2.0 METHODS AND PROCEDURES

The Project Study Area is sufficiently large to allow for the identification of several alternative routes and sites (see Map 1-1). This study area allows for an appropriate range of planning choices for consideration based on the collection of environmental information about its physical and biological characteristics (including wildlife and aquatic resources), as well as socio-economic and land use characteristics (including locations of communities, conservation areas, economic land uses [*e.g.*, trapping], and archaeological and heritage resources). Study area characterization, although broadly focused on all aspects of the **environment**, was guided by prior SSEA project experience through which Manitoba Hydro has established an understanding of the environmental issues and concerns associated with the development of transmission facilities.

From 2009 through 2011, SSEA studies were conducted to gather information on a variety of wildlife groups, including mammals, using the habitats within areas where the proposed transmission line routes are located. Information gained through these mammal studies, together with other environmental study results, will be used to assist in the route selection process for the Construction Power and Generation Outlet transmission lines. This information will be used in the development of the Keeyask Transmission Project Environmental Assessment Report that will be submitted to Manitoba Conservation and Water Stewardship for licensing approval.

This report also provides information gathered from 2001 to 2011 on mammal communities in various habitats located throughout areas proposed for transmission line development and from the Keeyask area (Manitoba Hydro 2011a, 2011b; Keeyask Hydropower Limited Partnership 2012). Mammal abundance and diversity were described and compared for the habitats potentially affected by the Project. The routing analysis and effects assessment is based on data using those methods described below.

2.1.1 Overview of Information Sources and Data

Assessment of mammal community composition and of the abundance and distribution of individual species within the Project Study Area was conducted using a variety of methods. Mammal studies began with desktop exercises, including a review of peer-reviewed literature, other reports, and field surveys. Important data sources included existing mammal data collected from field studies completed for the Keeyask Generation Project on Gull Lake and Stephens Lake between 2001 and 2011. Data included ground tracking surveys for mammals, aquatic furbearer aerial surveys, caribou and moose aerial surveys, and small mammal surveys. Data from Aboriginal traditional knowledge documents provided by the Keeyask Cree Nations (KCNs) involved with the Keeyask Generation Project were also used. Data and results were also reviewed from Bipole III field studies. Studies conducted in 2009 were designed fill in the

gaps in order to characterize wildlife and wildlife habitat types in the Project Study Area, and especially near the preliminary proposed Construction Power transmission line and Generation Outlet Transmission lines alternate routes. Resource use and commercial trapping is evaluated in the Keeyask Transmission Project Socio-economic Technical Report.

Data collections for wildlife species and habitats focused on mammal species of regulatory concern, conservation concern, and on potentially regionally rare (*i.e*., comprising about 1% or less) or uncommon habitat types found in the Project Study Area. Wildlife use of existing habitats and specific habitat features were measured from aerial surveys for beaver and muskrat, caribou calving island surveys, and mammal tracking surveys to describe relative abundance and distribution, relative habitat use, and seasonality (Schemnitz 1980; Elzinga *et al.* 2001).

In order to evaluate effects of the Project on mammals, Valued Environmental Components (VECs) were selected from the mammal species in the Keeyask region. Two species, caribou and moose, were selected as mammal VECs. A limited assessment was also conducted for all mammal species that were not selected as VECs where certain effects could not be described by only caribou and moose. These mammals were grouped according to general characteristics, and included:

- Small mammals;
- Aquatic furbearers;
- Terrestrial furbearers;
- Large carnivores; and
- Ungulates.

Two ungulate species can be found in the Keeyask region. Caribou and moose are both VECs and are described as such. Groups were based on general characteristics such as body size and broad habitat requirements, and not on biological **taxonomy**. As such, mammal groupings are not meant to imply similarity in specific characteristics such as diet (*e.g*., herbivore or carnivore), or particular habitat preferences (*e.g*., mature forest or recent burns).

