 also provides the plain language statement for each analysis of significant effects on VECs/KIs as requested below in part (c) of this information request. This is referred to as the "Plain Language Summary."

Table 1 Environmental Effects Criteria and Relationship to Significance Definitions and Significance Determination

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Atmospheric Environment: **Air Quality KI** A significant residual adverse environmental effect of the Project on Air Quality is one where, after mitigation has been considered, the Project-related emissions of air contaminants will frequently exceed the Newfoundland and Labrador or federal ambient air quality standards Frequent occurrence means the guidelines will be exceeded greater than 1 hour per week (for those air contaminants with a 1 hour standard) or 1 day per month (for those air contaminants with a 24 hour standard) An exceedance of the annual standard is also considered a significant residual adverse environmental effect because this represents a prolonged air quality event	Nature Magnitude Geographic Extent Duration/Frequency	Magnitude, geographic extent, and duration/frequency are elements of the significance definition, reflecting the regulatory requirements related to air quality Reversibility and ecological context are not used in determining significance as provincial and federal air quality standards do not consider these parameters	**Construction:** Air emissions will result from the use of fuel to power the heavy equipment during construction activities. Fugitive dust may also be generated during construction activities in dry weather. With the application of appropriate mitigation, the contribution of air pollutants to the Assessment Area from the Project are not likely to frequently result in ambient concentrations greater than the provincial ambient air quality standards. While any potential effects will be adverse, they will also be short term and reversible, occurring occasionally. The magnitude will be moderate and limited to the Assessment Area. Therefore, the residual adverse environmental effects of air pollutant emissions from the Project are not likely to be significant **Operation and Maintenance:** Emissions of air pollutants during operation and maintenance of the facilities are expected to originate only from vehicle traffic associated with commuting workers and from specific supplier and maintenance activities including inspection, maintenance and repairs along transmission line. Given that, there will be no likely measureable interaction between the Project and Air Quality during Operation and Maintenance phase **Plain Language Summary:** The environmental effects of the Project on Air Quality will occur during the construction phase as a result of operating construction equipment, and dust. These environmental effects will occur at the construction sites and will be reduced by operating procedures and dust control measures so that air quality will not be significantly affected by the Project. During the operation and maintenance phase, air emissions will be considerably less than during the construction phase and, therefore, are also not likely to be significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Atmospheric Environment: Climate KI The Climate KI is unique in that while Project-related environmental effects on climate are considered in the EIS, no significance determination is required and therefore no significance definition is made. Please see the "Comments" column	n/a	Consistent with CEA Agency idance (CEA Agency. 2003), Climate is assessed in the EIS by • conducting a preliminary scoping of GHG emissions • determining jurisdictional considerations (including GHG policies or plans) • determining the industry profile (where possible) and • considering the magnitude, intensity and timing of Project emissions Specifically, consideration is given to the quantities of GHG emissions from the Project, the relative amounts compared to similar projects, and to provincial, national and global GHG emissions Where GHG emissions are considered to be either medium or high, a GHG Management Plan will be prepared. Finally, consideration is given to follow-up and adaptive management	Please see "Comments" column. **Plain Language Summary:** Given its global nature, no significance determination is provided concerning the Project's predicted environmental effects on the climate because there will be no measurable or detectable change in the climate as a result of the Project. However, the Project will comply with all applicable climate change and GHG legislation and regulations. The average GHG emission intensity (in CO_2e) for the Project over its operating life will be much lower when compared to emission intensities of other generation types such as: natural gas, coal, and refined petroleum products for other competing types of electricity generation

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Aquatic Environment A significant adverse residual environmental effect is of sufficient magnitude, duration, frequency, geographic extent and/or irreversibility as to cause a change in a measurable parameter within the Assessment Area, such that conditions may not stabilize to their original levels within several generations of the fish assemblage that depend on that measurable parameter	Nature Magnitude Geographic Extent Duration/frequency Reversibility	For this VEC, all criteria with the exception of ecological context are used to inform determining significance While considered in describing predicted environmental effects, ecological context was not directly incorporated into the threshold for significance to ensure a precautionary (i.e., conservative) approach (i.e., significance determination for this VEC/KI was not influenced by the current regulated status of the river)	**Construction:** The primary environmental effect (change in fish habitat) is predicted to be neutral as a result of the removal of fish habitat due to construction of the dams (adverse environmental effects*),* but increase in fish habitat and fish habitat compensation required pursuant to the *Fisheries Act* (positive environmental effects*).* The environmental effects during the construction phase will be permanent and irreversible (e.g., unless the dams are entirely removed), local in geographic extent, and high magnitude. There is a high level of certainty of knowledge about the interactions and effectiveness of mitigation. Accordingly, the residual adverse environmental effect of construction is not likely to be significant **Operation and Maintenance:** The environmental effect is predicted to be neutral as a result of the increase in fish habitat, and in consideration of the fish habitat compensation pursuant to the *Fisheries Act* (positive effect) and effects resulting from fish mortality and accumulation of mercury (adverse effects). The environmental effects are likely to be high magnitude, local, permanent and irreversible. The residual adverse environmental effect of operation and maintenance is not likely to be significant because • the Fish Habitat Compensation Plan will mitigate environmental effects on fish and fish habitat • the absence of any population-based migration and the predicted mortality/injury rates of the turbines will likely be local • while fish mercury body burden is predicted to increase, health-related environmental effects on fish are not likely to be detectable at the population level **Plain Language Summary:** Fish habitat will be created as a result of the Project. Habitat that is important for fish, such as that for spawning, will also be built and enhanced. All newly created habitat will be monitored to make sure that it is being used by fish. Fish numbers will also be monitored and evaluated to verify environmental effects predictions and determine whether additional mitigation is needed. Some fish near the generation sites may be killed or hurt if they pass through the turbines. The rate of survival through the turbines is generally good and only a small portion of the population is likely to be entrained. The levels of mercury in the fish from the flooding of the reservoirs will not be high enough to affect the numbers of fish in the reservoirs and downstream. Mercury levels in fish will also be checked after the reservoirs are built to confirm this prediction. The Project is not likely to cause significant environmental effects for fish or their habitat

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: George River Caribou Herd (GR Herd) KI A significant adverse residual environmental effect from the Project is one that would cause a population decline, such that the viability or recovery of the Herd is threatened	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected. This is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether the sustainability and viability of recovery of the Herd would be threatened Reversibility and ecological context are also considered in this definition, given the status of the Red Wine Mountains Herd as a species of special conservation concern Duration and frequency of Project-related environmental effects were not considered to directly influence the determination of significance as the key environmental effect associated with this Project is habitat loss/alteration that for the most part will occur once, but will be permanent and irreversible	**Construction** – The environmental effects are predicted to be adverse as a result of limited loss and alteration of habitat for this KI which may seasonally occupy the Assessment Area. The Project activities that contribute most to this environmental effect are reservoir preparation and impoundment, physical disturbance at construction sites and access roads, and clearing of the transmission line right-of-way. While the dams are considered permanent, they are of little consequence for caribou habitat (as they will be constructed mostly within the lower Churchill River). The reservoirs are to be filled at the end of this phase and for a period of time may be considered reversible, as will most other areas of habitat alteration due to the Project. Although there have been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. Given that this KI occurs seasonally in the Assessment Area (if at all in some years) and the Assessment Area is a small portion of this species range, the magnitude of the extent of change from the baseline state was considered low in terms of habitat availability. Due to these factors, the local geographic extent, high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, the GR Herd will be able to continue to use the Assessment Area. Therefore, the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project is reduced and remains as low in magnitude. While the predicted environmental effects will still be adverse in nature, they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The suitable and extensive habitat available and the infrequent nature of the occupation of the Assessment Area provide a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect is considered not significant **Plain Language Summary** The GR Herd occupies an extensive range many times larger than the Assessment Area. When these animals do seasonally occur in the Assessment Area there is extensive habitat available, as most of the Assessment area is undisturbed. While some disturbance may occur during reservoir preparation and transmission line construction in particular, such interactions will likely not be of concern from a wildlife population perspective

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: **Red Wine Mountains Caribou Herd KI** A significant adverse residual environmental effect from the Project is one that would cause a population decline, such that the viability or recovery of the Herd is threatened	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected. This is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether the sustainability and viability of recovery of the Herd would be threatened Reversibility and ecological context are also considered in this definition, given the status of the Red Wine Mountains Herd as a species of special conservation concern Duration and frequency of Project-related environmental effects were not considered to directly influence the determination of significance as the key environmental effect associated with this Project is habitat loss/alteration that for the most part will occur once, but will be permanent and irreversible	**Construction** – The environmental effects are predicted to be adverse as a result of loss and alteration of habitat for this KI that occurs within the Assessment Area. The Project activities that contribute most to this environmental effect are reservoir preparation and impoundment, physical disturbance at construction sites and access roads, and clearing of the transmission line right-of-way. While the dams are considered permanent, they are of little consequence for caribou habitat (as they will be constructed mostly within the lower Churchill River). The reservoirs are to be filled at the end of this phase and for a period of time may be considered reversible, as will most other areas of habitat alteration due to the Project. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. This KI occurs throughout the Assessment Area, albeit at low density and overall abundance. The magnitude of the extent of change from the baseline state was considered moderate, as it is not likely a concern from a wildlife management and population perspective. Due to these factors plus the local geographic extent, high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, the Red Wine Mountains Caribou Herd will be able to continue to occupy the Assessment Area. Although the population is in decline, the contribution of the environmental effects from the Project is not likely to contribute to this decline. Therefore the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project is reduced, however, was considered to remain as moderate in magnitude. While the predicted environmental effects will remain as adverse in nature, they will be of a local geographic extent. The presence of the reservoirs and their operation will likely result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The suitable and extensive habitat available and the fact that habitat has been identified as one of the factors leading to the decline of this Herd provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect is considered as not significant **Plain Language Summary** The decline of the Red Wine Mountains Caribou Herd has been attributed to overhunting (poaching) and predation. The Project is not likely to contribute to either of these problems. While there will be some alteration and loss of habitat associated with the construction, there is extensive alternate habitat available throughout the Assessment Area. These interactions are not considered to be of concern from a wildlife population perspective during either phase of the Project

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Moose KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations and were considered Duration and frequency of Project-related environmental effects were not considered because the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once and will be permanent	**Construction** – The environmental effects are predicted to be adverse and positive as result of habitat loss and alteration that will likely result in an increase in deciduous hardwood vegetation where mineral soil is exposed (IR# JRP.102). This KI occurs throughout the Assessment Area, but during winter occupies areas of reduced snow depths (beneath coniferous cover) adjacent to areas that support suitable browse species. As a result of reservoir preparation and impoundment, there will be displacement from some wintering areas during the inundation. The reservoir preparation and physical disturbance at construction sites and access roads, and clearing of the transmission line right-of-way will encourage regeneration of suitable browse species. While the dams are considered permanent, they are of little consequence for Moose habitat (as they will be mostly constructed within the lower Churchill River). The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. Moose populations have increased and expanded in range in the last few decades. The magnitude of the construction activities was considered moderate, but much of the Project will result in positive aspects in terms of habitat quality. Health and mortality environmental effects on Moose from the Project are not expected. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, Moose will continue to occupy the Assessment Area. Therefore it is considered to continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project is reduced, but will likely remain as moderate in magnitude. While the predicted environmental effects will remain primarily as adverse in nature (with limited positive aspects due to the operation of the reservoir) they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat, and adaptability of Moose in areas of disturbance (IR# JRP.92), provides a high level of certainty for the knowledge of these interactions. Accordingly, the environmental effect is considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: **Moose KI cont.**			**Plain Language Summary** The lower Churchill River valley is an important area for Moose, particularly during the winter. The Project will cause displacement from some wintering areas during the formation of the reservoirs but other areas of disturbance will likely result in attractive habitat for this KI. Following construction, areas of disturbed habitat will continue to be attractive for this KI, as regeneration of vegetation occurs, and help offset losses that occurred during construction at those locations. It is predicted that population and range of Moose will continue to expand during both phases of this Project Note that in the EIS (Table 5-31 in Volume IIB), positive environmental effects should have been indicated in addition to adverse environmental effects. Disturbance during construction and to a lesser degree during operation and maintenance will likely continue to provide foraging areas for Moose as browse species regenerate

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: **Black Bear KI** A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects are predicted to be adverse as result of habitat loss and alteration, but health-related environmental effects and mortality as a result of the Project are not expected. This KI occurs throughout the Assessment Area and occupies a variety of habitat types. The lower Churchill River valley is an important area for Black Bear, particularly during the summer, although the telemetry program has indicated these areas may also be used for den sites during winter. As a result of reservoir preparation and impoundment, there will be displacement from areas occupied as part of seasonal ranges. The reservoir preparation and physical disturbance (and attraction) at construction sites and access roads, and clearing of the transmission line right-of-way will support the regeneration of forage species. While the dams are considered permanent, they are of little consequence for Black Bear habitat (as they will be constructed mostly within the lower Churchill River). The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered low, as much of the Assessment Area is considered to be primary habitat. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, Black bear will continue to occupy the Assessment Area. Therefore, Black Bear will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance (and attraction resulting in human-bear conflicts) associated with the Project is reduced, but will likely remain as local in magnitude and adverse in nature. The presence of the reservoirs and their operation will likely result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat, and the adaptability of Black Bear to a variety of habitat types, provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect is considered not significant **Plain Language Summary** The lower Churchill River valley is an important area for Black Bear, particularly during the summer, although the telemetry program has indicated these areas may also be used for den sites during winter. The Project will cause displacement from some of these habitats during the formation of the reservoirs. Following construction, areas of disturbed habitat and possible attractions that lead to human-bear conflicts will likely continue for this KI. It is predicted that Black Bear will continue to persist in the Assessment Area without any change in abundance as a result of activities during both phases of this Project and the environmental effect of the Project on Black Bear is considered to be not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Beaver KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse as result of habitat loss and alteration, primarily as a result of reservoir preparation and impoundment, when there will likely be displacement of some active colonies. The relocation of active colonies will assist in reducing adverse environmental effects, but there will still be an adjustment in distribution. While the dams are considered permanent, they are of little consequence for Beaver habitat (as they will be constructed mostly within the lower Churchill River where active colonies were found in relatively low density—beaver tend to be more abundant in the vicinity of the transmission line route). The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered low, given a general avoidance of waterbodies and wetlands whenever possible for siting Project components. Health and mortality-related environmental effects to Beaver from the Project are not expected. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, the efforts to relocate active colonies and that there is suitable and extensive alternate habitat available, Beaver will continue to occupy the Assessment Area. Therefore, as a sustainable population will persist, and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely remain as low in magnitude. While the predicted environmental effects will remain as adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible and permanent environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat, and lack of further disturbance to active colonies, provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect for Beaver is considered not significant **Plain Language Summary** Beaver tend be more abundant in the vicinity of the transmission line route. The preparation and inundation associated with the reservoirs will result in the disturbance of some active colonies but the Project components are not occurring in the area of highest density. Following construction, there will not be any need to relocate active colonies and there should be no additional intrusion on habitat or active colonies during operation and maintenance. It is predicted that Beaver will continue to persist as a sustainable population in the Assessment Area during both phases of this Project and the environmental effects are therefore considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Marten KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, as result of habitat loss and alteration primarily during reservoir preparation and impoundment, transmission line construction and establishment of other Project facilities. Marten prefer climax coniferous forest, so disturbance to those habitats may cause deterioration in habitat quality. While the dams are considered permanent, they are of little consequence for Marten habitat (as they will be mostly constructed within the lower Churchill River). The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered moderate for this KI. Health and mortality-related environmental effects to Marten from the Project are not expected. Due to these factors and the local geographic extent of environmental effects, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, Marten will continue to occupy the Assessment Area. Therefore, Marten will persist as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely continue, with a low magnitude. While the predicted environmental effects will remain as adverse in nature, they will be of a local geographic extent. The presence of the reservoirs and their operation will likely result in irreversible and permanent environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat, and lack of further disturbance to areas of primary habitat, provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect of the Project on Marten is considered not significant **Plain Language Summary** Marten are associated with the extensive mature coniferous forest in the Assessment Area. The preparation and inundation associated with the reservoirs will displace some animals or at least cause an adjustment to home ranges of animals in the lower Churchill River valley. Following construction, there will not be any further habitat loss or alteration associated with the Project. It is predicted that Marten will continue to persist in the Assessment Area as a sustainable population during both phases of this Project, and the environmental effects are therefore considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Porcupine KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations. Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, as result of habitat loss and alteration primarily as a result of reservoir preparation and impoundment, transmission line construction and establishment of other Project components. Porcupine prefer coniferous forest (although openings are important during spring) so disturbance to habitats may cause deterioration in habitat quality. While the dams are considered permanent (as they will be mostly constructed within the lower Churchill River), they are of little consequence for Porcupine habitat. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered low for this KI. Health and mortality-related environmental effects to Porcupine from the Project are not expected, although mortality resulting from collisions with vehicles may occur. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, Porcupine will continue to occupy the Assessment Area. Therefore, Porcupine will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely remain as low in magnitude. While the predicted environmental effects will remain as adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat, and lack of further disturbance to areas of primary habitat (plus lower levels of Project related traffic), provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect of the Project on Porcupine is considered not significant **Plain Language Summary** Porcupine is associated with the extensive coniferous forest in the Assessment Area. The preparation and inundation associated with the reservoirs will displace some animals or at least cause an adjustment to home ranges of animals in the lower Churchill River valley. Following construction, there will likely not be any further habitat loss or alteration associated with the Project. It is predicted that Porcupine will continue to persist as a sustainable population in the Assessment Area during both phases of this Project and therefore, the environmental effects of the Project are considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Canada Goose KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations. Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that for the most part will occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, primarily due to disturbance to areas of habitat throughout the reservoirs, resulting from reservoir preparation and inundation. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely only interact with nearby staging waterfowl), they are of little consequence for Canada Goose habitat. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered to be low, given a general avoidance of waterbodies and wetlands whenever possible during siting of Project components. Health and mortality-related environmental effects to Canada Goose from the Project are not expected. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate habitat available, Canada Goose will continue to occupy the Assessment Area. Therefore, Canada Goose will persist as a sustainable population in the Assessment Area and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely increase due to the presence of the reservoirs, which may remain ice covered during the spring staging period and is therefore considered as moderate in magnitude. While the predicted environmental effects will remain as adverse in nature, they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive habitat (breeding areas primarily in “string bogs” [or “sting fens”] above the Lower Churchill River valley), and lack of further disturbance to breeding areas, provides a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect for Canada Goose is considered not significant as sustainable populations will persist within the Assessment Area **Plain Language Summary** Canada Goose are early nesting waterfowl and typically arrive in the Assessment Area when the reservoirs could be ice-covered. Alternate open water habitat will likely be available elsewhere in this area and breeding habitat tends to be associated with “string bogs” above the lower Churchill River valley. It is the presence of the ice during the operation and maintenance phase that will likely have the greatest contribution to the environmental effect of habitat loss and alteration. It is predicted that Canada Goose will continue to persist in the Assessment Area during both phases of this Project and the environmental effect of the Project is considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: **Surf Scoter KI** A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population. Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, primarily due to disturbance to areas of habitat throughout the reservoirs, resulting from reservoir preparation and inundation. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely not interact with waterfowl staging in adjacent habitat), they are of little consequence for Surf Scoter habitat. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered moderate given the importance of the lower Churchill River for spring staging, although alternate staging and breeding habitat occurs elsewhere within the Assessment Area. Health and mortality-related environmental effects to Surf Scoter from the Project are not expected. Due to these factors and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that there is suitable and extensive alternate staging and breeding habitat available, Surf Scoter will continue to occupy the Assessment Area. Therefore, Surf Scoter will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely decrease with the reduction of human presence and other Project activities in the Assessment Area. Therefore, the magnitude is considered to be low during this phase. While the predicted environmental effects will remain as adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The amount of suitable and extensive habitat, and lack of further disturbance to breeding (and staging) areas, provides a high level of certainty of the knowledge of these interactions. Accordingly, a sustainable population will persist and the environmental effect for Surf Scoter is considered not significant **Plain Language Summary** Surf Scoter are late nesting waterfowl and arrive in the Assessment Area when the reservoirs are breaking up. The increased ice cover should be less of an issue for this species. Alternate open water habitat is available elsewhere in this Assessment Area and breeding habitat tends to be associated with small ponds and similar waterbodies above the lower Churchill River valley. It is the presence of human activity during the construction phase that will likely have the greatest contribution to the environmental effect of habitat loss and alteration. Regardless, it is predicted that Surf Scoter will continue to persist in the Assessment Area during both phases of this Project and the environmental effect is considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Ruffed Grouse KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects are predicted to be adverse (e.g., habitat loss and alteration) and positive (increase in deciduous hardwood vegetation where mineral soil is exposed (IR# JRP.102)). This KI occurs in close association with the hardwood ecotypes that tends to be concentrated in the eastern portion of the Assessment Area. As a result of reservoir preparation and impoundment, there will likely be displacement from some areas of primary habitat. The reservoir preparation and physical disturbance at construction sites and access roads, and clearing of the transmission line right-of-way will encourage the regeneration of suitable browse species. Additionally, the creation of additional hardwood habitat adjacent to the Muskrat Falls reservoir will likely offset losses during this phase. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River), they are of little consequence for Ruffed Grouse habitat. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered moderate, but much of the Project (and mitigation measures) will result in positive aspects in terms of habitat quality. Health and mortality-related environmental effects on Ruffed Grouse from the Project are not expected. Due to these factors, and the local geographic extent, the high level of certainty of the knowledge of these interactions, and that suitable alternate habitat will be created as a result of the Project, Ruffed Grouse will continue to occupy the Assessment Area. Therefore, Ruffled Grouse will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project is reduced to low in magnitude. While the predicted environmental effects will remain as adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will likely result in irreversible environmental effects that are considered to occur within a disturbed ecological context. Considering the amount of suitable habitat that will be created for Ruffed Grouse in areas of disturbance and the high level of certainty of the knowledge of these interactions, the environmental effect is considered not significant **Plain Language Summary** The Project will cause displacement from some primary habitat during the preparation and formation of the reservoirs but other areas of disturbance and the proposed mitigation to create hardwood habitat adjacent to the Muskrat Falls reservoir that will likely result in suitable habitat for this KI. It is predicted that Ruffed Grouse will continue to use habitats within the Assessment Area during both phases of this Project, a sustainable population will persist, and the environmental effects are considered not significant as a consequence

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Osprey KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects are predicted to be positive (although some adverse aspects may be expected due to disturbance in the vicinity of nesting habitat). This KI nests throughout much of the Assessment Area, but artifical nests are located above the new shoreline and the construction of the transmission line will likely provide new nesting opportunities on the poles. The magnitude of the number of nests created (in a positive manner) is considered to be high. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely not interfere with breeding habitat), they are of little consequence for Osprey. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The geographic extent of the construction activities was considered local but much of the Project (including mitigation measures) will likely result in positive changes in terms of habitat quality. Health and mortality-related environmental effects to Osprey from the Project are not expected. Considering the above factors and the high level of certainty of the knowledge of these interactions, Osprey will continue to occupy the Assessment Area. Therefore, Osprey will persist as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely remain high in magnitude. While the predicted environmental effects will remain as positive in nature (with some adverse aspects related to maintenance activities) they will be of a local geographic extent. The presence of the artificial nest platforms and maintenance of the transmission line will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. Considering the amount of suitable nesting habitat that will be created for Osprey and the high level of certainty of the knowledge of these interactions, the population will be sustainable, and consequently, the environmental effect is considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Osprey KI cont.			**Plain Language Summary** Osprey nest throughout the lower Churchill River watershed. In areas where suitable nesting habitat is absent (despite the presence of fish and suitable access to them), the presence of artificial platforms such as associated with transmission lines, can result in additional breeding sites. The Project will cause the loss of some nest sites along the river valley but the commitment to replace these sites, and the transmission towers, will likely result in an overall increase in breeding sites in the Assessment Area. Following construction, the maintenance of the transmission line will result in ongoing positives aspects for breeding Osprey in the Assessment Area. Therefore, the population will be sustainable and the environmental effects are considered not significant Note that in the EIS (Table 5-31 in Volume IIB), positive environmental effects should have been indicated, in addition to adverse environmental effects, in consideration of the increased nesting locations for this KI.

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Wetland Sparrows KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat Magnitude directly informed the determination of whether any decline would affect the sustainability of the population. Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects are predicted to be adverse, as result of habitat loss and alteration that will likely result in a decrease in the amount of primary habitat that is available in the Assessment Area. This KI occurs in close association with the riparian meadow ecotype that tends to be concentrated in the lower Churchill River valley of the Assessment Area. As a result of reservoir impoundment, there will be displacement from areas of primary habitat. The mitigation of creating riparian habitat will likely offset losses during this phase (and thereafter). While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely not interfere with breeding habitat), they are of little consequence for Wetland Sparrow habitat. The related Project activities are considered reversible. Although there have been forestry operations, road construction and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered high. Health and mortality-related environmental effects to Wetland Sparrows from the Project are not expected. Considering the above factors, the local geographic extent of the environmental effects, the availability of undisturbed areas of primary habitat, the high level of certainty of the knowledge of these interactions, and the creation of suitable alternate habitat, Wetland Sparrow will continue to occupy the Assessment Area. Therefore, Wetland Sparrows will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project is reduced, but given the proximity of undisturbed and created habitat to the reservoirs is considered to remain high in magnitude. While the predicted environmental effects will remain as adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible environmental effects that are considered to occur within a disturbed ecological context. There is a high level of certainty of the knowledge of these interactions. Accordingly, the environmental effect is considered not significant **Plain Language Summary** The Project will cause displacement from and loss/alteration of primary habitat as a result of the inundation. Nalcor Energy (Nalcor) will create suitable habitat for this KI to assist in addressing the anticipated decline for these species as a result of the Project. Regardless, these species will be able to continue to use available habitat in the Assessment Area during both phases of this Project, maintain a sustainable population, and consequently, the environmental effect is considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: Harlequin Duck KI A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, resulting primarily from disturbance to areas of habitat throughout the reservoirs, as a result of reservoir preparation and inundation. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely not interfere with breeding habitat), they are of little consequence for Harlequin Duck habitat. The related Project activities are considered reversible. Although there has been forestry operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered to be low, given that all known breeding territories for this KI occur above the projected shorelines for the reservoirs. Health and mortality-related environmental effects for this late-nesting waterfowl species from the Project are not expected. Considering the above factors, the local geographic extent, the high level of certainty of the knowledge of these interactions, Harlequin Duck will continue to occupy the Assessment Area. Therefore, Harlequin Duck will continue as a sustainable population and the environmental effect is considered not significant **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely decrease with the reduction of human presence and other Project activities in the Assessment Area; the magnitude will likely remain low during this phase. While the predicted environmental effects are adverse in nature they will be of a local geographic extent. The presence of the reservoirs and their operation will result in irreversible and permanent environmental effects that are considered to occur within a disturbed ecological context. The amount of suitable and extensive habitat, and lack of further disturbance to breeding (and staging) areas, provides a high level of certainty of the knowledge of these interactions. Accordingly, as a sustainable population will persist in the Assessment Area, the environmental effect for Harlequin Duck is considered not significant **Plain Language Summary** Harlequin Duck are known to breed in several areas throughout the lower Churchill River watershed, but not on the river itself. The river is used for spring and fall staging. This late-nesting waterfowl species arrives at break-up. Increased ice cover should be less of an issue for these species as alternate open water habitat is available elsewhere as breeding habitat tends to be associated with deltas at tributaries and at the outlets of lakes above the reservoirs in the watershed. It is the presence of human activity during the construction phase that will likely have the greatest contribution to the environmental effect of habitat loss and alteration. Regardless, it is predicted that Harlequin Duck will continue to persist as a sustainable population in the Assessment Area during both phases of this Project and consequently, the environmental effects are considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Terrestrial Environment: **Other Species of Concern KI** A significant adverse residual environmental effect from the Project would cause a decline such that a sustainable population cannot be maintained within the Assessment Area	Nature Magnitude Geographic Extent Reversibility Ecological Context	Magnitude is rated based on the percentage of habitat affected which is in turn based on geographic extent of the Project-related environmental effects in relation to loss of habitat. Magnitude directly informed the determination of whether any decline would affect the sustainability of the population Both ecological context and reversibility are concepts inherent in the objective of sustainable populations Duration and frequency of Project-related environmental effects were not considered to directly influence the significance threshold as the key environmental effect associated within this Project is habitat loss/alteration that will generally occur once, but will be permanent	**Construction** – The environmental effects of the Project are predicted to be adverse, primarily due to disturbance to areas of habitat in the Assessment Area, as a result of reservoir preparation and inundation. While the dams are considered permanent (as they will be constructed mostly within the lower Churchill River and will likely not interfere with breeding habitat), they are of little consequence for the species included in this KI. The related Project activities are considered reversible. Although there has been forest operations, roads and other activities, most of this Assessment Area is considered undisturbed within an ecological context. The magnitude of the construction activities was considered to be low, given that breeding habitat for these species tends to be above the reservoirs and/or associated with wetlands. Health and mortality-related environmental effects to this KI from the Project are not expected. Considering the above factors, the local geographic extent, the high level of certainty of the knowledge of these interactions, and that their known breeding habitat should not be disturbed, Other Species of Concern will continue to occupy the Assessment Area. Therefore, Other Species of Concern will continue as sustainable populations and the environmental effects are considered not significant as a consequence **Operation and Maintenance** – Once the construction phase is complete, the disturbance associated with the Project will likely decrease with the reduction of human presence and other Project activities in the Assessment Area; therefore, the magnitude is considered to remain as low during this phase. While the predicted environmental effects will remain as adverse in nature, they will be of a local geographic extent. The presence of the reservoirs and their operation will likely result in irreversible environmental effects that are considered to occur within a disturbed ecological context. The availability of suitable and extensive alternate habitat, provides a high level of certainty of the knowledge of these interactions. Accordingly, as sustainable populations will persist, the environmental effect for Other Species of Concern is considered not significant **Plain Language Summary** Other Species of Concern are known to breed in association with habitat types that are either above the projected shorelines of the reservoirs or associated with wetlands that were avoided whenever possible (e.g., transmission line routing). It is the presence of human activity during the construction phase that will likely have the greatest contribution to the environmental effect of habitat loss and alteration. Regardless, it is predicted that these species will continue to persist as sustainable populations in the Assessment Area during both phases of this Project and the environmental effects are consequently considered not significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Economy, Employment and Business: **Economy KI** A significant adverse residual socio-economic effect of the Project on Economy will result if the Project causes substantial decreases in the measurable parameters (i.e., income levels and revenues from taxes) over the life of the Project.	Nature Magnitude Geographic Extent Duration	Magnitude and duration are both directly incorporated into this significance definition Geographic extent is defined based on the Assessment Area The reversibility criterion was not considered because socio-economic effects, such as a change in income or a period of employment, may be of limited duration, but will likely have effects for the rest of individuals' lives, and hence cannot be 'reversed' By their nature, socio-economic effects are assessed in the social context	**Construction:** The Project will result in positive effects (modeled expenditure of over $6.4 billion, 2008 dollars. Please refer to IR# JRP.11.) throughout the construction phase on a continuous basis. The geographic extent is the province of Newfoundland and Labrador. The Project will not cause a decrease in the measureable parameters, and therefore, the adverse residual socio-economic effect is not likely to be significant. Positive effects to the Economy are likely to be significant **Operation and Maintenance:** The Project will result in positive effects (estimated annual income effects of approximately $16 million) throughout the operation and maintenance phase on a continuous basis. The geographic extent is the province of Newfoundland and Labrador. The Project will not cause a decrease in the measureable parameters, and therefore the residual socio-economic effect is not likely to be significant. Positive effects to the Economy are likely to be significant **Plain Language Summary:** The Project is predicted to result in positive effects to the Economy over the life of the Project (over $1.9 billion in personal income and over $315 million in Project related tax revenues during the construction phase. Please refer to IR# JRP.11.)

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Economy, Employment and Business: **Employment KI** A significant adverse residual socio-economic effect on Employment from the Project will result from changes in expenditures that produce substantial decreases in employment levels and employment rates from current levels over the life of the Project	Nature Magnitude Geographic Extent Duration	Magnitude and duration are both incorporated into this significance definition Geographic extent is defined based on the Assessment Area The reversibility criterion was not considered because socio-economic effects, such as a change in income or a period of employment, may be of limited duration, but will likely have effects for the rest of individuals' lives, and hence cannot be 'reversed' By their nature, socio-economic effects are assessed in the social context	**Construction:** The Project will result in positive effects (estimated 22,000 person-years of direct, indirect, and induced employment. Please refer to IR# JRP.11.) throughout the construction phase on a continuous basis. The geographic extent is the province of Newfoundland and Labrador. The Project will not cause a decrease in the measureable parameters, and therefore the adverse residual socio-economic effect is not likely to be significant. Positive effects to Employment are likely to be significant **Operation and Maintenance:** The Project will result in positive effects (estimated 63 person-years of employment. Please refer to IR# JRP.13.) throughout the operation and maintenance phase on a continuous basis. The geographic extent is the province. Because the Project will not cause a decrease in the measureable parameters, the adverse residual socio-economic effect is not likely to be significant. Positive effects to Employment are likely to be significant **Plain Language Summary:** The Project will likely result in positive effects to Provincial employment (estimated 22,000 person-years of employment throughout the construction phase and 63 person-years of employment throughout the operation and maintenance phase)

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Economy, Employment and Business: **Business KI** A significant adverse residual socio-economic effect from the Project on Business is one resulting in substantial decreases in the number of businesses in construction and related trades in Labrador and value of contracts obtained by Newfoundland and Labrador businesses as compared to current levels over the life of the Project	Nature Magnitude Geographic Extent Duration	Magnitude and duration are both incorporated into this significance definition Geographic extent is defined based on the Assessment Area. The reversibility criterion was not considered because socio-economic effects may be of limited duration, but will likely have effects for the rest of the Project life, and hence cannot be 'reversed' By their nature, socio-economic effects are assessed in the social context	**Construction** The Project will result in positive effects throughout the construction phase on a continuous basis (estimated expenditures of over $6.4 billion. Please refer to IR# JRP.11.). The geographic extent is the province of Newfoundland and Labrador. The Project will not cause a decrease in the measureable parameters, and therefore the adverse residual socio-economic effect is not likely to be significant. Positive effects to Business are likely to be significant **Operation and Maintenance:** The Project will result in positive effects throughout the operation and maintenance phase on a continuous basis (estimated annual operation and maintenance costs of $21 million to $23 million). The geographic extent is the province of Newfoundland and Labrador. The Project will not cause a decrease in the measureable parameters, and therefore the adverse residual socio-economic effect is not likely to be significant. Positive effects to Business are likely to be significant **Plain Language Summary:** The Project will likely result in positive effects to Provincial businesses (estimated expenditures of over $6.4 billion throughout the construction phase and estimated annual operation and maintenance costs of $21 million to $23 million throughout the operation and maintenance phase)

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Communities: **Physical Infrastructure and Services KI** A significant adverse residual socio-economic effect from the Project is one when demands from the Project exceed the existing capacity of the system on an ongoing and consistent basis during the life of the Project For example, if the design capacity for a highway is for a certain number of vehicles per day, and normal use plus Project activity equals more than that on an ongoing and consistent basis during the life of the Project, then the socio-economic effect of the Project will likely be adverse and significant	Nature Magnitude Geographic Extent Duration/frequency	Magnitude, frequency and duration are incorporated into this significance definition Geographic extent is inherent in the infrastructure/services being considered The reversibility criterion was not considered because socio-economic effects, such as a change in demands for physical infrastructure or social services, may be of limited duration, but will need to be addressed for that duration, and hence cannot be considered in the context of 'reversibility' By their nature, socio-economic effects are assessed in the social context	**Construction:** With the application of the effects management measures (e.g., on-site accommodation complexes), in-migration to the Upper Lake Melville Area is likely to be low, with an associated low level (low magnitude) in increased demand for physical infrastructure and services. With planning, increased demands at the Goose Bay airport, the dock facility in the port of Goose Bay, and local roads can be addressed. The effects will occur throughout the construction phase on a continuous basis within a regional geographic extent. Where upgrades are undertaken, there will be a benefit to all users (positive effects). Accordingly, the demands of the Project will not likely exceed capacity, and the residual adverse effect of construction is not likely to be significant. Effects resulting from upgrades to infrastructure are positive and likely to be significant **Operation and Maintenance:** The Project will not likely exceed the capacity of physical infrastructure and services systems (low magnitude). The effects will occur throughout the operation and maintenance phase on a continuous basis within a regional geographic extent. Accordingly, the residual adverse environmental effect of operation and maintenance is not likely to be significant. Positive effects are likely to result from infrastructure upgrades **Plain Language Summary:** The Project will likely result in positive effects to physical infrastructure and services at the community level over the life of the Project because any infrastructure upgrades required to meet Project requirements will benefit all users. The increased demand will be low and, with the application of effects management measures, will be within existing systems capacity, and adverse effects are not likely to be significant

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Communities: **Social Infrastructure and Services KI** A significant adverse residual socio-economic effect occurs when demands from the Project exceed the existing capacity of the system to meet normal demands on an ongoing and consistent basis during the life of the Project For example, if the design capacity for a school is for a given number of students, but normal use plus Project activity means that actual use is greater than design capacity on an ongoing and consistent basis during the life of the Project, then the socio-economic effect of the Project is likely to be adverse and significant	Nature Magnitude Geographic Extent Duration/frequency	Magnitude, frequency and duration are both incorporated into this significance definition Geographic extent is inherent in the infrastructure/services being considered The reversibility criterion was not considered because socio-economic effects, such as a change in demands for physical infrastructure or social services, may be of limited duration, but will need to be addressed for that duration, and hence cannot be considered in the context of 'reversibility' By their nature, socio-economic effects are assessed in the social context	**Construction:** With the application of the effects management measures (e.g., on-site accommodation complexes), in-migration to the Upper Lake Melville Area is likely to be low, with an associated low level (low magnitude) in increased demand for social infrastructure and services. With planning, increased demands for security, education, and other social services can be addressed. The Project will result in adverse and positive effects in those cases where benefits from upgraded services result to all users. The effects will occur within a regional geographic extent throughout the construction phase on a continuous basis. Accordingly, the residual adverse effect of construction is not likely to be significant **Operation and Maintenance:** The Project will not likely exceed the capacity of social infrastructure and services systems (low magnitude). The effects will occur throughout the operation and maintenance phase on a continuous basis within a regional geographic extent. Accordingly, the residual adverse effect of operation and maintenance is not likely to be significant **Plain Language Summary:** The Project will likely result in both positive (in those cases where services are upgraded) and adverse (increased demand), albeit not significant, effects to social infrastructure and services at the community level over the life of the Project. The increased demand will likely be low and, with the application of effects management measures, will be within existing systems capacity

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Communities: **Community Health KI** A significant adverse residual socio-economic effect on Community Health is likely to result when the socioeconomic effects of the Project lead to a deterioration of the determinants of health on an ongoing and consistent basis during the life of the Project such that Community Health or delivery of health services cannot be effectively managed on a regular basis For example, if the existing capacity of the health services system (e.g., doctor-to-population ratio), is exceeded on a regular basis, then the socio-economic effects of the Project are considered significant and adverse	Nature Magnitude Geographic Extent Duration/frequency	Magnitude, frequency and duration are both directly incorporated into this significance definition Geographic extent is defined based on the Assessment Area The reversibility criterion was not considered because socio-economic effects, such as a change in demands for health services, may be of limited duration, but will need to be addressed for that duration, and hence cannot be considered in the context of 'reversibility' By their nature, socio-economic effects are assessed in the social context	**Construction:** The Project will result in adverse (increased demand for health services; potential for personal health issues to occur) and positive effects (potential for increased self-esteem, income and social status). The magnitude is low to moderate, occurring within the Assessment Area. The effects will be medium-term and occur on a continuous basis. With the application of the effects management measures, the Project will not likely lead to a deterioration of the determinants on health. Because of the challenge in predicting human behavior, there is a moderate level of certainty of knowledge about the interactions and effectiveness of mitigation. The residual adverse effect of construction is not likely to be significant **Operation and Maintenance:** The Project will result in adverse (increase in mercury levels) and positive effects as indicated above. The magnitude is low, occurring within a regional geographic extent. The effects will be long-term and occur on a continuous basis. With the application of the effects management measures and follow-up, the Project is not likely lead to a deterioration of the determinants on health. There is a moderate level of certainty of knowledge about the interactions and effectiveness of mitigation. The residual environmental effect of operation and maintenance is not likely to be significant **Plain Language Summary:** The Project will likely result in both positive (potential for increased self-esteem, income and social status) and adverse (increased demand for health services, increase in mercury levels), albeit not significant effects to community health at the community level over the life of the Project

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Land and Resource Use VEC A significant adverse residual environmental effect is defined as one where the proposed use of land for the Project is not compatible with adjacent land use activities as designated through a regulatory land use process or the Project creates a change or disruption that widely restricts or degrades land and resource use to a point where activities cannot continue at or near current levels within the Assessment Area over the long term	Nature Magnitude Geographic Extent Duration Ecological or Social Context	Magnitude, geographic extent, duration, and social context are directly incorporated into this significance definition The definition is irrespective of frequency and reversibility (i.e., the significance of the environmental effect is not influenced of how often they occur and whether these changes are reversible)	**Construction:** The Project will likely result in adverse (e.g., increased access leading to competition, loss of ashkui, loss of cabins) and positive effects (e.g., increased opportunity for harvesting activities). The magnitude is moderate, occurring within the Assessment Area (local). The effects will be medium-term to permanent and occur on a continuous basis. With the application of the effects management measures, the Project will not likely lead to a point where land and resource use activities cannot continue at or near current levels over the long-term. Accordingly, the residual adverse effect of construction is not likely to be significant **Operation and Maintenance:** The Project will result in adverse (e.g., potential for consumption advisories, aesthetic effects) and positive effects (e.g., improved navigability). The magnitude is low, occurring within the Assessment Area. The effects will be permanent and continuous. With the application of effects management measures, the Project will not likely lead to a point where land and resource use activities cannot continue at or near current levels over the long-term. Accordingly, the residual adverse effect of construction is not likely to be significant **Plain Language Summary:** The Project will likely result in both positive and adverse (albeit not significant) effects to land and resource use over the life of the Project such that land and resource use activities can continue at or near current levels over the long-term

Significance Definitions	Criteria Considered in Determination of Significance	Comments	Significance Determination
Cultural Heritage Resources VEC: Historic and Archaeological Resources KI Significance criteria for Historic and Archaeological Resources are largely defined by the Newfoundland and Labrador *Historic Resources Act* A significant adverse residual environmental effect is the loss or disturbance of known Historic and Archaeological Resources without the appropriate documentation, or salvage and retrieval of the material culture and the information it contains, and without prior approval from the regulatory agency	Nature	This definition is based on legislative compliance and is irrespective of all of the stated criteria, with the exception of nature, as this is the definition for adverse residual environmental effects only	**Construction, Operation and Maintenance:** While the Project may result in adverse effects, with the application of the effects management measures, and in full compliance with the *Historic Resources Act*, the Project will not likely result in significant effects **Plain Language Summary:** By complying with the legislation concerning cultural heritage resources the Project is not likely to result in significant adverse effects on historic and archaeological resources over the life of the Project

Reference:

CEA (Canadian Environmental Assessment) Agency. 2003. *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*. Published by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, chaired by the CEA Agency, ISBN 0-662-67812-5, November 2003.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

c. a plain language definition or statement for each analysis of significant effects on VECs/KIs;

Response:

Plain language statements on the significance determination for each VEC or KI are provided in Table 1 of part (b) above.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

d. an indication of how the interests, values, concerns, contemporary and historic activities, Aboriginal traditional knowledge and important issues facing Aboriginal Groups were used to determine the significance of the residual environmental effects for each VEC/KI;

Response:

Issues and concerns of the public and Labrador Innu are provided in the EIS Volume IA, Table 7-4 and Volume IA, Table 8-1, respectively. Innu Traditional Knowledge was available through the ITKC Report (EIS Vol. IB Appendix IB-H) and was supplemented with secondary sources. This information regarding the interests, values, concerns, contemporary and historic activities, Aboriginal traditional knowledge and important issues were used in the effects assessment in several ways, as described below.

