6.0 ISLAND OF NEWFOUNDLAND

6.1 CARIBOU

The caribou on the island of Newfoundland are part of a larger boreal woodland caribou population that occurs in other parts of Canada. Caribou were selected as a VEC for this environmental assessment for several reasons: their occurrence throughout much of Newfoundland and Labrador; their role as an important herbivore and prey species in the ecosystem; and their cultural and economic importance. Additionally, caribou on the island of Newfoundland are less abundant than in the recent past and the decreasing trend is receiving much attention from the public, media, and resource managers within the provincial government and nationally. Caribou were selected over other ungulate species (*e.g.,* moose) primarily due to their value to the public, their sensitivity to disturbance and the ongoing attention to their sustainability on the island of Newfoundland.

Caribou that could be affected by the Project are the Buchans, La Poile and Grey River populations, all located in the southwestern portion of Newfoundland (Figure 6.1.1).

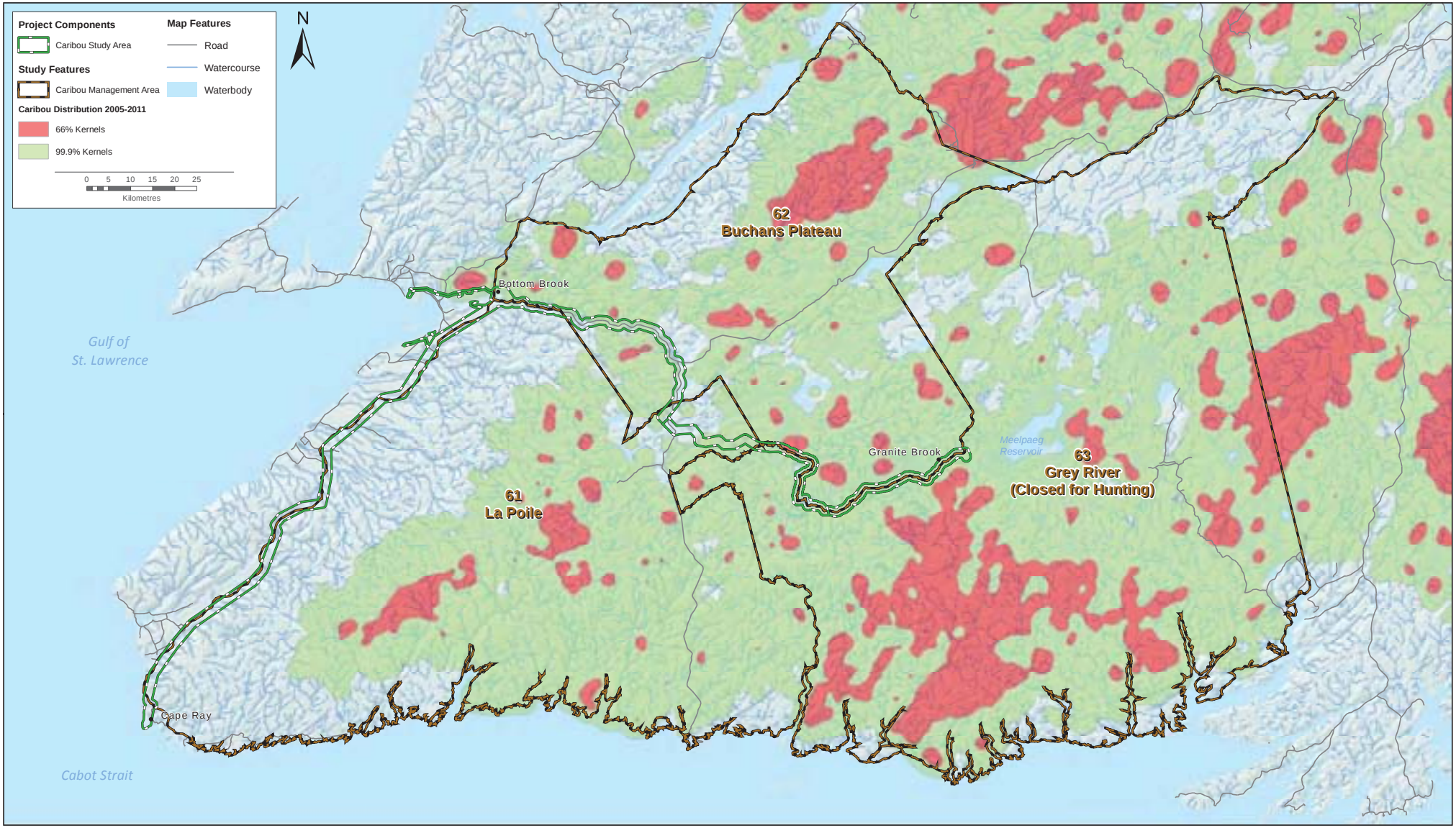
6.1.1 SCOPE OF ASSESSMENT

6.1.1.1 Regulatory Setting

Caribou of interest for this assessment are managed by NLDEC under the provisions of the Government of Newfoundland and Labrador *Wildlife Act*. The Wildlife Division and the Sustainable Development and Strategic Science (SDSS) Division of NLDEC undertake research on caribou and monitor the population. Caribou are managed by annually re-evaluating and amending, if necessary, the regional hunting quotas and by providing guidance to reduce the effects of proposed development projects (*e.g.,* Morgan and Doucet 2007).

In 2008 the NLDEC initiated a five-year Caribou Strategy designed to better understand the decline in caribou (NLDEC 2009). The Strategy has included the continued collection of caribou telemetry collar data, a predator-caribou ecology study, increased emphasis on habitat assessment, and an assessment of black bear populations on the island (NLDEC 2008). The ongoing program, which also includes population censuses, population composition surveys, health and disease assessments, and the deployment of nearly 400 telemetry collars on adult female caribou (NLDEC 2010), is generating large amounts of data that have improved the understanding of caribou distribution and behaviour on the island of Newfoundland.

Caribou on the island of Newfoundland were most recently assessed by the COSEWIC as ‘Not at Risk’ in both 2000 and 2002 (COSEWIC 2002).



Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21

Scale: 1:800,000

Data Sources: Natural Resources Canada (NRCAN); U.S. Geological Survey (USGS); Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Overall Distribution and Management Areas
Southwestern Newfoundland

FIGURE 6.1.1

CMA_Overall_Distribution

6.1.1.2 Selection of Environmental Effects and Measurable Parameters

With respect to caribou, the Guidelines for this assessment are very specific regarding the areas of concern and direction of analysis. This section is focused on meeting those requirements, as well as providing additional information that serves as a broader context within which to interpret the results of the assessment. The following potential environmental effects in relation to caribou were selected and assessed in accordance with the Guidelines, augmented where relevant with information from published research, field surveys and expert opinion.

Change in Habitat

The amount, suitability or availability of caribou habitat may be affected by the Project through loss, alteration, fragmentation and disturbance resulting from the construction, operation and maintenance phases of the Project.

Change in Distribution

Caribou distribution may be affected by Project-related structures and activities that disturb caribou or cause avoidance behaviour, such as construction noise, roads and traffic, and predation risks associated with the transmission corridor.

The measurable parameters used for the assessment of environmental effects on caribou are provided in Table 6.1.1.

Table 6.1.1 Measurable Parameters for Caribou

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in Habitat	• Change in amount of Primary Core Area[(a)] (km^2) or area of concentration (66% kernel estimate) that overlaps the Study Area relative to the total availability of Primary Core Area or area of concentration (km^2).	• Regulators have identified the conservation of primary or core habitat for management purposes. • Reducing, altering or fragmenting primary habitat could affect the population. • These parameters represent the physical persistent change to habitat.
	• Change in amount of primary habitat[(a)] (km^2) (not necessarily occupied) that may be altered or lost relative to its availability in the total distribution of caribou (km^2).	
Change in Distribution	• Change in size or location of Primary Core Area or area of concentration within Caribou Study Area (km^2).	• Changes in distribution, movements, or timing of movements may result in caribou selecting less suitable seasonal habitat. • These parameters include the temporal change associated with noise or the altered viewshed.
	• Change in frequency and/or timing of caribou movements across the centreline of the Caribou Study Area, as determined through analysis of point location data.	
	• Change in frequency and/or timing of caribou tracks crossing Caribou Study Area as observed on aerial surveys.	

Notes:
(a) Refer to Table 6.1.3 for an explanation of Primary Core Area and primary habitat.

6.1.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the caribou VEC include the periods of construction and operation and maintenance. Construction will be phased over a period of three years, such that various portions of the transmission corridor will be under construction at different times. Operations and maintenance will continue for at least 50 years, at which time the future of the system will be assessed.

Within these general temporal boundaries, there are specific time periods during which the potential Project-related effects could be of greater concern due to potential vulnerability (*e.g.,* from perspective of the annual life stage and/or particular habitat requirements), based on the known ecology of caribou. For this assessment, analyses were based temporally on the four seasons – winter (December-April), spring (May, June), summer (July-September), and fall (October-November) – in accordance with the organization of data recently (October 2012) provided by the NLDEC. Within these seasons, additional, biologically important periods of annual caribou activity were considered (where appropriate), including: spring migration/pre-calving (1 April – 19 May); calving (20 May to 10 June); early post-calving (11 June to 30 June); late post-calving (1 July to 31 August); fall rut (1 September to 31 October); fall migration/dispersal (1 November – 15 December); and winter (16 December to 31 March). Of these, winter and calving/post-calving periods were often the focus of each analysis due to the vulnerability of caribou at these times. Table 6.1.2 summarizes temporal and spatial boundaries for the various assessments used.

Table 6.1.2 Seasons Selected for Caribou Analyses

Analysis	Season	Spatial Boundary [a]	Justification
Total and seasonal distribution using kernel shape files based on 50%, 80% and 100% use distribution of telemetry locations from collard Caribou from 2006 – 2010 in Southwestern Newfoundland (Table 6.1.4)	Winter Calving Early Post-Calving Late Post-Calving	Southwestern Newfoundland and Caribou Study Area	Need to examine distribution during biologically sensitive periods
Total and seasonal distribution using kernel shape files based on 66% and 99.9% use distribution of GPS telemetry locations from collard Caribou from 1979 – 2011 and 2005 -2011 (Table 6.1.5).	Winter Spring Summer Fall	Southwestern Newfoundland and Project RoW with associated buffers for sensitivity analysis within the Area of New Access	Need to examine year round spatial distribution in Area of New Access
Caribou point locations within ELC habitat units (Table 6.1.9)	Winter Spring Summer Fall	ELC Data Extent within the Regional Study Area	Need to examine year round spatial distribution in the Area of New Access

Table 6.1.2 Seasons Selected for Caribou Analyses

Analysis	Season	Spatial Boundary [a]	Justification
Caribou Movements and crossings of Study Area (Figures 6.1.12 to 6.1.16, Tables 6.1.12 to 6.1.14)	Winter Spring Migration/Pre-calving Calving Fall Migration/Dispersal	Eastern portion of Study Area, from Silver Pond to Granite Canal	Need to examine year round spatial distribution and particularly movement across the proposed alignment in the Area of New Access
Area (km^2) and percentage of selected ELC habitat units directly or indirectly affected by the Project (Table 6.1.10)	Winter Spring Summer Fall	RSA: RoW and associated buffers.	Need to examine year round spatial distribution
Notes: Spatial boundaries described in Table 6.1.-3.			

The spatial boundary used in the assessment of Project environmental effects on caribou is the same as the Study Area (Figure 6.1.1, Table 6.1.3). However, part of the assessment related to effects on caribou habitat, included only the portion of the Study Area that is overlapped by the extent of the ELC data within the Area of New Access (Table 6.1.3). The area used for the assessment of cumulative environmental effects on caribou is the Occupancy Area as defined by the distribution of point location data from collared caribou in the three Caribou Management Areas (Figure 6.1.1, Table 6.1.3).

A variety of terms are used throughout this section which pertain specifically to other spatial dimensions used in the caribou assessment. To facilitate the discussion, these terms are defined in Table 6.1.3.

Table 6.1.3 Table of Terms Used in the Caribou VEC EA

Term	Definition
Study Area	Includes a 2-km-wide swath through the four Project segments in Newfoundland (Cape Ray to Bottom Brook; Burgeo Highway; Area of New Access and Granite Canal Access Road). Figure 6.1.1.
Caribou Study Area	Includes that area where information was collected and/or analyzed regarding habitat, distribution, movement or other data reflecting baseline conditions.
Cumulative Effects Assessment Area	Occupancy Area defined by distribution of Caribou collar point location data in three Management Areas
Regoinal Study Area (RSA)	The RSA includes the Project footprint where direct effects are anticipated, i.e, the 60-m-wide RoW, as well as three areas for "sensitivity analysis": (1) RoW plus a 500-m buffer (1.06-km-wide assessment area), (2) RoW plus a 1,000-m buffer (hypothetical 2.06-km-wide assessment area) and (3) RoW plus a 2,000-m buffer (hypothetical 4.06-km-wide assessment area).
Primary Core Area	Designated area of use based on spatial distribution of caribou. Defined and labeled by NLDEC, and provided as a kernel shapefile based on 50% use distribution of telemetry locations from collared caribou over a given period.
Secondary Core Area	Designated area of use based on spatial distribution of caribou. Defined and labeled by NLDEC, and provided as a kernel shapefile based on 80% use distribution of telemetry locations from collared caribou over a given period.

Table 6.1.3 Table of Terms Used in the Caribou VEC EA

Term	Definition
Occupancy Area	Designated area of use based on spatial distribution of caribou. Defined and labeled by NLDEC, and provided as a kernel shapefile based on 100% use distribution of telemetry locations from collared caribou over a given period.
Areas of Concentration	Designated area of use based on recently available (October 2012) data on the spatial distribution of caribou. Provided as a kernel shapefile based on 66% and 99.9% use distribution of telemetry locations from collared caribou collected over a given period.
ELC Data Extent	Area for which habitat information was collected and classified as part of the ELC (Illustrated in Figures 6.1.8 to 6.1.11.)
Area of New Access	An approximate 27 km long section where the Project alignment would not parallel an existing transmission line. This area received special attention as the ELC examined an expanded adjacent area as the basis for additional analyses in this assessment
Primary Habitat	Based on caribou point data in relation to ELC habitat units through a use-versus-availability analysis as was completed in the Area of New Acccess for this assessment. Primary habitat was used in greater proportion to its availability.

The Occupancy Area and 99.9% Area of Concentration (Table 6.1.3), as used for the assessment of cumulative effects, were delineated by NLDEC based on caribou distribution in southwestern Newfoundland (kernel shapefile determined from collared caribou locations) (Figure 6.1.1)

6.1.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A significant adverse residual environmental effect on caribou is defined as a Project-related environmental effect that results in a change in a caribou population that will alter its status or integrity beyond an acceptable level relative to baseline, (*i.e.,* population decline, such that the viability of the population is threatened). The overall environmental effect on the caribou population will be measured by changes in caribou habitat and distribution, as stated previously.

6.1.2 BASELINE CONDITIONS

Caribou are distributed throughout much of the island of Newfoundland. Although the density varies, the current distribution includes the majority of the Northern Peninsula, central and southwestern Newfoundland extending to the south coast, and the Avalon Peninsula. The total number of caribou in this area has varied widely ranging from the low thousands in the early 1900s and peaking at approximately 116,000 in 1995 (Bergerud 1969, Bergerud 1971, Trindade *et al.* 2010a). Since then, the number of caribou has decreased to approximately 34,000 (Lewis *et al.* 2011).

The caribou populations most likely to be affected by the Project are La Poile, Buchans and Grey River (Figure 6.1.1), all located in southwestern Newfoundland. The Caribou Management Areas associated with these populations reflect the historic distribution of caribou in the general area, but do not necessarily reflect the current understanding of population distribution nor

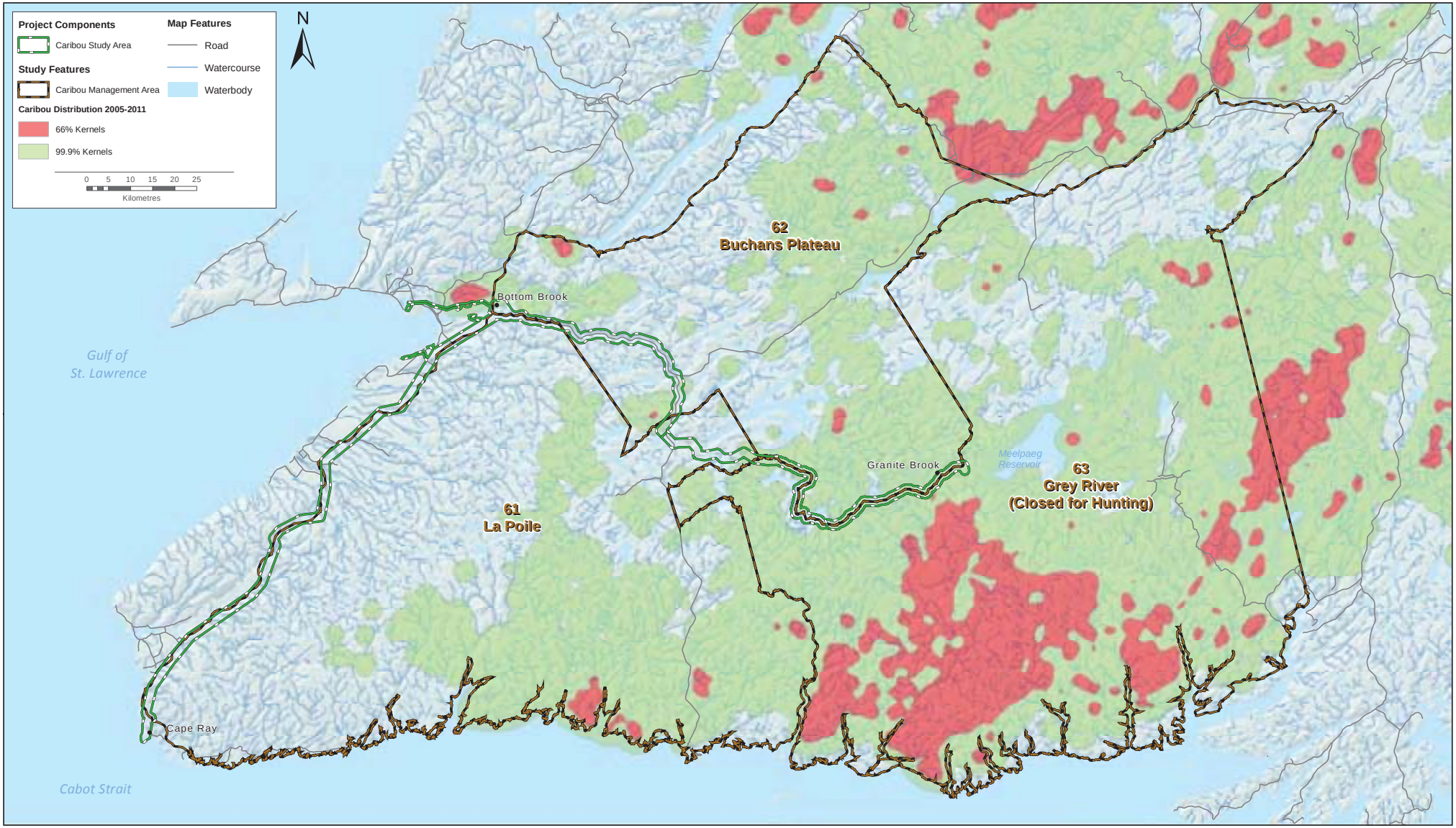
necessarily represent overlap with the Study Area (Figure 6.1.1). At this time, hunting is only permitted in the La Poile and Buchans Caribou Management Areas; the Grey River Area is closed to hunting (NLDEC 2012b).

All three populations identified above have undergone substantial fluctuations since the 1960s. The La Poile population was estimated at 500 caribou in 1960, peaking at approximately 11,210 in 1988 (Lewis pers. comm. 2012, Mahoney *et al.* 2011). More recently, preliminary estimates indicate a decline to approximately 4,200 ± 642 in 2011 (Lewis pers. comm. 2012). The Buchans population grew from 450 caribou in 1960 to approximately 9,800 in 1994 (Lewis pers. comm. 2012). The most recent estimate, though preliminary, is 4,654 ± 743 in 2011 (NLDEC 2012 pers. comm). The Grey River population was approximately 1,200 animals in 1960, peaking at between 8,600 and 11,900 between 1981 and 1997 (Lewis pers. comm. 2012). It has since decreased, based on preliminary analysis, to 2,136 ± 165 in 2011 (Lewis pers. comm. 2012).

Concurrent with the recent declines in abundance, ongoing research has identified several changes in caribou behaviour and body size. Changes in behaviour, such as the timing and routing of migration, calving and wintering locations and occupied habitats (particularly since 2004) have been observed (Dyke pers. comm. 2010, Saunders pers. comm. 2010). Changes in body size (*e.g.,* decreases in jawbone size in adults, antler size in males, and calf weights) have also been observed (Trindade and Mahoney 2011, Trindade *et al.* 2010b, Mahoney *et al.* 2011).

The caribou distribution data used in this assessment are based on telemetry locations from collared caribou collected during three time periods: 2006-2010 (GPS data only), 2005-2011 (Argos and GPS data), and 1979-2011 (Argos and GPS data), with the latter two time periods representing the most updated information available (provided by NLDEC in October 2012). The data, transferred as kernel shapefiles by NLDEC, show the distribution of caribou in southwestern Newfoundland as a larger group and do not distinguish by population affiliation.

The total distribution of collared caribou in southwestern Newfoundland between 2006 and 2010 (Occupancy Area) covered an area of 22,509 km^2, extending from The Topsails area in the north to the south coast of the island, and from west of Middle Ridge to the eastern edge of the Anguille Mountains along the west coast (Figure 6.1.1). The smaller seasonal occupancy areas indicate inter-seasonal movements within the total distribution. During the winter season a considerable spatial shift to the southeastern portion of the total distribution range has been observed (Figure 6.1.2). During the spring season, which includes the sensitive calving and post-calving periods, the pattern of was similar to the total distribution (Figure 6.1.3), but more concentrated (Table 6.1.4).



Emera Newfoundland & Labrador

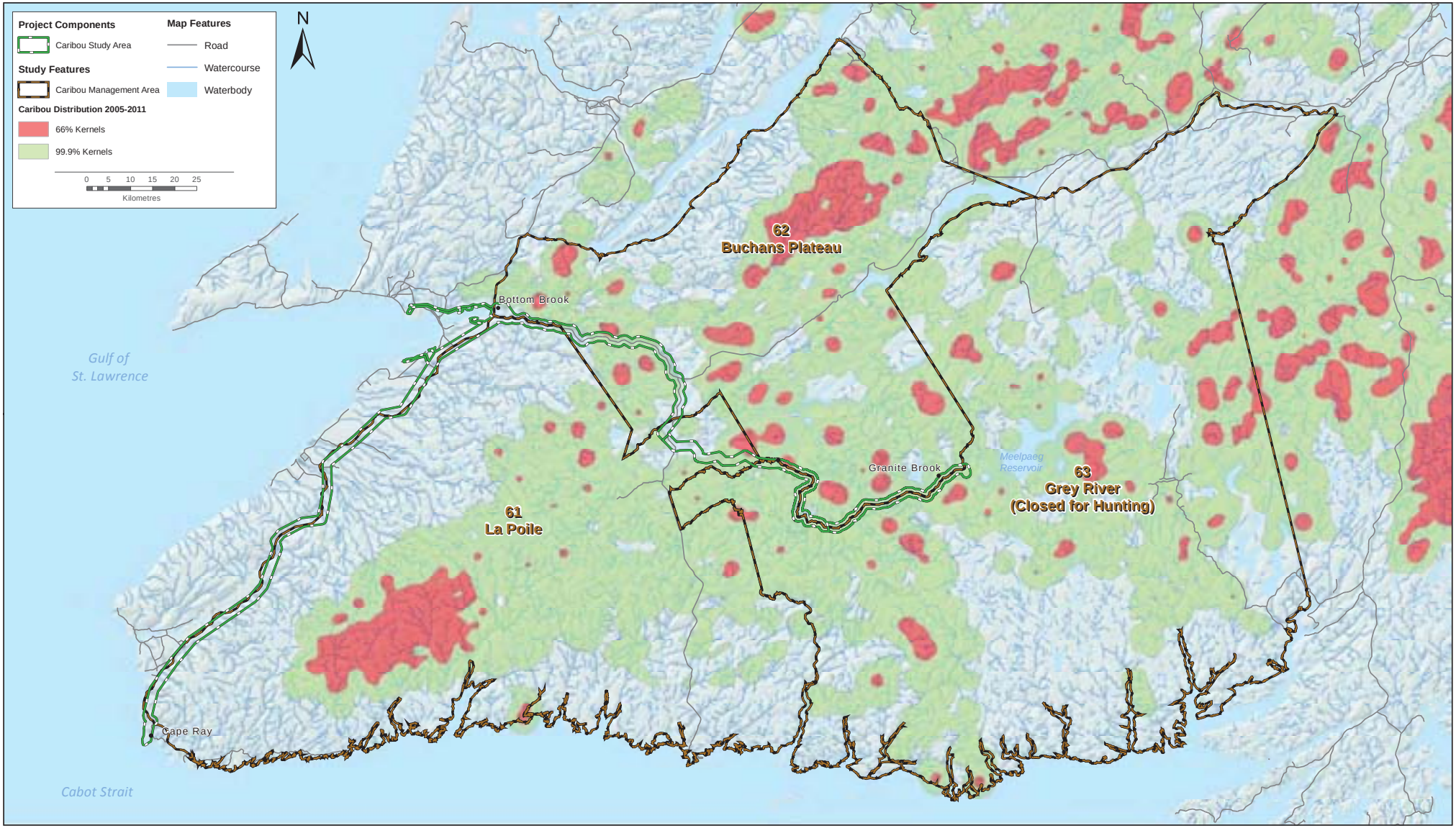
Coordinate System: UTM NAD 83 Zone 21
Scale: 1:800,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Winter Distribution and Management Areas
Southwestern Newfoundland

FIGURE 6.1.2

CWA_Winter_Distribution



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Scale: 1:800,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Spring Distribution and Management Areas
Southwestern Newfoundland

FIGURE 6.1.3

CWA_Spring_Distribution

Table 6.1.4 Total and Seasonal Caribou Distribution in Southwestern Newfoundland, based on GPS collared caribou from 2006-2010

	Total Distribution[(a)] (km^2)	Seasonal[(c)] Distribution (km^2)			
Occupancy Area[(b)]		**Winter**	**Calving**	**Early Post-Calving**	**Late Post-Calving**
Primary Core	3,061	1,308	944	536	925
Secondary Core	7,860	3,500	2,750	1,689	2,700
Occupancy	22,509	12,937	12,678	9,501	11,777

Notes:
(a) Total distribution indicates total caribou distribution (no seasonal division) rather than the sum of the seasonal values.
(b) Definitions provided in Table 6.1.2.
(c) Defined in Section 6.1.1.3.

Based on the total distribution of collared caribou in southwestern Newfoundland between 1979 and 2011, and between 2005 and 2011 the area of calculated distribution (*i.e.*, 99.9% kernels) of collared caribou covered an area of 22,234 km^2 and 20,406 km^2, respectively (Table 6.1.5). In comparing the two displays of distribution, this information also indicates a spatial shift to the southeastern portion of the total distribution range during the winter season (Figure 6.1.2). As with the 2005-2011 information, the general pattern of distribution during spring was similar to the total distribution (Figure 6.1.3), but more concentrated (Table 6.1.5). The smaller areas occupied indicate inter-seasonal movements within the total distribution.

Table 6.1.5 Total and Seasonal Caribou Distribution in Southwestern Newfoundland, based on collared caribou from 1979-2011 and 2005-2011.

	Total Distribution[(a)] (km^2)	Seasonal[(b)] Distribution (km^2)			
		Winter	**Spring**	**Summer**	**Fall**
1979-2011					
66% kernel	4,625	3,070	2,886	2,177	2,947
99.9% kernel	22,234	18,666	18,676	16,915	16,813
2005-2011					
66% kernel	3,583	2,601	1,971	1,637	1,917
99.9% kernel	20,406	16,141	15,143	12,691	13,161

Notes:
(a) Total distribution indicates total annual caribou distribution (no seasonal division) rather than the sum of the seasonal values.
(b) Refer toTable 6.1.2.

6.1.2.1 Information Sources

Required analyses identified in the Guidelines related to the caribou VEC were addressed through two information sources: caribou distribution data provided for this assessment by NLDEC and habitat data derived from the ELC model. Only caribou in southwestern

Newfoundland were considered in the analyses, (*i.e.,* the La Poile, Buchans and Grey River populations).

Two caribou distribution datasets were used in the analyses, based on the evolution of the understanding of caribou biology and the timing of availability of this information. Kernel shapefiles provided from NLDEC in 2010 showed the distribution of caribou based on GPS points from collared caribou between 2006 and 2010. Caribou distribution was divided into three areas of use: Primary Core Area, Secondary Core Area, and Occupancy Area (Lewis pers. comm. 2012). Table 6.1.3 provides further explanation of these occupancy areas. The areas are inclusive, not additive, meaning the Occupancy Area includes the Secondary Core Area, which includes the Primary Core Area. NLDEC delineated these areas to show caribou home range as well as daily, seasonal, and yearly movements (NLDEC 2011a). This assessment identified Primary Core Area, defined by NLDEC as the area of greatest use by caribou.

Subsequent to this, newly acquired data (October 2012) provided information on caribou distribution for the years 1979-2011 and 2005-2011. These data were organized and discussed in terms of 66% and 99.9% kernels, and were temporally grouped by four seasons versus annual caribou activity. The 66% kernel is used as a more objective definition of core area which may provide a more biologically meaningful boundary in terms of defining areas of concentration within the range for the given data.The period from 2005-2011 is based entirely on more accurate GPS collared caribou, whereas data from 1979-2011 incorporate information from older technology VHF-collared caribou.

As part of the baseline studies undertaken for the EA, an ELC was completed that provides a comprehensive characterization of terrestrial vegetation. Data from the ELC and supporting field sampling were used to identify unique vegetation assemblages (habitat units) that could then be classified as habitat for various species. To supplement this characterization a use-versus-availability analysis was completed. Telemetry (GPS) points from 2006-2010 were plotted for each of the four seasons to identify ELC habitat units that were used in greater, equal, or lower proportion to the distribution of the habitat types. These ELC habitat units were then classified as primary, secondary or tertiary habitat for caribou respectively.

Using these data sources, the Guidelines were addressed by the following analyses, grouped according to the potential environmental effects on caribou as defined above:

<u>Change in Habitat</u>

Habitat was assessed using two methods, based on specific requirements of NLDEC and on timing of data availability.

The area of disturbance was first estimated by assuming a 60-m-wide RoW, plus a 500 m buffer on either side (*i.e.*, 1.06 km wide assessment area) within the RSA only (*i.e.*, not the entire Caribou Study Area), to examine potential indirect effects of the Project on caribou habitat, consistent with Dyer *et al.* (2001) and the woodland caribou recovery strategy released by Environment Canada (EC 2012c). In addition to this, hypothetical 2.06-km-wide and 4.06-km-

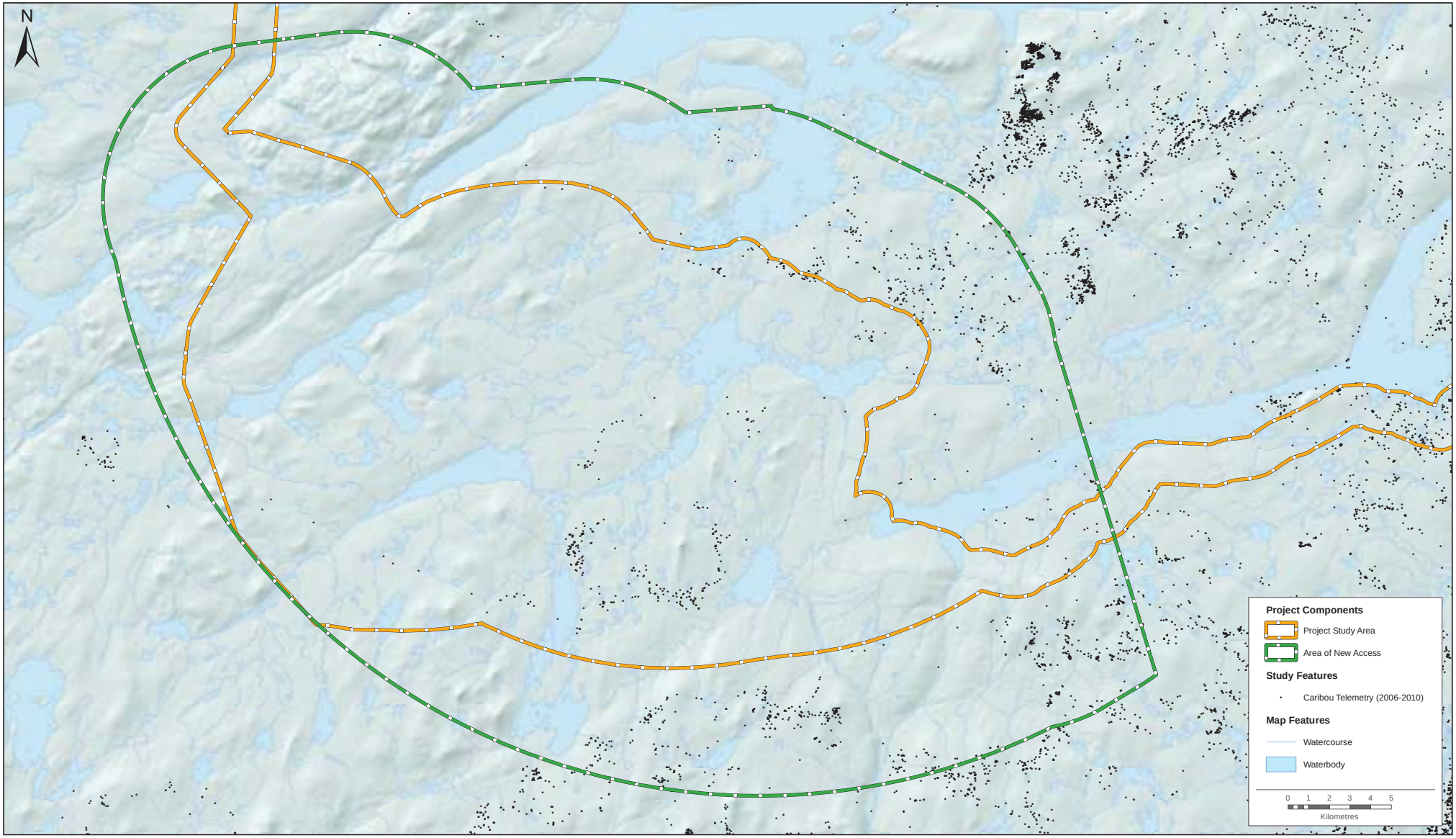
wide assessment areas were further analyzed. The amount (km^2) and proportion (%) of primary habitat overlapping the 66% and 99.9% caribou concentrations within the RoW and associated buffers were determined.

A second analysis was undertaken based on the overlap between caribou distribution and ELC habitat units in the Area of New Access. Telemetry (GPS) points from 2006-2010 were plotted for each of the four seasons to identify seasonal distribution of caribou within the Area of New Access (Figures 6.1.4 to 6.1.7). The point location data were then plotted on the ELC data extent to determine seasonal preferences. For each season, the number (and proportion) of point locations occurring within each ELC habitat unit was determined, and the amount (km^2) and percentage of selected ELC units determined for the RSA and associated buffers. Heavily used ELC habitat units (*i.e.,* ELC habitat units receiving higher proportions of locations than expected based on their availability) were considered to be selected by caribou for that season, and the amount (km^2) and percentage of selected ELC habitat units was determined for the RoW and associated buffers within the RSA. Habitats were subsequently ranked as primary, secondary or tertiary based on the use of ELC habitats as determined by number of point locations and plotted using GIS.