Mammal groups also included species listed by the federal *Species at Risk Act* (SARA) or *The Endangered Species Act* of Manitoba (MESA), or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Wolverine is listed as a species of special concern by COSEWIC. Its range includes the Project Study Area, but it is not found in large numbers in Manitoba. Little brown myotis (*Myotis lucifugus*) is not currently listed by SARA or MESA, but it is listed as endangered by COSEWIC, which has recommended that it be listed under Schedule 1 of SARA (COSEWIC 2012).

2.1.1.1 Aboriginal Traditional Knowledge and Local Knowledge

Aboriginal traditional knowledge (ATK) materials, including published information, were obtained from the following communities and reviewed: Tataskweyak Cree Nation (TCN), Fox Lake Cree Nation (FLCN), War Lake First Nation (WLFN), and York Factory First Nation (YFFN) (Keeyask Hydropower Limited Partnership 2012). Sensitive information that was known but not published was considered in alternative routing and the effects assessment.

Once collected, the ATK survey data were reviewed for species location information, species composition, and other relevant features such as hunting grounds. The locations of important sites and mammal habitats were also noted, especially in relation to the alternative routes and the preferred route.

Local knowledge was recorded during field studies when offered. The mammal study team included TCN, FLCN, WLFN, and YFFN. Members were responsible for identifying and recording **mammal signs** by species and by attributes such as sex, age, and activity.

2.1.1.2 Mammal Surveys

Summer Ground Tracking Survey

Ground tracking surveys were used to collect information on mammal species occurrences. Using the same methods as described in the Keeyask Generation Project Environmental Impact Statement (EIS) (Keeyask Hydropower Limited Partnership 2012), the presence or absence of species along surveyed transect routes was assessed in summer and winter. Summer ground tracking transects were distributed near the proposed Construction Power transmission line and Generation Outlet Transmission lines alternative routes (Map 2-1). Transects were located in a variety of habitats including **riparian** areas, wetlands, and coniferous and deciduous forested areas.

A total of 169 transects were established on the proposed Construction Power transmission line and Generation Outlet Transmission lines alternative routes and were distributed about in proportion to habitat availability. The Construction Power transmission line alternative routes overlapped 11 habitats and the GOT Route Alternative Options A, B and C overlapped 8 habitats. Summer ground tracking surveys were not established for GOT Route Alternative Option D option, which was identified by FLCN after the field studies were concluded. Ninety transects were distributed on the Construction Power transmission line alternative routes and 79 transects were surveyed on the GOT Route Alternative Options. Transects were 500 metre (m) long thread lines placed approximately 60 centimetres off the ground with sections marked every 50 m. Transects were visited on three occasions in summer. Data collected and recorded along each transect on the first visit included: UTM location, mammal signs (track and scat data), and sex and age of the animal where possible. Signs of all mammals were recorded

during the first visit. During the second and third visits, data were only collected at thread breaks along each transect. Due to the height of the thread, the presence of larger mammals such as black bear, gray wolf, caribou, and moose was detected.

Three surveys took place on the Construction Power transmission line alternative routes between June 15 and June 20, July 3 and July 8, and July 23 and July 29, 2009. Three surveys were completed on the GOT Route Alternative Options between July 7 and July 16, July 27 and August 14, and August 24 and August 27, 2009.

Winter Ground Tracking Survey

Using the same methods as described in the Keeyask Generation Project EIS (Keeyask Hydropower Limited Partnership 2012), a winter ground tracking survey of the Construction Power transmission line and Generation Outlet Transmission lines alternative routes (Map 2-2) took place from March 4 to March 10, 2010. Snow-track count surveys have been used extensively in studies of many forest-dwelling mammals (Livaitis *et al*. 1985; Thompson *et al*. 1989; Bayne *et al*. 2005). Snow tracking methods were used to detect signs of medium-sized mammals (*e.g.*, American marten) and large mammals (*e.g*., moose). One site visit was conducted for this survey. Data collected and recorded along each transect included: UTM location, mammal signs, and sex and age of the animal where possible. A total of 103 transects were established on the proposed Construction Power transmission line and Generation Outlet Transmission lines alternative routes and were distributed about in proportion to habitat availability.