The KIs were selected, in part, based on issues raised through Aboriginal engagement, and reflect input from Aboriginal groups. The VECs/KIs that were selected for assessment are therefore reflective of the interests, values, concerns, contemporary and historic activities, Aboriginal traditional knowledge and important issues facing Aboriginal Groups. For instance, caribou, black bear, porcupine, beaver, Canada goose, ruffed grouse, lake trout, brook trout, whitefish, are known to be valued resources for the Labrador Innu and have been assessed. Where available and applicable, Innu Traditional Knowledge supplements the environmental effects analysis. As described in the response to IR# JRP.3a, Innu Traditional Knowledge was presented in the EIS in accordance with an agreement reached between Nalcor and Innu Nation on its use.

Finally, the significance criteria selected are considered not only reflective of the values, concerns and activities of Aboriginal groups, but also of other land and resource users, local communities and government regulators. For instance, the sustainability criteria used for the Terrestrial Environment VEC and KIs were selected to reflect the values of those consulted, including Innu Nation. Wildlife populations are valued both as a resource and for intrinsic value and the sustainability criteria was selected to reflect the importance of continued, stable wildlife populations for the benefit of current and future generations. For the Land and Resource Use VEC, the significance definition reflects the importance of land and resource use being able to continue at or near current levels within the Assessment Area over the long term.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

e. **justification for a reversibility criterion that does not take into account partly reversible or partly mitigable effects and how partly reversible effects were taken into account during the analysis (e.g. were they considered to be reversible or not reversible?);**

Response:

A conservative approach to reversibility has been adopted in the EIS. This means that if an environmental effect was only partially reversible, it was considered to be irreversible, with the exception of the Terrestrial Environment VEC, as noted below. This has led to an increased degree of confidence in environmental effects predictions. From a Terrestrial Environment perspective, most activities during the construction phase involving surface disturbance were considered reversible. The construction of the dams and other permanent features, tend to be in locations that will not affect primary habitat for these KIs, and therefore the overall environmental effects were considered to be reversible during the construction phase. The reservoir will become a permanent feature of the landscape during the operation and maintenance phase, and for this reason, Project activities during the operation and maintenance phase were considered irreversible (as a conservative approach) although most other activities during this phase would be reversible.

As defined in the EIS, reversibility refers to the likelihood that a VEC or KI will recover from an environmental effect, including consideration of active management techniques (e.g., habitat mitigation). This may be due to the removal of a Project component/activity or due to the ability of a VEC or KI to recover or habituate. As well, reversibility is considered on a population level for biophysical VECs. Therefore, although an environmental effect like mortality is irreversible to an individual animal, the environmental effect on the population may be both reversible and negligible.

In the rationale for this IR it states that "As long as an effect is partly reversible at some point in the future, it is considered "not significant" in the EIS". This statement is not correct as it does not accurately reflect the methodology used in preparing the EIS. As stated in response to part (b) above, the VEC/KI-specific significance definitions developed for this Project were considered appropriate to both the populations being assessed and the nature of the predicted Project environmental effects. As indicated in Table 1, while reversibility is a factor that was considered in the significance definitions for some of the VECs and KIs, it was not the central consideration in any case.

The rationale for this IR also suggests that "The EIS does not justify why a more detailed analysis in order to predict, mitigate and evaluate potential residual environmental effects of partly reversible impacts is not required." This statement may represent a misunderstanding of the methodology used in preparing the EIS. All potential environmental effects were identified based on the potential for interactions between a Project activity or physical work and a VEC or KI. All interactions and associated environmental effects were assessed and mitigation identified where technically and economically feasible. As stated in the response to part (a), the criteria including reversibility were then used to inform the nature of the residual environmental effect (i.e., following application of applicable mitigation) and ultimately the assignment of significance. Therefore, the reversibility criterion was not at any time used to determine whether a potential environmental effect should be predicted, mitigated and evaluated.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

f. **justification and methodology for determining the extent of <u>each</u> study area (e.g. for the terrestrial environment: explain how a study area comprised of only the lower Churchill River watershed is inclusive of the landscape necessary to predict the environmental effects of the Project on <u>each</u> terrestrial VEC/KI);**

Response:

For each VEC/KI, the spatial boundaries for the environmental effects assessment are referred to as the Assessment Area, which is the spatial extent where Project effects are likely to occur and within which the significance of Project-related environmental effects is determined. The spatial boundaries were selected to capture the extent of Project environmental effects and provide an appropriate area for context. The Assessment Area was also determined in consideration of ecological or socio-economic boundaries, and administrative and technical boundaries, if and as appropriate. The Assessment Areas varied among VECs/KIs and the description and rationale for these boundaries is included in the EIS (Sections 9.3.1, 9.3.2, and 9.3.3, Volume IA; Sections 2.2.1.1, 2.3.1.1, and 2.4.1.4, Volume IIA; and Sections 2.3.1.1, 2.4.1, 2.5.1.1, 2.6.1, 2.7.1, 2.8.1.1, and 2.9.1.1, Volume III) and summarized below.

Atmospheric Environment VEC - Climate KI - Project-related emissions were compared with emissions from similar projects for the Province and Canada, and to provincial, national and global GHG emissions. An Assessment Area was not delineated for this KI because of its global scale and the need for it to be evaluated at a macro scale. This approach is consistent with the approach outlined in CEA Agency guidance (2003).

Atmospheric Environment VEC - Air Quality KI - The Assessment Area for the characterization of potential environmental effects on Air Quality resulting from Project activities is the Project footprint, plus an extended area out from the Project area in each direction to approximately 5 km, as well as 500 m from the centreline of the TLH Phase I (from Churchill Falls to Happy Valley-Goose Bay) and the transmission line access roads. This is the area within which Project-related emissions will be potentially measureable.

Aquatic Environment VEC – Fish and Fish Habitat KI: For the Aquatic VEC, the Assessment Area encompasses the lower Churchill River from the upper reaches of the lower Churchill main stem just upriver from the existing Churchill Falls Power Station to Muskrat Falls and Goose Bay (Figure 2-2, Volume IIA of the EIS) It also includes all tributary and stream habitat accessible to fish in the Churchill River (i.e., below any obstruction to fish passage) between the Churchill Falls Power Station and Muskrat Falls. This area was selected as it represents the likely geographic extent of Project-related environmental effects. Aquatic habitat within the main stem of the lower Churchill River that is above the existing Churchill Falls Power Station will not be affected by construction or operation and maintenance of the facilities on the lower Churchill River, since the extent of inundation does not extend above the elevation of the Churchill Falls Power Station tailrace. Likewise, tributaries downstream of Muskrat Falls will not be affected by the Project and hence are not included within the Assessment Area. Lake Melville is not included within the Assessment Area as there will be no substantive change in flow or salinity, water temperature, ice or other physical disturbance beyond the mouth of the Churchill River from this Project (please refer to the response to IR# JRP.43).

Terrestrial VEC and KIs: Spatially, the Assessment Area for the Terrestrial Environment VEC is the geographic area within which Project-related environmental effects would likely occur for each KI and where the significance of environmental effects is determined. For all KIs, except caribou, the Assessment Area coincides with the lower Churchill River watershed (Figure 2-12, Volume IAA of the EIS). All the KI species with the exception of the Red Wine Mountains Caribou Herd have widespread distribution patterns, a relatively limited proportion of their population confined to a zone of influence and, therefore, a high degree of resilience (Conover et al. 1985a; Conover et al. 1985b). While some avifauna populations, including Harlequin Duck, Common Nighthawk, Grey-cheeked Thrush, Olive-sided Flycatcher and Rusty Blackbird are considered species of concern, they still share the same populations characteristics described above. Despite their conservation status, each of these birds at risk in central Labrador has a widespread distribution, and most are not restricted to specific or localized habitats.

For the Terrestrial Environment KIs, the populations under assessment extend well beyond the lower Churchill River watershed. For KIs such as Moose, Canada Goose, Osprey and Harlequin Duck, the individuals occurring within the Assessment Area are part of a larger population (e.g., the Ungava Peninsula population for Canada Goose and Osprey). However, interactions are examined in detail within the Assessment Area. This selection represents a compromise between choosing a large area (representative of an entire population) that would mask the environmental effects of the Project, versus choosing a smaller area where the full environmental effects of the Project may not be captured, or environmental effects on the population at a landscape scale may not be understood. As a result, the chosen Assessment Area is a realistic buffer that is inclusive of the area in which Project-related environmental effects on the terrestrial environment will occur (i.e., alteration or loss of habitat, health, and mortality). Selecting this Assessment Area (i.e., the lower Churchill River watershed) represents a more conservative approach. For example, as magnitude is based on the percentage of habitat or individuals affected, the predicted magnitude of Project-related environmental effects would decrease if a larger area were selected. By limiting the assessment population to the lower Churchill River watershed, the Project-related environmental effects are actually magnified (conservatively) in terms of the entire population.

Because of the threatened status of caribou and that it is a species that may have a larger portion of its population in one geographic area at one time, the Red Wine Mountains (RWM) Caribou Herd's recent range was selected as the Assessment Area for caribou (Figure 2-13, Volume IIA of the EIS). By default, the George River Herd is also examined in the RWM Herd Assessment Area, given the similar habitat relationships when individuals from the migratory George River Herd overwinter in the lower Churchill River watershed (and within the range of the RWM Herd). Please refer to IR# JRP.122 for a description of how the Lac Joseph Caribou herd was considered.

Note that while the Assessment Area is the geographic area within which significance is defined, broader ecological boundaries were considered when describing and understanding the existing conditions of the KI populations and associated habitat, under assessment. This included consideration of national and provincial status, limiting factors and population trends within and external to the assessment areas. Habitat associations within the assessment area were derived from scientific literature (both inside and external to the Assessment Area) and augmented by the environmental baseline field studies.

Economy, Employment and Business VEC and KIs - The Assessment Area for the Economy, Employment and Business VEC and KIs was based on the geographic extent of the interactions with the Project, and the socio-economic and administrative boundaries described in Section 2.3, Volume III of the EIS. The Assessment Area for this VEC is the Upper Lake Melville area because this is the area within which most Project activity interactions will likely occur (Figure 2-5, Volume III of the EIS). The Upper Lake Melville area encompasses the communities of Happy Valley-Goose Bay, North West River, Sheshatshiu and Mud Lake. Depending on the

nature of the effects being assessed, socio-economic effects on Economy, Employment and Business were also assessed based on the Province as a whole and Labrador.

Socio-economic effects will occur mainly during construction and in those communities nearest the Project. Churchill Falls and communities in western Labrador are predicted to remain relatively unaffected by the Project because they will not be used as staging areas or as an accommodation base and are also not predicted to be the major source of labour for this Project.

Communities VEC and KIs - The Assessment Area for the Communities VEC and KIs is the Upper Lake Melville area as this is the area within which the Project will likely interact (Figure 2-5, Volume III of the EIS). The potential for socio-economic effects within Labrador as a whole were also considered.

Land and Resource Use VEC- The Assessment Area is based on the geographic extent of the interactions with the Project, and the ecological/socio-economic and administrative boundaries described in Section 2.8, Volume III of the EIS. It extends north from the southern limits of the proposed reservoirs to the transmission lines that approximately parallel Phase I of the TLH between Happy Valley-Goose Bay and Churchill Falls. It extends beyond the Churchill Falls Power Station in the west to the mouth of the Churchill River (Figure 2-13, Volume III of the EIS). Direct environmental effects resulting from the Project are restricted to the area upstream from the mouth of the river up to the Churchill Falls Power Station. This area represents the predicted geographic extent of likely Project environmental effects.

Cultural Heritage Resources VEC- Cultural Heritage Resources are fixed (not movable under normal circumstances), which limits the Assessment Area to the extent of the physical disturbance. For this VEC, the Assessment Area includes all areas where ground disturbance or landscape alteration will likely occur (Figure 2-30, Volume III of the EIS) including the reservoir and transmission line. Reservoir preparation and impounding will likely be the Project activities to result in environmental effects on Cultural Heritage Resources, although the preparation of the transmission line corridor may also have environmental effects.

References:

CEA Agency. November, 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners.

Conover, S.A.M., K.W. Strong, T. E. Hickey, and F. Sander. 1985a. Journal of Environmental Management. Volume 21, pp. 343-358. An Evolving Framework for Environmental Impact Analysis. I. Methods

Conover, S.A.M., K.W. Strong, T. E. Hickey, and F. Sander. 1985b. Journal of Environmental Management. Volume 21, pp. 359-374. An Evolving Framework for Environmental Impact Analysis. II. Applications

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

g. justification and methodology for selection of the temporal boundaries for <u>each</u> VEC/KI including a discussion of any deficiencies in information and how these have or will be addressed;and

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Response:

The temporal boundaries for the assessment of Project effects on VECs/KIs are defined by the predicted construction (2010 to 2020), and operation and maintenance phases (2017 onwards). This is reflective of standard environmental assessment practice in Canada.

With respect to temporal aspects of baseline data collected for the EIS, as stated in Response to IR# JRP.97(a), the description of the existing environment within the lower Churchill River watershed is supported by an extensive array of baseline studies, including those undertaken over a very long, time period from 1978-1979 to the present (i.e., studies associated with the Panel review of the Project in 1979 to 80, baseline studies conducted in 1998 to 2000, and again in support of this EIS in 2005 to 2008). Any specific uncertainties and/or limitations in information and predictions are described in response to IR# JRP.19(a).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.116**

Information Requested:

The Proponent is asked to provide:

h. rationale, including the ecological basis, for the use of fixed linear boundaries in the Ecological Land Classification including a discussion of the degree of uncertainty, reliability and sensitivity in the habitat classifications and utilizations that rely upon the ELC.

Response:

The key consideration in the determination of the significance of environmental effects on Terrestrial KIs is the sustainability of the population and hence, the extent to which habitat will be affected by the Project. To be able to accurately assess the loss of habitat and its implications for the KI populations within the Assessment Area, it was necessary to classify habitat types and associated preferences for each of the Terrestrial KIs. The Ecological Land Classification (ELC) boundaries chosen were appropriate to achieve this objective.

As stated above in the response to part (f) of this IR, the selection of the Assessment Area for the Terrestrial Environment to correspond with the boundaries of the Regional ELC represents a compromise between choosing a large area versus choosing a smaller area. A larger area may mask the environmental effects of the Project, whereas a smaller area may not capture the full environmental effects, or may not allow for a landscape-scale analysis.

To determine the specific details associated with actual habitat loss, a more detailed ELC was completed of the areas associated with the Project footprint. These are known as the Project Area ELC and the Transmission Line ELC. As stated in response to part (f), available literature and data from both within the Assessment Area and elsewhere were used to determine these habitat associations along with the baseline field studies. There is a high level of confidence in these predicted habitat associations.

The approach taken in the development of the ELCs for this Project was to consider the composition and position of the vegetation communities on the landscape as they related to slope, succession, juxtaposition and surficial terrain. This is consistent with the approach outlined in the National Ecological Framework for Canada: "The fundamental basis for delineation of ecological units is to capture the major ecological composition and the linkages between the various components (e.g., landforms, soils, water, and vegetation) rather than treating each component as a separate characteristic of the landscape" http://sis.agr.gc.ca/cansis/nsdb/ecostrat/.

Although there is always uncertainty in any interpreted landscape, the level of uncertainty for this Project is low. Additionally, the best available science and methodologies were used for this Project (Lapoukhine et al., 1977; Marshall and Shutt, 1999; Soil Classification Working Group, 1998).

A comprehensive field program was conducted throughout the area of future disturbance and included detailed vegetation, soils (including chemistry analysis), and surficial terrain sampling. All field teams were comprised of experienced (15 years plus) vegetation ecologists, soil scientists, wildlife biologists and geomorphologists working together under standardized data collection methodologies.

In addition to the detailed field data, high resolution air photographs were used in a computerized Geographic Information System (GIS) that allowed the landscape to be viewed in three dimensions and at scales approaching 1:300 (i.e., close enough to identify vehicles for example). Also made available to, and used within

the GIS, was a data layer of vegetation heights generated by LIDAR (high density laser beams measuring vegetation height in grids less than one metre square), slope classes, elevation and a digital surficial terrain map.

References:

Lopoukhine N, N.A. Prout and H.E. Hirvonen. 1977. The Ecological land Classification of Labrador: A Reconnaissance

Marshall, I.B. and P.H. Shutt. 1999. A National Ecological Framework for Canada – Overview. Ecosystems Science Directorate, Environment Canada, and the research Branch, Agriculture and Agr-Food Canada. 34 pp.

Soil Classification Working group. 1998. The Canadian System of soil classification. Agriculture and Agri-Food Canada publication, 1646 (Revised). 187 pp.

IR# JRP.117

Labrador Inuit Lands Claims Agreement

Requesting Organization – Joint Review Panel **Information Request No.: JRP.117**

Subject - – Labrador Inuit Lands Claims Agreement

References:

EIS, Volume IA, Section 1.5 (Land Claim Agreements and Interim Agreements)

Related Comments / Information Requests:

CEAR # 217 (Nunatsiavut Government)
IR# JRP.43 & JRP.73

Rationale:

With regards to possible effects of the Project on lands within the Labrador Inuit Settlement Area, the Proponent states in the EIS that "[t]he influence of the Project does not extend beyond the mouth of the Churchill River and, consequently, there is no reasonable possibility that the Project would have an adverse environmental effect on the Labrador Inuit Settlement Area" (Volume IA, p. 1-16).

In its submission to the Panel, the Nunatsiavut Government argued that "no defensible rationale is given as to why this is so [that the environmental assessment boundary does not reach beyond the mouth of the Churchill River] and, hence, (…) no reasonable possibility that the Project would have an adverse environmental effect on the Labrador Inuit Settlement Area." (p. 6).

In JRP.43, the Proponent was asked to provide a more thorough analysis of potential impacts of the main stem and tributaries below Muskrat Falls, the Goose Base estuary and Lake Melville. In JRP.73, the Proponent was asked to provide detailed information on existing recreational, commercial and aboriginal fisheries in Lake Melville and the relationship between these various fisheries and the Churchill River and its tributaries.

Requesting Organization – Joint Review Panel **Organization IR Number: JRP.117**

Information Requested:

The Proponent is asked to discuss and either justify or reconsider its determination that the Project can not be reasonably expected to have adverse environmental effects in the marine zone under the Labrador Inuit Land Claims Agreement.

Response:

Section 4.2.5 of the EIS Guidelines requires the proponent to determine whether the Project may be reasonably expected to have adverse environmental effects on the Labrador Inuit Settlement Area for the purpose of determining the applicability of the Labrador Inuit Land Claims Agreement.

Neither the Project nor its predicted effects extend into Labrador Inuit Lands or the Labrador Inuit Settlement Area as defined in Chapter 4 of the Labrador Inuit Land Claims Agreement. However, the Land and Resource Use Assessment Area does include the area identified in Schedule 12-E of the Labrador Inuit Land Claims Agreement (which area is not within the Labrador Inuit Settlement Area) as well as a portion of Upper Lake Melville (which is included within the 'Zone' – the marine component of the Labrador Inuit Settlement Area).

A discussion of the potential zone of influence of Project effects on the aquatic ecosystem downriver of the Muskrat Falls has been presented throughout the EIS for each of the measurable parameters (see Volume IIA Section 4.11.2.2, Section 4.12.2.1, Section 4.12.2.2). In addition, the potential zone of influence with respect to the aquatic habitat of the lower Churchill River was described in detail in the Fish Habitat Quantification report (pages 59-64 in AMEC & Sikumiut 2007: Fish and Fish Habitat Component Study Report 3 of 11). In addition, each of the Aquatic Environment component studies, which presented predicted future conditions below Muskrat Falls, described their downriver extent and study limits. Further information is provided in response to IR# JRP.43.

The response provided for IR# JRP.43 indicates that measureable adverse environmental effects resulting from the Project do not extend into the marine environment of Lake Melville. As a consequence, no measureable effect upon that portion of Upper Lake Melville which forms part of the marine component of the Labrador Inuit Settlement Area is predicted. Detailed information on existing recreational, commercial and aboriginal fisheries in Lake Melville and the relationship between these various fisheries and the Churchill River and its tributaries is provided in response to IR# JRP.73.

References:

AMEC & Sikumiut. 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. viii + 129 pp. + Appendices.

Labrador Inuit Land Claims Agreement, Chapter 11, Environmental Assessment.

IR# JRP.118

Potential Interactions (Aquatic Environment)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.118**

Subject - Potential Interactions (Aquatic Environment)

References:

EIS, Volume IIA, Section 4.3 (Environmental Effects Assessment – Potential Interactions)

EIS Guidelines, Section 4.5 (Environmental Effects)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.40)

Rationale:

In its submission to the Panel, Innu Nation questioned why certain construction activities have been deemed as having no interactions with the aquatic environment, hence not requiring further assessment of environmental and socio-economic effects (see the EIS, Volume IIA, Table 4-1). Among the activities mentioned by Innu Nation are the following:

- Concrete production activities;
- Vehicle traffic onsite;
- Camp Operations;
- Presence of a large workforce;
- Site waste management activities; and
- Employee activities.

According to Innu Nation, the potential for these activities to cause environmental effects "has not been assessed in a way that the reasonableness of impact conclusions can be evaluated" (Innu Nation, p.75).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.118**

Information Requested:

The Proponent is asked to:

a. **Provide a comprehensive discussion and justification of the rationale behind the assertion of no interaction between the aquatic environment and the activities noted above; or**

b. **In the absence of such justification, reassess and describe in detail the potential interactions between these activities and the aquatic environment.**

Response:

In order for the Project to have a potential effect on the aquatic environment, there needs to be a defined interaction, or pathway, between them. The Project can have an effect on the aquatic environment in a number of ways:

- through physical disturbance to the aquatic environment, including dam placement and blasting
- discharge of substances to the aquatic environment, including run off and contamination from the Project site
- air emissions that could affect water quality
- changes to hydrological regime (volume, flow) through a variety of mechanisms

If a Project activity does not connect to the aquatic environment through a pathway, there is no interaction. Applicable regulations and policies are designed to prevent or control certain types of activities, and thus will result in the removal of the potential pathways between the Project and the aquatic environment, thereby removing the potential for interaction and effects.

The rating of "0" listed for the above Project Activities and Physical Works was based on professional judgment, taking into account the complete project description as outlined in the EIS, Volume IA. The Project Description, Volume IA, Section 4.8.1 (pages 4-63 to 4-78) provides a detailed description of the Environmental Management System that will be integral to the Project. In this section, there is a comprehensive discussion of the Environmental Protection and Mitigation, Environmental Protection Planning, Environmental Orientation, Development of Specific Environmental Protection Plans, Standard Environmental Protection Procedures and Environmental Compliance Monitoring associated with the Project that will be applied to remove potential pathways and interactions with the aquatic environment. Provided below are the applicable regulations and/or policies related to each identified physical activity and works listed in the Information Request.

Physical Activities and Physical Works	Relevant EIS Sections	Applicable Regulations, Policies	Effect on Potential Pathway
Concrete Production Activities	Section 4.8.2.4 (Volume IA page 4-73:concrete production)	• Air Pollution Control Regulations 956-96; • Environmental Control Water and Sewage Regulations 1078/96; • Fisheries Act (SN1995 F-12.1)	Will prevent water quality changes caused by drainage or release of concrete, its constituents and other deleterious substances.
Vehicle Traffic Onsite	Section 4.8.2.4 (Volume IA pages 4-71:dust, 4-72:noise, 4-76:wildlife) Section 4.3.1 (Volume IIA page 4-3:dust)	• Best Practices for the use and Storage of Chloride-Based Dust Suppressants; • Occupational Health and Safety Guidelines	Will prevent water quality changes due to excess dust from roads.
Camp Operations	Section 4.8.2.2 (Volume IA page 4-65:Orientation) Section 4.8.2.4 (Volume IA pages 4-68: Storage of Fuel, 4-69: Sewage disposal, 4-70:Solid Waste, 4-73:Accommodations,	• Storage and Handling of Gasoline and Associated Products Regulations CNR775/96; • Health and Community Services Act SN1997; • Department of Environment and Lands Act RSN1990, plus amendments; • Environmental Control Water and Sewage Regulations 1078/96 • Air Pollution Control Regulations 956-96	Will prevent water quality changes due to releases of petroleum products, effluents, raw sewage and other debris from camp operations.
Presence of a Large Workforce	Section 4.8.2.2 (Volume IA page 4-65:Orientation Section 4.8.2.4, 4-76:Wildlife	• No hunting or Fishing Policy will be in force for all personnel on the Project site.	Will prevent fish and fish habitat changes due to excess angling pressure and habitat disturbance.
Site Waste Management Activities	Section 4.8.2.4 (Volume IA pages 4-69:Sewage, 4-70:Solid Waste, 4-77:Water Management	• Health and Community Services Act SN1997; • Department of Environment and Lands Act RSN1990, plus amendments; • Environmental Control Water and Sewage Regulations 1078/96	Will prevent water quality changes due to releases of effluents, raw sewage and other debris from camp operations.
Employee Activities	Section 4.8.2.2 (Volume IA page 4-65:Orientation Section 4.8.2.4 (Volume IA page 4-76:Wildlife Protection	• No hunting or Fishing Policy will be in force for all personnel on the Project site.	Will prevent fish and fish habitat changes due to excess angling pressure and habitat disturbance.

As stated in Section 4.4 of Volume IIA in the EIS, the detailed assessment was focused on interactions which would have the greatest potential for adverse environmental effects and the most need for development of mitigation measures.

IR# JRP.119

Spring Flood

Requesting Organization – Joint Review Panel **Information Request No.: JRP.119**

Subject - Spring Flood

References:

EIS, Volume IIB, Section 7.4.2 (Terrestrial Environment – The Capacity of Renewable Resources that are Likely to be Significantly Affected)

Related Comments / Information Requests:

CEAR #214 (Innu Nation – IN.44)

Rationale:

When describing conditions of the new reservoirs, the EIS mentions that "spring floods will be modest" (Volume IIB, p. 7-11). However, seasonal flooding is generally considered to be a key ecological process that shapes river morphology, creates habitat complexity and supplies nutrients to riparian areas.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.119**

Information Requested:

The Proponent is asked to:

a. **Discuss the existing knowledge concerning the importance of spring floods for river sedimentation, aquatic and shoreline vegetation, habitat complexity, biodiversity, nutrient supply, water quality and productivity;**

Response:

Information related to bank stability and formation (AMEC 2008) as well as predicted sediment transport (Minaskuat 2008) in the proposed reservoirs is presented in the identified reports appended to the EIS. Seasonal (spring) floods within the new area of the reservoirs are expected to be similar to those occurring prior to flooding, thus ecological processes that shape river morphology, create and contribute to riparian habitats including their productivity, complexity and biodiversity, and supply nutrients to these areas will likely be unchanged. Modest spring floods within the proposed reservoirs are predicted to create similar riparian habitat to that which currently exists (also see part (b) of this response).

Spring floods occur after the ice melt and combined with warm rain form the high water mark riparian zone. In terms of riparian habitat, it is also the time that new channels are cut and the alluvial terrace on each side develops. Spring floods affect river sedimentation by picking up material above the normal river level, and transporting it downstream. With respect to sediment transport, only the finest silt and clay materials are typically carried in suspension and deposited within the riparian zone. The sediments and associated nutrients are transported downstream, some of which are deposited on the banks and shallow areas. This creates or augments the substrate for aquatic and shoreline vegetation growth, including fast growing riparian vegetation such as grasses and sedges. The floods also carry seeds and propagules of upstream vegetation that may establish on areas within or along the waterbody (see response to IR# JRP.89 for additional details). This process can lead to maintenance in the quantity and diversity in vegetation areas (see response to IR# JRP.101 for additional details). This, in turn, can provide habitat for wildlife. The wildlife species that would use the habitat would depend on the type of habitat generated. The overall effect is a dynamic ecological system that helps maintain, or enhance biodiversity. This natural process is expected to continue along the shores of the reservoirs.

References:

AMEC. 2008. Bank Stability Study for the Proposed Lower Churchill Hydroelectric Generation Project: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Minaskuat Inc. 2008. Water and Sediment Modelling in the Lower Churchill River: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.119**

Information Requested:

The Proponent is asked to:

b. Describe the implications of conversion of shallow, fast-flowing river habitats to deeper, slow flow reservoir habitats in the region due to river regulation; and

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Response:

The extent of river regulation will not change significantly as a result of construction and operation of the Project; the river is already regulated as a result of the Churchill Falls development.

From the riparian habitat perspective, the conversion of shallow, fast-river habitats to deeper, slow flow reservoir habitats is expected to continue to provide sediment and associated nutrients to the transition zone. This, in association with seed and propagule transfer, is expected to promote establishment of riparian habitat, similar to that which currently exists.

In terms of fish and fish habitat, the implications of conversion of shallower, faster-flowing river habitats to deeper, slower reservoir habitats in the river due to river regulation is addressed in detail in the Habitat Quantification report (AMEC & Sikumiut 2007) and throughout Chapter 4, Volume IIA of the EIS. The result of that analysis was that the environmental effect of the Project on fish and fish habitat was predicted to be not significant.

Within the proposed reservoir areas, the spring flood will be contained somewhat by the operation of the facilities, however the volume/flow of the spring freshet will be similar to existing conditions. In this respect, all aquatic and riparian habitats outside the reservoirs will experience spring flows and key ecological processes similar to existing conditions. The response to IR# JRP.84 describes the proposed capture of the spring flow within the reservoirs. In general, the reservoir water elevations would be reduced prior to the spring flow (actual level change would depend on anticipated runoff based on snow pack estimates and precipitation forecasts). However, with a slight lowering of the reservoir water level prior to the spring flow and subsequent rapid influx of spring freshet, there will still remain aspects of spring flooding with respect to aquatic and riparian habitats within/near the reservoirs as well. The stability of the shorelines and banks (AMEC 2008), sediment transport (NHC 2008) and water quality/sediment (Minaskuat 2008) within the created reservoirs and assessment area have been described and modeled in detail in the appended reports of the EIS noted above.

In summary, the aquatic habitat that will be created, and hence the associated shoreline riparian habitat, will experience shoreline stabilization processes as it develops (see AMEC 2008 for additional details). Shorelines will stabilize and the formed riparian habitat will be subject to riverine/lacustrine processes, depending on its location within the reservoir (see Section 4.11, Volume IIA of the EIS for a description of the habitat classification of the proposed reservoirs).

References:

AMEC. 2008. Bank Stability Study for the Proposed Lower Churchill Hydroelectric Generation Project: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

AMEC and Sikumiut. 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. viii + 129 pp. + Appendices

Minaskuat Inc. 2008. Water and Sediment Modelling in the Lower Churchill River: Environmental Baseline Report. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Northwest Hydraulic Consultants (NHC). 2008. Lower Churchill Hydroelectric Generation Project Sedimentation and Morphodynamics Study. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.119**

Information Requested:

The Proponent is asked to:

c. **Assess the environmental effects of "modest" spring floods following the development of the Project on bio-physical parameters including fish and fish habitat in the lower Churchill River.**

Response:

The assessment considered all hydrological regimes expected during the operation of the Project, which would include "modest" spring floods. The effects of the Project reservoirs in terms of biophysical parameters (including fish and fish habitat) are addressed in Chapter 4, Volume IIA of the EIS.

It must be remembered that main stem and tributary habitat beyond the proposed reservoir boundaries are predicted to be not affected, and are expected to experience spring flows and key ecological processes similar to existing conditions.

IR# JRP.120

Total Suspended Solids (TSS)

Requesting Organization – Joint Panel Review **Information Request No.: JRP.120**

Subject - Total Suspended solids (TSS)

References:

EIS, Volume IIA, Section 4.12.2.2 (Environmental Effects Assessment – Total Suspended Sediments)

Minaskuat Inc. 2008. *Water and Sediment Modelling in the Lower Churchill River Valley*. Prepared for the Lower Churchill Hydroelectric Generation Project

Related Comments / Information Requests:

CEAR # 216 (Labrador Metis Nation)

Rationale:

The EIS indicates that "[a]ccording to CCME [Canadian Council of Ministers of the Environment] guidelines, long term increases in TSS [total suspended solids] should not exceed 5 mg/L above natural baseline for the protection of freshwater aquatic life" (Volume IIA, p. 4-45).

Based on the water and sediment modelling study conducted by Minaskuat Inc. (2008), TSS concentrations would increase substantially (12 to 30mg/L) for a number of years post-impoundment in the Muskrat Falls reservoir. These peak concentrations are expected to decline within 5 to 10 years post-impoundment as shoreline erosion rates decrease and after most flooded biomass have decomposed. Minaskuat Inc. (2008) also mentions that "[s]everal river systems throughout Canada have healthy fish populations despite natural TSS concentrations exceeding projections of this study" (p. 7-4). No additional details on the effect of TSS on freshwater aquatic life in the specific context of the lower Churchill River are provided in the study or in the EIS.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.120**

Information Requested:

The Proponent is asked to discuss the impacts of the projected increase in TSS on various water quality parameters (turbidity, photosynthesis, water temperature, nutrient availability, etc.) and aquatic habitats (plankton, benthos, etc.) and the resulting effects on fish species and populations. The Proponent should explicitly refer to conditions found within the lower Churchill River in its response.

Response:

Measurable water quality parameters used in the assessment of the aquatic environment to predict potential changes in fish habitat quality as a result of the project include total suspended sediment (TSS), temperature and total phosphorous. They were chosen as they adequately represent existing conditions and can be predictive and responsive to anticipated changes in the aquatic environment. These parameters were also chosen because of their close association with other parameters such as those identified above. For example, increases in TSS would typically correlate to an increase in turbidity and hence a decrease in light penetration through the water column. This in turn would correlate to a decrease in overall photosynthesis potential. Provided below is an overview of the parameter relationships as support for the parameters chosen to assess changes in fish habitat quality.

Turbidity is a measure of the lack of clarity or transparency of water caused by biotic and abiotic suspended or dissolved substances. The higher the concentration of these substances in water, the more turbid the water becomes. The type and concentration of suspended matter controls the turbidity and transparency of the water (CCME 2002). Relationships between turbidity and suspended sediments can be established but are site-specific, as turbidity is affected by factors such as the concentration, size, shape, and refractive index of suspended sediments and the water colour (CCME 2002). Relationships vary from stream to stream and between seasons in the same stream. At sites where the relationship between suspended sediment concentration and turbidity is known, turbidity can be used as a surrogate to predict suspended sediment concentrations (CCME 2002). In this respect, a general increase in TSS will cause a general increase in turbidity; however the specific relationship between the two has not been established for the lower Churchill River as a surrogate value for TSS is not required (i.e. TSS is the measurable parameter). Turbidity can therefore be expected to react similar to TSS in terms of its increase during the period of stabilization and its reduction in subsequent years.

In freshwater aquatic systems, the nutrient most commonly limiting primary production is phosphorus (Minaskuat 2008), therefore this was used as a measurable parameter. Chlorophyll concentrations can also be used as an index of primary productivity (Jacques Whitford 2001); as an increase in measured chlorophyll concentrations would indicate an increase in primary production. However it would not provide information regarding what may affect the level of primary production. Section 1.2.2 of the Water and Sediment Modelling Report (Minaskuat 2008) outlines the trends in reservoir phosphorus concentrations and primary production. While external nutrient loads are unlikely to change, temporal patterns of reservoir production result from changes in nutrient biogeochemistry due to flooding of terrestrial habitat. Sources of nutrients include erosion of newly formed shoreline, leaching of soluble nutrients from flooded soil, and decomposition of inundated vegetation (Minaskuat 2008).

Water temperature was chosen as a measurable parameter for the aquatic environment. Predicted changes within the reservoirs for pre- and post-project is presented in Section 4.12.2.1 of the Environmental Impact Statement (EIS) (page 4-41 in Volume IIA). The response to IR# JRP.43 includes the predicted water temperature change downstream of Muskrat Falls. While the Information Request is suggesting an increase in water temperature as a result of increased TSS, the TSS values are within the natural variability of the system and hence the greatest parameter that will affect water temperature will be the reservoir water volumes and subsequent thermal mass.

Aquatic Habitats

The assessment of the aquatic ecosystem has incorporated the predicted post-project changes of all measurable parameters and mitigations have recognized the timeline associated with reservoir stabilization.

Based on predicted nutrient levels in the reservoir, primary productivity (and hence chlorophyll concentrations) in the lower Churchill River would likely be lower than the potential during the early period (0 to 10 years) post-impoundment. Productivity below potential in the reservoir system would be attributed to the reduced light transmission (i.e. increased turbidity) from the increased suspended sediment load in the reservoir. Given that the peak total phosphorus and TSS concentrations are projected to occur over a similar temporal scale, the antagonistic interaction of these two parameters on primary productivity and the flushing effect of river flow would serve to mitigate water quality issues related to eutrophication in the early periods post-impoundment (0 to 10 years).

Fish habitat utilization predictions are based on stabilized post-project habitats (see AMEC & Sikumiut 2007 and Section 4.13.1 Volume IIA of the EIS) and hence the typical trophic surge associated with flooding was not incorporated in final estimates of fish utilization (i.e. the reservoir trophic upsurge would give an overestimate of post-project fish utilization). Fish biomass may initially decline related to a dilution effect, followed by an increase after impoundment over the initial three to five years, or longer, in response to the trophic upsurge and then decline to more stable levels thereafter as the physical and chemical conditions, and the biological communities stabilize.

As part of the fish habitat compensation planning process, any uncertainty associated with post-project aquatic conditions will be incorporated into a detailed, adaptive monitoring program (see response to IR# JRP.107). Various water quality parameters (turbidity, photosynthesis, water temperature, nutrient availability) and aquatic habitats (plankton, benthos) as well as the resulting effects on fish species and populations will be incorporated as appropriate.

References:

AMEC & Sikumiut. 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification.

CCME (Canadian Council of Ministers or the Environment). 2002. Canadian water Quality Guidelines for the Protection of Aquatic Life – Total Particulate Matter. http://ceqg-rcqe.ccme.ca/

Jacques Whitford. 2001. Water Quality and Chlorophyll Study (LHP 99-08). Prepared for Newfoundland and Labrador Hydro, Labrador Hydro Project, St. John's, NL.

Minaskuat. 2008. Water and Sediment Modelling in the Lower Churchill River-Environmental Baseline Report LCP#535725 Final Report

IR# JRP.121

Parasites in Fish

Requesting Organization – Joint Panel Review **Information Request No.: JRP.121**

Subject - Parasites in Fish

References:

n/a

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.46)

Rationale:

In its submission to the Panel, Innu Nation raised concerns about parasites in fish, noting that such concerns were previously raised following the development of the Churchill Falls Project.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.121**

Information Requested:

The Proponent is asked to discuss:

a. **The impact of the Churchill Falls Project on the presence of parasites in fish; and**

Response:

In their 1975 parsitological study of the Smallwood Reservoir, Chinniah and Threlfall (1978) found differences in the parasitofauna when compared to surrounding natural lakes. Surrounding lakes were used to represent baseline measures of parasite density and community composition. The study came to the conclusion that the reservoir had increased occurrences of infestation, as well as differing parasite species compositions.

Reference:

Chinniah, V.C., and W. Threlfall. 1978. Metazoan parasites of fish from the Smallwood Reservoir, Labrador, Canada. Journal of Fish Biology. 13: 203-213.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.121**

Information Requested:

The Proponent is asked to discuss:

b. The potential for the Lower Churchill Project to affect the presence of parasites in fish (for both harvested and non-harvested species).

Response:

Petersson (1971) found similar results to that of Chinniah and Threlfall (1978) in regulated and non-regulated watersheds in Sweden. Both studies came to the conclusion that impounded or regulated watersheds had increased occurrences of infestation, as well as differing parasite species compositions.

