4.0 ENVIRONMENTAL SETTING

This chapter provides a description of the existing environment in the Project Study Area (Map 1-1), including a summary of the biophysical and socioeconomic environments with respect to the Keeyask Transmission Project.

The Project Study Area is located in northern Manitoba, in the Boreal Shield Ecozone (Smith *et al.* 1998). The Project Study Area extends from the Radisson Converter Station (about 6 km northeast of the town of Gillam), along the south shore of Stephens Lake, to the proposed Keeyask Generating Station (GS). From this juncture, the Project Study Area extends north across the Nelson River approximately 4 km, and southward to a point about 3 km south of the existing Manitoba Hydro transmission line KN36 – 138 kV. The southern boundary extends east back to the Radisson Converter Station and parallel to KN36.

The Project is located entirely in the Split Lake Resource Management Area, about 300 km northeast of Thompson, Manitoba, and includes the town of Gillam. The area is utilized by resource users from Tataskweyak Cree Nation (Split Lake) as well as from Fox Lake Cree Nation (Bird/Gillam).

The Project Study Area occurs within a region, approximately 14,200 km^2 in size, shown in Map 4-1. Descriptions of the Region in the EA Report are intended to put into context the potential effects and characteristics of the Project Study Area. The region for the Keeyask Transmission Project coincides with the most commonly used regional study area defined in the terrestrial environment assessed for the Keeyask Generation Project. This permitted the utilization of information collected by the study team in the Keeyask Generation Project region for the Transmission Project assessment.

4.1 BIOPHYSICAL ENVIRONMENT

4.1.1 Terrain and Soils

The following is an overview of the existing terrain and soils environment of the region. This includes a discussion of topography, geology, terrain and soils components.

4.1.1.1 Topography

The Project Study Area occurs within the Knee Lake Ecodistrict. The topography of the Knee Lake Ecodistrict is generally flat with undulating loamy moraines that erode into drumlin crests and ridges. Elevations in the Ecodistrict range from 150 m above sea level (masl) in the lowlands near Stephens Lake to 213 m above sea level (masl). Eskers provide local relief to heights of 20 m to 30 m above ground level (Smith *et al.* 1998).

4.1.1.2 Geology

The region lies within the Canadian Shield near the boundary between the Churchill and Superior geological provinces in which the overburden thickness is estimated to be up to 30 m over the Precambrian bedrock (Betcher *et al.* 1995). This bedrock generally consists of greywacke gneisses, granite gneisses and granites. The overburden stratigraphy is a reflection of the last glacial retreat eastward and the resulting inundation of much of Manitoba by glacial Lake Agassiz. Some pre-glacial and silty sands are found immediately above the bedrock formation, but generally the overburden consists of a thick layer of deposited glacial material (till) overlain by post-glacial deposits in the form of alluvium (cobbles and boulders overlying sands and gravels) and Lake Agassiz silts and clays.

Soils and Permafrost

Organic soils are the most common soil group in the Project Study Area while mineral soils are concentrated on elevated areas which primarily occur along the Nelson River and the upper portions of eskers and moraines. Mineral soils tend to be well-drained due to their locations.

Peatlands are the dominant wetland type in the region and peat thicknesses ranges between 20 cm and over 5 m. Veneer bogs and blanket peatlands are the most common peatland types, covering approximately 65% of the region. Veneer bogs primarily occur on upper and mid-slope positions while blanket peatlands primarily occur on lower slopes, valleys and level areas. Blanket peatlands are thicker than veneer bogs and often contain scattered patches of ground ice. Peat plateau bogs and their transitional stages cover approximately 16% of land within the region. The remaining peatland types are horizontal peatlands, aquatic peatlands, thin wet peat and deep wet peat. (Keeyask HydroPower Limited Partnership 2012b)

Soil type and permafrost activity throughout soil horizons contributes to surface topography (Smith *et al.* 1998) in the region. Uneven soil horizon development in sediments with high clay content is evidence of permafrost effects on deeper soil layers. Permafrost activity is illustrated in surface layers by the presence of low earth hummocks (Smith *et al.* 1998). Mineral and organic soils present at regional and local scales frequently include bodies of permafrost. The permafrost table and bottom depths vary, depending on the depths of organic and mineral layers.

Discontinuous surface permafrost is widespread in the area and generally occurs in all peatland types except for horizontal and aquatic peatlands. The types of permafrost range from cold soil temperatures only to ice crystals, ice lenses and ground ice. Ground ice in peat plateau bogs can be several metres thick (Keeyask HydroPower Limited Partnership

2012b). Although permafrost may exist in the esker soils, it is unlikely that these frozen sandy/gravely soils will include large masses of frozen water (ice).

4.1.2 Groundwater

Both an upper groundwater table located near the ground surface within the peat (perched above the clay layer), and a lower groundwater table between 5 m (16 ft.) and 10 m (33 ft.) below grade (in the underlying till deposits) have been identified in some areas of the Project Study Area. For the most part, however, the local stratigraphy suggests that these two aquifers are connected, i.e., there is no continuous confining layer separating the two according to the boreholes drilled in the Project Study Area.

The inconsistent relationship between water levels in the adjacent lakes and in the groundwater at several locations suggests some, but not a complete, connection between the groundwater and surface-water system within the Project Study Area. Alternatively, this inconsistency may reflect the presence of clay or permafrost underlying the lakes, which may act as a barrier to hydrologic flow between the lakes and groundwater.

The Lake Winnipeg Regulation (LWR) and Churchill River Diversion (CRD) have caused river water levels and adjacent groundwater levels to rise along the shoreline. The groundwater level under post-LWR and -CRD conditions is likely higher, i.e., closer to the surface than it was under pre-LWR and -CRD conditions since the difference between high and low flows has been generally reduced.

The general groundwater conditions in the Project Study Area appear to be stable.

4.1.3 Climate, Noise and Air Quality

The following section documents an overview of the relevant climate, noise and atmospheric variables in the Project Study Area.

4.1.3.1 Climate

The proposed Project is located within the sub-Arctic climate zone that is characterized by long, usually very cold winters, and short, cool to mild summers. Based on measurements at Gillam Airport, the mean annual temperature is -4.2°C, with a range of monthly average temperatures from -25.8°C in January to +15.3°C in July (Environment Canada 2009).

The mean annual precipitation is 499.4 mm, of which approximately 63% is rain, with the highest values occurring in July (81.8 mm) and August (77.2 mm). October through April tend to receive the most amount of precipitation in the form of snow, typically in the range of

23.4 to 43.9 cm per month. September and May can be considered transitional months, when both rainfall and snowfall can occur.

The predominant wind direction is northeast from March to July, northwest from August to November, and westerly from December to February. Monthly normal wind speeds range from 14.0 km/h in February, March and December to 17.8 km/h in October. A maximum wind gust speed of 107 km/h was recorded in July of 1991.

4.1.3.2 Noise

No data is available for ambient noise levels; however, existing levels are expected to be typical of relatively undisturbed areas. Sources of noise in the Project Study Area are expected to be intermittent man-made noise from ATVs, snowmobiles, and other vehicle traffic as well as natural noise generated from Gull Rapids.

4.1.3.3 Air Quality

Existing air quality in Manitoba is considered by Manitoba Conservation to be “good to excellent in general,” and therefore, it is reasonable to believe that air quality in the Project Study Area is good to excellent and in compliance with all Manitoba’s Ambient Air Quality Guidelines (Manitoba Conservation 2012).

4.1.4 Aquatic Environment

This section focuses on the existing aquatic environment in the Project Study Area. This includes surface water flows (hydrology) and quality, as well as the aquatic biota that use surface waters.

4.1.4.1 Watershed and Hydrology

The Project Study Area is found within the Nelson River watershed basin and the Lower Nelson River sub-basin. It includes the Nelson River from Gull Rapids and the southern shore of Stephens Lake east to the Kettle GS. Discussion of the aquatic environment will include data collected at Gull Rapids and in Stephens Lake. The Project Study Area also includes the land south of these waterbodies, which contains numerous small lakes and streams, and several medium-sized rivers such as the Butnau and Kettle rivers.

The Nelson River basin consists mostly of Canadian Shield; however, the easternmost extent is on the Hudson Bay coastal plain (Mills *et al.* 1976). Marsh and bog areas are common throughout and the landscape is generally hummocky and dominated by small to medium oval and rounded lakes with smooth shorelines. Many larger lakes exist; often shallow with irregular rocky shorelines (Schlick 1972; Cleugh 1974; Veldhuis *et al.* 1979).

Riparian vegetation typically consists of a combination of alders, birch, larch, peat, poplar, sedge, spruce or willow (Mills *et al.* 1976).

The Lower Nelson River sub-basin includes the Nelson River mainstem and Split Lake as well as numerous headwater lakes and tributaries of these water bodies. The eastern portion of this sub-basin lies within the Hudson Bay coastal plain and is notable for a number of small to medium sized tributaries of the Nelson River mainstem that, with their coarse substrate and groundwater flows, support fall spawning runs and resident populations of brook trout (*Salvelinus fontinalis*). Further west, this sub-basin consists of more typical boreal lakes and rivers such as the Crying and Assean rivers.

Nelson River: Gull Rapids

Gull Rapids is located approximately 3 km downstream of Caribou Island on the Nelson River (Map 4-2). Two large islands and several smaller islands occur within the rapids prior to the river narrowing. The substrate and shoreline of the rapids are composed of bedrock and boulders. One small tributary, Gull Rapids Creek, flows into the south side of Gull Rapids, approximately 1 km downstream from the beginning of the rapids. The first 300 m of this tributary feature a diversity of pool, run, and riffle habitats and is characterized by boulder, gravel, and sand substrate with small amounts of organic material.

Stephens Lake

Construction of the Kettle Generation Station resulted in extensive flooding immediately upstream of the Generation Station. Flooded terrestrial habitats compose a large portion of the existing lake substrates, and include organic sediments as well as areas of clay and silt. Woody debris is abundant due to the extensive flooding of treed areas. Outside the flooded terrestrial areas, substrates are dominated by fine clay and silt. Sand, gravel, cobble, and areas of organic material dominate the shoreline, with much of the shoreline being prone to erosion.

During construction of the Kettle Generation Station, an earth dyke was constructed at the inlet of the Butnau River at Stephens Lake, and a channel developed to divert the Butnau River through Cache Lake into the Kettle River (Manitoba Hydro 1996a).

4.1.4.2 Surface Water Quality

The water in Stephens Lake is somewhat harder, more nutrient rich, and turbid than typical Canadian Shield lakes, primarily due to the presence of the glacio-lacustrine deposits (Hecky and Ayles 1974).

Studies conducted for the Keeyask Generation Project found that Stephens Lake was moderately alkaline, with ‘moderately soft’ water. Total phosphorus, total suspended solids,

and turbidity were lower in the lake in contrast to the Nelson River mainstem, likely due to settling occurring over this area. Concentrations of phosphorus and nitrogen were relatively high in the lake, with concentrations above Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG) in the southern portion of the lake. Conditions at the south end of Stephens Lake resembled those observed on the Nelson River mainstem upstream and downstream of the lake. This south end area was generally more nutrient-rich, more turbid, did not stratify, and was more oxygenated over winter than the north arm of the lake.

Within Gull Rapids, most areas were well-oxygenated, relatively turbid, slightly alkaline, and water was generally 'moderately soft'. Concentrations of phosphorus and nitrogen were relatively high, with concentrations above MWQSOG in most samples near the mouth to Stephens Lake. All sites in the area would be classified as eutrophic on the basis of total phosphorus.

Streams south of Stephens Lake were moderately nutrient-rich, near-neutral, and contained higher concentrations of organic carbon than the mainstem of the Nelson River. Some streams had low dissolved oxygen levels that did not meet, or were very close to, MWQSOG for the protection of aquatic life. This agreed with data from stream-crossing assessments collected as part of field studies for the Keeyask Transmission Project in 2009, which found fish habitat in many of the streams assessed was likely limited by dissolved oxygen levels.

4.1.4.3 Lower Trophic Levels

Lower trophic levels, as discussed in this document, include all aquatic organisms apart from fish that occupy the aquatic environment. Phytoplankton consists of small, aquatic, plant-like organisms (i.e., algae) that are most often found suspended or entrained in the water column. Changes in phytoplankton abundance or composition can result in changes to invertebrate and fish populations.

From Keeyask environmental studies, Stephens Lake and the Keeyask area were found to be similar to other Nelson River environments in the area, with the phytoplankton community dominated by diatoms through the open-water season.

Drift trap sampling upstream and downstream of Gull Rapids collected a substantial amount of drifting plant biomass, indicating that the upstream areas (Gull Lake and Gull Rapids itself) are productive areas. Zooplankton is very small invertebrates living in the water column and is consumed by larval, juvenile, and adult fish (e.g., lake cisco). Three important groups in open water are Cladocera (water fleas), and calanoid and cyclopoid Copepoda (copepods). The availability and quality of food (e.g., phytoplankton), the number of predators, and water residence time affect the abundance of zooplankton. From Keeyask environmental studies, Stephens Lake was found to have similar zooplankton diversity as other Nelson River lacustrine environments in the area, with Copepoda (predominately

cyclopoids) dominating the community. Aquatic macroinvertebrates are small animals living on or in the substrata or within the water column of lakes and rivers. They are important food items to fish and useful bio-indicators of environmental change.