Moose Browse Survey

Moose browse surveys were conducted concurrently with summer ground tracking surveys on 169 transects surveyed July 7 and July 20 2009. A linear intercept survey technique based on Canfield (1941) and Hoskins and Dalke (1955) was used to assess the quantity of moose browse on ground tracking transects: uniformly distributed samples at 100 m intervals and browse encounter samples at the first five times evidence of browse was observed.

Trail Camera Survey

Trail camera surveys for large mammals were conducted in 2010 and 2011 to monitor caribou and moose activity in potential calving areas in the Keeyask region. These studies were not specifically conducted for the Project; however, trail camera survey data for the Project Study Area were available from Manitoba Hydro (Keeyask Hydropower Limited Partnership 2012). Trail cameras were set up in potential caribou calving islands. Caribou calving and rearing islands consisted of either clusters of islands in Stephens Lake or terrestrial islands of black spruce surrounded by expansive wetlands or treeless areas (*i.e.*, peatland complexes). Data recorded from the cameras included species, number of individuals, activity, and where possible

sex and individual animal identification. These data allowed for the validation of the habitats animals either revisited or in which they spend considerable periods of time, and for determining how individuals move between areas. Ground tracking transects were also established on calving islands in the same fashion as the summer and winter ground tracking surveys in the Project Study Area. Table 2-1 outlines the number of calving islands surveyed in relation to various Project components.

Table 2-1: Number of Calving and Rearing Islands Surveyed Along Infrastructure Planned For the Project Infrastructure

Transmission Line	Option/ Structure	Calving and Rearing Islands Intersected	Calving and Rearing Islands within 1 km	Calving and Rearing Islands within 1 to 2 km	Calving and Rearing Islands within 2 km
Construction Power	CP Route 1	0	5	12	17
	CP Route 2	2	6	2	8
	Keeyask Construction Power Station	0	0	3	3
	Unit Transmission Lines	0	2	4	6
Generation Outlet	GOT Route Alternative Option A	0	3	9	12
	GOT Route Alternative Option B	0	5	6	11
	GOT Route Alternative Option C	0	3	11	14
Generation Outlet	GOT Route Alternative Option D	0	3	12	15
	Switching Station	0	1	3	4
	Radisson Converter Station	0	0	0	0

Caribou Radio-Collaring

Radio-collaring of caribou was not specifically conducted for the Project; however, radio-collaring reports from the Bipole III Transmission Line Project were available from Manitoba

Hydro (2012c). **Monitoring** of 22 collared caribou in the Pen Islands coastal caribou range occurred between January 2010 and January 2012. A subset of 8 of the 22 collared animals was found to inhabit the Gillam area for all or part of the year. Ten caribou from the Cape Churchill herd were also collared in 2010, and none were found to frequent the Project Study Area. Detailed methods are described in Manitoba Hydro 2011b and Manitoba Hydro 2012.

Aerial Survey for Ungulates

Aerial surveys for large mammals were not specifically conducted for the Project; however, aerial survey data for the Caribou Regional Study Area were available from Manitoba Hydro (Keeyask Hydropower Limited Partnership 2012) and Knudsen *et al.* (2010). Detailed methods are described in these reports.

Aerial Survey for Beaver and Muskrat

Using the same methods as described in Keeyask Hydropower Limited Partnership (2012), an aerial survey for beaver took place on October 1, 2009 and for muskrat on March 30, 2010 in the Project Study Area. A predetermined flight path was followed in fall and spring. Sample sites included creeks, streams, rivers, ponds, and small lakes in the Project Study Area. A helicopter with two observers was used to record all sign of beaver including lodge, lodge status (active or inactive), food cache presence, and other beaver activity in fall (Map 2-3). Flights were conducted at approximately 100 kilometres per hour at an altitude ranging from 60 to 80 m above ground level. A GPS was used for the duration of the flight to record the flight path and signs. Larger lakes on the survey route were circled to ensure that all signs were sampled. Muskrat **push-ups**, which indicate muskrat activity, were only recorded in spring, when they are more visible on frozen waterbodies without snow cover. Other wildlife sightings were recorded incidentally.