One explanation offered for the observed changes in demographics and abundances in parasites was a change in fish feeding patterns after inundation. Petersson (1971) found whitefish (*Coregonus spp.*) species most affected, as they changed from generally bottom-feeding, to more planktonic food sources within regulated watersheds. This change in diet can increase susceptibility to certain species of parasites (Petersson 1971; Chinniah and Threlfall 1978).

With respect to potential effects from the Lower Churchill Hydroelectric Generation Project, a change in feeding patterns of the fish species (both harvested and non-harvested) within the Gull Island and Muskrat Falls reservoirs could occur as a result of reservoir creation (see Section 4.3.7.4 of the Habitat Quantification report). As a result, it would be possible that changes in parasite composition in fish species could occur as the reservoir stabilizes. Whether fish species return to pre-reservoir feeding patterns or trophic levels would require monitoring.

As stated by Petersson (1971) and Chinniah and Threlfall (1978), the majority of fish parasites cannot infect humans if consumed.

References:

Chinniah, V.C., and W. Threlfall. 1978. Metazoan parasites of fish from the Smallwood Reservoir, Labrador, Canada. Journal of Fish Biology. 13: 203-213.

Petersson, A. 1971. The effect of lake regulation on populations of cestodan parasites of Swedish whitefish Coregonus. Oikos. 22(1): 74-83.

IR# JRP.122

Lac Joseph Caribou Herd

Requesting Organization – Joint Review Panel **Information Request No.: JRP.122**

Subject - Lac Joseph Caribou Herd

References:

Schmelzer, I. & Brazil, J, Chubbs, T., French, S., Hearn, B., Jeffery, R., LeDrew, L., Martin, H., McNeill, A., Nuna, R., Otto, R., Phillips, F., Mitchell, G, Pittman, G., Simon, N., Yetman, G. (2004). Recovery strategy for three Woodland caribou herds (*Rangifer tarandus caribou; Boreal population*) in Labrador. Department of Environment and Conservation, Government of Newfoundland and Labrador, Corner Brook. Available online at http://www.env.gov.nl.ca/env/ wildlife/wildatrisk/Recovery%20_Strategy_Feb2005_corrections.pdf, accessed July 23, 2009

EIS, Executive Summary

EIS Volume IA, Section 5.2.3.1 (Environmental Setting and Context – Terrestrial Wildlife)

Related Comments / Information Requests:

CEAR # 213 (Innus of Ekuanitshit)

Rationale:

According to the *Recovery Strategy for the Three Woodland Caribou Herds (Rangifer Tarandus caribou; Boreal Population) in Labrador*, the range of the Lac Joseph caribou herd extends south of the Trans-Labrador Highway, from Winokapau Lake (on the Churchill River) in the east to Wabush in the west.

With regards to the Project, the Proponent states that "Nalcor Energy's operations at Churchill Falls and the associated transmission, **as well as the Project**, are within the range of the sedentary Lac Joseph and Red Wine Mountains Caribou herds, both considered threatened under federal and provincial legislation" (Executive Summary, p. 7) (emphasis added).

However, the EIS also mentions that "[o]ther woodland caribou in Labrador and northeastern Québec include the Joir River, Mealy Mountains and Lac Joseph herds, ranging in size from a few dozen to several hundred individuals; all are outside the physical footprint of the Project" (Volume IA, p. 5-15).

Only the George River and Red Wine Mountain herds were considered in the Proponent's environmental assessment.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.122**

Information Requested:

The Proponent is asked to confirm its understanding of the range of the Lac Joseph Caribou Herd and to either justify or reconsider the exclusion of the Lac Joseph caribou herd from the environmental assessment. In doing so, the Proponent should address both the Project's physical footprint and the area(s) over which effects from any Project-related activity or infrastructure may extend. The Proponent may choose to include map(s) to support its response.

Response:

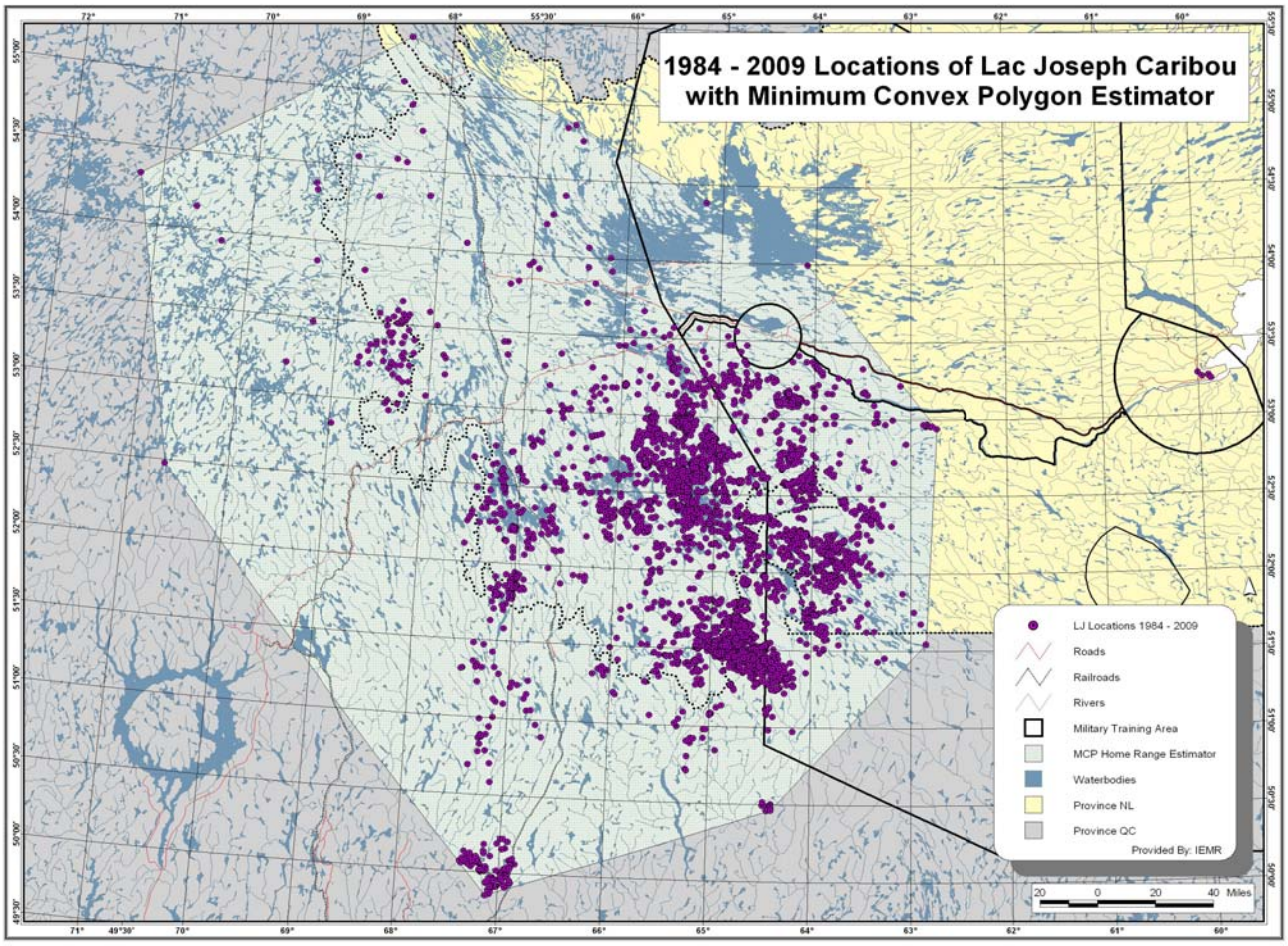
As indicated in IR# JRP.41 and IR# JRP.41S, the Key Indicators (KI) for this assessment were selected according to a set of principles outlined in the EIS Guidelines. In Table 2-10 (Volume IIA), the EIS indicates that two caribou ecotypes of *Rangifer tarandus* were examined in detail. One ecotype, the migratory George River Caribou Herd was selected as a KI given a portion of its annual movements may seasonally overlap with the Assessment Area. The EIS also examined the sedentary woodland ecotype, Red Wine Mountains Caribou Herd, as a KI due to the fact its range overlaps much of the lower Churchill River watershed (Figure 2-13 in Volume IIA). As indicated in IR# JRP.93, the EIS followed a habitat assessment approach focusing particularly on the telemetry locations of this woodland herd.

The Lac Joseph caribou herd, another woodland herd in Labrador, was not considered in the environmental assessment due to the limited spatial overlap at the northern extent of its range with the footprint of the Project. The assessment did examine woodland caribou (e.g., habitat, behavior, mortality), and the analysis focused on the George River and Red Wine Mountains caribou herds because there was the greatest overlap with these herd ranges and the Project (Section 2.4.4 in Volume IIA and Chapter 5 in Volume IIB of the EIS).

Telemetry data provided by the Institute for Environmental Monitoring and Research from the Lac Joseph caribou herd indicate that affiliated animals are occasionally found within the lower Churchill River watershed (Figure 1). A minimum convex polygon (technique for estimating species range – refer to Glossary Volume IIA of the EIS) indicates that the range overlaps a portion of the lower Churchill River watershed. However, these data also show that individual Lac Joseph female caribou (those equipped with the telemetry collars) rarely occur within the lower Churchill River valley or other locations where physical disturbances associated with the Project are anticipated (Figures 4-17 to 4-26 in Volume IA of the EIS). Based on this information, Project effects to Lac Joseph caribou are not likely.

Any mitigation proposed for the Project, as it relates to woodland caribou, would be applicable to any woodland caribou from the Lac Joseph herd, in the unlikely event that any of these animals encountered components of the Project.

Figure 1 **1984-2009 Locations of Lac Joseph Caribou With Minimum Convex Polygon Estimator (Note data and image provided by the Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL – refer to Figures 2-12 and 2-13 in Volume IIA for comparison)**



IR# JRP.123

Baseline Data Analysis and Modelling

Requesting Organization – Joint Review Panel **Information Request No.: JRP.123**

Subject - Baseline Data Analysis and Modelling

References:

EIS Guidelines, Section 3.1 (Study Strategy and Methodology)

EIS, Volume I, Section 9.1.3 (Baseline Data Analysis and Modelling)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.21)

Rationale:

The EIS Guidelines require that all data collection methods, models and studies shall be documented so that the analyses are transparent and reproducible. The degree of uncertainty, reliability and sensitivity of models used to reach conclusions is also to be indicated.

As noted in the issues raised in the Innu Nation submission, there is considerable concern among Innu regarding the effects of the Project on the populations of important species, and the effects of a drop in the population of one species on the populations of other species.

Direct mortality and loss of habitat resulting in changes to species populations is not clearly addressed in the EIS. While modelling has been undertaken, such as in the case of fish habitat modelling and caribou habitat modelling, this modelling has not produced estimates of population changes resulting from the Project but, rather, relative changes (expressed as percentages of unknown populations) are presented. In other cases, such as for avian species, no habitat modelling has been undertaken.

With sufficient data it is possible to develop predictive models using habitat specific densities to determine effects on species populations and to determine the populations that would be lost either directly to mortality or indirectly due to habitat loss. The results of such models should be both empirical and quantitative and should address concerns regarding the effects of the Project on species populations.

Without the prediction of population changes, the findings of the effects of the Project on wildlife are much less meaningful for resource users, including Aboriginal community members.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.123**

Information Requested:

The Proponent is asked to:

a. **Develop predictive models for key fish and wildlife species, including caribou, black bear and at least one songbird, waterfowl, furbearer and fish species;**

Response:

The habitat quantification approach followed for fish and fish habitat and the identified wildlife key indicator species are predictive models. Specifically, except for Harlequin Duck, Osprey and Beaver that were not mapped in terms of habitat quality, the description of baseline conditions for Key Indicator species addresses changes in availability of habitat, changes in health, and risk of mortality in order to predict likely effects on the population. A description of the use of biomass as a reasonable estimate of fish production, rather than population estimates, is provided in the response to IR# JRP.49S.

Canada Goose provides an example of the approach used in the EIS. Baseline conditions for the population were described based on a combination of Innu traditional knowledge, previous studies, and field work conducted specifically for this Project. For Canada Goose, as for most other species assessed, these data were insufficient to determine an accurate population estimate for the Project Area. Consequently, assessment of change focused on relative rather than absolute effects on population size. Table 5-21 (Volume IIB) summarizes the amount of primary habitat that would be lost in the Project Area for Canada Goose as a result of development. The extent of direct change to the population is assumed to be at most equivalent to this, but usually will be considerably less as individuals will tend to move to alternate locations, where many can be expected to survive, even if the quality is lesser and/or competition for resources greater.

Similar approaches were taken for moose, marten, porcupine, Surf Scoter, Ruffed Grouse, Osprey, wetland sparrows, and other species of concern (i.e., Common Nighthawk, Olive-sided Flycatcher, Gray-cheeked Thrush, and Rusty Blackbird). Likewise, the same basic approach was taken for caribou, moose and black bear, but in the case of these three species, predictions were additionally influenced by the availability of telemetry data.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.123**

Information Requested:

The Proponent is asked to:

b. Indicate the degree of uncertainty, reliability and sensitivity of each model; and

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Response:

The habitat based methodology employed for the Project assessment has offers reliable predictions of likely Project effects, and identification of appropriate mitigation measures so that Project effects are not likely to be significant. In making EIS predictions, uncertainty was identified and addressed through the application of conservative estimates or assumptions and the consideration of proposed mitigation measures, monitoring and follow-up, and adaptive management measures.

For caribou, existing data provided a high level of certainty regarding their abundance and distribution within the Project area. However, for most terrestrial KIs supplementary field surveys were required to enhance confidence in the understanding of existing conditions. Given the location of the Project and the relative inaccessibility of many parts of the area, it was not feasible to comprehensively census all parts of the area for species of interest. Rather, remote sensing was used to build a complex Ecological Land Classification (ELC) for the watershed, transmission line corridor, and lower Churchill River valley. Concurrently, species-specific field programs were designed and undertaken to representatively sample habitat types, to determine the relative abundance of species within each, as well as gain an overview of their overall pattern of distribution. In recognition of the potential for generating errors through extrapolation, population estimates for the Project area were not calculated based on the field sampling. Rather, the field data were used as the basis for determining favoured habitat associations for each species, supplemented by a review of available and relevant literature. Assessment of effects was then based on anticipated change to the availability of primary habitat. Since the determination of primary habitat was through a combination of literature review and ground-truthing via field programs, its analysis, application and usage has resulted in reliable predictions of the likely Project effects on caribou. This approach is used commonly in other environmental assessments particularly in the quantification and classification of fish habitat for example.

The approach described above was not applied to Beaver, Osprey, and Harlequin Duck, as their selection of habitat is primarily linked to specific landscape features (respectively fast-flowing rivers, fish-bearing lakes/rivers, and slightly inclined creeks adjacent to hardwood forests) (refer to IR# JRP.128, IR# JRP.105, Volume IIA, Sections 2.4.7.2, 2.4.13.2, and 2.4.15.2) that were not discernable using remote sensing techniques. As such, for each of these species their occurrence was determined through aerial surveys of the Project area. Given the specific requirements of each species, there is high certainty that the existing populations were surveyed comprehensively.

The reliability of the models completed for most terrestrial KIs is dependent on the literature reviewed, and is difficult to quantify, although much of the literature has been published and therefore subject to peer review. However, given that the needs of these species are well understood and the related effects of the Project can be accurately predicted, the reliability of the assessments of these species is considered high.

Similar to the terrestrial habitat associations, fish habitat utilization values for each identified habitat type were derived from catch data specifically from the lower Churchill River. A detailed description of the fish and fish habitat modeling of both pre- and post-Project conditions is presented in the Fish and Fish Habitat Methodology and Habitat Quantification reports appended to the EIS (AMEC 2001; AMEC and Sikumiut 2007). These reports explain the uncertainty associated with the predictions and how it was addressed in the assessment. The response to IR# JRP.19 also lists all studies used in the development of the habitat quantification method and their assumptions, uncertainties and sensitivities.

References:

AMEC Earth & Environment Ltd. 2001. Churchill River Power Project LHP00-07 HADD Determination Methodology Churchill River, Labrador. Prepared for Labrador Hydro Project, St. John's, NF.

AMEC Earth & Environment and Sikumiut Environmental Management Ltd. 2007. Lower Churchill Hydroelectric Generation Project Habitat Quantification. Prepared for Newfoundland and Labrador Hydro, St. John's, NL. viii + 129 pp. + Appendices.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.123**

Information Requested:

The Proponent is asked to:

c. **Where the Proponent is of the view that there is insufficient data to support development of predictive models, identify the data gaps and the work that would be required to address those gaps, and how these gaps impact the significance determination for each species.**

Response:

As described in (a), the assessment used predictive models. While they do not present a quantitative estimate of population change for any species, they do in most cases suggest an upper limit regarding the decline expected, based on percentage change in the availability of primary habitat. As summarized in (b), the significance determination for each species is reliable as it is based on a combination of scientific literature, ecological land classification, species-specific field sampling, and ground-truthing of habitat associations. The approach used is sound and the data available have resulted in reliable predictions and there is no need for additional analysis.

In the case of Beaver, Osprey and Harlequin Duck, their distribution is related to specialized features of habitat quality that cannot be mapped remotely (e.g., suitable and accessible food, underlying geology) and so could not be modeled in relation to change in availability of primary habitat in the same manner as other species. Therefore, actual locations of colonies, nests and/or other evidence of breeding were used to identify important habitat, which is appropriate and has resulted in reliable predictions. To address the uncertainty associated with these predictions, appropriate mitigation, monitoring and follow-up has been proposed. This has resulted in reliable predictions about the likely Project effects.

IR# JRP.124

Habitat Losses Due to Construction Activities and Project Components

Requesting Organization – Joint Review Panel **Information Request No.: JRP.124**

Subject - Habitat Losses Due to Construction Activities and Project Components

References:

EIS, Volume IIB, Section 5.11.1 (Change in Habitat during Construction)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.51)

Rationale:

The EIS presents, for each species, a quantification of primary, secondary and tertiary habitat that would be lost as a result of inundation. The EIS also mentions that some habitat may be disturbed and/or permanently lost as a result of preparation, construction, excavation and installation of various Project components during and following the construction phase. However, it is unclear to which extent habitat losses due to construction activities and Project components other than the reservoirs (and including access roads) have been considered in the Proponent's determination of significance for the terrestrial environment.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.124**

Information Requested:

The Proponent is asked to:

a. **Quantify the total amount of habitat losses anticipated as a result of construction activities and Project components other than the reservoirs (including access roads); and**

Response:

The estimated extent of habitat losses anticipated as a result of construction activities and Project components other than the reservoirs (including access roads) is provided in Table 1.

Table 1 Estimated Loss of Habitat

Category	Component	Details	Area
Dam Sites	Gull Island	Gull Island Project site footprint including the permanent accommodations complex measures 1.6 km x 2.0 km. The construction camp 300,000 m^2 A marshalling yard 200 m x 230 m	3.2 km^2 0.3 km^2 0.05 km^2
	Muskrat Falls	Muskrat Falls Project site footprint measures 1.2 km x 0.7 km and includes the Muskrat Falls switchyard. The construction camp 280,000 m^2	0.85 km^2 0.3 km^2
Roads	Gull Island Permanent Access Roads	18 m x 3.4 km (there are 10.6 km of permanent access roads, however, 7.2 km are existing)	0.06 km^2
	Gull Island Temporary Access Roads	16 m x 15 km includes access to switchyard and converter station, access to main dam, south side access road, and the access road to borrow area 7. Borrow areas 2 and 3 will require 10 km of access roads however these roads as well as the borrow areas will be inundated by the reservoir.	0.25 km^2
	Muskrat Falls Permanent Access Roads	18 m x 5.0 km, Permanent access will utilize 13 km of purposed forestry access road	0.09 km^2
	Muskrat Falls Temporary Access Roads	16 m x 2.0 km	0.03 km^2
Transmission Lines	Gull Island to Churchill Falls	203 km of transmission lines with at most an 80 m right of way	20 km^2
	Gull Island to Muskrat Falls	60 km of transmission lines with at most an 80 m right of way	6 km^2
Switchyards	Churchill Falls	Will utilize existing space, no habitat losses anticipated	0 km^2
	Gull Island	580 m x 550 m	0.3 km^2
	Muskrat Falls	Included in project footprint area.	0 km^2

Category	Component	Details	Area
Borrow Areas		Borrow Area 5 is 1,300,000 m^2 Borrow Area 6 is 525,000 m^2 Borrow Area 6B is 400,000 m^2 Borrow Area 7 is 150,000 m^2 Borrow Area 10 is 200,000 m^2	3.0 km^2
Wood Stockpiling Areas (if required)		10 areas of varying size totaling 0.5 km^2	0.5 km^2
		Total:	35 km^2

Requesting Organization – Joint Review Panel **Information Request No.: JRP.124**

Information Requested:

The Proponent is asked to:

b. Discuss the extent to which these habitat losses have been considered in the determination of significance.

Response:

As a precautionary approach, the environmental assessment was based on up to 200 km^2 of habitat being lost or altered as a result of the Project. The reservoirs were estimated to account for approximately 126 km^2 and part (a) has determined that the other Project components amounted to approximately 35 km^2. Thus, the assumption used in the EIS was conservative in terms of determining the significance of environmental effects to Terrestrial Environment Key Indicators.

IR# JRP.125

Noise Interactions with Wildlife

Requesting Organization – Joint Review Panel **Information Request No.: JRP.125**

Subject - Noise Interactions with Wildlife

References:

EIS Guidelines, Section 4.5 (Environmental Effects

EIS, Volume IIB, Section 5.3 (Potential Interactions)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.50)

Rationale:

The EIS Guidelines specify that the EIS shall contain a comprehensive analysis of the predicted environmental effects on the VECs of each project alternative. If the effects are attributable to a particular phase of the Project (construction, operation and/or maintenance) then they should be designated as such (section 4.5.1).

The potential for construction impacts (Section 5.3.1) on the terrestrial environment from vehicular traffic on-site requires further clarification. The EIS notes that "noise and human presence will keep most wildlife out of the immediate area" (Volume IIB, p.5-13). The definition of "on-site" is not provided, but if it means the Project footprint, this is a large area occupied by vehicular traffic for several years. The displacement of terrestrial wildlife from these areas during the construction period does not appear to be addressed in the EIS.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.125**

Information Requested:

The Proponent is asked to provide further details concerning the geographical extent of the "immediate" area from which wildlife will be deterred by the noise of construction activities over the duration of the construction period. The Proponent may choose to include map(s) to illustrate this area.

Response:

Wildlife disturbance due to noise is expected to occur primarily during the construction phase of the Project. During construction, a variety of activities will contribute sounds to the area. Whether these sounds would disturb wildlife depends on one or more of the following factors:

1. Certain sounds are more distinctive than others (e.g., associated with a different frequency), and even at low levels may be detected at greater than expected distances (e.g., the backup alarm on most construction equipment). Conversely, the collective sound produced by multiple vehicles may be masked at a closer distance by the natural sounds of the wind, even if it is higher at the source. Impulse sounds at levels of about 90 dBA may induce a startle response (i.e., reaction and possible flight of wildlife). The presence of continuous construction sound, serves to acclimatize some wildlife species to sound so that the occasional impulse sound would have less of an effect than an impulse sound in isolation (e.g., gunshot).
2. Although audible, sounds may not be alarming or disruptive to the behavior of wildlife. Many wildlife species will tolerate the presence of humans (and associated noise or other stimuli) if ecological requirements (e.g., foraging and/or breeding habitat) are available at this location.
3. The construction phase is scheduled to last several years, occur during different seasons of the year and of course, different times of day. Wildlife species may react differently to the same stimuli over different seasons, and the nature of the stimuli may change from season to season. For example, certain areas may be much more accessible in the winter over frozen ground. At the present time, the seasonal distribution of tasks is unknown, and it is likely to remain an unknown until such time as the contract is tendered and initiated.
4. The Project has been designed to minimize the footprint of disturbance, for example in the consultation processes that accompanied the design in the vicinity of Muskrat Falls. Although the Project description shows corridors for the transmission lines for example, the actual construction (and the noise generated) will take place within the route (to be selected) and move along the right-of-way as the construction progresses versus occurring throughout the Project footprint throughout the construction phase. The disturbance in these corridors, as in the reservoir clearing, will be confined to temporary, relatively small areas of disturbance; however, although the effect on the acoustic environment is reversible, other physical effects may result in a longer, or a permanent displacement of certain species.
5. Sound is only one of several stimuli that wildlife may perceive as a disturbance. For example, sight and smell are also important.

In terms of sound, the two main primary effects include auditory changes (e.g., hearing loss or threshold shift), and the masking of key auditory signals, such as mating calls and prey sounds. Secondary effects are non-auditory in nature, including increased stress levels and changes in mating and feeding patterns (Manci et al. 1988). Generally, there is little information pertaining to the relationship between the dose of noise (i.e., specific sound levels) and the response of mammals and birds. As a result, the literature provides a qualitative evaluation of noise effects.

For mammals in particular, impulsive sounds over 90 dB are considered to be adverse, and may result in retreat or strong startle reactions. Many mammals are physiologically constrained to produce low-frequency signals, which may be affected by masking noises (Warren et al. 2006; Rabin et al. 2006). Studies of mammals such as deer indicate a correlation between noise level and heart rate.

The most common concern related to noise and wildlife is the masking effect. Masking becomes an issue when the noise levels are able to mask acoustic signals on which an animal relies for survival, such as defending territory, attracting mates, or delivering distress calls (Warren et al. 2006).

Wildlife response to noise may also vary by habitat (Pepper et al. 2003). For example, wildlife in an open area may engage in more predator-avoidance behaviour, such as long duration fleeing, whereas wildlife in a forested area may be more protected and would not expend as much energy.

Unlike wildlife, livestock do not display strong responses to high intensity noises, such as aircraft (Pepper et al. 2003). This could partly be explained by the fact that livestock become accustomed to loud farming equipment, and therefore do not show signs of distress.

Studies on birds have produced a good understanding of their vocalization, consisting mainly of a dominant frequency and a range of harmonics (Kroodsma 1982). Although some birds have been found to produce sounds into the ultrasonic region (i.e., greater than 20,000 Hz), behavioural studies and brainstem measurements have shown that they have no response above 8,000 Hz (Narins et al. 2004).

With regards to masking of bird signals, field studies have revealed that birds adjust their vocalization to reduce the influence of background noise levels (Patricelli and Blickley 2006). For example, Song Sparrows have been found to shift the fundamental frequency of their songs from the lower frequency range (i.e., commonly found with urban noise), into the higher frequencies (i.e., above 4,000 Hz) (Wood and Yezerinac 2006). It has been found that higher-pitched frequencies in bird songs may make species less susceptible to noise effects from roads implying masking as a causative mechanism (Rheindt 2003). Birds in noisier urban environments also increased amplitude of songs when background noise increased. Another technique used by birds within noisy habitats is to increase the signal-to-noise ratio (i.e., sing louder), and increase the duration and timing of the songs (Patricelli and Blickley 2006). Field measurements have shown that the Least Bell's Vireo song may be masked when background noise exceeds 60 dBA (Ogden 1993).

Transportation related studies have revealed that not all bird species appear sensitive to noise. For example, a study in Spain estimated that only approximately 15 percent of breeding bird species was sensitive, although total density did not differ at different levels of traffic (Peris and Pescador 2004). Some species have been found to become more common near roads (Michael et al. 1976). Some species breed well even in noisy environments. Some bird species may adjust both the frequency content and sound level of their songs in such areas. The expected noise sources typically do not produce significant sound energy above 4,000 Hz, which may have a mitigating effect for some species that can communicate in higher frequencies.

Although difficult to quantify, the breeding behaviour and success of some species of birds and amphibians whose mating system is driven by auditory cues may be affected by noise levels immediately adjacent to construction activities and operational units. However, the human presence and industrial environment is expected to deter wildlife from interacting within close proximity of these areas where high sound levels may create masking effects of concern for some species. Occasional impulsive sounds above 70 dBA in these areas could be expected, causing the potential to startle some species.

At separation distances of approximately 300 to 500 m from construction activities, and 250 to 300 m from the main process units during operations, impulsive noise is expected to drop below 90 dBA. Based on the reviewed literature, sound levels above these values are typically necessary to create wildlife effects (e.g., communication masking, perception of predators, or breeding success).

Each wildlife species (including individuals) will exhibit a different level of tolerance, and a different ability to acclimatize to the presence of equipment and construction crews, and the associated noise, in the area. Although some animals may be attracted to waste, most species will avoid the footprint of physical disturbance. Different species are expected to be affected at different distances. Maximum construction noise levels will decrease to about half of the perceived volume of the background noise within about 4 to 5 km from the main construction sites at each dam. This is assuming that the background daytime sound levels are about 45 dBA, and is the point where predicted construction sound levels are about 35 dBA. These levels are illustrated in the maps submitted as part of IR# JRP.87. Attenuation is not equal in all directions because of topography, and also, to a lesser extent, by other factors such as tree cover or wind direction and strength. Along the roads, and in the vicinity of clearing activities, the zone of potential disturbance will be much lower, within a kilometer where the visual cues to wildlife become as important as the auditory cues. In the vicinity of roads, sound also provides a protective warning to wildlife. Distance remains the most important controlling factor in the attenuation of noise from the construction.

References:

Kroodsma, D.E. 1982. Acoustics Communication in Birds. Vol. 1-2, Academic, New York, NY.

Manci, K.M., D.N. Gladwin, R. Villella and M.G. Cavendish. 1988. Effects of Aircraft Noise and Sonic Booms on Wildlife: A Literature Synthes. USFWS National Ecology Research Centre. Ft. Collins, CO. NERC-88/29.

Michael, E.D., C.R. Ferris and E.G. Haverlack. 1976. Effects of Highway Rights-of-Way on Bird Populations. Proceedings of the First National Symposium on Environmental Concerns in Rights-of-Way Management.

Narins, P.M., A.S. Feng, W. Lin, H. Schnitzler and A. Densinger. 2004. Old World Frog, Bird Vocalizations Contain Prominent Ultrasonic Harmonics. J. Acousti. Soc. Am. Vol. 115, pp 910-913.

Ogden Environmental and Energy Services Co. Inc. 1993. Gregory Canyon Landfill Site Study, part of the County of San Diego's North Landfill Project.

Patricelli, G.L. and J.L. Blickley. 2006. Avian Communication in Urban Noise: Causes and Consequences of Vocal Adjustment. The Auk. 123(3): 639-649.

Pepper, C.B., M.A. Nascarella and R.J. Kendall. 2003. A Review of the Effects of Aircraft Noise on Wildlife and Humans: current control mechanisms, and the need for further study. Environmental Management. 32:418-432.

Peris, S. J., and M. Pescador. 2004. Effects of traffic noise on passerine populations in Mediterranean wooded pastures. Applied Acoustics. 65:357-366.

Rabin, L.A., R.G. Coss and D.H. Owings. 2006. The Effects of Wind Turbines on Antipredator Behavior in California Ground Squirrels. Biological Conservation. 131:410-420.

Rheindt, F.E. 2003. The impact of roads on birds: does song frequency play a role in determining susceptibility to noise pollution? Journal für ornithology. 144:295-306.

Warren, P.S., M. Katti and A. Brazel. 2006. Urban Bioacoustics: It's not just noise. Animal Behavior. 71:491-502.

Wood, W.E. and S.M. Yezerinac. 2006. Song Sparrow Songs Varies with Urban Noise. The Auk. 123(3): 650-659.

IR# JRP.126

Habitat Loss, Wildlife Displacement, and Increased Interspecies Competition and Predation

Requesting Organization – Joint Review Panel **Information Request No.: JRP.126**

Subject - Habitat Loss, Wildlife Displacement, and Increased Interspecies Competition and Predation

References:

EIS Volume IIB, Section 5.7 (Change in Habitat – Existing Knowledge); Section 5.11 (Environmental Effects Assessment – Change in Habitat) & Section 5.14 (Summary of Residual Environmental Effects and Evaluation of Significance – Terrestrial Environment)

Related Comments / Information Requests:

CEAR # 216 (Labrador Metis Nation)

Rationale:

The EIS offers little discussion of the effect of habitat loss and wildlife displacement on inter-species competition and predation, with the exception of caribou-moose-wolf interrelationships. As Key Indicators are discussed individually in the EIS, it is difficult to understand how different displaced species may interact with each other and how they may be affected by the resulting changes in competition and predation.

Requesting Organization – Joint Review Panel **Information Request No.: IR# JRP.126**

Information Requested:

The Proponent is asked to provide a more detailed discussion on how species displaced by the Project (Key Indicators (KI) species or others) may be affected by changes in competition or predation. In doing so, the Proponent should identify specific species that may interact together in their new environments, including species that may be most vulnerable to competition/predation and the level of competition or predation expected, and the need for species-specific monitoring and follow-up programs.

As appropriate, the Proponent should refer to the composite maps prepared in response to IR# JRP.15.

Response:

Depending on the wildlife species, the Project is expected to result in displacement or alteration of home range. The extent of this effect is expected to vary depending on the population density and habitat associations of each species. The composite maps provided with response to IR# JRP.15, provide the habitat types and their locations. These species interactions, in relation to the habitat types available after the Project, were considered during the environmental assessment for the Project.

As indicated in the terrestrial KI assessment (Chapter 5 of Volume IIB), one potential consequence of such displacement is increased competition for resources. Increased competition can occur within species (i.e., intra-specific), and also among species (i.e., inter-specific). Changes in distribution can also result in prey species becoming more vulnerable to predators.

In general, the potential for interaction between any pair of species can be classified in three broad categories:

(i) For species with substantially different ecological requirements, they are not likely to influence each other's success through either competition or predation.

(ii) Where two species share similar ecological requirements, but neither is a predator of the other, there may be a slight interaction due to competition, but it is unlikely to result in an effect.

(iii) In cases where one species is a predator, or otherwise can have substantial influence on local habitats (e.g., beaver through habitat change), the potential exists for that species to have an effect on the distribution and/or abundance of other species.

Table 1 summarizes the nature of potential interactions among KIs and other species. The Follow-up indicated in Table 1 is consistent with Table 7-3 in Volume IIB of the Environmental Impact Statement (EIS), and includes species-specific Follow-up that is considered adequate to capture information on effects related to competition/predation for the Key Indicators.

The displacement of wildlife by the Project will not result in a measurable change among Key Indicator species regarding such interactions as predation or competition (interspecific or intraspecific). Since these species have largely been selected as representative of the local fauna, it is likely that the low probability of such effects can be applied more generally to all wildlife in the Project area.

Table 1 Summary of Key Indicator Interactions with Prey, Predator, or Competitor in the lower Churchill River Watershed and Follow-up

Key Indicator	Prey of	Predator of	Competitor of, or Substantial Interaction	Follow-up
Caribou	**KIs:** Black bear **Other:** wolf	**KIs:** None	**KIs:** Moose may attract predators of, or introduce parasites to **Other:** some competition with various herbivores	Continue role on the Labrador Woodland Caribou Recovery Team regarding the RWM. Herd and support telemetry work with the wildlife division; interact with other stakeholders and management efforts, especially for RWM Herd
Moose	**KIs:** Black bear **Other:** wolf	**KIs:** None	**KIs:** None **Other:** some competition various herbivores	Winter aerial and ground and/or GPS Telemetry surveys of key Moose wintering areas and locations where habitat will be removed. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Black Bear	**KIs:** None	**KIs:** Caribou, Moose, Marten, Canada Goose, Beaver, Ruffed Grouse **Other:** most terrestrial species	**KIs:** None	Re-deploy GPS/VHF collars on bears in the river valley Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Beaver	**KIs:** Black bear **Other:** wolf	**KIs:** None	**KIs:** Moose, Canada Goose, Surf Scoter, Ruffed Grouse, Wetland Sparrows, Olive-sided Flycatcher, Rusty Blackbird attracted to wetland habitat modified by flooding **Other:** variety of terrestrial species that may be attracted to wetland habitat modified by flooding	Periodic surveys will be conducted in pre-established block to verify presence/absence of Beaver colonies Survey for active Beaver colonies near the areas to be flooded. Live trap and relocate animals to suitable alternative habitat prior to impounding Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Marten	**KIs:** Black bear **Other:** wolf, fox, raptors	**KIs:** Ruffed Grouse, Wetland Sparrows, Harlequin Duck, Common Nighthawk, Gray-cheeked Thrush **Other:** small mammals	**KIs:** None **Other:** other mustelids, other predators compete for same prey resources	Trapping data will be accessed for comparison with pre-Project trapping data

Table 1 Summary of Key Indicator Interactions with Prey, Predator, or Competitor in the lower Churchill River Watershed and Follow-up

Key Indicator	Prey of	Predator of	Competitor of, or Substantial Interaction	Follow-up
Porcupine	**KIs:** None	**KIs:** None	**KIs:** None	Transect surveys for winter tracks will be conducted to confirm presence/ absence Trapping data will be accessed and assessed for comparison with pre-Project trapping data Nalcor Energy will keep a log/database of road kills (all species) during the construction **phase of the Project**
Canada Goose	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids	**KIs:** None	**KIs:** Surf Scoter during staging or other use of water bodies; beaver, related to use of created wetlands **Other:** waterfowl and other wetland-nesting birds using waterbodies or wetland habitat	Aerial surveys of river and surrounding locations. Temporal use of traditional ashkui locations
Surf Scoter	**KIs:** Black Bear, Marten **Other:** wolf, fox, mustelids	**KIs:** None **Other:** various crustaceans	**KIs:** None **Other:** wetland-nesting waterfowl	Aerial surveys of river and surrounding locations. Temporal use of traditional ashkui locations
Ruffed Grouse	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids, raptors	**KIs:** None	**KIs:** None **Other:** various forest herbivores	Surveys of forest avifauna will be carried out at key intervals during construction, and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Osprey	**KIs:** None	**KIs:** None **Other:** various fish	**KIs:** None **Other:** Bald Eagle, large piscivorous fish	A survey for active Osprey nests (and other raptors) will be completed within 800 m of the proposed construction zone (mitigation for active raptor nests will be determined in consultation with the NLDEC Wildlife Division)
Wetland Sparrows	**KIs:** Marten **Other:** fox, other mustelids, raptors	**KIs:** None **Other:** various aquatic and terrestrial insects	**KIs:** None **Other:** other wetland songbirds, including Common Yellowthroat and Yellow Warbler	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Harlequin Duck	**KIs:** Black Bear, Marten **Other:** other mustelids, raptors	**KIs:** None **Other:** various aquatic invertebrates	KIs: None	Aerial surveys of river and surrounding locations. Temporal use of traditional ashkui locations
Common Nighthawk	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids, raptors	**KIs:** None **Other:** various aerial insects	**KIs:** None **Other:** bats	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project

Table 1 Summary of Key Indicator Interactions with Prey, Predator, or Competitor in the lower Churchill River Watershed and Follow-up

Key Indicator	Prey of	Predator of	Competitor of, or Substantial Interaction	Follow-up
Olive-sided Flycatcher	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids, raptors	**KIs:** None **Other:** various aerial insects	**KIs:** None **Other:** aerial insectivores, including other flycatchers, warblers, and vireos	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Gray-cheeked Thrush	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids, raptors	**KIs: None** **Other:** various terrestrial insects	**KIs:** None **Other:** terrestrial insectivores, including other thrushes, forest sparrows, and shrews	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project
Rusty Blackbird	**KIs:** Black Bear, Marten **Other:** wolf, fox, other mustelids, raptors	**KIs:** None **Other:** various aquatic and terrestrial insects	**KIs:** None **Other:** variety of insectivorous birds and small mammals	Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. Nalcor Energy will keep a log/database of road kills (all species) during the construction phase of the Project

IR# JRP.127

Terrestrial Environment Measurable Parameters – Mortality

Requesting Organization – Joint Review Panel **Information Request No.: JRP.127**

Subject - Terrestrial Environment Measurable Parameters – Mortality

References:

EIS, Volume IIB, Section 5.4 (Selection of Measurable Parameters for Terrestrial Environment Key Indicators)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.51)

Rationale:

The EIS mentions that mortality will be used to compare effects of the Project against baseline values or conditions. For all Key Indicators within the Terrestrial Environment, mortality is defined as the "number of fatalities as a proportion of the population present in the Assessment Area" (Volume IIB, p. 5-14). In its submission to the Panel, Innu Nation mentioned that, for Innu, the absolute number of fatalities, as opposed to relative fatalities, is important.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.127**

Information Requested:

The Proponent is asked to justify why it has chosen to measure mortality as a proportion of the population present rather than in absolute terms. Where possible, the Proponent should provide absolute numbers.

Response:

With the mitigation proposed, Nalcor Energy (Nalcor) expects minimal wildlife mortality as a result of this Project.

As discussed in response to IR# JRP.123, a habitat quantification approach (as opposed to a population based approach) was followed for the identified wildlife Key Indicator (KI) species as a form of predictive modeling. All KI species assessments address changes in availability of habitat, changes in health, and risk of mortality in order to predict likely environmental effects on the population.

Consistent with this approach was the selection of the measurable parameter for mortality represented by the number of fatalities as a proportion of the population present in the Assessment Area. The environmental effects of this Project are primarily associated with habitat alteration or loss. While the selected assessment approach does not provide absolute numbers related to the anticipated low level of mortality, it does provide a reliable prediction of Project effects and assists in the identification of appropriate mitigation. In contrast, a population-based modeling approach used to arrive at absolute numbers would have a lower level confidence associated with its predictions given the inherent variability and uncertainty associated with the assumptions. For example, it would be inherently difficult to predict the number of Porcupine that may be killed through collisions with vehicles associated with the Project.

Nalcor has committed to include mortality as part of its Follow-up and Monitoring Program. For example, mortality as a result of collisions with vehicles will be documented and reported on a regular basis. Nalcor will be applying adaptive management to the Project to address the results of the Follow-up and Monitoring Program.

