Nalcor Energy – Lower Churchill Project

LCP Species at Risk Protection and Environmental Effects Monitoring Plan

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B5	24 Sept 2014	Issue for Use	J. Wells	D. Haley	R. Power

Inter-Departmental / Discipline Approval (where required)

Department	Department Manager Approval	Date
	Name	
	Name	
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TABLE OF CONTENTS

PAGE

1 PURPOSE

The purpose of this Lower Churchill Project (LCP) Species at Risk (SAR) Protection and Environmental Effects Monitoring Plan (PEEMP) is to demonstrate how any negative environmental effects on avifauna SAR and caribou will be mitigated, and sets out a program for monitoring the effectiveness of the mitigation measures.

Provincially, wildlife species at risk are managed under the *Newfoundland and Labrador Endangered Species Act* (*NLESA*). The *NLESA* was developed to meet provincial commitments under the National Accord for the Protection of Species at Risk and the Canadian Biodiversity Strategy. The *NLESA* protects wildlife species, subspecies or populations within the province that are considered Endangered, Threatened or Vulnerable based on recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the provincial Species Status Advisory Committee (SSAC) (Government of Newfoundland and Labrador 2004, internet site). Under *NLESA* it is prohibited to disturb, harass, injure or kill any individual of a listed species, disturb or destroy the residence of listed species, or be in possession of individuals of a listed species (Government of Newfoundland and Labrador 2004, internet site).

To comply with regulatory requirements and commitments made in the Environmental Impact Statement (EIS) (Nalcor 2009), the SAR PEEMP includes consideration of:

- Mitigation objectives – performance objectives in respect of each negative 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 ensure that mitigation strategies are meeting the mitigation objectives; and
- Contingency – plan to be implemented should monitoring reveal that mitigation measures have not been successful.

This SAR PEEMP builds on existing information and commitments made in the EIS (Nalcor 2009), and conditions of permits and licenses for the Lower Churchill Hydroelectric Generation Project (the Project).

NL Reg. 18/12, also referred to as the *Lower Churchill Hydroelectric Generation Project Undertaking Order* releases the Project from environmental assessment and sets conditions for

this release that LCP must meet. The release of the Project from environmental assessment under section 3 is subject to the following conditions:

(a) Nalcor Energy shall abide by all commitments made by it in the Environmental Impact Statement dated February 2009, and all the Environmental Impact Statement Additional Information Requests made by the Lower Churchill Hydroelectric Generation Project Environmental Assessment Panel and consequently submitted by Nalcor Energy, and the submissions made by Nalcor Energy during the panel hearings and, subsequent to the hearings, to the panel, unless one or more of the commitments, or a part of a commitment is specifically waived by the minister;

(e) Nalcor Energy shall prepare and abide by the requirements of environmental effects monitoring plans for all phases of the project, and those plans shall be submitted to and approved by the Minister of Environment and Conservation or the appropriate minister of the Crown before the commencement of an activity which is associated with or may affect one or more of the following matters:

(xiii) species at risk

Submission of this EEMP satisfies the condition/requirement in NL Reg. 18/12 that Nalcor Energy prepare and submit to the Minister of Environment and Conservation or the appropriate minister of the Crown, an environmental effects monitoring plan for all phases of the project, before the commencement of an activity which is associated with or may affect the following matters:

(xiii) species at risk

Note, this SAR PEEMP also meets requirements under the federal SARA. It contains the same information as the SAR IMMP which was a provincial requirement under the *ESA.*

2 SCOPE

The SAR PEEMP addresses the required aspects of species at risk for both avifauna and caribou protection and effects monitoring for the design, construction and operation phases of the LCP including Muskrat Falls Generation, and the 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 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

BOD	Basis of Design
CEAA	Canadian Environmental Assessment Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DND	Department of National Defence
EA	Environmental Assessment
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
EMS	Environmental Management System
ERC	Environment and Regulatory Compliance
ERP	Emergency Response Plan
FMD	Forestry Management District

GRH	George River Herd
Gen	Generation
HSE	Heath Safety and Environment
HVac	High voltage alternating current
HVdc	High voltage direct current
JRH	Joir River Herd
KI	Key Indicator
LTA	Labrador Transmission Asset
LCP	Lower Churchill Project
LWCRT	Labrador Woodland Caribou Recovery Team
MMH	Mealy Mountains Herd
NE	Nalcor Energy
NLESA	Newfoundland and Labrador Endangered Species Act
NLDEC-WD	Newfoundland and Labrador Department of Environment and Conservation – Wildlife Division
OSEM	On-Site Environmental Monitor
PAN	Protected Area Network
PEEMP	Protection and Environmental Effects Monitoring Plan
RWM	Red Wine Mountains
SARA	federal Species at Risk Act
SAR PEEMP	Species at Risk Impacts Protection and Environmental Effects Monitoring Plan
SSAC	Species Status Advisory Committee

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-EV-PL-0011-01	Generation /LTA Environmental Protection Plan
LCP-PT-MD-0000-SM-ST-0001-01	Post Environmental Assessment Release

5 INTERNAL REFERENCES

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
LCP-PT-MD-0000-EV-PL-0005-01	Caribou Protection and Environmental Effects Monitoring Plan
LCP-PT-MD-0000-EV-PL-0004-01	Avifauna Protection and Environmental Effects Monitoring 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 five principal areas of the development:

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

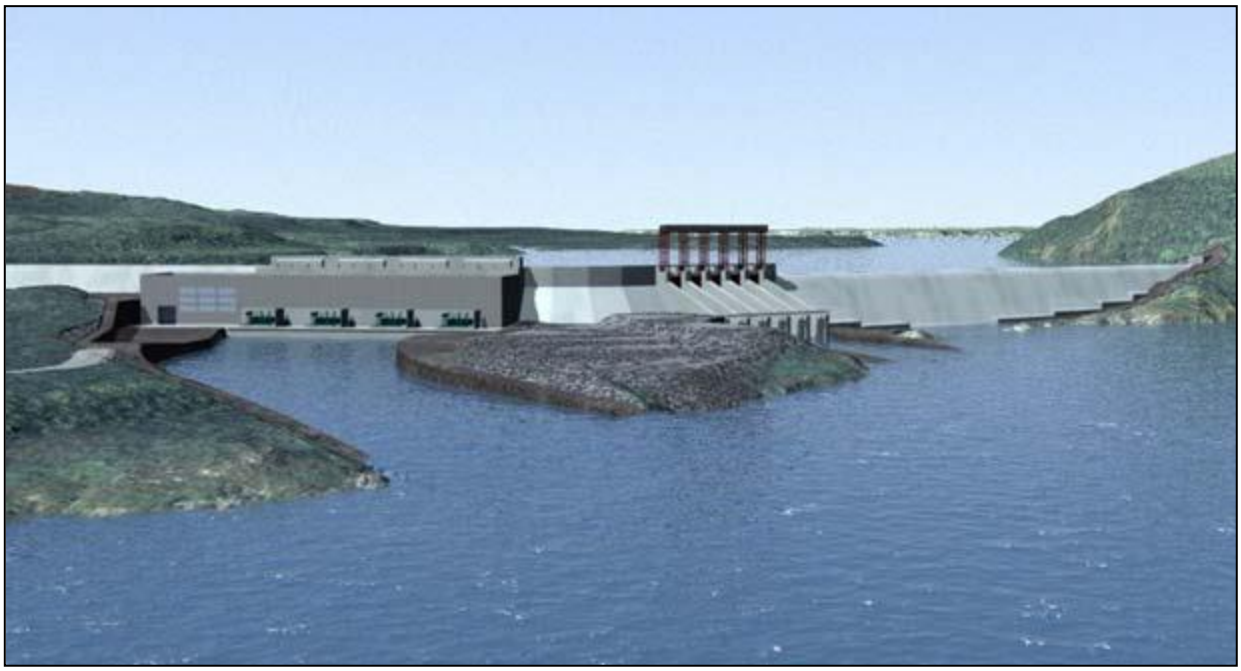

Figure 6-1 Muskrat Falls Generating Facility

6.2 LABRADOR TRANSMISSION ASSET (LTA)

LTA consists of the ac transmission line system form 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 Churchill Falls switchyards.

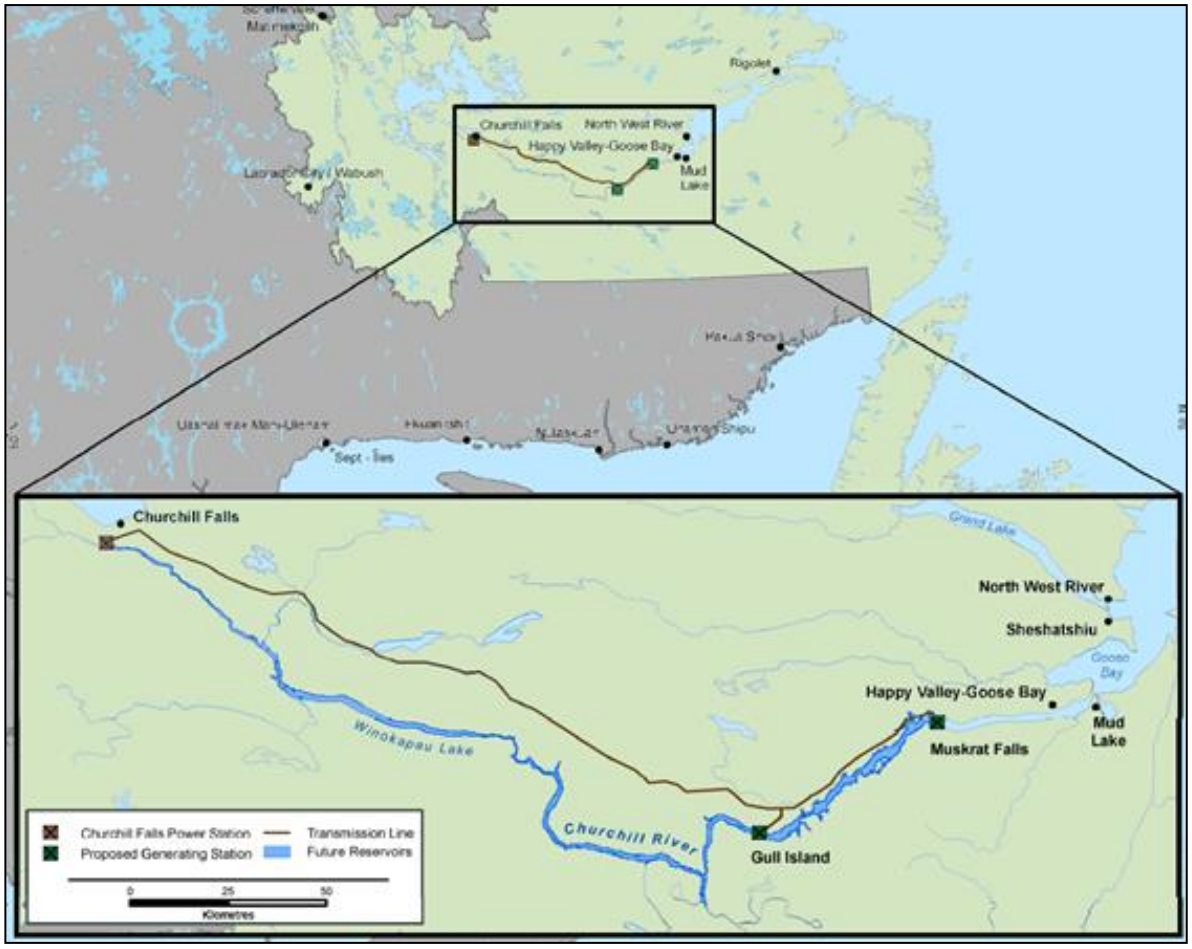

Figure 6-2 Labrador Transmission Asset

7 CARIBOU

7.1 EXISTING INFORMATION

As described in Nalcor (2009) woodland caribou (*Rangifer caribou*) are an important cultural, economic, and ecosystem component in Labrador, supplying a hunting resource for residents and prey for wildlife. Caribou within Labrador are classified as one of three ecotypes: (i) sedentary, (ii) migratory, or (iii) montane (Bergerud et al. 2008; Boulet et al. 2005; Thomas and Gray 2002). Currently, the province recognizes the George River Herd (GRH) as a migratory ecotype. Sedentary caribou are the forest dwelling ecotype that undergoes a seasonal dispersion (rather than migration) during calving (Bergerud et al. 2008).