Change in Distribution

The area (km^2) and the proportion of the total (%) of Primary Core Area, Secondary Core Area and Occupancy Area, and 66% and 99.9% kernels, occurring within the Study Area were calculated to examine potential effects on distribution and seasonal movements. An analysis of caribou movement across the Study Area was undertaken using caribou point location data from 2006-2010 (provided by NLDEC). GPS-enabled collars were used that recorded approximately 12 locations per day (a location every 2 hours). The analysis was limited to only those points occurring within a 20 km buffer (10 km either side of the centreline of the Study Area) to remove caribou that were not using the area in the general vicinity of the Project. Animals crossing the centreline of the Study Area were identified, both overall and by season. Subsequently, the total number of crossings, the number of caribou that crossed, the mean number of crossings per caribou (and range), and the proportion of collared caribou that crossed were determined. The locations and directionality of crossings were also determined. The portion of the Study Area crossed by caribou (the eastern end) was divided into thirteen 10-km long sections, among which the crossings were plotted to identify areas of highest use and seasonal directional movement.

Information on caribou distribution in relation to the proposed Project alignment was also collected as part of aerial wildlife surveys of the Project. Five general aerial surveys were completed (Survey I – 11-12 November 2011; Survey II – 12 January 2012; Survey III – 7 March 2012; Survey IV – 16 May 2012; Survey V – 13 and 14 September 2012), and two dedicated aerial caribou surveys over the Area of New Access only (8 and 15 June 2012). Both observations of caribou and caribou track sightings (including possible caribou track sightings) were used to determine distribution and potential movement paths across the Study Area. Although there is information based on observations over a wider area, only those observations within the Study Area are considered in this report.



Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21

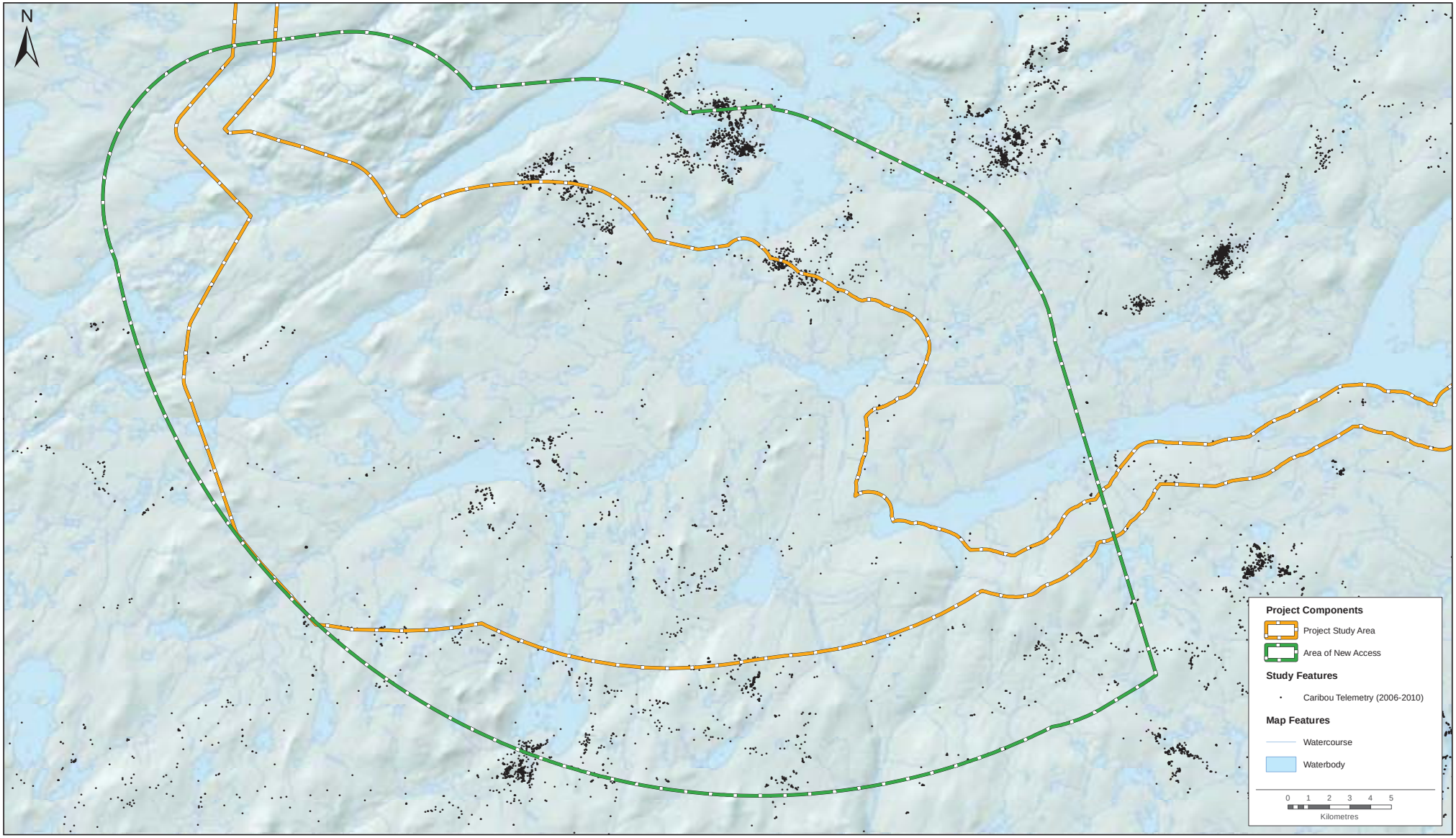
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Winter Distribution (Dec-Apr) within Area of New Access
2006-2010

FIGURE 6.1.4

RSA_Winter_Kennedy



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Data Sources:
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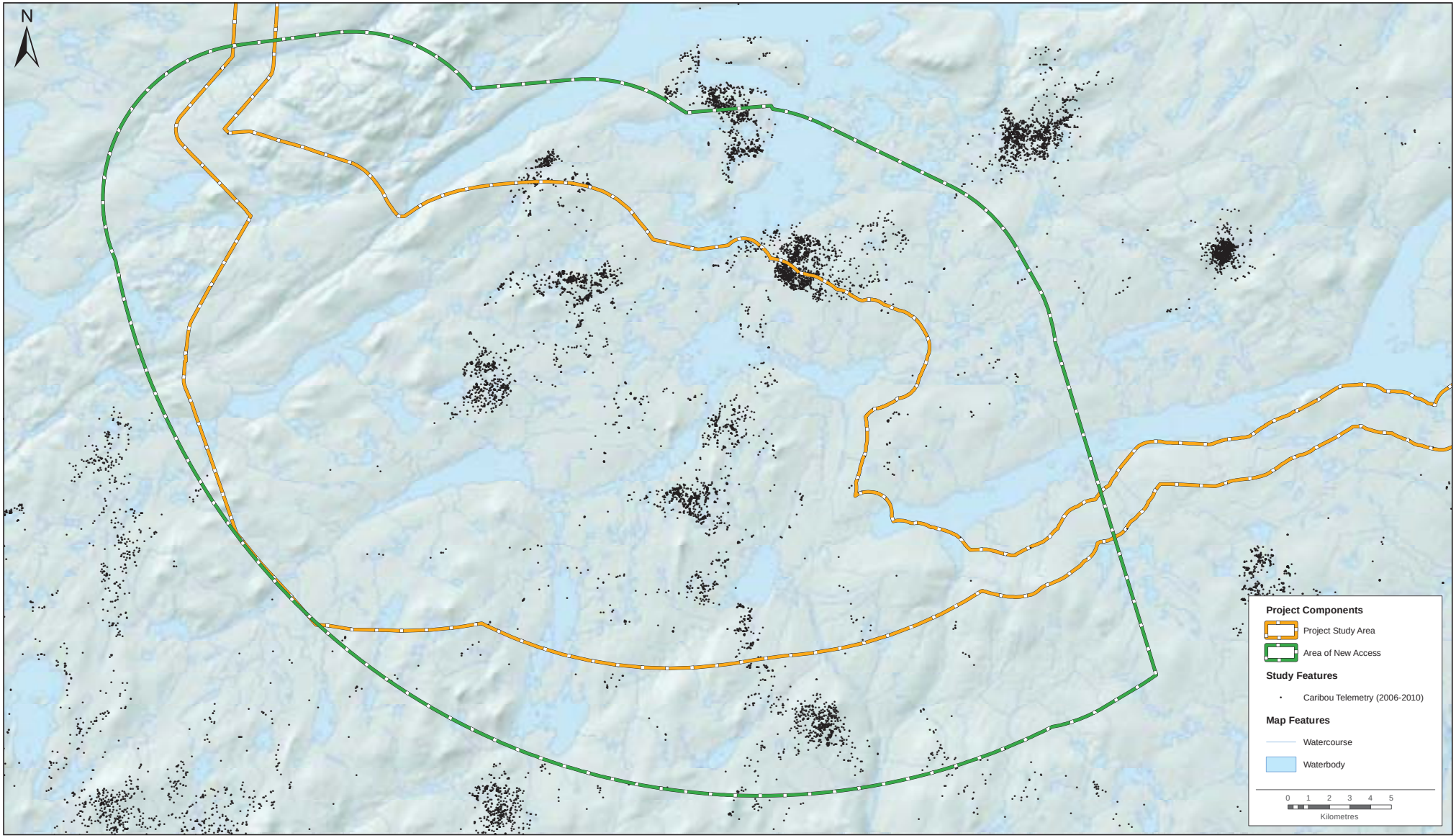
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Spring Distribution (May-June) within Area of New Access
2006-2010

FIGURE 6.1.5

RSA_Spring_Telemetry



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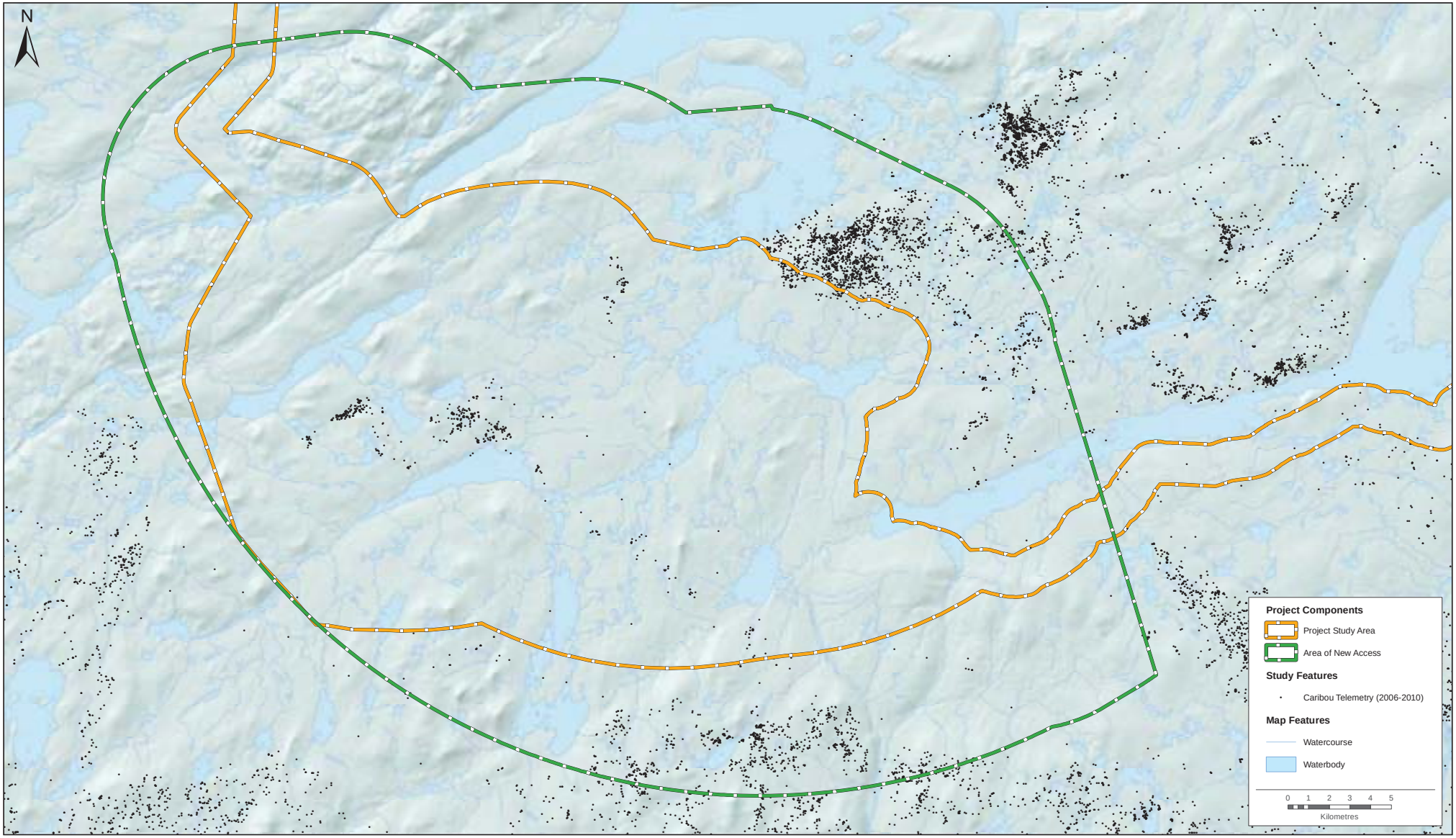
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Summer Distribution (July-Sept) within Area of New Acess
2006-2010

FIGURE 6.1.6

RSA_Summer_Distribution



Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Fall Distribution (Oct-Nov) within Area of New Access
2006-2010

FIGURE 6.1.7

6.1.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

6.1.3.1 Potential Project-VEC Interactions

Table 6.1.6 lists each Project activity and physical work for the Project, and ranks each interaction as 0, 1, or 2 based on the level of interaction each activity or physical work will have with caribou.

Table 6.1.6 Potential Project Environmental Effects on Caribou

Project Activities and Physical Works	Potential Environmental Effects	
	Change in Caribou Habitat	Change in Caribou Distribution
Construction		
Site Access and Site Preparation	2	2
Transmission and Grounding Line Infrastructure	1	2
Converter Station	1	2
Operation		
Overland Power Transmission	0	2
Power Conversion	0	0
Maintenance		
Regular Inspection	1	2
Repair to Infrastructure	1	2
Vegetation Management	2	2

KEY
0 = No interaction.
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.

Standard mitigation measures that will reduce the environmental effects of the Project are presented in Section 2.6.7. Many of these would be appropriate to reduce the effects on caribou. In addition, Project-specific measures that address those interactions for caribou ranked as 1 include:

- Using data on caribou occupancy areas provided by the NLDEC, the Proposed routing has avoided primary core areas or 66% kernels for calving and winter distribution; these areas will also be avoided during construction of new access roads;
- Laws and regulations pertaining to fish and wildlife, forest fires, forest travel, smoking and littering will be followed by Project personnel; and
- Implementation of environmental awareness training and regular briefings for all personnel including information on sensitive species such as caribou.

For the operation phase, power transmission and conversion are rated 0 for change in habitat; once construction is complete, continued power transmission will not cause any further change in caribou habitat. Power conversion is ranked as 0 for operation, as the environmental effect on caribou occurs during construction, when area is removed from future use and potential disturbance of caribou distribution will take place. During operation, these facilities will be static, with most activity taking place near the shoreline.

Transmission and grounding line infrastructure, construction of converter station, and infrastructure repair were ranked as 1 for change in caribou habitat, as these may result in changes in habitat through physical construction on the landscape. The disturbance will be localized and of short duration and the majority of this environmental effect will occur during site preparation. Standard mitigation measures outlined in Section 2.6.7 will reduce potential environmental effects from these activities, such as using dedicated access routes and limiting the area of disturbance.

In consideration of the nature of the interactions and the planned implementation of known and proven mitigation, the potential environmental effects of all Project activities and physical works on caribou that were ranked as 0 or 1 in Table 6.1.6, during any phase of the Project, are rated as not significant, and are not considered further in the assessment.

6.1.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

The Project activities associated with construction and operation and maintenance phases that were ranked as 2 in Table 6.1.6 have potential to result in significant adverse residual environmental effects, and will thus be considered in more detail in this EA.

6.1.4.1 Change in Caribou Habitat

The potential effects on caribou habitat from site access/preparation during construction and vegetation management during operation were ranked as 2. Although the majority of the new transmission line will run parallel with, or adjacent to, existing transmission lines or roads, there will be some habitat loss. Although the majority of the habitat loss will occur during construction, the environmental effects of vegetation clearing will persist throughout the operation phase.

Linear features (*e.g.*, transmission lines) are actively avoided by woodland caribou (Dyer *et al*. 2002, Dyer *et al*. 2001, Mercer *et al.* 1985). Females, especially those with calves, may be most sensitive to disturbances, including linear features (Dyer *et al.* 2002, Dyer *et al*. 2001, Nellemann *et al.* 2001, Vistnes and Nellemann 2001, Nellemann and Cameron 1998, Cameron *et al.* 1992, Cameron *et al.* 1979), possibly due to reduced habitat suitability associated with the disturbance. The calving and post-calving periods may be the most sensitive as females and calves are more easily disturbed than other cohorts (Wolfe *et al.* 2000).

Habitat availability for caribou may be affected through habitat loss, alteration or fragmentation associated with Project clearing, construction and maintenance activities. Alteration, loss or fragmentation of habitat will occur during initial clearing activities and may persist to some

degree for the duration of the Project, (*e.g.,* vegetation management during operation). Caribou displaced by the Project may move into other areas or expand their home ranges in response to disturbance (Courtois *et al.* 2007, McCarthy *et al.* 2011).

Mitigation of Project Environmental Effects

There are a number of mitigation measures identified in Section 2.6.7 that would reduce the effect of the Project on caribou habitat. Primarily, where feasible, areas of sensitivity for caribou (*e.g.,* calving and post-calving areas) will be avoided during final routing of the transmission line and associated facilities. Furthermore, the creation of new areas of disturbance will be limited through the use of existing roads and transmission corridors, where feasible, and by decommissioning temporary access roads following construction. Specific mitigation measures include:

- existing access roads will be used wherever feasible, and development of new access will only be undertaken where necessary;
- clearing limits will be marked and Project activities will be limited to designated areas, where feasible;
- work areas and temporary access roads no longer required will be decommissioned to encourage a return to natural conditions; and
- clearing or alteration of sensitive caribou areas (such as calving habitat) will be avoided to the extent feasible. Where such activities cannot be avoided, they will be planned in consultation with regulatory agencies.

Characterization of Residual Environmental Effects

Caribou distribution on the island of Newfoundland has been described by NLDEC as occupancy areas (Primary Core Area, Secondary Core Area, and Occupancy Area), based on intensity of use. The sizes of the overall and seasonal occupancy areas are listed in Table 6.1.4. The estimated amount of direct habitat loss in caribou range due to clearing is less than 1% in all occupancy areas (Table 6.1.7).

Table 6.1.7 Change in Habitat due to Project Related Disturbance within Caribou Occupancy Areas

Total Distribution - Occupancy Area[(a)]	Total Caribou Distribution	Estimated Direct Habitat Loss[(b)]		Caribou Distribution Within the Study Area[(c)]	
	Area (km^2)	Area (km^2)	%	Area (km^2)	%
Primary Core	3,061	<1	<1	5	<1
Secondary Core	7,860	1	<1	22	<1
Occupancy	22,509	9	<1	269	1

Table 6.1.7 Change in Habitat due to Project Related Disturbance within Caribou Occupancy Areas

Total Distribution - Occupancy Area[(a)]	Total Caribou Distribution	Estimated Direct Habitat Loss[(b)]		Caribou Distribution Within the Study Area[(c)]	
	Area (km^2)	Area (km^2)	%	Area (km^2)	%

Notes:
(a) Total distribution indicates total caribou distribution (no seasonal division) rather than the sum of the seasonal values.
(b) Calculated from length of the transmission corridor (with a 20% contingency) and width.
(c) Size of caribou occupancy areas overlapping the Study Area.

Seasonal forage and habitat preferences are presented according to calving, post-calving and winter seasons, given their importance to caribou. In Newfoundland, summer forage for caribou includes deciduous shrubs, sedges, reindeer moss or lichen (*Cladina* spp.), and fungi (Bergerud 1972), but they also exhibit a preference for mature coniferous forests (Chubbs *et al.* 1993), with or without the presence of terrestrial lichens (Courtois *et al.* 2008). Forested areas may also be selected for insect relief during summer, as caribou in some studies were usually found under trees during the day to escape harassment by flies (Bergerud 1969, 1971).

A study by Mahoney and Virgil (2003) found that adult caribou in western Newfoundland selected rock and heath barrens and virgin and mature forest stands significantly more than other habitats in all seasons, while hardwood and softwood scrub were preferred during calving, post-calving and fall. Recent research suggests that caribou in certain areas of Newfoundland (*e.g.,* Middle Ridge, La Poile and the Northern Peninsula) select areas of low-lying vegetation (Morgan *et al.* 2010), and barrens and wetlands (McCarthy *et al.* 2011) for calving, but select against mixed-forest (McCarthy *et al.* 2011). Bogs, early climax stands, ponds and lakes were intermediate in their selection value, while recently harvested stands and disturbed sites were used significantly less than other habitats (Mahoney and Virgil 2003). Of the intermediate habitats, bog habitat was more important during summer and fall (Mahoney and Virgil 2003).

Female caribou seek calving sites with low predation risk (Bergerud and Page 1987; Bergerud *et al.* 2008) and often form small groups in open barrens following parturition (Mahoney and Virgil 2003). Open water can also be important as it offers escape from predators (Bergerud *et al.* 1990, 2008). Areas that support alternative prey such as moose would be avoided during summer, as they may increase the risk of predation by black bear (Mahoney and Virgil 2003).

Winter forage for caribou in Newfoundland consists primarily of terrestrial lichens, such as *Cladina* spp. (Courtois *et al.* 2004; Mayor *et al.* 2007; Fortin *et al.* 2008; Mayor *et al.* 2009), arboreal lichens (Bergerud 1972),and evergreen shrubs (Bergerud 1972). Caribou have been known to dig craters up to 142 cm deep to access forage beneath the snow (Brown and Theberge 1990). Although very important, terrestrial lichens may not be essential, as caribou have been observed to select closed conifer stands without terrestrial lichens as well as open conifer stands with or without terrestrial lichens (Courtois *et al.* 2008). Access to arboreal lichens, frequently available in coniferous forest landscapes (Schaefer 1996; O'Brien *et al.* 2006; Fortin *et al.* 2008), is particularly important when snow is deepest (Bergerud 1972; Fortin

et al. 2008), although Bergerud (1972) found that caribou in Newfoundland would not venture into spruce forests with deep snow unless there was a crust substantial enough to bear their weight. As well, Mayor *et al.* (2007) found that caribou in Newfoundland select for shallow snow conditions.

Adult caribou in western Newfoundland have been shown to select rock and heath barrens, and virgin and mature forest stands, more than other habitats during winter (Mahoney and Virgl 2003). Use of bogs, early climax stands, and ponds and lakes was intermediate during winter, while recently harvested stands and disturbed sites were used the least. Of the intermediate successional habitats, early climax forest stands were more valuable during winter (Mahoney and Virgil 2003).

Caribou may avoid areas that support alternative prey (*e.g.,* moose) as they may increase the risk of predation (Seip 1992; Fortin *et al.* 2008). Fortin *et al.* (2008) confirmed that woodland caribou avoided burned and harvested forests while moose select disturbed areas (Forbes and Theberge 1993). Shallow snow can offer a reduced predation risk by allowing increased mobility for caribou (Bergerud *et al.* 2008). Ice-covered areas (*e.g.,* frozen lakes, wetlands, rivers) provide visibility and mobility advantages when predators are encountered (compared to deep snow in wooded areas), and are often used to access new sources of food (Fortin *et al.* 2008). Ice-covered open areas are also selected possibily because winds reduce snowfall accumulation (Fortin *et al.* 2008).

Using this background, ELC habitat units were first scored in terms of the seasonal importance for caribou. To address the Guidelines pertaining to the ELC and caribou habitat, the extent of caribou distribution and the overlap with the habitat ranks were determined (Table 6.1.8). Primary ranked habitats used in this analysis describe habitats that provide adequate forage (*e.g.*, lichens), protection from predators, and resting habitat, based on ELC habitat classifications. Determination of habitat potential (or ranks) from the ELC in this analysis was based on the applicable literature and not based on caribou distribution data. Note that a use-versus-availability analysis (based on caribou distribution data) was completed separately for the Area of New Access to identify the relative importance of seasonal habitats for that portion of the Study Area.

Table 6.1.8 Seasonal Caribou Distribution and Primary Habitat within Study Area

Occupancy Area	Seasonal Distribution within Caribou Study Area (km^2)[(a)]	Proportion (%) of Seasonal Area Distribution[(b)]	Area (km^2) of Primary Habitat[(c)]	Proportion (%) of Primary Habitat[(d)]
Total Distribution[(e)]				
Primary Core	3	<1	-[(f)]	-
Secondary Core	15	<1	-	-
Occupancy	257	1	-	-
Winter[(g)]				
Primary Core	1	<1	<1	6

Table 6.1.8 Seasonal Caribou Distribution and Primary Habitat within Study Area

Occupancy Area	Seasonal Distribution within Caribou Study Area (km^2)[(a)]	Proportion (%) of Seasonal Area Distribution[(b)]	Area (km^2) of Primary Habitat[(c)]	Proportion (%) of Primary Habitat[(d)]
Secondary Core	9	<1	3	35
Occupancy	95	<1	44	46
Calving[(g)]				
Primary Core	0	0	0	0
Secondary Core	9	<1	4	40
Occupancy	151	1	60	40
Early Post-Calving[(g)]				
Primary Core	0	0	0	0
Secondary Core	4	<1	2	51
Occupancy	130	1	85	65
Late Post-Calving[(g)]				
Primary Core	<1	<1	<1	99
Secondary Core	12	<1	8	73
Occupancy	151	1	110	73

Notes:
(a) Amount of seasonal distribution that occurs within the boundaries of the Caribou Study Area.
(b) Amounts of seasonal distribution for occupancy areas available in Table 6.1.3.
(c) Amount of primary ranked habitat (winter, calving, or post-calving) that occurs within the boundaries of the Caribou Study Area
(d) Of the extent of caribou distribution that occurs within the boundaries of the Caribou Study Area, the proportion that is primary ranked habitat (winter, calving, or post-calving).
(e) Total distribution indicates total caribou distribution (no seasonal division) rather than the sum of the seasonal values.
(f) Analysis was focused on the seasonal caribou distribution as it better describes patterns of use during sensitive biological periods, rather than total distribution, which considers the patterns of use for the entire year.
(g) Season dates provided in Section 6.1.1.3.
Source: NLDEC data

Without knowing the exact alignment, the area of disturbance (*i.e.*, habitat alteration or loss) was estimated by assuming the 60 m-wide right of way to be cleared would occur along the centerline of the corridor, plus a 20% contingency applied as a precautionary measure. The contingency area was included to encapsulate the effects of any deviations from the proposed alignment or access roads, or access roads that will be constructed outside the final alignment. The amount (km^2) and relative proportion of caribou occupancy areas affected by potential habitat loss were determined. Additionally, the amount (km^2) and proportion of Occupancy Areas within the Caribou Study Area, and length of transmission corridor (km^2) occurring within each occupancy area, were determined. The area of caribou distribution that may be affected by sensory disturbance, (*i.e.,* within the Study Area), is 1% (269 km^2) of the Occupancy Area and less than 1% of the Primary Core Area (5 km^2) (Table 6.1.7). These are considered to be conservative estimates, since only a portion of the Study Area will be affected by potential habitat alteration, and sensory disturbance is predicted to rarely extend beyond 500 m of

construction activities. Even within 500 m of the activity, complete avoidance of the area is not considered likely (Dyer *et al.* 2001, Environment Canada 2011).

Within the Study Area, primary ranked winter habitat from the ELC comprised 6% of the Primary Core Area, 35% of the Secondary Core Area and 46% of the Occupancy Area. The proportion of habitat ranked from the ELC as primary during the calving season was higher than for winter habitat for the Secondary Core Area (40%), but not for Primary Core Area (0%) and the Occupancy Area (40%). The amounts of habitat distributed among Primary Core, Secondary Core and Occupancy Areas during the early and late post-calving seasons are also presented in Table 6.1.8. Some of these values appear high, [*e.g.,* early post-calving primary ranked habitat in the Secondary Core Area (51%), or late post-calving primary ranked habitat for Primary Core Area (99%)]. However, several of these values constitute only a small portion, area-wise, of caribou distribution: early post-calving (Secondary Core Area - 4 km^2); and late post-calving (Primary Core Area - <1 km^2; Secondary Core Area - 12 km^2).

The amount of occupancy area overlapping the Study Area was 1% or less, both for overall and for each season, and the amount of Primary Core Area overlapping the Study Area was less than 1% for all seasons (Table 6.1.8).

Habitat Selection Based on Collared Caribou from 2006-2010

To further address the Guidelines pertaining to the ELC and caribou habitat, caribou point location data from the more accurate GPS collared caribou (2006-2010) were overlaid with the ELC habitat units within the ELC data extent. This analysis revealed an apparent selection of certain ELC habitat units by caribou that varies seasonally based on the relative proportion of locations during each time frame (Table 6.1.9).

During spring coniferous forest, ericaceous/lichen heathland, ericaceous/coniferous scrub complex and wetland (ericaceous/lichen) were used at a higher rate than their availability would indicate (Table 6.1.9). Similarly, during summer coniferous forest and ericaceous/lichen heathland were used at a higher rate than expected based on availability (Table 6.1.9). The only ELC habitat units used at a higher rate than its availability during fall were ericaceous/lichen heathland and wetland (bryoid/graminoid); and in winter ericaceous/lichen heathland and wetland (unvegetated peat) (Table 6.1.9). During fall and winter, ericaceous/lichen heathland contained more than double the number of point locations that would be expected with no selection. Several ELC habitat units were indicated as being avoided seasonally. The most obvious occurrence of an ELC habitat unit being used at a lesser rate than its availability is water. The few locations occurring in water could be due to caribou swimming, erroneous telemetry locations or records during winter when the animals were travelling on ice.

Table 6.1.9 Seasonal results of ELC habitat types use-versus-availability analysis for the Area of New Access

ELC Habitat Type	Area of New Access		Spring		Summer		Fall		Winter		Total	
	Area (km^2)	% of total ELC Coverage	GPS Points	% of Total Points	GPS Points	% of Total Points	GPS Points	% of Total Points	GPS Points	% of Total Points	GPS Points	% of Total Points
Coniferous Forest	159.17	12%	556	17%+	1500	25%+	62	2%	113	8%	2231	15%+
Coniferous Scrub	150.09	11%	224	7%	697	12%	234	6%	93	7%	1248	9%
Deciduous Forest	14.95	1%	13	0%	64	1%	5	0%	5	0%	87	1%
Deciduous Scrub	6.71	0%	23	1%	3	0%	2	0%	0	0%	28	0%
Mixed Wood Forest	0.00	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Ericaceous / Lichen Heathland	142.00	11%	616	18%+	1082	18%+	1593	44%+	446	31%+	3737	26%+
Ericaceous / Coniferous Scrub Complex	208.60	15%	655	19%+	972	16%	562	15%	194	14%	2383	17%+
Subalpine	20.18	1%	0	0%	0	0%	0	0%	0	0%	0	0%
Wetland: Ericaceous / Coniferous Scrub	11.60	1%	20	1%	71	1%	18	0%	16	1%	125	1%
Wetland: Ericaceous / Lichen	141.83	11%	631	19%+	575	10%	220	6%	145	10%	1571	11%
Wetland: Bryoid / Graminoid	162.90	12%	373	11%	679	11%	656	18%+	226	16%+	1934	13%
Wetland: Graminoid / Herbaceous	0.00	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Wetland: Unvegetated Peat	33.19	2%	49	1%	143	2%	97	3%	66	5%+	355	2%
Water	195.50	15%	23	1%	87	1%	26	1%	28	2%	164	1%
Exposed Rock / Unvegetated Anthropogenic	7.57	1%	23	1%	24	0%	29	1%	12	1%	88	1%
Riverbanks and Lakeshores	13.92	1%	17	1%	42	1%	5	0%	12	1%	76	1%
Vegetated Anthropogenic	0.00	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Imagery Cloud and Shadow	78.79	6%	139	4%	13	0%	152	4%	66	5%	370	3%
Dune System	0.00	0%	0	0%	0	0%	0	0%	0	0%	0	0%
TOTAL	1347.00	100%	3362	100%	5952	100%	3661	100%	1422	100%	14397	100%

Notes:
Based on collared caribou data, 2006-2010.
(a) Season dates provided in Section 6.1.1.3.
+ Denotes ELC habitat units that received a higher amount of seasonal use than expected based on its availability (value >15% ELC coverage)

Source: Caribou data – NLDEC

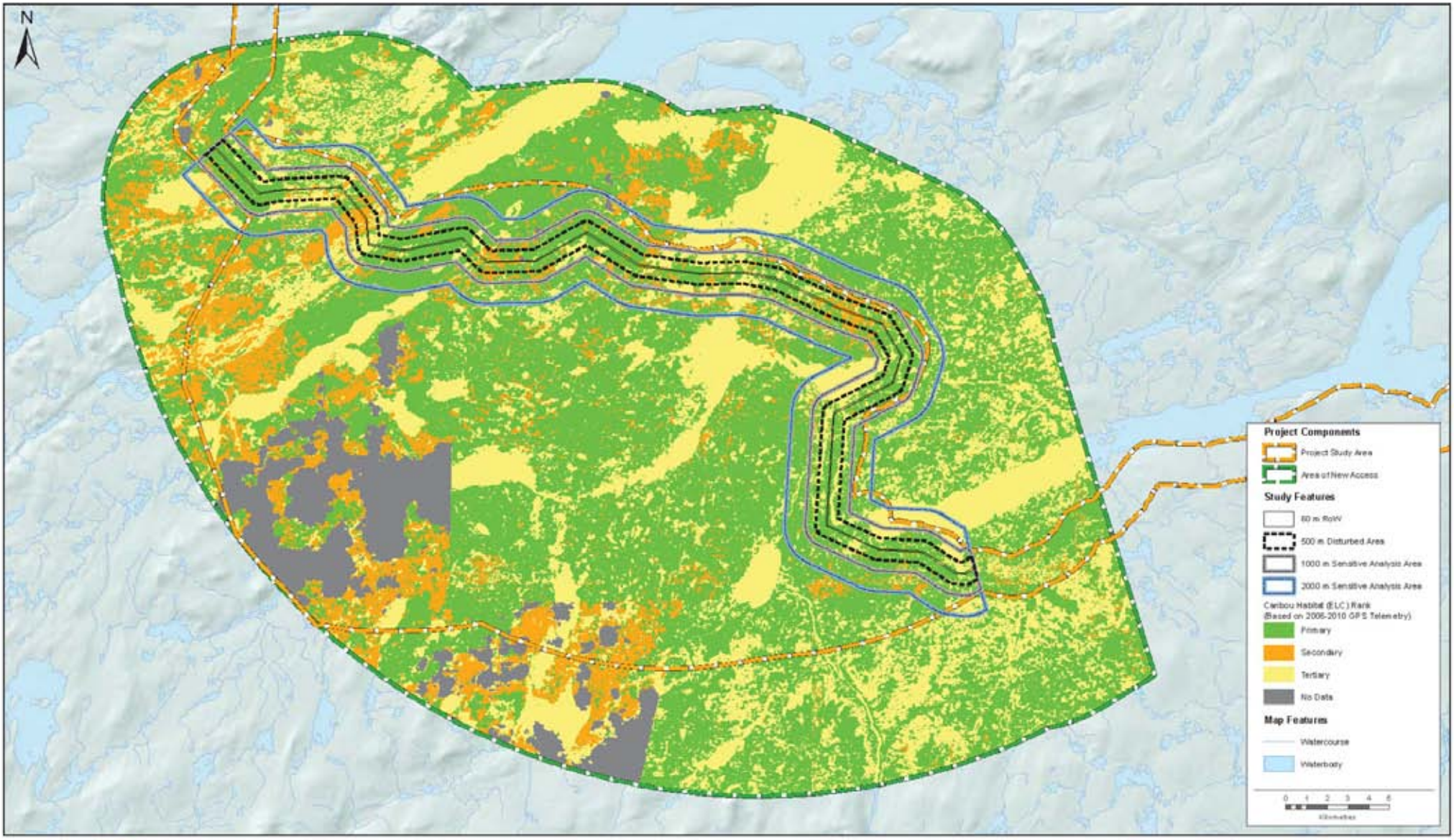
To examine the implications of the proposed alignment, selected ELC habitat units were over laid on the 60 m wide right of way (representing direct habitat effects) and an anticipated avoidance area of 500 m (indirect effects) (Table 6.1.10). Additional 'buffers' of 1,000 m and 2,000 m were also applied to explore indirect effects at greater distances of avoidance. Important spring ELC habitat units [coniferous forest, ericaceous/lichen heathland, ericaceous/coniferous scrub complex and wetland (ericaceous/lichen)] represent approximately 34% of the Area of New Access. Within the right of way, approximately 1.5 km^2 of important spring habitat in this area would be subjected to direct effects. Within the assessment area (*i.e.*, right of way and a 500 m buffer), there would be approximately 31 km^2 (ranges from 4.9 to 7.2% of each ELC habitat unit within the Area of New Access) of selected ELC habitat units. These values are increased approximately twice or four times when exploring the sensitivity analyses of 1,000 m and 2,000 m respectively.

