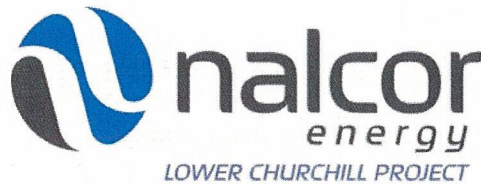


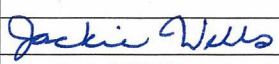
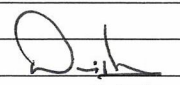
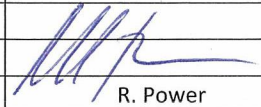
Nalcor Energy – Lower Churchill Project



LCP MOOSE PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN

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1 PURPOSE

The purpose of this Moose Protection and Environmental Effects Monitoring Plan (MPEEMP) is to demonstrate how any adverse environmental effects of the Lower Churchill River Hydroelectric Generation Project (the Project) will be mitigated, and to set out a program for monitoring the effectiveness of mitigation measures. To comply with regulatory requirements and commitments made in the Environmental Impact Statement (EIS) (Nalcor 2009), the Lower Churchill Project (LCP)'s MPEEMP approach includes consideration of:

- Mitigation objectives – performance objectives in respect of each adverse environmental effect;
- Mitigation – measures planned to achieve the mitigation objectives;
- Metrics and targets – specific, quantifiable, relevant and time constrained;
- Follow-up or Monitoring Programs – how the Project will include follow-up or monitoring surveys to confirm that mitigation strategies are meeting the mitigation objectives; and
- Contingency – plan to be implemented should monitoring reveal that mitigation measures have not been successful.

The LCP's MPEEMP builds on existing information and commitments made in the EIS (Nalcor 2009), and conditions of permits and licenses for the Project.

2 SCOPE

This plan addresses the required aspects of moose protection and effects monitoring for the construction and operation phases of the LCP including Muskrat Falls Generation and Labrador Transmission Assets (described in Section 6.0).

3 DEFINITIONS

Environmental Assessment: An evaluation of a project's potential environmental risks and effects before it is carried out and identification of ways to improve project design and

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implementation to prevent, minimize, mitigate, or compensate for adverse environmental effects and to enhance positive effects.

Environmental Management: The management of human interactions with the environment (air, water and land and all species that occupy these habitats including humans).

Environmental Management System: Part of an organization's management system used to develop and implement its environmental policy and manage its environmental aspects.

Environmental Protection Plan: Document outlining the specific mitigation measures, contingency plans and emergency response procedures to be implemented during the construction or operations of a facility.

Environmental Effects Monitoring: Monitoring of overall Project effects to confirm the predictions of EA and to fulfill EA commitments.

Environmental Compliance Monitoring: Monitoring of Project activities to confirm compliance with regulatory requirements and commitments made through the EA process.

Integrated Project Delivery Team: The integration of the Nalcor Energy and SNC Lavalin Inc. Environmental and Regulatory Compliance Teams.

4 ABBREVIATIONS AND ACRONYMS

CEAA	Canadian Environmental Assessment Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
C-SEPP	Component-Specific Environmental Protection Plan
CWS	Canadian Wildlife Service
EA	Environmental Assessment
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
EMS	Environmental Management System
ERC	Environment and Regulatory Compliance
Gen	Generation
HSE	Health Safety and Environment
HVac	High voltage alternating current
HVdc	High voltage direct current
IBA	Impacts and Benefits Agreement
IPD	Integrated Project Delivery
LTA	Labrador Transmission Asset
LCP	Lower Churchill Project
NE	Nalcor Energy

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NLDEC	Newfoundland and Labrador Department of Environment and Conservation
OSEM	On-Site Environmental Monitor
PEEMP	Protection and Environmental Effects Monitoring Plan
RCP	Regulatory Compliance Plan
RP	Rehabilitation Plan
SARA	Species at Risk Act