Macroinvertebrates, typically a diverse assemblage, are adapted to a range of substrate types and water flow regimes. From Keeyask environmental studies, 54 taxa of macroinvertebrates were observed in the Stephens Lake Area, and 93 taxa were observed in the Keeyask Area.

4.1.4.4 Fish Resources

Fish community assessments were conducted as part of the Keeyask Environmental Studies Program from 1997-2008 (Keeyask Hydro Power Limited Partnership 2012) within the Keeyask Generation Station region (of which the Project Study Area is a part). A total of 37 fish species are known to occur in the region (North/South Consultants Inc. 2012). The principal large-bodied species include walleye, sauger, northern pike, yellow perch, burbot, lake whitefish, cisco, longnose sucker, white sucker, and lake sturgeon, while the most common small-bodied species include spottail shiner, emerald shiner, and trout-perch. The area is similar to the aquatic environment in much of the northern boreal forest of Manitoba, Ontario, and western Quebec. From a biodiversity and conservation perspective, the aquatic environment of the region is not unique despite its traditional and cultural values to the local Cree Nations.

Lake sturgeon occurs throughout the region in the riverine and lacustrine portions of the Nelson River. First Nations have identified lake sturgeon as a culturally important species. It has also been assessed as a heritage species in Manitoba and the Nelson River lake sturgeon populations have been assessed as ‘endangered’ by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Presently, lake sturgeon is under consideration for being listed under Schedule 1 of Canada’s *Species at Risk Act* (SARA). The area also has one introduced species; the rainbow smelt, which was first reported in Stephens Lake in 1996 (Remnant *et al.* 1997).

Stephens Lake

Due to the similar characteristics observed across waterbodies in the region, it is anticipated that tributaries surrounding Stephens Lake may contain many of the same fish. A total of 23 fish species were captured in the Stephens Lake area. The most abundant large-bodied fish included walleye, northern pike, and white sucker, while the most abundant forage species included spottail shiner, trout-perch, and rainbow smelt. Lake sturgeon were also among the species captured.

Gull Rapids

A total of 32 fish species were captured in or immediately below Gull Rapids. Abundant large-bodied species below the rapids were walleye, sauger, and northern pike. Lake sturgeon was also among the large-bodied species caught. Abundant forage fish species below the rapids were emerald shiner, trout-perch, and spottail shiner. The use of riverine habitat below the rapids for foraging was approximately twice the level as in riverine habitat upstream of the rapids. Numerous species of large-bodied fish spawned in the rapids, including lake whitefish, lake sturgeon, white sucker, longnose sucker, yellow perch, freshwater drum, mooneye, northern pike, walleye, and sauger.

Walleye were an important component of the fish population in the rapids. The rapids provided important walleye spawning and foraging habitat; however, the rapids were likely limited in potential rearing and overwintering habitat. Northern pike were present in the rapids but did not make up an important component of the fish population in the rapids. The rapids provided important northern pike spawning habitat; however, the rapids were likely limited in potential rearing, foraging, and overwintering habitat for northern pike. Lake whitefish were a seasonally important component of the Gull Rapids fish population, with large numbers congregating in the fall for spawning. However, rearing, foraging, and overwintering by lake whitefish did not occur to a large extent within the rapids. Lake sturgeon were found throughout Gull Rapids. Suitable lake sturgeon spawning habitat existed, with most sturgeon spawning along the edges of the main channel. Suitable sturgeon foraging habitat also existed, however no suitable sturgeon rearing or overwintering habitat existed within the rapids.

Streams South of Stephens Lake

The Butnau and Kettle rivers (Map 4-3), as well as several other smaller creeks south of Stephens Lake, were assessed as part of Keeyask Environmental Studies Program. The smaller creeks were found to support forage fish species such as brook stickleback, fathead minnow, and longnose dace. Potential forage, spawning, and rearing habitat existed for forage fish, and overwintering was identified as potentially occurring in deeper pools. Northern pike were also captured in some of the smaller creeks. These creeks were characterized by minimal flows after spring freshet, and stagnant conditions due to beaver dams, low stream gradients, and broad floodplains. Most creeks likely froze to the bottom in winter in most areas. Use by large-bodied fish was likely impeded by these low water conditions.

The Butnau and Kettle rivers were found to be used extensively by northern pike, with suitable northern pike spawning habitat found in both rivers in areas with low to moderate velocity environments, variable water depths, soft substrates, and submerged vegetation. Walleye were relatively uncommon in both rivers; however, suitable walleye spawning

habitat existed in the Butnau River diversion channel and the lower Kettle River. Lake whitefish were very uncommon in the Kettle/Butnau river system. White and longnose sucker were found to spawn in both rivers.

4.1.4.5 Fish Habitat

Fish habitat is considered a VEC and is generally used as a surrogate for measuring productive capacity and is defined in the *Fisheries Act* as:

> *"spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes."*

Fish habitat is typically classified on the basis of water depth, water velocity, substrate type, and cover (including large rooted plants, terrestrial debris, riparian vegetation, and other large structures). These characteristics determine whether individuals, communities, and populations of fish and other aquatic biota can find the biophysical features they need for life, such as suitable areas for reproduction, feeding sites, resting sites, cover from predators and adverse environmental conditions, movement corridors, and overwintering. The biophysical characteristics of the habitat play a large role in determining the species composition and biomass of the biotic community that can be sustained.

Fish habitat within and adjacent to the Project Study Area is largely characterized by the Nelson River, consisting of both lotic habitats, such as Gull Rapids, and lentic habitats, such as Gull and Stephens lakes. Waterbodies south of Stephens Lake, such as the Butnau and Kettle rivers, are also included. The following description of fish habitat for these areas is based upon information presented in the Keeyask Environmental Studies Program (North/South 2012, i.e., Aquatic Environment Technical Report). The existing environment was based on the period 1977 to 2006, while biological components were based on field studies conducted from 1997 to 2006.

Stephens Lake

Stephens Lake can be divided into a northern and southern portion. The northern arm was formed by flooding from the Kettle Generation Station, and consists of lentic habitat. The southern portion consists of the original river channel flowing eastward into the Kettle Generation Station forebay. Lotic conditions occur in the southern portion under higher inflow conditions, especially in the western half of the reservoir. The reservoir is wider and relatively deep in the eastern half.

Both mineral and organic-based substrates are found in the lake. The western half, including the north arm, contains a large amount of flooded terrestrial habitat and has predominantly silt or fine organic material substrates. However, the eastern side of the north arm is relatively deep and retains much of its original rocky shoreline and mineral-based

substrates. Substrates within the eastern portion of the lake consist primarily of fine silt depositional materials; however, granular (sand/gravel) materials are found in clay along both the north and south shorelines.

Aquatic plants were found frequently in standing water areas, and showed a strong affinity for clay and organic based substrata. No plants were observed on inundated peat. Nine species of macrophytes were observed within Stephens Lake. *Potamogeton richardsonii* was most common, showed a strong affinity for clay substrata and was found at depths mainly below the intermittently exposed zone. *Myriophyllum sibiricum* was also common and showed a preference for areas with fine organic deposits that are commonly found at the ends of flooded bays.

Gull Rapids

Gull Rapids is the largest set of rapids in the region. There are several islands and channels located in the rapids, with new channels being cut periodically due to the erosive forces of ice and water. Most of the flow passes through the south channel, with little to no flow through the north channel during low Nelson River discharge. However all channels include rapid and turbulent flows. Between the rapids and Stephens Lake there is an approximately 6.0 km long reach that, although affected by the Kettle reservoir, remains a lotic environment with moderate water velocity. The substrate and shoreline of Gull Rapids are composed of bedrock and boulders. Macrophyte habitat is limited within and downstream of the rapids.

Streams South of Stephens Lake

Most smaller creeks assessed as part of the Keeyask Environmental Studies Program were found to have pool habitat with low water velocities, and wide, saturated floodplains. They usually drained upstream bog/fen areas, and/or small headwater lakes. Beaver activity was common, and substrates were usually fine organics. Cover was abundant in the form of instream and overhanging vegetation.

The upper reaches of the Butnau and Kettle rivers were similar to the smaller creeks, with low water velocities, soft substrates, and abundant cover. Lower reaches of the Kettle River were shallow, with moderate water velocity, and rocky substrate. The Butnau River Diversion Channel's habitat was similar to the Kettle River's lower reaches (Johnson and Barth 2007).

4.1.5 Terrestrial Habitat, Ecosystems and Plants

4.1.5.1 Terrestrial Habitat

This section describes the terrestrial habitat, ecosystems and plants within the Keeyask region (Map 4-1).

Regional land cover in 2010 was dominated by sparsely to densely treed needleleaf vegetation on thin or shallow peatlands (about 80% of the land area). Broadleaf treed land cover accounted for approximately 1% of the land area, typically occurring on upland mineral soils, in richer riparian areas and near the Nelson River. Tall shrub and low vegetation on mineral or peatland ecosites covered 16% of land area, primarily occurring along streams and rivers, other wet areas and poorly regenerating burned areas (a substantial proportion of the low vegetation on mineral, thin peatland and shallow peatland was treed vegetation prior to burning in wildfires, both north and south of the Nelson River, during the 1980s and 1990s). Shoreline wetlands other than shallow water wetlands accounted for less than 1% of land area. Human infrastructure comprised approximately 2% of the existing land area.

Black spruce (*Picea mariana*) on thin peatlands and black spruce on shallow peatlands were the two most abundant coarse habitat types, with each covering approximately one-third of the land area (ECOSTEM 2012, i.e., Terrestrial Habitat, Ecosystems and Plants Technical Report). The other needleleaf coarse habitat types were jack pine (*Pinus banksiana*) and tamarack (*Larix laricina*). The overstorey species included in the broadleaf treed and mixedwood coarse habitat types were trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and white birch (*Betula papyrifera*). Black spruce and jack pine typically were the needleleaf species in the mixedwood types.

Because of frequent large fires, approximately one-quarter of inland terrestrial habitat in the region was less than 50 years old in 2010.

Shoreline wetland coarse habitat types comprised less than 1% of land area (shallow water wetland class not included in land area or as a type since bathymetry data were not available to separate shallow from deep water throughout the region). Shrub and/or low vegetation on the upper beach on the Nelson River was the most abundant of these types (0.6% of the land area).

Land cover in the Project Study Area was similar to that in the region. There was a lower proportion of needleleaf vegetation on mineral, thin or shallow peatlands (71% vs. 80%), and a higher proportion of tall shrub and low vegetation cover (24% versus 16%). Much of this difference is due to slowly regenerating burned areas occurring throughout a large portion of the Project Study Area. The overall habitat composition with respect to overstorey

species was very similar to that of the region, with black spruce on thin peatlands and black spruce on shallow peatlands being the most abundant habitat types.

4.1.5.2 Terrestrial Ecosystems: Valued Environmental Components

The following section discusses Fragmentation, Core Areas and Ecosystem Diversity, which are all VECs for terrestrial ecosystems.

Fragmentation

Linear Feature Density

The region included 5,628 km, or 0.45 km/km^2, of mapped linear features in 2010. The 738 km of existing roads created a road density of 0.06 km/km^2 in the region, with Provincial Road (PR) 280 making the largest contribution. The remaining roads occur around small communities, such as York Landing and Ilford, with about half of these being winter roads.

Roads and rail lines combine to create a regional transportation density of 0.13 km/km^2. Transmission line density in 2010 was 0.06 km/km^2.

At 0.30 km/km^2, cutlines made the highest contribution to total linear feature density in the region. The ecological effects of cutlines are expected to be lower than those of other linear features for a variety of reasons (e.g., narrower footprint, lower habitat disturbance). Regarding the access function of linear features, it is likely that portions of cutlines and transmission line rights-of-way are not used as human or wildlife corridors because they are partially overgrown, distant from any current human uses and/or are accessible only in winter due to natural barriers. For example, of the 883 km of cutlines surveyed for vegetation regeneration and game trails in 2011, approximately 35% had regenerated to the degree that they were no longer expected to function as travel corridors. To illustrate the effect of cutlines on linear density, total linear feature density declined from 0.45 km/km^2 to 0.15 km/km^2 when cutlines were not considered.

There are very high concentrations of linear features near Thompson, which skew the linear feature densities for the rest of the region. Whereas the Thompson area comprises only 15% of the region, it included 38% of the linear features. Total linear feature density in the Thompson area was 1.27 km/km^2 compared with only 0.32 km/km^2 in the rest of the region.

Core Areas

Core areas larger than 200 ha (0.2 km^2) accounted for 84% of land area in the region in 2010. When the minimum size for a core area was increased to 1,000 ha (10 km^2) the core area percentage only dropped to 83%. Almost 98% of the total core area is comprised of core areas that are larger than 1,000 ha (10/km^2).

The three largest core areas make up over half of the total core area. The largest core area (270,769 ha [2,707 km^2]) is located north of PR 280 between Split Lake and Long Spruce Generation Station. The second largest core area (181,147 ha [1,811 km^2] is located north of PR 280 between Split Lake and Thompson.

Ecosystem Diversity

The region includes 55 native broad habitat types (ECOSTEM 2012).

The distribution of area amongst the native broad habitat types was very uneven. Three black spruce habitat types (black spruce dominant on thin peatland, black spruce dominant on shallow peatland, and black spruce dominant on ground ice peatland) account for nearly 65% of the total land area. In contrast, the 44 least abundant broad habitat types cover less than 9% of land area.