The direct effects on the selected ELC habitat units during summer (*i.e.*, coniferous forest and ericaceous/lichen heathland) involve 1.1 km^2. In the assessment area that includes the 500 m buffer, there would be 18.4 km^2 (Table 6.1.10). During fall, selected ELC habitat units [*i.e.*, ericaceous/lichen heathland and wetland (bryoid/graminoid)] which represent 22% of the Area of New Access, direct and indirect effects represent 12.3 km^2. In winter, there are 7.6 km^2 of selected ELC habitat unit [*i.e.*, ericaceous/lichen heathland and wetland (unvegetated peat)] within the assessment area (Table 6.1.10).

Figures 6.1.8 to 6.1.11 indicate the amount of seasonal primary (selected for), secondary (used in proportion to its availability) and tertiary (selected against) habitat based on GPS telemetry during 2006-2010, within the Area of New Access.

Table 6.1.10 Area of ELC habitat units Selected by Caribou in the Project RoW and Associated Buffers within the Area of New Access, based on Collared Caribou from 2006-2010.

ELC Unit	Area of New Access		60 m RoW		RoW + 500m buffer		RoW + 1000m buffer		RoW + 2000m buffer	
	Area (km^2)	% of total ELC Coverage	Area (km^2)	% of total ELC Coverage	Area (km^2)	% of total ELC Coverage	Area (km^2)	% of total ELC Coverage	Area (km^2)	% of total ELC Coverage
Coniferous Forest	159.2	12%	0.7	0.4%	11.5	7.2%	19.4	12.2%	34.5	21.7%
Ericaceous / Lichen Heathland	142.0	11%	0.4	0.3%	6.9	4.9%	13.8	9.7%	27.5	19.4%
Ericaceous / Coniferous Scrub Complex	208.6	15%	0.7	0.4%	12.7	6.1%	23.3	11.1%	42.4	20.3%
Wetland: Ericaceous / Lichen	141.8	11%	0.4	0.3%	6.7	4.7%	13.1	9.2%	25.3	17.9%
Wetland: Bryoid / Graminoid	162.9	12%	0.3	0.2%	5.4	3.3%	11.1	6.8%	23.1	14.2%
Wetland: Unvegetated Peat	33.2	2%	0.0	0.1%	0.7	2.1%	1.6	4.7%	3.9	11.8%



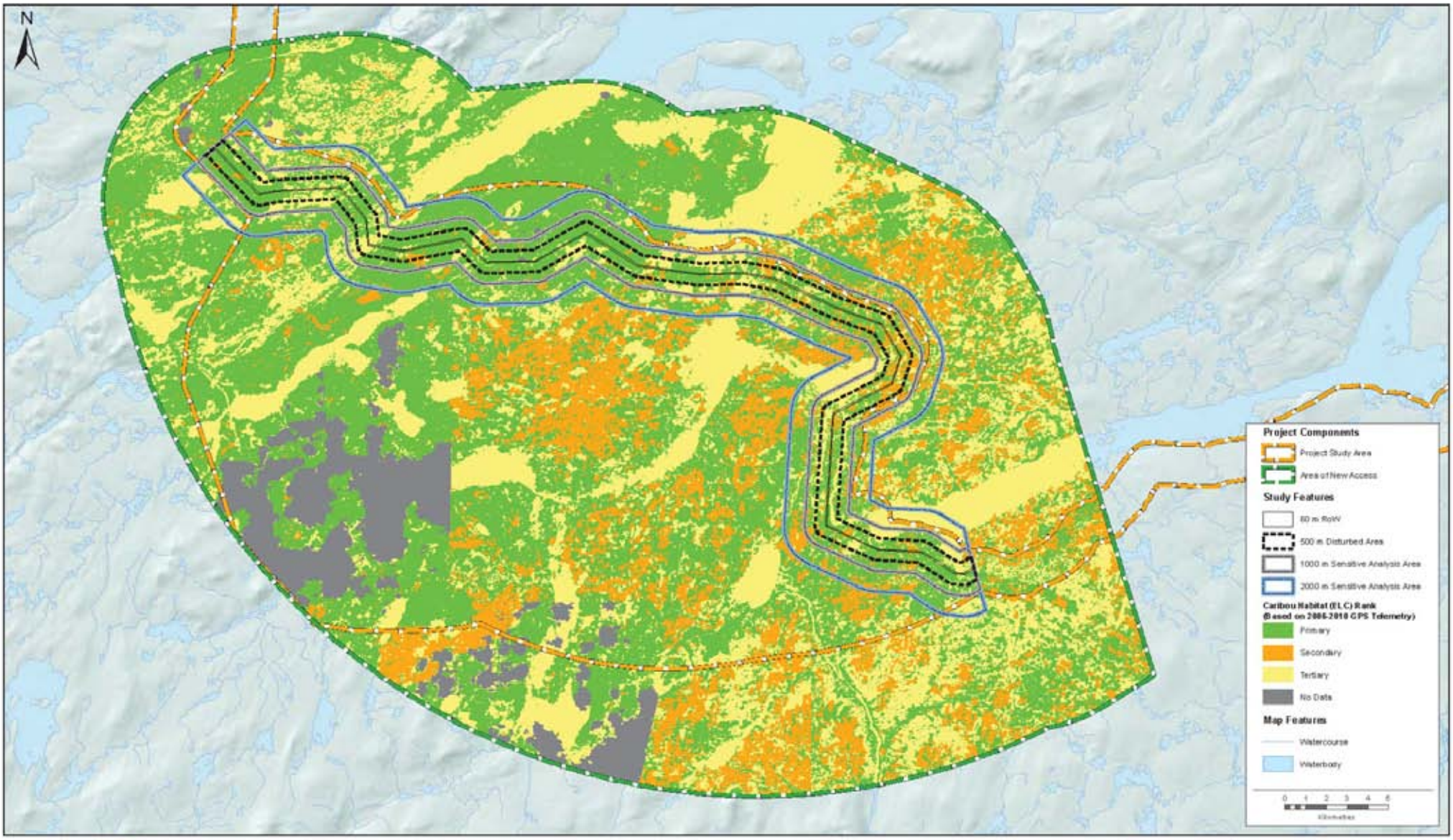
Emera
Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Habitat Quality during Winter within Area of New Access

FIGURE 6.1.8



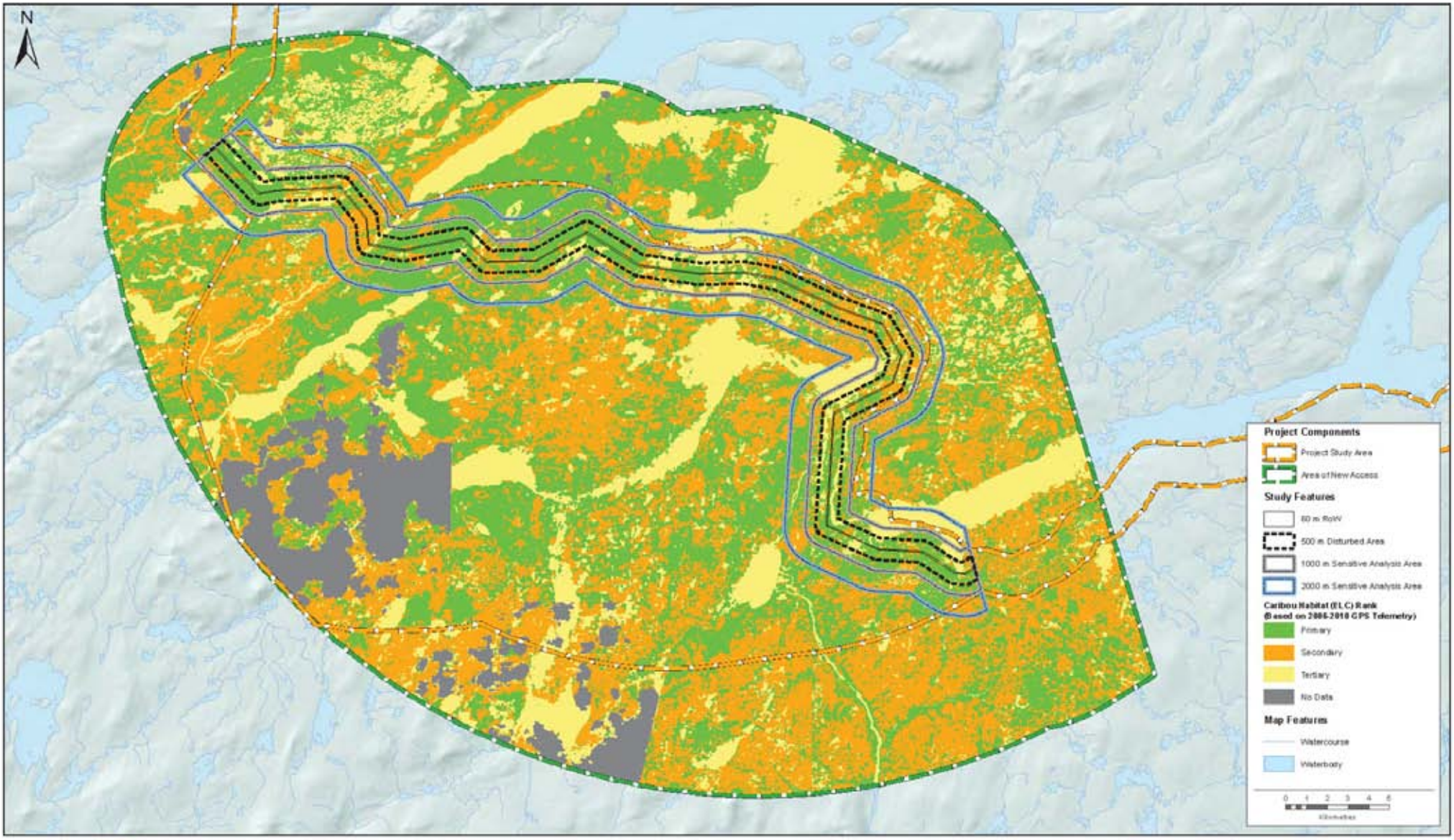
Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDOE)

Caribou Habitat Quality during Spring within Area of New Access

FIGURE 6.1.9



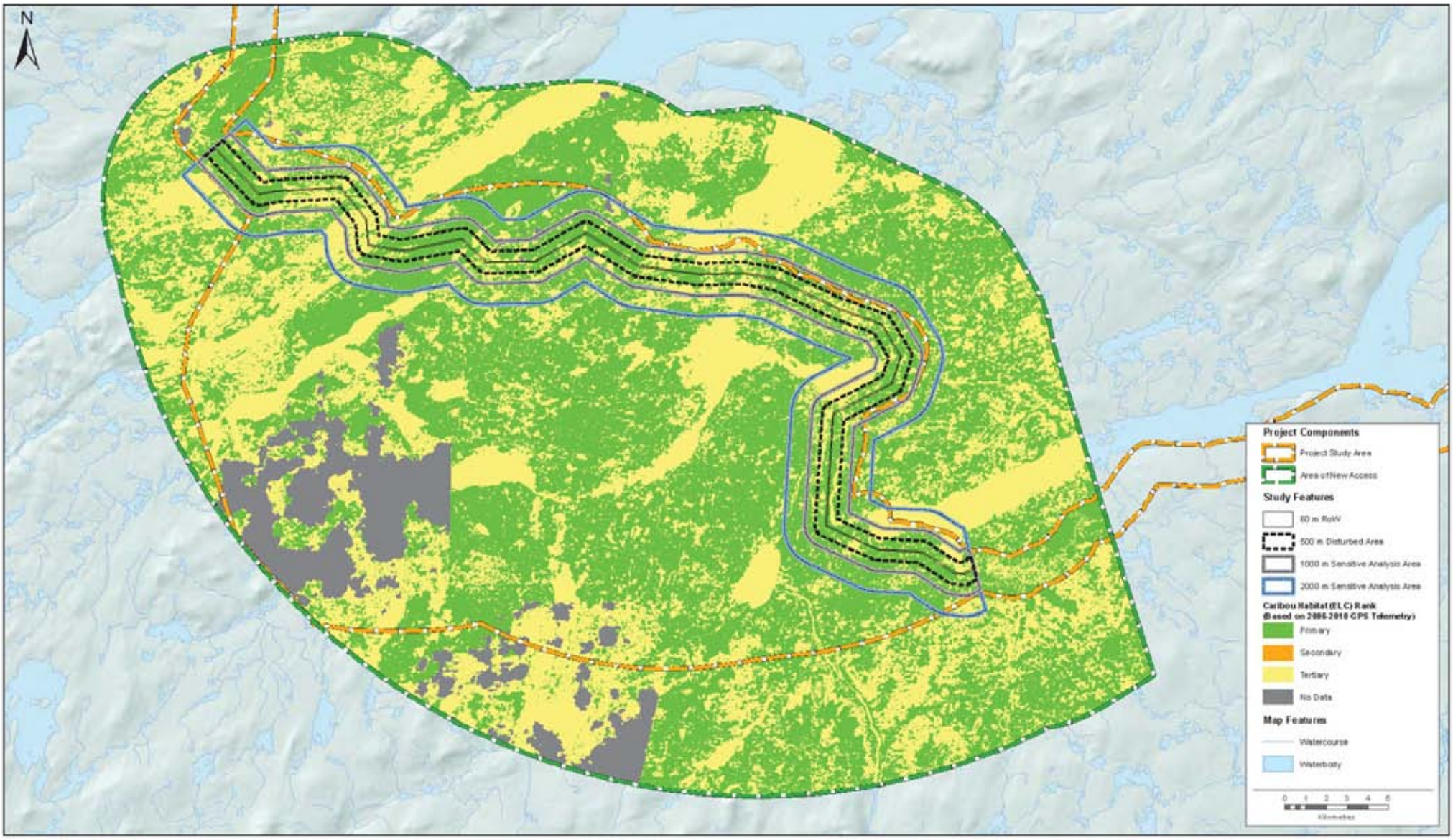
Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDOE)

Caribou Habitat Quality during Summer within Area of New Access

FIGURE 6.1.10



Emera
Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:170,000

Data Sources:
Natural Resources Canada (NRCAN)
U.S. Geological Survey (USGS)
Newfoundland and Labrador Department of Environment (NLDOE)

Caribou Habitat Quality during Fall within Area of New Access

FIGURE 6.1.11

6.1.4.2 Change in Caribou Distribution

Potential Environmental Effects

With the exception of power conversion, all other activities were ranked as 2 for potential Project interactions with caribou distribution.

Caribou can be sensitive to disturbances (*e.g.,* noise, road traffic, visual disturbance, forestry activities and development) and may alter their distribution and movement patterns in response. Disturbance may cause changes in caribou distribution in the vicinity of active access roads during the construction and commissioning phase. There will be less activity on access roads during the operation phase; however caribou may still demonstrate some avoidance. There will be less avoidance of decommissioned roads, where over time distribution of caribou would be expected to return to patterns similar to baseline. Although caribou may continue to cross the transmission corridor, crossing frequency may be reduced depending on various factors, such as cleared width, location or habitat type. Additionally, any off-highway vehicle traffic along the transmission corridor may cause avoidance by caribou and could result in some intermittent deterrent to crossing.

Research indicates that caribou may alter their distribution in avoidance of disturbance such as fires, forestry activity, linear features and hydroelectric development. Caribou responses to forestry operations or clear cuts may result in larger home ranges (Courtois *et al.* 2007) or site avoidance (Schaefer and Mahoney 2007, Vors *et al.* 2007, Chubbs *et al.* 1993). Dyer *et al.* (2001) found that, although open habitat beyond 250 m from roads was not substantially avoided, some avoidance may remain up to 500 m from roads. Environment Canada (2011b) has also suggested that 500 m is an appropriate zone of influence for anthropogenic disturbance. Linear features may act as semi-permeable barriers to caribou (Dyer *et al.* 2002) and may be avoided by both caribou and reindeer (Joly *et al.* 2006, Vistnes *et al.* 2004, Dyer *et al.* 2001, Nellemann *et al.* 2001, Vistnes and Nellemann 2001). Research indicates that areas used by individual females for calving and post calving expanded with increasing total disturbance within the overall calving and post-calving ranges (McCarthy *et al.* 2011). Although female caribou may be more sensitive to disturbance than males (Nellemann and Cameron 1998), not all caribou are displaced by disturbance, and habituation can occur (Schaefer and Mahoney 2007, Nellemann *et al.* 2001, Vistnes and Nellemann 2001, Nellemann and Cameron 1998, Cameron *et al.* 1992, Cameron *et al.* 1979). Some studies have found that caribou may use transmission corridors as movement pathways (Jacques Whitford 1997b). Thus, while caribou generally avoid landscape perturbations, this is not always the case; they may cross features such as roads, transmission lines or industrial sites if they are not disturbed by humans.

The addition of linear features to the landscape, such as those created by the construction and operation and maintenance of the Project, will cause disturbance for caribou and could result in changes in distribution. Although the avoidance of some features (*e.g.,* decommissioned roads) will likely decrease over time, other potential sources of disturbance (*e.g.*, vehicular activity on

access roads, vegetation management during operation and visual disturbance from transmission structures) will likely persist for the duration of the Project. Changes in caribou distribution in response to the Project may be determined through a post-construction monitoring program to compare caribou distribution pre- and post-construction.

Mitigation of Project Environmental Effects

In addition to standard mitigation listed in Section 2.6.7, there are several Project-specific mitigation measures that may further reduce or avoid potential environmental effects on caribou distribution. Through planning and design of the Project the area of disturbance will be minimized by the use of existing roads and by choosing routes that are parallel or adjacent to existing linear features. The following mitigation measures that limit the intensity, duration, location and extent of disturbance-creating activities will further reduce the environmental effect of the Project on caribou:

- Through Project design, the area of disturbance will be limited through the use of existing roads and by choosing routes that parallel existing linear features, where feasible;
- Site-specific mitigation measures relating to caribou will be developed, in consultation with NLDEC. These will be included in the EPP;
- Activity within the Primary Core Areas will be limited during calving and post-calving seasons, as feasible;
- Areas identified as important movement paths will be avoided during high use periods, where feasible;
- Standard operating procedures will be developed and included in the EPP that specify required actions to be followed if caribou approach work sites. These procedures will include buffer zone distances and will specify permitted and restricted activities;
- Where feasible, NLDEC will be requested to provide the locations of collared caribou within a specified distance from construction sites in order that activities could be modified to reduce potential effects (to be determined in consultation with NLDEC);
- A policy of no hunting or other harassment of wildlife by Project personnel will be in effect, which will forbid the possession of pets on the work site;
- 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 determine the presence of caribou; blasting will be delayed until caribou have left the area of their own accord;
- Work activities will be undertaken in a manner that does not knowingly harass wildlife;
- Access to Project-related roads and work areas will be restricted to site personnel, when feasible; and
- Obsolete work areas and temporary access roads will be decommissioned to encourage a return to natural conditions.

Characterization of Residual Project Environmental Effects

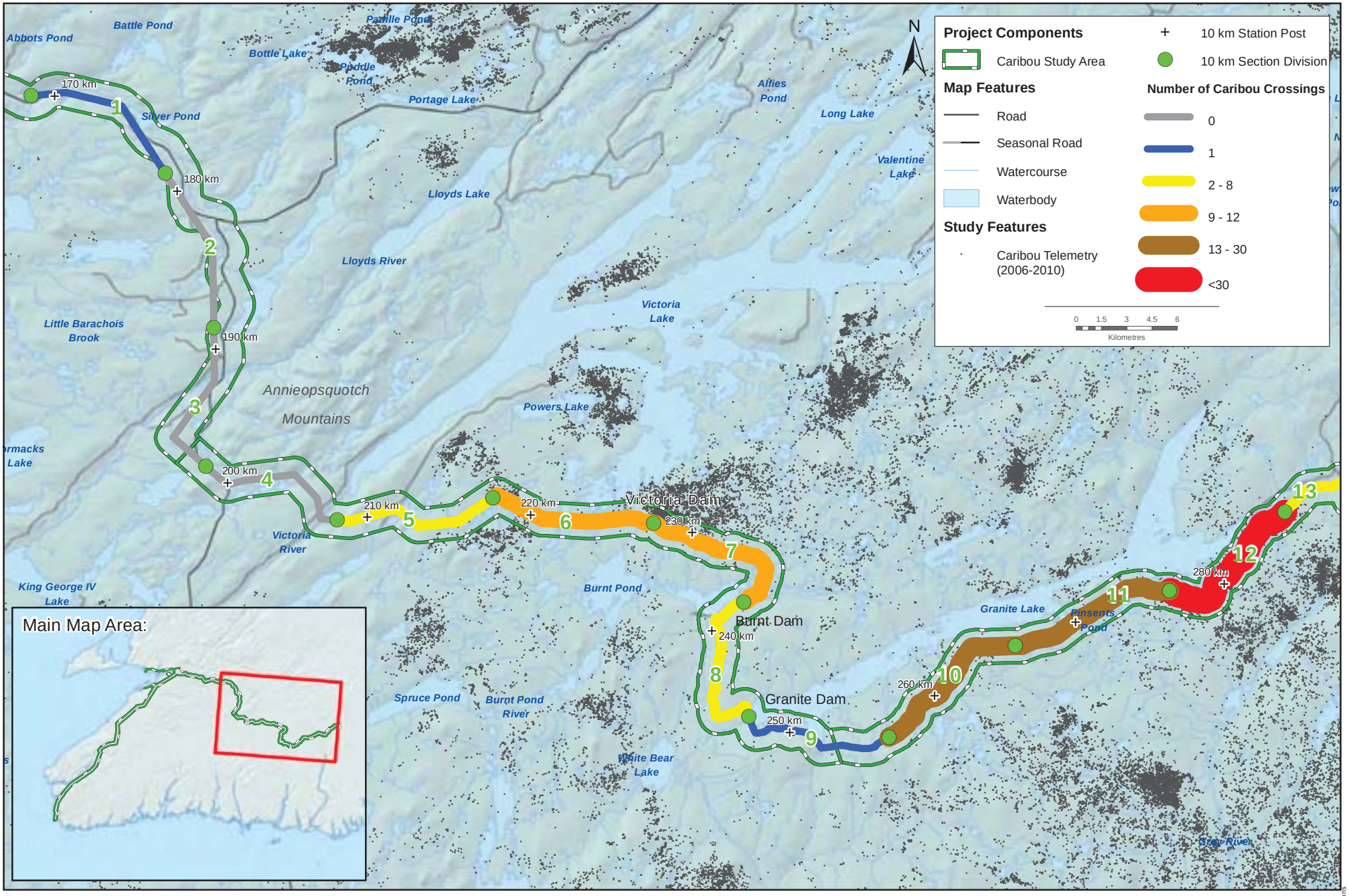
Avoidance of disturbance by caribou can alter their local movements and overall distribution. To address Guidelines pertaining to caribou distribution, caribou distribution kernel shapefiles provided by NLDEC were analysed. Although the total occupancy area is large, the seasonal occupancy areas are considerably smaller, indicating seasonal preferences for distinct areas within the overall caribou range (Table 6.1.11). Seasonal estimates of direct habitat loss (*i.e.*, project RoW) and indirect habitat loss (*i.e.*, RoW and associated buffers), within the Area of New Access are provided in Table 6.1.8. Based on this analysis, the area of caribou distribution overlap with the Project increases with increasing size of the assessment area, as expected, and also varies seasonally (Table 6.1.8). The amount of caribou distribution that may be affected by sensory disturbance (*i.e.*, the RoW plus 500m buffer, or 1.06 km wide area) is <5 % of the Area of New Acces. Predicted changes in seasonal caribou distribution following construction and during operation and maintenance are expected to be minimal as the Project will overlap only small proportions of the seasonal Primary Core Areas (<1% or less) (Table 6.1.11).

Analysis shows that there is movement by collared caribou across the centreline of the Study Area, the intensity of which varies seasonally (Figures 6.1.12 – 6.1.16). This movement of caribou was restricted to the eastern portion of the Project, from near Silver Pond to Granite Canal. Although there was a single crossing near Silver Pond in section 1, all other crossings occurred between Victoria River (section 5) and east of Granite Canal (section 13). Between 0 and 18 crossings occurred per section (Tables 6.1.12 and 6.1.13). The highest numbers of crossings were recorded in areas with existing transmission lines or roads, [*i.e.,* sections 10 through 12 (east of Granite Dam to Granite Canal)] (Tables 6.1.12 and 6.1.13).

In seasons with the fewest crossings (*i.e.,* calving, early and late post-calving and fall rut), they tended to be distributed along the transmission corridor between sections 5 and 12, with between 0 to 4 crossings occurring per section (Tables 6.1.12 and 6.1.13). In seasons with the greatest number of crossings (spring migration/pre-calving, fall migration/dispersal and winter), most crossings occurred between sections 10 and 13, with some occurring as far west as section 6 (Tables 6.1.12 and 6.1.13). The spring migration/pre-calving (Figure 6.1.14) and fall migration/dispersal (Figure 6.1.6) seasons had the highest number of crossings and the highest proportion of collared caribou crossing the centreline of the Study Area (spring migration/pre-calving – 37%; fall migration/dispersal – 33%). Winter appears to be more variable as there were many crossings made but by fewer individuals (11% of collared individuals crossed) (Figure 6.1.13). By comparison, there are few crossings in the other seasons with less than 10% of collared caribou moving across the centre of the Study Area (Tables 6.1.12 and 6.1.13).

Table 6.1.11 Seasonal Caribou Kernel Overlap with Various Assessment Areas - the Area of New Access

Assessment Area	Year	Winter			Spring			Summer			Fall			All		
		Kernel Overlap in Assessment Area (km^2)[a]	% in Assessment Area	% in RSA	Kernel Overlap in Assessment Area (km^2)	% in Assessment Area	% in RSA	Kernel Overlap in Assessment Area (km^2)	% in Assessment Area	% in RSA	Kernel Overlap in Assessment Area (km^2)	% in Assessment Area	% in RSA	Kernel Overlap in Assessment Area (km^2)	% in Assessment Area	% in RSA
66% Kernel																
RoW Direct Effects	1979-2011	0	0	0	0.21	6.25	0.20	0.21	6.22	0.26	0.21	6.25	0.18	0.20	5.82	0.25
	2005-2011	0	0	0	0.21	6.13	0.20	0.22	6.41	0.25	0.18	5.26	0.21	0.21	6.04	0.24
RoW + 500m buffer	1979-2011	0	0	0	3.44	5.75	3.24	3.67	6.13	4.60	3.22	5.38	2.69	3.43	5.73	4.34
	2005-2011	0	0	0	3.28	5.48	3.17	3.77	6.31	4.35	3.77	6.31	4.38	3.56	5.95	4.20
RoW + 1000m buffer	1979-2011	0	0	0	6.57	5.67	6.20	6.84	5.90	8.56	6.12	5.28	5.12	6.11	5.27	7.73
	2005-2011	0	0	0	6.33	5.46	6.12	7.25	6.26	8.36	5.33	4.60	6.19	6.34	5.47	7.49
RoW + 2000m buffer	1979-2011	0	0	0	14.03	6.17	13.23	13.78	6.06	17.27	13.80	6.07	11.55	11.72	5.16	14.83
	2005-2011	0	0	0	13.38	5.88	12.95	14.78	6.50	17.04	11.77	5.18	13.67	11.95	5.26	14.12
99.9% Kernel																
RoW Direct Effects	1979-2011	2.43	71.51	0.22	2.83	83.42	0.23	2.32	68.39	0.21	1.70	50.04	0.18	2.70	79.51	0.21
	2005-2011	1.37	40.21	0.16	2.61	76.88	0.22	2.16	63.53	0.22	1.74	51.17	0.20	2.51	74.06	0.21
RoW + 500m buffer	1979-2011	42.98	71.85	3.88	50.05	83.66	4.12	40.38	67.49	3.63	29.78	1.67	3.20	48.22	80.59	3.74
	2005-2011	23.67	39.57	2.83	46.42	77.59	3.87	38.31	64.03	3.90	38.31	64.03	4.42	45.27	75.67	3.80
RoW + 1000m buffer	1979-2011	84.46	72.84	7.62	96.29	83.05	7.92	78.08	67.33	7.02	57.27	49.39	6.15	95.22	82.12	7.38
	2005-2011	47.23	40.73	5.64	90.87	78.37	7.47	75.24	64.89	7.66	59.05	50.93	6.81	88.53	76.35	7.44
RoW + 2000m buffer	1979-2011	165.96	73.01	14.97	165.96	73.01	13.66	162.93	71,67	14.65	112.18	49.35	12.04	194.21	85.43	15.05
	2005-2011	95.47	42.00	11.39	179.62	79.02	14.96	153.25	67.42	15.60	114.61	50.42	13.21	176.50	77.65	14.83



Emera

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:300,000

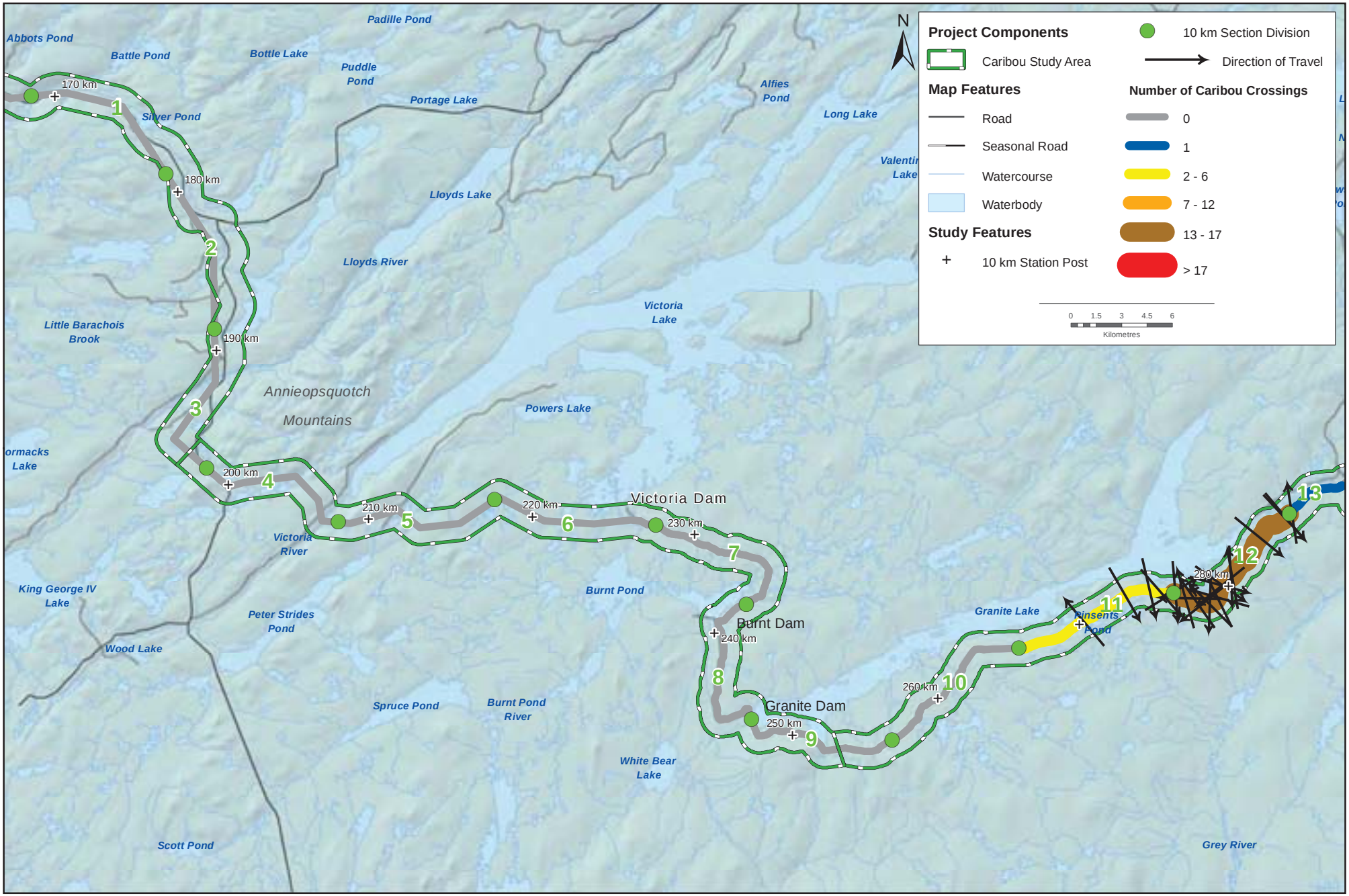
Data Sources: Geobase - Road Network; Geogratis - National Atlas

Caribou Movement - All Seasons

21 Collared Animals (2006-2010)

FIGURE 6.1.12

Caribou_Movement_All_Seasons



Emera

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:300,000

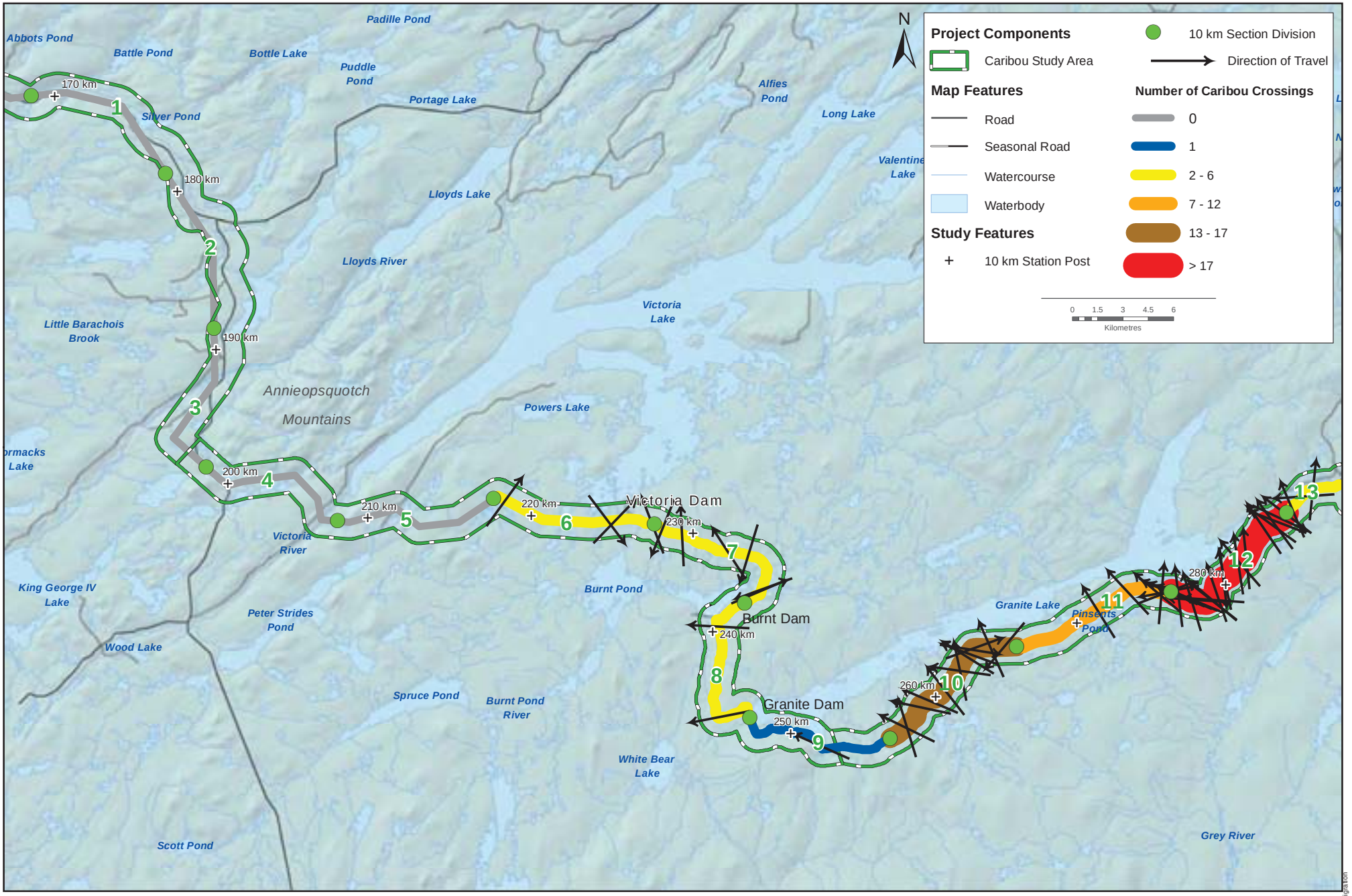
Data Sources:
Geobase - Road Network
Geogratis - National Atlas

