Nalcor Energy – Lower Churchill Project

nalcor energy
LOWER CHURCHILL PROJECT

Labrador-Island Transmission Link
Species at Risk
Impacts Mitigation and Monitoring Plan

Nalcor Doc. No. ILK-PT-MD-0000-EV-PL-0001-01

Comments:	Total # of Pages: (Including Cover): **96**

Status / Revision	Date	Reason for Issue	Prepared by	Functional Manager Approval	Quality Manager	General Project Manager (Gen + Island Link) Approval
B2		Issued for Use	J. Wells	D. Haley	D. Green	R. Power
B1		Issued for Use	J. Wells	D. Haley	D. Green	R. Power

LITL – Species at Risk IMMP		
Nalcor Doc. No.	Revision	Page
ILK-PT-MD-0000-EV-PL-0001-01	B2	2

Inter-Departmental / Discipline Approval (where required)

Department	Department Manager Approval	Date
	Name	
	Name	
	Name	
	Name	

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

FIGURE **PAGE**

LIST OF TABLES

TABLE **PAGE**

1 PURPOSE

The purpose of this Labrador-Island Link Transmission (L-ITL) Species at Risk (SAR) Impacts Mitigation and Monitoring Plan (IMMP) is to demonstrate how any negative environmental effects on species at risk will be mitigated, and sets out a program for monitoring the effectiveness of the mitigation measures. This SAR IMMP is a requirement for the issuance of a Section 19 Permit under the provincial Endangered Species Act (ESA).

Provincially, wildlife species at risk are managed under the Newfoundland and Labrador Endangered Species Act (ESA). 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 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 2012a), the SAR IMMP 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.

L-ITL's SAR IMMP builds on existing information and commitments made in the EIS (Nalcor 2009), and conditions of permits and licenses for the Project. The purpose of this plan is to meet requirements for the issuance of a Section 19 permit under the ESA.

2 SCOPE

The SAR Listed Species IMMP addresses the required aspects of listed species impacts mitigation and monitoring for the design, construction and operations and maintenance phases of the L-ITL (described in Section 6.0).

3 DEFINITIONS

Environmental Assessment (EA): The evaluation of the 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. This includes Component Studies, the L-ITL EIS (Nalcor 2012a) and subsequent Information Requests (Nalcor 2012b).

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

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

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

Environmental Effects Monitoring: Monitoring of overall Project effects to confirm the predictions of the EIS (Nalcor 2012a, 2012b) and to fulfill commitments.

Environmental Compliance Monitoring: Monitoring of Project activities to confirm compliance with regulatory requirements and commitments.

Local Study Area: Focuses on the 2 km wide transmission corridor while also considering the general nature and location of other Project components and activities (e.g., shoreline electrode sites, electrode lines, borrow sources, storage areas, temporary camps) and the 500 metre (m) wide Strait of Belle Isle submarine cable crossing corridor.

Regional Study Area: The area extending 1 km out from each side of the Local Study Area.

4 ABBREVIATIONS & ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
CEAA	Canadian Environmental Assessment Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
C-SEPP	Contract-Specific Environmental Protection Plan
CWS	Canadian Wildlife Service
DND	Department of National Defense
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
HVdc	High voltage direct current
IMMP	Impacts Mitigation and Monitoring Plan
KI	Key Indicator
LCP	Lower Churchill Project
L-ITL	Labrador - Island Transmission Link
LSA	Local Study Area
LWCRT	Labrador Woodland Caribou Recovery Team
MMH	Mealy Mountains Herd
Nalcor	Nalcor Energy
NLDEC-WD	Newfoundland and Labrador Department of Environment and Conservation, Wildlife Division
NLESA	Newfoundland and Labrador Endangered Species Act
OHV	Off-Highway Vehicle
OSEM	On-Site Environmental Monitor

PEEMP	Protection and Environmental Effects Monitoring Plan
EPP	Environmental Protection Plan
RSA	Regional Study Area
ROW	Right of Way
RWMH	Red Wine Mountains Herd
SAR IMMP	Species at Risk Impacts Mitigation and Monitoring Plan
SSAC	Species Status Advisory Committee
SOBI	Strait of Belle Isle
VEC	Valued Ecosystem Component

5 REFERENCE DOCUMENTS

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 Environmental Assessment Commitment Management Plan
LCP-PT-ED-0000-EA-SY-0002-01	Environmental Impact Statement and Supporting Documentation for the Labrador-Island Transmission Link
LCP-PT-MD-0000-EV-PL-0009-01	LCP HVdc Overland Transmission and HVdc Specialties Environmental Protection Plan
LCP-PT-MD-0000-RT-PL-0001-01	Regulatory Compliance Plan
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-EV-PY-0001-01	LCP No Harvesting Policy

6 LABRADOR-ISLAND TRANSMISSION LINK PROJECT DESCRIPTION

As described in the L-ITL EIS, the Project consists of the Construction and Operations of a ± 350 kilovolt (kV) High Voltage direct current (HVdc) electricity transmission system from Central Labrador to the Avalon Peninsula on the Island of Newfoundland (the Island) (Figure 6-1).

The transmission system will include the following key components:

- An alternating current (ac) to direct current (dc) converter station at Muskrat Falls;
- Approximately 400 km overhead HVdc transmission line from Muskrat Falls to Forteau Point;
- A 60 m wide right of way (ROW);
- Three, approximately 35 km long, submarine cables across the Strait of Belle Isle (SOBI) (i.e., between Forteau Point and Shoal Cove), with associated onshore infrastructure (transition compounds and land cables at both cable landings);
- Approximately 700 km of overhead HVdc transmission line from Shoal Cove to the Avalon Peninsula;
- A dc to ac converter station at Soldiers Pond;
- Shoreline electrodes at L'Anse au Diable and Dowden's Point,
- An overhead, wood pole electrode line
    - Near Forteau Point and L'Anse au Diable; and
    - Between Soldiers Pond and Dowden's Point.

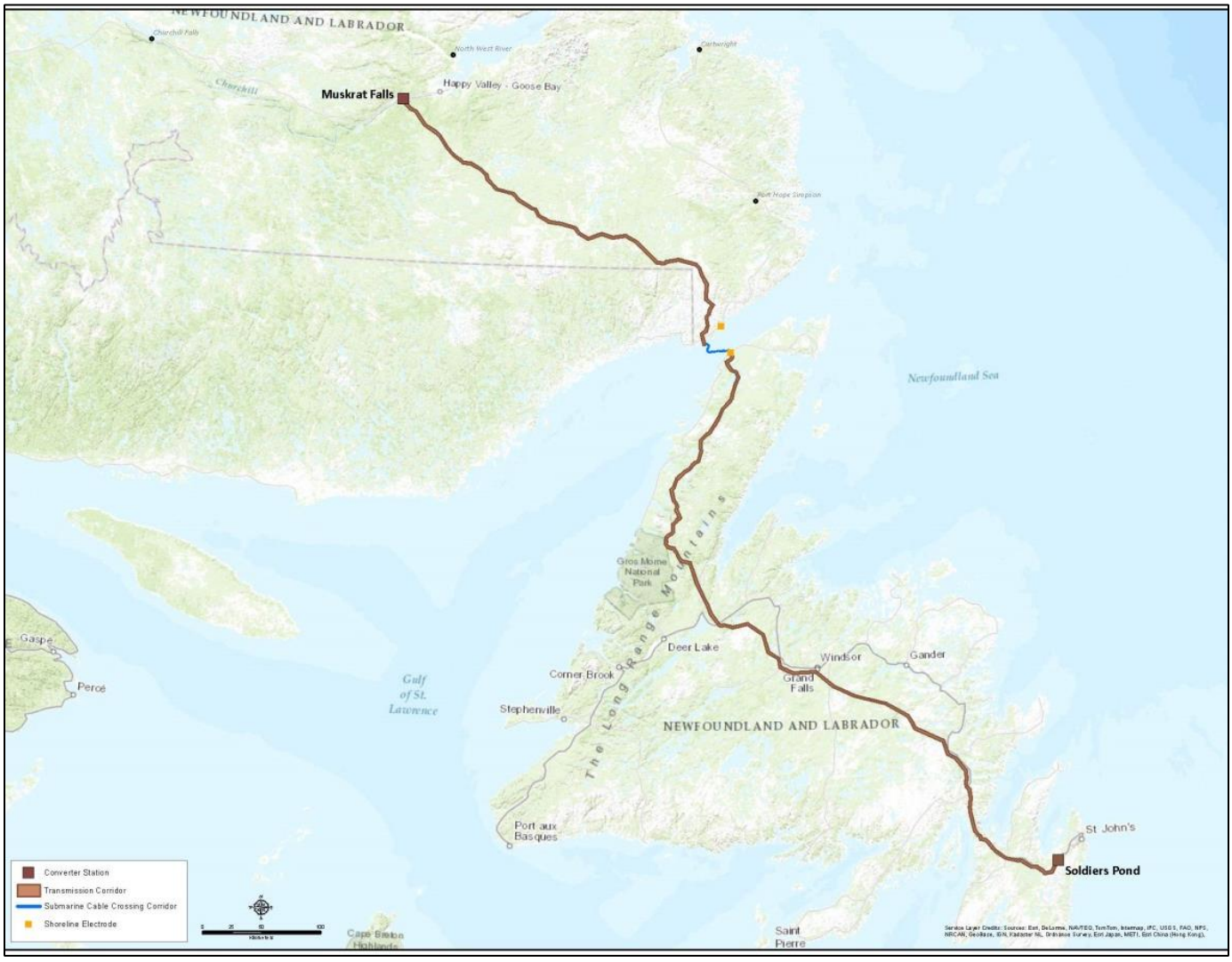

Figure 6-1 Labrador-Island Transmission Link (Nalcor 2012)

7 AVIFAUNA

7.1 Existing Information

Existing information regarding Avifauna Species at Risk within the L-ITL project area is summarized from data within the Species of Special Conservation Concern Component Study

(Nalcor 2011) and the L-ITL EIS (Nalcor 2012a), which was based on a literature review, Project-specific baseline surveys, and other sources including traditional and local environmental knowledge.

The province has eight species with NLESA designations that are known, or potentially present within the L-ITL Study Area (Table 7-1).

Table 7-1 *NL ESA* Designated Avifauna Species

Species	*NL ESA* Designation
Red Crossbill (*Loxia curvirostra percna*)	Endangered
Common Nighthawk (*Chordeiles minor*)	Threatened
Rusty Blackbird (*Euphagus carolinus*)	Endangered
Olive-sided Flycatcher (*Contopus cooperi*)	Threatened
Harlequin Duck (*Histrionicus histrionicus*)	Vulnerable
Red Knot (*Calidris canutus rufa*)	Endangered
Gray-cheeked Thrush (*Catharus minimus minimus)*	Endangered
Short-eared Owl (*Asio flammeus*)	Vulnerable
Bobolink (*Dolichonyx oryzivorus*)	Vulnerable

7.2 Red Crossbill

Red Crossbills are a medium-sized finch which uses its crossed bill to open conifer cones. Males are a dull red colour with brown shading and the females are a gray-olive colour with yellow rumps (Environment Canada 2006).

This subspecies of Red Crossbill is endemic to eastern Canada, and it is likely restricted to insular Newfoundland. Red Crossbills are associated with conifer forests (Environment Canada 2006). This species could potentially occur in all of the Newfoundland regions: the Northern Peninsula, Central and Eastern Newfoundland, and the Avalon Peninsula. Observations of two Red Crossbills were recorded in the Central and Eastern Newfoundland region during field surveys conducted for the Project (Stantec 2010a).

The Red Crossbill subspecies percna, was once common in Newfoundland, however it has experienced sharp declines since the mid-1990s (Environment Canada 2006).

Red Crossbills appear to be limited by changes to their habitat and / or food abundance (Environment Canada 2006). Such changes have possibly resulted from a combination of anthropogenic and non-anthropogenic factors including deforestation, insect infestation and alterations to forest fire regimes (Environment Canada 2006).

Red Crossbill are highly specialized for conifer habitats. They generally prefer unlogged or mature forests that produce abundant cones, such as large, mature black spruce and balsam fir stands, and also red pine, white pine, and white spruce stands (Environment Canada 2009, internet site). In Newfoundland, sightings have been made in native red pine and eastern white pine stands, suggesting that these stands have been historically important to the species, and may be linked to their current survival (Environment Canada 2006). Red Crossbill nest in conifer trees and forage in large flocks (according to the availability of cones) (Environment Canada 2009, internet site). Although Red Crossbill has an association with mature coniferous forests, they have an irruptive behaviour and an ability to breed throughout the year in response to cone production. As such, habitat associations are difficult to identify (Environment Canada 2006).

While there are no records of Red Crossbill in Labrador (Environment Canada 2009, internet site), the potential range for this species, based on the distribution of mature coniferous forests, includes the Northern Peninsula, Central and Eastern Newfoundland and Avalon Peninsula regions (IFWD, n.d.). As indicated in the Recovery Strategy for the Red Crossbill (Environment Canada 2006), critical habitat as defined by the NLESA has not been described due to lack of knowledge regarding the subspecies existence, insular distribution and habitat associations. It also indicates that critical habitat is unlikely to be spatially mapped unless a nest is found. Rather, critical habitat would be managed at the landscape level through measures such as maintaining a percentage of the forest landscape with cone-bearing trees, which shifts spatially over time. The proposed clearing associated with this Project will not conflict with conservation measures for this species.

Based on data provided in Section 12.2.5 (Vegetation) of the L-ITL EIS (Nalcor 2012a), effects of the Project are not likely to affect high proportions of particular habitat types that have capacity to support Red Crossbills. In particular, losses of Conifer Forest and Open Conifer Forest Habitat Types within all regions on the Island of Newfoundland are estimated to be less than 4% of that available in the Local Study Area (LSA). Therefore, potential breeding habitat will exist in each region following the clearing of the ROW and construction of Project infrastructure.

7.1 Common Nighthawk

This species is a medium-sized bird, with a large flattened head, small bill, long, slender wings and a long, slightly notched tail. Its plumage is dark brown, and mottled with black, white and buff (GNL, DEC, Species at Risk, 2011b, internet).

Common Nighthawks are found across Canada however, in Eastern Canada, they only breed in the southern part of Labrador and are uncommon in Newfoundland (GNL, DEC, Species at Risk, 2011b, internet). Common Nighthawk locations are not often captured using typical avifauna survey methods. Targeted methods must be used for this species, however during baseline surveys, targeted methods specific to Common Nighthawk were not used. Observations of this species are rare, and no observations were recorded during baseline field surveys conducted for the Project (Stantec 2010a). Observations were recorded during targeted baseline surveys conducted for the Lower Churchill Hydroelectric Generation Project in 2014. This bird breeds on bare ground in a variety of environments (i.e., sand dunes, rocky outcrops, peatbogs, forest clearings, and burned areas) (GNL, DEC, Species at Risk, 2011b, internet).

The Common Nighthawk is a rare bird that has experienced significant long-term population decreases averaging 4.2% per year in Canada, although provincial population trends are not known (GNL, DEC, Species at Risk, 2011b, internet).

The Common Nighthawk has been affected by a variety of factors including a decrease in prey abundance (i.e., a decrease in the abundance of insects) and habitat loss and alteration (COSEWIC 2007a).

Common Nighthawk breeds in Labrador, but is rare, if present at all, on the Island of Newfoundland (Environment Canada 2009, internet site). This species prefers open, vegetation-free habitats including dunes, beaches, recently harvested or burned forests, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores and river banks (Poulin et al. 1996, internet site), as well as mixed and coniferous forests (Environment Canada 2009, internet site). The Common Nighthawk is an aerial insectivore, feeding at dusk and dawn on flying ants and coleopterans (Environment Canada 2009, internet site). Because it is a territorial species that requires large areas in response to reduced habitat quality, local effects to its habitat can be reflected at the regional level (Poulin et al. 1996, internet site).

Primary habitat is that which provides shelter and food sources for all stages of the lifecycle. Dry black spruce / lichen habitat was identified as particularly important habitat for this species in Labrador (Minaskuat Inc. 2008c). For the purposes of the habitat mapping conducted in support of this EA, primary habitat was identified as cutover, burn, open conifer and black

spruce lichen habitats. Cutover habitat may not be as beneficial to the Common Nighthawk as naturally open habitat, however they may occupy areas of cutover. Secondary habitat includes some combination of feeding, protection, nesting and resting sites. For the Common Nighthawk in Labrador, this includes riparian shoreline vegetation and wetlands, including marshes, fens and bogs.

Table 7-2 summarizes the likely alteration or loss of primary habitat as a result of Project Construction by region for Common Nighthawk. The likely amount of primary habitat altered or lost for all regions, estimated by the centre line ROW including 20% contingency, is 9 km2, representing 4% of available habitat within the LSA and less than 1% within the RSA. Note that the likely amount of primary habitat altered or lost due to construction activities would be lower as only certain cutover and burn habitats (i.e., within regenerating forests) would be preferred by this species. Additionally, because Common Nighthawk are known to utilize cutovers, vegetation clearing for the various Project components could create habitat for this species.

Table 7-2 Primary Habitat for Common Nighthawk Potentially Affected by Construction (By Region)

Region	Primary Habitat Within the LSA		Primary Habitat Within the RSA		Primary Habitat Within the ROW		
	(km^2)	(%)	(km^2)	(%)	(km^2)	(% of Available Habitat in the LSA)	(% of Available Habitat in the RSA)
Central and Southeastern Labrador	214	28	1,536	27	9	4	<1
Northern Peninsula	—[(a)]	—	—	—	—	—	—
Central and Eastern Newfoundland	—	—	—	—	—	—	—
Avalon Peninsula	—	—	—	—	—	—	—

Note: Rounding errors less than 1% may occur in final totals. ROW calculations include the 20% contingency.
(a) "—" values not provided because the Common Nighthawk is extremely rare, if present at all, on the Island of Newfoundland.

Although activities associated with Operations and Maintenance may disturb Common Nighthawk, this relatively uncommon species uses a variety of open habitats, including cutovers, and may therefore find some increased habitat opportunities as a result of periodic vegetation management, which will positively affect the Common Nighthawk if conducted outside the breeding season. Although the threshold noise level that elicits a response for Common Nighthawk is not known, this species will likely experience sensory disturbance, in the unlikely event that it is encountered.

Among other factors, such as decreases in prey base and nest predation, some suggest that the decline of the Common Nighthawk may be partly attributable to vehicle collisions (Savignac 2007, internet site; Iron and Pittaway 2000). However, collisions with terrestrial vehicles during Project Construction are expected to be minimal due to the slow-moving nature of most vehicles during construction activities within the Project components. Nighthawks are also known to collide with aircraft and relatively high mortality rates have been reported during fall migration at some sites (Cumming et al. 2003). Interactions with aircraft are expected to be minimal, as helicopters may be used to move equipment or materials, depending on the terrain and site-specific conditions.

7.4 Rusty Blackbird

This species is a medium-sized passerine with a slightly rounded tail, pale yellow eyes and a black slightly curved bill. During the breeding season, the male has black plumage with a green and violet iridescence, while the female is grayish brown during this season. During the winter, both sexes are rust-coloured (GNL, DEC, 2011e, internet).

Within Newfoundland and Labrador, the distribution is thought to occur throughout the boreal forest, breeding in forest wetlands, bogs, and meadows, and wintering in the United States (COSEWIC 2006a; GNL, DEC, 2011e, internet). Rusty Blackbird was observed at 23 point locations during the 2008 passerine surveys conducted for the Project, with 22 in the Southeastern Labrador region and one other observation in the Avalon Peninsula region (Stantec 2010a).

The Rusty Blackbird has experienced a severe decline that appears to be ongoing, with suggestions that the rate of decline may have slowed, however there is no evidence to suggest this decline will be reversed (COSEWIC 2006a). Christmas bird counts suggest that their decline has been 85% since the mid-1960s (GNL, DEC, 2011e, internet).

One of the key limitations for this species during the breeding season is habitat loss, whereby wetlands are converted for agriculture and urban development (COSEWIC 2006a).

Rusty Blackbird breed throughout the province, but are more common in Labrador. During the breeding season they prefer riparian areas in forested wetlands, but will utilize a diversity of habitats, including wetlands and riparian areas in cutovers, stream buffers untouched by fire in recent burns, treatment ponds in forested areas and the banks of hydroelectric reservoirs. However, their productivity in disturbed habitats is unknown (COSEWIC 2006, internet site). Adults feed mainly on wetland invertebrates but are considered opportunistic feeders (Warkentin and Newton 2009). Nests are built in riparian vegetation on the edges of wetlands or other bodies of water in May to June (Environment Canada 2009, internet site). The conversion of wetland forests on the wintering grounds of the Rusty Blackbird in the United States is thought to be the most important factor in the decline of this species, but habitat conversion in the southern part of the species' breeding range in Canada is also considered a contributing factor (COSEWIC 2006, internet site).