Sedentary populations of woodland caribou in the province are considered Threatened under the *NLESA*, and occur in the lower Churchill River watershed. Sedentary herds that occur in the vicinity of the Project include the Red Wine Mountains (RWM) Herd and the Mealy Mountains Herd (MMH), which includes the Joir River Herd (JRH) subpopulation (Bergerud et al. 2008). Of greatest concern is the RWM herd, which has a current range that overlaps with the Project. The RWM Herd was considered stable in the 1980s but declined dramatically to 151 animals in 1997 (Schaefer et al. 1999) with a further decrease to 87 animals by 2003 (NLDEC 2010, internet site). The JRH and MMH occur outside the physical footprint of the Project.

Existing information regarding RWM Herd caribou, the scope of this IMMP, is summarized from data compiled for NE's Environmental Impact Statement (EIS) for the Project (Nalcor 2009) and subsequent information (e.g., Schmelzer 2012).

7.2 HABITAT USE / HABITAT PREFERENCES

The most current information on habitat selection by RWM Herd caribou was recently completed by the Newfoundland and Labrador Department of Environment and Conservation, Wildlife Division (NLDEC-WD). The RWM habitat selection was based on 16 female caribou wearing GPS collars between 2007 and 2012, but statistical tests determined these data were applicable to the entire population. Tests for population-level versus individual-level selection were completed and in all cases population-level preferences were statistically predominant, indicating the results could be generalized to the RWM population as a whole. The RWM habitat selection (Schmelzer 2012) described calving habitat as including large muskegs, lakes and islands, peninsulas of large lakes, and combinations of these feature. Alpine areas, burns, lichen woodlands and anthropogenic features were avoided. Post-calving habitat includes wetlands and areas with open water and adjacent areas of mature, and dense coniferous

forest. Open habitats such as lichen woodlands, other than open-canopied forests and burns are avoided at this time. Wintering habitat is associated with open conifer lichen woodlands, in well-drained river uplands, and in tundra and alpine habitats dominated by grasses, sedges and dwarf birch in the RWM.

To examine these findings with the baseline work completed for the EIS, Schmelzer (2012) compared the results of the seasonal habitat selection (based on 16 female caribou from the RWM Herd) with the Ecological Land Classification (ELC) completed for the Labrador - Island Transmission Link and the Lower Churchill Hydroelectric Generation Project. The comparison was completed for two important seasons (calving/post-calving and winter) on a pixel by pixel basis in the area of overlap between these two areas. The comparison resulted in the adjustment of the seasonal importance of some of the habitat types from the ELC (that had been determined from the literature), namely: decreasing importance of 'Black Spruce Lichen Forest' (during Calving/Post-calving) from 'primary' to 'secondary'; increasing importance of 'Open Conifer Forest' (during Calving/Post-calving) from 'secondary' to 'primary'; decreasing 'Conifer Scrub' from 'primary' to 'secondary' during winter; and increasing 'Lichen Heathland' to 'primary' from 'secondary' during winter (Table 7-1).

Table 7-1: Ecological Land Classification Habitat Type and Potential Caribou Use of Area of Overlap between the Red Wine Mountains Caribou Herd and the Lower Churchill Project.

HABITAT TYPE	CALVING/ POST-CALVING	WINTER	COMMENTS
Black Spruce Lichen Forest	Tertiary	Secondary	Avoided during calving/post-calving (Schmelzer 2012); continuous lichen cover provides a source of food during winter; predator abundance low (Fortin et al. 2008; Courtois et al. 2003)
Burn	Tertiary	Tertiary	Avoided during these periods (Schmelzer 2012) and no evidence documented during surveys in 2008 (Stantec 2011)
Conifer Forest	Secondary	Tertiary	As confirmed by Chubbs et al. (1993) and Courtois et al. (2003), and documented during surveys in 2008 (Stantec 2011)
Conifer Scrub	Secondary	Tertiary	Associated with low abundance of lichen and avoided during winter, but selected during calving/post-calving (Schmelzer 2012)
Exposed Earth (Anthropogenic)	Tertiary	Tertiary	Avoided (Schmelzer 2012; Stantec 2011)
Hardwood Forest	Tertiary	Tertiary	No evidence of use (Stantec 2011)
Lichen Heathland	Tertiary	Primary	Best relationship with primary habitat in winter according to Schmelzer (2012); some evidence of use during surveys in 2008
Mixed wood Forest	Tertiary	Tertiary	No evidence during 2008 surveys (Stantec 2011)

Open Conifer Forest	Secondary	Tertiary	Selected based on Schmelzer (2012); moss ground cover with some use during surveys in 2008 (Stantec 2011)
Wetland	Primary	Tertiary	Reduced predation risk, selected during calving/post-calving in Schmelzer (2012), documented use during surveys in 2008 (Stantec 2011)

7.3 CUMULATIVE EFFECTS

The following section describes the interaction of Project components and potential effects on the RWM Herd. The combined potential contribution to incremental and/or cumulative landscape change in Labrador is described in conjunction with other existing and potential (future) land use activities (Nalcor 2009).

The environmental effects of the Project on wildlife are primarily associated with habitat alteration or loss. Depending on the species, the Project is expected to result in the displacement or alteration of home range of individuals. This displacement of wildlife by the Project will not result in a measurable change in such interactions as predation or competition (interspecific or intraspecific). By their nature, species at risk tend to have discontinuous distribution across preferred habitat (as is the case with the RWM Herd) and are therefore further examined in detail below due to their potential greater vulnerability to disturbance.

Environmental effects of the Project on the RWM Herd are characterized using the following descriptors (additional information is available in Section 5.5 of Volume IIB of the EIS [Nalcor 2009]):

- Nature - the long term environmental effects of the Project on the Key Indicator (KI) (adverse, positive or neutral).
- Magnitude - the extent of change from the baseline state.
- Geographic extent - the physical area within which interactions are expected to occur.
- Duration - the period of time the environmental effect will occur.
- Frequency - the number of times the Project will have an environmental effect.
- Reversibility - whether the adverse environmental effects are reversible or irreversible.
- Ecological context - the general characteristics of the area with respect to existing levels of human activity in the Assessment Area.
- Level and degree of certainty of knowledge, low or high level of certainty.
- Likelihood.

For all terrestrial environment components that were assessed, a significant adverse residual environmental effect from the Project was defined as one which would cause a decline such

that a sustainable population cannot be maintained within the Assessment Area. As species at risk populations may already be challenged in terms of their sustainability, the determination needs to examine whether the recovery of the population is possible in consideration of the Project. A residual adverse environmental effect that does not meet the above criteria is not significant.

The effects analysis of species at risk was assessed on the basis of expected changes in habitat availability (EIS Volume IIB, Section 5.11), and other aspects of the Project activities that could lead to changes in distribution, health or mortality.

Over the past two decades and recent survey results that indicate the Herd might presently contain fewer than 100 individuals. Therefore, the Herd is vulnerable to disturbances that result in incremental mortality and/or affect productivity. The following section summarizes the potential cumulative environmental effects of projects and activities that are expected to affect this Herd during the foreseeable future.

7.3.1 Activities Considered

7.3.1.1 NATO Special Forces Training

In 1996, the area used for NATO special forces training (jet fighter training) by 5 Wing Goose Bay was expanded to include most of the range of the RWM Herd (Schmelzer et al. 2004). Because of its proximity to the base, the RWM Herd has been exposed to particularly high frequencies of aircraft overflights. Several studies and ongoing monitoring by the Department of National Defence (DND) have evaluated the effects on Caribou of repeated exposure to low-level overflights.

Harrington and Veitch (1991, 1992) reported that individuals exhibit overt behavioural responses and changes in movement patterns in response to low-level overflights. During the study, individuals from the RWM Herd were experimentally overflown by military jet aircraft and helicopters. The authors reported that direct overflights by jet aircraft as low as 30 m agl elicited overt responses 88 percent of the time (Harrington and Veitch 1991). Responses typically involved a startle reaction, with animals scrambling to their feet and bolting short distances. Detectable responses were observed just 38 percent of the time when flights were not directly overhead or were higher than 300 m. Stronger responses (speed of flight, distance moved) were reported when animals were overflown by helicopters than by jets. Harrington and Veitch (1992) also reported lower calf survival in groups of Woodland Caribou exposed to overflights. Maier et al. (1998) found that the response of Caribou in Alaska to military jet aircraft varied seasonally. The strongest

responses were observed in the post-calving period, when animals exposed to overflights were more active and travelled farther than did those that were not overflown.

These studies indicate that exposure to training is a disturbance factor for Caribou. Disruption of normal behaviour patterns, including increased movement and reduced foraging and resting time, could have energy consequences that affect the overall health and fitness of affected animals. In 1991, DND implemented an Environmental Management Program that included avoidance measures to minimize effects on the RWM Herd (DND 1994; Schmelzer et al. 2004).

7.3.1.2 Commercial Forestry

Extending over 7.1 million ha, Forestry Management District (FMD) 19A contains almost the entire range of the RWM Caribou Herd. The Forest Ecosystem Strategy Plan set out a number of strategies and guidelines to protect habitat for priority wildlife species, maintain watershed values, and address various other cultural and environmental priorities for the people of Labrador (Innu Nation and Government of Newfoundland and Labrador 2003). A key feature of this plan was the establishment of an extensive protected area network for FMD 19. This was designed to protect ecological functions at several different planning scales. At the landscape scale, a number of core reserve areas were designated along with protected corridors to link these core habitats.

The protected area network (PAN) includes a RWM Herd core reserve located north of the Churchill River in the northwestern part of FMD 19A. Remaining areas have been designated for commercial, selective-commercial and domestic timber harvesting. The Forest Ecosystem Strategy Plan for FMD 19 has been acclaimed for its consultative process and balanced approach to forest resource development. While the PAN and habitat protection guidelines established will clearly benefit Caribou and other wildlife and protect a sizable portion of the Herd's range, analysis of radio-telemetry data shows that portions of the Herd's core calving/post-calving and winter ranges extend into areas allocated for timber harvesting (Schmelzer et al. 2004).

Effects include loss or alteration of habitat, sensory disturbance and displacement, predator avoidance and mortality resulting from vehicle collisions.

7.3.1.3 Cultural and Recreational Land Use

Snowmobile trails pass through the center of the RWM Herd's range, generally following the highway and transmission line corridor. Labrador Winter Trails Inc. established a network of winter snowmobile trails existing of old roads, the existing transmission line

right-of-way, and other trails cut to a 6 m width. Snowmobiling may expose Caribou to sensory disturbance and possible harassment.

As recently as 2007, three poaching incidents resulted in the loss of 39 individuals from the Threatened Mealy Mountain, Joir River and Lac Joseph herds in Labrador. Since many poaching incidents go undetected, it is difficult to determine the role that illegal hunting has had on the decline of the RWM Herd. Given the Herd's status, losses of the magnitude that have been reported are not considered sustainable (Schmelzer et al. 2004).

7.3.1.4 Trans Labrador Highway

Caribou can be affected by future development and upgrades to the Trans Labrador Highway (TLH) in a number of ways. Phase I of the highway bisects the core winter and summer range of the RWM Herd. Additional habitat losses due to highway upgrading and hard surfacing are expected to be minimal. However, construction of Phase III of the TLH may affect the eastern portion of the RWM Herd range, with the route passing near to known wintering and calving/post-calving areas. This could result in both direct and indirect habitat loss.

Increased traffic volumes could deter Caribou from crossing the highway. Although individuals are commonly observed crossing roads and highways, there is evidence that highways may have a filter effect, restricting passage by some individuals or cohorts as traffic levels increase (Curatolo and Murphy 1986; Cameron et al. 1992). Fragmentation of Caribou habitat by highways and other linear corridors can increase predation rates by interfering with the ability of the animals to maintain optimal spatial dispersion from predators and other prey. If RWM Caribou exists as part of a metapopulation or a group of localized populations (Boulet et al. 2005), disturbances that disrupt movements and reduce dispersal opportunities could increase the risk of local extinction.

7.3.1.5 Additional Transmission

Future construction of additional transmission could also affect the RWM Herd. Depending on the route, the associated clearing for additional transmission right-of-way could remove habitat within the Assessment Area. Vegetation management along the lines associated with additional transmission would be expected to reduce habitat suitability for Caribou over the life of the Project. The transmission line right-of-way is not likely to create additional access into previously remote areas for snowmobilers and hunters, given the adjacency of the existing Transmission Line 240.