2.1.1.3 Mammal Habitat Models

Habitat models for the Project were adopted from the expert knowledge and professional judgement models developed as part of the Keeyask Generation Project EIS. Models were used to:

- Improve the understanding of patterns, processes and functions that were relevant to the assessment;
- Predict potential changes caused by the Project; and
- Evaluate uncertainty in the assessment.

The caribou and moose habitat models used in this assessment are described in detail in Section 7.3.6.1 of the Keeyask Generation Project EIS (Keeyask Hydropower Limited Partnership 2012). Caribou winter habitat, primary and secondary caribou calving and rearing

islands, and intact caribou habitat are used to describe caribou habitat quality and quantity in both summer and winter. Moose primary and secondary habitat used to describe moose habitat quality and quantity is a non-seasonal model.

2.2 VALUED ENVIRONMENTAL COMPONENT SELECTION

Valued Environmental Components (VECs) are components of the biological or socio-economic environment that may be affected by the Project. VECs are species and/or environmental components that are used to highlight or focus an environmental assessment. They are defined as elements of the environment having scientific, social, cultural, economic, historical, archaeological, or aesthetic importance and are proposed and identified and described under each environmental component. VECs are typically selected on the basis of their importance or relevance to stakeholders (*e.g*., species such as moose that are hunted) and/or as indicators of environmental effects to a broader range of animals. They are typically determined with input from regulators and stakeholders, Aboriginal people, and discipline experts, as well as literature reviews and experience with other projects. Environmental indicators and measurable parameters or variables were identified and described for each VEC. The same indicators and parameters/variables were used to describe environmental effects and residual environmental effects, and to monitor changes or trends over time during the Project construction and operation/maintenance phases.

VECs were selected to evaluate potential environmental impacts on species and/or environmental components with an identified ecological or societal importance. Mammal VECs for were selected from a review of the Project Description, consideration of the VECs selected for the Keeyask Generation Project EIS, and a review of the Bipole III Transmission Project EIS. All mammal species in the Project Study Area were considered to determine which should be identified as VECs.

The selection of mammal VECs took a variety of selection criteria into consideration (Appendix A). One selection criterion used was the importance of each species to people, including First Nations. Protection under the federal *Species at Risk Act* or *The Endangered Species Act* of Manitoba was also used as a selection criterion. Federal regulatory requirements applied to species currently listed as ‘species of special concern,’ ‘threatened’, or ‘endangered’ by COSEWIC. Provincial regulatory requirements such as those applied to those mammal species that are intensively managed and are particularly vulnerable to harvesting such as big game species, were also criteria considered.

Ecological concepts including **umbrella species**, **keystone species,** and **indicator species** were used as selection criteria to rank species. Other selection criteria included whether species’ presence was confirmed in the area through field studies for the Keeyask Transmission

Project or for the Keeyask Generation Project. Consideration was given to the expected positive or negative environmental impacts of the Project on mammal species through a net gain or loss of habitat, the expectation of population pressures caused by **density dependence,** and the potential for increased harvesting of species. Habitat use by mammal species was categorized based largely on Kuhnke and Watkins' (1999) work and was instructive in applying habitat selection criteria by mammals residing in the Boreal Shield Ecoregion (Appendix A).

As moose and caribou were ranked the highest, they were selected as VECs. Other important topics considered when evaluating and assessing potential Project effects on mammals were mortality, habitat alteration, disruption of movements, and sensory disturbance. Refer to the Terrestrial Habitat Ecosystem and Plants Technical Report, the Bird Technical Report, the Amphibian Technical Report and the Keeyask Transmission Project Socio-economic Technical Report for other VEC topics considered in the environmental assessment.