Table 7-3 indicates the predicted alteration or loss of primary habitat (i.e., wetland and scrub / heathland / wetland) as a result of Project Construction, by region, for Rusty Blackbird (based on the centre line ROW). The potential amount of primary habitat altered or lost for all regions, including the 20% contingency, is 20 km^2, representing approximately 4% of the primary habitat available within the LSA. Within the RSA, the amount of primary habitat predicted to be affected by the Project is <1% for all regions. Although primary habitat occurs in all regions, this species is considered uncommon on the Island and often transient (Warkentin and Newton 2009). Therefore, Table 7-3 reflects likely Project effects on available habitat, but does not consider occupancy. Regardless, the loss of primary habitat to Construction activities will likely have a small measurable effect on habitat availability at the local scale and little if any effect at the regional scale.

Mitigation in place for riparian zones, as described in Section 12.2.5 (Vegetation) of the L-ITL EIS (Nalcor 2012a), will minimize effects on breeding sites for Rusty Blackbird. Because Rusty Blackbird have been shown to utilize a diversity of habitat types during the breeding season, including anthropogenically modified and disturbed ones (COSEWIC 2006, internet site), the estimated alteration or loss of habitat for this species as a result of Construction activities will likely be less than indicated.

Table 7-3 Primary Habitat for Rusty Blackbird Potentially Affected by Construction (By Region)

Region	Primary Habitat Within the LSA		Primary Habitat Within the RSA		Primary Habitat Within the ROW		
	(km^2)	(%)	(km^2)	(%)	(km^2)	(% of Available Habitat in the LSA)	(% of Available Habitat in the RSA)
Central and Southeastern Labrador	145	19	1,198	21	4	3	<1
Northern Peninsula	148	30	1,255	31	6	4	<1
Central and Eastern Newfoundland	158	24	1,293	26	5	3	<1
Avalon Peninsula	105	43	797	45	5	4	<1

Note: Rounding errors less than 1% may occur in final totals. ROW calculations include the 20% contingency.

Passerines are known to be particularly susceptible to vehicle collisions (Erickson et al. 2005), likely due to their small size and low-flying behaviour. Elevated risks of mortality may occur where roads pass through the primary habitats of species that forage on or near the ground, such as Rusty Blackbird. However, passerine collisions with vehicles during the Project are likely to be minimal due to the slow-moving nature of most vehicles during Construction activities within the Project component (i.e., speed limits associated with Project access roads vary from 10-60 km/hr and are set as per the regulatory requirements by the Department of Transportation and Works).

7.5 Olive-sided Flycatcher

This bird is approximately 18 to 20 cm in length and the adults are deep brown olive-gray plumage, with white on the throat area, the centre of the breast and the belly, with both sexes similar in appearance. The wings are dark with pale wing bars, and it has a stout and blackish bill (COSEWIC 2007b).

This species is most often associated with open areas containing perching locations (COSEWIC 2007b). These open areas include forest openings including near wetlands and human-made openings like clearcuts (COSEWIC 2007b). During passerine surveys for this Project, the Olive-sided Flycatcher was observed at 11 point counts: three in the Central and Eastern Newfoundland region and eight in the Northern Peninsula region (Stantec 2010a).

The Olive-sided Flycatcher has experienced a population decline over the last 30 years, with the decline estimated to have been 79% from 1968 to 2006, and 29% from 1996 to 2006 (COSEWIC 2007b).

The reasons for the decline for this species are not certain, however it has been suggested that habitat loss and alteration has been one of the limiting factors for this species. Also, undocumented but a suggested limiting factor is the reduction in prey abundance resulting from insect control (COSEWIC 2007b).

The Olive-sided Flycatcher is known to breed throughout Newfoundland and in portions of Central and Southeastern Labrador. It is primarily associated with natural and man-made edge habitats, including forest openings, forest edges, farmlands, cutovers, burns, riparian areas and wetland edges (Altman and Sallabanks 2000, internet site). These habitats are generally found adjacent to coniferous and mixed-coniferous forests and, in Canada, this species is also associated with open habitats of bogs, muskegs and swamps (Altman and Sallabanks 2000, internet site). Given their primary association with specific and localized riparian and edge habitats, habitat quality indices for Olive-sided Flycatcher have not been mapped during the L-ITL EA process.

Given this species' association with edge habitat, clearing associated with the Project is not necessarily representative of a loss of habitat. However, there is evidence that the breeding success of birds nesting in harvested habitats is lower than the breeding success of birds nesting in natural (e.g., burned) openings (COSEWIC 2007a, internet site). Robertson and Hutto (2007) present evidence that harvested landscapes harbour more nest predators, resulting in significantly greater egg and nestling loss for birds nesting in these areas. Given the linear configuration of the Project, generally low amounts of any habitat type within the LSA will be affected by construction activities. Additionally, mitigation in place for riparian zones, as described in Section 12.2.5 (Vegetation) of the L-ITL EIS (Nalcor 2012a), will limit the effects of the Project on breeding habitat for the Olive-sided Flycatcher.

The effects of vegetation management on Passerines will vary depending on the species and may provide benefits to some. For example, periodic maintenance within the ROW will promote an early successional vegetation community and the presence of forest edge along the

ROW boundary. Many Passerine species, such as the Olive-sided Flycatcher, utilize edges and may therefore benefit from increased habitat availability.

7.6 Harlequin Duck

The Harlequin Duck is a subarctic sea duck. The males have slate blue plumage, with chestnut sides and streaks of white on their head and body, and a black stripe on their head with a chestnut stripe on either side. Females have brown-gray plumage with patches of white near their eyes (Species at Risk Public Registry 2011c, internet).

This species spends most of the year in coastal marine environments and move inland to breed along fast-flowing rivers (Species at Risk Public Registry 2011c, internet). During wintering, the ducks are often associated with offshore islands, headlands and rocky coastlines where they feed close to rocky shorelines (Species at Risk Public Registry 2011c, internet).

In Labrador, Harlequin Ducks are common and the population appears to be stable or increasing (Trimper et al. 2008). In Newfoundland however, relatively low numbers are present year-round. Breeding mostly occurs on the Northern Peninsula with some evidence of breeding in remote areas of the eastern part of Newfoundland. A large molting area is found on the Grey Islands off the east coast of the Northern Peninsula, and wintering occurs on the south coast of Newfoundland (Thomas 2008).

The Harlequin Duck was designated based on low population estimates, and localized decreases in the number of birds at several of the known wintering areas in eastern North America (Environment Canada 2007).

The cause of the decline in population for this duck is not clearly known, however accidental take could be an important contributor. The preferred habitat near shore, and the resemblance of females and immatures to other legally hunted species increases their vulnerability. Other suggested limiting factors include contamination, destruction and habitat alteration (including forestry, mining, and hydroelectric developments) (Thomas 2008; Species at Risk Public Registry 2011c, internet).

Since habitat requirements for Harlequin Duck are based on small-scale and localized biophysical parameters (Goudie and Gilliland 2008; Environment Canada 2007b; Rodway et al. 1998), it was not possible to assign habitat quality ratings at the mapping scale conducted for this Project. However, because Harlequin Ducks have a strong affinity for specific breeding sites (Robertson and Goudie 1999), it is possible to discuss known observations of this species and

breeding sites along watercourses (Stassinu Stantec Limited Partnership 2010; ACCDC 2010, internet site; ACCDC 2008, internet site; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999) in relation to the centre line ROW and LSA:

- Traverspine River (Central and Southeastern Labrador): the centre line ROW crosses tributaries of this river approximately 18 km south-west of where a pair of Harlequin Duck were recorded in 2010;
- St. Paul River (Central and Southeastern Labrador): the centre line ROW intersects this river approximately 1 km from the location where a pair was recorded during 1998 surveys (i.e., record is on the edge of the LSA);
- Torrent River (Northern Peninsula): the centre line ROW is located approximately 5 km downstream of the main breeding area for Harlequin Ducks on this river (which is the most important breeding site on the Northern Peninsula) and no recorded observations of this species along the Torrent are known within the LSA;
- Brian's Pond River (Northern Peninsula): although the centre line ROW crosses this river downstream of the known breeding area for Harlequin Ducks, observations of this species have been recorded within the LSA;
- Castor River West (Northern Peninsula): the centre line ROW crosses this river approximately 2 km downstream of where Harlequin Duck have been observed; and
- Inner Pond Brook (Northern Peninsula): The centre line ROW crosses this brook approximately 4 km upstream of where Harlequin Duck have been recorded.

Although the LSA is located outside of the main breeding areas for most rivers, including the Torrent River, there is some concern during the early spring and summer that pairs may move through the LSA and upstream to breeding sites. Areas that support known Harlequin Duck nesting that overlap the LSA include Castor River and Brian's Pond River. An estimated 128±45 Harlequin Duck (indicated pairs) breed along the rivers of western and northern Newfoundland (Goudie and Gilliland 2008). Densities of 0.042 to 0.187 birds/km were estimated breeding on the Northern Peninsula (Gilliland et al. 2008a). These numbers may represent 20% of wintering Harlequin Ducks in Eastern North America.

Breeding pairs such as those found in these locations are particularly sensitive to disturbance as they already have low success rates. As such, construction activities in these areas will take place in the fall or winter when individuals have migrated back to coastal areas. Mitigation measures in place for riparian zones, as described in Section 12.2.5 (Vegetation) of the L-ITL EIS (Nalcor 2012a) are likely to limit effects on nesting sites for Harlequin Duck. 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. Additionally, the final ROW alignment within the transmission corridor has been sited to avoid known breeding sites and limit vegetation clearing at the edge of rivers, to the extent practical.

Maintenance of the ROW will involve both mechanical and chemical vegetation control techniques, and these activities will interact with Waterfowl through habitat alteration and sensory disturbance, depending on the season. Herbicide will be applied by qualified, trained personnel in a careful manner, following the manufacturers' instructions and the requirements of the applicable regulations will be met or exceeded. Such activities will be performed periodically according to the maintenance schedule, but may also occur intermittently as a result of unforeseen maintenance requirements and / or inspections. Whereas such activities may adversely influence a number of Waterfowl, interactions with Harlequin Ducks are considered to be most important as a result of their high fidelity to breeding areas and general sensitivity. Breeding pairs such as those found on the Castor River are particularly sensitive and have low success rates. As such, Project maintenance activities within the vicinity (e.g., 500 m) of locations where breeding Harlequin Duck have been reported (e.g., Trimper et al. 2008; Thomas 2008) will not take place from May through July to limit disturbance to this species. The herbicide that Nalcor is proposing to use is non-toxic to wild birds.

Waterfowl are likely to be exposed to increased hunting pressure as a result of the presence of Project infrastructure, which provides a means of improved off-highway vehicle (OHV) and snowmobile access for hunters. Waterfowl species such Harlequin Duck are particularly vulnerable to hunting pressures because many are not capable of flight at the start of the hunting season in early September (LGL Limited 2008). Although Harlequin Duck are not legally hunted in the province of Newfoundland and Labrador, juveniles and females are easily confused with other species of Waterfowl and some individuals may be shot occasionally. Insufficient hunter education is the key component contributing to the misidentification, and subsequent mortality of Harlequin Duck during hunting activities (Environment Canada 2007a).

The Project ROW and associated access roads have the potential to play a role in the sensory disturbance of Harlequin Ducks on breeding rivers by providing increased access for other recreational purposes. For example, large scale rafting is known to be disruptive to Harlequin Ducks (Hunt 1998), and recreational fishers may present a problem when they remain along watercourses for long periods of time (Wallen 1987). As previously discussed, a variety of mitigation measures will be employed to limit unwanted traffic along the ROW, including the possible use of barriers and other access control measures.

7.7 Bobolink

The Bobolink (*Dolichonyx oryzivorus*) is a small blackbird and the only member of the genus *Dolichonyx*. The total length is ranges from 15.2-20.5 cm, and the male range is 34-56 g and the female mass is 29-49 g. The bill is short and conical, and iris brown. The sexes are dimorphic in breeding plumage but similar in Fall plumage (SSAC 2009).

The preferred breeding habitat is tall-grass or mixed-grass prairie, and open hay fields. The species also breeds in grass-sedge fields along river bottomland, and in irrigated meadows in arid climates. After leaving the nesting fields, birds seek the shelter of freshwater marshes and coastal areas to molt. Winter range habitat includes grasslands, marshes, and rice and sorghum fields (SSAC 2009). Natural grasslands are rare in Newfoundland, thus the Bobolink is naturally rare (SSAC 2009).

Bobolinks are highly migratory, travelling to south-central South America each Autumn, making a round trip of approximately 20,000 kilometers, and then returning to the breeding grounds in May. The Bobolink has a large global range of 20,000 to 2,500,000 km^2 (SSAC 2009). Newfoundland is on the fringe of the Bobolink's range.

In Newfoundland, the main threat is probably habitat loss and/or a decline in habitat quality; except for in recent years, the Codroy Valley area.

7.8 Red Knot

The rufa subspecies of Red Knot breeds in the Arctic and winters in South America, but passes along Newfoundland and Labrador during migration. Migratory stopovers are generally sandflats and occasionally mudflats, and they are very faithful to their sites (COSEWIC 2007b), however there are no known important stopover locations for Red Knots designated, but there are several locations that have been identified as important for Red Knot use. The most important areas for this subspecies during migration in eastern Canada are along the north shore of the St. Lawrence in Quebec (COSEWIC 2007b). While there are no known important areas for Red Knot in Labrador or on the Island of Newfoundland, they may still occur in small numbers in the Study Area.

Red Knot are not known to breed in Newfoundland and Labrador, but do stopover during their southward migration in the fall. While there are no known important areas for Red Knot in Labrador or on the Island of Newfoundland, they may occur in small numbers in the Study Area. Red Knot have been reported in relatively large numbers on the beaches of the Northern

Peninsula in recent years (CWS unpublished data). During migration they have been recorded along coastal areas, mostly on shorelines, sandflats, and salt marshes around the province, and have been observed to frequently utilize Bellevue Beach (Garland and Thomas 2009), which is within the RSA of the Avalon Peninsula region. However, Bellevue Beach along with other locations where Red Knot has been recorded are outside the extent of the LSA. As such, Construction activities associated with the Project are not likely to interact with this species. Additionally, Newfoundland and Labrador has a lower population density compared to some other migratory stopover locations. According to local bird experts, there are few if any, threats to this species within the province that would cause any substantial decrease in their numbers (Mactavish pers. comm.; Whitaker, pers. comm., cited in Garland and Thomas 2009).

7.9 Gray-cheeked Thrush

This species of thrush is slightly larger than other species of thrush (GNL, DEC, 2011c, internet). As its name suggests its plumage is primarily gray, with Newfoundland birds having chestnut edging on their wings and tail (GNL, DEC, 2011c, internet).

In Newfoundland, the Gray-cheeked Thrush have most commonly been observed on the Northern Peninsula, the northeast coast, and the Avalon Peninsula, and less commonly observed on the west coast and the interior (Dalley et al. 2005). During passerine surveys for the Project, 16 individuals were observed on the Island (Labrador observations are not relevant as designated subspecies only occurs on the Island portion), 14 of which were within the Northern Peninsula region, and two were within the Central and Eastern Newfoundland region (Stantec 2010a).

In Newfoundland and Labrador, the Gray-cheeked Thrush has a declining population, at 11.5% per year from 1968-2008, with a sudden decrease in 1990 (GNL, DEC, 2011c, internet).

Limiting factors for the Gray-cheeked Thrush have not been identified. However suggested threats include loss of habitat, nest predation, and mortality during migration from collisions with anthropogenic structures (GNL, DEC, 2011c, internet).

Gray-cheeked Thrush prefer dense, low coniferous forest for breeding, including young regenerating forest, open-canopy old growth forest with a dense shrub understorey, and dense, stunted spruce on windblown sites or near the tree line (Dalley et al. 2005). In western Newfoundland, a 1999 study found Gray-cheeked Thrush in mature forests 77 to 87 years old,

and absent in younger stands from 40 to 73 years old (Thompson et al. 1999). Gray-cheeked Thrush are known to breed throughout Newfoundland and Labrador (NLDEC-W 2010).

Although considered somewhat tolerant of clear-cutting, the loss of large proportions of forested habitat on a landscape scale is likely to negatively affect Gray-cheeked Thrush (NLDEC-W 2010). Large-scale displacement from habitat, may lead to increased inter-specific competition for resources with Swainson's Thrush, with which it shares considerable ecological overlap (Mack and Yong 2000, internet site). Table 7-4 summarizes the amount of primary (i.e., conifer forest, conifer scrub and mixedwood forest) habitat potentially altered or lost as a result of Project Construction by region for the Gray-cheeked Thrush, based on the centre line ROW. The potential amount of primary habitat altered or lost for all Newfoundland regions, including the 20% contingency, is 32 km^2, representing approximately 4% of available habitat within the LSA and less than 1% of the primary habitat available within the RSA, by region.

Table 7-4 Primary Habitat for Gray-cheeked Thrush Potentially Affected by Construction (By Region)

Region	**Primary Habitat Within the LSA**		**Primary Habitat Within the RSA**		**Primary Habitat Within the ROW**		
	(km^2)	**(%)**	**(km^2)**	**(%)**	**(km^2)**	**(% of Available Habitat in the LSA)**	**(% of Available Habitat in the RSA)**
Northern Peninsula	178	37	1,392	34	7	4	<1
Central and Eastern Newfoundland	275	42	1,803	37	10	4	<1
Avalon Peninsula	62	25	467	27	2	3	<1

Note: Rounding errors less than 1% may occur in final totals. ROW calculations include the 20% contingency.

Central and Southeastern Labrador Region not included as the subspecies only occurs on the Island.

Passerines are known to be particularly susceptible to vehicle collisions (Erickson et al. 2005), likely due to their small size and low-flying behaviour. Elevated risks of mortality may occur where roads pass through the primary habitats of species that forage on or near the ground, such as Gray-cheeked Thrush. However, passerine collisions with vehicles during the Project are likely to be minimal due to the slow-moving nature of most vehicles during Construction activities within the Project components (i.e., speed limits associated with Project access roads vary from 10-60 km/hr and are set as per the regulatory requirements by the Department of Transportation and Works).

As with other Avifauna, there is the potential for passerines such as Gray-cheeked Thrush to be adversely affected by the presence of transmission lines through collisions. However, the small size and agility of most passerines limits the potential for collisions with transmission lines because they are able to react quickly to the presence of unexpected obstacles (Bevanger 1998). Nonetheless, there is the potential for collision rates to exhibit seasonal patterns, particularly along features where migratory activity is concentrated, such as the Northern Peninsula of Newfoundland. For example, collisions with man-made structures are known to cause mortalities of the Gray-cheeked Thrush during its migration (Lowther et al. 2001, internet site), although the effect of such features in Newfoundland and Labrador is not known (NLDEC-W 2010).

7.10 Short-eared Owl

The Short-eared Owl is a medium-sized owl, with a round head, and yellow eyes. The plumage is brown on the back and creamy-buff on the chest with brown streaks, with both sexes similar in appearance (COSEWIC 2008).

Unforested habitats are used by this species including tundra, bog, sand dunes, and coastal barrens in Newfoundland and Labrador. However, it has been proposed that the primary factor influencing habitat choice is food abundance (COSEWIC 2008). These habitats are particularly abundant on the west coast and the Northern Peninsula, the coastal barrens and above the treeline in Labrador (GNL, DEC, 2011f, internet).

This species has been continually declining over the past 40 years, including a decrease of 23% in the last decade alone (COSEWIC 2008).

In Newfoundland and Labrador, Short-eared Owl are associated with tundra, coastal barrens, sand dunes and field and bog habitats (Schmelzer 2005). Throughout its range, this species

prefers open fields for feeding and nesting (Warkentin and Newton 2009). Short-eared Owl are nomadic, and wander throughout their range looking for prey consisting primarily of small mammals, insects and other birds (Schmelzer 2005). Nests are flattened depressions in the ground, typically hidden under low shrubs, reeds and grasses near water. Within the RSA, records indicate that this species is most abundant in the coastal barrens along the SOBI (including both the Labrador and Newfoundland sides) and to a lesser extent in the Avalon Peninsula (ACCDC 2010, internet site; ACCDC 2008, internet site; Schmelzer 2005; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999; Jacques Whitford 1999).

Habitat loss is considered the main factor affecting the population of Short-eared Owl in other parts of its range (Schmelzer 2005). However, the amount of suitable habitat available to them in Newfoundland and Labrador has remained largely unchanged over the past century, suggesting that its population within the province may occur at historical levels in the absence of other important limiting factors (Schmelzer 2005). In addition to the loss of habitat, declines in Short-eared Owl populations have been attributed to increased nest depredation as a result of habitat fragmentation, declines in prey abundance as a result of habitat changes, and other factors (Schmelzer 2005).

