6.0 EVALUATION OF ALTERNATIVE ROUTES AND INFRASTRUCTURE

This chapter outlines the approach that was used to identify and evaluate alternative routes and to select Preferred Routes and sites for the proposed Keeyask Generation Outlet and Construction Power Transmission Project.

6.1 ALTERNATIVE MEANS

Since the inception of the Keeyask Transmission Project by Manitoba Hydro, several options that facilitate the transfer of power from the Keeyask Generation Station to the Radisson Converter Station were evaluated. All alternatives evaluated facilitate the purpose of transferring energy into the Northern Collector System.

Alternative means for the Project are the functionally different ways to meet the need for the Project in a manner that achieves the Project's purpose. The following alternative means for developing this Project were identified early in the planning process and included:

1. Generation Outlet Transmission Lines: Three different routes (Route Alternatives A, B and C) were identified (Map 6-1). A fourth route (Route Alternative D) was added later in the evaluation phase as a result of input from Fox Lake Cree Nation (FLCN) during the Public Involvement Program (see Chapter 5).
2. Construction Power Transmission Line: Two transmission line routes (Route Options 1 and 2) were considered early in the feasibility stage (Map 6-1). The option of using diesel power for the construction of the Keeyask Generating Station was considered and rejected due to high costs and environmental concerns.
3. Switching Station: Seven potential sites for the Keeyask Switching Station were identified (Map 6-2).
4. Construction Power Station: Five potential sites (Construction Power Sites 2, 3, 4, 5 and 6) for the Construction Power Station were identified (Map 6-2).

When selecting routing alternatives for the Keeyask Generation Outlet and Construction Power Transmission Lines, the main objective was to minimize adverse biophysical and socio-economic effects, while satisfying technical and capital cost requirements for the Project.

During the course of the planning process, several variations of the Generation Outlet Transmission route alternatives were considered based on input from Tataskweyak Cree Nation and Fox Lake Cree Nation, as well as environmental, social and technical considerations. These evaluations led to revisions to the alignment of Route B and the inclusion of a new alternative:

Route Alternative D. Route Alternative D parallels the existing KN36 transmission line and the proposed Route Option 1 for the Construction Power Transmission Line.

A two-staged approach (route identification and route comparison/selection) was used to select transmission line routes that have the greatest positive and least negative effect on people and the environment (while recognizing cost and technical considerations). The alternative routing process used regional and site-specific biophysical, socioeconomic and cultural features to identify and evaluate the viable alternative transmission line routes and to select Preferred Routes for the proposed Keeyask Transmission Lines. The evaluation approach is discussed further in Sections 3.3.3 and 6.2.1.

This chapter summarizes the process used in describing and assessing transmission routes and infrastructure sites towards selection of the alternative and the Preferred Routes and Station Sites.

6.2 DESCRIPTION AND COMPARISON OF ALTERNATIVE TRANSMISSION LINES

This section discusses the alternative routes for the Generation Outlet Transmission Line, followed by a discussion of the Construction Power Transmission Line route options. The transmission line options were evaluated based on the potential physical, environmental, heritage and socio-economic effects of the Project. Physical effects consider the landforms and soils/geology of the alternate routes, as well as technical issues such as river crossings and associated requirements for establishing a solid tower foundation, and Project cost. Cost is generally related to line length. Potential environmental effects consider effects on aquatic and terrestrial habitat, fish, plants, invertebrates, amphibians, birds and mammals.

Socio-economic effects primarily relate to potential Project effects on domestic and commercial resource users in the Project Study Area, residents of the Town of Gillam and Members of Tataskweyak Cree Nation (TCN) and FLCN. The assessment of potential socio-economic effects considered Aboriginal Traditional Knowledge (ATK) provided through TCN's technical report and workshops held with FLCN Members. Manitoba Hydro has also engaged the Manitoba Metis Federation in the development of a Traditional Land Use and Knowledge Study to understand the potential effects of the Project on Metis. Potential effects on heritage resources were considered based on a review of existing registered archaeological sites, ATK and a predictive model for potential heritage site locations[8].

[8] Refer to the Heritage Resources Technical Volume for a description of the heritage predictive model.

6.2.1 Preferred Route Selection Process

An evaluation matrix was used to systematically assess the four alternative routes for the Generation Outlet Transmission Lines. A rating system (high, medium, low) was used to rank the level of concern related to potential Project effects expected on the various technical and environmental factors. The resultant rating for each route option was considered in the preferred route selection process.

6.2.2 Generation Outlet Transmission Line Route

6.2.2.1 Routing Alternatives

The three Generation Outlet Transmission Line route alternatives (A, B, C) that were originally identified are shown on Map 6-1. TCN Members made the recommendation that Route B should be modified so that it remains on the south side of the access road until it intersects with the Construction Power Transmission Line (Shown in Figure 12 in TCN 2011). This variation was subsequently made to Route Alternative B.

These four routing alternatives considered for the Generation Outlet Transmission Line routes have some common segments in their routing including a common crossing area for the Nelson River, which is also shared with Construction Power Route Option 1. The Generation Outlet Transmission Line begins on the south shore of the Nelson River at Gull Rapids, travels south and then easterly to Radisson Converter Station near Gillam (Map 6-1). Route Alternative D extends southward along the same right-of-way as the Construction Power Route Option 1 to the existing KN36 transmission line. At this point, Route Alternative D turns easterly and follows the right-of-way for the KN36 transmission line to Radisson Converter Station. Route Alternative A extends about 6 km south before it changes to an easterly direction. Route Alternatives B and C start to extend easterly at a more northerly location than Alternative A and follow basically the same route beginning at Construction Power Option 1 and extending east to the end of the Butnau Dyke. All three lines share similar routing alternatives in proximity to the Radisson Converter Station.

The following section provides an evaluation of the key environmental features associated with each of the four routing alternatives. The completed evaluation matrix with respect to biophysical and socio-economic criteria is presented in Table 6-1. Comments that support the evaluation conclusions are provided in the footnotes to Table 6-1.

Further detail on the technical criteria regarding the Generation Outlet Transmission Line is provided in Table 6-2. The Route Selection Matrix tables provide a “score” of route alternatives (Tables 6-1 and 6-2). Route alternatives are listed on the left (vertical) axis of Table 6-1. The 19 biophysical and socio-economic technical evaluation criteria are listed on the top (horizontal)

Table 6-1: Generation Outlet Transmission Line – Route Selection Matrix Regarding Biophysical and Socio-economic Criteria

Route Alternative	Aquatics			Terrestrial Environment													Socio-economic		Heritage	
				Species at Risk				Plant/Ecosystem VECs			Mammal VECs		Bird VECs							
	1. Number of Stream Crossings	2. Species at Risk	Aquatic Habitat VECs			6. Wildlife Habitat *	7. Forestry										17. Sites Important to Locals	18. Resource Users	VECs	Level of Effect Rating** (L=0, M=1, H=2)
			3. Fish Habitat	4. Wolverine	5. Bats (Little Brown Myotis, Northern Myotis)			8. Fragmentation Ecosystem Diversity	9. Ecosystem Diversity	10. Priority Plants	11. Caribou	12. Moose	13. Bald Eagle	14. Common Nighthawk	15. Olive-sided Flycatcher	16. Rusty Blackbird			19. All Heritage Resources	
A	H	M	H	M	L	L	L	H	M	M	M	M	L	M	M	M	M	M	M	18
B	H	M	H	L	L	M	L	M	M	H	L	L	M	M	M	H	L	L	M	16
C	M	M	M	L	L	M	L	L	L	L	L	L	M	M	M	H	L	L	M	10
D	M	M	M	L	L	L	L	H	H	M	H	M	L	L	M	M	L	L	L	13