The four broad habitat types represented by less than ten stands included balsam poplar dominant on all ecosites, balsam poplar mixedwood on all ecosites, jack pine dominant on shallow peatland, and jack pine mixedwood on shallow peatland.The four broad habitat types represented by 10 to 20 stands include white birch dominant on all ecosites, white birch mixedwood on all ecosites, tamarack dominant on mineral and black spruce mixedwood on shallow peatland.

Due to the highly uneven distribution of area amongst the broad habitat types, 45 broad habitat types met the regional rarity criterion for priority habitat types while 28 satisfied at least two priority habitat criteria. The two rarest habitat types in the region were balsam poplar mixedwood and balsam poplar dominant on all ecosites. Many of the regionally rare and uncommon habitat types were more abundant in the Project Study Area portion of the region, generally located on the esker and along the Nelson River.

The most structurally and/or plant species diverse priority habitat types are tall shrub on shallow peatland, tall shrub on thin peatland, balsam poplar mixedwood on all ecosites, trembling aspen mixedwood on all ecosites, black spruce mixedwood on thin peatland, jack pine dominant on mineral, jack pine dominant on thin peatland, jack pine mixedwood on thin peatland, jack pine mixture on shallow peatland, tamarack dominant on mineral, tamarack mixture on mineral, tamarack dominant on thin peatland and tamarack mixture on thin peatland.

Priority habitat types with the highest potential to support rare plant species are jack pine, trembling aspen mixedwood and balsam poplar mixedwood on all ecosites, tamarack on mineral or thin peatland ecosites, black spruce mixture and mixedwood on thin peatland, and tall shrub types.

4.1.5.3 Terrestrial Plants

Field studies in the Project Study Area were conducted to gather information on a variety of terrestrial plants including plant communities, priority plants, and invasive plants using the habitats within areas where the proposed transmission line routes are located. Information gained through these terrestrial plant studies, together with other environmental study results, was used to assist in the final route selection process for both the Construction Power Transmission Line and Generation Outlet Transmission Lines.

Plant Communities

The plant species occurring in the region are typical of the central Canadian boreal forest, consisting primarily of species that are tolerant of the cold, harsh climate and can grow in wetlands. Available information indicated that over 750 vascular terrestrial plant species could potentially occur in the region (Keeyask HydroPower Limited Partnership 2012b). Of this total, 120 species and 12 additional species groups (e.g., species only identified to the genus level) were detected by field studies conducted in the Project Study Area corridors. Based on field data and ground layer samples collected at the terrestrial habitat plots, 88 mosses, six lichens and two liverworts were identified to either a species or a broader taxon (field studies only attempted to identify the most common and abundant ground mosses and lichens in the field).

In descending order, the most widespread and abundant inland plant species recorded to the species level during field studies were black spruce, green alder (*Alnus viridis*), Bebb's willow (*Salix bebbiana*), myrtle-leaved willow (*S. myrtillifolia*), flat-leaved willow (*S. planifolia*), bog willow (*S. pedicellaris*), swamp birch (*Betula pumila*), Labrador tea (*Ledum groenlandicum*) and rock cranberry (*Vaccinium vitis-idaea*). Of the plants that were only identified into identified species groups, peat mosses (*Sphagnum* spp.) were the only group that was widespread and abundant. The most widespread shoreline wetland plants were marsh reed-grass (*Calamagrostis canadensis*), common horsetail (*Equisetum arvense*) and water sedge (*Carex aquatilis*). More beach and sub-littoral zone species occurred in off-system waterbodies. Species only found in off-system waterbodies included bitter-cress (*Cardamine pensylvanica*), wooly sedge (*Carex pellita*), thread rush (*Juncus filiformis*), small yellow pond-lily (*Nuphar lutea* ssp. *variegata)* and several pondweed species. Of the shoreline plants that were only identified into groups, none of the groups were widespread and abundant.

Priority Plants

The priority plant list consisted of 101 vascular plants. The Terrestrial Habitat, Ecosystems and Plant Technical Report (ECOSTEM 2012) provides the species list, their Manitoba Conservation Data Center (MBCDC) conservation concern ranking (G-Rank and S-Rank),

their reasons for inclusion as a priority plant species, the number of sample locations where the species was found at in the region, and general habitat associations (ECOSTEM 2012).

Species listed as endangered or threatened under the *Manitoba Endangered Species Act* (*MBESA)*, *SARA* or COSEWIC are not expected to occur in the region. All of these except for flooded jellyskin lichen (*Leptogium rivulare*) are prairie species. Flooded jellyskin lichen is not expected to occur in the area, primarily because its required microhabitat was not found in the region.

None of the 13 provincially very rare species that could potentially occur in the region were found during field studies. One species with an uncertain rare or very rare conservation concern ranking, elegant hawk's-beard (*Crepis elegans*), was found at nine roadside locations.

Field studies recorded seven of the 45 provincially rare to uncommon upland and wetland plant species that could potentially occur in the region, including small pondweed (*Potamogeton pusillus* ssp. *tenuissimus*), Robbin's pondweed (*Potamogeton robbinsii*), shrubby willow (*Salix arbusculoides*), rock willow (*Salix vestita*), horned pondweed (*Zannichellia palustris*), oblong-leaved sundew (*Drosera anglica*), muskeg-lousewort (*Pedicularis macrodonta*) and American milk-vetch (*Astragalus americanus*; see Section 3.2.4.2 of ECOSTEM 2012) All species except for American milk-vetch were more common in the region than suggested by their provincial conservation concern rank, being found at more than 25% of locations sampled in appropriate habitat. American milk-vetch, which was recorded in a few locations at the eastern end of the region, was found at a larger number of locations to the northeast of the region.

Of the remaining 42 priority plants, 27 were regionally rare and/or near a range limit. Range limit species included jack pine (*Pinus banksiana*), shrubby willow, rock willow, northern Labrador tea (*Ledum palustre* ssp. *decumbens*), wolf-willow (*Elaeagnus commutata*), elegant hawk's-beard, hairy goldenrod (*Solidago hispida*), arctic wintergreen (*Pyrola grandiflora*) and small yellow pond-lily (*Nuphar lutea* ssp. *variegata*).

Plants of particular interest to the Keeyask Cree Nations were sweet flag (*Acorus americanus*; locally known as ginger root in English; *wekes, wekas* or *wihkis* in Cree), white birch (*Betula papyrifera* and *B. neoalaskana; asatee* in Cree), strawberries *(Fragaria virginiana; odahihminah* in Cree), northern Labrador tea, currants and gooseberries (*Ribes triste* or *R. lacustre; ekomina* or *anikimina* in Cree), cloudberries (*Rubus chamaemorus; ostikonihminah* in Cree), red raspberry (*Rubus ideaus; anouskanuk* in Cree), dewberry (*Rubus pubescens; ooskeesihikoominh* in Cree), blueberries (*Vaccinium uliginosum; niskeminah* in Cree) and cranberries (*Vaccinium vitis-idaea; wesahkeminah* in Cree). Most of these species are common in their preferred habitats. Exceptions are ginger root and

northern Labrador tea. Ginger root was not found during field studies. Northern Labrador tea was recorded at seven locations in the region.

None of the provincially very rare species that could potentially occur in the Project Study Area were found during field studies. Elegant hawk's-beard, shrubby willow, rock willow, Robbin's pondweed, oblong-leaved sundew, muskeg-lousewort and American milk-vetch were all recorded in the Project Study Area. Six regionally rare species and eight range limit species were recorded in the Project Study Area. Nine of the plants of particular interest to the Keeyask Cree Nations were also recorded in the Project Study Area.

4.1.5.4 Invasive Plants

Invasive plants are widely considered to be a threat to species and ecosystems. Invasive plants are introduced and spread by human activities and natural dispersal mechanisms. Invasive plants are spreading in Manitoba.

Field studies detected all of the 19 invasive plants known to occur in the region (see Section 3.2.4.3 of ECOSTEM 2012). The majority of invasive plant locations were in disturbed areas, such as along PR 280 in borrow pits, or along Nelson River shorelines having substrates similar to those in human-disturbed inland areas. Two of these species occurred within the alternative route corridors.

Reed-canary grass (*Phalaris arundinacea*), the only detected plant species that is currently classified as highly invasive, was found at 27 locations in the region (primarily along Nelson River shorelines), and at one location in the Project Study Area. Moderately invasive species included smooth brome grass (*Bromus inermis*) and white sweet-clover (*Melilotus albus*). These species were found at five locations. Common dandelion (*Taraxacum officinale*) was recorded at five locations in the Construction Power Route Option 1 corridor, and wild barley (*Hordeum jubatum*) was recorded at one location in the Construction Power Route Option 2 corridor. No invasive non-native species were recorded along the Generation Outlet Transmission (GOT) routing alternatives.

Purple loosestrife (*Lythrum salicaria*) and leafy spurge (*Euphorbia esula*), other species classified as being highly invasive, have not been recorded in the region to date. Purple loosestrife has been extending its range northward in Manitoba.

4.1.6 Terrestrial Invertebrates

Terrestrial invertebrates (animals without backbones) are a diverse group of organisms that play a key role in the function of boreal ecosystems. Invertebrates comprise 97% of all known animal species. Terrestrial invertebrates are represented within four phyla:

- Nematoda (unsegmented worms, *e.g.*, roundworms)
- Annelida (segmented worms, *e.g.*, earthworms)
- Mollusca (*e.g.*, snails)
- Arthropoda (*e.g.*, spiders, insects, crayfish)

Both the terrestrial and aquatic habitats present within the region provide important habitat for terrestrial invertebrates. The diversity of plant communities in the boreal forest zones, including the region, gives rise to equally diverse terrestrial invertebrate communities.

Such invertebrate communities include species living in the soil (nematodes, earthworms), on the ground (beetles, spiders), in the air (butterflies, moths, flies), and within the vegetation canopy (spiders, aphids, beetles). Terrestrial invertebrates are ecologically important for their role as nutrient cyclers and decomposers (e.g., earthworms), as predators of pest species, as pollinators of flowering plants (e.g., bees) and as food for other animals (e.g., birds).

None of the invertebrate species listed as rare by the Manitoba Conservation Data Centre (MBCDC) or those listed under the *Manitoba Endangered Species Act* (MBESA) or the *Species at Risk Act* (SARA) are expected to occur within the region, or were found incidentally during several years of field studies. Given this, no invertebrate-targeted field studies were conducted for terrestrial invertebrates. Terrestrial invertebrate communities are therefore described and assessed based on existing literature for boreal ecosystems, which are considered representative to the region.

4.1.7 Amphibians and Reptiles

Field studies in the Project Study Area from 2009 to 2011 were conducted to gather information on a variety of wildlife groups, including amphibians, using the habitats within areas where the proposed transmission line routes are located (Stantec 2012a, i.e., Amphibian Technical Report). Information gained through these amphibian studies, together with other environmental study results, was used to assist in the final route selection process for both the Construction Power Transmission Line and Generation Outlet Transmission Lines.

None of the reptile species native to Manitoba are known to have breeding ranges that extend as far north as the region, and none were observed during environmental baseline studies in the Project Study Area. As reptile species are not readily found in the region, they are not discussed further in this document. This section provides information gathered in June 2009, 2010 and 2011 on amphibian communities utilizing various habitats located throughout the Project Study Area. Amphibian abundance and diversity was described for the various habitat types potentially affected by the Project.

The Project Study Area is within the documented range of three amphibian species: the northern leopard frog (*Rana pipiens*), the wood frog (*Rana sylvicata*), and the boreal chorus frog (*Pseudacris triseriata*; Preston 1982). Wood frogs and boreal chorus frogs are common throughout most of Manitoba, and are not listed by COSEWIC (2007), MBESA (2012), or the MBCDC (2007). Northern leopard frog populations in Manitoba are classified by COSWEIC 2007 as being of 'Special Concern' due to population declines throughout most of Western Canada (COSEWIC 2009).

The findings of these studies (from 2009 through 2011) indicate that boreal chorus frogs and wood frogs are widely dispersed and relatively abundant throughout the Project Study Area; however, frog populations in boreal regions are generally lower than those observed in southern Manitoba (Cash *pers. comm.* 2006). Boreal chorus and wood frogs breed in localized populations throughout the region. Breeding commences soon after ponds thaw, usually in May, and after the courtship and egg-laying period, adult frogs generally spend their time foraging in adjacent areas.

4.1.7.1 Species at Risk

The northern leopard frog is the only "at risk" amphibian species observed during amphibian surveys conducted in the region from 2001 through 2011. It is listed as 'Special Concern' status by COSEWIC and Schedule 1 of *SARA* (COSEWIC 2012; Government of Canada 2009). While uncommon, a single northern leopard frog was noted outside of the Project Study Area in 2004, indicating a small breeding population might exist. This species may be limited in the Project Study Area by the availability of suitable hibernacula (i.e., ponds that do not freeze to the bottom).

4.1.8 Birds

Approximately 178 bird species (Keeyask HydroPower Limited Partnership 2012b) potentially breed within or migrate through the region. Of these 178 species, 155 are migratory, overwintering in southern areas and breeding in the region and/or in areas further north. The remaining 23 species are residents which breed and overwinter within the region. Between 2001 and 2011, 124 different species were observed during the ground-based, boat-based and helicopter-based bird surveys.