Table 7-5 summarizes the potential amount of alteration or loss of primary (alpine vegetated, kalmia lichen / heathland and lichen heathland habitat) as a result of Project Construction by region for Short-eared Owl. The potential amount of primary habitat altered or lost for all regions, assuming the centre line ROW plus the 20% contingency is approximately 3 km^2. This predicted alteration of loss represents up to 5% of available habitat within the LSA and 3% or less of the available primary habitat within the RSA, by region. Disturbance to wetland habitats (i.e., secondary habitat) are likely to be limited as construction activities will generally avoid these areas where possible and vegetation clearing will be minimal within many wetlands as a result of the often low-lying character of their vegetation.

Table 7-5 Primary Habitat for Short-eared Owl Potentially Affected by Construction (By Region)

Region	Primary Habitat Within the LSA		Primary Habitat Within the RSA		Primary Habitat Within the ROW		
	(km^2)	(%)	(km^2)	(%)	(km^2)	(% of Available Habitat in the LSA)	(% of Available Habitat in the RSA)
Central and Southeastern Labrador	44	6	341	6	2	3	<1
Northern Peninsula	2	<1	35	<1	<1	3	3
Central and Eastern Newfoundland	8	1	56	1	<1	5	2
Avalon Peninsula	15	6	76	4	1	5	1

Note: Rounding errors less than 1% may occur in final totals. ROW calculations include the 20% contingency.

Raptors are generally not as susceptible to vehicle collisions as other bird groups (Erickson et. al. 2005), although they have been documented to be vulnerable in some areas. For example, a study which examined driving surveys over a 10-year period in New Jersey estimated that 25 raptors were killed per year within a 145 km survey route along roads, with most fatalities being of owls (Loos and Kerlinger 1993). Collisions with aircraft and cars have been documented as a source of accidental mortality for the Short-eared Owl (Cadman and Page 1994). However, collisions rates are likely to be minimal due to the general ecology and behaviour of Raptors, as well as the slow-moving nature of most vehicles during Construction activities, and adherence to appropriate speed limits applicable to the size and class of the access roads to reduce the potential for vehicle-wildlife collisions (i.e., speed limits associated with Project access roads vary from 10-60 km/hr and are set as per the regulatory requirements by the Department of Transportation and Works).

Being relatively large, heavy-bodied, and less agile than many other bird groups, Raptors are generally susceptible to collisions with power lines. Collisions with high-tension guy wires have been documented as a source of accidental mortality for the Short-eared Owl (Cadman and Page 1994). Raptors are considered amongst the most susceptible bird groups to collisions in upland habitats (Erickson et al. 2005).

Because Short-eared Owl nests on the ground they are potentially sensitive to changes in predation activities and human recreational activities (Schmelzer 2005) that may result from increased access along the ROW. With respect to human activities, repeated disturbance associated with OHVs and other recreational uses, or transmission line maintenance equipment during nesting or brood rearing may result in nest abandonment and or failure (Schmelzer 2005). To minimize sensory disturbance to raptors, annual transmission line maintenance activities within 200 m of an active raptor nest will only be conducted in consultation with the Newfoundland and Labrador Department of Environment and Conservation (NLDEC), and may require specific conditions. Additionally, as previously discussed, access control measures will be developed during Construction and maintained during Operations and Maintenance to reduce sensory disturbances associated with recreational activity within the ROW.

Vegetation management activities within the ROW may provide some indirect benefits to raptors through increased feeding opportunities. For example, Short-eared Owl prefer open habitats for feeding (Warkentin and Newton 2009) and may therefore benefit from the conversion of heavily-forested habitats to early succession vegetation communities that are promoted by maintenance activities. However, due to their wide distribution, high trophic status and territoriality, raptors have the potential to accumulate environmental contaminants (Sheffield 1997). For example, they are considered susceptible to secondary poisoning from rodenticides and pesticides through consumption of contaminated prey items (Steininger 1952). However, the application of herbicide products is a highly regulated activity. The herbicide will be applied by qualified, trained personnel in a careful manner, following the manufacturers' instructions and the requirements of the applicable regulations will be met or exceeded. All herbicide applications will be approved by the NLDEC pursuant to the Pesticides Control Regulations, 1996 (plus amendments) under the Environmental Protection Act SNL 2002.

7.11 Cumulative Effects

Cumulative environmental effects were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. Cumulative

environmental effects are those likely residual environmental effects of the Project that overlap in time and space within the RSA with likely environmental effects from other projects and activities. The environmental effects of past and existing projects and activities are captured in the baseline conditions for Avifauna (i.e., as presented in the existing environment chapter of the L-ITL EIS). Currently, much of the landscape within the RSA is relatively intact, although areas with considerable amounts of infrastructure (e.g., road networks) and / or subject to disturbance activities (e.g., forestry) are present, particularly in Central and Eastern Newfoundland and on the Avalon Peninsula.

Much of the Labrador portion of the RSA remains relatively undisturbed by anthropogenic activity and populations therein are considered to be in a “natural” state. However, the north-western portion of the RSA follows the TLH3 and is within the Low Level Training Area (LLTA) military area and would therefore be subject to fragmentation and infrequent sensory disturbance effects. While some behavioural reactions to aircraft have been noted, no effects on reproduction or survival at the individual or population level have been documented (LaPierre 2008, pers. comm.). A study on the effects of low-level flying military aircraft on Harlequin Ducks in Labrador observed behavioural responses, but there was insufficient data to determine any population level effect on the species (Goudie and Jones 2004). Physiological investigations of the response of moulting Black Duck (Minaskuat Limited Partnership 2005c), and behavioural reactions of nesting Osprey (Trimper et al. 1998a, b; Minaskuat Limited Partnership 2003a), nesting Canada Jay (Minaskuat Limited Partnership 2003b) and nesting Canada Geese (Minaskuat Limited Partnership 2007, 2004) to military and civilian over-flights demonstrated short-term (i.e., usually <5 minute) reactions with no measurable effect on reproductive success or at a population level. Additionally, communities and associated infrastructure are present at the northern (i.e., Muskrat Falls) and southern (i.e., Strait of Belle Isle) segments of the RSA, and avifauna within these areas are likely to have been affected by associated activities, including habitat loss, fragmentation, and hunting pressure.

Avifauna habitats and populations within the Newfoundland segment of the RSA have been subjected to greater degrees of anthropogenic effects, as evidenced by the presence of human development, access roads, various aged cut blocks and intensity of recreational activity. However, much of the non-commercial forest landscape crossed by the Project is still in a relatively “natural” state, including large tracts of land on the Northern Peninsula. Stressors to Avifauna in Newfoundland that the Project has the potential to interact with include a diversity of infrastructure, such as that associated with transportation (e.g., the TCH, secondary and tertiary roads, woods roads), commercial (e.g., existing transmission lines) and residential activities, as well as disturbance processes, particularly those related to forest management.

Due to the migratory nature of many Avifauna species, stressors acting within the RSA are not necessarily indicative of effects to Avifauna populations.

The primary environmental effect of Project Construction on Avifauna within the RSA will be through an alteration or loss of habitat. However, a number of other Project components or activities also have potential to affect Avifauna, including vegetation management initiatives, the presence of high voltage transmission lines, sensory disturbance, and subsequent increased OHV use and hunting pressure. Nalcor has committed to mitigation measures that will limit Project effects on Avifauna habitat and populations. Overall, residual environmental effects to Avifauna are low to moderate in magnitude, are limited to the RSA.

Future activities that result in the clearing or disturbance of vegetation have the greatest potential to act cumulatively with the Project to affect Avifauna. These clearing activities may create additional sources of sensory disturbance, including during sensitive times of the year, and may increase access for OHVs, resulting in disturbance to potentially sensitive habitats / nesting areas and / or result in increased hunting pressure. The reasonably foreseeable future projects considered in the cumulative effects assessment for the Labrador portion of the Project include:

- Lower Churchill Hydroelectric Generation Project;
- TLH3 (although recently completed, operational effects may not be reflected in the current baseline);
- 5 Wing Goose Bay Military Flight Training;
- commercial forestry activity (FMDs 19A and 21);
- general economic and infrastructure development in the Central Labrador and Labrador Straits Region; and
- other land uses activities, particularly OHV use.

For Newfoundland, the reasonably foreseeable projects and activities considered in the cumulative effects assessment include:

- general economic and infrastructure development;
- commercial forestry activity (FMDs 1, 2, 4, 6, 9, 10, 11, 12, 16, 17, and 18);
- Parsons Pond oil and gas exploration drilling; and
- other land use activities, particularly OHV use.

Locally situated projects such as the Parsons Pond oil and gas exploration project are not likely to act cumulatively because the geographic scope of these activities is limited and / or may

occur within previously disturbed areas. However, there is potential for cumulative effects to occur as a result of interactions between the Project and the effects associated with the Lower Churchill Hydroelectric Generation Project. For example, Rusty Blackbird populations have been considered sensitive to mercury contamination of boreal wetlands following forestry activities and the creation of hydroelectric reservoirs (Gerrard and St. Louis 2001; Garcia and Carignan 2000; DesGranges et al. 1998). Additionally, future forestry activities and recreational pressure may act cumulatively with the effects of the Project.

Commercial forestry activity in general involves wide-scale vegetation clearing, which could result in habitat fragmentation, loss of nests and nesting sites, damage to wetlands and riparian zones and increased public OHV access through logging roads. In particular, forestry activities have contributed to population declines of provincially and / or federally designated species at risk that are known to occur within the RSA. For example, forestry operations continue to expand into known breeding areas of Harlequin Duck within Atlantic Canada, and logging activities are known to remove suitable breeding habitat and also increase stream siltation that may affect food availability (Crowley and Patten 1996; Breault and Savard 1991). However, as noted in the management plan for Harlequin Duck (Environment Canada 2007a), it is difficult to fully assess the impact of forestry across its range because the majority of breeding for the regional population occurs in Labrador (Trimper et al. 2008), which is not presently exploited by the forest industry. Forestry activity in the province is conducted through District-based Sustainable Forest Management Plans, and includes Five Year Operating Plans that detail the specific mitigation and management measures to minimize the potential environmental effects of these activities. This, in conjunction with forestry exhibiting a general decline on the Island of Newfoundland due to the closure of several mills in recent years, will limit the potential for cumulative effects of forestry with the Project.

Project activities and infrastructure may interact with existing stressors in the RSA resulting in cumulative effects on Avifauna. For example, as a result of clearings and roads created by the Project and other developments, cumulative sensory disturbances and hunting effects may occur as a result of increased public OHV access. To limit the contribution to cumulative environmental effects resulting from recreational activities, access control measures will be developed to monitor and manage public OHV and other uses of the Project ROW, roads and trails. This will include an education component, local community involvement with active participation and support from Nalcor, and ongoing evaluation during inspections.

The effects of the Project in combination with other projects and activities that have been or will be carried out are not expected to result in an effect on the Avifauna that would cause a change in the population or regional distribution of a species such that its population will not be

sustainable. The planning, consultative and other effects management measures identified for this VEC will serve to avoid or reduce potential interactions and adverse effects as a result of the Project. Avoiding or managing potential effects on Vegetation resulting from other ongoing and future projects and activities will require that appropriate resource management, planning, regulatory and enforcement measures are in place and implemented by the relevant agencies.

A description and determination of the likely cumulative environmental effects of the Project in each geographic region are provided in Table 7-6. Additional mitigation is not considered to be necessary to eliminate or reduce the predicted cumulative effects on Avifauna.

Table 7-6 Cumulative Environmental Effects Summary: Avifauna

Cumulative Environmental Effects Analysis	Central and Southeastern Labrador	Northern Peninsula	Central and Eastern Newfoundland	Avalon Peninsula
Current (Baseline) VEC Condition (reflecting the effects of past and ongoing projects and activities)	Avian populations, including listed species, are considered stable. They are influenced by limited human activities in the region and may be considered to be in a relatively "natural" state (not considering the influence of stressors acting in other parts of their range). Existing projects and activities that have and continue to affect Avifauna populations by habitat alteration or loss include the TLH3, and the northern (Muskrat Falls) and southern (Strait of Belle Isle communities and infrastructure) segments, and activities associated with the LLTA military area within the north-western section of the RSA.	Avian populations, including listed species, are considered stable. They are and have been influenced by extensive forest harvesting and recreational activities in the region. Nevertheless, these populations may be considered to be in a relatively "natural" state (not considering the influence of stressors acting in other parts of their range). Existing projects and activities that have and continue to affect Avifauna populations through habitat alteration or loss include the various developments (e.g., roads, transmission lines, communities) and timber harvesting.	Avian populations, including listed species, are considered stable. They are influenced by low to moderate amounts of human activities in the region. Existing projects and activities that have and continue to affect avifauna populations through habitat alteration or loss include various developments (e.g., roads, transmission lines, communities) and timber harvesting.	A concentration of human development (e.g., roads, transmission lines, villages, cottages) occurs within the RSA primarily due to the proximity of population centres. As such, Avian populations may be considered stable but they are moderately influenced through habitat alteration or loss by human activities in region.
Likely Residual Environmental Effects of Labrador - Island Transmission Link	Residual environmental effects include habitat alteration or loss and fragmentation, sensory disturbance, incidental take (via electrocutions and collisions with transmission lines and vehicles), and increased access and associated hunting pressure.	Residual environmental effects include habitat alteration or loss and fragmentation, sensory disturbance, incidental take (via electrocutions and collisions with transmission lines and vehicles), and increased access and associated hunting pressure.	Residual environmental effects include habitat alteration or loss and fragmentation, sensory disturbance, incidental take (via electrocutions and collisions with transmission lines and vehicles), and increased access and associated hunting pressure.	Residual environmental effects include habitat alteration or loss and fragmentation, sensory disturbance, incidental take (via electrocutions and collisions with transmission lines and vehicles), and increased access and associated hunting pressure.

Cumulative Environmental Effects Analysis	Central and Southeastern Labrador	Northern Peninsula	Central and Eastern Newfoundland	Avalon Peninsula
Likely Cumulative Environmental Effects (within RSA) of Other Future Projects and Activities	Overlapping projects and activities that will affect habitat alteration or loss in particular include: the Lower Churchill Hydroelectric Generation Project, TLH3, commercial forestry activity (FMDs 19 and 21), general economic and Infrastructure development in the Central Labrador and Labrador Straits region, and other land uses, particularly OHV use.	Overlapping projects that will affect habitat alteration or loss in particular include general economic and Infrastructure development, commercial forestry activity, Parsons Pond oil and gas exploration drilling, and other land uses, particularly OHV use.	Overlapping projects that will affect habitat alteration or loss in particular include general economic and infrastructure development, commercial forestry activity, and other land uses, particularly OHV use.	Overlapping projects that will affect habitat alteration or loss in particular include general economic and Infrastructure development, commercial forestry activity, and other land uses, particularly OHV use.
Cumulative Environmental Effects Summary	While the contribution of the Project to cumulative environmental effects will extend through the life of the Project, effects such as habitat alteration or loss will be limited in scale to the LSA or potentially the RSA (relative to OHV access along the transmission ROW and access trails), and low in magnitude. The cumulative effects are not expected to cause a change in the population or regional distribution of a species such that its population is not sustainable.	While the contribution of the Project to cumulative environmental effects will extend through the life of the Project, effects such as habitat alteration or loss will be limited in scale to the LSA or potentially RSA (relative to OHV access along the transmission ROW and access trails), and low in magnitude. The cumulative effects are not expected to cause a change in the population or regional distribution of a species such that its population is not sustainable.	While the contribution of the Project to cumulative environmental effects will extend through the life of the Project, effects such as habitat alteration or loss will be limited in scale to the LSA or potentially RSA (relative to OHV access along the transmission ROW and access trails), and low in magnitude. The cumulative effects are not expected to cause a change in the population or regional distribution of a species such that its population is not sustainable.	While the contribution of the Project to cumulative environmental effects will extend through the life of the Project, effects such as habitat alteration or loss will be limited in scale to the LSA or potentially RSA (relative to OHV access along the transmission ROW and access trails), and low in magnitude. The cumulative effects are not expected to cause a change in the population or regional distribution of a species such that its population is not sustainable.

Source: Nalcor (2012)

7.12 Consideration of Avoidance and/or Reasonable Activity Alternatives

Alternatives were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. As the transmission corridor must connect all facilities, the evaluation of alternatives considered corridors that were feasible from technical and environmental perspectives, between Muskrat Falls in Central and Southeastern Labrador and Soldiers Pond on the Avalon Peninsula. Routing, used as a mitigation strategy, was used to limit the environmental footprint (e.g., utilize existing disturbance corridors to the extent practical, avoid environmentally sensitive areas such as Gros Morne National Park), while considering engineering and construction requirements. This routing process incorporated information collected during the consultation. Ten alternative transmission corridor segments have been identified by Nalcor, including two in Central and Southeastern Labrador, five on the Northern Peninsula, two in Central and Eastern Newfoundland, and one on the Avalon Peninsula.

The various alternative segments considered in this assessment could vary in their respective effects on the selected KIs in relation to alteration or loss of primary and secondary habitat for select species. As such, the character of the alternative corridors and the proposed alignment were compared using information on the habitat types preferred by each of the species for which habitat mapping was completed (Table 7.7). Additional notes on the known presence of Avifauna species of special conservation status, as indicated by ACCDC records (ACCDC 2010, internet site; ACCDC 2008, internet site), are included in the relevant alternative descriptions, as applicable.

Table 7-7 Summary Evaluation of Project Alternative Means: Avifauna Species of Special Conservation Status

Project Alternative Means[(a)]	**Environmental Implications (Compared to the Proposed Transmission Corridor)**[(b)]
	Species of Special Conservation Status
A2: Northwest of Strait of Belle Isle Alternative Segment	This alternative corridor segment has 1.0 km^2 more habitat than the proposed corridor segment. This includes 3 km^2 more of Conifer Scrub and 2 km^2 more of Lichen Heathland. It will traverse 3 km^2 less Wetland Habitat. The implications of this alternative would be less effects on wetland affiliated species such as, Rusty Blackbird.
A3: Point Amour Alternative Segment	The alternative corridor segment has approximately 18 km^2 less habitat than the proposed corridor segment, including 18 km^2 less Conifer Scrub, <1 km^2 less Wetland, and 2 km^2 more Lichen Heathland.
A4: Strait of Belle Isle Newfoundland Side Alternative Segment	The alternative corridor segment has 13 km^2 more habitat than the proposed corridor segment. This includes 9 km^2 more of Open Conifer Forest and 3 km^2 more of Scrub / Heathland / Wetland Complex. This alternative corridor segment has greater implications for Common Nighthawk in association with the Open Conifer Forest, and Rusty Blackbird, due to the greater amount of Scrub / Heathland / Wetland Complex affected.
A5: GNP Northeast Alternative Segment	The alternative corridor segment has more habitat than the proposed corridor segment. This includes 5 km^2 more of Open Conifer Forest (that provides primary habitat for Common Nighthawk) and 2.4 km^2 more of Scrub / Heathland / Wetland Complex that provides primary habitat for Rusty Blackbird. The alternative corridor segment, however, does traverse 2 km^2 less of Wetland Habitat than the proposed corridor. Whereas both the proposed corridor and alternative cross Castor River West, the alternative corridor segment does so further upstream and within portions of the river which are known to support breeding pairs of Harlequin Duck (Stassinu Stantec Limited Partnership 2010; ACCDC 2008, internet site).
A6: GNP West-central Alternative Segment	The alternative corridor segment has less habitat than the proposed corridor segment. This includes 9 km^2 less of Conifer Forest, 1 km^2 less of Conifer Scrub, 7 km^2 less of Open Conifer Forest and 5 km^2 less of Scrub / Heathland / Wetland Complex. The alternative corridor segment would have less effect on coniferous habitat affiliated species such as Gray-cheeked Thrush and Common Nighthawk. The alternative corridor segment traverses 15 km^2 less of Mixedwood Forest which is rated as primary habitat for Gray-cheeked Thrush.