Caribou Movement - Winter

5 Collared Animals (2006-2010)

FIGURE 6.1.13

Caribou_Movement_Winter



Emera

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:300,000

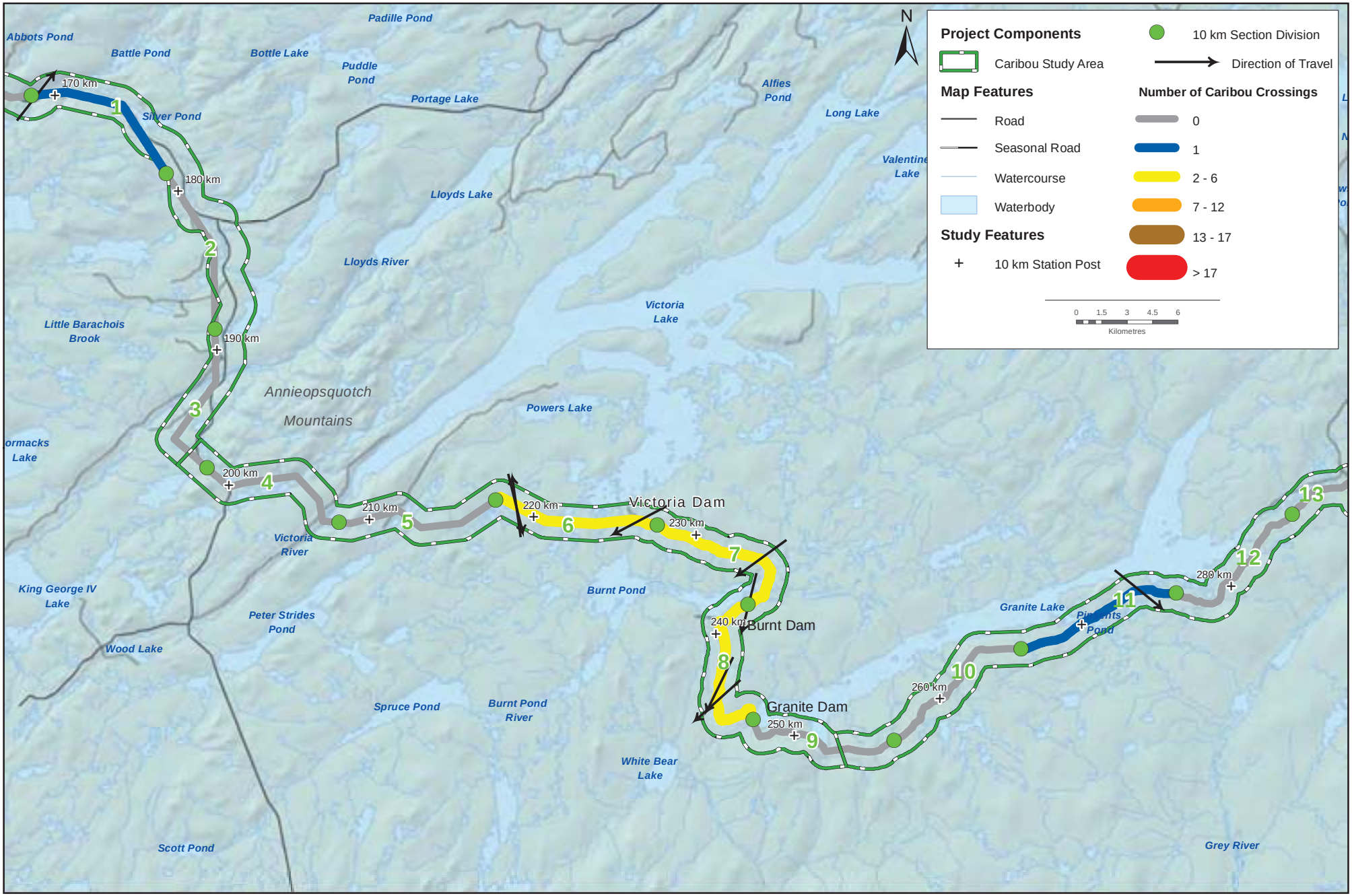
Data Sources:
Geobase - Road Network
Geogratis - National Atlas

Caribou Movement - Spring Migration/Pre-Calving

17 Collared Animals (2006-2010)

FIGURE 6.1.14

Caribou_Movement_Spring_Migration



Emera

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:300,000

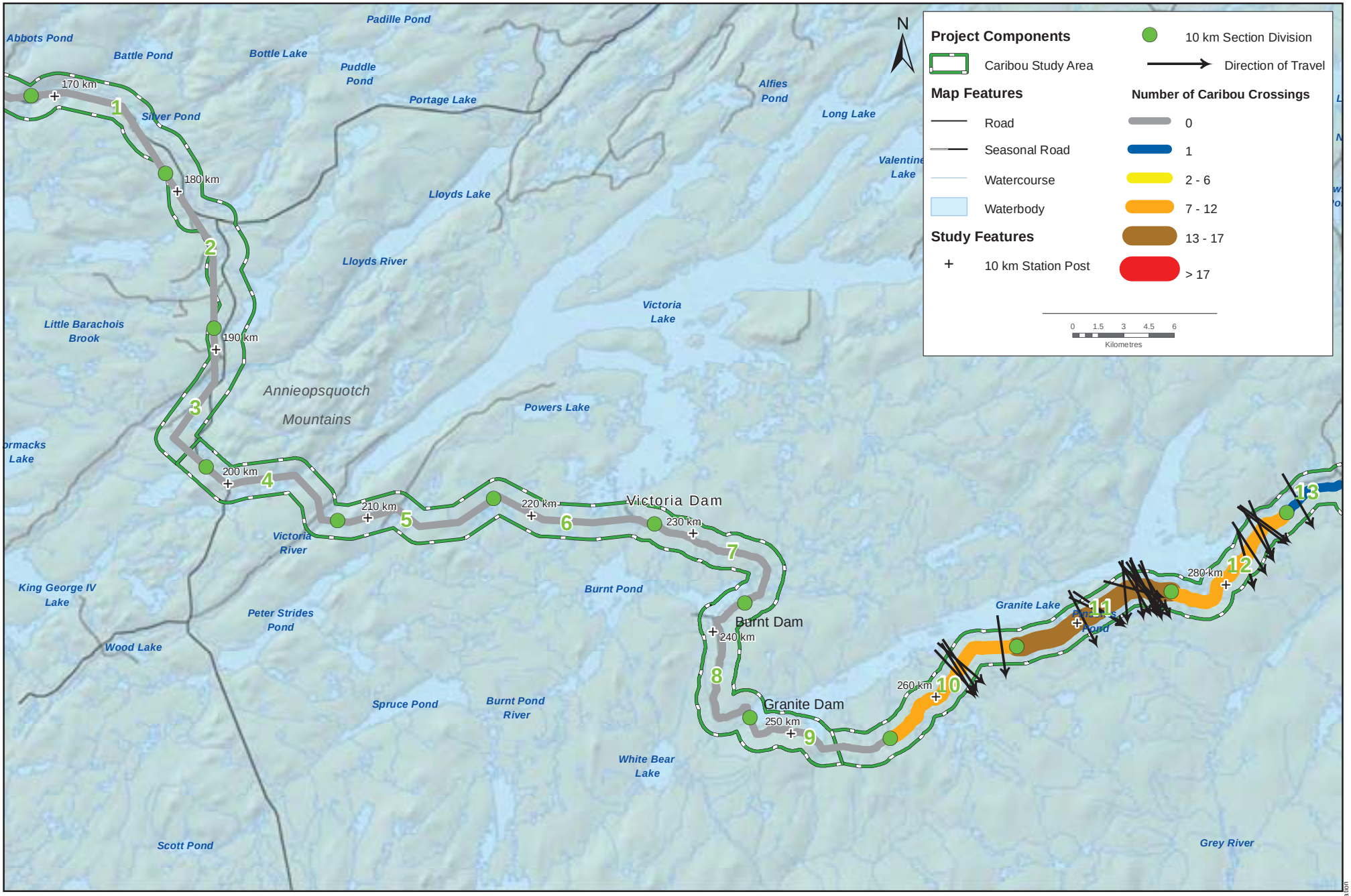
Data Sources:
Geobase - Road Network
Geogratis - National Atlas

Caribou Movement - Calving

4 Collared Animals (2006-2010)

FIGURE 6.1.15

Caribou_Movement_Calving



Emera

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:300,000

Data Sources:
Geobase - Road Network
Geogratis - National Atlas

Caribou Movement - Fall Migration/Dispersal

15 Collared Animals (2006-2010)

FIGURE 6.1.16

Caribou_Movement_Fall_Migration

Table 6.1.12 Number of Seasonal Crossings of Caribou Study Area (centre) by Collared Caribou (Proportion of Seasonal Crossings in Brackets)

10 km Section	Winter	Spring Migration/ Pre-Calving	Calving	Early Post-Calving	Late Post-Calving	Fall Rut	Fall Migration/ Dispersal	Total
1	0	0	1 (11%)	0	0	0	0	1 (1%)
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	4 (67%)	2 (22%)	0	0	6 (4%)
6	0	4 (7%[(a)])	3 (33%)	0	1 (11%)	2 (40%)	0	10 (7%)
7	0	6 (11%)	2 (22%)	0	0	3 (60%)	0	11 (8%)
8	0	2 (4%)	2 (22%)	0	3 (33%)	0	0	7(5%)
9	0	1 (2%)	0	0	0	0	0	1 (1%)
10	0	13 (24%)	0	0	0	0	8 (26%)	21 (15%)
11	3 (23%)	7 (13%)	1 (11%)	0	0	0	14 (45%)	27 (20%)
12	16 (73%)	18 (33%)	0	2 (33%)	3 (33%)	0	8(26%)	47 (35%)
13	1 (5%)	3 (6%)	0	0	0	0	1 (3%)	5 (4%)
Total	22 (100%)	54 (100%)	9 (100%)	6 (100%)	9 (100%)	5 (100%)	31 (100%)	136 (100%)

Notes:
Based on collared caribou data, 2006-2010.
(a) Proportions are rounded to the nearest whole number therefore total proportions may not add up to 100%.

Source: NLDEC data

Table 6.1.13 Seasonal Movement Across the Study Area (centre) by Collared Caribou

Seasons	No. of Collared Caribou	No. of Crossings of the Caribou Study Area (centre)[(a)]	No. of Individuals Crossing Caribou Study Area (centre)	Mean No. of Crossings per Caribou (range in brackets)[(b)]	Proportion of Collared Animals Crossing Caribou Study Area (centre)(%)[(c)]
Winter	47	22	5	4.40 (1-13)	11
Spring Migration/ Pre-Calving	46	54	17	3.18 (1-11)	37
Calving	45	9	4	2.25 (1-5)	9
Early Post-Calving	45	6	2	3.00 (2-4)	4
Late Post-Calving	45	8	3	3.00 (3)	7
Fall Rut	47	5	2	2.50 (2-3)	4
Fall Migration/ Dispersal	46	31	15	2.07 (1-4)	33

Notes:
Based on collared caribou data, 2006-2010.
(a) Indicates the number of collared caribou crossing per season, not the number of individual animals crossing. This may include multiple crossings by a single animal.
(b) Based only on collared animals that cross the Caribou Study Area (centre) and does not include caribou that do not cross.
(c) All values were rounded to the nearest whole number.

Source: NLDEC data

The directionality of crossings differed among seasons. In early and late post-calving, fall rut and winter seasons, the direction of movement across the centreline of the Caribou Study Area was approximately divided between northward (44 to 60%) and southward (40 to 56%) (Table 6.1.14). The calving season showed a distinct movement southwards (78%), however, this was based on fewer crossings than in other seasons . The seasons with the most movement (spring migration/pre-calving and fall migration/dispersal) show most collared animals moving predominantly northwards during the spring migration (80%) and southwards during fall migration (100%) (Table 6.1.14).

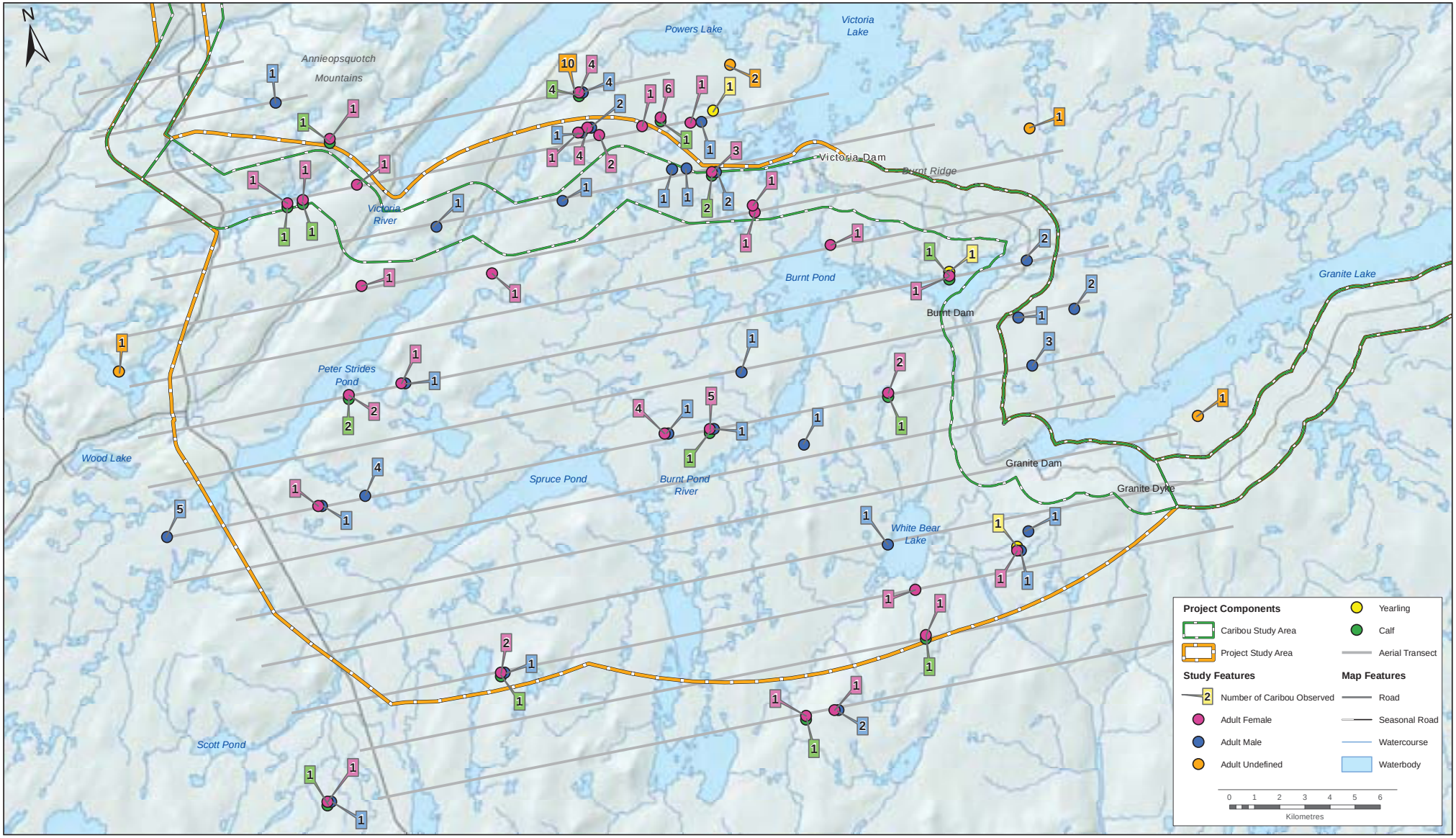
Table 6.1.14 Proportion and Directionality of Collared Caribou Crossing the Study Area (centre)

Seasons	Northwards[(a)]		Southwards[(a)]	
	No. of Crossings	Proportion of Total Crossings (%)[(b)]	No. of Crossings	Proportion of Total Crossings (%)[(b)]
Winter	10	45	12	55
Spring Migration/Pre-Calving	43	80	11	20
Calving	2	22	7	78
Early Post-Calving	3	50	3	50
Late Post-Calving	4	44	5	56
Fall Rut	3	60	2	40
Fall Migration/Dispersal	0	0	31	100

Notes:
Based on collared caribou data, 2006-2010.
(a) General direction of travel across Caribou Study Area (centre). Actual direction, depending on location crossing, may be northwest or northeast, or southwest or southeast.
(b) All values were rounded to the nearest whole number.

Source: NLDEC data

In addition to the movement analysis, caribou sightings and track information gathered from the on-going aerial wildlife survey were used to provide further evidence as to location and timing of movements across the Study Area. From information available to date, the information from the aerial wildlife surveys supports the results of the movement analysis of the point location data. Most of the track sightings occurred, not surprisingly, during winter due to the snow cover, while most of the caribou observations occurred during the spring migration/pre-calving period (Table 6.1.15). Although tracks across the Study Area were not visible during the dedicated aerial caribou surveys over the Area of New Access, the number of caribou observations indicates a heavier use of the area than at other times of the year (Table 6.1.15, Figures 6.1.17 and 6.1.18). Approximately half of the sightings occurred in areas identified as movement paths from the analysis of point location data [*i.e.,* between Silver Pond and east of Granite Canal (caribou observations – 15; track sighting – 3; possible track sighting - 1)] (Figure 6.1.17 and 6.1.18).



Emera Newfoundland & Labrador

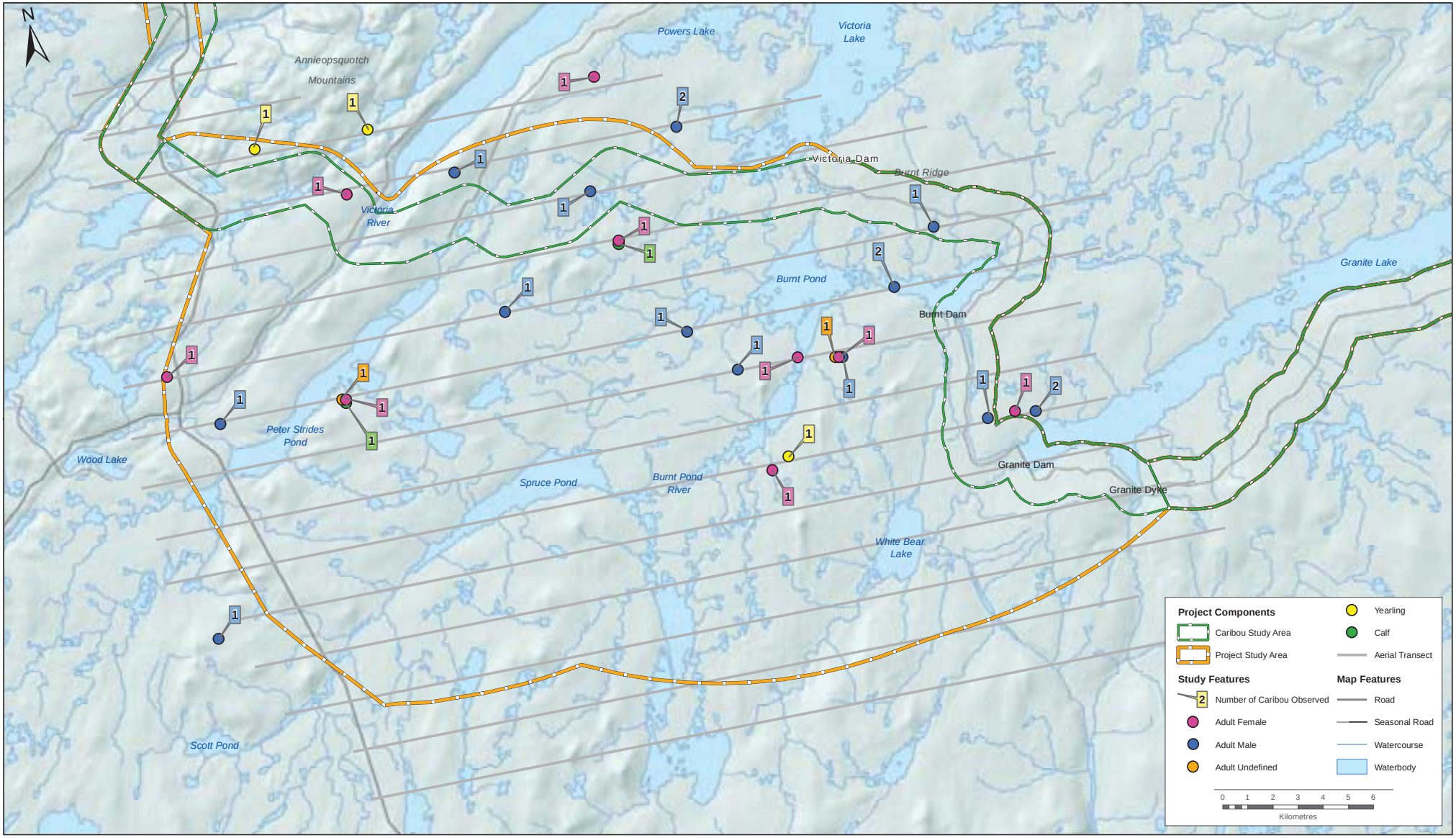
Coordinate System: UTM NAD 83 Zone 21
Scale: 1:140,000

Data Sources: Natural Resources Canada (NRCAN); U.S. Geological Survey (USGS); Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Observations during Aerial Wildlife Surveys in the Area of New Access - June 8, 2012

FIGURE 6.1.17

Aerial_Observations_June8_2012



Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21
Scale: 1:140,000

Data Sources: Natural Resources Canada (NRCAN); U.S. Geological Survey (USGS); Newfoundland and Labrador Department of Environment (NLDEC)

Caribou Observations during Aerial Wildlife Surveys in the Area of New Access - June 15, 2012

FIGURE 6.1.18

Aerial_Observations_June15_2012

Table 6.1.15 Caribou Observations within Study Area from Aerial Wildlife Surveys

Survey No. [a]	Aerial Observation	
	Caribou Observation	Notes[b]
Dedicated Caribou Survey I (8 June 2012)	136	45 AM, 54 AF, 15 AU, 2 YM, 1 YF, 19 C Including 14 calf-cow pairs in groups of two or more (up to 18)
Dedicated Caribou Survey II (15 June 2012)	32	16 AM, 9 AF, 2 AU, 2 YM, 1 YF, 2C Including two calf-cow pairs in isolation
Survey I (Fall Migration/Dispersal)	0	1 caribou track
Survey II (Winter)	3	4 caribou tracks
Survey III (Winter)	0	4 caribou tracks
Survey IV (Spring Migration/Pre-Calving)	18	caribou were not classified
Survey V (Fall Rut)	26	caribou were not classified
Total Observations	**214**	

Notes:
[a]Survey dates available in Section 6.1.2.1
[b]AM = Adult Male; AF = Adult Female, AU = Adult Unknown Sex, YM = Yearling Male, YF = Yearling Female, C = Calf

6.1.5 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

The residual environmental effects of the Project on caribou are summarized in Table 6.1.16.

Table 6.1.16 Summary of Project Residual Environmental Effects: Caribou on the island of Newfoundland

CHANGE IN HABITAT

Mitigation

- Through Project design, limit the area of disturbance through the use of existing roads and by choosing routes that parallel existing linear features, where feasible.
- Obsolete work areas and temporary access roads will be decommissioned to encourage a return to natural conditions.
- The proposed routing has avoided primary core areas for calving and winter distribution. Any contemplated route adjustments will, where feasible, avoid these areas of sensitivity for caribou.
- Clearing limits will be marked and Project activities will be limited to designated areas, where feasible.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	Magnitude	Extent	Duration	Frequency	Reversibility	Environmental Context	Significance
Construction	Adverse	Low	Local/ Regional	Medium/ Permanent	Regular basis	Reversible/ Irreversible	Developed/ Undisturbed	Not significant
Operations	Adverse	Low	Local/ Regional	Medium/ Permanent	Continuous	Irreversible	Developed/ Undisturbed	Not significant

Table 6.1.16 Summary of Project Residual Environmental Effects: Caribou on the island of Newfoundland

CHANGE IN HABITAT

Follow-up

All follow-up and monitoring for caribou undertaken by ENL will be developed collaboratively with the SDSS and Wildlife Division to determine the most effective and informative programs, as appropriate. This includes developing and refining proposed mitigation measures upon confirmation of the final routing of the transmission corridor.

CHANGE IN DISTRIBUTION

Mitigation

- Through Project design, limit the area of disturbance through the use of existing roads and by choosing routes that parallel existing linear features, where feasible.
- Site-specific mitigation measures will be developed in consultation with NLDEC, and included in the EPP.
- Activity within the Primary Core Areas / 66% kernel distributions will be limited during calving and post-calving season, as feasible.
- Areas identified as important movement paths will be avoided during high use periods, where feasible.
- Standard operating procedures will be developed and included in the EPP that specify required actions to be followed if caribou approach work sites. These procedures will include buffer zone distances and will specify permitted and restricted activities.
- Where feasible, NLDEC will be requested to provide the locations of any collared caribou within a specified distance from construction sites. Where feasible, such activities could be modified while caribou are within a specified distance (to be determined in consultation with NLDEC).
- A policy of no hunting or other harassment of wildlife by Project personnel will be developed which will prohibit possession of pets on the work site.
- 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 determine the presence of caribou; blasting will be delayed, where feasible, until caribou have left the area of their own accord.
- Access to Project-related roads and work areas will be restricted to site personnel, where feasible.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
Construction	Adverse	Low	Local/ Regional	Medium/ Permanent	Regular basis	Reversible/ Irreversible	Developed/ Undisturbed	Not significant
Operations	Adverse	Low	Local/ Regional	Medium/ Permanent	Continuous	Irreversible	Developed/ Undisturbed	Not significant

Follow-up

Analysis of caribou seasonal distribution following Project construction will be conducted to confirm predictions. Additional monitoring and follow-up activities could include continued collection and analysis of caribou distribution and movement data from telemetry collars, and aerial wildlife surveys of the Study Area following construction.

KEY

Direction:
Positive.
Adverse.

Magnitude:
Change in Habitat
Low: Less than 5% of the Primary Core

Geographic Extent:
Local: within the Caribou Study Area
Regional: within the Occupancy Area,

Duration:
Use quantitative measure; or
Short term: During the Project Phase.

Environmental Context:
Undisturbed: Area relatively or not adversely affected by human activity; includes Area of New Access.
Developed: Area has been substantially previously disturbed by human

Table 6.1.16 Summary of Project Residual Environmental Effects: Caribou on the island of Newfoundland

CHANGE IN HABITAT		
Area / 66% kernel distribution will be exposed to the effect, with no predicted measurable change to a caribou herd M Moderate: Between 5% to 25% of the Primary Core Area / 66% kernel distribution will be exposed to the effect, with a predicted measurable change to a caribou herd that does not cause management concern H High: Greater than 25% of the Primary Core Area / 66% kernel distribution will be exposed to the effect, with a predicted measurable change to a caribou herd that does cause management concern. . ***Change in Distribution*** Less than 5% change in size or location of the Primary Core Area / 66% kernel distribution, with no predicted measurable change to a caribou herd Moderate: Between 5% to 25% change in size or location of the Primary Core / 66% kernel distribution, with a predicted measurable change to a caribou herd that does not cause management concern High: Greater than 25% change in the size or location of the Primary Core Area / 66% kernel distribution, with a predicted measurable change to a caribou herd	Medium term: Duration of the Project. Long term: Duration of the Project plus 10 years. Permanent: Will not change back to original condition. ***Frequency:*** Occasionally, once per month or less. Occurs sporadically at irregular intervals. Occurs on a regular basis and at regular intervals. Continuous. ***Reversibility:*** Reversible. Irreversible.	development or human development is still present. N/A Not Applicable. ***Significance:*** Significant. Not Significant.

6.1.6 CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the caribou VEC, the assessment area for cumulative environmental effects is the Occupancy Area defined by the point location data from collared caribou, (*i.e.*, the southwest portion of the island of Newfoundland).

In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 6.1.17 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 6.1.17 also ranks the potential cumulative environmental effects to caribou as 0, 1, or 2 based on the degree of interaction with other project or activities and the potential for overlapping effects with the Project.

Table 6.1.17 Potential Cumulative Environmental Effects to Caribou

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Change in Caribou Habitat	Change in Caribou Distribution
Existing Linear Facilities	2	2
Existing Residential and Recreational Land Use	1	1
Resource Land Use	1	1
Indian Head Salmon Hatchery	0	0

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.

The future projects and activities considered for the cumulative environmental effects assessment include those likely to have residual environmental effects that overlap with the Project. General infrastructure and economic development projects, such as road maintenance/construction, municipal works, and localized industrial construction, which often have short-term construction periods, are not likely to have significant residual environmental effects on caribou. Even larger scale construction projects will most likely be limited in scope.

On the island of Newfoundland the western and central portions of the Maritime Link will roughly parallel existing transmission lines. Although increases in the density of linear features have the potential to adversely affect caribou, the Project will have less of an environmental effect due to its close proximity to the existing facilities.

Land use is expected to be more intense in the areas with existing access, such as transmission lines or forestry roads. Although off-road vehicles (ATVs and snowmobiles in particular) currently travel in the In the Area of New Access, it is relatively remote and thus subject to more limited and less frequent use by the general public. Increased access may allow greater use of the region by off-highway vehicles that may, in turn, increase hunting opportunities and the potential for harassment of caribou. However, careful project planning and design will result in minimal changes in the ease of access to, and within, the Area of New Access. Maximum use of existing roads to gain access to the area, the routing of the transmission corridor through natural “break points” (major water crossings and steep rock slopes), coupled with limiting temporary construction trails, will reduce the potential for increased access and the attendant adverse effects on caribou arising from human interference.

Forestry is an example of resource use on the island of Newfoundland that can have implications for caribou through the removal of potential habitat. Clearcutting can create habitat that is avoided by caribou as it does not offer adequate forage or protection from predators. Furthermore, clearcutting can support increases in moose population that can, in turn, lead to an increased population density of wolves and a subsequent increase in caribou predation. The

Project overlaps Forest Management Districts 13 and 14 where there has been forestry activity in the past, especially in the area between Bottom Brook and Granite Canal. However, there is no forestry activity indicated for the eastern portion of this area (in District 13) in the proposed current Five-Year Operating Plan (2011-2015) (NLDNR 2011a).

The Indian Head Salmon Hatchery will be a land-based hatchery for salmon eggs, smolt and broodstock. The level of avoidance by caribou is likely to be similar to any other building near a road. Although this facility will be adjacent to the Project, there will be minor overlap and little interaction is anticipated.

Overall, there could be cumulative effects on caribou from interaction between the Project and past, present and future projects and activities within the southwestern portion of the island of Newfoundland. However, the potential contribution of the Project to the cumulative environmental effects on caribou will be limited due to the scope of the Project, planning and design decisions, and proposed mitigation measures.

Landscape disturbances have the potential to cause the direct and indirect loss of caribou habitat and influence caribou movements. However, implementing effective mitigation measures as well as monitoring programs will play an important role in minimizing the potential for cumulative environmental effects associated with the Project. According to Thomas and Gray (COSEWIC 2002), "*if sources of mortality such as wolf predation and hunting are managed, caribou may be able to co-exist with well-managed developments*".

6.1.7 DETERMINATION OF SIGNIFICANCE

6.1.7.1 Residual Project Environmental Effects

An adverse residual environmental effect is considered significant if it is of sufficient magnitude, duration or geographic extent to cause a change in the affected caribou population that will alter its status or integrity beyond an acceptable level relative to baseline. This assessment considered environmental effects including changes in caribou habitat and distribution.

With regard to minimizing the effects on caribou, this report has benefitted from the a number of important sources of information and data that were critical in designing the Project, assessing environmental interactions and determining the significance of residual effects, as follows:

- Clearly defined requirements as set out in the Guidelines
- Extensive scientific literature on the biology and ecology of woodland caribou
- Experience with the effects on caribou from other similar projects
- Data and information from over 30 years of research on Newfoundland populations of caribou

- The Ecological Land Classification that provided the basis for mapping caribou habitat units
- Consultations with relevant experts in NLDEC (Wildlife Division and SDSS)

The integration of information from these sources enabled the engineering team to maximize the benefits of mitigation by design through routing and siting of Project components. Similarly, it provided the environmental team with the data and analytical tools to (i) design caribou-specific mitigation measures, (ii) confidently predict the Project-caribou interactions, (iii) determine the significance residual effects, and (iv) recommend effective monitoring and follow-up programs. The results of these analyses and interpretations are summarized below.

Change in Habitat

The proportion of total caribou distribution that will be affected by direct habitat loss from clearing will be less than 1% in all occupancy areas (Primary Core, Secondary Core or Occupancy Areas). Environmental effects related to sensory disturbance, which may cause avoidance by caribou, are also predicted to affect 1% or less of all occupancy areas. Within the more sensitive seasons, although large proportions of the Primary Core Area (as defined by caribou distribution) within the Study Area were ranked as primary habitat, this accounts for only a small portion of the seasonal Primary Core Area (1% or less).

Analysis of the overlap of caribou locations and the ELC indicate that some ELC Units are being selected by caribou, including coniferous forest, ericaceous/lichen heathland and ericaceous/coniferous scrub complex. The distribution of point locations shows the highest densities of caribou occur outside of the Study Area and no overlap between caribou and the Study Area west of Victoria Lake. As the magnitude and extent of this environmental effect is low, the residual environmental effects of change in habitat are considered not significant.

Change in Distribution

The caribou populations in southwestern Newfoundland currently (based on 2006-2010 data) have little overlap with the Project. The areas of highest use (Primary Core Area) overlap 1% or less with the Project in all seasons. There is some movement of caribou across the centreline of the Study Area (as shown by data from collared animals); particularly during the periods of spring migration/pre-calving and fall migration/dispersal; spatially the area of highest use is between Victoria River and Granite Canal. Caribou may demonstrate avoidance of disturbance and linear structures, however there is little overlap between the Project and the overall distribution of the caribou populations of concern. Therefore, it is unlikely that any effects arising from the Project would result in large-scale changes in seasonal distribution. The residual environmental effects of change in distribution are considered not significant.

6.1.7.2 Residual Cumulative Environmental Effects

There is limited overlap between the Project and the caribou populations of concern (La Poile, Buchans and Grey River). Considering this, as well as the low proportion of Primary Core Area

potentially disturbed by Project (<1%) and proposed mitigation measures for the Project, combined with the nature, scope and location of other past, present and foreseeable future projects and activities, the potential cumulative effects relative to changes in caribou habitat or distribution are predicted to be not significant.

Although the predicted changes to caribou habitat and distribution are adverse, they are also predicted to be of low magnitude, thereby not having a population-level effect. Based on information derived from an extensive literature review, relevant datasets provided by the provincial caribou management and research body (NLDEC), discussions with the NLDEC and professional judgment, the level of confidence in this determination is high.

6.1.8 FOLLOW-UP AND MONITORING

All follow-up and monitoring for caribou undertaken by ENL will be developed collaboratively with the SDSS and Wildlife Division to determine the most effective and informative programs, as appropriate. This includes developing and refining proposed mitigation measures upon confirmation of the final routing of the transmission corridor.