Within the region, the diverse terrestrial habitats and abundant food sources (e.g., insects, seeds) support several landbird species (i.e., songbirds, woodpeckers, upland game birds, raptors, nighthawks), including resident species (e.g., gray jay [*Perisoreus canadensis*], ruffed grouse [*Bonasa umbellus*], boreal owl [*Aegolius funereus*] that inhabit the region year-round). Inland lakes, creeks and wetlands provide key breeding habitats for many waterbirds including ducks, shorebirds and sandhill cranes (*Grus canadensis*).

Birds are a key food source for the Keeyask Cree Nations, with spring and fall hunts being important community events. For Fox Lake Cree Nation, the spring goose hunt has become increasingly important, both for the food harvested and as a tradition that welcomes and celebrates the spring season (FLCN 2012). Tataskweyak Cree Nation and War Lake First Nation members indicate that the activity of hunting, as an affirmation of the traditional way of life, is more important than the actual game harvested (CNP 2011). York Factory First Nation community members travel to the coastal area for their spring goose hunt (YFFN 2012).

A number of factors, including fire, weather, disease, insect populations, human development, hunting and climate change, affect bird communities inhabiting the area. Some of the bird species at risk (e.g., rusty blackbird [*Euphagus carolinus*] listed as special concern status by COSEWIC and *SARA*), have been and will likely continue to experience population declines due to loss of overwintering habitats (COSEWIC 2006). Other species (e.g., turkey vulture [*Cathartes aura*]) have increased in abundance and have been expanding their range into northern areas because of climate change, increased availability of food sources and loss of habitat in their current range (Cox 2010).

The following section provides a brief overview of the bird community, first by bird group, and then more specifically by priority birds that includes the bird VECs (raptors, olive-sided flycatcher [*Contopus cooperi*], rusty blackbird [*Euphagus carolinus*] and common nighthawk [*Chordeiles minor*]).

4.1.8.1 Passerines

Of the 44 passerine species recorded in the Project Study Area during the 2009 to 2011 breeding bird surveys for the Keeyask Transmission Project (Stantec 2012b, i.e., Avian Technical Report), 36 were found within black spruce pure habitats and 31 within low vegetation habitats. Areas of tamarack mixture habitat also supported high passerine species richness (27 species; n= 16 stops) relative to other habitat types surveyed.

Blackpoll warbler (*Setophaga striata*) was the most abundant and frequently noted species occurring within all surveyed habitat types and at over half of all stops surveyed (n=279 of 490 survey stops; overall average density of 0.32 birds/ha). The highest observed densities of blackpoll warbler occurred in pure tamarack mixture (0.94 birds/ha).

Ruby-crowned kinglet (*Regulus calendula*; occurred at nearly 33% of all stops) and northern waterthrush (occurred at 37% of stops) were also among the most common species observed during surveys. Ruby-crowned kinglet, a common breeder in the boreal forest that nests in coniferous tree tops, was also recorded in all surveyed habitat types. This species was most abundant in areas of black spruce mixedwood and pure jack pine vegetation (0.28 birds/ha). Northern waterthrush (*Parkesia noveboracensis*) is a species regularly found in wet habitats supporting shrubs, such as bogs, creeks and other low-lying wet areas. Creeks and wetlands are common throughout the Project Study Area.

Three passerine species recorded during the 2009 to 2011 bird surveys are listed as being 'At Risk' by COSEWIC and *SARA* (COSEWIC 2009; Government of Canada 2012): rusty blackbird (Special Concern; Schedule 1), olive-sided flycatcher (Threatened, Schedule 1) and common nighthawk (Threatened, Schedule 1).

4.1.8.2 Waterbirds and Shorebirds

Observations of waterfowl and other waterbirds (cranes, gulls and shorebirds) were generally uncommon during land-based surveys and occurred primarily at survey stops that coincided with riparian habitat adjacent to creeks or lakes.

June 2009 surveys (aerial and land-based) of the Construction Power and Generation Outlet Transmission line potential route alternatives revealed a minimum of 15 species of waterbirds utilizing surveyed inland waterbodies. Species such as black scoter, mallard, ring-billed gull, common merganser, ring-necked duck, common loon and Canada goose were regularly encountered in the area. Several pairs of waterbirds were observed on many waterbodies in the area indicating that the breeding season was well underway at this time.

August 2009 aerial surveys revealed notably fewer waterbirds utilizing surveyed inland waterbodies than was observed in June, suggesting that many birds had moved on to other habitats at this time. During aerial surveys in late September, larger groups (20-50 birds) were more commonly observed relative to other months, indicating that a small population of birds use inland lakes for staging during migration. The degree of waterbird use of inland lakes is consistent with observations made during fall overflights for the Keeyask Generation Station Studies. Most species of waterbirds tend to leave smaller lakes in favour of larger waterbodies (e.g., Gull Lake) during the fall migration season.

4.1.8.3 Upland Game Birds

Two upland game bird species, spruce grouse and ruffed grouse, were recorded during the 2009 to 2011 bird surveys (Stantec 2012b). The presence of grouse scat at many survey stops, as well as one identified ptarmigan kill along a survey transect, confirms the presence

of at least three upland game bird species using the Project Study Area. Although not observed during surveys, sharp-tailed grouse may also utilize the Project Study Area.

The distribution of grouse and ptarmigan is widespread throughout the region, with species inhabiting different vegetation communities that meet their specific diet requirements. For example, spruce grouse generally inhabit coniferous stands, as well as muskeg and bogs. Spruce grouse eat berries, leaves and insects in the summer, while feeding almost entirely on conifer needles in the winter (Boag and Schroeder 1992). Sharp-tailed grouse and willow ptarmigan prefer more open habitats. Sharp-tailed grouse forage in shrub cover during the winter, switching to coniferous forest clearings, recent burns and other edges and openings during the summer. Willow ptarmigan breed in regions north of the Project Study Area (i.e., in tundra), and over-winter in forested habitat such as that located in the Project Study Area and general region. Both sharp-tailed grouse and ptarmigan feed primarily on willow and birch seeds, buds, berries, leaves and insects in open areas including along cut-lines and roadways (Connelly *et al.* 1998). Ruffed grouse are usually observed in areas that have a hardwood component to the vegetation community.

4.1.8.4 Valued Environmental Components

Raptors

Raptor observations were generally uncommon during terrestrial breeding bird surveys. Bald eagle, merlin and one unidentified hawk species were the only raptors observed during surveys.

Reconnaissance observations identified a pair of osprey nesting on an existing transmission tower, adjacent to Generation Outlet Transmission Line Route Alternative A (Stantec 2012b, i.e., Avian Technical Report, Map 3-1). Two osprey were observed nesting at this site in 2009, 2010 and 2011. Additional reconnaissance observations by a field team conducting mammal studies in the Project Study Area in June 2009, identified the location of a great-horned owl nest along Construction Power Transmission Line proposed Route Option 1 (Stantec 2012b, i.e., Avian Technical Report, Map 3-1). Investigations by the bird survey team on June 24, 2009, confirmed that the nest was active and one owl was observed flying out of the nest.

Raptors occupy a range of habitats within the Project Study Area. Some interior forest species will be mainly unaffected by transmission line development. Other species, which forage in openings in the boreal forest may utilize the cleared right-of-way.

Common Nighthawk

Common nighthawk habitat is mainly found in high, dry areas of the region. Rock out crops, ridges, high banks, and eskers with bare ground, such as recent burns make up primary and

secondary breeding habitat for this species. Within the region, common nighthawks have been observed nesting and foraging in regenerating forests (burns) and wetlands associated with creeks and inland lakes. Habitat is not considered as limiting common nighthawk populations within the region as breeding habitat is widespread and abundant throughout (Keeyask HydroPower Limited Partnership 2012b).

A single common nighthawk was recorded during both the 2010 and 2011 bird surveys. In 2010, surveys associated with the Generation Outlet Transmission Line route alternatives identified this species along a raised esker dominated by jack pine pure vegetation adjacent to black spruce pure and low vegetation habitats (Figure 2-1). In 2011, surveys associated with the Construction Power route options identified a common nighthawk among low, sparsely vegetated black spruce habitats.

The common nighthawk is considered a valuable component of the environment as it is a species of regulatory interest (listed as Threatened by COSEWIC and Schedule 1 of *SARA*), and it has been observed in the Project Study Area. Common nighthawk habitat in the Project Study Area is shown on Map 4-4.

Olive-sided Flycatcher

Bird studies undertaken in and near the Project Study Area revealed variable numbers of olive-sided flycatchers (Keeyask HydroPower Limited Partnership 2012b). This species is associated with mature forest stands, with complex canopy structures. Preferred nest sites near forest edges, where a closed canopy lies adjacent to bogs or post-fire habitats, provide adults with tall trees for perching as well as forest openings, where flying insects are more abundant (Altman and Sallabanks 2000). In the region, primary and secondary breeding habitat for olive-sided flycatcher is widespread, occurring in areas where coniferous forest edge occurs (Keeyask HydroPower Limited Partnership 2012b). The majority of olive-sided flycatchers detected were in association with riparian habitat. Olive-sided flycatcher habitat in the Project Study Area is shown on Map 4-5.

Olive-sided flycatcher is considered a valued component of the environment due to its regulatory status (listed as Threatened by COSEWIC and Schedule 1 of *SARA*). Low offspring survival may impair this species' ability to maintain viable populations in suitable habitat, thus limiting its ability to recover from reduced habitat availability following environmental change (COSEWIC 2007).

Population declines throughout North America have been noted for this species, with possible explanations including habitat loss in wintering grounds, changes in forest structure, urbanization, loss of wetlands and associated edge habitats (Diamond 1991; Petit *et al.* 1993; Altman and Sallabanks 2000). However, data to support these hypotheses are limited enough to make reasons for olive-sided flycatcher declines inconclusive. On a local

level, increased severity of forest fires resulting from factors such as increased frequency and extent of dry periods may benefit this species by creating post-fire habitats with dead trees for perching.

Rusty Blackbird

The rusty blackbird is listed as a species of Special Concern by Schedule 1 of *SARA* (2009) and COSEWIC. Rusty blackbirds breed in treed wet peatlands, along beaver ponds, fens and slow-moving streams (COSEWIC 2006). These areas occur throughout the region and are considered to be primary breeding habitats for rusty blackbird (Map 4-6). Rusty blackbird diet consists of aquatic insects, snails, small frogs and small fish. Nests are typically constructed within a mass of dense branches in live or dead conifers, hanging over or standing beside wetlands (COSEWIC 2006).

Field observations of rusty blackbirds have been made throughout the region with most detections occurring in primary breeding habitat located along creeks, lakes and wetlands.

The conversion of wetlands to agriculture in southern Canada has been noted as a likely cause of rusty blackbird southern breeding population declines (Griffiths and Woynillowicz 2003; Kling *et al.* 2003). Similar loss of wetland forests in their southern wintering grounds has been recognized as a significant threat to the species (Greenberg and Droege 1999).

4.1.9 Mammals

Mammals that occur within the Project Study Area are organized into four major mammal groupings for the following sections:

- Ungulates
- Furbearers
- Small Mammals
- Large Carnivores

4.1.9.1 Ungulates

Ungulates are hoofed mammals that contribute to ecosystem function by consuming plants and providing prey for large carnivores. Ungulates that could occur in the region include caribou, moose, white-tailed deer, and mule deer. Caribou and moose are widespread throughout the Project Study Area and both species are considered VECs while the range of white-tailed deer and mule deer does not typically include the region (Banfield 1987). White-tailed deer are absent to scarce in the Project Study Area and no signs were observed

during field studies. Mule deer are considered highly unlikely to occur in the Project Study Area (WRCS 2012).

4.1.9.2 Furbearers

Aquatic Furbearers

Aquatic furbearers are medium-sized mammals that rely on water for a large portion of their food or habitat. Aquatic furbearers in the Project Study Area include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and river otter (*Lontra canadensis*). A number of furbearer species have previously been identified within the Project Study Area, none of which are listed by the MBCDC. They are currently widespread and secure throughout their ranges in Manitoba (NatureServe 2011), including within the Project Study Area.

Terrestrial Furbearers

Terrestrial furbearers spend the majority of their time in and acquire most or all of their food from upland habitats. Snowshoe hare (*Lepus americanus*), woodchuck (*Marmota monax*), red fox (*Vulpes vulpes*) arctic fox (*Alopex lagopus*), American marten (*Martes Americana*), fisher *(Martes pennanti*), weasels (*Mustela spp*.), and lynx (*Lynx canadensis*) can be found in the Project Study Area. While woodchucks' range includes the Project Study Area, they were not detected during formal surveys. An individual was observed incidentally along PR 280 and reported in the Keeyask Generation Station Environmental Impact Statement (Keeyask HydroPower Limited Partnership 2012b).

4.1.9.3 Small Mammals

Small mammals are the foundation of the carnivore and omnivore food web and include mice, voles, bats, shrews, squirrels, and chipmunks and tend to 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 region. Many species have been 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 Project Study Area (Keeyask HydroPower Limited Partnership 2012b), while their populations cycle with relative regularity (Boonstra *et al.* 1998).

Little brown myotis (*Myotis lucifugus*) listed as Endangered by COSEWIC, occurs in the Project Study Area as a migrant.