5 INTERNAL REFERENCES

LCP-PT-MD-0000-PM-PL-0001-01	LCP Project Execution Plan
LCP-PT-MD-0000-PM-CH-0001-01	LCP Project Charter
LCP-PT-MD-0000-EA-PL-0001-01	LCP Generation Environmental Assessment Commitment Management Plan
LCP-PT-ED-0000-EA-SY-0001-01	Environmental Impact Statement and Supporting Documentation for the Lower Churchill Hydroelectric Generation Project
LCP-PT-ED-0000-EV-RG-0001-01	Lower Churchill Project Permit Registry
LCP-PT-MD-0000-SM-ST-0001-01	Post Environmental Assessment Release
LCP-PT-MD-0000-RT-PL-0001-01	Regulatory Compliance Plan
LCP-PT-ED-000-EN-PH-0031-01	Design Philosophy for Environmental Rehabilitation
LCP-PT-ED-0000-EN-PH-0007-01	Design Philosophy for Environmental Mitigation
LCP-PT-MD-0000-HS-PL-0001-01	Health and Safety Plan
LCP-PT-MD-0000-HS-PL-0004-01.	LCP Emergency Response Plan
LCP-PT-MD-0000-IM-PL-0003-01	Information Management Plan
LCP-PT-MD-0000-CO-PL-0001-01	Communications and Stakeholder Relations Plan
LCP-PT-MD-0000-EV-PL-0002-01	LCP Integrated Environmental Management Plan

6 PROJECT DESCRIPTION

6.1 MUSKRAT FALLS GENERATION

The Muskrat Falls Generation Project will include the following sub-components which are broken down under the following principal areas of the development (See Figure 6-1 for dam):

- 22 km of access roads, including upgrading and new construction, and temporary bridges;
- A 1,500 person accommodations complex (for the construction period); and

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- A north roller compacted concrete overflow dam;
- A south rock fill dam;
- River diversion during construction via the spillway;
- 5 vertical gate spillway;
- Reservoir preparation and reservoir clearing;
- Replacement fish and of terrestrial habitat;
- North spur stabilization works;
- A close coupled intake and powerhouse, including:
- 4 intakes with gates and trash racks;
- 4 turbine/generator units at approximately 206 MW each with associated ancillary electrical/mechanical and protection/control equipment;
- 5 power transformers (includes 1 spare), located on the draft tube deck of the powerhouse; and
- 2 overhead cranes each rated at 450 Tonnes



Figure 6-1 Muskrat Falls Generating Facility

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6.2 LABRADOR TRANSMISSION ASSET (LTA)

LTA consists of the ac transmission line system from Churchill Falls to Muskrat Falls (see Figure 6-2), specifically:

- Churchill Falls switchyard extension;
- Muskrat Falls switchyard;
- Transmission lines from Muskrat Falls to Churchill Falls: double-circuit 315 kV ac, 3 phase lines, double bundle conductor, Single circuit galvanized lattice steel guyed suspension and rigid angle towers; 247 km long; and
- 735 kV Transmission Line at Churchill Falls interconnecting the existing and the new Churchil Falls switchyards.

