Canadian Environmental Assessment Agency

Agence canadienne d'évaluation environnementale

Keeyask Generation Project

Comprehensive Study Report

Artist Rendition

April 2014

Canada

Cover art courtesy of Manitoba Hydro.

Catalogue No.: En106-126/2014E

ISBN: 978-1-100-23611-7

This document has been issued in French under the title
Projet de centrale hydroélectrique Keeyask – Rapport d'étude approfondie

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Executive Summary

The Keeyask Generation Project considered in this *Comprehensive Study Report* consists of a 695-megawatt hydroelectric generating station at Gull Rapids (Keeyask) on the lower Nelson River in Manitoba and associated transmission lines.

The proponent is a joint venture between four local Cree Nations, Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation, and Manitoba Hydro. The Project would be located approximately 30 kilometres southwest of Gillam, 60 kilometres northeast of Split Lake and 180 kilometres northeast of the City of Thompson and would consist of a power house complex, spillway, dams and dykes, cofferdams, access roads, borrow sources, a work camp, and supporting infrastructure. A 93 square kilometre reservoir would be created upstream of the principal structures, consisting of approximately 45 square kilometres of newly inundated lands. A transmission line would be developed, owned, and operated by Manitoba Hydro to provide construction power to the Project site. Manitoba Hydro would also build three new transmission lines to transmit electricity from the Keeyask Generation Project to an existing converter station for use in Manitoba and export markets (Figure 1-2).

The Project is designed to produce and deliver about 4400 gigawatt hours per year of energy. It will be used to meet Manitoba's demand, including expected future growth. Energy in excess of Manitoba's demand will be exported from the province.

To enable the Project to proceed, Fisheries and Oceans Canada and Transport Canada may issue authorizations under the *Fisheries Act* and the *Navigation Protection Act* (should approvals under be sought) respectively. These authorizations trigger the requirement for a federal environmental assessment under the former *Canadian Environmental Assessment Act* S.C. 1992, c. 37 (the former Act). The type of environmental assessment required is a comprehensive study, as mandated by the *Comprehensive Study List Regulations* of the former Act. These regulations require comprehensive study of projects that include "*…the proposed construction, decommissioning, or abandonment of a hydroelectric generating station with a production of 200 MW or more*" (Part II, Section 4).

This *Comprehensive Study Report* presents the Canadian Environmental Assessment Agency's (the Agency's) evaluation of the Project's environmental effects. This evaluation is based on the Agency's review of technical information provided by the proponent, environmental reports prepared by Aboriginal groups, advice from a Federal Review Team and provincial experts, and comments from Aboriginal groups and the public through various consultations.

The proponent identified and assessed potential impacts of the Project on valued environmental components representing aspects of the environment including aquatic ecosystems and habitat, terrestrial ecosystems and habitat, wildlife and wildlife habitat, and socio-economic factors.

This report presents the assessment of the following key valued environmental components: key aspects of the physical environment; fish and fish habitat, including water quality; terrestrial vegetation communities, wetlands, and priority plants; terrestrial wildlife and wildlife habitat; and human health (including country foods). The Agency's assessment also considered the effects of the Project and its impacts on the current use of land and resources by Aboriginal groups for traditional purposes, and on archaeological and heritage resources.

The Project could result in adverse environmental effects on fish and fish habitat, country foods and human health, birds, wildlife, wetlands,

and terrestrial habitats proposed to be flooded. Measures to reduce or eliminate these potential effects were incorporated into the overall planning and design of the Project.

A follow-up program is required to verify the accuracy of the environmental assessment and to determine the effectiveness of the proposed mitigation measures. The follow-up program will focus on country foods and human health, freshwater fish and fish habitat, water resources, birds and wildlife, wetlands, rare plants, and archaeological and heritage resources.

The Agency concludes that the Project is not likely to cause significant adverse environmental effects when implementation of the proposed mitigation measures, the follow-up program and adherence to conditions and requirements related to the necessary federal permits, authorizations and approvals are taken into account.

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List of Acronyms and Abbreviations

Agency	Canadian Environmental Assessment Agency
DFO	Fisheries and Oceans Canada
Former Act	*Canadian Environmental Assessment Act* S.C. 1992, c. 37
Keeyask Cree Nations	Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation
Minister	Minister of the Environment
Project	Keeyask Generation Project and Keeyask Transmission Project
VEC	Valued environmental component

1. Introduction

1.1 Project Overview

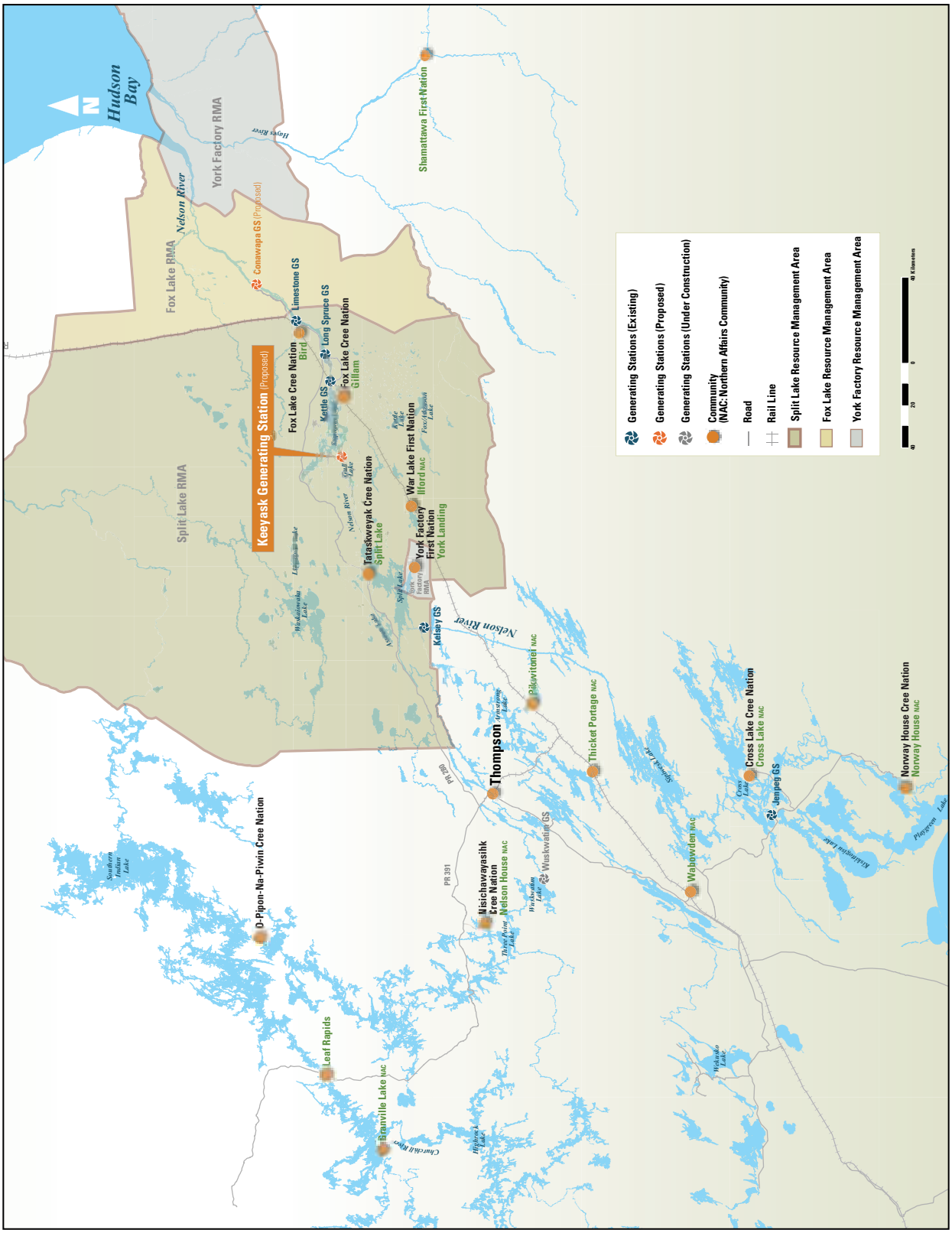
The Keeyask Generation Project considered in this Comprehensive Study Report consists of a 695-megawatt hydroelectric generating station at Gull Rapids (Keeyask) on the lower Nelson River in Manitoba and associated transmission lines.

The proponent is a joint venture between four local Cree Nations, Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation, and Manitoba Hydro. The Project would be located approximately 30 kilometres southwest of Gillam, 60 kilometres northeast of Split Lake and 180 kilometres northeast of the City of Thompson and would consist of a power house complex, spillway, dams and dykes, cofferdams, access roads, borrow sources, a work camp, and supporting infrastructure. A 93 square kilometre reservoir would be created upstream of the principal structures, consisting of approximately 45 square kilometres of newly inundated lands. A transmission line would be developed, owned, and operated by Manitoba Hydro to provide construction power to the Project site. Manitoba Hydro would also build three new transmission lines to transmit electricity from the Keeyask Generation Project to an existing converter station for use in Manitoba and export markets (Figure 1-2).

Table 1-1: Administrative Information

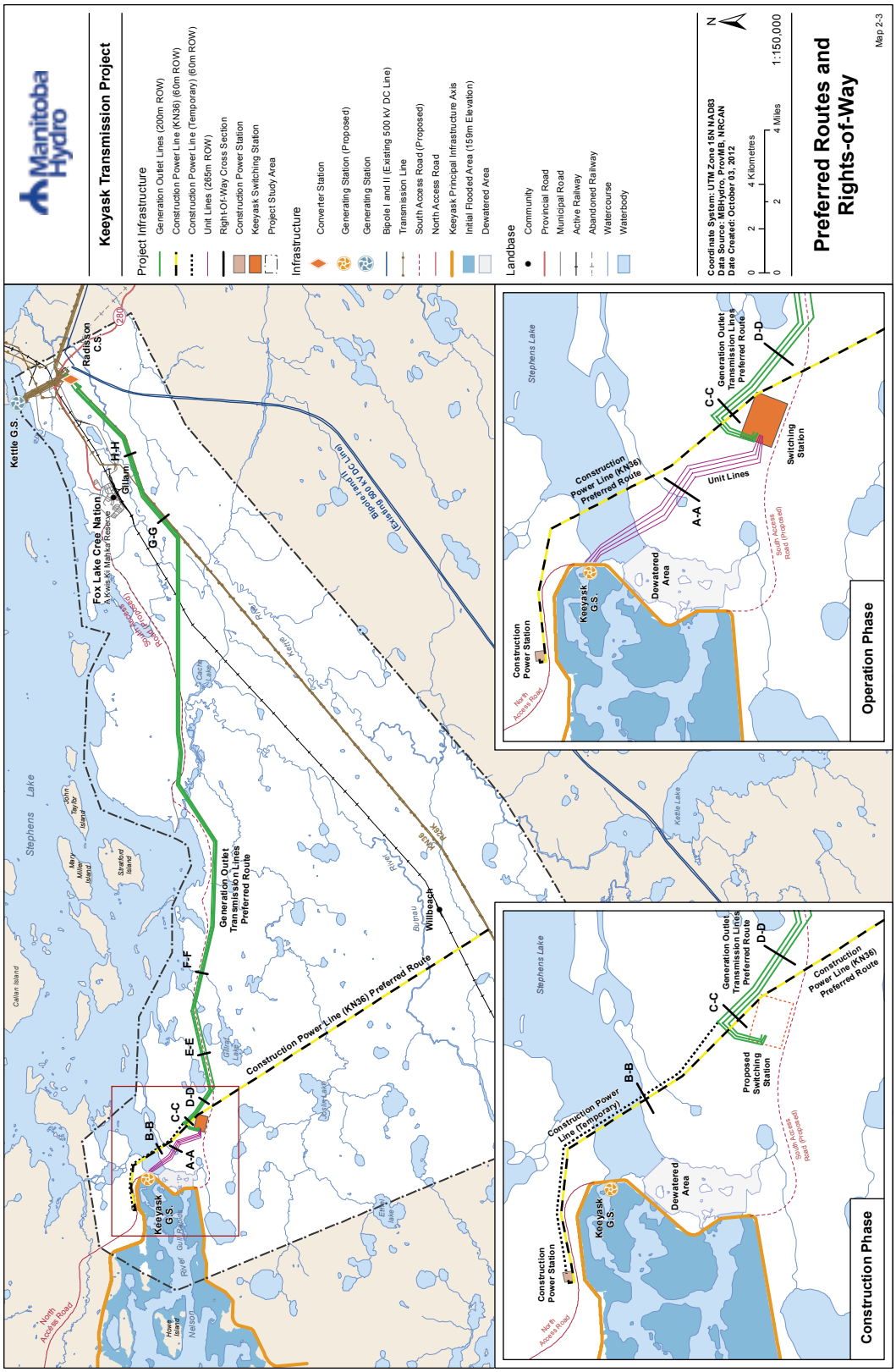
Keeyask Generation Project	*Keeyask Generating Station Proponent:* **Keeyask Hydropower Limited Partnership, 5900345 Manitoba Ltd.** **360 Portage Avenue (18th Floor), P.O. Box 815** **Winnipeg, MB R3C 0G8** **Attention: Ken Adams, President** **Email: kradams@hydro.mb.ca** *Environmental Assessment Contact:* **Manitoba Hydro Major Projects Assessment and Licensing Department** **360 Portage Avenue (15th Floor), P.O. Box 815** **Winnipeg, MB R3C 0G8** **Attention: Vicky Cole** **Email: vcole@hydro.mb.ca**
	Keeyask Transmission Proponent: **Manitoba Hydro** *Environmental Assessment Contact:* **Manitoba Hydro Licensing and Environmental Assessment,** **Transmission Planning & Design** **820 Taylor Avenue (3)** **Winnipeg, MB R3C 2P4** **Attention: James Matthewson** **Email: jmatthewson@hydro.mb.ca**
Federal Environmental Assessment:	**Canadian Environmental Assessment Agency** **Prairie and Northern Region** **CDI Building #425, 10115 100A Street** **Edmonton, Alberta, T5J 2W2** **Email: KeeyaskGeneration@ceaa-acee.gc.ca**
	Canadian Environmental Assessment Registry: **http://www.ceaa-acee.gc.ca/050/details-eng.cfm?evaluation=64144** **File Number: 64144**

Figure 1-1: Keeyask Generation Project Location



Source: Keeyask Hydropower Limited Partnership (2012).
Executive Summary to the Response to Environmental Impact Assessment Guidelines.

Figure 1-2: Keeyask Transmission Project Location



Source: Manitoba Hydro (2012). *Environmental Assessment Report*. Map 2-3, Preferred Routes and Rights of Way.

1.2 Environmental Assessment Process

The former *Canadian Environmental Assessment Act* S.C. 1992, c. 37 (the former Act) applied to federal authorities that contemplated certain actions that would enable a project to proceed in whole or in part. Such actions included authorizations, permits, and approvals.

An environmental assessment is required under the former Act as Fisheries and Oceans Canada and Transport Canada are responsible authorities as they may issue authorizations, permits or approvals in relation to the project pursuant to the *Fisheries Act* and the *Navigation Protection Act*.

Under the *Comprehensive Study List Regulations* of the former Act, this Project required a comprehensive study type of environmental assessment, as a component of the Project is described in section 4(b): "*…the proposed construction, decommissioning, or abandonment of a hydroelectric generating station with a production of 200 MW or more*" (Part II, Section 4).

This comprehensive study commenced in November 2011 and was completed under the former Act, as per the transition provisions of the *Canadian Environmental Assessment Act, 2012*, which came into force July 6, 2012.

The Canadian Environmental Assessment Agency (the Agency) is responsible for the conduct of the comprehensive study and prepared this comprehensive study report in consultation with Fisheries and Oceans Canada, Transport Canada, Environment Canada, Natural Resources Canada, Health Canada, and Aboriginal Affairs and Northern Development Canada.

The Project is also subject to Manitoba's *Environment Act*. Information on the provincial environmental assessment and the Clean Environment Commission hearings related to the Project can be found online at the Manitoba Conservation and Water Stewardship public registry.

The Governments of Canada and Manitoba conducted the federal and provincial environmental assessments cooperatively to the fullest extent possible.[1]

1.3 Purpose of the Comprehensive Study Report

This *Comprehensive Study Report* presents the Agency's analysis and findings of whether or not the Project is likely to cause significant adverse environmental effects. The analysis and findings are based on the Agency's review of the environmental assessment documentation prepared by the proponent; responses of the proponent to information requests from Aboriginal, public, and technical reviewers; and public and Aboriginal comments in relation to the Project.

The federal Minister of the Environment (the Minister) will consider this *Comprehensive Study Report* and comments received from the public and Aboriginal groups before releasing the environmental assessment decision statement. The Minister may identify additional information or public concerns to be addressed before issuing this statement. After issuing this statement, the Minister will refer the Project back to Fisheries and Oceans Canada and Transport Canada for appropriate action under Section 37 of the former Act.

1 Environment Canada (2012). *Keeyask Generation Project Cooperative Environmental Assessment Process*. Available from **www.ceaa-acee.gc.ca/050/documents-eng.cfm?evaluation=64144**. Note however that the federal-provincial cooperation encompassed the assessment of the Generation Project only. The federal and provincial assessments of the Keeyask Transmission Project were conducted separately.

2. Project Description

2.1 Project Context

2.1.1 Hydroelectric Development on the Nelson River

The Project is the latest hydroelectric development in a long history of such initiatives in northern Manitoba (Figure 2-1). The first hydroelectric development on the system was Kelsey generating station, constructed on the Nelson River in 1961. It provided 320 megawatts of power to the International Nickel Company of Canada mine and refinery at Thompson, Manitoba. A 927-kilometre high-voltage direct current transmission line was constructed to convey Nelson River power to markets in southern Canada and the northern United States.

In the 1960s, the first studies were undertaken that would eventually lead to the Keeyask Project, when the Government of Canada, the Government of Manitoba and Manitoba Hydro began examining options for generating power from the 27 metres of head on the lower Nelson River between Split Lake and Stephens Lake.[2] In 1974, a second generating station with 1220 megawatts capacity was completed at Kettle Rapids on the lower Nelson River.

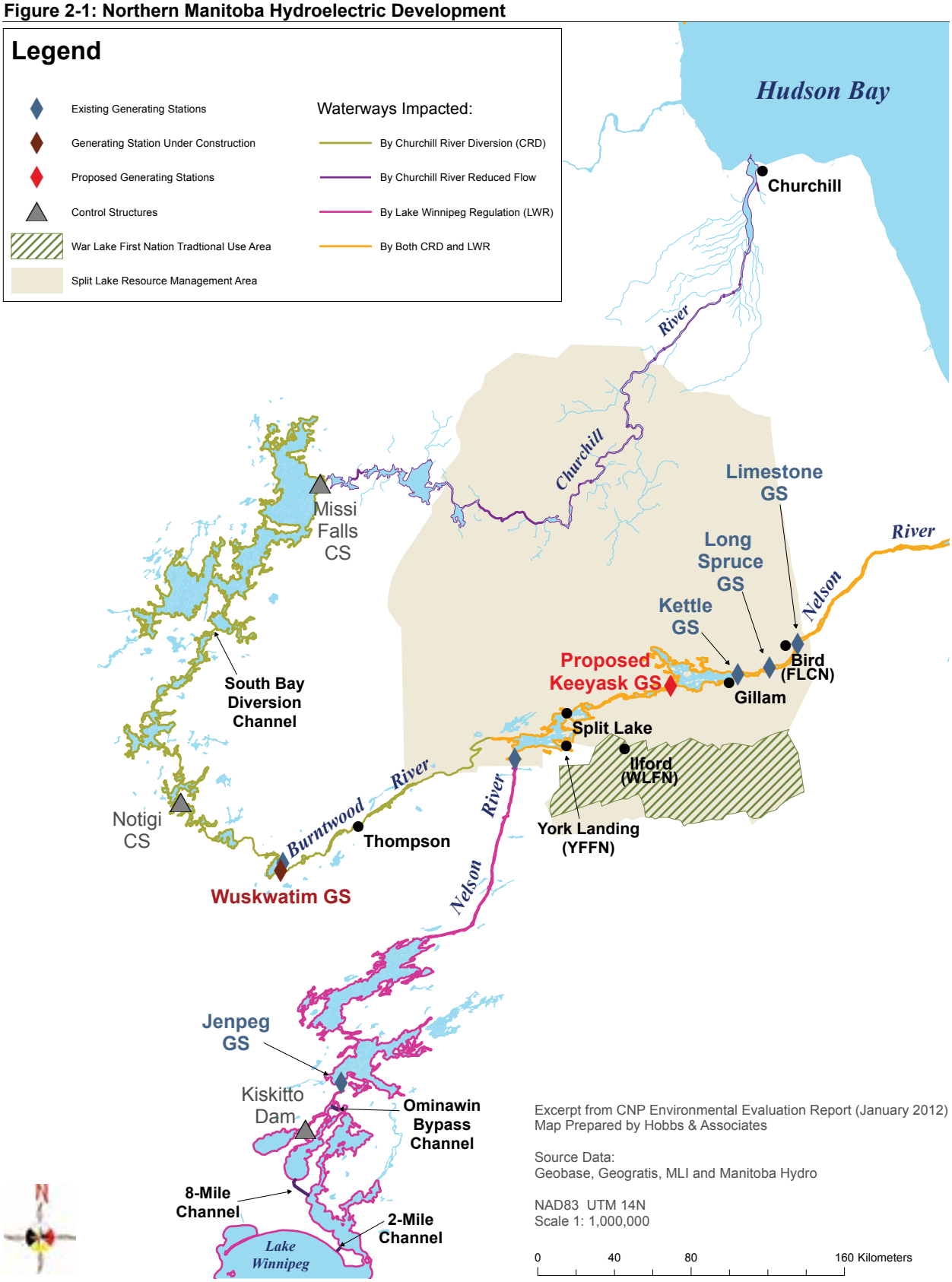
During 1971-1975, Canada and Manitoba initiated the *Lake Winnipeg, Churchill and Nelson Rivers Study* that produced a 13-volume report on the sociological, economic and environmental aspects of the proposed Lake Winnipeg Regulation and Churchill River Diversion projects. The purpose of these projects was to increase Nelson River flows and thus its hydroelectric power generation potential by increasing winter outflows from Lake Winnipeg into the Nelson River and re-routing water from the Churchill River into the Nelson River via the Rat-Burntwood River system.

In May 1973, Manitoba licensed the Churchill River Diversion and by 1977 it had reached full operating discharge. The Diversion increased mean flows in the Burntwood River at Thompson during 1979 to 1988 from 93 to 888 cubic meters per second, and caused substantial flooding in Southern Indian Lake and throughout the Rat-Burntwood system. The flooding directly affected five Aboriginal groups (Nelson House - now Nisichawayasihk Cree Nation, Split Lake – now Tataskweyak Cree Nation, York Factory First Nation, Cross Lake First Nation, and Norway House Cree Nation). They formed the Northern Flood Committee that signed the 1977 Northern Flood Agreement with Manitoba Hydro, the Government of Canada, and the Government of Manitoba. Subsequently, four of the five Aboriginal groups signed Comprehensive Implementation Agreements (CIAs), or a Master Implementation Agreement as it named for Norway House, under the Northern Flood Agreement.

Four additional generating stations were subsequently constructed on the Nelson River and its tributary, the Burntwood River. Long Spruce (1010 megawatts) began operation in 1977, Jenpeg (129 megawatts) in 1979, and Limestone (1340 megawatts) in 1990 on the Nelson River. Wuskwatim (200 megawatts) began operation in 2012 on the Burntwood River. Potential future projects and activities, including additional hydropower stations and transmission lines, are discussed in Section 4.13.

2 Head is the height that water falls in flowing from one location to another. Power production depends on head and flow rate.

Figure 2-1: Northern Manitoba Hydroelectric Development



Source: Cree Nation Partners (2012). *Keeyask Environmental Evaluation*. Map 1, p. 5.

2.1.2 Nelson River Contribution to Manitoba Hydro Electricity

Manitoba Hydro's hydroelectric generating stations on the Nelson River produce approximately 75 percent of the utility's electricity. The Keeyask Generation Project (the Generation Project) would increase Manitoba Hydro's 5406 megawatt total installed generating capacity by approximately 12 percent. In 2012-13, approximately 70 percent of electricity delivered by Manitoba Hydro was used within the province, and the remainder was exported to other provinces and the United States.

2.2 Scope of the Project

The scope of the Project for the purposes of this comprehensive study includes all construction- and operation-phase physical works and activities associated with the generation project including transmission lines.

2.3 Project Components, Activities, and Schedule

2.3.1 Components and Activities

The proposed Project consists of the construction of infrastructure, the decommissioning of temporary infrastructure, and the operation of project components listed in Table 2-1, located as shown in Figure 1-2 and Figure 2-2. Table 2-2 lists the project activities.

2.3.2 Project Schedule

Construction is expected to require approximately eight and a half years. The final three years of construction overlap with the first three years of project operation, during which powerhouse units would be commissioned into power production, temporary infrastructure decommissioned, and site restoration and clean-up completed. The proponent plans to continue operation and maintenance of the Project indefinitely, and has therefore deferred the planning and design of decommissioning measures to such time as and when the need for decommissioning arises to allow the regulatory, technical, and other circumstances prevailing at that time to be taken into consideration.

Table 2-1: Project Components

Component	Purpose/Detail
Main Infrastructure	
Powerhouse complex	Generate electricity with 695 megawatts capacity using 18 metres head, consisting of a control building, service bay, and seven turbines each with generator; intake with trash rack, bulkhead, and service gates; scroll case, and draft tube
Spillway channels	Pass normal and flood flows as needed to protect structural integrity of dams and dykes, equipped with seven bays, each having a vertical lift gate and electro-mechanical control and operation systems
Intake and discharge channels	Direct water into and away from the powerhouse and spillway, excavated through overburden and bedrock
Dams	Create a reservoir upstream of the powerhouse with three dams across Gull Rapids, consisting of a north dam (25 metres high and 100 metres long, from the north dyke to the powerhouse), a central dam (28 metres high and 1600 metres long, from the powerhouse to the spillway), and a south dam (22 metres high and 565 metres long, from the spillway to the south dyke), each consisting of earth-fill embankment
Dykes	Contain water in the reservoir and limit flooding along both sides of the river in sections where ground levels are low with two dykes each consisting of earth-fill embankment, 11.6 and 11.2 kilometres north and south of the Nelson River respectively
Reservoir	Store water upstream of the powerhouse (length, 42 kilometres from the powerhouse to Clark Lake outlet; live storage volume, 81 million cubic metres; variable water level, from 158 to 159 metres above sea level and approximately six to seven metres above current Gull Lake water levels; area after initial filling, 93 square kilometres, comprised of existing waterway area, 48 square kilometres, and newly inundated area, 45 square kilometres; area increase from ongoing shoreline erosion during the first 30 years of operation, 7 to 8 square kilometres)
Transmission lines	Provide construction power (one 22 kilometre transmission line from the existing KN-36 138 kilovolt transmission line to the Generation Project construction site), transmit generated electricity from the powerhouse to Radisson Converter Station near Gillam, Manitoba (three 35 kilometre transmission lines in a single corridor), and provide backup construction power (via one 35 kilometre line that is scheduled for early construction)
Supporting Infrastructure	
Cofferdams and groins	Control water levels around work sites in the river and subsequently to be partially incorporated into the principal structures (nine rock fill and earth cofferdams plus two rock groins)
Floating ice boom	Initiate ice cover development upstream of Gull Rapids, used during construction and then removed, anchored to the riverbed approximately 3 kilometres upstream of the powerhouse and about 600 metres upstream of the location where the Nelson River splits into north and south channels
Borrow sites	Supply Project construction and operation materials, such as impervious fill, granular fill and crushed rock, rock fill, riprap and concrete aggregates. Most granular material will be sourced from the north side of Nelson River. Impervious material will be sourced from both sides of Nelson River. Most rock and bedrock quarry will be located within Gull Rapids and principal structure excavations.
Designated emplacement areas	Receive excavated materials not used for construction
Navigation facilities	Facilitate waterway access during construction and to support operation-phase activities such as environmental monitoring, waterways management, and reservoir clearing with boat launches and barge landings upstream and downstream of the generating station as required
South Access Road	Allow construction access to the south dyke construction site before access across the river is available, and operation-phase access between the generating station and Gillam where some of the workers are expected to live (length, 35 kilometres, comprising new road for 13.5 kilometres and upgraded road for 21.5 kilometres)
North Access Road (operation only)	Provide primary access to generating station construction site (road was constructed under the Keeyask Infrastructure Project)

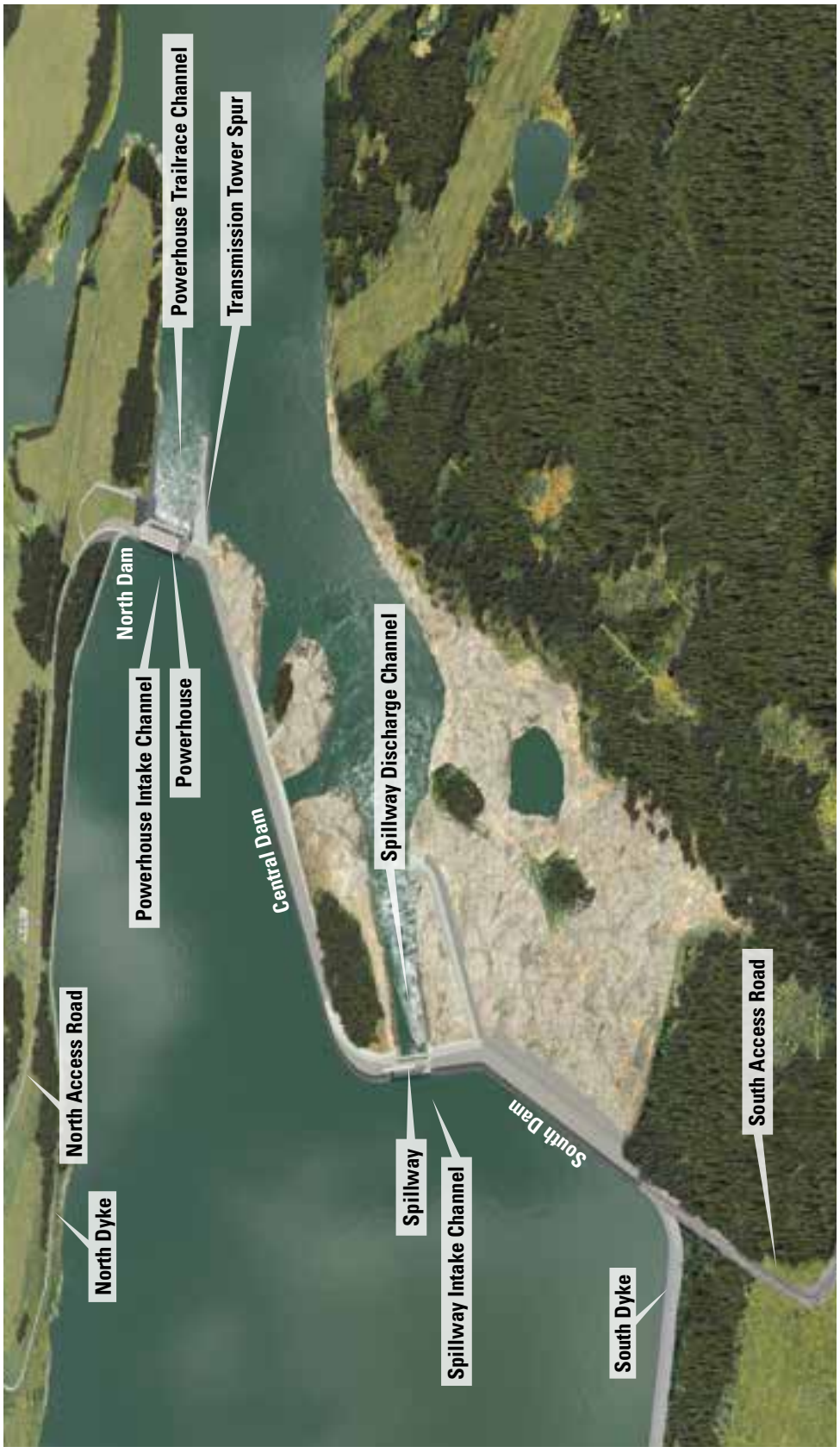
Table 2-1: Project Components continued

Component	Purpose/Detail
Access roads and haul trails	Allow access to borrow sites, boat launches, quarries, ice boom and dyke construction, future reservoir area land clearance activities, and maintenance sites
Portage route	Allow movement of boats between Stephens Lake reservoir and Keeyask reservoir on the north side of the Nelson River (length, 3.2 kilometres, partially along the North Access Road and other service roads)
Camp and work areas	Provide housing and work space for 2000 workers, including operation of 500-worker housing constructed under the Keeyask Infrastructure Project, located on approximately 120 hectares north of Gull Rapids, about 1.8 kilometres from the Nelson River
Temporary bunkhouse-trailer work camp	Provide housing for an additional 100 workers on the south side of the river during South Access Road construction, if needed