4.1.9.4 Large Carnivores

Large predatory species such as the gray wolf (*Canis lupus*) and black bear (*Ursus americanus*) play an important role in the overall mammal ecology in the Project Study Area. They contribute to ecosystem function by preying on other animals.

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 n.d.a), and the species is sparse in the Project Study Area (WRCS unpublished data – see WRCS 2012, i.e., Mammal Technical Report for reference). At least one wolf pack was reported in the Project Study Area. Wolf sign were detected during ground tracking surveys on about 10% of the transects.

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. Black bear sign were commonly detected during summer ground tracking surveys on about 20% of the transects.

4.1.9.5 Valued Environmental Components

Caribou

Three types of caribou have been identified in the Keeyask region: barren-ground caribou (*Rangifer tarandus groenlandicus*) from the Qamanirjuaq herd, coastal caribou from the Pen Islands and Cape Churchill herds (*R. t. caribou*), and boreal woodland caribou (*R. t. caribou*). A group of summer resident caribou have also been reported. The types of caribou described for the Project Study Area include Pen Islands coastal caribou, barren-ground caribou, and summer resident caribou.

Barren-ground caribou from the Qamanirjuaq herd migrate from Nunavut in autumn to overwinter in Manitoba's forests. The Qamanirjuaq population was estimated at 348,000 individuals in 2008. Few were observed in Manitoba in 2011, and the Qamanirjuaq herd may be in decline (Beverly and Qamanirjuaq Management Board 2011). Although the herd may be shrinking and/or has been redistributed, recent reports indicate that Qamanirjuaq caribou

are still plentiful and the declines are not statistically significant (Beverly and Qamanirjuaq Management Board 2011). Barren-ground caribou are an occasional winter resident, temporarily migrating into the Project Study Area.

Pen Islands coastal caribou occur in the Project Study Area mainly in winter, but individuals have also been observed in summer. The Pen Islands population was estimated at 10,800 individuals in 1994 (Abraham and Thompson 1996) and at 16,600 individuals in 2011 (G.Racey pers.comm.) plus individuals known to be in Manitoba that were not counted (V. Trim pers. comm.). Radio-collaring studies indicated that Cape Churchill caribou do not occur in the Project Study Area.

The group of summer resident caribou in the Keeyask region has been observed to calve in isolation or make use of island habitat, as is characteristic of boreal woodland caribou in Manitoba and elsewhere (Shoesmith and Storey 1977; Hirai 1998; Rettie and Messier 2000). The summer residents have been described in several ways including woodland caribou (FLCN Environment Evaluation Report [Draft]), migratory woodland caribou (Mammals Working Group 2012, January 24; Fox Lake Aski Keskentamowin Keeyask Powistik 2012) and Pen Islands coastal caribou (Manitoba Hydro 2012). Summer resident caribou are conservatively estimated to number 20 to 50 individuals in an area broader than the Project Study Area. Based on telemetry data, some of the summer residents were identified as Pen Islands caribou. Some of these caribou calved in the Caribou Regional Study Area and Project 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. 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.

Caribou are common in the Project Study Area in summer and are sparse in winter. When observed in summer, caribou sign was mostly found in black spruce pure, conifer treed on peatlands and mineral soil and riparian habitats. No caribou were detected during winter surveys in the Project Study Area in 2010. Although winter habitat is limited in the Project Study Area because of fire, it appears to be extensive in the Region. Large variations in the number of animals occupying the Project Study Area have been reported historically during winter.

Moose

Moose are very common in the Project Study Area. Moose have traditional seasonal ranges as well as migratory routes (Goddard 1970; LaResche *et al.* 1974). During field studies conducted in the Project Study Area, moose sign was abundant in black spruce, riparian and low vegetation habitat in summer and tall shrubs or low vegetation on peatland in

winter. During 2009-2010 aerial surveys completed in the Split Lake Management Area (SLMA), estimated the moose population at 2,600 individuals (Keeyask HydroPower Limited Partnership 2012b). Moose densities ranged from extra low to high. Habitat quality, predation, hunting and other factors are influential factors that affect moose density and distribution.

4.1.9.6 Rare and Regionally Rare Species

Little Brown Myotis

In an emergency assessment in February 2012, COSEWIC designated the little brown myotis (*Myotis lucifugus*), also known as little brown bat, as "Endangered" (COSEWIC 2012). Little brown myotis currently has "No Status" under *SARA*. Little brown myotis are habitat generalists, occupying a range of habitats (Wund 2006).

Little brown myotis appear to be sparse in the Project Study Area. No little brown myotis were positively identified in the Project Study Area during field surveys; however, one bat was detected in late July and August 2001 feeding at Gull Lake camp. Anecdotal reports of bats, likely little brown myotis, and observations near cabins in Stephens Lake have been made, but not confirmed.

Wolverine

As declines have been reported in parts of the wolverine (*Gulo gulo*) range, and little data exists related to wolverine population trends, the Western (Canada) population of wolverine was listed as a "Special Concern" (COSEWIC 2003). Currently, the Western population of wolverine has no status under *SARA*.

In the early 1900s, wolverine was widely distributed in the area between Lake Winnipeg and Hudson Bay, but were particularly rare in the southern region (Preble 1902). 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).

Wolverine are sparse in the Project Study Area and surrounding region, and no animals were recorded during 2009 summer or 2010 winter field studies. During 2001 to 2004 Keeyask GS field studies, wolverine sign was rarely observed. Local resource users report that the number of wolverine observed in the lower Nelson River area has recently increased (Mammals Working Group December 9, 2010). An FLCN Elder reported that "he and others have observed increased number of wolverines over the past year [2009], and that they had disturbed many of the boxes…erected for trapping marten" (FLCN 2009).

Wolverine den sites were not identified during field studies in the Project Study Area, but it cannot be stated that none exist in the region. The presence of wolverine sign in the Project

Study Area indicates that the Project may overlap with a portion of at least one wolverine home range.

4.2 SOCIO-ECONOMIC ENVIRONMENT

4.2.1 Study Area Characterization

This section provides an overview of the socio-economic environment. The description of the Socio-economic Project Study Area (SPSA; Map 4-7) focuses on the following VECs:

- Land and Resource Use: Including domestic resource use; commercial trapping; other commercial resource use and recreation.
- Economy: Including labour force, employment and unemployment, employment challenges, education levels and businesses in the communities.
- Population, Infrastructure and Services: Including community populations; transportation infrastructure; health and emergency services and other public services.
- Personal, Family and Community Life: Including governance, workplace health and safety, community health, public safety and worker interactions, aesthetics (the way the landscape looks) and culture and spirituality.

The SPSA (Map 4-7) includes the Project Study Area and the following census communities:

- Split Lake, the reserve community for Tataskweyak Cree Nation (TCN). The Project would be constructed in the Split Lake Resource Management Area (SLRMA).
- Fox Lake (Bird), one of the reserve communities for Fox Lake Cree Nation (FLCN). Many FLCN members live in Gillam and on the A Kwis Ki Mahka reserve and engage in resource harvesting activities in the Project Study Area.
- Gillam is the primary service centre for the area.

In addition, information is provided for the following First Nations:

- Tataskweyak Cree Nation (TCN) refers to the First Nation that has members living on-reserve in Split Lake, as well as off-reserve in Thompson, Winnipeg and other locations. TCN is also used to refer to the First Nation's leadership and services provided by the First Nation.

- Fox Lake Cree Nation (FLCN) refers to the First Nation that has members living on-reserve in Fox Lake (Bird), on the A Kwis Ki Mahka Reserve near Gillam and off-reserve in Gillam, Thompson, Winnipeg and other locations. FLCN is also used to refer to the First Nation's leadership and services provided by the First Nation.

4.2.2 Land and Resource Use

Land and resource use considers the way people in the area use the land and water for traditional purposes, commercial uses and recreation. This section focuses on existing land and resource use activities in the SPSA.

4.2.2.1 Domestic Resource Use

Domestic resource use activities, such as fishing, hunting and gathering plants and berries, are important to people and communities in the North.

TCN's evaluation report notes that TCN Members travel extensively throughout the SPSA and use the right-of-way for the Canadian National Railway line between Wivenhoe and Gillam as well as the right-of-ways for the existing transmission lines KN36 and R26K (TCN 2011). TCN's evaluation report also documents a variety of traditional land use, occupancy and cultural sites in the Project Study Area including: gathering places, cabins, graves and sacred sites, trails, fishing areas, trapping areas, hunting areas, medicinal plant collecting, trails, fish weirs, geese blinds and boat launches (TCN 2011).

FLCN Members also engage in domestic resource use activities in the SPSA. FLCN Members hunt for moose and caribou in the areas around Stephens Lake. FLCN has also identified Cache Lake, the Butnau, Moswakot and Kettle rivers as important domestic resource use areas (Keeyask Hydropower Limited Partnership 2012).

4.2.2.2 Commercial Trapping

The Registered Trapline System is a provincial commercial furbearer harvest management system whereby a person is granted the exclusive opportunity to commercially harvest furbearing animals in a particular area. Portions of traplines 7, 8, 9, 15, 17 and 65 fall within the SPSA. More details regarding commercial trapping is available in Section 3.1.2 of the Socio-economic Technical Report (InterGroup 2012).

Harvest data for these traplines were obtained from Manitoba Conservation for the years 2000/01 through 2010/11. The most commonly reported trapped species were marten, mink and beaver (Berezanski *pers. comm.* 2012). Additional information on commercial trapping is available in the socio-economic technical report.

Manitoba Hydro is working with the Manitoba Metis Federation to develop a Traditional Land Use and Knowledge Study that will include consideration of the Keeyask Transmission Study. This study will document use of the Project Study Area by Metis resource users.

4.2.2.3 Commercial Fishing

Twenty-two lakes listed in the 2008 Manitoba Commercial Fishing Harvest Schedule are located in the Split Lake Resource Management Area. Commercial fishing has historically occurred at Gull Lake and Stephens Lake; however, since 1997, commercial fishing activity has occurred only at Split Lake and Assean Lake. These areas are located outside of the SPSA.

A Gillam resident holds a license authorizing catch in Stephens Lake and a dealer's license authorizing local sale of fish. Due to the unique nature of these licenses, production from this fishery is not published in Freshwater Fish Marketing Corporation records and a quota for Stephens Lake is not published in the Manitoba Commercial Fishing Harvest Schedule. The primary target of this fishery is walleye (also known as pickerel), which is sold directly to restaurants and individuals in Gillam and Churchill.

4.2.2.4 Forestry

This section describes the commercial aspect of the existing environment as it relates to forestry resources, domestic timber use and values in the Project Study Area.

The proposed Project Footprint encompasses a range of ecosites with soil types ranging from mineral to organic (Section 4.1.5).The vast majority of the Project Study Area is comprised of peatlands and water while productive forestlands (a minor component) are associated with mineral soils. Forest and woodland stands on mineral soils, comprised primarily of black spruce and jack pine in pure and mixed wood stands, populate the area. Also present are trembling aspen and white birch; however, these are found primarily as minor admixtures to the conifer dominant stands. White spruce is not commonly found within this northern region.

Wildfires govern the stage of development of vegetation communities in the Project Study Area. Much of the Project Study Area was affected by the 1999 and 2005 wildfires, as well as earlier wildfires (Section 3.2.2 of ECOSTEM 2012). These burnt areas now host young regenerating forest stands and shrub communities. Any timber killed at the time of these fires is now past the point of salvage. The Project Footprint straddles both the Manitoba Forestry Branch designated Non-commercial Forest Zone (NCFZ) and Commercial Forest Zone (CFZ). The NCFZ in northern Manitoba is so designated due to its limited timber production potential (due to climatic conditions), distance to mills and markets, and lack of infrastructure (i.e., roads, railroads). Although so classified, specific ecosite types within the

Project Study Area have the potential to grow timber to useable size. Growth rates however, are generally less than in more southern latitudes and this is typified in the Project Study Area. Although nearing their theoretical rotation age (maturity), tree stems are small in diameter and short in length resulting in low timber volumes per hectare.

At present, there is no commercial scale demand, and therefore no commercial harvest of timber within the Project Study Area (Holmes *pers. comm.* 2012). In part, this condition is created by a supply of wood fibre that exceeds the demand in closer proximity to mills and markets. Small-scale timber harvest for personal use, primarily firewood, does exist in the Project Study Area, most notably in the vicinity of Gillam. This community is the beneficiary of the Waterways Management Program that collects and disposes of wooden debris floating in the Nelson River system and washed up on shorelines. Some of this wood is piled near Gillam for local use (Walkoski *pers. comm 2012*).

Minor quantities of timber of useable size are present on portions of the Project Footprint, specifically those sites classified as “forest” and “woodland” on mineral soil (productive forestland). Primary species are black spruce and jack pine with minor quantities of trembling aspen and white birch also present.

4.2.2.5 Other Commercial Resource Use

There are no operating mines within the SPSA. One exploration license has been granted on the north shore of Stephens Lake. In February 2008 a Mineral Exploration License for a 12,341 ha area on the north side of Stephens Lake was granted to Exploratus Ltd.

Lodges and outfitting companies identified as operating in proximity to the SPSA include Dunlop’s Lodge at the mouth of the Little Churchill River on Lake Waskaiowaka; Ace Wilderness Guiding operates out of Gillam; and Fox River Outfitters, located in Gillam.