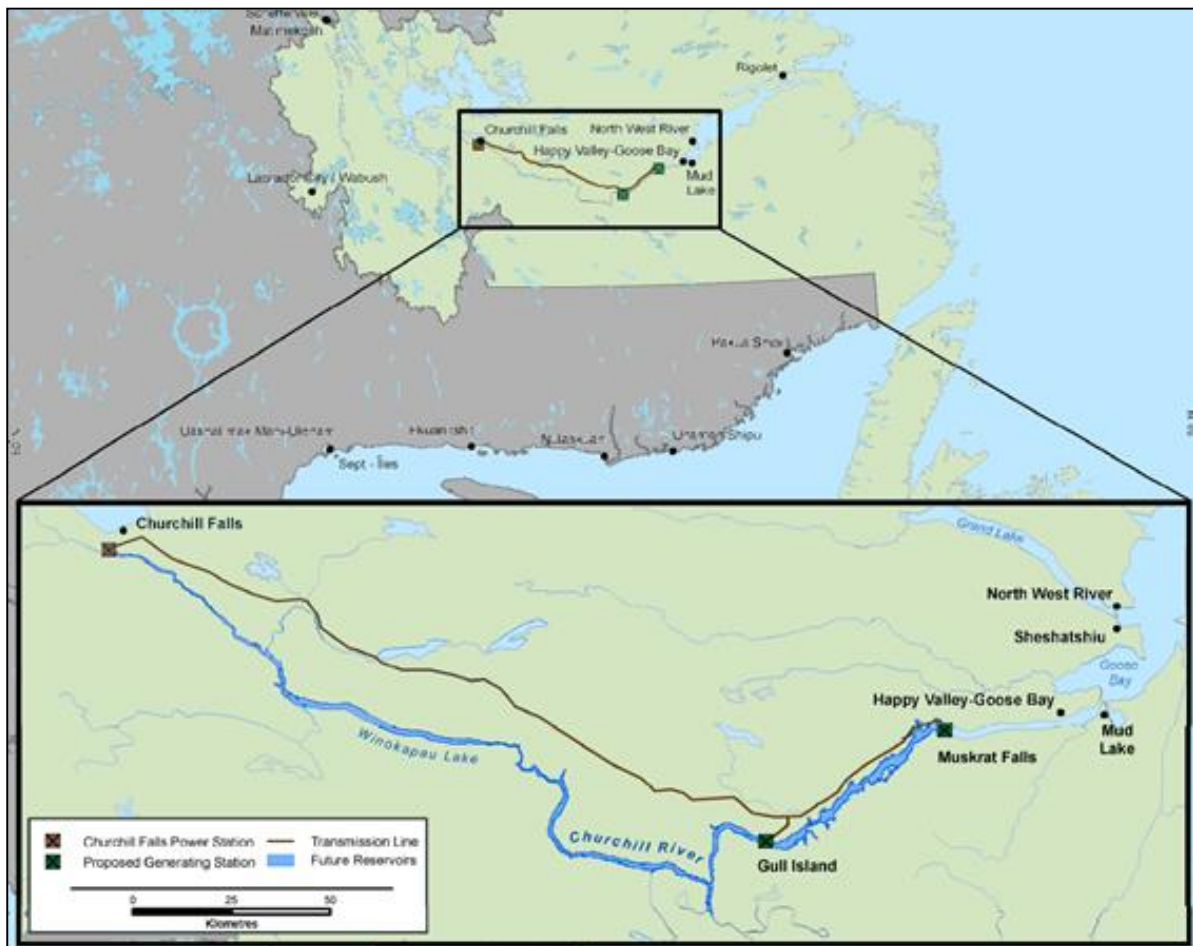


Figure 6-2 Labrador Transmission Asset

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7 EXISTING INFORMATION

As described in Nalcor (2009), Moose (*Alces alces*) is a relatively new species to Labrador that, since the 1950s, has spread across the region, including the lower Churchill River valley. While Moose appear to be at the north-eastern extent of their range, their population in Labrador is believed to be increasing through range expansion into new areas (e.g., via river valleys, linear developments) (Nalcor 2010). Moose is a habitat generalist and selects habitat at a landscape level to include suitable forage and cover (Dussault et al. 2005; Bowyer et al. 2003; Courtois et al. 2002). Moose feed primarily on deciduous species such as willow, birch and alder, occasionally supplementing their diet with conifers such as balsam fir during winter. In summer, Moose favour wetlands and adjacent forests, and are less sensitive to habitat alteration or loss. In winter, Moose rely on habitat that provides refuge from deep snow while maintaining access to available browse; most notably, mature mixed wood forests with high canopy cover and a rich understory (Jackson et al. 1991; Schwab and Pitt 1991).

Studies conducted over the past several decades (Minaskuat Inc. 2009; Northland and Jacques Whitford 2000; Chubbs and Schaefer 1997; Jacques Whitford 1997; Trimper et al. 1996; Folinsbee 1974; Mercer and Kitchen 1968) conclude that the Churchill River valley is heavily used by Moose in winter. Moose use riparian areas and islands within the lower Churchill River valley during winter and appear to move out of the valley to higher elevations and wetland areas during summer months. The Project will interact with Moose primarily in a portion of its wintering habitat.