2.3 EVALUATION OF ALTERNATIVE ROUTES AND INFRASTRUCTURE

Careful routing of transmission facilities is important to avoid and minimize potential adverse effects associated with their development. As such, the process of identification, comparison, and evaluation of alternative routes is based on criteria related to environmental issues and concerns, Project-specific criteria identified during the course of Project Study Area delineation and characterization (including initial consultation), and on the technical and economic feasibility requirements of the transmission facilities. As part of this process, potential constraints and opportunities were assessed for mammals and mammal habitat near the alternative routes and the location of Project infrastructure. Potential constraints and opportunities for the Construction Power transmission line and Generation Outlet Transmission lines alternative routes were identified by using scientific literature, existing data, and professional judgement. The criteria used to assess the constraints and opportunities that consider routing alternatives for mammals included:

Constraints	**Opportunities**
Caribou calving and rearing habitat	Proximity to other linear features
Riparian habitat (*i.e.*, stream crossings)	Common mammal habitat
Movement corridors	
Habitat fragmentation (including line of sight)	

Calving and rearing islands are considered sensitive sites because they are usually uncommon and caribou are particularly susceptible to disturbances. These habitats are particularly important because they decrease the risk of predation, and in the case of rearing, these areas provide more forage while providing a safe haven from predators (Hirai 1998; Dyke 2008). These habitats are best avoided where possible. The spatial relationship of calving and rearing islands was assessed in relation to the proposed alternative routes and Project infrastructure using a Geographic Information System (GIS).

Riparian areas are considered sensitive sites and these are best avoided where possible. Mammal species generally have higher densities in wetland, creek, and riparian habitats, often due to higher-quality food and foraging opportunities (Shultz and Leininger 1991; Naiman *et al.* 1993). Biodiversity tends to be higher near waterbodies and watercourses (Naiman *et al*. 1993). The spatial relationship of creeks in the Project Study Area was assessed in relation to the proposed alternative routes and Project infrastructure using GIS.

Movement corridors are best avoided where possible. Traditional migration routes for more sensitive species such as caribou could be affected by linear features if these become barriers to movements (James and Stuart-Smith 2000; Wolfe *et al.* 2000; Hundertmark 2007), and distribution patterns on the landscape could be influenced. The spatial relationship of known caribou movement corridors were assessed in relation to the proposed alternative routes and Project infrastructure using GIS. Movement corridors are often associated with watercourses (Naiman *et al*. 2000), and these were considered below.

The Project could increase fragmentation of mammal habitat by adding linear features to the landscape and reducing core areas. The transmission lines and associated access trails and roads will likely increase linear feature density. The evaluation that compares route lengths and core area reductions for each of the alternatives is described in the Terrestrial Habitat Ecosystem and Plants Technical Report. Opportunities exist for the selection of a route that would be near existing transmission lines, a railway, or future linear features, including the proposed Keeyask Generating Station south access road (Keeyask Hydropower Limited Partnership 2012). The placement of linear features together would be preferred, as it would minimize potential fragmentation effects. Finally, line of sight, defined as the straight line between a hunter or predator and its prey, is also associated with access and habitat fragmentation. The wider and/or longer a linear feature without visual obstructions, the greater the potential effect for prey. Although in many cases this can be mitigated by allowing vegetation to regenerate in a transmission line ROW, a very wide ROW is generally less preferable than a narrow ROW.

The Project Study Area is comprised of common and widespread habitat mosaics mostly made up of tall shrub or low shrub on peatland, needleleaf treed on peatland, and needleleaf treed on mineral soil (ECOSTEM 2009). Because common and widespread habitats are much less likely

to be affected by a Project as compared to rare or uncommon habitats, numerous opportunities exist to select a preferred route through these common mammal habitats.

