

3.0 STUDY AREA CHARACTERIZATION

3.1 STUDY AREA OVERVIEW

Up to 38 mammal species (Table 3-1) could currently range into the Project Study Area. Some species, such as snowshoe hare and moose, are common and widely distributed in the region, while others are at the edge of their ranges: porcupine (*Erithizon dorsatum*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and white-tailed deer (*Odocoileus virginianus*). Common mammals found in the Keeyask region include red-backed vole (*Clethrionomys gapperi*), beaver, muskrat, snowshoe hare, American marten (*Martes americana*), gray wolf, black bear, moose, and caribou (Appendix B). Detailed results of mammal studies in the Project Study Area are outlined in Appendix C. Several species or their sign were observed incidentally and outside of formal studies in the Keeyask region, including woodchuck (*Marmota monax*), northern flying squirrel (*Glaucomys sabrinus*), ermine (*Mustela erminea*), and arctic fox (*Alopex lagopus*). Signs of fifteen mammal species or groups were recorded during field studies in the Project Study Area.

Table 3-1: Mammal Species in the Project Study Area

Common Name	Taxonomic Name	Summer Ground Tracking Survey ¹	Winter Ground Tracking Survey	Aerial Survey for Ungulates	Aerial Surveys for Beaver and Muskrat	Presence in Region Confirmed by KGS Field Studies
Masked shrew	<i>Sorex cinereus</i>	-	-	-	-	✓
American water shrew	<i>Sorex palustris</i>	-	-	-	-	✓
Arctic shrew	<i>Sorex arcticus</i>	-	-	-	-	✓
Pygmy shrew	<i>Sorex hoyi</i>	-	-	-	-	✓
Little brown myotis	<i>Myotis lucifugus</i>	-	-	-	-	Bat species unconfirmed
Hoary bat	<i>Lasiurus cinereus</i>	-	-	-	-	Bat species unconfirmed
Snowshoe hare	<i>Lepus americanus</i>	i	✓	-	-	✓
Least chipmunk	<i>Tamias minimus</i>	-	-	-	-	✓
Woodchuck	<i>Marmota monax</i>	-	-	-	-	

Table 3-1: Mammal Species in the Project Study Area

Common Name	Taxonomic Name	Summer Ground Tracking Survey ¹	Winter Ground Tracking Survey	Aerial Survey for Ungulates	Aerial Surveys for Beaver and Muskrat	Presence in Region Confirmed by KGS Field Studies
Red squirrel	<i>Tamiasciurus hudsonicus</i>	i	-	-	-	✓
Northern flying squirrel	<i>Glaucomys sabrinus</i>	-	-	-	-	
Beaver	<i>Castor canadensis</i>	-	-	-	✓	✓
Deer mouse	<i>Peromyscus maniculatus</i>	-	-	-	-	✓
Gapper's red-backed vole	<i>Clethrionomys gapperi</i>	-	-	-	-	✓
Northern bog lemming	<i>Synaptomys borealis</i>	-	-	-	-	✓
Heather vole	<i>Phenacomys intermedius</i>	-	-	-	-	✓
Muskrat	<i>Ondatra zibethicus</i>	i	-	-	✓	✓
Meadow vole	<i>Microtus pennsylvanicus</i>	-	-	-	-	✓
Meadow jumping mouse	<i>Zapus hudsonius</i>	-	-	-	-	✓
Porcupine	<i>Erethizon dorsatum</i>	-	-	-	-	
Coyote	<i>Canis latrans</i>	-	-	-	-	✓
Gray wolf	<i>Canis lupus</i>	✓	✓	-	-	✓
Arctic fox	<i>Alopex lagopus</i>	-	-	-	-	
Red fox	<i>Vulpes vulpes</i>	i	i	-	-	✓
Raccoon	<i>Procyon lotor</i>	-	-	-	-	✓
American marten	<i>Martes americana</i>	i	✓	-	-	✓
Fisher	<i>Martes pennanti</i>	i	-	-	-	✓
Ermine	<i>Mustela erminea</i>	i	✓	-	-	✓
Least weasel	<i>Mustela nivalis</i>					
Mink	<i>Mustela vison</i>	i	✓	-	-	✓
Wolverine	<i>Gulo gulo</i>	-	-	-	-	✓
Striped skunk	<i>Mephitis mephitis</i>	-	-	-	-	
River otter	<i>Lontra canadensis</i>	i	✓	-	-	✓

Table 3-1: Mammal Species in the Project Study Area

Common Name	Taxonomic Name	Summer Ground Tracking Survey ¹	Winter Ground Tracking Survey	Aerial Survey for Ungulates	Aerial Surveys for Beaver and Muskrat	Presence in Region Confirmed by KGS Field Studies
Lynx	<i>Lynx canadensis</i>	-	✓	-	-	✓
Black bear	<i>Ursus americanus</i>	✓	-	-	-	✓
Caribou	<i>Rangifer tarandus</i>	✓	X	✓	-	✓
White-tailed deer	<i>Odocoileus virginianus</i>	-	-	-	-	
Moose	<i>Alces alces</i>	✓	✓	✓	-	✓

1. A dash indicates that the study was not intended to detect the presence of the species and no incidental observations of its presence were observed; ✓ indicates that sign of the species was observed; X indicates that the species was not observed; i indicates that the species was not expected to be detected consistently due to study design, species activity pattern, or species rarity, but was observed incidentally

Species that are likely rare in the Project Study Area but are common elsewhere in Manitoba include American water shrew, little brown myotis, porcupine, striped skunk, and coyote (Keeyask Hydropower Limited Partnership 2012). No species listed by SARA or MESA are found. The range of boreal woodland caribou, which are listed as threatened by SARA and MESA, does not overlap the Project Study Area (Manitoba Conservation 2005; Environment Canada 2011; Map 3-1); however, the presence of caribou calving and rearing habitat was considered (see Section 0). The current ranges of little brown myotis and wolverine, which are not listed by SARA or MESA but are listed under COSEWIC (2003, 2012b), overlap the Project Study Area.

Mammal communities within the Project Study Area consist predominantly of resident species, although a few species such as caribou migrate into the Keeyask region from Ontario and Nunavut. Resident species rely on a wide variety of boreal forest habitats to support their life functions for breeding, food, and shelter. Mammal community dynamics in the Project Study Area are influenced by many factors including fire, weather, disease, insect populations, human development, hunting, and climate change (Fisher and Wilkinson 2005; Murray *et al.* 2006).

3.2 ENVIRONMENTAL SETTING

3.2.1 Small Mammals

Small mammals are the foundation of the carnivore and omnivore food webs. Small mammals include mice, voles, shrews, squirrels, chipmunks, and bats. They occupy a diverse range of habitats, including exposures of bedrock along river and stream channels and in areas of stunted tamarack and swamp birch.