Project Alternative Means[(a)]	**Environmental Implications (Compared to the Proposed Transmission Corridor)**[(b)]
	Species of Special Conservation Status
A7: GNP Eastern LRM Crossing Alternative Segment	The alternative corridor segment has less habitat than the proposed corridor segment. This includes 1.4 km^2 less Mixedwood Forest, 3 km^2 less Open Conifer Forest, 7 km^2 less Scrub / Heathland / Wetland Complex and 5 km^2 less Wetland Habitat. It traverses 13 km^2 more of Conifer Forest, and 2 km^2 more of Conifer Scrub used by Gray-cheeked Thrush. Harlequin Duck have been observed along the portion of Brian's Pond Brook that is crossed by the proposed corridor segment (ACCDC 2008, internet site), and the A7 alternative corridor segment crosses both Brian's Pond Brook and Inner Pond Brook in locations where Harlequin Duck have been recorded (Stassinu Stantec Limited Partnership 2010; ACCDC 2008, internet site).
A7: GNP Eastern LRM Crossing Alternative Segment + A8: GNP IATNL Alternative Segment	The alternative corridor segment has more habitat than the proposed corridor segment. This includes 16 km^2 more of Conifer Forest, 2 km^2 more of Conifer Scrub, and 5 km^2 more of Open Conifer Forest used by Gray-cheeked Thrush and Common Nighthawk. In addition, there will be 5 km^2 more Wetland Habitat that supports species such as Rusty Blackbird.
A9: Birchy Lake Alternative Segment	The alternative corridor segment has 13 km^2 more habitat than the proposed corridor segment. This includes a variety of less affected habitats such as 2 km^2 more Cutover, 4 km^2 more Mixedwood Forest, 1 km^2 more Open Conifer Forest, 3 km^2 more Scrub / Heathland / Wetland Complex and 3 km^2 more Wetland Habitat which would result in increased effects on a wide variety of avian species.
A10: NLOA Alternative Segment	This alternative corridor segment occurs almost entirely beyond the RSA, and therefore insufficient information exists for a detailed habitat comparison. However, the proposed corridor segment is 87 km in length, while the alternative corridor segment is 130 km. This represents an increase of approximately 43 km in length which would be expected to result in greater effects on many species of avifauna. Rusty Blackbird have been recorded approximately mid-way along the A10 alternative corridor.
A11: Avalon Alternative Segment	The alternative corridor segment has 3 km^2 less habitat than the proposed corridor segment. With the exception of Cutover (2 km^2) and Mixedwood Forest (1 km^2), the difference in the amount of habitat between the proposed corridor segment and the alternative corridor segment were all less than 1 km^2 and therefore of little consequence for the various avifauna species of interest.

— Indicates that avifauna distribution does not overlap with this alternative.

(a) As identified and described in Chapter 2, Project Rationale and Planning.

(b) Namely, the proposed Project described in the EIS Project Description Chapter 3, and assessed in the preceding Environmental Effects Analysis.

Because of the variety of habitat types present along the proposed and alternative corridors and differences in their habitat use for the suite of avifauna species included in this VEC, it is challenging to provide a concise, yet thorough, evaluation of the likely relative effects of the proposed corridor in comparison to the alternatives. However, given the importance of Wetland Habitat and Scrub / Heathland / Wetland Complex Habitat for several of the selected species (i.e., Rusty Blackbird nd Short-eared Owl), alternatives which have a greater potential to affect these habitat types also have a greater potential effect on avifauna in general. The proposed corridor traverses a similar amount of habitat or less habitat than the alternatives, and is likely to have similar or lesser effects on Wetland and Scrub / Heathland / Wetland Complex habitats. Alternatives A3, A6, A7, and A11 are shorter than the proposed corridor, however, and most of these (i.e., A3, A6, A7) also traverse through less wetland. The overall habitat traversed by the A7+A8 alternative corridors is more, but it crosses less wetland habitat.

Data on the distribution of species of special conservation status along the alternative corridors indicates that several of the alternatives are in conflict with federally and / or provincially designated Species at Risk. In particular, alternatives A5 and A7 are in conflict with areas where Harlequin Duck have been reported, and are known to breed. Whereas both the A5 alternate and the corresponding section of the proposed corridor cross Castor River West, which is known to harbour breeding Harlequin Duck, the A5 alternate does so further upstream and within portions of the river that are known to support breeding pairs. Similarly, whereas this species has been observed along the portion of Brian's Pond Brook, which is crossed by the proposed corridor, the A7 alternate crosses both Brian's Pond Brook and Inner Pond Brook in locations where Harlequin Duck has been recorded (Stassinu Stantec Limited Partnership 2010a; ACCDC 2008, internet site). Additionally, data indicate that the Rusty Blackbird has been recorded approximately midway along the A10 alternate corridor near Buchans during both 2003 and 2006 (ACCDC 2010, internet site), suggesting that the alternative corridor could interact with this species.

7.13 Mitigation and Monitoring

To ensure the protection of Avifauna SAR, the following general mitigation and monitoring measures (collected from the L-ITL EIS (Nalcor 2012a) and the EPP) will be included:

- Implement no harvesting policy and 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;
- Utilize trained and experienced environmental monitors to implement the EPP;
- Use existing roads, quarries and other disturbed areas, where possible;
- Restrict public access to temporary roads and work areas;
- Post and enforce speed limits;
- 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;
- Use existing right-of-way corridors for construction of transmission lines where possible;
- Schedule activities related to transmission line construction around sensitive periods or areas, to the extent practical;
- The herbicide will be applied by qualified, trained personnel in a careful manner, following the manufacturers' instructions and the requirements of the applicable regulations will be met or exceeded. All herbicide applications will be approved by the NLDEC pursuant to the Pesticides Control Regulations, 1996 (plus amendments) under the Environmental Protection Act SNL 2002.
    - All herbicide products used are registered by Health Canada for their intended purpose. This registration process involves in-depth science to determine risks to flora, fauna and humans associated with the storage, application, transport and handling of these products and the potential risks posed to the natural environment. The Provincial Department of Environment and Conservation is responsible for regulating the use of these federally registered products in Newfoundland and Labrador (Environmental Protection Act, SNL2002-E-14.2 and Pesticide Control Regulations 2003). The Province is responsible for the requirements associated with the application, storage and handling of these products within Newfoundland and Labrador. The Province also establishes buffer zones for the application of herbicides in Newfoundland and Labrador. These buffer zones are based on the fate and persistence parameters of the herbicides applied and are intended to prevent the movement of herbicides and/or their residues into waterbodies adjacent to application sites and, in general, to protect the natural environment where these products are used. If these buffers are not adequate, LCP looks to the Province to provide appropriate regulations with respect to buffer widths.

  - Herbicide application by Nalcor will meet or exceed these regulations. In addition, Nalcor employs knowledgeable and experienced inspectors to oversee all operations involving the application of herbicides by companies with an "Industrial Vegetation" license in the field. These inspectors are responsible to see that all requirements associated with compliance during mixing, loading and application operations are strictly adhered to and prepare Daily Application Reports to support their observations.

- LCP will note public OHV use of transmission corridor roads and trails observed during maintenance and inspections, as part of the access control measures.
- During the Project Construction and routine inspections during Operations and Maintenance, if despite the implementation of Nalcor's proposed mitigation measures there are any incidents related to effects on migratory birds or species at risk, Nalcor details of such incidents involving mortality will be reported to the Canadian Wildlife Service of Environment Canada, and the NLDEC-WD;
- Helicopter surveys for active raptors nests will be completed during late May through early June of the area of interest. Line transects will be flown along 3 transect lines covering 100% of the area to be cleared.
- Trained surveyors will complete ground searches for avifauna nests during 15 May to 31 July (Labrador), and 1 May to 31 July (Island) <7 days prior to the clearing activity. The census techniques will vary according to habitat but will be based on 100% coverage of the area of interest. To assure 100% coverage of the area of interest, three surveyors will each survey line transects of 10 m wide. The line transects will be completed in the area of interest by 1 km intervals to insure a thorough search. In total, 8 teams of 3 surveyors will be required for 3 nesting seasons, while 2 teams of 3 surveyors will be required for the final season. Active and potentially active nests will be identified using the criteria identified above according to species with information collected based on Maritime Bird Breeding Atlas Nest Record Card (Bird Studies Canada, 2006) and locations and mitigation measures communicated to the Construction Manager who will communicate to the On-site Environmental Monitors. The area of interest will only be cut after the survey team has cleared the area after completing their search. No cutting will be permitted until the survey team has returned to a buffered area to confirm fledging within the appropriate timeframe for the species in question found at the active nest. Note that an experienced avifauna biologist will be available for assistance and consultation following the initial surveys and throughout the identified period for the project. 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). For raptors such as hawks and owls, active nests will be identified as per the Avifauna Management Plan and appropriate buffers applied.;

  - Clearing and associated mitigations apply to ground/shrub/scrub clearing as well as forest removal in areas where ground-nesting birds may be present.

- No clearing shall take place within 800 m of an active raptor nest between the months of May 1 to August 15 (Island) and May 15 to August 15 (Labrador). If a nest is encountered during clearing activities, all work shall stop until the site is cleared by the On-Site Environmental Monitor, in consultation with the appropriate regulatory agencies;
- Where required (i.e., as per the Avifauna Management Plan or associated EEM Plans), prior to commencement of work, an on-site wildlife biologist shall be onsite to survey for areas of concern (critical breeding habitat, rare plants, nest sites, etc.) and to provide input on work methods, lay out approved travel routes and work areas and associated buffer zones;
- Where possible, the bulk of clearing shall take place during the non-breeding season.

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:

- Environmental personnel and OSEMs will conduct a pre-blast survey for species of risk. 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.;
- 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/or the nest is inactive.
- The LCP has conducted aerial surveys of relevant portions of rivers known to support breeding Harlequin Duck pairs (e.g., St. Paul River, Torrent River, East River) at several intervals during 2011-12 to cover the various life history stages. The presence of an adult pair was recorded on the Torrent River during the spring survey. The information collected has been considered in the identification of final alignment.
- Mitigation measures in place for riparian zones, as described in Section 12.2.5 of the L-ITL EIS (Vegetation) (Nalcor 2012a) are likely to limit effects on nesting sites for Harlequin Duck by maintaining undisturbed buffers around streams and watercourses. Details are outlined in the HVdc Transmission and HVdc Specialties Environmental Protection Plan. Additionally, the final ROW alignment within the transmission corridor has been sited to avoid known breeding sites and limit vegetation clearing at the edge of rivers, to the extent practical.
- Mitigation in place for riparian zones, as described in Section 12.2.5 of the L-ITL EIS (Vegetation) (Nalcor 2012a), will minimize effects on breeding sites for Rusty Blackbird by maintaining undisturbed buffers around streams and watercourses. . Because Rusty Blackbird have been shown to utilize a diversity of habitat types during the breeding season, including anthropogenically modified and disturbed ones (COSEWIC 2006, internet site), the estimated alteration or loss of habitat for this species as a result of construction activities will likely be less than indicated.
- No one shall disturb, move or destroy migratory bird nests. If a nest or young birds are encountered, work shall cease in the immediate area of the nest. Work shall not continue in the area until the nest is no longer occupied, otherwise the work plan shall be modified to avoid nest sites by a minimum of 30 m (100m for Rusty Blackbird).

- Because Short-eared Owl nests on the ground they are potentially sensitive to changes in predation activities and human recreational activities (Schmelzer 2005) that may result from increased access along the ROW. With respect to human activities, repeated disturbance associated with OHVs and other recreational uses, or transmission line maintenance equipment during nesting or brood rearing may result in nest abandonment and or failure (Schmelzer 2005). To minimize sensory disturbance to raptors, annual transmission line maintenance activities within 200 m of an active raptor nest will only be conducted in consultation with the NLDEC, and may require specific conditions. Additionally, access control measures will be developed during Construction and maintained during Operations and Maintenance to reduce sensory disturbances associated with recreational activity within the ROW.
- Some of the listed bird species are ground nesters that prefer open habitat. Any open areas that are to be used for travel or clearing of non-tree vegetation, will be surveyed for nests.
- Nalcor will note any observations of Red Knot or other avian species of conservation status during Project construction activities; and
- To ensure protection of Common Nighthawk nests in open areas, vehicle traffic in open areas should be kept along established routes.

7.14 Environmental Effects Monitoring

This L-ITL SAR IMMP 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.

Nalcor has committed to conduct baseline, follow-up and monitoring surveys for Listed Species. This would apply to the following, as appropriate:

- Baseline data collection (i.e., data collected prior to construction);
- Data collection during construction; and
- 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 insure that the mitigation is appropriate. Where it is determined that the mitigation is not appropriate, a contingency plan would be presented that Nalcor could incorporate as per an adaptive management approach.

To evaluate the presence of breeding pairs of Harlequin Duck on the Torrent River in Newfoundland, a river known to support this species, a survey 5 km upstream and downstream of the right-of-way intersection with the Torrent River will be conducted before Construction activities commence to determine the extent of breeding activities of Harlequin Duck. A follow-up survey for Harlequin Duck will also be conducted following the construction phase of the Project. A survey will be conducted immediately following the Construction phase of the Project and for a period of two years following commencement of Operations and Maintenance. These follow-up surveys will document the abundance and distribution of Harlequin Duck on the Torrent River (i.e., 5 km upstream and downstream of the intersection with the right-of-way) to determine the effects of the Project on breeding pairs.

During Nalcor's routine inspection of the ROW and other Project components (e.g., access) throughout the life of the Project, the inspectors will maintain a log of observations or evidence of avifauna involved with vehicle collisions or interactions with the transmission line (i.e., collisions or electrocutions), note the presence of nests on transmission towers or poles, and note any areas of environmental concern related to avifauna including species at risk, within or adjacent to the Project components. Information from these routine inspections will be shared with the NLDEC-WD. Mortalities of Avifauna SAR will be collected where possible and provided to the NLDEC-WD.

8 CARIBOU

8.1 Existing Information

As described in Nalcor (2012) woodland caribou (*Rangifer caribou*) are an important cultural, economic, and ecosystem component in Newfoundland and Labrador (NL), supplying a hunting resource for residents and prey for wildlife. Caribou within NL 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 sedentary caribou are the forest dwelling ecotype that undergoes a seasonal dispersion (rather than migration) during calving (Bergerud et al. 2008).

The Red Wine Mountains Herd (RWMH) and Mealy Mountains Herd (MMH) (including the Joir River subpopulation of the MMH) are sedentary herds that occur near the Study Area in Labrador. An Ecological Land Classification (ELC) was completed of the Study Area from Muskrat Falls in Central Labrador to Soldiers Pond on Newfoundland's Avalon Peninsula (Stantec 2011b, 2010a). This ELC identified, categorized and evaluated vegetation types and associated habitats.

In Labrador, sedentary woodland caribou are listed as threatened by the NLESA which prohibits disturbing, killing, capture, possession or trading of these caribou. The RWMH and MMH have been closed to licensed hunting since 1972 and 1976, respectively (with the exception of a single licensed hunt in 1989 permitted for the MMH). Population estimates for the sedentary herds that overlap the Study Area in Labrador are 97 for the RWMH (2001) and 1604 in the MMH (20012).

Existing information regarding caribou is summarized from data compiled for the L-ITL EIS (Nalcor 2012a, 2012b) and subsequent information (e.g., Schmelzer 2012).

Table 8-1 Population estimates for surveys conducted between 2000 and 2012

Herd	Estimate (Confidence Interval)	Year of Census	Trend
Red Wine Mountain	97(72-189) (2001) 87_1 75_1	2001 2007 2009	Declining
Mealy Mountain	2581 (989-4181) 2106 (765 – 3447)$_2$ 1604 (1409-2171)	2002 2005 2012	Declining
Joir River	110_3 69_3	2009 2012	Minimum Count Minimum Count

1. Count of all animals in groups with collared individuals during early winter
2 Post-hoc analysis indicates estimate could have been as high as 2985 (Jeffery and Otto 2005)
3. Minimum count associate with systematic survey of herd range in 2012

Source: Nalcor (2012)

8.2 Habitat Use / Preference

The most current information on habitat selection by RWM Herd caribou was recently completed by the 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 Project, 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 L-ITL 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 8-2).

Table 8-2 Ecological Land Classification Habitat Type and Potential Caribou Use of the Study Area in Central and Southeastern Labrador

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
Mixedwood 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)

The EIS predicted that likely residual effects on caribou include habitat loss or alteration due to vegetation clearing, possible mortality directly due to collisions with vehicles or indirectly as a result of sensory disturbance and avoidance of human activity at least 250 m from project activities; a reduction in forage availability or access; and changes to migration or movement

patterns. Less than 5% of caribou herd ranges in Labrador will be exposed to the effects of the Project. The Project is not predicted to affect the viability or recovery of woodland caribou populations in Central and Southeastern Labrador.

Table 8-3 Direct and Indirect Habitat Alteration/ Loss for Red Wine Mountains Herd as a Result of the L-ITL (Total Seasonal Habitat = 46, 970 km^2)

Area Considered	Total Seasonal Habitat (km^2)	Total Seasonal Habitat (%)	Calving/Post Calving Primary Habitat Overlapping with Assessment Area (km^2)	Winter Primary Habitat Overlapping with Assessment Area (km^2)
60 m ROW	4	0.01	0.18	0
60 m ROW + 500 m buffer	66	0.1	1.2	0
60 m ROW + 1000 m buffer	129	0.3	2.0	0
60 m ROW + 2000 m buffer	258	0.5	11.6	0

Table 8-4 Direct and Indirect Habitat Alteration/Loss for the Mealy Mountains Herd as a Result of the L-ITL (Total Seasonal Habitat = 44, 213 km^2)

Area Considered	**Total Seasonal Habitat (km^2)**	**Total Seasonal Habitat (%)**	**Calving/Post Calving Primary Habitat Overlapping with Assessment Area (km^2)**	**Winter Primary Habitat Overlapping with Assessment Area (km^2)**
60 m ROW	8	0.02	152.3	0.085
60 m ROW + 500 m buffer	143	0.3	238.9	0.1
60 m ROW + 1000 m buffer	277	0.6	267.5	0.3
60 m ROW + 2000 m buffer	544	1.2	365	104.2

Table 8-5 Overlap between RWMH Herd 90-Percent Calving/Post-Calving and Winter Kernels and ROW plus Buffers

Area Considered	**Overlap with 90% Kernel in Summer (km^2)**	**Overlap with 90% Kernel in Summer (%)**	**Overlap with 90% Kernel in Winter (km^2)**	**Overlap with 90% Kernel in Winter (%)**
60 m ROW and buffers (up to 2000m)	0	0	0	0

Table 8-6 Overlap between Mealy Mountains Herd 90-Percent Calving/Post-Calving and Winter Kernels and the ROW and ROW plus Buffers

Area Considered	**Overlap with 90% Kernel in Summer (km^2)**	**Overlap with 90% Kernel in Summer (%)**	**Overlap with 90% Kernel in Winter (km^2)**	**Overlap with 90% Kernel in Winter (%)**
60 m ROW	1.6	0.02	0	0
60 m ROW + 500 m buffer	27.6	0.33	0	0
60 m ROW + 1000 m buffer	51.5	0.62	0	0
60 m ROW + 2000 m buffer	99.3	1.19	0.6	0.01

As stated in the EIS, it is not likely that crowding of individuals into smaller areas would occur as a result of landscape disturbance above that occurring at baseline conditions, nor a subsequent increase in predation risk. Development of the ROW is not expected to substantially increase forage availability for moose, and therefore, moose density is not likely to increase due to the Project, suggesting that wolf density and predation pressure on caribou in Central and Southeastern Labrador will also not increase. Furthermore, development of the ROW is not likely to substantially increase forage availability for moose. As moose numbers along the corridor are not likely to increase measurably, it is predicted that there will be little or no increase in the local predator populations (e.g., wolves in Central and Southeastern Labrador, and coyotes) and subsequent predation on caribou.

To limit the potential for habitat fragmentation and increased access, Nalcor used standard, accepted routing considerations to follow existing disturbance corridors to the extent practical within Labrador (i.e., direct route from Muskrat Falls to coincide with the orientation of the TLH3) (see Figure 12.3.2-1 in the EIS). Nalcor's route presented and assessed in the EIS (see Figure 12.3.2-1 in the EIS) crosses a small portion of the south-east portion of the RWM Herd range on the south side of the Churchill River, avoids the Joir River subpopulation range, and follows the TLH3, on the south side, through much of where the right-of-way crosses the western extent of the Mealy Mountains Herd range. The majority of the northern third of the

Project transmission line right-of-way assessed in the EIS lies adjacent to an existing disturbance corridor, thereby minimizing the amount of habitat fragmentation caused by the Project.

Existing linear disturbance in the RWM herd range is limited (e.g., the TLH3 and the TLH1 from Goose Bay west to Labrador West). Since the submission of the EIS, Nalcor has changed the northern portion of the route to follow a forestry access road off the TLH3 that has been extended to access the Lower Churchill Hydroelectric Generation Project. The Project right-of-way then follows the TLH3 at the southeast edge of the RWM Herd's range. As such, it is not expected that the northern and southern components of the RWM Herd's range (see Figure 12.3.2-1 in the EIS) will become isolated (i.e., there is limited overlap of the Project and the RWM Herd's reported range). This is supported by the discussion that follows regarding Nalcor's evaluation of Project overlap with the most recent caribou winter and calving season habitat polygons provided by the Wildlife Division. Further, as shown in the 12.3.2-1 of the EIS, the Project crosses a small portion of the south-east quadrant of the RWM Herd's range, and is not expected to result in a split of the range as the Project follows existing access (i.e., access to Muskrat Falls and the TLH3) to the extent practical in this area.