2.4 PREFERRED ROUTE ASSESSMENT

The selection of preferred transmission line routing options was done to reduce the potential environmental effects from proposed Project components on mammal species in the Project Study Area. The selection of the final preferred route options was done based on a weighing of varying environmental factors as they applied to selected VECs, which in the case of mammals was limited primarily to moose and caribou; however, the routing process took other mammal grouping into consideration as well.

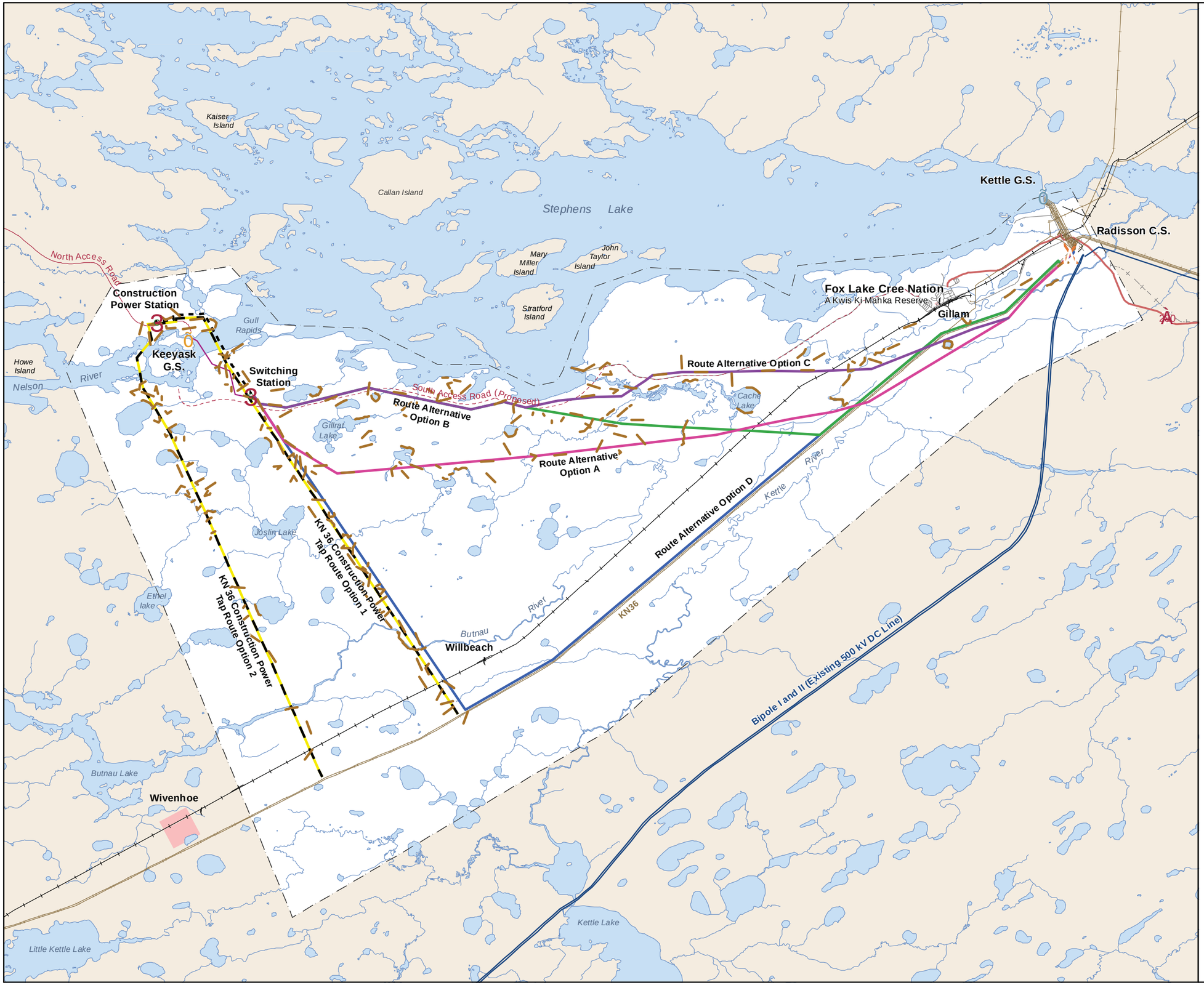
2.5 EFFECTS ASSESSMENT

Residual effects are the actual or anticipated Project effects that remain after considering mitigation and the combined effects of other past and existing developments and activities. The significance of the residual environmental effects was evaluated using factors adapted from the Canadian Environmental Assessment Agency (see Chapter 3 of the Keeyask Transmission Project Environmental Assessment Report). Significance was evaluated based on the criteria and ratings described below. Each potential effect on a VEC is initially evaluated using the following criteria:

- Direction or nature (*i.e.*, positive, neutral, or adverse) of the effect;
- Magnitude (*i.e.*, severity) of the effect;
- Duration (temporal boundaries); and
- Geographic extent (spatial boundaries).

For those VECs requiring further evaluation the frequency, reversibility, and ecological context of the potential residual environmental effects were considered using additional criteria, as follows:

- Frequency;
- Reversibility; and