4.2.2.6 Protected Areas

Areas can be permanently protected under four Manitoba Acts as Provincial Parks, Ecological Reserves, Wildlife Management Areas and Provincial Forests. Areas of Special Interest is a term used to describe “candidate” sites which have not been protected in any formal manner but have a high potential to protect groupings of enduring features and associated natural and cultural values. There are no protected areas such as national parks, provincial parks, ecological reserves or wildlife management areas in the SPSA. There are no candidate Areas of Special Interest in the SPSA.

4.2.2.7 Outdoor Recreation

A number of outdoor recreation activities occur in the SPSA including fishing, hunting and snowmobiling. Recreational hunting and fishing usually occur at areas accessible by road

and trail. Ice fishing shacks have been observed on Stephens Lake. Gillam residents have also reported travelling to Atkinson and Butnau lakes for ice fishing (Keeyask Hydropower Limited Partnership 2012).

A number of residents of Gillam and members of FLCN have cabins on Stephens Lake. The Gillam Marina acts as a staging point for access to cabins, with people travelling on Stephens Lake by boat in open water conditions, and by snowmobile in winter. Recreational snowmobiling occurs on trails around Gillam. Trails are groomed approximately every two weeks, depending on the snow conditions (Keeyask Hydropower Limited Partnership 2012).

4.2.3 Economy

4.2.3.1 Labour Force Characteristics and Income

In 2001 Split Lake and Fox Lake (Bird) had lower participation rates and employment rates and higher unemployment rates than the Manitoba average. The 2006 participation rates, employment rates and unemployment rates for Split Lake and Fox Lake (Bird) were not available. These lower employment rates and higher unemployment rates are consistent with many Northern Manitoba First Nations communities that have young and growing labour forces (Keeyask Hydropower Limited Partnership 2012).

The 2001 and 2006 participation rates for Gillam were higher than the average participation rate for Manitoba. Employment rates for Gillam were higher in both 2001 and 2006 than the average for Manitoba. Unemployment rates for 2001 and 2006 in Gillam were higher than Manitoba as a whole (Statistics Canada CDs 2001, 2006).

All categories of income in Split Lake were lower in 2001 than the Manitoba average. The 2006 income information for Split Lake was not available. Income information for Fox Lake (Bird) was not available for either 2001 or 2006. All categories of income for Gillam were higher in both 2001 and 2006 than the Manitoba average.

4.2.3.2 Occupation Classifications

In 2001, the most common occupation categories in Split Lake were sales and service occupations (20.5%); trades, transport and equipment operators and related occupations (15.4%) and occupations in social science, education, government, service and religion (13.7%). In 2001, the most common occupation category in Fox Lake (Bird) was sales and service occupations. Other occupation categories reported included business, finance and administration occupations and occupations in social science, education, government service and religion (Statistics Canada CD 2001). Data from 2006 were not available.

In 2001, the most common occupation categories in Gillam were trades, transport and equipment operators and related occupations (33.6%); sales and service occupations

(19.2%); and business, finance and administration occupations (12.0%). In 2006 the most common occupation categories in Gillam were trades, transport and equipment operators and related occupations (32.3%); sales and service occupations (21.1%); and natural and applied sciences and related occupations (12.8%; Statistics Canada CD 2001, 2006).

4.2.3.3 Education Levels

In 2001, the proportion of the population 20 years and over with less than a high school certificate was 60.9% in Split Lake and 62.5% in Fox Lake (Bird). Both of these percentages are higher than the Manitoba average (34.4%). The 2006 education data were not available for Split Lake and Fox Lake (Bird; Statistics Canada CD 2001).

In 2001, the proportion of the Gillam population 20 years and over with less than a high school certificate was 29.0%. This figure is lower than the Manitoba average (34.4%). In 2006, the proportion of the Gillam population 15 years and over with less than a high school certificate was 31.0%. This figure is higher than the Manitoba average (29.5%). The 2001 and 2006 figures are not directly comparable because the population ages included in the surveys are different between the two years (Statistics Canada CD 2001, 2006).

4.2.3.4 Employment Challenges

Employment challenges for some communities in the SPSA have recently been noted to include lack of opportunities, lack of training and work experience, perceptions and attitudes of potential employers, language barriers, and cultural differences. In addition, many employment and education opportunities require individuals or family members to leave their home communities. This can lead to stress and anxiety for those who leave and can diminish social networks and resources for families and the home community (Keeyask Hydropower Limited Partnership 2012).

4.2.3.5 Business

A number of businesses and joint-ventures operate in the SPSA communities. Businesses owned or partly owned by TCN and FLCN that may be able to provide goods and services required by the Project include:

- Tataskweyak Construction Limited Partnership is owned by TCN and located in Split Lake. It provides services to business and government including road building and maintenance, water and sewer, soil remediation, dyke construction, snow removal and house construction.
- Ininew Limited Partnership is jointly owned and operated by TCN and the Mosakahiken Cree Nation. The partnership is located in Winnipeg and provides project management services in civil engineering and architecture.

- Iron North Limited Partnership is a TCN business involved in the purchase and leasing of heavy construction equipment to contractors.
- Tataskweyak Gas Bar is owned by TCN and provides retail gasoline services in Split Lake.
- Amisk Construction is a joint venture between CNP No. 2 Limited Partnership (owned by TCN and War Lake First Nation) and Sigfusson Northern Ltd. The company has provided services to the Keeyask Infrastructure Project and has the capacity to undertake site preparation and camp maintenance as well as clearing and construction of access roads.
- ESS-Tataskweyak Camp Services is a joint venture between TCN and ESS (part of Compass Group Canada) that provides camp services.
- TC Building Materials Limited Partnership is owned by TCN and is headquartered in Winnipeg. It provides building supplies and building design (architecture, drafting and engineering) and construction services.
- Keeyask Emergency Medical Services is a joint venture between CNP No. 3 Limited Partnership (owned by TCN and War Lake First Nation) and Criticare EMS Inc., formed to provide emergency services at the Keeyask Generation Project construction site.
- Keeyask Maintenance Services is a joint venture between CNP No. 3 Limited Partnership (owned by TCN and War Lake First Nation) and Newton Mechanical Inc., formed to provide camp maintenance services at the Keeyask Generation Project construction camps.
- FLCN has signed a memorandum of understanding with Smook Contractors to provide construction services.
- FLCN has signed a memorandum of understanding with Kleysen Transportation to supply transportation and materials management services. (Keeyask Hydropower Limited Partnership 2012).

Construction service businesses operating in Gillam include Gardon Construction Ltd. and T and E Zelen Construction. Gardewine North provides supplying, shipping and hauling services. Restaurants are available at two motels in the Town. The motels in Gillam report high occupancy rates (Keeyask Hydropower Limited Partnership 2012).

4.2.4 Population, Infrastructure and Services

TCN and FLCN provide housing, infrastructure and a variety of facilities and services to Members living on-reserve. The Town of Gillam is a base of operations for Manitoba Hydro's northern hydroelectric facilities. Gillam is also the historic and present day home for many FLCN Members and the location of a FLCN reserve. FLCN also provides services for its

Members in Gillam. Manitoba Hydro provides housing for its employees and contributes to a range of facilities and services in Gillam.

4.2.4.1 Population

In the 2006 Census of Canada, Split Lake had the highest population of the communities in the SPSA (1,819) and showed the largest growth in population between 2001 and 2006 (238 individuals or a 15% increase). Fox Lake (Bird) has the lowest 2006 Census population of the communities in the SPSA (103) and showed a decrease in population between 2001 and 2006 (41 individuals or a 28% decrease). The population in Gillam in 2006 was 1,209 people and showed small growth between 2001 and 2006 (31 individuals or a 3% increase) (Statistics Canada CDs 2001, 2006).

Many First Nations have members that live off-reserve due to housing constraints, employment and education opportunities and other factors (Keeyask Hydropower Limited Partnership 2012). In order to understand the size of the TCN and FLCN on-reserve and off-reserve populations, population data from Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada) was reviewed. Approximately 30% of TCN's members lived off-reserve in 2001 and 28% lived off-reserve in 2006. FLCN experienced a higher percentage of its members living off-reserve (72% in 2001 and 73% in 2006).

4.2.4.2 Housing

The availability of good quality, affordable housing is an ongoing concern in many Northern Manitoba communities. Between 2001 and 2006, the number of occupied private dwellings in Split Lake increased from 355 units to 370 units (4%) compared to a 15% increase in population over the same period. In 2001, approximately 54% of occupied private dwellings in Split Lake were reported as needing major repairs[3] (Statistics Canada CD 2001, 2006). Limited housing availability, overcrowding and poor housing quality is a concern for TCN's leadership. In 2010, TCN reported a housing waiting list with more than 200 Members (Keeyask Hydropower Limited Partnership 2012).

Between 2001 and 2006, the number of occupied private dwellings reported in Fox Lake (Bird) increased from 35 units to 40 units. This increase should be interpreted with caution due to the low number of dwellings and the random rounding of data used by Statistics Canada (Statistics Canada CD 2001, 2006). The availability and quality of existing housing is a concern for FLCN's leadership. In 2009, the Government of Canada transferred 1.29 ha of land in Gillam in the area known as Kettle Crescent to FLCN to create the A Kwis Ki Mahka Reserve. In 2010, FLCN had 27 First Nation-owned housing units on Kettle Crescent (Keeyask Hydropower Limited Partnership 2012).

[3] The equivalent figure for 2006 was suppressed.

4.2.4.3 Transportation Infrastructure

PR 280 is a gravel provincial road that runs from the intersection with PR 391 immediately north of Thompson to PR 290, Bird and Gillam. It is the main road connecting Split Lake, Gillam and Bird and is important to both TCN and FLCN Members. In 2011, the average annual daily traffic (AADT) on PR 280 was between 80 and 330 vehicles (MIT 2011). Residents in the area have noted concerns with respect to the poor condition of PR 280 in many sections including damage to vehicles as a result of the poor road conditions.

Upgrades to PR 280 between Thompson and Gillam have been initiated by Manitoba Infrastructure and Transportation (MIT) in 2012. PR 280 is to be rerouted once the Keeyask Generation Project is completed to include the Keeyask Generation Project north access road, the generation station facility over the Nelson River and the south access road to Gillam. FLCN has expressed concern that community Members living in Fox Lake (Bird) will face increased travel distances to Thompson if the northern portion of PR 280 around Stephens Lake is decommissioned (Keeyask Hydropower Limited Partnership 2012).

A rail line passes through the SPSA. The rail line provides both freight and passenger services. A rail station is located on the south side of Gillam. VIA Rail provides passenger service from Gillam to Thompson, Fox Lake (Bird) and Churchill three times weekly.

The Gillam Airport is located on the north side of the town. The runway is 1,524 m in length with a gravel surface. Calm Air provides daily scheduled air service to Gillam from Thompson. Direct flights between Winnipeg and Gillam are available on weekdays and Sunday (Calm Air 2012).

4.2.4.4 Health and Emergency Services

Split Lake has a volunteer fire crew of approximately 10 Members, headed by the Fire Chief and a Deputy Chief who are cross-trained as paramedics. The Split Lake fire hall is equipped with a fire truck, water truck and ambulance (Keeyask Hydropower Limited Partnership 2012). Split Lake has two full-time special constables who have completed training and acquired provincial accreditation; two full-time constables who have not yet acquired provincial accreditation; and seven to ten part-time, untrained constables. A Band Constable station was opened in early 2011 (Keeyask Hydropower Limited Partnership 2012).

The Gillam fire and ambulance service provides fire protection and emergency medical services to the Town of Gillam and Fox Lake (Bird). The Gillam fire and ambulance service has 20 volunteer firefighters including a chief and deputy chief. The Gillam fire and ambulance service has one pumper truck and two ambulances.

Fox Lake (Bird) has one Band constable for community policing. Fox Lake (Bird) also relies on the Gillam Royal Canadian Mounted Police (RCMP) detachment (Keeyask Hydropower Limited Partnership 2012). The Gillam RCMP detachment has six constables and one administrative assistant. The detachment has two holding cells. Gillam RCMP constables are involved in drug education programming and operate a weekly drop-in youth program (Keeyask Hydropower Limited Partnership 2012).

The John Wavey Health Centre opened in Split Lake in 2009. The Health Centre has a dedicated unit for emergency patients, a pharmacy, a kitchen and accommodations for visiting health professionals. The facility has 12 staff including a director, five full-time public health nurses, support staff and a dispatcher. TCN provides a number of health services to its Members including nutritional programs, drug and alcohol programs and home care services (Keeyask Hydropower Limited Partnership 2012).

Fox Lake (Bird) has a community health centre that provides basic health services such as health education, home care nursing and transportation for medical appointments. Residents of Fox Lake (Bird) generally access primary health care services in Gillam. FLCN leadership have identified the need for a new nursing station in Fox Lake (Bird) as part of the 20-year capital plan (Keeyask Hydropower Limited Partnership 2012).

The Gillam Hospital is a ten-bed facility with an emergency department and an x-ray department. The hospital has 32 staff including one physician and ten nurses. The hospital operates a medical clinic and local retail pharmacy. Critical care patients arriving at the Gillam Hospital are flown to either Thompson or Winnipeg (Keeyask Hydropower Limited Partnership 2012).