Table 2-2: Project Activities

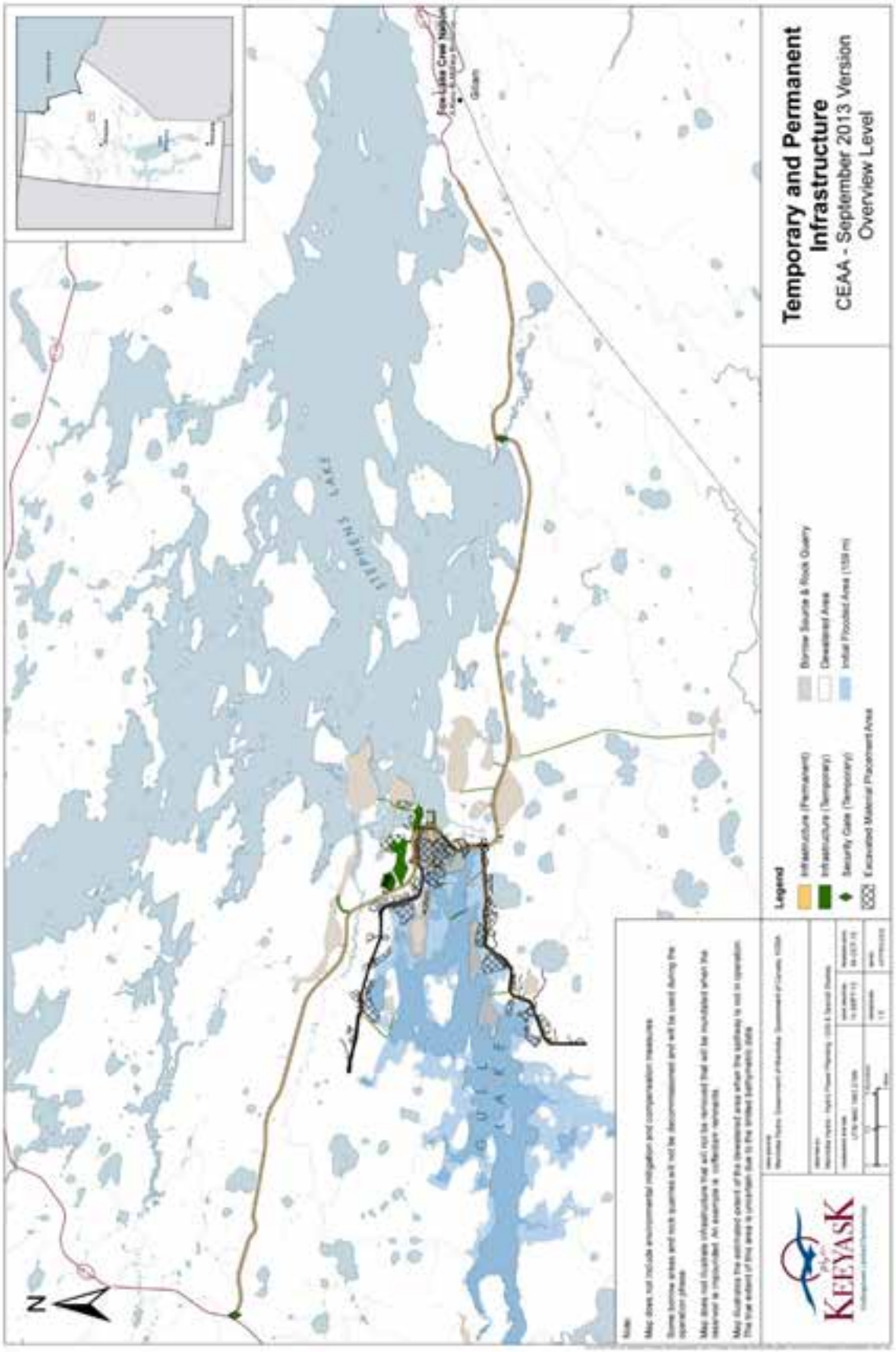
Construction Phase	Operation and Maintenance Phase
• Site preparation including clearing and grubbing; removal of vegetation from the future reservoir area • Development of borrow areas and quarries (excavation and blasting) • Temporary explosives magazine, handling, storage, and use • Installation of river ice boom • Installation of boat docking and launching facilities • Construction of access roads and temporary work camp facilities • Construction of cofferdams, north and south dykes, north, central and south dams • Construction of the generating station including intake and discharge channels and spillway • Construction of transmission lines • Development of a switching station and construction power station • Upgrades to an existing converter station • Decommissioning of temporary infrastructure including work camps and explosive and magazine storage sites • Construction site clean-up • Progressive rehabilitation of disturbed areas during multiyear construction	• Generating station operation in modified peaking mode • Generating station operation in special or emergency mode • Debris management • Operation of transmission lines, construction power station and switching station • Annual transmission line inspections • Transmission line maintenance • Vegetation management of transmission line right of way • Maintenance of site erosion and sediment controls • Operation and maintenance of roads and stream crossings • Use of borrow areas and quarries for maintenance • Fuel and materials management • Operation of main camp and work areas • Domestic sewage treatment and disposal • Solid waste management

Figure 2-2: Primary Infrastructure, Keeyask Generation Project



Source: Keeyask Hydropower Limited Partnership. (2012). Executive Summary. In: *Environmental Impact Statement*, p. 10.

Figure 2-3: Keeyask Generation Project Footprint Overview (Construction and Operation Phase)



2.4 Need for and Purpose of the Project

The need for the Project is to generate electricity to meet anticipated future demand in Manitoba and extra-provincial markets. The purpose of the Project is to generate an average of 4400 gigawatt-hours per year of hydroelectricity at Gull Rapids and convey it to existing transmission facilities.

2.5 Assessment of Alternatives

2.5.1 Alternatives to the Project

As directed by the former Act, paragraph 16(1)(3), the proponent is required to assess alternatives to the project as proposed. Alternatives to a project are functionally different ways to meet its need and purpose.

The Generation Project proponent, Keeyask Hydropower Limited Partnership, was created under the Joint Keeyask Development Agreement for the purpose of the Project and has indicated that no alternative course of action meets the need and purpose described in Section 2.4. The alternative to the Project is to not proceed and to cancel existing development arrangements and contracts. The costs and benefits to Keeyask Cree Nations resulting from the Project would therefore not occur, and Manitoba Hydro's generation of electricity would require alternative sources of supply.

2.5.2 Alternative Means of Carrying Out the Project

The former Act, paragraph 16(2)(b), requires a project proponent to consider alternative technically and economically feasible means of carrying out the project, and the environmental effects of these alternative means. A summary of alternative means considered for different project components is presented below. Additional details regarding each alternative means, and the key effects and considerations examined in selecting the preferred option are presented in Appendix A.

Alternative site and head options

Over the last 50 years, a range of alternative means of hydropower generation on the Lower Nelson River have been considered. These include high-head, intermediate-head, and low-head one-site options at Gull Rapids; and a low-head two-site option at Gull Rapids and Birthday Rapids. The low-head one-site option was selected for the Project based on concerns raised by Tataskweyak Cree Nation. This option avoids flooding on Clark Lake and Split Lake, of concern to Tataskweyak Cree Nation and York Factory First Nation, and addresses other engineering, environmental, economic, and stakeholder considerations.

Alternative dam alignments at Gull Rapids

Five alternative alignments for the dam structure were considered. Alignment locations were evaluated for construction risk and environmental considerations. The selected option has the least construction risk and the greatest potential for mitigation of downstream aquatic and terrestrial impacts.

Powerhouse discharge capacity options

A range of discharge capacities (maximum flows) through the powerhouse were considered for the high-head, intermediate-head, and low-head options, from 3600 to 5200 cubic metres per second. An intermediate value of 4000 cubic metres per second was selected as the optimal discharge capacity when Keeyask and Kettle generating stations are at their respective full supply levels.

Generating unit options

The number and type of generating units was determined based on discharge capacity; compatibility with other generating stations on the Lower Nelson; fish mortality rate; and cost effectiveness. The selected design, incorporating

seven fixed-blade vertical-shaft generating units, exhibited what was considered by the proponent to be the best combination of these characteristics.

Dyke alignment and height options
Potential north and south dyke designs for an operating range of 158 to 159 metres were evaluated. The selected alignments minimize creek crossings; reduce dyke height and fill volumes; minimize reservoir clearing and flooded area; minimize sensitive habitat impacts; avoid white birch habitat impacts; provide adequate drainage management; and reduce construction costs.

South Access Road alignment options
Three alternative routes were evaluated for the South Access Road connecting the Project to the town of Gillam. The most southerly route was selected to reduce stream crossings, road length, and sensitive terrestrial habitat impacts. The selected alignment relocates the route off of an existing dam to address driver and dam safety issues and reduce road construction and maintenance costs. The length will be approximately 35 kilometres, of which 13 kilometres will be newly constructed and 22 kilometres will be upgraded.

Alternative routes, generation outlet and back-up construction power transmission
Four alternative routes for the generation outlet / back-up construction power transmission corridor were identified on the basis of biophysical and socio-economic factors. The selected route is cost-effective, has the best technical solution, and is shorter. It has a smaller number of water crossings, has lesser impacts on uncommon and cultural plants and caribou, and provides for a construction power back-up transmission route that is spatially separate from the primary construction power transmission route.

Alternative sites, construction power station
Five alternative sites were considered for the construction power station. The selected site has no identified environmental, socio-economic, or heritage concerns.

2.5.3 Agency Assessment

The Agency carried out a review of the rationale and method for selecting preferred alternative means and is satisfied that the proponent adequately considered technically and economically viable alternative means of carrying out the Project, and identified preferred means that take into account differences in the environmental effects of the alternatives.

3. Scope of the Environmental Assessment

3.1 Introduction

Scoping establishes the limits of the environmental assessment and focuses the study on relevant factors and concerns.

3.2 Factors to Be Considered

Pursuant to *Canadian Environmental Assessment Act* S.C. 1992, c. 37(the former Act), subsections 16(1) and 16(2), the following factors were considered as part of the comprehensive study:

- purpose of the Project
- alternative means of carrying out the Project that are technically and economically feasible, and the environmental effects of such alternative means
- environmental effects of the Project, including environmental effects of malfunctions or accidents that may occur in connection with the Project, and any cumulative environmental effects likely to result from the Project in combination with other projects or activities that have been or will be carried out
- capacities of renewable resources that are likely to be significantly affected by the Project to meet present and future needs
- the significance of these environmental effects
- comments from the public and Aboriginal groups received in accordance with the former Act and its Regulations
- measures that are technically and economically feasible that would mitigate significant adverse environmental effects of the Project
- the need for, and the requirements of, any follow-up program associated with the Project

The former Act, subsection 16(1)(e), also requires assessment of the need for the Project (see above, Section 2.4); an evaluation of alternatives to the Project (see above, Section 2.5); and an examination of the benefits of the environmental assessment to Canadians (see below, Section 8).

Under the former Act, an environmental effect is:

- any change that a project may cause in the environment;
- the effect of any such change on
  - health and socio-economic conditions;
  - physical and cultural heritage;
  - current use of lands and resources for traditional purposes by Aboriginal persons;
  - any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance; and
- any change that the environment may cause to a project.

Further to the requirements under the former Act, the *Species at Risk Act*, section 79, requires responsible authorities to identify adverse effects of projects on listed species and their critical habitats and residences, and to ensure that these effects are mitigated, using measures consistent with species recovery strategies and action plans, and monitored.

3.3 Scope of the Factors

For the purposes of identifying the potential for significant, adverse environmental effects, the environmental assessment focused on those components of the natural and human environment that have particular value or importance and are likely to be impacted by the Project.

The Canadian Environmental Assessment Agency's (the Agency's) review of project-related effects and assessment of their significance are summarized in Section 4 and Appendix C.

3.3.1 Valued Environmental Components

The proponent selected environmental and socio-economic VECs meeting the following criteria:

- overall importance and value to people whom the Project may affect or who have an interest in it
- importance to ecosystem functioning
- "umbrella" indicator species correlated with broader environmental effects
- amenable to scientific study and analysis of pre- and post-Project conditions
- subject to potentially substantial Project effects
- subject to regulation

At least one measurable parameter was identified for each VEC to facilitate quantitative or qualitative characterization of potential project effects and cumulative environmental effects.

The proponent also assessed project effects to other environmental components, not specifically defined as VECs, including aspects of the Project's physical environment and setting, rare species, and species favoured for use by local people. The Agency's analysis of the potential project effects and cumulative environmental effects on VECs incorporated these environmental components.

Keeyask Cree Nations considered the Project in relation to their own worldview, values and experience with past hydroelectric development, and their relationships with *Askiy*.[3]

3.4 Temporal Boundaries

Temporal boundaries were defined as construction and operation phases. The construction phase includes one year for transmission line construction and approximately eight years (2014 to 2022) for generating station construction. Activities to transition the generating station from construction to operation are scheduled for the final three years of the construction phase (for example, 2019 – 2022). These activities include commissioning of the seven generation units, decommissioning of temporary infrastructure, and site cleanup and rehabilitation. Initial generation of power from the first unit is expected in late year six (November 2019). The remaining six units are proposed to be brought into operation progressively over the following year (November 2019 to December 2020). The operation phase of the project is anticipated to extend indefinitely for at least 100 years.

3.5 Spatial Boundaries

Multiple spatial boundaries were defined by the proponent's biophysical environment assessment:

- The Project's footprint during construction and operation includes the physical works and associated activities where direct physical environmental effects are expected to occur (Figure 1-2 and Figure 2-3). This area includes the disturbance footprint for the proposed south access road, borrow areas, camp areas, cofferdams, the powerhouse, the spillway, the transmission towers and station site, and associated infrastructure and the flooded area.
- The Project's generalized Physical Environment Local Study Area, extending from just downstream of Clark Lake to the inlet of Stephens Lake (Appendix B, Figure B-1), within the open water hydraulic zone of influence.
- The proponent's generalized Physical Environment Regional Study Area, an area extending eastward from Thompson to the Limestone Generating Station.

Specific local study areas and regional study areas were defined for each valued environmental component (VEC). These are listed in Tables B-1

3 *Askiy*, also spelled *Aski*, is the word used by Cree people for "the living earth and all within and upon it"; "for the whole of the land, water (*nipi*), animals (*aweassisak*), plants including medicines (*muskikeya*), people (*Ininewak*), all other creatures, and the interrelatedness of all things." From, Keeyask Hydropower Limited Partnership (2012). Keeyask Cree Nations Worldview and Values. In: *Keeyask Generation Project: Response to [Environmental Impact Assessment] Guidelines*.

through B-3 and shown in Figures B-1 through B-5 in Appendix B.

The spatial boundaries of the local and regional study areas for each VEC were determined by the locations where potential project effects on the VEC were thought to be possible. Local study areas include locations of potential direct and more-localized indirect effects to a VEC. Regional study areas include locations of indirect effects at larger-scale, including cumulative effects. Potential project effects were then assessed within the local and regional study areas relevant to each VEC and effect type.

Table 3-1: Valued Environmental Components Considered in the Comprehensive Study Report

Aspect of the Environment/ Valued Environmental Component	Rationale
Aquatic Environment – assessed considering aspects of death of fish, permanent alteration of fish habitat, and destruction of fish habitat relative to the Fisheries and Oceans Canada's goal of providing sustainable and ongoing fisheries.	
Water quality	Changes to surface water quality affect the suitability of aquatic environment to support life. Water quality is important to Keeyask Cree Nations communities, health and wellbeing of humans, wildlife, and aquatic biota, and a major pathway for Project aquatic ecosystem effects. Surface water quality is subject to regulatory guidelines and restrictions.
Freshwater fish: Walleye (pickerel) (*Sander vitreus*), Northern Pike (jackfish) (*Esox lucius*), Lake Whitefish (*Coregonus clupeaformis*), Lake Sturgeon (*Acipenser fulvescens*) Fish habitat	Fish and fish habitat contribute to local fisheries and support ecological diversity. Species selected as valued environmental components require different habitats and will be affected differently by the Project. Lake Sturgeon is vulnerable to effects of hydroelectric development due to low population and habitat requirements, culturally and spiritually important to the Keeyask Cree Nations and other Aboriginal groups and important for limited domestic harvest. The species has special status as a heritage species in Manitoba, is designated endangered by the Committee on the Status of Endangered Wildlife in Canada, and is currently being considered for federal *Species at Risk Act* protection. Considered an indicator of effects on other riverine habitat-dependent species.
Terrestrial Vegetation and Habitat	
Ecosystem diversity	Ecosystem diversity refers to the biodiversity of an area at the level of ecosystems: the variety of ecosystems and the spatial extent and interrelationships among them in a particular area. Important to health, resilience, and the present and future benefits of regional ecosystems, which are fundamentally important to the proponent and the people of Manitoba and Canada. Indicators of diversity include habitat composition and maintenance of priority habitat types.
Wetland function	Wetlands are lands seasonally or permanently covered by shallow water or having the water table at or close to the surface. They are valued for their functions to convert sunlight into vegetation, create soil, protect shorelines, contribute to biodiversity, provide high-quality habitat not otherwise available for some plant and animal species, benefits to people. Fundamentally important to the proponent and the people of Manitoba and Canada. Indicators of wetland function include wetland type, and maintenance of key wetland types.
Intactness/fragmentation	Selected to indicate overall Project effects on ecosystems, habitats, and some species. Intactness condition and trends are evaluated using linear feature density (kilometre per square kilometre of roads or transmission lines) and core area measures (area left after buffering human features, an indicator of habitat availability to human-disturbance sensitive species). Fragmentation refers to reduced interior area size, isolated habitat, and increased disturbance exposure.

Table 3-1: Valued Environmental Components Considered in the Comprehensive Study Report continued

Aspect of the Environment/ Valued Environmental Component	Rationale
Priority plants	Defined as terrestrial plant species that are rare; of food, cultural, or other importance to Keeyask Cree Nations; federally or provincially important; listed as endangered or threatened; or classified globally rare or provincially very rare or rare. Effects generally assessed for species found during field studies as the percentage of known locations affected by the Project; and for species as common as their habitats, indirectly in terms of the ecosystem diversity and wetland function valued environmental components.
Birds and Bird Habitat	
Waterbirds (Canada Goose, Mallard), colonial waterbirds, raptors (Bald Eagle)	Game birds, including geese and duck species, are important to local people, subject to potential Project effects and regulated under the federal *Migratory Birds Convention Act*. Raptors, including Bald Eagle are valued by local communities. Colonial waterbirds, while not assessed as a VEC by the proponent, were considered in the assessment of potential project effects to birds regulated under the federal *Migratory Birds Convention Act*.
Bird species at risk (Olive-sided Flycatcher, Common Nighthawk, Rusty Blackbird)	Bird species listed under the *Migratory Birds Convention Act* and/or the *Species at Risk Act*. Potential project effects to these species require consideration of additional mitigations, beyond those proposed for birds in general.
Wildlife and Wildlife Habitat	
Caribou, Moose, Beaver	Very important to resource users, especially the Keeyask Cree Nations; harvested by residents and non-residents of the Keeyask region. Caribou evaluated on indicators including physical habitat loss, intactness and linear feature density. Moose evaluated on indicators including physical habitat loss, harvest, and gray wolf density. Beaver evaluated on the condition of physical habitat loss.
Human Health	
Mercury and human health	Influence of the Project on human health, considering effects of the Project to physical and biophysical components. Includes project effects to country food safety.
Resource Use	
Domestic fishing, domestic hunting and gathering (current use of lands and resources for traditional purposes) Commercial trapping	Influence of the Project on safe practice of traditional resource use, cultural practices of the Keeyask Cree Nations and community resource users. Current use of lands and resources for traditional purposes considered the proponent's domestic fishing, and domestic hunting and gathering VECs. Commercial trapping considered trapping of furbearers for the sale of furs.
Heritage Resources	
Archaeological and cultural resources	The Project's proposed physical alteration of the Keeyask landscape has the potential to alter, disturb or cause to be lost cultural and heritage resources. These are non-renewable resources that provide an historical record and cultural links of great importance to Aboriginal groups.

4. Environmental Effects Assessment

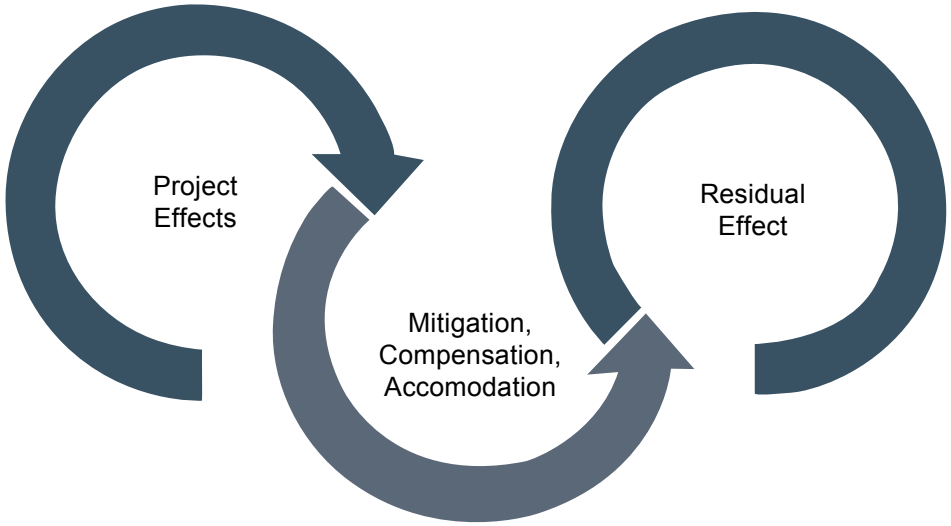
4.1 Methodology

The Agency, in collaboration with federal departments, evaluated the proponent's assessment of the Project's potential adverse environmental effects, proposed mitigation measures, and assessment of residual effects remaining following the implementation of mitigation, compensation, or accommodation. This analysis was based on information provided by the proponent, which included traditional knowledge provided by proponent Aboriginal partners, comments received from Aboriginal groups and comments received during public participation opportunities.[4]

The environmental assessments completed by the proponent compared predicted future conditions with and without the Project to determine the project impacts and described the mitigation measures incorporated in the Project to lessen adverse impacts. These include modifications to the Project's proposed siting, design, construction, and operation.[5]

To determine the overall significance of the effects (see Table 4.1), each residual effect is characterized in terms of its magnitude, geographic extent, duration, frequency, reversibility, and ecological and cultural context. The definitions used for these criteria are provided generally for all VECs in Table C-1, Appendix C.

For some VECs magnitude of the effect was more precisely defined. These definitions are provided in Table C-2. In addition to the above mentioned criteria, for some VECs such as fish and fish habitat, migratory birds and species at risk, the compliance with the relevant federal legislation protecting the specific component, such as birds listed under the *Migratory Birds Convention Act* and *Species at Risk Act*, is a key factor that has been considered by the Agency to determine whether an effect is significant or not. Where relevant, such factors have been discussed in the Agency's analysis.



4 Section 10 lists proponent environmental assessment documentation.

5 Additional information regarding the proponent's assessment methods may be found in their respective environmental assessment documents.

4.2 Physical Environment Setting

The Project's physical environment includes terrain composed of lakes and wetlands, mostly peatlands (bogs and fens) centred on the Nelson River. The Project is located in a relatively remote, rural and non-industrialised area, which is typically consistent with good to excellent air quality, low noise levels, and good water quality.

The boreal (subarctic) climate of the project area has long, very cold winters, and short, cool summers. Daily average temperatures are below freezing for over five months of the year, causing soil to freeze solidly to a considerable depth and surface waterbodies to be ice covered from November to May or June. Daily average temperatures exceed 20°C for only a few weeks in July. Summer warmth thaws only a shallow layer of soil, with permafrost occurring in many areas. Average annual precipitation is approximately 500 millimetres, of which 60 percent is rain falling in July and August and the remainder is snow in the winter months.

The Project will alter hydrologic conditions in the Nelson River by creating a reservoir at the project location, separating the Stephens Lake reservoir from the Nelson River mainstem below Clark and Split lakes. The landscape within the approximately 140 square kilometre project footprint will be changed from a remote, rural boreal river valley to a developed reservoir of approximately 93 square kilometres (including approximately 48 square kilometres of existing waterways) (Figure 4-1).

Fox Lake Cree Nation noted that, "Prior to the construction of dams, the Nelson River was a natural system. There were no barriers to the flow of water or to the movement of fish and aquatic animals. Our land was abundant with plants and animal species that included multiple types of berries and other edible and medicinal plants, caribou, moose, and other furbearing animals, fish such as Brook Trout, Sturgeon, etc., and migratory and other birds. Our people did not have to venture far to obtain vital food sources".[6]

Table 4-1: Significance Determination

Category	Refers to:
Not significant (minor or low)	Residual effects that are generally low in magnitude, site-specific or local in extent, short- to long-term in duration, low in frequency (once or intermittent), reversible and of low ecological context. These effects are not distinguishable from effects resulting from background physical, chemical, and biological processes.
Not significant (moderate)	Residual effects that are generally moderate in magnitude, local to regional in extent, medium- to long-term in duration, may occur at all frequencies (once to continuous), reversible or irreversible, and of moderate ecological context. These effects and consequences are distinguishable at the level of populations, communities and ecosystems. Follow-up or monitoring of these effects may be required.
Significant	Residual effects that are generally high in magnitude, regional in extent, long-term in duration, occur at all frequencies, irreversible, and of high ecological context. These effects and consequences bring structural and functional changes in populations, communities, and ecosystems. They may or may not be deemed justifiable in the circumstances. Significant residual effects, if accepted, require follow-up and monitoring.

Source: Federal Environmental Assessment Review Office (1994). *Reference Guide – Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects*. **www.ceaa-acee.gc.ca/default.asp? lang=En&n=D213D286-1**

6 pg. ii-iii, Mino Pimatisiwin, Fox Lake Cree Nation Environmental Evaluate Report (Fox Lake Cree Nation, 2012)

"Prior to the construction of dams, the Nelson River was a natural system. There were no barriers to the flow of water or to the movement of fish and aquatic animals. Our land was abundant with plants and animal species that included multiple types of berries and other edible and medicinal plants, caribou, moose, and other furbearing animals, fish such as Brook Trout, Sturgeon, etc., and migratory and other birds. Our people did not have to venture far to obtain vital food sources."

Mercury and the Physical Environment

Mercury is released into the environment by natural and man-made processes. Atmospheric releases are deposited onto vegetation and waterbodies, absorbed by organic materials and soils, or washed into aquatic systems. Mercury is present in low concentrations in Canadian rivers and lakes, including the Nelson River and lakes near the proposed Keeyask generating station site.

Reservoir flooding often results in conditions favourable for biochemical processes that create methylmercury - the organic form of mercury. Methylmercury bioaccumulates in the food chain (fish and wildlife) and ultimately may impact people who consume country foods. Throughout the next sections of the CSR, the potential effects of mercury on the aquatic environment and living organisms, including humans, will be discussed.

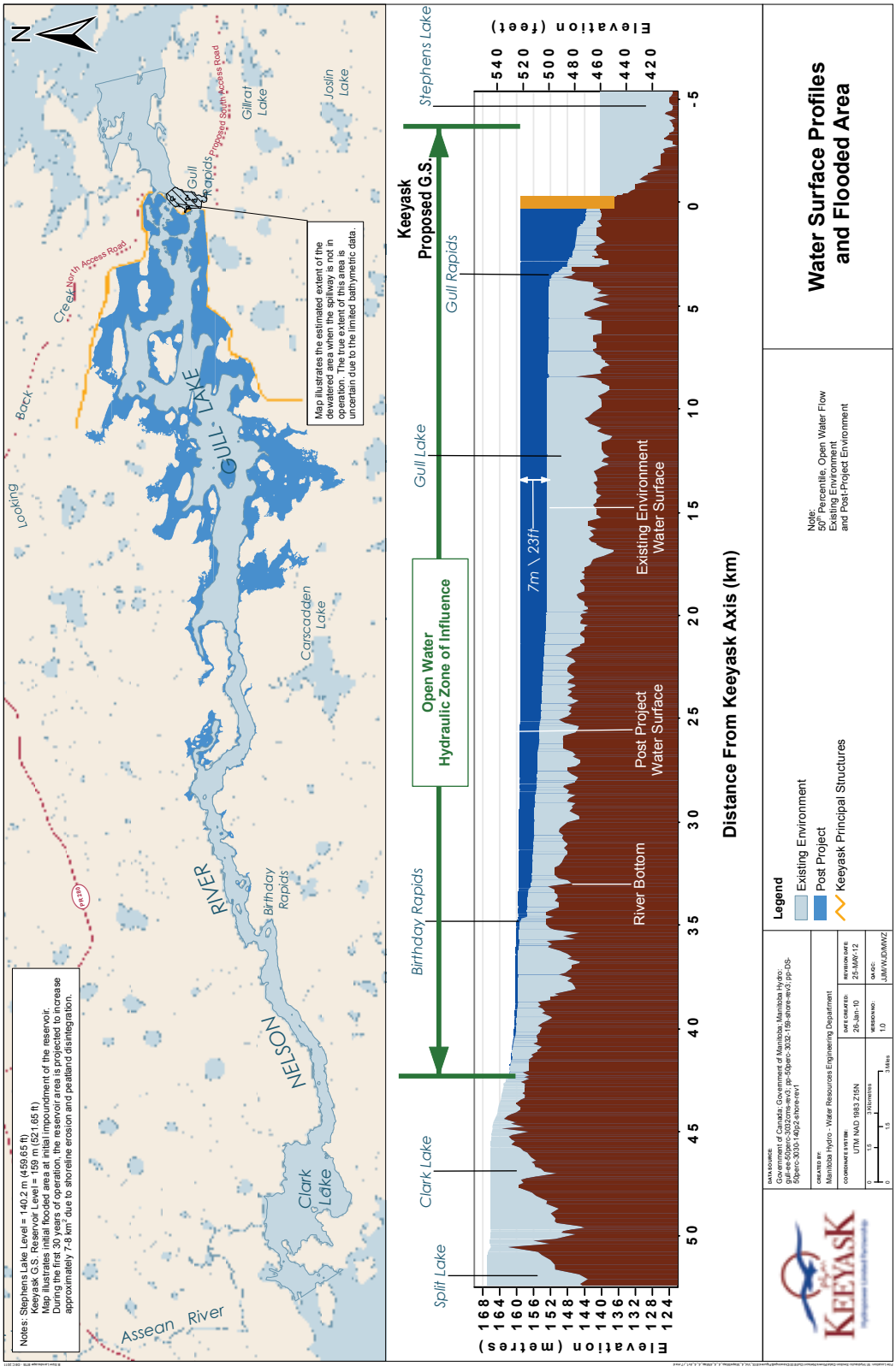
4.3 Aquatic Environment: Water Quality, Fish Habitat, and Fish

4.3.1 Description of Baseline Environment

The region supports a diverse array of aquatic habitats including lakes and manmade reservoirs, swift flowing river segments, off-current bays, sandy channels, rapids, small streams, and wetlands that are subject to periodic natural disturbances (including flooding). Over the last 50 years, hydroelectric development both up-stream and downstream of the Keeyask Area (see Section 2-1) has altered the natural Nelson River water regime creating flows that are generally higher with rapid variation in daily flows and water levels. Seasonally, there is less month-to-month variability and a reversal in flow, with higher winter flows and lower summer flows.