- Ecological context.



Manitoba Hydro

Keeyask Transmission Project

Project Infrastructure

- Route Alternative Option A
- Route Alternative Option B
- Route Alternative Option C
- Route Alternative Option D
- Construction Power Line (KN36) Option 1 and 2
- Construction Power (Temporary)
- Unit Lines
- Construction Power Station
- Switching Station
- Project Study Area

Infrastructure

- Converter Station
- Generating Station (Proposed)
- Generating Station
- Bipole I and II (Existing 500 kV DC Line)
- Transmission Line
- South Access Road (Proposed)
- Access Road

Mammal Tracking

- Summer Transect

Landbase

- Community
- Provincial Road
- Municipal Road
- Active Railway
- Abandoned Railway
- Watercourse
- Waterbody

Coordinate System: UTM Zone 15N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: September 24, 2012

0 2 4 Kilometres
0 2 4 Miles

1:150,000

Location of Summer Mammal Transects

Map 2-1

Manitoba Hydro

Keeyask Transmission Project

Project Infrastructure

- Route Alternative Option A
- Route Alternative Option B
- Route Alternative Option C
- Route Alternative Option D
- Construction Power Line (KN36) Option 1 and 2
- Construction Power (Temporary)
- Unit Lines
- Construction Power Station
- Switching Station
- Project Study Area

Infrastructure

- Converter Station
- Generating Station (Proposed)
- Generating Station
- Bipole I and II (Existing 500 kV DC Line)
- Transmission Line
- South Access Road (Proposed)
- Access Road

Mammal Tracking

- Winter Transect

Landbase

- Community
- Provincial Road
- Municipal Road
- Active Railway
- Abandoned Railway
- Watercourse
- Waterbody