7.3.2 Changes in Habitat Availability

Cumulative changes in habitat availability may be pronounced for the RWM Herd. The zone of influence modeling for the RWM Herd indicates that existing disturbances (natural and anthropogenic) within the seasonal range may already be affecting Caribou use of approximately 17 percent of the calving home range, eight percent of the post-calving home range and seven percent of the winter home range. In light of recent changes in the distribution of RWM Caribou, it appears that FMD 19A may now contain a substantial portion of the Herd's core range.

There are opportunities for the LCP to continue its cooperation and involvement with the Labrador Woodland Caribou Recovery Team and the Province to develop conservation and impact management strategies that could be applied at the landscape scale to reduce adverse effects. Sequencing of Project activities in a way that would limit disturbance along portions of this corridor during sensitive periods throughout construction will be an effective approach. Appendix IIB-A-1 of the EIS contain a number of mapping products that will be utilized to inform this approach, that were based on consultation with the NLDEC-WD. Opportunities may also exist to work with other stakeholders in the region (forestry and mining companies, recreational organizations, aboriginal organizations), to sequence planned development within the Project footprint in order to reduce overall levels of disturbance in the Assessment Area during the construction period.

7.3.3 Mortality

The RWM Herd is considered vulnerable to increased levels of mortality. The most recent population estimates indicate that the Herd may have declined to a point at which future survival is uncertain. Small populations of any species may face increased risk of extinction. In the case of the RWM Herd, events such as a major forest fire, severe or unusual weather events (e.g., deep snow, icing over of lichen feeding areas) or accidents (e.g., vehicle collisions that kill a group of animals) could further precipitate the population decline. Uncontrolled hunting or poaching would have the same effect. Hunting (and poaching) is considered additive to other forms of mortality. It has been estimated that stable Caribou populations, in non-fragmented areas that are not subject to predator management, can withstand no more than two to three percent annual mortality from hunting (Yukon Renewable Resources 1996). The prohibition of subsistence hunting of RWM Caribou was implemented by the provincial government in 2002 (Schmelzer et al. 2004).

Continued loss of individuals through poaching threatens the Herd's viability. On the same basis, it can be argued that incremental mortality of RWM Caribou because of other human disturbance and land use changes will also threaten the viability of the Herd.

As discussed in the preceding sections, a number of existing, planned and proposed projects in the region could directly or indirectly contribute to increased mortality of Caribou. Direct mortality could result from vehicle collisions on the TLH or resource roads in the region. The completion of the TLH, including upgrades to Phase I, is expected to increase traffic volumes and vehicle speeds, which is likely to increase the frequency of collisions.

7.3.4 Summary

Given the present status of the RWM Herd, the cumulative environmental effects assessment supports a conclusion that the ongoing pressures of predation and illegal hunting and the combined effects of all existing, planned and reasonably foreseeable projects and activities in the region will contribute to possible further decline in numbers and viability of the Herd. There will be a significant cumulative environmental effect. Note that the effects of the Project are overall considered adverse but are not at a scale that would result in a decline to this Herd. In the case of the RWM Herd, landscape disturbances all have the potential to cause loss of critical habitat and additional mortality of individuals. While the extent to which these activities might individually affect the Herd's survival is not clear, the cumulative environmental effects of all of these activities are considered a serious risk to the Herd's viability. It is also recognized that the stable but small number of remaining RWM Caribou, place the Herd in peril even if future development in the region, including the Project, does not occur.

The Labrador Woodland Caribou Recovery Team, of which the LCP is an active participant, has developed an extensive recovery plan for the Threatened Woodland Caribou herds in Labrador (I. Schmeltzer, pers. comm.). The action plan addresses many of the information requirements and risk factors described above, including the need to identify and protect critical habitat, enforcement of conservation measures and research to determine the existing status and viability of these herds. During operation and maintenance of the Project, additional pressure is expected on the RWM Herd. These effects are likely to be most pronounced in the eastern part of the Herd's range (FMD 19A), where landscape changes associated with ongoing forestry operations, along with increased access are likely to affect habitat availability for Caribou. Future forest harvesting operations will cause further direct and indirect habitat loss, reducing the size of undisturbed patches of core calving, post-calving and wintering habitat. Although the conservation measures set out in the Forest Ecosystem Strategy Plan represent substantive efforts to reduce the effects of commercial forestry development on the RWM Herd, it is likely

that the amount and distribution of effective Caribou habitat will change as forest resources are exploited.

According to Thomas and Gray (2002), "if sources of mortality such as wolf predation and hunting are managed, Caribou may be able to co-exist with well-managed developments". Because many developments are likely to occur concurrently within the RWM Herd's range, it is unlikely that such co-existence is possible without careful coordination and planning of all resource development and management activities at a regional level. Such a planning initiative would require participation and commitment by all stakeholders with leadership from the provincial government. The Forest Ecosystem Strategy Plan for FMD 19, prepared by the Province and Innu Nation, establishes a precedent for sustainable resource development in the FMD and may serve as a model for developing an integrated, cumulative environmental effects management framework for the region. The LCP will work closely with other stakeholders and will be able to assist in such aspects as monitoring, controlling access and maintaining a physical presence in terms of deterring further illegal hunting.

7.4 CONSIDERATION OF AVOIDANCE AND/OR REASONABLE ACTIVITY ALTERNATIVES

Although alternatives to the Project were considered in Section 2.5, Volume 1 of the EIS (Nalcor 2009), the Lower Churchill Project was confirmed to be the optimal alternative to address the province's power demand. Therefore, Project infrastructure as previously described is a requirement. Alternatives within the Project were considered throughout the planning and are ongoing. The Project footprint was minimized wherever possible, as illustrated through the use of the existing TL240 right of way corridor for the HVac transmission line from Muskrat Falls to Churchill Falls and existing access roads and trails. General examples of how alternatives are considered within the Project planning are described in the EIS (Nalcor 2009).

In terms of alternatives within the Project, while there have been advancements in technology in some aspects of the design over the past 30 years, it remains that most of the alternative means of carrying out a hydroelectric development are well established and proven by the electrical utility industry. This encompasses the proven technology principle and known experience with a particular design concept or construction technique in Arctic/sub-Arctic conditions (as per the design principles the design selected must consider local climatic/service conditions such as ambient temperature, elevation, humidity and wind).

In considering the overall record of proven performance of a technology, the Project Team also considered specific experience within the organization and applications of the technology within Canada. Consideration of economic feasibility includes capital (construction cost including interest during construction and financing) and operating cost.

The Basis of Design (BOD) includes a life-cycle cost analysis approach that captures this aspect in the design process. Life-cycle cost analysis selects the most cost effective approach from a series of alternative means of carrying out the Project. This is done so that the least long term cost of ownership is achieved, where life cycle costs are total costs estimated to be incurred in the design, development, production, cooperation, maintenance, support and final disposition of an asset over its anticipated useful life from inception to disposal. Economic feasibility in this EIS relies upon evaluation using life-cycle cost analysis. Environmental effects were considered and compared at a preliminary level, but only for alternative means that were economically and technically feasible. The preferred alternative means are those that are carried forward in design and environmental assessment.

A stepwise analysis protocol was used for the assessment of alternative means of carrying out the Project:

- Evaluation of the technical feasibility of alternative means of carrying out the Project;
- Identification of the range of alternative means of carrying out the specific components or aspects of the Project;
- Evaluation of the economic feasibility of alternative means of carrying out the Project;
- Consideration of the environmental effects of technically and economically feasible alternatives of carrying out the Project; and
- Selection of the preferred alternative means of carrying out the Project.

Details of the alternative component analyses are presented in Section 3.7, Volume 1 of the EIS (Nalcor 2009). Following the protocol listed above, it is important to note that for each suite of identified alternative means of carrying out the Project, the analysis does not consider the differentiating environmental effects unless there is more than one alternative that is technically and economically feasible.

7.5 MITIGATION AND MONITORING

The effects management measures (i.e., mitigation measures outlined in the EIS [Nalcor 2009] and the LCP Integrated Generation and Labrador Transmission Assets Environmental Protection Plan (Nalcor 2013) and the commitments made by the Project during the Information Request responses and the environmental assessment hearings to ensure regulatory compliance of the above discussed Acts and regulations include:

- All site personnel shall receive training to recognize any Endangered, Threatened or Vulnerable species of plant or animal and its habitat prior to the start of clearing and any other site activities;

- Personal pets are not permitted on the construction site;
- Buffer zones (of various distances) shall be implemented to protect wildlife at the site;
- Hunting is prohibited at the construction site. All Project participants shall be prohibited from hunting at the construction site while working on the Project;
- Under no circumstances are wildlife to be fed and all measures shall be taken to avoid inadvertent feeding;
- Wildlife shall not be chased, caught, diverted, followed or otherwise harassed by Project participants;
- All wildlife sightings and nuisance wildlife shall be reported to the On-Site Environmental Monitor (OSEM) who will oversee various mitigation measures and collect observation and other monitoring data related to wildlife;
- The Forestry Branch shall be contacted and updated with regards to nuisance wildlife and wildlife encounters;
- Equipment and vehicles shall yield the right-of-way to wildlife and adhere to construction site speed limits. Speed limits associated with Project access roads vary from 10 – 60 km/hr, and are set as per the regulatory requirements set by the Department of Transportation and Works. LCP enforces speed limits on all Project roads;
- LCP will create breaks every 500 m in snow berms alongside roads to enable caribou crossings;
- Where possible, the design of ROW will provide clear sightlines for caribou across the width of the ROW;
- Environmental awareness training, with regular briefings, shall be implemented for all personnel;
- Firearms shall not be permitted on site, with exception of approved bear monitors;
- Where possible, scheduling of activities will be limited and adaptable during calving and post-calving periods as well as during sensitive periods in the winter for caribou (LCP will consult with the NLDEC-WD in such instances);
- Maintain higher flight altitudes (300 agl or higher) during the 'critical' periods (as defined below in Section 7.6.1) during flights and monitoring programs. If caribou are startled ascend to a higher flight path or veer away.
- When caribou (based on collar or observational data) occupy an area under construction/development, LCP will contact the NLDEC-WD to determine if appropriate

mitigation can be put into place or if activities must be suspended at that location (see Section 7.6.1);

- When roads not essential to long-term maintenance are not needed, they will be decommissioned, habitat stabilized, and access shall be restricted;
- Temporary decommissioning of access roads may be considered if Project construction is considerably delayed;
- If access roads are deemed to be necessary during the operations and maintenance phase of the Project, LCP will consult with NLDEC-WD regarding the implementation of access control measures;
- The LCP will continue its participation on the Labrador Woodland Caribou Recovery Team regarding the RWM Herd and support of related research such as the telemetry monitoring program; and
- If necessary, access control measures will be applied in certain areas associated with facilities and/or ongoing activities to prevent disturbance of individual caribou:
    - the reservoir preparation approach will be mostly river based, thereby reducing the need for access from the TLH
    - existing access points will be used;
    - signage in the Project area will be used to deter access; and
    - site security will be in place during construction at the South Side Access Road and other Project locations to restrict public access.

Throughout the construction of the Project, LCP will maintain communications with the provincial NLDEC-WD regarding the movements of RWM Herd sightings in the Project area (see Section 7.6.1). An important component of the mitigation program is the advance planning to minimize the area and time over which caribou may be disturbed. This advanced planning is designed to consider spatial and temporal aspects of caribou ecology.

7.6 ENVIRONMENTAL EFFECTS MONITORING

This SAR PEEMP contains follow-up programs to confirm the predictions of the EIS and to determine the effectiveness of any measure taken to mitigate the adverse environmental effects of the Project. Studies or surveys are also designed to determine whether the Project is implemented as proposed.

The LCP has committed to conduct baseline, follow-up and monitoring surveys for RWM Herd caribou to determine their current state, apply the appropriate mitigation, 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:

- Baseline data collection (i.e., telemetry and other data collected prior to construction);
- Telemetry and other data collection during construction; and
- Telemetry and other data collection during operations.