Route Alternative	Segment Comments
A	1, 2 & 3. Second greatest number of stream crossings including five streams with fish and fish habitat sensitivity ratings of moderate or moderate-high: Butnau River, Butnau River Channel (2 crossings), and the Kettle River (2 crossings). Lake Sturgeon (COSEWIC Endangered) may make use of the lower reaches of the Kettle River including the stream crossing closest to Radisson (common to all alternative routes). 4. Marginally higher risk of potential fragmentation effects due to bisection of an unfragmented core area. Small but higher potential for habitat loss due to slightly longer length. Increased risk of harvest effects because of access into new areas. Small but improved potential for increased movements into new areas. Low risk of few individuals affected. 5. No known hibernacula present along this alternative route. Low risk of potential effect to roosting habitat. Low risk of few individuals affected. 6. Wildlife Habitat-Amphibians: Route has more stream crossings (and associated effect on riparian habitat) than alternative routes further north. 7. Commercial forestry and domestic timber values are limited within the Project Study Area and very similar between the route alternatives. Forestry values should not influence the route selection process. 8, 9 & 10. Ratings are relative to the alternative with the lowest effects. 11. Highest risk of potential fragmentation effects due to bisection of an unfragmented core area. Small but higher potential effect of forest cover habitat loss due to slightly longer length. Increased risk of harvest effects because of access into new areas. Larger increase in line of sight and potential harvest effects due to development into new areas. Although it does not intersect calving islands, there is a small risk of potential disturbance effects because it is located in proximity to a few calving islands. Low risk of few individuals affected. Slightly lower risk of barrier to movements because of narrower right-of-way. 12. Highest risk of potential fragmentation effects due to bisection of an unfragmented core area. Small but higher potential effect of forest cover habitat loss due to slightly longer length. Increased risk of harvest effects because of access into new areas. Large increase in line of sight and potential harvest effects due to development into new areas. Low risk of few individuals affected. Low potential for riparian habitat effects at a moderate number of stream crossings.

Table 6-1: Generation Outlet Transmission Line – Route Selection Matrix Regarding Biophysical and Socio-economic Criteria	
Route Alternative	**Segment Comments**
A (cont'd)	13. Route is removed from Stephens Lake which is expected to reduce line strike potential for birds utilizing the lake (i.e., eagles). Also, route avoids traversing between Gillrat and Joslin Lakes which may be a travel corridor for birds utilizing these lakes. 14. Common nighthawk habitat is more plentiful in areas further north (i.e., nearer B & C). 15-16. Route traverses a contiguous tract of habitat which is abundant in the study area. Loss of a portion should not be significant on a regional level. 17. This route involves the largest requirement for new right-of-way of the four alternatives. Local residents (through PIP process) and governments (Gillam Town Council) have indicated a preference to limit the creation of new rights-of-way if possible. 18. This route involves the largest requirement for new right-of-way of the four alternatives. It therefore creates the greatest potential for new conflicts with resource users. TCN's report notes this route is the furthest from Stephens Lake and therefore may minimize effects on the aquatic environment and shorebirds. FLCN noted a preference during workshops for transmission lines to twin existing rights-of-way. 19. Heritage concern where route crosses Kettle and Butnau rivers.
B	1, 2 & 3. Greatest number of stream crossings including five streams with fish and fish habitat sensitivity ratings of moderate or moderate-high: Butnau River, Butnau River Channel (2 crossings), and the Kettle River (2 crossings). Lake Sturgeon (COSEWIC Endangered) may make use of the lower reaches of the Kettle River including the stream crossing closest to Radisson (common to all alternative routes). 4. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Small but lower potential for habitat loss due to shorter length. Limited risk of improved harvest effects because of proximity to south access road. 5. No known hibernacula present along this alternative. Low risk of potential effect to roosting habitat. Low risk of few individuals affected. 6. Wildlife Habitat-Amphibians: Once route separates from Alternative Route C it traverses more streams (and associated riparian habitat) than Alternative Route C. 7. Commercial forestry and domestic timber values are limited within the project study area and very similar between the route alternatives. Forestry values should not influence the route selection process. 8, 9 & 10. Ratings are relative to the alternative with the lowest effects. 11. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Although it does not intersect calving islands, there is a small risk of potential disturbance effects because it is located in proximity to a few calving islands. Small but lower potential for habitat loss due to shorter length. Slightly higher risk of barrier to movements because of wider right-of-way with traffic. Larger increase in line of sight and potential harvest effects due to widening of south access road right-of-way. Low risk of few individuals affected. Limited risk of improved harvest effects because of proximity to south access road. 12. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Small but lower potential for habitat loss due to shorter length. Low potential for riparian habitat effects at a low number of stream crossings. Larger increase in line of sight and potential harvest effects due to widening of south access road right-of-way. Low risk of few individuals affected. Limited risk of improved harvest effects because of proximity to south access road. 13. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions. At west end of route, is in close proximity to Stephens Lake. This could result in increased risk of bird-wire collisions for birds utilizing Stephens lake. 14-16. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions 17. This route largely follows proposed right-of-way for the Keeyask South Access Road. This limits the requirement to create substantial new rights-of-way. Tataskweyak's report identifies this as their Preferred Route as it represented the best compromise of the routes. TCN recommended a modification be made to Route B so that it remains on the south side of the access road until it intersects with the Construction Power Line. FLCN noted a preference during workshops for transmission lines to twin existing rights-of-way. 18. This route largely follows proposed right-of-way for the Keeyask South Access Road. This limits the requirement to create substantial new rights-of-way and new effects on resource users. 19. Heritage concern where route crosses Kettle and Butnau rivers.
C	1, 2 & 3. Fewest stream crossings including three streams with fish and fish habitat sensitivity ratings of moderate or moderate-high: Butnau River and Kettle River (2 crossings). Lake Sturgeon (COSEWIC Endangered) may make use of the lower reaches of the Kettle River including the stream crossing closest to Radisson (common to all alternative routes). 4. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Small but lower potential for habitat loss due to shorter length. Limited risk of improved harvest effects because of proximity to south access road. Low risk of few individuals affected. 5. No known hibernacula present along this alternative route. Low risk of potential effect to roosting habitat. Low risk of few individuals affected. 6. Wildlife Habitat-Amphibians: Route is the shortest. Location adjacent to existing roads will localize the disturbance of the routing. 7. Commercial forestry and domestic timber values are limited within the Project Study Area and very similar between the route alternatives. Forestry values should not influence the route selection process. 8. 9 & 10. Ratings are relative to the alternative with the lowest effects. 11. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Although it does not intersect calving islands, there is a small risk of potential disturbance effects because it is located in proximity to a few calving islands. Small but lower potential for habitat loss due to shorter length. Slightly higher risk of barrier to movements because of wider right-of-way with traffic. Larger increase in line of sight and potential harvest effects due to widening of south access road right-of-way. Low risk of few individuals affected. Limited risk of improved harvest effects because of proximity to south access road. 12. Lower risk of potential fragmentation effects due to shorter length and adjacency to south access road. Small but lower potential for habitat loss due to shorter length. Low potential for riparian habitat effects at a low number of stream crossings. Larger increase in line of sight and potential harvest effects due to widening of south access road right-of-way. Low risk of few individuals affected. Limited risk of improved harvest effects because of proximity to south access road. 13. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions. At west end of route, is in close proximity to Stephens Lake. This could result in increased risk of bird-wire collisions for birds utilizing Stephens lake. 14. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions. 15. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions. At west end of route, is in close proximity to Stephens Lake. Traverses close to OSFL habitat in the area just west of Cache Lake 16. Route passes between Gillrat and Joslin lakes. This area could serve as a travel corridor for birds between the two waterbodies which could result in an increased risk of bird-wire collisions. At west end of route, is in close proximity to Stephens Lake. Traverse close to Rusty blackbird habitat in the area to the north of Cache lake 17. This route largely follows proposed right-of-way for the Keeyask South Access Road. This limits the requirement to create substantial new rights-of-way. 18. This route largely follows proposed right-of-way for the Keeyask South Access Road. This limits the requirement to create substantial new rights-of-way and new effects on resource users. TCN's report notes trapline holders from the Wivenhoe and Butnau Lake area preferred this route as it is furthest from the Wivenhoe and Butnau Lake areas. FLCN noted a preference during workshops for transmission lines to twin existing rights-of-way. 19. Heritage concern where route crosses Kettle and Butnau rivers.