Analysis of caribou seasonal distribution following Project construction will be conducted to confirm predictions. Additional monitoring and follow-up activities could include continued collection and analysis of caribou distribution and movement data from telemetry collars in the context of a BACI (Before-After-Control Impact) design, and aerial wildlife surveys particularly in the Area of New Access following construction.

With the implementation of proposed mitigation described for Caribou, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. However, additional work and/or monitoring may be required pending the results of mitigation required for the Project.

6.2 SPECIES OF CONSERVATION INTEREST

The SOCI VEC for NL refers to those wildlife species that live for at least part of their life cycle in NL, and that have been identified by federal or provincial laws and regulations as being “Endangered,” “Threatened,” “Vulnerable,” or of “Special Concern,” or listed as such by COSEWIC. The effects assessment of SOCI includes all SOCI located within the vicinity of, and with the potential to interact with, the Project, and their habitats.

SOCI were collectively selected as a VEC because of the specific regulatory requirements of *SARA*, and provincial endangered species laws and regulations. SOCI require special attention during the environmental assessment process as their populations may be more sensitive to anthropogenic stressors than secure or non-threatened species and they often serve as important indicators of ecosystem health and regional biodiversity. Woodland caribou are assessed in the Caribou VEC (Section 6.1). SOCI in the Cabot Strait and NS are assessed in Sections 7.1 and 8.1, respectively. Non-SOCI marine and coastal species are assessed in other

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VECs, including the Commercial Fisheries VEC (Section 7.2) and Marine Environment VEC (Section 7.3).

6.2.1 SCOPE OF ASSESSMENT

6.2.1.1 Regulatory Setting

Both federal and provincial legislation protect SOCI. *SARA* and the Newfoundland and Labrador *Endangered Species Act* (NL *ESA*) generally protect species listed as being extirpated, endangered or a threatened as well as the residences and critical habitats of those species.

At the federal level, *SARA* seeks "to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened." A "wildlife species" under *SARA* is "a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and (*a*) is native to Canada; or (*b*) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years."

Key provisions protecting SOCI under *SARA* include:

- S. 32(1): "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species."
- S. 32(2): "No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual."
- S. 33: "No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada."
- For listed wildlife species that are not an aquatic species or a species of birds that are migratory birds protected by the *Migratory Birds Convention Act*, 1994, ss. 32 and 33 only apply to federal lands unless an order is made.
- A recovery plan and an action plan must be prepared for a wildlife species listed as an extirpated species, an endangered species or a threatened species. [ss. 37, 47]
- S. 58: "No person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species — or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada — if (a) the critical habitat is on federal land, in the exclusive economic zone of

Canada or on the continental shelf of Canada; (b) the listed species is an aquatic species; or (c) the listed species is a species of migratory birds protected by the *Migratory Birds Convention Act*, 1994."

"Critical habitat" in *SARA* means "means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."

- Section 61 provides for the protection of the critical habitat of listed endangered species and threatened species not located on federal land specified by an order.
- Protection of wildlife species not listed under *SARA* but listed by a provincial or territorial minister and their habitat on federal land is provided under ss. 36 and s. 60.
- A management plan must be prepared for a wildlife species listed as a species of special concern and its habitat. [s. 65]

A person may, however, be authorized by an agreement or a permit under s. 73 (or under another Act of Parliament or provincial legislation) to engage in an activity affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals provided that certain conditions are satisfied.

Ministerial notification is required under s. 79 if a project is likely to affect a listed wildlife species or its critical habitat. The person required to notify the minister must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans.

Migratory birds in general, including SOCI, are protected federally under the *MBCA*, which is administered by EC. The MBCA and Regulations provide protection to all birds listed in the Canadian Wildlife Service (CWS) Occasional Paper No. 1, "Birds Protected in Canada under the *Migratory Birds Convention Act*". The Act and associated Regulations state that no person may disturb, destroy, or take/have in their possession a migratory bird (alive or dead), or its nest or eggs, except under authority of a permit. Migratory birds protected by the Act generally include all seabirds, except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles) (EC 2012d).

Aquatic organisms in general, including SOCI, are protected federally under the *Fisheries Act*. The *Fisheries Act* and Regulations provide protection for the habitats of all aquatic organisms, where the definition of "fish habitat" includes spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.

Key provisions protecting SOCI under the NL *ESA* include:

> S. 16(1): "A person shall not disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated."
>
> S. 16(2): "A person shall not capture, possess, buy, sell or trade a specimen of a species designated as threatened, endangered or extirpated or part of it or anything derived from it."
>
> S. 16(3): "A person shall not disturb or destroy the residence of an individual of a species designated as threatened, endangered or extirpated."

An area of land may be protected as "recovery habitat" and "critical habitat" for species designated as vulnerable, threatened, endangered or extirpated under s. 28.

A recovery plan must be prepared for species designated as threatened, endangered or extirpated whereas a management plan must be prepared for a species designated as vulnerable. Recovery and management plans are put in place to support and/or facilitate the recovery of the species. NLDEC coordinates the conservation and recovery of listed species. The management of wildlife species in Newfoundland and Labrador is regulated under the *Wildlife Act*.

The Minister may issue a permit to a person under s. 19 to engage in an activity affecting a designated species, the residence of a specimen of a designated species or critical or recovery habitat when certain prescribed conditions are met.

6.2.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of SOCI is focused on changes that would directly or indirectly affect a species at the population level. This environmental effect was chosen based on regulatory requirements as well as public concern regarding the at-risk status of these species.

The Project has the potential to affect SOCI through changes in their abundance, as well as the quantity and quality of their habitat, which could lead to a reduction in regional biodiversity. The specific concerns are habitat loss, degradation and/or avoidance of habitat by SOCI, as well as loss of individuals, which collectively could result in population declines.

The measurable parameters used for the assessment of the environmental effects presented above, and the rationale for their selection, are provided in Table 6.2.1. The selection was based on professional judgment of the study team. The measurable parameters have a clear unit of measurement and are indicative of parameters that are important to SOCI populations.

Table 6.2.1 Measurable Parameters for SOCI

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in SOCI Populations	Change in Habitat	• Interactions between the Project activities and areas used by SOCI could affect SOCI populations where they overlap.
	Change in Mortality Risk	• An increase in mortality could have an effect on the sustainability of endangered, threatened, and special concern (vulnerable) populations of SOCI.

6.2.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on SOCI include the periods of construction, and operation and maintenance. The effects will be greatest during construction, when ground work causes the majority of disturbance. Operation and maintenance would have the least potential to create adverse environmental effects on SOCI.

Construction of the Project will be carried out over approximately three years. Operation and maintenance would begin following the completion of construction and will continue for the life of the Project.

The spatial boundaries for the environmental effects assessment of SOCI are defined below.

The Study Area for the SOCI VEC is shown on Figure 1.2.2 as 2-km-wide area which runs from the Granite Canal substation to Cape Ray. The Study Area is divided in to four segments as described in Section 2: Granite Canal Access Road, Area of New Access, Burgeo Highway, and Bottom Brook to Cape Ray. The Project parallels existing transmission corridors, except within the Area of New Access.

The assessment area for cumulative effects for SOCI comprises the following Subregions as defined by the Protected Areas Association of Newfoundland and Labrador (PAA 2008a, b, c, d, e, and f): the Central Barrens; Red Indian; Portage Pond; Southern Long Range; St. George's Bay; and Codroy.

6.2.1.4 Threshold for Determining the Significance of Residual Environmental Effects

The federal *SARA* and the provincial NL *ESA* protect species that are most vulnerable. However, within these Acts there are different levels of protection afforded a species, depending upon its vulnerability (*e.g.*, Schedule 3 listed species are not afforded the same protection as Schedule 1 species). These rarity rankings are used in establishing the residual environmental effects rating criteria for the potential effects of the Project on SOCI populations.

A **significant adverse residual environmental effect** on SOCI is defined as a Project-related environmental effect that meets any of the following criteria:

- One that results in a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of *SARA* or in Section 16 of the NL *ESA.* These prohibitions stipulate that it is an offence to kill, harm, injure, disturb, harass, capture, buy, sell, possess, trade, or take any individual belonging to a species that is designated as "Endangered," "Threatened," or "Extirpated." Similarly, it is an offence to attempt the actions above, or to direct another to do them. It is also illegal to damage or destroy the residence of an individual of an "Endangered" or "Threatened" species, or of an extirpated species if reintroduction is recommended.

- One that is not in compliance with the objectives of recovery or management plans created under *SARA* and/or NL *ESA* that are in place at the time of relevant Project activities.

- One that alters the habitat of the SOCI within the spatial boundaries of the Project, physically, biologically, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of SOCI populations that are dependent upon that habitat such that the likelihood of the long-term survival of those populations in NL is substantially reduced as a result.

- One that results in the direct mortality of individuals of a SOCI such that the likelihood of the long-term survival of the population on the island of Newfoundland is substantially reduced as a result.

6.2.2 BASELINE CONDITIONS

The following section summarizes the current state of knowledge of baseline conditions for SOCI likely to be found within the Study Area on the island of Newfoundland. The determination of which SOCI are likely to be found within the Study Area is based on known distributions and potential habitat as determined from a review of various sources of information (described in Section 6.2.2.1), and the professional judgment of the study team.

Table 6.2.2 lists the species included within this VEC, as well as their designation under *SARA,* COSEWIC, and NL *ESA.*

Table 6.2.2 SOCI with Potential to Occur in the Study Area (NL)

Common Name	Scientific Name	Designation		
		SARA[a]	**COSEWIC**	**NL *ESA***
Mammals				
Newfoundland marten	*Martes americana atrata*	Threatened	Threatened	Threatened
Little brown myotis	*Myotis lucifugus*	No Status	Endangered	No Status
Northern myotis	*Myotis septentrionalis*	No Status	Endangered	No Status
Birds				
Harlequin Duck (Eastern pop.)	*Histrionicus histrionicus pop. 1*	Special Concern	Special Concern	Vulnerable
Barrow's Goldeneye	*Bucephala islandica*	Special Concern	Special Concern	Threatened

Table 6.2.2 SOCI with Potential to Occur in the Study Area (NL)

Common Name	Scientific Name	Designation		
		SARA[a]	COSEWIC	NL *ESA*
Piping Plover *melodus* subspecies	*Charadrius melodus* ssp. *melodus*	Endangered	Endangered	Endangered
Red Knot *rufa* subspecies	*Calidris canutus* spp. *rufa*	Endangered	Endangered	Endangered
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered	Endangered
Short-eared Owl	*Asio flammeus*	Special Concern[b],	Special Concern	Vulnerable
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Barn Swallow	*Hirundo rustica*	No Status	Threatened	No Status
Gray-cheeked Thrush	*Catharus minimus*	No Status	No Status	Vulnerable
Bobolink	*Dolichonyx oryzivorus*	No Status	Threatened	No Status
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Vulnerable
Red Crossbill *percna* subspecies	*Loxia curvirostra* ssp. *percna*	Endangered	Endangered	Endangered
Fishes				
American eel (catadromous)	*Anguilla rostrata*	No Status	Threatened	Vulnerable
Banded killifish	*Fundulus diaphanus*	Special Concern	Special Concern	Vulnerable
Vascular Plants				
Mountain holly fern	*Polystichum scopulinum*	Threatened	Threatened	No Status
Low northern rockcress	*Braya humilis/Neotorularia humilis*	No Status	No Status	Endangered
Lichens				
Boreal felt lichen (Boreal pop.)	*Erioderma pedicellatum*	Special Concern	Special Concern	Vulnerable

[a] *SARA* designations are within Schedule 1 unless otherwise noted
[b] Recommended by Species Status Advisory Committee to be listed as Vulnerable.

Source: *SARA* Public Registry

6.2.2.1 SOCI Information Sources

For each SOCI, the status under *SARA*, NL *ESA* and COSEWIC was determined through a review of the following sources:

- SAR Public Registry website (http://www.sararegistry.gc.ca/default_e.cfm);
- the NL SAR website (http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/index.html);
- the most recent COSEWIC status reports; and
- Species Status Advisory Committee Annual Reports and Species Status Reports.

Current provincial S-ranks refer to sub-national, or provincial, rarity or conservation status ranks. General Status ranks refer to national and provincial rankings that summarize current state and known trends in population distribution and size, and individual or habitat threats. These status ranks were determined through a review of the most recently released information from the Atlantic Canada Conservation Data Centre (AC CDC) and the Canadian Endangered Species Conservation Council (CESCC), respectively (AC CDC 2011, CESCC 2011).

Primary habitat for each species, defined broadly as habitat that provides the main requirements for the survival of a species and/or defined critical/recovery habitat where applicable, was determined from known habitat associations and information from COSEWIC status reports, COSEWIC management plans, and other literature. For each species, this information was then related to habitat types within the Study Area, as delineated in the (ELC) developed for the Project. Species are often associated with habitats that are more specific than the described ELC types; in these cases, primary habitat was listed as the ELC type(s) that contains the primary habitat for the species, with additional parameters stated when necessary.

Table 6.2.3 lists the ELC types by area and percentage of total coverage in the four segments of the Study Area on the island of Newfoundland (Bottom Brook to Cape Ray and Burgeo Highway are combined).

Table 6.2.3 ELC Types by Area and % of Total Coverage Within the Four Segments of the Study Area (NL)

ELC Types	Cape Ray to Burgeo Highway		Area of New Access		Granite Canal		Total Area (ha)
	(ha[1])	(%)	(ha)	(%)	(ha)	(%)	
Coniferous Forest	12805.1	29.9	7056.5	10.2	836.1	12.6	20697.7
Coniferous Scrub	1828.9	4.3	6032.7	8.7	864.8	13.1	8726.4
Deciduous Forest	703.6	1.6	1106.6	1.6	109.5	1.7	1919.7
Deciduous Scrub	2623.9	6.1	350.1	0.5	12.9	0.2	2986.9
Mixed Wood Forest	9806.6	22.9	0	0.0	0	0	9806.6
Ericaceous/Lichen Heathland	700.6	1.6	7451.6	10.7	647.3	9.8	8799.5
Ericaceous/Coniferous Scrub Complex	2444.9	5.7	12073.3	17.4	1686.8	25.5	16205.0
Subalpine	12.9	0.0	400.4	0.6	0	0	413.3
Wetland: Ericaceous/ Lichen	1401.8	3.3	8787	12.6	719.9	10.9	10908.7
Wetland: Ericaceous/ Coniferous Scrub	5232.1	12.2	749	1.1	120.8	1.8	6101.9
Wetland: Bryoid/ Graminoid	1553.6	3.6	8794.7	12.7	1413.3	21.3	11761.6
Wetland: Graminoid/Herbaceous	139.2	0.3	0	0.0	0	0	139.2
Wetland: Unvegetated Peat	37.6	0.1	1026.4	1.5	209.3	3.2	1273.3
Water	1629.9	3.8	8636.8	12.4	681.7	10.3	10948.4
Riverbanks and	191.8	0.4	996.6	1.4	315.4	4.8	1503.8

Table 6.2.3 ELC Types by Area and % of Total Coverage Within the Four Segments of the Study Area (NL)

ELC Types	Cape Ray to Burgeo Highway		Area of New Access		Granite Canal		Total Area (ha)
	(ha[1])	(%)	(ha)	(%)	(ha)	(%)	
Lakeshores							
Exposed Rock/Unvegetated Anthropogenic	932.2	2.2	410	0.6	255.2	3.9	1597.4
Vegetated Anthropogenic	758.4	1.8	0	0.0	0	0	758.4
Dune System	0.4	0.0	0.0	0.0	0.0	0.0	0.4
Imagery Cloud and Shadow	60.0	0.1	5597.9	8.1	0.0	0.0	5657.9
No data	2.7	0.0	0.0	0.0	0.0	0.0	2.7
Total	**42,808**	**100**	**63,873**	**100**	**7,588**	**100**	**120,208.7**

[1]ha = hectare (10,000 m^2)

ENL commissioned several field-based studies to gain more knowledge on the distribution and abundance of wildlife species within the Study Area on the island of Newfoundland. These field studies, undertaken by Stantec, included land-based wildlife surveys (conducted in conjunction with ELC field work), winter aerial wildlife surveys, coastal migration surveys and avifauna breeding surveys.

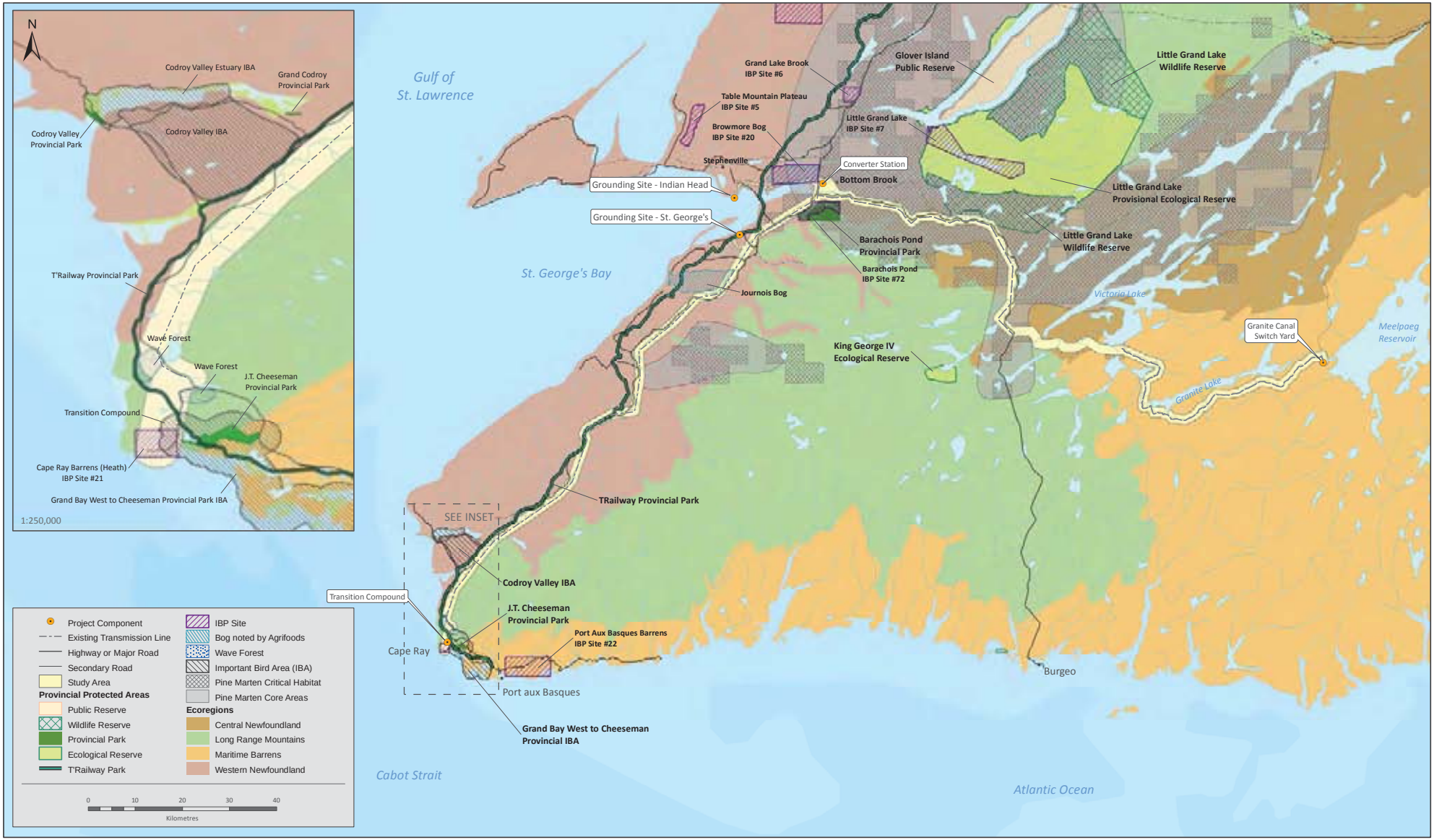
Additional information on the distribution of SOCI in Canada, and specifically on the island of Newfoundland, was attained from COSEWIC status reports, AC CDC reports, and scientific literature. For bird SOCI information from the North American Breeding Bird Survey (BBS) was also used (Breeding Bird Atlas Explorer 2012). The BBS is a program that was implemented in 1966 to monitor bird populations throughout North America, and is composed of data collected on set roadside routes by skilled volunteers.

6.2.2.2 Protected and Sensitive Areas near the Project

A number of recognized protected and sensitive areas have been identified in the general vicinity of the Study Area on the island of Newfoundland. These areas can provide important habitat for many wildlife species, and SOCI in particular. The locations of protected and sensitive areas in southwestern Newfoundland are illustrated in Figure 6.2.1.

Federal Protected Areas

Federal protected areas on the island of Newfoundland include National Parks, National Historic Sites, and National Marine Conservation Areas, managed by Parks Canada; National Wildlife Areas (NWAs), Marine Wildlife Areas, and Migratory Bird Sanctuaries (MBSs), managed by EC; and Marine Protected Areas, managed by Fisheries and Oceans Canada.



Emera

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:750,000
Date: 20/11/2012

Data Sources:
Geobase - Road Network
Geogratis - National Atlas
Government of Newfoundland and Labrador

Protected and Sensitive Areas
Island of Newfoundland

FIGURE 6.2.1

EN/0058

There are two National Parks on the island of Newfoundland: Gros Morne National Park, located at the base of the Northwestern Arm, and Terra Nova National Park, located on the east coast. Neither of these parks is near the Study Area. Seven National Historic Sites are located on the island of Newfoundland, none of which are near the Study Area. There are currently only two National Marine Conservation Areas in Canada, neither of which is in NL waters.

There are no NWAs and three MBSs on the island of Newfoundland, two on the Northern Peninsula and one on the east coast, none of which are near the Study Area.

There is currently one Marine Protected Area on the island of Newfoundland, located at Eastport Peninsula, on the east coast, outside the Study Area. Two other "Areas of Interest" or potential Marine Protected Areas, Laurentian Channel and St. Anns Bank, are located between the islands of Newfoundland and Cape Breton, east of the Study Area.

Provincial Protected Areas

There are six different protected area designations in NL; these include: Provincial Parks and Park Reserves; Wilderness Reserves and Ecological Reserves; Wildlife Reserves; IBAs; wetlands and watercourses; IBP Areas and wave forests. These are discussed in the following sections.

Provincial Parks

There are thirty Provincial Parks and Provincial Park Reserves within the island of Newfoundland, four of which are within the vicinity of the Study Area. Both parks and park reserves are intended to protect areas with significant natural features and landscapes, but parks have day use or camping facilities whereas park reserves do not.

Barachois Pond Provincial Park is located approximately 1.5 km inland from St. George's Bay, with the northwestern boundary of the park bordered by the Trans Canada Highway. It is the largest Provincial Park in Western Newfoundland, showcasing 3,500 hectares of the Western Newfoundland Ecoregion. The park is known primarily for its camping, hiking, and bird watching opportunities, but it is also within a Newfoundland marten core area and identified critical habitat. The Study Area follows the Trans Canada Highway in this part of the province and overlaps with roughly 100 hectares of the northwestern boundary of the park (NLDEC 2012b).

The Grand Codroy Provincial Park Reserve is near the community of Doyles to the northwest of the Trans Canada Highway, along the Grand Codroy River. It is known as a scenic attraction for the view it offers of the Long Range Mountains. The 8 hectare park also protects a portion of a fluvial delta. The park is roughly 1.5 km northwest of the Study Area (NLDEC 2011c).

The Codroy Valley Provincial Park is located at the outlet of the Grand Codroy River to Searston Bay. The 25 hectare park has natural scenic attractions while providing beach and wetland habitat to various species of migrating shorebirds and waterfowl, including important nesting

habitat for the endangered Piping Plover. The park is approximately 8 km to the northwest of the Study Area (NLDEC 2011b).

The J.T. Cheeseman Provincial Park is located on the Cape Ray barrens, roughly 15 km east of Port aux Basques. The park is composed of a variety of natural features with diverse flora including typical bog species such as violet bog aster, ericaceous shrubs such as sheep laurel, and the pitcher plant. The J.T. Cheeseman Provincial Park also provides important nesting habitat for the Piping Plover. The western border of the park is just outside the eastern side of the Study Area at Cape Ray (NLDEC 2011c).

The T'Railway Provincial Park follows the main line of the abandoned Canadian National railbed for almost 900 km from St. John's to Port aux Basques. It overlaps with the Study Area in several areas between Port aux Basques and Codroy Pond. This provincial park forms part of the Trans Canada Trail, and is enjoyed by hikers, cyclists, horseback riders, cross country skiers, ATV drivers, and snowmobilers. It provides access to scenic landscapes and remote wilderness, and also provides a historic link to railway heritage as many original railbeds, trestles, bridges, station houses and train cars remain (NLDEC 2011d).

Wilderness and Ecological Reserves

Wilderness Reserves are large (over 1,000 km^2) areas that protect important landscapes and larger natural features, provide areas within which to conduct scientific research, and allow for outdoor wilderness activities. There are only two Wilderness Reserves on the island of Newfoundland, the Avalon and the Bay du Nord, neither of which is near the Study Area.

Ecological Reserves are similar to Wilderness Reserves, but are less than 1,000 km^2 in size, and have more specific objectives, namely, to protect areas that represent specific ecosystems or ecoregions, and to protect plant or wildlife species, or natural heritage elements that are unique or rare. There are currently 16 Ecological Reserves on the island of Newfoundland, including six Botanical Ecological Reserves, three Fossil Ecological Reserves, six Seabird Ecological Reserves, and one Ecosystem Ecological Reserve (provisional). Two of these Ecological Reserves, Little Grand Lake Provisional Ecological Reserve and King George IV Ecological Reserve, are within approximately 12.8 km and 8.3 km of the Study Area, respectively.

The Little Grand Lake Provisional Ecological Reserve is NL's first and only Ecosystem Ecological reserve. It encompasses 731 km^2 of bogs, barrens, and mature boreal forest, which is primary habitat for Newfoundland marten. It is representative of three ecoregions: Western Newfoundland, Central Newfoundland, and Long Range Barrens. It is adjacent to Little Grand Lake Wildlife Reserve and the Glover Island Public Reserve, which extend protection for the Newfoundland marten and provide buffers from human activity. It is approximately 5 km north of the Study Area (NLDEC 2011e).

The King George IV Ecological Reserve protects 18.4 km^2 of the largest undisturbed river-delta system on the island of Newfoundland. It is located where the Lloyds River and an unnamed

stream enter King George IV Lake. This botanical reserve encompasses several freshwater marshes, barrens, forests, basin bogs and shore fens. It hosts a rich floral community and provides habitat for waterfowl and caribou. It is approximately 8 km west of the study area (NLDEC 2011f).

Wildlife Reserves

Wildlife Reserves are established to protect a specific wildlife species. There are currently only three Wildlife Reserves on the island of Newfoundland. The Middle Ridge Wildlife Reserve is adjacent to the Bay du Nord Wilderness Reserve in eastern Newfoundland, and protects the Middle Ridge caribou herd. The Big Barasway Wildlife Reserve near Burgeo protects known Piping Plover habitat. The Little Grand Lake Wildlife Reserve extends protection of Newfoundland marten, in conjunction with the Little Grand Lake Provisional Ecological Reserve. The Study Area intersects the southern extent of the Little Grand Lake Wildlife Reserve.

Important Bird Areas

The IBA Programme is an international bird conservation program established by BirdLife International that aims to identify important bird habitat, and monitor and protect these areas. In Canada, Bird Studies Canada and Nature Canada are IBA Programme co-partners. There are a number of IBAs on the island of Newfoundland, three of which are near or intersect with the Study Area.

The Codroy Valley IBA is located on the western side of the Trans Canada Highway, between the Little Codroy River and the Grand Codroy River, near Doyles. This largely forested IBA was established to protect two forest species, Red Crossbill, and Ovenbird. Bobolink are also seen in this IBA (IBA Canada 2010). Adjacent and contiguous to the northern boundary of the Codroy Valley IBA, the Codroy Valley Estuary IBA protects the tidal Codroy Valley Estuary, which contains coastal and freshwater marsh habitat. This IBA provides important breeding habitat for a number of waterfowl species. A pair of Piping Plovers successfully nested in the Codroy Valley Estuary IBA from 1992 to 1998 (IBA Canada 2010). The Grand Codroy estuary is internationally recognized as a Ramsar site. In particular, the estuary supports flocks of up to 3,000 Canada Geese during fall and early winter and up to 1,000 Black Duck in late September (Wetlands International 2007).

The Grand Bay West to Cheesman Provincial Park IBA encompasses a beach system along approximately 8 km of coastline near Port aux Basques. The site extends from Cheesman Provincial Park on the western end to Grand Bay West beaches in the center and eastern end. The beach is between 50 and 100 m wide with rocky sections interspersed, and includes small sand dunes and a rocky peninsula. It provides nesting habitat for the endangered Piping Plover. An annual average of 17 adult Piping Plovers were observed at this site between 1995 and 1998 by the Wildlife Division of NLDEC. The Grand Bay West beaches have been identified as “critical habitat” for the endangered Piping Plover and is afforded protection as such under *SARA*. Many tourists and local residents use the beaches recreationally, and ATV usage is also

frequent. Several organizations have initiated efforts to protect nests from the public. The western edge of this IBA overlaps with the Study Area (IBA Canada 2010).

Wetlands and Watercourses

Both wetlands and watercourses are protected in NL by the *Water Resources Act*. Wetlands are defined as "land that has the water table at, near, or above the land surface". A watercourses is defined as "surface or subterranean source of fresh or salt water within the jurisdiction of the province, whether that source usually contains liquid or frozen water or not". Developments that could affect wetlands or watercourses require permits, and typically also require mitigation and restoration. The Project intersects many wetlands and watercourses, both mapped and unmapped by the Province (Figure 4.1.1).

International Biological Programme Areas

The IBP was established in the 1960s and early 1970s to identify biologically important areas throughout the world. Although the IBP is no longer active, the overall importance of IBP areas is still recognized. IBP areas are included in this report based on consultation with NLDEC. A number of IBP Areas have been identified on the island of Newfoundland, some of which are within or near the Study Area (Figure 6.2.1).

Wave Forests

The island of Newfoundland is home to a number of balsam fir wave forests, the product of a phenomenon that was once thought only to occur in Japan and high elevation stands in northeastern United States (Robertson 1987a). Wave forests are seen as bands of windfall areas where trees have died, grading into increasingly mature trees, until the next area of dead trees, in a sinusoidal pattern (Parks Canada 2008, Robertson 1987a). Trees next to the area of dead trees are more susceptible to edge effects such as blowdown, drying, and ice damage and are the next to die in the cycle, while new trees regenerate in the recently cleared areas (Parks Canada 2008, Robertson 1987a). The length of the pattern from most recently deceased to most mature trees is typically approximately 100-150 m. As a result of the continuous blowdown and regeneration processes, the different stages of growth in a wave forest will actually move over time, in a cyclic event that takes approximately 55 years on the island of Newfoundland (Robertson 1987a).

Although wave forests currently have no legal protection in NL, they are valued for the unique habitat they represent, and the opportunities they present to study the ecological and financial effects of wind on forest stand development in a complete chronosequence (Robertson 1987b). Two wave forests are located at the southern end of the Study Area, one near Red Rocks and the other northeast of Cape Ray, NL (Figure 6.2.1). Both of these wave forests partially intersect with the Study Area.

6.2.2.3 Summary of Primary Habitat for SOCI

Table 6.2.4 relates ELC types to primary habitat for SOCI likely to occur within the Study Area on the island of Newfoundland. Although it is included in the VEC, low northern rockcress was not assessed for primary habitat and not included in Table 6.2.4. Low northern rockcress is a small herbaceous plant that is endemic to limestone barrens, only found in areas with minimal competing vegetation, and only known from one location on the island of Newfoundland (Table Mountain), west of the Study Area. Because of the unique habitat associations of this plant, it is considered highly unlikely to be found within the Study Area.

Table 6.2.4 Primary ELC Types for SOCI Likely to Occur Within the Study Area (NL)

ELC Types	Newfoundland marten	Little brown myotis and Northern myotis	Harlequin Duck	Barrow's Goldeneye	Piping Plover *melodus* ssp.	Red Knot *rufa* ssp.	Ivory Gull	Short-eared Owl	Chimney Swift	Olive-sided Flycatcher	Barn Swallow	Gray-cheeked Thrush	Bobolink	Rusty Blackbird	Red Crossbill *percna* ssp.	American eel and Banded killifish	Mountain holly fern	Boreal Felt Lichen
Coniferous Forest	✓	✓							✓	✓		✓		✓	✓			✓
Coniferous Scrub												✓						
Deciduous Forest		✓							✓	✓								
Deciduous Scrub																		
Mixed Wood Forest	✓	✓							✓	✓								
Ericaceous/Lichen Heathland																		
Ericaceous/Coniferous Scrub Complex												✓						
Subalpine																		
Wetland: Ericaceous/ Lichen																		
Wetland: Ericaceous/Coniferous Scrub														✓				
Wetland: Bryoid/ Graminoid								✓		✓								
Wetland: Graminoid/ Herbaceous								✓		✓								
Wetland: Unvegetated Peat								✓		✓								
Water			✓	✓			✓									✓		
Riverbanks and Lakeshores			✓		✓	✓				✓				✓				
Exposed Rock/ Unvegetated Anthropogenic		✓	✓	✓					✓		✓						✓	
Vegetated Anthropogenic		✓						✓	✓		✓		✓					
Dune System					✓													

The relatively coarse scale used for classification of habitat types in the ELC does not normally delineate the more specific habitats types that SOCI require. Therefore, the primary habitat for these species is within, or a subset of, the ELC types, (*i.e.*, the ELC types represent the potential for primary habitat).

6.2.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

6.2.3.1 Potential Project-VEC Interactions

Table 6.2.5 lists potential interactions between SOCI and Project activities and physical works, and ranks each effect as 0, 1, or 2 based on an assessment of the level of risk at the population level.

Table 6.2.5 Potential Project Environmental Effects to SOCI (NL)

Project Activities and Physical Works	Potential Environmental Effect
	Change in SOCI populations
Construction	
Site Access and Site Preparation	2
Transmission and Grounding Line Infrastructure	2
Converter Station	2
Grounding Facilities	2
Operation	
Overland Power Transmission	1
Power Conversion	1
Maintenance	
Regular Inspection	1
Repair to Infrastructure	1
Vegetation Management	2

KEY
0 = No interaction
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.

No interactions with Project activities or physical works have been ranked as 0.

Potential interactions relating to power transmission, power conversion and infrastructure maintenance were ranked as 1.

Avifauna mortality can occur as a result of a collision with overhead transmission structures or lines, or electrocution. Migratory flight heights are usually higher than 50 m and therefore migrating species are not prone to collision during flight. Diurnal migrants (*i.e.*, waterfowl, waterbirds, raptors) tend to vary flight heights but unless there are distinct features to draw them in (*i.e.*, wetlands, lakes) for staging purposes, they are likely flying higher than transmission line

heights. Local movement of birds between habitats (*e.g.*, wetlands to uplands) are expected to be below power lines as separation distance and bird flight behaviour would typically result in low flight heights and in close association with the height of trees being flown to, or from. The RoW naturally provides a vertical and horizontal separation between the transmission lines and trees/perches which allows for easier detection and avoidance of the lines. Electrocution can only occur if a bird touches two phase conductors, or a conductor and an energized device simultaneously. Based on conceptual design the clearance between two phase conductors for AC and DC lines are approximately 6.5 m and 9 m respectively. The clearance between the grounded and energized equipment on the proposed transmission lines is approximately 3 m. These clearance distances are larger than the maximum wing span of birds found within the study area (maximum wing spans for Bald Eagle and Osprey are approximately 2.5 m and 2 m, respectively) therefore the risk of electrocution is considered low and with respect to making contact with two phase conductors extremely rare. Electrocutions are most likely to occur on lower voltage distribution lines (4 to 34.5 kV, in which the spacing between conductors may be small enough to be bridged by birds (APLIC and USFWS 2005). In addition, avian avoidance devices may be installed to minimize bird collisions with Project infrastructure in identified high risk areas.

The potential environmental effects of power transmission and conversion on avian species are limited to accidental events (including collision with power lines), or indirect effects such as noise. Infrastructure maintenance will occur in habitat that has already been altered through Project activities associated with construction and, therefore potential environmental effects are limited to accidental events or indirect effects such as increased human presence and access. The interaction between SOCI and these activities will be mitigated by the use of standard best management practices, such as those described in Section 2.6.7, or would be low enough in magnitude and frequency so as to not result in a significant adverse environmental effect on SOCI populations.