Six aquatic valued environmental components (VECs) were considered in the assessment of the aquatic environment, including: surface water quality, fish habitat, and four culturally important

Figure 4-1: Pre- and Post-Project Water Surface Profiles and Flooded Areas



Source: Keeyask Hydropower Limited Partners (2012). Section 4, Surface Water and Ice Regimes.
In: Physical Environment Supporting Volume, *Environmental Impact Statement*.

fish species (Lake Sturgeon, Walleye, Northern Pike, and Lake Whitefish). Boundaries of the local and regional aquatic study areas are defined in Table B-1, Appendix B.

Surface Water Quality

The overall water quality of the Nelson River mainstem within the study area is moderately nutrient rich, well oxygenated, and has a slightly alkaline pH. Water clarity is affected by suspended sediments (clays and silts) throughout the reach from Split Lake downstream to Stephens Lake. Total suspended sediment increases with flow in the Nelson River because of processes of shoreline and bedload erosion, and ice scour. Peatland disintegration and erosion of shorelines following forest fires are also sources of debris.

Dissolved oxygen was consistently within water quality objectives[7,8] for the protection of aquatic life along the mainstem of the Nelson River in open water and ice-cover seasons. However, Manitoba dissolved oxygen water quality objectives and Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life were not always met at ice-covered or lower flow areas in the north arm of Stephens Lake, and at some sites in the vicinity of York Landing, and access road stream crossings.

Aluminum and iron often exceed Manitoba Water Quality Guidelines Standards, Objectives, and Guidelines (MWQSOG) for the protection of aquatic life within the Nelson River mainstem, which is typical for many Manitoban rivers. Baseline monitoring indicated that ambient copper, selenium and silver occasionally exceed provincial standards; however, most other metals, including arsenic, boron, cadmium, chromium, lead, molybdenum, nickel, thallium, uranium, and zinc are consistently below the provincial standards.

Mercury was occasionally detected in baseline monitoring of water quality and, when detected, exceeded CCME guidelines for inorganic mercury. Measurements of mercury (total and methyl-mercury) downstream of the Keeyask area at the Limestone generating station between 2003 and 2007 were below the current MWQSOG for the protection of aquatic life.[9]

Fish Habitat

Gull Rapids, site of the proposed generating station, provides 488 ha of rapids habitat, representing 99 percent of the rapids habitat in the Project's aquatic area of impact. Gull Rapids are significant spawning areas for three of the VEC species, Lake Sturgeon, Walleye, and Lake Whitefish.

Upstream of the proposed Keeyask Generating Station, 3978 to 4657 hectares of riverine and riverine-like lake habitat, including the 6.59 hectare Birthday Rapids would be affected. Downstream of the Keeyask Generating Station, habitat includes riverine-like lake habitat created through reservoir backwatering from previous generation projects. This habitat provides spawning areas for fish including Northern Pike.

Fish species within the Study Area move upstream and downstream, and use inflowing streams to access feeding, rearing, overwintering, and spawning habitats. The movements of some fish species may be localized to stream reaches bounded by major features like Gull Rapids, although Gull Rapids is not likely a complete barrier to fish passage. Details of the magnitude,

7 Canadian Council of Ministers of the Environment (1999). *Canadian environmental quality guidelines*. **http://ceqg-rcqe.ccme.ca/**

8 Manitoba Water Stewardship (2011). *Manitoba Water Quality Standards, Objectives, and Guidelines*. Available from **www.gov.mb.ca/waterstewardship/water_quality/quality/website_notice_mwqsog_2011.html**

9 (Kirk and St. Louis, 2009)

timing, and importance of movements through Gull Rapids for the lifecycles and ongoing productivity of Lake Sturgeon, Walleye, and Lake Whitefish are uncertain.

Freshwater Fish

Thirty-seven (37) fish species, typical for the region, occur in the Keeyask Generation Project's aquatic environment regional study area. With the exception of Lake Sturgeon, native fish populations are reasonably robust and there is sufficient habitat to support them.

Lake Sturgeon is a Manitoba heritage fish species and is also identified as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Lake Sturgeon is currently being assessed for listing under the federal *Species at Risk Act*. Lake Sturgeon is culturally and spiritually important to Aboriginal people in the project area and is harvested for subsistence purposes.

The present Lake Sturgeon population upstream of Gull Rapids is about 7 percent to 23 percent of the minimum viable population.[10] Downstream of Gull Rapids, the population size is very low and cannot be estimated using standard survey methods. Recruitment is generally poor with only one relatively strong year-class produced in the last ten years. Commercial fishing for Lake Sturgeon is presently prohibited, recreational fishing is limited to catch and release, and Aboriginal harvest is unrestricted except at Landing River.

Although the population has been in decline, a significant amount of riverine habitat with spawning, rearing, foraging, and movement corridors is presently available to support Lake Sturgeon in the Keeyask area. Within the project effects area, Lake Sturgeon upstream of the proposed generating station may depend on Birthday Rapids and perhaps Long Rapids for spawning. Lake Sturgeon downstream of the proposed generation station may depend on spawning habitat in Gull Rapids.

Only one confirmed young-of-year rearing area is located upstream of the proposed Gull Rapids Keeyask generating station. Lake Sturgeon rearing areas downstream of Gull Rapids have not been identified. Foraging areas, both up and downstream are not considered limiting habitat features.

Fish species that either support or are capable of supporting commercial, recreational and Aboriginal fisheries include Walleye, Northern Pike, and Lake Whitefish. Effects to fisheries are discussed in section 4.7 Land and Resource Use.

4.3.2 Potential Environmental Effects and Proposed Mitigation

The construction and operation of the Project could have adverse effects on surface water quality, could permanently alter and destroy fish habitat that supports the four fish VECs, Lake Sturgeon, Walleye, Northern Pike, and Lake Whitefish, and could affect the health or result in the death of fish. These project impacts have been evaluated relative to Fisheries and Oceans Canada's goal of providing sustainable and ongoing productivity of commercial, recreational, and Aboriginal fisheries and the fish that support such fisheries.

Surface Water Quality

Project activities that may affect surface water quality include blasting, processing of aggregates, dewatering of cofferdams, stockpile runoff, discharge of effluents, sedimentation, erosion from vegetation clearing and soil disturbance, and accidental deposits of deleterious substances.

10 (Nelson, 2013)

Naturally occurring mercury contained in vegetation, organics, and soils may be released into a reservoir over decades through flooding and subsequent disintegration of thick peaty soils and discontinuous permafrost. Elevated mercury levels have been observed in created reservoirs and the waters downstream from past hydroelectric developments. These elevated levels may impact fish and are discussed below under Freshwater Fish species.

Effects from the construction and maintenance of the watercourse crossings for the generating station and the transmission lines will be mitigated through:

- the In-stream Construction Sediment Management Plan, which includes measures to direct river flows away from construction during generating station construction, to reduce the potential for erosion, and to work in the dry where possible;
- the Manitoba Steam Crossing Guidelines; and
- standard mitigation available from Fisheries and Oceans Canada to prevent serious harm to fish.

Mitigation associated with the accidental deposits of deleterious substances is discussed in section 4.10, Accidents and Malfunctions.

Fish Habitat

The following permanent effects on fish habitat would result from the creation of the generating station and reservoir:

- elimination of Gull Rapids, spawning habitat for multiple species
- reduction in the quality of spawning habitat at Birthday Rapids once the reservoir is filled
- change of primarily riverine habitat to reservoir habitat
- siltation in Gull Lake and mouths of inflowing tributaries affecting spawning by some species, including Walleye and Lake Whitefish
- change in flow through Gull Rapids (initially by flow diversion through the south channel, and subsequently to regulated flow through the turbines and spillway) eliminating upstream fish movement, modifying downstream movement, and impacting spawning, cover, and foraging in Gull Rapids
- elimination of the only known Lake Sturgeon young-of-the year rearing habitat in Gull Lake

Mitigation measures for these effects include:

- construction of a 5.3 hectare Lake Sturgeon and Walleye spawning shoal in the generating station tailrace with maintenance of water levels and rates to support spawning;
- construction of a 0.1 hectare Lake Whitefish and Walleye spawning shoal downstream of the tailrace. Upon removal of cofferdams, causeways, and temporary dykes, rock remnants will be left to enhance suitability as spawning habitat;
- the establishment of 3.0 hectares of Walleye and Lake Whitefish spawning habitats upstream of the generating station;
- construction of structures to maintain white water, turbulent conditions at Birthday Rapids to ensure high quality spawning habitat is retained;
- removal of debris from tributary stream mouths to maintain fish access to remnant upstream reaches in tributary creeks currently used by forage fish, Northern Pike, and White Sucker and other species as rearing habitat;
- incorporation of retrofit options to support fish passage that will be implemented if monitoring demonstrates that impediments to fish passage negatively affect sustainability and recovery of fish populations;
- establishment of 45 hectare young-of-year Lake Sturgeon habitat in the Keeyask reservoir; and
- establishment of a Lake Sturgeon stocking program to offset lost year classes of Lake Sturgeon during the 8.5 years of construction an until there is at least one successful generation of Lake Sturgeon, which is approximately 25 years, to assist persistence and recovery of Lake Sturgeon populations.

Freshwater Fish

The Project may affect fish through the death of fish and the permanent alteration to, and destruction of, fish habitat.

Fish may be killed during construction (Figure 4-2: Map – River Diversion, Stages I and II) by:

- the installation of cofferdams, dams, and dykes, which may bury fish eggs and larvae;
- stranding of fish upon dewatering of wetted areas behind cofferdams, dykes, and dams;
- blasting activities in and around water; and
- water pumping activities and possible entrainment or impingement of fish through improperly screened water intakes.

Mitigation measures for the above project construction activities include: adherence to timing windows for in-water activities to avoid sensitive times of year such as when fish eggs and larvae are present; implementing standard mitigation from Fisheries and Oceans Canada (DFO) to prevent fish entrainment and entrapment including screening water intakes according to DFO fish screen guidelines, and conducting fish rescue prior to dewatering and blasting; following best management practices for the use of explosives and handling and using potentially deleterious substances near water; controlling effluent quality; and stocking of Lake Sturgeon.

During operation, fish passage through the turbines and the associated blade strikes may result in the injury or death of fish. The generation station design incorporates trash racks that exclude the largest fish and turbines that include features designed to reduce harm to fish passing through them.

The death of fish resulting from impingement on trash racks and passage through turbines will be monitored, and requirements for additional mitigation, including additional fish exclusion measures, will be determined by DFO in consultation with the proponent and other stakeholders.

Intermittent flow, with rapidly varying water velocities and water levels, could kill eggs and larvae, and strand fish either in the reservoir or downstream, including in the tailrace and spillway spawning and rearing habitats. Replacement spawning habitat created in the station tailrace could be less effective than required because of the highly variable flow. To increase effectiveness of tailrace replacement habitats, two turbines will operate continuously during spawning periods to provide suitable downstream flow through the tailrace. The spillway will operate as long as required to provide suitable flow over remnant habitat when use coincides with spawning.

Two escape channels would be excavated in the former Little Gull Lake area to protect Northern Pike from winterkill due to low oxygen levels.

4.3.3 Government, Aboriginal, and Public Comments

Fox Lake Cree Nation did not agree with the VEC fish species approach as it does not consider the larger fish community and interactions among the species that are important in their consideration of sustainable fisheries. Burbot, for example, was not included as a VEC by the proponent. The proponent felt their selection of VECs included fish species that used a range of habitats and could therefore be used as representatives for effects to other species not specifically assessed.

Surface Water Quality

Aboriginal groups, including Norway House Cree Nation, and Cross Lake First Nation and Pimicikamak, expressed concern about shoreline erosion and its effects on aquatic habitat, and the apparent lack of mitigation measures, e.g. rip-rap shoreline armouring. The proponent responded that instream components (e.g. principal structures, cofferdams) were designed to be stable and that the application of erosion protection along the entire shoreline is not economically feasible. Shoreline erosion (e.g. peatland disintegration

and release of organic sediments and pear, mineral sediment release) is expected to occur primarily within the first 15 years of reservoir operation, peaking in the first five years.

Freshwater Fish and Fish Habitat

Natural Resources Canada suggested that the proponent consider whether mitigation measures, such as the removal of soils from the reservoir clearing area to reduce the pool of organic material contributing to methylmercury levels in the reservoir would be feasible and result in reduced mercury levels in the reservoir. The proponent responded that such measures could result in increases in methylmercury in surface runoff from the disturbance of the soil and may not be feasible given the inaccessible nature of soils in floating peatlands in the proposed reservoir.

To support monitoring and adaptive management of methylmercury in the aquatic environment, the proponent agreed to consider the Natural Resources Canada request for the additional study of organic carbon and mercury in soils and vegetation in the area to be flooded by the reservoir.

Fox Lake Cree Nation expressed interest in the proposed fish and fish habitat offsetting plan. Cross Lake First Nation and Pimicikamak suggested that the proponent's proposed mitigations for fish and fish habitat, such as the placement of substrate to create young-of-the-year sturgeon habitat, should be considered in the environmental assessment as project components because of their environmental effects. DFO will consider Aboriginal concerns during its review of the fish and fish habitat offsetting plan as part of the regulatory process.

Shamattawa First Nation expressed concern regarding the effects of Nelson River hydro-development, including their concern with the genetic risks of stocking to sustain Lake Sturgeon in the Nelson River. Fox Lake Cree Nation members stated that prior to hydroelectric development, Lake Sturgeon were plentiful and were harvested by Cree Nations along the entire stretch of the lower Nelson River system, particularly at the mouths of the larger tributaries.

Public comments and questions focussed on project planning to avoid destruction of spawning habitat, habitat compensation, monitoring, and the effects of proposed fish stocking.

In response to aboriginal groups, the public, and Fisheries and Oceans Canada's concerns, the proponent defined a suite of habitat mitigation measures in the reservoir and at the generating station site to provide habitat to support all life history stages of Lake Sturgeon so that a self-sustaining population could be established and maintained. Stocking will provide needed support for maintenance and enhancement of the population while functional habitat was being established. The proponent indicated that in addition to stocking at the project site, Lake Sturgeon would be stocked at off-site locations that currently provide habitat to support all life history functions where the current small populations are limiting the potential for recovery. Candidate sites identified include the upper Split Lake area (i.e. in the Nelson River below the Kelsey generating station, the Grass River, and the Burntwood River downstream of First Rapids). The long-term goal of the stocking program is to establish self-sustaining populations that are not reliant on stocking in perpetuity. In response to concerns that conservation stocking could result in negative genetic effects to Lake Sturgeon populations in the Keeyask area, the proponent indicated that population benefits outweigh the concern.

York Factory First Nation indicated that concerns regarding success of mitigation could in part be addressed through an appropriately funded and scoped community-based Aboriginal Traditional Knowledge monitoring program. Results of the Traditional Knowledge monitoring program

would need to be meaningfully incorporated into the Project's follow-up programs. Fox Lake Cree Nation described community-based monitoring as a key means to address concerns raised by Aboriginal groups in consultation. Benefits of such monitoring would be in the provision of real-time, local monitoring for mitigation effectiveness. The proponent has committed to involvement of the Keeyask Cree Nations in the Project Environmental Protection Program, which includes monitoring programs (see Appendix G).

4.3.4 Agency Analysis of Residual Effects

A summary of the Project's residual effects on surface water quality, fish habitat and freshwater fish is provided in Appendix C, Environmental Effects Analysis Summary. With the application of mitigation measures outlined in Appendix F, there will be no or negligible residual effects on:

- water quality from the construction and operation of the Project from stream bank erosion, pollution, and sedimentation;
- Split Lake during generation station operation;
- the death of fish from fishing pressure during construction;
- fish habitat fragmentation or permanent alteration from south access road construction; and
- fish from winter stranding or permanent submergence of tributary mouths during generation station operation.

Residual Effects on Water Quality

The following residual effects on water quality are expected:

- Short-term increases in total suspended solids will occur during instream construction, with the largest increases being localized, immediately downstream. There will also be short-term increases in total suspended solids in nearshore areas during operation that will eventually decrease in most areas of the reservoir and for a number of kilometres downstream of the reservoir. These residual effects are considered low in magnitude as the effects will be localized in geographic extent with concentrations returning to baseline conditions or lower within one to two years.
- Increased nutrients, metals, organic carbon, true colour, conductivity and total dissolved solids, and decrease pH and water clarity will occur in nearshore areas due to flooding and peatland disintegration during operation. The increases will occur for the first fifteen years of operation of the reservoir, returning to baseline conditions after that time period. These residual effects are considered low in magnitude as the effects will be localized in geographic extent, with concentrations remaining below water quality guidelines in the main reservoir body, and returning to baseline after 15 years.
- The increase in methylmercury within the reservoir and downstream is considered a moderate magnitude residual effect as it will last for thirty years requiring monitoring and fish consumption restrictions (see residual effects section 4.8).

Residual Effects on Fish Habitat

Loss of fish habitat from the development of the generating station, creation of the reservoir, and downstream effects will be compensated through the establishment of functional aquatic habitat in the newly flooded reservoir and proposed offset habitat. Residual effects are anticipated as a result of the temporary negative effects resulting from initial destruction of habitat, less than optimal habitat expected following initial formation of the reservoir, and the delayed time lag as proposed compensation measures are brought on-line. These residual effects are considered moderate in magnitude, local in geographic extent and reversible.

Fish migration patterns will be permanently altered through the creation of the generating station. The degree to which this alteration will affect fish productivity is uncertain. The proponent will include retrofit options to provide for fish passage if monitoring demonstrates that fish passage is permanently impeded.

To achieve the goal of providing for the sustainable and ongoing productivity of commercial, recreational, and Aboriginal fisheries and the fish that support such a fishery, the proponent will be required by DFO to implement a suitable Aquatic Effects Monitoring Plan and Fish Habitat Offsetting Plan to counterbalance serious harm to fish.

Residual Effects on Freshwater Fish

Mercury accumulation in fish will limit the amount of Walleye and Northern Pike from the reservoir that could be safely consumed as a regular part of a healthy diet. The limitation on fish consumption will continue for 30 or more years. This will be mitigated by providing off system lakes (offset lakes for fishing) for domestic fishers. Residual effects on fish consumption are described in Section 4.8, Human Health.

The operation of the generation station will result in some fish mortality and loss of spawning habitat but should not impact fish populations. As a result, the residual effects on fish, except for Lake Sturgeon, while permanent, will be local in geographic extent and low to moderate in magnitude. This range in magnitude reflects the residual change in habitat that is likely to result in variable fish community composition and species over time. Decreases in year-class strength for species in Stephen's Lake that use the Keeyask rapids for spawning are expected to result from construction. Other species such as Northern Pike (jackfish) may benefit from the initial flooding of the reservoir upstream of the generating station.

Residual effects on Lake Sturgeon will depend on the success of the proposed suite of habitat mitigation measures and stocking programs. Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation all expressed concern about the effectiveness and therefore uncertainty regarding the proposed mitigations, which they consider in many cases experimental. This uncertainty was also expressed by Norway House Cree Nation, and Cross Lake First Nation and Pimicikamak.

Fisheries and Oceans Canada noted that the stocking program has incorporated key elements of other successful programs; however, they also acknowledged that stocking programs frequently do not meet their goals. Therefore the development and implementation of effective monitoring of stocking success and subsequent adaptive management would be imperative. The proponent has developed a draft Aquatic Effects Monitoring Plan to verify predictions, evaluate the success of mitigation, and implement any required contingency measures. York Factory First Nation noted that a strong monitoring program is absolutely critical to the success of Lake Sturgeon mitigation.

Fisheries and Oceans Canada indicated that even with the implementation of the proposed mitigation, there could be residual effects on the Lake Sturgeon population given existing and proposed developments on the Nelson River, the uncertainty associated with the proposed stocking program and habitat replacement success, and the ability of the monitoring program to allow adequate adaptive management.

The Agency is of the view that the residual effects on Lake Sturgeon will be local in geographic extent, reversible, and low in magnitude if the habitat mitigation measures and stocking program are successful because the population of Lake Sturgeon will be maintained and habitat to support this population will be established.

The Agency is confident that DFO has the regulatory tools to ensure that adequate monitoring and adaptive management will be implemented should the proposed mitigation measure not be as effective as anticipated. The Agency also notes the commitment made by the Manitoba Hydro to involve the Keeyask Cree Nations in the Environmental Protection Plan.

4.3.5 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse effects on water quality, fish habitat, and freshwater fish after taking into account the proposed mitigation measures and follow-up commitments of the proponent to monitor effects to the aquatic environment, including fish and fish habitat.

The Agency recommends that the Aquatic Effects Monitoring Plan and Fish Offsetting Plan required by Fisheries and Oceans Canada describe how the proponent will monitor for and mitigate effects on water quality, fish, and fish habitat during project construction and ongoing operation activities. The Agency further recommends that proponent actions under these plans, including monitoring the effectiveness of mitigation measures and determining the need for adaptive management, should be informed by community-driven Aboriginal Traditional Knowledge monitoring, as outlined by the Keeyask Cree Nations and committed to by Manitoba Hydro.[11]

4.4 Terrestrial Vegetation and Habitats

4.4.1 Description of Baseline Environment

Human activities, climate change, and fire influence habitat and ecosystem changes, with fire being the dominant natural factor shaping terrestrial Boreal Shield Ecozone habitat in the Regional Study Area (Figure B-3, Appendix B). This was highlighted by significant fires between June and September 2013, which affected 1 416 193 hectares (23.8 percent of the terrestrial Regional Study Area). This has been considered, where relevant, in the terrestrial effects assessment (Figure B-3: Study Zone 5, Appendix B).

The diversity of terrestrial ecosystems and habitat is important for regional ecological health and resilience.

Four VECs were considered in the assessment of terrestrial habitat and vegetation, including: ecosystem diversity, wetland function, intactness (fragmentation) of habitat areas, and priority plants.

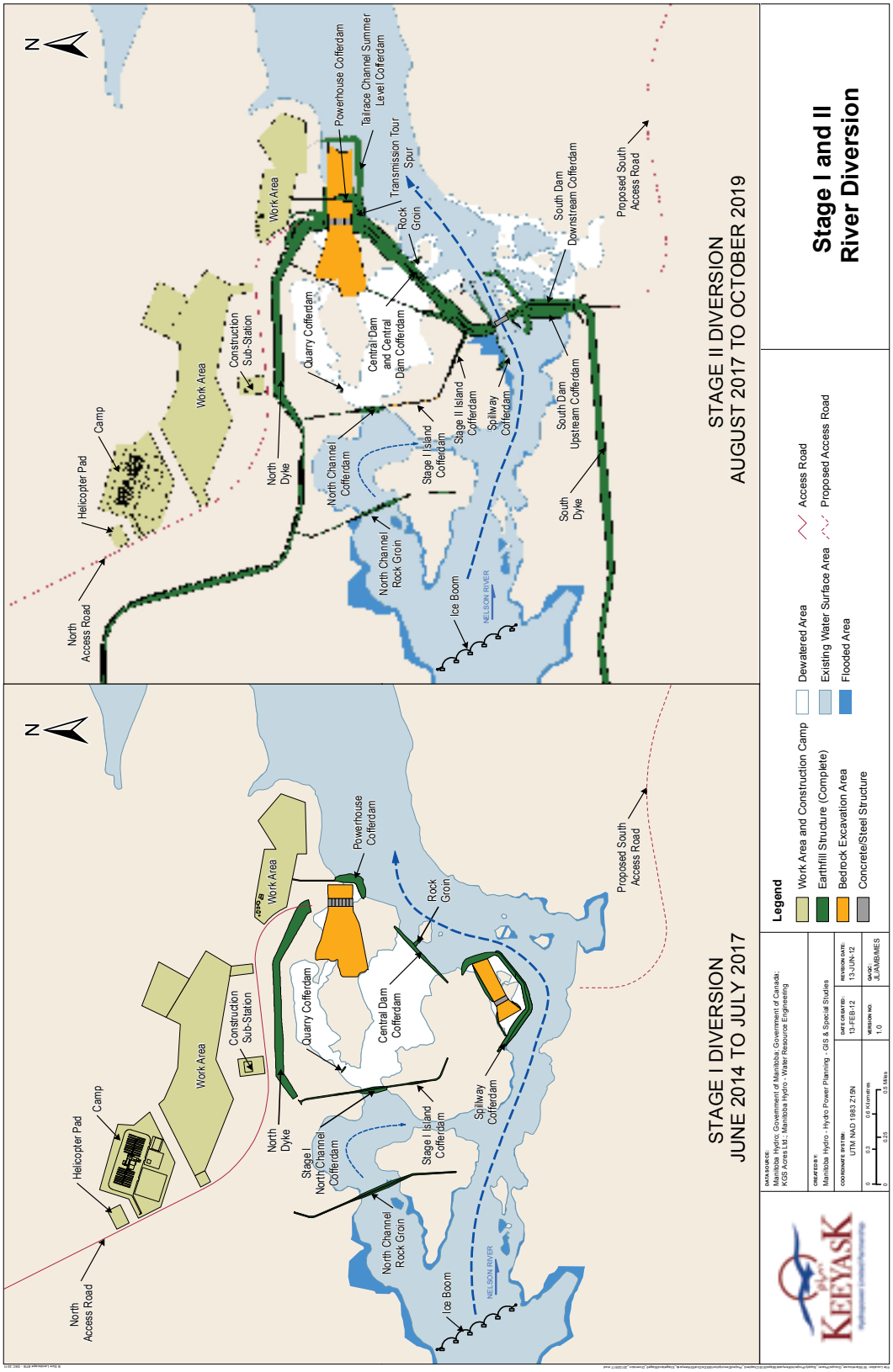
Ecosystem Diversity and Wetland Function

The diversity of terrestrial ecosystems and habitat is important for regional ecological health and resilience. Black spruce mixes and peatlands (fens and bogs) dominate the terrestrial habitat. Of the 53 stand-level habitat types identified in the Regional Study Area, 43 are considered priority habitat types.[12] These include stands dominated by balsam poplar, jack pine, white birch, tamarack and mixed-wood stands. Wetlands dominate the Regional Study Area, covering over 90 percent of the land base. Of the wetland types present, bogs are predominant (91 percent of wetland area) outside of the Nelson River's area

11 Manitoba Hydro, Shawna Pachal, letter dated October 17, 2013, to chiefs of the Keeyask Cree Nations, re: Keeyask Cree Nations Involvement in Environmental Protection Program – Keeyask Project.

12 Priority Habitat Types: habitats that are regionally rare (cover less than 1 percent of the land area) or uncommon (cover between 1 and 10 percent of the land area); have a relatively high number of plant species; are structurally complex; are highly sensitive to disturbance; have high potential to support rare plants; or are highly valued by people.

Figure 4-2: Map – River Diversion, Stages I and II



Source: Keeyask Hydropower Limited Partnership (2012). Map 2-12, Project Description Supporting Volume, *Environmental Impact Statement.*

of influence.[13] Any wetland sites located in the Regional Study Area identified as being globally, nationally or provincially significant by Ramsar, the *North American Waterfowl Management Plan*, Ducks Unlimited, or the Manitoba Heritage Marsh Program were considered by the proponent to be particularly important wetlands. Marsh, which account for approximately 1 percent of wetland area, is the only regionally important wetland type.

Intactness/Fragmentation

Intactness is a measure of the size of continuous habitat areas. Past and current linear features (e.g. roads, railways, transmission lines) and other permanent infrastructure reduce the size of continuous habitat areas, which may result in some animals either partially or completely avoiding areas that would otherwise be habitat for them. Of the approximately 12 000 square kilometres comprising the terrestrial portion of this Regional Study Area, there are 5 628 kilometres of linear disturbance, which is 0.47 kilometres per square kilometre, including roads and cutlines.

There are 111 core or large, intact habitat areas greater than 0.07 square kilometres (7 hectares). Approximately half of these core areas, or 57, are greater than 0.35 square kilometres (35 hectares) with a maximum size of 10 square kilometres (1 000 hectares). Several core areas were identified on islands in the Keeyask Area, which will be lost when the reservoir is filled.

Priority Plants

No plant species listed or assessed as endangered or threatened by the federal *Species at Risk Act*, Committee on the Status of Endangered Wildlife in Canada, or Manitoba *Endangered Species Act* was found by the proponent in the Regional Study Area. Three provincially rare to uncommon plant species were found in the Keeyask Generation Project footprint and the terrestrial plants Local Study Area: oblong-leaved sundew, rock willow, and shrubby willow.

The following plants are of particular interest to the Keeyask Cree Nations because of their cultural significance: sweet flag (locally known as ginger root), white birch, strawberries, northern Labrador tea, currant, gooseberry, cloudberry, red raspberry, dewberry, bog bilberry (blueberries), and rock cranberry. Most of these plants are widespread throughout the assessed Regional Study Area, with the exception of sweet flag, which was not found during project field studies, and Labrador tea, which was found at seven locations including islands within the proposed reservoir.

4.4.2 Potential Environmental Effects and Proposed Mitigation

The construction and operation activities that could affect the terrestrial VECs include land clearing for generating station development, the creation of new linear features across undisturbed habitat, and filling and operating of the reservoir causing direct loss of terrestrial habitat.

Ecosystem Diversity

Adverse changes to terrestrial ecosystem diversity include a reduction in the total number of native broad habitat types, the total number of stands of a type, or the total area of a priority habitat type.

The areas of regionally common or uncommon native broad habitat types would change very slightly with the Project. Black spruce, considered regionally common, will be reduced by 0.2 percent in the RSA. The removal of small stands of white birch mixed-wood and jack pine mixture on shallow peatland (bog and fen) priority habitat types would be reduced by less than 2 percent.

13 Project Hydraulic Zone of Influence: reach of river over which water levels and water level fluctuations caused by the operation of a particular project are measurable within the accuracy required for operation and license compliance.

The Project design mitigated some impacts to terrestrial ecosystem diversity by the selection of the low-head option reducing terrestrial flooding, routing the South Access Road to avoid important wetland habitat, locating excavated material in areas to minimize vegetation impacts and changing the boundaries of potential borrow locations.

Additional mitigation measures include minimizing clearing and disturbance within the project footprint, avoiding disturbance of areas adjacent to the project footprint, and focussing on the rehabilitation of the most affected priority habitat types. Appendix F provides additional mitigation measures specific to terrestrial ecosystem diversity.

Intactness/Fragmentation

Intactness is evaluated based on the total linear density (cumulative length of linear features within an area) and the number and size of core areas (undisturbed, continuous habitat). Construction of access roads, work camps, dykes, coffer dams, and transmission lines and stations; development of borrow areas and quarries; and removal of vegetation associated with reservoir clearing would affect the intactness of vegetation and habitat.

The magnitude of the average linear feature density for the entire Regional Study Area is predicted to remain between 0.40 and 0.60 kilometres per square kilometre as linear disturbances are reclaimed or developed into non-linear disturbances.

Loss of core areas would result from reservoir clearing, dyke construction, and coffer dam diversions. One core area slightly larger than 1000 hectares (10 square kilometres) and two core areas between 200 and 1000 hectares (2 and 10 square kilometres) would be removed. Several larger core areas on the north and south sides of the Nelson River would become smaller, including a 279 hectare core area on Caribou Island, the largest core area on an island in the Keeyask reach of the Nelson River. The number of core areas of at least 200 hectare size overlapping with the Local Study Area would be reduced from 13 to 12 and their combined area would decline from 115 308 to 106 754 hectares.

Project vegetation and habitat intactness would be mitigated by revegetating blocked cutlines and trails within 100 metres of the project footprint. Additional mitigation measures are presented in Appendix F.

Wetland Function

Up to 7765 hectares (0.7 percent) of wetlands in the Regional Study Area would be impacted by the Project. Within this area, 9 hectares of marsh will be lost. A 12 hectare marsh would be developed outside of the Keeyask hydraulic zone of influence (off the Nelson River and Keeyask reservoir) as mitigation. Additional mitigation measures regarding wetland function may be found in Appendix F.

Priority plants

There are 101 priority plant species in the Regional Study Area. Mitigation measures to avoid the disturbance, alteration or removal of these plants include design modification to the South Access Road, refining the boundaries of the potential borrow areas, locating the excavated material placement areas away from areas of concern, and minimizing clearing and disturbances within and adjacent to the project area.

Pre-construction rare plant surveys will be conducted. If plant surveys identify very rare species, the site will be avoided or the plants appropriately relocated. Additional mitigation measures associated with the presence of priority plants are located in Appendix F.

4.4.3 Government, Aboriginal, and Public Comments

Concerns identified during the federal review included timely restoration of project disturbances and protection of wetland functions in the compensation wetland proposed near the South Access Road. York Factory First Nation noted that they favour the approach to develop the 12 hectare marsh to offset project effects to marsh wetland in the Keeyask area.