Table 6-1: Generation Outlet Transmission Line – Route Selection Matrix Regarding Biophysical and Socio-economic Criteria	
Route Alternative	**Segment Comments**
D	1, 2 & 3. Second fewest stream crossings including three streams with fish and fish habitat sensitivity ratings of moderate or moderate-high: Butnau River and Kettle River (2 crossings). Lake Sturgeon (COSEWIC Endangered) may make use of the lower reaches of the Kettle River including the stream crossing closest to Radisson (common to all alternative routes). 4. Marginally higher risk of potential fragmentation effects due to longer length and bisecting the core area next to Construction Power transmission line after it is decommissioned. Small but higher potential for habitat loss due to longer length. Limited risk of improved harvest effects because of existing transmission lines. 5. No known hibernacula present along this alternative route. Marginally higher risk of affecting potential roosting habitat at river crossings near Gillam. Low risk of few individuals affected. 6. Wildlife Habitat-Amphibians: Route parallels the Kettle River for a long stretch. While the river itself does not constitute good amphibian habitat, nearby wetlands and ponds can, and they could be affected by t-line development. 7. Commercial forestry and domestic timber values are limited within the Project Study Area and very similar between the route alternatives. Forestry values should not influence the route selection process. 8, 9 & 10. Ratings are relative to the alternative with the lowest effects. There is no terrestrial habitat data for approximately 17 km of Route D. Route D ecosystem diversity ranking is based on total area of terrestrial habitat affected and assumes that there are no issues of concern in the segment with missing data. Will be reviewed once additional habitat information is compiled for this alternative. Terrestrial plant data was not collected along Route D. Route D priority plant ranking assumes that: (i) plant distributions along the north-south leg are the same as along Construction Power Alternative 1; and, (ii) to the extent that the priority plants are associated with particular stand level habitat types, habitat mapping is a proxy for the likelihood that these species occur along the route (note that habitat mapping is missing for approximately 17 km of the route. Rankings for Alternative D are preliminary and may change when additional information is compiled for this route. 11. Marginally higher risk of potential fragmentation effects due to longer length; will bisect a core area if considered independent of construction power route. Small but higher potential effect of forest cover habitat loss due to slightly longer length. Limited risk of improved harvest effects because of pre-existing access (existing transmission lines). Larger increase in line of sight and potential harvest effects due to widening of existing rights-of-way. Marginally higher risk of more individuals (i.e., Pen Islands caribou) to be affected. Slightly higher risk of barrier to movements because of wider right-of-way. High risk of potential effects because it Intersects one calving complex; there is a small risk of further potential disturbance effects because it may be located in proximity to other calving islands. 12. Marginally higher risk of potential fragmentation effects due to longer length; will bisect a core area if considered independent of construction power route. Small but higher potential effect of forest cover habitat loss due to slightly longer length. Limited risk of improved harvest effects because of pre-existing access (existing transmission lines). Larger increase in line of sight and potential harvest effects due to widening of existing rights-of-way. Low risk of few individuals affected. Low potential for riparian habitat effects at a moderate number of stream crossings. 13. For the entire route, traverses along existing or proposed rights-of-way for other t-lines. This will localize the effects of the t-line. 14. Habitat mapping currently unavailable for this alternative route. Existing habitat mapping suggests that preferred habitat for Bird VECs in the t-line study area is more plentiful further north in the study area. 15. Route traverses a contiguous tract of habitat which is abundant in the study area. Loss of a portion should not be significant on a regional level. 16. Route traverses a contiguous tract of habitat which is abundant in the study area. Loss of a portion should not be significant on a regional level. Habitat mapping currently unavailable for this alternative route. Existing habitat mapping suggests that preferred habitat for Bird VECs in the transmission line study area is more plentiful further north in the study area. For the entire route, traverses along existing or proposed rights-of-way for other t-lines. This will localize the effects of the t-line. 17. This route follows existing Transmission (KN36) or other proposed Transmission (Construction Power line) rights-of-way. No substantial new rights-of-way created. FLCN requested that this alternative route be considered and identified it as their preferred route. Gillam Town Council identified this route as their preferred alternative route. TCN's report was prepared before route D was added as an alternative. 18. This route follows existing Transmission (KN36) or other proposed Transmission (Construction Power line) rights-of-way. No substantial new rights-of-way created. 19. The route follows an existing transmission corridor and therefore has already been affected; No water crossings.

Legend:
* Wildlife habitat will include consideration of amphibians (no VEC)
** Level of Impact on Criteria: L = Low; M = Medium; H = High

Table 6-2: Generation Outlet Transmission Line – Route Selection Matrix Regarding Technical Criteria

Route Alternative	Engineering						Construction		Maintenance			System Planning	Level of Effect Rating ** L=0 M=1 H=2
	1. Line Length	2. Number of Road/Rail/River Crossings	3. Number of Angles	4. Foundations	5. Parallel Existing Transmission Lines or Roads	6. Perpendicular Crossings of Linear Facilities	7. Access	8. Crossings (water, other line crossings)	9. Line Access/Parallel Existing Transmission Lines or Roads	10. Number of Water Crossings	11. Line/Foundation Design	12. Parallel Existing Transmission Lines or Roads	
A	0	1	0	1	0	2	2	2	2	1	1	0	12
B	0	1	1	0	1	0	1	2	0	1	0	0	7
C	0	2	2	0	1	2	0	1	0	1	0	0	9
D	2	0	0	1	1	0	1	1	1	1	1	1	12

Route Alternative	
A	Accessibility would be an issue in terms of requiring trail/road to be developed.
B	Route Alternatives B and C will likely provide the best foundation conditions as they generally follow a ridgeline. Accessibility could be an issue due to the requirement to cut new access on the eastern portion.
C	Physically impossible to locate 230 m wide corridor between Keeyask Road and Butnau Dam**.** Would like to shift a portion of the line to more closely align with the south access road routing; less new access required; from a construction perspective this is the favoured routing.
D	Route Alternatives D is the most expensive option due to line length.

Notes: Levels of effect documented here are assumed to be negative effects. Transmission Line design criteria typically identifies the parallel alignment with other linear facilities as a routing opportunity. This opportunity, however, is based on the overall design/impact/construction/maintenance considerations. From strictly a design perspective, parallel alignment opportunities may result in additional design efforts.

axis. Ratings for each factor are provided for the four GOT route alternatives (Map 6-1). The technical criteria in Table 6-2 are similarly evaluated based on low, medium and high ratings.