The Wildlife Division provided information indicating an 'area of exchange' where caribou are known to travel between the Mealy Mountains Herds and the Joir River subpopulation (J. Fenske 2012, pers. comm.). The Project would occur in this area. For this and other environmental considerations, Nalcor designed its alignment to occur along the existing Trans-Labrador Highway right-of-way for much of the Labrador-Island Transmission route through the Central and Southeastern Labrador region. This was completed so that a single 'service corridor' would remain in this area, and coincidentally through most of this area of exchange thereby limiting the potential for habitat fragmentation and increased access. Nalcor acknowledges that although following existing access will help mitigate the effects of the Project, it will not eliminate them entirely. For example, research by Dyer et al. (2002) and Leblond et al. (2012) suggest that the frequency that caribou cross linear disturbances decreases as disturbance intensity increases. Dyer et al. (2002) found that although 5 to 9 m wide seismic lines did not affect caribou movement, caribou crossed roads up to six times less frequently than undisturbed areas. It is reasonable to assume that the effects of the ROW on caribou movement will be greater than those of a seismic line due to the greater width, and particularly during construction due to sensory disturbance. However, although caribou may cross the ROW less frequently than undisturbed areas, the ROW will not present a meaningful impediment to caribou movement. The effects on caribou movement of the Project ROW adjacent to a

highway may be greater than the effects of the highway alone, but the additional effects are predicted to be relatively small.

As per the EIS Addendum, WD-3, indirect habitat loss was predicted due to sensory disturbance within the recognized 500 m wide buffer (Dyer et al. 2001; Environment Canada 2012). Analyses of additional buffer widths (i.e., 1,000 m and 2,000 m buffers) also represent potentially affected areas that are small relative to the size of the ranges (i.e., <0.5 % for the RWM Herd, <1.2 % for the Mealy Mountains Herd, and no overlap with the Joir River 'subpopulation'); and <1.2% of the 90% occupancy probability kernel during calving / post-calving and <0.01% during winter for the Mealy Mountains Herd. Due to the right-of-way realignment, habitat within the 90% occupancy kernel for the RWM herd will not be directly or indirectly affected by the Project.

8.3 Cumulative Effects

Cumulative environmental effects were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. The following section describes the interaction of Project components and potential effects on species at risk such as the RWMH and MMH (as stated in Nalcor 2012a, 2012b). 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 Energy 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 RWMH and MMH) and are therefore further examined in detail below due to their potential greater vulnerability to disturbance.

The effects analysis of species at risk was assessed on the basis of expected changes in habitat availability (L-ITL EIS Volume IIA, Section 10.3.4), and other aspects of the Project activities that could lead to changes in distribution, health or mortality. Although a population viability analysis has not been conducted for the RWMH, its abrupt decline over the past two decades and recent survey results that indicate the Herd might presently contain fewer than 100

individuals. The future projects and activities considered for the cumulative effects assessment included those with likely overlapping environmental effects within the RSA.

Lower Churchill Hydroelectric Generation Project

Habitat loss and sensory disturbance from all project activities are predicted to result in a relatively small change in habitat availability and displacement of animals from the RWMH seasonal home ranges. Compared to baseline conditions, construction may result in disturbance increases during calving and post-calving (up to a 5% increase) and winter (less than a 9% increase) seasons. The total amount of disturbance (baseline + project zone of influence) within the ranges will be relatively small, totaling approximately 12% of the calving range, 9% of the post-calving range and 15% of the winter range.

TLH3 (Happy Valley-Goose Bay to Cartwright Junction)

Both the Project and the TLH involve vegetation removal and disturbance to caribou from noise, dust, and general construction activities. The highway has been operational since 2009, so construction impacts are no longer an issue; however, there is potential for spatial overlap with the Project in terms of disturbance effects to caribou and increased access for hunters.

Caribou can be affected by future development and upgrades to the TLH in a number of ways. Note that the nearby TLH1 (Happy Valley-Goose Bay to Churchill Falls) crosses the winter and summer ranges of the RWMH. Additional habitat losses due to highway upgrading and hard surfacing are expected to be minimal. However, use of the TLH3 may affect the eastern portion of the RWMH range, with the route passing near known wintering and calving / post-calving areas. TLH3 also bisects the MMH range. This could result in both direct and indirect habitat loss (e.g., habitat fragmentation) for both herds. Increased traffic 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 (Cameron et al. 1992; Curatolo and Murphy 1986). 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. Furthermore, if sedentary caribou in Labrador exist as part of a metapopulation or a group of localized populations (Boulet et al. 2007, 2005) disturbances that disrupt movements and reduce dispersal opportunities could increase the risk of local extinction. Further details can be found in Nalcor (2012b), specifically Information Requests WD-3 and WD-4.

5 Wing Goose Bay Military Flight Training

The area used for NATO special forces jet fighter training by 5 Wing Goose Bay was expanded to include most of the range of the RWMH in 1996 (Schmelzer et al. 2004). Because of its proximity to the base, the RWMH had been exposed to particularly high frequencies of aircraft overflights. Several studies and ongoing monitoring by DND have evaluated the effects on caribou of repeated exposure to low-level overflights. Harrington and Veitch (1992, 1991) reported that individuals exhibit overt behavioural responses and changes in movement patterns in response to low-level overflights. During the study, individuals from the RWMH were experimentally overflown by military jet aircraft and helicopters. The authors reported that direct overflights by jet aircraft as low as 30 m above ground level elicited overt responses 88% 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% 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 RWMH 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 RWMH, GRH (Schmelzer et al. 2004; DND 1994) and more recently, the Joir River Caribou. Although there is little overlap between the Project and the military flight area, there is potential for cumulative effects on Caribou in Labrador, hence the inclusion of discussion regarding military flight training.

Commercial Forestry Activity

In both Newfoundland and Labrador, forestry practices remove potential habitat for Caribou. From 2003 to 2007, the total allowable cut of softwoods in Labrador was 325,000 m3/year (NLDFRA 2003). Clearcutting has been shown to create habitat that Caribou avoid as it does not offer adequate forage or protection from predators. Furthermore, clearcutting can support increases in moose population which can, in turn, lead to an increased population density of wolves and a subsequent increase in predation of Caribou. One of the threats identified by the Recovery Team for the MMH was further forestry activity near Cartwright (Schmelzer et al. 2004). An area representing the core habitat for the RWMH overlaps a portion of commercial

forest, yet was set aside to reduce potential disturbance effects. Given the threatened status of sedentary herds in Labrador, efforts are underway to define critical habitat that may have implications on future forest harvesting.

General Economic and Infrastructure Development

Infrastructure projects, such as road maintenance / construction, municipal works, and industrial construction, often have localized, short-term construction periods, and are not thought to have residual effects on Caribou that will cause a decline such that a sustainable population cannot be maintained. Even a large construction project will most likely be limited in scope. The remote nature of the majority of the Project suggests that even if the Project effects do overlap with an infrastructure project, the cumulative effects will be temporary.

Other Land Uses

Snowmobile trails pass through the centre of the RWMH range, generally following the highway and transmission line corridor, and across the north-western and eastern portions of the MMH range. Labrador Winter Trails Inc. established a network of winter snowmobile trails consisting of old roads, the existing transmission line ROW, and other trails cut to a 6 m width.

Although disturbance from snowmobiling is a concern, access by snowmobile provides opportunity for illegal hunting. In 2003, poaching accounted for the loss of at least 14 animals from the RWMH and as recently as 2007, three poaching incidents resulted in the loss of 39 individuals from the Lac Joseph Herd and MMH in Labrador (Schmelzer 2010, pers. comm.). As many poaching incidents go undetected, it is difficult to determine the role that illegal hunting has had on the decline of the sedentary Caribou herds in Labrador. Given the status of the RWMH, losses of the magnitude that have been reported are not considered sustainable (Schmelzer et al. 2004). Effects on the MMH and RWMH are expected to persist through Operations and Maintenance of the Project. For the RWMH, 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, not only in FMD 19A (RWMH range), but also through the development of the commercial forest industry near Cartwright (MMH range) will likely result in 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 RWMH, it is likely that the overall amount and distribution of effective caribou habitat will change as forest resources in Labrador are exploited.

It appears that the factor preventing the MMH population from increasing is illegal hunting. One goal of the LWCRT recovery strategy is to improve the status of sedentary herds in Labrador. Any increase in wolf predation or illegal hunting combined with any future developments could prevent the herd from increasing, or if sufficiently detrimental, cause the population size to decline. The Project effects on the herd relative to the baseline condition were assessed to not cause a decline such that a sustainable population cannot be maintained within the Assessment Area. The cumulative effects of the Project in combination with other projects and activities on the MMH, are also predicted to not cause a decline such that a sustainable population cannot be maintained within the Assessment Area.

The RWMH (Central and Southeastern Labrador) is perhaps of greatest concern because the population size is currently estimated to be less than 100 individuals. It is recognized that, in light of the recent population trend and the small number of remaining RWMH Caribou, the herd is likely in peril even if future development in the region, including the Project, do not occur. The Project interaction with the RWMH is limited to the southeastern portion of the RWMH range and the effects of the Project are overall considered adverse, but are not at a scale that would result in a further decline of this herd. The Project effects on the herd relative to the baseline condition were assessed to not cause a decline such that a sustainable population cannot be maintained within the Assessment Area. The overall fate of the RWMH is likely one of continued decline, without the Project, as a result of pressures such as poaching and predation that are ongoing. 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.

If these existing (pre-Project) factors continue, the cumulative environmental effects may affect the herd's recovery and / or viability.

Table 8-7 Cumulative Environmental Effects Summary: Caribou

Cumulative Effects Analysis	Central and Southeastern Labrador
Current (Baseline) VEC Condition	**MMH** – The status of the MMH is stable. Although hunting is prohibited (protected by *NLESA*), hunting has been identified as the major threat to the MMH as illegal hunting of the herd, including the Joir River group, has occurred recently. Predation and hunting, are key limiting factors. **RWMH** – The herd's abrupt decline since the late 1980s and recent survey results indicate that the herd has less than 100 individuals, and the herd is protected by *NLESA*. Therefore, the RWMH is particularly vulnerable to disturbances that result in incremental mortality or affect productivity. Predation and hunting are key limiting factors.
Likely Residual Environmental Effects of Labrador-Island Transmission Link	**MMH and RWMH** Residual environmental Project effects include habitat alteration or loss, increased access, alteration or disturbance of movement routes, and sensory disturbance.
Likely Cumulative Environmental Effects (within RSA) of Other Future Projects and Activities	**MMH and RWMH** Overlapping projects including the Lower Churchill Hydroelectric Generation Project, TLH3, commercial forestry activity (FMDs 19 and 21), general economic and infrastructure development in the Central Labrador and Labrador Straits region, and other land uses, particularly OHV use, will contribute to habitat loss or alteration and increased potential for mortality due to hunting and increased predation.
Cumulative Environmental Effects Summary	**MMH** The overall level of contribution of the Project to cumulative effects on caribou is limited due to the mitigation proposed, including use of an existing disturbance corridor (i.e., TLH3) and access control. Also, the transmission corridor is relatively remote thereby reducing activities such as OHV use. The cumulative effects of the Project and other foreseeable projects are not expected to affect the recovery and / or viability of the MMH. **RWMH** The Project interaction with the RWMH is limited to the south-eastern portion of the RWMH range. The effects of the Project are not expected to result in a further decline of this herd. In recognition of the present status of this herd, and that other activities and pressures such as poaching and predation may continue, the overall fate is likely one of continued decline with or without the Project. If these existing (pre-Project) factors continue, the cumulative environmental effects may affect the herd's recovery and / or viability.

8.4 Consideration of Avoidance and/or Reasonable Activity Measures

Alternatives were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. A number of Project alternatives have been presented by the LCP and by stakeholders during consultation activities in support of the Project. Potential effects on Caribou for each of these alternatives, in relation to the proposed (preferred) transmission corridor were assessed in the EIS (Nalcor 2012a), and EIS Addendum (Nalcor 2012b). The LCP considered re-routing of the ROW to parallel the TLH and the south side access road, has limited additional effects with respect to linear features and range fragmentation.

8.5 Mitigation and Monitoring

To ensure the protection of Woodland Caribou, the following general mitigation and monitoring measures (as per the L-ITL EIS (Nalcor 2012a) and the EPP) will include:

- Vegetation removal will be limited to reduce opportunities for direct and indirect mortality of caribou such as:
  - clearing activities will only occur within the ROW and other site specific areas (e.g., converter station, marshalling yards, camps).
- Vegetation clearing for the transmission ROW and other Project components will be conducted using the following measures:
  - all vegetation shall be cut within 150 mm of the surface of the ground;
  - all vegetation that exceeds 2 m height at maturity will be cut;
  - trees will be felled onto the ROW away from standing forest and away from any waterbody; any leaning or danger trees partially knocked down during clearing will be removed; and
  - merchantable timber will be cleared through various means (e.g., feller-buncher (mechanical), hand-falling), de-limbed, and neatly piled at a right angle to, but within the ROW, to a height not exceeding 3 m.
- Tree tops, limbs, brush and debris will be piled along the edge of the ROW or used for brush mats.
- A 6.5 m break will remain between slash piles at least every 200 m to facilitate drainage and wildlife passage.

- Biodegradable lubricants and hydraulic fluids will be used where practical, when working near waterbodies.
- Mobile storage tanks will comply with the transportation of Dangerous Goods regulation SOR/200834, as well as the Storage and Handling of Gasoline and Associated Products Regulations, 2003, under the Environmental Protection Act.
- Spill kits will be available at all work sites, and a spill response team will be formed and trained prior to Construction, and all spills will be reported to the designated Environmental Monitor, construction supervisor, or designated Project personnel.
- Any spill of reportable quantities of hazardous or regulated materials will be contained immediately and the application of absorbent pads (e.g., granular, pillow, sock) will be used to absorb and contain the spill; these spills will be reported to the appropriate federal or provincial authority to coordinate the provincial response.
- Existing access roads will be used and development of new access will be minimized, to the extent practical. LCP will provide access plans, as available, to the NLDEC-WD.
- Nalcor will comply with laws and regulations pertaining to fish and wildlife, forest fires, forest travel, smoking and littering.
- Engine idling will be minimized and environmental awareness training with key contract personnel will be conducted on this topic.
- Well maintained equipment with quality mufflers will be used, and equipment maintenance schedules will be followed.
- During windy conditions, specific Project activities that generate air-borne dust will be assessed on a case by case basis and corrective actions implemented as warranted and appropriate to reduce dust.
- Haul distances for construction material will be limited to the extent practical.
- Construction activities will be conducted in accordance with municipal by-laws regarding noise.
- High noise-producing construction equipment will be strategically placed as far away as practical from receptors.
- Blasting activities will be designed and undertaken in compliance with provincial and federal regulations.
- Blasting mats will be used in environmentally sensitive areas as defined in the EPP.
- The size of explosive charges will be limited during blasting activities. Three hours prior to any blasting, a visual reconnaissance of the area will be conducted to establish the

presence of any wildlife; blasting will be delayed where practical until wildlife have been allowed to leave the area of their own accord.

- Work activities will occur in a manner that does not deliberately harass wildlife.
- Only essential vehicular activity, including helicopter flights, will be permitted within the transmission corridor to minimize disturbance to wildlife.
- Project personnel will adhere to appropriate speed limits applicable to the size and class of the access roads to reduce the potential for vehicle-wildlife collisions.
- Signage will be installed to indicate crossing areas in known Caribou crossing areas.
- Active work areas and access roads will be off limits to unescorted non-Project personnel, including during hunting season.
- Project personnel will not be permitted to possess firearms or have pets on-site and Nalcor will enforce a 'no-harvesting' policy during working hours. The exception to firearm possession will be bear monitors as described in the EPP.
- Where access roads and trails require the installation of permanent watercourse crossing structures (e.g., bridges, culverts), the protection of riparian shoreline(s) will include regular inspection and maintenance of those structures.
- Vegetation buffer zones, established at environmentally sensitive areas during construction, will be maintained. Only danger trees will be removed from these areas.
- Upon completion of Construction, all disturbed areas (e.g., exposed mineral soils) and construction staging areas not required for Operations and Maintenance or access will be regraded to re-establish drainage patterns, blend with the natural terrain and allowed to revegetate naturally. Temporary access will be assessed to determine if it will be needed; where access is to be decommissioned, the disturbed area will be returned to a comparable land use capability, depending on the condition of the road or trail.
- Access roads and trails built during construction will be decommissioned that are not required for operations and maintenance activities.
- Disturbances related to inspection, maintenance and vegetation management will, for the most part, be contained within the existing ROW, already cleared during construction.
- Access control measures (e.g., signage, gates) to address OHV use of access roads and trails required for Project operations and maintenance will be examined and discussed with NLDEC-WD, and applied as applicable and will be described in the EPP.

- Nalcor will use non-residual herbicides and mechanical methods for vegetation removal, where practical. The requirements of the applicable regulations will be met or exceeded. All herbicide applications will be conducted by qualified, trained personnel in a careful manner, following the manufacturers' instructions and as per the Pesticides Control Regulations 1996 (plus amendments) under the Environmental Protection Act SNL 2002.
- Ground travel for maintenance of the transmission line will be restricted to existing approved travel routes, which will be used and maintained in accordance with the applicable regulations.
- Transmission line maintenance and repair personnel will adhere to appropriate speed limits applicable to the size and class of the access roads to reduce the potential for vehicle-wildlife collisions.
- Nalcor will implement a policy of no wildlife harvesting during working hours, no feeding, and no possession of firearms or pets by transmission line maintenance and repair personnel.
- Effective scheduling and logistics for maintenance work will be completed to minimize the number of vehicle trips per maintenance task, and any inspections, maintenance and / or repairs will be completed as quickly and efficiently as safety allows.
- 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;
- Buffer zones shall be implemented to protect wildlife at the site, (see relevant section of the EPP, Buffer Zones);
- All wildlife sightings and nuisance wildlife shall be reported to the 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 ROW to wildlife and adhere to construction site speed limits. Nalcor will create breaks in snow berms alongside roads to enable caribou crossings;
- 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;

- Nalcor will continue its participation on the Labrador Woodland Caribou Recovery Team (LWCRT) as an observer regarding the RWMH 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:

8.6 Environmental Effects Monitoring

This L-ITL SAR IMMP 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 RWMH and MMH 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., data collected prior to construction);
- Data collection during construction; and
- 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, LCP would seek to find other alternative methods to monitor and mitigate in consultation with the NLDEC-WD as per its adaptive management approach.

8.7 Compliance Monitoring to Address Interactions

Known occupation of areas by season for the RWMH and the MMH have 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:

- Through a cooperation agreement with the NLDEC-WD, the LCP will access data from satellite collars in the lower Churchill River watershed. In collaboration with the NLDEC-WD, the LCP will purchase, deploy and monitor up to 10 satellite collars for the RWM Herd (as previously committed under the Generation and LTA IMMP) and up to 5 satellite collars for the MMH; (Note, if collaring activity cannot occur for some unforeseen reason then LCP in consultation with NLDEC-WD will explore other monitoring activities.)
- 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;
- An aerial survey will be conducted each winter during the construction period to provide a general understanding of the location of the RWMH and the MMH 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 dc transmission line follows existing linear features such as the South Side Access Road.)

Throughout the construction of the Project, LCP will maintain communications with the NLDEC-WD regarding the movements of RWMH and/or MMH sightings in the Project area. 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.

Annual timing of migration and calving in the vicinity of the Study Area shall be considered at all times. Important habitats and periods of occupation (e.g., lichen rich winter ranges or repeatedly used calving areas) will be identified on site plans or plan profiles for roads and transmission lines for the Contract-Specific Environmental Protection Plan (C-SEPP).

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

- **Scenario 1** – Caribou **within 20 km** of Project activities (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

- **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
  - 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

Effects Monitoring

The primary objective of the EEM program will be to monitor the effects of the Project on the RWMH and the MMH in relation to the effects predictions made in the EIS. Specifically, the monitoring program will:

1) Monitor distribution and movement patterns of caribou in relation to construction activities by:

a) Determining whether there is a 25% change in caribou distribution in response to a disturbance if it occurs (i.e., a 25% decrease in probability of selecting the disturbance area)

Nalcor has been participating as an observer of the Labrador Woodland Caribou Recovery Team, which was established to help protect the sedentary Caribou herds in Labrador, and will continue to support research (such as telemetry work) that will lead to further understanding of the threatened herds.