IR# JRP.128

Beavers

Requesting Organization – Joint Review Panel **Information Request No.: JRP.128**

Subject - Beavers

References:

EIS Volume IIA, Section 5.11.1.7 (Environmental Effects Assessment – Beaver); Section 5.13.2 (Environmental Effects Assessment – Impounding) & Section 5.16 (Environmental Effects Assessment – Monitoring and Follow-up)

Minaskuat Inc. 2008. *Inventory of Beaver Colonies in the Lower Churchill River Valley.* Prepared for the Lower Churchill Hydroelectric Generation Project.

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.101)
CEAR # 216 (Labrador Metis Nation)

Rationale:

In the EIS, the Proponent states that active beaver colonies located within the limits of the proposed reservoirs would be identified in advance of impounding, and beavers would be live-trapped and relocated to alternate locations above the reservoir limits. Relocation areas would be selected in advance. The Proponent further mentions that a monitoring program would be implemented to determine if relocation is successful.

Minaskuat Inc. (2008) indicates that most of the areas surveyed were evaluated as *medium* or *poor* habitat for beavers, but that the "consistent trend in terms of increasing beaver colony density from Riparian, to River Valley to the Transmission Line Sections was likely a reflection of the habitat quality" (p. 7-1).

However, in reference to beaver habitats, the EIS states that "[e]xtensive alternate riparian and wetland habitat will be present throughout the remainder of the Assessment Area (…) [but] are of lower quality than the areas that will be lost" (Volume IIA/B, p. 5-86).

No further details are provided in the EIS relative to the availability of adequate alternate beaver habitats above the proposed reservoir limits, nor does the Proponent provide any indication on the success rate expected from this mitigation measure. This information is required to support the Proponent's assertions that beaver relocation would be successful and that the effects of the Project on beavers would not be significant.

Finally, a field survey for determining beaver population density was conducted only over a single four-day period (October 24 to 27, 2006).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.128**

Information Requested:

The Proponent is asked to:

a. **Discuss the availability and quality of habitats suitable for beavers above the proposed reservoir limits;**

Response:

Based on the habitat characteristics of beaver (Allen 1983; Northcott 1971; Novak 1987) described in the Beaver Environmental Baseline Report (Minaskuat 2008a), most of the area surveyed within the lower Churchill River watershed was considered to be of medium or poor quality compared to elsewhere in North America. These habitat characteristics include valley width (exceeding the stream width) of at least 46 m; a valley grade of less than six percent; appearance of bedrock; and presence of deciduous cover as a food source. As indicated in Section 2.4.1.3 in Volume IIA of the EIS, habitat mapping could not be completed for the Beaver Key Indicator (KI) as characteristics indicative of quality, are not discernable through the remote sensing employed in the Ecological Land Classification (Minaskuat 2008b, 2008c).

In terms of describing the availability and quality of habitat above the proposed reservoir limits, the aerial surveys completed in the fall of 2006 (Minaskuat 2008a) provides sufficient information to understand the existing environment and predict likely Project effects. Comparing observations at the 63 survey blocks examined by Minaskuat (2008a), it was apparent that blocks in the 'riparian section', those immediately adjacent to the lower Churchill River, were less productive than locations further up on the slope in the 'river valley section'. The highest number of colonies per block was recorded in the vicinity of the 'combined transmission line section'. This information was considered in the identification of appropriate mitigation (i.e., relocation of active colonies within the limits of the reservoirs) and prediction of no likely significant adverse environmental effect.

References:

Allen, A.W. 1983. Habitat suitability index models: beaver. US Fish and Wildlife Service, FWS?OBS-82/10.30 Revised. 20 p.

Minaskuat Inc. 2008a. Inventory of beaver colonies in the lower Churchill River valley environmental baseline report – LCP 535743. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Minaskuat Inc. 2008b. Project area ecological land classification. Prepared for the Lower Churchill Hydroelectric Generation Project.

Minaskuat Inc. 2008c. Regional area ecological land classification. Prepared for the Lower Churchill Hydroelectric Generation Project.

Northcott, T.H. 1971. Feeding habits of beaver in Newfoundland. OIKOS 22: 407-410.

Novak, M. 1987. Beaver. Pp. 282-312. In M. Novak, J.A. Baker, M.E. Obbard and B. Malloch (eds.). Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.128**

Information Requested:

The Proponent is asked to:

b. Provide examples of successful beaver relocation programs in other comparable situations;

Response:

The relocation of beavers is a common technique used successfully throughout North America to deal with nuisance situations (refer to internet sites listed below). Live-trapping techniques attempt to capture all animals from a particular colony and introduce them to areas of suitable habitat.

Typical problems associated with relocating beavers relate to ensuring the relocation occurs far enough away to prevent these animals from returning, and that deterrents are in place to discourage other beavers from colonizing in the area. This situation would not be relevant for the relocation planned for the Project as it would be designed to occur immediately prior to the scheduled inundation in the fall. Disturbance of active colonies within the area identified for reservoir preparation (i.e., clearing) would be avoided by at least 20 m until the relocation program is implemented.

References:

http://www.tswildlife.com/beavers.html.

http://kezi.com/news/local/132742.

http://www.wildlifedamage.com/beavers.htm.

http://www.tswildlife.com/beavers.html.

http://www.n-sea.org/fishtale/fall2001/BeaverRelocationProject.shtml.

http://www.opb.org/programs/ofg/episodes/view/412.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.128**

Information Requested:

The Proponent is asked to:

c. **Discuss the apparent contradiction between the conclusion reached by Minaskuat Inc. (i.e., that habitat quality for beavers increases from the river to the transmission line), and the statement found in the Environmental Impact Statement (EIS) (i.e., that habitats above the proposed reservoir limits are of lower quality than the habitats that would be lost due to flooding below the proposed reservoir limits); and**

Response:

As indicated above in response to part (a), Minaskuat Inc. (2008a) observed a higher density of beaver colonies in randomly selected blocks located further from the lower Churchill River. Blocks immediately adjacent to the Churchill River were least productive.

Section 5.14.5.1 in Volume IIB includes the following sentence…*Extensive alternate riparian and wetland habitat will be present throughout the remainder of the Assessment Area, although much of it is far from any deciduous forest and, therefore, of lower quality than areas that will be lost.* This sentence relates to the relative concentration of deciduous hardwood vegetation in the eastern portion of the Assessment Area. Wetlands that occur in conjunction with deciduous hardwood vegetation would present two important characteristics of beaver habitat identified above in response to part (a).

The point being made was that a majority of wetland habitat exists at the perimeter of the Assessment Area near the boundary of the lower Churchill River watershed (refer to Figure 2-44 in Volume IIA). From a beaver habitat perspective, these wetlands would be of lower quality given the relative low abundance of deciduous hardwood vegetation. The blocks associated with the 'combined transmission line section' were not located at the perimeter of the Assessment Area, but rather within or immediately adjacent to the lower Churchill River valley which was the area of greatest interest for the Project.

Reference:

Minaskuat Inc. 2008a. Inventory of beaver colonies in the lower Churchill River valley Environmental Baseline Report – LCP 535743. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.128**

Information Requested:

The Proponent is asked to:

d. **Explain the limitations that conducting only a single survey over a four day period may have had on the findings of beaver population density in the lower Churchill River, including an estimate of the likely error(s) in the estimate(s) of population density given sample size and predictive value of a single survey.**

Response:

As indicated in Section 3 of the Environmental Baseline Report on beaver (Minaskuat Inc. 2008a), the objective of the fall 2006 helicopter survey was to document baseline conditions for beaver in the lower Churchill River valley and its tributaries. A related objective was to determine the relationship between beaver distribution and habitat quality in different sections of this study area. Based on the resources available Minaskuat Inc. (2008a) expended four days and surveyed 63 randomly selected blocks to meet these objectives.

The following measures were implemented by Minaskuat Inc. (2008a) to address potential errors or limitations associated with a single survey:

- Survey was conducted during late October following leaf-fall and prior to freeze-up after Hay (1958) and Novak (1987);
- Survey technique employed a thorough examination of 4 km^2 blocks *versus* using larger blocks or other techniques such as strip-transect; and
- Survey was carried out by an experienced crew.

The ability to detect a beaver colony was high, and although it was not calculated, it is estimated that no correction error would be needed for this parameter. The survey blocks were randomly selected at fixed intervals along the length of the lower Churchill River and not stratified. The estimates of density indicated in the results of Minaskuat Inc. (2008a) are not presented as representing the population and are appropriately qualified as a relative evaluation of habitat quality within the lower Churchill River valley.

As indicated in part (a) of this response, the survey supplemented existing knowledge of this KI in the Assessment Area. When combined with the appropriate mitigation (i.e., relocation of active colonies within the limits of the reservoirs), this information provided a high degree of certainty regarding the prediction of no likely significant adverse environmental effect.

References:

Hay, K.G. 1958. Beaver census methods in the Rock Mountain region. Journal of Wildlife Management 22(4): 395-402.

Minaskuat Inc. 2008a. Inventory of beaver colonies in the lower Churchill River valley environmental baseline report – LCP 535743. Prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Novak, M. 1987. Beaver. Pp. 282-312. In M. Novak, J.A. Baker, M.E. Obbard and B. Malloch (eds.). Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, ON.

IR# JRP.129

Waterfowl (Survey Methodology)

Requesting Organization – Joint Review Panel **Information Request No.: JRP.129**

Subject - Waterfowl (Survey Methodology)

References:

LGL Limited. 2008. *Waterfowl in the Lower Churchill Area*. Prepared for Minaskuat Inc. and Newfoundland and Labrador Hydro, Lower Churchill Hydroelectric Generation Project, St. John's, NL.

EIS Guidelines, Section 4.4.4 (Description of the Existing Environment)

Related Comments / Information Requests:

CEAR # 213 (Innus of Ekuanitshit)

Rationale:

LGL Limited (2008) mentions that a survey to assess use of the lower Churchill River by spring waterfowl during migration was conducted on May 25, 2007.

The EIS Guidelines recommend that the EIS includes "[w]here appropriate and possible to do so, (…) a time series of data and sufficient information to establish the averages, trends and extremes of the data that are necessary for the evaluation of potential environmental and cumulative effects of the Project" (p. 25).

Since there might be waves of migratory individuals staging at any given location on the Churchill River over a period of multiple days, conducting a survey during only one single day may under-estimate the use of the river by migratory waterfowl.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.129**

Information Requested:

The Proponent is asked to explain any limitations inherent in conducting a single survey over a one-day period to determine the use of the lower Churchill River by migratory waterfowl and any consequent effects of the certainty of impact predictions.

Response:

The spring migration of waterfowl across central Labrador, including the temporal and spatial use of habitats is well understood. This understanding is based on dedicated surveys in association with this Project on the lower Churchill River and staging surveys completed by others in this region. The survey completed on May 27, 2007 was designed to supplement this understanding and examined migratory waterfowl activity across the watershed.

As indicated in Section 2.4.10.2 (Volume IIA) various studies have reported that sections of the lower Churchill River and the estuarine wetlands of Upper Lake Melville are important staging areas for waterfowl in spring and fall (S. Fudge and Associates 1989a, 1989b; Bateman 1992; Department of National Defence 1994; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Bateman and Hicks 1999). Relatively high numbers (for Labrador) of Canada Goose pairs have been identified in spring and early summer along the lower Churchill River (AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). It appears that only small numbers of geese remain to breed along the river, however, and most continue to migrate elsewhere in this watershed or beyond (LGL Limited 2008). In Section 2.4.11.2 (Volume IIA) it was indicated that AGRA Earth and Environmental Ltd.and Harlequin Enterprises (1999) reported high numbers of Surf Scoter pairs along the Churchill River in spring to early summer. As with geese, it appeared that the pairs of scoters did not remain to breed along the lower Churchill River, but migrated onward, to breed in more typical habitat at ponds and other wetlands on adjacent foothills and plateaus.

Turner and Chaulk (2000) and Chaulk and Turner (2001; 2002) conducted weekly surveys from late April to early June over most of the known principal staging habitats within the Military Training Area from Lac Fourmont in the south to Border Beacon in the north. The lower Churchill River valley is not within the scope of this series of surveys and for that reason the staging habitats along the river were not surveyed. Nonetheless, these surveys yield useful information on the species composition, as well as the temporal and spatial distribution, of waterfowl that stage throughout the region.

As a general rule the early nesting species in Labrador, e.g., Canada Goose, American Black Duck, Common Goldeneye, and Common Merganser, arrive early and spring staging numbers tend to peak around mid-May. The mid- to late-nesting species, Green-winged Teal and Ring-necked Duck, generally peak around May 20 while the late-nesting species, Surf Scoter, scaup sp., and Red-breasted Merganser reach maximum numbers during the last week of May. It is the experience of the Study Team that there is greater variation in the dates associated with early-nesting species, as they would be more influenced by weather and the advance of spring.

Upon completion of their investigations, Chaulk and Turner (2002) concluded that the important staging sites they identified, with the exception of Lac Fonteneau and Lac Norman, are located along major rivers systems (i.e., Shipiskan, Kanairiktok, Naskaupi, George, Minipi, Petit Mecatina, Natashquan and Romaine). The authors also noted these areas are more attractive as staging habitats because they tend to have larger areas of open

water, and may offer better foraging opportunities, particularly in areas where there are deltaic habitats with associated marsh development.

The Chaulk and Turner (2002) findings, in conjunction with the experience of the Study Team, were used to design the May 2007 survey. In addition, the habits and adaptations of the various waterfowl species potentially migrating through the area were considered, to help determine the optimal timing. Early nesting species tend to rely on endogenous energy reserves for egg production and disperse to breeding habitats as soon as favorable habitat conditions prevail. As there are a number of alternate staging areas proximal to the lower Churchill River, the potential effects of the formation of the reservoirs on these species, particularly Canada Goose and American Black Duck, were deemed less than on the late-nesting species. However, it is recognized that riverine habitats are important to Common Goldeneye and both Common and Red-breasted Merganser, and the consideration of potential effects on the segments of the populations that remained to breed were informed by the breeding pair and production surveys that were conducted later in the year. In light of this, the survey effort was directed toward the late-nesting species, which may rely on the foraging opportunities afforded by the lower Churchill River habitats to maintain and enhance energy reserves of these species for reproduction, and for that reason have the potential to more likely be affected by the Project.

Based on the survey results of Turner and Chaulk (2000) and Chaulk and Turner (2001; 2002) the survey conducted on May 25, 2007 is expected to have captured the peak numbers of late-nesting species, in particular Surf Scoter. Additional surveys would have provided more information on arrival and departure dates but these efforts, in the absence of marked individuals to measure turnover rates during this period, would have offered little addition data to assist in assessing potential effects. Furthermore, the effect of the Project on late-nesting waterfowl species, in particular Surf Scoter, is dependent on the extent to which the lower Churchill River is used as foraging habitat. Additional surveys would not have resolved this uncertainty, however, overall certainty associated with the environmental effect prediction was considered high, reflecting the knowledge of the existing environment, including the importance of breeding areas beyond the footprint of the Project.

References:

AGRA Earth & Environmental Ltd. and Harlequin Enterprises. 1999. Churchill River Power Project: LHP98-01 Waterfowl, Final Report. Report prepared for Newfoundland and Labrador Hydro, St. John's, NL.

Bateman, M.C. 1992. Harlequin Duck Survey on Selected Rivers on the Lower Churchill River Watershed - June 1992. Unpublished report, Canadian Wildlife Service, Atlantic Region, Sackville, NB.

Bateman, M.C. and A.H. Hicks. 1999. Waterfowl Populations in the Low Level Training Area of Labrador – A Data Compilation and Analysis. Unpublished report commissioned by Department of National Defence, Goose Bay Office, Ottawa. Canadian Wildlife Service, Atlantic Region, Sackville, NB. 75 pp.

Chaulk, K. and B. Turner. 2001. Waterfowl Use of Spring Staging Areas in the Western and Central Portion of the Low-level Flight Training Area of Labrador and Quebec. Unpublished Report prepared for Goose Bay Office, Department of National Defence, Ottawa, ON. 17 pp. + appendices.

Chaulk, K., and B. Turner. 2002. Waterfowl Use of Spring Staging Areas in the Southwestern Portion of the Low-level Flight Training Area of Labrador and Quebec. Unpublished Report prepared for Goose Bay Office, Department of National Defence, Ottawa, ON. 46 pp.

DND (Department of National Defence). 1994. EIS Military Training: Military Flying Activities in Labrador and Quebec: Unpublished Technical Reports. National Defence Headquarters, Ottawa, ON.

LGL Limited. 2008. Waterfowl in the Lower Churchill River Area. Report prepared for Minaskuat Inc. and Newfoundland and Labrador Hydro, Lower Churchill Hydroelectric Generation Project. St. John's, NL.

S. Fudge and Associates Limited. 1989a. Identification of Spring Staging Areas Utilized by Waterfowl on the Ungava Peninsula. Unpublished Report Prepared for Department of National Defence. 10 pp.

S. Fudge and Associates Limited. 1989b. Waterfowl Breeding and Staging Surveys of the Ungava Peninsula: 1987-1988. Unpublished Report Prepared for Department of National Defence. 10 pp.

Turner, B. and K. Chaulk. 2000. Waterfowl Use of Spring Staging Areas in the Eastern Portion of the Low-level Flight Training Area of Labrador. Unpublished Report prepared for Goose Bay Office, Department of National Defence, Ottawa, ON. 46 pp.

IR# JRP.130

Data on Economy, Employment and Business

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Subject - Data on Economy, Employment and Business

References:

EIS Guidelines, Section 4.4.4.7 (Economy, Employment and Business)

EIS, Volume III, Section 2.4 (Existing Environment – Employment and Business)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.59)

Rationale:

The EIS Guidelines require the Proponent to "describe relevant economy, employment and business elements in the study areas of the VECs, including the following: (a) Economy of Upper Lake Melville area, Labrador and the Province, including: taxes and royalties; effects on gross domestic product" (p. 30).

In its submission to the Panel, Innu Nation indicated that "[t]he description of labour force characteristics and trends for the Upper Lake Melville area (…) does not portray the unique labour force characteristics of Sheshatshiu and the influence this community has on the overall study area profile and trends" (p. 104). Innu Nation provides several examples to support their claim.

Further, Innu Nation indicated that the description of the economy of the Upper Lake Melville area lacks information on individual and household incomes, education levels and industry profiles of the various geographic areas.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to address the concerns raised by Innu Nation and to provide:

a. **A contextual analysis regarding how labour force characteristics of Sheshatshiu and Mud Lake influence the overall profile of the Upper Lake Melville area;**

Response:

The population of Upper Lake Melville (ULM) was just under 9,200 persons in 2006 with 88 percent of the population residing in the towns of Happy Valley-Goose Bay (HVGB) and North West River (NWR). The remaining 12 percent of the population of ULM resides in Sheshatshiu and Mud Lake, the majority of whom reside in Sheshatshiu. Because of the low proportion of the overall regional population residing in Sheshatshiu and Mud Lake, the ability of the labour force characteristics of Sheshatshiu and Mud Lake to influence the overall profile for ULM is limited.

Since the population of Mud Lake is very small in comparison with that of Sheshatshiu, the inclusion of combined data for Sheshatshiu and Mud Lake provides a fair representation of the unique labour force characteristics of the population of Sheshatshiu.

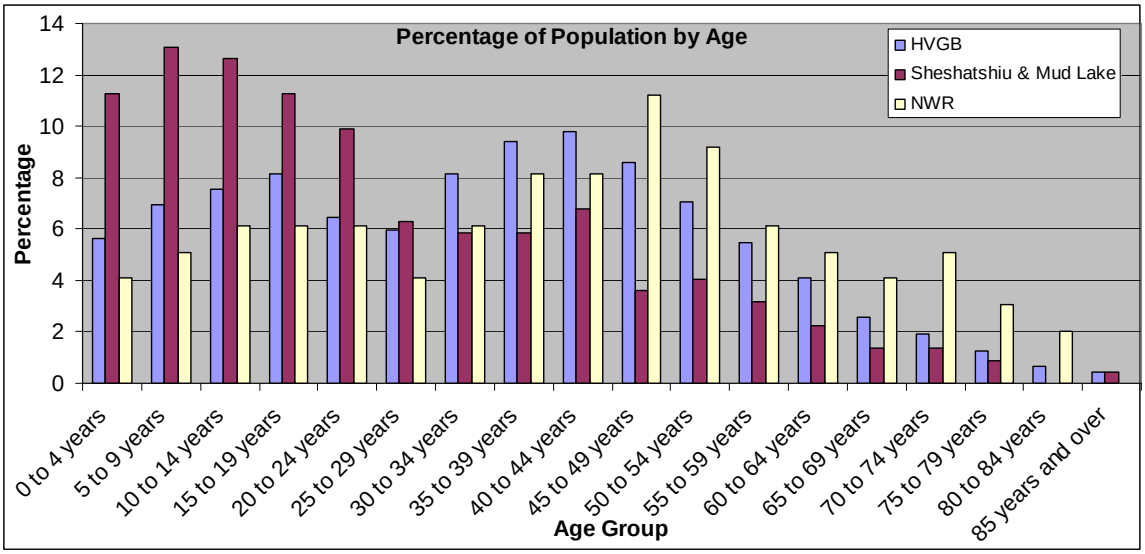
A brief overview of how the overall regional labour force characteristics are influenced by Sheshatshiu and Mud Lake is provided below in terms of the age distribution, labour force participation, and educational levels of the labour force.

Please note that the data in the following tables are subject to random rounding errors. Please refer to Statistics Canada, Census Dictionary 2006, "Appendix B – Data quality, sampling and weighting, confidentiality and random rounding".

Age Profile

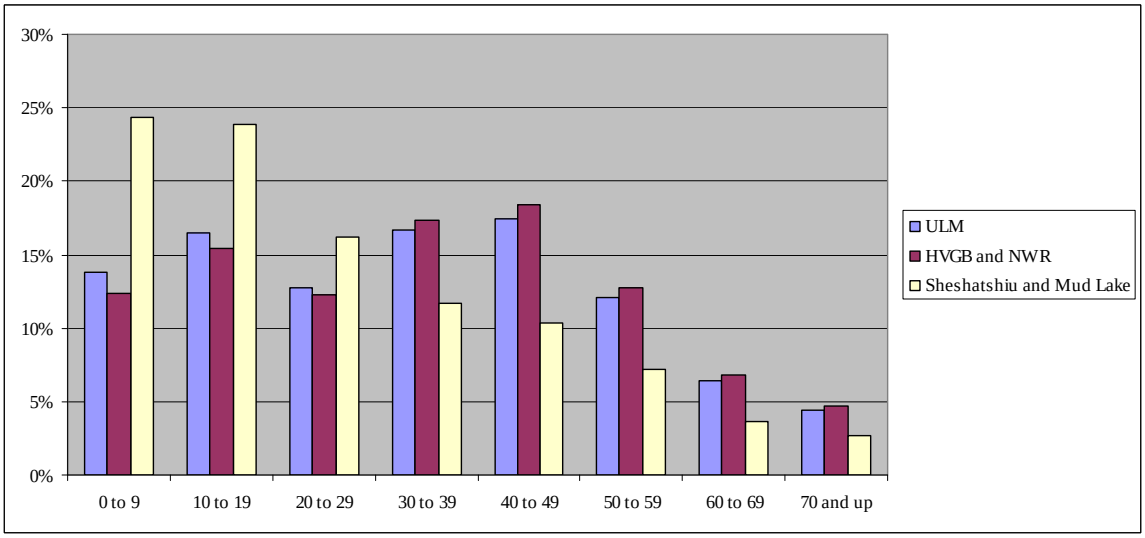
Figure 1 below depicts the age profile of each community as a percentage of its total population. Sheshatshiu and Mud Lake show significantly higher proportions of their population below the age of 29.

Figure 1 Age Profile – Upper Lake Melville Communities



In terms of the influence that the age characteristics of Sheshatshiu and Mud Lake have on the overall Upper Lake Melville region, the age distributions of ULM (including Sheshatshiu and Mud Lake) and HVGB and NWR are illustrated in Figure 2 below.

Figure 2 Influence of Age Profile for Sheshatshiu and Mud Lake on Upper Lake Melville



As Figure 2 illustrates, despite having only 12 percent of the region's population, Sheshatshiu and Mud Lake do have a positive influence on the age distribution of the ULM region. This indicates that the age profile for Sheshatshiu and Mud Lake is considerably younger than that of HVGB and NWR.

Labour Force Participation

Participation in the labour force is measured by the participation rate, which is the ratio of persons in the labour force to the total population aged 15 and older. For the ULM region as a whole, the participation rate was 72 percent during 2006. When Sheshatshiu and Mud Lake are excluded, the participation rate increases to 75 percent for HVGB and NWR. A similar effect is found in the employment rate, which measures the percentage of the population 15 years and older who are employed. As such, the inclusion of Sheshatshiu and Mud Lake in

the labour force of ULM results in an overall lower participation rate and employment rate, due to the lower labour force participation rates in Sheshatshiu and Mud Lake (Table 1).

Table 1 Labour Force Indicators – Upper Lake Melville Communities

	ULM	HVGB and NWR	Sheshatshiu and Mud Lake
Total population 15 years and over	7,045	6,360	685
In the labour force	5,105	4,755	350
Employed	4,375	4,125	250
Unemployed	725	625	100
Not in the labour force	1,945	1,610	335
Participation rate	72 percent	75 percent	51 percent
Employment rate	62 percent	65 percent	36 percent
Unemployment rate	14 percent	13 percent	29 percent

Educational Profile

When the educational levels for Sheshatshiu and Mud Lake are included in the overall population for ULM, the percentage of persons without a high school diploma increases from 29 percent to 33 percent of the population. Conversely, the percentage of persons with a high school diploma or post-secondary education decreases. Table 2 below illustrates the relative influence that Sheshatshiu and Mud Lake have on the educational profile of the overall ULM region.

Table 2 Influence of Sheshatshiu and Mud Lake Characteristics on the Education Levels for the Upper Lake Melville Region

	Totals			Percentage Breakdown		
Education Level	**ULM**	**HVGB & NWR**	**SML***	**ULM**	**HVGB & NWR**	**SML**
Total population 15 years and over	7,045	6,360	685	100 %	100 %	100 %
No certificate; diploma or degree	2,320	1,840	480	32.9 %	28.9 %	70.1 %
High school certificate or equivalent	1,225	1,160	65	17.4 %	18.2 &	9.5 %
Apprenticeship or trades certificate or diploma	1,005	915	90	14.3 %	14.4 %	13.1 %
College; CEGEP or other non-university certificate or diploma	1,555	1,515	40	22.1 %	23.8 %	5.8 %
University certificate or diploma below the bachelor level	245	235	10	3.5 %	3.7 %	1.5 %
University certificate; diploma or degree	705	695	10	10.0 %	10.9 %	1.5 %

* Sheshatshiu and Mud Lake

Reference:

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

b. A detailed table showing trends from 1996-2006 for each of the census areas within the Upper Lake Melville area;

Response:

The trends from 1996 to 2006 for each of the census areas within Upper Lake Melville (ULM) are presented in the following tables (Statistics Canada 1996; 2001; 2006). The trends included in this analysis are age breakdowns, education levels, and labour force participation.

Age Breakdowns

The data on the age profile for each community are presented in Tables 3 to 5.

Table 3 Sheshatshiu and Mud Lake Demographic Trends

Characteristic	1996	2001	2006
Total - All persons	1,020	1,130	1,115
Age 0-4	155	145	125
Age 5-14	295	325	285
Age 15-19	85	135	125
Age 20-24	85	85	110
Age 25-54	330	365	360
Age 55-64	35	35	60
Age 65-74	25	25	30
Age 75 and over	10	10	15
Average age	22.2	NA	NA
Median age	NA	18.5	20.4

Table 4 North West River Demographic Trends

Characteristic	1996	2001	2006
Total - All persons	570	550	495
Age 0-4	30	35	20
Age 5-14	75	70	55
Age 15-19	45	40	30
Age 20-24	45	30	20
Age 25-54	255	245	230
Age 55-64	50	55	55
Age 65-74	40	45	45
Age 75 and over	20	20	25
Average age	34.9	NA	NA
Median age	NA	38.1	43.4

Table 5 Happy Valley – Goose Bay Demographic Trends

Characteristic	1996	2001	2006
Total - All persons	8,655	7,965	7,575
Age 0-4	720	540	425
Age 5-14	1,495	1,335	1,095
Age 15-19	605	615	615
Age 20-24	690	465	490
Age 25-54	4,370	4,040	3,700
Age 55-64	435	565	725
Age 65-74	220	280	340
Age 75 and over	115	135	180
Average age	29.2	NA	NA
Median age	NA	32.7	35.7

Education Levels

Trends in education levels from 1996 to 2006 are presented in Tables 6 to 8 below. Caution should be taken in comparing the data over time because of the different reporting used in each Census year. In 2001, for example, education data are only presented for the population from age 20 to 64, which explains why the total population surveyed is lower for 2001 than 1996 and 2006. In contrast, the data are presented for the total population aged 15 and over for 1996 and 2006. This also affects the rates because the population aged 15 to 19 is excluded from 2001 data and thus the impact of the educational levels of this demographic is not included in the 2001 data.

Table 6 Sheshatshiu and Mud Lake Education Trends

Characteristics	1996	2001	2006
Highest level of schooling for the population			
Total - All persons surveyed	555	480	685
Persons without a high school certificate	76.6 percent	64.8 percent	70.1 percent
Persons with a high school certificate/some post secondary	12.6 percent	16.0 percent	11.0 percent
Persons with trades or non-university certificate or diploma	9.9 percent	15.4 percent	19.0 percent
Persons who have completed university	1.8 percent	4.4 percent	1.5 percent

Table 7 North West River Education Trends

Characteristics	1996	2001	2006
Highest level of schooling for the population			
Total - All persons surveyed	450	315	415
Persons without a high school certificate	33.3 percent	19.4 percent	26.5 percent
Persons with a high school certificate/some post secondary	17.8 percent	24.1 percent	24.1 percent
Persons with trades or non-university certificate or diploma	34.4 percent	45.1 percent	38.6 percent
Persons who have completed university	13.3 percent	17.5 percent	10.8 percent

Table 8 Happy Valley – Goose Bay Education Trends

Characteristics	1996	2001	2006
Highest level of schooling for the population			
Total - All persons surveyed	6,350	5,025	5,945
Persons without a high school certificate	36.6 percent	27.6 percent	29.1 percent
Persons with a high school certificate/some post secondary	18.7 percent	16.7 percent	21.8 percent
Persons with trades or non-university certificate or diploma	34.8 percent	45.8 percent	38.2 percent
Persons who have completed university	9.8 percent	10.2 percent	10.9 percent

Labour Force Characteristics

The labour force characteristics presented below are related to the participation, employment and unemployment rates for each of the communities in ULM. One of the key trends is the employment rate, which indicates the percentage of the population aged 15 and over that is employed. This reflects a combination of the participation rate (the percentage of the population that is in the labour force) and the unemployment rate. In all communities, the employment rate has been increasing between 1996 and 2006, with the most dramatic increase occurring in Sheshatshiu and Mud Lake.

Table 9 Sheshatshiu and Mud Lake Labour Force Characteristics

Labour Force Characteristics	1996	2001	2006
Persons in the employed labour force	135	195	250
Participation Rate	42.3 percent	43.1 percent	55.1 percent
Employment rate	17.4 percent	30.0 percent	36.5 percent
Unemployment rate	41.7 percent	28.6 percent	28.6 percent

Table 10 North West River Labour Force Characteristics

Labour Force Characteristics	1996	2001	2006
Persons in the employed labour force	170	195	220
Participation Rate	59.6 percent	55.3 percent	66.3 percent
Employment rate	33.3 percent	44.7 percent	53.0 percent
Unemployment rate	34.0 percent	19.1 percent	20.0 percent

Table 11 Happy Valley–Goose Bay Labour Force Characteristics

Labour Force Characteristics	1996	2001	2006
Persons in the employed labour force	4,050	3,920	3,905
Participation Rate	75.8 percent	74.9 percent	75.4 percent
Employment rate	53.0 percent	65.3 percent	65.7 percent
Unemployment rate	15.8 percent	12.8 percent	12.7 percent

References:

Statistics Canada. 1996. 1996 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2001. 2001 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

c. A forecast of the labour force for each of the census areas within Upper Lake Melville for the duration of the Project construction phase;

Response:

A forecast of the labour force for each of the Census areas within Upper Lake Melville has been developed using the trend function in Microsoft Excel. The trend function fits a straight line using the method of least squares based on known data. In the case of the labour force for each of the census areas in ULM, the total experienced labour force data for 1996, 2001 and 2006 (Statistics Canada 1996; 2001; 2006) was used to estimate the labour force in 2011, 2016 and 2021 based on the 10-year trend from 1996 to 2006.

There are several measures of the total labour force used by Statistics Canada. For the purposes of this analysis, the metric of total persons who worked in the Census year was used. This metric measures persons who worked at any time during the Census year. The employed labour force metric measures those who worked in one specific week prior to the Census.

The actual data for 1996 to 2006 and the extrapolated data for this metric are presented in Table 12 below.

Table 12 Labour Force Forecast – ULM Communities

	1996	2001	2006	2011*	2016*	2021*
Total persons who have worked in Census year						
HVGB	4,670	4,800	4,940	5,073	5,208	5,343
NWR	220	265	305	348	391	433
Sheshatshiu and Mud Lake	170	385	395	542	654	767

* Data projections based on trended data from 1996, 2001 and 2006 census

Based on the data from 1996 to 2006 (Statistics Canada 1996; 2001; 2006), the labour force, as defined by the number of persons who were employed at some point during each Census year, is projected to continue to grow over the course of the Lower Churchill Project. The most dramatic expected growth is shown for Sheshatshiu and Mud Lake, which demonstrates a potential for almost doubling of the labour force from 395 in 2006 to 767 by 2021.

Caution should be used when interpreting these results due to the small sample size and the extraordinary growth in the labour force in Sheshatshiu and Mud Lake during the 1996-2006 time frame, a large part of which was most likely the result of the Voisey's Bay project.

References:

Statistics Canada. 1996. 1996 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2001. 2001 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

d. A discussion of factors that might result in the labour force data contained in the 2001 and 2006 census underestimating the unemployment rate;

Response:

There are several factors which could result in an under-estimation of the unemployment rate in the 2001 and 2006 Census.

Sample Size – The unemployment data for small sub-provincial areas such as Upper Lake Melville are only available once every five years based on the Census data. The labour force characteristics which are used to determine the unemployment rate are generated by a 20 percent sample of the population. On a provincial level, this is a significant sample size to provide confidence in the results, however, for small areas such as NWR and Sheshatshiu, the sample size can be problematic in terms of the level of confidence in the results.

Surveying Aboriginal People – Statistics Canada has acknowledged some of the inherent difficulties with surveying difficult-to-reach populations, including Aboriginals. In a 2004 symposium on dealing with such issues, Statistics Canada reported:

> *"Conducting questionnaire testing with Aboriginal people presents some unique challenges. Aboriginal people feel that they are studied too much. This creates a great reluctance to participate in surveys. Aboriginal people living on reserves may be difficult to reach because they live in areas that are geographically remote and often have a low rate of telephone coverage. The distinct Aboriginal cultures and traditions can sometimes result in miscommunication with survey collectors. Finally, a serious mistrust of government can strain relations between survey takers and Aboriginal respondents."*[1]

Census Data Versus Labour Force Survey – The Labour Force Survey (LFS) is a monthly survey which uses a much smaller sample than that used in the Census to measure unemployment rates on a monthly basis. Even for a large population base such as Newfoundland and Labrador, there are some differences between results reported in the census versus the LFS. For example, the 2006 census reported an unemployment rate of 18.6 percent for Newfoundland and Labrador. The LFS for the same month in which the Census was conducted (June 2006) showed an unemployment rate of 14.8 percent for Newfoundland and Labrador. While the LFS does not provide data for small sub-provincial areas such as ULM, these statistics for NL as a whole indicate the potential for different results based on sample size differences.

1 Statistics Canada International Symposium Series – Proceedings, "Symposium 2004: Innovative Methods for Surveying Difficult-to-reach Populations"

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to address the concerns raised by Innu Nation and to provide:

e. **Gender disaggregated labour force characteristics for the Upper Lake Melville area communities, namely Happy Valley-Goose Bay, Northwest River, Sheshatshiu and Mud Lake;**

Response:

Table 13 illustrates the gender disaggregated labour force characteristics by community for the Upper Lake Melville area. Data for this table were collected from the 2006 Census of Canada. Some discrepancies are evident in the summing of male and female workforce into the total due to the rounding process used in presenting census data.

Table 13 Disaggregated Labour Force Characteristics

Occupation	Happy Valley-Goose Bay			North West River			Sheshatshiu and Mud Lake		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total experienced labour force 15 years and over	4,435	2,295	2,135	270	130	140	335	175	155
Management occupations	415	280	135	25	10	15	25	20	10
Business, finance and administration occupations	805	145	655	40	0	30	30	10	20
Natural and applied sciences and related occupations	260	235	25	20	10	10	0	0	0
Health occupations	150	20	130	20	10	15	10	0	0
Occupations in social science, education, government service and religion	475	150	325	45	10	35	75	35	40
Occupations in art, culture, recreation and sport	65	20	45	0	0	0	10	0	0
Sales and service occupations	1,250	500	745	50	20	35	120	50	75
Trades, transport and equipment operators and related occupations	855	815	40	65	65	0	50	45	0
Occupations unique to primary industry	115	90	30	10	10	0	20	20	0
Occupations unique to processing, manufacturing and utilities	40	35	0	0	0	0	0	0	0

Reference:

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to address the concerns raised by Innu Nation and to provide:

f. A table showing median earned and total income for individuals, households, female and male single parent households for each of the Upper Lake Melville area communities; and

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Response:

Table 14 illustrates the median earned and total income by household and family type for each of the Upper Lake Melville communities.

Table 14 Median and After Tax Income of Lake Melville Residents by Household Type

Characteristic	Sheshatshiu and Mud Lake	HVGB	NWR
Median income in 2005 - All private households	53,632	67,811	58,240
Median after-tax income in 2005 - All census families	32,896	60541	53,888
Median income in 2005 - One-person households	31,360	37,523	29,568
Median after-tax income in 2005 - One-person households	27,392	31946	26,304
Median income in 2005 - Couple households with children	57,216	87,812	82,944
Median after-tax income in 2005 - Couple households with children	51,328	74113	69,376
Median income in 2005 - Lone-parent families	19,648	33,664	33,664
Median after-tax income in 2005 - Lone-parent families	19,264	31,561	32,768
Median income in 2005 - Female lone-parent families	16,960	33,033	29,888
Median after-tax income in 2005 - Female lone-parent families	16,960	31,475	29,888
Median income in 2005 - Male lone-parent families	27,328	69,006	0
Median after-tax income in 2005 - Male lone-parent families	26,560	58,722	0

Earned income by individuals, households and household type are not available. The only data available are the breakdown of income by type for the entire community. The relevant data for each of the communities are presented in Table 15.

Table 15 Composition of Income of Lake Melville Residents

Characteristic	Sheshatshiu and Mud Lake	HVGB	NWR
Composition of Income as a percent of total income:			
Earnings	74.3 percent	83.7 percent	76.4 percent
Government transfers	23.8 percent	9.8 percent	14.6 percent
Other income	1.9 percent	6.5 percent	9.1 percent

Reference:

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.130**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to address the concerns raised by Innu Nation and to provide:

g. A table showing educational information for each of the Upper Lake Melville area communities.

Response:

Tables 16-19 present statistical information on the level of educational attainment for each of the Upper Lake Melville communities. The tables are provided for each distinct age group as presented in the 2006 Census.

Table 16 Level of Educational Attainment - Total Population 15 and Over

Educational attainment	Sheshatshiu and Mud Lake			North West River			Happy Valley-Goose Bay		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total population 15 years and over	685	335	350	415	200	210	5945	2,925	3,020
No certificate, diploma or degree	480	220	260	110	60	60	1730	855	870
High school certificate or equivalent	65	35	25	65	30	30	1095	510	590
Apprenticeship or trades certificate or diploma	90	60	25	65	45	20	850	580	270
College, CEGEP or other non-university certificate or diploma	40	15	25	95	45	45	1420	645	775
University certificate or diploma below the bachelor level	10	0	10	35	10	20	200	75	125
University certificate, diploma or degree	10	10	10	45	10	35	650	260	395

Table 17 Level of Educational Attainment - Population Aged 15 to 24

Educational attainment	Sheshatshiu and Mud Lake			North West River			Happy Valley-Goose Bay		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total Population Aged 15 to 24	235	115	120	50	30	25	1145	590	555
No certificate, diploma or degree	185	85	100	35	15	15	545	305	235
High school certificate or equivalent	20	10	10	10	10	0	320	155	165
Apprenticeship or trades certificate or diploma	15	15	0	0	0	0	55	40	10
College, CEGEP or other non-university certificate or diploma	0	0	0	0	0	0	145	55	90
University certificate or diploma below the bachelor level	0	0	0	0	0	0	40	15	30
University certificate, diploma or degree	0	0	0	0	0	0	35	20	15

Table 18 Level of Educational Attainment - Population Aged 25 to 34

Educational attainment	Sheshatshiu and Mud Lake			North West River			Happy Valley-Goose Bay		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total population aged 25 to 34	140	70	65	55	25	30	1055	435	625
No certificate, diploma or degree	90	45	50	0	10	0	145	45	105
High school certificate or equivalent	10	10	0	10	10	0	190	90	100
Apprenticeship or trades certificate or diploma	20	15	10	10	0	10	110	65	45
College, CEGEP or other non-university certificate or diploma	15	0	0	10	0	10	390	160	230
University certificate or diploma below the bachelor level	0	0	0	10	0	10	45	15	35
University certificate, diploma or degree	0	0	0	10	0	10	170	60	110

Table 19 Level of Educational Attainment - Population Aged 35 - 64

Educational attainment	Sheshatshiu and Mud Lake			North West River			Happy Valley-Goose Bay		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total Population aged 35 to 64	275	135	140	240	115	125	3325	1,710	1,620
No certificate, diploma or degree	165	75	95	40	20	20	795	405	385
High school certificate or equivalent	30	15	10	35	20	10	525	250	275
Apprenticeship or trades certificate or diploma	50	35	15	45	35	15	580	400	180
College, CEGEP or other non-university certificate or diploma	15	10	15	70	30	40	875	430	445
University certificate or diploma below the bachelor level	10	10	10	20	0	15	115	50	65
University certificate, diploma or degree	10	10	0	30	0	25	440	175	260

Reference:

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

IR# JRP.131

Economic Modelling

Requesting Organization – Joint Review Panel **Information Request No.: JRP.131**

Subject – Economic Modelling

References:

EIS, Volume III, Section 3.0 (Environmental Assessment of Socio-Economic Effects – Economy, Employment and Business)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.67)

Rationale:

Economic effects of the Project were measured using a model developed by Strategic Concepts Inc. for Newfoundland and Labrador-based resource projects. Regarding the applicability of the model to the Lower Churchill Project, the EIS notes that "while the model results are illustrative, rather than definitive, they are adequate for the purpose of the socio-economic effects of the Project" (Volume III, p. 3-1).