The three-tier rating (high, medium and low concern) system is used for the biophysical factors (mammals, caribou, birds, core communities, fragmentation) where potential effects on protected species and habitats are identified. The three-tier rating system is also used to assess heritage and technical (engineering) constraints, as well as resource use information and sites identified by local people to be important.

6.2.2.2 Environmental Features

Aquatic Environment

The four Generation Outlet Transmission line alternative routes cross a total of 27 watercourses.

Route Alternative A avoids the large lakes at the western end of the Study Area (Gillrat and unnamed lakes to the north; Map 6-1). Route Alternatives B and C are routed between these lakes and also extend close to the Stephens Lake shoreline. Route Alternative C also crosses the Butnau River between Cache Lake and where it terminates at the Butnau Dyke. This is a low, wet area that could present some technical issues to foundation siting.

Route Alternative D follows the existing KN36 transmission line right-of-way and does not traverse in close proximity to any large lakes. Route Alternative D crosses the Kettle River near its west end and roughly parallels the river at a distance of 125 to 800 m for much of its length.

All routing alternatives avoid Cache Lake, which has been identified as an important sensitive aquatic site by local residents from FLCN.

From an aquatics perspective, there is a preference for the GOT route closest to the shore of Stephens Lake. This is not considered a “strong” preference since none of the routing alternatives have much potential to impact fish habitat. The northernmost alternative crosses the fewest streams overall, as well as the fewest fish-bearing streams and the fewest streams with large-bodied fish. This alternative therefore presents the lowest risk to aquatic habitat.

Terrestrial Environment

Terrestrial Habitat, Ecosystem and Plants

Terrestrial habitat and ecosystem types are relatively similar within the footprint of the four route alternative (Map 6-1). Tree cover is mainly black spruce and ecosite type is predominantly blanket and veneer bog (ECOSTEM 2012). There is a relatively large area of low vegetation (predominantly a 25-year-old poorly regenerating burn) located just west of Cache Lake. Short segments of Route Alternatives A and B cross this vegetation, while approximately half of Route Alternative D traverses this area. From a terrestrial ecosystem, habitat and plant perspective, there are no major concerns with any of the four Generation Outlet routing alternatives. Route Alternative C is the preferred alternative from an ecosystem perspective because it is expected to minimize effects on fragmentation, ecosystem diversity and priority plants, largely because more of the route is near existing human features. Route Alternatives A and D would have the greatest fragmentation effects and Route Alternative D would have the highest ecosystem diversity effects. While Route Alternative C was the preferred route overall from the perspective of terrestrial ecosystems and Route Alternative D had the highest adverse effects relative to the other routes, the overall differences between the four Generation Outlet Transmission alternatives were not large.

Route Alternative C is the preferred alternative in terms of fragmentation effects on terrestrial ecosystems. Route Alternative C would produce the smallest increase to total linear feature density (since it is the shortest route) and the lowest reduction to core area (because more of its length is near existing human infrastructure). Route Alternative B has the second lowest effect on total core area because it is near existing human features for much of its length. Route Alternatives A and D have the highest fragmentation effects. Route Alternative A would create the largest reduction in total core area, traverse near the central portion of a large core area (approximately 70 km^2), and subdivide this large core area into three smaller blocks. Although Route Alternative D would be routed near existing or proposed human features, it would still create the second highest reduction in total core area. Additionally, the first 28.8 km of Route Alternative D is situated between two existing transmission line rights-of-way and a railway line. The preference would generally be to locate a human linear feature next to another linear feature to minimize the fragmentation of core areas. However, in this situation four linear features located in close proximity could be a substantial deterrent for annual movements across this area.

Route Alternative C is the preferred route in terms of potential ecosystem diversity effects because it affects a lower total area of terrestrial habitat, includes the highest proportion of common habitat types and has the smallest area in priority habitat types. Route Alternative D would affect substantially more terrestrial habitat than the other alternative

routes as well as the highest amount of the priority habitat types that are of highest concern. Route Alternatives A and B would have similar overall ecosystem diversity effects.

Route Alternative C is also the preferred route in terms of potential priority plant effects because much lower numbers of rare and uncommon plant locations were found within this alternative route corridor. Endangered, threatened or provincially very rare plants are not expected to occur along any of the alternative routes. Elegant hawk's-beard (*Crepis elegans*), the only provincially rare to very rare terrestrial plant found during field studies in the region, was not observed along either route. For the remaining priority plant species, Alternative Route C had considerably fewer priority plant species locations than the other two routes. Although the amount of rare plant survey work was comparably lower along Route Alternative D, one provincially rare plant species was found at one location along this route. To the extent that rare plants are associated with the regionally rare habitat types, Route Alternative D could have the highest priority plant effects.

Wildlife

With respect to invertebrates and reptiles, there is currently no reason to prefer one GOT alternative route over another. In general, the best route is typically one that is shortest, and avoids or minimizes contact with riparian habitats and productive wetlands, i.e., Route Alternative C. From the perspective of amphibians, the northernmost route is slightly preferred because it is the shortest route but crosses the productive wetlands (Stantec 2012a).

The riparian habitat is generally more productive for bird communities than any other habitat type in the Study Area (Map 1-1). While the northernmost route (Route Alternative C) is in closer proximity to Stephen's Lake for a longer length than any other route, much of that route follows either an existing road extending from Gillam to the Butnau Dam or the proposed South Access Road (Map 6-1; Stantec 2012b). The shoreline of the Kettle River is lined with relatively tall trees, so the presence of the transmission line is not expected to have a noticeable effect on birds or animals utilizing the river. As well, the KN36 transmission line already traverses along that right-of-way. The southern shores and bays of Stephens Lake were not found to contain large concentrations of birds.

This environmental assessment showed some potential that birds nesting on inland lakes such as Cache Lake and Gilbert Lake would have increased potential to collide with transmission lines, guy wires and towers situated close to Stephens Lake. More importantly, there is considerably increased potential for transmission line collisions during their fall migration, when birds use major water bodies such as Stephens Lake as both staging areas and as corridors in their flights southward.

When TCN members were originally presented three GOT line alternatives (TCN 2011; Alternative D was not considered at that time), they initially stated a preference for Route Alternative A as it was further from Stephens Lake. They felt this would reduce effects on birds, particularly shorebirds. With respect to fragmentation, aligning the transmission route alongside the proposed route has some advantage over further clearing and expanding the collective right-of-way of existing linear facilities (e.g., KN36) currently habitat further south.

Reducing the need to create rights-of-way in previously undisturbed areas was part of the reason that FLCN originally suggested a new route alternative (D) be considered for the GOT lines. The evaluation with respect to birds is at the southernmost routes (Route Alternatives D and A) have lower bird densities and are further from productive wetlands than Route Alternative B and C. This would minimize the potential for line strikes and place the transmission line in an area that appears to support lower bird abundance and diversity.

Based on field studies, mapping, literature, and professional judgement, GOT Route Alternatives B and C are moderately preferred over GOT Route Alternative A and D from a mammal's perspective because GOT Route Alternatives B or C would have the fewest adverse Project effects on caribou and moose (WRCS 2012). GOT Route Alternatives B and C are moderately preferred from a caribou perspective because these shorter routes would disturb fewer caribou calving islands and result in the lowest habitat loss. GOT Route Alternatives B and C are slightly preferred from a moose perspective because potential habitat loss and fragmentation effects would be lower on these shorter routes. Route Alternatives B and C are slightly preferred for wolverine, largely because the routes are shorter and follow existing human features. GOT Route Alternatives C and D, with the fewest stream crossings, are slightly preferred from an aquatic furbearer perspective. No substantial little brown myotis habitat differences are apparent on any of the routes. GOT Route Alternatives B and C are also the slightly preferred routes for other mammals because they are the shorter routes, and potential habitat loss and access effects would be slightly less than on the other routes.