Because many developments are likely to occur concurrently within the Caribou range, careful coordination and planning of all resource development and management activities at a regional level is necessary. Such a planning initiative would require participation and commitment by all stakeholders with leadership from the provincial government. For example, in Labrador, the Forest Ecosystem Strategy Plan for FMD 19, prepared by the province and Innu Nation, establishes a precedent for sustainable resource development in the District and may serve as a model for developing an integrated, cumulative environmental effects management framework for the region. The LCP will work closely with all stakeholders and will be able to assist in such aspects as monitoring and controlling access.

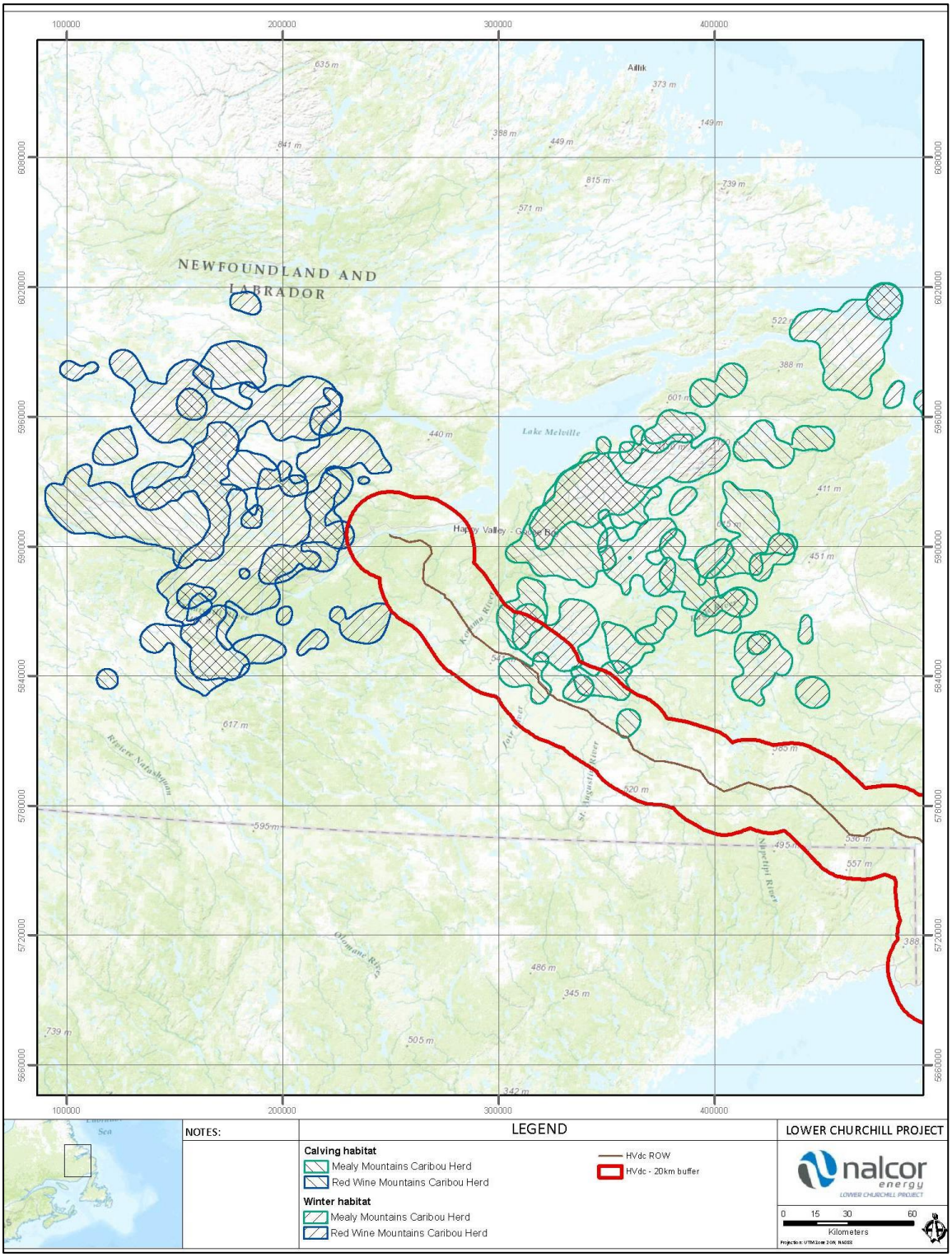

Figure 8-1 20 km radius around project activities in areas of overlap with the Red Wine Mountains Herd and the Mealy Mountains Herd

9 NEWFOUNDLAND MARTEN

9.1 Existing Information

Marten (*Martes Americana atrata*), on the island of Newfoundland are a genetically and geographically distinct population of the American marten, and are restricted to three core habitats in Newfoundland, where it is listed as Threatened under the NLESA. Five subpopulations are distributed among three core areas (Near Main River, Terra Nova and west-central Newfoundland). These populations overlap or are adjacent to the Study Area (Figure 9-1).

Core areas are estimates based on visual stratification of locations of adult animals, and includes data from live trapping, accidental captures, radio telemetry, bait stations and sightings, covering an area of 11,238 km^2 (Schmelzer 2008).

The population of Newfoundland Marten on the Northern Peninsula is concentrated along the Main River, adjacent to Gros Morne National Park (Figure 9-1). This area (2,177 km^2) has suitable Marten habitat over 60% of the landscape and as a result has the ability to support more Marten than is currently documented there. This may be important for future recovery of Newfoundland Marten (Schmelzer 2008). The Marten population in this core area is estimated to be between 94 and 190 individuals (Schmelzer 2008). This area falls within the Main River Study Area, which is a wildlife reserve in which no snowshoe hare snaring is permitted and only trapping methods having low potential to capture Marten are permitted. The Project Study Area crosses the Main River core area including an area of important or proposed critical (NLDEC 2011e) Marten habitat near the northern portion of the core area (Figure 9-1). The Main River population has not been censused by the Wildlife Division in recent years, and expansion in adjacent areas suggest it has likely grown (NLDEC-WD 2014, pers. comm.)

The Little Grand Lake / Red Indian Lake Marten population encompasses a large area in west-central Newfoundland (6,232 km^2) (Figure 9-1). Also included in this core area is a smaller core area just south of Sandy Lake with four adult Marten locations documented between 1990 and 2007. To the south of the Little Grand Lake / Red Indian Lake core area is another small core area near Crabbes River. This core area contains an estimated 14 to 16 Marten (Schmelzer 2008). The Marten population in the Little Grand Lake / Red Indian Lake core area is estimated to be between 237 and 481 individuals (Schmelzer 2008). The Little Grand Lake / Red Indian Lake Marten core area (specifically, the smaller core area south of Sandy Lake) is located just south of the Project Study Area and does not overlap with the core area.

The Terra Nova Marten core area (2,829 km^2) encompasses Terra Nova National Park which is approximately 10 km north of the Study Area (Figure 10.3.6-5). The Marten population in this core area is estimated to be 47 to 102 individuals (Schmelzer 2008). No trapping is permitted in the park and only trapping techniques having low potential to capture Marten are permitted in the adjacent Terra Nova Marten Study Area and Charlottetown Enclave Modified Snaring and Trapping Area. These two areas are wildlife reserves that have been established outside of Terra Nova National Park to provide protection to Marten from incidental trapping. The Study Area passes through the Terra Nova Marten Study Area just to the west of the National Park. The transmission corridor primarily crosses through a gap between the two areas of important Marten habitat (Figure 9-1). More information on modeling can be found in the Furbearer and Small Mammal Component Study (Stantec 2010b).

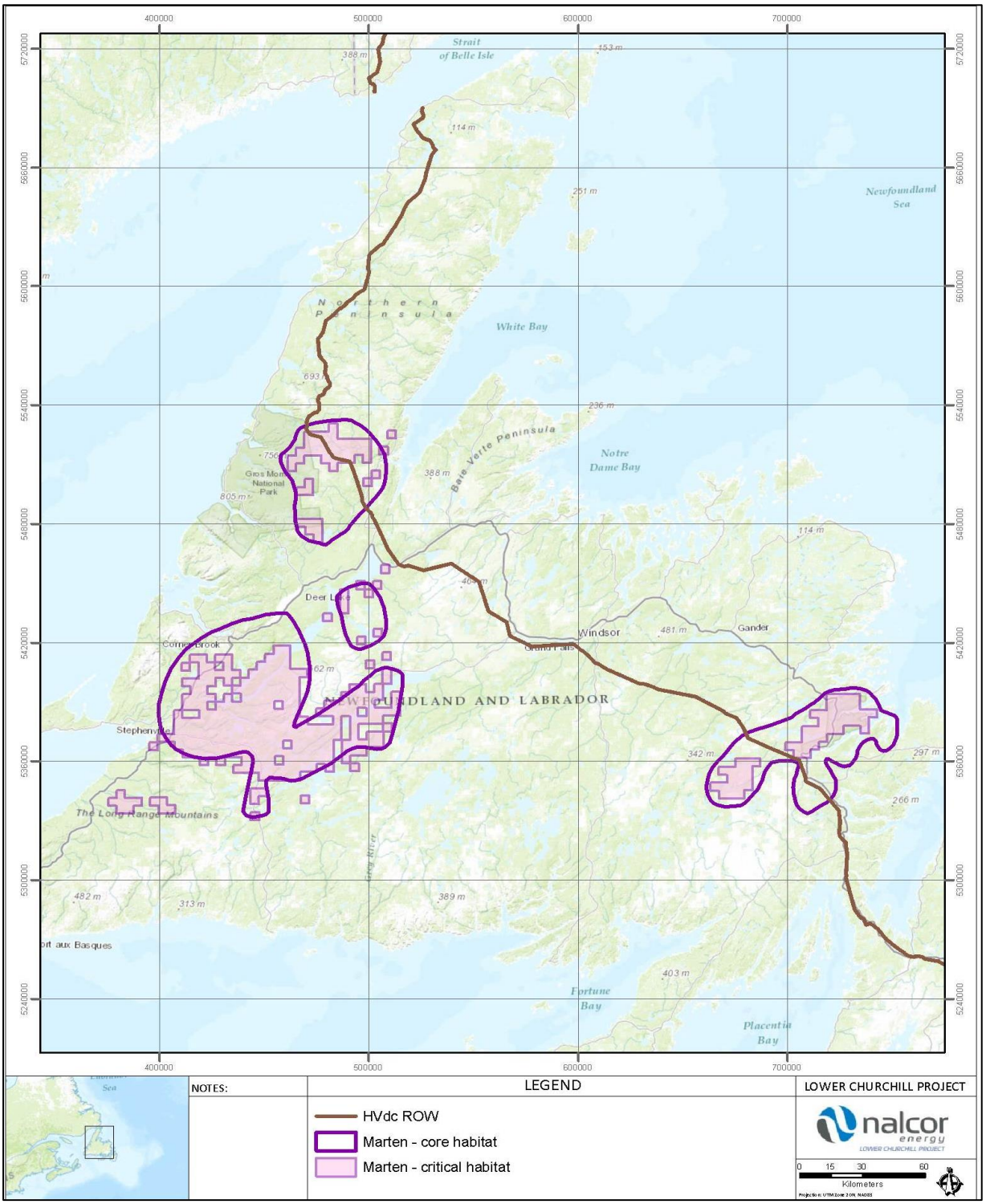

Figure 9-1 Core and critical areas of Newfoundland Marten

9.2 Habitat Use / Preference

Table 9-1 summarizes primary, secondary and tertiary potential habitat quality ratings for Newfoundland Marten within the Study Area. In Newfoundland, primary habitat occupies 1,200 km^2 (13%) of the Study Area in the Northern Peninsula and Central and Eastern Newfoundland regions.

Secondary habitat is represented by the Black Spruce and Lichen Forest, Open Conifer Forest, Conifer Scrub, Hardwood Forest and Mixedwood Forest habitat types. There is an estimated 2,579 km^2 (45%) of secondary habitat in the Central and Southeastern Labrador Study Area. The Newfoundland portion of the Study Area comprises 3,555 km^2 (40%) secondary habitat. The remaining habitat types in Table 9-1 were classified as tertiary, based on the provision of limited foraging, protection and resting opportunities.

Table 9-1 Summary of Potential Habitat Quality Ratings

Habitat Type	Habitat Quality	Comments
Alpine Vegetated	Tertiary	Lack of vertical and horizontal structure
Black Spruce and Lichen Forest	Secondary	Vertical structure is marginal
Burn	Tertiary	Will use these areas for forage if adjacent to mature, coniferous forest
Conifer Forest	Primary	Cover, and both vertical and horizontal structure are important (Gosse et al. 2005; Smith and Schaefer 2002; Bowman and Robitaile 1997)
Conifer Scrub	Secondary	Based on association with small mammals
Cutover	Tertiary	Lack of vertical and horizontal structure
Exposed Bedrock	Tertiary	Lack of vertical and horizontal structure
Kalmia Lichen / Heathland	Tertiary	May forage on berry species in years of small mammals crashes
Lichen Heathland	Tertiary	Lack of vertical and horizontal structure
Mixedwood Forest	Secondary	Where coniferous forest dominates mixedwood would rate as primary

Open Conifer Forest	Secondary	Cover and vertical / horizontal structure are important (Gosse et al. 2005; Smith and Schaefer 2002; Bowman and Robitaille 1997) Also based on association with vole species
Rocky Barrens	Tertiary	Lack of vertical and horizontal structure
Scrub / Heathland / Wetland	Tertiary	Lack of vertical and horizontal structure
Wetland	Tertiary	Lack of vertical and horizontal structure

Although important Marten habitat occurs at the southern end of the Northern Peninsula, in general this region offers relatively low amounts of primary Marten habitat, with small concentrations located in the Study Area near the northern and southern boundaries of the Northern Peninsula Forest and Long Range Barrens Ecoregions. The Northern Peninsula Forest Ecoregion comprises 50% of the Study Area in this region, 27% of which is primary Marten habitat. Primary habitat also occupies 21% of the Long Range Barrens Ecoregion (which comprises 44% of the Study Area in this region) and the Strait of Belle Isle Ecoregion (6% of the Study Area in the Northern Peninsula) provides 14% of primary habitat quality for Marten.

Secondary habitat represents 38%, 32% and 24% of the Study Area in the Strait of Belle Isle Barrens, Northern Peninsula Forest and Long Range Barrens Ecoregions, respectively. Tertiary habitat is relatively high throughout the Study Area in this region, ranging from 27% to 47% of Ecoregions on the Northern Peninsula.

The Study Area in the Central and Eastern Newfoundland region, in general, offers relatively little primary habitat for Marten (7%, 5% and 0% in the Maritime Barrens, Central Newfoundland Forest and Long Range Barrens Ecoregions, respectively). Moderate proportions of secondary habitat are found throughout the region (up to 47% in the Central Newfoundland Forest Ecoregion, which comprises 92% of the Study Area in this region). Tertiary habitat is widely distributed and comprises 80%, 55% and 41% of the Study Area in the Long Range Barrens, Maritime Barrens and Central Newfoundland Forest Ecoregions, respectively.

9.3 Cumulative Effects

Cumulative environmental effects were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. Cumulative effects are the overall effect on the VEC within the RSA as a result of the Project's likely residual environmental effects that overlap both temporally and geographically with those of other projects and activities. The environmental effects of past and existing projects and activities are captured in the baseline conditions for Furbearers (i.e., as presented in the existing environment chapter).

Furbearer habitats and populations within the Newfoundland segment of the RSA have been affected by anthropogenic effects to a greater extent, as evidenced by the presence of communities, cottage areas, highways, access roads, various aged cut blocks and recreational activity. However, much of the non-commercial forest landscape crossed by the Project is still in a relatively "natural" state, including large tracts of land, particularly on the Northern Peninsula. Stressors to Furbearers in Newfoundland that the Project has the potential to interact with include a diversity of infrastructure, such as that associated with transportation (e.g., the TCH, secondary and tertiary roads, forestry roads), commercial (e.g., existing transmission lines) and residential activities, as well as those related to forest management activities.

The primary environmental effect of Project Construction on Furbearers within the RSA will be through the alteration or loss of habitat required for the various Project components (e.g., access, transmission ROW). However, a number of other Project components or activities also have potential to affect Furbearers, including vegetation management, sensory disturbance, and subsequent increased OHV use and hunting or trapping pressure. Nalcor has committed to mitigation measures that will limit Project effects on Furbearers and their habitat. Overall, likely residual environmental effects to Furbearer KIs are predicted to be low in magnitude, are limited to the RSA and not to cause a decline such that a sustainable population cannot be maintained within the Assessment Area. It is predicted that the Project will not have a measurable effect on the regional distributions or populations of Furbearers.

Future activities that result in the clearing or disturbance of vegetation have the greatest potential to act cumulatively with the Project to affect Furbearers. These clearing activities will result in habitat alteration or loss and may create additional sources of sensory disturbance. Also, increased access for OHVs could be created, resulting in increased hunting and trapping pressure, particularly in previously inaccessible areas in close proximity to communities or existing access.

In the Northern Peninsula, projects and activities with residual effects that are likely to overlap with the effects of the Project include: general economic and infrastructure development; commercial forestry activity; Parson's Pond oil and gas exploration drilling; and, other land uses, particularly hunting, trapping and OHV use.

Projects and activities in Central and Eastern Newfoundland with residual effects that are likely to overlap with the effects of the Project include: general economic and infrastructure development; commercial forestry activity; and, other land uses, particularly hunting, trapping and OHV use.

On the Avalon Peninsula, projects and activities with residual effects that are likely to overlap with the effects of the Project include: general economic and infrastructure development; commercial forestry activity; and, other land uses, particularly hunting, trapping and OHV use.

The Project will result in clearing of vegetation for the various Project components, which is likely to act cumulatively with the clearing related to activities such as infrastructure development and forestry, resulting in habitat alteration or loss and fragmentation, where these activities overlap with the RSA. Nalcor has limited the potential for these effects by routing the transmission corridor in the vicinity of existing disturbance corridors within Newfoundland, to the extent feasible. Forestry activity in the province is conducted through District-based Sustainable Forest Management Plans, and includes Five Year Operating Plans that detail the specific mitigation and management measures to minimize the potential environmental effects of these activities. This, in conjunction with forestry exhibiting a general decline on the Island of Newfoundland due to the closure of several mills in recent years, will limit the potential for cumulative effects of forestry with the Project on Furbearers.

Project activities and infrastructure may interact with existing stressors in the RSA resulting in cumulative effects on Furbearers. For example, as a result of clearings and roads created by the Project and other developments, cumulative sensory disturbances and hunting / trapping effects may occur as a result of increased OHV access. To limit the contribution to cumulative environmental effects resulting from increased access, access control measures will be developed to monitor and manage public OHV and other uses of the Project ROW, roads and trails. This will include an education component, local community involvement with active participation and support from Nalcor, and ongoing evaluation during inspections.

The effects of the Project in combination with other projects and activities that have been or will be carried out are not expected to result in an effect on Furbearers KIs that would cause a decline in the numbers of animals such that a population cannot be maintained within the RSA or in any of the regions considered (i.e., populations will be sustainable). Therefore, significant

cumulative effects on the Furbearers VEC are not likely to occur. The planning, consultative and other effects management measures identified for this VEC will serve to avoid or reduce potential interactions and adverse effects on as a result of the Project. Avoiding or managing potential effects on Furbearers resulting from other ongoing and future projects and activities will require that appropriate resource management, planning, regulatory and enforcement measures are in place and implemented by the relevant agencies.

A description and determination of the likely cumulative environmental effects of the Project on Newfoundland marten in each geographic region is provided in Table 9-2.

Table 9-2 Newfoundland Marten - Cumulative Environmental Effects Summary

Cumulative Effects Analysis	Northern Peninsula	Central and Eastern Newfoundland
Current (Baseline) VEC Condition	• Marten are stable within their core areas, although past logging and trapping activities have resulted in current population of approximately 600-800 individuals on the Island	• Marten are stable within their core areas, although past logging and trapping activities have resulted in current population of approximately 600-800 individuals on the Island
Likely Cumulative Environmental Effects (within RSA) of Other Future Projects and Activities	• Future projects are likely to result in a limited increase in habitat alteration or loss and fragmentation. Access will likely increase, resulting in additional opportunities for hunting and trapping, OHV and vehicle traffic disturbance. The overlapping effects of the Project with existing and reasonably foreseeable future projects are likely to be localized (e.g., traffic on the highways within the RSA; habitat alteration or loss and increased access for forestry; and habitat alteration or loss and disturbance near populated areas and access.	• Future projects are likely to result in a limited increase in habitat alteration or loss and fragmentation. Access will likely increase, resulting in additional opportunities for hunting and trapping, OHV and vehicle traffic disturbance. The overlapping effects of the Project with existing and reasonably foreseeable future projects are likely to be localized (e.g., traffic on the highways within the RSA; habitat alteration or loss and increased access for forestry; and habitat alteration or loss and disturbance near populated areas

		and access.
Cumulative Environmental Effects Summary	• The contribution of the Projectto cumulative environmental effects will primarily be limited to the LSA or potentially the RSA (relative to OHV access along the transmission ROW or access trails) and will be low in magnitude, with a far future duration. The cumulative effects are not likely to affect the KI populations on a regional basis.	• The contribution of the Project to cumulative environmental effects will primarily be limited to the LSA or potentially the RSA (relative to OHV access along the transmission ROW or access trails) and will be low in magnitude, with a far future duration. The cumulative effects are not likely to affect the KI populations on a regional basis.