Environment Canada recommended that Manitoba Hydro commit to active restoration of all project-related cleared areas, including access trails, within and beyond 100 metres of the project footprint and to 100 metre setbacks for all wetlands to buffer them from project disturbance. Restoration is to mimic nearby native vegetation communities and pre construction conditions. The proponent agreed to active restoration using native species where practicable and to incorporate recommended setbacks for wetlands not in the project footprint. For 12 on-site wetlands, the proponent stated that 100 metre buffers are not practicable but would use erosion control and smaller buffers. This was accepted by Environment Canada.

The proponent included a 100 m buffer along the South Access Road and associated water control structures to protect the 12 hectares of marsh that will be developed as mitigation. This 100 metre buffer will only be modified for road construction and to improve water flows for downstream aquatic mitigation. The road construction will be completed prior to establishing the mitigation wetland and will follow procedures described in the proponent's South Access Road Construction Environmental Protection Plan, which includes a sediment and erosion control plan.

4.4.4 Agency Analysis of Residual Effects

A summary of the Project's residual effects on ecosystem diversity, intactness (fragmentation) of habitat areas, wetland function, and priority plants is in Appendix C, Environmental Effects Analysis Summary.

Ecosystem Diversity

The project will result in a residual loss of less than 0.2 percent of regionally common or uncommon native habitat types (low magnitude) and a loss of less than 2 percent of the regionally rare white birch mixed-wood and jack pine on shallow peatland habitat types (moderate magnitude). Although some habitat will be permanently altered, no ecosystem (habitat) type is expected to be lost across the Regional Study Area, and terrestrial habitat present on the post-project landscape will be similar to those found on the current landscape.

Intactness/Fragmentation

The residual effects on intactness/fragmentation will be a permanent, non-reversible increase of less than 0.1 percent in the linear feature density of the Regional Study Area when compared to the baseline and a reduction of less than 1 percent of core areas greater than 200 hectares (2 square kilometres), and core areas larger than 1000 hectares (10 square kilometres), therefore a change of low magnitude. The regional core area would remain above 80 percent intact/unfragmented within the Regional Study Area.

Wetland Function

The magnitude of residual effects on wetland function is considered low to moderate because, while irreversible change is expected to lower quality shoreline wetlands along the reservoir, there would be no net area loss for high quality marsh, native wetland types would be reduced by 0.7 percent, remaining wetlands are widespread, abundant, and

relatively pristine, and no wetlands of global, national, and provincial wetlands would be affected.

Priority Plants

While the Project would affect the locations and habitat for some of the priority plant species, the magnitude of the residual effect is considered low based on the species affected and because there will be less than 1 percent of known locations affected. Residual effects are not anticipated for very rare plants. Plants that are important to aboriginal groups are widespread so that the residual effects will be negligible with the exception of Labrador tea. The residual effect on Labrador tea is considered moderate in magnitude because it is not widespread in the regional study area and there will be a permanent loss of these plants found on islands within the proposed reservoir.

4.4.5 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse effects to terrestrial habitat and wetlands after taking into account the implementation of proposed mitigation measures and follow-up commitments of the proponent.

4.5 Birds and Bird Habitat

4.5.1 Description of Baseline Environment

Year-round, the project area supports many types of birds. Birds of conservation concern or that are used as a resource include waterbirds (e.g. Mallard, Canada Goose), colonial waterbirds (e.g. Ring-Billed Gull, Herring Gull, Common Tern, and Bonaparte's Gull), bird species at risk (e.g. Olive-sided Flycatcher, Common Nighthawk, Rusty Blackbird, Short-eared Owl, Peregrine Falcon, Red Knot, Yellow Rail, and Horned Grebe) and raptors (e.g. Bald Eagle). Of these, Canada Goose, Mallard, raptors, Bald eagle, and bird species at risk known to breed in the project area (Olive-sided Flycatcher, Common Nighthawk, and Rusty Blackbird) were assessed as VECs.

Waterbirds

Waterbirds are prevalent in the Regional Study Area during migration. Canada Goose generally does not breed in the area as adequate breeding habitats (floating or anchored bog or fen) and forage habitats (sedges) are rare. Mallard, the most abundant duck species, does use the food-rich bays, inlets, and creek mouths of Gull Lake, the Nelson River, and Clark Lake for breeding, forage, and migration.

Colonial waterbirds

Ring-Billed Gull, Herring Gull, and Common Tern use environmental features for breeding, such as the rocky reefs and islands, that are rare in the local and regional study areas. Bonaparte's Gull is less common than other colonial waterbirds and breeds in tops of spruce trees near the Nelson River or along the edges of lakes, habitat that is abundant and widespread throughout the Regional Study Area. These colonial waterbirds were considered by the proponent to be priority birds due to their use of unique habitats affected by the Project. Colonial waterbirds, while not assessed as a VEC by the proponent, were considered in the assessment of potential project effects on birds regulated under the federal *Migratory Birds Convention Act*.

Bird species at risk

The Olive-sided Flycatcher, Common Nighthawk, and the Rusty Blackbird were the only birds of conservation concern listed under the *Species at Risk Act* and assessed by the Committee on the Status of Endangered Wildlife in Canada, with known breeding use of habitat (Table 4-2). Other species, such as Short-eared Owl, were observed during surveys within the study area but at such a low density that breeding use was not noted.

Abundant coniferous edge forest habitat, the preferred breeding habitat for the Olive-sided

Table 4-2: Bird Species of Conservation Concern with Potential Project Interactions

Species	Conservation Status	Comment	Likelihood of Potential Interaction/Relative Abundance[1]
Common Nighthawk *(Chordeiles minor)*	SARA Schedule 1 listed, 'Threatened'	Known breeding: one nest located during field studies, on an esker supporting regenerating forest. Known to be more abundant in the Regional Study Area but have declined in recent years (FLCN 2010).	Likely (less than 3 birds per square kilometer)
Olive-sided Flycatcher *(Contopus borealis)*	SARA Schedule 1 listed, 'Threatened'	Known breeding: observed in Project Area studies (2001-2003 and 2009-2011), associated with riparian habitats.	Likely (less than 2 birds per square kilometer)
Rusty Blackbird *(Euphagus carolinus)*	SARA Schedule 1, 'Special Concern'	Known breeding: field observations made throughout the Regional Study Area in primary breeding habitats along creeks, lakes and wetlands.	Likely (less than 4 birds per square kilometer)
Short-eared Owl *(Asio flammeus)*	SARA Schedule 1 listed, 'Special Concern'	Three birds observed during surveys. EIS notes potential effects on this species and proposes mitigation; argues that these effects are small and transitory (and in one case positive), and that the project footprint will not cause net permanent loss of breeding habitat.	Unlikely (3 birds observed)
Yellow Rail *(Contunicops noveboracensis)*	SARA Schedule 1 listed, 'Special Concern'	EIS states that none were observed in targeted night surveys 2001-2011. Potential construction impacts are noted and mitigation described in the EIS.	Unlikely (none observed)
Horned Grebe *(Podiceps auritus)*	COSEWIC Special Concern	One bird observed during spring migration period.	Unlikely (none observed)
Peregrine Falcon anatum/tundrius subspecies *(Falco peregrinus anatum/tundrius)*	SARA Schedule 1 listed, 'Threatened'	None observed and breeding habitat is not found in the RSA. EIS identifies this species as using the LSA (if at all) for migration alone.	Unlikely (one observed in migration)
Red Knot rufa subspecies *(Calidris canutus rufa)*	SARA Schedule 1 listed, 'Endangered'	None observed; may occur during migration. EIS identifies this species as using the LSA (if at all) for migration alone and states that project effects are not anticipated.	Unlikely (none observed, may pass in migration)

Note: 1. Relative abundance estimates based on proponent surveys and field data gathered between 2001 and 2011. KHLP (2012).

Flycatcher, is present in the local and regional study areas. The Common Nighthawk breeding habitat (rock outcrops, high banks, eskers with bare ground, and regenerating burned forests) is also abundant within the Regional Study Area. The preferred Rusty Blackbird breeding habitat, trees next to wetlands or areas that pool water (bogs and wooded swamps), is also widely available throughout the Regional Study Area.

Raptors

Bald Eagles are abundant along the shorelines of the Nelson River, which provides fishing access and nesting and perching habitats. Nests are located along the reservoir shoreline, with the nearest located 12 kilometres from the proposed generating station. Merlin, Osprey, and Great Horned owl were uncommonly observed raptors in breeding bird and reconnaissance surveys of the Keeyask Transmission Project.

4.5.2 Potential Environmental Effects and Proposed Mitigation

Project construction and operation activities could affect birds by causing habitat loss, alteration, and fragmentation; a change in habitat quality; direct construction and operation mortality; and increased predation and harvest (of game birds) stemming from increased access to the Regional Study Area. Construction blasting activities, should they occur during bird breeding, nesting and chick rearing, could disturb birds nesting on rocky shoals and in treed and wetland areas surrounding the blasting sites.

Waterbirds

Approximately 3 percent (1908 hectares) of Mallard nesting, breeding, and brood-rearing habitat would be permanently lost through construction activities, filling of the reservoir, and the inundation of inland lakes and wetland areas. In addition to the habitat loss, reservoir filling would also decrease the quality of staging habitats in what was Gull Lake and parts of the Nelson River.

Canada Goose staging and foraging habitat that occurs in shallow bays, inlets, and creek mouths of Gull Lake and parts of the Nelson River would be lost upon inundation but similar habitat is present throughout the Regional Study Area so this is not expected to affect Canada Goose populations.

Noise disturbance from construction equipment and blasting may result in short-term habitat avoidance by Mallards using wetlands, lakes, and riverine habitat located adjacent to construction sites. Construction equipment noise and blasting would indirectly result in a temporary reduction in use of some goose staging habitat.

To mitigate for habitat loss, alteration, fragmentation, and noise disturbance, 100 metre vegetated buffers will be retained around lakes located adjacent to infrastructure sites. Project-related cutlines and trails will be blocked where they intersect with the project footprint and the portions of these features within 100 metres of the Project. Mitigation measures for loss of wetland function could also mitigate habitat losses for Canada Goose and other waterbirds. Mallard nesting platforms will be installed to mitigate for some of the losses in upland nesting cover.

The implementation of the Construction Access Management Plan will mitigate the potential for an increase in hunting pressure on birds in the Regional Study Area. Additionally, areas disturbed during construction will be revegetated to reduce hunter vehicle access.

Colonial Waterbirds

The construction of cofferdams and subsequent flooding of islands, reefs, and gravel shorelines, would disrupt nesting habitat for approximately 800 to 1500 pairs of gulls (Herring Gulls and Ring-billed Gulls) and 30 to100 terns breeding pairs. During operations, forage habitat and 2.7 hectares of potential gull and tern breeding habitat would be lost or adversely affected. To offset the loss of gull and tern nesting habitat at Gull Rapids and areas upstream, artificial gull and tern nesting platforms (e.g. reef rafts), breeding habitat enhancements to existing islands, and one or more artificial islands will be introduced.

Sensory disturbance by equipment noise and blasting within 1 600 metres of Gull Rapids, a historical breeding site, is the main project construction effect on nesting colonial waterbirds. The proponent proposes to prevent colonial waterbirds from establishing nest sites within the 1600m of the blasting area to mitigate construction sensory disturbance of active Gull Rapids breeding colonies from April 1 to August 31 by:

- developing nearby nesting and breeding habitat;
- installing physical barriers on islands (visual barrier or wire grids);
- deploying noise deterrents (cannons, predator and distress calls); and
- placing injured gull and predator models.

Degradation of tern foraging due to increased water turbidity from peatland degradation and shoreline erosion will be mitigated by tailrace operations as it may provide clear water zones for foraging.

Bird Species at Risk

Assessment of effects on species at risk requires an evaluation of project effect before and after mitigation is applied.

The project would result in an approximate loss of: 5 percent (420 hectares) of Olive-sided Flycatcher breeding and foraging habitat; 10 percent (2000 hectares) of Common Nighthawk breeding habitat, and 3 percent (547 hectares) of Rusty Blackbird breeding and foraging habitat present in the regional study area.

Reduction in breeding and foraging habitats for Olive-sided flycatcher, Common Nighthawk, and Rusty Blackbird is unlikely to have any notable effect on regional populations because breeding and foraging habitat for these species is widely available in the Regional Study Area.

Mitigation measures that will be applied to address the loss of habitat include:

- Olive-sided Flycatcher: retention of treed areas located within the future reservoir back bays, and create perching structures in open and decommissioned borrow areas that retain water to provide sources of invertebrates;
- Common Nighthawk: leaving patches of bare ground to provide suitable nesting habitat; and
- Rusty Blackbird: buffering marsh wetlands from construction impact, and the creation of 12 hectares of marsh wetlands.

Sensory disturbances during construction such as noise from equipment, blasting, and other human activities may cause species such as Olive-sided Flycatchers to avoid nesting within and adjacent to infrastructure zones. And although it is not expected to adversely affect Rusty Blackbird reproductive success, construction-related noise may reduce the acoustical quality of bird song communication. Mitigation of these direct effects to breeding birds from construction land clearing activities including noise includes avoiding typical breeding periods for most birds (April 1 to August 31).

Mitigation of these direct effects to breeding birds from construction land clearing activities including noise includes avoiding typical breeding periods for most birds (April 1 to August 31).

The impact of operation of construction camp lights may attract flying insects, which may enhance the quality of infrastructure sites as foraging habitats for Common Nighthawk, a night forager. Since this species is most active at dusk, construction activity, primarily in daylight hours, is not anticipated to adversely affect foraging birds. No impacts from construction camp lights on Rusty Blackbirds or Olive-sided Flycatchers were identified.

Sensory disturbance from noise and light during operation of the generating station and transmission line is not anticipated for bird species at risk.

Raptors

Project construction would result in the loss of perching and nesting trees for raptors (including Bald Eagles) along cleared rights of way and reservoir edges. Land clearing along the reservoir is expected to require the removal of five nests. Raptor use of the Gull Rapids area and the transmission line footprint would also be reduced during construction as a result of construction activity and noise disturbance.

Bald Eagle nests potentially influenced by the Project will have a 100 m buffer established and artificial nesting platforms will be used to replace lost nesting trees. Selective use of bird diverters is also planned for the transmission line conductors.

4.5.3 Government, Aboriginal and Public Comments

Fox Lake Cree Nation, Tataskweyak Cree Nation and War Lake First Nation expressed concern about increased hunting pressure on geese, ducks, grouse, and ptarmigan within the Local Study Area related to the influx of workers to the generating station construction site. The proponent developed a Construction Access Management Plan to address this concern. Aboriginal groups other than the Keeyask Cree Nations also identified concerns relating to their ability to continue to hunt birds at the project site. The proponent committed to provide an opportunity for Métis and members of First Nations other than the Keeyask Cree Nations to request access to the project site as resource users under this Construction Access Management Plan. Resource use is further discussed in Section 4.7.

The results of field studies and Aboriginal Traditional Knowledge of past hydro development projects in the region confirm that water levels appear to have influenced the abundance and distribution of Mallards along the Nelson River. York Factory First Nation indicated fewer ducks are found in the Split Lake area "because the shoreline habitat that they use has been flooded and eroded"[14] and Fox Lake Cree Nation states that "after hydro flooding and the loss of stable shorelines the number of nesting waterfowl declined."[15] Fox Lake Cree Nation and York Factory First Nation identified flooding loss to Gull Rapids and nesting islands as a consequence of the Project and noted adverse impacts would be anticipated for the thousands of gulls and terns known to breed and nest there. With the loss of Gull Rapids, it is unknown what alternative areas these species might access. Fox Lake Cree Nation identified mitigations, including the building of floating islands and enhancement of nesting areas which are supported by York Factory First Nation. This mitigation was incorporated into the proponent's Environmental Protection Plan.

Cross Lake First Nation and Pimicikamak noted concerns regarding the Project's contribution to cumulative degradation of natural environments in the Keeyask region that would adversely affect birds such as Olive-sided Flycatcher. Manitoba Hydro provided bird nest setback distances and information on construction timing for species at risk for the transmission lines and committed to having Environmental and Construction Inspectors educated in species at risk identification on the site during construction activities to monitor implementation of the Environmental Protection Plans.

The proponent agreed to avoid clearing and flooding activities, during the minimum period of April 1 to August 31, to minimize population level effects on breeding birds to address the Environment Canada concern related to habitat destruction. Additionally, the proponent requested and received an alteration to the

14 - p. 81, York Factory First Nation. 2012. "PetosissekiskayNitakona Mena NisowanatonNipe, Askiy Mena Inninew Pima Che Win, Change & Damage to the Water." In *Kipekiskwaywinan, Our Voices*.

15 - p. 58, Fox Lake Cree Nation (2012). *Environment Evaluation Report*.

Manitoba Environment Act Licence for the Keeyask Infrastructure Project to include the clearing of 31 hectares in the proposed Project footprint during winter to avoid the sensitive breeding time.

The proponent prepared a detailed survey protocol and response to address Environment Canada's questions regarding the proponent's plans for active nest surveys and nest avoidance, should limited habitat destruction proceed during the migratory bird breeding season. This protocol indicates that if an active nest is either found or likely in an area, the area will be flagged and a buffer established. The proponent will not proceed with clearing until it is confirmed that the birds have fledged.

Environment Canada does not agree with the proposed mitigation measures to use deterrents during the bird breeding season so that gulls will not nest in the blasting locations. There is a high risk that these actions will disturb, harm, and harass migratory birds and species at risk, thereby contravening the *Migratory Birds Convention Act* and Regulations as well as the *Species at Risk Act*. In addition, Environment Canada indicated that where deterrents have been applied elsewhere, they have had limited effectiveness. The deterrents directed at preventing gulls nesting also risks disturbing upland and wetland migratory birds nesting in the areas surrounding the blasting sites. As a result, it is highly likely that some colonial waterbirds will nest in the traditional colony sites and be subject to disturbance from blasting effects during their breeding season.

The proponent indicated that schedule delays to avoid blasting in the sensitive time period will shift the project schedule back a full year based on the limited working seasons and timing constraints. The delay would impact construction scheduling, contract coordination, and have an economic impact. The proponent did not offer alternative mitigation measures.

Environment Canada recommended implementation of a long-term monitoring and adaptive management plan to ensure restoration and confirm rehabilitation of native broad habitat types. Additional or alternative rehabilitation would be required in areas where rehabilitation targets are not met. The proponent agreed to modify the Terrestrial Effects Monitoring Program to reflect Environment Canada's recommendations for survey times and make explicit that colony assessments will occur from great distances during the July fledging period. The success of these measures for colonial birds will be based on nesting pair density observed during June surveys and continued use of the islands and reefs by colonial waterbirds as indicated by the July investigation. The monitoring will evaluate whether platforms are being used as planned and whether additional measures are required to enhance their use by terns.

4.5.4 Agency Analysis of Residual Effects

A summary of the Project's residual effects on Canada Goose, Mallard, raptors (including Bald Eagle), and bird species at risk known to breed in the project area (Olive-sided Flycatcher, Common Nighthawk, and Rusty Blackbird) is shown in Appendix C, Environmental Effects Analysis Summary.

Criteria used to evaluate the magnitude of residual effects on birds was based on changes in the availability of bird habitat and other factors that could affect bird populations including increased risk of mortality.

Waterbirds

The residual effects on Mallards would be a loss of 3 percent (1908 hectares) of Mallard breeding habitat, a decrease in the availability and quality of staging habitat, and a potential increase in local harvest associated with increased access. The loss of the habitat will be permanent, but

local in geographic extent given the availability of Mallard habitat elsewhere in the Regional Study Area. Potential increases in harvesting will be low in magnitude with the implementation of the Access Management Plan. The magnitude of the residual effects is considered low.

Annual monitoring for Mallard will be done during the first three years of operation and periodically thereafter to assess the abundance and distribution of Mallards within the Regional Study Area until shoreline wetland habitat re-establishes. The success of nesting platforms and boxes would be monitored annually during the first two years of deployment.

The residual effects on Canada Goose include some noise disturbance during the construction phase and a reduction in the quality of staging habitats in Gull Lake and parts of the Nelson River. These effects are not expected to create a long term change in the regional populations of Canada Goose and are considered low in magnitude. Monitoring would assess abundance and distribution of geese in the Regional Study Area on an annual basis during the first three years of operation, and periodically thereafter until shoreline wetland habitat re-establishes.

Colonial waterbirds

The residual effects on colonial waterbirds will be a permanent loss of 2.7 hectares of nesting and foraging habitat affecting 800 to 1500 gulls and up to 100 terns.

Given the availability of similar nesting habitat in Regional Study Area, it is expected that these birds will find suitable nesting habitat in subsequent years. The residual effects of the loss of habitat are considered moderate in magnitude, local in geographic extent and permanent. With the implementation of mitigation measures recommended by Environment Canada, residual effects from construction, noise, and blasting are expected to be moderate in magnitude, local in geographic extent and reversible given the limitation of this effect to the blasting time period.

The abundance and distribution of colonial waterbirds and the effectiveness of mitigation measures within the Regional Study Area would be monitored annually during the first three years of generating station operation.

Species at Risk

The creation of the Keeyask reservoir would result in Olive-sided Flycatcher habitat loss which is considered to be low in magnitude. It is unlikely to have notable effect on regional Olive-sided Flycatcher populations as suitable nesting-habitat occurs in areas of the Regional Study. The species' abundance and distribution within the Regional Study Area would be monitored annually during construction and for the first three years of operation to verify population levels are maintained.

The loss of 2000 hectares (approximately 10 percent) of Common Nighthawk habitat is a residual effect with moderate magnitude and local geographic extent given the availability of similar habitat available in the Regional Study Area. Common Nighthawk would be monitored for abundance and distribution within the Regional Study Area annually during construction and for the first three years of operation to verify population levels are maintained.

The residual effects on Rusty Blackbird will be a loss of 921 hectares of breeding habitat (6 percent) which is considered to be of low magnitude as marsh wetlands will be buffered from construction and 12 hectares of wetland marsh habitat will be constructed. The Rusty Blackbird abundance and distribution within the Regional Study Area would be monitored annually during construction and for the first three years of operation to verify population levels are maintained.

Raptors

Residual effects to raptors, including Bald Eagle, are the loss of nesting and foraging habitat. These losses are not expected to affect regional population levels. These effects are considered low in magnitude given the availability of similar habitat in the Regional Study Area.

4.5.5 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse effects to birds and bird habitat after taking into account the implementation of the proposed mitigation measures and follow-up commitments of the proponent.

The Agency recommends that the proponent's Avian Management Plan should describe how the proponent will monitor for and mitigate impacts on migratory birds, their nests and eggs during vegetation clearing and removal activities, and confirm that blasting activities should not be conducted when nesting birds are present within 1 600 metres of the blast site.

4.6 Wildlife and Wildlife Habitat

4.6.1 Description of Baseline Environment

Terrestrial wildlife VECs included in the assessment of project environmental effects are caribou, moose, and beaver.

Caribou

Three groupings of caribou occur within the Regional Study Area (Appendix B, Figure B-3):

- barren-ground caribou from the Qamanirjuaq herd;
- coastal caribou from the Cape-Churchill and Pen Islands herds; and
- "summer-resident caribou" which "could be coastal Caribou, boreal woodland caribou, or a mixture of both" (KHLP, 2012).

Boreal woodland caribou, a threatened species under the *Species at Risk Act* and the *Manitoba Endangered Species Act,* occurred historically in the Keeyask region; however, it has blended with the coastal Pen Islands herd so that it no longer exists as a discrete population. Boreal woodland caribou are not recognized by Manitoba Conservation and Environment Canada as occurring in the Gull Lake and Stephens Lake reservoir area. Fox Lake Cree Nation and York Factory First Nation indicated that based on their traditional knowledge, Boreal woodland caribou are present in the Keeyask area.

Barren-ground caribou migrate in the fall from Nunavut to Manitoba's northern forests for winter. In the Keeyask region, these animals are found to the area north of the Nelson River and may range as far south as Split Lake and as far east as the Hudson Bay railway track running between Ilford and Churchill. They leave the Regional Study Area in spring to calve. The population was estimated at 348 000 individuals in 2008 but few were observed in 2011. It is estimated that about 10 000 barren ground Qamanirjuaq caribou may be found the Regional Study Area.

Coastal caribou from the Cape Churchill and Pen Islands herds migrate from northern Manitoba and northern Ontario into parts of the Regional Study Area in winter. They leave the area in spring to calve. Population counts have varied greatly. Field studies conducted in 2011 projected that less than 300 Pen Island caribou were present in the Regional Study Area. However, larger migrations have been documented between 2001 and 2005, and in 2013, 7500 animals were observed on the north side of the Nelson River near the proposed generating station site.

The summer-resident Caribou are found year round within the Regional Study Area, remaining in the area to calve. This group could be coastal caribou, woodland caribou, or a mixture of both, and are referred to as summer-resident caribou. It is unclear whether the same individuals calve in the area year after year. Summer-resident caribou are conservatively estimated to number 20 to 50 individuals.

For the assessment of potential project effects, the group of summer-resident caribou has been treated as an independent population that uses a smaller range than the migratory groups, and is more likely to use calving and rearing habitat that occurs within the Keeyask region.

Caribou habitat is based on food availability, predator avoidance, and the level of disturbance. Winter habitat for all of the caribou groups consists of undisturbed mature coniferous forest composed of black spruce, jack pine, or tamarack-dominated peatland, with a ground cover of lichens. Areas with relatively shallow snow are preferred. When calving, summer resident caribou inhabit calving and rearing complexes, which are clusters of islands in lakes or islands of black spruce surrounded by expansive wetlands or treeless areas (peatland complexes) to avoid predators. Primary calving and rearing habitat includes islands in lakes greater than ten hectares or peatland complexes greater than 200 hectares. Secondary calving and rearing habitat is defined as islands in lakes between 0.5 and ten hectares in size or peatland complexes between 30 and 200 hectares.

Caribou do not appear to be using all habitats available in the Local Study Area, with the possible exception of islands in Stephens Lake reservoir, which have become a productive calving and summering area. Approximately 55 percent of the islands sampled in Stephens Lake reservoir and Gull Lake were occupied by adult caribou during at least one summer between 2003 and 2011. Potential calving habitats are common in the Regional Study Area, and habitat does not appear to be limiting to the summer resident cows and calves.

Primary calving and rearing habitat includes islands in lakes greater than ten hectares or peatland complexes greater than 200 hectares.

Moose

Moose is an important large game animal for Aboriginal groups and local communities. Primary moose habitat covers about 10 percent of the Local Study Area and 69 percent is secondary moose habitat. Thirty eight percent of habitat in the Regional Study Area is primary moose habitat, and the remainder is considered secondary habitat. Islands within and the shorelines of lakes and peatland (bog and fen) complexes are important calving and rearing habitat for moose.

Beaver

Beaver is key to ecosystem function and an important furbearer for Aboriginal trappers. Primary and secondary beaver habitat, including shoreline and riparian areas, respectively cover about 1 and 6 percent of the Local Study Area and 1 and 8 percent of the Regional Study Area.

Wildlife Species at Risk

Several species of conservation concern that may be found in the Local and Regional Study Areas were considered for potential project effects. Table 4-3 lists wildlife species of conservation concern with potential project interactions.

Table 4-3: Wildlife Species of Conservation Concern with Potential Project Interactions

Species	Conservation Status	Comment	Likelihood of Potential Project Interaction/ Relative Abundance
northern leopard frog ***(Rana pipiens)***	COSEWIC Special Concern	EIS states the species was historically present in RSA and the breeding range includes RSA. In 2004 a Fox Lake Cree Nation member saw an individual east of RSA near Limestone Generating Station but the species was not observed during surveys. The Endangered Species Conservation Council ranked the species as "Secure" in Manitoba in 2011.	Historically present, none observed
caribou – boreal woodland caribou Population ***(Rangifer tarandus)***	SARA Schedule 1 listed, 'Threatened'	EIS notes that boreal woodland caribou historically occurred in the Keeyask region, but current range does not extend into the Local Study Area.	Historically present, none observed
wolverine ***(Gulo gulo)***	COSEWIC 'Special Concern'	No den sites were detected in project surveys of the Local Study Area (Terrestrial Study Zone 4). Keeyask Transmission Project Environmental Assessment Report notes that the wolverine large home range use and low density reduces potential for measurable project interactions.	None observed
little brown myotis ***(Myotis lucifugus)***	COSEWIC 'Endangered' recommended for SARA Schedule 1 listing	Bats have been observed near Gillam, but no little brown myotis were positively identified in field surveys. One bat was detected in late July and August 2001 feeding at Gull Lake camp.	None observed

Mercury in Wildlife

Current mercury levels in wildlife, including river otters, minks, and bird that consume aquatic organism such as fish, have not been identified as a concern.

4.6.2 Potential Environmental Effects and Proposed Mitigation

Project construction would result in habitat loss, alteration, and fragmentation. Project-related construction and operation noise and activity create sensory disturbances and may reduce habitat availability as mammals avoid use of the area. Loss, alteration, and fragmentation of habitat by linear features (roads and cutlines) provide movement corridors for predators, such as red fox and gray wolf, and makes access to formerly remote areas easier for resource users. This may increase predation, harvest, and wildlife-vehicle collisions. Improved hunting efficiency could benefit some predator species.

The risk of accidental fire, which would displace wildlife from the affected area and alter forest composition and food availability, may increase during construction and lessen during operations corresponding to the volume of vehicular traffic.

The permanent loss of habitat, impacts of linear features and issues associated with access can be mitigated by blocking cutlines and trails and revegetation where they intersect and to within 100m of the Project (Zone 1, Figure B-3, Appendix B). Temporarily cleared and excavated materials placement areas will be rehabilitated to native habitat types.

Caribou and moose mortality may increase due to increased access and an increase in the human population. The Access Management Plan will address resource user needs including the needs of trappers. Additionally, the potential effects on moose and caribou from habitat fragmentation and linear disturbances will be mitigated by revegetation of the cutlines, and development of wetlands in the local study area.

Caribou

About 6 percent of the caribou winter habitat in the Local Study Area and 1 percent of caribou winter habitat in the Regional Study Area (Zone 5, Appendix B, Figure B-3) will be affected by the Project. Two islands will be lost at the generating station site, which comprise less than 1 percent of the primary calving and rearing habitat in the Regional Study Area. Less than 2 percent, of primary calving and rearing habitat will be affected in the reservoir.

In addition to direct habitat loss, the alteration of habitat would reduce food and decrease predator protection. Indicators for these project effects include the relative loss of available pre-project habitat, intactness of habitat and predator density (Table 4-4).

Approximately 9 percent of primary and secondary calving and rearing habitat of summer resident caribou could be affected from sensory disturbance caused by blasting and construction noise in the Local Study Area. This is would affect less than one 1 percent of effective primary and secondary calving and rearing habitat in the Regional Study Area.

Gray wolf density varies by area, and the total estimated density of gray wolves in the Split Lake Resource Management Area was 1.4 individuals per 1000 square kilometres (Appendix B, Figure B-4). Transient wolves, individuals that are dispersing[16] or small groups of wolves that follow migratory caribou, also enter the Split Lake Resource Management Area. The gray wolf density is not expected to increase so that caribou populations would not be impacted.

Appendix F lists the mitigation that will be applied to project effects from construction and operation. To mitigate the loss and avoidance of summer caribou calving and rearing habitat the following mitigation will be implemented:

- Excavated material placement areas will be sited to avoid caribou calving complexes
- Potential calving islands greater than 0.5 hectares in the reservoir area will be left undisturbed

Table 4-4: Benchmarks for Potential Project Effects to Caribou

Indicator	Magnitude	Benchmark
Physical habitat loss	Low	habitat loss is less than 1 percent
	Moderate	habitat loss is between 1 and 10 percent
	High	habitat loss is greater than 10 percent
Intactness	Low	less than 35 percent of the range is undisturbed
	Moderate	35 to 45 percent of the range is undisturbed
	High	more than 45 percent of the range is disturbed
Gray wolf density	Low	less than four wolves per 1000 square kilometres
	Moderate	From four to six wolves per 1000 square kilometres
	High	greater than six wolves per 1000 square kilometres

16 (Mech 1970)

- Access roads will be routed to avoid caribou calving complexes
- Blasting will be minimized from May 15 to June 30 to reduce the effects on calving females and their young
- Gates on the north and south dykes will be kept closed and locked from May 15 to June 30 and during other sensitive periods

Moose

Moose habitat loss and alteration will occur in Zone 2 (Appendix B, Figure B-3) Moose Local Study Area. Long-term habitat loss or alteration will result from reservoir flooding, shoreline erosion, peatland disintegration, and reservoir-related groundwater and edge effects. As primary and secondary moose habitat covers a large portion of the Regional Study Area, the effects of additional habitat loss on moose will likely be negligible to small.