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

7.6.1 Compliance Monitoring to Address Interactions

Known occupation of areas by season for RWM Herd caribou has been prepared using geo-referenced telemetry data from 2007-2012. These locations of important habitat and expected seasonal occupation are the basis for many of the following mitigation measures:

- LCP is committing to covering costs for the purchase, deployment and annual data fees for up to 10 satellite collars for RWM herd within the study area identified in the EIS. This work will be conducted in conjunction with NLDEC-WD. LCP will purchase collars as per the specifications provided by the NLDEC-WD to acquire the information needed to monitor Project effects and assist in mitigation measures associated with the presence of caribou. Locations of deployment will be determined by NLDEC-WD. LCP will provide logistical support and fund helicopter charters for the deployment of the collars on RWM caribou. NLDEC-WD will lead all collaring activities including dedicating staff for the capture and handling of caribou. LCP will provide funding resources to NLDEC-WD associated with collar activation and data downloads. All data collected on collars of animals located in the Project footprint and those for which LCP has provided collars will be shared with LCP and its contractors. This information will be kept in the strictest confidence and utilized for monitoring and mitigation purposes only. No further release of the data or information will occur by LCP or its contractors. NLDEC-WD and LCP will establish a protocol for the collection and data transfer between the two groups.
- An aerial survey will be conducted each winter during the construction period to provide a general understanding of the location of caribou relative to Project components and planned Project construction areas;

- Caribou will be permitted to cross work areas, and access roads with traffic yielding to the animals when crossing a road;
- If human-mediated caribou mortality occurs, LCP will contact NLDEC-WD immediately;
- Garbage control measures will be used to prevent bears, wolves, and other animals from accessing garbage and prevent attraction of animals to garbage storage areas; and
- The Project footprint will be minimized to the extent possible, including access and other disturbances on the landscape being kept within existing areas of disturbance where possible. (Where it was possible the Project was designed to minimize the creation of new access. For example, the ac transmission line for the Project follows existing linear features such as a transmission line and the TLH.)

The following describes specific potential interaction scenarios and the associated mitigation:

- **Scenario 1** – Caribou **within 20 km** of Project activities as shown in Figure 7-1 (based on satellite telemetry or other reports)
    - OSEM will conduct weekly visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat).
        - If present, wildlife observations will be included in the weekly environmental report to be sent to NLDEC-WD in Corner Brook (whenever Project activities are ongoing), and such information will be presented during environmental awareness training and regular briefings for all personnel.

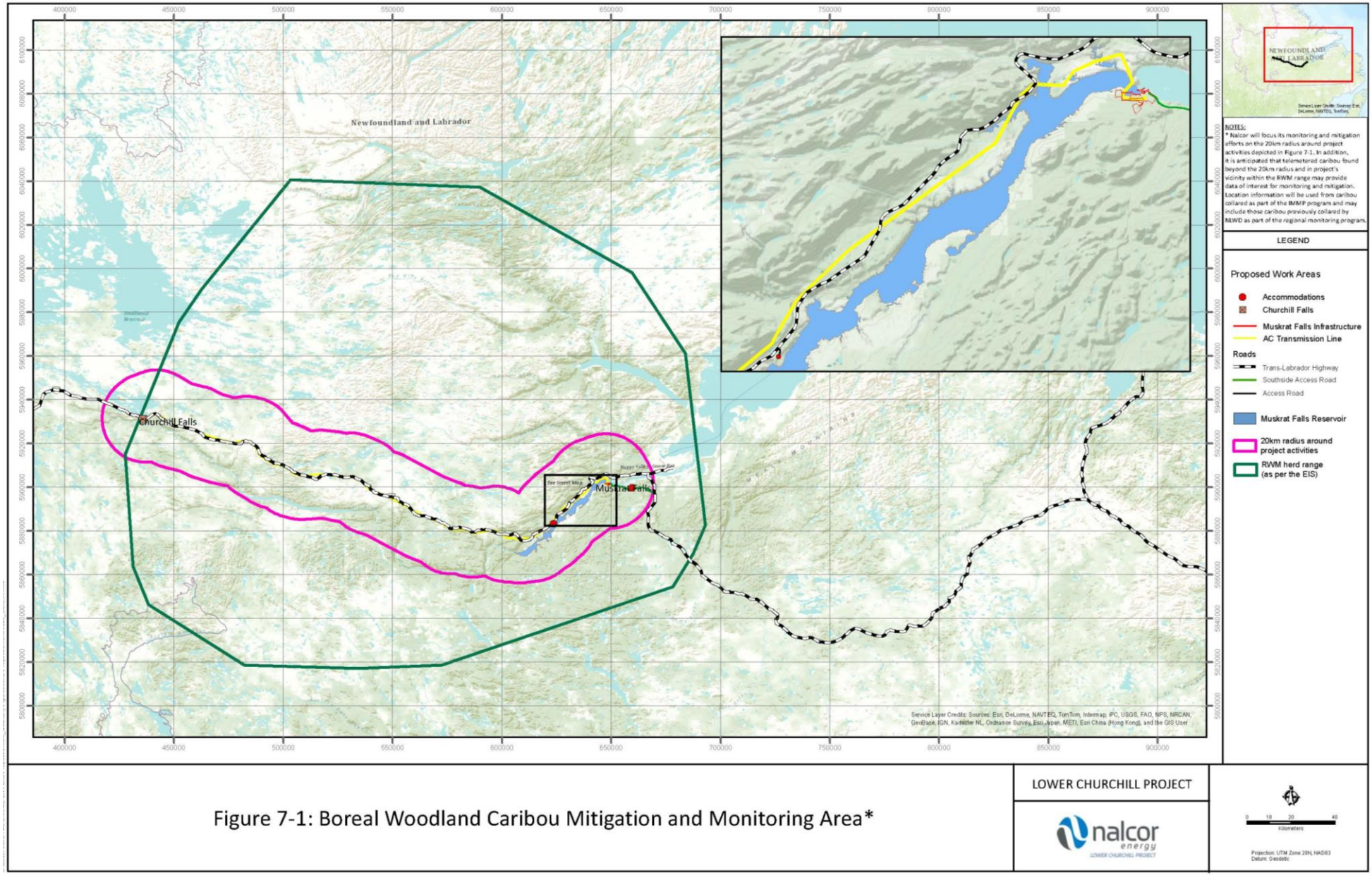

Figure 7-1: Boreal Woodland Caribou Mitigation and Monitoring Area*

- **Scenario 2** – Caribou **within 5 km** of Project activities (based on satellite telemetry or other reports)
    - OSEM to issue advisory to all Project personnel that all sightings of caribou to be reported immediately to the OSEM. The OSEM will then immediately notify all vehicle operators.
    - OSEM will conduct daily visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat).
        - If present, wildlife observations will be included in the weekly environmental report to be sent to NLDEC-WD in Corner Brook.

- **Scenario 3** – Caribou present during sensitive time periods. To reduce disturbance to caribou during the late winter and late pregnancy periods, NLDEC-WD has identified two sensitive time periods during which Project activities may be restricted, delayed or minimized:
    1) A cautionary period (late winter) – February 3 to April 15
        - If Project activities are to occur within 1 km of the known 90% kernels for the wintering period and caribou are known to be present in these areas based on satellite telemetry or other reports, LCP and NLDEC-WD will develop appropriate mitigation which may include restricting, delaying or minimizing an activity.
    2) A critical period (calving/immediately post-calving) – May 30 to June 30
        - If Project activities are to occur within 1 km of the known 90% kernels for the calving/immediately post calving period and caribou are known to be present in these areas based on satellite telemetry or other reports, LCP and NLDEC-WD will develop appropriate mitigation such as restricting, delaying or minimizing an activity.
        -

- **Scenario 4** – Blasting at the Main Site
    - Prior to blasting, the OSEM will conduct a visual survey.
    - If caribou are within 3 km of the site, blasting will be delayed until caribou have left the area.
    - Methods to encourage caribou to leave the area may be implemented in consultation with NLDEC-WD.

- Note, if LCP can demonstrate the planned blasting activity will not likely result in a behavioural response by caribou, the 3 km radius may be reduced.

- **Scenario 5 –** Other Project activities (e.g., grubbing, grading and leveling, laydown and storage of equipment and material in existing areas, generators to support the activity, vehicle and heavy equipment use, handling and transfer of fuel and other hazardous material, waste disposal, sewage disposal and hazardous waste disposal, localized and low intensity blasting, tower erection and conductor stringing).
    - As these activities would not be audible beyond a short distance, if caribou are observed within 500 m of such an activity, the OSEM will determine if the activity will be delayed or curtailed.
    - Wildlife interactions will be included in the weekly environmental report to be sent to NLDEC-WD in Corner Brook .

7.6.2 Effects Monitoring

The LCP has been participating as an observer of the Labrador Woodland Caribou Recovery Team established for the RWM Herd and will continue to support research (such as telemetry work) that will lead to further understanding of this Threatened population. As indicated, LCP will contribute towards the purchase, deployment and monitoring of up to 10 satellite telemetry collars on the RWM Herd. Note, these telemetered animals would be in addition to the estimated 16 animals currently collared in this Herd. Collectively the data being obtained would support the mitigation measures listed above and be used in the effects monitoring program.

The LCP is interested in supporting management interventions that could reverse the decline of this population, attributed as predation and illegal hunting. Increasing the number of individuals in the RWM Herd is an important environmental objective. Parameters for consideration include calf survival, movement and distribution patterns. The LCP will continue communications with the NLDEC-WD to determine the effects of the Project on the RWM Herd, if any, and address issues proactively through an adaptive management approach. As noted in this SAR PEEMP, monitoring will be structured to address the two main predicted effects from the Project, the alteration or loss of habitat and effects on distribution, between baseline, construction and post-construction periods.

Baseline, construction and post-construction follow-up of woodland caribou distribution, movement and habitat selection patterns in the RWM Herd range will be conducted using geo-

referenced telemetry collar data. Analyses would be conducted on an annual basis, and by season (i.e., calving, post calving, and winter). The design would involve a comparison of use versus availability within various buffer distances from the Project footprint, and comparing habitat selection patterns post-construction (after 2018) and during construction (June 2012-2018), to pre-construction (i.e., 2007- June 2012). Habitat selection within various buffer distances from the Project footprint will be quantified and compared using Manly's standardized selection ratio (Manly et al. 1972, 2002). Preliminary buffer distances from Project disturbances will be 100 m, 250 m, 500 m, 1,000 m, 2,500 m, and 5,000 m. The adequacy of the current and projected telemetry sample and their location would be discussed with the NLDEC-WD with agreed financial, personnel and logistical support provided and agreed by LCP.

To further describe activities during construction, LCP will produce quarterly map products showing the spatial and temporal extent of activity and measures of the type of activity. Predictions as to the response of caribou will be made and later evaluated after a description of the functional loss or alteration of habitat near access roads and other areas of activity is completed.

Telemetry collar data will also be used to examine mortality rates of collared caribou within buffers around the Project footprint, if data on caribou mortality are available. When collars cease to move and indicate a mortality event, the cause of the mortality may be determined when collars are retrieved. This will provide information on the effects of predation on caribou without collaring predators, depending on data availability. Broader analyses of herd demographics such as age class and sex distributions, recruitment rates and rates of population change may be derived from provincial ungulate aerial surveys. However, although such data are generally useful for inferring demographic statistics and change at the range scale and therefore cumulative effects, they would likely not be informative for inferring Project-specific effects. Nonetheless, when available, data on the demographics of the RWM Herd will be examined and discussed to provide a broader context for the ecology of the herd.

An aerial survey will be conducted each winter for the presence of caribou (uncollared) within the Project area. This information will further support the telemetry data and ground surveys.

A summary of the caribou specific monitoring commitments and relevant details is presented in Table 7-2.

7.7 ADDITIONAL INFORMATION

The LCP has agreed to support additional wildlife monitoring that will provide a measure of predator, moose and other indicators of the ecosystem that would influence caribou. These include:

- Furbearer transect replication completed in 2006 and previously throughout the lower Churchill River watershed; and
- Aerial surveys for moose and other wildlife at seventeen 10.5 km^2 long term monitoring blocks throughout central Labrador that have been examined on several occasions since 1995 (e.g., Trimper et al. 1996, Minaskuat Inc. 2009).
- If during the capturing and collaring of the 10 caribou, feces is voided, it will be collected and provided to NLDEC-WD to support its research initiatives.
- Any incidental observations of wildlife collected during LCP's baseline, follow up, or monitoring surveys will be made available to NLDEC-WD.
- Traffic data currently being recorded for the South Side Access Road will be provided to NLDEC-WD to support its research initiatives.
- LCP will collect traffic count data on the access road associated with the construction camp for reservoir clearing and ac transmission line clearing and will provide the data to NLDEC-WD to support its research initiatives.