In consideration of the nature of the interactions and the planned implementation of proven mitigation, the potential environmental effects on SOCI from all Project activities and physical works that were ranked as 1 are rated not significant, and are not considered further in the assessment.

6.2.3.2 Potential Environmental Effects

All construction activities and vegetation management were ranked as 2, and will thus be considered in more detail in this EA.

Project activities associated with construction can potentially have an effect on SOCI populations through changes in habitat. Partial vegetation removal will result from clearing activities, and complete vegetation removal will occur in areas where tower assembly and installation, and construction and installation of permanent facilities (*e.g.,* converter station) take place. Vegetation removal will result in a direct change in habitat within the Study Area, but will

also result in indirect changes to abiotic habitat features, such as increased light availability and changes in temperature and humidity.

Change in habitat may result in adverse environmental effects on SOCI. For example, the Project has potential to result in the loss of breeding habitat for several bird SOCI. Construction activities may also result in a change in habitat through fragmentation, *(i.e.*, discontinuity in preferred habitat), leading to the reduction or loss of freedom of movement between resulting patches. Change in habitat through fragmentation may be substantial for species that are found in the vicinity of the Study Area and currently move through and within the Study Area to access preferred habitat. The promotion of edge-influenced habitat (*i.e.,* habitats adjacent to edges) by the Project may result in increased predation on birds and small mammals, but also has potential benefits related to food availability. Generally, linear developments such as transmission lines contribute to habitat fragmentation due to the large amount of edge that they produce relative to the area disturbed. However, this potential fragmentation is only a concern in the Area of New Access, as the Project will contribute relatively little to habitat fragmentation within the other segments as it parallels existing linear developments.

Small mammal and herpetile populations which have limited dispersal capabilities are particularly susceptible to habitat fragmentation. Remnant populations that are isolated in small fragments are more prone to local extirpation. Additionally, although fragments may be large enough to support a population, they may not be large enough to provide enough animals to rebuild the population should it be heavily affected by disease or predators. Isolation of the fragment can also impair the immigration of new animals into an area where a local population has been extirpated. Impaired immigration can also adversely affect populations by restricting gene flow between populations, leading to inbreeding.

Although habitat fragmentation is typically of greater concern for species with limited dispersal ability such as small mammals and herpetiles, it can also affect highly mobile animals such as birds. During the breeding season some species may be reluctant to cross clearings, causing populations to be isolated in resultant habitat fragments. Studies by CWS of bird use of forest patches in agricultural areas in Québec found that bird movement between patches decreased with increasing distance between patches (CWS 2009). The authors determined that the influence of edge effects extended as far as 300 m from the forest edge. It was also observed that approximately 98% of the movements between habitat patches were concentrated in gaps smaller than 200 m and some species traveled up to three times as far to avoid a gap. Physical isolation of a population combined with the edge effects may eliminate species in fragmented habitats.

Project activities associated with construction, and vegetation management associated with operation and maintenance, have potential to effect SOCI populations through a change in mortality risk. Change in mortality risk for non-mobile SOCI (such as plants, lichens, or very immature mammals or birds) may result from construction, either directly on individuals that occur within areas cleared for the Project through ground disturbance, or indirectly on individuals that are found adjacent to cleared areas, as removal of vegetation may change

abiotic and biotic habitat features (*e.g.,* light availability) within the Study Area. Furthermore, animals that are displaced by loss of habitat may eventually succumb if they are unable to establish new home ranges due to a lack of suitable or unoccupied habitat.

Under certain conditions, such as nights with fog or mist, migrating birds may be attracted to lights. They may collide with the light or structures near the light or circle around the light until they become exhausted, making them easy prey for predators. Various factors affect the level of attraction to lights including intensity, spectral characteristics and the manner in which lights are placed in the environment. Typically more intense lights are more attractive to birds (Jones and Francis 2003). Lights that are shielded from above are generally less attractive than those that are visible from above.

Erosion and increased sedimentation in watercourses resulting from vegetation removal associated with clearing activities also has the potential to result in a change in mortality risk for freshwater SOCI within the Study Area.

Clearing activities will also allow increased access for humans, which has the potential to result in a change in mortality of SOCI through increased activities such as hunting, trapping, snaring, and fishing, and also by humans acting as a vector for disease, (*e.g.*, transferring white-nosed fungus from an infected bat hibernaculum to a previously uninfected hibernaculum).

Vegetation removal associated with clearing activities has the potential to result in a change in mortality risk through increased predation. This may result from aerial predators frequenting areas from which overhead cover has been removed, or from terrestrial predators taking advantage of the removal of trees and other structural elements used by prey for escape. Additionally, food waste that is improperly disposed of onsite can lead to wildlife mortality. The availability of food scraps can attract generalist predators and the presence of elevated numbers of these predators can result in increased predation on wildlife in the area. Attraction of predators and scavengers to the site can also result in the habituation of these species to the presence of humans on the site and such species may have to be killed to prevent damage or possible injuries to workers. Animals that are trapped and relocated may also die if there is no available habitat or insufficient resources in the area where they are released.

Tower assembly and installation and construction and installation of permanent facilities on land have the potential to result in a change in mortality risk for some aerial species (*i.e.*, bats and birds) through direct collision. As the Project will run parallel with an existing transmission corridor for most of the length, change in mortality associated with direct collision with physical works will not represent a new potential environmental effect in the area, but it could lead to an incremental increase in mortality risk due to a simple increase in the number of structures with which to collide.

Vegetation management associated with operation and maintenance, specifically the use of herbicides, has the potential to result in a change in mortality risk for SOCI (particularly plants, lichens, and freshwater fishes).

6.2.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

The mitigation measures that will be implemented for SOCI on the island of Newfoundland during the construction and operation of the Project are listed in Table 6.2.6. Key mitigation measures that will be used (wherever technically and economically feasible) to reduce environmental effects of the Project on SOCI, are listed below:

- Detailed mapping, through the application of the ELC will be produced to identify the distribution and known locations of SOCI and associated habitat such that they can be considered during detailed design for avoidance during micrositing of Project routing, transmission tower and foundation placement, and timing of Project activities. For example, every effort will be made to avoid known locations of non-mobile SOCI within the Study Area. Where ranges of mobile SOCI are known, (*e.g.*, Newfoundland marten), ENL will work with NLDEC and EC-CWS to plan appropriate routing through identified core areas and identified critical habitat within the Study Area.

- Reference will be made to the distribution of SOCI habitat when considering Project routing, transmission tower and foundation placement, and timing of Project activities. For example, various types of forested habitat have been identified as SOCI habitat for a number of SOCI that potentially exist within the Study Area—as a result, ENL will work to avoid identified SOCI habitat within the proposed alignment.

- Tree clearing activities will be executed in a manner that complies with the *MBCA and SARA*, specifically the prohibition of incidental take:

    - Primary mitigation will be through project planning and scheduling of clearing activities, on a best-efforts basis, to avoid key migratory bird nesting periods. ENL recognizes that there are geographic differences in nesting periods over the length of the proposed transmission line and will request direction from regulatory agencies in this regard.

    - Secondary mitigation will be the development and implementation of an avifauna management plan designed to reduce the likelihood of interaction; establish training protocols for personnel to identify active nests; and protocols for nesting surveys by trained ornithologists in advance of activities.

- The timing of any construction activities in the shoreline/intertidal zone will consider Harlequin Ducks, which may be found wintering near Cape Ray. Following confirmation of Project design and schedule, and in advance of construction activities, ENL will engage applicable regulatory departments to review final details and determine if specific mitigation programs are required.

- Only the amount of lighting required for safe operation of construction and operation activities will be installed. Lights that are not necessary for a particular function will be turned off, and exterior lights will be shielded from above, where the need is identified. Minimal site security lighting will be maintained.

- Where feasible, watercourses will be avoided when planning transmission tower and foundation placement, and effective erosion and sedimentation controls will be used around all watercourses (Section 2.6.7).

- The proposed alignment will avoid identified SOCI habitat, where possible. Where not possible, specialized considerations will be developed and implemented in accordance with regulatory requirements and in consultation with applicable regulatory agencies.

- Avian avoidance devices may be installed to minimize bird collisions with Project infrastructure in identified high risk areas.

- Typical best management practices to be used for vegetation management are included in Section 2.8 and will be detailed in a vegetation management plan.

- Use of herbicides will be restricted in buffer areas around watercourses, and in areas where SOCI are known to occur. These areas will be considered as special management areas within the vegetation management plan.

- Adherence to the Project Environmental Management Plan (requirements of the EPP).

6.2.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

Habitat within cleared and adjacent areas on the island of Newfoundland will be changed as a result of Project activities and/or physical works. The majority of the Project parallels existing transmission corridor, and will likely have minimal residual environmental effects on SOCI. The remainder is within the Area of New Access, and will not parallel an existing transmission corridor.

Project-related changes in population levels of SOCI that occur within the Study Area after mitigation, from loss or disturbance of habitat, are considered residual environmental effects. This effect will be minimized by avoiding SOCI habitat, particularly in areas where they are known to occur, to the extent feasible. Given this approach, it is likely that the amount of SOCI habitat changed through Project activities will be minimal relative to SOCI habitat in non-disturbed areas outside of the Study Area. The specific amount of SOCI habitat that will be disturbed will be determined through application of the ELC, once a finalized transmission line route is confirmed. The results will then be used to create a detailed habitat characterization of the transmission corridor that focuses on SOCI habitat.

In the Area of New Access and Bottom Brook to Cape Ray segments of the Study Area, the Project may result in changes to habitat adjacent to the Little Grand Lake-Red Indian Lake Newfoundland Marten Core Area, and Lobster House Newfoundland Marten Core Area, respectively. Within the proposed alignment ENL will work to avoid SOCI habitat. To confirm habitat useage by marten, ENL will also undertake a hair snag study in areas within the proposed alignment. In addition, detailed routing will be determined in consultation with NLDEC. This approach will also limit residual effects on several other SOCI which share similar habitat

(such as both species of myotis when roosting, Gray-cheeked Thrush, and Olive-sided Flycatcher).

Many SOCI use various types of wetlands, water, riverbanks and lakeshores. Avoidance of these areas will help to reduce residual effects on these species. When wetlands cannot be avoided, manual vegetation clearing, appropriate timing, and other practices such as those described in Section 2.6.7, will further limit potential residual environmental effects on habitat and individual mortality.

The residual environmental effect on habitat for fish SOCI, resulting from erosion and sedimentation, and encroachment on watercourses, will be minimized with the use of standard erosion and sedimentation controls around watercourses and waterbodies and avoidance where feasible (Section 2.6.7).

Despite the implementation of mitigation, some change in habitat for SOCI resulting from habitat loss or habitat fragmentation will occur as a result of Project activities and/or physical works. Though the overall environmental effect will be adverse, the magnitude of change in habitat is expected to be low given the mitigation measures that will be implemented, and considering the probable width of any cleared areas (~60 m). Even considering that some effects of the habitat change within cleared areas will extend somewhat into adjacent areas, the overall magnitude will remain low. The change in habitat will be long term and will occur within and adjacent to the Project, in particular within the undisturbed habitat in the Area of New Access. However, the process for finalizing the transmission route will include additional work to characterize specific habitats potentially affected by construction activities as part of follow-up programs and Project permitting. Project routing that potentially affects identified critical habitat (or equivalent) for listed species will be reviewed with relevant authorities to explore mitigation options, including avoidance.

Change in mortality risk of SOCI resulting from the Project is possible, but will be reduced with proper mitigation, specifically by implementing the same measures to be used in avoiding habitat as described above. Furthermore, if clearing activities are undertaken outside of the breeding season for migratory bird SOCI, the potential residual environmental effect of change in mortality risk for immature birds would be further reduced.

The residual environmental effect of change in mortality for fish SOCI resulting from erosion and sedimentation will be minimized with the use of standard erosion and sedimentation controls around all watercourses and waterbodies (Section 2.6.7).

Increases in Project-related mortality risk resulting from increased predation and increased access by humans may occur. These effects, however, can be reduced through mitigation used to minimize change in habitat for SOCI; namely, avoiding habitat where SOCI are known to occur, whenever feasible. Although in some areas increased predation and access by humans will be unavoidable, with careful Project routing, the resulting residual environmental effect is expected to be low, as the Project largely parallels existing transmission corridors.

Change in mortality risk for aerial species such as birds and bats resulting from direct collision with physical works may result in a residual environmental effect, particularly in the Area of New Access.

Following implementation of mitigation, there will likely be a residual change in mortality risk for SOCI as a result of Project activities and/or physical works. Though the overall environmental effect will be adverse, specific micrositing of Project infrastructure (*e.g.,* tower placement) will be undertaken to avoid known SOCI habitat. With this mitigation in place, the magnitude of change in mortality is expected to be low. Change in mortality risk related to construction activities will be short term, and change in mortality risk for operation and maintenance related activities will be long term. The geographic extent of any change in mortality will be restricted to cleared and immediately adjacent areas for the majority of the Project, and in undisturbed habitat in the Area of New Access.

6.2.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 6.2.6 summarizes the residual environmental effects of the Project on SOCI.

Although the Project would likely result in some adverse change to SOCI populations through changes in habitat or mortality risk, during micrositing of Project components and activities (*e.g.,* tower placement) at the detailed design phase, based on field studies and consultation with NLDEC, the effect can be minimized. The residual environmental effect for construction activities is predicted to be low in magnitude, restricted in geographic extent to cleared and adjacent portions of the Study Area, short term in duration, occur on a regular basis, reversible, and occur in both disturbed and undisturbed areas. The residual environmental effect for operation and maintenance activities is predicted to be low in magnitude, restricted in geographic extent to cleared and adjacent portions of the Study Area, long term in duration, occur on a regular basis, reversible, and occur in both disturbed and undisturbed areas.

Table 6.2.6 Summary of Project Residual Environmental Effects: SOCI (NL)

CHANGE IN SOCI POPULATIONS
Mitigation - Construction
• Detailed mapping, through the application of the ELC will be produced to identify the distribution and known locations of SOCI and associated habitat such that they can be considred during detailed design for avoidance during micrositing of Project routing, transmission tower and foundation placement, and timing of Project activities. Where ranges of mobile SOCI are known, (*e.g*., Newfoundland marten), ENL will work with NLDEC and EC-CWS to plan appropriate routing through identified core areas and identified critical habitat within the Study Area. • Reference will be made to the distribution of SOCI habitat when considering Project routing, transmission tower and foundation placement, and timing of Project activities. For example, various types of forested habitat have been identified as SOCI habitat for a number of SOCI that potentially exist within the Study Area—as a result, ENL will work to avoid identified SOCI habitat within the proposed alignment. • Primary mitigation will be through project planning and scheduling of clearing activities, on a best effort basis, to avoid key migratory bird nesting periods. ENL recognizes that there are geographic differences in nesting periods over the length of the proposed transmission line and will request direction from regulatory agencies in this regard. • Secondary mitigation will be the development and implementation of an avifauna management plan designed to reduce the likelihood of interaction; establish training protocols for personnel to identify active nests; and

Table 6.2.6 Summary of Project Residual Environmental Effects: SOCI (NL)

CHANGE IN SOCI POPULATIONS

protocols for nesting surveys by trained ornithologists in advance of activities.

- The timing of any construction activities in the shoreline/intertidal zone will consider Harlequin Ducks, which may be found wintering near Cape Ray. Following confirmation of Project design and schedule, and in advance of construction activities, ENL will engage applicable regulatory departments to review final details and determine if specific mitigation programs are required.
- Allow establishment of shrub or scrub (*i.e.*, non-tree) vegetation in transmission corridors to the extent feasible, to promote their use by SOCI.
- Siting of landfall and grounding sites to avoid bird SOCI nesting sites and fall migration feeding grounds.
- Only the amount of lighting required for safe operation of construction activities will be installed. Lights that are not necessary for a particular function will be turned off, and exterior lights will be shielded from above, where the need is identified. Minimal site security lighting will be maintained.
- Where feasible, watercourses will be avoided when planning transmission tower and foundation placement, and effective erosion and sedimentation controls will be used around all watercourses (Section 2.6.7).
- The proposed alignment will avoid identified SOCI habitat, where possible. Where not possible, specialized considerations will be developed and implemented in accordance with regulatory requirements and in consultation with applicable regulatory agencies.
- Appropriate erosion and sedimentation controls will be implemented to stabilize the watercourse slopes/banks on either side and prevent sediment run-off into the watercourses.
- Clear vegetation in SOCI habitat by hand, and only remove trees in wetland habitats.
- Draw conductors in wetland habitats by hand or using light vehicles such as ATVs.
- Avian avoidance devices may be installed to minimize bird collisions with Project infrastructure in identified high risk areas.
- Adherence to the Project Environmental Management Plan (requirements of the EPP).

Mitigation – Operation and Maintenance

- Restrict use of herbicides in buffer areas around watercourses, and in areas where SOCI are known to occur. These areas will be considered as special management areas within the vegetation management plan.
- Adherence to the Corporate EMS.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
Construction	Adverse	Low	Local	Short term	Regular	Reversible	Developed / Undisturbed	Not Significant
Operations	Adverse	Low	Local	Long term	Regular	Reversible	Developed / Undisturbed	Not Significant

Follow-up

- ENL will implement a program to collect additional data on marten presence within the Project area using protocols developed by, and in consultation with, the Wildlife Division of NLDEC.
- Detailed mapping will be prepared using the ELC to identify the distribution and known locations of SOCI and associated habitat. This information will be utilized during detailed design to avoid sensitive areas and/or periods during micrositing of transmission infrastructure (*e.g.,* tower placement) to minimize interactions with SOCI. This information will be developed in consultation with the Wildlife Division of NLDEC and EC.
- Upon final selection of the grounding facility location, additional work will be undertaken to further characterize the sites.
- ENL will obtain all required permits for SOCI to construct and operate the Project.

Table 6.2.6 Summary of Project Residual Environmental Effects: SOCI (NL)

CHANGE IN SOCI POPULATIONS		
KEY ***Direction:*** Positive. Adverse. ***Magnitude:*** Low: Change in SOCI populations that do not affect the sustainability of populations within the Study Area. Moderate: Change in SOCI populations that affect the sustainability of populations or results in the loss of individuals within the Study Area. High: Change in SOCI populations that affect their sustainability within the Subregions of Central Barrens; Red Indian; Portage Pond; Southern Long Range; St. George's Bay; and Codroy, and/or results in a substantial loss of individuals.	***Geographic Extent:*** Local: within the Study Area. Regional: within the Subregions of Central Barrens; Red Indian; Portage Pond; Southern Long Range; St. George's Bay; and Codroy. ***Duration:*** Use quantitative measure; or Short term: During the Project Phase. Medium term: Duration of the Project. Long term: Duration of the Project plus 10 years. Permanent: Will not change back to original condition. ***Frequency:*** Occasionally, once per month or less. Occurs sporadically at irregular intervals. Occurs on a regular basis and at regular intervals. Continuous.	***Reversibility:*** Reversible. Irreversible. ***Environmental Context:*** Undisturbed: Area relatively or not adversely affected by human activity; includes Area of New Access. Developed: Area has been substantially previously disturbed by human development or human development is still present. N/A Not Applicable. ***Significance:*** Significant. Not Significant.

6.2.7 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the SOCI VEC, the assessment area for cumulative environmental effects includes the following Subregions as defined by the Protected Areas Association of Newfoundland and Labrador: Central Barrens, Red Indian, Portage Pond, Southern Long Range, St. George's Bay, and Codroy. In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 6.2.7 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 6.2.7 also ranks the potential cumulative environmental effects to SOCI as 0, 1, or 2 based on the degree of interaction with other project or activities and the potential for overlapping effects with the Project.

Table 6.2.7 Potential Cumulative Environmental Effects on SOCI Populations(NL)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in SOCI Populations
Existing Linear Facilities	1
Existing Residential and Recreational Land Use	1
Resource Land Use	1

Table 6.2.7 Potential Cumulative Environmental Effects on SOCI Populations(NL)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in SOCI Populations
Indian Head Salmon Hatchery	0

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.

There is potential for the effects on habitat from existing linear facilities interact cumulatively with the Project to adversely affect SOCI. Linear facilities, such as roads, highways, railroads, and utility corridors contribute to habitat loss, fragmentation of forest habitats, and the promotion of adverse edge effects. There is also potential for an increase in mortality of SOCI from predation and illegal hunting resulting from increased access to relatively undisturbed habitats. Of particular note for the island of Newfoundland is the routing of the transmission corridor through the Area of New Access.

Roads cause relatively more severe fragmentation and disturbance to SOCI than transmission corridors since they are largely devoid of cover and often support a high degree of disturbance in the form of vehicle traffic. Transmission lines are maintained in a semi-natural state and there is little ongoing human activity at these sites to dissuade wildlife from crossing them or utilizing the resulting habitat. Some species, however, may be reluctant to cross clearings, and where Project infrastructure parallels existing linear developments (roads or transmission lines) there is potential that the combined linear facilities present a greater barrier to wildlife movement than the effects of the individual facilities alone. For example, studies in agricultural areas in Québec found that bird movement between patches of forest decreased with increasing distance between patches (CWS Undated).

Potential cumulative fragmentation of fish SOCI habitat associated with linear facilities may also occur where the Project parallels an existing transmission line or road. However, transmission lines typically span watercourses without the need for in-water work, thereby minimizing additional fish habitat fragmentation.

Housing and cottage development within the boundaries of the cumulative effects assessment area has potential to encroach on lands and waters which could result in loss or change of SOCI habitat. Such changes have potential to be amplified due to overlap with Project-related activities and infrastructure. However, even with such changes the combined area of disturbance will still be minimal relative to the proportion of habitat available for SOCI.

The use of offroad vehicles (*e.g.*, ATVs and snowmobiles) on recreational trails disturb wildlife habitat important to SOCI, the effects of which can overlap cumulatively with new development corridors. The Project could inadvertently connect otherwise separate trails, which could result in more off-road vehicle traffic; this is of particular concern in the Area of New Access where

such access is currently limited. As described in Section 2.6.7, the transmission line will be routed through this area to take account of natural “break points” (major water crossings and steep rock slopes). In addition, every effort will be made to use existing access roads and temporary transportation routes will be confined to the transmission corridor, where feasible.

Resource land use in the cumulative effects assessment area, including forestry, agriculture, and small-scale quarries, has potential to interact cumulatively with the Project to affect SOCI populations through removal, destruction, or disturbance of individuals and habitats. Forestry-related activities (clearcuts, logging roads, harvesting) pose the most potential to interact with the Project, however, possible cumulative effects on SOCI will be mitigated through compliance with provincial forestry guidelines, and by the natural regeneration of harvested areas in the vicinity of the Project.

The Indian Head Salmon Hatchery will be located on property within the town of Stephenville that is zoned for industrial use, and the Project has been subject to environmental review and approval. It is therefore assumed that no substantial residual environmental effects on SOCI have been identified. Potential environmental effects from the operation of the facility are related to waste effluent, which is subject to a regulatory process and permitting; therefore, no overlapping environmental effects are anticipated.

6.2.8 DETERMINATION OF SIGNIFICANCE

Construction and operation of the Project could result in potential loss of habitat and increased mortality risk of SOCI individuals. With the implementation of proposed mitigation and environmental protection measures, the residual environmental effect of a change in SOCI populations is predicted to be not significant.

Based on the limited potential for cumulative effects as described above, combined with the mitigation measures proposed in Section 6.2.4, the residual cumulative environmental effect of a change in SOCI populations is predicted to be not significant.

In summary, residual environmental effects and cumulative effects on a change in SOCI populations are rated not significant.

6.2.9 FOLLOW-UP AND MONITORING

ENL will implement a program to collect additional data on marten presence within the Project area using protocols developed by, and in consultation with, the Wildlife Division of NLDEC.

Detailed mapping will be prepared using the ELC to identify the distribution and known locations of SOCI and associated habitat. This information will be utilized during detailed design to avoid sensitive areas and/or periods during micrositing of transmission infrastructure (*e.g.,* tower placement) to minimize interactions with SOCI. This information will be developed in consultation with the Wildlife Division of NLDEC and EC.

Upon final selection of the grounding facility location, additional work will be undertaken to further characterize the sites.

With the implementation of proposed mitigation described for the SOCI VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.

6.3 SOCIO-ECONOMIC ENVIRONMENT

The Socio-economic Environment was selected as a VEC in consideration of the potential Project interactions with local communities and associated infrastructure; the current uses of land in the immediate vicinity of the Project; and the potential interactions between Project activities and the economy.

6.3.1 SCOPE OF ASSESSMENT

The assessment of the socio-economic environment is restricted to potential direct and indirect interactions of planned Project activities with known uses of land and resources, and with the economic environment. The assessment of potential project interactions with the commercial fisheries is assessed in the Commercial Fisheries VEC Section 7.2.

6.3.1.1 Regulatory Setting

Designated water supplies are protected under the Newfoundland and Labrador *Water Resources Act*. Any development within protected water supply areas is subject to approval by the NLDEC under the Policy for Land and Water Related Developments in Protected Public Water Supply Areas (NLDEC 2002). There are no known active regional municipal land use plans in place that include parts of the Study Area; however, the Project is located within the regional district of Stephenville–Port aux Basques, as defined by the Newfoundland Rural Secretariat. The province is divided in to nine regions, each of which is represented by a nominated council. The Stephenville–Port aux Basques council prepares annual reports of plans and activities and has developed a vision document (NL Rural Secretariat 2007), which helps to define long-term planning goals and priorities for the region. The council employs a regional planner.

6.3.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of the socio-economic environment is focused on the following environmental effects:

- change in land and resource use; and
- change in economy.

Change in land and resource use was selected as an environmental effect due to potential interactions between the Project and nearby community and private infrastructure as well as use of land for recreational or resource extraction purposes. Change in economy was chosen as an environmental effect due to the potential interactions of the Project with local communities through employment and business opportunities.

The measurable parameters used for the assessment of the environmental effects presented above, and the rationale for their selection, are provided in Table 6.3.1.

Table 6.3.1 Measurable Parameters for Socio-economic Environment

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in Land and resource use	Community infrastructure	• Includes potential interactions with services (*e.g.*, water, sewer, communications), as well as potential effects from worker influx including the need for temporary accommodations and services.
	Recreational land use	• Identification of recreational use of land proximate to the Project will help determine the potential environmentall effects on such activities (*e.g.,* fishing and hunting establishments, other recreational establishments)..
	Private land use proximate to and within the Study Area	• Understanding residential or other private land ownership that will be intersected by the Project will provide an indication of the extent of potential effects on such assets.
	Resource activities	• Project activities may involve changes to current and future use of natural resources within and proximate to the Study Area (*e.g.*, forestry, mining, farming).
Change in Economy	Change in employment	• Construction and Operation/Maintenance of the Project may result in temporary changes to the local/regional employment profile within the Study Area.
	Change in business income	• Understanding the extent to which the Project will have a measureable effect on local/regional businesses will be important in managing the impact of such changes to local economies.

6.3.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the environmental effects of the Project on the Socio-economic Environment VEC include the periods of construction and commissioning, and operation and maintenance. In addition, the seasonal versus year-round uses of land will need to be considered. The spatial boundaries for the assessment of effects of the Project on the land and resource use includes the Study Area, and areas directly adjacent to it where Project activities, including accidents, malfunctions, and unplanned events, could potentially interact with the current (or continued) use of land and resources (Figure 6.3.1).

The assessment area for the effects of the Project on economy is Regional Economic Zones 9 and 10 (Figure 6.3.2).

Emera Newfoundland & Labrador

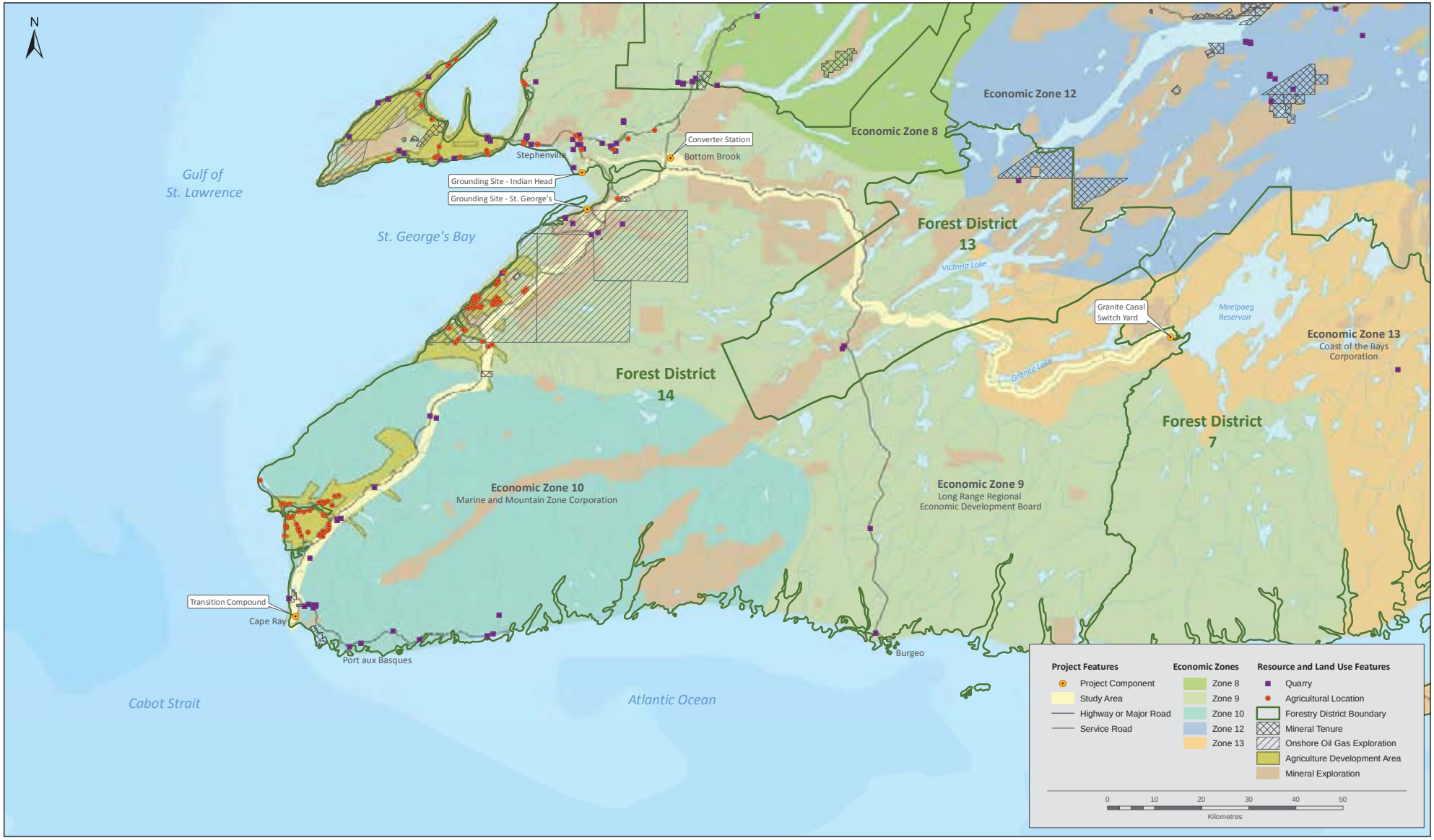
Coordinate System: UTM NAD 83 Zone 21
Scale: 1:700,000
Date: 19/11/2012

Data Sources:
Geobase - Road Network
Geogratis - National Atlas
Government of Newfoundland and Labrador

Recreational Land Use
Island of Newfoundland

FIGURE 6.3.1

EN10063



Emera

Coordinate System: UTM NAD 83 Zone 21

Scale: 1:750,000

Data Sources: NL Department of Environment and Conservation

Date: 20/11/2012

Resource Use and Economic Zones
Island of Newfoundland

FIGURE 6.3.2

EN10067

The spatial area for the assessment of potential cumulative environmental effects on land and resource use includes the Local Areas (as defined by Newfoundland and Labrador Community Accounts) of Codroy Valley, Crabbes River, St. George's, and Port aux Basques (Figure 6.3.1); and Regional Economic Zones 9, and 10 (Figure 6.3.2) for the assessment of potential cumulative environmental effects on the economy.

6.3.1.4 Threshold for Determining the Significance of Residual Environmental Effects

For land and resource use, a **significant residual adverse environmental effect** is defined as one where (i) the use of land for the Project and related facilities is not compatible with adjacent land and resource use activities as designated through a regulatory land use process, if one is in place, and/or (ii) the use of the land for the Project will create a change or disruption that widely restricts or degrades present land and resource use to a point where the activities cannot continue at current levels and for which the environmental effects cannot be mitigated or compensated.

A **significant residual adverse environmental effect** on economy is one where the Project results in an extended loss of access to businesses, or a long-term (more than one year) and substantial decrease to business income in the vicinity of the Project that cannot be compensated.

6.3.2 BASELINE CONDITIONS

Baseline conditions for this VEC are based on research conducted in support of the Project by AMEC and CBCL.

6.3.2.1 Land and Resource Use

The most prevalent uses of land resources within the Study Area include the following, which are further described below:

- communities (infrastructure and services);
- residential land use;
- recreational land use; and
- resource use.

Communities

The Study Area intersects four Statistics Canada Census subdivisions, which have the same geographic boundaries as four Local Areas, as defined by Newfoundland and Labrador Community Accounts. There are 37 defined communities within the four Local Areas. The Project is also located within two Regional Economic Zones. This information is summarized in Table 6.3.2, and the geographic boundaries of these areas are shown on Figure 6.3.1.

Table 6.3.2 Local Areas and Communities

Local Area	Census Division (Subdivision)	Regional Economic Zone*	Communities
No. 34, Codroy Valley Area	4(A)	No. 9	Cape Anguille, Coal Brook, Codroy, Doyles, Great Codroy, Loch Lomond, Millville, O'Regan's, Searston, South Branch, St. Andrews, Tompkins, Upper Ferry and Woodville
No. 35, Crabbes River	4(B)	No. 10	Cartyville, Heatherton, Highlands, Jeffrey's, Lock Leven, St. Fintan's, Maidstone, McKay's, Robinsons, and St. David's.
No. 36, St. George's	4(C)	No. 10	Barachois Brook, Flat Bay, Journois, St. George's and St. Teresa
No. 32, Port aux Basques	3 (H)	No.9	Town of Port aux Basques, Burnt Islands, Cape Ray, Fox Roost, Isle aux Morts, Long Grade and Margaree

*the Regional Economic Zone listed is the one within which most communities fall. Some Local Area/Census Division boundaries cross economic zones. Zone 9 is the Long Range Regional Economic Development Board; Zone 10 is the Marine and Mountain Zone Corporation.

The Codroy Valley local area consists of 14 communities with a total of approximately 2,200 residents. The valley is a fertile glacial basin formed in the Anguille Mountains, a sub-range of the Long Range Mountains. Favourable topography and climate resulted in early land settlement; the valley has the earliest recorded evidence (1822) of settlement on Newfoundland's West Coast and a long history of farming. These attributes, combined with a mixed ancestry of French, Mi'kmaq, Gaelic and English, have resulted in a distinctive music, heritage and culture. Three small areas are located along Route 1 near the proposed transmission corridor: North Branch, Codroy Pond and River Brook (Community Accounts NL 2012).

The Crabbes River local area includes 11 communities within a farming region that was populated primarily by Scottish descendants. The coastal communities of Robinson's, McKay's, Jeffrey's and Heatherton are known for their open fields that reflect the land's capacity to sustain crops and livestock – mainly sheep. The Robinson's, Crabbes and Barachois Rivers have long attracted salmon angling tourists (NLDTCR 2012). In 2006, this area had an overall population of about 1,400 people (Community Accounts NL 2012).

The St. George's local area, with five communities, was settled in the 1600s by French fish harvesters who were attracted to St. George's natural harbour. The community remained a fishing village for nearly 200 years until the railroad was constructed in 1898. Thereafter, the town became a distributor of goods to the surrounding area and the Port au Port Peninsula. Lumbering, fishing and farming were the primary occupations. The town of St. George's remained important until the construction of the American Air Force Base in Stephenville in 1941, which resulted in the town becoming a service centre. The closure of the railway in 1988 and the collapse of the cod fishery in the early 1990s had an adverse effect on St. George's economy (Town of St. George's 2012). The 2006 population of this area was about 1,870

residents (Statistics Canada 2006). Mi'kmaq people reside throughout Southwest Newfoundland, but particularly in the St. George's area (Mi'kmaq Nation 2012).