There is little historical information describing small mammal populations and habitats in the Keeyask region. Many species were reported as far north as the Churchill area in the early 1900s (Preble 1902). Currently, small mammals are abundant and widespread in Manitoba (Banfield 1987) including the Keeyask region (Keeyask Hydropower Limited Partnership 2012), while their populations cycle with relative regularity (Boonstra *et al.* 1998). While no studies were conducted to detect the presence of small mammals, their sign was observed incidentally on ground tracking transects.

Common small mammals reported in the Project Study Area during field studies for the Keeyask Generation Project EIS include red-backed vole, heather vole, and masked shrew. Uncommon small mammals include pygmy shrew and American water shrew. Of the ten small mammal species reported, some species such as meadow vole were captured more frequently in riparian habitats; however, many small mammal species occupied most broad habitat types (Keeyask Hydropower Limited Partnership 2012).

The little brown myotis, a species of bat, is a habitat generalist, occupying a range of habitats (Wund 2006). While they inhabit parts of Alaska and northern Canada, their wings and ears are poorly suited to the cold, and they hibernate in caves or other shelters for the winter (Banfield 1987). They occur throughout much of Manitoba, including the Keeyask region (Humphrey 1982). While breeding occurrences in Manitoba are rare, the Manitoba Conservation Data Centre lists the non-breeding status of the little brown myotis as widespread, abundant, and secure in the province or throughout its range. This species is not yet listed by SARA, but an emergency order to place this and other bat species on Schedule 1 of the *Species at Risk Act* has been requested (COSEWIC 2012b) and it is listed as endangered under COSEWIC. The primary threat to little brown myotis is the spread of white-nose syndrome, caused by a fungus, which is predicted to result in the extirpation of little brown myotis within 16 years (Frick *et al.* 2010; Forbes 2012). While white-nose syndrome has not been identified west of Ontario, it is expected to spread to hibernacula across North America within 11 to 22 years (Frick *et al.* 2010; Forbes 2012).

Little brown myotis appear to be sparse in the Keeyask region (Keeyask Hydropower Limited Partnership 2012). No little brown bats were positively identified in the Project Study Area during

field surveys; however, a bat was detected in late summer 2001 feeding at Gull Lake camp (Keeyask Hydropower Limited Partnership 2012). Anecdotal reports of bat (likely little brown myotis) observations near cabins in Stephens Lake have been made, but not confirmed. Bats have also been observed in and near Gillam, Manitoba, but the species is not reported (FLCN 2010 Draft).

3.2.2 Furbearers

Furbearers are generally medium-sized mammals that inhabit aquatic or terrestrial habitat. Furbearers such as snowshoe hare are recognized as important species by local resource users (Manitoba Hydro and Fox Lake Cree Nation Elder and Resource User Group Keeyask Transmission Project Workshop June 13, 2012). Due to their size, they were not expected to break the thread during summer ground tracking surveys, and signs of their presence were only recorded during the first visit. Winter ground tracking surveys are better suited to assess furbearer abundance than summer surveys, as signs such as tracks and scat are more easily detected in snow. As such, summer data should be interpreted with caution (Keeyask Hydropower Limited Partnership 2012b).

3.2.2.1 Aquatic Furbearers

Aquatic furbearers rely on water for a large portion of their food or habitat. Aquatic furbearers in the Project Study Area are beaver, muskrat, mink, and river otter. They are currently widespread and secure throughout their ranges in Manitoba (NatureServe 2012), which includes the Project Study Area and the Furbearers Regional Study Area (Zone 4).

Beavers inhabit waterbodies in forested areas (Banfield 1987). They alter aquatic **ecosystems** by building dams and through their feeding activities, and increase the diversity of species and habitat on a landscape (Naiman *et al.* 1986; Wright *et al.* 2002; Rosell *et al.* 2005). As such, the beaver is an important keystone species in the Project Study Area.

Beavers are abundant and common in the Project Study Area, but their distribution is highly variable (Appendix C). A total of 167 beaver lodges were observed during the fall 2009 aerial survey (Map 3–2). Of these, 59 were active. Beavers were most active in streams and ponds in the Project Study Area, and their presence was seldom detected in upland habitats. The current beaver population in the Beaver Regional Study Area (Zone 4) is estimated at approximately 250 active colonies (Keeyask Hydropower Limited Partnership 2012; Appendix C). Trapping is an important cultural activity (Tataskweyak Cree Nation 2011). Beavers were one of the three most commonly reported trapped furbearers on traplines 7, 8, 9, 15, 17, and 65 from 2001 to 2011, portions of which overlap the Project Study Area (Keeyask Transmission Project Socio-Economic Technical Report).

Muskkrats require a source of permanent water such as marshes, ponds, lakes, streams, and rivers for habitat (Boutin and Birkenholz 1998). They generally inhabit the edges of emergent vegetation zones and are absent from large bodies of open water (Errington 1963; Banfield 1987), where wave action is greater. A total of 272 muskrat push-ups were observed during the spring 2010 aerial survey. Muskrat activity was most common on ponds, but activity was also detected on other riparian shorelines such as streams and lake perimeters (Map 3–2). Muskrat activity was greatest in streams and ponds in the Furbearers Regional Study Area over three years of aerial surveys. Although muskrat was not one of the most commonly trapped species on the six traplines overlapping the Project Study Area from 2001 to 2011 (Keeyask Transmission Project Socio-Economic Technical Report) or in the Keeyask region from 1996 to 2008, this species accounted for 32% of the furbearer harvest in the Split Lake Resource Management Area from 1960 to 1996 (Keeyask Hydropower Limited Partnership 2012).

Mink and river otter occupy similar habitats in the Project and Furbearers Regional Study Areas. Mink habitat is associated with water, including stream banks, lakeshores, forest edges, and swamps (Banfield 1987). Signs of mink activity were observed on ground tracking transects in summer and winter, but were generally scarce. All but one of the eight mink signs found in the Project Study Area were observed in summer. River otters inhabit aquatic environments including lakes, streams, and other wetlands (Melquist and Dronkert 1998). Of the 69 river otter signs observed during ground tracking surveys, 32 were found in summer and 37 were found in winter. Mink was one of the three most commonly reported trapped furbearer species on the six traplines that overlap the Project Study Area from 2001 to 2011 (Keeyask Transmission Project Socio-Economic Technical Report), while river otter was less commonly trapped. Mink and otter accounted for 5% and 2% of the furbearer harvest in the Keeyask region from 1996 to 2008, respectively (Keeyask Hydropower Limited Partnership 2012).