Increasing Moose densities in Labrador have been associated with increased wolf density and predation on local woodland Caribou (*Rangifer tarandus*) such as the Red Wine Mountains Herd (Schaefer et al. 2001; Schmelzer et al. 2004). It is anticipated that Moose will continue to increase and expand into the lower Churchill River watershed and elsewhere. Moose also provides a food source for area residents and is an important prey species for wolf and occasionally for black bear. Pressures on the Moose population in Labrador relate to ongoing predation, legal and illegal harvest, sparse habitat or a combination of these factors (Trimper et al. 1996, Chubbs and Schaefer 1997).

Moose wintering habitat will likely be lost due to impounding of the reservoirs for the Project. However, Moose habitat may also be enhanced through the establishment of early seral vegetation that is suitable forage as a result of Project activities that involve cutting trees and shrubs (e.g., transmission line construction and reservoir preparation during the Construction phase, and inspection, maintenance, repairs along the transmission line during the Operation

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and Maintenance phase) and other vegetation disturbance activities such as forest harvesting (Nalcor 2010).

8 REGULATORY COMPLIANCE

Moose are a common species throughout NL. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has not assessed Moose (internet site: COSEWIC 2013), which are classified as 'secure' in NL through the General Status initiative (internet site: Wild Species – the General Status of Species in Canada 2012). Moose are not managed provincially under the *Newfoundland and Labrador Endangered Species Act, 2004 (NLESA)* or protected under the *Species at Risk Act, 2002 (SARA)* (internet site: SARA 2013).

Moose in NL are managed by the Wildlife Division of the NL Department of Environment and Conservation. In Labrador, they are managed under NEWFOUNDLAND AND LABRADOR REGULATION 72/12 Open Season Big Game Moose Hunting Order, Labrador, 2012-2013 under the Wild Life Regulations and the *Wild Life Act*.

To comply with federal and provincial legislation and regulations the LCP has, or will:

- identified Moose wintering habitat in the Project area (Nalcor 2009);
- designed and employed appropriate best management mitigation to avoid disturbance and mortality of Moose;
- conduct monitoring and/or follow-up, as appropriate, to determine success of the mitigation; and
- if required, address contingency plans in an adaptive management framework if the mitigation is found to be unsuccessful.

The intent of the MPEEMP is to allow the LCP to evaluate and mitigate, to the extent practicable, the Project effects during construction and operations of the Project on:

- disturbance to Moose and their habitat, particularly wintering habitat; and
- mortality of Moose.

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9 ENVIRONMENTAL EFFECTS MANAGEMENT

The effects management plans (i.e., mitigation measures outlined in the EIS [Nalcor 2009] and the LCP Muskrat Falls (MF) Generation and Labrador Transmission Assets (LTA) Environmental Protection Plan (EPP) and the commitments made by Nalcor during the Information Request responses and the hearing to ensure regulatory compliance of the above discussed Acts and regulations include the following:

- Reservoir preparation will include removal of forest cover where safe and practical to do so such that the reservoir water surface (and littoral zone) will provide unimpeded access for wildlife;
- The new reservoirs' riparian zone (generally up to 3 metre (m) elevation above high water level) will be cleared of existing vegetation to encourage the growth of shoreline vegetation reflecting a natural (pre-Project) riparian zone;
- At the inflow areas for major tributaries, special measures (e.g., scarification) will be taken to encourage development and re-establishment of delta areas and wetlands;
- Reservoir preparation will be designed to avoid sensitive wildlife areas/habitats during sensitive periods (e.g., Moose in wintering areas) using set-back distances where appropriate;
- The LCP will limit the physical footprint of the Project where possible, and not replace Moose wintering habitat in areas adjacent to those lost during impoundment;
- The LCP will conduct wildlife surveillance prior to blasting, and will discontinue blasting in the presence of high densities of animals (Caribou, Moose, Black Bear);
- Critical habitats shall be identified on site plans or plan profiles for roads and transmission lines for C-SEPP;
- Construction activities shall be scheduled considering any sensitive areas wildlife habitat and critical periods in wildlife cycles, including moose wintering areas, and considering additional mitigation measures that may be required;
- The LCP MF Generation and LTA EPP and best management practices will be followed, and Environmental Monitors will oversee the implementation of the LCP MF Generation and LTA EPP;
- Personal pets will not be brought to the construction site;
- Buffer zones will be implemented to protect wildlife at the site (see Section 5.7 of the LCP MF Generation and LTA EPP for the buffer zones for helicopter traffic at the site);