Proximity to lakeshores and roads are among the main factors in assessing the effect of the four Generation Outlet Transmission Line alternatives on wildlife. The differences outlined in this section will likely be relatively minor and overall would not eliminate any of the alternatives from consideration on plants and wildlife. The potential effects on wildlife overall would likely be larger for Route Alternatives B and C than Route Alternatives A or D. This is because they traverse in closer proximity to Stephens Lake as well as some several other lakes in the extreme western portion of their routes. In the Project Study Area (Map 1-1), riparian areas along lakes and rivers usually support higher densities and diversities of wildlife (e.g., insects, amphibians, birds and mammals). Transmission line rights-of-way routed along roads (i.e., Route Alternatives B and C) may result in increased hunting pressure for wildlife species that may be attracted to the rights-of-way as a food source and/or a travel corridor.

6.2.2.3 Aboriginal Traditional Knowledge, Socio-economic and Technical Considerations

Socio-economic Environment

Construction workforce requirements and transportation requirements are expected to be similar regardless of which preferred route is selected. As a result, the potential effects on the economy and population, infrastructure and services VECs are not expected to vary between the alternatives. Therefore the evaluation of alternatives from a socio-economic perspective focused on the land and resource use and personal, family and community life VECs.

TCN's report (TCN 2011) states that Members interviewed for the TCN study did not indicate a strong preference for any of the proposed routes. Those who indicated a preference for Route Alternative A commonly commented on this route's distance from Stephens Lake and therefore believed this route would have less effect on the aquatic environment, the shoreline and wildlife, particularly shorebirds. Some TCN Members noted preference for Route C because it is the furthest from the Wivenhoe and Butnau Lake resource areas. TCN's report also notes that during interview for the Bipole III Transmission Project, TCN Members preferred routes closest to existing rights-of-way to limit further fragmentation. For the GOT lines, TCN's report notes that Route Alternative B is close in proximity to the existing KN36 and R26K transmission lines and the future Keeyask South Access Road and could therefore also limit fragmentation. TCN's report notes these results were reviewed with its Members and that Route Alternative B, with a modification to remain on the south side of the Keeyask South Access Road, is the preferred route from TCN's perspective (TCN 2011).

During workshops held during the summer and fall of 2012, FLCN noted a general preference for transmission line routes that follow existing rights-of-way to minimize fragmentation and the creation of new access points. FLCN noted that existing transmission lines have opened up areas to recreational hunters, fishers and snowmobilers already. During workshops with FLCN it was noted GOT line route alternative A would fragment the most habitat and create access separate from the Keeyask South Access Road and the existing transmission lines. FLCN requested that Manitoba Hydro consider an alternative GOT line route that follows the existing KN36 right-of-way and then the proposed Construction Power line right-of-way. This GOT line route alternative was subsequently labelled Route Alternative D. FLCN indicated during workshops that Route Alternative D was its preferred route.

Route Alternative B, with the modification recommended by TCN, is a suitable route alternative from a socio-economic perspective. Route B is close to the future south access road and therefore would minimize additional disturbance to resource use areas. Route B,

as modified, would be expected to minimize potential effects to land and resource use and personal, family and community life.

Route Alternatives C and D also minimize additional disturbance to resource use areas by following rights-of-way of existing or planned infrastructure to a large extent. Both TCN and FLCN have noted a general preference for routes that follow existing rights-of-way. Route Alternatives C and D are also considered suitable from a socio-economic perspective.

Route A is the least Preferred Route from a socio-economic perspective. This route alternative would create the greatest additional disturbance to resource use areas and fragmentation of culturally important landscapes. Both TCN and FLCN have noted a preference for routes that minimize additional linear fragmentation. FLCN has also expressed concerns about route alternatives that would increase access for recreational resource users.

The effects of the proposed Keeyask Transmission Project on commercial forestry values are minimal/inconsequential regardless of routes/sites chosen. Therefore, the selection of preferred routes for Generation Outlet and Construction Power Transmission Lines does not consider commercial forestry values. A forestry effects assessment is conducted on the Preferred Route selected (Plus4 2012, i.e., Keeyask Transmission Project Forestry Technical Report).

The effects of the Keeyask Transmission Project on heritage resources are considered to be neutral or negligible. Field studies conducted as part of the Heritage Resource Impact Assessment did not reveal any tangible evidence of past occupations. However, two stream crossing, the Kettle River and former Butnau River (now referred to as Cache Creek) will require monitoring. Route Alternative D has fewer stream crossings, including avoiding Cache Creek, so there would be a slight preference for this route. Construction Power Transmission Line crossing of the Nelson River at Gull Rapids is near known archaeological sites HcKs-01 and HcKt-02; both sites have been disturbed and contain only a few lithic flakes. The Heritage Resource Protection Plan will set out guidelines as to the management of found heritage during the time of construction activities.

From a heritage perspective, none of the Generation Outlet Transmission Line alternative routes are more favorable than the others, although the southern route may have the lowest potential effects (NLHS 2012). A predictive model that includes four relatively stable variables (distance from potable water, slope, aspect and vista) was used in this evaluation; as well, soil and vegetation, geology and cultural components were considered.

Technical Considerations

Table 6-1 illustrates that Route Alternative C is the shortest route (36 km) and Route Alternative D is the longest (47 km). However, there are more road and railway crossings associated with Route Alternative C than any of the other routes. Route Alternative D parallels these linear features further (40 km) than any other route.

6.2.2.4 Preferred Route

Selection of the Preferred Route used input from the criteria summarized in Tables 6-1 and 6-2, input from the public involvement process, the results of environmental studies and professional judgement.

The biophysical and socio-economic criteria summarized in Table 6-1 indicate Route Alternative C has the most favourable ranking across these criteria. Route Alternative A has the least favourable ranking across these criteria. Technical criteria summarized in Table 6-2 indicate that Route Alternative B has the most favourable ranking and Route Alternative A has the least favourable ranking.

The Preferred Route incorporates aspects of Route Alternative B, which received the most favourable ranking on the technical criteria, and Route Alternative C, which received the most favourable ranking on the biophysical and socio-economic criteria. Extending eastward from the Keeyask Switching Station (Map 2-2), the Preferred Route generally parallels the proposed South Access Road for about 16 km and incorporates the route adjustment proposed by TCN in their technical report (TCN 2011). The Preferred Route continues eastward between Cache and Gillrat lakes southwest and parallels KN36 for approximately 10 km to the Radisson Converter Station.

The Preferred Route for the Generation Outlet Transmission Line will involve development of three transmission lines along a single 200-m-wide corridor about 43 km long (Map 2-2). These three Generation Outlet Transmission Lines will transmit power from the 138 kV ac switchyard at the Keeyask Switching Station to the 138 kV ac switchyard at the existing Radisson Converter Station. Manitoba Hydro is proposing to prebuild one (KR1) of the three 138 kV transmission lines from the Radisson Converter Station to the Keeyask Construction Power Station as a source of backup construction power during the construction of Keeyask Generation Station. Once construction of the Generation Station is complete, a portion of KR1 from the Construction Power Station back to the Keeyask Switching Station will be salvaged, and KR1 will be terminated into the Keeyask Switching Station. The two additional 138 kV transmission lines (KR2 and KR3) will be built from the existing Radisson Converter Station 138 kV ac Switchyard to the new Keeyask Switching Station.