The EIS also mentions that the results obtained are to be considered the most likely scenario because "the assumptions made are based on current knowledge of and experience with other hydroelectric construction projects in the Province" (Volume III, p. 3-3).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.131**

Information Requested:

The Proponent is asked to:

a. **Describe the limitations of the Strategic Concepts Inc. model and the factors that may influence the accuracy of its results (i.e., lack of data, uncertainty regarding the availability of goods and supplies within and outside the province, and within Labrador and the Upper Lake Melville area, etc.);**

Response:

To effectively answer questions contained in IR# JRP.131 regarding the use of Strategic Concepts' economic impact model we have prepared a brief overview of the company's methodological approach to economic modelling. An understanding of the methodology will provide insight to the factors that influence the results derived from the model.

The model used to measure economic impacts, the Strategic Concepts Inc. (SCI) model, was developed specifically for Newfoundland and Labrador-based resource projects and has been applied to the majority of large resource projects proposed or occurring within the province.[1] The economic model is based on the principal of tracking expenditures through the economy and applying coefficients to determine direct, indirect and induced impacts on employment, incomes, gross domestic product, and taxation.[2] The economic impact parameters used in the analysis were gathered from a number of sources including Statistics Canada, Canada Revenue Agency, various provincial government departments and agencies, and from economic impact assessments on other projects in Newfoundland and Labrador. Many of these assessments were based on actual development and operating expenditures where vendor identification was used to develop estimates for local supply capabilities and value added assumptions. As an example, SCI has conducted economic impact analysis on the Iron Ore Company of Canada's actual 2003 and 2005 operations. As part of the analysis SCI was provided with actual employment data, financial statements and a breakdown of expenditures by vendor profile. This information was used to calibrate SCI's economic model. Later a comparison of results generated between real and expected expenditures was made in an effort to calibrate and validate SCI' economic impact model.

The primary sources of information used in the economic impact analysis were construction phase expenditure profiles and a single year of operating costs as prepared by Nalcor Energy (Nalcor) and provided to SCI for the purpose of estimating the economic impacts. The working basis underlying the SCI model is that the economic impacts that flow throughout the economy emanate from the project expenditures incurred during construction and operation. These impacts are further magnified as incomes earned by labour and businesses associated with the expenditure activities are re-spent throughout the economy.

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[1] A sample list of the projects analyzed with this model include IOC's iron ore operations in Labrador City, LabMag's proposed iron ore development in Labrador, White Rose oil field development and extension to the White Rose Oil field development, the Hebron oil field development, and the Vale Inco's nickel mine in Labrador and processing plant at Long Harbour.

[2] Direct impacts are those associated directly with the project. For example, direct operating employment is composed of people who operate the facilities or are engaged in maintenance activities. Likewise, direct capital phase employment is composed of individuals directly involved in construction activities such as erecting transmission lines or operating heavy equipment constructing the dam at Gull Island. Indirect impacts are those impacts associated with materials, services and equipment purchased by the project during its operating and construction phases. This would include, for instance, the extra workers needed by the contractor to meet the project's needs for cement or the extra employees needed by the contractor who supplies services to Nalcor during the operations phase of the project. Induced impacts are those occur in the services sector throughout the economy as direct and indirect incomes get spent throughout the economy. This would include extra employment in restaurants, hotels and the retail sector that is supported by the project.

Core cost components that drive the economic impact analysis are costs associated with labour, materials, services and equipment. The decomposition of expenditures allows for the calculation of employment and incomes generated by the capital and operating phases of each of the project components. Nalcor provided SCI with its internal estimates for expenditure decomposition. The direct employment and income impacts were then derived by applying the appropriate estimate of labour cost per person year of employment[3] to the direct expenditures allocated to labour.

Next, indirect impacts were calculated by applying supply content on materials, services and equipment. The estimates of the proportion of each expenditure component to be purchased by jurisdiction (Newfoundland and Labrador, Rest of Canada, Canada as a whole and internationally) were provided by Nalcor and specified in various economic impact reports presented to Newfoundland and Labrador Hydro (NLH) between July 2007 and July 2009. Within each jurisdiction, SCI supplemented these capture rates with value-added parameters to more accurately reflect the import content of each component. In the economic reports presented to NLH, capture rates are defined as the capacity of labour and businesses located in a specified geographical region or stakeholder group to meet the needs of the Project and supply the goods and services in question. More specifically, the value-added parameters utilized are contingent on both the type of goods and services required and the ability of the business communities in Newfoundland and Labrador, and across the country, to supply and/or add value to the particular type of good or service required by the project. From this detail, it was possible to derive the indirect employment and incomes may flow from the business opportunities associated with the Project. By way of illustration, indirect income impacts were calculated as the multiplicative product of the direct expenditure impacts, the assumed capture rate and the estimated valued added factors. Additionally, employment estimates were obtained by dividing indirect income by an average representative income associated with indirect employment.

Following this is the calculation of induced economic impacts that are generated from construction and operation. These were determined by applying an appropriate income multiplier to the direct and indirect income generated by jurisdiction (Newfoundland and Labrador and Canada). Income multipliers used by SCI were derived from various input output models and from direct consultations with federal and provincial government economists. On a regular basis personnel from SCI meet with government representatives to review economic parameters and in some instances, calibrate multipliers to be consistent with those used by government agencies. In the context of the current analysis, GDP and income effects were considered equivalent and were reported simply as income effects. This was because the economic impact analysis did not take into consideration revenue generation from the hydro developments.

The final step for this economic analysis involved calculating taxation benefits for the provincial and federal treasuries utilizing taxation scalars. The direct and indirect personal income tax parameters were derived from the most recent taxation statistics available through the Canada Revenue Agency's website. They were estimated based on the implied average tax rates and federal/provincial government split of taxes for income ranges that correspond to the direct and indirect labour incomes earned by workers associated with the Project. The indirect corporation income taxes were calculated as the current tax rate in each jurisdiction applied to the estimate of corporate profits associated with the indirect income estimate for the Project.[4] The induced tax parameters for personal income and corporate income tax parameters were derived by using Ordinary Least Squares regression to each of the taxes and GDP calculation for each jurisdiction. Induced HST revenues were calculated employing the statutory rates to induced GDP in each jurisdiction.

[3] In this analysis a person year of employment has been defined as 2,080 hours of work per annum, worked by one or more individuals within the calendar year considered.

[4] The proportion of indirect income allocated to corporate profits were derived as the average proportion of corporate income profits as a share of GDP, which was derived from the most recent Provincial Economic Accounts data for Canada and Newfoundland and Labrador.

One of the most important concepts to appreciate in assessing the economic impacts of any project is the leakage from the local economy because leakages determine the size of the income multiplier that can be expected for a given level of expenditure. Leakages are the different ways by which money spent in the area can be withdrawn from the local economy, rather than be re-spent. High leakages will result in relatively low impacts through small income multipliers and vice versa. There are three main sources of leakages that reduce the amount of money available for re-spending in the local economy: (1) imports of goods and services, (2) government taxes, and (3) savings and retained earnings.

A hypothetical, but representative, Input-Output (IO) profile was developed in support of this report using data reflecting the electric power industry in Canada. The IO model was based on the types and proportions of expenditures expected for a typical hydro electric power project. The input-output analysis was run to determine reasonable ranges of the leakages that result for the various types of expenditures. These estimated coefficients were utilized to confirm the portion of project expenditures that can reasonably be expected to be produced locally. The coefficients generated through this work, along with the study team's experience with similar resource projects, i.e., VBNC Mine/Mill expansions, IOC, Terra Nova, and White Rose, are reflected in the value added capture rates used in the analysis.

The SCI economic impact model is a value added economic impact model as described in the methodology. The stage of engineering in which capital costs are estimated and the level in which the project team are able to decompose costs are the two primary factors attributing to the model's utility. The results of the economic impact model were based on the best available engineering data and decomposition of costs as provided by Nalcor. The approach used to derive value added parameters was based on the experience of the study team as noted in the methodology.

Typically, it is very difficult to validate the results of an economic impact model. As projects evolve, schedules change as well capital and operating costs. However, the assumptions used in the SCI model have been validated in part through the following review procedures:

- Capital cost estimates provided by the client were based on the best available information;
- Strategic Concepts is employed to monitor employment and industrial impacts on large resource projects across the country including:
    - Voisey's Bay Nickel Company, mine and mill in Labrador as well as processing plant at Long Harbour;
    - De Beers Canada, Victor Diamond Mine in northern Ontario;
    - Imperial Oil/ExxonMobil, on the Mackenzie Gas Pipeline and the Taglu Gas field projects in the Northwest Territories;
    - ConocoPhillips Canada, on the Parsons Lake gas field project in the North West Territories; and
    - Imperial Oil/ExxonMobil, Kearl Oil Sands Project in Alberta.

The monitoring process involves the collection of very detailed information on employment as well as expenditures by vendor, type and geographical distribution. Information collected in the process is used to validate economic impacts previously identified in the SCI economic impact model. In addition, the results contained in the monitoring process are incorporated into the employment, labor costs, supply and value added assumptions used in the model.

The SCI economic impact model has also been validated and calibrated in the past by project owners attempting to understand the economic footprint of their operations. As an example, in Labrador, the Iron Ore Company of

Canada regularly retains SCI to perform an economic impact analysis of their operations based on actual employment and financial results. The results of the footprint analysis are compared to historical projections and statistical income data available from the Canada Revenue Agency. To date the results contained in estimates made by SCI have been very similar to available statistical information.

The vast majority of expenditures identified were for goods and services in which Newfoundland and Labrador have a known capacity to supply. Estimates for materials, supplies and equipment are based on known suppliers. While a certain portion of materials, supplies and equipment may be sourced in the province, value added parameters are sufficiently low to accurately reflect the small manufacturing base in Newfoundland and Labrador. Please see Table 1 in the response to part (b) of this IR.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.131**

Information Requested:

The Proponent is asked to:

b. Provide information about the assumptions that were made when applying the Strategic Concepts Inc. model;

Response:

A summary of the supply capability and value added parameters used in the economic impact model are provided in Tables 1 to 10. The relationships between expenditures and coefficients are described in part (a) of this IR.

Table 1 Input Summary (Supply Factors and Value Added Factors)

Category	NL Supply Factors (%)	NL Value Added Factors (%)
Capital		
Gull Island – Capex – Civil Works		
Labour	65	100
Materials	18	54
Equipment	20	25
Gull Island – Capex – Elect & Mechan		
Labour	65	100
Materials	18	54
Equipment	20	25
Gull Island – Capex – Facilities		
Labour	65	100
Materials	18	54
Equipment	20	25
Gull Island – Capex – Trans Lines		
Labour	72	100
Materials	8	42
Equipment	48	25
Gull Island – Capex – Management		
Labour	65	100
Materials	18	54
Equipment	20	25
Muskrat Falls - Capex – Civil Works		
Labour	65	100
Materials	18	54
Equipment	20	25
Muskrat Falls - Capex – Elect & Mechan		
Labour	65	100
Materials	18	54
Equipment	20	25
Muskrat Falls - Capex – Facilities		
Labour	65	100
Materials	18	54
Equipment	20	25

Category	NL Supply Factors (%)	NL Value Added Factors (%)
Muskrat Falls - Capex – Trans Lines		
Labour	72	100
Materials	8	42
Equipment	48	25
Muskrat Falls - Capex – Management		
Labour	65	100
Materials	18	42
Equipment	20	25
Operations		
Gull Island – Opex - Generation		
Labour	100	100
Materials	100	54
Equipment	100	25
Gull Island – Opex - Transmission		
Labour	100	100
Materials	100	54
Equipment	100	25
Muskrat Falls – Opex - Generation		
Labour	100	100
Materials	100	54
Equipment	100	25
Muskrat Falls – Opex - Transmission		
Labour	100	100
Materials	100	54
Equipment	100	25

Table 2 Input Parameters: Direct Tax (NL)

	Percent
Direct PIT (as a percent of Total Direct Income)	28.7
Share of total PIT (as a percent of total PIT)	43.6
CAN share of total PIT (as a percent of total PIT)	56.4
Payroll Taxes (as a percent of Total Direct Income)	2.0

Table 3 Input Parameters: Indirect Tax (NL)

CIT	**Percent**
Profits (as a percent of Indirect GDP)	14.6
CIT rate (as a percent of Indirect profits)	14.0
PIT	
Wages (as a percent of Indirect GDP)	66.9
Indirect PIT (as a percent of Total Indirect Income)	24.3
Provincial Share of total PIT (as a percent of total PIT)	43.8
Federal Share of total PIT (as a percent of total PIT)	56.2
Other	
Payroll/Health taxes (as a percent of Total Indirect Income)	1.50

Table 4 Input Parameters: Induced Tax (NL)

	Percent
Wages (as a percent of Induced GDP)	66.9
CIT Parameter (as a percent of Induced GDP)	2.0
PIT Parameter (as a percent of Induced GDP)	7.5
Consumption Tax Parameter (as a percent of Induced GDP)	8.0
NF Payroll Tax Parameter	1.0
Profits (as a percent of Induced GDP)	11.0

Table 5 Indirect and Induced Income and Employment Parameters (NL)

Indirect Income Parameters (income per indirect person year)	
Cost Type	
Materials	$72,015
Equipment	$72,015
Services	$72,015
Induced Income Multiplier	1.24
Income per induced PY	$49,762
Income as a percent of indirect per induced PY	69.1 percent

Table 6 Total Indirect Employment (NL)

	Person Years
Operations	
GI - Generation O&M	45
GI - Transmission O&M	3
MF - Generation O&M	30
MF - Transmission O&M	1
Capital	
GI - Civil works	1,045
GI - Electrical and mechanical works	1,072
GI - Construction facilities and support	271
GI - Transmission lines	103
GI - Management and engineering/Owner's costs	316
MF - Civil works	456
MF - Electrical and mechanical works	634
MF - Construction facilities and support	259
MF - Transmission lines	33
MF - Management and engineering/Owner's costs	235
Totals	
Total Opex/Year	79
Total Capex	4,423

Table 7 Direct, Indirect and Induced Income Summary (M2008$ Cdn) (NL)

	NL
Income Summary	
Income from Operations	
Direct Labour Income	$9
Indirect Income	$6
Induced Income	$3
Total Income from Operations	**$18**
Income from Capital	
Direct Labour Income	$1,289
Indirect Income	$319
Induced Income	$384
Total Income from Construction Capital	**$1,985**

Table 8 Direct, Indirect and Induced Employment Summary (NL)

	Person Years
Employment Summary	
Employment from Operations	
Direct Employment	90
Indirect Employment	79
Induced Employment	69
Total Employment from Operations	**238**
Income from Capital	
Direct Employment	10,154
Indirect Employment	4,434
Induced Employment	7,722
Total Employment from Construction Capital	**22,310**
Implicit Employment Multiplier	**2.20**

Table 9 GDP Summary (M2008$ Cdn) (NL)

GDP Impacts from Income	
Direct Labour Income - NL	$1,288
Indirect Income - NL	$324
Induced Income - NL	$387
Induced income from other income	$0
Total GDP from Income	**$1,999**

Table 10 Direct, Indirect and Induced Taxes Summary (M2008$ Cdn) (NL)

Direct Taxes	
Corporate Income Taxes	$0
Personal Income Taxes	$161
Payroll Taxes	$26
Total Direct Taxes	**$187**
Indirect Taxes	
Corporation Income Taxes	$7
Personal Income Taxes	$23
Payroll Taxes	$3
Total Indirect Taxes	**$33**
Induced Taxes	
Corporate Income Taxes	$8
Personal Income Taxes	$29
Payroll Taxes	$3
HST	$31
Total Induced Taxes	**$70**
Total Taxes	**$291**
Other Revenue	
WCC Premiums	
Direct WCC	$10
Indirect WCC	$6
Induced WCC	$8
Total WCC	**$24**
Net Revenue	**$315**

Requesting Organization – Joint Review Panel **Information Request No.: JRP.131**

Information Requested:

The Proponent is asked to:

c. **Provide information on other hydroelectric construction projects that informed assumptions used in the model; and**

Response:

Project-specific information was provided to SCI by Nalcor. Nalcor cash flow and expenditure profiles were based on the best available engineering studies. No specific other hydroelectric projects were considered in developing the assumptions used in the model.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.131**

Information Requested:

d. Discuss whether other models exist for predicting socio-economic effects of large resource projects within the context of Labrador and explain why the Strategic Concepts Inc. model was chosen over other existing and/or available ones.

Response:

We are unaware of any other models that exist for predicting socio-economic effects of large resource projects within the context of Labrador.

The SCI model has been used for numerous resource projects within the province, in general and within Labrador in particular. In Labrador, these would include: the Voisey's Bay project, IOC's mining operations, LabMag's proposed iron mine, Aurora Energy's proposed uranium development in Postville, various aspects of the Project for Nalcor as well as economic impacts of low level military flight training in Labrador. Other projects that have been analyzed with SCI's model are: the White Rose project (original and extension), the Hebron project, non-pipeline options for natural gas natural gas developments, the St. John's airport, the Mile One Stadium, Vale-Inco's nickel processing plant, and the installation and operation of broad-band fibre optic cable in Newfoundland and Labrador. As well, the expertise of SCI's analysts have been used throughout Canada and internationally – the former has occurred for the Government of Alberta, the Government of Nova Scotia, Natural Resources Canada, the University of British Columbia, and the Government of British Columbia, while the latter is illustrated by their work for the Ministry of Fuel and Energy, Government of Russia.

The scope of the projects worked on by SCI has allowed the company to develop an intimate understanding of doing business in Labrador with all stakeholder groups relevant to the Project. In addition, SCI is now recognized by major resource companies in Canada as being the leader in monitoring employment and industrial benefits on large scale resource projects. The company has developed a multi-level data collection and reporting system, designed to capture information related to bidder opportunities and awards, employment, expenditures and training on large scale projects.

The software was designed with an intimate understanding of the process and flow of resource-based construction and development projects, particularly projects being developed in sparsely populated areas and with Aboriginal and/or First Nations impacts.

Currently, SCI's software and industrial benefits monitoring capabilities are being used on projects across Canada including:

- De Beers Canada, on the Victor Diamond Mine in northern Ontario;
- Imperial Oil/ExxonMobil, on the Mackenzie Gas Pipeline and the Taglu Gas field projects in the Northwest Territories;
- ConocoPhillips Canada, on the Parsons Lake gas field project in the North West Territories;
- Imperial Oil/ExxonMobil, on the Kearl Oil Sands Project in Alberta; and
- Kivalliq Inuit Association, on the Agnico-Eagle gold mine in Nunavut.

The company's knowledge and experience in gathering employment and expenditure data on these projects was incorporated into the Project economic impact analysis. This experience led to Nalcor choosing the SCI economic impact model.

IR# JRP.132

Business

Requesting Organization – Joint Review Panel **Information Request No.: JRP.132**

Subject - Business

References:

EIS Guidelines, Section 2.4 (Sustainable Development), Section 3.1 (Study Strategy and Methodology) & Section 4.5 (Environmental Effects)

EIS, Volume III, Section 3.7 (Socio-economic Effects Assessment – Business) & Section 3.8.3 (Environmental Assessment of Socio-Economic Effects – Business)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.70)

Rationale:

The EIS Guidelines states that "[p]romotion of sustainable development is a fundamental purpose of environmental assessment, and the Proponent shall include in the EIS consideration of … (c) The extent, distribution and duration of social and economic benefits" (p. 9). The Guidelines further state that "[t]he assessment of the beneficial and adverse effects of the Project on the socio-economic environment shall consider how the Project may affect various segments of the local populations (e.g., youth, elders, men, women, Aboriginal groups, harvesters, existing workforce including professionals)" (p. 33).

In the EIS, Table 3-11 and Table 3-12 (Volume III) provide lists of the general categories of services and commodities required by the Project. The EIS indicates that some of the goods (commodities) and services are not available within the Province or, in some cases, Canada.

The additional information that the Proponent provided in this regard in response to JRP.12 is insufficient.

The EIS also outlines a series of contracting policies proposed to enhance business opportunities for the Upper Lake Melville area and for Innu. In its submission to the Panel, Innu Nation stated that "[m]any of these initiatives sound "good in theory", but evidence from other similar circumstances is required in order to support their effectiveness" (Innu Nation, p. 115).

Requesting Organization –Joint Review Panel **Information Request No.: JRP.132**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to:

a. **Update Table 3-11 and Table 3-12 by showing either the dollar amount or percentage of total goods or services expenditures for each category estimated to be spent in the Upper Lake Melville area, Labrador, Province, Canada and internationally; and**

Response:

As stated in the response to IR# JRP.12, the level of detail available on the quantity and value of specific goods and services required for the Project is not known at this time. As this information becomes better defined after detailed engineering, the local supplier community will be provided with further information as it becomes available. The specific initiatives that are being contemplated for enhancing local supplier involvement in the Project are discussed in the response to part (b) of this IR response.

The specific dollar values and quantities of the identified goods and services cannot be provided for a number of reasons, including:

- some of the goods and services identified are included throughout the estimate and are not easily extracted (e.g. equipment parts and repairs are included in overall equipment rental rates and thus cannot be easily extracted);
- because of the competitive nature of the pending bidding process, the provision of information on costs could compromise the integrity of the contracting process;
- because of the current stage of the project (pre-FEED with no detailed engineering having been completed), the level of precision regarding costs and quantities is not high enough to provide cost and quantity estimates at this time; and
- some of the items listed will most likely be tendered through sub-contracts with main contactors and thus the specific quantities and values are difficult to precisely estimate at this time.

With respect to the additional information requested related to Newfoundland and Labrador supply capability for the items listed in Tables 3-11 and 3-12 of Volume III of the EIS, Nalcor Energy's (Nalcor) procurement team has added information for each item based on their expertise and knowledge of the local and provincial business capabilities (Table 1). Specific quantities or percentages are not able to be provided at this time.

Table 1 Estimated Percentage Supply by Region

Item from EIS Table	Comments on Local, Provincial and National Supply Capability	Estimated Percentage Supply by Region			
		ULM	Other Lab	Other NL	Other CAN
Services					
Accommodations	High provincial and local content expected.	40	10	50	0
Blasting/drilling	High provincial and local content expected.	10	20	20	50
Catering	High provincial and local content expected.	40	10	50	0
Containers	High provincial and local content expected.	0	5	95	0
Counselling/employee assistance	Skills expected to be available in provincial labour force.	20	40	40	0

Table 1 Estimated Percentage Supply by Region

Item from EIS Table	Comments on Local, Provincial and National Supply Capability	Estimated Percentage Supply by Region			
		ULM	Other Lab	Other NL	Other CAN
Cranes	Cranes generally available from NL and nationally depending on the size and type of crane.	5	20	20	55
Engineering - Civil	Overall engineering contract will be too large for any local firms to be lead contractor. Local firms expected to be involved in sub-contract work or as JV partners with large international firms.	5	5	5	40
Engineering - Electrical		5	5	10	80
Engineering - Geotechnical		5	5	20	70
Engineering - Mechanical		5	5	20	70
Engineering - Structural		5	5	50	40
Excavation	NL and local capability exists for excavation services, however, scale of excavation requirements will result in the requirement for support from national suppliers.	5	5	30	60
Freight forwarding/Logistics	Experience gained from Voisey's Bay project can be leveraged; Local knowledge important and therefore high potential for local supply.	5	5	65	25
Environmental	High local capacity for environmental services.	5	5	65	25
Fireproofing	Good potential for local and provincial supply.	10	5	35	50
Instrumentation	Good potential for local and provincial supply, expect for specialized instrumentation products.	5	0	30	65
Insulation	Good potential for local and provincial supply.	10	5	35	50
Logging	Limited availability of harvesting equipment in Labrador. Good potential for Island-based contractor(s).	10	10	30	50
Machinery and equipment repair	Labour can be supplied from NL labour force; parts typically sourced from local suppliers.	10	10	30	50
Mapping and surveying	Provincial and local expertise available and has been used for surveying and mapping services.	20	10	30	40
Medical	Provincial and local expertise available for provision of medical equipment and services.	60	10	30	0
Non-destructive testing	Provincial and local expertise available for provision of non-destructive testing services.	5	5	50	40
Oil spill/pollution control	Provincial and local expertise available for provision of oil spill and pollution control equipment and services.	20	10	50	20
Safety	Provincial and local expertise available for provision of safety equipment and services.	10	10	70	10
Security	Provincial and local expertise available for provision of security services.	15	10	75	0
Commodities					
Camp	No local capability for supply of camp buildings; however, installation and hook-up can be done with NL-based resources.	5	0	5	90
Concrete	Provincial and national expertise and experience in supply of large quantities of concrete available.	5	5	5	85
Converter stations	No local capability to supply converter station and equipment; local capacity for civil site prep work and installation available.	0	0	0	25

Table 1 Estimated Percentage Supply by Region

Item from EIS Table	Comments on Local, Provincial and National Supply Capability	Estimated Percentage Supply by Region			
		ULM	Other Lab	Other NL	Other CAN
Electrical supplies	Local capacity expected to be able to supply most non-specialized electrical supplies.	10	10	30	50
Heavy equipment	Local capability in supplying and servicing heavy equipment exists; however, manufacture of heavy equipment will be sourced nationally or internationally.	5	5	20	70
Safety equipment	General safety equipment can be supplied locally; specialized equipment may be sourced outside of NL.	5	5	40	50
Generator equipment	No local capability for supplying generators for the Project.	0	0	0	20
Industrial equipment	Some industrial equipment expected to be sourced locally; specialized equipment may not.	5	5	20	70
Fuel	Expected to be sourced locally.	10	0	50	40
Gates	Gates are large specialty fabricated metal items and are expected to be sourced nationally or internationally.	0	0	0	20
Lumber	Expected to be sourced locally.	20	10	40	30
Overhead crane	Cranes generally available from NL and nationally depending on the size and type of crane.	0	0	0	100
Packaging	May be sourced locally.	5	5	40	50
Piping	May be sourced provincially or nationally.	5	5	40	50
Rebar	May be sourced provincially or nationally.	5	5	30	60
Scaffolding	May be sourced provincially or nationally.	10	5	50	35
Structural steel	May be sourced provincially or nationally.	5	5	40	50
Switchgear	Expected to be sourced nationally or internationally.	0	0	0	20
Transformers	Expected to be sourced nationally or internationally.	0	0	0	20
Transmission	Some components of transmission may be able to be sourced locally.	0	0	0	60
Turbines	No local or provincial capability for supplying turbines for the Project. Expected to be sourced internationally.	0	0	0	20

Requesting Organization –Joint Review Panel **Information Request No.: JRP.132**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to:

b. Support the efficacy of the proposed local business enhancement measures with information concerning how and whether such measures have delivered the intended results in other circumstances (i.e., other large-scale construction projects situated in similar settings), and how "lessons-learned" have been incorporated into the Proponent's strategy for achieving intended outcomes.

Response:

Nalcor is committed to working with local and provincial business communities to optimize Newfoundland and Labrador (NL) and local content. Nalcor is working to achieve high levels of local content through a number of supplier enhancement measures. Nalcor has built its local business enhancement measures based upon prior experience in the oil and gas sector as well as Vale Inco's experience with Voisey's Bay.

Nalcor will use the lessons learned from these experiences to build on the successful business development measures and avoid the pitfalls of less successful ones. Ultimately, however, the efficacy of these programs is dependent on the capabilities of the local business communities and their willingness to participate. Some of the specific local business enhancement measures being proposed for the Project, along with a brief discussion of the experiences of and results from other large projects, are provided below.

Vendor Pre-qualification

One of the procurement principles for the Voisey's Bay project states that the acquisition of goods and services for the Project will be undertaken on the basis of the pre-qualification of potential suppliers. This policy, which is also common in the oil and gas sector, is also proposed for the Project and allows Nalcor to evaluate suppliers and provides suppliers with an early understanding of whether or not they meet the requirements. To this end, Nalcor has a website established which contains a vendor registration questionnaire. To date, over 1,500 companies are registered in Nalcor's vendor database, including over 600 NL-based firms. This system is also used extensively in the offshore oil sector for the numerous mega-projects located in the Newfoundland offshore.

Supplier Development Seminars

Nalcor participates in the annual ExpoLabrador conference and trade show, which provides a forum for meeting Labrador-based suppliers and providing updated information about the project to the business community.

In advance of the start of construction, Nalcor will hold Project-specific supplier development seminars in Labrador. These will provide the business community with the latest information on Project requirements, the procurement procedures and other means by which the business community in Labrador will be kept informed of opportunities.

Tender Notification

Nalcor endeavours to give as much advance notice as possible regarding upcoming tender opportunities. This will be done trough the maintenance of an updated website with tender information, as well as the use of newspaper advertising in relevant print media throughout Labrador.

Location of Project Management and Procurement Offices

The Project Management and Procurement Offices will be located in St. John's; however the already established office in Happy Valley-Goose Bay (HVGB) will be used as a support office for local procurement activities in Labrador.

Information Centres

The HVGB office will also support a Project information centre which will serve as the contact point for potential Labrador-based suppliers to the Project and the Nalcor Energy procurement office.

Publication of Bidder's Lists

Nalcor will publish the lists of bidders for major contracts. This will provide the provincial supplier community with information on the bidders for major contracts and thus will provide them with the opportunity to pursue joint ventures, sub-contracts and other arrangements with the main bidders.

Voisey's Bay Impact and Benefits Agreement

Local business enhancement measures for the Voisey's Bay Mine and Mill project were similarly driven by the IBA commitments. Some of the specific business enhancement measures and success factors related to the Voisey's Bay IBAs include:

- Business Centres – These not-for-profit organizations were established to promote and facilitate the creation and growth of Aboriginal businesses. The role of the Nunatsiavut and Innu Business Centres is to provide training, loan funding and advice to Aboriginal beneficiaries who wish to start or expand a business;
- Business Development Committee – A business development committee consisting of members from Innu Nation, Nunatsiavut Government and Vale Inco meets quarterly to discuss contracting and procurement issues and to share information;
- Qualified Business Entities (QBE) – A QBE is a business which has been approved by the Nunatsiavut Government or Innu Nation, as well as Vale Inco, as an Aboriginal business which meets the requirements established by Vale Inco. Before a tender is closed, the opportunity to nominate a QBE for the tender is given to each Aboriginal group. If an acceptable QBE is nominated, then the QBE has the first opportunity to be awarded the contract through bilateral negotiations between the QBE and Vale Inco for the contract. Anecdotal evidence suggests that this process has worked very well and is the cause of the successful development of Aboriginal business capability; and
- Local Offices and Personnel – Many of the non-Aboriginal workers for the Voisey's Bay project are from Labrador. This local knowledge and familiarity with the Aboriginal business community has helped Vale Inco achieve its success in developing the Aboriginal business community. The mutual openness required to implement the business development measures in the IBAs through the Business Development Committee, the QBE process and the Business Centres has resulted in a positive environment that facilitates the flow of information and has generated the successful results witnessed from the Voisey's Bay project.

IR# JRP.133

Pre-Employment Training

Requesting Organization – Joint Review Panel **Information Request No.: JRP. 133**

Subject - Pre-Employment Training

References:

EIS Guidelines, Section 4.6.1 (Mitigation)

Related Comments / Information Requests:

CEAR # 217 (Nunatsiavut Government)

Rationale:

The EIS Guidelines requires the Proponent to describe measures "to maximize labor market opportunities, including Aboriginal labor, and address labor challenges with an emphasis on strategies to enhance recruitment and retention and increase employment and participation (…)" (p. 37).

In its submission to the Panel, the Nunatsiavut Government indicated that it would be difficult for the Aboriginal population to receive funding and gain access to employment training before the Project is approved by governments and construction begins. They recommend that a "pre-employment" phase for training be implemented to ensure that Labrador's Aboriginal population does not miss employment opportunities related to the Project.

Requesting Organization –Joint Review Panel **Information Request No.: JRP. 133**

Information Requested:

The Proponent is asked to discuss efforts undertaken to date and proposed future actions to ensure that Aboriginal groups would be able to access employment training in advance of the Project being approved and the beginning of construction.

Response:

In the fall of 2008, Nalcor Energy (Nalcor) advised all three Labrador Aboriginal groups – Innu Nation, Nunatsiavut Government and the Labrador Metis Nation – of the skill requirements for the construction of the Project.

In April of 2009, the three Aboriginal groups along with Nalcor began working together on a proposal that was submitted in May to the Human Resources and Skills Development Canada (HRSDC) under the Aboriginal Skills and Employment Partnership program (ASEP).

The ASEP program is a Federal Government program to support training and employment with the overall objective being sustainable employment for Aboriginal people in major economic industries, leading to lasting benefits for Aboriginal communities, families, and individuals. It is geared to providing Aboriginal people with the skills they need to participate in economic opportunities such as mining, construction, fisheries, tourism, hydro development, and public infrastructure projects across Canada.

ASEP is a nationally managed, opportunity-driven, and project-based program that promotes increased participation of Aboriginal people in major economic developments. It achieves this through a collaborative approach of Aboriginal, private-sector, and provincial/territorial partnerships. The program supports multi-year training strategies developed by Aboriginal organizations and industry employers, leading to long-term skilled jobs for Aboriginal people in existing and emerging economic opportunities. The program requires there to be an agreed management approach between the Aboriginal groups in the geographic region and the project proponent. All partners must contribute funds to the program to train individuals with ASEP matching the partner funding.

To date, ASEP funding has supported the following projects across Canada:

2004–2008/2009

1. People, Land and Opportunities around the New Brunswick Forestry Industry implemented by ASEP – NB Inc.
2. The NWT Oil and Gas Aboriginal Skills and Employment Partnership: Skills Development Strategy implemented by the Aboriginal Futures Society.
3. The Manitoba Hydro Northern Training & Employment Initiative implemented by Wuskwatim and Keeyask Training Consortium Inc.
4. The 2010 Olympic Construction Initiative implemented by the VanASEP Training Society.
5. The NWT Industrial Mining Skills Strategy implemented by the Mine Training Society.
6. A Long Term Training Initiative for Nunavut's Fishing Industry implemented by the Nunavut Fisheries Training Consortium.

7. Aboriginal Mine Works implemented by the Wood Buffalo Partners for Aboriginal Training Association.
8. Trade Winds to Success implemented by Trade Winds for Success Training Society.
9. James Bay Employment & Training for the Victor Project implemented by the James Bay Employment and Training, Inc.

2007–2012

1. VanASEP Hydro Construction Project implemented by VanASEP Training Society.
2. Northern Career Quest Partnership implemented by Northern Career Quest.
3. Trade Winds to Success II implemented by Trade Winds to Success Training Society.
4. Northeast Aboriginal Skills and Employment Program Society implemented by the Northeast Aboriginal Skills and Employment Program Society.
5. Aboriginal Aerospace Employment Initiative implemented by Aboriginal Aerospace Initiative Inc.
6. An'onwentsa implemented by Corporation Anionwentsaen.
7. Partnership for Prosperity – Unama'ki implemented by Unama'ki First Nations.
8. Partnership, People, Production: Get Into It implemented by Yukon Mine Training Association.
9. Building on Success: New Directions for Mine Training in the NWT implemented by Mine Training Society.
10. Matachewan's Aboriginal Access to Jobs Training Strategy, implemented by Matachewan First Nation.
11. ASEP – NB Enhancing Skills and Self-Sufficiency implemented by ASEP – NB.
12. The Prince Rupert Coast Tsimshian and Kitkatla Training and Recruitment Initiative implemented by Prince Rupert Port Authority.

The projects above resulted in thousands of people trained and employed since the programs inception in 2004. The fiscal year 2008-09 alone saw over 2000 trained people employed as a result of ASEP.

More specifically, VanASEP and the Manitoba Hydro Northern Training & Employment Initiative have both implemented partnerships under ASEP for the purpose of development of hydro projects. The specific results for these hydro initiatives are yet to be seen but VanASEP has initiated this most recent program based on the success of its previous program which saw 1200 people entered in training and 300 provided direct employment on Olympic highway construction.

Due to, amongst other things, previous success like that of Van ASEP, the Federal Government is investing an additional $100 million over three years in ASEP to help Aboriginal people participate in the work force and get the training they need to make the most of employment opportunities.

In the ASEP submission that Nalcor is participating in, each Aboriginal group contributed its own training strategy as part of an overall training plan. These individualized plans will allow each group to get the necessary training to optimize their participation in the Project. Training is scheduled to begin in October 2009, pending proposal approval. This proposal was supported by the province of Newfoundland and Labrador. This training initiative will enable Aboriginal groups to access employment training in advance of the Project being approved and prior to the beginning of construction.

A condition of ASEP approval will be for Nalcor and the three Aboriginal groups in Labrador to partner together and form a non-profit organization which will be tasked with administering funding and approving training.

References:

www.rhdcc-hrsdc.gc.ca/eng/employment/aboriginal_training/index.shtml

www.VanASEP.ca

Labrador Aboriginal Training Partnership Proposal – Submitted to Human Resources and Skills Development Canada, May 2009. Prepared by; Nalcor Energy, Nunatsiavut Government, and Labrador Metis Nation.

IR# JRP.134

Demographic Data

Requesting Organization – Joint Review Panel **Information Request No.: JRP.134**

Subject – Demographic Data

References:

EIS Guidelines, Section 4.4.4 (Description of the Existing Environment) & Section 4.5 (Environmental Effects)

EIS, Volume III, Section 2.2 (Existing Environment – Demographics)

Related Comments / Information Requests

CEAR # 214 (Innu Nation – IN.58)

Rationale:

The EIS Guidelines state that "[t]he EIS shall describe relevant aspects of the existing environment in the study area for each VEC prior to development of the Project, which constitutes the reference state of the environment" (p. 25). It further states that "[t]he assessment of the beneficial and adverse effects of the Project on the socio-economic environment shall consider how the Project may affect various segments of the local populations (e.g., youth, elders, men, women, Aboriginal groups, harvesters, existing workforce including professionals) (…) the following should be taken into account (…) (a) demographics" (p. 32).

In its submission to the Panel, Innu Nation indicated that "[t]here are four very distinct communities within the assessment area chosen for the socio-economic baseline description (i.e. Upper Lake Melville area). The characterization of the demographic structure for the Upper Lake Melville area, which is based upon aggregated data for the four communities, camouflages substantial differences in the character of these communities" (Innu Nation, p. 104). For example, the median age for Happy Valley-Goose Bay is reported in the 2006 census as 35.7 versus 20.4 for Sheshatshiu. Similarly, the percentage of the population under the age of 15 in Happy Valley-Goose Bay was 22% versus 37% for Sheshatshiu.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.134**

Information Requested:

To the extent that the information and/or data are available, the Proponent is asked to provide table(s) and/or graphic(s) illustrating the differences between the various Upper Lake Melville communities with respect to the following characteristics:

a. **Population rates of growth/decline;**

Response:

Please note that the data in some of the tables do not add. This is due to the use by Statistics Canada of a confidentiality procedure known as random rounding (Statistics Canada 2006a). This procedure prevents the possibility of associating statistical data with any identifiable individual. Under this method, all figures are randomly rounded either up or down to a multiple of five, and in some cases to a multiple of 10.

The population growth in each of the Upper Lake Melville communities from 1991 to 2006 is illustrated in Table 1. As this table illustrates, Happy Valley-Goose Bay (HVGB), North West River (NWR) and Mud Lake have experienced population declines over this time period ranging from -7 to -21 percent, however, Sheshatshiu has experienced a 26 percent growth in its population over this same time period.

Table 1 Population Growth in Upper Lake Melville

Community	1991	1996	2001	2006	% Change (1991-2006)
HVGB	8,610	8,655	7,969	7,572	-12
NWR	528	567	551	492	-7
Sheshatshiu	839	933	1,067	1,054	26
Mud Lake	73	77	67	58	-21

Source: Statistics Canada (1991; 1996; 2001; 2006b)

References:

Statistics Canada. 1991. 1991 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 1996. 1996 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2001. 2001 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2006b. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Statistics Canada. 2006a. Appendix B – Data Quality, sampling and weighting confidentiality and random rounding. In: Census Dictionary. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.134**

Information Requested:

To the extent that the information and/or data are available, the Proponent is asked to provide table(s) and/or graphic(s) illustrating the differences between the various Upper Lake Melville communities with respect to the following characteristics:

b. Age and Gender Structure;

Age Structure

The age profile of the populations of HVGB and that of census Sub-division 10-C is provided in Table 2. The latter group includes NWR, Sheshatshiu and Mud Lake. While total population counts are available for each community, there is no breakdown by age available for NWR, Sheshatshiu and Mud Lake.

Table 2 Age Profiles of Upper Lake Melville

	Population by Age Group (total)			Population by Age Group (% of total)		
	HVGB	Sheshatshiu*	NWR	HVGB	Sheshatshiu	NWR
0 to 4	425	125	20	6	11	4
5 to 9	525	145	25	7	13	5
10 to 14	570	140	30	8	13	6
15 to 19	615	125	30	8	11	6
20 to 24	490	110	20	7	10	4
25 to 29	450	70	20	6	6	4
30 to 34	615	65	30	8	6	6
35 to 39	710	65	40	9	6	8
40 to 44	740	75	40	10	7	8
45 to 49	650	40	55	9	4	11
50 to 54	535	45	45	7	4	9
55 to 59	415	35	30	5	3	6
60 to 64	310	25	25	4	2	5
65 to 69	195	15	20	3	1	4
70 to 74	145	15	25	2	1	5
75 to 79	95	10	15	1	1	3
80 to 84	50	-	10	1	0	2
85 to 89	25	5	-	0	0	0
90+	10	-	-	0	0	0
Totals	**7,570**	**1,110**	**480**			

* Includes Mud Lake
Source: Statistics Canada. (2006b)

As this table demonstrates, the age profile of Sheshatshiu is much younger than that of HVGB or NWR. For example, 48 percent of the population in Sheshatshiu is less than 20 years of age. This compares to 28 percent for HVGB and 22 percent for NWR.