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- Fishing and hunting are prohibited at or near the construction site. All Project participants shall be prohibited from fishing and hunting at or near the construction site while working on the Project;
- Firearms will not be permitted on site, with exception of approved bear monitors;
- Under no circumstances are wildlife to be fed and all measures shall be taken to avoid inadvertent feeding;
- Wildlife will not be chased, caught, diverted, followed or otherwise harassed by Project participants;
- All wildlife sightings and nuisance wildlife will be reported to the On-Site Environmental Monitor and the appropriate Government of NL personnel;
- The forestry branch will be contacted and updated with regards to nuisance wildlife and wildlife encounters;
- Equipment and vehicles will yield the right-of-way to wildlife and adhere to construction site speed limits;
- Environmental awareness training, with regular briefings, will be implemented for all personnel;
- When Project construction ends, all roads not essential to to operation and maintenance must be decommissioned, and habitat must be restored and access will be restricted;
- If used during operation, herbicide will be applied from the ground, by hand;
- Project personnel are prohibited from fishing and hunting within the project footprint during the construction phase. It will be advised that antifreeze not be used around camps to eliminate rodent problems - as it attracts other wildlife in addition to the targeted animals; and
- Mitigation measures in the Forest Management District (FMD) 19A Management Plan, Provincial regulations will be followed.

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10 ENVIRONMENTAL EFFECTS MONITORING

This MPEEMP contains both:

Follow-up Programs – studies or surveys designed and implemented to evaluate the predictions of the environmental assessment and to determine the effectiveness of any measure taken to mitigate the adverse environmental effects of the Project; and

Monitoring Programs – studies or surveys designed and implemented to determine whether the Project is implemented as proposed, and that mitigation measures proposed by the LCP to minimize the Project's environmental effects are implemented.

10.1 SURVEY PROTOCOLS

The LCP has committed to conduct follow-up and monitoring programs to evaluate the effectiveness of the effects management plans, and to determine if expansion or reduction or deletion of the indicated programs is appropriate (with justification). This would apply to the following, as appropriate:

- data collection during construction;
- data collection during operations; and
- follow-up and monitoring report.

Protocols for the data collection are discussed in the following subsections. Data collection includes metrics that are species specific, quantifiable, repeatable, relevant and time constrained. The goal is to collect meaningful data in a focused, defensible, repeatable approach, within a reasonable timeline to ensure that the mitigation is appropriate. Where it is determined that the mitigation is not appropriate or can be improved, a contingency plan would be presented that the LCP could incorporate as per their adaptive management approach.

Moose has shown considerable adaptation to the Labrador winters during its population expansion; the Moose population in Labrador is generally increasing and is expected to remain sustainable. While some wintering habitat will be impounded, the Project is expected to increase available Moose habitat in other areas of clearing for the Project. Significant adverse effects on Moose are not predicted and specific habitat enhancements for Moose are not proposed. Consequently, the scope of the effects monitoring is limited to aerial block surveys and observation of Moose sightings and interactions as described below. Incidental observations of Moose during other Project-specific surveys will also be recorded. Telemetry

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surveys are not proposed, as all telemetry resources are focused on caribou monitoring due to the endangered status.

The LCP has agreed to support a moose and caribou monitoring program, done in consultation with the NLDEC Wildlife Division, aimed at providing a measure of depredation by wolf. The Caribou Protection and EEMP prepared for the Project describes the Caribou monitoring plan as part of this program. Monitoring of Moose in relation to wolf predation is not planned. However, if Caribou monitoring results indicate an issue in relation to the wolf-moose-caribou balance or interactions and it is determined that additional monitoring may be valuable, plans to include Moose in the monitoring program will be considered at that time.