Source: Nalcor (2012a)

9.4 Consideration of Avoidance and/or Reasonable Activity Alternatives

Alternatives were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. A number of project alternatives have been considered during the planning of the Project. These alternatives represent different route options that have been considered in response to stakeholder, environmental or engineering considerations. All Construction and Operations and Maintenance activities discussed for the preferred option would be applied to these options, in the event that they

were selected. Likely effects on Marten for each of these alternatives, in relation to the preferred transmission corridor, are presented in Table 9-3.

Table 9-3 Project Alternative Means – Newfoundland Marten

Project Alternative Means	Newfoundland Marten
Northern Peninsula	
A4: Strait of Belle Isle, Newfoundland Side Alternative Segment	No difference; no known occurrence of Marten in this area.
A5: Great Northern Peninsula (GNP) North-east Alternative Segment	No difference; no known occurrence of Marten in this area.
A6: GNP West-Central Alternative Segment	No difference; no known occurrence of Marten in this area.
A7: GNP Eastern Long Range Mountain (LRM) Crossing Alternative Segment	No difference; no known occurrence of Marten in this area.
A7: GNP Eastern LRM Crossing Alternative Segment + A8: GNP International Appalachian Trail NL Alternative Segment	No difference; no known occurrence of Marten in this area.
Central and Eastern Newfoundland	
A9: Birchy Lake Alternative Segment	Implications for but still outside west-central (Little Grand Lake / Red Indian Lake) population; loss/alteration of habitat in the core area
A10: Newfoundland and Labrador Outfitters Association Alternative Segment	Increase in habitat alteration or loss in the core area of the west-central population
Avalon Peninsula	
A11: Avalon Peninsula Alternative Segment	No difference; no known occurrence of Marten in this area.

9.5 Mitigation and Monitoring

The following mitigations shall be implemented with respect to Newfoundland Marten in the Study Area:

- Critical Newfoundland Marten habitat shall be identified on site plans or plan profiles for roads and transmission lines for C-SEPP;
- All site personnel shall receive training to recognize the Newfoundland Marten and its habitat prior to the start of clearing and any other site activities;
- Work plans shall be submitted in advance and shall be reviewed for potential conflicts, including endangered species, critical habitat and other areas of concern (i.e., beaver dams and nesting sites);
- Where required (i.e., as per associated EEM Plans), prior to commencement of work, an on-site wildlife biologist shall be on-site to survey for areas of concern (critical breeding habitat, rare nest sites, etc.) and to provide input on work methods, lay out approved travel routes and work areas and associated buffer zones;
- In areas where concerns have been identified, OSEM shall ensure work crews are aware of concerns identified and work methods to be used;
- Waste management will be implemented to avoid attracting marten or other species;
- Hunting, trapping and feeding of marten is prohibited;
- Crews shall not travel outside of marked work areas and trails. If markers are not clear or are missing, the OSEM shall be consulted prior to commencing or continuing with the work;
- The OSEM shall monitor work activity in sensitive sites at all times and provide advice on access and travel requirements;
- In areas of identified critical habitat, clearing activities will take place outside the denning season, to avoid potential disturbance or destruction of marten dens and individuals (breeding season is early April – June 30); and
- Only essential vehicular activity shall be permitted.

9.6 Environmental Effects Monitoring

This L-ITL SAR IMMP 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.

NE has committed to conduct baseline, follow-up and monitoring surveys for the Newfoundland population of Marten 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., data collected prior to construction);
- Data collection during construction; and
- 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 its adaptive management approach.

9.7 Monitoring and Follow up Programs

Two follow-up studies are proposed for Newfoundland marten. The first program involves investigation of the effects of ROW construction and operation on marten habitat use. This program utilizes a before-after-control impact experimental design. The study will be conducted in the Main River core area. Baseline data regarding the movement of marten through the area will be collected. Marten movement patterns will be recorded during and after construction of the ROW to determine how these activities affect marten habitat use, particularly whether or not the cleared ROW acts as a barrier to marten movement. This program was developed in consultation with NLDEC-WD.

The second study would involve assessing the degree of public access afforded by the ROW and access roads in the first winter following the completion of construction. This program would be an aerial survey conducted during the winter months to document areas of the ROW that are being used by snowmobiles. The presence and abundance of snowmobiles and snowmobile tracks would serve as an indicator of the degree of increased trapping pressure and disturbance that may be associated with increased public access. The program will also document the portions of the ROW that are accessible by snowmobiles. The advantage of conducting the program during the winter is the ability to determine where snowmobiles are accessing the ROW by following tracks. The results of the program would be used to determine: (i) how

effective access control measures are; (ii) which areas of the ROW are being accessed; (iii) whether sensitive areas such as marten core areas are being accessed via the ROW; and (iv) where the access points are for snowmobiles. This information would then be used in an adaptive management framework to adjust access control measures and help minimize the potentially adverse effects of the Project on Newfoundland marten.

The specifics on these two programs are described below by year.

Year 1 – Winter 2014

As the Main River area is remotely located in the Long Range Mountains, a helicopter will be used to deploy hair snag traps and complete a transmission line ROW survey transect to determine existing snowmobile activity.

Hair snags will be used to determine the distribution of Newfoundland marten within the study area. The hair snags will allow for the identification of individual and their distribution within the critical habitat of the Main River core area as baseline data. There are 17 critical habitat blocks (Wildlife Division study blocks for insular Newfoundland) (Figure 9-2) adjacent to the ROW within marten critical habitat that will be sampled. The hair snag deployment and sampling will follow the Newfoundland Marten Hair Snag Construction and Deployment Guidelines (Herdman 2014). A field team of two will conduct this hair snag program starting in late winter 2014. Each hair snag will be revisited 3 times, with each visit separated by at least 7-10 days. The hair snag samples will be sent to the Memorial University CREAIT lab for genetic analysis for individual identification.

Snowmobile activity will be quantified by developing track densities along the proposed ROW in the core area. This approach was chosen based on the landscape and technology limitations of trail cameras and counters. Snowmobile track density along the ROW would provide an index of use. A transect will be placed along the ROW and be surveyed by two scientists during one flying day. The transect start and end points will be defined by where the ROW enters and exits the Main River core area at two points (see Figure 9-2). Winter 2014 survey data will serve as baseline/pre-construction data.

Year 2 – Winter 2015 and Year 3 – Winter 2016

After the ROW has been cleared, the Newfoundland marten distribution will be assessed in response to the Project effects. The 17 hair snags will be re-sampled, following the protocols defined above for Winter 2014.

Six transects will be surveyed during the survey period. The transects will be placed in forested habitats parallel to the ROW in critical Newfoundland marten habitat as well as perpendicular to the ROW where active hair snags have been identified. These transects will be used in assessing if the ROW is a barrier to Newfoundland marten distribution.

A transect providing an index of snowmobile activity along the ROW will be conducted by two scientists during one flight day to be repeated three times, once in earlier winter, and twice during the rebaiting of hair snags. The repeated aerial surveys will capture the variance of snowmobile use with changing backcountry conditions.

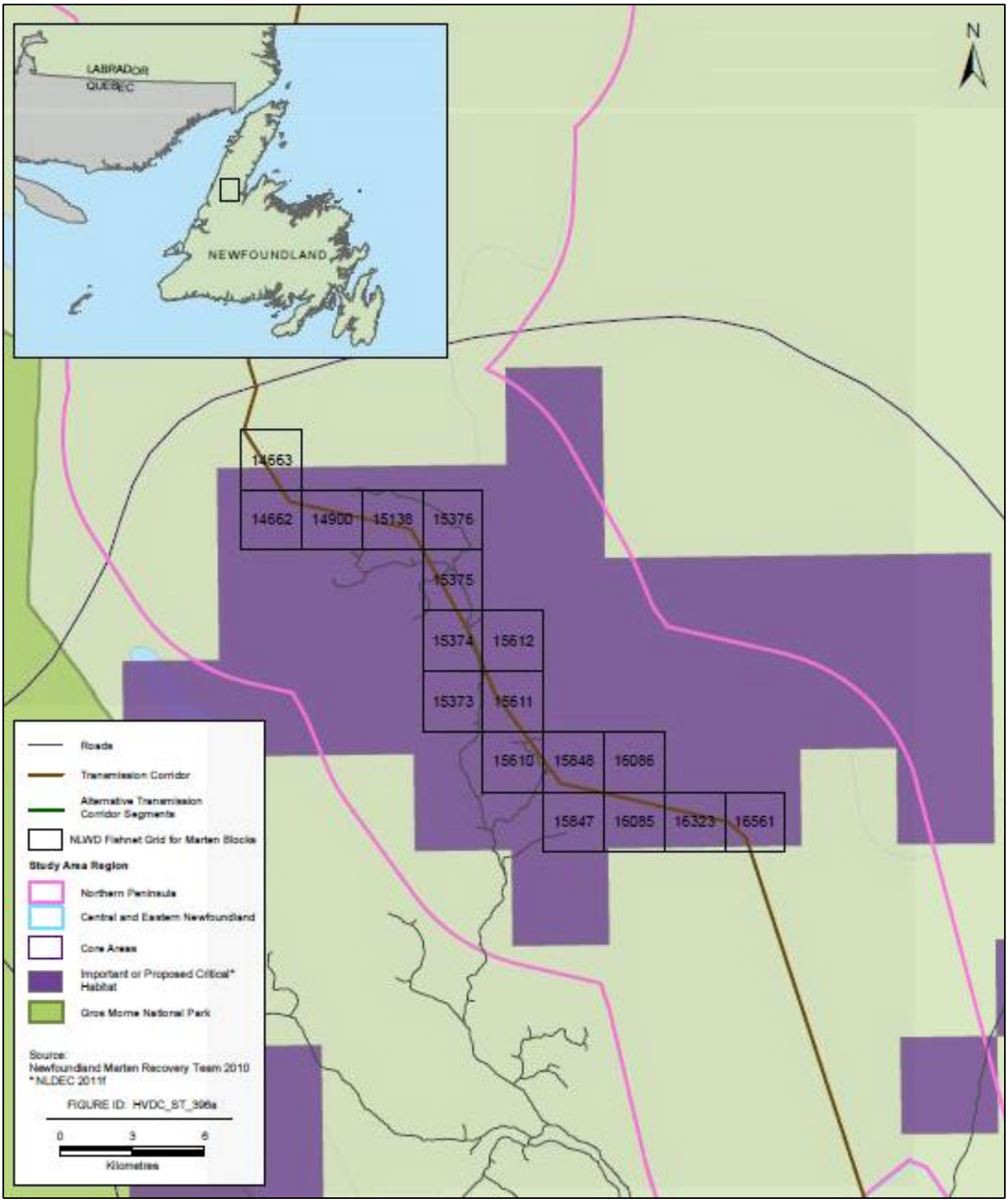

Figure 9-2 Habitat blocks to be surveyed for marten

9.7.1 Data Collection during Construction - Marten Sightings and Interactions

LCP will compile the results of the OSEM's reports that reference sightings, interactions and consequences that relate to Newfoundland Marten encounters during construction, and will include regulatory compliance tracking. These data will be presented in Excel, or similar format, with the following information:

- date;
- time;
- location (UTM or lats/longs);
- interaction type – brief description of the type of interaction: sighting, human/animal conflict, vehicle/animal conflict);
    - interactions that result in negative consequences to the animal will be reported to NLDEC-WD as soon as possible;
- Physical details – sex, age, behavior at the time of the interaction;
- interaction details - explanation of the nature of the interaction;
- issue resolution - explanation of the action(s) undertaken to resolve the interaction;
- interaction consequence – description of the outcome (animal was scared away; animal was killed); and
- additional actions undertaken – details of actions undertaken by LCP (e.g., no additional actions required; report sent to Wildlife Division) and notes on regulatory compliance.

This data will be compiled by LCP's EEM/EA Commitments Coordinators once each year (December) and the data evaluated to determine if the observed effects of the Project on Furbearers would require changes to the mitigation through LCP's adaptive management approach. Any proposed changes would be communicated with the Wildlife Division prior to implementation. In addition, Marten sightings, interactions and consequences will be reported in a timely manner to the OSEM and the information distributed to crews to increase their level of awareness and caution when these species are in the Project vicinity. Interactions with marten that may result in negative consequences will be reported to NLDEC-WD immediately.

9.7.2 Data Collection during Operations - Marten Sightings and Interactions

The data collected during operations of the Project will be the same as collected during the construction period, but will be collected by LCP's Inspection Crews, Maintenance Crews and other operations staff during the first five years of operation.

These data will be compiled once each year (December) and the data evaluated to determine if the observed effects of the Project on Furbearers would require changes to the mitigation through LCP's adaptive management approach. Any proposed changes would be communicated with the Wildlife Division prior to implementation. As during construction, Marten sightings, interactions and consequences will be reported in a timely manner to the OSEM and the information distributed to crews to increase their level of awareness and caution when furbearer species are in the Project vicinity.

10 LISTED PLANTS

The province has four plant species with *NLESA* designations that are known, or potentially present within the L-ITL Study Area (Table 10-1).

Figure 10-1 *NL ESA* Designated Plant Species

Species	***NL ESA* Designation**
Long's braya (*Braya longii*)	Endangered
Fernald's braya (*Braya fernaldii*)	Threatened
Boreal Felt Lichen (*Erioderma pedicellatum*)	Vulnerable
Graceful Felt Lichen (*Erioderma mollissimum*)	Endangered

In September, 2013, LCP submitted a Listed Plants IMMP to meet requirements for the issuance of a Section 19 permit. That IMMP focused on the activities specifically associated with the horizontal directional drill pad and trenching activities at Shoal Cove. The listed plant section in this IMMP will therefore focus on the Boreal Felt Lichen and the Graceful Felt Lichen.

10.1 Boreal Felt Lichen

Exiting Information

The Boreal Felt Lichen is conspicuous, foliose arboreal lichen which is restricted to regions having a cool, humid oceanic climate. It is an epiphytic cyanolichen that is easily identified by its slate-grey color, the minute hairs on the upper surface of the thallus, the absence of a lower

cortex and distinctive fruiting bodies (apothecia). It has been historically documented in Atlantic Canada, Sweden, and Norway. There are two disjunct populations in Canada: the Boreal population (the island of Newfoundland) and the Atlantic population (Nova Scotia and at one time, New Brunswick). The Atlantic population is in imminent danger of disappearing, having undergone a 90 percent reduction over the past 20 years (NLDEC-WD 2006). As few as 70 to 100 individual thalli remain in these provinces.

In Newfoundland, the species is still known from a number of sites, although many populations have disappeared since the first reports of this species in the 1970s (Ahti & Jørgensen 1971, Maass 1980, Maass & Yetman 2002, Keeping & Hanel 2006). Boreal Felt Lichen is currently listed as vulnerable under the Newfoundland and Labrador Endangered Species Act. Approximately 8000 thalli have been discovered on insular Newfoundland over the past two decades, but monitored populations are declining rapidly (R. I. Goudie & E. Conway unpubl. data).

Goudie et al. (2011) state the populations of Boreal Felt Lichen in Newfoundland is predicted to be unsustainable because of adult mortality, attributed to a decline in forest of balsam fir which predominantly support the lichen.

Habitat

Habitats of the boreal felt lichen may be referred to as the Suboceanic Lichen Forests of Atlantic Canada both because of the moist, Sphagnum-rich sites and because of the presence of a distinct cyanolichen community including *E. pedicellatum*. According to COSEWIC (2003), these suboceanic sites where *Erioderma* is found are generally on north or east-facing slopes that have a constant supply of moisture. The species also occurs on different slopes and flat areas but the high moisture is believed to be the key habitat factor (C. Hanel, pers. comm.). Within these sites, the species is found mostly on balsam fir (*Abies balsamea*) and to a lesser extent on black spruce (*Picea mariana*) with rare occurrences on white spruce (*Picea glauca*), red maple (*Acer rubrum*) and white birch (cf. Betula *cordifolia*). On the coniferous trees mentioned, it can be found on both branches and trunks depending on the relationship between the level of moisture and light (COSEWIC 2003).

There are over 5000 known thalli in Newfoundland. Informal monitoring indicates that there is a substantial decrease in thalli numbers over part of the Avalon Peninsula, suggesting that if not balanced by sufficient regeneration the Boreal population of the species may be under localized stress. Lack of sufficient knowledge on the life cycle, habitat requirements and potential threats

to the species has provided challenges in the development of an effective management strategy (NLDEC-WD 2006).

Mitigation Measures

Mitigation measures for the Boreal Felt Lichen include:

- Avoiding all known occurrences of Boreal Felt Lichen during the routing for the transmission line;
- As part of the Regionally Uncommon Plant Surveys to be conducted in areas of high potential, surveys for boreal felt lichen will be conducted in the areas of known occurrences of the lichen as recommended by NLDEC-WD. Following completion of the Regionally Uncommon Plant Surveys, identification of the lichen will become a part of the Regionally Uncommon Plant awareness training for the OSEMs; and
- If an occurrence of a Boreal Felt Lichen is recorded in the Project area, LCP will consult NLDEC-WD to discuss an appropriate mitigation measures. Mitigation could include relocating the occurrence(s) to another suitable tree in close proximity (i.e., within 1 km of the occurrence).

10.2 Graceful Felt Lichen

Existing Information

Graceful Felt Lichen (*Erioderma mollissimum*) is similar to the Boreal Felt Lichen. The Graceful Felt Lichen is part of a small group of rare foliose epiphytic cyanobacterial macrolichens found only in the humid coastal forests of eastern North America. It is a foliose (leafy), grayish (dry) to brownish-green (wet) macrolichen. It forms roundish patches that are very seldom more than 10 cm in diameter, and generally less than half this size. The lobes are thick (up to 0.5 mm), rounded with upturned edges, and loosely attached to the substrate (typically balsam fir). There is a distinctive felt-like tomentum (fine hairy covering) on the upper lobe surface and bluish granular soredia (granular asexual reproductive structures) are produced along the lobe margins of older thalli and sometimes at breaks in the upper surface. The white-fibrous lower surface lacks a protective outer layer and with the exception of a narrow band at the margin edge has a dense tomentum of light brown rhizohyphae.

Habitat

In Newfoundland, the graceful felt lichen habitat is characterized by mature or uneven aged coniferous forests dominated by balsam fir (*Abies balsamea*). Distribution of this species in the Study Area occurs within the Avalon Forest Ecoregion, notably in an area known as Hall's Gullies, and therefore potentially within the Study Area. Current threats and / or limiting factors for the graceful felt lichen include anthropogenic threats such as forestry operations and wood harvesting, industrial development, air pollution, pesticides, and climate change. Natural stressors may include moose herbivory, invertebrate (mites and slugs) herbivory, blow down, insect outbreaks, fire and stand senescence.

Mitigation Measures

Mitigation measures for the Graceful Felt Lichen include:

- Avoiding all known occurrences of Graceful Felt Lichen during the routing for the transmission line;
- As part of the Regionally Uncommon Plant Surveys to be conducted in areas of high potential, surveys for graceful felt lichen will be conducted in the areas of known occurrences of the lichen as recommended by NLDEC-WD;
- Following completion of the Regionally Uncommon Plant Surveys, identification of the lichen will become a part of the Regionally Uncommon Plant awareness training for the OSEMs; and
- If an occurrence of a Graceful Felt Lichen is recorded in the Project area, LCP will consult NLDEC-WD to discuss an appropriate mitigation measures. Mitigation could include relocating the occurrence(s) to another suitable tree in close proximity (i.e., within 1 km of the occurrence).