Information provided by TCN and FLCN as well as the Town of Gillam and members of the public were considered during the selection of the Preferred Route, in particular:

- TCN, FLCN and members of the public all noted a general preference for the Project to follow existing rights-of-way as much as possible to minimize fragmentation. The majority of the Preferred Route follows the proposed Keeyask South Access Road and the existing KN-36 rights-of-way.
- TCN proposed a modification to Route Alternative B to follow the Keeyask South Access Road more closely. This modification has been adopted as part of the Preferred Route.

Other key factors considered in the selection of the Preferred Route included:

- Minimizing the number of water crossings.
- Reducing overall line length to the extent feasible.
- Fewer rare, uncommon and cultural plants in the vicinity of the Preferred Route.
- Minimizing potential effects on caribou.
- Cost considerations.
- Allowing separation of Construction Power transmission and back-up transmission.

6.2.3 Construction Power Transmission Line

6.2.3.1 Routing Options

There are two routing options for the Construction Power Transmission Line that were considered and evaluated: Route Options 1 and 2 (Map 6-1). Both options extend on the south side of the Nelson River at Gull Rapids, cross the Nelson River to the north side and join up with the Construction Power Station and the existing KN36 transmission line, which extends from Kelsey Generating Station to Radisson Converter Station.

Route Option 1 is the more easterly of the two routes. It crosses the Nelson River in a single span downstream of the proposed Keeyask Generation Station axis. Route Option 2, which is located about 2.5 km west of Option 1 in the Gull Rapids area, crosses the Nelson River, utilizing a tower located on a mid-river island, resulting in shorter spans between towers.

As the lines are in close proximity to one another, there is little difference in the soils or topography traversed. There is a fairly extensive area of relatively wet land along Route Option 1 between Joslin and Gillrat lakes (Map 6-1). The major difference between route

options is that the Nelson River crossing for Route Option 2 involves tower foundations on islands that will be flooded by the newly created Keeyask reservoir.

6.2.3.2 Environmental Features

A preliminary evaluation of the two alternative Construction Power Transmission Lines suggested that the environmental implications for these two lines are fairly similar as they traverse very similar terrain. However, the westernmost route (Route Option 2) is somewhat longer, crosses more streams and has more technical constraints associated with the Nelson River crossing location. Route Option 2 was also judged to be impractical, as the route relied upon utilizing islands in the Nelson River for tower locations, which would be flooded by the Keeyask reservoir. This, in addition to the environmental and heritage resources evaluations which identified Route Option 1 as the preferred option, was a key factor leading to the conclusion that the eastern-most route (Route Option 1) is the Preferred Route for the Construction Power Transmission Line.

When the transmission line routing was originally discussed by TCN, only Route Option 1 was presented for the Construction Power. As a result, there was no input from TCN on routing options (TCN 2011).

Aquatic Environment

Construction Power transmission routing options were assessed for fish and fish habitat at stream crossings within the right-of-way or within the area of the stations. Physical data gathered from the site assessments, as well as existing information on fish and fish habitat, were used to rate the sensitivity of fish and fish habitat from low to high sensitivity (based on the Department of Fisheries and Ocean's risk assessment approach). Construction Power alternative routes were found to cross a total of 15 watercourses.

The Construction Power Transmission Line Route Option 1 had fewer crossings (5) than Route Option 2 (10), and most crossings on both lines were of low sensitivity (e.g., wetland/bog drainages) with only a few of moderate-high (e.g., Nelson River) or moderate sensitivities (e.g., Butnau River). Route Option 2 crossing of the Butnau River was relatively close to Butnau Lake and the channel was considerable wider than where Route Option 1 crossed the Butnau River (80 m and 20 m, respectively). Considering the similarity in habitat at the stream crossings, the preference for Route Option 1 is based on the lower number of stream crossings as compared to Route Option 2.

Terrestrial Environment

Terrestrial Habitat, Ecosystem and Plants

Both Construction Power routing options traverse relatively similar terrestrial habitat types. Both routes are dominated by black spruce tree cover and the ecosite types are mainly blanket or veneer bogs. At the south end of both routes, low shrubby vegetation becomes more plentiful and this is particularly evident on Route Option 2, which has the low vegetation extending along approximately 30% of the route.

From a terrestrial habitat, ecosystem, and plant perspective, there are no major concerns with either of the two construction power routing options. Route Option 1 is the slightly preferred route from a terrestrial ecosystem perspective since it is expected to create less fragmentation and have lower effects on ecosystem diversity.

Route Option 1 is the slightly preferred option in terms of potential fragmentation effects. It is the shorter route, which produces a smaller increase to total linear feature density. Both routing options would have similar core area effects since they both fragment three core areas into six core areas with neither alternative producing a clearly preferable core area configuration. However, Route Option 1 follows an existing trail for approximately 3.5 km, which may create less potential for increased access than Route Option 2.

Route Option 1 is the preferred option in terms of potential ecosystem diversity effects because it affects a lower total area of terrestrial habitat, includes the highest proportion of common habitat types and has the smallest area in priority habitat types.

Neither routing option is preferred for priority plants. Endangered, threatened or provincially rare plants are not expected to occur along either of the routes. Elegant hawk's-beard (*Crepis elegans*), the only provincially rare to very rare terrestrial plant found during field studies in the region, was not observed along either route. The number of locations where the remaining regionally rare or range limit plants were found during field studies was low and sufficiently similar given the sampling effort so that neither alternative was preferred. Route Option 1 had more species of particular interest to Keeyask Cree Nations because it had higher proportions of the common and uncommon habitat types, which is where most of these species are found.

Wildlife

Construction Power Route Option 1 is preferred with respect to amphibians largely because:

- Route Option 1 requires fewer crossings of riparian-edge habitat (streams and waterbodies) which is known to support a slightly higher abundance of amphibians.

- Route Option 2 is sited in closer proximity to a greater number of lakes and other waterbodies than Route Option 1. Although fish-bearing waterbodies are not considered preferred amphibian habitat in the Project Study Area, there are usually higher numbers of other wetlands adjacent to lakes which can be preferred amphibian habitat.

Construction Power Route Option 1 is preferred with respect to birds partly because it has more black spruce, which typically supports lower bird densities. Route Option 2 has more (about double) low vegetation and more young regeneration. Low vegetation has a more diverse vegetation structure and is able to support a variety of species, particularly those songbirds that nest on the ground or in shrubs (e.g., white-throated sparrow and dark-eyed junco). Route Option 2 is longer, crosses more streams and has issues regarding Nelson River crossing. As a result, more breeding bird (particularly songbird) pairs would potentially be disturbed along Route Option 2 than Option 1.

Surveys revealed a higher diversity of birds at survey stops adjacent to or in riparian edge habitats. Stream or waterbody crossings of the Construction Power lines increase the potential for disturbance to riparian edge habitats and the bird communities they support. Route Option 1 crosses nine streams/waterbodies and Route Option 2 crosses 11 streams/ waterbodies.