3.2.2.2 Terrestrial Furbearers

Terrestrial furbearers spend the majority of their time in and acquire most or all of their food from upland habitats. Snowshoe hare, woodchuck, red fox, arctic fox, American marten, fisher, weasels, and lynx can be found in the both the Project Study Area and Furbearers Regional Study Area. While woodchucks' range includes the Project Study Area, they were not detected during formal surveys. An individual was observed incidentally along Provincial Road (PR) 280 during studies for the Keeyask Generation Project and reported in the Keeyask Generation Project EIS (Keeyask Hydropower Limited Partnership 2012).

Snowshoe hares are found in deciduous, coniferous, and mixedwood forests, with an apparent preference for conifer-dominated habitats (Litvaitis *et al.* 1985; Hoover *et al.* 1999). In winter, snowshoe hares use dense understory vegetation for thermal cover and protection from predators (Litvaitis *et al.* 1985). Habitat structure, not species composition, is the primary factor for selection by snowshoe hares (Ferron and Ouellet 1992). Snowshoe hares may shelter under branches or in short tunnels dug under the snow (Banfield 1987). Signs were relatively

abundant on ground tracking transects in summer and winter. As snowshoe hare scat, the sign most commonly observed in summer, tends to be scattered along a transect and it cannot be determined how many individuals it came from, abundance is likely overestimated and summer data should be interpreted with caution. Observations of signs were most frequent in winter. Signs of snowshoe hare activity were relatively widely distributed, found on 44% of transects in the Project Study Area.

The red fox prefers diverse habitats including farmland, pasture, hardwood stands, and open areas with edges suitable for hunting. They are rarely found in the core area of boreal forests (Eadie 1943; Cook and Hamilton 1944; Ables 1974; Banfield 1987). Diverse edge habitat is particularly desirable (Ables 1974). The red fox is a generalist predator capable of increasing predation pressure in boreal areas exhibiting human fragmentation (Kurki *et al.* 1998). Although **anthropogenic** fragmentation can increase populations, studies indicate that red foxes avoid areas with high human densities (Randa and Yunger 2006). A limited number of red fox signs were observed in the Project Study Area (Appendix C).

The arctic fox is not a resident of the Project Study Area; it is a migrant seen only in winter (see Appendix B). No arctic fox signs were recorded during winter tracking surveys.

American martens are predators whose diet varies somewhat with the season (Takats *et al.* 1999). While voles are the preferred prey (Banfield 1987; Strickland *et al.* 1998), the American marten diet extends to berries, mice, shrews, snowshoe hares, squirrels, birds, amphibians, insects, and fish, when available (Banfield 1987; Ben-David *et al.* 1997; Takats *et al.* 1999). American martens have also been known to scavenge winterkilled ungulates and other carrion (Strickland *et al.* 1998; Ben-David *et al.* 1997; Takats *et al.* 1999). While American martens spend much of their time in trees, they also move and hunt on the ground (Banfield 1987). Contiguous, mature, or old forest is preferred by this species (Chapin *et al.* 1998). Most of the American marten signs observed in the Project Study Area were encountered in winter, on 33% of the transects surveyed. Signs were relatively scarce in summer. American marten has always been an important furbearing species for First Nations Members (Split Lake Cree 1996), and local trappers have commented that its numbers have been increasing over the past two decades (Keeyask Hydropower Limited Partnership 2012). American marten was one of the three most commonly reported trapped furbearer species on the six traplines that overlap the Project Study Area from 2001 to 2011 (Keeyask Transmission Project Socio-Economic Technical Report) and accounted for 68% of the furbearer harvest in the Keeyask region from 1996 to 2008 (Keeyask Hydropower Limited Partnership 2012).

The fisher is a common inhabitant of mature boreal forest (Banfield 1987). Mammals such as squirrels, voles, shrews, and particularly snowshoe hares constitute the majority of the fisher diet (Banfield 1987). Fishers are also capable predators of porcupines (Powell 1994). Local trappers have commented that fisher numbers have been in decline over the past two decades. It has been suggested that the increase in American marten in the area may have resulted in

fisher being out-competed for food resources, and subsequently, a population decline in fisher may have occurred. A resource user from FLCN noted that there were no fishers around his trapline (FLCN 2010 Draft). A contributing factor that may help explain the lower abundance of fishers is the scarcity of porcupine, a potential food source, in northeastern Manitoba. A single fisher sign was observed during summer and winter ground tracking surveys.

Ermine (*Mustela erminea*) and least weasel (*Mustela nivalis*) are the two species of weasel (collectively referred to as weasels) found in the Project Study Area. Ermine are the larger of the two species and least weasels are the smallest carnivores in North America (Banfield 1987; Fagerstone 1987). Weasels have been described as both nocturnal (Banfield 1987) and active during the day (Fagerstone 1987), with peak activity varying with the season (Svendsen 1982). Weasels are active all year and do not hibernate (Svendsen 1982). These species occupy similar, wide-ranging habitats (Fagerstone 1987) such as boreal coniferous or mixedwood forests, tundra, meadows, lakeshores, and riverbanks (Banfield 1987). Most of the weasel signs observed on ground tracking transects were found in winter. Three signs were observed in summer. Due to an overlap in track size between ermine and least weasel, signs could not be identified to species.

The lynx is a common inhabitant of mature boreal forest, and prefers dense understory (Banfield 1987). Snowshoe hare is an important prey species for lynx, and has been linked to cyclical population peaks and lows (Brand and Fischer 1976; Banfield 1987; Poole 1994; O'Donoghue *et al.* 1997; Krebs *et al.* 2001). Relatively few signs of lynx activity were observed in the Project Study Area. None were observed in summer. Eight signs were observed on 5% of the transects surveyed in winter.

Historically, the trapping of terrestrial furbearers has been a common practice in the Keeyask region and has been a valuable cultural and economic practice (Keeyask Hydropower Limited Partnership 2012). Some of the terrestrial furbearers trapped in the Keeyask region include American marten, mink, lynx, fisher, and ermine. American marten (14%) and mink (12%) made up most of the terrestrial harvest from 1960 to the mid-1990's (Keeyask Hydropower Limited Partnership 2012). More recently, American marten has made up 68% of the harvest and mink has made up 5% of the harvest (Keeyask Hydropower Limited Partnership 2012).

Wolverines were widely distributed in the area between Lake Winnipeg and Hudson Bay in the early 1900s, but were particularly rare in the southern region (Preble 1902). They were somewhat more abundant in the north (Preble 1902). Because declines have been reported in parts of the wolverine range and little data exists related to wolverine population trends, wolverines were listed as special concern by COSEWIC (2003). The western population of wolverine is not listed under SARA. The Manitoba wolverine population has been estimated to be between 1,200 and 1,600 animals, and it is estimated that the provincial population is either increasing or stable (COSEWIC 2003).