7.8 REPORTING

A compilation of daily reports will be submitted to NLDEC-WD on a weekly basis. This report will provide a synopsis of completed activities, any new mapping or data plots, photographs as well as a weekly look-ahead. Any alteration to habitat, monitoring updates and changes in activities, timeline or schedule will also be communicated to NLDEC-WD.

A yearly report will be submitted to NLDEC-WD that summarizes the monitoring activities described in this PEEMP and any associated environmental effects monitoring conducted for the Project related to species at risk in Labrador. The yearly report will include all data collected as part of monitoring programs. The data associated with field programs will also be provided to NLDEC-WD upon request.

Table 7-2 Summary of Caribou Environmental Effects Monitoring

	Survey Type	Objective	Location	Timing	Frequency	Contingency (e.g., If caribou are present)
Pre-Construction						
	Presence of Caribou	• Determine if caribou are present in the vicinity of the Project components prior to initiation of construction	• Planned construction locations	• Within seven days of initiation of construction activities	• Ongoing - prior to work in a given area	• Refer to Section 10.32.2 of Generation / LTA EPP for appropriate response
Construction						
	Presence of Caribou	• Determine if caribou are in the vicinity of the Project components during construction activities and if so, initiate appropriate mitigation	• Locations of construction activities	• During construction activities	• Ongoing – during construction	• Refer to Section 10.32.2 of Generation / LTA EPP for appropriate response
Post-Construction						
	Caribou Habitat Use and Distribution	• Using telemetry data provided by the NLDEC-WD to compare use versus availability within various buffer distances from the Project footprint, and comparing habitat selection patterns post-construction to pre-construction	• Project area and associated buffers.	• During operations	• Year 2 and Year 5 of operations	• Refer to Section 10.32.2 of Generation / LTA EPP for appropriate response

8 AVIFAUNA

8.1 HABITAT USE / HABITAT PREFERENCES

Avian species at risk that have been confirmed in the lower Churchill River watershed include Rusty Blackbird, Olive-sided Flycatcher, Common Nighthawk, Harlequin Duck, and Gray-cheeked Thrush. Some observations of these species (i.e., Common Nighthawk, Olive-sided Flycatcher) occurred during baseline forest songbird surveys in 2006 and 2007 (Minaskuat 2008a), or during the longer-running Happy Valley Breeding Bird Survey route (i.e., Gray-cheeked Thrush, Rusty Blackbird) (Sauer et al. 2007).

Each of these species has specific habitat requirements/preferences that have been identified in an ELC of the area of interest (Minaskuat 2008b). The thirteen ecotypes, described in *Project Area Ecological Land Classification* (Minaskuat Inc. 2008b), are summarized in Table 8-1. For subsequent discussion, some ecotypes were combined into habitat types based on similar characteristics.

Table 8-1 Summary of ELC Ecotypes for the Lower Churchill River Valley

ECOTYPE	GENERAL DESCRIPTION
Black Spruce/Lichen Woodland	Open black spruce/lichen complex; small patches of mostly stunted black spruce surrounded by large areas of *Cladina* spp. lichens.
Black Spruce/Sphagnum Woodland	Open canopy of stunted black spruce with understory of *Sphagnum* spp. mosses, forbes, sedges and other mosses. Often found at the margin of wetlands such as between bog and fens, and coniferous forest
Marsh	Exists along the banks of the Churchill river and its tributaries. Flooding and scouring by ice limit vegetative growth. No tree cover and sparse ground cover including bulrushes, rushes, sedges and grasses.
Black Spruce on Outcropping	Exists on exposed bedrock typically on crests of hill and ridges. Due to exposure in thes areas, shrub cover is sparse and tree cover consists of black spruce growing in small sheltered areas. Ground cover may include *Cladina* spp. lichens and feathermoss.
Fen	Ground cover includes sphagnum mosses, sedges and grasses with sparse shrub cover. Tree cover is balsam fir and American larch. Fens may be patterned (ribbed fens) or unpatterned.
Low Shrub Bog	Peat lands that support sparse tree cover (black spruce or American larch) and stunted patchy shrub cover. Sphagnum mosses and sedges form the ground cover. Bogs may also be patterned and unpatterned. Most common wetland ecotype in the Survey Area.

Riparian Meadow	Exist along the shores of long rivers with large flood plains. Due to ice scouring and flooding, vegetation is maintained at an early stage of succession. Meadows consist primarily of blue-joint reedgrass, tall meadow-rue and dwarf red raspberry mixed with patches of shrubs, generally less than 2 m tall. There is no tree cover.
Black Spruce/Feathermoss	Dense black spruce tree canopy. Shrub layer consists of common Labrador tea, velvetleaf blueberry and small black spruce. Ground vegetation includes feathermoss and *Cladina* spp. Ecotype occurs in river valley and surrounding upland areas.
Mixedwood Forest	Occurs along the Churchill River valley but also along the valley of tributaries. Dense tree canopy includes heart-leaved paper birch, balsam fir and black spruce. Shrub layer includes green alder, squashberry and young black spruce and balsam fir. Ground vegetation consists of mosses intermixed with forbes and pteridophytes.
Fir-White Spruce Woodland	Dense tree canopy of balsam fir and white spruce which may include heart-leaved paper birch. Shrub cover primarily composed of regenerating balsam fir and speckled alder and squashberry. Ground cover includes mosses mixed with forest forbes.
Hardwood	Ecotype generally occurs on slopes in upland areas and is most common north of Gull Island. Dense forest canopy includes heart-leaved paper birch, paper birch, quaking aspen, balsam poplar, balsam fir and black and white spruce. Shrub layer may consist of green or speckled alder, squashberry and regenerating balsam fir, black spruce and heart-leaved paper birch. Ground cover includes forest forbes.
Spruce-Fir Feathermoss	Ecotype mostly restricted to the Churchill River valley and the larger tributaries. Moderately dense canopy consisting of black spruce and balsam fir. Shrub layer includes regenerating canopy tree species. Ground cover consists of a moss carpet and may include other vegetation species such as mountain cranberry.
Riparian Thicket	Ecotype often occurs along shores of large river in areas where sediments have accumulated, at bends in the river and on river islands. Riparian Thickets are a successional stage between Riparian Meadow and other forest ecotypes. Shrub cover includes alder and willow spp. Tree cover is sparse and may include heart-leaved paper birch, white spruce and balsam fir with sparse ground cover.
Notes: **Source:** Minaskuat Inc. 2008b	

8.1.1 Harlequin Duck

Harlequin Duck in Labrador are part of the Eastern population that has a Vulnerable status under the *NLESA*. A variety of factors across this species' range may pose threats to this population of Harlequin Duck. When these birds spend time at sea during the over-wintering and moulting periods potential threats include: entanglement in fishing nets, aquaculture development, illegal/incidental harvest, disturbance, and chronic and catastrophic oiling. Land-use practices involving resource extraction (e.g., forestry) or hydroelectric development in some areas of the Harlequin Duck breeding range may also pose a threat (Government of NL n.d., Internet site).

Over the last decade, population numbers of this migratory species have slowly rebounded (since being first listed) with a strong recovery across much of Eastern Canada (SARA 2012, Internet site). Aerial surveys and ground-based studies throughout Labrador indicate the importance of the region overall as a breeding area (Trimper et al. 2008). Within the lower Churchill River watershed, Harlequin Duck nest in the upper reaches of many of the Gull Island tributaries such as the Fig, Metchin and Minipi Rivers; however, only the Penas River of the Muskrat Falls reservoir is known as breeding habitat (i.e., rocky and fast-flowing river sections) (not discernible in the ELC). Other sections of the river such as tributary estuaries may be used as staging locations (Nalcor 2009).

8.1.2 Common Nighthawk

The Common Nighthawk has a Threatened status under the *NLESA*. This species has experienced a rapid population decline across its range (Savignac 2007). This decline has largely been a result of altered and lost habitat. In particular, forest harvesting and the reforestation of agricultural fields have reduced the amount of suitable breeding habitat. Human disturbances such as fire suppression, intensive agriculture (including insecticide use), and the reduction of flat, gravel covered rooftops over time have all contributed to a decrease in suitable nesting sites and prey (i.e., insect) availability.

Other contributing factors to the population decline of this species include motor vehicle collisions and fluctuations in climate at both migration and breeding sites (Savignac 2007). Its distribution extends into central and southern Labrador (Godfrey 1986; NatureServe 2007, Internet site). In the boreal ecoregion, Common Nighthawk prefer open forest habitat in the form of rocky barrens or forests (e.g., black spruce lichen woodland) regenerating from fire or clear-cuts (Poulin et al. 1996, Internet site). Minaskuat (2008) frequently observed this species in the Churchill River valley and in Happy Valley-Goose Bay.

Common Nighthawk are present on breeding grounds from late May to August. In winter, it extends across much of South America (NatureServe 2007, Internet site).

8.1.3 Olive-sided Flycatcher

The Olive-sided Flycatcher has a Threatened status under the *NLESA*. The continued population decline of this species is not well understood but change in boreal forest fire cycles suggests there is significantly lower nest success in harvested stands compared with stands that originated with fire (COSEWIC 2007). Altered and lost habitat on this species' wintering/migration habitats may also be a factor contributing to population declines

(COSEWIC 2007). Its northeastern range extends into Labrador, as far as the lower Churchill River watershed (Godfrey 1986; Dunn and Alderfer 2007; NatureServe 2007, Internet site).

The Olive-sided Flycatcher is an exclusively boreal breeding species that prefers forest edges in burns and riparian habitat (such as along Lower Brook), or wetlands and open forest types (Altman and Sallabanks 2000, Internet site). As a late spring and early fall migrant, this species is usually present at breeding locations from late May or early June to mid-August. This species overwinters in northern South America and Central America (Altman and Sallabanks 2000, Internet site).

8.1.4 Rusty Blackbird

The Rusty Blackbird has a Vulnerable status under the *NLESA*. The decline of this species is largely attributed to the loss of wetlands to development particularly in the Mississippi Valley flood plain, however this is not thought to be the only threat that drove original declines or which may be responsible for continuing decline. Bird control programs in the United States are also considered to be a threat to this species (COSEWIC 2006). The lower Churchill River valley contains primary habitat of the winter range for Rusty Blackbirds.

This species occurs across most of Labrador except the far north during the breeding season (Godfrey 1986; NatureServe 2007, Internet site), and is generally uncommon. Rusty Blackbird are attracted to riparian and wetlands habitat that are limited in the lower Churchill River valley. Nesting habitat for the Rusty Blackbird is typically conifers along the edge of a bog or other wetland.

8.1.5 Gray-cheeked Thrush

The Gray-cheeked Thrush is provincially designated as Vulnerable under *NLESA* (Government of NL n.d., Internet site). Due to insufficient data, threats and limiting factors that may have contributed to the decline of this species cannot be made conclusively.

However, there is some evidence that conditions and circumstances on the wintering grounds in South America (i.e., deforestation), and during migration in both spring and fall may have contributed. One such threat during migration may include collisions with man-made structures (i.e., towers).

Threats on the breeding grounds in Newfoundland and Labrador have not been definitively determined. Industrial forest activity and the introduction of the Red Squirrel to the island of Newfoundland are two such possible threats (SSAC 2010). Its range extends across much of Labrador and includes the lower Churchill River watershed (Todd 1963; Godfrey 1986; Lowther et al. 2001, Internet site). Although records from within this area are limited to fewer than five

documented reports each from Happy Valley-Goose Bay and North West River (Dalley et al. 2005), this likely reflects a lack of documentation, rather than an accurate inventory regarding the abundance of Gray-cheeked Thrush.

This species was not recorded on the Happy Valley Breeding Bird Survey route (Sauer et al. 2007). Breeding habitat in the Project area occurs primarily along the south side of Muskrat Falls in white spruce/mixed wood, fir spruce, and balsam fir/mixed wood forest (Nalcor 2009).