10.1.1 Baseline Data Collection

Baseline data collection refers to the determination of the presence of Moose where Project activities are taking place. Baseline surveys have been conducted previously, most recently in winter 2007 (Minaskuat Inc. 2009), to document Moose presence, and assess habitat use and associated movements of Moose occupying the Churchill River valley and in the general Project area. The survey results are presented in Nalcor (2009) and would be considered an integral part of the data analysis process during the follow-up program.

10.1.1.1 *Aerial Block Surveys*

Additional aerial block surveys will be conducted for a 2 day period commencing at most 24 hours post-snowfall to ensure fresh tracks. The personnel will consist of 3 observers and a pilot experienced in conducting wildlife surveys.

The survey area will include 10.5 km² blocks previously identified as potential habitat for moose through transect surveys transects over the Project footprint.

10.1.2 Data Collection during Operations

10.1.2.1 *Moose Sightings and Interactions*

The LCP will compile the results of the On-Site Environmental Monitors' reports that reference sightings, interactions and consequences that relate to Moose encounters during construction, and will include regulatory compliance tracking/

This data will be compiled once each year (December) and evaluated to determine if the observed effects of the Project on Moose would require changes to the mitigation through

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the LCP's adaptive management approach. Any proposed changes would be communicated with the Wildlife Division prior to implementation. In addition, Moose sightings, interactions and consequences will be reported in a timely manner to the On-Site Environmental Monitor and the information distributed to crews to increase their level of awareness and caution when Moose are in the Project vicinity.

Data will be presented in Excel, or similar format, with the following information:

- date;
- time;
- location (UTM or lats/longs);
- interaction type – brief description of the type of interaction: sighting, human/Moose conflict, vehicle/Moose conflict);
- Moose details – behavior at the time of the interaction;
- interaction details - explanation of the nature of the interaction;
- issue resolution - explanation of the action(s) undertaken to resolve the interaction;
- interaction consequence – description of the outcome (Moose was scared away; Moose was killed); and
- additional actions undertaken – details of actions undertaken by the LCP (e.g., no additional actions required; report sent to Wildlife Division) and notes on regulatory compliance.

10.1.3 Follow-up and Monitoring Program

A final Follow-up and Monitoring Report will be generated that contains a section that compiles the information collected on Project interactions with Moose as outlined above to address Follow-up (i.e., verification of EIS predictions) and a section to address Monitoring (i.e., regulatory compliance), as discussed in the following subsections.

10.1.3.1 Follow-up

The Follow-up portion of the Follow-up and Monitoring Report, within the MPEEMP, will include the collation of all the data related to Project interactions with Moose collected during the construction period and the first five years of operations. The Follow-up portion of the report will present the pre-construction Moose baseline information, consider the data as a description of the effects collected on interactions with Moose during the Project construction and operations time periods, and discuss the effects observed in relation to

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the effects predictions made in the EIS (i.e., no significant adverse residual effects on Moose).

Aerial block surveys as discussed in Section 10.1.1.1 will also be conducted during construction and for the follow-up period to be used for comparison with the acquired baseline data.

10.1.3.2 Monitoring

The Monitoring portion of the Follow-up and Monitoring Report will summarize the On-Site Environmental Monitors' observations and efforts related to the interactions of the Project components and activities with Moose to show that the Project was implemented as proposed, and that mitigation and compensation measures to minimize the Project's environmental effects were implemented appropriately. This will include a subsection to address Compliance Monitoring, also undertaken by the On-Site Environmental Monitors to ensure Project compliance with regulatory requirements and other environmental commitments made in the EIS, the responses the LCP provided to the information requests, and conditions of EA release.

At this time, contingency plans are not anticipated and any changes to LCP's procedures or mitigation plans would be addressed through the Adaptive Management Plan, if and as appropriate. Any changes proposed by the LCP would be based on the findings of the Follow-up and Monitoring Programs. At this time, the LCP is not proposing to conduct aerial surveys, ground surveys, or telemetry work due to the low numbers of Moose found and considering the moose movement information collected in the general Project area during the baseline surveys (Minaskuat 2009) and the likely inability to link any findings of such surveys to effects of the Project. It is expected that the NLDEC Wildlife Division will continue to manage the Moose population in Labrador.

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