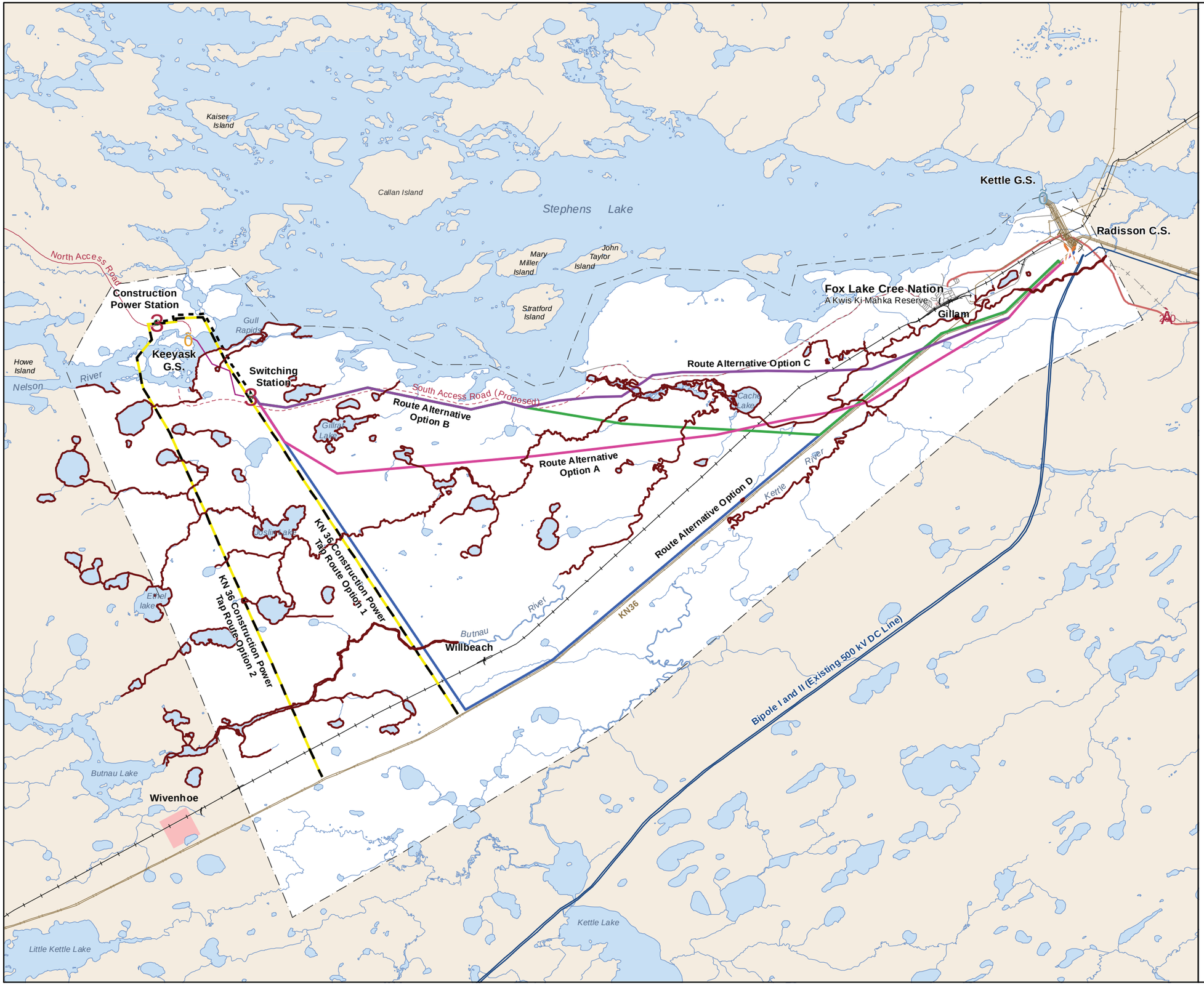
Coordinate System: UTM Zone 15N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: September 24, 2012

0 2 4 Kilometres
0 2 4 Miles

1:150,000

Location of Winter Mammal Transects

Map 2-2



Manitoba Hydro

Keeyask Transmission Project

Project Infrastructure

- Route Alternative Option A
- Route Alternative Option B
- Route Alternative Option C
- Route Alternative Option D
- Construction Power Line (KN36) Option 1 and 2
- Construction Power (Temporary)
- Unit Lines
- Construction Power Station
- Switching Station
- Project Study Area

Infrastructure

- Converter Station
- Generating Station (Proposed)
- Generating Station
- Bipole I and II (Existing 500 kV DC Line)
- Transmission Line
- South Access Road (Proposed)
- Access Road

Survey

- Aerial Survey Flight Path

Landbase

- Community
- Provincial Road
- Municipal Road
- Active Railway
- Abandoned Railway
- Watercourse
- Waterbody

Coordinate System: UTM Zone 15N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: September 24, 2012

0 2 4 Kilometres
0 2 4 Miles

1:150,000

Location of Aquatic Furbearer Aerial Surveys

Map 2-3