Beaver

Approximately 5 percent of beaver habitat will be affected in the Regional Study Area. The magnitude of the loss of beaver habitat is considered moderate (1 to 10 percent) and permanent. Between 20 and 30 active beaver colonies will be removed during clearing in Zone 1, which is less than 10 percent of the estimated population in the Regional Study Area. As beaver can replace an annual mortality of 30 percent, the effect of removing 20 to 30 beaver colonies from the overall population is expected to be small.

Flooding of creeks, tributaries, small ponds, and lakes will result in a permanent loss of beaver habitat. Reservoir levels will fluctuate up to 1 metre, which is greater than beavers' tolerance of 0.7 metre so that any potential habitat in the reservoir area will be unsuitable and is not considered habitat replacement.

To mitigate the impacts of project flooding on beaver the following measures will be implemented:

- A minimum of a 100 metre buffer will be left at creeks, streams, ponds and lakes to maintain existing beaver habitat
- Individuals from affected areas will be trapped prior to and during reservoir clearing, and periodically until the reservoir reaches maximum capacity, to manage inadvertent winter mortality that is highly likely to occur during operation
- Beaver baffles will be used where culverts and control structures are repeatedly blocked due to beaver dam construction to minimize mortality due to conflicts with humans

Mercury in Wildlife

During and after reservoir filling, tissue mercury levels are predicted to increase in wildlife such as river otters and minks that consume Keeyask reservoir fish. Liver mercury levels in river otters are predicted to increase from a baseline of between 0.3 and 4 parts per million, to a peak of between 0.3 and 18 parts per million. Mink liver mercury levels are expected to increase from a baseline of between 0.6 to 6 parts per million to a peak of between 0.6 and 31 parts per million. Reduced reproduction and survival may occur but will likely result in a negligible to small decline in otter numbers in the Local Study Area.

The Project is expected to have a negligible impact on tissue mercury levels in birds (waterbirds, herons, Belted Kingfisher, and raptors) and the eggs of species that consume Keeyask fish as a large proportion of their diets.[17]

17 *Terrestrial Effects Supplemental Volume*, Section 8.5, Appendix 8A.

4.6.3 Government, Aboriginal, and Public Comments

Caribou Ranges and the Project Area

York Factory First Nation and Cross Lake First Nation and Pimicikamak were concerned about the description of the taxonomy and distribution of the woodland caribou. The Fox Lake Cree Nation Environmental Evaluation Report identifies certain populations of caribou that are present in the region year-round could be boreal woodland caribou. Environment Canada does not consider this population to be boreal woodland caribou.

The proponent clarified that the current range of boreal woodland caribou extends into the southwest corner of the Regional Study Area (Appendix B, Figure B-3). The range of *Species at Risk Act*-listed boreal woodland caribou does not extend to the Local Study Area where the direct and most of the indirect project impacts are expected to occur. The proponent is of the view that no effects on boreal woodland caribou would occur as the northernmost portion of their ranges is located about 100 kilometres southwest from Gull Lake.

Project Effects on Caribou

Fox Lake Cree Nation expects southward migration of the Qamanirjuaq caribou to be negatively impacted by increased traffic along highway 280. This southerly Qamanirjuaq caribou migration is inconsistent and does not extend as far south as the Gillam area during most years. Fox Lake Cree Nation was concerned that construction activities will make it too difficult for these animals to return to this region and the subspecies will leave this area. Fox Lake Cree Nation were also concerned that debris and shoreline erosion will negatively impact caribou movement. Debris and shoreline erosion make it difficult for caribou crossings along the shores of Stephens Lake reservoir.

Similar impacts are expected on caribou movement along the Keeyask reservoir shorelines. Concern about increased hunting pressure was also expressed, along with the comment that the Keeyask Project will alter wolf movement and behaviour, which will negatively impact the caribou population.

The Shamattawa First Nation was concerned with the impacts of development on caribou migration and the potential effects on their livelihoods. Concerns included increased caribou hunting in the Regional Study Area west of Shamattawa due to increased access and displacement from the project area into traditional areas of use by people from the Shamattawa First Nation.

York Factory First Nation is skeptical that significant effects to caribou can be avoided.

The proponent has responded to these concerns with the mitigation measures described in Appendix F.

Project Effects on Moose

The Fox Lake Cree Nation expects there will be a reduction in moose hunting at Gull Rapids and other affected locations. They expect that noise from construction activities will cause moose populations to avoid the area and may adversely affect breeding. An increase in the human population from the influx of workers and hunting pressure may also negatively impact the moose population. They are concerned that increased vehicular traffic will adversely affect moose populations. The Kitayatisuk (elders) believe they will have to travel greater distances to hunt moose due to the construction activities.[18] Section 4.7 includes further discussion of hunting effects, including the proponent's response and proposed mitigation.

18 (Fox Lake Cree Nation, 2012)

Flooding Effects on Beaver

The Keeyask Cree Nations partners expressed concern with the potentially negative impact of flooding and changing water levels on beaver and moose populations. Comments noted that changes in winter water levels are expected to cause suffering and deaths of muskrats and beavers. Section 4.7 includes further discussion of effects on trapping.

4.6.4 Agency Analysis of Residual Effects

A summary of the Project's residual effects on caribou, moose, and beaver is shown in Appendix C, Environmental Effects Analysis Summary. With the application of mitigation as outlined in Appendix F, there will be no residual effects on moose or caribou from transmission line maintenance vegetation clearing or on beaver from construction and operation noise.

Caribou

Residual effects on caribou will be moderate in magnitude, limited mainly to the Local Study Area, and long-term given the permanent loss of calving habitat for the summer resident caribou. While there is uncertainty about how populations will change over time, grey wolf densities are not expected to increase and therefore caribou predation by wolves is not expected to increase. Although there is some uncertainty regarding the long-term frequency and variability of habitat use and movements, there is confidence in the availability of suitable habitat, the retention of existing core areas, regional intactness estimates, and in the ability to mitigate and manage potential project effects. The magnitude of the residual effects on caribou is considered moderate.

The proponent has committed to regular monitoring of:

- Caribou populations throughout operation for productivity, mortality, and recruitment during construction; and
- Summer resident caribou calving and rearing habitat effects during construction and operation in areas associated with project effects.

Moose

The magnitude of residual effects on moose are expected to be low as primary and secondary moose habitat covers a large portion of the Regional Study Area, calving or rearing habitat will not be lost, and the possible decrease in population from altered habitat or increased mortality could affect two or more generations in the Regional Study Area.

Beaver

The residual effects on beaver are low in magnitude as the loss of thirty dens is local in geographic extent and will not affect regional beaver populations due to the high degree of reproductive success and availability of habitat within the Regional Study Area.

Other Wildlife

Adverse effects of bioaccumulation of mercury are anticipated in wildlife, such as river otter that would consume Keeyask reservoir fish. Reduced reproduction and survival may occur but would not likely affect numbers of otters within the local or Regional Study Area. The residual effect is considered to be of low magnitude, because river otter is common in the Regional Study Area, and their high reproductive capacity and dispersal behaviours should allow for re-occupation of vacant habitat.

4.6.5 Agency Conclusion

The Agency concludes that the Project is not likely to result in significant adverse effects to wildlife and wildlife habitat including caribou, moose, and beaver after taking into account the implementation of proposed mitigation measures and follow-up commitments of the proponent.

4.7 Land and Resource Use

Current use of Keeyask land and resources by Aboriginal groups considered in this assessment includes fishing, hunting, gathering, and commercial trapping on lands and waterways. The assessment also includes activities incidental to these uses such as travelling along various routes and the occupation and use of camp sites and cabins. Effects on places of cultural significance in the Keeyask area are considered in Section 4.9.

Lake Whitefish, pickerel (Walleye), jackfish (Northern Pike), and Lake Sturgeon are the most important species for fishing. Species valued for hunting include moose, caribou, waterfowl, and small game. Plant species that are gathered include medicinal plants, berries, and tea. Trapping is directed at furbearers including marten, beaver, and muskrat.[19]

Available literature, community interviews, and Aboriginal traditional knowledge were used by the proponent to assess project effects on resource use VECs, including domestic fishing, hunting and gathering, and commercial trapping and country food safety.

The Project Resource Use Regional Study Area includes the Split Lake, Fox Lake, and York Factory Resource Management Areas. These include lands and resources, reserves and traditional use areas of the proponent partner Keeyask Cree Nations (see Section 5). The Local Study Area for resource use includes Split Lake Resource Management Area Traplines 7, 8, 9, 15, 25, and 65.

Manitoba Metis Federation, Shamattawa First Nation, and Cross Lake First Nation and Pimicikamak, indicated that they also have traditional use in the project area (local or regional).

4.7.1 Potential Environmental Effects and Proposed Mitigation

Current Use of Lands and Resources for Traditional Purposes

Potential project effects on domestic fishing, hunting and gathering, and trapping include:

- reduced hunting and trapping success resulting from project construction noise and other disturbances
- reduced safety for fishers and reduced availability of fish from increased debris and sediment produced during project construction and reservoir operation
- harvesting of fewer animals such as moose, waterfowl, beaver, and muskrat due to reduced access to or alteration of traditional hunting, fishing, and trapping grounds during construction and operation
- reduced availability of animals for traditional harvesting due to increased worker population having improved access to hunting;
- potential risks to human health from consuming fish including Northern Pike (jackfish) and Walleye (pickerel) that have increased mercury levels
- the destruction of traditional locations for harvesting berries, medicinal plants, firewood, building timber, and traditional camp sites and cabins due to reservoir flooding
- reduced ability to travel safely over the ice covered reservoir because of water level fluctuations
- loss of income for local artisans, trappers, and harvesters if they cannot access resources

Recreational fisheries occur throughout the project area and downstream under provincial management. Aboriginal fisheries occur throughout the Project Regional and Local Study areas (Appendix B, Figure B-2). In their Environmental Evaluation

19 DonMacDonell, CEC hearings transcript, Nov. 5, 2013

reports for the Project, the Keeyask Cree Nations indicated a preference for harvesting in waterbodies outside the Keeyask hydraulic zone of influence due to concerns about fish quality.

Section 4.3 outlined the potential impacts on fish in Stephens Lake and the Keeyask reservoir. Habitat replacement, stocking, and off-system fisheries are proposed to maintain existing system productivity for fisheries. Regional ecosystem diversity would be retained and a cumulative loss of area of priority habitat types is expected to be minimized. While impacted by the project, it is expected that fisheries resources would be maintained.

The creation of the reservoir would result in some long-term effects on water quality, predominantly through increases to methylmercury, which is predicted to peak over the first 30 years of reservoir impoundment. Mercury effects to fish tissue would limit the food use of fisheries resources within the Keeyask reservoir and Stephens Lake for at least 30 years following reservoir impoundment. Healthy fish programs of the Keeyask Cree Nations are proposed to maintain access to fish as a country food. Sustainable harvest plans for fish and wildlife resources are included in plans being developed by the Proponent First Nation Partners.

Project effects to commercial fishing are expected to be negligible as fish populations which support commercial fisheries are not expected to be affected by the Project (see Section 4.3 for further discussion).

Manitoba Hydro has negotiated Adverse Effects Agreements with each of the Keeyask Cree Nations that include accommodations to ensure access to fishing, and to a lesser extent hunting and gathering, in the larger land bases of the community Resource Management Areas. The Adverse Effects Agreements with each First Nation provide specific accommodations for project effects on the communities' resource use and access. Included in these agreements are the Tataskweyak Cree Nation *Access Program*, the War Lake First Nation *Improved Access Program*, the York Factory First Nation *Resource Access and Use Program*, and the Fox Lake Cree Nation *Alternative Resource Use Program*. Fish harvest and supply programs are also described in Tataskweyak Cree Nation *Healthy Foods Fish Program* and the War Lake First Nation *Community Fish Program*.

For groups other than the Keeyask Cree Nations, the proponent described current resource use for traditional purposes in the Keeyask Resource Use Regional Study Area by Shamattawa First Nation (caribou hunting, goose hunting, trapping, fishing), and by Manitoba Métis (moose hunting, fishing in Stephen's Lake and gathering).[20]

Shamattawa First Nation traditional land use study maps and reports for their traditional territory indicate hunting and fishing locations in the southern and eastern portions of the Regional Study Area. The proponent's assessment of use indicated that Shamattawa First Nation's traditional use and associated travel and navigation were not expected to be affected in any noticeable way by the development and operation of Keeyask.

The proponent's initial assessment also described limited or no effects on Métis hunting and gathering for traditional purposes or on access for use of the area for fishing. Further, the proponent indicated that mitigations addressing risks to navigation and information regarding fish consumption advisories would also be available to other users of the area, including Métis.

20 Proponent's Response to Information Request. TAC Public Rd 2 CEAA-0014, submitted to CEAA on July 12, 2013 as part of the federal EIS review (see KHLP (2012)).

Manitoba Metis Federation presented preliminary results and mapping from a Traditional Land Use and Knowledge Study (TLUKS) for the Keeyask area in December 2013 that suggested potential for project effects to impact the experience of Metis gathering and upland bird harvest activities along Public Highway 280 and hunting southwest of Gillam.

For groups other than the Keeyask Cree Nations, including Manitoba Métis Federation, Shamattawa First Nation, and Cross Lake First Nation and Pimicikamak, the proponent has committed to "implementing reasonable measures so that effects to Aboriginal traditional uses beyond the KCNs [Keeyask Cree Nations] are appropriately managed" and that "any additional information made available through the MMF [Manitoba Métis Federation] and possible CLFN/PCN [Cross Lake First Nation and Pimicikamak] studies would be reviewed and discussed with these parties through on-going processes…" The proponent also committed that "efforts will be made during the course of these discussions to determine the nature of predicted effects so that the Partnership can assess whether effects can be avoided through changes to project implementation, or whether modifications or additions to existing project mitigation measures are required".[21]

The *Construction Access Management Plan* is proposed to mitigate effects on and by resource users by providing worker orientation about respect for the surrounding area, fisheries and wildlife resources, heritage resources, and local communities. It provides for safe, coordinated access to the Project for authorized users and restricts access to unauthorized individuals who may otherwise enter the project site. The plan includes prohibitions on hunting by workers and monitored gated entry along access roads.

The *Reservoir Clearing Plan* is expected to minimize impacts on standing trees and shrubs in newly flooded areas and reduce hazards to boating and fishing.

The *Waterways Management Program* will involve waterway monitoring to support safe navigation, including the construction of safe shoreline landing sites, and includes the designation of unsafe waterway areas near construction. Safe winter ice trails will also be monitored.

All fishing within the construction site will be limited to shore-based angling. Province of Manitoba fisheries management objectives for the Keeyask Area (Appendix B, Figure B-2) include the maintenance of fish populations to support sustainable harvests and specify that the fish community, including forage and non-target fish populations, should be self-sustaining with similar or appropriate ecological structure and function as presently exists. Specific goals include the maintenance of a valued Lake Whitefish population in Gull Lake, upstream of the proposed Keeyask site, at levels that support subsistence harvesting.

Proposed dust control and speed restrictions would mitigate dust and traffic along access roads, and therefore would reduce adverse effects on hunting and gathering near construction areas. While the proponent has not proposed specific mitigation for noise, noise effects are expected to be localized.

The proponent commits to the inclusion of a *Resource Use Monitoring Plan*, as a component of the environmental monitoring plans within the *Environmental Protection Program* for the Project. This will include workforce harvesting monitoring, recreational harvest monitoring (during construction and for eight years

21 Vicky Cole, Manitoba Hydro, letter dated October 16, 2013. Re: Keeyask Generation Project: CEAA outstanding information needs.

post-construction), and will reference other relevant project monitoring programs, including Aboriginal Traditional Knowledge monitoring, monitoring of the offsetting programs, and wildlife monitoring from the terrestrial and aquatic monitoring programs.

Aboriginal Traditional Knowledge environmental monitoring programs, such as those committed to by the proponent, are central to community acceptance of the monitoring results and key means to address concerns raised by Aboriginal groups in consultation. Benefits of such monitoring would be in the provision of real-time, local monitoring to evaluate and communicate the results of mitigation effectiveness.

Commercial Trapping

North access road construction, right of way clearing and maintenance of the construction power transmission line crossing will affect Traplines 7, 8, 9, 15, and 65. Traplines 7, 15 and 25 will also be affected by flooding. Changes to local beaver populations are also anticipated as a result of habitat flooding with operation of the Keeyask reservoir.

The *Construction Access Management Plan*, would limit access during construction to outside resource users on Traplines 9 and 15. The proponent will be negotiating compensation settlements with trapline holders consistent with its Trappers Notification and Compensation Policy for New Transmission Development Compensation.

4.7.2 Government, Aboriginal, and Public Comments

A number of Aboriginal groups submitted comments throughout the environmental assessment process on issues pertaining to the Project's impacts on the current use of lands and resources for traditional purposes. Comments included the historical context of the traditional land and resource uses by Cree Ininewak[22] in the project area and included specific information on potential project impacts from the Keeyask Cree Nations, Shamattawa First Nation and Manitoba Metis Federation.

Comments focused on the loss or alteration of hunting, fishing, trapping and gathering areas as a result of flooding of the Keeyask reservoir; the risk of contamination of foods, particularly through increased mercury levels in fish; anticipated changes in the taste of fish, game and eggs; localized displacement of fishing activity for food, social and ceremonial purposes in addition to restrictions to hunting and gathering activities; and concerns about the displacement of current uses from lands affected by the project footprint creating increased pressure on resources in nearby traditional areas used by other resource users.

Throughout the consultation process, Aboriginal groups have also shared their concerns about the potential direct and indirect socio-economic and cultural impacts that could result from the proposed Keeyask Generation Project based on their direct experience with past hydrodevelopment.

The proponent notes[23] from one of the partner Keeyask Cree Nations, Tataskeweyak Cree Nation (TCN), "the changes to water and land resources caused by these [hydro] projects and their associated works were widespread and pronounced, resulting in adverse economic, social and cultural impacts on TCN that continue to be felt today. TCN experienced cultural disruption and changes to their way of life that reduced their ability to

22 See footnote #3, pg. 15. Ininewak may also be spelled as Inninuwak, or Ininiwak.

23 Keeyask Hydropower Limited Partnership (2012), Supporting Volume: Socio-economic Environment, Resource Use and Heritage Resources. pg. 2-21.

rely on the land and water for sustenance. TCN has described the changes as a "devastation of our homeland ecosystem caused by hydrodevelopment."[24]

Fox Lake Cree Nation, another Keeyask partner First Nation, in their Environment Evaluation Report of the project, points out that the "Aski Keskentamowin (AK) passed down from (our) ancestors was disrupted as the natural rhythms of the environment that knowledge was based on, was destroyed." [25]

Given their experience from past hydro development, Cross Lake First Nation and Pimicikamak, Norway House Cree Nation, Shamattawa First Nation, and Manitoba Metis Federation all expect the following impacts from the Project:

- long term impacts to navigation and fishing, as tree stumps and woody debris left in place release from soils, enter the reservoir, and are carried downstream
- long term loss of traditional sites for gathering of medicines, wildlife hunting and trapping as a result of ongoing shoreline erosion and water level and flow changes
- impacts to culture from the disturbance of archaeological and heritage sites, and loss of access to medicines as a result of continuing shoreline erosion
- impacts to safe navigation and trapping, as a result of rapid, erratic or unpredictable water level changes and unsafe ice conditions

The proponent has acknowledged impacts to current use of lands and resources for traditional purposes including socio-economic impacts to the Keeyask Cree Nations through the Adverse Effects Agreements. However, groups commented that while cultural and spiritual impacts can be compensated through the agreements, residual effects will remain.

The Manitoba Metis Federation presented concerns that the proponent's description of project effects on Aboriginal groups other than the Keeyask Cree Nations did not adequately consider Métis use in the local and regional study areas. Shamattawa First Nation, and Cross Lake First Nation and Pimicikamak also expressed these concerns, indicating that their use in the local and regional study area was not adequately reflected in the EA, and therefore potential impacts go unacknowledged and specific mitigations are not provided.

As indicated in section 4.7.1, the proponent has committed to implementing reasonable measures so that effects to Aboriginal traditional uses beyond the Keeyask Cree Nations are appropriately addressed and to make efforts to determine whether effects can be avoided through changes to the project and existing project mitigation measures.

York Factory First Nation trappers remained concerned that Keeyask could adversely affect furbearers on traplines around Split Lake and individual trappers on or around Trapline 13. They also expressed concern about encroachment from other trappers displaced from their traditional trapping area. While their Adverse Effects Agreement includes provisions for unforeseen occurrences with respect to trapping, York Factory First Nation commented that post-project monitoring activities need to include impacts to trapping by York Factory First Nation trappers.

Appendix D provides a summary of key concerns raised by the Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, York Factory First Nation, Shamattawa First Nation, Cross Lake First Nation and Pimicikamak, Manitoba Metis Federation, Norway House Cree Nation, and Nisichawayasihk Cree Nation, and the responses of the proponent and Agency.

24 From Cree Nation Partners, Environmental Evaluation Report, Keeyask Generation Project. In Keeyask Hydropower Limited Partnership (2012), Supporting Volume: Socio-economic Environment, Resource Use and Heritage Resources.

25 - pg.11, Fox Lake Cree Nation Environment Evaluation Report, Keeyask Generation Project.

4.7.3 Agency Analysis of Residual Effects

Traditional use in the direct project footprint and local study area will be lost or greatly modified on a permanent and irreversible basis. As the local study area is in or bordering Resource Management Areas associated with Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation, this area represents a preferred area of use for these First Nations and thus they will be most affected. In the Agency's analysis, traditional use of the local study area by other Aboriginal groups is less intense and areas further from the project area are more preferred for use.

In assessing potential residual effects to current use of lands and resources for traditional purposes, the Agency first considered project effects remaining after project mitigation for environmental effects. These were predominantly associated with changing access to resource use areas and the cultural and aesthetic experience of traditional use as a result of direct project effects:

- loss of preferred plant gathering locations and displacement to alternative sources of plants and medicines
- displacement of hunting from within the Project footprint and local study area
- the elimination of local fisheries harvest from the Keeyask reservoir for a period of about 30 years because of methylmercury accumulation in fish muscle, and the resulting displacement of use from existing locations on the Nelson River to offset lakes
- a small increase in competition for fisheries resources from licenced recreational fisheries use expected with the increasing worker population
- displacement of commercial trapping from portions of currently operated traplines, and in some cases permanent loss of traplines

The Agency considered that there will also be social and cultural effects on traditional use due to displacement from the project footprint and local study area, as Aboriginal groups are now limited in their preferred means of practicing their traditional uses and in accessing their historical and cultural connections to the project site.

These effects include: loss of traditional uses at culturally-valued locations; change in the traditional use aesthetic experience; and potential increased travel time and costs for accessing gathering, hunting, and trapping outside of the Project footprint and fishing opportunities off of the Nelson River (at offset lakes or other waterbodies outside of the project footprint), which may pose barriers for traditional family and group activities. These social and cultural effects, which are difficult to fully compensate or assess, are likely to remain as residual effects.

Provided proponent commitments within the Adverse Effects Agreements are met, the Agency is of the view that the residual effects to the Keeyask Cree Nations' current use of lands and resources for traditional purposes would be largely accommodated. Similarly, residual effects to commercial trapping would be negligible, provided Manitoba Hydro commitments to reach compensation agreements with affected trapline holders are met.

Within the regional study area, access to resources traditionally relied on such as caribou, fish, and birds are not expected to be directly affected by the Project on a regional basis. However, displacement of users from the local study area to the regional area is expected to put some additional pressure on these areas in supporting traditional practices such as fishing, hunting and trapping. The Agency expects that Manitoba Metis Federation and Shamattawa First Nation will potentially experience minor direct project effects, but will likely experience some indirect effects from the displacement of the Keeyask Cree Nations partners into their preferred traditional resource and land use areas.

The Agency considers that residual effects to land and resource use within the Project's local and regional study areas, following mitigation and

compensation, are expected to be moderate in magnitude on a local extent, low in magnitude on a regional geographic extent, and long term.

4.7.4 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse effects to land and resource use after taking into account the implementation of proposed mitigation measures to protect the biophysical resources and follow-up commitments of the proponent, including commitments to provide reasonable accommodation for demonstrable loss of access to traditional land and resources for Aboriginal groups.

4.8 Human Health

Human health considers health status and health issues of both individuals and communities that may be affected by various project components and activities and their associated environmental outcomes (e.g. dust, noise, light, water quality, aesthetic changes, or methylmercury contamination in country food). Given the location and characteristics of this project the primary human health issue is the contamination of country foods from mercury.

4.8.1 Potential Environmental Effects and Proposed Mitigation

Mercury and Country Foods

As described in section 4.2, mercury is present in low concentrations in the Nelson River and lakes near the proposed Keeyask generating station site. It originates from natural and anthropogenic sources, and is found in the atmosphere, vegetation, organic materials and soils, and aquatic systems.

Peak concentrations of methylmercury are anticipated within three to five years after flooding of the Keeyask reservoir and would likely decrease gradually 25 to 30 years after flooding.

Methymercury, an organic form of mercury, is created from inorganic mercury found in rocks and soils and bioaccumulates in the food chain due to the flooding of the land, where it becomes a concern for people who consume country foods. Peak concentrations of methylmercury are anticipated within three to five years after flooding of the Keeyask reservoir and would likely decrease gradually 25 to 30 years after flooding.

Methylmercury levels in fish are predicted to increase within the Keeyask reservoir and downstream to Stephens Lake reservoir (Table 4-5) during operation of the generating station. This increase may result in domestic consumption advisory limits[26] that could prevent commercial sale of fish and may reduce the subsistence harvest. Mercury levels in wildlife consumed as food (hunted and trapped mammals, water and other birds, and bird eggs) will also increase.

26 Manitoba has fish consumption guidelines for some northern Manitoba lakes that advise limits on daily fish consumption, based on fish tissue mercury levels in these lakes. Government of Manitoba (n.d.) *Recreational Fish Consumption Guidelines*. Available at the Conservation and Water Stewardship website **www.gov.mb.ca/waterstewardship/fish/mercury/manitobamap.html**

Aboriginal group members are concerned with elevated mercury levels in reservoirs created by hydroelectric developments and the waters downstream in the Nelson River watershed. Consequently, they have reduced their use of resources from these waterbodies.

The proponent's human health risk assessment evaluated the Keeyask Cree Nations' potential exposure to methylmercury from country food consumption given the expected increases in methylmercury concentrations in fish tissue (Table 4-6). The assessment could also be applied to people who fish in Stephens Lake reservoir or Gull Lake. The proponent's assessment concluded that there could be unrestricted eating of fish with 0.2 micrograms of methylmercury per kilogram of body weight per day. However, Health Canada noted that the Guidelines for the Consumption of Recreationally Angles Fish in Manitoba (2007) recommends that women of childbearing age and children under 12 years of age limit their consumption of fish with under 0.2 micrograms of mercury to eight meals per month.

The proponent will revise their original conclusions within their Risk Management Plan and communication products.

To address the effects of increased mercury concentrations in fish from the Keeyask reservoir, the proponent has included fish offsetting (replacement) programs in each of the Keeyask Cree Nations *Adverse Effects Agreements*. The Tataskweyak Cree Nation's *Healthy Food Fish Program* and War Lake First Nation's *Community Fish Program* provide members with transportation to fish lakes not affected by the Project.

The proponent has also committed to developing and implementing a Risk Management Plan containing monitoring and follow-up and communication activities to address exposure to mercury in country foods. This plan will address Health Canada's concerns regarding the human health risk of mercury in country foods. The Risk Management Plan is currently in production and Health Canada is available to review it when it is made available. It will include:

Table 4-5: Mercury in Fish Tissue

Location (upstream to downstream)	Fish species	Mercury in fish tissue (parts per million)	
		Baseline[1]	Predicted peak levels with project
Split Lake	Lake Whitefish	0.03	**Expected to fluctuate around current values**
	Northern Pike	0.18	
	Walleye	0.12	
Nelson River below Birthday Rapids; Gull Lake; Keeyask reservoir (with project)	Lake Whitefish	<0.10	0.06 to 0.2
	Northern Pike	<0.32	1.0 or more
	Walleye	<0.32	1.0 or more
Stephens Lake reservoir	Lake Whitefish	0.03	0.12
	Northern Pike	0.18	0.4 or more
	Walleye	0.20	0.4 or more

Note 1: Mean value estimates derived from available data.

Source: Keeyask Hydropower Limited Partnership (2012). Aquatic Environment Supporting Volume, *Environmental Impact Statement*. Section 7.2, Figures 7-1 to 7-5, and Appendix 7H.

- post-impoundment, annual monitoring within Keeyask reservoir and Stephens Lake reservoir until fish mercury concentrations do not increase over a three-year period, an indicator that they have stabilized;
- subsequent monitoring every three years until variations in fish mercury concentrations in three consecutive sampling periods are not statistically significant;
- monitoring of fish mercury levels upstream and downstream of both water bodies if maximum fish mercury concentrations in either Keeyask reservoir or Stephens Lake reservoir exceed predicted levels;
- communicating with Keeyask Cree Nations, Gillam residents, and other users of the affected lakes of the potential risks of consuming fish prior to and after impoundment;
- signage at Gull Lake stating the fish consumption recommendations;
- communication of monitoring results, as they become available, to local communities and resource users;
- evaluation of monitoring results to determine if adjustments are required to consumption advisories until mercury levels return to pre-project conditions; and
- liaising through the Partnership Monitoring Advisory Committee with provincial and federal authorities and Manitoba Conservation and Water Stewardship about preparation of restrictions at Gull Lake and Stephens Lake reservoir.

Construction and Operation Effects to Air Quality and Noise

In addition to mercury effects to country foods, fugitive air emissions (dust from road traffic and construction, and smoke from burning reservoir clearing), increased noise levels, and vibrations, in some circumstances, effect physical health. Construction dust and smoke emissions will vary with the level of construction activity, the specific operations and local weather conditions. Very few air emissions are associated with project operation.

Noise will be generated by equipment and machinery used for site preparation and clearing activities, materials handling, concrete and aggregate processing, and blasting at quarry sites and within powerhouse and spillway approach and discharge channels. During construction, noise levels at the site and along access roads are expected to be occasionally elevated from the range typically found in a natural setting.

Noise from the powerhouse machinery during operation of the generating station is mitigated by submersion under several metres of water. Additionally, any powerhouse machinery noise is likely to be masked by spillway noise. Water flowing through the powerhouse tailrace and spillway during high flow conditions is expected to be the most audible noise. High-flow tailrace-spillway noise is expected to sound like a waterfall and have noise levels of 75 to 80 decibels (A-filtered)[27] within three metres of the flow. When changes in spillway flow occur, a warning siren would be sounded to alert downstream users.

Potential health effects may also occur during operation of the transmission line and associated structures from noise, electromagnetic field generation, and potential exposure to chemical herbicides used for vegetation maintenance along the transmission line right of way. Manitoba Hydro's proposed design allows for a maximum noise level of 50 decibels (A-filtered) at the edge of the right of way. As the transmission line is located more than 500 metres from seasonal or permanent noise sensitive receptors and more than one kilometre from sensitive receptors, levels of audible noise outside of the transmission

27 Unit used in Manitoba noise guidelines **http://safemanitoba.com/sites/default/files/uploads/guidelines/hearing.pdf&ei=uvmMUrOHBYr7qAGIsoGgCg&usg=AFQjCNEjbRAGxfS3_ThsuVAtDVTpH0txcw**

line right of way are considered to be within recommended provincial limits. Based on the proposed mitigation, air quality and noise standards at receptor locations are not predicted to be exceeded. Proponent mitigations are described in Appendixes F.