The Port aux Basques area includes the town of Port aux Basques and six other communities. Since the 1500s, the large natural and ice-free harbour has acted as a shelter for storm-stricken vessels passing through the Cabot Strait. Port aux Basques was also the terminus of the Newfoundland railway between 1893 and 1988. Today, the community's harbour handles 90 percent of all passenger and road freight traffic arriving and leaving the Island (Community Accounts NL 2012, NHS 2012). The other smaller communities are either bedroom communities for Port aux Basques and/or participate in the fishery.

As is the case in many areas of the province, Southwest Newfoundland is a sparsely populated rural region. Most of the communities are quite small and infrastructure and services are limited throughout the region. As a result, Port aux Basques tends to be the service centre for the Codroy and Port aux Basques Local Areas, and Stephenville tends to be the service area for the Crabbes and St. George's Local Areas (NLDOF 2011).

The main transportation route is the Trans Canada Highway, which links Port aux Basques to Corner Brook and Stephenville via Route 490. Other smaller secondary roads connect communities within each of the Local Areas to the TCH. Traffic data for 2011 indicates that the peak season is between May and September, which can be attributed to tourism-related travel.

The Stephenville International Airport is classified as a regional/local airport. Two airlines currently offer regularly scheduled flights: Flair Air and Provincial Airlines (PAL). Flair Air operates work crew charters direct to Fort McMurray, Alberta; PAL operates regular flights to St. John's. Air Saint Pierre provides special-event charter services to Saint-Pierre et Miquelon, a French possession off the south coast of Newfoundland. The airport is a refueling stop for both international passenger and military aircraft and is the official alternate destination for Gander International Airport. There is also a provincially owned landing strip in the Codroy Valley (Our Airports 2012).

The port at Port aux Basques has been in operation since 1898. Marine Atlantic carries approximately 400,000 passengers, 130,000 passenger vehicles, and 88,000 commercial vehicles annually and is the sole shipping company operating in Port aux Basques (MAI 2012). The Canadian Coast Guard, oil tankers, cruise ships and other shipping companies occasionally use the port facilities (PAB 2011). Stephenville's harbour, which is located approximately 50 km east of Cape St. George, is operated by the Port Harmon Authority Ltd. Over the last 10 years, the port has had approximately $10 million in renovations and upgrades to meet local demand, including dredging and new floating wharves. In addition to Stephenville and Port aux Basques, various smaller ports and harbours are located in the Local Areas of Codroy, Crabbes, St. George's, and Port aux Basques. Harbour authorities are responsible for the operation of harbours in St. David's (Crabbes River), Codroy and Little Port Harmon (Stephenville). Many ports are currently underutilized (DFO 2012).

Of the 37 communities located in the four Local Areas, 15 have public water supplies; the remaining communities are serviced by private wells. As shown on Figure 6.3.1, there are two protected public water supplies within the Study Area. Both supplies service the community of St. George's; one is a surface water supply, and one is a groundwater supply. There are two unprotected public groundwater supplies in the Study Area (Figure 6.3.1 - Benoits Siding and Tompkins). These are considered unprotected, as they have not been designated through a process under the *Water Resources Act*; however, they are known and defined areas, and were brought to ENL's attention through consultation with the Crown Lands Division of NLDEC.

Since 2000, nine boil water advisories have been issued within the four Local Areas. The majority of advisories are a result of issues with chlorine in the water distribution system. (NLDEC 2012d).

Other municipal and community infrastructure includes sewer and septic systems, and power distribution and communication infrastructure.

The Royal Canadian Mounted Police (RCMP) provide policing services for communities along the Study Area. Municipal and community fire protection services are provided throughout the province by local or regional fire departments and staffed by volunteer and/or paid fire fighters.

Residential Land Use

There is no known permanent residential land use within the Study Area from Granite Canal to the Bottom Brook area. Table 6.3.3 provides a summary of the number of registered dwellings in the Local Areas and municipalities (Statistics Canada 2006).

Table 6.3.3 Summary of Registered Dwellings by Local Area/Municipality

Local Area/Municipality	Total Dwellings
Stephenville	3,181
St. George's	543
Crabbes River	971
Codroy Valley	1,572
Port aux Basques	1,912

Table 6.3.4 summarizes available temporary accommodations in the Local Areas. The 2010 accommodations occupancy rate for the entire western region of Newfoundland was approximately 42%. Occupancy was highest between June and September and lowest in December and January (NLDTCR 2010). Within the four Local Areas, 352 rooms were available in 2010 (NLDTCR 2012) (Table 6.3.4).

Table 6.3.4 Short-Term Accommodations in the Local Areas

Accommodation Type	Rooms (2010)
Hotel/Motel/Inn	249
Bed and Breakfast	24

Table 6.3.4 Short-Term Accommodations in the Local Areas

Accommodation Type	Rooms (2010)
Cottage/Cabin	20
Efficiency Unit	39
Lodge	20
Total	**352**

Recreational Land Use

Recreational land uses include motorized and non-motorized activities (*e.g.,* hiking, skiing, snowmobiling, ATV use); hunting and fishing; bird watching and cabin and cottage use. Protected areas such as provincial parks also provide recreational opportunities.

The use of snowmobiles and ATVs is regulated by the *Motorized Snow Vehicles and All-Terrain Vehicles Act* and Regulations. In addition to official trails, there is likely widespread unofficial use of crown and private land in the area for recreational purposes. As shown in Figure 6.3.1, there are no Newfoundland and Labrador Snowmobile Federation (NLSF) trails within the Study Area from Granite Canal to Bottom Brook. From Bottom Brook to Cape Ray, the Study Area intersects the T'Railway Park, which the NLSF has proposed to manage for snowmobiling. ATVs are used on the T'Railway and other trails in Southwest Newfoundland (NLDEC 2012e, NLDTCR 2012). The Study Area crosses the T'Railway in several areas and other trails near South Branch and Benoit's Siding.

Hiking trailheads are identified in Barachois Pond and J. T. Cheeseman Provincial Parks, and at South Branch, Doyles, Upper Ferry and Cape Ray (NLDTCR 2012). While these trails are not georeferenced, the trailheads are shown on Figure 6.3.1. The International Appalachian Trail Newfoundland and Labrador (IATNL) Grand Codroy Way is a 32 km backcountry route that crosses barren land in the Long Range Mountains. The southern access begins 3 km north of the TCH exit to Cape Ray. The trail is accessed in the north via the Starlight Trail south of Tomkins in Little Codroy River Valley (IATNL 2008). The Study Area crosses the IATNL and the T'Railway.

Designated camping locations are shown on Figure 6.3.1, and include provincial parks and private camp grounds. The Project is proximate to or crosses a number of these areas including Barachois Pond Provincial Park, Crabbes River Park and Wishingwell Campgrounds.

There are defined management areas for big game (moose, black bear and caribou). Small game management areas and zones apply to a variety of species. Waterfowl and murre are also hunted. The Wildlife Division of NLDEC manages hunting and trapping through annual management plans for big game, small game and furbearers. Hunting is an important and widely practiced recreational pursuit, and is also a means to supplement food supplies. Table 6.3.5 lists the hunting zones that are intersected by the Study Area. Additional information about hunting and Caribou is provided in the Section 6.1 (Caribou VEC).

Table 6.3.5 Summaries of Various Hunting Zones Intersected by the Study Area

Moose/Black Bear	Designated Zones
	Zones 8, 10, 11, and 18.
Caribou	Zones 61, 62, and 63.
Bird Hunting	Southern coastal, western coastal, southern inland and Murre hunting Zone 3.
Lynx	Zone A; hunting was open in this zone for 2011-2012 following the lifting of a moratorium due to low lynx numbers.
Small game	The area is open for small game hunting (*e.g.*, ptarmigan, grouse, hare), although various restrictions apply within parks and protected areas.

Recreational fishing is an important activity as a means to supplement food supplies, and as a component of the tourism-based economy. DFO's Atlantic Salmon Management Plan (2007-2011) annually sets season dates and retention limits for angling on 186 scheduled salmon rivers (DFO 2011). The Project crosses 12 of these rivers (Figure 6.3.1); numbering reflects designation provided in the 2011/2012 Anglers Guide (DFO 2011):

- 122 – White Bear River, open for salmon fishing;
- 145 – Southwest and Bottom Brook, partly closed to salmon fishing;
- 144 – Little Barachois Brook, partly closed to salmon fishing;
- 143 – Flat Bay Brook, partly closed to salmon fishing;
- 142 – Fischell's Brook, partly closed to salmon fishing, associated watershed management plan;
- 141 – Robinson's River, partly closed to salmon fishing, associated watershed management plan;
- 140 – Middle Barachois River; catch and release with a limit;
- 139 – Crabbe's River, partly closed to salmon fishing, associated watershed management plan;
- 138 – Highlands River, partly closed to salmon fishing, associated watershed management plan;
- 137 – Great Codroy River, partly closed to salmon fishing;
- 136 – Little Codroy River, open for salmon fishing; and
- 135 – Bear Cove River, open for salmon fishing.

For trout fishing, the Project falls within Zone 1 – Insular Newfoundland. Arctic char and smelt are also fished in this area.

Known camps and cottages in proximity to the Project are shown on Figure 6.3.1; there are likely also a number of unregistered camps and cottages within the Local Areas.

Outfitting is an important part of the Newfoundland economy. There is a thriving travel tourism in Newfoundland and Labrador that primarily caters to American and European hunters and anglers. Hunters and anglers are drawn by high hunting success rates (*i.e.*, 85% for moose), and record fish sizes (*i.e.*, Atlantic salmon as large as 13 kg) (Nalcor 2012). Salmon fishing and guided hunting for bear, caribou, and moose are the most popular services offered. The location of known outfitting camps in proximity to the Project is shown on Figure 6.3.1.

The agriculture, forestry, fishing, and hunting sectors generated $381.9 million in revenue for the province in 2011, representing approximately 2% of the province's GDP (NLDOF 2012). Tourism revenues from 2010 amounted to $410.6 million (NLDTCR 2011). Tourism in the province grew by 7.3% between 2009 and 2010, while revenues increased by 9.6% over the same period (NLDTCR 2011). The outfitting industry, which is mainly involved in hunting and fishing activities, is an important part of the province's tourism sector. The outfitting industry provides a variety of spin-off revenues to local communities in western Newfoundland. Local airports, hotels, restaurants, and retail outlets in the towns of Deer Lake and Stephenville in particular benefit from tourists arriving during the summer and early winter. The importance of the outfitting industry to the local economy was recognized by the federal government, which awarded the NLOA a $100,000 grant to aid in the promotion of the industry (ACOA 2011).

Angling and hunting is also an important recreational activity for local residents. Several non-profit and charitable organizations have been established to conserve wildlife stocks and promote sustainable wildlife management. These include the Atlantic Salmon Federation (ASF) and the Salmon Preservation Association for the Waters of Newfoundland (SPAWN). SPAWN was founded in 1979 as an affiliate of the ASF, working to conserve and protect Atlantic salmon from poaching and habitat destruction (SPAWN 2012). These groups are also active in rehabilitating local rivers, brooks and streams, raising awareness through regular communication, and outreach and engagement with local schools and communities.

The Project is located within 5 km of a number of protected areas such as IBAs, and provincial parks. The IBAs are assessed in terms of their ecological function in Section 6.2 (SOCI VEC); the provincial parks associated with the IBAs are discussed here in relation to their socio-economic value. The protected areas are summarized in Table 6.3.6 and shown on Figure 6.3.1.

Table 6.3.6 Parks and Protected Areas within 5 km of the Study Area (NL)

Park/Protected Area	Description	Approximate Distance from Study Area
Little Grand Lake (south) Wildlife Reserve	This Reserve is approximately 569 km^2 and augments Little Grand Lake Provisional Ecological Reserve by providing a larger contiguous protected area for the threatened Newfoundland marten. Activities are restricted, although a construction permit may be obtained for mineral exploration, timber	Adjacent to and overlaps with the southern boundary.

Table 6.3.6 Parks and Protected Areas within 5 km of the Study Area (NL)

Park/Protected Area	Description	Approximate Distance from Study Area
	harvesting, commercial development (outfitting and tourism operations) or existing development.	
Barachois Pond Provincial Park	The largest provincial park, at 3500 ha. It is characterized by a balsam fir forest with an understory of ferns and moss. This park is popular for hiking, camping, and water activities including fishing.	Intersects the park at the northwest corner.
T'Railway Provincial Park	This linear park extends almost 900 km from St. John's to Port aux Basques, along the main line of the abandoned Canadian National railbed. It provides access to many representative natural and scenic landscapes. It is used for motorized and non-motorized activities.	Adjacent to and intersects at numerous locations.
Codroy Valley Provincial Park (associated with the Codroy Valley IBA)	This is a day-use park, with views of the long range mountains and a beach area that is popular for bird watching.	8 km.
Cheeseman Provincial Park (associated with the Grand Bay West to Cheeseman Provincial Park IBA)	This is a natural environment park that is situated in the Cape Ray barrens. Park activities include camping, hiking, swimming, beach combing, and bird watching.	Intersects the park at the western edge.

A viewscape study was commissioned for the Project to determine the visibility of the proposed transmission line and how changes in views resulting from the Project could affect sensitive viewing areas and/or diminish opportunities to enjoy existing views. This study evaluated a 20 km wide Study Area (10 km from either side of anticipated centerline) and assessed the potential visibility of the transmission infrastructure from the following tourism-related sensitive viewing areas located within or intersecting with the Study Area:

- four provincial parks;
- two protected areas;
- seven hiking trails;
- one beach (Grand Codroy Beach/Searston Beach);
- two golf courses;
- five campgrounds;
- two historical resources;
- 30 outfitters;
- five scenic drives; and

- two other areas (Cape Ray Lighthouse; Grand Codroy Estuary/Interpretative Centre).

Additional sensitive viewing areas considered in the viewscape study included portions of the Trans Canada Highway and residential areas located within the Study Area.

Using Project design information (*e.g.*, Project structures, corridor cross sections), a viewshed model was prepared to analyze the visibility of the Project from the locations described above, while taking into account natural topographic and forest-cover features that could act as visual screens.

Transmission tower visibility was found to be greatly influenced by viewing distance, background composition and tower design. Generally, the wood transmission towers tend to be more visible than lattice steel towers, but all towers blend into the landscape background, regardless of design, at distances of greater than 2 km, except for towers seen against the sky. Over the total length of the 20 km wide Study Area, the new transmission towers are potentially visible from 30% of the Study Area. From 56% of the Study Area the new transmission towers are likely not visible due to topography and from 14% of the Study Area the new transmission towers are potentially not visible due to forest cover.

Considering 198 km of the proposed transmission corridor will parallel existing transmission lines, the magnitude of visual alteration by the Project is substantially reduced. The most substantial net change in tower visibility occurs in the section between the Cape Ray landing compound and Trans Canada Highway and the section between Route 480 (Burgeo Highway) and Granite Canal. Along Route 480 where the proposed tower model is identical to existing structures, no net change in tower visibility occurs.

Resource Use

The province of Newfoundland and Labrador is divided into 24 Forest Management Districts. Each district has an associated five year operating plan which details environmental management objectives; planned activities; proposed harvest areas; locations and types of silviculture activities; and plans for construction, upgrades and removal of access roads.

The Project crosses Forest Management Districts 13 and 14 (Figure 6.3.2). The extensive forestry road system has resulted in a high level of existing access for industrial/commercial, recreational and subsistence activities.

The Southwest Newfoundland region is one of the most important agricultural areas of the province, and there are currently 111 farms within the Local Areas. These are mainly dairy and vegetable farms and most are located around the Crabbes River and Codroy Valley areas. The Department of Natural Resources, Agrifoods Branch, administers a land use program. This program supports the development and long term availability of the province's relatively limited amount of arable land. Crown Land agriculture leases are issued for a period of 50 years and

are eligible for renewal. Lease conditions, including environmental requirements and rates of development, are tailored to each production commodity and can be adjusted for specific sites.

Mining exploration and development is approaching record levels in Newfoundland and Labrador. There are many staked claims for mineral exploration and several areas of mineral tenure (Figure 6.3.2) within the four Local Areas. Exploration areas are located inland from Buchans to Port aux Basques, along Route 1 both east and west of Stephenville, north of the former coastal community of Grand Bruit and in various other areas. There has been active exploration for oil and gas in western Newfoundland, particularly on the Port-au-Port peninsula. The Project crosses several exploration areas for mining and onshore oil and gas, various areas under mineral tenure, and multiple quarries (Figure 6.3.2). No mines that are currently producing or under active development are located within or immediately adjacent to the Project (NLDEC 2012f, NLDNR 2012, NLDNR 2011b, NLDNR 2011c).

Mineral exploration licences are issued for five year terms, but can be held for a maximum of 20 years if renewed and proper assessment goals have been maintained. Mineral Tenure includes mining leases and other activities or mining exemptions (Whelan pers. comm. 2012, NLDNR 2012).

6.3.2.2 Economy

Production in the Newfoundland and Labrador economy is led by goods-producing industries, which accounted for 40.9 percent of provincial GDP in 2010. This represents a major increase in share of output from 27.3 percent in 1997 (Table 6.3.7). The bulk of this change came from a six-fold rise in contribution from mining and oil and gas extraction industries. The relative influence of all other goods-producing sectors remained essentially the same (NLDOF 2012).

Table 6.3.7 Newfoundland and Labrador Economy, GDP and Employment by Sector in 2010

Sector	Gross Domestic Product		Employment	
	$ millions	% of total	P-Y 000s	% of total
Agriculture, forestry, fishing and hunting	350.6	2.0%	7.9	3.6%
Mining and oil and gas extraction	4,736.5	26.7%	9.6	4.4%
Utilities	509.6	2.9%	1.9	0.9%
Construction	951.7	5.4%	15.4	7.0%
Manufacturing	711.9	4.0%	9.8	4.5%
Goods producing Total	**7,260.3**	**40.9%**	**44.6**	**20.3%**
Wholesale trade	589.5	3.3%	5.5	2.5%
Retail trade	1,061.9	6.0%	31.9	14.5%
Transportation and warehousing	496.1	2.8%	11.8	5.4%
Information, cultural industries and entertainment	571.1	3.2%	7.8	3.6%
Finance and insurance, real estate and management	2,654.5	15.0%	13.2	6.0%
Professional, scientific and	450.0	2.5%	7.1	3.2%

Table 6.3.7 Newfoundland and Labrador Economy, GDP and Employment by Sector in 2010

Sector	Gross Domestic Product		Employment	
	$ millions	% of total	P-Y 000s	% of total
technical services				
Accommodation and food services	324.2	1.8%	13.9	6.3%
Other services (except public administration)	359.9	2.0%	11.2	5.1%
Service producing Total	**6,507.2**	**36.7%**	**102.4**	**46.7%**
Educational services	1,084.3	6.1%	17.1	7.8%
Health care and social assistance	1,425.2	8.0%	36.6	16.7%
Public administration	1,464.3	8.3%	18.6	8.5%
Public administration Total	**3,973.8**	**22.4%**	**72.3**	**33.0%**
Total NL GDP	**17,741.3**		**219.3**	

Source: Statistics Canada 2010

The Project is within the Long Range (9) and Marine and Mountain (10) Regional Economic Zones, shown in Figure 6.3.2. The economy of this region is predominantly resource-based with two urban centres, Stephenville and Port aux Basques.

Economic Zones 9 and 10 include some of the most active farmland in western Newfoundland, with upwards of 30 agricultural sites growing root vegetables and berries on a total of 60 ha. Two dairy farms operate in the region, contributing to a provincial dairy industry with a combined employment of approximately 450 people in 2009. Farms grow hay and silage on over 800 ha to support their operations. Three small livestock farms and one abattoir also operate in the region (NLDOF 2011). Active agricultural areas are shown in Figure 6.3.2.

Marine-based commercial fisheries are described and assessed in Section 7.2. The region includes one active fish processing plant located in Piccadilly. There are four active aquaculture sites in Economic Zones 9 and 10, in the Piccadilly Bay-Stephenville area, which produce blue mussels, scallops, eels and salmon (NLDFA 2012).

Mining activity in Economic Zones 9 and 10 is limited to the extraction of industrial minerals, primarily limestone, dolomite and tungsten. Two companies operate year-round and employ over 100 people at peak production. Four companies currently prospecting in the region are exploring the production potential of gold, salt, copper, nickel, magnetite, titanium and vanadium (NLDOF 2011).

Economic Zones 9 and 10 are within the province's Forestry Management District 14 (FMD 14). Economic activity related to forestry and forest products is limited, with a total annual harvest value of approximately $700,000. The closure of the Stephenville Abitibi-Bowater Mill in 2005 resulted in the end of pulp and paper production in the area and the loss of nearly 300 direct jobs (NLDOF 2011).

The bulk of other business activity within the region occurs in the centres of Stephenville and Port aux Basques, with a combined population of over 11,000. These towns are at the centre of the region's commercial, financial, and retail economies. Key regional infrastructure is located in Economic Zones 9 and 10 (*e.g.*, Marine Atlantic's ferry service connecting The island of Newfoundland to mainland Nova Scotia, operating out of Port aux Basques), and the regional/local airport located in Stephenville.

Regional labour force data (Table 6.3.8) provide an indication of the importance of industry sectors and how the industrial labour force in the region has been redistributed over recent years. As with many economies in Atlantic Canada, from 1996 to 2006, Economic Zones 9 and 10 saw declines or minimal growth in employment in agriculture (-29%) construction (no change), and manufacturing (+7%). The region also saw fairly sizeable employment losses in retail (-30%), finance and real estate (-17.5%) and educational services (-14%), the latter due in part to the closure of a number of schools in the region (NLDOF 2011). The business services industry experienced the greatest increase in labour force (64%) over the ten-year period. Growth in this type of employment is characteristic of an economy that is shifting away from rural, labour-intensive industries toward service-oriented jobs based in more populated centres. The region also saw a 57% increase in employment in wholesale trade, although the actual number of jobs gained was relatively small with only 65 added over the decade (NLDOF 2011).

Table 6.3.8 Economic Zones 9 and 10 Experienced Labour Force by Industry

Industry	1996	2001	2006	% Change 2006/1996
Agriculture and other resources	1,000	600	710	-29%
construction	380	825	380	0%
Manufacturing*	415		445	7%
Wholesale trade	105	1,125	165	57%
Retail trade*	1,235	-	855	-31%
Finance and real estate**	200	205	165	-17.5%
Health care and social services	690	1,300	725	5%
Educational services*	655	-	565	-14%
Business services	620	950	1,015	64%
Other services	795	1,515	1,015	28%
Total	**6,095**	**6,520**	**6,040**	

*construction/manufacturing, wholesale/retail trade, health and education combined in 2001
**Percent change in Finance and Real Estate is for 2001 to 2006

6.3.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

6.3.3.1 Potential Project-VEC Interactions

Table 6.3.9 ranks for each Project activity the potential effects on the socio-economic environment as 0, 1, or 2 based on the degree of interaction with the Project and the potential associated environmental effect.

Table 6.3.9 Potential Project Environmental Effects to the Socio-economic VEC (NL)

Project Activities and Physical Works	Potential Environmental Effects	
	Change in Land and Resource Use	Change in Economy
Construction		
Site Access and Site Preparation	1-2	1
Transmission and Grounding Line Infrastructure	1-2	1
Converter Stations	0	0
Grounding Facilities	1-2	1
Operation		
Overland Power Transmission	0	0
Power Conversion	0	0
Maintenance		
Regular Inspection	1	1
Repair to Infrastructure	1	1
Vegetation Management	1	1

KEY
0 = No interaction.
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.

Construction effects are rated as 1 for change in economy. The Project is expected to have a positive effect on the local economy as discussed in Section 2.11. In addition to direct employment, goods and services will be required and will be sourced from the Local Areas and the province as much as feasible. Providers of local goods and services (*e.g.*, construction, accommodations, and materials) will have an opportunity to learn about the Project and register for supplier information sessions. Accommodation facilities will be constructed for workers, especially for work in the Area of New Access. The Project is expected to benefit the province and the Local Areas. It is expected that most of these benefits will be achieved during the construction phase. Ongoing operation and maintenance will require additional staff for monitoring and repair; however, these numbers are not anticipated to be substantial over the long-term.

Construction effects are rated as 1-2 for change in land and resource use. Some land uses (*i.e.*, residential, recreational, and resource-based are rated as a 1. Based on a review of the Project Description (Emera 2011) by the Interdepartmental Land Use Committee (ILUC), potential effects on community infrastructure and services, particularly public water supplies, are rated as 2; these potential interactions are assessed below.

Residential and recreational land use, including camps, cottages, and outfitter facilities may be affected by Project-related land easement or purchase, or construction activities may affect enjoyment of properties as a result of noise or a change in the viewscape. There is no known residential land use within the area of new transmission alignment between Granite Canal and Bottom Brook. Private and commercial camps and outfitters located near the Study Area where new alignment is required in the Area of New Access may experience some disturbance with construction activities, but these are anticipated to be infrequent, and short in duration.

Although the Area of New Access to be traversed by the Project corridor is relatively inaccessible, compared with the balance of the Project in Newfoundland, an important aspect of managing potential added land use in this area includes controlling access. This area of the transmission corridor is currently accessible during winter months with snowmobiles. Throughout the rest of the year, there is existing access to the 10-km mark within the Area of New Access. This access road, as well as the intersection with Burgeo Highway, will provide the primary access points to the transmission corridor from the west. The existing Granite Canal access road will provide the access in the east (refer to Figure 2.6.1).

The results of the viewscape study indicate that of the 46 tourism operations (*e.g.*, outfitters, parks, camping) identified within the 20 km viewshed study area, one site is in the foreground distance zone (0-500 m), nine are in the mid-ground zone (500 m-2,000 m, and 36 are in the background zone (2,000-10,000 m). Project visibility zones for other sites within the viewscape study area include:

- residential areas (82% in the background);
- trans-Canada highway (8% in the background);
- scenic drives (59% in the background);
- T'Railway (59% in the background); and
- the Appalachian Trail (72% in the background).

Consultation with the NL ILUC indicated that viewshed changes were of particular concern for tourism operators and recreational trail users. The viewshed study results suggest that the potential effect on viewsheds is reduced primarily through Project design (*i.e*., paralleling existing transmission corridors). The natural topography and forest cover of the province further reduces the potential visual impact of the Project.

Where construction occurs adjacent to an existing RoW (*i.e.*, road or transmission line), minimal clearing will be required and construction activities will occur over a short period of time.

As discussed in Section 2.6.7, mitigation for noise during construction will be in place, and work will be undertaken to comply with Heath Canada's objectives for project-related noise levels (Health Canada, 2010) wherever feasible. However, potential for noise levels to be above these Health Canada guidelines exists where the converter stations are located, and where HDD is planned (Section 2.6.7). ENL will undertake a noise assessment at these locations and wherever sustained noise activities are planned in order to measure the potential effects of noise on receptors. A plan will be developed and implemented to mitigate noise to the extent feasible (*e.g*., installation of sound barriers, and/or timing restrictions on work).

The Study Area is adjacent to, or intersects with the following parks and protected areas:

- Little Grand Lake (south) Wildlife Reserve;
- Barachois Pond Provincial Park;
- T'Railway Provincial Park; and
- Cheeseman Provincial Park (associated with the Grand Bay West to Cheeseman Provincial Park IBA).

Where the Study Area is adjacent to Little Grand Lake Wildlife Reserve, the final routing is likely to follow the existing road leading to Bottom Brook. This road forms the southern boundary of the reserve and it is not anticipated that construction within the reserve will be required. Reserve boundaries will be considered during final alignment and avoidance will be a priority.

Where the Study Area intersects the northwest corner of Barachois Pond Provincial Park, the alignment will follow the existing transmission corridor. Final design and routing will attempt to avoid the park boundaries where feasible.

The Project crosses or is adjacent to the T'Railway Provincial Park in a number of areas. Potential interactions during construction include limited access to specific areas under construction for short periods of time. If sections of the trail are inaccessible temporary detours will be provided for users. As the Study Area in this location follows an existing corridor (*i.e.*, road or transmission), user experience of the park is not anticipated to change substantially during Project operation.

The Study Area intersects Cheeseman Provincial Park at its western extent. The transmission line in this location will follow the road, which accounts for the curve in the Study Area as shown on Figure 6.3.1. Final design and routing will attempt to avoid park boundaries where feasible.

As the Project will follow an existing corridor (*i.e.,* road or transmission) in areas where it might be visible from parks and recreational areas, a substantial change to the viewshed that would adversely affect user experience is not anticipated.

The Project will not necessarily remove portions of the land base from future development (*e.g.,* resource use or industrial activities) should opportunities be identified within the Study Area.

ENL will work through municipal planning requirements to facilitate such development to proceed, where feasible.

Where the Study Area crosses active agricultural land (Figure 6.3.2) reasonable efforts will be made during final design and routing to minimize direct interactions. As the Project follows existing corridors (*i.e.*, road, transmission) in areas where active farms may be located, potential environmental effects will be localized, and small in magnitude.

Power transmission and conversion activities are ranked as 0 for land and resource use and economy. Once the Project components are in place, the transmission of electricity will have minimal interaction with land and resource use or the economy.

Vegetation management and infrastructure maintenance activities are ranked as 1 for economy. These activities will occur infrequently, and according to standard procedures described in Section 2.6.7. Because these activities will be undertaken as part of normal maintenance and inspection programs, there will be a limited positive effect on economy.

Considering the nature of the interactions and the planned mitigation, the potential environmental effects of all Project activities and physical works that were ranked as 0 or 1 in Table 6.3.9, on the Socio-economic Environment VEC during any phase of the Project are rated not significant, and are not considered further in the assessment.

6.3.3.2 Potential Environmental Effects

Potential Project interactions with land and resource uses were rated as 2 for community infrastructure and services, as a result of potential effects on public water supply areas.

Project interactions with community physical infrastructure (*e.g.,* communications, electrical) are not anticipated. In the unlikely event that services are interrupted, appropriate mitigation will be in place such that services will be restored or temporarily replaced within a short timeframe.

Many areas crossed by the Project are not serviced by community water supplies, but depend on private wells (dug or drilled). The Project crosses three known water supply areas:

- Dribble Brook, a protected water supply area that has a groundwater and surface water component and supplies St. George's;
- an unprotected water supply for Benoit's Siding; and
- an unprotected water supply for Tompkins.

The Project has the potential to affect groundwater quality and quantity for private and community water sources. Potential effects during construction include sedimentation during site preparation or materials storage. Project vehicles and equipment, and the storage of materials may introduce contaminants from oil and fuel during all phases of construction. If bedrock removal (*e.g.*, ripping, blasting) is required in the vicinity of water sources, it could

result in changes to drainage patterns or pathways for contamination. During operation, the improper use of herbicides and/or pesticides could have a negative environmental effect on the water quality.

6.3.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

The Policy for Treated Utility Poles in Water Supply Areas (NLDEC) mandates avoidance, minimization and mitigation of potential risks associated with placing new poles in protected water supply areas. In order of preference, water supply areas will be avoided when feasible. If avoidance is not possible, new poles using environmentally acceptable materials such as western red cedar or composite material are to be used. This policy also mandates that a detailed plan must be submitted to the Water Resources Management Division for new construction within protected water supply areas. This plan should include a written letter of consent from the concerned council(s) that they have no objection to the proposed work.

The Policy for Land and Water Related Developments in Protected Public Water Supply Areas (NLDEC 2002) outlines a number of requirements for undertaking work in protected water supply areas. Under this Policy, a permit is required for the installation of power and telecommunication transmission lines. All construction, and operation and maintenance activities will be done in compliance with this Policy and the conditions of the permit.

ENL will apply the same mitigation required for construction in a protected water supply area to the unprotected supply areas at Benoit's Landing and Tompkins.

In addition to the requirements of any permits, standard construction mitigation and best management practices will help to mitigate any potential interactions with water supply areas. These are detailed in Section 2.6.7 and include setbacks from water bodies for clearing, groundbreaking activities, materials storage, and fuelling. The setback distances described in Section 2.6.7 will be supplemented as necessary within the Dribble Brook designated protected public water supply area to comply with Newfoundland's Policy for Land and Water Related Developments in Protected Public Water Supply Areas (NLDEC 2002). Accordingly, applicable development activities will be undertaken outside of the buffer zones specified in Table 6.3.10.

Table 6.3.10 Buffer Zones Around and Along Water Bodies in Protected Water Supply Area

Water Body	Width of Buffer Zones (from the High Water Mark)
Intake pond or lake	a minimum of 150 metres
River intake	a minimum of 150 metres for a distance of one km upstream and 100 m downstream
Main river channel	a minimum of 75 metres
Major tributaries, lakes or ponds	a minimum of 50 metres
Other water bodies	a minimum of 30 metres

If blasting is required within the protected and unprotected public water supply areas, a hydrological assessment will be carried out, and mitigation and monitoring will be developed in

consultation with NLDEC. If blasting is required outside of these areas, the proponent will undertake a pre-blasting well survey of a representative sample of private wells within 500 m of the planned blasting activities. These surveys will include testing for general chemistry and bacteria, and an interview with the well owner, where applicable. Follow-up testing will be undertaken involving wells in proximity to the blasting site to verify that water quality and/or well integrity has not been affected due to blasting activities.

The protected and unprotected water supply areas will be considered no-herbicide zones and considered as special management areas in the vegetation management plan. This designation will be reflected in the EPP for the Project.

Through the detailed design process avoidance of private water wells will be considered where feasible. Where avoidance is not feasible, alternative mitigation measures will be considered in consultation with the landowner. Suspected Project-related effects on water quality or quantity in a residential or commercial water supply well will prompt investigation and mitigation as required. The EPP will contain a contingency plan for providing temporary water should water supply wells be affected.

6.3.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

By following standard mitigation and best management practices outlined in Section 2.6.7, and implementing additional mitigation as described above, including adherence to conditions of permits, residual environmental effects to water supply areas and private wells are not anticipated. In the unlikely event that damage occurs, an investigation will take place and a contingency plan will be activated to provide temporary water until a permanent solution is developed and implemented.

6.3.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 6.3.11 summarizes the residual environmental effects of the Project on the Socio-economic VEC.

Table 6.3.11 Summary of Project Residual Environmental Effects: Socio-economic Environment (NL)

Mitigation – Construction & Operation and Maintenance
In addition to the standard construction mitigation and ENL best management practices outlined in Section 2.6.7, the following mitigation will apply: • No treated wood poles will be used within known protected and unprotected water supply areas. • Requirements laid out in the Policy for Land and Water Related Developments in Protected Public Water Supply Areas (NLDEC 2002) will be followed in protected and unprotected water supply areas. • Where required, permits will be obtained under the Policy for Land and Water Related Developments in Protected Public Water Supply Areas, and all conditions of permits will be followed. • If blasting is required in protected or unprotected water supply areas, a hydrological assessment will be carried out and mitigation and monitoring will be developed in consultation with NLDEC. • A pre-blast survey of all structures (*e.g.*, homes, wells, *etc.*) will be completed within a radius of the blasting zone that is consistent with regulatory requirements. The survey will include, where applicable, analysis of well water

Table 6.3.11 Summary of Project Residual Environmental Effects: Socio-economic Environment (NL)

quantity and quality (*e.g.*, chemistry, bacteria).

- ENL will undertake a noise assessment where high-noise events and/or sustained noise-producing activities are planned (*e.g.*, converter stations, HDD locations). This assessment will identify noise receptors and quantify the potential effects of noise on those receptors.
- The protected and unprotected water supply areas will be considered no-herbicide zones and will be considered as special management areas in the vegetation management plan.
- Water supply wells will be avoided during final design and alignment if feasible.
- The EPP will contain a contingency plan for providing temporary water should a water supply well be affected.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
Construction and Operation and Maintenance	Adverse	Low	Local	Short term	Occasionally	Reversible	Developed / Undisturbed	Not Significant

Follow-up

- ENL will undertake a noise assessment where high-noise events and/or sustained noise-producing activities are planned (*e.g.*, converter stations, HDD locations). A plan will be developed and implemented to mitigate noise to the extent feasible (*e.g.*, installation of sound barriers, and/or timing restrictions on work).