4.2.4.5 Other Services

Utilities

Water and sewer services are available to most, but not all, residences in Split Lake. The water treatment plant in Split Lake was expanded in 2005. Ongoing upgrades to water treatment and water and sewer services are planned. Split Lake receives electrical service from Manitoba Hydro. Telephone services are available through MTS.

Fox Lake (Bird) obtains water from the Nelson River. A water treatment facility was built in 2006. Heavy sludge is transported to Gillam. The existing system requires upgrading and at the time of writing, a proposal for an upgrade to the system was being prepared (Keeyask Hydropower Limited Partnership 2012). Electricity is provided by Manitoba Hydro. Manitoba Telecom Services (MTS) provides telephone service to the community.

Water for the Town of Gillam is sourced from Stephens Lake and the Kettle River. Gillam has a treated-water reservoir that can store an eight-hour supply of water. Piped water and

sewer services are available throughout the Town. The water treatment plant and the wastewater treatment facility both have sufficient capacity to accommodate future development (Keeyask Hydropower Limited Partnership 2012). Manitoba Hydro provides electricity service. Telephone service is provided by MTS.

Education

The Tataskweyak Education Authority is responsible for delivering the kindergarten to grade 12 education programs in Split Lake. The Chief Sam Cooke Mahmuwee Education Centre provides education from kindergarten through high school. The school was designed for a capacity of 500 students but is frequently overcapacity. A University College of the North Regional Centre is located 5 km outside of Split Lake (Keeyask Hydropower Limited Partnership 2012).

The Fox Lake School provides education services for kindergarten through grade eight to residents of Fox Lake (Bird). The school has three classrooms, a computer room, a library, a gymnasium and living space for teachers. The school has 8 full-time teaching staff and two administrative staff. After grade eight, students must travel to Gillam or other communities to continue their education (Keeyask Hydropower Limited Partnership 2012).

The Gillam School provides education services for kindergarten through grade 12. In 2009, the school had approximately 335 students enrolled with an additional 50 adult education students. High school enrolment has been noted to be increasing recently. The Gillam School has 54 staff members including 32 teachers.

Childcare

The TCN Headstart/Day Care Centre provides childcare, early childhood education and basic health care to approximately 30 children in Split Lake. The Centre has a director and six full-time employees. The Centre generally has a waiting list. The limited availability of childcare has been noted as a challenge for parents who wish to pursue local employment opportunities

There is no current daycare program operating in Fox Lake (Bird). A previous day care at the Fox Lake School was closed in 2008 due to lack of funding. FLCN is currently examining options to provide daycare services to Members in Fox Lake (Bird) and Gillam.

The Gillam Pre-School Co-op Daycare offers pre-school services as well as day care and after school care for pre-school- and school-aged children, respectively. The day care has a capacity of 40 children, but generally cannot operate at capacity due to staffing challenges and a lack of space. There is generally a waiting list for the daycare. A new childcare centre is under construction and expected to be completed in 2012 with a capacity for 75 children (Keeyask Hydropower Limited Partnership 2012).

Recreation Services

The TMC Arena in Split Lake is a multi-purpose facility that houses a hockey rink, fitness area, volleyball courts and a canteen. The arena has a full-time manager and two-full time maintenance workers. The Tataskweyak Education Authority provides extra-curricular activities for children and youth.

Recreation activities in Fox Lake (Bird) often occur at the school. Treaty Days, sports nights and community feasts are held at the school throughout the year. Residents of Fox Lake (Bird) also access recreation facilities in Gillam (Keeyask Hydropower Limited Partnership 2012).

The Gillam Recreation Centre is a multi-use facility that includes an arena, curling rink, meeting room space, gymnasium and bowling alley. The Nelson River Aquatic Centre opened in 2005 with a swimming pool and a water slide. Other recreational facilities in Gillam include a driving range, baseball diamonds and soccer fields.

4.2.5 Personal, Family and Community Life

Personal, family and community life play a central role in the quality of life experienced by people and communities. This section describes the following aspects of personal, family and community life for communities in the SPSA.

4.2.5.1 Governance

TCN is governed by a Chief and six Councillors elected under Section 74 of the *Indian Act*. The Chief and Councillors serve two-year terms. Chief and Council are mandated to provide leadership, guidance, service and accountability to TCN Members on- and off-reserve.

FLCN is governed by a Chief and three Councillors elected under a custom electoral system. Chiefs and Councillors do not have set terms in office. Councillors are responsible for portfolios including education, training and employment; health; housing; operations and maintenance; economic development; justice and emergency services.

The Town of Gillam is governed by a Mayor and four Councillors who are elected to four-year terms. Following the creation of the A Kwis Ki Mahka reserve, FLCN and the Town of Gillam entered into a municipal services agreement that identifies facilities and services subject to cost sharing, as well as processes related to future land use changes (Keeyask Hydropower Limited Partnership 2012).

4.2.5.2 Workplace Health and Safety

Workplace safety and health for Manitoba Hydro and contractors is a priority at all times during a project. Manitoba Hydro's safety systems and services provide prevention by minimizing risks to people, property, and the environment. All Manitoba Hydro employees and contractors are required to follow *The Workplace Safety and Health Act* and associated regulations dealing with the health and safety of workers, protection of the public from unsafe mechanical and electrical equipment and fuel-burning appliances in buildings, and the licensing of tradespersons in the province.

4.2.5.3 Public Safety and Worker Interaction

Public safety refers to the overall prevention and protection of people from issues that affect their personal and collective security. It also involves individual and community perceptions of safety.

TCN's Band constables work closely with the Thompson RCMP detachment to respond to public safety concerns (Keeyask Hydropower Limited Partnership 2012). The FLCN Band constable is primarily responsible for policing related to public safety concerns in Fox Lake (Bird). The Band constable also works with the Gillam RCMP detachment (Keeyask Hydropower Limited Partnership 2012). The Gillam RCMP is responsible for policing in Gillam and is involved in several public safety programs in Gillam and Fox Lake (Bird; Keeyask Hydropower Limited Partnership 2012).

The communities in the SPSA have experienced the development of multiple hydroelectric and other projects. Past experiences have resulted in fears and concerns about the potential for negative interactions between local residents and non-local workers. Issues identified by communities in the SPSA related to worker interactions include harassment and racism, alcohol and drug use, physical abuse, violence, infidelity, pregnancy and paternal abandonments. These incidents have affected not only the individuals who directly experienced them, but also their families, friends and broader community (Keeyask Hydropower Limited Partnership 2012).

4.2.5.4 Community Health

Community health is influenced by a wide variety of factors. Drinking water quality, food choices, behaviours such as smoking and physical activity and air quality all affect health. Socio-economic indicators reviewed in the previous sections of this report such as housing, income and education are also determinants of overall community health. Measuring determinants of health is challenging due to the breadth of factors that can contribute to health and the availability of health indicator data.

Mino-pimatisiwin (living a good and honourable life) is a key concept in Cree perspectives on community health. *Mino-pimatisiwin* includes being a good person, harvesting and consuming healthy foods and following Cree values. Adleson (2000) notes that from a Cree perspective:

> *"health has as much to do with social relations, land and cultural identity as it does with individual physiology".*

For TCN and FLCN Members, changes in the ability to engage in cultural practices lead to changes in community health.

4.2.5.5 Aesthetics (the Way the Landscape Looks)

The area in proximity to the Project, features gently sloping terrain with lakes of various sizes scattered across the landscape. Bogs and peatlands occur through much of the area. The area is also characterized by the presence of discontinuous permafrost (Keeyask Hydropower Limited Partnership 2012).

First Nations perspectives on the aesthetic value of the area relates to their understanding of their environment. TCN and FLCN's traditions are rooted in a relationship with the land, and each of the communities recount stories about how their existence is intertwined with the rivers and lakes. The existing landscape in the Project Study Area is markedly different than the landscape their ancestors knew and has witnessed substantial changes through the development of major infrastructure projects such as the Hudson Bay Railway, road development and hydroelectric development (including generating stations, transmission lines and converter stations). First Nations communities note the Project Study Area area is considered by them to be an altered environment, not a pristine environment (Keeyask Hydropower Limited Partnership 2012).

The appearance of the Town of Gillam has changed over time as the community evolved. Long-term residents have noted recent improvements to the town's appearance through efforts by the town's Beautification Committee. Others have noted derelict buildings and facilities in need of updating. FLCN's visual presence is increasing through the introduction of new buildings and signage (Keeyask Hydropower Limited Partnership 2012).

4.2.5.6 Culture and Spirituality

TCN and FLCN each have a unique set of historical experiences that has shaped their individual communities. However, there are common cultural and spiritual elements. Both TCN and FLCN self-identify as Cree, speak the Cree language and acknowledge roots to York Factory coastal Cree (Keeyask Hydropower Limited Partnership 2012).

Engaging in traditional cultural practices and retaining and transmitting ATK are core aspects of cultural identify for TCN and FLCN. Culture and spirituality are influenced by a relationship with their surrounding environment and the Cree worldview indicates that everything is alive, is interconnected and needs to be respected. TCN states that

> *"The customs, practices and traditions that are integral to our distinctive cultural identity, and that are reflected in our social organizations, are rooted in our relationships with Mother Earth."* (TCN 2011).

TCN has developed its Mother Earth Ecosystem Model which expresses its worldview and its relationship with Mother Earth and the need for harmony and balance. Customs, practices and traditions integral to TCN's distinctive cultural identity are rooted in relationships with Mother Earth.

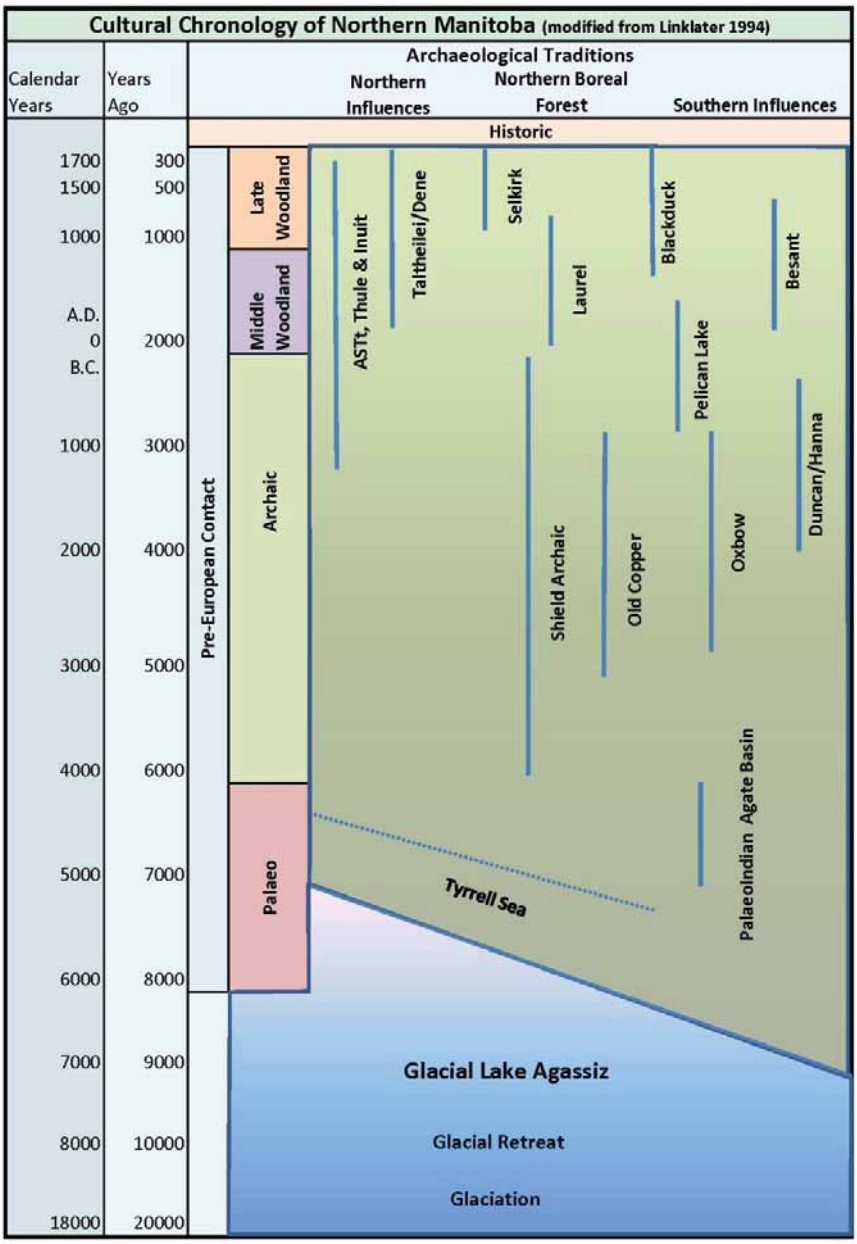
FLCN describes cultural practices and Aboriginal Traditional Knowledge as fundamental means of cultural expression and transmission (Keeyask Hydropower Limited Partnership 2012).

Kinship is also an important element of culture and spirituality for TCN and FLCN. First Nation communities are often structured around social networks, kinship relationships and functional roles within a community. These roles and relationships are not limited to families and child rearing but are community wide and intertwined into all aspects of daily life, including sharing of resources and providing services. All of these elements of culture and spirituality are fundamental to life for TCN and FLCN. The value placed on cultural knowledge and practices and the Cree language strengthen social-capital, personal and community well-being and resilience to change.