Wolverines are sparse in the Project Study Area and surrounding region, and no signs were recorded during summer or winter ground tracking surveys. Wolverine signs were rarely observed in the Terrestrial Furbearers Study Area during Keeyask Generation Project field studies (Keeyask Hydropower Limited Partnership 2012). Local resource users report that the number of wolverines observed in the lower Nelson River area has recently increased (Mammals Working Group December 9, 2010). More wolverines were observed in the Keeyask region in 2009 than in previous years (FLCN 2010 Draft). No wolverine den sites were identified during field studies in the Project Study Area, but it cannot be stated with certainty that none exist in the region.

3.2.3 Large Carnivores

Large carnivores are larger-sized mammals that contribute to ecosystem function by preying on other animals. Gray wolf and black bear are the two species found in the Project Study Area and Large Carnivores Regional Study Area (Zone 6).

Gray wolves are not restricted to a single habitat type, as they will typically follow their primary prey (Banfield 1987; Carbyn 1998). They are more likely to occupy mixed conifer-hardwood forests and forested wetlands than other habitat types (Mladenoff *et al.* 1995), and prefer to inhabit areas with low densities of roads and human activity (Houts 2001; Larsen and Ripple 2004). In the mid-1900s, gray wolf numbers decreased from rabies outbreaks and wolf control programs in western Canada (Paradiso and Nowak 1982). The gray wolf population is now stable in Manitoba (Manitoba Conservation and Water Stewardship 2012a). At least one wolf pack has been reported in the Project Study Area (WRCS unpubl. data). Gray wolf signs were relatively sparse in the Project Study Area. Most of the signs observed in summer were during the first visit. Fewer signs were encountered in winter ($n = 8$) than in summer ($n = 21$), which may be accounted for by the greater survey effort in summer. Signs were localized, observed on 7% of the transects surveyed in summer and 4% of the transects surveyed in winter.

Black bears are common inhabitants of coniferous and deciduous forests, swamps, and berry patches (Banfield 1987). Black bears are distributed throughout North America and now occupy approximately 85% of their historic range in Canada (Kolenosky and Strathearn 1998). The Manitoba black bear population is sustainable (Manitoba Conservation and Water Stewardship 2012b) and the species is common in the Project Study Area (Appendix C). Black bear signs were observed on 20% of the transects surveyed in the Project Study Area. No sign of black bear activity was observed in winter, likely because bears are hibernating and inactive at that time of year. No black bear dens were found during the winter surveys.

3.2.4 Ungulates

Ungulates are hooved mammals that contribute to ecosystem function by consuming plants and providing prey for large carnivores. Ungulates that occur in the Project Study Area are moose

and caribou. Caribou and moose are widespread throughout the Project Study Area as well as their respective regional study areas. Traditional resource use activities in the Keeyask region include moose and caribou hunting by TCN, WLCN, YFFN, and FLCN Members (Keeyask Hydropower Limited Partnership 2012). FLCN Members hunt for moose in the areas around Stephens Lake (Keeyask Hydropower Limited Partnership 2012). FLCN has also identified Cache Lake, the Butnau, Moswakot and Kettle rivers as important traditional resource use areas (Keeyask Transmission Project Socio-Economic Technical Report). TCN reports that Members travel in the Project Study Area and use rights-of-ways such as the CN Rail line between Wivenhoe and Gillam existing transmission lines. TCN documents a variety of traditional land uses that include hunting areas (Tataskweyak Cree Nation 2011). Moose and caribou are VECs and are discussed in Section 3.2.5.

It is unlikely that white-tailed deer occur in the Project Study Area. White-tailed deer range does not include the Keeyask region (Banfield 1987). White-tailed deer are absent to scarce in the Keeyask region and no signs were observed during field studies. Limited habitat supply and severe winters likely restrict white-tailed deer from becoming established residents of the Keeyask region.

3.2.5 Valued Environmental Components

3.2.5.1 Moose

Moose inhabit the boreal forest and their distribution follows those of preferred trees and shrubs. In winter, moose ranges are smaller than in summer (Phillips *et al.* 1973). Food availability, thermal cover, and predator avoidance influence habitat selection in winter (Dussault *et al.* 2005). Moose occupy habitat in a wide range of seral stages, riparian and forested areas, and the periphery of burns (Irwin 1975; Coady 1982). Upland and lowland habitats are used throughout the winter and lowland riparian areas are used when snow is deep (Coady 1982).

In summer, moose home ranges expand (Stevens 1970; Phillips *et al.* 1973; Crête and Courtois 1997). Lowland and upland mature stands, shrubby areas, and aquatic areas are commonly inhabited (Irwin 1975; Coady 1982). Burned areas are also used in summer; deciduous stands are preferred but conifer stands may also be used (Irwin 1975). Coniferous trees near shrub stands often create edge effects that allow moose to browse on new growth while utilizing protective cover from the nearby canopy.

Moose may have migratory routes in addition to seasonal ranges (Goddard 1970; LaResche *et al.* 1974). Moose migrate as a survival tactic for locating optimal forage throughout the year, as they generally consume aquatic vegetation in summer and browse on shrubs in winter (Drucker *et al.* 2010). Change in habitats may involve movements that vary in length and elevation. Snow conditions are the prime factor in initiating winter moose migration, but in other seasons,

changes in forage quality or quantity may be responsible for moose movement (LaResche *et al.* 1974).

Historically, moose were a main staple for First Nations Members in the Keeyask region (Keeyask Hydropower Limited Partnership 2012). Hunters typically harvest moose near waterways, as moose are attracted to riparian habitats and are easier to transport after harvest (Keeyask Hydropower Limited Partnership 2012). As moose numbers fluctuate, hunters must travel further from their home communities when populations are low (Keeyask Hydropower Limited Partnership 2012). Moose are often observed on the shores of Stephens Lake, and the islands in the lake are used by cows for calving (FLCN 2010 Draft).

Signs of moose activity were common on ground tracking transects in the Project Study Area in summer and winter. Moose signs were widely distributed in summer, observed on 98% of the transects surveyed over three visits. Signs were observed in all habitats surveyed. In winter, signs were observed on 25% of the transects surveyed. Moose browse was generally observed in shrubby habitats. It was recorded at the greatest proportion of sites in tall shrub on riparian peatland (50%) and tamarack-black spruce mixture on wet peatland (45%; Appendix C). Browse was observed at a third of the sites in black spruce mixedwood on mineral or thin peatland, broadleaf treed on all ecosites, low vegetation on mineral and thin peatland, tall shrub on mineral or thin peatland, and tall shrub on wet peatland habitat. No browse was observed in off-system marsh, shallow water, tall shrub on shallow peatland, or tamarack-black spruce mixture on wet peatland habitat. A single site was surveyed in tall shrub on shallow peatland habitat, which probably reduced the likelihood of detecting browse in this habitat type.