8.2 CUMULATIVE EFFECTS

The following section describes the interaction of Project components and potential effects on the Harlequin Duck, Common Nighthawk, Olive-sided Flycatcher, Rusty Blackbird and Gray-cheeked Thrush. The combined potential contribution to incremental and/or cumulative landscape change in Labrador is described in conjunction with other existing and potential (future) land use activities (Nalcor 2009).

The environmental effects of the Project on wildlife are primarily associated with habitat alteration or loss. Depending on the species, the Project is expected to result in the displacement or alteration of home range of individuals. This displacement of wildlife by the Project will not result in a measurable change in such interactions as predation or competition (interspecific or intraspecific). By their nature, species at risk tend to have discontinuous distribution across preferred habitat and are therefore further examined in detail below due to their potential greater vulnerability to disturbance.

Environmental effects of the Project on each of the species at risk are characterized using the following descriptors (additional information is available in Section 5.5 of Volume IIB of the EIS [Nalcor 2009]):

- Nature - the long term environmental effects of the Project on the KI (adverse, positive or neutral).
- Magnitude - the extent of change from the baseline state.
- Geographic extent - the physical area within which interactions are expected to occur.
- Duration - the period of time the environmental effect will occur.
- Frequency - the number of times the Project will have an environmental effect.
- Reversibility - whether the adverse environmental effects are reversible or irreversible.
- Ecological context - the general characteristics of the area with respect to existing levels of human activity in the Assessment Area.
- Level and degree of certainty of knowledge, low or high level of certainty.

- Likelihood.

For all terrestrial environment components that were assessed (which included species at risk), a significant adverse residual environmental effect from the Project was defined as one which would cause a decline such that a sustainable population cannot be maintained within the Assessment Area. As species at risk populations may already be challenged in terms of their sustainability, the determination needs to examine whether the recovery of the population is possible in consideration of the Project. A residual adverse environmental effect that does not meet the above criteria is not significant.

The effects analysis of avian species at risk was assessed on the basis of expected changes in habitat availability (EIS Volume IIB, Section 5.11), and other aspects of the Project activities that could lead to changes in distribution, health or mortality.

8.2.1 Harlequin Duck

During construction, some staging habitat used during spring/fall migration may be altered or lost during reservoir preparation and subsequent flooding, and construction of access roads and the interconnecting transmission line. Additional activities are not expected to affect aquatic habitat and, therefore, further changes to the Harlequin Duck population will be limited to temporary and local disturbances related to access roads. As the reservoir preparation approach will be mostly river based, the need for access has been greatly reduced. Increased access, both from the Project and other activities, may lead to an increase in mortality due to hunting, but this should be limited as the harvesting of this species is prohibited, and mitigation efforts can limit public use of private roads. Other activities such as military training will not result in measurable environmental effects to Harlequin Duck. In combination, the cumulative environmental effects of increased forestry and hunting will be at a regional level, continue over the long term, be reversible and occur predominantly in a previously undisturbed area.

A portion of the spring-staging habitat for Harlequin Duck in the Assessment Area will be lost as a result of more extensive and persistent ice cover on the reservoirs during operation and maintenance of the Project. This is expected to have a low magnitude effect, especially if lowering of spring reservoir levels mitigates the extent of additional ice cover.

Annual forest harvesting will result in ongoing creation of new access roads on the landscape; however, as hunting pressure on the protected Harlequin Duck is minor and any disturbance caused along such access roads will be short term, forestry activities are not expected to have a significant environmental effect on the population.

With the proposed mitigation and environmental protection measures, the cumulative adverse environmental effect on Harlequin Duck of all past, present and reasonably foreseeable

projects and activities, in combination with the environmental effects of the Project, is considered not significant during either the construction or operation and maintenance phases.

8.2.2 Other Species of Concern

During construction, variable amounts of primary habitat will be lost for each of the other species at risk (i.e., Common Nighthawk, Olive-sided Flycatcher, Rusty Blackbird and Gray-cheeked Thrush). Forestry operations will cause further loss of habitat and changes in distribution primarily for Gray-cheeked Thrush. The cumulative environmental effects of forestry during the construction period will be minimized as commercial harvesting efforts during this time will focus on the reservoir area and this loss of habitat has already been assessed as part of the Project. Increased access, both from the Project and other activities, may cause an increase in mortality due to vehicle collisions, but this can be mitigated by rehabilitating access roads where possible and posting speed limits. As previously stated, the reservoir preparation will be mostly river based which has greatly reduced the requirement for new access roads. Other activities such as military training will not result in measurable environmental effects to these species at risk.

Environmental effects during the construction phase of the Project, as well as from other reasonably foreseeable projects and activities, are predicted to be adverse but not substantial for most of these other species at risk, and may even be beneficial for Common Nighthawk and Olive-sided Flycatcher (due to the opening up of the landscape which offers new breeding and foraging opportunities). While some of the individuals of the existing population of each species will be displaced, the relatively widespread availability of undisturbed primary and secondary habitat is expected to limit changes in abundance and competition-related changes in health. There will be a short term recovery period resulting in the population stabilizing at a level likely to be similar to that of the pre-disturbance population.

During operation and maintenance, additional pressure on other species at risk is expected to occur primarily through forestry activities. Road construction and use is likely to negatively affect the Common Nighthawk due to their susceptibility to collisions with vehicles. It may have a moderate adverse environmental effect on Gray-cheeked Thrush, a slight positive environmental effect on Common Nighthawk, and minimal influence on the Rusty Blackbird population. The Olive-sided Flycatcher may also be affected by forest harvest as a result of negative effects on nesting success rates (e.g., ecological traps) (Robertson and Hutto 2007).

A Methyl-Mercury EEMP has been developed to measure the effects on Osprey. If high or significant levels of methyl-mercury are measured in Osprey tissues, consideration of instituting an appropriate mercury monitoring protocol for Rusty Blackbirds will be discussed with the

NLDEC-WD, due to their high consumption of aquatic insects they are considered to be prone to mercury accumulation.

With the proposed mitigation and environmental protection measures, the adverse cumulative environmental effect on these species at risk of all past, present and reasonably foreseeable projects and/or activities, in combination with the environmental effects of the Project, is considered not significant during either the construction or operation and maintenance phases.

8.3 CONSIDERATION OF AVOIDANCE AND/OR REASONABLE ACTIVITY ALTERNATIVES

Although alternatives to the Project were considered in Section 2.5, Volume 1 of the EIS, the Lower Churchill Project was confirmed to be the optimal alternative to address NL's power demand. Therefore, Project infrastructure as previously described is a requirement. Alternative means of carrying out the Project were considered throughout the planning phase and are ongoing. The Project footprint was minimized wherever possible, as illustrated through the use of the existing TL240 right of way corridor for the HVac transmission line from Muskrat Falls to Churchill Falls and the use of existing access roads and trails where possible. General examples of how alternatives are considered within the Project planning are described in Section 4.1 of the EIS.

8.4 MITIGATION AND MONITORING

The Avifauna Protection and Environmental Effects Monitoring Plan includes three levels of mitigation measures to be implemented during construction activities. These mitigation measures include specific monitoring actions proposed to document any residual adverse effects of Project activities on the identified species at risk.

8.4.1 Level 1 Protection - General Mitigation Measures

There are a number of general mitigation measures that will be implemented to reduce the effects of construction on all species of wildlife, including avifauna species at risk.

- Where possible, scheduling of activities will be limited and adaptable during sensitive time periods (as per Table 8-3). If activities must occur during the sensitive time periods, LCP will consult with the NLDEC-WD in such instances to determine if additional mitigation measures are necessary;
- Implement policy of no harvesting or other harassment of wildlife, and no possession of firearms or pets by Project personnel;

- Implement environmental awareness training and conduct regular briefings for all personnel and all site personnel shall receive training to recognize any Endangered, Threatened or Vulnerable species of plant or animal and its habitat prior to the start of clearing and any other site activities;
- Use of environmental monitors to oversee application of the Environmental Protection Plan (EPP).
- Use existing roads, quarries and other disturbed areas where possible, vehicle traffic should follow established routes to ensure protection of the Common Nighthawk nests in open areas;
- Restrict public access to temporary roads and work areas;
- Speed limits associated with Project access roads vary from 10 – 60 km/hr, and are set as per the regulatory requirements set by the Department of Transportation and Works. LCP enforces speed limits on all Project roads;
- Locate construction roads within the reservoirs where possible;
- Rehabilitate work areas and access roads no longer required in accordance with the EPP to encourage re-formation of natural conditions;
- Undertake blasting in accordance with permits and standard procedures; and
- Use existing right-of-way corridors for construction of transmission lines where possible.

The OSEMs ensure general mitigation measures as outlined in the Generation and LTA EPP, Avifauna Management Plan (AMP) and this SAR PEEMP are implemented and followed. OSEMs will report sightings and general orientation will include an educational component for all personnel on the identification of species at risk.

Table 8-2 Sensitive Life History Stages for Avifauna

Species	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
Early Nesting Waterfowl																								
Late Nesting Waterfowl																								
Forest Avifauna																								
Raptors																								

No interaction
Low Interaction
Moderate to High Interaction

*Table taken from Environmental Impact Statement, Lower Churchill Hydroelectric Generation Project.

8.4.2 Level 2 Protection - General Awareness Mitigation Measures

There are several cues personnel will be made aware of that may identify an active nest. Such cues will indicate that the disturbance footprint for the Project will include potential nesting habitat for many migratory bird species (ground, tree and shrub nesters), including avian species at risk. Nests could be located in trees or shrubs or on the ground. An active nest could be identified by:

- The presence of birds or eggs in a nest;
- Adult birds carrying food or nesting materials to a specific location; and
- Adult birds defending territory, through singing, screeching or diving.

When one or more of these cues are noted, measures will be undertaken to identify if the potential location of the nest is in the disturbance footprint or within the recommended setback buffer.

8.4.3 Level 3 Protection – Directed Survey Protocols

Additional avifauna mitigation measures include ground surveys to identify breeding migratory bird species including species at risk within areas that will be disturbed. A qualified avian biologist will lead the program that includes conducting ground searches for avifauna nests during the time period 1 May to 31 July.

These surveys will be designed to occur <7 days prior to the clearing activity. The census techniques will vary according to the configuration of the area of interest but will be based on 100% coverage. Active nests will be identified and locations and mitigation measures communicated to the OSEMs. In addition, OSEMs are directed to continue to watch for signs of active nests while working during the breading period.

The ground survey team will be instructed in the identification of nests that may be readily visible or well concealed. The survey team will be aware of behavioral cues that suggest the presence of an active nest, even if it cannot be seen. These cues include singing males, pairs observed together (including courtship and copulation), adult birds repeatedly carrying nest materials or foods to a specific location, aggressive defense of a location (against other birds or people), or the presence of recently fledged birds (often with some tufts of down feathers remaining, or begging persistently for food).

When avian species at risk are in an area under construction/development the NLDEC-WD will be contacted to determine if appropriate mitigations can be put into place or if activity in the area must be halted. For most situations, buffers surrounding Project activities, in addition to

clearing activities have been identified, to ensure the effect on nest success is mitigated. These buffers and mitigation activities include:

- A visual survey of the immediate area of a blast site within one hour prior to a blast and operations will be curtailed if wildlife (e.g., Harlequin Duck) is observed within 500 m. Environmental personnel and OSEMs will conduct a pre-blast survey for species of risk;
- Only essential vehicular activity shall be permitted;
- Crews will cease work if there is a disturbance at a nest until activity at the nest has returned to normal; work will not commence again until approved by the OSEM;
- Helicopters are to respect a minimum altitude when moving through specific locations along the Churchill River that are known as spring and fall staging areas for Harlequin Duck. Helicopters moving through these locations (typically during May or September) will maintain a minimum altitude of 500 m from Harlequin Duck;
- For known Rusty Blackbird nests, a minimum 75 m buffer of natural vegetation will be maintained to increase likelihood of successful fledging;
- For known Harlequin Duck nesting areas, a 100 m buffer of natural vegetation will be maintained along the river's edge during their breeding, nesting and staging times (May through September). A 30 m buffer will be maintained outside the sensitive nesting season. Clearing and construction within these buffers during this time will not occur unless otherwise authorized; and
- For active nests of other species at risk, a 30 m buffer of natural vegetation will be maintained during May through July until the young have fledged and the nest is inactive.