4.3 HERITAGE RESOURCES

4.3.1 Study Area Overview

Most archaeological sites located within the region are associated with ancient, historic and recent Cree land use and occupancy. Diagnostic artifacts, such as projectile points and pottery, plus datable organic materials provide temporal markers of past cultural groups. Using these diagnostic artifacts, archaeologists have subdivided the ancient past into three main cultural periods and a number of small cultural complexes and are presented in a cultural timeline (Figure 4-1). These periods are loosely based on the changing technology used by past peoples. The more recent past, defined by European contact over the last 350 years, has also been subdivided into three periods: Early, Middle and Late Historic. The Historic Periods are also identified by specific types of technology; and are augmented with written records such as fur trade journals, maps, ethnographic studies and induction based on present-day land use activities.



Source: NLHS 2011

Figure 4-1: Cultural Timeline for Northern Manitoba

4.3.1.1 Early Pre-European Contact Period (10,000 – 6,500 Years Ago)

The region was not habitable until around 7,500 years ago because of environmental conditions (Nielsen *et al.* 1988; Teller 1984:25). Prior to this time, the area was covered by the Laurentide ice sheet, then by glacial Lake Agassiz until it drained northward into Hudson Bay. Groups of people living at the edge of the boreal forest during the last glacial advance may have gradually moved into the region once it became habitable.

Based on the archaeological record as it currently exists, the earliest human inhabitants in Manitoba are believed to be Palaeo people (Pettipas 1984:26). They are characterized as big game hunters who subsisted primarily on the bison as their main food source (Pettipas 1970:17). However, Palaeo people are believed to have culturally evolved into a Plano culture, which moved northwards through the Great Central Plain. Archaeological evidence indicates movement of Plano people into the Southern Keewatin District of Nunavut. The emergence of Plano out of the plains brought with it a change in stone tool technology. Projectile points such as Agate Basin, which is dated *ca.* 7,000 to 8,000 years ago, have been found in association with boreal forest faunal remains in northern Manitoba, northern Saskatchewan and eastern Northwest Territories (Ebell 1982:96). To date there has been no evidence of Plano cultural materials within the general study area.

Potential animal kill and associated campsites largely depended on locations that favoured intercepting caribou herds along migration routes. These include stream crossings, lake narrows, eskers or beach ridges. Other potential sites would include quarry locations for lithic tools, areas of plant harvesting and sacred areas. The groups probably travelled in small nuclear family groups and may have banded together during certain seasons of the year.

4.3.1.2 Middle Pre-European Contact Period (6,500 – 2,000 Years Ago)

Models of cultural mobility of this early period suggest that by 6,500 years ago northern people referred to as Shield Archaic may have emerged out of the earlier Plano Complex in the north central plains of Saskatchewan and Southern Keewatin (Wright 1972:33-38; 1970; Gordon 1996). These cultures may have gradually shifted southeast across the northern boreal shield as deglaciation and glacial Lake Agassiz diminished. Shield Archaic sites are associated with big game hunting but may have also included small game, fishing and gathering activities. Knowledge of this period is limited by soil conditions and repetitive collapsed stratigraphy due to cyclical forest fires.

Preferred sites appear to have been strategically located at caribou interception points and adjacent to swift-moving water for fishing. Many of the habitation sites face open water with a westerly to southerly view. Based on these and other variables data, several locations along the north bank of Gull Lake would be high potential areas for Middle Period sites.

Two large archaic projectile points have been recovered on the north shore of Gull Lake, approximately 7 km from the Project Study Area (Figure 4-2). Their size and manufacture suggest affiliation to the Middle Pre-European Contact Period (NLHS 2003a).

Figure 4-2: Stone Tools of the Middle Pre-European Contact Period found at Gull Lake; from left to right HcKt-1-40 and Hckt-5-1 (from NLHS 2003a)

Human remains radiocarbon dated to 4,800 BP were recovered from the southeast shore of Gull Lake at the edge of Keeyask Generation Station Borrow area S-5 (NLHS 2011). The remains have been temporarily reinterred approximately 30 m from the present shoreline and will be permanently reinterred to the Keeyask Burial Site once this is identified.

4.3.1.3 Late Pre-European Contact Period (2,800 – 360 Years Ago)

In the Late Pre-European Contact Period, new technologies were introduced by diffusion, or adaptation to or by parallel invention by resident groups within the boreal forest. The period is commonly referred to as the Woodland Tradition by archaeologists. Major technological changes that occurred during this time period include development of distinctive types and styles of Native clay pottery based on signature motifs and changes to weaponry through the introduction of the bow and arrow. Many other organic aspects of lifeways have not survived over the years; because of acidic soils, forest fires and other natural phenomena; this lack of organic data is more pronounced the earlier the occupation.

The Woodland Tradition in Manitoba is frequently divided into two periods, Middle and Late (or Initial and Terminal). In Manitoba, the Middle Woodland Period is represented by Laurel complex pottery as well as other signature tool assemblage (2,000-1,200 years ago). The Late Woodland Period in Northern Manitoba is represented mainly by pottery and tools associated with the Selkirk complexes; Clearwater Lake pottery (*ca.* 900-360 years ago) is

considered by archaeologists to be the product of early Cree people who inhabited the northern Manitoba boreal forest. Interestingly, variations of a ceramic type referred to as Blackduck (*ca.* 1,200-300 years ago) and usually associated with more southerly early Ojibwa, has been found on occasion, suggesting possible exogamous marriages between cultural groups (Wright 1998:77-78).

A small concentration of Laurel sites (HbKx-2, 3, 10, 12, and 18) was found on Clark Lake approximately 40 km upriver from Gull Rapids during the Heritage Resource Impact Assessment (HRIA) for the Keeyask Project. Comparative archaeological investigations on Fox/Atkinson Lake also resulted in a single Laurel neck sherd decorated with a pseudo-scallop design. The finding of Laurel pottery in Clark Lake and Fox/Atkinson Lake are the only evidence for the Middle Woodland period to-date.

Selkirk, Clearwater Lake and Blackduck ceramics display fabric or cord-impressed exterior surfaces. The method of construction is still not completely known but may have been by textile-wrapped paddle-and-anvil or the use of a woven bag or basket as a mould. The latter method has been tested successfully by experimental archaeology.

The Selkirk composite is well known throughout the boreal forest, extending from northwestern Ontario through to northern Saskatchewan, and is generally considered to represent ancestral Western Woods Cree (Meyer 1987; Meyer and Russell 1987). Selkirk pottery findings in north-eastern Manitoba include a single rim sherd found at the mouth of the Hayes River (Dawson 1976:79) along with a number of fabric-impressed ceramic body sherds indicative of Late Woodland material culture found along the Nelson River, including Gull Lake, and Clark Lake.

Blackduck vessels, associated with Proto-Ojibwa inhabitants, are identified by their globular body shapes, constricted necks, and flared lips. Geologist Dr. Robert Bell in 1878-79, reportedly found two rim sherds of Blackduck pottery at the mouth of the Nelson River near Hudson Bay (Wright 1968:66).

4.3.1.4 Early Historic Period (1640 – 1821 A.D.)

Although earlier explorers such as Thomas Button and Jens Munk wintered along the Manitoba shores of Hudson Bay, the first European in the immediate vicinity of the study area was probably Pierre Esprit Radisson. In 1682, Radisson and his crew paddled up the Hayes River meeting up with a group of Cree men at or near the confluence of the Hayes and Fox rivers. It is highly likely that the local Cree knew of the presence of Europeans along the coastal waters since 1612 when Button wintered at the Nelson River estuary (Manitoba Historical Society 2002) and 1619 when Jens Munk and his crew wintered over at the mouth of the Churchill River (Kenyon 1980). Later, after the establishment of York Fort I, Henry Kelsey in 1690, was assigned to explore the interior of the country. He ascended the

Hayes River in the company of Cree, branched off to the Fox River and eventually made his way onto the Nelson River system via an ancient connecting waterway through Fox Lake, the Cyril River and into the Landing (Aiken) River to Split Lake. From there he continued up the Saskatchewan River and onto the prairie (Kelsey 1929:2).

For the initial period of contact, little evidence of European goods has been found at Aboriginal archaeological sites and these usually consist of metal items that were reworked for a secondary use. Prior to the 19th century, European material goods were likely selected for by local Cree populations through trade at coastal trade posts. Trade goods were then brought into the study area long before inland trade posts were established.

With the introduction of copper and brass kettles, native clay pots appear to have been quickly discarded in favor of the more durable metal. The flintlock rifle gradually replaced the bow and arrow and metal knives succeeded stone scrapers. Personal adornment, which formerly had consisted of locally available resources or exotic material acquired through trade, now contained a realm of European goods including glass beads, copper rings, tinkling cones, and silver bands.

According to archival records the Hudson's Bay Company (HBC) did not establish any post at Gull Rapids (Keeyask); but a trading house was built at nearby Split Lake in 1790; this operated until 1794 when it was abandoned for several years. It was reopened by the HBC in 1797 and remained open until the 1940s (HBCA B.207a). Additional outposts were also situated near the entrance of Moosenose Creek into the Nelson River in the early 1800s but the archaeological record of this site was destroyed during the creation of the Kettle Generating Station forebay (Stephens Lake; HBCA E.3/4 fo.8B). Peter Fidler's 1809 map identified a log tent that may have acted as an outpost ca. 1790 at the mouth of the Assean River where it drains into Clark Lake (HBCA E.3/4 fo.7B).

To-date, Clark Lake is the only lake within the study area where Early Historic Period goods have been found. No other sites have been recorded in the region. It is likely that historic trails, resting areas and perhaps overnight camping areas dating to this period are present given the importance of the river as a major transportation artery from Hudson Bay to the interior of western Canada and the need to portage around the Gull Rapids.

4.3.1.5 Middle Historic Period (1821 – 1870 A.D.)

The origin of the family hunting territory, whether a construct of the fur trade or an institution already in place prior to contact, has received considerable attention by social scientists (Speck 1915; Smith 1971, 1974, 1981; Martin 1982). The origin of this type of land tenure system is important to archaeologists who use ethnographic analogy to study the social organization and land use practices of Pre-European contact period populations. The

hunting territory debate is equally important to social anthropologists particularly when remnants of this system are visible in today's registered traplines.

One previously identified site, between Birthday Rapids and Gull Lake, contained Middle Historic Period artifacts. Types of artifacts that would be expected at camp sites of this period would consist of the remnants of metal pots and pans, gun parts, gunflints, musket balls, shot gun shot, tinkling cones, silver bands, thimbles, beads, rings, clay pipe fragments and metal tools. Further south at Clark Lake on the Nelson River, the Pointe West site HbKx-2 contains a wide variety of items from this time period.

4.3.1.6 Late Historic Period (1871 – 1920 A.D.)

Details of life ways during the post-1870 period are not entirely known but, based on informal oral narrative from Tataskweyak Cree Nation; family/kin-based satellite settlements were distributed throughout the traditional lands and are still known to the Elders and resource-users. In general, a seasonal round of activities was maintained whereby summer coalescence at important fisheries and winter dispersal within the forest at predetermined locations took place. Fishing and hunting were important activities for daily sustenance, while organized traplines were sustained to acquire furs to trade for additional European commodities as well as traps, guns and ammunition.

A number of sites are situated along the Nelson River in the region of Gull Rapids. Cabins, tepees, tent frames, and portages show the presence of Cree people throughout the region. These site types are usually situated inland from major waterways and trails may lead further to the interior.

The period commonly referred to as the Recent Historic commences *ca.* 1920 and ends *ca.* 1970. The distinguishing feature of this period is the introduction of mechanical technology in the forms of outboard motors, chain saws and snow machines (including the Bombardier).

4.3.1.7 Project Study Area Existing Environment

The Heritage Resource study area is divided into two geographic areas; Project Study Area and a broader Regional Study Area (Section 2.1 of NLHS 2012, i.e., Heritage Technical Report). Within the Regional Study Area there are 52 registered archaeological sites, of these, four fall within the Project Study Area (Table 4-1; Map 4-8). All known archaeological sites in the region were recorded through heritage investigations for the Keeyask Generation Station Project and were used for comparative purposes to determine the range of site types that could be located within the more specific Project Study Area.

Table 4-1: List of Archaeological Sites Within the Project Study Area

Registered Archaeological Site Borden Number*	Site Type	Cultural Affiliation
HcKs-01 “Jimmy’s Camp”	Lithic Workshop	Pre-European Contact
HcKt-08 “Bryant’s Cabin”	Campsite	Late Historic 1870-1930 A.D.
HcKt-09 “Sandstone Flakes”	Lithic Workshop	Pre-European Contact
HcKt-02 “Keeyask Rapids”	Lithic Workshop	Pre-European Contact

*A Borden Number is an Alpha-numeric identifier which is based on a lat/long coordinate system

The four archaeological sites in the Project Study Area occur within 2 km of the alternative transmission line routes or sites for project facilities. Three of the sites are small, Pre-European Contact sites that do not have diagnostic artifacts and therefore are unable to provide affiliation to a specific cultural period or complex. The fourth site is a historic cabin foundation that dates to the Late Historic Period (1870-1930 A.D.).