Gender Structure

The gender structure for both HVGB and Division C are similar with slightly more females than males in both census areas (Table 3).

Table 3 Gender Structure

	HVGB	Sheshatshiu*	NWR
Male	3,740	560	240
Female	3,835	555	250
Total	**7,575**	**1,155**	**495**

* Includes Mud Lake

Source: Statistics Canada (2006b)

Reference:

Statistics Canada. 2006b. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.134**

Information Requested:

To the extent that the information and/or data are available, the Proponent is asked to provide table(s) and/or graphic(s) illustrating the differences between the various Upper Lake Melville communities with respect to the following characteristics:

c. Ethnic Background; and

Table 4 Ethnic Background of Upper Lake Melville

	Sheshatshiu*	NWR	HVGB
Total population	1,100	490	7,470
Total visible minority population	0	0	35
Chinese	0	0	0
South Asian	0	0	0
Black	0	0	0
Filipino	0	0	10
Latin American	0	0	0
Southeast Asian	0	0	0
Arab	0	0	15
West Asian	0	0	0
Korean	0	0	0
Japanese	0	0	10
Visible minority; (not included elsewhere)	0	0	0
Multiple visible minority	0	0	10
Not a visible minority	1,100	490	7,430
Aboriginal identity population	1,035	340	2,720
Non-Aboriginal identity population	65	150	4,750

* Includes Mud Lake

Source: Statistics Canada (2006b)

Reference:

Statistics Canada. 2006b. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.134**

Information Requested:

To the extent that the information and/or data are available, the Proponent is asked to provide table(s) and/or graphic(s) illustrating the differences between the various Upper Lake Melville communities with respect to the following characteristics:

d. Projected Population Change With and Without the Project.

Response:

The Newfoundland and Labrador Statistics Agency prepares population projections by Economic Zone; however, they are not available at the community level. The latest low, medium and high growth projections for Economic Zone 3 (Central Labrador) as prepared by the Newfoundland and Labrador Statistics Agency are presented in Table 5. Note that Table 5 is an update made by the Government of Newfoundland and Labrador in 200, of a projection prepared by the Province in 2007, which was included in Volume III, Chapter 2 of the EIS.

Table 5 Population Forecasts: Zone 3 – Central Labrador

Year	Low	Medium	High
2006	9,284	9,284	9,284
2007	9,170	9,170	9,170
2008	9,167	9,167	9,167
2009	9,184	9,217	9,245
2010	9,208	9,270	9,308
2011	9,203	9,283	9,334
2012	9,213	9,302	9,369
2013	9,260	9,348	9,457
2014	9,272	9,442	9,545
2015	9,235	9,441	9,540
2016	9,235	9,516	9,604
2017	9,169	9,461	9,594
2018	9,158	9,485	9,644
2019	9,131	9,483	9,684
2020	9,089	9,470	9,707
2021	9,120	9,527	9,799
2022	9,100	9,522	9,835
2023	9,136	9,562	9,916
2024	9,119	9,565	9,951
2025	9,159	9,614	10,032

Source: Government of Newfoundland and Labrador (2009).

The Government of Newfoundland and Labrador's population and economic forecasting models do not include the Project. The differences between the scenarios are attributable to varying assumptions about birth rates and in-migration rates. Overall, the Government of Newfoundland and Labrador uses the medium growth scenario as their base case with the low and high scenarios presented as "riverbanks".

The impact on the population of the ULM communities from the Project are not available nor can they be reasonably determined at this time. However, given that the Project will utilize on-site accommodation camps, it is expected that that the impacts on the population of the ULM communities will be minimal.

Reference:

Government of Newfoundland and Labrador. 2009. Population Projections. Prepared by the Department of Finance, Economic Resarch and Analysis. Available at: http://www.economics.gov.nl.ca/population.

IR# JRP.135

Community Health Data

Requesting Organization – Joint Review Panel **Information Request No.: JRP.135**

Subject - Community Health Data

References:

EIS, Volume III, Section 2.7.3 (Existing Environment – Community Health)

Community Accounts, Available online at: http://www.communityaccounts.ca/communityaccounts/onlinedata/getdata.asp, last accessed July 23, 2009

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.66)

Rationale:

The EIS describes existing health issues based upon aggregate data for the Labrador-Grenfell Health Authority, which includes both parts of Labrador and the northern peninsula of Newfoundland. However, the Community Accounts Unit from the Newfoundland and Labrador Statistics Agency has compiled health-related data on the basis of economic zones. Economic Zone no. 3 includes only the communities of Happy Valley-Goose Bay and North West River- Sheshatshiu.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.135**

Information Requested:

The Proponent is asked to provide health-related data for Economic Zone 3 in order to describe the current conditions of those health determinants that are most likely to be affected by the Project. The response should provide for comparison over multiple years and by gender, to the extent that the information and/or data are available.

Response:

Additional community health data for Economic Zone 3 that are not detailed in the EIS or in Aura Environmental Research and Consulting Ltd. (2008), but that were used to characterize the Study Area baseline conditions and potential effects of the Project, are summarized in Tables 1 to 14 below. All data were compiled based on the Community Accounts Unit from the Newfoundland and Labrador Statistics Agency. Data are not available by year and by gender for all community health determinants. Community health is multi-dimensional – it consists of determinants that are social, economic, biological, and environmental in nature. Thus, data, issues, and trends reported under Community Health should be considered alongside those reported in other sections of the EIS, including Economy, Employment and Business, and Social Infrastructure and Services sections of the EIS (Volume III, Sections 2.2, 2.3.2, 2.3.3, 2.3.4, 2.4.2, 2.4.3, 2.4.4, 2.6.2, 2.6.3, 2.6.4, 2.6.5, 2.6.6, 2.6.7).

A more detailed overview of existing health issues in the Study Area is also available in: Aura Environmental Research and Consulting Ltd. (2008) (Report Number 2, Socio-economic Component Studies). In this report, health data, where available, and current health conditions are described at the provincial, regional (Economic Zone), and community levels (Aura Environmental Research and Consulting Ltd. 2008).

The challenges in discerning community health issues and trends from census data and other published data are exacerbated for the Innu population at both the local and regional scale. In the most recent iteration of the Canadian Community Health Survey, only 34 individuals from Sheshatshiu participated in the survey. Data often have a high coefficient of variation, indicating extreme sampling variability, and the population is not well represented by data presented for the Economic Zone.

Income, Employment and Social Status

Table 1 Self-reported Personal Health, 2001 – 2005, Economic Zone 3[1]

	2001			2003			2005		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Excellent	11.4% +/- 6.0%	21.8% +/- 7.1%	16.6% +/- 4.7%	18.9% +/- 7.1%	12.4% +/- 6.3%	15.6% +/- 4.8%	20.1% +/- 7.5%	13.9% +/- 6.0%	17.0% +/- 4.8%
Province[2]	*24.1% +/- 2.0%*	*21.3% +/- 1.8%*	*22.6% +/- 1.3%*	*18.8% +/- 1.8%*	*23.4% +/- 1.8%*	*21.1% +/- 1.3%*	*19.5% +/- 1.8%*	*18.2% +/- 1.6%*	*18.8% +/- 1.2%*
Very good	48.1% +/- 9.5%	43.0% +/- 8.5%	45.5% +/- 6.3%	54.1% +/- 9.1%	50.3% +/- 9.5%	52.2% +/- 6.6%	42.5% +/- 9.3%	53.8% +/- 8.6%	48.2% +/- 6.3%
Province	*43.1% +/- 2.3%*	*44.5% +/- 2.2%*	*43.8% +/- 1.6%*	*45.5% +/- 2.4%*	*45.4% +/- 2.1%*	*45.4% +/- 1.6%*	*43.3% +/- 2.3%*	*47.9% +/- 2.1%*	*45.7% +/- 1.5%*
Good	24.7% +/- 8.2%	24.9% +/- 7.4%	24.8% +/- 5.5%	18.1% +/- 7.0%	29.5% +/- 8.6%	23.9% +/- 5.6%	31.7% +/- 8.7%	23.7% +/- 7.4%	27.7% +/- 5.7%
Province	*20.6% +/- 1.9%*	*21.7% +/- 1.8%*	*21.1% +/- 1.3%*	*23.6% +/- 2.0%*	*21.4% +/- 1.7%*	*22.5% +/- 1.3%*	*25.1% +/- 2.0%*	*22.1% +/- 1.7%*	*23.6% +/- 1.3%*
Fair	12.5% +/- 6.3%	8.4% +/- 4.8%	10.4% +/- 3.9%	6.4% +/- 4.5%	5.7% +/- 4.4%	6.0% +/- 3.1%	4.6% +/- 3.9%	7.0% +/- 4.4%	5.8% +/- 3.0%
Province	*9.0% +/- 1.4%*	*9.5% +/- 1.3%*	*9.3% +/- 0.9%*	*8.0% +/- 1.3%*	*7.0% +/- 1.1%*	*7.5% +/- 0.8%*	*8.2% +/- 1.3%*	*8.7% +/- 1.2%*	*8.5% +/- 0.9%*
Poor	3.4% +/- 3.4%	1.8% +/- 2.3%	2.6% +/- 2.0%	2.5% +/- 2.9%	2.2% +/- 2.8%	2.3% +/- 2.0%	1.0% +/- 1.9%	1.6% +/- 2.2%	1.3% +/- 1.4%
Province	*3.2% +/- 0.8%*	*3.1% +/- 0.7%*	*3.1% +/- 0.6%*	*4.1% +/- 0.9%*	*2.8% +/- 0.7%*	*3.4% +/- 0.6%*	*3.9% +/- 0.9%*	*3.0% +/- 0.7%*	*3.5% +/- 0.6%*

[1] Based on data compiled by the Community Accounts Unit based on information from Statistics Canada (2005). 2005 population estimates used in the calculation of the confidence intervals were compiled by SESA Unit based on Census Sub-Division Population Estimates, Demography Division, Statistics Canada. All regions with a sample size of less than 30 are suppressed. Only asked to those aged 15 or older. Note that in 2001 this question was asked to those age 18 or older. All confidence intervals are calculated at the 95% confidence level.

[2] Comparative responses for the Province of Newfoundland and Labrador.

Table 2 Self-perceived Life Stress, 2001 – 2005, Economic Zone 3[1]

	2001			2003			2005		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Not at all	11.2% +/- 6.6%	13.3% +/- 6.2%	12.2% +/- 4.5%	12.8% +/- 6.6%	8.3% +/- 5.4%	10.5% +/- 4.3%	4.8% +/- 4.1%	6.4% +/- 4.4%	5.6% +/- 3.0%
Province[2]	*17.8% +/- 1.9%*	*12.7% +/- 1.5%*	*15.2% +/- 1.2%*	*17.7% +/- 1.9%*	*12.2% +/- 1.4%*	*14.9% +/- 1.2%*	*17.7% +/- 1.8%*	*13.4% +/- 1.4%*	*15.5% +/- 1.1%*
Not very	23.5% +/- 8.8%	28.0% +/- 8.2%	25.7% +/- 6.0%	32.0% +/- 9.2%	31.9% +/- 9.1%	31.9% +/- 6.5%	41.9% +/- 9.5%	34.2% +/- 8.5%	37.9% +/- 6.4%
Province	*25.6% +/- 2.2%*	*25.4% +/- 2.0%*	*25.5% +/- 1.5%*	*27.2% +/- 2.2%*	*25.7% +/- 1.9%*	*26.5% +/- 1.4%*	*27.5% +/- 2.1%*	*27.6% +/- 1.9%*	*27.6% +/- 1.4%*
A bit	50.4% +/- 10.4%	35.9% +/- 8.8%	43.2% +/- 6.8%	45.6% +/- 9.8%	44.4% +/- 9.7%	45.0% +/- 6.9%	41.1% +/- 9.5%	39.8% +/- 8.8%	40.4% +/- 6.4%
Province	*42.7% +/- 2.5%*	*45.6% +/- 2.3%*	*44.2% +/- 1.7%*	*40.6% +/- 2.4%*	*47.7% +/- 2.2%*	*44.2% +/- 1.6%*	*41.4% +/- 2.3%*	*43.1% +/- 2.1%*	*42.2% +/- 1.6%*
Quite a bit	13.0% +/- 7.0%	21.2% +/- 7.5%	17.0% +/- 5.2%	9.3% +/- 5.7%	14.2% +/- 6.8%	11.8% +/- 4.5%	11.6% +/- 6.2%	18.3% +/- 7.0%	15.0% +/- 4.7%
Province	*12.1% +/- 1.7%*	*13.3% +/- 1.6%*	*12.7% +/- 1.1%*	*12.1% +/- 1.6%*	*12.8% +/- 1.5%*	*12.5% +/- 1.1%*	*10.6% +/- 1.5%*	*13.2% +/- 1.4%*	*11.9% +/- 1.0%*
Extremely	2.0% +/- 2.9%	1.6% +/- 2.3%	1.8% +/- 1.8%	0.4% +/- 1.3%	1.2% +/- 1.2%	0.8% +/- 1.2%	0.6% +/- 1.5%	1.3% +/- 2.0%	1.0% +/- 1.3%
Province	*1.7% +/- 0.7%*	*2.9% +/- 0.8%*	*2.3% +/- 0.5%*	*2.3% +/- 0.7%*	*1.6% +/- 0.6%*	*2.0% +/- 0.5%*	*2.8% +/- 0.8%*	*2.7% +/- 0.7%*	*2.8% +/- 0.5%*

[1] Based on data compiled by the Community Accounts Unit based on information from Statistics Canada (2005). 2005 population estimates used in the calculation of the confidence intervals were compiled by SESA Unit based on Census Sub-Division Population Estimates, Demography Division, Statistics Canada. All regions with a sample size of less than 30 are suppressed. Only asked to those aged 15 or older. Note that in 2001 this question was asked to those age 18 or older. All confidence intervals are calculated at the 95 percent confidence level.

[2] Comparative responses for the Province of Newfoundland and Labrador.

Table 3 Self-reliance Ratio[1], 2001 – 2006, Economic Zone 3[2]

Region	Community	2001	2002	2003	2004	2005	2006
Zone 2	Churchill Falls	96.1	97.2	96.8	96.4	96.9	96.4
	Labrador City	93.6	92.4	92.9	92.4	93.4	93.1
	Wabush	93.7	92.8	93.7	92.8	93.4	93.6
Zone 3	Happy Valley-Goose Bay	88.1	88.1	88.8	89.2	89.7	89.4
	North West River (Incl. Sheshatshiu)	72.9	72.7	77.8	81.0	81.8	80.5
Province		77.5	77.4	77.4	78.1	78.4	78.5

[1] Self-reliance ratio is the ratio of market income of all types to total personal income. A higher self-reliance ratio indicates less reliance on transfers from government.

[2] Based on data compiled by the Community Accounts Unit, based on Canada Customs and Revenue Agency summary information as provided by Small Area and Administrative Data Division, Statistics Canada. Newfoundland & Labrador Statistics Agency.

Table 4 Summary of Hospital Separations[1], 1994-99, 2000-02, 2003-05, Economic Zone 3[2]

	1994 - 1999						2000 – 2002[3]						2003 - 2005					
	Male		**Female**		**Total**		**Male**		**Female**		**Total**		**Male**		**Female**		**Total**	
Separations	2,760		2,935		5,695		1,855		2,520		4,375		1,845		2,460		4,310	
Rate per 1,000 population	106		113		110		31		43		148		32		43		149	
Selected diagnosis	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*	*Rate per 1,000*	*Ratio to Province*
Disease of circulatory system	13	0.64	9	0.57	11	0.60	4	0.67	2	0.47	13	0.57	4	0.71	3	0.58	13	0.64
Disease of digestive system	14	1.06	16	1.01	15	1.03	3	0.92	4	0.80	14	0.85	3	0.87	3	0.77	13	0.82
Disease of respiratory system	16	1.23	15	1.18	15	1.20	4	1.12	3	0.98	14	1.05	4	1.03	4	1.09	15	1.05
Disease of genitourinary system	5	0.74	14	1.10	9	0.97	1	0.79	3	0.89	8	0.87	1	0.83	2	0.77	7	0.82
Injury and poisoning	14	1.47	11	1.39	13	1.43	3	1.35	3	1.35	13	1.34	3	1.17	2	0.79	9	0.98
Neoplasms (cancer)	4	0.65	5	0.64	5	0.65	1	0.49	2	0.61	5	0.56	1	0.43	2	0.56	5	0.48
Infectious & parasitic disease	1	0.58	1	0.68	1	0.70	..[4]	0.73	..	0.71	1	0.71	..	0.25	..	0.64	1	0.58
Endocrine, nutritional	2	0.57	2	0.64	2	0.61	1	1.02	1	0.85	4	0.92	1	1.01	1	0.70	3	0.84

[1] Hospital separation occurs anytime a person leaves a hospital because of death, or discharge or transfer. Separation data are used instead of the number of admissions as patient data are collected at the time of hospital leave.

[2] Data based on the Community Accounts Unit, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Numbers do not reflect individual cases as one person with multiple stays for the same condition is counted multiple times. Data exclude medical day care and surgical care. Not all disease classifications shown and for this reason values to not add to totals. The diagnoses for 1994 to March 2001 are based on the ICD-9 Codes (NCHS and CMS 2008, Internet Site) and the diagnoses for April 2001 to 2005 are based on the ICD-10 Codes (WHO and DIMDI 2007, Internet Site). The 'complications of pregnancy, childbirth and the time immediately after childbirth' category was not included in the diagnosis breakdown for 1994-1999, but there was a significant number in this category for 2000-2002 and 2003-2005.

[3] The rates per 1,000 population are calculated using the sum of 1994 to 1998, 2000 to 2002, and 2003 to 2005 tax filers and dependents. The number of tax filers and dependents is not available by gender; half the total was used for the gender categories. The data for years 1994 to 1999 are based on fiscal year. The data for years 2000 to 2005 are based on calendar years.

[4] '..' indicates data not available or suppressed due to sample size.

Health Services

Table 5 Average Days in Hospital per Admittance, 2000 - 2005, Economic Zone 3[1]

	2000	2001	2002	2003	2004	2005
Male	5.9	5.6	5.7	6.4	4.9	5.7
Province[2]	*8.5*	*8.7*	*8.2*	*8.3*	*8.6*	*8.7*
Female	4.5	3.6	4.7	5.0	4.7	4.7
Province	*7.4*	*7.5*	*7.6*	*7.4*	*7.6*	*7.6*
Total	5.1	4.5	5.1	5.6	4.8	5.1
Province	*7.8*	*8.0*	*7.9*	*7.8*	*8.1*	*8.1*

[1] Data based on the Community Accounts Unit, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Data includes only hospital stays less than 1 year.
[2] Comparative responses for the Province of Newfoundland and Labrador.

Table 6 Proportion of the Population Reporting having a Regular Medical Doctor, Economic Zone 3[1]

	2001	2003	2005
Male	42.9% +- 9.4%	34.2% +/- 8.7%	51.4% +/- 9.4%
Province[2]	*78.5% +/- 1.9%*	*81.8% +/- 1.8%*	*83.4% +/- 1.7%*
Female	67.6% +/- 8.0%	72.7% +/- 8.4%	67.9% +/- 8.1%
Province	*87.8% +/- 1.4%*	*89.8% +/- 1.3%*	*90.7% +/- 1.2%*
Total	55.3% +/- 6.3%	54.4% +/- 6.5%	59.8% +/- 6.2%
Province	*83.2% +/- 1.2%*	*85.9% +/- 1.1%*	*87.1% +/- 1.0%*

[1] Data based on the Community Accounts Unit, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Raw data compiled by the Community Accounts Unit based on information from Statistics Canada (2005).
[2] Comparative responses for the Province of Newfoundland and Labrador.

Healthy Child Development

Table 7 Births by Age of Mother (calendar year), 2002 – 2007, Economic Zone 3[1]

	2000	2001	2002	2003	2004	2005	2006	2007
Total Births, Zone 3	150	135	125	135	130	130	140	135
% Birth by Selected Ages of Mother								
Age < 20 yrs	23.3%	18.5%	16.0%	11.1%	19.2%	15.4%	10.7%	18.5%
Province[2]	*7.9%*	*7.3%*	*6.5%*	*6.5%*	*6.6%*	*5.9%*	*6.2%*	*6.2%*
Age ≤ 16 yrs	6.7%	3.7%	4.0%	..	3.8%	3.8%	..	3.7%
Province	*1.2%*	*1.2%*	*1.2%*	*0.8%*	*1.2%*	*1.0%*	*0.8%*	*0.9%*

[1] Data derived from the Community Accounts Unit, based on information from the Live Birth Notification System, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Data are for live births. Data are rounded. '..' indicates suppressed data due to sample size.
[2] % of total births in each age category, by year, for the Province of Newfoundland and Labrador.

Table 8 Live Births and Birth Rates, Sheshatshiu, 2000 – 2006[1]

Year	Province		Labrador-Grenfell		Sheshatshiu	
	Live Births	Birth Rate[2]	Live Births	Birth Rate	Live Births	Birth Rate
2000	4887	9.1	460	11.0	36	32.5
2001	4721	9.0	415	10.1	31	26.8
2002	4685	9.0	411	10.2	35	29.8
2003	4628	8.9	383	9.6	33	27.6
2004	4506	8.7	384	9.8	17	14.0
2005	4527	8.8	392	10.1	28	22.5
2006	4579	9.1	412	11.1	35	31.5

[1] Data supplied by NLCHI 2007. Based on Live Birth System, Centre for Health Information, 2000-2006; Population Estimates for Census Subdivisions, Statistics Canada, 2000-2005 (based on 2001 Census); Statistics Canada (2006). Live births and population estimates for Sheshatshiu include communities coded in census subdivision 1010020.
[2] Birth Rate is the number of live births per 1,000 people in the population.

Table 9 Self-reported Age at Time of First Sexual Intercourse, 2005, Economic Zone 3[1]

	Male	Female	Total
< 15 yrs	17.5% +/- 9.5%	18.5% +/- 10.3%	18.0% +/- 7.0%
Province[2]	*10.7% +/- 2.2%*	*8.7% +/- 1.8%*	*9.7% +/- 1.4%*
15 - 19 yrs	73.8% +/- 11.0%	58.5% +/- 13.0%	65.6% +/- 8.6%
Province	*76.3% +/- 3.0%*	*72.7% +/- 2.8%*	*74.5% +/- 2.0%*
≥ 20 yrs	8.7% +/- 7.1%	22.9% +/- 11.1%	15.5% +/- 6.6%
Province	*13.0% +/- 2.4%*	*18.6% +/- 2.4%*	*15.9% +/- 1.7%*

[1] Data based on the Community Accounts Unit, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Raw data compiled by the Community Accounts Unit based on information from Statistics Canada (2005). Confidence intervals calculated at 95% confidence interval. Survey question only asked to those 15 to 49 yrs of age.
[2] Comparative responses for the Province of Newfoundland and Labrador.

Table 10 Self-reported Number of Sexual Partners in Past 12 Months, 2005, Economic Zone 3[1]

	Male	Female	Total
1 partner *Province*[2]	91.1% +/- 7.7% *88.6% +/- 2.6%*	86.3% +/-10.1% *91.3% +/- 1.9%*	88.8% +/- 6.3% *89.0% +/- 1.6%*
2 partners *Province*	5.5% +/- 1.9% *6.4% +/- 1.8%*	13.2% +/- 9.9% *5.4% +/- 1.5%*	9.1% +/- 5.7% *5.9% +/- 1.2%*
3 partners *Province*	1.9% +/- 1.5% *2.5% +/- 1.2%*	0.5% +/- 2.2% *2.0% +/- 0.9%*	2.2% +/- 1.7% *2.2% +/- 0.7%*
4 or more *Province*	1.5% +/- 3.3% *4.5% +/- 1.6%*	.. *1.3% +/- 0.8%*	0.8% +/- 1.7% *2.9% +/- 0.8%*

[1] Data based on the Community Accounts Unit, Newfoundland and Labrador Centre for Health Information, Newfoundland and Labrador Statistics Agency. Raw data compiled by the Community Accounts Unit based on information from Statistics Canada (2005). Confidence intervals calculated at 95% confidence interval. Survey question only asked to those 15 to 49 yrs of age, and to those who reported intercourse in last 12 months. '..' indicates suppressed data due to sample size.
[2] Comparative responses for the Province of Newfoundland and Labrador.

Personal Health Practices and Coping Skills

Table 11 Self-reported frequency of having 5 or more drinks on one occasion in past 12 months, 2001 – 2005, Economic Zone 3[1]

	2001			2003			2005		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Never	20% +/- 8.8%	50.5% +/- 9.9%	35.4% +/- 7.0%	24.8% +/- 9.7%	38.5% +/- 11.2%	31.3% +/- 7.5%	24.7% +/- 9.1%	44.2% +/- 10.9	33.7% +/- 7.2%
Province[2]	*33.2% +/- 2.5%*	*60.3% +/- 2.6%*	*45.9% +/- 1.9%*	*26.9% +/- 2.4%*	*53.6% +/- 2.6%*	*39.8% +/- 1.9%*	*26.6% +/- 2.3%*	*55.6% +/- 2.5%*	*40.5% +/- 1.8%*
Less than once a month	22.4% +/- 9.1%	26.9% +/- 8.8%	24.7% +/- 6.4%	23.3% +/- 9.5%	33.6% +/- 10.9%	28.3% +/- 7.3%	32.8% +/- 9.9%	33.7% +/- 10.4	33.2% +/- 7.1%
Province	*26.0% +/- 2.4%*	*22.9% +/- 2.3%*	*24.5% +/- 1.6%*	*26.3% +/- 2.4%*	*29.1% +/- 2.4%*	*27.7% +/- 1.7%*	*27.2% +/- 2.4%*	*26.5% +/- 2.3%*	*26.8% +/- 1.6%*
Once a month	11.1% +/- 6.9%	6.5% +/- 4.9%	8.7% +/- 4.2%	13.0% +/- 7.6%	13.4% +/- 7.9%	13.2% +/- 5.5%	14.3% +/- 7.4%	8.9% +/- 6.2	11.8% +/- 4.9%
Province	*10.9% +/- 1.7%*	*7.8% +/- 1.4%*	*9.4% +/- 1.1%*	*12.6% +/- 1.8%*	*6.3% +/- 1.3%*	*9.6% +/- 1.1%*	*13.4% +/- 1.8%*	*6.1% +/- 1.2%*	*9.9% +/- 1.1%*
2 to 3 times a month	19.9% +/- 8.7%	8.1% +/- 5.4%	13.9% +/- 5.1%	10.3% +/- 6.8%	7.7% +/- 6.1%	90% +/- 4.6%	13.5% +/- 7.2%	10.6% +/- 6.7	12.2% +/- 5.0%
Province	*11.4% +/- 1.7%*	*5.4% +/- 1.2%*	*8.6% +/- 1.1%*	*13.2% +/- 1.9%*	*6.6% +/- 1.3%*	*10.0% +/- 1.1%*	*11.9% +/- 1.7%*	*6.4% +/- 1.3%*	*9.2% +/- 1.1%*
Once a week	17.1% +/- 8.3%	80% +/- 5.4%	12.5% +/- 4.9%	24.0% +/- 9.6%	4.5% +/- 4.8%	14.7% +/- 5.7%	6.6% +/- 5.2%	0.6% +/- 1.7	3.8% +/- 2.9%
Province	*13.4% +/- 1.8%*	*2.7% +/- 0.9%*	*8.4% +/- 1.1%*	*14.5% +/- 1.9%*	*3.8% +/- 1.0%*	*9.3% +/- 1.1%*	*15.1% +/- 1.9%*	*4.4% +/- 1.1%*	*10.0% +/- 1.1%*
More than once a week	9.6% +/- 6.4%	..	4.7% +/- 3.1%	4.6% +/- 4.7%	2.3% +/- 3.5%	3.5% +/- 3.0%	8.1% +/- 5.7%	2.0% +/- 3.1	5.3% +/- 3.4%
Province	*5.2% +/- 1.2%*	*0.9% +/- 0.5%*	*3.2% +/- 0.7%*	*6.5% +/- 1.4%*	*0.7% +/- 0.4%*	*3.7% +/- 0.7%*	*5.9% +/- 1.2%*	*1.0% +/- 0.5%*	*3.5% +/- 0.7%*

[1] Based on data compiled by the Community Accounts Unit based on information from the Statistics Canada (2005). 2005 population estimates used in the calculation of the confidence intervals were compiled by SESA Unit based on Census Sub-Division Population Estimates, Demography Division, Statistics Canada. Data suppressions are represented in the table as "..". All confidence intervals are calculated at the 95% confidence level. Only asked of those who reported having drank in the past 12 months.

[2] Comparative responses provided for the Province of Newfoundland and Labrador

Table 12 Self-perceived Work-related Stress, 2005, Economic Zone 3[1]

	2001			2003			2005		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Not at all	14.5% +/- 7.4%	11.4% +/- 5.8%	12.2% +/- 4.5%	21.4% +/- 8.2%	15.2% +/- 7.2%	18.3% +/- 5.5%	10.1% +/- 6.1%	18.1% +/- 7.4%	14.1% +/- 4.8%
Province[2]	*14.4% +/- 1.8%*	*15.4% +/- 1.7%*	*14.9% +/- 1.2%*	*17.5% +/- 1.9%*	*16.6% +/- 1.7%*	*17.1% +/- 1.3%*	*18.6% +/- 2.0%*	*16.3% +/- 1.7%*	*17.5% +/- 1.3%*
Not very	23.3% +/- 8.9%	30.8% +/- 8.4%	25.7% +/- 6.0%	20.8% +/- 8.1%	24.3% +/- 8.5%	22.5% +/- 5.9%	18.3% +/- 7.8%	23.0% +/- 8.1%	20.6% +/- 5.6%
Province	*24.1% +/- 2.2%*	*22.7% +/- 1.9%*	*23.4% +/- 1.5%*	*20.8% +/- 2.1%*	*22.4% +/- 1.9%*	*21.5% +/- 1.4%*	*21.3% +/- 2.1%*	*21.6% +/- 1.8%*	*21.4% +/- 1.4%*
A bit	43.5% +/- 10.5%	42.4% +/- 9.0%	43.2% +/- 6.8%	45.8% +/- 10.0%	33.8% +/- 9.4%	39.8% +/- 6.9%	50.9% +/- 10.1%	35.2% +/- 9.2%	43.1% +/- 6.9%
Province	*45.5% +/- 2.6%*	*43.5% +/- 2.3%*	*44.5% +/- 1.7%*	*40.7% +/- 2.5%*	*42.2% +/- 2.3%*	*41.4% +/- 1.7%*	*40.5% +/- 2.5%*	*40.8% +/- 2.2%*	*40.7% +/- 1.6%*
Quite a bit	15.4% +/- 7.6%	12.9% +/- 6.1%	17.0% +/- 5.2%	9.5% +/- 5.9%	24.3% +/- 8.5%	16.9% +/- 5.3%	19.9% +/- 8.1%	22.0% +/- 8.0%	21.0% +/- 5.7%
Province	*13.8% +/- 1.8%*	*15.3% +/- 1.7%*	*14.5% +/- 1.2%*	*16.5% +/- 1.9%*	*15.3% +/- 1.7%*	*15.9% +/- 1.3%*	*16.7% +/- 1.9%*	*17.3% +/- 1.7%*	*17.0% +/- 1.3%*
Extremely	3.4% +/- 3.4%	2.5% +/- 2.5%	1.8% +/- 1.8%	2.4% +/- 3.1%	2.4% +/- 3.0%	2.4% +/- 2.2%	0.8% +/- 1.8%	1.7% +/- 2.5%	1.3% +/- 1.5%
Province	*2.2% +/- 0.8%*	*3.2% +/- 0.8%*	*2.7% +/- 0.6%*	*4.5% +/- 1.1%*	*3.4% +/- 0.8%*	*4.0% +/- 0.7%*	*2.8% +/- 0.8%*	*4.0% +/- 0.9%*	*3.3% +/- 0.6%*

[1] Based on data compiled by the Community Accounts Unit based on information from the Statistics Canada (2005). 2005 population estimates used in the calculation of the confidence intervals were compiled by SESA Unit based on Census Sub-Division Population Estimates, Demography Division, Statistics Canada. Only asked to those aged 15 - 75. This question is not asked to those respondents for whom the interview is being carried out by proxy. All confidence intervals are calculated at the 95% confidence level. All regions with a sample size of less than 30 are suppressed.
[2] Comparative responses provided for the Province of Newfoundland and Labrador.

Social Environments and Social Support Networks

Table 13 Reported Sense of Belonging to Community, 2001 – 2005, Economic Zone 3[1]

	2001			2003			2005		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Very strong	28.1% +/- 9.1%	25.2% +/- 7.6%	26.6% +/- 5.9%	26.4% +/- 8.2%	22.9% +/- 8.0%	24.6% +/- 5.8%	27.3% +/- 8.6%	22.9% +/- 7.4%	25.0% +/- 5.6%
Province[2]	*31.3% +/- 2.3%*	*29.5% +/- 2.0%*	*30.4% +/- 1.5%*	*31.6% +/- 2.2%*	*29.6% +/- 2.0%*	*30.6% +/- 1.5%*	*32.2% +/- 2.2%*	*28.7% +/- 1.9%*	*30.4% +/- 1.4%*
Somewhat strong	52.6% +/- 10.1%	51.3% +/- 8.8%	51.9% +/- 6.6%	60.4% +/- 9.1%	59.4% +/- 9.4%	59.9% +/- 6.6%	57.6% +/- 9.6%	62.1% +/- 8.5%	60.0% +/- 6.4%
Province	*47.3% +/- 2.5%*	*47.4% +/- 2.2%*	*47.4% +/- 1.6%*	*48.2% +/- 2.4%*	*50.5% +/- 2.2%*	*49.4% +/- 1.6%*	*46.7% +/- 2.4%*	*50.5% +/- 2.1%*	*48.7% +/- 1.6%*
Somewhat weak	18.5% +/- 7.9%	19.8% +/- 7.0%	19.2% +/- 5.2%	10.5% +/- 5.7%	16.8% +/- 7.1%	13.7% +/- 4.6%	14.8% +/- 6.9%	12.2% +/- 5.7%	13.4% +/- 4.4%
Province	*16.6% +/- 1.8%*	*16.7% +/- 1.6%*	*16.7% +/- 1.2%*	*14.7% +/- 1.7%*	*15.5% +/- 1.6%*	*15.2% +/- 1.2%*	*16.4% +/- 1.8%*	*15.8% +/- 1.5%*	*16.1% +/- 1.2%*
Very weak	0.7% +/- 1.7%	3.7% +/- 3.3%	2.3% +/- 2.0%	2.7% +/- 3.0%	0.9% +/- 1.8%	1.7% +/- 1.8%	0.3% +/- 1.1%	2.9% +/- 2.9%	1.6% +/- 1.7%
Province	*4.7% +/- 1.0%*	*6.4% +/- 1.1%*	*5.6% +/- 0.8%*	*5.4% +/- 1.1%*	*4.3% +/- 0.9%*	*4.8% +/- 0.7%*	*4.7% +/- 1.0%*	*5.0% +/- 0.9%*	*4.9% +/- 0.7%*

[1] Based on data compiled by the Community Accounts Unit based on information from Statistics Canada (2005).. 2005 population estimates used in the calculation of the confidence intervals were compiled by SESA Unit based on Census Sub-Division Population Estimates, Demography Division, Statistics Canada. All confidence intervals are calculated at the 95% confidence level. All regions with a sample size of less than 30 are suppressed.
[2] Comparative responses provided for the Province of Newfoundland and Labrador.

Table 14 Proportion of Individuals Requiring Help with Preparing Meals or Personal Care, 2001[1]

	Economic Zone 2			Economic Zone 3			Province		
Need help with:	M	F	Total %	M	F	Total %	M	F	Total %
Preparing meals	3.0%	5.9%	4.4%	3.9%	4.1%	4.0%	3.1%	4.5%	3.8%
Personal care	1.1%	5.9%	3.5%	3.9%	3.6%	3.8%	2.3%	2.4%	2.3%

[1] Based on data compiled by the Community Accounts Unit based on information from Statistics Canada (2001). All regions with a sample size of less than 30 are suppressed.

References:

Aura Environmental Research and Consulting Ltd. 2008. Lower Churchill Hydroelectric Generation Project: Community Health Study. Prepared for Minaskuat Inc., Happy Valley-Goose Bay, NL.

National Center for Health Statistics (NCHS) and the Centers for Medicare and Medicaid Services (CMS). 2008. The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). Sixth Edition. Available at: http://icd9cm.chrisendres.com/index.php.

Statistics Canada. 2001. Canadian Community Health Survey (CCHS). Statistics Canada: Ottawa, ON.

Statistics Canada. 2005. Canadian Community Health Survey (CCHS). Statistics Canada: Ottawa, ON.

Statistics Canada. 2006. 2006 Census of Canada. Statistics Canada: Ottawa, ON.

World Health Organisation (WHO) and the German Institute of Medical Documentation and Information (DIMDI). 2007. International Statistical Classification of Diseases and Related Health Problems. 10th Revision. Available at: http://apps.who.int/classifications/apps/icd/icd10online/

IR# JRP.136

Income Support

Requesting Organization – Joint Review Panel **Information Request No.: JRP.136**

Subject – Income Support

References:

EIS Guidelines, Section 4.4.4 (Description of the Existing Environment) & Section 4.4.4.6 (Communities)

EIS, Volume III, Section 2.6.6 (Existing Environment – Housing and Temporary Accommodations)

Related Comments / Information Requests

CEAR # 214 (Innu Nation – IN.62)

Rationale:

The EIS Guidelines states that "[t]he EIS shall identify the study area for each VEC and include a description of the existing biophysical and socio-economic environment and the resources within it that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the Project" (p. 25).

In its submission to the Panel, Innu Nation noted that the EIS presents information on changes in the use of income support for the Upper Lake Melville area between 1992 and 2006 (page 2-40) and indicated that the number of individuals requiring income support and the incidence of income support has declined substantially.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.136**

Information Requested:

The Proponent is asked to discuss the factors that may explain why there has been a substantial decline in the number of individuals in the Upper Lake Melville area requiring income support. To the extent that information and/or data are available, this discussion should provide a breakdown of how the incidence of income support varies between Happy Valley-Goose Bay and the other communities in the Assessment Area.

Response:

It is not known with certainty why there has been a decline in the number of individuals in the Upper Lake Melville (ULM) area requiring income support. Officials with the Government of Newfoundland and Labrador's Department of Human Resources, Labour and Employment (HRLE) were not able to specify any concrete factors which may have resulted in the substantial decline in the requirement for income support; nor were they able to account for the significant differences in the reductions in the incidence of income support between Happy Valley-Goose Bay (HVGB) and Sheshatshiu/North West River (NWR)[1]. However, the data for these two sub-regions within ULM show striking differences in the reduction in the incidence of income support. In 1992 for example, the income support incidence rate for NWR/Sheshatshiu was 56.9 percent, but by 2006 the rate had dropped considerably to 14.5 percent. HVGB also showed a drop in the incidence of income support, albeit not as dramatic, from 11.8 percent in 1992 to 9.5 percent in 2006, while the rate for the province as a whole dropped from 17.6 to 11.3 percent over the same time period (Newfoundland and Labrador Statistics Agency 2008, Internet Site).

While no specific reasons can be cited, Nalcor Energy (Nalcor) believes that a combination of the following factors may be responsible for the overall decline in the incidence of income support in Newfoundland and Labrador and ULM and specifically for the dramatic drop in NWR/Sheshatshiu:

- Employment and business activity resulting from the Voisey's Bay project, both directly on the project and indirectly through the various Innu joint ventures, is one possible reason. During the construction phase of the Voisey's Bay project from 2002 to 2005, some 1,100 Aboriginal persons worked on the project, including 140 Innu during 2005 alone (VBNC 2006). As of October, 2005, 211 Aboriginal persons and 120 other Labradorians were employed on the operations phase of the project (VBNC 2005). While no data on how many of these positions were likely filled by people from Sheshatshiu and NWR is available, even a small proportion of these positions would have contributed to the increase in employment activity amongst the labour force of Sheshatshiu and NWR and thus the decrease in the incidence of income support.

[1] Information on the breakdown between the communities of NWR and Sheshatshiu is not available.

- Further confirmation of the increased labour force participation in NWR/Sheshatshiu can be gleaned from a review of taxfiler data. In 1992, 580 individuals in NWR/Sheshatshiu reported having market incomes. By 2006, the number of persons who reported market incomes had increased to 780 persons. This increase in employment activity is further confirmed by Census data which shows that the number of persons in the employed labour force in Sheshatshiu rose from 135 in 1996 to 250 in 2006. Comparable figures for NWR showed 170 persons in the employed labour force in 1996, rising to 220 in 2006 (Newfoundland and Labrador Statistics Agency 2008, Internet Site).
- Increased expenditures within Sheshatshiu on a new Band Council office, schools, housing and other municipal infrastructure, which has provided employment for residents of the community and which would have affected the incidence of income support in Sheshatshiu.
- Out-migration and general population decline (for ULM and the province as a whole).
- Better education levels and a greater attachment to the labour force both for ULM and for the province as a whole.
- Province-wide initiatives to reduce the incidence of income support, which have resulted in significant declines in the incidence of income support throughout the province.
- A strategic change in direction for the Department of HRLE with a focus on decreasing the number of youth on Income Support by *"providing supports that prevent or reduce the need for Income Support and help youth join the workforce"* (Government of Newfoundland and Labrador 2008).
- A greater emphasis in the Department of HRLE on work transition programs to reduce the incidence of income support, with a particular focus on single parents.