The moose population in the Split Lake Resource Management Area and the Moose Regional Study Area (Zone 5) was estimated at 2,600 and 950 individuals, respectively, based on aerial surveys conducted in 2009 and 2010 (Keeyask Hydropower Limited Partnership 2012). Moose density varied throughout the Moose Regional Study Area and ranged from extra low to high (Map 3-3). Habitat quality, predation, and hunting play important roles in moose density and distribution.

Trail cameras and ground tracking transects in potential moose calving habitat in the Project Study Area indicated potential evidence of calving on ten of the 33 islands (33%) surveyed in (Table 3-2). Adult moose activity was documented on 21, or 64%, of the islands surveyed.

Table 3-2: Moose Activity on Calving and Rearing Islands in the Project Study Area, 2010 and 2011

Age of Moose	Number of Islands	Proportion of Islands
Adult	21	0.64
Calf	10	0.30
Total surveyed	33	1.00

3.2.5.2 Caribou

Three types of caribou have been identified in the Keeyask region (see Map 3-1): barren-ground caribou (*Rangifer tarandus groenlandicus*); coastal caribou (*R. t. caribou*), also known as the forest-tundra migratory woodland caribou ecotype; and boreal woodland caribou (*R. t. caribou*), also known as the forest-dwelling sedentary woodland caribou ecotype. Barren-ground caribou from the Qamanirjuaq herd migrate from Nunavut in autumn to overwinter in Manitoba’s forests (Keeyask Hydropower Limited Partnership 2012). Barren-ground caribou are an occasional winter resident, temporarily migrating into the Caribou Regional Study Area (Zone 6). However, they are generally found north of the Nelson River, and while river crossings have been reported (FLCN 2010 Draft; Keeyask Hydropower Limited Partnership 2012) they are not likely to inhabit the Project Study Area. Coastal caribou occupy the Caribou Regional Study Area mainly in winter, and originate from the Pen Islands and the Cape Churchill areas, for which their herds are named. The current range of the Wapisiu boreal woodland caribou (*R. t. caribou*) herd (Manitoba Conservation 2005; Environment Canada 2011) near Harding Lake overlaps a small fraction of the southwestern portion of the Caribou Regional Study Area (Manitoba Hydro 2012). Additionally, a group of caribou inhabits the Stephens Lake area in summer, which has been identified as Pen Islands coastal caribou (Manitoba Hydro 2012). As barren-ground caribou and coastal caribou inhabit the area in winter and are thought to depart in spring for their calving grounds, the identity of this group, called summer resident caribou, is uncertain.

Prior to contact with Europeans, residents of the Keeyask region subsisted, in part, on caribou. Families would travel between the region and the arctic coast, following migrating caribou (Keeyask Hydropower Limited Partnership 2012). Today, caribou still play an important role as a food source for First Nations Members, but caribou are harvested to a lesser extent than moose (Keeyask Hydropower Limited Partnership 2012).

Surveys conducted during the 1980s estimated the Qamanirjuaq barren-ground caribou population between 125,000 and 190,000 animals (Beverly and Qamanirjuaq Caribou

Management Board 2002). The 1994 estimate for the Qamanirjuaq herd was about 496,000 animals (Campbell *et al.* 2010). The population was estimated at 348,000 individuals in 2008 (Campbell *et al.* 2010). Few were observed in Manitoba in 2011, and the Qamanirjuaq herd may be in decline (Beverly and Qamanirjuaq Management Board 2011). Barren-ground caribou spend much of the summer in the tundra, beyond the tree line, and overwinter in the boreal forest (Kelsall 1968). They form large herds during the calving season and tend to calve *en masse* and form nursery groups (Kelsall 1968). Previous studies indicate that barren-ground caribou from the Qamanirjuaq herd range as far south as Split Lake and as far east as the Hudson Bay railway track running between Ilford and Churchill (Miller and Robertson 1967; Engin 1996). In the 1990s, there was a limited return of caribou (Engin 1996) while recently, in the winter of 2004–2005, a large number of barren-ground caribou returned to the Caribou Regional Study Area. Current range data for the herd supports this, where the southeastern limit is now near Stephens Lake (WRCS unpubl. data).

Coastal caribou behaviour is similar to that of barren-ground caribou, particularly during calving (Abraham and Thompson 1998). Animals from the Pen Islands herd were only reported in the Caribou Regional Study Area in the 1990s (Thompson and Abraham 1994; Abraham and Thompson 1998). The herd was estimated at 10,000 individuals in 1997 (Keeyask Hydropower Limited Partnership 2012). Aerial surveys of known Pen Islands caribou calving grounds in Manitoba indicate that summer residency has declined in the province and that the majority of observed animals now calve near Cape Henrietta Maria, Ontario, east of their traditional calving grounds near Fort Severn, Ontario (Abraham *et al.* 2012a). Post-calving surveys indicated that the majority of caribou were around Cape Henrietta Maria, but groups of caribou were observed inland in Ontario (Abraham *et al.* 2012a). Eight of the 22 Pen Islands caribou collared between 2010 and 2012 were active in the Project Study Area, with the largest concentrations of GPS locations occurring in the western portion of the Project Study Area around Joslin Lake, south of Gull Rapids (Manitoba Hydro 2012). Data for the rest of the Project Study Area indicated that collared animals made periodic movements through the Gillam area (Manitoba Hydro 2012), and occasionally staged near Gillam and Stephens Lake, south of the Nelson River (Manitoba Hydro 2011b).

The Cape Churchill coastal caribou herd was estimated at approximately 3,000 individuals in 2007 (Abraham *et al.* 2012b) and is currently estimated at 3,500 to 5,000 individuals (Manitoba Hydro 2012). A large migration into the Bipole III Study Area, which is located north of the Project Study Area and the Nelson River, was observed in December 2010 (Manitoba Hydro 2012). This herd generally remains north of the Nelson River, where winter use of the Caribou Regional Study Area has been documented (Manitoba Hydro 2011b). Cape Churchill caribou are unlikely to occur in the Project Study Area

Boreal woodland caribou, which are listed as threatened under SARA and MESA, occurred historically in the Keeyask region, but their current range does not include the Project Study Area (Manitoba Conservation 2005; Environment Canada 2011). They do not tend to form large

herds when calving, calve on islands when possible (Thomas and Gray 2002), and can exhibit seasonal movements within a range (Darby and Duquette 1986; Brown *et al.* 2000; Brown *et al.* 2003; Ferguson and Elkie 2004). Manitoba Conservation and Water Stewardship range maps show the Nelson-Hayes boreal woodland caribou herd once occurred within the Project Study Area. It appears the Nelson-Hayes herd blended with the coastal Pen Islands herd and no longer exists as a discrete population (Manitoba Conservation 2005).