Project Effects to Drinking Water

Project-related water quality changes are not expected to affect the quality of drinking water at sources and community water intakes along the Nelson River including the Town of Gillam water supply and York Landing,

4.8.2 Government, Aboriginal, and Public Comments

In addition to the development and implementation of the Risk Management Plan, Health Canada recommended that:

- future monitoring data be assessed to determine whether consumption of water birds and waterfowl poses a health risk and implement mitigation measures if an unacceptable risk has been identified;
- communications products be developed for consumption recommendations in offset lakes; and
- supplementary field studies for Lake Sturgeon include long-term monitoring for mercury levels.

The proponent has committed to expand the Risk Management Plan, to include:

- undertaking a voluntary wild game monitoring program focused on mercury levels to validate assumptions in the human health risk assessment and to serve as baseline data for risk assessment of other hydro projects (e.g. Conawapa);
- collection of waterfowl samples annually on a voluntary basis, for mercury testing post impoundment until mercury levels return to baseline conditions;
- conducting preliminary fish mercury testing for offset lakes without a baseline that were identified by the Keeyask Cree Nations communities for alternative fishing;
- monitoring of offset lakes, so the offset programs can be adjusted, if necessary; and
- development of detailed Lake Sturgeon and fish consumption recommendations and risk communication protocols in cooperation with provincial health officials and with Health Canada guidance.

Keeyask Cree Nations environmental evaluation reports expressed a broader health perspective. Fox Lake Cree Nation noted "the continued connection to the land is critical to our overall wellness. Physical, intellectual, social, spiritual, health and healing benefits are derived from our connection to Aski."[28] This broader health perspective was reiterated by Norway House Cree Nation, Cross Lake First Nation and Pimicikamak, and Fox Lake Cree Nation during consultation. According to Norway House Cree Nation, "health isn't just about the ingestion of mercury" and psychological and psychosocial impacts resulting from environmental change must be taken into account in an examination of the environmental effects of the Keeyask project.

York Factory First Nation noted that proponent commitments to regular community-based water quality monitoring near York Factory First Nation's community recreation areas and domestic water source are required. This would address concerns regarding potential unforeseen circumstances including project impacts to water quality.

Manitoba Metis Federation expressed concern about mercury levels in fish in the Nelson River watershed and the anticipated timeframe for the return of fish tissue levels to pre-project baseline.

28 (Fox Lake Cree Nation, 2012), pg. 22.

The York Factory First Nation presented specific concerns that fish mercury levels in the Aiken River will increase due to the Project. Although the proponent predicts no project effect on fish caused by mercury in the Aiken River, the proponent will measure mercury in Walleye and Northern Pike from the Aiken River every three years, with the next scheduled sampling in 2015.

4.8.3 Agency Analysis of Residual Effects

A summary of the Project's residual effects on mercury in country foods is shown in Appendix C, Environmental Effects Analysis Summary.

Mercury and Human Health

An increased risk of dietary exposure to methylmercury through country foods, primarily through fish harvested from the Keeyask reservoir and Stephen's Lake is one of the primary residual effects on human health. Consumption restrictions will be required to avoid human health effects.

The proponent has included monitoring of methyl mercury concentrations in fish under the Project's Aquatic Effects Monitoring Plan. In addition the proponent will collect of samples of wild game, waterfowl, and plants for mercury testing to confirm mercury concentrations remain acceptable for domestic consumption. This has been cross referenced in the *Terrestrial Environment Monitoring Program.*

Monitoring of mercury levels in selected fish species and waterbodies will be done annually until maximum levels are reached and then every three years thereafter until concentrations return to long-term stable levels. The monitoring results will be compared with predicted increases in mercury concentrations every five years starting in 2022. Unpredicted increases in fish tissue mercury concentrations will require a reassessment of the fish consumption guidance.

The Agency considers the magnitude of the residual effects to be moderate because of the expected measurable increases in fish tissue mercury concentrations that will require ongoing monitoring to ensure fish consumption advisories are appropriate. These effect, local in geographic extent and long term, given that concentrations are not expected to start declining for approximately 25 years.

Air Quality and Noise Effects

Residual effects to local air quality are expected to be appropriately managed and are not anticipated to result in exceedances of the ambient air quality objectives and guidelines[29] in the Local Study Area, with the exception of possible local and short duration exceedances associated with smoke produced from the burning of debris. The magnitude of the residual effects to air quality are considered low, of short term duration, would be intermittent and will be readily reversible.

Construction noise levels upon application of mitigation are not expected to affect environmental conditions in the nearby construction worker camp (three kilometres from the project construction site) or to affect users of known trappers' cabins located further away than the main camp.

Residual noise effects of the operation of the transmission line and associated structures are expected to be limited to the right of way and area immediately adjacent to station sites and towers. Residual noise effects of generating station operation include permanent changes to the sound of Gull Rapids. The removal of Gull Rapids is not mitigable, and the proponent has committed to compensate for this loss by providing for cultural ceremonies associated with the loss of Gull Rapid sound profile.

Residual effects of noise from the generation project and transmission line are considered to

29 Manitoba's Ambient Air Quality Guidelines.

be of low magnitude, limited in extent, will occur mainly during the construction phase of the project and are reversible.

4.8.4 Agency Conclusions

The Agency concludes that the Project is not likely to cause significant adverse environmental effects to human health, taking into account implementation of the proposed mitigation measures and follow-up commitments of the proponent.

4.9 Heritage Resources

Heritage resources are a non-renewable resource that are protected under the *Heritage Resources Act* of Manitoba and have cultural importance to Aboriginal groups and the public. Potential project effects on heritage resources were considered by the proponent in Local and Regional Study Areas defined by their proximity to the project footprint (Appendix B, Figure B-5).

As a result of the proponent's ongoing heritage and archaeological investigations, 114 archaeological sites were catalogued and identified in the Keeyask Generation Project's Environmental Impact Statement. Archaeological investigations in 2012 discovered an additional 10 sites, including one undisturbed campsite, in the area proposed for the Keeyask reservoir. Investigations in 2013 added an additional four sites and two possible burial locations.

The proponent predicts permanent disturbance or loss of seven recorded sites during construction of the generating station or impoundment of the reservoir. Two possible burial locations and 17 additional sites may be permanently disturbed or lost through flooding or shoreline erosion caused by fluctuating water levels. As the proponent continues to catalogue new sites, permanent disturbance or loss of still uncatalogued sites is also predicted. Increased project traffic may also affect sites and cause permanent changes in the interpretive capacity of the sites.

4.9.1 Potential Environmental Effects and Proposed Mitigation

As a result of the Project, historically known cultural landscapes that would be flooded by the reservoir would be permanently lost, affecting the ability of Keeyask Cree Nations to orally narrate their history at heritage sites. Proposed mitigations to address these effects are included in Adverse Effects Agreements with Keeyask Cree Nations. These include:

- archaeological salvage of known affected sites;
- education and awareness training;
- construction monitoring and, should sites be encountered, reporting and salvage of sites as directed under the *Heritage Resources Act* of Manitoba;
- annual monitoring under the construction Heritage Resources Protection Plan[30], periodic seasonal monitoring as part of the Waterways Management Program's monitoring of shoreline erosion, and, should sites be encountered, reporting and salvage of sites as directed under the *Heritage Resources Act* of Manitoba; and
- provision for a Cultural Centre Museum and Oral Histories Program that would repatriate, display and interpret heritage resources found within the area, within Tataskweyak Cree Nation's Adverse Effects Agreement Offsetting Program and provision for a Museum and Oral History Program within War Lake First Nation's Adverse Effects Agreement Offsetting Program.

30 The proponent has drafted a preliminary Construction Heritage Resources Protection Plan (the "HRPP") as part of the overall Environmental Protection Program (the "EnvPP"). The HRPP is a preliminary draft subject to review by the Historic Resources Branch, Manitoba Culture, Heritage and Tourism, public comment and updating once the terms and conditions of the licence are provided (if the Project is approved).

4.9.2 Government, Aboriginal, and Public Comments

Cross Lake Cree Nation and Pimacikamak, Fox Lake Cree Nation, Nisichiwayisihk Cree Nation, Tataskweyak Cree Nation, War Lake First Nation, Norway House Cree Nation, and Manitoba Metis Federation commented that there was a need to identify and protect culturally important places and objects. Fox Lake Cree Nation noted that heritage resources also include intangible aspects of culture, such as the historical and family connections to particular places. Nisichiwayisihk Cree Nation expressed concern about the treatment of any disturbed human remains and the challenge of inspecting and monitoring for the protection of sites located under snow cover during winter construction activities. They further recommended that Aboriginal methods and traditional knowledge should be used to find sites.

The proponent responded with additional information including a draft Heritage Resource Protection Plan. The proponent has also undertaken ongoing field investigations to identify heritage and archaeological sites within the proposed Keeyask reservoir prior to construction.

4.9.3 Agency Analysis of Residual Effects

With the application of mitigations (see section 4.9.1), there will still be a permanent loss of valued sites through construction and flooding of the reservoir. The Keeyask Cree Nations partners have included such compensation measures as they determined acceptable to address the disturbance of sites and loss of access to culturally valued locations through adverse effects agreements. However, other First Nations and Metis without adverse effects agreements may experience uncompensated loss of access to valued sites.

The proponent has also continued to identify new archaeological sites and others may be discovered and disturbed through on-going shoreline erosion in the operation phase. Monitoring for sites will be part of the proponent's Environmental Protection Program. As a result, this residual effect is considered moderate in magnitude and permanent because of the residual loss of the original sites, which include burial sites and locations of cultural significance such as the Keeyask rapids.

4.9.4 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse effects to historic and heritage resources, including archaeological resources after taking into account the implementation of proposed mitigation measures and follow-up commitments of the proponent.

4.10 Effects of Accidents or Malfunctions

Under the *Canadian Environmental Assessment Act* S.C. 1992, c. 37(the former Act), an environmental assessment must consider the possible effects of accidents and malfunctions that could adversely affect the environment at any stage of the Project. Accidents and malfunctions have the potential to occur throughout the life of the Project.

4.10.1 Potential Environmental Effects and Mitigation

Accidents and malfunctions are unplanned, infrequent, and generally short-term in nature. The accidents and malfunctions with potential environmental effects considered by the proponent in this assessment include:

- Dam or dyke failure,
- sewage and wastewater spills,
- hazardous materials spills,
- accidental fires, and
- wildlife mortality due to vehicular collisions.

Dam or Dyke Failure

Downstream impacts of dam or dyke failure and the resulting release of uncontrolled, high velocity flow include watercourse and terrestrial erosion, terrestrial flooding, and pressure on downstream generating stations (Kettle, Long Spruce, and Limestone). Such a catastrophic failure would also have economic and social impacts on downstream communities. Canadian Dam Safety Guidelines have been applied to the design of the Keeyask generating station. They address safe construction, operation, and maintenance of dams; emergency preparedness for dam failure; safe passage of the probable maximum flood; and include independent reviews. The Keeyask generating station is designed to pass a flood twice as large as any on record, which is less than a 1:10 000 year frequency. While the effect of the worst case scenario dam failure is assessed as being large in magnitude and geographic extent, and of moderate to high ecological and social context, it has a very low probability of occurring and is mitigated during design and through emergency planning. Dyke failure would have similar impacts and is also pre-emptively mitigated through design and emergency planning.

Sewage, Wastewater, or Hazardous Materials Spills

Sewage, wastewater, or hazardous materials spills or releases may occur during construction or operation. Impacts would include water contamination impacting fish and fish habitat, compromised water quality, and possible terrestrial soil contamination. The measures specified in Manitoba Hydro's environmental management system, *Project Emergency Plan*, and *Spill Response Plan* include providing necessary training and equipment to address spills of sewage, wastewater and hazardous materials as a result of accidents and malfunctions during construction and operation. Spill response programs and equipment would be in place for spillage or leaks of any oils or contaminants. All material would be stored and handled in accordance with established federal and provincial policies and regulations. Legislation and regulations would be followed for the transportation of dangerous goods, and onsite emergency response teams would receive training about fuel spill containment, clean-up, and other emergency measures.

Accidental Fires

Project construction equipment and activities such as clearing, grubbing, road construction, welding, rock cutting, and use of explosive may cause fires during construction. Expected impacts of accidental fires due to construction are similar to those impacts caused by naturally occurring fire such as alteration of terrestrial habitat and of vegetation community composition, and subsequent release of sediment and increased likelihood of erosion.

Risk of fire would be greater when construction activities are most active and when project activities are scheduled in summer. Fire prevention and suppression measures would be incorporated into the Project Environmental Protection plans, the project-specific emergency response plan, and the Reservoir Clearing Plan to mitigate the potential for an accidental fire occurring. These measures include training in fire prevention and suppression, and use of equipment that reduces the risk of fire from construction activities. Additionally, vegetation cleared for the reservoir, camp areas and other sites would be removed and disposed of, thereby reducing the availability of fuel for a fire.

Wildlife Mortality

Moose and caribou mortality are expected to increase due to increased vehicle-wildlife collisions on the north and south access roads during construction and operation of the Project. Increased vehicle traffic at sensitive watercourse crossings

may also cause waterbird and raptor mortality. Mitigation measures to reduce wildlife-vehicle collisions would include warning signs, rehabilitation of roadside ditches, driver wildlife awareness training, and reduced speed limits.

Appendix E summarizes potential project accidents and malfunctions, their environmental effects, their likelihood of occurrence, preventative mitigation measures, and contingency and emergency response procedures.

4.10.2 Government, Aboriginal and Public Comments

General concerns were raised regarding the management of accidental spills on land and in water, with an emphasis on potential effects to fish habitat. Deficiencies were noted in the initial information provided by the proponent regarding project safety, security and emergency response. For example, Peguis First Nation noted that consideration of a failure of the reservoir dykes at the Keeyask generating station was not included by the proponent.

In response, the proponent provided an assessment of the risks associated with potential accidents and malfunctions and clarified emergency and spill response procedures to be employed in the event of an accident or malfunction in response to a federal government request.

4.10.3 Agency Conclusions

The Agency is satisfied that the proponent has identified and assessed the key potential accidents and malfunctions associated with the project. The Agency notes that the project has been designed to prevent such scenarios and that contingency and response plans would be in place should an accident occur. Overall, the Agency is of the view that accidents or malfunctions that could result in significant adverse residual effects are unlikely to occur.

4.11 Effects of the Environment on the Project

Environmental factors that could potentially affect the Project and lead to adverse environmental effects include extreme weather, forest fires, seismic events, and local effects of long-term climate change (e.g. permafrost melting, greater frequency and intensity of storm events, lower summer precipitation, and an increase in average annual area burned by forest fires). These factors may contribute to damage to infrastructure or interruption of service and increase the risk of accidents and malfunctions.

4.11.1 Potential Environmental Effects and Proposed Mitigation

Extreme weather

The Project and all facility components and operation procedures will be designed to relevant engineering codes and standards with the knowledge of site environmental conditions including extreme weather events and predicted changes due to a changing global climate. Table 4-6 lists extreme weather values considered by the proponent.

The Keeyask Transmission Project considered hazards associated with wind throw, accidental arcing, and ice accumulation on transmission lines. Design features to reduce risks to the Project include separation of lines on the tower and between towers on the right of way. Maintenance activities include monitoring for icing conditions on lines and removal of ice where needed to maintain safety.

Lightning strikes can potentially cause forest fires and transmission disruptions. Risks from lightning strikes are addressed by the inclusion of electrical grounding facilities in the Keeyask Transmission Project.

Table 4-6: Extreme Weather Values for the Project Environment.

Factor	Extreme values
Wind	Maximum recorded hourly wind speed is 83 kilometres per hour
	Maximum gust speed recorded at 107 kilometres per hour
Temperature	Historical daily maximum of +36.8°C
	Historical daily minimum -46.1°C.
Precipitation (rain and snow)	Daily maximums of 6.44 and 36.6 millimetres
	Average annual snowfall of 228.6 centimetres, and average March snow depth of 56 centimetres

Forest Fire

The boreal forest in which the Project resides has an active history of forest fires including fires in 2013 that burned over five million hectares in the Project's terrestrial Regional Study Area. A sizeable portion of the affected area was situated directly adjacent to the project location. Past and recent events indicate that the likelihood of forest fires impacting the Keeyask area in the future is very high.[31]

Mitigation measures are included in Appendix E. Fires resulting from the Project are addressed in Section 4.9 – Accidents and Malfunctions.

Seismic and Geotechnical Risk

The Keeyask Generation Project is being built in accordance with the Canadian Dam Safety guidelines. The final design of earthworks and concrete structures would account for potential earthquake loads and include analysis of earthworks and concrete structures under horizontal and vertical ground accelerations and hydrodynamic forces due to a seismic event.

Climate Change

Degradation of permafrost due to the effects of climate change may impact the substrate on which many transmission towers are situated. Regular patrols of transmission lines will be conducted and any threats to tower foundations will be repaired.

4.11.2 Government, Aboriginal, and Public Comments

Comments focussed on the consideration of environmental risks to the Project. Natural Resources Canada reviewed the proponent's information on seismicity and confirmed that the Project is located in a seismically stable environment (e.g. very low seismic activity).

4.11.3 Agency Conclusions

The Agency is satisfied that the proponent has adequately designed its Project to account for the effects of the environment on the Project.

4.12 Capacity of Renewable Resources

A comprehensive study must address the capacity of renewable resources that are likely to be significantly affected by the Project to meet present and the future needs. Renewable resources that may be affected by the project include aquatic resources, wildlife, and vegetation and plant communities. Significant adverse residual effects on these

31 Response to Undertaking #10.

resources could result in a reduced capacity to provide drinking water or to support sustainable fishing, harvesting, and other traditional uses. Each of these renewable resources was assessed in previous section of the report. In each case, based on the implementation of the measures proposed to mitigate and compensate the effects, the Agency has concluded that the residual effects on these renewable resources would not be significant.

4.12.1 Agency Conclusions

The Agency therefore concludes that the Project is not likely to cause significant adverse effects on the capacity of renewable resources when implementation of the proposed Project's mitigation and compensation measures is taken into account.

4.13 Cumulative Effects Assessment

Cumulative effects assessments examine environmental effects likely to result from the Project in combination with effects from other projects or human activities (including those that have been or will be carried out in the area) on all valued components where residual effects could be expected, including current use by Aboriginal people.

4.13.1 Potential Cumulative Effects

The proponent's analysis of cumulative effects for the Project identified and described any likely overlaps in space and time among residual effects to VECs caused by the Project and effects caused by other projects and human activities – past, current, and reasonably foreseeable.

Where the assessment found an adverse effect to a VEC by the Project and other projects or activities, the cumulative effects assessment determined what, if any, additional mitigation may be required to address the cumulative effects, and further predicted the residual effects following mitigation. The assessment was based on the *Environmental Impact Assessment Guidelines* and other guidance documents for cumulative effects. [32,33]

The proponent's cumulative effects assessment prepared as part of the environmental assessment for the project is summarized in Table 4-7. Taking into account the mitigation measures previously identified, the proponent has concluded that there would be no significant adverse cumulative effects to the VECs for the Project and therefore no additional mitigation measures are required.

4.13.2 Government, Aboriginal, and Public Comments

Cumulative effects were identified as an important issue for a number of VECs, including those summarized below. Norway House Cree Nation, Shamattawa First Nation, Cross Lake First Nation and Pimacikamak, and Manitoba Metis Federation expressed concern over the methodology and disagreed with the time and area boundaries used in the proponent's cumulative effects assessment and with the VEC approach to cumulative effects assessment. The proponent recognizes that the VEC approach does not capture the concept of Cree worldview, which considers the Project in the context of "everything that has happened in the past and everything that is anticipated to happen in the future".

32 Hegmann et al. (1999). *Cumulative Effects Assessment Practitioners Guide*. **www.ceaa-acee.gc.ca/default.asp?lang=En&n=43952694-1**

33 CEAA (2007).Operational Policy Statement – Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act. Available from **www.ceaa-acee.gc.ca/default.asp?lang=En&n=1F77F3C2-1**

Aboriginal groups are concerned about the cumulative effects of hydrodevelopment on wildlife populations, waterfowl, fish, sturgeon, water safety, water quality and quantity, and on habitat within the Nelson River and the Keeyask area. Several groups noted that hydro development has affected the taste of fish, eggs and wildlife and that people have stopped eating fish because they worry about methylmercury contamination.

Cross Lake First Nation and Pimicikamak, Norway House Cree Nation, Shamattawa First Nation, and Manitoba Metis Federation, who were not identified by the proponent as highly impacted groups, strongly argue that any change to Manitoba Hydro's generation system will have impacts throughout the Nelson River. They asked that a cumulative effects assessment include as Keeyask Generation Project effects, within the scope of this EA, modifications to the operation of Manitoba Hydro's overall hydro power system.

With the addition of Keeyask to the series of water diversions and reservoirs operated on the Lake Winnipeg – Nelson River system, Aboriginal groups expressed concern that the environmental effects experienced from the operation of existing facilities would change in a way that would not have been considered in past project by project reviews.

All of the Aboriginal groups consulted expressed concern about the cumulative effects of hydro development on the ability to hunt, fish, gather, and travel within the Nelson River and the Keeyask area.

Shamattawa First Nation, Manitoba Metis Federation, Cross Lake First Nation and Pimicikamak, and Norway House Cree Nation, who are groups outside of the immediate project area, have identified ongoing impacts from the operation of past projects on the Nelson River watershed.

Cross Lake First Nation and Pimicikamak identified that:

- Past development has decreased family connections resulting in the loss of traditional languages, negative cultural identify and community health impacts, and contributed to the incremental loss of archaeological and heritage sites;
- Impacts from shoreline erosion, in-water woody debris, and water level and flow changes have occurred on navigation, gathering of medicines, fishing, wildlife hunting and trapping; and
- Impacts to culture are also experienced through disturbance to archaeological and heritage sites, and intangible cultural impacts not commonly reflected in an environmental effects assessment.

Norway House Cree Nation emphasized that on-going interventions are required to address the psychological and psycho-social impacts of hydrodevelopment, based on their experience with previous hydro development on the Nelson River upstream of the Keeyask project area.

Federal experts' comments considered cumulative effects on individual VECs throughout the EIS review. It was noted that the analysis was conducted in the absence of regionally-based thresholds and there are several areas where potential project effects are uncertain or mitigations proposed are untested. The proponent has committed to monitoring for residual project effects on VECs including Lake Sturgeon, caribou, and mercury and human health.

Table 4-7: Proponent Summary of Findings from the Cumulative Effects Assessment for each Aquatic and Terrestrial VEC

Aquatic and Terrestrial VECs Adversely Affected by the Project	Overlap with Past and Current Projects or Activities in Space or Time													Mitigation Measures	
	CRD	LWR	Kelsey (& re-runnering)	Kettle	Long Spruce & Limestone	Transmission Lines	Mining Activities	Commercial Fishing	PR280 Upgrades	Community Development	GSs on Burntwood River	Wuskwatim	KIP		
Water quality	✓	✓	✓	✓	✓						✓			Application of sediment and effluent best management practices and spill response readiness.	
Pickerel/Jackfish/Lake Whitefish	✓	✓	✓	✓				✓				✓		Adherence to in-stream construction timing windows, blasting guidelines, creation of spawning shoals, construction of channels to prevent fish stranding.	
Lake Sturgeon	✓	✓	✓	✓				✓				✓		Constructed habitat for all life stages, trap and haul up stream passage, regional stocking program and collaborative monitoring and management efforts.	
Ecosystem Diversity	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	An access management plan will be in place and priority habitats will be rehabilitated.	
Wetland Function	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	New wetlands will be developed and erosion controlled.	
Intactness	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	Planning and design has minimized disturbance.	
Priority Plants	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	Very rare species, if identified, will be avoided/transplanted.	
Caribou	✓	✓	✓	✓	✓	✓			✓				✓	An access management plan will be in place and firearms will be prohibited in camp. Collaborative management efforts are proposed to manage uncertainty with natural and potential development-related change.	
Moose	✓	✓	✓	✓	✓	✓			✓				✓	An access management plan will be in place and firearms will be prohibited in camp. New wetlands will be developed. A sustainable harvesting plan will be developed by TCN for the Split Lake RMA.	
Beaver	✓	✓		✓	✓	✓			✓				✓	A 100 metre buffer will be applied along shorelines. Beaver bafflers will be installed along culverts and harvest will be managed by registered trapline holders.	
Canada Goose	✓	✓	✓	✓	✓	✓							✓	Site was selected to minimize flooding and clearing, clearing will be conducted outside of nesting season, vegetated buffers will be retained adjacent to water bodies to reduce noise. An access management plan and construction avian management plan will be in place. New wetlands will be developed.	
Mallard	✓	✓	✓	✓	✓	✓							✓	See mitigation in Canada Goose.	
Bald Eagle	✓	✓	✓	✓	✓	✓			✓				✓	Nests will be removed from trees that may fall into the reservoir, and artificial nesting platforms installed where necessary and appropriate. See mitigation in Canada Goose.	
Olive Sided Flycatcher		✓	✓	✓	✓	✓	✓		✓	✓			✓	Perching structures will be installed in decommissioned borrow areas that provide appropriate habitat. See mitigation in Canada Goose.	
Common Nighthawk		✓	✓	✓	✓	✓	✓		✓	✓			✓	Retention of standing dead trees. Clearing will occur outside the breeding season.	
Rusty Blackbird	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	See mitigation in Canada Goose.	

[1] Direction of effect is expressed as either: no effect (0), an adverse effect (-) or a positive effect (+)

[2] Magnitude of effect is expressed as either: small (sm), moderate (mod), or large (lg)

[3] The spacial extent of effect is expressed as either: small (sm), medium (me), or large (lg)

[4] Duration of effect is expressed as either: short, medium (med), or long

	Construction(C) Operation(O)	Step 1 Significance (Post-Mitigation)				Carried Forward to Step 2 (Y/N)	Step 2 Significance (Post-Mitigation)			Overlap with Future Projects				Concluding Statements including Consideration of Future Projects and Activities
		Direction[1] (0/-/+)	Magnitude[2] (sm, mod, lg)	Spatial[3] (sm, me, lg)	Duration[4] (short, med, long)		Frequency (inf, freq, con)[5]	Reversibility (irr, rev)[6]	Ecological & Social Context (low, mod or high)[7]	Keeyask Transmission	Bipole III	Gillam Redevelopment	Conawapa	
	C	-	sm-mod	sm-lg	short	N	NA[8]	NA	NA				✓	Increases in TSS are expected during construction of the Project. During operation, most effects will be confined to the reservoir and further downstream. Over the long term, effects will be negligible to small.
	O	-	mod-lg	sm-me	med-long	Y	con	irr	mod				✓	
	C	-	mod	me	med	N	NA	NA	NA					During construction, there may be a reduction in spawning habitat. Over the long term, jackfish populations are expected to remain stable, and pickerel and lake whitefish populations are expected to increase. No overlap is expected with future projects.
	O	+	sm	me	long	N	NA	NA	NA					
	C	-	mod	me	med	Y	con	rev	high					No overlap is expected with future projects. The regional stocking program accompanied by ongoing and collaborative monitoring and management will continue over the long term and it is xpected that Lake Sturgeon populations will increase as a result.
	O	+	mod	lg	long	N	NA	NA	NA					
	C	-	sm-mod	me	long	Y	con	irr	low	✓	✓	✓		Although habitat will be lost and altered due to the Project, future project area losses for all priority habitat types will be well below 10% of historical area. Effects are considered regionally acceptable.
	O	-	sm-mod	me	long	Y	con	irr	low	✓	✓	✓		
	C	-	sm-mod	me	long	Y	con	irr	low	✓	✓	✓		There will be none to little loss of off-system marshes. No globally, nationally or provincially significant wetlands will be affected. Effects are considered regionally acceptable.
	O	-	sm-mod	me	long	Y	con	irr	low	✓	✓	✓		
	C	-	sm	me	long	N	NA	NA	NA	✓	✓	✓		Although habitat will be lost and altered due to the Project and future projects, it is expected that due to large remaining core areas, the effects will be regionally acceptable.
	O	-	sm	me	long	N	NA	NA	NA	✓	✓	✓		
	C	-	mod	me	long	Y	con	irr	low	✓	✓	✓	✓	Although habitat will be lost and altered due to the Project and future projects, there is a low percentage of known habitats affected by planned development. Overall, effects will be regionally acceptable.
	O	-	mod	sm	long	Y	con	irr	low	✓	✓	✓	✓	
	C	-	sm	sm	long	N	NA	NA	NA	✓	✓	✓	✓	Habitat loss in area will be small (<1%). Changes to intactness and mortality are negligible, altered movements and distribution are likely limited to habitat near the Project and future projects and activities and will have little effect on landscape-level movements and distribution. Overall, effects are expected to be negligible to small for both resident and migratory caribou.
	O	-	sm	me	long	N	NA	NA	NA	✓	✓	✓	✓	
	C	-	sm	me	long	N	NA	NA	NA	✓	✓	✓	✓	A small amount of habitat loss or alteration (<1%), sensory disturbance and improved predation, harvest and vehicle mortality is expected with the Project. Future projects may increase habitat loss and mortality with increased human presence and access. Overall, effects are expected to be negligible to small.
	O	-	sm	me	long	N	NA	NA	NA	✓	✓	✓	✓	
	C	-	sm	sm	long	N	NA	NA	NA	✓	✓	✓		Although there will be habitat loss or alteration and there is potential for increased harvest and predation due to increased access, no appreciable change in beaver population is expected. Overall, effects are expected to be small.
	O	-	sm	sm	long	N	NA	NA	NA	✓	✓	✓		
	C	-	sm	sm	short	N	NA	NA	NA	✓	✓		✓	Although there is potential for increased harvest, there is not expected to be a measurable effect. Overall, effects will be regionally acceptable.
	O	-	sm	me	long	N	NA	NA	NA	✓	✓		✓	
	C	-	sm	sm	long	N	NA	NA	NA	✓	✓		✓	Potential for increased harvest and additional loss or alteration of nesting cover. Overall, effects are expected to be small.
	O	-	sm	me	long	N	NA	NA	NA	✓	✓		✓	
	C	-	sm	sm	short	N	NA	NA	NA	✓	✓		✓	Potential for increased harvest and additional loss or alteration of nesting cover. Overall, effects are expected to be neutral to small.
	O	o	NA	NA	NA	N	NA	NA	NA					
	C	-	mod	sm	long	Y	inf	irr	high	✓	✓			Potential for additional loss of breeding habitat with future projects. Overall, effects are expected to be small.
	O	-	sm	sm	long	Y	inf	irr	high	✓	✓			
	C	+	lg	sm	short	Y	NA	NA	NA	✓	✓			Potential for additional habitat loss with future projects; however, land clearing is expected to moderately increase foraging habitat. Overall, effects are expected to be positive.
	O	-	mod	sm	long	Y	freq	rev	high	✓	✓			
	C	-	mod	sm	long	Y	inf	rev	high	✓	✓			Additional loss of breeding habitat through land clearing. Overall, effects are expected to be minimal.
	O	-	mod	sm	long	Y	con	irr	high	✓	✓			

[5] Frequency is expressed as either: infrequent (inf), frequent (freq) or continuous (con)

[6] Reversibility is expressed as either: reversible (rev) or irreversible (irr)

[7] Ecological and Social Context is expressed as either: low, moderate (mod) or high

[8] NA-not applicable

Table 4-8: Proponent Summary of Findings from the Cumulative Effects Assessment for Each Socio-Economic VEC