References:

Government of Newfoundland and Labrador, Department of Human Resources, Labour and Employment. 2008. Annual Report 2007-2008. Government of Newfoundland and Labrador, St. John's, NL.

Newfoundland and Labrador Statistics Agency/Community Accounts. 2008. Available at: http://www.communityaccounts.ca/communityaccounts/onlinedata/getdata.asp.

VBNC (Voisey's Bay Nickel Company). 2005. Presentation to the Canadian Aboriginal Minerals Association. October 2005. Voisey's Bay Nickel Company Limited, St. John's, NL.

VBNC (Voisey's Bay Nickel Corporation). 2006. 2005 Social Responsibility Report. Available at: http://vinl.valeinco.com/SocialResponsibility2005/maximizing/sub1.htm

IR# JRP.137

Rental Properties and Daycare Facilities

Requesting Organization –Joint Review Panel **Information Request No.: JRP. 137**

Subject - Rental Properties and Daycare Facilities

References:

EIS Guidelines, Section 4.4.4 (Description of the Existing Environment), Section 4.4.4.6 (Communities) & Section 4.5 (Environmental Effects)

EIS, Volume III, Section 2.6.6 (Existing Environment – Housing and Temporary Accommodations) & Section 4.6 (Socio-economic Effects Assessment – Social Infrastructure and Services)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.60, IN.61 & IN.78)

Rationale:

The EIS Guidelines require the Proponent to describe relevant community elements in the study areas of the VECs, including Community services and infrastructure. More specifically, the Guidelines require "[t]he assessment of the beneficial and adverse effects of the Project on the socio-economic environment shall consider how the Project may affect various segments of the local populations (e.g., youth, elders, men, women, Aboriginal groups, harvesters, existing workforce including professionals)." (p. 33) Services and infrastructures should be taken into account when assessing effects of the Project on the socio-economic environment.

The EIS concludes that in-migration as a result of the Project would be reduced and it is likely that it would cause only minimal socio-economic effects. In its submission to the Panel, Innu Nation disagreed with this conclusion, arguing that "[t]he lack of quantitative evidence to support a finding that in-migration will be minimal puts the entire assessment of impacts on social infrastructure and services in question." (Innu Nation, p. 125) Among the issues raised by Innu Nation are:

- A lack of baseline description of the availability and costs of housing accommodation (including rental accommodation);
- Uncertainty regarding foreign labour and where they would be housed during their offshift rotations;
- The possibility of induced/in-fill migration and resulting pressures on housing demand; and
- The current shortage of childcare facilities and services.

Requesting Organization – Joint Review Panel **Information Request No.: JRP. 137**

Information Requested:

To the extent that information and/or data are available the Proponent is asked to provide:

a. **Estimates of the numbers and types of rental accommodations that might be required to meet the needs of in-migration and assess the capacity of the existing rental stock to meet this need;**

Response:

As noted in the response to IR# JRP.139, estimates of in-migration to the local area of the Project are difficult to predict. As workers will be provided with free, high-quality accommodations at the work site, the likelihood of employees moving to the Lake Melville area and renting their own housing is considered to be low.

The existing rental stock in Happy Valley-Goose Bay is not extensive, and ranges from 45 to 50 units of various sizes (one-bedroom, two-bedroom, three-bedroom, four-bedroom). Generally, these rental units are not actively advertised, as many have long-term tenants, or landlords rent the units by relying on word-of-mouth.

Based on the fact that the workplace accommodation complexes will meet the needs of workers, the trend of construction workers not relocating to or near a worksite (see IR# JRP.139) and the long duration of the Project that allows for ample planning, it is likely that further demand put on the existing rental capacity in Happy Valley-Goose Bay due to the Project will be mitigated to a manageable level. The long Project duration, in addition to the lead time before Project sanction provides real estate developers with ample opportunity to invest in rental accommodations to meet the expected demand. Unlike a short-term project, the ten-year construction phase will provide developers with a longer period to recognize a return on their investment.

Furthermore, for those currently living in or nearby Happy Valley-Goose Bay who will find employment during construction, the majority of these individuals already have housing and will not require access to rental accommodations.

References:

Happy Valley Goose Bay Rental Accommodations List, Town of Happy Valley-Goose Bay.

Appendix E, Happy Valley Goose Bay Landlords Contact Info, Labrador Friendship Centre.

Requesting Organization – Joint Review Panel **Information Request No.: JRP. 137**

Information Requested:

To the extent that information and/or data are available the Proponent is asked to provide:

b. An estimate or target of the numbers of Sheshatshiu workers anticipated for direct employment, and given the demographic structure of the community, an estimate of the numbers of children who may require child care services;

Response:

Based on the characteristics of the local population and the Aboriginal Skills and Employment Partnership (ASEP) program referenced in IR# JRP.133, it is estimated that Sheshatshiu workers could fill as many as 150 to 200 direct jobs with the Project.

Currently, there is only one daycare facility in the community (Shakastueu Pishum Mitshuap) which has been at peak capacity (eight spaces) for years. This facility currently has a wait-list of 18 families seeking childcare services.

According to the 2006 Census, there are 195 families with children at home in Sheshatshiu and North West River (Governmnent of Newfoundland and Labrador 2009). Despite not having a confirmed number for Sheshatshiu alone, it would be reasonable to conclude that the majority of the 195 families are from Sheshatshiu given the age breakdown between the communities (see response IR# JRP.134).

Based on the demographic profile of Sheshatshiu, it is anticipated that of the 150 to 200 workers who could obtain direct employment with the Project, a large percentage, up to 75 percent (110 to 150), could require some form of childcare.

However, while there are no statistics available to corroborate, many families who require childcare services rely heavily on family members on an ad hoc, informal basis. It is conceivable that this situation will continue to be desirable for some families due to the strong familial ties within the community.

Given Innu Nation's close ties to the Project through its IBA and participation in the ASEP training partnership, Innu Nation will have adequate lead time to address their own child care requirements. The provision of child care allowances through the ASEP training programs will also provide financial incentives for the establishment of new child care capacity in the community.

Reference:

Government of Newfoundland and Labrador. 2009. Community Accounts. Newfoundland and Labrador Statistics Agency. Available at: http://communityaccounts.ca/communityaccounts/onlinedata/display_table.asp?p=%D1%B7%C0%8C%8C%9D%A5%A5%AB%9D%B4%93%87%9F%C5%BC%ABk%86%B4%92X%81%87%7FM%A9%C9%9A%BA%89%C6%90%8F%A0%C7%8C%90%5C

Requesting Organization – Joint Review Panel **Information Request No.: JRP. 137**

Information Requested:

To the extent that information and/or data are available the Proponent is asked to provide:

c. **Details on the existing usage and capacity limitations of existing early childhood education and daycare facilities; and**

Response:

Data related to the existing use and capacity limitations of existing early childhood education and daycare facilities are provided in the following table.

Facility	Location	Capacity	Usage
College of the North Atlantic Day Care	HVGB	27 spaces, ages 2 – 6 years Students first priority, then staff, followed by the general public (low due to staff shortage)	14
Kids First After School Program	HVGB	30 spaces, ages 6 – 11 years	20
Military Family Resource After School Program	HVGB	15 spaces current due to staff shortage, 30 normal capacity	12
Pumpkin House Day Care	HVGB	58 spaces, 24 – 72 months	56
Robin's Nest	HVGB	15 spaces currently due to staff shortage, 30 normal capacity	9
Shakastueu Pishum Mitshuap	Sheshatshiu	8 spaces, 24 – 72 months	8

Reference:

Government of Newfoundland and Labrador, Department of Health and Community Services. Licensed Childcare Centers. Available at: www.health.gov.nl.ca/health/childcare/pdfiles/child%20care%20list.pdf

Requesting Organization – Joint Review Panel **Information Request No.: JRP. 137**

Information Requested:

To the extent that information and/or data are available the Proponent is asked to provide:

d. Information on the numbers and capacities of other types of childcare facilities, e.g. before/after school care

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Response:

The other types of childcare facilities available and their capacities are shown in the table below.

Facility	Location	Capacity	Usage
Kids First After School Program	HVGB	30 spaces, ages 6 – 12 years	20
Military Family Resource After School Program	HVGB	15 spaces current due to staff shortage, 30 normal capacity	12
Robin's Nest	HVGB	15 spaces current due to staff shortage, 30 normal capacity	9
Shakastueu Pishum Mitshuap	Sheshatshiu	8 spaces, 24 – 72 months	8

Reference:

Government of Newfoundland and Labrador, Department of Health and Community Services. Licensed Childcare Centers. Available at: www.health.gov.nl.ca/health/childcare/pdfiles/child%20care%20list.pdf

IR# JRP.138

Snowmobile Trails

Requesting Organization – Joint Review Panel **Information Request No.: JRP.138**

Subject - Snowmobile trails

References:

EIS Guidelines, Section 4.4.4 (Description of the Existing Environment) and 4.4.4.6 (Communities)

EIS, Volume III, Section, 2.5 (Existing Environment – Physical Infrastructure and Services)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.60)

Rationale:

The EIS Guidelines require the Proponent to identify the study area for each VEC and include a description of the existing biophysical and socio-economic environment and the resources within it that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the Project.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.138**

Information Requested:

To the extent that information and/or data are available, the Proponent is asked to provide a map showing the locations of snowmobile trails near/adjacent to the Trans Labrador Highway from Happy Valley-Goose Bay to the Gull Island Site and within and adjacent to the proposed reservoirs and other project infrastructure.

Response:

Please see the attached map. The trail route is approximate, and based on a global positioning system (GPS) file provided by Mr. Rob Pilgrim (pers. comm. 2009). The trail parallels the Trans Labrador Highway Phase I and also uses the existing transmission line right-of-way over part of its length. Depending on varying snow or ice conditions, the route is, at times, re-located up to a few hundred feet. The route from Churchill Falls to Happy Valley-Goose Bay has not been very active over the last few years, but plans are in place to make this part of the route more active in the coming year (2010) (R Pilgrim, pers. comm. 2009). Information pertaining to snowmobile trails was not provided by Innu Nation in the Innu Traditional Knowledge Committee Report (Innu Nation 2007).

References:

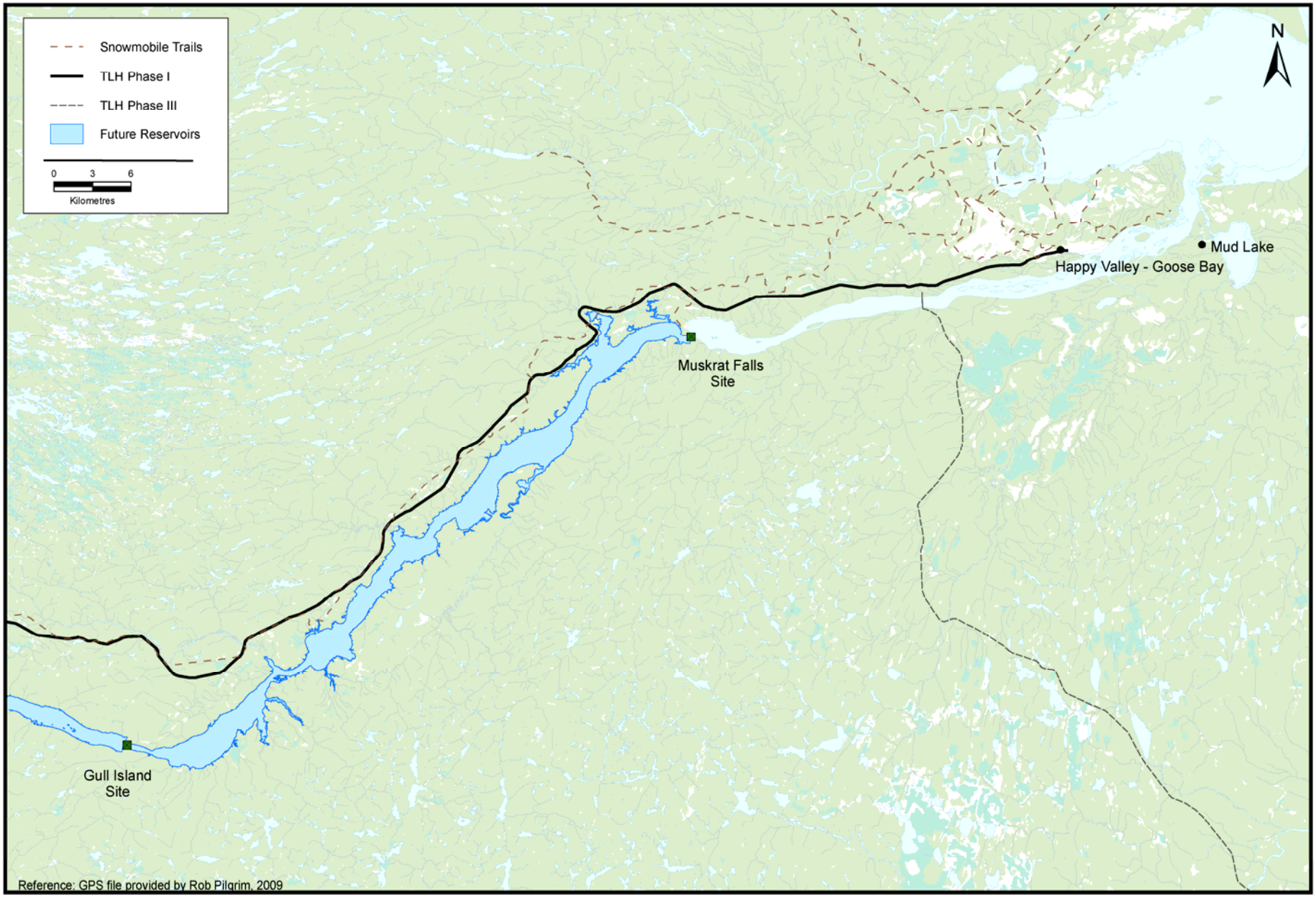
Personal Communications

Pilgrim, R. President, Grand River Snowmobile Club. 2009.

Literature Cited

Innu Nation. 2007. Innu Kaishitshissenitak Mishta-shipu (Innu Environmental Knowledge of the Mishta-shipu (Churchill River) Area of Labrador in Relation to the Proposed Lower Churchill Project). Report of the Work of the Innu Traditional Knowledge Committee prepared by Wolverine & Associates, Inc. for Innu Nation.

Figure 1 Labrador Snowmobile Trails in the Happy Valley-Goose Bay to Gull Island Region



IR# JRP.139

In-Migration

Requesting Organization –Joint Review Panel **Information Request No.: JRP.139**

Subject – In-Migration

References:

EIS Guidelines, Section 3.1 (Study Strategy and Methodology), Section 4.4.4.6 (Communities), Section 4.4.7 (Future Environment without the Project) & Section 4.5 (Environmental Effects)

EIS, Volume III, Section 2.2 (Existing Environment – Demographics), Section 4.1, (Environmental Assessment of Socio-Economic Effects – Introduction), Section 4.2.4, (Environmental Assessment of Socio-Economic Effects, In-Migration of Construction Workers), & Section 4.6.5.4 (Immigrants)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.80)

Rationale:

The EIS Guidelines state that the Proponent shall clearly identify and justify all hypotheses and assumptions, substantiate all conclusions and predictions regarding project effects on the receiving environment, and identify all significant gaps in knowledge and explain their relevance to key conclusions drawn. The Guidelines also state that the Proponent shall describe "relevant community elements in the study areas of the VECs, including demographics" (p. 29) and "the predicted future condition of the environment within the expected life span of the Project, if the Project were not to proceed" (p. 32). Finally, the Proponent is required to take demographics into account when assessing effects of the Project on the socio-economic environment.

In its submission to the Panel, Innu Nation indicated that "[t]he Proponent correctly identifies that in-migration is an important consideration in considering socio-economic effects, but indicates that the number of new people that may move to the Upper Lake Melville area is uncertain (...) Notwithstanding this uncertainty, the EIS assumes that the combination of a short Project construction phase and management of the non-local workforce through a commute and on-site accommodation approach will minimize in-migration" (Innu Nation, p. 127-128). The submission further stated that the "EIS does not present any concrete evidence from other projects in Labrador (e.g. Voisey's Bay) or other locations in Canada (e.g. diamond mines in the NWT, hydro projects in northern Manitoba or Québec) to substantiate this assumption" (Innu Nation, p. 128).

In addition, Innu Nation argues that "with respect to in-migration (new people moving to the Upper Lake Melville area to live because of the Project), the EIS only considers new people moving to the area to work directly on the Project. The issue of new people moving to the area to fill new jobs created by indirect and induced Project-related employment and/or jobs vacated by existing residents who take direct Project jobs has not been considered" (Innu Nation, p. 128).

Requesting Organization –Joint Review Panel **Information Request No: JRP.139**

Information Requested:

The Proponent is asked to provide data, along with an explanation of assumptions and methods used, concerning Project effects on the population and demographic structure of the Upper Lake Melville area, including:

a. **Scenario-based estimates (e.g. low, medium, high) of the numbers, as well as age and gender characteristics, of individuals predicted to relocate to Upper Lake Melville area as a consequence of:**

   i. **direct employment (non foreign);**
   ii. **direct employment (foreign);**
   iii. **indirect employment; and**
   iv. **induced and/or "in-fill" employment; and**

Response:

An "effects management" approach was used for assessing socio-economic effects of the Project because it results in residual effect predictions that are more reliable than ones based on population projections. Furthermore, it provides a better basis for the management of Project-related community growth and change. The effects management approach has been adopted by the assessments of other major projects undertaken in the Province in the past three decades. This approach has been accepted by federal and provincial regulatory authorities in the case of the Hibernia project, and the resulting effects management initiatives were also proven effective in minimizing adverse outcomes.

Relative to the effects management approach used in the EIS, demographic estimates generally result in effects predictions in which there can be little confidence. Migration is typically the least predictable component in demographic change; the reasons for this are clear when examining the challenges there would be in preparing the Upper Lake Melville in-migration estimates requested here:

Direct Employment

- Direct Project employment estimates, with the caveats associated with them noted, are provided in Volume III, Section 3.1 and are updated in the response to IR# JRP.11. The potential for the in-migration of some of these workers is discussed in detail in Volume III, Section 4.2.4, which states that "a number of factors influence whether construction workers commute to a project site from their communities or relocate to a community closer to the site" (pp. 4-7). The factors discussed are: the role of organized labour, the length of the individual work contract, competition for workers and incentives to attract and retain labour, government and community policies and objectives, the cost of living, and the personal preferences of workers (including the construction work culture, demographic considerations, family members' needs and preferences, and such personal issues as dislike of flying). It is concluded that "individual worker decisions are complex and consequently difficult to predict with any accuracy" (pp. 4-8).
- However, "experience (with other projects), (Hibernia and White Rose for example) suggests that construction workers do not relocate where the potential employment period is finite and short-term" (pp. 4-8). This is particularly so when, as in the case of the Project, workers are provided with free transportation to and from, and free high-quality accommodations at the worksite.

- Any workers who do relocate to Upper Lake Melville may bring family members with them. It is, again, very difficult to estimate numbers given that the decision will be influenced by such factors as family status, stage of family lifecycle, the number of children, the location of members of the extended family, and spousal employment. It is also difficult to estimate the prevalence of these factors across the construction workforce.
- None of the above discussion addresses an additional dimension of the request: that there be estimates of not only the number of in-migrants, but also of their ages and gender. Projecting these characteristics requires yet more assumptions, which in turn increases the unreliability of the results generated.

Direct Employment (foreign)

- Foreign construction workers will be used if the Canadian labour market cannot satisfy the Project labour requirements. The Canadian market has been highly volatile in the recent past, and is likely to see further unpredictable change prior to, and over the course of, the Project construction phase. As such, it is not possible to establish defensible forecasts of the total Project requirement for foreign construction workers, or their numbers by age group and gender.
- However, international migrant workers are unlikely to move to the Upper Lake Melville area given that most will be on temporary work visas. Furthermore, if their priority is to maximize their net incomes, this would be diminished if they had to pay the costs of living in a community, rather than in the Project accommodations complexes.

Indirect Employment

- Nalcor Energy's (Nalcor's) Contracting Policy and Practice will facilitate the involvement of local companies, including 'businesses located in communities adjacent to the Project' (Volume III, Section 3.7.5.2, pp. 3-31). However, 'goods and services will be acquired on a Best Value basis' (pp. 3-31), and the amount of business accruing to Labrador, or to Upper Lake Melville in particular, will depend upon the success of businesses there in meeting that criterion.
- However, it is not possible to estimate in a defensible manner any of the following: the absolute number of Upper Lake Melville businesses that will succeed in getting Project contract work; the scale of any such work; whether their existing workforces are sufficient to undertake the work; if not, whether the required additional labour is available locally; and hence, if not, how much in-migrant labour will be required. Furthermore, the above discussion does not address the request to provide estimates of the ages and gender of any who move into the community to take up indirect Project employment. This requires an additional set of questionable assumptions and result in a low reliability of the projections generated.

Induced Employment

- There are no known studies of the in-migration effects of induced employment associated with large projects. In any event, it is not possible to establish whether, or the degree to which, such in-migration can be attributed to the project in question, especially when the community has a broad economic base and a large number of other factors are in play.

- The Upper Lake Melville share of induced employment will be determined by such factors as the number of local workers employed directly by the Project, the number of companies and their employees providing goods and services to the Project, and the amount of 'leakage' from the local economy as these direct and in-direct employees save their incomes or spend them outside the Upper Lake Melville area. All these different parameters are difficult to forecast, and little information is available to meaningfully generate estimates of the numbers of such in-migrants by age group and gender.
- However, much of the induced employment will be in the retail and service sector, making it unlikely that the rates of remuneration will be sufficient to justify the costs of moving to the area.

Given the numerous limitations to making demographic estimates, the socio-economic assessment methodology employed for the EIS focuses on effects management, which takes into consideration the desire to minimize the potential adverse consequences of boom and bust associated with construction activity that, while it will last for several years, is not in and of itself the basis for sustainable community development. The use of accommodations complexes will minimize the community effects of the influx of a large group of workers directly and indirectly associated with the Project. The effects on local services and infrastructure of those and their families who do chose to move to the area will be easier to monitor and their needs more easily addressed, the net result being that community growth and change can be better managed.

Newfoundland and Labrador has seen a large number of assessments of major projects since 1980 (e.g., the Voisey's Bay Mine/Mill; Hibernia, Terra Nova and White Rose oilfields, Newfoundland Transshipment Terminal, and Grassy Point LNG Terminal). Only the earliest of these assessments, the 1985 Hibernia Socio-economic Impact Statement (SEIS), sought to provide population projections for the Province and the impact area regions with and without the Project, as is requested herein. The Hibernia assessment provides a useful demonstration of the effectiveness of the effects management approach, and the unreliability of demographic predictions. The Hibernia SEIS included a significant note of caution with respect to their predictions:

> "The projections included within this section should be read with caution. Changes in social or economic conditions in Newfoundland or Canada could greatly affect the rate of population growth in Newfoundland and the three impact areas. As the time period of the projection increases, the possibility of such social or economic changes occurring also increases. Furthermore, predicting population changes for small areas is more difficult that for larger regions. Any changes to project design, location of construction and fabrication activities or the timing of such activities, could significantly affect employment and related migration levels." (Mobil Oil Canada, Ltd. 1985).

These cautions were fully justified, as many of the concerns raised were realized:

- the project start was delayed for five years;
- it was then further delayed, after it had commenced, by the withdrawal of one of the project partners; and
- there were significant changes in the construction techniques used, resulting in significantly different personnel requirements.

The result was a much larger labour requirement than had been originally estimated, reaching almost 6,000 workers, compared to the 3,500 projected in the SEIS. Furthermore, the 'without project' projections were affected by fisheries moratoria, with out-migration increasing dramatically.

The important lessons from the Hibernia project SEIS are not only that the population projections were incorrect, but also that the desired social outcomes (the minimization of community social disruption) were achieved. The mechanism for this was an effects management approach, the key elements of which are:

- a good understanding of current demand and service and infrastructure capacity;
- clearly defined outcome goals;
- implementation of flexible management strategies as part of the project design; and
- appropriate follow-up.

An effects management approach has been used in the Project SEIS because it results in residual effects predictions that are more reliable than ones achieved based on demographic predictions, in which there can be little confidence. Furthermore, it provides a better basis for the management of Project-related community growth and change.

References:

Government of Newfoundland and Labrador, Department of Finance, 2009. Population Projections – On-line Projections. Economic Analysis and Research Division, St. John's, NL. http://www.economics.gov.nl.ca/population/default.asp.

Mobil Oil Canada, Ltd. 1985. Hibernia Development Project, Environmental Impact Statement, Volume IV Socio-Economic Assessment. Mobil Oil Canada, Ltd., St. John's, Newfoundland.

Requesting Organization – Innu Nation **Information Request No: JRP.139**

Information Requested:

The Proponent is asked to provide data, along with an explanation of assumptions and methods used, concerning Project effects on the population and demographic structure of the Upper Lake Melville area, including:

b. Population projections to the year 2021 with and without the Project.

Response:

As requested, a without-the-Project population projection for Economic Zone 3 (equivalent to Upper Lake Melville) is provided below. This is a 2009 Government of Newfoundland and Labrador update of a projection prepared by the Province in 2007 which was included in Volume III, Chapter 2 of the EIS. The differences between the 2007 and 2009 results illustrate the high levels of uncertainty associated with such projections, with changes in assumptions over a couple of years resulting in large variations in projected totals.

Such uncertainties are compounded when it comes to making with-the-Project projections, primarily as a result of the impossibility of establishing defensible estimates of in-migration, as per the above response to IR# JRP.139a. Additional challenges are posed by the need to estimate fertility, mortality and out-migration. For these reasons, as is further discussed below, no such projections have been prepared.

Projections without the Project

Updated (2009) provincial government population projections are now available (Government of Newfoundland and Labrador 2009). They project the population by age and gender for the Province and various sub-provincial regions, including economic zones, the smallest geographic unit for which projections are made for Labrador. The system uses information/assumptions about fertility, mortality and migration to produce high, medium and low projections.

The 2009 provincial population estimates show upward revisions compared to the previous projections, produced in November 2007. Fertility rate and death rate assumptions have not changed substantially; however, due to the notable change in migration trends in 2008 (i.e., net in-migration and the first population growth in 16 years), and a favourable outlook for major project development, migration assumptions have been revised upwards. The impact of these changes is considerable; by 2025 projected total provincial population under the "high" scenario is approximately 20,000 higher than under the 2007 projection, and the new "medium" scenario is roughly equivalent to the 2007 "high" scenario.

In general, the smaller the regional unit/population group for which the projections are made, the less reliable the projection, as the influence of 'local' factors will be more important and less predictable. As previously noted, of the main elements of population change, migration is the most volatile and difficult to forecast. Migration is related to a range of economic and other factors, many of which are subject to rapid and unpredictable change (for example, in the economy and labour market), some of which are community-specific.

The 2009 provincial government projections for Economic Zone 3 (Upper Lake Melville), which explicitly do not include the effects of the Project, are presented in Table 1.

Table 1 Population Projections without Project, Economic Zone 3, 2009-2021

Year	High Scenario	Medium Scenario	Low Scenario
2009	9245	9217	9184
2010	9308	9279	9208
2011	9334	9283	9203
2012	9369	9302	9213
2013	9457	9348	9260
2014	9545	9442	9272
2015	9540	9441	9235
2016	9604	9516	9235
2017	9594	9461	9169
2018	9644	9485	9158
2019	9684	9483	9131
2020	9707	9470	9089
2021	9799	9527	9120

Source: Government of Newfoundland and Labrador, Department of Finance, 2009

Projections with Project

Projecting the demographic effects with-the-Project is primarily concerned with estimating levels of Project-related in-migration. Other Project-related components of population change -- fertility, mortality and out-migration -- are expected to be much less important in affecting total demographic change.

As has been discussed in detail above in part (a) of this response, the number and nature of the underlying assumptions about the levels of direct, indirect and induced employment, and their effects in terms of the residential decision-making of workers and their families make any projections of in-migration very unreliable and difficult to defend. Any errors resulting from initial assumptions are compounded in the process of generating the total projections. Furthermore, even small differences in assumptions can result in a range of significantly different outcomes. Accordingly, due to the unreliability of with-Project population projections, and the inability to produce defensible with-Project population projections, an "effects management" approach was used to assess the socio-economic effects of the Project.

Reference:

Government of Newfoundland and Labrador, Department of Finance, 2009. Population Projections – On-line Projections. Economic Analysis and Research Division, St. John's, NL. http://www.economics.gov.nl.ca/population/default.asp.

IR# JRP.140

Residual Socio-Economic Effects on Social Infrastructure and Services & Community Health

Requesting Organization – Joint Review Panel **Information Request No.: JRP.140**

Subject - Residual Socio-Economic Effects on Social Infrastructure and Services & Community Health

References:

EIS, Volume III, Section 4.8.2 (Summary of Residual Socio-economic Effects and Evaluation of Significance – Social Infrastructure and Services) & Section 4.8.3 (Summary of Residual Socio-economic Effects and Evaluation of Significance – Community Health)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.84)

Rationale:

The EIS concludes that, with the implementation of the proposed effects management measures, the residual adverse socio-economic effects of the Project on Social Infrastructures and Services and Community Health during construction, and operation and maintenance would not be significant.

In its submission to the Panel, Innu Nation raised issues that may cause Innu to be uniquely affected by the Project in terms of socio-economic effects:

- Demand for locally delivered social services already exceeding capacity;
- Current social resilience at a critical stage;
- Increased vulnerability to effects on health and well-being; and
- Inability to increase limited government funding for existing social infrastructures.

Both the Innu Nation submission and the EIS also refer to how an increase in disposable income as a result of Project-related employment could potentially result in increased incidence of substance abuse, crime and family dysfunction.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.140**

Information Requested:

The Proponent is asked to:

a. **Justify how the issues raised above were specifically taken into consideration when determining significance for impacts on Social Infrastructure and Services and Community Health; and**

Response:

The decision to use a determinants of health-based Community Health key indicator (KI), in addition to the more conventional Social Infrastructure and Services KI, is inclusive of the concerns raised above. Consistent with the determinants approach, significance of effects to Community Health was determined using a holistic approach, as opposed to weighing individual Community Health issues and concerns. In other words, the significance of a socio-economic effect on Community Health is determined based on the nature and magnitude of potential change in the status of Community Health determinants. As such, the issues raised above are addressed holistically.

1. *Demand for locally delivered social services already exceeding capacity*: 'health services' is the key determinant that includes and addresses this issue. The current health service conditions in the Study Area, including social services and the ability of existing services to meet current demands are described in the Community Health Study (Aura, 2008). For some services, such as the demand for mental health and addictions treatment services, capacity is an issue. However, for other services, such as Libra House's protective social services for women and children, capacity was deemed sufficient to meet current demands. Pre-natal health programs, which help to ensure 'healthy child development', are significantly under-utilized. Health services and current capacities to meet the demand for health services are described for Regional Economic Zones 2 and 3, and at the community level for Sheshatshiu (where quantitative or qualitative data is available) (Aura, 2008). This information was used in determining the significance of potential effects on Community Health, and considered in relation to other health determinants that relate to 'health services'; namely, 'personal health practices and coping skills', 'social environments and social support networks', and 'income, employment and social status.'

   The threshold of a significant adverse residual effect on Community Health, with respect to 'health services', is when the effects of the Project lead to a deterioration of health services on an ongoing and consistent basis such that community health or the delivery of health and social services cannot be managed on a regular basis. Project actions deemed to have the most direct impact on Community Health are worker in-migration and interaction. Within the Upper Lake Melville area, most of the effects will be experienced in Happy Valley-Goose Bay. Health and social services will be affected primarily by demographic changes; however, measurable Project-related in-migration or worker-community interaction in Sheshatshiu is unlikely. The adoption of an on-site accommodations strategy will minimize in-migration to the Upper Lake Melville area and thus manage increase in demand for local health and social services.

   Compared to the Community Health KI, the Social Infrastructure and Services KI includes some different types of infrastructure and services including, for example, policing, schooling and housing. The potential for, and significance of, a socio-economic effect on these Social Infrastructure and Services is determined based on the relationship of new demand to the existing capacity, measured as appropriate

at the community or regional scale. It is anticipated that, where new demand will exceed the existing supply or capacity, government and the private sector, as appropriate, will respond through the provision of additional infrastructure and services.

Indirect effects on health services are related to personal choices about income consumption, as well as personal health practices and coping skills. These issues are addressed below under item # 3 with regard to significance determination.

2. *Inability to increase limited government funding for existing social infrastructures*: the effects analysis reasonably assumed that Government will continue to provide health and social services support to the region to meet current demands and to address any increases in demand for services in the future. Included amongst the 2007 *Northern Strategic Plan for Labrador* (Government of Newfoundland and Labrador 2007), for example, is a commitment to $8.3 million over the next five years to enhance social work staffing and a family resource coordinator position to improve family resource planning in the region. In an April 2008 Health and Community Services news release, the Province committed to invest approximately $8 million in the purchase of a new air ambulance to increase service capacity to those regions and patients who cannot be transported by commercial airline or by road ambulance. The Labrador Innu Comprehensive Healing Strategy has also made many positive steps toward improving health within the two communities. However, a 2006 review of the strategy noted that additional commitment and collaboration is required by the communities and by the federal/provincial governments. Nalcor Energy (Nalcor) will provide support to Government and Innu Nation's health and social services planning and delivery through the provision of Project-related data, if requested.

3. The remaining three issues:

   - *current social resilience at a critical stage*;
   - *increased vulnerability to health and well being*; and
   - *effects of an increase in disposable income on substance abuse, crime and family dysfunction;*

   were considered as factors largely related to the 'personal health practices and coping skills' determinant of Community Health. Many of these social issues are already pressing issues in the region, and a change in these conditions due to Project actions depend on social responses, individual practices and coping skills, and the availability of social support networks. The threshold of a significant adverse residual effect on Community Health is when the effects of the Project lead to a deterioration of the determinant (in this case, personal health practices and coping skills), on an ongoing and consistent basis. The three issues raised above were considered under the umbrella of the health determinants frameworks when determining significance. Project employment, for example, is discussed in Volume III, Section 3.6 of the EIS. Those who are employed by the Project will have additional money to spend, which can have both positive and adverse effects on Community Health. The significance of such effects were considered in light of the proposed effects management measures, such as an Employee Assistance Program (EAP), and similar actions to help Project employment create a positive effect on health and well-being for those who choose to make it so. Where feasible, flexible work schedules will be available to provide opportunities for workers to optimize other values (e.g. family, culture) important to them outside the workplace. As discussed in Section 4.7.5.1, Volume III of the EIS, there is a potential for Project employment to generate a substantial positive socio-economic effect on the personal health and well-being of the residents of Sheshatshiu. For example, increased employment will lead to increased income, which could result in increased spending on traditional hunting and fishing

activities. However, as discussed above, depending on the manner in which this increased income is spent, there may be increased incidence of alcohol and substance abuse and increased demand for services such as health care, counseling, and protection services. Alcohol and substance abuse are existing problems within the Upper Lake Melville area, and in particular amongst the Innu of Sheshatshiu. As discussed above, a workplace Employee Assistance Program will be available to all Project employees to support healthy lifestyles and decisions. Nalcor will work with Innu Nation to implement measures and policies to support the traditions and interests of Labrador Innu. In addition, the Impact and Benefits Agreement now under negotiation with Innu Nation could provide resources that will support Innu Nation in working with government authorities to address any increases in demands on social and community services.

References:

Aura Environmental Research and Consulting Ltd. 2008. Community Health Study. Prepared for Nalcor Energy.

Government of Newfoundland and Labrador. 2007. The Future of Our Land. A Future for Our Children: A Northern Strategy for Labrador. Government of Newfoundland and Labrador. St. Johns, NL.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.140**

Information Requested:

The Proponent is asked to:

b. To the extent that they are applicable, discuss how these issues may have influenced significance determination for all other Aboriginal groups.

Response:

The issues identified above were considered in the determination of significance for all potentially affected communities and regions. A geographic approach was adopted in the Community Health study (Aura, 2008), focusing on communities and the conditions of health determinants within those communities, regardless of Aboriginal or non-Aboriginal status. For example, the health of Aboriginal populations residing in Labrador City or in any other community was not the focus of attention; rather, the focus of the baseline characterization and hence the effects analysis and significance determination was on the community as a whole and its health status in terms of each of the various health determinants. As such, the same determinants and parameters were considered across all populations, and used in significance determination at the community level. Specific issues and trends in Community Health determinants were identified for the community of Sheshatshiu only where they differ significantly from other communities or regions in the Study Area. The effects management measures as outlined in Table 8-1, Volume III of the EIS, for example, address potential adverse socio-economic effects on the Aboriginal and non-Aboriginal populations. These effects management measures would be applicable to other Aboriginal groups, and include adaptive management as the Project proceeds (please refer to IR# JRP.112). There is no likely distinction in significance determination associated with these issues among other Aboriginal groups.

Reference:

Aura Environmental Research and Consulting Ltd. 2008. Community Health Study. Prepared for Nalcor Energy

IR# JRP.141

Fish Consumption Advisory Levels

Requesting Organization – Joint Review Panel **Information Request No.: JRP.141**

Subject - Fish Consumption Advisory Levels

References:

Minaskuat Inc. 2008. Calculations of Anticipated Consumption Advisory Levels of Fish in the Lower Churchill Area. Prepared for the Lower Churchill Hydroelectric Generation Project

Minaskuat Inc. 2009. Lower Churchill River Fish Consumption and Angling Survey. Report prepared for the Lower Churchill Hydroelectric Generation Project

Related Comments / Information Requests:

CEAR # 217 (Nunatsiavut Government)
IR # JRP.73

Rationale:

According to Minaskuat Inc. (2008), meal size values used for calculating Anticipated Daily Consumption (DACmax) and recommended Monthly Meal Consumption (CAmm) advisories aimed at Aboriginal peoples were obtained from Inuit and Amerindian community surveys' results found in literature. While the Proponent acknowledges that, in the absence of site-specific data, conservative values from the literature were used for the purpose of the environmental assessment, the study does offer any explanation as to why it did not obtain local consumption data.

In addition, fish consumption patterns and angling practices used to calculate DACmax and CAmm values were obtained by conducting a random telephone survey with residents of Happy Valley-Goose Bay, Mud Lake, Northwest River and Churchill Falls. Although 27.5 percent of the survey's respondents reported being Nunatsiavut beneficiaries (Minaskuat, 2009, p. 5-11), the EIS does not specifically characterize Inuit communal fishing patterns, especially in the Lake Melville area, for the purpose of establishing consumption advisories levels.

JRP.73 asked the Proponent detailed information on existing recreational, commercial and Aboriginal fisheries in Lake Melville.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.141**

Information Requested:

The Proponent is asked to:

a. **Justify why it did not obtain local consumption data when calculating Anticipated Daily Consumption levels and recommended Monthly Meal Consumption advisories; and**

Response:

Information regarding the average maximum number of fish meals per week was obtained during a fish consumption and angling telephone survey with central Labrador residents. Due to constraints with obtaining standardized information regarding sizes of meals from a telephone survey, and in the absence of community specific meal size data in published literature, meal sizes were taken as the maximum value published by Health Canada (2004) for either the general Canadian population or Canadian Aboriginal populations. Conservative values from the literature were used for the purpose of the environmental assessment.

Reference:

Health Canada. 2004. Mercury and Human Health. Catalogue # 0-662-38218-8. Minister of Health, Health Canada. Ottawa, ON.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.141**

Information Requested:

The Proponent is asked to:

b. Explain the extent to which Inuit communal fishing was considered in the Proponent's characterization of current fishing patterns within the Assessment Area and in Lake Melville for the purpose of defining fish consumption advisory levels.

Response:

Fishing patterns are not required parameters for calculating fish consumption advisories, and therefore a characterization of Inuit communal fishing patterns was not required for the purpose of defining fish consumption advisory levels.

IR# JRP.142

Effects of Project-Related Employment on Traditional Activities

Requesting Organization – Joint Review Panel **Information Request No.: JRP.142**

Subject - Effects of Project-Related Employment on Traditional Activities

References:

EIS, Volume III, Section 5.2 (Existing Knowledge – Land and Resource Use) and Section 5.5.5 (Environmental Effects Analysis and Effects Management – Land and Resource Use)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.82)

Rationale:

The EIS briefly presents a few case studies from the literature that examines the "complex relationship between employment and subsistence or traditional harvesting activities" (Volume III, p. 5-5). On the basis of this existing knowledge, the EIS claims that positive impacts would result from Project-related employment because it would provide financial resources that may support hunting and/or fishing traditional activities during off hours.

In addition, the Proponent argues that "a rotational schedule provides greater flexibility than a job with standard hours" (for the pursuit of traditional activities) and that those flexible work hours would be more "likely to accommodate leave for harvesting or other purposes" (Volume III, p. 5-12).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.142**

Information Requested:

The Proponent is asked to:

a. **Further explain how case studies found in literature and referenced in the EIS support its predictions that increased income would support traditional activities, in part by promoting the purchase of equipment for the pursuit of traditional activities. In doing so, the Proponent should highlight how the chosen case studies compare or contrast with conditions in Labrador; and**

Response:

Many case studies (Kleinfeld et al. 1983; Mackey and Orr 1987; Wolfe and Walker 1987; Glass et al. 1990; Kruse 1991; Wolfe 1991; Condon et al. 1995; Williamson 1997; Duhaime et al. 2002; Usher et al. 2003; Myers et al. 2004) argue that access to income is an important factor for successful levels of harvesting for Aboriginal peoples in the Canadian North and Alaska.

Kruse (1982, as cited in Dinero 2003) found a correlation between increased income and an increase in harvesting activities. Wolfe and Walker (1987) note that income enables households to afford to and continue harvesting. Glass et al. (1990), Wolfe (1991), Condon et al. (1995), Williamson (1997), Duhaime et al. (2002), Usher et al. (2003) and Myers et al. (2004) all note that income supports the continuation of harvesting activities specifically through the purchasing of harvesting equipment.