A group of summer resident caribou in the Keeyask region has been observed to calve in isolation or make use of island habitat (Map 3–4), as is characteristic of boreal woodland caribou in Manitoba and elsewhere (Shoesmith and Storey 1977; Hirai 1998; Rettie and Messier 2000). This group of caribou has recently been described as migratory woodland caribou (Keeyask Hydropower Limited Partnership 2012). Summer resident caribou are conservatively estimated to number 20 to 50 individuals in an area slightly broader than the Project Study Area. Based on telemetry data, it has been suggested that these summer residents are Pen Islands caribou, some of which calved in the Caribou Regional Study Area, spent the summer near Gillam, and moved toward Hudson Bay or Ontario for the winter (Manitoba Hydro 2012). During the winter, these animals most likely interact with long-distance migratory caribou, making it difficult to differentiate among caribou populations. The annual home range of collared summer residents was significantly larger than those of individual collared boreal woodland caribou (Manitoba Hydro 2012), and substantially larger than other boreal woodland caribou ranges (*e.g.*, Stuart-Smith *et al.* 1997; Brown *et al.* 2000; Rettie and Messier 2001; Brown *et al.* 2003; Schindler 2005), but the total range was smaller than the entire Pen Islands range that extends to Cape Henrietta Maria in Ontario. It is unclear whether summer residents are boreal woodland caribou or are coastal caribou that do not return north to calve. Regardless of specific type, the occurrence of limited calving and rearing habitat in the Project Study Area is important, and is considered in the habitat assessment.

Signs of caribou activity were relatively abundant on ground tracking transects surveyed in the Project Study Area in summer. Caribou signs were observed in 13 of the 19 habitats surveyed. No signs were observed in aspen mixture, black spruce mixedwood, jack pine pure, tamarack pure, tall shrub, or young regeneration habitat. No signs of caribou activity were observed during the 2010 winter ground tracking surveys (Appendix C). Although winter habitat is limited in the Project Study Area, it appears to be extensive in the Caribou Regional Study Area. Large variations in the number of migratory caribou occupying the Caribou Regional Study Area have been reported historically during winter (Keeyask Hydropower Limited Partnership 2012; Manitoba 2012).

Trail cameras and ground tracking transects in potential caribou calving and rearing habitat in the Project Study Area indicated use by cows with calves on six of the 33 islands (18%) surveyed (Table 3-3). Adult caribou activity was documented on 16, or 48%, of the islands surveyed. Calves or their signs were observed on six, or 18%, of islands surveyed.

Table 3-3: Caribou Activity on Calving and Rearing Islands in the Project Study Area, 2010 and 2011

Age of Caribou	Number of Islands	Proportion of Islands
Adult	16	0.48
Calf	6	0.18
Total surveyed	33	1.00

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 Line (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)
- North Access Road

Caribou Observation

- Track
- Scat

Caribou Ranges

- Boreal Woodland Caribou
- Barren Ground(Qamanirjuaq) Infrequent Winter Habitat
- Coastal - Pen Islands
- Coastal - Pen Islands Infrequent Winter Habitat