10.3 Cumulative Effects on Listed Plants

Cumulative environmental effects were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. Cumulative effects are the overall effect on the VEC as a result of the Project's residual environmental effects that overlap both temporally and geographically with those of other projects and activities. The environmental effects of past and existing projects and activities are captured in the baseline conditions (i.e., existing environment). Vegetation affected by Project components in Labrador exists generally in a natural pattern (i.e., has not been subject to

anthropogenic disturbances), except for the portion along the TLH3. Throughout much of Newfoundland, the transmission corridor crosses or follows areas of previous disturbance, including forest harvesting, highways (e.g., provincial highway 430, the TCH, provincial highway 360, various regional routes), and existing transmission line ROWs (e.g., Nalcor's transmission line infrastructure on the Avalon Peninsula).

The likelihood of cumulative effects as a result of ongoing and future projects is the focus of this cumulative effects assessment. The following future projects and activities with likely overlapping environmental effects within the RSA were considered for the cumulative effects assessment (as stated in Nalcor (2012a):

- Lower Churchill Hydroelectric Generation Project – flooding for the reservoir will result in loss of vegetated habitat in the area of the lower Churchill River valley. Loss of vegetation within the reservoir will be permanent and could act in a cumulative manner with the Vegetation KIs in Central and Southeastern Labrador, particularly with respect to Riparian Shoreline habitat. It also requires construction of access roads which will increase public OHV access.
- TLH3 – construction of the TLH3 resulted in many of the same effects on Vegetation that will result from the proposed Project. Routing of the transmission line ROW to follow the TLH3 for at least part of its length within Central and Southeastern Labrador will minimize the overall cumulative effects of these two projects on vegetation abundance and diversity. The highway has been operational since 2009, so the potential for future cumulative effects are largely related to increased public and OHV access to sensitive habitats and timber resources, and potential for introduction and spread of non-native and invasive species. The former effect would likely be greatest in proximity to communities, while the latter could extend along the length of both corridors. There is already some evidence that the presence of the TLH3 has contributed to expansion of domestic cutting (Russo Garrido and Stanley 2002). The effect of the TLH3 on sensitive habitats such as wetlands and riparian habitat has not been documented.
- 5 Wing Goose Bay Military Flight Training – flight activity will occur to the north and west of the project and no cumulative effects are anticipated on vegetation.
- Commercial Forestry Activity – the LSA crosses FMDs in both Central and Southeastern Labrador and in Newfoundland. There are several effects from the forestry industry that could act cumulatively with the Project. This includes alteration or loss of vegetation, fragmentation of vegetation communities, displacement of natural vegetation due to the introduction and spread of non-native and invasive species, alteration or loss of

sensitive habitat such as Wetlands, Riparian Shoreline areas and Listed and Regionally Uncommon Plants species and increased access for the public and OHVs.

The effects of the Project in combination with other projects and activities that have been or will be carried out are not expected to threaten the sustainability of the Vegetation KIs' contribution to ecosystem function within the RSA. The planning, consultative and effect management measures identified for this VEC will serve to avoid or reduce potential interactions and adverse effects as a result of the Project. Avoiding or managing potential effects on Vegetation resulting from other ongoing and future projects and activities will require that appropriate resource management, planning, regulatory and enforcement measures are in place and implemented by the relevant agencies.

10.4 Consideration of Avoidance and/or reasonable activity alternatives

Alternatives were assessed during the environmental assessment for the Project and the information provided here is a summary for context only. A summary of the likely effects to Vegetation by comparing the effects of the Project on the alternative segments and the proposed transmission corridor is provided in Table 10-2. The comparison is based on the predicted Project effects on each KI, in terms of area or length. Alternative segments A4 and A7 + A8 are the only options where further evaluation is warranted from a Vegetation perspective. Alternatives A2, A5, A6, and A7 present no measurable difference in the overall area of affected habitat or disturbance to individual species over that of the preferred corridor. The remaining alternatives, including alternative segments A3, A9, A10 and A11 will likely have greater effects on Vegetation. With respect to the alternative segments in Central and Southeastern Labrador, A2 presented no measurable difference in the area of affected habitat or disturbance to individual species.

In Newfoundland, the majority of alternatives present no measurable difference in the area of habitat affected and no disturbance to individual plant species of concern is likely. However, alternatives A9 and A10 in Central and Eastern Newfoundland will affect considerably more habitat associated with the KIs of Vegetation Abundance and Diversity, Wetland and Riparian Shoreline. Similar to the environmental concerns associated with A3, alternative segment A11, has potential to intersect marginally more habitat for federally and provincially listed species – boreal felt lichen, and will likely have greater effects on Vegetation.

Figure 10-2 Summary Evaluation of Project Alternative Means: Listed Plants

Project Alternative Means[a]	**Environmental Implications on Listed Plants (compared to the proposed transmission corridor)**[b] **(positive** [c]**, neutral** [d]**, negative** [e] **)**
A2: North-west of Strait of Belle Isle Alternative Segment	Neutral
A3: Point Amour Alternative Segment	Negative
A4: Strait of Belle Isle Newfoundland Side Alternative Segment	Positive
A5: Great Northern Peninsula (GNP) North-east Alternative Segment	Neutral
A6: GNP West-central Alternative Segment	Neutral
A7: GNP Eastern Long Range Mountain (LRM) Crossing Alternative Segment	Neutral
A7: GNP Easter LRM Crossing Alternative Segment +A8: GNP International Appalachian Trail Newfoundland and Labrador Alternative Segment	Neutral
A9: Birchy Lake Alternative Segment	Neutral
A10: Newfoundland and Labrador Outfitters Association Alternative Segment	Neutral
A11: Avalon Alternative Segment	Negative

(a) As identified and described in Chapter 2, Project Rationale and Planning,

(b) The proposed Project described in the EIS Project Description Chapter 3, and assessed in the preceding Environmental Effects Analysis.

(c) Positive = Alternative segment 5 will have a lesser effect on the VEC.

(d) Neutral = Alternative segment and proposed segment will result in approximately equal Project effects to the VEC.

(e) Negative = Alternative segment will have a greater effect on the VEC.

Environmental Effects Monitoring

This L-ITL SAR IMMP 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.

Nalcor has committed to conduct baseline, follow-up and monitoring surveys for Listed Species. This would apply to the following, as appropriate:

- Baseline data collection (i.e., data collected prior to construction);
- Data collection during construction; and
- 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 insure that the mitigation is appropriate. Where it is determined that the mitigation is not appropriate, a contingency plan would be presented that Nalcor could incorporate as per an adaptive management approach.

10.5 Monitoring and Follow Up Programs

A monitoring and follow up program for Long's braya and Fernald's braya was described in the Listed Plants IMMP previously submitted and approved.

10.6 Data Collection during Construction

LCP will compile the results of the OSEM's reports that reference observations of Graceful Felt Lichen and Boreal Felt Lichen and will submit this information to NLDEC-WD.

10.7 Data Collection during Operations

The data collected during operations of the Project will be the same as collected during the construction period, but will be collected by LCP's Inspection Crews, Maintenance Crews and other operations staff during the first five years of operation.

11 REPORTING

11.1 Avifauna

The Monitoring portion of the Follow-up and Monitoring Report will summarize the On-Site Environmental Monitors' observations and efforts related to the interactions of the Project components and activities with avifauna to show that the Project was implemented as proposed, and that mitigation measures to minimize the Project's adverse environmental effects on avifauna 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, the responses LCP provided to the information requests, and conditions of EA release.

11.2 Caribou

Each year an annual report will be submitted to NLDEC-WD that will include the following components:

- Analysis of woodland caribou distribution, movement and habitat selection in the range of the RWMH and MMH, based on telemetry collar data.
- Discussion of any mortality events involving collared caribou.
- Georeferenced information on all caribou sightings (from this program and other programs or sources) and monitoring of established buffers, as they related to ground and aerial-based surveys within 20 km of the Project area.

11.3 Marten

An annual report and a final report will be submitted to NLDEC-WD that will present the results of the study in each year (2014, and 2 years post construction) of the effects of ROW construction and operation on marten habitat use. Marten movement patterns will be presented to assess how Project activities affected marten habitat use, particularly whether or not the cleared ROW acts as a barrier to marten movement.

11.4 Listed Plants

The results of all surveys conducted in the Shoal Cove area and the areas surveyed for regionally uncommon plants will be submitted to NLDEC-WD.

In addition, in the growing season following construction, known locations of listed plant species identified within, or adjacent to the Project components will be revisited to evaluate the health and extent of the population. This will include evaluating the success of mitigation efforts undertaken. The report will also include consideration of any increase in OHV use in the vicinity of the plants.

As a part of the monitoring program, potential weed colonization will be monitored and weeds removed as required for at least three years along the north side of Route 430.

11.5 Contingency Plan

At this time, contingency plans are not anticipated for the listed species, and any changes to LCP's procedures or mitigation plans would be addressed through the adaptive management approach, if and as appropriate. Any changes proposed by the LCP would be based on the findings of the Follow-up and Monitoring Programs.

12 EXTERNAL REFERENCES

ACCDC (Atlantic Canada Conservation Data Centre). 2008. Rarity Ranks and Legal Status by Province. Data obtained for the Study Area in 2008. Available at: http://accdc.com/home_nl.html. Accessed: September 2008

ACCDC. 2010. Rarity Ranks and Legal Status by Province. Updated October 2010. Available at: http://www.accdc.com/Products/ranking.html. Accessed: October 2010.

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

Altman, B. and R. Sallabanks. 2000. Olive-sided Flycatcher (*Contopus cooperi*). In A. Poole (ed.). The Birds of North America Online, Ithaca: Cornell Lab of Ornithology. Retrieved from the Birds of North America Available at: http://bna.birds.cornell.edu/bna/species/502.

Bergerud, A.T. 1971. The Population Dynamics of Newfoundland Caribou. Wildlife Monographs No. 25, The Wildlife Society, Inc.

Bergerud, A.T. 1972. Food Habits of Newfoundland Caribou. Journal of Wildlife Management 36: 913 - 923.

Bergerud, A.T. 1985. Antipredator Strategies of Caribou: Dispersion along Shorelines. Canadian Journal of Zoology 63: 1324 - 1329.

Bergerud, A.T. and R.E. Page. 1987. Displacement and Dispersion of Parturient Caribou as Calving Tactics. Canadian Journal of Zoology 65: 1597 - 1606.

Bergerud, A.T., R. Ferguson and H.E. Butler. 5 1990. Spring Migration and Dispersion of Woodland Caribou at Calving. Animal Behaviour 39: 360 - 368.

Cadman, M.D. and A.M. Page. 1994. Status Report on the Short-eared Owl (*Asio flammeus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, Ontario

COSEWIC 2006a. COSEWIC assessment and status report on the Rusty Blackbird *Euphagus carolinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

COSEWIC 2007a. COSEWIC assessment and status report on the Common Nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 25 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

COSEWIC 2007b. COSEWIC assessment and status report on the Olive-sided Flycatcher *Contopus cooperi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 25 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

COSEWIC. 2008. COSEWIC assessment and update status report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.vi + 24 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Courtois, R., L. Bernatchez, J.-P. Ouellet and L. Breton. 2004. Significance of Caribou (*Rangifer tarandus*) Ecotypes from a Molecular Genetics Viewpoint. Conservation Genetics 4: 393 - 404.

Courtois, R., A. Gingras, D. Fortin, A. Sebbane, B. Rochette and L. Breton. 2008. Demographic and Behavioural Response of Woodland Caribou to Forest Harvesting. Canadian Journal of Forest Resources 38: 2837 -2849.

Cumming, J.L., P.A. Pipas, J.C. Luchsinger, J.E. Davis, M.J. Pipas and J.B. Bourassa. 2003. Managing Common Nighthawks at McConnel Air Force Base, Kansas, to reduce aircraft strikes. In K.A. Fagerstone, and C.W. Witmer (ed.). Proceedings of the 10th Wildlife damage management Conference.

CWS (Canadian Wildlife Service). Unpublished data. Data provided by the Canadian Wildlife Service collected during 1996 waterfowl surveys at Point Amour, Labrador.

Dalley, K. Powell, K. and D. Whitaker. 2005. The Status of Gray-cheeked Thrush (*Catharus minimus*) in Newfoundland and Labrador. Prepared for the Species Status Advisory Committee

Environment Canada. 2006. Recovery Strategy for the Red Crossbill, percna subspecies (*Loxia curvirostra percna*), in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 29 pp.

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

Environment Canada. 2009. Species at Risk Public Registry. Available at: http://www.sararegistry.gc.ca. Accessed: 2009.

Erickson, W.P., G.D. Johnson and D.P. Young Jr. 2005. A summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions. USDA Forest Service General Technical Report PSW-GTR-191:1029-1042.

Garland, S. and P. Thomas. 2009. Recovery Plan for Red Knot, Rufa Subspecies (*Calidris canutus rufa*), in Newfoundland and Labrador. Wildlife Division, Department of Environment and Conservation, Government of Newfoundland and Labrador, Corner Brook, NL. iv + 12 pp.

Gilliland, S.G., G.J. Robertson and G.S. Goodyear. 2008a. Distribution and Abundance of Harlequin Ducks Breeding in Northern Newfoundland. Waterbirds 31 (Special Publication 2): 104-109

GNL, DEC. 2011b. Newfoundland and Labrador Species at Risk – Common Nighthawk. Available at: http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/common_nighthawk.pdf. Accessed July 2011.

GNL, DEC. 2011c. Newfoundland and Labrador Species at Risk – Gray – cheeked Thrush. Available at: http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/gray_cheeked_thrush.pdf Accessed July 2011.

GNL, DEC. 2011e. Newfoundland and Labrador Species at Risk – Rusty Blackbird. Available at: http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/birds.html#p9. Accessed July 2011.

GNL, DEC. 2011f. Newfoundland and Labrador Species at Risk – Short-eared Owl. Available at: http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/birds.html#p9. Accessed July 2011.

Goudie, R.I. and S.G. Gilliland. 2008. Aspects of Distribution and Ecology of Harlequin Ducks on the Torrent River, Newfoundland. Waterbirds 31 (Special Publication 2): 92-103.

Goudie, R. I., Scheidegger, C., Hanel, C., Munier, A., and Conway, E. 2011. New population models help explain declines in the globally rare boreal felt lichen *Erioderma pedicellatum* in Newfoundland. Endangered Species Research 13: 181-189.

Government of Canada. 2002. Species at Risk Act, 2002. Available at:

http://laws-lois.justice.gc.ca/eng/acts/S-15.3/page-1.html. Accessed on: 12 April 2012.

Government of Newfoundland and Labrador. 2004. Endangered Species Act, 2004. Available at: http://www.assembly.nl.ca/Legislation/sr/statutes/e10-1.htm#31_. Accessed on: 1 April 2012.

Government of Newfoundland and Labrador. 2013 Species at Risk. Available at: http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/. Accessed on: 18 September 2013

Herdman, E. Newfoundland Marten Hair Snag Construction and Deployment Guidelines Labrador – Island Transmission Link. 7pp., 2014.

Hunt, W.A. 1998. The Ecology of Harlequin Ducks (*Histrionicus histrionicus*) Breeding in Jasper National Park, Canada. Master's Thesis, Simon Fraser University, Burnaby, BC.

Iron, J. and R. Pittaway. 2000. Urban crows and nighthawks. Ontario Field Ornithologists News 18: 13.

Jacques Whitford. 1999. Osprey and Bald Eagle Study. Prepared for the Churchill River Power Project. 1998 Environmental Studies, LPH 98-11. Newfoundland and Labrador Hydro. St. John's, NL. 30 pp. + Appendices.

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

Loos, G. and P. Kerlinger. 1993. Road mortality of Saw-whet and Screech-owls on the Cape May peninsula. Journal of Raptor Research 27(4): 210-213.

Lowther, P.E., C.C. Rimmer, B. Kessel, S.L. Johnson and W.G. Ellison. 2001. Gray-cheeked Thrush (*Catharus minimus*). In A. Poole (ed.). The Birds of North America Online, Cornell Lab of Ornithology, Ithaca, NY. Available at: http://bna.birds.cornell.edu/bna/species/591.

Mack, D.E. and W. Yong. 2000. Swainson's Thrush (Catharus ustulatus). In A. Poole (ed.). The Birds of North America Online. Cornell Lab of Ornithology; Ithaca, NY. Available at: http://bna.birds.cornell.edu/bna/species/540.

Minaskuat Inc. 2008c. Forest Songbird Surveys. Prepared for the Lower Churchill Hydroelectric Generation Project. St. John's, NL.

Nalcor (Nalcor Energy). 2011. Labrador-Island Transmission Link Environmental Assessment: Species of Special Conservation Concern Component Study. Nalcor Energy, St. John's, NL

Nalcor (Nalcor Energy). 2012a. Labrador-Island Transmission Link Environmental Impact Statement. Nalcor Energy, St. John's, NL

Nalcor (Nalcor Energy). 2012b. Labrador-Island Transmission Link Environmental Impact Statement Addendum. Nalcor Energy, St. John's, NL

NLDEC-WD (Newfoundland and Labrador Department of Environment and Conservation, Wildlife Division). 2010. Endangered Species and Biodiversity Section. Management Plan for

the Gray-cheeked Thrush (*Catharus minimus*) in Newfoundland and Labrador. Corner Brook, Canada. iii + 19 pp

NLDEC-WD. 2014. Pers comm.

Poulin, R.G., S.D. Grindal and R.M. Brigham. 1996. Common Nighthawk (*Chordeiles minor*). In A. Poole (ed.). The Birds of North America Online, Cornell Lab of Ornithology, Ithaca, NY. Available at: http://bna.birds.cornell.edu/bna/species/213.

Robertson, G. J. and R. I. Goudie. 1999. Harlequin Duck (*Histrionicus histrionicus*). In A. Poole and F. Gill (ed.). The Birds of North America, No. 466, The Birds of North America Inc., Philadelphia, PA.

Robertson, B.A. and R.L. Hutto. 2007. Is Selectively Harvested Forest an Ecological Trap for Olive-sided Flycatchers. Condor 109:109-121.

Rodway, M.S., J.W. Gosse, I. Fong and W.A. Montevecchi. 1998. Discovery of a Harlequin Duck Nest in Eastern North America. Wilson Bulletin 110: 282-285.

Savignac, C. 2007. COSEWIC Assessment and Status Report on the Common Nighthawk *Chordeiles minor*. Report prepared for the Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp. Available at: http://www.gov.ns.ca/natr/wildlife/biodiversity/pdf/statusreports/sr_CommonNighthawk.pdf.

Schmelzer, I. 2005. A Management Plan for the Short-eared Owl (*Asio flammeus flammeus*) in Newfoundland and Labrador. Wildlife Divison, Department of Environment and Conservation. Corner Brook, NL

Sheffield, S.R. 1997. Owls as Biomonitors Of Environmental Contamination. In J. R. Duncan, D. H. Johnson, and T.H. Nicholls (ed.) Biology and Conservation of Owls in the Northern Hemisphere: 2nd International Symposium. USDA, Forest Service General. Technical Report NC—190, North Central Forest Experimental Station. p. 383-398

SSAC (Species Status Advisory Committee). The Status of Graceful Felt Lichen (*Erioderma mollissimum*) in Newfoundland and Labrador. The Species Status Advisory Committee Report No. 19. April 28, 2008.

Species at Risk Public Registry. 2011c. Species Profile – Harlequin Duck. Available at: http://www.sararegistry. gc.ca/species/speciesDetails_e.cfm?sid=22. Accessed: July 2011.

Stantec Consulting Ltd. 2010a. Avifauna Component Study. Prepared for Nalcor Energy. St. John's, NL.

Stantec. 2010b. Furbearers and Small Mammals Component Study. Prepared for Nalcor Energy. St. John's, NL.

Stantec. 2012. 2011- Listed and Regionally Uncommon Plant Survey: Strait of Belle Isle Cable Landing Sites And Shore Electrode Locations

Stassinu Stantec Limited Partnership. 2010. Survey Population Trends of the Harlequin Duck in Labrador. Prepared for Institute for Environmental Monitoring and Research, Happy Valley-Goose Bay, NL.

Steininger, F. 1952. Rodent Control and secondary Poisoning of Birds of Prey and Owls. Ornithologische Mitteilungen 4: 36-39.

Todd, W.E.C. 1963. Birds of the Labrador Peninsula. Carnegie Museum and University of Toronto Press, Canada.

Thomas, P. 2008. Harlequin Ducks in Newfoundland. Waterbirds 31 (Special Publication 2): 44-49.

Thompson, I.D., H. A. Hogan and W.A. Montevecchi. 1999. Avian Communities of Mature Balsam Fir Forests in Newfoundland: Age-dependence and Implications for Timber Harvesting. The Condor 103:311-323.

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

Wallen, R.L. 1987. Habitat utilization by Harlequin Ducks in Grand Teton National Park. Master's thesis, Montana State University Bozeman.

Warkentin, I. and S. Newton. 2009. Birds of Newfoundland Field Guide. Boulder Publications. Portugal Cove-St. John's, NL