Socio-Economic VECs Adversely Affected by the Project	Overlap with Past and Current Projects or Activities in Space or Time											Mitigation Measures	Construction (C) Operation (O)	Step 1 Significance (Post-Mitigation)				
	CRD	LWR	Kelsey (and re-runnering)	Kettle	Long spruce & Limestone	Mining Activities	BRHA Temp Accom.	All Linear Development	GSs on Burntwood River	Wuskwatim	KIP			Direction[1] (0/-/+)	Magnitude[2] (s,mo,lg)	Spatial[3] (s,med,lg)	Duration[4] (sh,med,long)	
Housing				✓	✓	✓	✓					Workers housed in camp, MH participating in joint community land use planning and new housing in Gillam to respond to MH operations staff requirements and town growth	C	-	sm	med	sh	
													O	0	0	0	0	
Infrastructure & Services				✓	✓						✓	Ongoing communication with local service providers to all for effective and timely planning of service delivery, including RCMP and Northern Regional Health Authority (NRHA). Participation in Gillam land use planning process.	C	-	sm-mod	sm-med	sh	
													O	-	sm	sm	long	
Transportation Infrastructure				✓	✓			✓			✓	PR280 is being upgraded, including widening, grading and curve shaping	C	-	sm	med-lg	sh	
													O	0	0	0	0	
Community Health[9]				✓	✓							At main camp, 24/7 emergency medical and ambulance services, and on-site public health professional responsible for provision and referral to health promotion and risk management programming (including sexually transmitted infection education, if required). Ongoing consultation with NRHA to inform and provide necessary support for implementation of its 5-year strategic plan. FLCNAEA programming for health and wellness at local level already included in Project.	C	-	sm	med	med	
													O	+	sm	med	long	
Public Safety and Worker Interaction				✓	✓	✓						Cross-cultural awareness training; main camp lounge and recreational facilities; a Construction Access Management Plan; shuttles between camp, Gillam and Thompson airports and KCNs communities; Harmonized Gillam Development: Worker Interaction sub-committee, involving FLCN, Town of Gillam and MB Hydro (and TCN as required) and local stakeholders, as a forum to coordinate, prevent and respond to worker interaction issues across all MH proposed projects. See also measures described in Infrastructure & Services and Community Health.	C	-	mod	s-med	sh-med	
													O	-	sm	med	long	
Travel, Access and Safety	✓	✓		✓		✓					✓	Safety is first priority with all MH activities and projects. Reservoir Clearing Plan will eliminate most vegetation that may interfere with boat travel; Waterways Management Program will collect reservoir debris, install safe launches, landing sites and safety shelters, an develop and monitor safe ice trails. Rerouting and upgrades to PR280 will improve road conditions. Development of boat launches and portage will enable travel around the generating station.	C	-	s-mo	med	sh-long	
													O	+	sm	med	long	
Aesthetics	✓	✓		✓		✓		✓			✓	Reservoir Clearing Plan will reduce unsightly debris, construction site will be decommissioned, disturbed site reclamation construction are as (such as borrow areas), using native plants types; boat launches and rest areas will be developed. Creation of main camp nature trails and ceremonies and rituals will assist in addressing long-term loss of landscape elements. Also see Culture and Spirituality.	C	-	sm	med	long	
													O	-	sm	med	long	
Culture and Spirituality	✓	✓		✓				✓			✓	Adverse effects agreements (AEAs) with the KCNs include programming to promote healing and well-being, provide opportunities for a traditional lifestyle, healthy food consumption and to strengthen cultural identity. In addition, ceremonies and rituals will be undertaken at key project milestones; a video of existing environment for interpretive display, counselling services; and inclusion of culturally appropriate protocols in Heritage Resources Protection Plan.	C	-	sm	med	long	
													O	-	sm	med	long	
Heritage Resources	✓	✓		✓				✓			✓	Archaeological salvage to recover and record valuable cultural information and shoreline monitoring, Heritage Resources Protection Plan; development of cemetery site for found human remains associated with the Project; KCNs involvement in the identification of culturally and spiritually important sites through Waterways Management Plan; cultural centre museum and oral histories program at TCN.	C	-	mo	s	sh	
													O	-	mo	s	long	
Mercury and Health				✓								In addition to AEAs, which include programs for KCNs to access country food from locations unaffected by the Project, other measures were identified, monitor mercury concentrations in fish and voluntary sampling of wild game, waterfowl, plants and gull eggs for mercury analysis, communicate results; encourage use of fish from unaffected lakes, country foods, and use of fish with low mercury concentrations; prior to impoundment, prepare and distribute communication products to inform KCNs communities, Gillam and others about increases in mercury concentrations post-impoundment; employment of a risk communication protocol for residents of Gillam; liaison (through MAC) with federal and provincial health authorities and Water Stewardship re: consumption restrictions.	C	0	0	0	0	
													O	-	mod	med	med	

[1] Direction of effect is expressed as either: no effect (0) ,an adverse effect (-) or a positive effect (+)

[2] Magnitude of effect is expressed as either: small (sm), moderate (mod), or large (lg)

[3] The spacial extent of effect is expressed as either: small (sm), medium (med), or large (lg)

[4] Duration of effect is expressed as either: short (sh), medium (med), or long

	Carried Forward To Step 2 (Y/N)	Step 2 Significance (Post-Mitigation)			Overlap with Future Projects				Concluding Statements including Consideration of Future Projects and Activities
		Frequency (inf, freq, con)[5]	Reversibility (irr, rev)[6]	Ecological & Social Context (low, mod or high)[7]	Keeyask Transmission	Bipole III	Gillam Redevelopment	Conawapa	
	N	NA[8]	NA	NA	✓	✓	✓	✓	All future projects require additional workforces with some workers likely drawn from within and outside the Local Study Area. This non-local workforce may place an increased demand for housing in Gillam and Thompson. The Gillam redevelopment will address some of that demand. Existing housing shortages in KCN communities, short-term crowding and ongoing demand for temporary accommodation may occur with the Project in combination with future projects. The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.
	N	NA	NA	NA	✓	✓	✓	✓	
	N	NA	NA	NA	✓	✓	✓	✓	It is anticipated that the influx of non-local construction workers from future projects will exacerbate the pressure on community-based infrastructure and services, particularly emergency (i.e. RCMP) and social services in Gillam. With collaborative mitigation measures in place, future projects and activities may increase the magnitude of effects from small to moderate for the short term due to an increase in workers and associated service needs. Operations staff for Keewatinoow Converter Station and the potential Conawapa Generating Station project is expected to be based in Gillam adding to the demands for infrastructure and services in the community. The conclusion from the residual effects significance assessment undertaken in Chapter 6 (EIS) does not change.
	N	NA	NA	NA					
	N	NA	NA	NA	✓	✓	✓	✓	With the increased in traffic on PR391 from Thompson to PR280 and PR280 to the junction of the north access road the magnitude of the residual effects when taking into account cumulative effects may change from small to moderate during the short term; however the change related to cumulative effects would not modify the conclusion from the residual effects significance assessment undertaken in Chapter 6 (EIS).
	N	NA	NA	NA					
	N	NA	NA	NA	✓	✓	✓	✓	Effects on community health associated with the construction of future projects stem from effects related to worker interaction. This includes the potential for increases in communicable diseases, increased alcohol abuse, and adverse interactions between workers and community members such as women and youth. Operations phase cumulative effects stem from population growth in Gillam, and the potential for increases in community health issues. Ongoing monitoring and coordination amongst all projects will reduce the likelihood of cumulative adverse effects. The conclusion from the residual effects significance assessment undertaken in Chapter 6 (EIS) does not change.
	N	NA	NA	NA					
	N	NA	NA	NA	✓	✓	✓	✓	Future projects will further increase the number of non-local workers visiting Gillam, increasing the potential for adverse effects. At the peak of construction, a combined future project workforce of up to 2 300 local and non-local workers may be required. The residual adverse effects of the Keeyask Project on public safety and worker interaction may interact cumulatively with adverse effects of other projects and activities planned during the Keeyask construction phase. A collaborative and cooperative mitigation program is proposed to mitigate these potential effects.
	N	NA	NA	NA					
	N	NA	NA	NA	✓	✓	✓	✓	During construction of the Project, boaters will not have access to the area around Gull Rapids; during operation there will be new boat launches and a portage. A Reservoir Clearing Plan that will reduce debris, and a Waterway Management Program aim to deal with changes in water and ice-based travel safety during operation. Increased construction road traffic is being addressed through upgrades to PR280 by Manitoba Industry and Transportation. Construction of future projects that use the same road network will add to road traffic, resulting in moderate to large residual effects for a short period of time during project overlap.
	N	NA	NA	NA					
	N	NA	NA	NA	✓	✓	✓	✓	Although effects are not reversible, the Project has been planned with the participation of the KCNs and Manitoba Hydro to minimize the physical changes to the landscape. The AEAs were designed to offset foreseeable effects of the Keeyask Project, including permanent changes to the physical landscape, views and loss of rapids, and new infrastructure. While other future projects will affect the landscape looks, their effects should be less prominent and geographically dispersed. The conclusion from the residual effects significance assessment undertaken in Chapter 6 (EIS) does not change.
	N	NA	NA	NA	✓	✓	✓	✓	
	N	NA	NA	NA	✓	✓	✓	✓	KCNs' participation as partners in the Project and their AEAs, which have cultural programming components, access programs for increased traditional activities, traditional lifestyle programs and Cree language programs among others, aim to offset effects on culture and spirituality that are expected to be experienced. Additional mitigation measures are also planned. There is spatial and temporal overlap between the Keeyask Project and construction and operation of the Keeyask Transmission Project, the Conawapa Project, Bipole III Project and Gillam Redevelopment. Future projects will add to physical alterations to land and water, changing the relationship with Askiy, and accentuating adverse effects on culture and spirituality. Manitoba Hydro will work with KCNs and others to minimize adverse effects as much as possible. Where appropriate, adverse effects agreements will negotiate adverse effects agreements. Based on these measures and those of Keeyask, the assessment of significance is not changed when other future projects are considered.
	N	NA	NA	NA	✓	✓	✓	✓	
	N	NA	NA	NA	✓				There will be permanent loss of heritage resources during the construction phase and, during operation, due to flooding and ongoing shoreline erosion. Unknown heritage resources may be lost. Thousands of artifacts have been found and recovered, adding to the knowledge and history of the KCNs. Yet to be discovered heritage resources (including human remains) will be provided a level of protection through the Heritage Resources Protection Plan. The only future project with spatial and temporal overlap with the Project is the Keeyask Transmission Project. Given the mitigation and monitoring that will be associated with both the Keeyask Project and the future Keeyask Transmission Project, no additional mitigation or monitoring will be required. The conclusion from the residual effects significant assessment undertaken in Chapter 6 (EIS) does not change.
	N	NA	NA	NA	✓				
	N	NA	NA	NA					Overall, residual Project effects on mercury and human health are expected to be adverse during the operation phase due to elevated levels of methylmercury (mercury) in fish consumed as country food (lake whitefish, jackfish, pickerel and lake sturgeon). The KCNs AEA off setting programs that permit KCNs to access country food from locations unaffected by the Project, and mitigation measures focused on risk communication, are important in reducing this adverse effect. There is no spatial or temporal overlap between effects on mercury and health from the Keeyask Project and effects of other relevant future projects.
	N	NA	NA	NA					

[5] Frequency is expressed as either: infrequent (inf), frequent (freq) or continuous (con)

[6] Reversibility is expressed as either: reversible(rev)or irreversible (irr)

[7] Ecological and Social Context is expressed as either: low, moderate (mod) or high

[8] NA-not applicable

[9] Since the EIS submission, additional measures have been put into place to alleviate pressure on health care services in the Gillam as a result of the Project (see CECRd1 CAC81b).

4.13.3 Agency's Analysis of Residual Cumulative Effects

The Agency's analysis of Project residual cumulative effects focused on key VECs: fish and fish habitat, caribou, mercury, and current use of lands and resources for traditional purposes as these were key issues of concern that were raised throughout the assessment.

Fish and Fish Habitat

There has been a historical decline in the number of Lake Sturgeon in the Nelson River as a result of historical overfishing and habitat changes from hydrodevelopment. Although residual effects of the Project on Lake Sturgeon were not found to be significant by the proponent, nor to overlap with future projects including Conawapa, considering the proponent commitments for effective mitigation, they were identified as a potential contributor to regional cumulative effects and a concern for the regional management of Lake Sturgeon in the Nelson River.

Traditional knowledge from Fox Lake Cree Nation and Cross Lake First Nation and Pimicikamak indicate that Lake Sturgeon move up and down throughout the Nelson River system, contrary to the federal perspective that genetic studies by the proponent support local scale movement and population exchange. In the Keeyask area and Stephens Lake reservoir, the Project's proposed mitigation measures for Lake Sturgeon, including stocking for population enhancement and recovery, were considered to be of benefit for the potential recovery of Lake Sturgeon, given the present low population.

Caribou

Because of the general scale of caribou movement patterns and the sensitivity of some caribou populations to habitat loss and increased mortality, project residual effects to caribou, while not significant, were raised by several Aboriginal groups as a potential contributor to regional cumulative effects. Annual variability in the populations of caribou and the causal factors behind this variability creates some uncertainty in the population projections. Cumulative effects associated with future projects, including habitat loss and alteration, fragmentation, and access-related mortality from hunting and predation could delay the cycle and recovery of wide-ranging caribou populations currently experiencing declines.

York Factory First Nation indicated that there is uncertainty regarding the identity, movement and numbers of 'Keeyask' caribou and that traditional knowledge should be considered. Traditional knowledge provided by Cross Lake First Nation and Pimicikamak indicates that there are boreal woodland caribou present in the Keeyask area, contrary to the conclusions drawn by the proponent and supported by the federal review. Cross Lake First Nation and Pimicikamak believe that the Keeyask Project will contribute to cumulative degradation of natural environments in the region, and that flooding will adversely impact caribou habitat particularly the loss of calving and calf rearing habitat, thus, adversely affecting the caribou population.

According to the proponent, residual project effects on caribou are expected to overlap with the effects of reasonably foreseeable future projects including the Conawapa Generation Project, the Bipole III Transmission Project, and Gillam redevelopment. Large variability in migratory caribou populations' ranges and migration routes are expected to continue due to natural shifts in range use and migration patterns.

Management of access to and harvest of migratory coastal and barren-ground caribou in the lower Nelson River area was identified as a concern. Infrequent but potentially high harvest events, coupled with incremental habitat effects over a broad region, could result in a decrease and prolonged decline of coastal caribou populations in particular. Current harvest regulations and the management of caribou populations by the province are designed to prevent this from occurring. Management success will require that monitoring of Project-related caribou mortality incorporate all potential mortality causes and

effects to better predict and reduce the risk of cumulative effects. The proponent has started to develop a plan to coordinate caribou monitoring activities among northern hydroelectric developments, and with government authorities and existing caribou committees and management boards. York Factory First Nation noted that the proponent's Monitoring Advisory Committee Caribou Coordination Committee is important for the long-term sustainability of caribou.

The Agency is of the view that the project will not measurable affect caribou in the regional study area. Given annual variability in the population of the three groups and the uncertainty behind that variability, the Agency strongly supports the development and implementation of a Monitoring Advisory Committee Caribou Coordination Committee that will monitor, evaluate, and advise on regional effects on caribou.

Mercury in Fish and Wildlife, Country Foods

As noted, the project may result in human health effects if fish containing excessive levels of methylmercury are consumed too often. However, there is no anticipated spatial overlap with future projects and activities that could also affect methyl mercury levels in the Keeyask area. The concentrations of mercury in fish are considered to represent the estimates from the cumulative effects of all past projects and the proposed Keeyask Project. Flooding as a result of the project is not expected to affect mercury concentrations in fish in the future proposed Conawapa project area.

The Agency is of the view that the risk management plan to address potential exposure to elevated methylmercury concentrations in fish and other country foods will manage potential health risks from methylmercury exposure.

Current Use of Lands and Resources for Traditional Purposes

The proponent's analysis of cumulative effects did not directly address traditional uses such as fishing, hunting, trapping, and gathering. However, VECs such as fish and fish habitat, habitat loss and alteration, methyl mercury contamination of country foods that are directly related to the current use of lands and resources for traditional purposes, were included and were considered by the Agency as indicators of potential cumulative effects on the ability to fish, hunt, gather and trap. These VECs represent how the resources relied on for traditional use may be affected. The Agency considers the proponent's mitigations and follow-up for these VECs will address cumulative effects on the resources.

The Agency expects there will a residual effect from the displacement of current use of lands and resources for traditional purposes that could contribute to cumulative effects.The geographic extent of Bipole III overlaps with the Resource Management Areas associated with the Keeyask project and thus may further displace use of the Keeyask Cree Nations. The proposed Conawapa Generating Station minimally overlaps areas near Fox Lake Cree Nation, which may have additional effects on their use. Any additional displacement into the regional study area may also put additional restriction or pressures on other Aboriginal groups that harvest resources in the broader regional area.

The proponent has indicated that the capacity of other areas in the region to support additional resource harvesting has been considered in the development of the offset programs. Management of offsetting programs will be coordinated with the local Resource Management Board which will also serve to consider effects on the resources and carrying capacity of the broader region.

Aboriginal Traditional Knowledge monitoring, committed to by the proponent, will incorporate an assessment of cumulative impacts to hunting, fishing, gathering and trapping. Follow-up monitoring for biophysical VECs, such as fish and fish habitat or methylmercury and human health, will also be designed to evaluate cumulative effects on

current use of lands and resources for traditional purposes, including fishing, hunting, gathering and trapping.

Given the concerns raised about cumulative effects on traditional use and the uncertainty of the effects of future projects, the Agency is supportive of a regional study that would consider these aspects.

The Agency acknowledges concerns raised by Aboriginal groups about regional development and the scope of the cumulative effects assessment. However, it is satisfied that the assessment of cumulative effects is appropriate and consistent with Agency guidance.

Regional Cumulative Effects Assessment

Throughout the project review, Aboriginal groups have advocated for a broader, approach to cumulative effects assessment. While the proponent's assessment was consistent the *Environmental Impact Assessment Guidelines,* it is important to note that the Agency guidance also states that:

> …regional 'nibbling' effects usually cannot be adequately dealt with on a project-by-project review basis. Although broad changes in a landscape can often be quantified (e.g. total cleared land and fragmentation of wildlife habitat), it is more difficult to determine significance to this change that is only attributable to the specific action under review…

A regional scale effects analysis, evaluating the entire river corridor, fragmentation and habitat loss from all historical and future projects would be a helpful contribution to addressing Aboriginal groups' concerns that the scope of cumulative effects assessment in a project EA is too narrow.

The Agency supports a regional approach to cumulative effects assessment as it offers the opportunity to closely examine cumulative environmental effects that occur when many projects are being undertaken or proposed in a region. It allows for the establishment of appropriate thresholds to manage or avoid anticipated impacts over the long term. A regional approach can also inform the design and implementation of integrated monitoring programs to assist in identifying cumulative impacts and assess appropriate adaptive management approaches, if necessary.

Throughout the project review, Aboriginal groups have advocated for a broader, approach to cumulative effects assessment.

The province of Manitoba and Manitoba Hydro have committed to undertaking a regional cumulative effects assessment and are currently in the process of drafting the Terms of Reference. The Agency understands that Aboriginal groups potentially impacted by hydro development will be engaged in the process.

4.13.4 Agency Conclusions

The Agency concludes that the Project is not likely to result in significant adverse cumulative effects after taking into account the proponents' assessment of potential cumulative effects. The Agency further concludes that development of the regional effects assessment, with engagement of affected Aboriginal communities will be essential to provide a long term approach for managing the hydro operations within the Nelson River watershed.

5. Aboriginal Consultation

The federal government has a legal duty to consult and, where appropriate, to accommodate, Aboriginal peoples when its proposed conduct might adversely affect potential or established Aboriginal or treaty rights. Aboriginal consultation is also an important part of good governance and sound policy development and decision making. *Canadian Environmental Assessment Act* S.C. 1992, c. 37 (the former Act) requires that all federal environmental assessments consider the effect of any change in the environment caused by the Project, as well the effect of that change on health and socio-economic conditions, physical and cultural heritage, the current use of land and resources for traditional purposes by Aboriginal peoples, and any structure, site or thing that is of historic, archaeological, paleontological, or architectural significance.

The Agency served as Crown consultation coordinator for the federal government for the purposes of this comprehensive study. The Manitoba Department of Aboriginal Affairs, through the Aboriginal Consultation Unit, led Crown consultation for the provincial government. Federal and provincial departments worked together to conduct consultations in a manner that was integrated with the environmental assessment to the extent possible.

The Project is located within the boundaries of Treaty 5 that grants rights including hunting and fishing to signatory First Nations, including: Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, York Factory First Nation. Cross Lake First Nation, Norway House First Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, and Shamattawa First Nation.[34] The *Manitoba Natural Resources Transfer Act* extends these rights to include trapping and to additional First Nations.[35]

Under the *Comprehensive Implementation Agreements* under the *Northern Flood Agreement*, resource management areas have been designated where the respective First Nation has a direct role in decision-making and co-management of the land and resources through Resource Management Boards.[36,37] Figure B-4 and Figure B-1 (Appendix B) delineate the proponent's Socio-economic Regional Study Area and Physical Environment Study Area respectively. The Socio-economic Regional Study Area includes the Split Lake Resource Management Area (co-managed by Tataskweyak Cree Nation), a portion of the York Factory Resource Management Area (co-managed by York Factory First Nation), borders on the Fox Lake Resource Management Area (co-managed by Fox Lake First Nation) and includes portions of the traditional use area of the War Lake First Nation.

As indicated, Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation are Treaty 5 signatories. Their resource management areas, reserves and traditional use areas are located within the Physical Environment Study Area. Through the Joint Keeyask Development Agreement they are

34 *Treaty 5 Between Her Majesty the Queen and the Saulteaux and Swampy Cree Tribes of Indians at Beren's River and Norway House With Adhesions* (1875/1969). Aboriginal Affairs and Northern Development Canada online version [Layout not exactly like original. Transcribed from: The Queen's Printer, Ottawa] **www.aadnc-aandc.gc.ca/eng/1100100028699/1100100028700**

35 Government of Canada and Government of Manitoba (1929). *Memorandum of Agreement*.Approved by the Manitoba Legislature under the *Manitoba Natural Resources Transfer Act* (1988). Unofficial version available from **web2.gov.mb.ca/laws/statutes/ccsm/n030e.php**

36 Aboriginal Affairs and Northern Development Canada (n.d.).Backgrounder - Manitoba Northern Flood Agreement: Implementation. **http://www.aadnc-aandc.gc.ca/eng/1100100016370/1100100016371**

37 Manitoba Hydro (n.d.).*Northern Flood Agreement.* **http://www.hydro.mb.ca/community/aboriginal_ relations/northern_flood_agreement.shtml**

members of the Keeyask Hydropower Limited Partnership and part of the proponent group for the project with Manitoba Hydro. They are jointly referred to within the Environmental Impact Assessment documentation as the Keeyask Cree Nations partners.

Other Treaty 5 Aboriginal groups whose established treaty rights may potentially be affected within the Project's larger Regional Study Area and within the broader Nelson River watershed include Cross Lake First Nation, Norway House First Nation, Nisichawayasihk Cree Nation, O-Pipon-Na-Piwin Cree Nation, and Shamattawa First Nation. The Manitoba Metis Federation has asserted Aboriginal rights on behalf of its Métis members related to traditional activities such as hunting, trapping, fishing, or gathering in the Project area. Pimicikamak also asserts Aboriginal rights and interests in the Treaty 5 area. Pimicikamak asserts that while Cross Lake First Nation is a band under the Indian Act, it is Pimicikamak who holds aboriginal and treaty rights under Canadian law and who is party to Treaty 5.[38]

5.1 Consultation Activities

The Agency consulted with Aboriginal groups identified as having potential or established Aboriginal Treaty rights that could be adversely affected by the project. Consultation opportunities are identified in Table 5.1. There were also regular communications through phone calls, emails and letters.

Cross Lake First Nation identified Pimicikamak as their representative for the purposes of consultation on this project.[39] Pimicikamak is a self-identified entity that asserts it is an Aboriginal people with Aboriginal and treaty rights. The membership of the two groups is similar and the governance structure is related. The Agency conducted consultations with representatives of Pimicikamak on behalf of both groups. With respect to views expressed related to environmental effects and impacts on potential or established Aboriginal or Treaty rights, Cross Lake First Nation and Pimicikamak are referenced jointly throughout this report.[40] Funds were provided through the Agency's *Participant Funding Program* to reimburse eligible expenses incurred by Aboriginal groups that participated in the environmental assessment. Six Aboriginal groups (Manitoba Metis Federation, Fox Lake Cree Nation, Cross Lake First Nation, O-Pipon-Na-Piwin Cree Nation, Nisichawayasihk Cree Nation and York Factory First Nation) applied and were awarded funding through the program.

5.1.1 Provincial Consultation Activities

Throughout the environmental assessment process, provincial consultations with First Nation communities and the Manitoba Metis Federation were undertaken by Manitoba Aboriginal Affairs' Aboriginal Consultation Unit and Manitoba Conservation and Water Stewardship. However, the Manitoba Metis Federation continues to maintain that they were not adequately consulted by the province. The Aboriginal Consultation Unit coordinated community meetings with First Nation groups which included information

38 Letter to CEAA dated March 25, 2014 from Olthus Kleer Townshend – LLP on behalf of Pimicikamak. Re: Pimicikamak and Cross Lake First Nation

39 Letter to CEAA dated July 5, 2012 from Chief Settee of Cross Lake First Nation

40 References to Pimicikamak in the report are not intended as admissions of rights asserted by Pimicikamak.

Table 5-1: Aboriginal Consultation during the Federal Environmental Assessment

Stage	Activity	Timing
Environmental Assessment Planning	Opportunity to comment on the Project and conduct of the comprehensive study. Meeting or phone call to discuss the EA process, key points for consultation and integrated approach to Aboriginal consultation.	**June 2011 to January 2012**
Draft Environmental Impact Assessment Guidelines	Aboriginal groups provided a 30-day review of draft *Environmental Impact Assessment Guidelines* and *Scoping Document* (prior to general public review), including discussions with some groups.	**February to March 2012**
Environmental Impact Statement	Aboriginal group review of the *Environmental Impact Assessment*, component studies conducted by the proponent and supplemental materials, including Agency discussions with some groups.	**July to December 2012**
Review of responses to information requests	Aboriginal group review of Information requests and proponent responses, including Agency discussions with some groups.	**January 2013 to January 2014**
Draft Comprehensive Study Report	Aboriginal groups provided with 4 weeks to review the draft *Comprehensive Study Report* (prior to general public review), with the potential for discussions with the Agency.	**February to March 2014**
Final Comprehensive Study Report	Aboriginal groups provided with a 30-day review of final *Comprehensive Study Report* (concurrent with public review), with the potential for discussions with the Agency.	**TBA**

sessions involving provincial regulators and, on occasion, the proponent. Where possible, Agency and federal representatives participated in these consultation sessions, which included meetings with Fox Lake Cree Nation and War Lake First Nation prior to the draft *Comprehensive Study Report*. Provincial consultation activities continued concurrently with the Clean Environment Commission hearings and should they be required, will occur during provincial regulatory licencing.

5.1.2 Proponent Engagement Activities

Through the *Environmental Impact Assessment Guidelines* and subsequent information requests, the Agency instructed the proponent to collect information on the current use of lands and resources for traditional purposes by Aboriginal groups and to inform and engage with all potentially affected Aboriginal groups. This included providing Aboriginal groups with information on the Project, any potential environmental effects, and any mitigation measures. The proponent conducted engagement activities directly with potentially impacted Aboriginal groups. The Keeyask Cree Nations led engagement activities with their communities and Manitoba Hydro led consultations with other Aboriginal groups. The proponent's activities included community information sessions and open houses with First Nation communities as part of the Public Involvement Program.

Manitoba Hydro provided funding to each of the Keeyask Cree Nations to develop their own environmental evaluations of the project. Manitoba Hydro also funded the Manitoba Metis Federation to undertake a limited Traditional Land Use and Knowledge Study, a socio-economic impact assessment and a historical narrative of the Métis for the Keeyask region.

5.2 Potential Adverse Impacts of the Project on Potential or Established Aboriginal or Treaty Rights

The Agency considered the information provided by Aboriginal groups as well as information provided by the proponent in determining if the Project would cause potentially adverse impacts on potential or established Aboriginal or treaty rights, and in considering appropriate accommodation measures.

Project effects on valued environmental components in the Physical Environment Study Area (Appendix B, Figure B-1) will have the greatest impact on the exercise of rights by the Keeyask Cree Nations partners. The key potential environmental effects in the study area and the main concerns of the Keeyask Cree Nations partners are:

- the footprint of the generating station itself and creation of the reservoir would eliminate or make inaccessible some traditional use areas, displacing Keeyask Cree Nations partner members from their preferred areas for hunting, fishing, trapping and gathering;
- the Project would result in permanent alteration of the landscape affecting the cultural heritage value and historical context of the area. Construction of the Project would result in the loss or damage of important cultural or archaeological sites and artifacts, such as Gull Rapids; and
- Lake Sturgeon, an important traditional and cultural resource in the Split Lake to Stephens Lake section of the Nelson River system, would be affected by alteration of water regimes. Other fish and wildlife relied on for traditional use in the area may also be affected by these changes.

In the Regional Study Areas the key effects and areas of concern of Aboriginal groups include:

- potential increases in levels of mercury expected in fish consumed for food and to a minor extent other traditionally harvested wildlife;
- increased mercury levels in Lake Sturgeon may impact the exercise of the right to fish Lake Sturgeon which is an important traditional and cultural resource;
- potential loss of caribou habitat and disturbance to migration routes which may impact hunting success by Aboriginal groups;
- loss or alteration of travel routes used to access traditional hunting, trapping and fishing areas due to alteration to water regimes upstream and downstream of the Physical Environment Study Area; and
- displacement of the Keeyask Cree Nations with Adverse Effects Agreements from the Physical Environment Study Area would put pressure on resources in nearby areas relied on by other traditional resource users.

Project effects on housing, employment, and spirituality, the effects of the distribution of benefits within Adverse Effects Agreements, the impact of community workers on community safety and the risk of injury or death from increased road traffic were also identified as concerns by Aboriginal groups. Except for the mitigation measures included in the construction management plan, which will reduce wildlife collisions and control vehicle speed, the Agency considers these issues to be outside the scope of the EA process and has referred these issues to the relevant authorities.

The Manitoba Metis Federation, Shamattawa First Nation and Pimicikamak suggested that information contained in the *Environmental Impact Statement* regarding the potential impacts of the Project on their traditional land use is incomplete or inaccurate. The proponent presented information based on literature review and local knowledge of Keeyask Cree Nations partners to describe use by such Aboriginal groups. Traditional land use maps or studies from the other Aboriginal groups were not included. Shamattawa First Nation provided the Agency with traditional land use study maps and reports for their traditional territory. Although this information did not directly address the Project, it was considered by the Agency when assessing effects to traditional use.

Manitoba Metis Federation provided summaries of information gaps they identified in the proponent's *Environmental Impact Statement* and preliminary results of a Traditional Land Use and Knowledge Study (TLUKS) completed for the Keeyask area in December 2013 and a Manitoba Metis Community TLUKS Keeyask Study Area Map dated January 2014. This information suggests that there may be potential project impacts to Metis gathering and upland bird harvest along

Public Highway 280. This information also suggests that there may be cultural impacts to fishing in Stephen's Lake and to hunting southwest of Gillam. No additional project-specific traditional land use information or assessment of impacts has been provided by Pimicikamak or Cross Lake First Nation to inform the Agency's assessment of impacts.

In addition to the project specific effects, Aboriginal groups raised concerns regarding the cumulative effects of hydro development on their ability to exercise their Aboriginal and treaty rights:

> *"We are trying to maintain our ways and means of survival, and any project added reduces this."*[41]
>
> *"Ability to practice defines who we are as people; if everything is contaminated, we can't exercise our rights."*[42]
>
> *"We have Treaty rights to hunt, fish, trap and Aboriginal rights to practice our cultures. They are being violated in a very grave way."*

These concerns include effects of hydrodevelopment on the regional land base, on wildlife populations, waterfowl, fish, sturgeon, water safety, water quality and quantity, and on habitat within the Nelson River and the Keeyask area, as well as the consequences of these effects to health and cultural wellbeing.

Pimacikamak, Cross Lake First Nation, Norway House Cree Nation, Shamattawa First Nation, and Manitoba Metis Federation strongly argue that any change to Manitoba Hydro's generation system will have impacts on the Nelson River and to Aboriginal people who exercise Aboriginal and treaty rights in the area.

Aboriginal groups indicated that the Agency's approach to the assessment of significance does not consider impacts to culture and the impacts to their ability to exercise their Aboriginal and treaty rights.

Concerns raised by Aboriginal groups related to specific valued environmental components are noted and addressed in Section 4. Appendix D also provides a summary of concerns raised by Aboriginal groups and the responses of the proponent and the Agency.

5.3 Proposed Accommodation Measures

The Keeyask Cree Nations partners are expected to be the most highly affected communities. These groups have actively participated in project planning and mitigation selection. Manitoba Hydro has established Adverse Effects Agreements with each of these groups. These agreements include commitments for mitigation measures to address foreseeable adverse effects of the project, offsetting programs and compensation. With respect to elevated mercury levels in fish, members of the Keeyask Cree Nations would be provided opportunities to fish at lakes outside of the Nelson River.