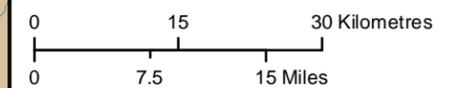
Study Area

- Zone 5
- Caribou Regional Study Area

Landbase

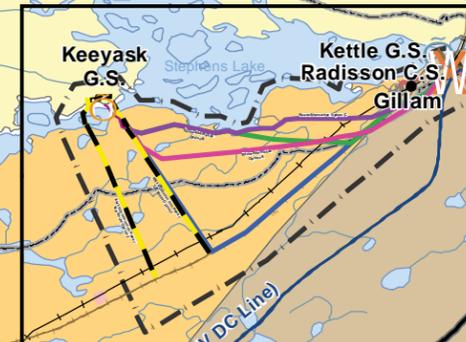
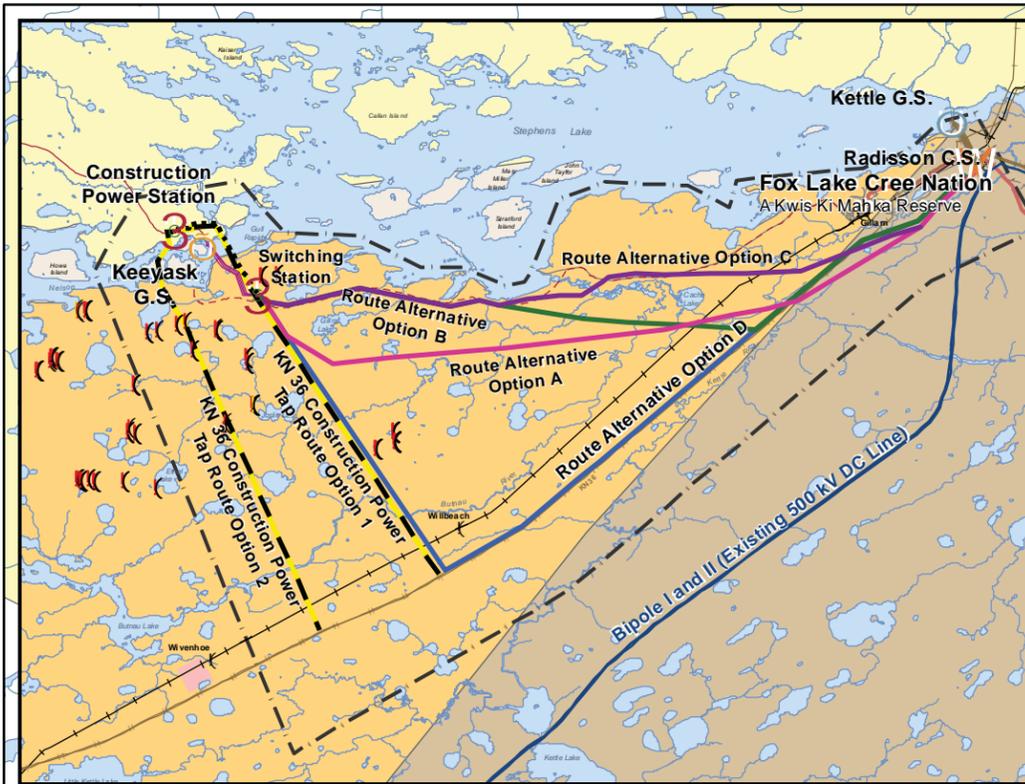
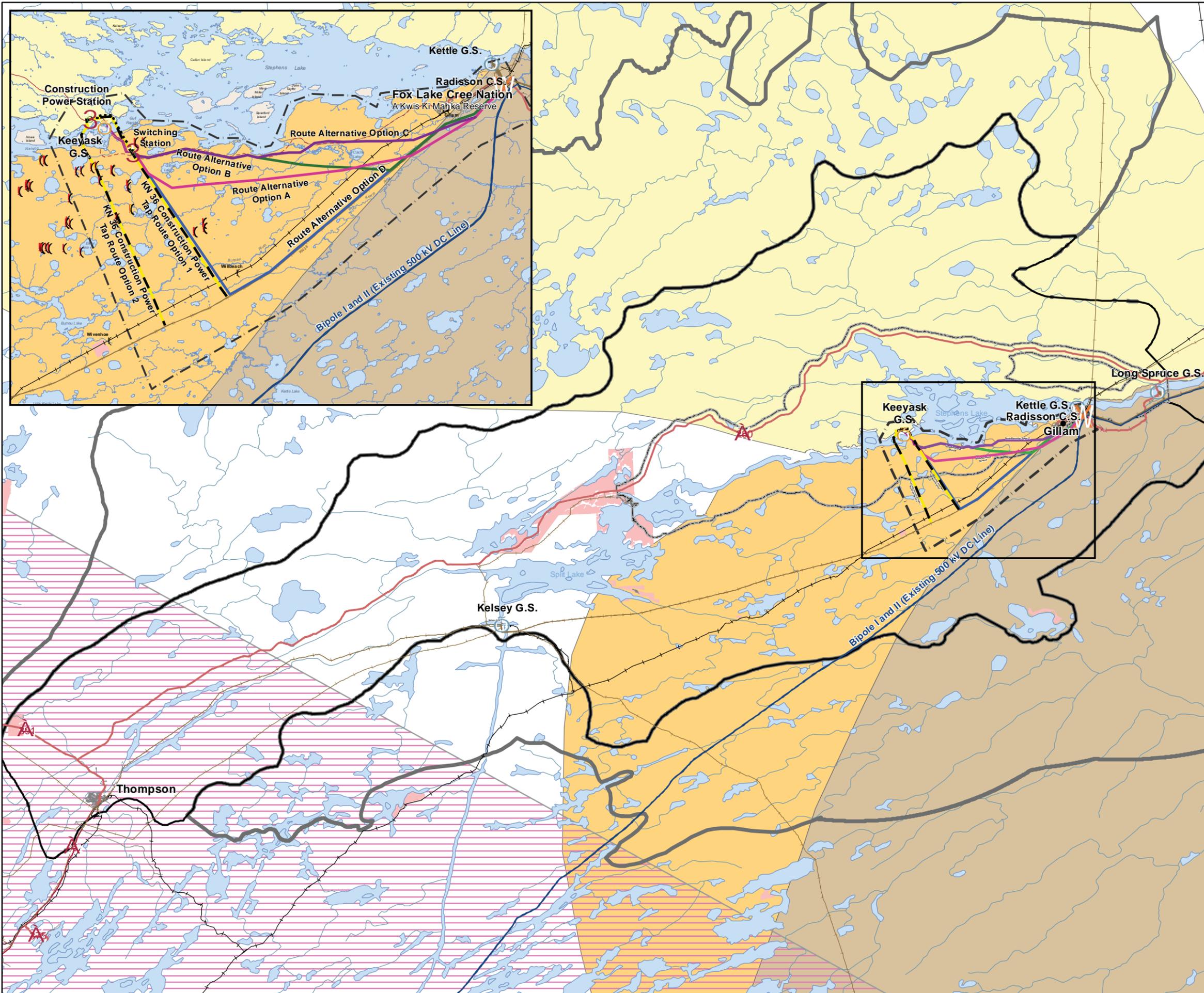
- | | |
|--------------------|-------------------|
| Community | Active Railway |
| Provincial Road | Abandoned Railway |
| Provincial Highway | Watercourse |
| Municipal Road | Waterbody |
| | First Nation |

Coordinate System: UTM Zone 15N NAD83
 Data Source: MBHydro, ProvMB, NRCAN
 Date Created: September 26, 2012



1:750,000

Caribou Ranges



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
- 3 Construction Power Station
- 3 Switching Station
- Project Study Area