Based on field studies, mapping, literature, and professional judgment, Construction Power Route 1 is preferred from a mammal's perspective. Construction Power Route 1 is marginally preferred for moose because potential moose habitat loss would be lower and there would be less fragmentation along the slightly shorter route. Construction Power Route 1 is highly preferred from a caribou perspective because it would not cross any potential calving and islands compared with five islands on Construction Power Route 2. Neither alternative is preferred for listed species; no site-specific habitat differences were observed for little brown myotis or wolverine. Wolverine tend to occupy large home ranges, and because the separation distance between the proposed alternatives is so small geographically, the alternate placement of Construction Power Route 1 or 2 would make little difference concerning habitat or fragmentation effects. Construction Power Route 1 is also the slightly preferred option for other mammals because it has fewer potential fragmentation effects as it is the shorter route, and because potential habitat loss and access effects would be slightly less on Construction Power Route 1 than on Construction Power Route 2 because the diversity of mammals is somewhat lower and less riparian habitat would be crossed on Construction Power Route 1 than on Construction Power Route 2.

There is some variation in the amount of water along the routes. Construction Power Route Option 2 is routed near six small- to medium-sized lakes, while Route Option 1 passes near two medium-sized lakes. Also, the Butnau River crossing on Option 2 is an area of desirable wildlife habitat for both waterbirds and aquatic mammals. The wet area between Joslin and

Gillrat lakes mentioned earlier could be an important area for amphibians. There is, however, a considerable amount of similar habitat in the Keeyask Project Study Area.

6.2.3.3 Socio-economic and Technical Considerations

Socio-economic Environment

Environmental and heritage studies indicated a preference for Construction Power Transmission Line Route Option 1 due to the fewer number of water crossings and the shorter transmission line distance.

TCN's report notes comments from its Members on the Construction Power Line were generally limited because only Route Option 1 was identified for their consideration. Potential effects of the Construction Power Line identified by TCN are discussed in Chapter 7.

During workshops with FLCN there was discussion related to caribou habitat and it was noted that Route Option 1 crosses fewer caribou calving complexes and is further away from other complexes. Route Option 1 is preferred from a socio-economic perspective due to the shorter line length, fewer water crossings and fewer potential effects on caribou habitat.

Technical Considerations

An evaluation of the engineering constraints revealed that Route Option 1 of the Construction Power Transmission Line is preferred, largely because Route Option 2 would have towers on an island that would be flooded by the Keeyask Generation reservoir. Since the route options traversed similar habitats and landforms, the technical and costing differences were limited to items such as the Nelson River crossing.

6.2.3.4 Preferred Route

When comparing the Construction Power options with respect to the various study disciplines (aquatics, terrestrial habitat, mammals, birds, etc.), factors considered included proximity to wetlands, presence of wildlife habitat and habitat structure/fragmentation. Line length and number of stream crossings were among the key environmental parameters. It was also noted during workshops with FLCN that Route Option 1 would minimize potential effects on caribou. After consideration of the above factors, the Construction Power Transmission Line Route Option 1 was selected as the preferred routing option.

The Preferred Route for Construction Power Transmission Line will be a 21-km, 138 kV transmission line that will tap the existing KN36 transmission line between Ilford Station and the tap to Gillam Station (Map 2-2). The tap point along KN36 is approximately 33 km from

Ilford Station and 29 km from the Gillam Station tap. The width of the right-of-way will be 60 m (Figure 2-2). Information on the technical design of the Construction Power line is provided in Section 2.2.3.

6.3 CONSTRUCTION POWER STATION AND KEEYASK SWITCHING STATION SITES

The alternative sites for the Construction Power Station and Keeyask Switching Station were evaluated on the basis of environmental, technical and cost considerations similar to the transmission-related evaluation outlined in Sections 3.3.3 and 6.2. Among the key factors considered by Manitoba Hydro when identifying alternative station sites were:

- Length of transmission lines.
- Proximity to and potential conflicts with Keeyask Generation Station components.
- Technical considerations such as geology, soils and water crossings.

These factors were incorporated into station siting as described in the following sections.

6.3.1 Construction Power Station

Planning constraints dictated that the new Construction Power Station be located within the future Keeyask Generation Station construction and future operational load centre on the north side of the Nelson River (i.e., camp site, work areas and black start contingency).

The new Construction Power Station will be comprised of a new 138 kV to 12.47 kV permanent wood-pole/steel transformer station, located on the north side of the Nelson River. Map 2-2 illustrates the location of the preferred transmission line routes and Construction Power Station and Keeyask Switching Station. The Construction Power Station will be built on a 2.25-ha site (Site 6) that will be developed to accommodate three transformer banks T1-3 and will supply the necessary power (22 MVA) for the construction of the generating station (Figure 2-7).

An evaluation of environmental, technical and cost considerations revealed the primary factors influencing siting the Construction Power Station were mainly technical in nature.

6.3.1.1 Alternative Sites

Five alternative Construction Power Station sites (Construction Power Sites 2, 3, 4, 5 and 6; Map 6-2) were identified within the Project Study Area by Manitoba Hydro as being likely candidate options from the perspective of engineering design. Due to the new north access

road alignment from PR 280 to the Keeyask Generation Station site, four of the five sites (Construction Power Sites 2, 3, 4 and 5) were rejected as the access road would go through the center of these proposed sites. Site 6 is the preferred site for the Construction Power Station.

6.3.1.2 Environmental Features

A preliminary examination of the alternative transformer station sites did not reveal any substantial differences from an environmental perspective. An analysis of available information for the alternative sites, and information collected during field studies revealed that none of the five alternative sites included particularly sensitive habitat types or plant species of high conservation concern. The transformer station sites were not found to be in the immediate vicinity of any watercourses. There did not appear to be any notable differences with regard to wildlife (amphibian, bird or mammal) habitat.

The Preferred Site for the Construction Power Station (Site 6) was very similar to the other alternatives. No conditions existed at Site 6 that would preclude its development as the station site (i.e., no unique habitat existed, no bird or mammal nesting/calving areas were identified).

6.3.1.3 Socio-economic and Technical Considerations

Construction Power Station Sites 2, 3 and 4 were ruled out as the location of the road changed, resulting in the road traversing through the sites. Construction Power Station Site 5 was ruled out as it blocks the transmission lines from crossing the Nelson River, would require an access road to the site and is located in a work area. Four of the five potential Construction Power sites (Construction Power Sites 2, 3, 4 and 5) were therefore ruled out. No socio-economic or heritage concerns were identified with the remaining site (Map 1-1).

6.3.1.4 Preferred Site

Site 6 is the Preferred Site for the Construction Power Station. This selection was based primarily on costs and technical considerations associated with station design and operation; for example, transmission-related requirements and costs are reduced by developing the station south of the Nelson River.

6.3.2 Keeyask Switching Station

6.3.2.1 Alternative Sites

Several sites for the proposed Keeyask Switching Station were initially considered. The preliminary determination considered whether to locate the proposed switching station on the north or south side of the Nelson River within the Study Area. This determination by Manitoba Hydro planners as to general siting occurred in conjunction with the identification of seven alternative station sites.

6.3.2.2 Environmental Features

A preliminary examination of the alternative switching station sites did not reveal any substantial differences from an environmental perspective. An analysis of available information for the alternative sites, and information collected during field studies revealed that none of the five alternative sites included particularly sensitive habitat types or plant species of high conservation concern. There did not appear to be any notable differences with regard to wildlife (amphibian, bird or mammal) habitat. FLCN members indicated there was a rare habitat type (jack pine ridge) in the vicinity of the alternative switching station sites. It would be their preference to not have a tower sited on this feature. The preferred switching station does not conflict with the jack pine ridge location identified by FLCN. The location of the jack pine ridge is southeast of the final preferred switching station location.[9]

6.3.2.3 Socio-economic and Technical Considerations

Three of the alternative sites (Sites 5, 6 and 7) on the north side of the Nelson River were ruled out as the distance of the Unit Transmission Lines would double, and there would be a need for approximately four to 16 electrical crossovers. Site 5 does not provide enough surface area to develop a station and meet future requirements. If the Keeyask Switching Station could feasibly be developed on the north side of the Nelson River, Site 6 would be considered an excellent site with considerable potential for development of a switching station site, a potential future camp site and to provide an alternative location for the Construction Power Station. The soft terrain and limited size at Site 7 also negated it from further consideration as a potential location for the Keeyask Switching Station.