8.5 ADDITIONAL MONITORING SURVEYS

During construction and operation of the Project, areas to be disturbed will be identified prior to the start of specific Project activities and surveyed during the breeding season before disturbances occur. Survey techniques vary for each avian group, location, frequency and objective for pre-construction and post-construction activities (Table 8-3). Species at risk in the area will be detected through these surveys as well as through targeted surveys during monitoring point surveys to determine species presence, abundance and distribution in habitat/areas of high potential within the Project area.

Monitoring and follow up activities as they pertain to species at risk include:

- aerial surveys of the lower Churchill River and surrounding locations for waterfowl and observation of waterfowl temporal use of traditional ashkui locations in this area; and

- survey for active raptor nests within 800 m of the construction site.

Mitigation for active raptor nests will be determined in consultation with the NLDEC-WD. The implementation of the AMP addresses other songbird species of risk: Common Nighthawk, Olive-sided Flycatcher, Rusty Blackbird and Gray-cheeked Thrush. Surveys of forest avifauna will be carried out at key intervals during construction and operation and maintenance. The LCP will keep a log/database of road kill (all species) during the construction phase of the Project.

Monitoring surveys will follow guidelines developed for the "Newfoundland and Labrador Boreal Bird Monitoring Program" however, additional and separate surveys for Common Nighthawk will be completed in areas of good habitat within and outside of the Project footprint. The number and distribution of Common Nighthawk surveys will be determined in collaboration with the NLDEC-WD.

Monitoring and Follow-up activities are described in the following sections. Figure 8-1 illustrates the avifauna environmental effects monitoring area.

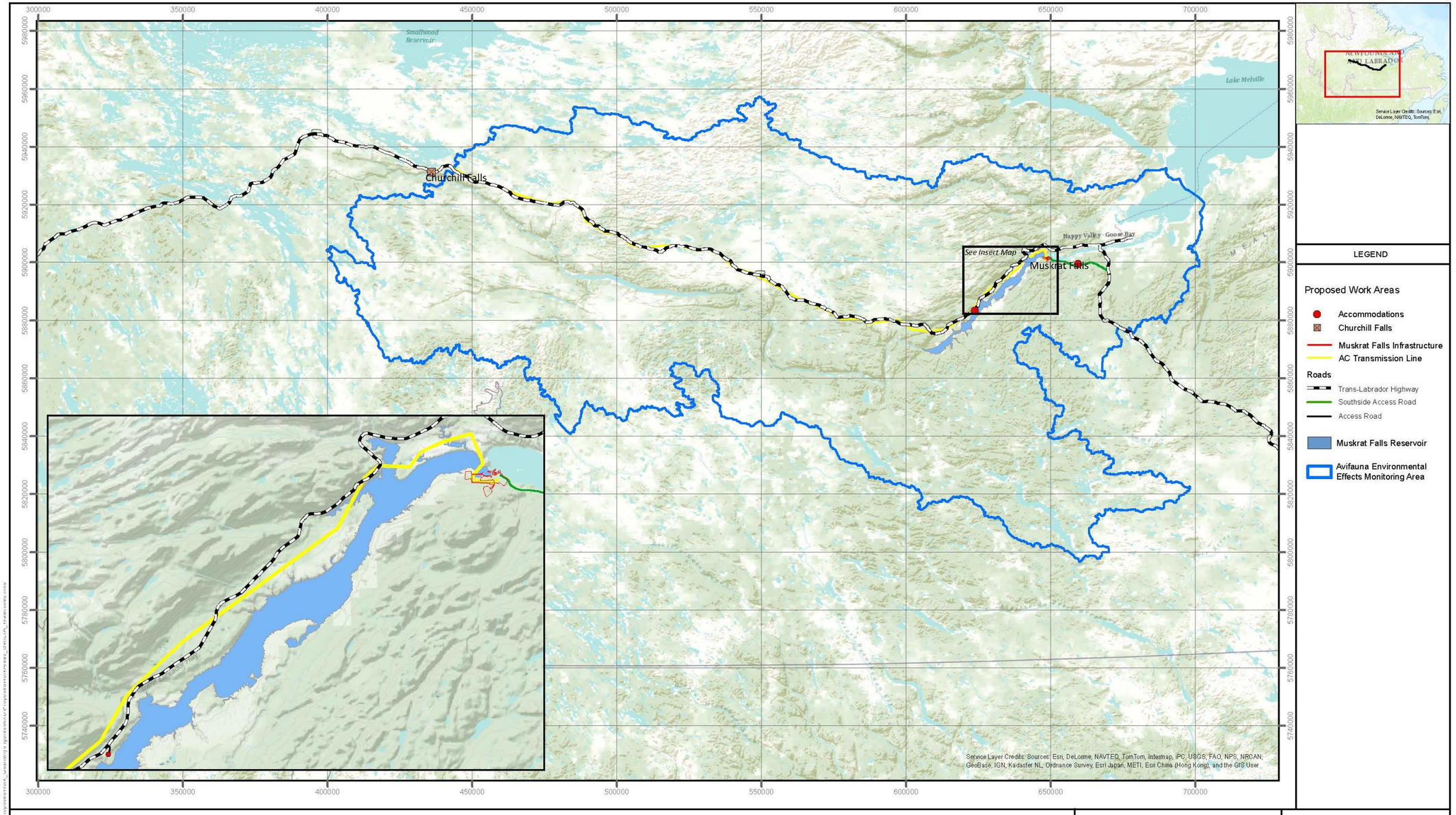

Figure 8-1: Avifauna Environmental Effects Monitoring Area

LOWER CHURCHILL PROJECT

8.5.1 Waterfowl-Ashkui Surveys

A qualified avian biologist will be included in the aerial survey to monitor ice conditions to identify open water areas (ashkui) suitable as habitat for waterfowl such as Harlequin Duck, both inside the Project footprint and near the Project.

Following identification and documentation (e.g., size) of ashkui locations during the ice monitoring survey, two aerial waterfowl surveys will be conducted during the breeding season in late May to early June. The goal of each survey is to document waterfowl species, abundance (number of each species), and activity (nesting/breeding, staging, foraging) at the ashkui sites. Surveys will be flown by helicopter approximately 50 to 100 m above ground level at a speed of 50 to 100 km/h. Speed and altitude will vary at the discretion of the biologists and pilot to facilitate identification of waterfowl species, avoid disturbing the waterfowl and maintain safe flying conditions.

The flight path will follow the shoreline of the lower Churchill River, with focus on ashkui identified during the survey to monitor ice conditions. The general flight path will be pre-determined, but the actual flight path will be refined during the flight based on the direction of the navigator. The flight path will be tracked using a handheld GPS unit. When the helicopter approaches an ashkui, the flight path will follow the edge of the open water.

Two qualified avian biologists will accompany the pilot. The biologist seated in the front will primarily act as navigator and spotter as duties permit. The other biologist will be seated in the back, acting as primary spotter and recorder. Waterfowl are generally counted within 200 m of the helicopter, beyond which distance accuracy of detection and identification decrease. When waterfowl are observed, the biologists will record the species, sex, and group size. All observations during spring will be placed in one of the following categories which enable inferences to be made about the breeding population (after Dzubin 1969):

- Pair: A male and female in close association. Each pair represents one breeding pair.
- Lone drake: Single isolated drake. Each lone drake is considered to have a nesting hen and is thus considered a breeding pair.
- Grouped drakes: Two to four drakes in close association. The drakes in these smaller groups are considered to have been paired on territory, such that they each represent a breeding pair.
- Other groups: Large groups or groups containing five or more drakes. These groups are generally comprised of individuals not dispersed into breeding territories and are considered migrants that are not counted towards the local population.

Observations will also include notes on the behaviour of the birds noted (e.g., feeding, courting). These surveys will be conducted at least two years post-inundation due to environmental conditions or other factors to guarantee results. The location of incidental wildlife observed during survey flights will also be recorded and geo-referenced.

8.5.2 Point Count / Breeding Surveys

The objective of the Point Count/Breeding Survey is to verify the predicted environmental effects associated with construction. Point count surveys identify birds through song (visual) or call (auditory).

Point Count Breeding Surveys will be conducted in selected habitat types both outside and within the Project area to measure presence and relative abundance of breeding birds. Point locations will be determined *a priori* and will be distributed to target wetland and other habitat types preferred by avifauna species at risk. Survey locations will be a minimum of 100 m from a road or 50 m from other linear disturbances (e.g., a cutline or trail), and a minimum of 250 m apart.

Surveys will be conducted by two qualified avian survey team members using a standard point count method, including appropriate weather and time of day, consistent with that of the North American breeding bird survey (Ralph 1993). Surveys will be conducted between 0600h and 1000h during the breeding season, between May 1 and July 31. Using binoculars, two team members will conduct each survey by remaining still (occasionally rotating) for 10 minutes at the point location and recording all bird species observed within 300 m of the point location.

Both visual and auditory observations are recorded. Data collection follows a presence-absence study design and each species is recorded only upon the first observation at each point location. For each bird observed, the following information is recorded in accordance with the stated methodology: species name, sex, and location of bird in relation to observer (i.e., individual located within 50 m, individual located between 50 and 100 m, individual located beyond 100 m, species flying through the survey area below the forest canopy, and species flying through the survey area above the canopy).

The movements and behaviour of the individual will also be noted. Weather data including temperature, sky condition (e.g., cloud cover) and wind conditions (Beaufort wind scale) will be recorded at the beginning of each point count. The UTM coordinates for each plot will be recorded using a hand-held global positioning (GPS) unit.

The location of incidental wildlife encountered during the breeding bird surveys will also be recorded and geo-referenced.

8.5.3 Wetland Songbirds Surveys

Wetland songbird species are restricted in their choice of habitat. Most wetland species have little or no ability to adapt to forested habitat. The species that exemplify this limited adaptability are the migratory sparrows of wetland and riparian habitats; specifically, Swamp Sparrow, Song Sparrow, Lincoln's Sparrow and Savannah Sparrow. These sparrows are more susceptible to alteration or loss of habitat than are other songbirds because they are dependent on wetland and riparian habitat.

Ground point count breeding bird surveys will be conducted in the wetland habitat types both outside and within the Project area to measure presence and relative abundance of breeding wetland songbirds. Ground point locations will be determined *a priori* and will be distributed to target wetland and other habitat types preferred by these sparrows. Survey locations will be a minimum of 100 m from a road or 50 m from other linear disturbances (e.g., a cutline or trail), and a minimum of 250 m apart.

Surveys will be conducted by two qualified avian survey team members using a standard point count method, including appropriate weather and time of day, consistent with that of the North American breeding bird survey (Ralph 1993). Surveys will be conducted between 0600h and 1000h during the breeding season, between May 1 and July 31.

Using binoculars, two team members will conduct each survey by remaining still (occasionally rotating) for 10 minutes at the point location and recording all bird species observed within 300 m.

Both visual and auditory observations will be recorded. Data collection follows a presence-absence study design and each species is recorded only upon the first observation at each point location. For each bird observed, the following information is recorded in accordance with the stated methodology: species name, sex, and location of bird in relation to observer (i.e., individual located within 50 m, individual located between 50 and 100 m, individual located beyond 100 m, species flying through the survey area below the forest canopy, and species flying through the survey area above the canopy). The movements and behaviour of the individual will also be noted. Weather data including temperature, sky condition (e.g., cloud cover) and wind conditions (Beaufort wind scale) will also be recorded at the beginning of each point count. The UTM coordinates for each plot will be recorded using a hand-held global positioning (GPS) unit.

The location of incidental wildlife encountered during the breeding bird surveys will also be recorded and geo-referenced.

8.6 FOLLOW UP AND MONITORING

A final Follow-up and Monitoring Report will be generated that contains a section that compiles the information collected on Project interactions with avian species at risk 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.

8.6.1 Follow-Up

The follow-up portion of the Follow-up and Monitoring Report for the SAR PEEMP will include the collation of all data related to Project interactions with species at risk collected during the construction period and the first five years of operations. The follow-up portion of the report will present the pre-construction species at risk baseline information, consider the data as a description of the effects collection on interactions with species at risk during the Project construction and operation time periods, and discuss the effects observed in relation to the effects predictions made in the EIS.

8.6.2 Monitoring

The monitoring portion of the Follow-up and Monitoring Report will summarize the OSEMs observations and efforts related to the interactions of the Project components and activities with species at risk, to show that the Project was implemented as proposed, and that mitigation and measures to minimize the Project's environmental effects were implemented appropriately.