Infrastructure

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

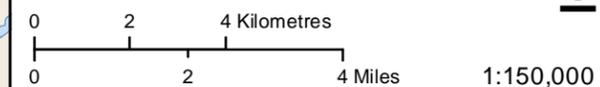
Mammals

- Muskrat Pushups
- Active Beaver Lodges
- Inactive Beaver Lodges

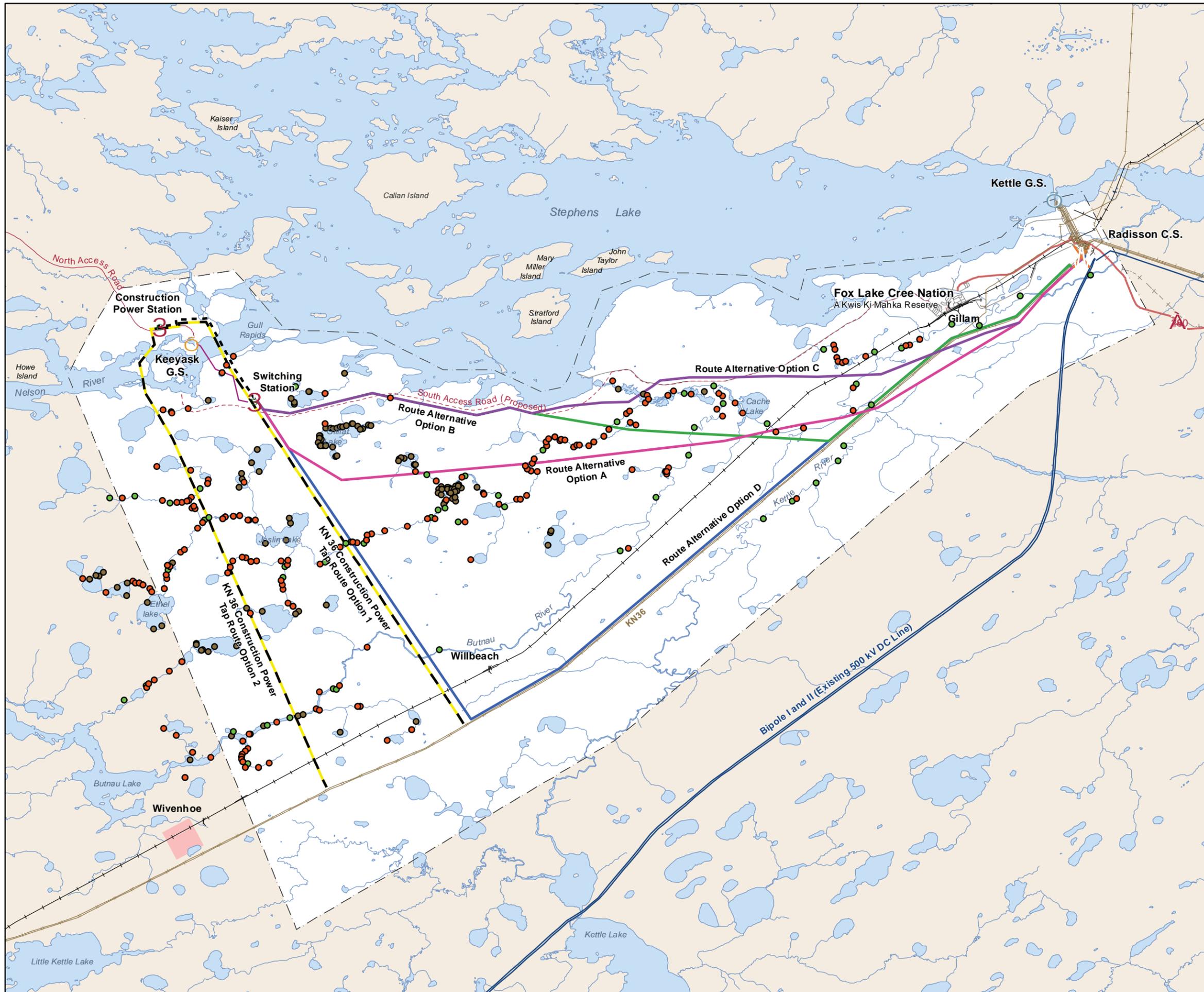
Landbase

- 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



Beaver Lodges and Muskrat Push-ups in the Local Study Area



Keyask 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

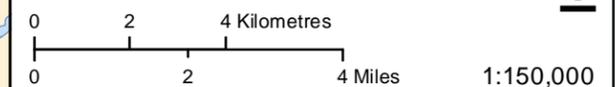
Estimated Moose Density

- Very Low
- Low
- Medium / High

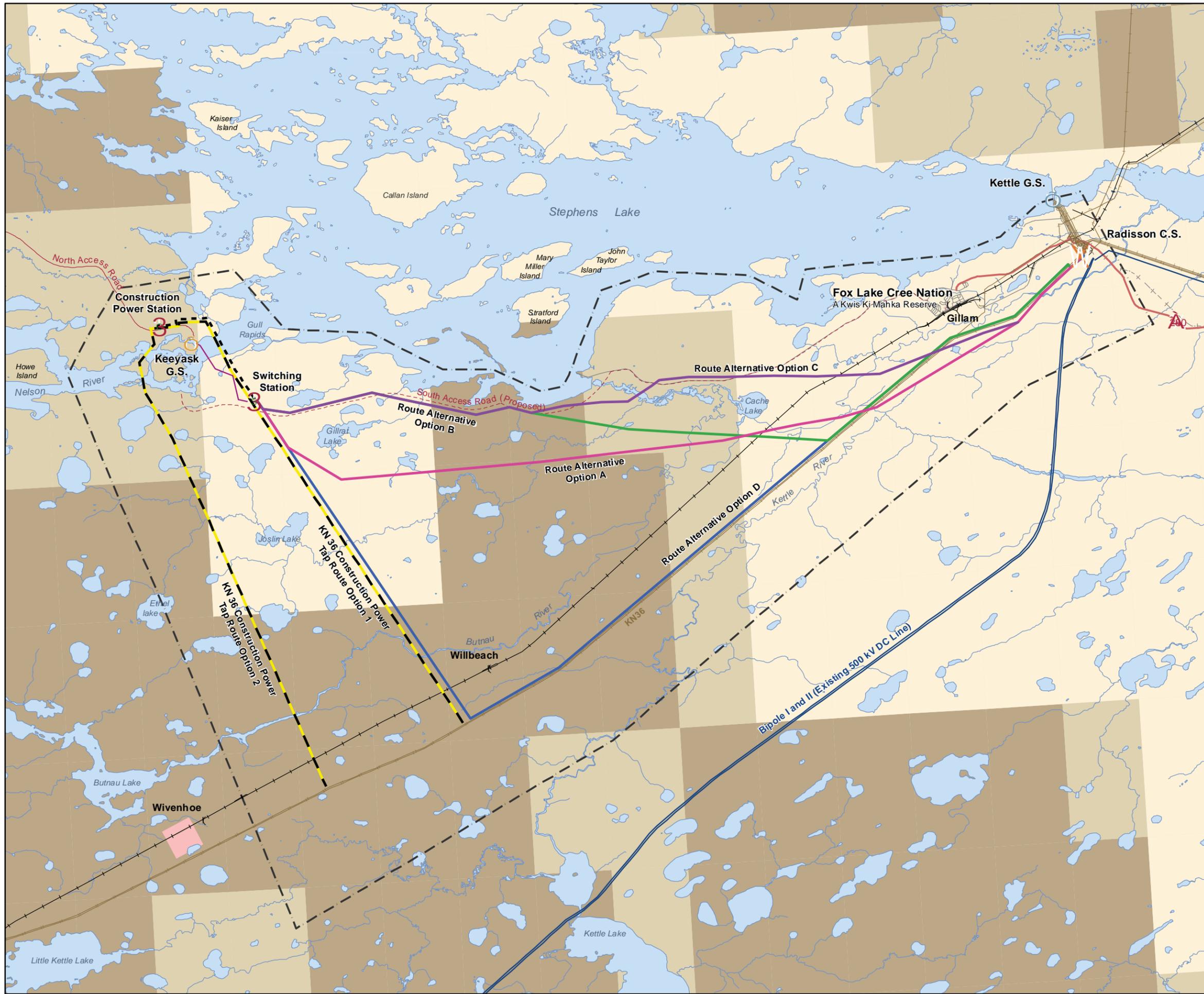
Landbase

- ⌘ 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



Moose Density in the Moose Regional Study Area



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
- 3 Construction Power Station
- 3 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

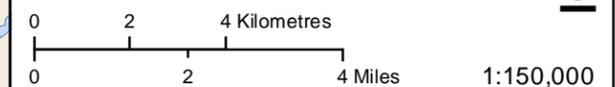
Caribou Calving and Rearing Habitat

- Virtual Island / Island in Lake
- Virtual Complex

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



Caribou Calving and Rearing Habitat in the Local Study Area