Condon et al. (1995) found in their study of Inuit in the Northwest Territories that the effectiveness of the subsistence activities of households with access to income to invest in harvesting equipment increased. Duhaime et al. (2002) demonstrated that income, which is the means to purchase harvesting equipment, affects positively the level of harvesting activities in Inuit communities in northern Québec: increased income leads to a higher proportion of country food consumed.

Usher et al. (2003) report that "(t)he successful harvesting household is often also the successful wage-earning household, as this cash income is used for purchasing harvesting equipment ..." Natcher (2008) observes that northern Aboriginal households with the most access to income, and thus the means to purchase the necessary harvesting equipment, more often produce, consume and distribute country foods than those with limited or no access to income opportunities.

Mackey and Orr (1987) found in their study conducted in Makkovik that "(t)he households that produced the highest volumes of country food during the study year (1980-1981) ... were those headed by (persons) with full-time employment."

Williamson (1997) noted that residents of Nain who were employed were the ones who could afford to buy the necessary equipment to travel to the country for harvesting activities.

In 2008, community members in Salluit and Kangiqsujuaq, northern Quebec, received increased income pursuant to the Raglan Impacts and Benefits Agreement. According to Nunatsiaq News (George, 2009), "Some said Raglan profit-sharing money was a good thing because it paid to buy equipment for traditional activities".

The study team believes that the preceding case studies are applicable to Labrador because:

- harvesting today is an expensive activity that requires equipment, supplies and travel;
- in other areas of Canada and Alaska where harvesting is important to the Aboriginal population, those persons with more money use some of that money to facilitate harvesting;
- there is evidence from Nain and Makkovik of a link between employment and income and increased harvesting; and
- if Aboriginal persons in Labrador increase their income through Project-related employment and contracting, they are likely to spend some of that money on harvesting.

References:

Condon, R.G., P. Collings and G. Wenzel. 1995. The Best Part of Life: Subsistence Hunting, Ethnicity, and Economic Adaptation among Young Adult Inuit Males. Arctic 48(1): 31-46.

Dinero, S.C. 2003. Analysis of a "Mixed Economy" in an Alaskan Native Settlement: the Case of Arctic Village. The Canadian Journal of Native Studies 23(1): 135-164.

Duhaime, G., M. Chabot and M. Gaudreault. 2002. Food Consumption Patterns and Socioeconomic Factors among the Inuit of Nunavik. Ecology of Food and Nutrition 41: 91-118.

George, J. 2009. Payout hit by plummeting commodity price. Makivik nickel share dwindles to $6.8 million. Nunatsiaq News Online. June 18, 2009. Available at http://www.nunatsiaqonline.ca/stories/article_print/ 7170/. Accessed 11 August, 2009.

Glass, R., R. M. Muth and R. Flewelling. 1990. Subsistence as a Component of the Mixed Economic Base in a Modernizing Community. United States Department of Agriculture, Forest Service. Research Paper NE-638. May, 1990. Northeastern Forest Experiment Station, Pennsylvania.

Kleinfeld, J., J. Kruse and R. Travis. 1983. Inupiat Participation in the Wage Economy: Effects of Culturally Adapted Jobs. Arctic Anthropology 20(1): 1-21.

Kruse, J.A. 1982. Subsistence and the North Slope Inupiat: The Effects of Energy Development. Man in the Arctic Program. Monograph No. 4. Anchorage: Institute for Social and Economic Research, University of Alaska.

Kruse, J.A. 1991. Alaska Inupiat Subsistence and Wage Employment Patterns: Understanding Individual Choice. Human Organization 50(4): 317-326.

Mackey, M.G.A. and R.D. Orr. 1987. An Evaluation of Household Country Food Use in Makkovik, Labrador, July 1980-June 1981. Arctic 40(1): 60-65.

Myers, H., S. Powell and G. Duhaime. 2004. Setting the Table for Food Security: Policy Impacts in Nunavut. The Canadian Journal of Native Studies 24(2): 425-445.

Natcher, D. 2008. The Social Economy of Canada's Aboriginal North. Submitted to the Northern Research Forum, 24-27 September, 2008, Anchorage, Alaska.

Usher, P., G. Duhaime and E. Searles. 2003. The Household as an Economic Unit in Arctic Aboriginal Communities, and its Measurement by Means of a Comprehensive Survey. Social Indicators Research 61: 175-202.

Williamson, T. 1997. From Sina to Sikujâluk: Our Footprint, Mapping Inuit Environmental Knowledge in the Nain District of Northern Labrador. Prepared for the Labrador Inuit Association.

Wolfe, R. J. 1991. Trapping in Alaska Communities with Mixed, Subsistence-Cash Economies. Division of Subsistence, Alaska Department of Fish and Game. Technical Paper No. 217. Juneau, Alaska.

Wolfe, R.J. and R.J. Walker. 1987. Subsistence economies in Alaska: productivity, geography, and development impacts. Arctic Anthropology 24: 56-81.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.142**

Information Requested:

The Proponent is asked to:

b. Provide evidence showing how rotation work schedules may impact on the occurrence, frequency and duration of traditional activities.

Response:

Hobart (1980) found that, among the Coppermine Inuit, seasonal rotational employment did not have negative effects on trapping, seal- or caribou-hunting or fishing. In fact, there was an increase in trapping activity over the five-year study.

Hobart (1982) conducted a 20-year study on the impacts of various work schedules on the harvesting practices of First Nations and Inuit across Canada. He found that "those with rotation employment have both the money for equipment and the leisure during their time at home to hunt relatively frequently . . . (and) are better able to develop a satisfying integration of traditional interests and activities with their industrial employment than any other category of industrial workers."

Kleinfeld et al. (1983) found that rotational employment and other culturally adapted jobs provided more opportunities for harvesting activities than other forms of wage employment.

The Baffin Region Inuit Association (1980, as cited in Hobart, 1982) conducted a study on year-round rotational employment, which found that being employed reduced the duration of trips to hunting and fishing camps, but that few families stopped travelling to those camps.

Mackey and Orr (1987) noted that, in Makkovik, "(f)ully employed householders could accumulate the same volume of country food as fishermen, whose cash income is earned mainly in the summer months by having jobs with flexible working hours (e.g., shift work) or that allow extra time off for critical harvesting periods (e.g., in spring for caribou hunts) and by making efficient use of their spare time."

The Tongamiut Inuit Annait (an organization of Inuit women in Labrador) responded to the Voisey's Bay Nickel Mine Environmental Impact Statement:

> *". . . [the] women expressed concerns that the two-week in/two-week out work schedule will possibly lead to less hunting. . . Given people's seasonal land and sea-based activities, full-time work may seriously disrupt the lifestyle and economies of families and communities. These disruptions must be carefully weighted against the benefits of an increase in income, especially when it means losing a family member to the mine two weeks of every four"* (as cited in Archibald and Crnkovich, 1999).

North Slave Métis Alliance note that employed persons might be able to harvest the same amount of country foods, but could miss specific hunts because their rotation schedule might not be timed right or that the employed persons would not spend the same amount of time in the country because they would harvest in just a day or a weekend and would miss out on the campfires and story telling traditions of the elders (Stevenson et al., 1999). In Lutselk'e, Northwest Territories, 71 percent of the spouses of rotationally employed persons at the diamond mines said that they now spend less time on the land (ibid).

The additional information provided through this literature review is consistent with the information provided in the EIS in that rotational work schedules are compatible with maintaining the practice of traditional activities.

References:

Archibald, Linda and Mary Crnkovich. 1999. If Gender Mattered: A Case Study of Inuit Women, Land Claims and the Voisey's Bay Nickel Project. Status of Women Canada's Policy Research Fund, Ottawa, Ontario.

Hobart, Charles. 1980. Rotational Employment of Coppermine Inui Men: Effects and Community Perspectives. Hobart, Walsh and Associate Consultants Ltd. Indian and Northern Affairs Environmental-Social Program, Northern Pipelines, Ottawa, Ontario.

Hobart, Charles. 1982. Industrial Employment of Rural Indigenes: The Case of Canada. Human Organization 41(1): 54-63.

Kleinfeld, Judith, Jack Kruse and Robert Travis. 1983. Inupiat Participation in the Wage Economy: Effects of Culturally Adapted Jobs. Arctic Anthropology 20(1): 1-21.

Mackey, M.G. Alton and R. D. Orr. 1987. An evaluation of household country food use in Makkovik, Labrador, July 1980–June 1981. Arctic 40(1): 60-65.

Stevenson, Marc G., J. Michael Thoms, Jennifer Bellman and Caroline MacKay. 1999. Can't Live Without Work: North Slave Métis Alliance Environmental, Social, Economic and Cultural Concerns: A Companion to the Comprehensive Study Report on the Diavik Diamonds Project, North Slave Métis Alliance.

IR# JRP.143

Existing Knowledge – Effects of Change to Land Access on Hunting, Fishing and Trapping

Requesting Organization – Joint Review Panel **Information Request No.: JRP.143**

Subject - Existing Knowledge – Effects of Change to Land Access on Hunting, Fishing and Trapping

References:

EIS, Volume III, Section 5.2 (Land and Resource Use – Existing Knowledge)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.54)

Rationale:

In its review of existing knowledge of effects of major natural resource projects on land and resource use, the Proponent mentions that hydroelectric developments can lead to change in physical configuration of the landscape, in turn inhibiting or increasing land access.

For example, in its submission to the Panel, Innu Nation stated that past hydroelectric projects in Quebec and Labrador have made possible the year-round use of lands (including lakes) that were previously accessible only at specific times of the year or after lengthy portage or overland travel and have therefore transformed the nature of hunting, fishing and trapping.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.143**

Information Requested:

The Proponent is asked to discuss in greater detail the transformative changes to Aboriginal hunting, trapping and fishing patterns that could result from changes to land access. In doing so, the Proponent should draw on the existing literature discussing the experience of Aboriginal people in Québec and Labrador with comparable hydroelectric developments.

Response:

The relevant transformative changes to Aboriginal hunting, trapping and fishing patterns reported in the literature for Aboriginal groups in Quebec and Labrador are summarized below. Given that there are some common features (e.g., roads and flooding) between the Project and other hydroelectric projects in Quebec, it seems reasonable that some or all of the effects reported for Quebec may also occur in the case of the Lower Churchill Hydroelectric Generation Project.

It should be noted that the lower Churchill River is currently accessible at Churchill Falls, at Gull Island, upstream of Muskrat Falls, and at Black Rock Bridge (downstream of Muskrat Falls). The general area is also accessible by the existing transmission line right-of-way from Churchill Falls to Happy Valley-Goose Bay, by Phase I of the Trans Labrador Highway, and by snowmobile trails.

Quebec

Berkes (1988) describes various land access issues that the Cree have had with the James Bay Hydroelectric Project through the years: loss of hunting and trapping and other harvesting areas due to flooding and new infrastructure; difficulty in maintaining traditional harvesting 'law and order' in areas made accessible by the new road networks; and difficulty in accessing certain traditional harvesting grounds.

Rosenberg et al. (1995) describe encroachment from outsiders being facilitated by new road networks and the associated disruption to traditional systems and to the abundance and distribution of fish and wildlife. Rosenberg et al. (1997) note that "(i)ncreased discharge, unstable ice conditions, or debris resulting from shoreline erosion make access to resources difficult or impossible in many areas affected by hydroelectric development (ibid)". The Ekuanitshit Innu Council and the Corporation Nishipiminan both expressed concern that increased traffic along new access routes could adversely affect traditional hunting and fishing in the Romaine River Hydroelectric Complex Development Project area (BAPE 2009).

Guertin et al. (1993) note that, within the La Grande Rivière Hydroelectric Complex, various measures were implemented to facilitate access to harvesting areas. They included construction of access roads, docking areas and snowmobile trails and the use of the reservoirs for reaching trapping areas. Hayeur (2001) notes that "the construction and operation of the La Grande complex considerably disrupted the resource harvesting methods used by the Cree people. However, the road network, remedial measures and the many mitigation and enhancement measures carried out lessened the project's impact on resources harvested and facilitated access to those resources significantly".

Fletcher et al. (1997) note that a major issue in the environmental impact assessment of the proposed Great Whale River hydroelectric project was the potential impact of constructing a new access road to Kuujjuarapik/Whapmagoostui, northern Quebec (this project was not constructed).

Referring to La Grande Rivière Hydroelectric Complex, Fletcher et al. (1997) state that "(t)he question of the road network is one of the more ambiguous changes felt by the Inuit. The increased access to the territory is beneficial for hunters and people who have vehicles, decreases costs and permits quicker access to some hunting areas. On the other hand, it places Inuit hunters in competition with non-natives for resources on the same road network . . ." (ibid).

Labrador

Published sources of empirical data on transformative changes to Aboriginal hunting, trapping and fishing patterns resulting from changes to land access due to hydroelectric development in Labrador are rare.

Paradine et al. (1980) note various land use issues that were raised by the Innu community during the review process of the initial proposal to develop the lower Churchill River for hydroelectric generation. These were flooding of traplines and habitat of caribou and moose, and increased pressure on hunting areas near the proposed transmission lines.

According to Rich (as cited in Froschauer 1999), many of the Innu traditional hunting lands were flooded for the Upper Churchill Hydroelectric Project. She states, "Our people lost . . . territory and possessions when Mishikamau and Mishikamas were flooded to create the Smallwood Reservoir." The area to be flooded by this Project is much less than that flooded for the Upper Churchill project.

Wadden (1991) describes various accounts from Innu community members of losses of hunting equipment and supplies from the flooding of Mishikamau and Mishikamas for the Upper Churchill Hydroelectric Project. She refers to hydroelectric projects scattered throughout Nitassinan (Quebec and Labrador) and states that "access roads built by the hydro companies have made it easier for non-natives to trap and fish, so that the Innu now compete for reduced resources".

According to Duxbury and Moghal (1999), most of the reports on the effects of the Upper Churchill Hydroelectric Project on the Innu communities are anecdotal, but that the Innu claim in general that "their lands and traditional way of life, in terms of hunting and fishing, were affected".

References:

Berkes, F. 1988. The Intrinsic Difficulty of Predicting Impacts: Lessons from the James Bay Hydro Project. Environmental Impact Assessment Review 8: 201-220.

BAPE (Bureau d'audiences publiques sur l'environnement). 2009. Romaine River Hydroelectric Complex Development Project: Investigation and Public Hearing Report 256. February 2009. Canadian Environmental Assessment Agency, QC.

Duxbury, P. and Z. Moghal. 1999. An Examination of Environmental Studies Carried out by Companies Involved in the Construction of Hydroelectric Dams in Canada, during the 1960s and early 1970s. April 30, 1999. Paul F. Wilkinson & Associates, Montréal, QC.

Fletcher, C., B. Elias, J. O'Neil and A. Yassi. 1997. Health Risk Perception and Hydro-Electric Development in Kuujjuarapik, Quebec. Final Report. Northern Health Research Unit, University of Manitoba.

Froschauer, K.. 1999. White Gold: Hydroelectric Development in Canada. University of British Columbia Press, Vancouver, BC.

Guertin, G., C. Demers and M. Pérusse. 1993. La Grande Rivière: 'In accord with its environment,' a case study. International Journal of Water Resources Development 9(4): 387-409.

Hayeur, G. 2001. Summary of Knowledge Acquired in Northern Environments from 1970 to 2000. Montréal: Hydro-Québec.

Paradine, P., I. Baird, G. Beanlands, A. Ducharme, F. Pollett and M. Warnes. 1980. Lower Churchill Hydroelectric Project: Report of the Environmental Assessment Panel: 15. Federal Environmental Assessment Review Office, Hull, QC.

Rosenberg, D.M., R.A. Bodaly and P.J. Usher. 1995. Environmental and social impacts of large scale hydroelectric development: who is listening? Global Environmental Change 5(2): 127-148.

Rosenberg, D.M., F. Berkes, R.A. Bodaly, R.E. Hecky, C.A. Kelly and J.W.M. Rudd. 1997. Large-scale imp acts of hydroelectric development. Environmental Review 5: 27-54.

Wadden, M. 1991. Nitassinan: The Innu Struggle to Reclaim Their Homeland. Douglas & McIntyre Ltd., Vancouver, BC.

IR# JRP.144

Archaeology Studies

Requesting Organization – Joint Review Panel **Information Request No.: JRP.144**

Subject - Archaeology Studies

References:

EIS Volume III, Section 2.9.4 (Existing Environment - Historic and Archaeological Resources)

Related Comments / Information Requests:

CEAR # 216 (Labrador Metis Nation)

Rationale:

The EIS indicates that "(t)o date, 46 archaeological sites have been identified in the Assessment Area, including 26 sites with pre-contact components, six historic tilts (i.e., makeshift trapper's cabins), 14 historic campsites and other indeterminate historic occupations, and two nineteenth century Hudson's Bay Company trading posts" (Volume III, p. 2-87 & 2-88).

In its submission to the Panel, Labrador Metis Nation stated that "(t)raditionally, it has been the Labrador Metis Nation who has used the lower Churchill River as its primary hunting and trapping locations" (p. 15). According to the submission, Labrador Metis Nation was not consulted or given access to the recovered artifacts in order to assist the Proponent in determining authenticity and origin.

Requesting Organization – Joint Review Panel **Information Request No.: JRP.144**

Information Requested:

The Proponent is asked to discuss how involving only Innu Nation in its archaeological surveys and studies may have affected the completeness and results of the environmental assessment. In its response, the Proponent should consider Labrador Metis Nation's assertion that Metis people have been, traditionally, the main users of the lower Churchill River area.

Response:

The design and implementation of the archaeological surveys and studies, and the background and experience of the Study Team as a whole, resulted in a comprehensive study and interpretation of the archaeological data recovered for the entire Assessment Area. This also resulted in a comprehensive environmental assessment and identification of appropriate mitigation measures.

Labrador Metis (typically referred to in pre-1980s archaeological and ethnographic literature as "Settlers") were among the key users of the Assessment Area during the Historic (ca. AD 1500 to ca. AD 1960) and Contemporary Periods (post-1960). This use, even though now much reduced in nature and extent, does continue in the Churchill River valley, including the lower Churchill River valley.

Historic and Archaeological Resources (HAR) studies related to the Project were conducted between 1998 and 2000 and in 2006 (IEDE/Jacques Whitford 2000; Jacques Whitford/IELP 2001a, 2001b, 2001c, 2001d; Minaskuat Inc. 2008). In accordance with provincial guidelines (Government of Newfoundland and Labrador 1992), the primary objective of the research was to locate, identify and interpret HAR within the Assessment Area, with no bias directed toward any particular time-period, type of remains, or culture represented, in order to reduce the likelihood of Project interactions with any sites or materials present.

HAR include sites, objects (such as stone tools), and structural remains pre-dating 1960 that show evidence of manufacture, alteration or use by humans. Also included are burial and other heritage sites and materials dating to the Pre-contact and Historic Periods as well as cultural and/or spiritual sites or places. The Pre-contact Period is defined as the time prior to the arrival of Europeans in North America and contact with Aboriginal people ca. AD 1500.

Under current regulatory policy for Labrador, all material evidence of contemporary land use (defined as land use occurring after 1960) is recorded, inventoried and assigned ethnographic registration numbers. Contemporary sites can include, for example, evidence of campsites or tilts, or remains suggestive of hunting, fishing or trapping locations. If distinct cultural indicators are present, such as the method of setting a tent or the type of trap used for a certain species, this information is recorded by the study team, and in some cases, allows a determination of cultural affiliation to be made. A detailed recording of contemporary sites and materials has value in that such data may serve as proxy indicators of archaeological potential and help broaden the picture of land-use patterns and activities across a landscape. Though recorded by provincial regulators, contemporary sites are not normally subject to the same mitigation measures as those required for HAR.

As part of the Project HAR studies, background research of documentary information, published and unpublished archaeological reports, aerial photograph and Project mapping analysis, and informant interviewing with Innu and other residents of Labrador, including Metis persons, was undertaken to direct and target the field research effort in order to identify and sample specific land use areas for any sites or materials present.

Also, a training program in archaeological field techniques and site and artifact recognition and interpretation, was developed and delivered to Field Research Assistants prior to implementation of field studies. Aspects of the training focused on:

- an overview of the land use and occupancy of Labrador by various cultures during the Pre-contact, Historic and Contemporary Periods;
- the overall purpose and regulatory requirements of the HAR study;
- basic field methods and techniques required for the field program;
- identification of the types of locations (such as raised terraces, river-mouths, and shorelines) where camping, hunting, fishing, trapping and other land use activities from the various periods of occupation may have occurred;
- identification and classification of archaeological and ethnographic materials, sites and structures (such as stone, metal and ceramic objects, refuse deposits, and camp and tilt remains);
- preparation of field and other records;
- individual aptitudes and attitudes (e.g., observation, working as a team member); and
- the value and significance of HAR identification, preservation and interpretation.

With the broad-based training described above, combined with on-going instruction from Team Leads (i.e. trained Archaeologist) and the practical experience obtained during field studies, the Field Research Assistants had a good understanding of how to recognize areas of HAR potential in order to identify sites and artifacts (whether pre-contact or historic, or contemporary Settler or Innu). In total, 46 archaeological sites were recorded within the Assessment Area, and Nalcor Energy (Nalcor) is confident that the study design and implementation, and the background and experience of the study team as a whole, led to a comprehensive HAR study for the Assessment Area and interpretation of the data recovered, in the environmental effects analysis, and the selected mitigation measures.

In reference to the submission of Labrador Metis Nation (LMN) to the Joint Review Panel regarding the provision of access to recovered artifacts, LMN has not requested that Nalcor provide access to archaeological artifacts and such access has not been denied to LMN or any other Aboriginal group by the study team. According to the *Historic Resources Act*, RSNL 1990, C. H-4, the underlying property in all historic resources resides in the Crown and such historic resources are held in the legal custody of the Minister of Tourism, Culture and Recreation. Nalcor is not in possession of any artifacts and the determination of access to such artifacts is beyond the authority of Nalcor.

References:

Government of Newfoundland and Labrador. 1992. Historic Resources Assessment and Impact Management Summary. Copy on file at the Provincial Archaeology Office, St. John's, NL.

IEDE/Jacques Whitford (IED Enterprises in partnership with Jacques Whitford Environment Limited). 2000. Churchill River Power Project 1998 Environmental Studies-Historic Resources Overview Assessment, Labrador Component. (LHP 98-17). Final Report submitted to Labrador Hydro Project, St. John's, NL. Copy on file at the Provincial Archaeology Office, Confederation Building, St. John's, NL.

Jacques Whitford/IELP (Jacques Whitford Environment Limited and Innu Environmental Limited Partnership). 2001a. Labrador Hydro Project 1999 Environmental Studies-Historic Resources (Labrador Study) (LHP 99-17). Report submitted to Newfoundland and Labrador Hydro, St. John's, NL. Copy on file at the Provincial Archaeology Office, Confederation Building, St. John's, NL

Jacques Whitford/IELP (Jacques Whitford Environment Limited and Innu Environmental Limited Partnership). 2001b. Labrador Hydro Project 2000 Studies-Historic Resources Field Program (LHP 00-17). Report submitted to Newfoundland and Labrador Hydro, St. John's, NL. Copy on file at the Provincial Archaeology Office, Confederation Building, St. John's, NL.

Jacques Whitford/IELP (Jacques Whitford Environment Limited and Innu Environmental Limited Partnership). 2001c. Labrador Hydro Project 2000 Studies-Historic Resources Potential Mapping (LHP 00-17). Report submitted to Newfoundland and Labrador Hydro, St. John's, NL. Copy on file at the Provincial Archaeology Office, Confederation Building, St. John's, NL.

Jacques Whitford/IELP (Jacques Whitford Environment Limited and Innu Environmental Limited Partnership). 2001d. Labrador Hydro Project Churchill River Power Project Historic Resources Overview Assessment 1998-2000, Volume 1: Interpretive Summary and Recommendations (LHP 00-17C). Report submitted to Newfoundland and Labrador Hydro, St. John's, NL. Copy on file at the Provincial Archaeology Office, Confederation Building, St. John's, NL.

Minaskuat Inc. 2008. 2006 Historic Resources Overview and Impact Assessment of Muskrat Falls Generating Facility and Reservoir and Muskrat Falls to Gull Island Transmission Line Corridor (LCP 535865/866). Lower Churchill Hydroelectric Generation Project Environmental Baseline Report. Report prepared for the Lower Churchill Hydroelectric Generation Project.

IR# JRP.145

Accidents and Malfunctions

Requesting Organization – Joint Review Panel **Information Request No.: JRP.145**

Subject - Accidents and Malfunctions

References:

EIS Guidelines, Section 4.5.2 (Accidents and Malfunctions)

Related Comments / Information Requests:

CEAR # 214 (Innu Nation – IN.16 and IN.17)

Rationale:

The EIS Guidelines state that the Proponent will identify and describe the potential accidents and malfunctions related to the Project, including an explanation of how those events were identified, potential consequences (including the potential environmental effects), the worst case scenarios and the effects of these scenarios.

In its submission to the Panel, Innu Nation described the events that led to and followed a fire within the Churchill Falls' generating station in September 1999 (p. 34-36).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.145**

Information Requested:

The Proponent is asked to:

a. **Consider the communities of Northwest River and Sheshatshiu when responding to JRP.96 which asks the Proponent to evaluate and describe the risks and impacts of a dam failure, as well as the mitigation measures proposed to reduce the effects and consequences of such a failure, on the communities of Happy Valley-Goose Bay and Mud Lake;**

Response:

The communities of North West River and Sheshatshiu have been considered in the response to IR# JRP.96(f).

Requesting Organization – Joint Review Panel **Information Request No.: JRP.145**

Information Requested:

The Proponent is asked to:

b. To discuss the environmental effects of all potential accidents and malfunctions identified in Volume IA, Section 4.11, including potential accidents and malfunctions related to waste management and spill of hazardous materials (including oil in transport or transfer) and fires other than forest fires (fire in a plastic recycling area for example). For all potential accidents and malfunctions, the Proponent should indicate how it would reduce the effects or consequences, should they occur;

Response:

A discussion of the environmental effects of all potential accidents and malfunctions identified in Volume IA, Section 4.11, including potential accidents and malfunctions related to waste management and spill of hazardous materials (including oil in transport or transfer) and fires other than forest fires (fire in a plastic recycling area for example) is provided in Table 1. For all potential accidents and malfunctions identified in Volume IA, Section 4.11, an indication is provided of how the effects or consequences would be reduced, should they occur.

Table 1 Environmental Effects Summary for Accidents and Malfunctions

	Accidents Related to Waste Management and Disposal (i.e., accidental release of release of solid or liquid waste).	Hazardous Material Spill	Dam Failure	Forest Fire	Fires Other than Forest Fires (i.e. recycling)
Valued Environmental Component					
Atmospheric (Air Quality)	Local odours and perhaps dust or debris could be associated with such an event. Not significant adverse effect.	Local odors and perhaps other vapors associated with such events. Not significant adverse effect	Dust, water and other vapour associated with this event. Not significant adverse effect	Various air quality contaminants associated with combustion with local exceedances and perhaps further depending on conditions. Significant adverse effect	Not significant adverse effect as scenarios consistent with scale of forest fire not expected.
Aquatic	Release of waste material (e.g. domestic garbage) may result in the unsightly appearance of garbage in the aquatic environment but adverse effects are predicted to be minimal. Not significant adverse effect. Discharge of untreated sewage may result in the input of nutrient rich water into the aquatic environment but adverse effects would be minimal as the volume and duration would be minimal relative to river discharge. Not significant adverse effect.	Primarily restricted to fuels, oils and grease used by on site equipment. A spill may result in the discharge of fuel or lubricants into the aquatic environment resulting in reduced water quality. Depending on the size of the spill and location this could cause effects on fish health and/or mortality. Not significant, adverse effect.	Failure of either dam may result in the disruption of the aquatic habitat downstream of the reservoir, or within the reservoir where the dam has failed. The sudden rush of water may result in the scouring of downstream habitat and removal of instream cover. Within the reservoir a sudden drop in water levels due to dam failure will result in the loss of aquatic habitat through dewatering. While revegetation of shorelines would occur and aquatic habitat would recover the timeline would be longterm. Significant adverse effect.	Alteration of habitat through the release of nutrients into the aquatic environment after the fire may increase productivity of previously lower productive areas. Loss of riparian cover and associated effects would occur (e.g., water temperatures may increase in burned areas). While revegetation of shorelines would occur, the timeline would be longterm. Depending on the quantity of riparian habitat lost there could be a significant adverse effect.	May result in the release deleterious residual by-products into the aquatic environment. Not significant adverse effect.
Terrestrial	Not significant, adverse effect could occur particularly if untreated sewage introduced into areas used by waterfowl or other aquatic wildlife. Discharge of untreated sewage, and increase of nutrient rich water could change foraging patterns (both attracting and displacing certain species).	Not significant, adverse effect could occur particularly if hydrocarbons introduced into areas used by waterfowl or other aquatic wildlife. This could lead to fouling of feathers or fur, ingestion of contaminants and possibly effects on health and potentially mortality depending on the exposure.	Loss and alteration of at least riparian habitat, possibility of mortality for some individuals and lowered productivity. Not significant adverse effect	Alteration of habitat will change distribution, consistent with patterns around natural events, some mortality expected. Not significant adverse effect	Some alteration of habitat will change distribution, consistent with patterns around natural events, some mortality is possible. Not significant adverse effect

	Accidents Related to Waste Management and Disposal (i.e., accidental release of release of solid or liquid waste).	Hazardous Material Spill	Dam Failure	Forest Fire	Fires Other than Forest Fires (i.e. recycling)
Economy, Employment and Business	Not Applicable	Not Applicable	Potential significant adverse effect resulting from potential disruption to downstream infrastructure and loss of revenues resulting from these disruptions and the the stoppage of the Project itself.	Significant adverse effect resulting from disruption to infrastructure in the Upper Lake Melville area (i.e., TLH, airport)	Not applicable
Communities	If a spill occurs in the river, there could be adverse effects on Community Health. With the application of effects management measures the effects will likely be not significant.	Not significant adverse effect	Potential significant adverse effect, resulting from potential damage to downstream infrastructure, including Black Rock Bridge, highways, the port and water, sewer, power and communications infrastructure and potential loss of life.	The effects to downstream infrastructure would be adverse, but are not likely to be significant due to the short duration of the effect.	Adverse effects may result to Upper Lake Melville infrastructure, but it is likely that the effects would not be significant due to the low magnitude and short duration of the effect.
Land and Resource Use	Depending on the nature and extent of an event with waste management, land and resource users may avoid the affected area, resulting in an adverse effect. The adverse effect will not be significant with the application of effects management measures.	Depending on the nature and extent of a hazardous material spill resulting in an adverse effect. The adverse effect will not be significant with the application of effects management measures.	There is potential for a significant adverse effect, resulting from alteration or destruction of fish and wildlife habitat and subsequent adverse effects to harvesting. Adverse effects could also result from loss of boat launches, or other access points, and snowmobile trails.	Adverse effects could result from loss or disturbance of fish and wildlife habitat, depending on the location and extent of the fire. The adverse effects are not likely to be significant due to the short duration and application of effects management measures.	Not significant adverse effects, as described for Forest Fire.
Historic Resources	Release of waste material (i.e. domestic waste), may result in the alteration of historic resources. However the extent would be localized and therefore the residual adverse effects will likely be not significant.	Release of hazardous waste material, may result in the alteration of historic resources. However the extent would be localized and therefore the residual adverse effects will likely be not significant.	A dam failure could result in disturbance and loss of historic and archaeological resources. The associated soils and context in which they were placed could be lost. Therefore the adverse residual effect could be significant.	A forest fire could disturb historic and archaeological resources. However, typically some evidence would survive, and therefore the adverse effect is likely to be not significant.	Not significant adverse effects, as described for Forest Fire.
Mitigative Measures					
	EPP with standard operating procedures; training; on-site response plans; standard environmental protection measures for solid waste and sewage disposal as outlined in the EIS Volume IA, Section 4.8.2.4	Standard environmental protection measures for hazardous materials as outlined in the EIS Volume IA, Section 4.8.2.4 and measures as outlined in Section 4.11.2.2	Stringent dam design and construction standards, Emergency Preparedness Plan and other measures as outlined in the EIS Volume IA, Section 4.11.3.2	Forest Fire Prevention and Response Plan; on-site response and other measures as outlined in the EIS Volume IA, Section 4.11.4.2	Prevention; on-site response; limited recyclable materials will be stored on site; measures to mitigate or prevent fires within the power plants as outlined in part (d) of this IR

Requesting Organization – Joint Review Panel **Information Request No.: JRP.145**

Information Requested:

The Proponent is asked to:

c. **For the worst-case scenario described for a forest fire, provide details to support its assumptions that the worst-case fire would have its source within the Muskrat Falls reservoir and that it would burn to a maximum distance of 10 km from the source. Additional details on the response capacity in Happy Valley-Goose Bay are also requested; and**

Response:

The identification of a worst case fire included considerations of Project phase (timing), location of the incident and the potential consequences.

Timing – Worst-case scenarios were considered for both the construction and operation phase of the Project. During construction there will be many activities where the presence of heat, flames and combustible material could combine to create a fire. During the operation phase, there will be far fewer activities being conducted in the Project area, and hence far less likelihood of a forest fire. Consequently the assumption was made that the more likely timing for a forest fire would be during construction.

Three main activities will be ongoing during the construction phase; dam and power house construction and reservoir clearing. Activities associated with the dam and power house construction will be limited to the dam sites and will primarily entail earth movement and building erection, which would have a relatively low potential for a forest fire as these activities will be occurring within an area that has already been cleared. The reservoir clearing component of construction would have the highest likelihood of a brush fire originating from clearing activities. Heavy machinery (likely diesel fueled) will be operated throughout the river valley in a mature forest setting. The clearing activities include several fire-related hazards, such as sparking of blades on rocks and the heat from engines igniting dry vegetation, which could lead to a brush fire in the river valley that would have a relatively high probability of spreading to the surrounding vegetation, given its proximity. As well, the small work crews involved in this work will serve to limit the numbers of personnel available to serve as first responders in the event of a fire.

Location - It was assumed that a worst case fire would occur during reservoir clearing for the Muskrat Falls Reservoir, rather than the Gull Island Reservoir due to the amount of fuel (vegetation) and wind present in the Muskrat Falls Reservoir area. The Muskrat Falls Reservoir area has a more dense vegetation cover which would be expected to provide more fuel to a fire. The differing topography of the two areas influences the direction and strength of wind, which in turn affects both the direction and distance a fire could spread. For the most part, the Gull Island Reservoir is within a steep sided, narrow valley while the Muskrat Falls Reservoir is within a lower sloped, wider valley, thus, exposing a fire to more variable and stronger winds. The presence of the additional fuel and variable and stronger wind conditions resulted in the Muskrat Falls Reservoir being considered the worst-case scenario.

Potential consequences - The record of forest fires and their average size (8 km^2) as described by personnel of the Forest Services Branch (Michelin, pers. comm.), were each considered in assuming the size of fire that would represent a reasonable “worst case” scenario. The largest fires recorded would be associated with fires that would not have been fought. These larger fires would not be consistent with scenario being considered for the

reasonable worst case as in this situation as the fire would be responded to by on-site personnel and local resources. The Forest Services Branch has indicated that it would be extremely unlikely for a "fought" fire to exceed 1 km^2 (Michelin, pers. comm.).

As stated above, the proximity of the forest fire to Happy Valley-Goose Bay and the forest fire response capability located in that community would serve to restrict the spread of a fire originating within the Muskrat Falls Reservoir. Nevertheless in order to reflect a "worst-case", it was assumed that the forest fire would cover an area 20 percent greater in size than the average forest fire as reported in available statistics, i.e. 10 km^2. Hence, assuming an average width of 1 km, the maximum distance of 10 km from source was determined.

The regional office of the Forest Services Branch of the Provincial Department of Natural Resources is located in Happy Valley-Goose Bay. The coordination of forest fire response for all of Labrador is the responsibility of this office. The current resources available to the Happy Valley-Goose Bay Regional Office includes: two stand-by helicopters; one water bomber stationed in Happy Valley-Goose Bay and 1 stationed in Labrador City; four additional water bombers located in Deer Lake (1), Gander (2) and St. John's (1) are available if required; two fire response equipped trucks (pumps, back-packs, shovels etc.); two standby duty officers and 16 full time fire fighting personnel.

Both the municipality of Happy Valley-Goose Bay and 5 Wing Goose Bay have fire response capabilities, however, their expertise and responsibility is limited to structural and mechanical fires response. Neither would be expected to respond to a forest fire in the area of the Muskrat Falls Reservoir clearing activities.

Reference:

Michelin, S. Forest Services Branch

Requesting Organization – Joint Review Panel **Information Request No.: JRP.145**

Information Requested:

The Proponent is asked to:

d. **Provide the potential environmental effects and proposed measures to reduce the effects or consequences of a potential fire within a generating station. Details of specific measures with regards to industrial fires and oil spill response contingency planning introduced by the Proponent in its operations since the September 1999 events should also be described.**

Response:

The primary environmental effects of a fire in a hydroelectric generation station such as the one proposed at Gulls Island or Muskrat Falls would be similar to those from a fire in any industrial complex. The principal difference in the potential environmental effects from fires within the two facilities would be due to the proximity of a hydroelectric station to the aquatic environment, and the potential for downstream effects. These effects could result from equipment damage, or malfunction as a result of the fire and the subsequent release of pollutants into the aquatic environment.

The primary effects of a fire would be the result of combustion from flammable building materials and equipment and the subsequent air emissions. These events would result in a reduction of air quality due to the presence of various emissions.

Flammable material within a hydroelectric generating station would include: building infrastructure, office equipment, insulating material, electrical equipment, transformer oil and diesel fuel. Transformer oil, Luminol TR-1, will be used at the Gull Island and Muskrat Falls sites and approximately 1,000 litres of diesel fuel will be stored in a day tank inside the generating stations. Emissions from a fire would primarily consist of: Carbon oxides (CO, CO_2); Nitrogen oxides (NOx); Sulphur oxides (SOx); Particulate Matter (PM) - PM 10 , PM 2.5; Poly Aromatic Hydrocarbons (PAHs); and heavy metals.

Events triggered by a fire could lead to potential environmental effects resulting from the overflowing of sumps; failures of oil water separators, explosions of high pressure containers and other equipment malfunction. These could lead to the release of pollutants including transformer oils, lubricants and diesel fuel into the aquatic environment. However, designed-in environmental mitigation measures would minimize the likelihood of these secondary environmental effects. Such measures will include, but are not limited to:

- all fuel/diesel holding tanks will be double-walled or dyked;
- all powerhouse water drains will lead to an interceptor sump equip with oil water separators and/or oil skimmers so that contaminates are removed from waste water before it leaves the powerhouse; and
- all storage rooms in the powerhouse where petroleum based fluids are stored will be dyked.

For the operation and maintenance of the Lower Churchill Project, environmental protection measures and mitigations will be managed and controlled through the ISO 14001 compliant Environmental Management System (EMS). The EMS monitors environmental performance and integrates environmental management into the daily operations, long term planning and other quality management systems.

For the protection of personnel, assets and the environment, measurement and control systems will be installed to monitor and/or control:

- fire detection and protection systems including deluge/sprinkler/inert gas fire suppression systems;
- critical temperature, flow, current and voltage levels or measurements;
- emergency shut-down systems;
- reservoir, intake, sump and tailrace water levels;
- fuel levels and flows of the emergency diesel storage system;
- presence of oil in interceptor tanks; and,
- oil levels in equipment including main transformers , power transformers, turbine and generator bearings, governor sumps and accumulator tanks and any major oil storage tanks

With the implementation of sophisticated surveillance and control systems, as well as the Project EMS, the likelihood of secondary environmental effects occurring as a result of a fire in the generating station is considered to be very low.

Subsequent to the events of September 1999, CF(L)Co has undertaken a thorough review of equipment, operating procedures and monitoring within the Churchill Falls plant. This review has resulted in the replacement and installation of new equipment and modifications to existing equipment and procedures. Oil water separators have been installed in the un-watering sumps, as well as improved alarm systems, cable failure detection monitoring equipment, and deluge system sensors. Oil pressure monitoring protocols have been implemented and regular cable testing has been incorporated into the station Program Maintenance procedures. Personnel have also received training in environmental protection procedures in relation to: the monitoring of sumps for the presence of oil; response to oil releases within the powerhouse; cleaning sumps of oil; and for response to low sump level alarms.

CF(L)Co has also switched to a more environmentally acceptable transformer oil, Luminol TR-i. This insulating oil is bio-degradable and does not contain the polychlorinated bi-phenols (PCBs).

As per its ISO 14001 compliant, Environmental Managements System, CF(L)Co has prepared environmental emergency response plans (a sample Table of Contents is attached). Plans have been developed for spills of fuel and other hazardous materials in water bodies; spills of fuel and other hazardous material on land; and for fires. Personnel have received training from the Canadian Coast Guard in oil spill response, including the deployment of containment booms in the Churchill River. A storage facility for oil spill response equipment has been erected at the tailrace and appropriate containment equipment obtained.

As part of its commitment to continual improvement, CF(L)Co has upgraded the equipment in its generating station, increased its systems monitoring capability and adopted a high level of emergency response preparedness to minimize the likelihood of a re-occurrence of the 1999 event.

INFORMATION RESPONSES
LOWER CHURCHILL PROJECT
CEAA REFERENCE NO.07-05-26178

JOINT REVIEW PANEL

Attachment A

Environmental Emergency Response Plan (EERP)
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IR# JRP.145

October 5, 2009

nalcor energy
LOWER CHURCHILL PROJECT

ENVIRONMENTAL EMERGENCY RESPONSE PLAN (EERP)

NALCOR ENERGY, CHURCHILL FALLS

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PART F CONTINGENCY PLAN FOR VEGETATION CONTROL
• Pesticide Spill Response Plan Procedures • Pesticide Spill Prevention • First Aid • Fires • Fires and Theft Prevention
Refer to Part F for complete Table of Contents

Appendices

TABLES

LIST OF FIGURES