This will include a subsection to address Compliance Monitoring, also undertaken by the OSEMs to ensure Project compliance with regulatory requirements and other environmental commitments made in the EIS, responses to information requests, and conditions of EA release.

It is anticipated that three avifauna species at risk (Rusty Blackbird, Common Nighthawk and Olive-sided Flycatcher) will be of particular focus during effects monitoring studies associated with forest landbirds during the Project. Point count techniques consistent with the provincial protocols, will be used to examine species abundance and species diversity within and adjacent to locations of lost or altered habitat. Some temporary displacement is anticipated therefore the design of the program will consider this effect as the Project footprint is expanded.

The LCP will work with NLDEC-WD to develop long term monitoring plots on the Project site, comparable to existing monitoring sites outside the Project area. As the Project proceeds, a quantification of habitat altered or lost from the perspective of each of these species at risk will be prepared.

8.7 REPORTING

A compilation of daily reports will be submitted to NLDEC-WD on a weekly basis. This report will provide a synopsis of completed activities, any new mapping or data plots, photographs as well as a weekly look-ahead. Any alteration to habitat, monitoring updates and changes in activities, timeline or schedule will also be communicated to NLDEC-WD.

A yearly report will be submitted to NLDEC-WD and Environment Canada that summarizes the monitoring activities described in this PEEMP and any associated environmental effects monitoring conducted for the Project related to species at risk in Labrador. The yearly report will include all data collected as part of monitoring programs. The data associated with field programs will also be provided to NLDEC-WD upon request.

Table 8-3 Summary of Species at Risk and Other Relevant Avifuana Survey Techniques

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
Pre-Construction						
RAPTORS (Golden Eagle, Bald Eagle, Red-tailed Hawk, Rough-legged Hawk, Osprey)	Aerial Helicopter Survey (Pre-clearing)	• to identify occupied and unoccupied raptor nests by species, as feasible, prior to clearing activity in any given area within the Project during the nesting season (1 May to 31 July); • to identify suitable locations above full supply level (FSL) or at least 800 m from the transmission line ROW to install artificial nesting platforms to mitigate the loss of Osprey or Bald Eagle nests due to clearing activity • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• areas within the Project area scheduled to be cleared that were not already cleared between August and April • flight paths will be on predetermined transects along the lower Churchill River and other watercourses, shorelines, rocky outcrops or ledges, and along the transmission line right-of-way, plus an 800 m buffer of the Project area (i.e., to identify nests potentially exposed to sensory disturbance); • suitable platform locations (e.g., with consideration for access and stability) will be identified in the vicinity of occupied Osprey or Bald Eagle nests that will be lost due to clearing activity	• late May to early June • if clearing was not concluded as scheduled following the nest survey in a given year, a second survey will be necessary if clearing is again scheduled during the nesting season of a subsequent year	• one survey for the reservoir and transmission lines (these could be concurrent depending on the clearing schedule)	• if an occupied nest is identified during pre-construction surveys: clearing schedule in that area will be adjusted to accommodate fledging of the young for the particular species/nest identified; clearing will not be conducted within 800 metres of the nest until the young have fledged; and, an artificial nest platform will be installed at a suitable location identified to replace the occupied Osprey or Bald Eagle nest that will be disturbed • results of the aerial survey for tree-nesting raptors will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
WATERFOWL (ashkui users) (Harlequin Duck, Surf Scoter)	Aerial Helicopter Survey	• to identify the location and size of each of the ashkui • to identify waterfowl species, abundance (number of each species), and species activity/use (i.e., behaviour) of the ashkui • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• flight paths will be along predetermined transects along the lower Churchill River to the upstream extent of the FSL, with focus on ashkui (early open water typically at the mouths of tributaries to the Churchill River) areas identified during the ice monitoring survey • where open water areas are encountered, the flight path is to follow the edge of open water areas where appropriate • survey area to include 100% of the ashkui within the extent of the FSL	• late May through early June (survey dates to be coordinated as per the findings of the ice monitoring survey)	• two surveys following the initial ice monitoring survey, within the identified time period; • the first survey one week after the ice monitoring survey, and the second survey two weeks after the first, as appropriate, depending on ice conditions	• results of the ashkui aerial survey will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
WETLAND and RIPARIAN (wetland sparrows, Rusty Blackbird) SPECIES at RISK (Rusty Blackbird, Olive-sided Flycatcher, Common Nighthawk, Harlequin Duck, Gray-cheeked Thrush) FOREST SPECIES (passerines, Ruffed Grouse)	Ground Point Count/Breeding Bird Survey (species presence, abundance, breeding activity)	• to determine species presence, abundance and distribution for species at risk in habitat/areas of high potential, within the Project area and outside the Project area (i.e., within 800 m of the Project area as a control) • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• preferred habitat types within the Project area and outside the Project area (i.e., beyond 800 m of disturbance area) will be sampled to allow comparison between pre- and post-clearing	• 1 May to 15 June (during the breeding season)	• two point counts in each of the seven (7) affected habitat types identified in Table 3-2 of the AMP within the area to be cleared and the control area	• results of the habitat based breeding bird survey will be provided to the NLDEC and Environment Canada
RAPTOR (Osprey)	Ground Mercury Level Baseline	• to collect baseline data on mercury levels in Osprey and their prey • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• identified occupied Osprey nests along the lower Churchill River and fish samples from within the FSL extent on the lower Churchill River	• late May to early July (timing to be determined after the aerial nest surveys)	• one survey to collect samples	• results of the baseline mercury levels will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
During Construction						
RAPTORS (Golden Eagle, Bald Eagle, Red-tailed Hawk, Rough-Legged Hawk, Osprey)	Aerial Helicopter Survey	• to document the presence and breeding activity of large raptors within the Project area and within 800 m of the Project area • to document the use of artificial nest platforms • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• flight paths will be predetermined transects along the lower Churchill River shorelines, watercourses, rocky outcrops or ledges, and along the transmission line right-of-way in areas that have not been cleared in the Project area plus an 800 m buffer of the Project area (i.e., to identify nests potentially exposed to sensory disturbance) • will include erected artificial nest platforms	• late May to early June	• one survey to be conducted one year after construction start and repeated in the year of construction completion	• results of the aerial survey will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
WETLAND and RIPARIAN (wetland sparrows, Rusty Blackbird) SPECIES at RISK (Rusty Blackbird, Olive-sided Flycatcher, Common Nighthawk, Harlequin Duck, Gray-cheeked Thrush) FOREST SPECIES (passerines, Ruffed Grouse)	Ground Point Count/Breeding Bird Survey (species presence, abundance, breeding activity)	• to determine species presence, abundance and distribution for species at risk in habitat/areas of high potential, within the Project area and outside the Project area (i.e., within 800 m of the Project area as a control) • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• preferred habitat types within the Project area and outside the Project area (i.e., beyond 800 m of disturbance area) will be sampled prior to flooding to allow comparison between pre- and post-clearing	• 1 May to 15 June (during the breeding season)	• two point counts in each of the seven (7) affected habitat types identified in Table 3-2 of the AMP within each of the cleared areas (prior to flooding) and the control area	• results of the habitat based breeding bird survey will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
WETLAND and RIPARIAN (wetland sparrows, Rusty Blackbird) SPECIES at RISK (Rusty Blackbird, Olive-sided Flycatcher, Common Nighthawk, Harlequin Duck, Gray-cheeked Thrush) FOREST SPECIES (passerines, Ruffed Grouse)	Ground Nest Search (pre-clearing nest search)	• to identify occupied nests of avian species at risk in potential habitat within the Project area to be cleared during the nesting season (1 May to 31 July) • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• areas within the Project area scheduled to be cleared in a given year that were not already cleared between August and April • survey area to include a 100 m buffer outside the Project area to be cleared	• 1 May to 31 July, <7 days prior to the clearing activity; • if clearing was not conducted as scheduled following the nest survey in a given year, a second survey will be necessary if clearing is again scheduled during the nesting season	• meandering survey in the area to be cleared	• if an occupied nest is identified during pre-construction surveys: clearing schedule in that area will be adjusted to accommodate fledging of the young for the particular species/nest identified; clearing will not be conducted within 30 m of a passerine nest or 100 m of a waterfowl/waterbird nest until the young have fledged • nest location will not be marked, as this could increase the risk of predation • the boundary of the buffer will be marked to identify the extent of the allowable clearing at that location • results of the ground nest search for will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
Post-Construction						
RAPTORS (Golden Eagle, Bald Eagle, Red-tailed Hawk, Rough-Legged Hawk, Osprey)	Aerial Helicopter Survey	• to document the presence and breeding activity of large raptors within the Project area and within 800 m of the Project disturbed area • to document the use of artificial nest platforms • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• flight paths will be predetermined transects along the reservoir shorelines, watercourses, rocky outcrops or ledges, and along the transmission line right-of-way in the Project area and will include erected artificial nest platforms	• late May to early June	• five years post-flooding; one survey	• results of the aerial raptor nest survey will be provided to the NLDEC and Environment Canada
WATERFOWL (ashkui users) (Harlequin Duck, Surf Scoter)	Aerial Helicopter Survey	• to identify location and size of each of the ashkui, and document use by late breeding waterfowl as staging, breeding and foraging habitat • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• flight paths will be predetermined transects along the reservoir shorelines, with focus on the ashkui identified during the ice monitoring survey • where open water areas are encountered, the flight path is to follow the edge of open water areas where appropriate • survey area to include 100% of the ashkui within the extent of the FSL	• late May to early June	• five years post-flooding; two surveys following the initial ice monitoring survey • the first survey one week after the ice monitoring survey, and the second survey two weeks after the first, as appropriate, depending on ice conditions	• results of the ashkui helicopter survey will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
WETLAND and RIPARIAN (wetland sparrows, Rusty Blackbird) SPECIES at RISK (Rusty Blackbird, Olive-sided Flycatcher, Common Nighthawk, Harlequin Duck, Gray-cheeked Thrush) FOREST SPECIES (passerines, Ruffed Grouse)	Ground Point Count/Breeding Bird Survey (species presence, abundance, breeding activity)	• to document post-construction avian species use of habitat types within the Project area, including cleared habitat types, control habitat types and created wetland habitat (naturally 'encouraged' and engineered) • to determine species abundance and species use of the habitat types within the Project area • to evaluate the success of the wetland habitat created through the Wetland Compensation Plan • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• preferred habitat types within the Project area and outside the Project area (i.e., beyond 800 m of disturbance area) will be sampled following flooding to allow comparison between pre- and post-reservoir conditions • this would include the wetland and riparian habitat created through the Wetland Compensation Plan (and control wetland previously surveyed outside the Project area)	• 1 May to 31 July (during the breeding season)	• five years post-flooding; one survey	• results of the ground based breeding bird survey will be provided to the NLDEC and Environment Canada

Avian Group	Survey Type	Survey Objective	Location	Timing (From Avifauna Management Plan)	Frequency	Contingency (e.g., If Active Nest Is Identified During Pre-Clearance Survey)
RAPTOR (Osprey)	Ground Mercury Level	• to evaluate mercury levels in Osprey likely exposed to fish from the reservoir • to allow comparison with mercury levels in Osprey and their prey following five years of reservoir presence • to note incidental observations such as sign (e.g., whitewash, tracks, partial nests) of all wildlife, including avifauna species at risk,	• identified occupied Osprey nests along the lower Churchill River and fish samples from within the FSL extent on the lower Churchill River	• late May to early July (timing to be determined after the aerial nest surveys)	• five years post-flooding; one survey	• results of the Osprey mercury level follow-up program will be provided to the NLDEC and Environment Canada

8.8 ADDITIONAL INFORMATION

Mapping

Detailed mapping of the Project components (including GIS-appropriate information) for the NLDEC-WD's use has been transmitted on 18 July 2013 – transmittal number NE-LCP-MEMO-000290. Updated mapping will be provided. A real time database containing mapping and coordinates for each observation (e.g., nests, buffers) will be maintained.

Training

Prior to any employee commencing work on the Project site, a Health Safety and Environmental orientation is conducted. The environmental component of this orientation includes an overview of the employee handbook containing specific sections for species at risk awareness and protection measures. This will assist employees in the identification of such species at risk as the Common Nighthawk and Rusty Blackbird. In addition to the orientation, a separate Environmental Awareness program has been developed and delivered to environmental staff which covers specific components of the AMP and this SAR PEEMP.

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