KEY

Direction:
Positive.
Adverse.

Magnitude:
Low: *e.g.*, specific group, residence or neighbourhood affected such that Land and Resource Use in Study Area is disrupted but current activities can continue after short periods of time.
Moderate: *e.g.,* part of a community affected such that Land Use in the Study Area will be disrupted such that current activities cannot continue for extended periods of time longer than two years. Economic activities in the Assessment Area affected for more than 18 months but less than the life of the Project.
High: *e.g.*, community affected such that adjacent Land Use in the Study Area will be disrupted such that current activities cannot continue for extended periods of time longer than two years and are not compensated for. Economic activities in the Study Area affected for the life of the Project.,

Geographic Extent:
Local: within the Study Area.
Regional: within the Local Areas of Codroy, Crabbes, St. George's, and Port aux Basques

Duration:
Use quantitative measure; or
Short term: During the Project Phase.
Medium term: Duration of the Project.
Long term: Duration of the Project plus 10 years.
Permanent: Will not change back to original condition.

Frequency:
Occasionally, once per month or less.
Occurs sporadically at irregular intervals.
Occurs on a regular basis and at regular intervals.
Continuous.

Reversibility:
Reversible.
Irreversible.

Environmental Context:
Undisturbed: Area relatively or not adversely affected by human activity; includes Area of New Access.
Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance:
Significant.
Not Significant.

6.3.7 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the Socio-economic VEC, the assessment area for cumulative environmental effects includes the Local Areas of Codroy Valley, Crabbes River, St. George's, and Port aux Basques (Figure 6.3.1); and Regional Economic Zones 9, and 10 (Figure 6.3.2). In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 6.3.12 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted within the assessment area. Table 6.3.12 also ranks the potential cumulative environmental effects as 0, 1, or 2 based on the degree of interaction with other projects or activities and the potential for overlapping effects with the Project.

Table 6.3.12 Potential Cumulative Environmental Effects on the Socio-economic Environment (NL)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Change in Land and Resource Uses	Change in Economy
Existing Linear Facilities	1	0
Existing Residential and Recreational Land Use	1	0
Resource Land Use	1	0
Indian Head Salmon Hatchery	1	1

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of project-specific or regional mitigation.

The future projects and activities considered for the cumulative environmental effects assessment include those likely to have residual environmental effects that overlap with the Project. Ongoing infrastructure and economic development projects, such as road maintenance/construction, municipal works, and small-scale industrial construction, which usually have localized, short-term construction periods, are not likely to combine with Project-related activities to pose adverse cumulative environmental effects on the socio-economic environment.

As a result of the design process and best environmental management practices, the Project is not anticipated to result in substantive residual adverse environmental effects on land or resource use (*e.g.,* following existing RoWs where feasible; the application of standard mitigation; and adherence to existing regulations and policies, including permitting).

Past uses of land for roads, residential development, recreational activities and resource harvesting/extraction, have caused a change to land and resource use patterns in the Study Area through increased access and settlement. It is unlikely, however, that the addition of Project infrastructure will act cumulatively to substantially change overall land use patterns locally.

The Indian Head Salmon Hatchery will cause changes to the landscape through ground disturbance and construction activities; however, this Project will be developed in an existing industrial area where public land and resource use is already limited. Therefore, the potential for overlapping environmental effects with the Maritime Link that would cause an adverse change to land and resource use is very low. The schedule for this project is not fully defined, however, even if it overlaps with the construction period for the Maritime Link, the skill sets required for each is quite different and labour shortages as a result of direct competition for personnel is not anticipated. Therefore, the likely cumulative environmental effects of these projects in combination would be positive overall for the economy.

6.3.8 DETERMINATION OF SIGNIFICANCE

Public and private water supplies are important and central to the health of communities. The planned construction activities near water supplies will occur in areas where development already exists, and do not, in themselves, pose unusual risk to private or public water supplies. Standard mitigation described in Section 2.6.7 will be followed, including set-backs from bodies of water for materials storage, clearing, and groundbreaking activities, in addition to any mitigation prescribed by permits and policies regulating water supply areas. This mitigation will be applied to both protected and unprotected water supplies affected by the Project. The amount of new construction has been reduced in Project design by routing the Project adjacent to existing corridors (*i.e.*, road and transmission) in many areas. Similarly, although private water wells are present within the Study Area, the methods and level of construction activities required for the Project do not pose unusual or heightened risk of damage to private water wells. Mitigation to protect these wells will be in place, including contingency plans to provide temporary water and replace damaged wells, in the unlikely event that this should occur.

The Project will not result in environmental effects that will restrict or degrade present land and resource use in the Study Area to a point where activities cannot continue at current levels or be mitigated or compensated. Therefore, based on the consideration of the environmental effects of construction and operation and maintenance, the proposed mitigation, and the residual environmental effects rating criteria, the residual environmental effects of the Project on the Socio-economic Environment are determined to be not significant.

In consideration of the nature of the interactions and the planned implementation of known and proven mitigation, the potential cumulative environmental effects of the Project, acting in combination with other known existing and planned projects and activities on the Socio-economic Environment during any phase of the Project are rated not significant.

6.3.9 FOLLOW-UP AND MONITORING

ENL will undertake a noise assessment where high-noise events and/or sustained noise-producing activities are planned (*e.g.,* converter stations, HDD locations). A plan will be developed and implemented to mitigate noise to the extent feasible (*e.g.,* installation of sound barriers, and/or timing restrictions on work).

With the implementation of proposed mitigation described for the Socio-economic Environment VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.

6.4 ARCHAEOLOGICAL AND HERITAGE RESOURCES

Archaeological and heritage resources has been selected as a VEC in recognition of the interest of provincial and federal regulatory agencies who assure the effective management of these resources, the general public as a whole, and potentially affected Aboriginal groups that have an interest in the preservation and management of heritage resources related to their culture.

Archaeological and heritage resources are defined as any physical remnants found on top of and/or below the surface of the ground, including on or below the sea floor, that inform us of past human interaction with the physical environment. These resources may be from the earliest period of human occupation (Precontact) or from the more recent Historic Periods of human occupation. These resources are relatively permanent features of the environment and their integrity is highly susceptible to the effects of construction and ground disturbing activities. The context, or archaeological landscape, of built heritage resources is also considered susceptible to change, such as the addition of new structures in the immediate area of such resources.

Potential interactions between the Project and archaeological and heritage resources that may cause potential environmental effects are discussed in this section. For example, any surface or subsurface Project-related disturbance within an identified high potential area may result in interaction with archaeological and heritage resources. Potential changes to the context of built heritage resources are considered, with emphasis on the damage or removal of structures.

6.4.1 SCOPE OF ASSESSMENT

6.4.1.1 Regulatory Setting

In Newfoundland and Labrador, archaeological investigations are conducted under the general terms of the *Historic Resources Act* and the specific terms of the Archaeological Investigation Permit Regulations. The following definitions from the *Historic Resources Act* are relevant to the current assessment.

- Archaeological object: "…an object showing evidence of manufacture, alteration or use by humans that is found in or on land within the province and is of value for the information that

it may give on prehistoric or historic human activity in the province and includes human remains".

- Palaeontological resource: " … a construct, structure or work of nature consisting of or being evidence of prehistoric multicellular organisms and palaeontological resources that are designated by regulation."

- Land: Includes land covered by water, whether fresh or salt, within the province.

- Historic resource: "…a work of nature or of humans that is primarily of value for its archaeological, prehistoric, historic, cultural, natural, scientific, or aesthetic interest, including an archaeological, prehistoric, historic or natural site, structure or object."

In Newfoundland and Labrador, archaeological artifacts are considered to be non-renewable resources and ownership of these is vested in the Crown. Thus, the disturbance of such resources is only authorized under strictly controlled conditions imposed by terms of an Archaeological Investigation Permit, issued by the Government of Newfoundland and Labrador Provincial Archaeology Office (PAO) to qualified personnel under the *Historic Resources Act* (1990).

6.4.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of the archaeological and heritage resources is focused on the following environmental effect:

- Change in archaeological and heritage resources.

This environmental effect reflects the *CEAA* requirements for the assessment according to the definition of environment in *CEAA* as "any structure, site, or thing that is of historical, archaeological, palaeontological or architectural significance."

The measurable parameter for the selected environmental effect is included in Table 6.4.1.

Table 6.4.1 Measurable Parameters for Archaeological and Heritage Resources

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in archaeological and heritage resources	Presence/Absence of an archaeological or heritage resource	▪ Mitigation required only if an archaeological or heritage resource is identified, is deemed significant by provincial agencies, and unavoidable by construction activities.

6.4.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on archaeological and heritage resources include the periods of construction, and operation and maintenance.

Environmental effects to archaeological and heritage resources are most likely to occur during the construction phase. Construction activities carried out at any time of the year can affect any archaeological and heritage resources encountered. Ground disturbances are relatively short-term; however, any potentially adverse effects on archaeological and heritage resources would be permanent.

The operation and maintenance phase of the Project is not anticipated to involve ground disturbance in previously undisturbed areas or the addition of Project-related infrastructure in areas near built heritage resources; thus this phase of the Project will have limited potential to cause adverse environmental effects to these resources.

The spatial boundaries for the environmental effects assessment of archaeological and heritage resources are defined below.

Southwestern Newfoundland is the area within which cumulative environmental effects for archaeological and heritage resources may occur, depending on physical and biological conditions and the type and location of other past, present, and reasonably foreseeable projects.

6.4.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A **significant adverse residual environmental effect** on archaeological and heritage resources is defined as:

- An unmitigable change in a Project-related disturbance to, or destruction of, all or part of an archaeological or heritage resource considered by the provincial heritage regulatory agency to be of major importance due to factors such as rarity, undisturbed condition, context, spiritual significance or research importance.

6.4.2 BASELINE CONDITIONS

Existing conditions for the Archaeological and Heritage Resources VEC were established through research and field assessments conducted in 2011 by Cultural Resource Management Group Limited (CRM). CRM conducted the archaeological screening and reconnaissance which included background research, the development and application of an archaeological potential model, preliminary aerial reconnaissance, and limited pedestrian survey. A brief summary of existing conditions for archaeological and heritage resources VEC, with emphasis on the Study Area, is provided below.

6.4.2.1 Land-Based Conditions

Existing Knowledge from Previous Studies

Background research into land-based conditions included a review of relevant documentation available through the Government of Newfoundland and Labrador Provincial Archaeology

Office, the Provincial Archives of Newfoundland and Labrador, and the Newfoundland and Labrador Site Inventory.

Archaeological research conducted on the island of Newfoundland has traditionally focused on coastal areas as proximity to the sea and coastal resources have proven to be major determinants in the location of human settlement and distribution of archaeological sites (Bell and Renouf 2003). Furthermore, the resource base of the central portion of the island has generally been characterized as inadequate, impoverished, and unpredictable (Tuck and Pastore 1985).

Historical research suggests the presence of two Basque shipwrecks and a First Nations campsite on the shore of St. George's Bay (Downer 1997, Penney 1994). According to Mi'kmaq historians, St. George's Bay was home to one of the first permanent Mi'kmaq settlements on the island of Newfoundland (Downer 1997).

Previous archaeological surveys of the Codroy Valley have resulted in the registration of 16 archaeological sites (Penney 1994). Documentation suggests that the Mi'kmaq and the French from Nova Scotia inhabited the Codroy Valley as early as 1713 (MacLean 1991).

Cape Ray is the most extensively studied area within southwestern Newfoundland and is the location of CjBt-01, one of the largest and most important Dorset sites on the island (Figure 6.4.1). The site was occupied between 2035 before present (BP) and 1205 BP. It is contained within an area of approximately 5,600 m², plus a 100 m archaeological buffer.

Cape Ray has a long history of European settlement as well, with the first French settlement being recorded in the early eighteenth century. The area became a trading centre for English merchants and the French shipping industry (Penney 1994).

Cape Ray is an important place in communication history. The first submarine telegraph cable linking the island of Newfoundland to the rest of North America was installed at Cape Ray and was in operation by 1856. In addition, the Cape Ray Lighthouse was one of five lighthouses that served as a Marconi radiotelegraph station.

Project-Related Archaeological and Heritage Resource Studies

A site search of the Canadian Inventory of Historic Buildings was conducted prior to initial field investigations. Based on preliminary information and on discussions with CRM Group archaeologists, there are no built heritage resources of concern within the Study Area.

Application for appropriate permits to conduct archaeological fieldwork in NL were completed under the Archaeological Investigation Permit Regulations of the *Historic Resources Act*.

Emera Newfoundland & Labrador

Coordinate System:
UTM NAD 83 Zone 21

Scale: 1:30,000
Date: 22/11/2012

Data Sources:
Substrate & Vegetation: Stantec
Bathymetry: Fugro
Archaeological Features: CRM Group

FIGURE 6.4.1

Areas of High Archaeological Potential
Cape Ray, Island of Newfoundland

EN10091

The 2011 archaeological assessment of the proposed transmission corridor consisted of a number of components. Discussions with provincial regulators were initiated at the beginning to outline the Project. A logistical overview of the proposed transmission corridor was then completed to familiarize the study team, evaluate access to key locations and facilitate the finalization of strategies for subsequent preliminary reconnaissance and field truthing.

Background research was used to identify cultural and environmental factors that contributed to human occupation and exploitation within the study corridor. The goal of the research was to identify known archaeological and historic sites, and delineate areas of archaeological potential. This research involved a review of environmental factors as well as historical settlement and development patterns within the study corridor and included a review of relevant documentation available through the NL Provincial Archaeology Office (PAO), the Provincial Archives of Newfoundland and Labrador, the Newfoundland and Labrador Archaeological Site Inventory, the Canadian Inventory of Historic Buildings and other pertinent records and inventory files. Research focused on identification of areas of potential settlement or resource processing, supplemented by a review of land grant records, historic maps and local/regional histories. Topographic maps and aerial photographs, both current and historic, were used to identify environmental and physiographic features, such as topography and watercourse features, that would have influenced human settlement and resource exploitation patterns. The historical and cultural information was then integrated with the environmental and physiographic data and incorporated into the archaeological potential model.

The development and implementation of an archaeological potential model allowed for the identification of areas of high archaeological potential within the defined study corridor. Modelling was based on 1:50 000 NTS mapping and the result was a visual, GIS-based depiction of archaeologically sensitive areas within the proposed development areas. The model was developed through the analysis of a range of natural and environmental variables that contributed to decisions made regarding past land use. The generated output identified locations that, based on key natural and environmental data, exhibited the most favourable conditions for Precontact or historic settlement. The validity of the output was assessed by cross-referencing with available datasets, such as air photos, detailed topographic maps, and inventories of known archaeological and historic sites. Field reconnaissance, both pedestrian and aerial, was also used to test the validity of the model and to refine the areas identified as exhibiting high archaeological potential. The natural and environmental variables incorporated into the archaeological potential model included proximity to water (essential for drinking and transportation), slope, aspect and elevation. Areas of high archaeological potential were flagged for avoidance, field inspection or subsurface testing. The results were then used to create a detailed constraint map by applying the archaeological potential model to the base maps developed by ENL for environmental and engineering applications. A preliminary reconnaissance was then undertaken to conduct high level visual assessment of the proposed transmission corridor, to evaluate areas that were ascribed as high archaeological potential from the model.

The preliminary reconnaissance was followed by a more extensive program of archaeological reconnaissance to expand upon the preliminary results. Known as field truthing, this program involved the documentation of encountered archaeological sites and the development of strategies for the protection and preservation of those resources. Due to the length and remote nature of the transmission corridor in Newfoundland, a helicopter was used to access identified areas of particular sensitivity, supplemented, where possible by road access, particularly along the West Coast section of the alignment.

As field truthing was undertaken in areas ascribed high archaeological potential on the basis of background research, archaeological modelling and/or preliminary reconnaissance, the boundaries of those areas were re-evaluated. Discoveries of unfavourable environmental conditions (*e.g,.* steep slopes, hummocky terrain, boggy ground, *etc.*) or extensive ground disturbance resulted in the reduction of some areas of high archaeological potential and the elimination of others. In general, high archaeological potential was ultimately ascribed to areas of relatively flat, dry ground within 50 metres of visible archaeological features, significant water bodies or watercourses, as well as to areas where such conditions were present within 100 metres of a renowned avenue for Precontact and/or historic travel.

These areas, listed in Table 6.4.2 and shown in Figure 6.4.2, have been identified for further investigation.

Table 6.4.2 Areas of High Archaeological Potential (NL)

Area Identifier	Description
NFLD – 01	Located at the outflow of Granite Lake into Meelpaeg Lake; high and dry banks suitable for human occupation and/or utilization.
NFLD – 04	An unnamed watercourse south of Granite Lake; suitable and appealing as a potential fishing location.
NFLD – 05	Located at western end of Granite Lake; level and dry areas suitable for occupation and/or utilization; presence of an historic mill site (registered site DaBh-01).
NFLD – 06	Located near Granite Dam; features high and dry level areas suitable for human occupation and/or utilization.
NFLD – 07	Located along an unnamed watercourse flowing out of Granite Lake; large rapids; important transportation route; high, dry and level areas suitable for occupation and/or utilization.
NFLD – 09	Located along Burnt Pond River; important link in transportation route from interior to coast; sand/gravel bars suitable for occupation and/or utilization.
NFLD – 10	Located along unnamed tributaries at the east end of Burnt Pond; dry and level areas suitable for occupation and/or utilization.
NFLD – 14	Located along a series of ponds; presence of rapids; intermittent high and level areas suitable for occupation and/or utilization.
NFLD – 15	Located along an unnamed pond and associated tributary; presence of two registered archaeological sites (DbBl-01 and DbBl-02); peripherally located in the Study Area.
NFLD – 16	Located along an unnamed tributary south of Lloyds River located peripherally in the Study Area.
NFLD – 18	Located along an unnamed pond located peripherally in the Study Area.
NFLD – 19	Located along Southwest Brook; potential high in areas where there are rapids.
NFLD – 20	Located along Silver Pond.

Table 6.4.2 Areas of High Archaeological Potential (NL)

Area Identifier	Description
NFLD – 21	Located along Southwest Brook.
NFLD – 23	Located along Southwest Brook.
NFLD – 24	Located along Southwest Brook; potentially navigable water important for transportation and resources; possible path.
NFLD – 25	Located along the confluence of Southwest Brook and St. George's River and along the shore of First Pond; high potential on the north bank and at the confluence of Southwestern Brook and Bottom Brook.
NFLD – 26	Located along a crossing of the Little Barachois Brook; high potential along the plateau of the southern bank and on the sandy islands in the watercourse.
NFLD – 30	Located along a crossing of Fischells Brook between Flat Bay Brook and Robinson's River; elevated plateau suitable for human occupation and/or utilization.
NFLD – 31	Located along a crossing of Robinson's River; presence of two registered 20th century archaeological sites (Dbbq-01 and DbBq-02); level terraces and possible source of raw lithic material.
NFLD – 32	Located potential along a crossing of the Middle Barachois River; presence of a plateau on the south bank; likely a large river for transport and resource exploitation.
NFLD – 34	Located along a crossing of Crabbs River; a high, dry and level area suitable for occupation and/or utilization.
NFLD – 37	Area of high potential along Codroy Pond; located peripherally in the Study Area.
NFLD – 39	Located along the North Branch of the Grand Codroy River; high, dry and level plateaus suitable for occupation and utilization.
NFLD – 40	Located at a crossing of the South Branch of the Grand Codroy River; high and dry northern bank suitable for occupation and/or utilization.
NFLD – 42	Located along the South Branch of the Grand Codroy River; located peripherally in the Study Area.
NFLD – 44	Located along the Grand Codroy River; located peripherally in the Study Area.
NFLD – 45	Located along the Little Codroy River; consists of a series of plateaus rising from floodplain, current agricultural use.
NFLD – 46	Located along the Little Codroy River; high and dry plateaus, current agricultural use.
NFLD – 47	Located along a crossing of an unnamed tributary of the Little Codroy River; high and dry plateaus on the north and south banks; possible historic trail on the south bank.
NFLD – 48	Located along Big Pond and Bear Brook Cove; level areas suitable for human occupation and/or utilization.
NFLD – 49	Located between the communities of Red Rocks and Cape Ray.
Grounding Site	**Description**
NL ES #1 – Grounding Site near Stephenville	Located at the crossing of Brook Street and Harrys River.

A general reconnaissance was also conducted in the Cape Ray area. High archaeological potential had been ascribed to the entire coastal area of Cape Ray within 150 m of the shore, based on background research, archaeological potential modeling, and field truthing. During reconnaissance at Cape Ray, CRM Group identified a number of Precontact find spots and historic features, some of which have since been registered as new archaeological sites. Figure 6.4.1 presents the high potential areas identified on the Cape Ray Peninsula.

Emera Newfoundland & Labrador

Coordinate System:
UTM NAD 83 Zone 21
Scale: 1:750,000
Date: 22/11/2012

Data Sources:
Geobase - Road Network
Geogratis - National Atlas
High Potential Model/Verification - CRM Group

Areas of High Archaeological Potential
Island of Newfoundland

FIGURE 6.4.2

EN/0090

Table 6.4.3 presents the ten new archaeological sites recorded by CRM Group following fieldwork conducted in 2011. Nine of these sites are located at Cape Ray, and the tenth, DaBh-01, is located at the northern end of Granite Lake.

Table 6.4.3 Archaeological Sites (NL)

Site Identifier	Description
CjBt-04	Consists of a probable Historic Period stone-lined cellar, obscured by dense brush, vegetation and water. A culturally modified landscape was encountered approximately 95 m southwest and may be associated.
CjBt-05	Consists of a large amount of ballast-stone encountered on the cobble beach located north of Cape Ray, which may be associated with a shipwreck or shipwrecks in the vicinity.
CjBt-06	Consists of traces of an Historic Period foundation, in-filled well, a root cellar and another unidentified feature.
CjBt-07	Consists of a potential slipway and historic artifacts recovered from an eroding bank and in preliminary shovel test pitting.
CjBt-08	Consists of the remains of an Historic Period root cellar.
CjBt-09	Consists of the remains of an Historic Period stone foundation, two potential root cellars and a circular stone feature that may be an in-filled well.
CjBt-10	Consists of traces of an Historic Period church foundation, a depression, a circular stone feature and a possible outbuilding.
CjBt-11	Consists of an unmarked burial (Historic Period).
CjBt-12	Consists of a surface scatter of three chert flakes (Precontact Period)
DaBh-01	Consists of abandoned machinery and possible remains of a milling operation.

Summary

Thirty-three areas of high archaeological potential have been identified within the Study Area. Project activities will be planned to avoid these areas. In circumstances where avoidance is not possible, further archaeological assessment will be initiated. In addition to these 33 areas, high potential has been ascribed to the entire coastal area of Cape Ray in general. Within this zone, several specific areas of high potential have been identified, including nine newly registered archaeological sites. Project activities will be planned to avoid these areas. In circumstances where avoidance is not possible further archaeological assessment will be initiated.

6.4.2.2 Marine-Based Conditions

An assessment of potential marine-based archaeological and heritage resources within the Study Area at Cape Ray was undertaken for the Project. Research for the nearshore marine study (*i.e.*, within 10 km) included a review of historic documents and research databases including geotechnical and geophysical surveys in the form of side-scan sonar, sub-bottom profile and multi-beam bathymetry. The latter were also reviewed for indications of archaeological potential, specifically for shipwrecks. The study also involved direct consultation with individuals and organizations with knowledge of the archaeological, geological and historical resources in the target area.

During reconnaissance at Cape Ray, a concentration of ballast stone was observed on the beach along the northwestern shoreline. The presence of this ballast is suggestive of the presence of shipwrecks in the area, for which there is historical reference.

In 2011, McGregor GeoScience Limited identified a large shipwreck from side-scan sonar data collected along a portion of the Cabot Strait Study Area.

The wreck of the HMCS Shawinigan is believed to be located in the Cabot Strait, near Port aux Basques at approximately 47°34”N 59°11”W (LGL 2010). The exact position for this site is unknown, as historical review and site survey to date have not yet located the wreck. This ship was a Flower Class corvette used to escort convoys across the Atlantic during World War II and is believed to potentially contain unexploded ordnance (UXO); it was torpedoed by a German u-boat (U-1228) in 1944.

6.4.2.3 Palaeontological Resources

Palaeontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Palaeontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced.

The palaeontological resources within the Study Area are part of the Carboniferous Period (360 to 290 million years ago), which was a time when the island of Newfoundland was located close to the equator and the warm climate resulted in lush vegetation dominated by large trees and swamp plants. This vegetation, along with many small animals, died and was buried in deposits that became peat and, much later, coal.

The only palaeontological resources currently identified near the Study Area are the Carboniferous deposits found in one area at Blanche Brook near Stephenville. This is the oldest known fossil bed of mountain trees that produced seeds, dating from 305 million years ago. The area is protected under the provincial *Historic Resources Act*.

6.4.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

6.4.3.1 Potential Project-VEC Interactions

Table 6.4.4 ranks for each Project activity the potential effects on archaeological and heritage resources as 0, 1, or 2 based on the level of interaction with the Project and the degree of environmental effect.

Table 6.4.4 Potential Project Environmental Effects to Archaeological and Heritage Resources (NL)

Project Activities and Physical Works	Potential Environmental Effect
	Change in Archaeological and Heritage Resources
Construction	
Site Access and Site Preparation	2
Transmission and Grounding Line Infrastructure	2
Grounding Facility	2
Subsea Cables	2
Operation	
Overland Power Transmission	0
Power Conversion	0
Subsea Power Transmission	0
Maintenance	
Regular Inspection	0
Repair to Infrastructure	0
Vegetation Management	0

KEY
0 = No interaction.
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.

Construction activities are rated as 2, and are further discussed below.

It is not anticipated that operation and maintenance of the Project will have an environmental effect on archaeological and heritage resources. These activities will take place where construction-related ground disturbance has already occurred, and thus where archaeological and heritage resources will have been fully assessed and mitigated to reduce the potential for adverse environmental effects to a level which is considered not significant. Therefore, the potential environmental effects of all Project activities during operation and maintenance on the Archaeological and Heritage Resources VEC are rated not significant and will not be considered further in this assessment.

6.4.3.2 Potential Environmental Effects

Project-related environmental effects could occur as a result of ground disturbance associated with construction activities.

Ground disturbance related to Project activities could lead to a change in the integrity of an archaeological or heritage resource. Archaeological resources could be directly affected by machinery, or the context of the materials may be altered through a change to the surrounding environment.

Background research, consultation with regulatory agencies, archaeological potential modeling, as well as preliminary archaeological field reconnaissance surveys, resulted in the identification of several areas within the Study Area holding high potential for archaeological and heritage resources.

6.4.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

Mitigation measures for known archaeological and heritage resources follow guidelines outlined in the Historic Resources Assessment and Impact Management Summary (Government of Newfoundland and Labrador 1992), which is an appendix to the *Historic Resources Act* (1990).

Proposed mitigation of environmental effects to archaeological and heritage resources includes the following.

- An archaeological assessment of the Project Study Area has been undertaken to determine areas of high archaeological potential.
- Avoidance of physical disturbance, where feasible, of areas of high archaeological potential and/or of known archaeological and heritage resources within the Study Area during final routing.
- Where avoidance of high potential areas for archaeological or heritage resources within the Project Study Area is not possible, archaeological testing will be undertaken to determine resources are present, in consultation with the Provincial Archaeology Office.
- Identified resources will be protected through avoidance, mitigation through archaeological recovery, or a combination of these measures. These activities will occur in advance of any Project-related ground disturbances, to the satisfaction of the Provincial Archaeology Office.
- Any excavations, or similarly invasive work, undertaken in areas of high potential will be completed with a qualified archaeologist present.
- The area of ground disturbance for the subsea cables will be assessed for archaeological resources using available geophysical data (*e.g.,* side scan sonar, magnetometer), during final routing. Avoidance of potential marine archaeological resources is the primary form of mitigation for the Cabot Strait.
- Provide the Provincial Archaeology Office and/or the Provincial Museum palaeontological staff the opportunity to examine any newly exposed bedrock known or suspected to contain fossils.
- If unexpected archaeological and heritage resources are encountered during construction activities, the EPP will contain a contingency plan for this situation.

6.4.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

With the proposed mitigation, the residual environmental effects of Project activities associated with construction will be highly localized in geographic extent and will be negligible or moderate in magnitude. Where avoidance of archaeological and heritage resources is not practical, the duration of the adverse environmental effect will be permanent and irreversible as archaeological and heritage resources are non-renewable and cannot be returned to their original context if altered or removed from the ground.

Any further archaeological investigations have the potential to contribute to the overall knowledge of the specific archaeological site, former inhabitants and cultural context.

6.4.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 6.4.5 summarizes the residual environmental effects of the Project on archaeological and heritage resources.

Table 6.4.5 Summary of the Residual Environmental Effects of the Project on Archaeological and Heritage Resources (NL)

Archaeological and Heritage Resources on the island of Newfoundland								
Mitigation - Construction								
• An archaeological assessment of the Project Study Area has been undertaken to determine areas of high archaeological potential. • Avoidance of physical disturbance, where feasible, of areas of high archaeological potential and/or of known archaeological and heritage resources within the Study Area during final routing. • Where avoidance of high potential areas for archaeological or heritage resources within the Project Study Area is not possible, archaeological testing will be undertaken to determine resources are present, in consultation with the Provincial Archaeology Office. • Identified resources will be protected through avoidance, mitigation through archaeological recovery, or a combination of these measures. These activities will occur in advance of any Project-related ground disturbances, to the satisfaction of the Provincial Archaeology Office. • Any excavations, or similarly invasive work, undertaken in areas of high potential will be completed with a qualified archaeologist present. • The area of ground disturbance for the subsea cables will be assessed for archaeological resources using available geophysical data (*e.g.*, side scan sonar, magnetometer), during final routing. Avoidance of potential marine archaeological resources is the primary form of mitigation for the Cabot Strait. • Provide the Provincial Archaeology Office and/or the Provincial Museum palaeontological staff the opportunity to examine any newly exposed bedrock known or suspected to contain fossils. • If unexpected archaeological and heritage resources are encountered during construction activities, the EPP will contain a contingency plan for this situation. • The mitigation of any archaeological sites discovered through further field work will be carried out by a permitted professional archaeological team conducted under permit by the Provincial Archaeology Office.								
Assessment								
Construction	**Residual Environmental Effects Characteristics**							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
	Adverse	Moderate	Local	Permanent	Occasionally	Irreversible	Undisturbed	Not Significant

Table 6.4.5 Summary of the Residual Environmental Effects of the Project on Archaeological and Heritage Resources (NL)

Archaeological and Heritage Resources on the island of Newfoundland		
Follow-up		
• The objective during Project planning is to avoid areas with known archaeological resources. Areas designated as "high potential" for archaeological resources through surveys completed to date will be avoided, where possible. If these areas cannot be avoided archaeological testing will be undertaken to determine if resources are present. Identified resources will be protected through avoidance and/or mitigation through archaeological recovery, in consultation with the PAO. Any excavations, or other similar disturbances, undertaken in areas of high potential, will be completed with a qualified archaeologist present. As required, protocols will be developed in Project EPPs to govern such undertakings. • Upon final selection of the grounding facility location, an archaeological assessment will be undertaken to characterize the proposed site.		
KEY ***Direction:*** Positive. Adverse. ***Magnitude:*** Low: Neither disturbance to or destruction of, archaeological and heritage resources. Moderate: Mitigated disturbance to, or removal of, archaeological and heritage resources that is authorized by regulatory agencies. High: Unmitigated disturbance to, or destruction of, Archaeological and heritage resources considered to be of major importance, or unauthorized disturbance or destruction of archaeological and heritage resources. ***Geographic Extent:*** Local: within the Study Area. Regional: within southwestern NL	***Duration:*** Use quantitative measure; or Short term: During the Project Phase. Medium term: Duration of the Project. Long term: Duration of the Project plus 10 years. Permanent: Will not change back to original condition. ***Frequency:*** Occasionally, once per month or less. Occurs sporadically at irregular intervals. Occurs on a regular basis and at regular intervals. Continuous. ***Reversibility:*** Reversible. Irreversible.	***Environmental Context:*** Undisturbed: Area relatively or not adversely affected by human activity; includes Area of New Access. Developed: Area has been substantially previously disturbed by human development or human development is still present. N/A Not Applicable. ***Significance:*** Significant. Not Significant.

6.4.7 CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the Archaeology and Heritage Resources VEC, the assessment area for cumulative environmental effects is the southwest portion of the island of Newfoundland. In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 6.4.6 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area.

Table 6.4.6 also ranks the potential cumulative environmental effects as 0, 1, or 2 based on the degree of interaction with other projects or activities and the potential for overlapping effects with the Project.

Table 6.4.6 Potential Cumulative Environmental Effects to Archaeological and Heritage Resources (NL)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in Archaeological and Heritage Resources
Existing Linear Facilities	1
Existing Residential and Recreational Land Use	1
Resource Land Use	1
Indian Head Salmon Hatchery	0

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.

Currently the disturbance of archaeological and heritage resources is only authorized under strictly controlled conditions imposed by the terms of an Archaeological Investigation Permit, issued to qualified personnel by the Government of Newfoundland and Labrador PAO under the *Historic Resources Act* (1990). The PAO maintains an inventory of all permitted sites which are subject to varying degrees of protection.

In the past, however, there was no requirement to conduct an assessment of archaeological and heritage resources prior to Project development. Thus, for the major linear features existing in the Study Area, such as roads and transmission lines, it is not possible to determine if such resources were encountered during construction, or if they were documented prior to their destruction or disturbance. Similarly, it is not known the degree to which housing and cottage development and recreational land use, [*e.g.,* trails, off-road vehicles (ATVs and snowmobiles) and hunting and fishing], may have affected archaeological and heritage resources in the past.

There is the same lack of information from past resource developments such as mines, aggregate quarries and forest harvesting, although there are no planned forestry activities in Zone 13 between Granite Canal and Bottom Brook in the current 5-year operating plan (2011-2016).

The Indian Head Salmon Hatchery, a land-based hatchery for salmon eggs, smolt, and broodstock, is planned for construction and operation in the near future. As the Project is located on property within the town of Stephenville that is zoned for industrial use, and has been

subject to environmental review and approval, it is assumed that no substantial residual environmental effects on archaeology have been identified.

Although areas of high potential for archaeological and heritage resources have been identified within the Study Area, given the lack of relevant information from prior projects and activities, it is not possible to determine the potential for cumulative environmental effects on archaeological and heritage resources in this area, should they exist.

6.4.8 DETERMINATION OF SIGNIFICANCE

6.4.8.1 Residual Project Environmental Effects

The residual environmental effects on archaeological and heritage resources may potentially occur during the construction phase for the Project. If disturbance to any archaeological resources that have been or may be discovered through further field truthing and subsurface test pitting cannot be avoided during final design, mitigation will be applied. The documentation, and analysis and interpretation of data recovered during mitigation should generate further scientific understanding and will help advance the knowledge of archaeological and heritage resources in NL.

The mitigation of any archaeological sites discovered through further field work will be carried out by a permitted professional archaeological team conducted under permit by the Provincial Archaeology Office.

Based on the results of this analysis, it is concluded that, with planned mitigation, the residual environmental effects of the Project during all phases are rated not significant.

6.4.8.2 Residual Cumulative Environmental Effects

Assuming that there are no unmitigated effects on archaeological and heritage resources as a result of the Project, it is concluded that, with planned mitigation, the residual cumulative environmental effects of the Project are rated not significant.

6.4.9 FOLLOW-UP AND MONITORING

The objective during Project planning is to avoid areas with known archaeological resources. Areas designated as “high potential” for archaeological resources through surveys completed to date will be avoided, where possible. If these areas cannot be avoided archaeological testing will be undertaken to determine if resources are present. Identified resources will be protected through avoidance and/or mitigation through archaeological recovery, in consultation with the PAO. Any excavations, or other similar disturbances, undertaken in areas of high potential, will be completed with a qualified archaeologist present. As required, protocols will be developed in Project EPPs to govern such undertakings.

Upon final selection of the grounding facility location, an archaeological assessment will be undertaken to characterize the proposed site.

With the implementation of proposed mitigation (*e.g.,* avoidance, additional archaeological investigation and where required, recovery of artifacts), as implemented in consultation with the PAO, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.