Four alternative sites on the south side of the Nelson River were identified (Sites 1, 2, 3 and 4). Switching Station Site 1 was ruled out by Manitoba Hydro engineers as an option as it is too close to the Nelson River and a dyke for the Keeyask Generating Station, i.e., it was in the flooded area. Site 2 had a considerable number of rocks throughout the site and is designated as the rock quarry site to be used for construction of the Keeyask Generating Station. Site 3 was considered an ideal location on the south side of the Nelson River. Site 4

[9] Refer to Section 4.4.2 of the Terrestrial Habitat, Ecosystems and Plants Technical Report for more information.

is also a viable location however it would require more work to level the site due to elevation changes. During workshops held with FLCN, a concern was noted that the proposed switching station location is close to a jack pine ridge an elevated area with an unusual type of cover. The preferred site for the Keeyask Switching Station was reviewed and it was determined the jack pine ridge is to the southeast.

6.3.2.4 Preferred Site

The preferred location for the new Keeyask Switching Station is Site 3 which is located on the south side of the Nelson River. Power from the proposed Keeyask Generating Station will be delivered to the Switching Station by the four (KE1-4) 138 kV Unit Transmission Lines (Map 2-2; Figure 2-8). The Preferred Site for the Keeyask Switching Station was selected primarily on the basis of aforementioned technical considerations. There were no notable differences between the various options with respect to socio-economic considerations. While Site 3 is the Preferred Site for development of the Keeyask Switching Station, Site 4 is considered a viable alternative location.

6.4 RADISSON CONVERTER STATION

As the modifications at the Radisson Converter Station are contained within the existing station fence line and will utilize existing foundation and oil containment infrastructure, there was no requirement to conduct an evaluation of alternatives. The assessment of potential effects of the upgrade to the Radisson Converter Station (as described in Section 2.2.7) is provided in Chapter 7 along with an evaluation of potential effects associated with the transmission lines and other infrastructure.

Potential effects associated with the preferred routes and sites and infrastructure, including mitigation measures to address those effects and any residual impacts, are addressed in Chapter 7 (Environmental Assessment and Mitigation).

Manitoba Hydro

Keeyask Transmission Project

Project Infrastructure

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

Infrastructure

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

Landbase

- Community
- Provincial Road
- Municipal Road
- Active Railway
- Abandoned Railway
- Resource Management Area
- First Nation
- Watercourse
- Waterbody

Coordinate System: UTM Zone 15N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: October 11, 2012

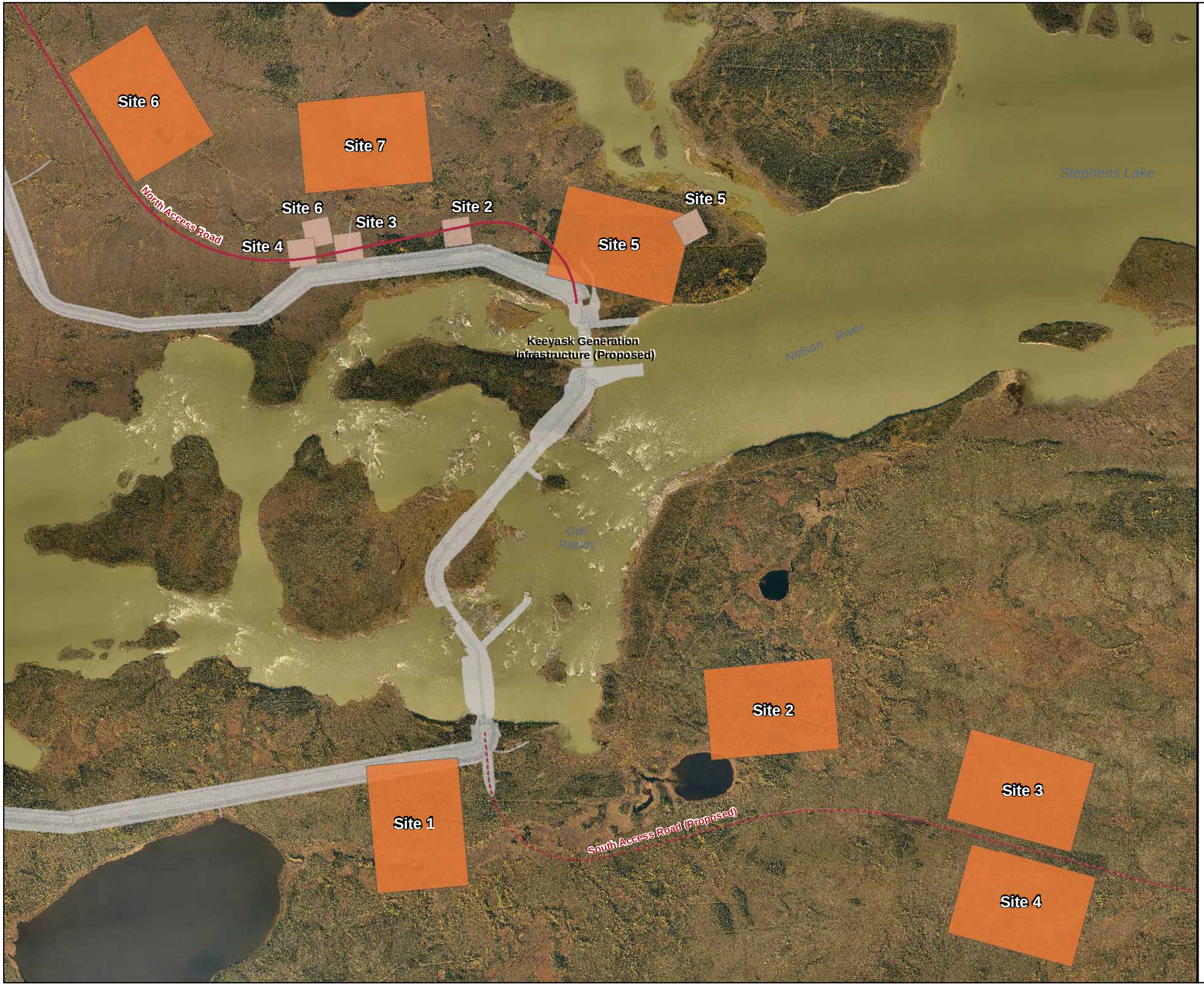
0 2 4 Kilometres
0 2 4 Miles

1:150,000

Project Infrastructure

Alternative Transmission Line Routes

Map 6-1



Manitoba Hydro

Keeyask Transmission Project

Project Infrastructure

- Alternative Construction Power Station Site
- Alternative Switching Station Site

Infrastructure

- Keeyask Generation Infrastructure (Proposed)
- South Access Road (Proposed)
- North Access Road

Coordinate System: UTM Zone 15N NAD83
Data Source: MBHydro, ProvMB, NRCAN
Date Created: September 18, 2012

N

0 250 500 Metres

1:20,000

Alternative Construction Power and Switching Station Sites

Map 6-2