As a result of the partnership, the involvement of the Keeyask Cree Nations in project planning directly affected decisions about site selection and reservoir levels. For example, the selection of the Gull Rapids site and a low-head reservoir avoids impacts on Split Lake (home of Tataskweyak Cree Nation and York Factory First Nation) and reduces impacts on Birthday Rapids (important for fish, including Lake Sturgeon). The environmental evaluation reports prepared by Keeyask Cree Nations and their traditional knowledge have also shaped project plans and the overall environmental assessment process.

41 Pimicikamak, March 19, 2014, CEAA consultation on the draft Keeyask Generation Project Comprehensive Study Report.

42 Norway House Cree Nation, March 24, 2014. CEAA consultation on the draft Keeyask Generation Project Comprehensive Study Report.

The Keeyask Cree Nations and Manitoba Hydro conducted studies to identify important heritage resources that will be disturbed by the Project and consequently, developed a *Heritage Resources Protection Plan*. The Keeyask Cree Nations would be involved in implementation of this plan, including during the potential removal or relocation of important heritage resources or burial sites. The Keeyask Cree Nations and Manitoba Hydro also committed to support ceremonies, counselling and other culturally-based activities for the most impacted Aboriginal groups in order to address the loss of connection to the land created by changes to the landscape.

The proponent has committed to Aboriginal Traditional Knowledge monitoring with the Keeyask Cree Nations partners, which will support the evaluation of cumulative impacts to hunting, fishing, gathering and trapping. Follow-up monitoring for biophysical VECs, such as fish and fish habitat or methylmercury and human health, will also evaluate cumulative impacts on current use of lands and resources for traditional purposes, including fishing, hunting, gathering and trapping. The proponent has also committed to mitigating effects to Aboriginal traditional uses beyond the Keeyask Cree Nations and to make efforts to determine whether effects can be avoided through changes to the project and existing project mitigation measures .

Many of the measures proposed to mitigate project effects on valued environmental components, such as measures to limit habitat alteration or loss, would also reduce impacts on the exercise of potential or established Aboriginal or treaty rights. Key mitigation measures that will also reduce impacts on potential or established Aboriginal or treaty rights include:

- avoiding effects to existing or potential caribou calving habitat outside of the reservoir, developing new wetland habitat, and rehabilitating construction areas
- ensuring access to hunting and fishing areas through the development of a boat portage system around the Project and the establishment and monitoring of safe ice trails;
- reducing the Project's long-term impacts on Aboriginal fishing by developing alternative spawning locations and fish habitat and a stocking program for Lake Sturgeon; and
- publicly communicating fish consumption recommendations related to mercury throughout the project area.

5.4 Issues to Be Addressed During the Regulatory Approval Phase

If the Project moves to the regulatory approval phase, federal authorizations, approvals or permits related to impacts on fish and fish habitat and navigation would be required. Various provincial authorizations would also be required for the project, including those relating to water licencing.

The proponent is developing an offsetting plan (formerly known as a fish habitat compensation plan) that will address the reduction in Lake Sturgeon population, destruction of fish habitat, and reduced fish movement. The final offsetting plan would be approved by DFO during the regulatory phase. DFO would consider the concerns raised by aboriginal groups regarding these issues as part of their approval process.

Transport Canada is satisfying consultation requirements for the *Navigation Protection Act*, (should approvals be sought) via the environmental assessment process. Measures necessary to mitigate direct effects on navigation would be included as conditions of approval.

The Government of Manitoba has initiated a consultation process with aboriginal communities potentially affected by decisions related to the Project. This provincial consultation process is separate from the regulatory review pursuant to the *Environment Act;* however, the outcome of these processes will help inform the pending licensing decisions of Manitoba on the Keeyask

generating station and transmission line. In the event *Environment Act* licences are issued, the consultation process may also help identify important mitigation measures related to environmental protection or human health that can be accommodated as conditions in provincial *Environment Act* Licences.

5.5 Agency Conclusions to Impacts on Aboriginal Rights

The Agency has taken into account the following elements in reaching a conclusion on whether the Project is likely to cause adverse impacts on potential or established Aboriginal or treaty rights:

- reports, comments, and other submissions of Aboriginal groups;
- discussions with Aboriginal groups;
- documentation submitted by the proponent including the Environmental Impact Assessment, technical memoranda and response to information requests;
- effects on VECs that may impact potential or established Aboriginal or Treaty rights and the related mitigation measures; and
- additional accommodation measures and commitments of the proponent, including Adverse Effects Agreements.

Based on this information, the Agency concludes that potential adverse impacts of the Project to potential or established Aboriginal or treaty rights will be appropriately avoided, mitigated, or accommodated.

6. Public Consultation

6.1 Federal Public Participation Activities

Canadian Environmental Assessment Act S.C. 1992, c. 37 (the former Act) required that the public be provided with a minimum of three formal participation opportunities during a comprehensive study. For this Project, the Agency provided four public consultation periods.

Three of the consultation periods were coordinated with the provincial government. From December 15, 2011 to January 13, 2012, a joint public comment period on the Project Notice of Environment Act Proposal and participant funding opportunities. From February 29 to March 28, 2012, a second public comment period was completed on the draft *Keeyask Environmental Impact Assessment Guidelines* prepared by the Agency and Manitoba Conservation and Water Stewardship. From November 21 to December 21, 2012, a third public comment period was held on the *Environmental Impact Statement* documentation. Notices of these opportunities were posted on the online Canadian Environmental Assessment Registry, Individuals and groups who had indicated an interest in the Project at earlier phases were notified directly.

The Agency will invite the public and Aboriginal groups to comment on this *Comprehensive Study Report* in the fourth and final public participation opportunity for this Project.

As part of the Participant Funding Program, the Agency made available $35 000 in public funding for this Project.[43] Manitoba Wildlands was the sole applicant and was awarded $2000.

6.2 Provincial Public Participation Activities

In addition to the coordinated activities noted above, Manitoba referred the project to the Clean Environment Commission (the Commission) which provided opportunities for public participation as part of its Commission process. As part of the Commission's evaluation process, public hearings began on September 24, 2013 and ended January 9, 2014. The Commission will submit its report to the Manitoba Minister of Conservation and Water Stewardship in 2014.

6.3 Proponent Public Participation Activities

The proponent provided public engagement opportunities through the Keeyask Public Involvement Program, including: a project website, newsletters, information sessions, open houses, and workshops. This program focused on communities in northern Manitoba and potentially interested or affected organizations.

The proponent's Public Involvement Program also provided three formal public participation periods. In Round One, from June 2008 to November 2008, the proponent introduced the project to identify public issues and receive input to future consultations. In Round Two, from February 2012 to May 2012, the proponent informed on changes in the Project, responded to questions raised in Round One, and sought input on preliminary results of the biophysical and socio-economic assessments and potential mitigations. In Round Three, from April 2013 to July 2013, the proponent shared the format and

43 Funding Review Committee (February 29, 2012). *Funding Review Committee's Report - Participant Funding Program – Regular Funding Envelope Funding Review Committee's Report, Allocation of Federal Funds for the Environmental Assessment of the Keeyask Generation Project.* **www.ceaa-acee.gc.ca/050/document-eng.cfm?document=54427**

content of the *Environmental Impact Assessment*, discussed supplemental information since the filing of the *Environmental Impact Assessment* with Regulators in 2012, and outlined how input received to date had influenced the project assessment. In addition, Manitoba Hydro, as the sole proponent for the Keeyask Transmission component of this project, held two rounds of open-house sessions specific to the transmission component of the Project.

6.4 Summary of Public Comments

Over the course of the government-led public comment periods, the Agency and Manitoba Conservation and Water Stewardship received submissions, from Manitoba Wildlands, the Consumers Association of Canada (Manitoba) Inc., Peguis First Nation and the Bipole III Coalition. Submissions identified concerns relating to:

- the consideration of alternatives to the project;
- the consideration of the project in a broader context along with other Manitoba Hydro projects, including the Bipole III transmission line and Conawapa generating station;
- the nature of habitat to be flooded;
- the integration of Aboriginal traditional knowledge and western science within the *Environmental Impact Assessment*;
- details of proposed habitat compensation, stocking, and monitoring for Lake Sturgeon;
- turbine design options;
- potential construction effects to heritage sites and burials; and
- a preference for hydroelectric and energy developments in the Nelson River watershed to be assessed via regional studies so as to better address cumulative effects of the project.

Details on how these issues have been considered by the Agency and have been addressed through changes to the Project are provided in Section 4, Environmental Effects Assessment, and in Section 8.

Any additional comments received on the *Comprehensive Study Report* during the public comment period will be provided to the Minster of Environment to inform her environmental assessment decision statement.

7. Follow-Up under the Former Act

Under *Canadian Environmental Assessment Act S.C. 1992, c. 37* (the former Act), every comprehensive study must consider the need for, and the requirements of, a follow-up program. A follow-up program is to verify the accuracy of an environmental assessment and to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of a project.

Fisheries and Oceans Canada (DFO) and Transport Canada, responsible authorities under the former Act, will be responsible to ensure the follow-up program is designed and implemented to their satisfaction with the support of the relevant federal and provincial authorities.

The proponent has proposed to monitor various environmental components potentially affected by the Project and to integrate community-based Aboriginal traditional knowledge throughout the monitoring program. Appendix G outlines the proponent's proposed follow up program.

The Canadian Environmental Assessment Agency (the Agency), Fisheries and Oceans Canada, Environment Canada, Natural Resources Canada, and Health Canada have identified additional monitoring requirements in relation to specific environmental components. These are also outlined in Appendix G.

The follow up program will determine the requirements for the installation of fish passage facilities at a later date in conjunction with DFO and with Manitoba Conservation and Water Stewardship, based on the results of monitoring, established Fisheries Management Objectives and support for ongoing fisheries productivity.

The proponent will work with regulators and other stakeholders to finalize the proposed follow-up programs and to include further monitoring requirements stipulated by regulators in potential project permits. If unforeseen adverse environmental effects are identified during project monitoring or follow-up, existing mitigation measures would be adjusted or, if necessary, new mitigation or other measures developed to address those effects through adaptive management.

8. Benefits to Canadians

The comprehensive study process gave the Canadian public and Aboriginal groups opportunities to participate in improving the Project during the design phase and help reduce the environmental effects of its construction and operation. As a result, the design, construction and operation of the Project are not based solely on technical or economic criteria, but also incorporate environmental criteria that promote a balanced approach in keeping with the principles of sustainable development.

The Project design incorporated precautionary approaches, conservatism, and best management practices (e.g. avoidance) to minimize the ecological footprint of the Project. The Project also reflects design changes made in response to information and comments received from government experts, the public and Aboriginal groups, including:

- final reservoir flood levels that respected concerns of Aboriginal communities regarding reservoir influences to Split Lake;
- transmission line routing alternatives along existing rights of way using existing disturbance corridors to the extent practical;
- Lake Sturgeon conservation initiatives, including stocking, to support maintenance and enhancement of Lake Sturgeon populations and habitat;
- a Risk Management Plan, to address human health concerns and maintain the safety of country foods during operation of the reservoir;
- commitments to consider any additional information provided on the use of lands and resources for traditional purposes by Metis and Non-KCN First Nations; and
- commitments to extend current mitigations, and/or examine further mitigations, for project effects to the use of the Keeyask area for traditional, commercial and recreational purposes, should new information be provided.

9. Conclusions of the Agency

The Agency has taken into account the following elements in reaching a conclusion on whether the Project is likely to cause significant adverse environmental effects:

- documentation submitted by the proponent including the *Environmental Impact Assessment*, technical memoranda and response to information requests;
- analysis and findings in this report;
- opinions and comments of Aboriginal groups, the public and government agencies;
- the proponent obligations as documented in this report and summarized in Appendix F; and
- the regulatory authorizations and permits the proponent will be required to obtain, namely:
  - paragraph 35(2)(b) Fisheries Act authorization with terms and conditions, including an offsetting plan containing measures required to offset serious harm to fish;
  - approvals under the Navigation Protection Act (should approvals be sought); and
  - licence under the Explosives Act for a temporary magazine

The environmental effects of the Project have been determined using assessment methods that reflect the current best practices of impact assessment practitioners. The Agency concludes that with the implementation of the proposed mitigation measures, the Project is not likely to cause significant adverse environmental effects.

Following a public consultation period on this report, the Minister of Environment will decide whether, after taking into account the implementation of mitigation measures, the Project is likely to cause significant adverse environmental effects. Should the environmental assessment decision allow the Project to proceed, the Project will then be referred back to Fisheries and Oceans Canada and Transport Canada for appropriate course of action in accordance with Section 37 of *Canadian Environmental Assessment Act* S.C. 1992, c. 37 (the former Act).

10. References

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11. Appendix

Appendix A

Alternative Means of Carrying Out the Project

Table A-1: Alternatives for Project Component Design

Project Component / Alternative Means	Description	Key Considerations Including Potential Adverse Effects	Preferred Alternative
Dam Siting and Reservoir Full Supply Level (Figure A-1)			
Full reach development, high head, single site	Develop the full hydraulic potential of the river reach with a single generating station at Gull Rapids regardless of water level impacts on Split Lake. Produce 1150 megawatts with a full supply level of 168.5 metres	• Split Lake average water level increases by three metres • Gull Lake annual water levels increase by 15.2 metres • Floods 78 square kilometres between Gull Rapids and Clark Lake • Increases flood levels by 2.4 metres at Split Lake community • Requires upward adjustment of the Tataskweyak Cree Nation Northern Flood Agreement severance line that delineates reserve land at Split Lake community	
Partial reach development, intermediate head, single site	Develop the river reach with fewer water level impacts on Split Lake and no impact to Northern Flood Agreement severance line, with a single generating station at Gull Rapids. Produce 900 megawatts with a full supply level of 162.5 metres	• Affects Split Lake water levels somewhat during low-flow, open-water conditions • May impact winter ice conditions • Floods 78 square kilometres between Gull Rapids and Clark Lake	
Partial reach development, low head, single site	Develop the river reach with no water level impacts on Split Lake, with a single generating station at Gull Rapids. Produce 695 megawatts with a full supply level of 159 metres	• Does not affect Split Lake water levels • Floods 48 square kilometres between Gull Rapids and Clark Lake • No impact to the Tataskweyak Cree Nation Northern Flood Agreement severance line (design constraint for this alternative)	✓
Full reach development, two sites	Develop the river reach with limited water level impacts on Split Lake, with two smaller generating stations at Birthday Rapids and Gull Rapids: 380 to 460 megawatt Birthday Rapids generating station with reservoir at 168.5 metre full supply level; and a 640 megawatt Gull Rapids station with reservoir at 158 metres full supply level	• Three meter increase in Split Lake average water levels • Requires upward adjustment of the Tataskweyak Cree Nation Northern Flood Agreement severance line	

Table A-1: Alternatives for Project Component Design continued

Project Component / Alternative Means	Description	Key Considerations Including Potential Adverse Effects	Preferred Alternative
Alternatives for Gull Rapids Infrastructure Axis (Figure A-3)			
GR-1 Alignment	NA	• Eliminated; similar to Alternative GR-3.	
GR-2 Alignment	NA	• Eliminated; too far downstream into Gull Lake.	
GR-3 Alignment, (i) north and (ii) south options	Powerhouse and spillway either north or south of river	• Relatively expensive • Considerably greater adverse environmental impacts than other options • South dyke design would be too high to construct on permafrost-affected soils More construction risk, due to large cofferdam • Challenging and less effective to develop Lake Sturgeon spawning habitat downstream	
GR-4 Alignment	Powerhouse and spillway on north side of river. This alternative is compatible with full supply levels < 158.0 metres	• Floods 48 square kilometres between Gull Rapids and Clark Lake • Less construction risk • Stable upstream ice cover created at full supply level of 159.0metres • Greater operational flexibility to meet peak demand periods • Locating camp and associated infrastructure north of the river allows for easier employment access • Maintains lake sturgeon and other aquatic habitats between Clarke Lake and Birthday Rapids • Fewer adverse environmental effects than Alternative GR-3 • Greater potential for aquatic and terrestrial mitigation and compensation measures downstream of the project	✓
GR-5 Alignment	Suitable for high-head generation station alternative only (see above). Alternative is compatible with full supply levels < 158.0 metres	• Significantly more costly and one year longer construction time than Alternative GR-4 • Greater construction risk due to additional supporting infrastructure on the south side of the river; larger more complex central dam and dyke; larger upstream excavations for channel and spillway; and larger cofferdams • Additional adverse effects to fish and fewer fish habitat compensation measures available compared to Alternative GR-4 • Siting of associated infrastructure including work camp on south side of river, which is not favoured by Tataskweyak Cree Nation	

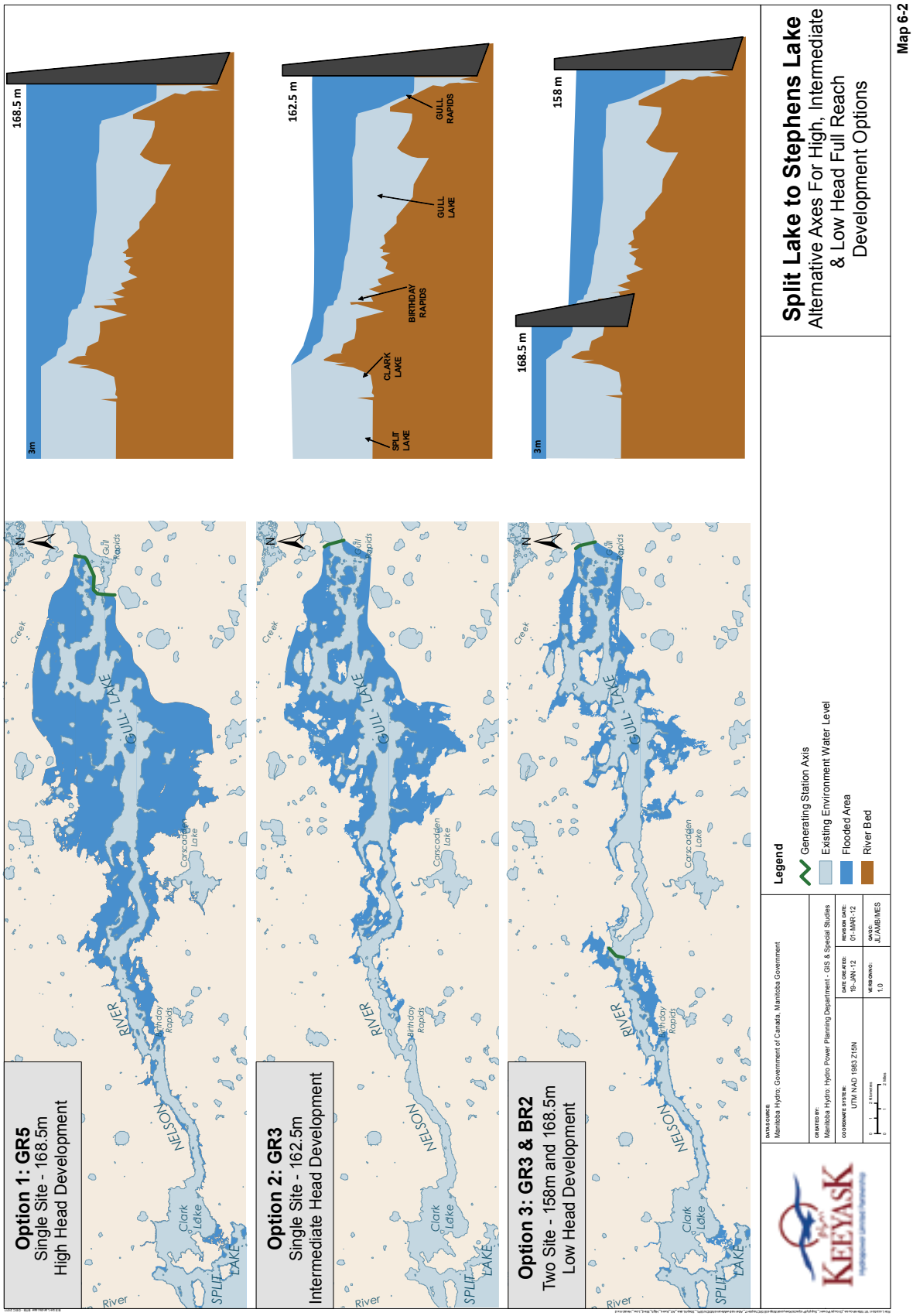
Table A-1: Alternatives for Project Component Design continued

Project Component / Alternative Means	Key Considerations Including Potential Adverse Effects	Preferred Alternative
Alternatives for Dyke Alignments (Figure A-4)		
North Dyke		
North dyke original alignment	• Minimizes costs and adverse environmental effects • Preferred alignment for most of north dyke	✓
North dyke Alignment no. 1	• Reduces the dyke length by 900 metres • Increases reservoir clearing and adds a creek crossing	
North dyke alignment no. 2	• Reduces the maximum dyke height • Increases dyke length about 750 metres compared to alignment no. 1 • Slight increase in reservoir clearing • Reduces creek crossings • Deep post-glacial sediments unlikely to be associated with creek crossings.	✓
North dyke alignment no. 3	• Located further upstream • Takes advantage of topographic high, increasing the length of the dyke but decreasing excavation and fill volumes • Decrease in reservoir clearing and flooding • Require for rerouting drainage from Little Gull Lake and surrounding area • Impact on Deposit N-6 at topographic high, which is to be used as impervious fill for the project • High impacts to highly sensitive terrestrial habitat	
South Dyke		
South dyke original alignment	• Minimizes both costs and environmental effects • Preferred alignment for majority of south dyke	
South dyke alternative alignment no. 1	• Reduces maximum height of dyke • Alleviates downstream ponding and drainage by enclosing the lowest portion of the drainage area within the reservoir • Drainage of second lake to the west of the alignment through natural drainage system. • Increase in reservoir clearing requirements	
South dyke alternative alignment no. 2	• Located along western portion of south dyke • Reduces excavation and fill volume required to construct the dyke • Slight increase in reservoir clearing	✓
South dyke alternative alignment no. 3	• Located at west end of the south dyke • Reduces fill volume required to construct the dyke • Eliminates a creek crossing	✓

Table A-1: Alternatives for Project Component Design continued

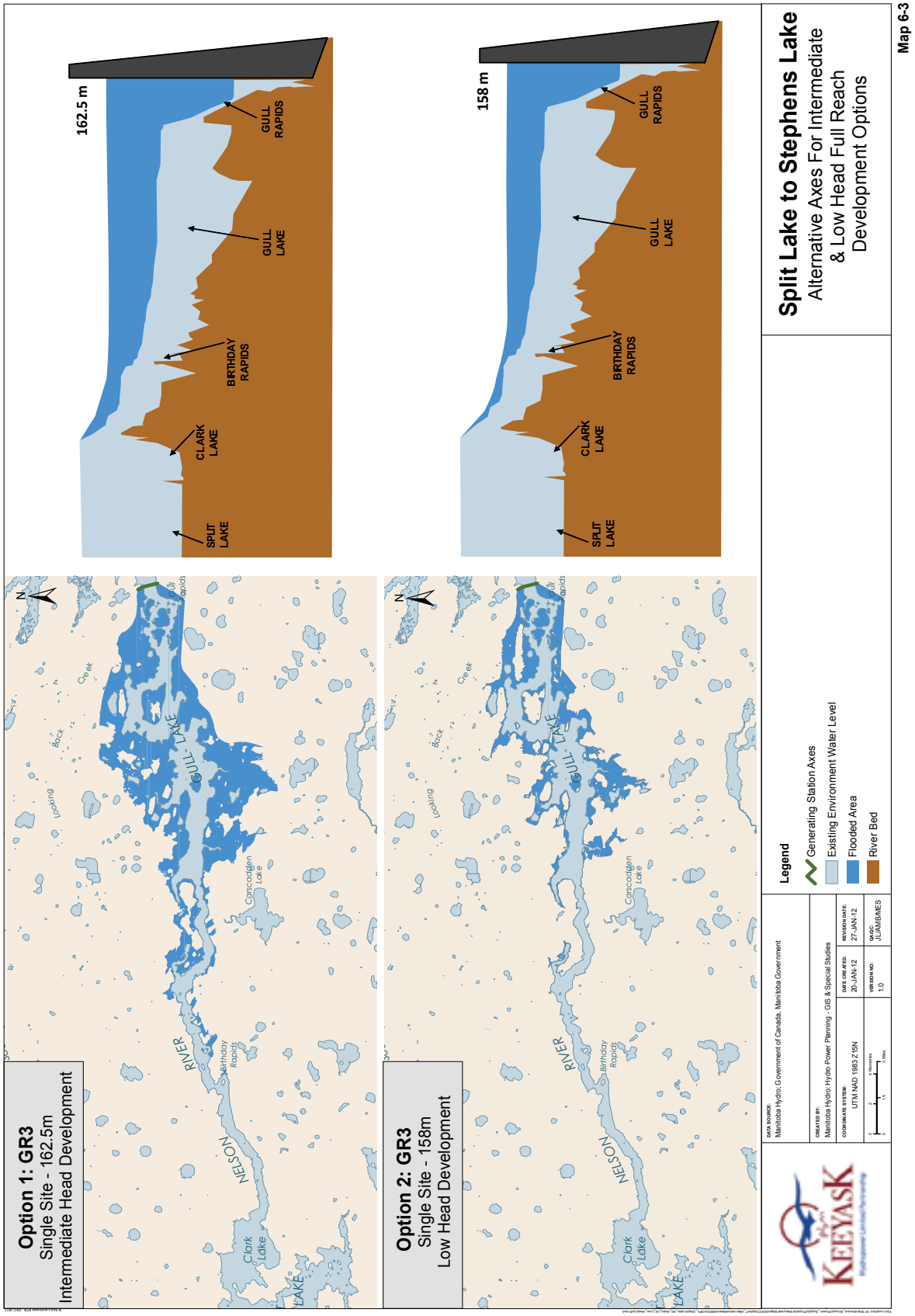
Project Component / Alternative Means	Key Considerations Including Potential Adverse Effects	Preferred Alternative
Transmission Line Components (Figure A-5)		
Generation Outlet		
Route alternative A	• Requires largest creation of new right-of-way • Second greatest number of stream crossings, including five streams with moderate or moderate high sensitivity • Highest risk of caribou and moose habitat fragmentation • Heritage concern where route crosses Kettle River and Cache Creek (Butnau River) • Greatest disturbance to resource use areas and fragmentation of culturally important landscapes • Accessibility issue, trail/road required	
Route alternative B	• Greatest number of stream crossings, including five streams with moderate or moderate high sensitivity ratings • Lower relative risk of potential habitat fragmentation for caribou and moose • Potential for increased bird-wire collisions between Gillrat and Joslin Lakes • Limited creation of new right-of-way as route largely follows Keeyask South Access Road • Heritage concern as for route alternative A • Accessibility issue, new access required on eastern portion	
Route Alternative C	• Fewest stream crossings including three streams with moderate or moderate high sensitivity ratings • Lower relative risk of potential habitat fragmentation for caribou and moose. • Potential for increased bird-wire collisions between Gillrat and Joslin Lakes and at Stephens Lake • Heritage concern as for route alternative A • Right-of-way creation as for route alternative B • No construction accessibility issue	✓
Route alternative D	• Second fewest stream crossings including three streams with moderate or moderate high sensitivity ratings • Marginally higher risk of caribou and moose habitat fragmentation due to longer length • Limited creation of new right-of-way as route largely follows existing transmission (KN36) or proposed transmission construction power line • Route follows existing transmission corridor(s) and heritage resources have already been affected • Most expensive alternative due to line length	
Construction Power		
Route alternative 1	• Crosses Nelson River in a single span downstream of the selected generating station site • Fewer stream and waterbody crossings • Lesser potential adverse effects to fish, fish habitat, caribou habitat, and wetlands • Feasible construction • More easterly of the two routes	✓
Route alternative 2	• Located 2.5 kilometres west of Route Alternative 1 • Crosses Nelson River in the Gull Rapids area in two shorter spans using a mid-river island tower • More stream and water body crossings • Greater potential adverse effects to fish, fish habitat, caribou habitat, and wetlands • Construction impractical as tower foundations would be located on islands flooded after impoundment	

Figure A-1: Alternatives for Generation Siting and Reservoir Full Supply Level (Part 1 of 2)



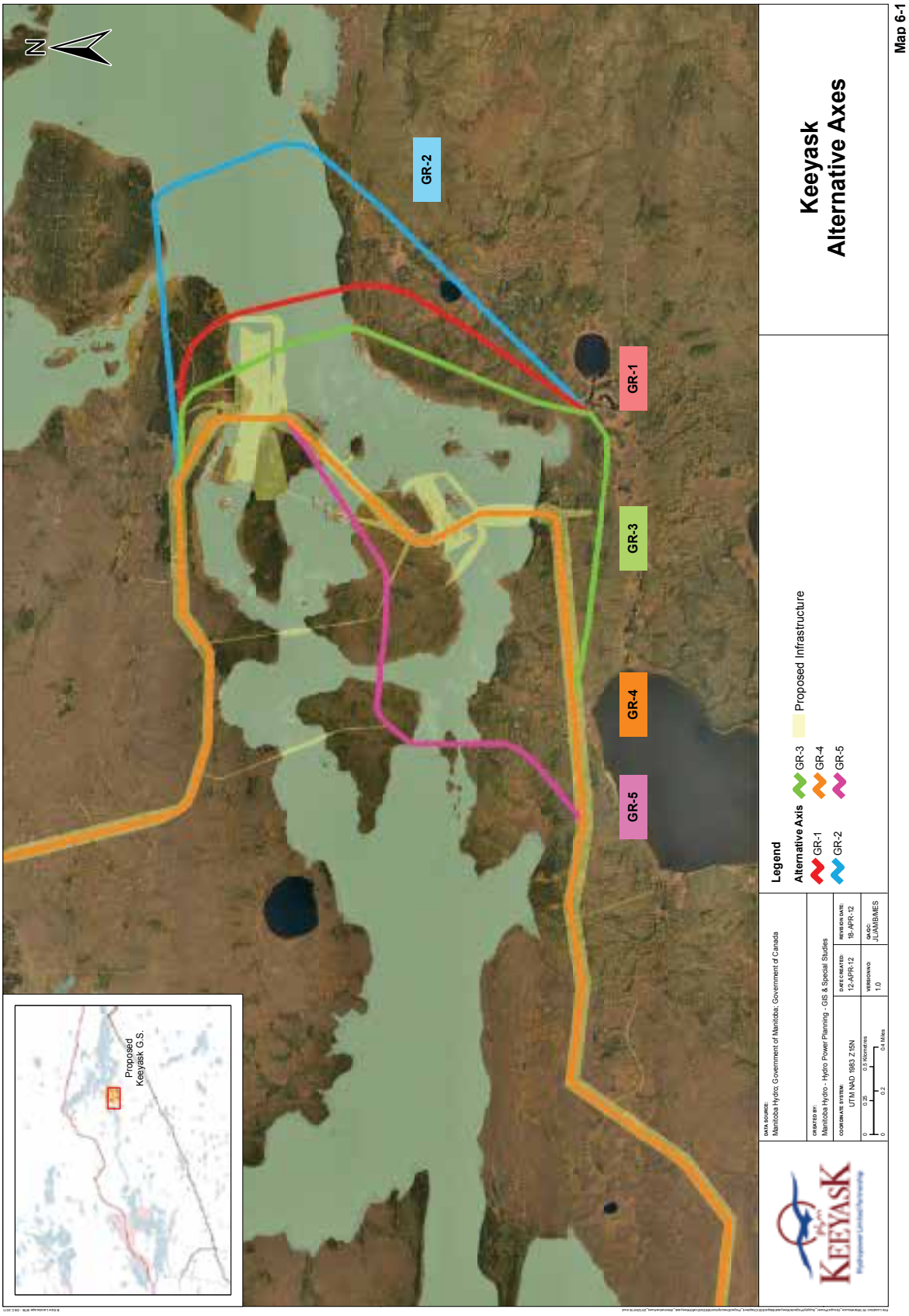
Source: Project Description Supporting Volume, *Environmental Impact Statement*, Map 6-2.

Figure A-2: Alternatives for Generation Siting and Reservoir Full Supply Level (Part 2 of 2)



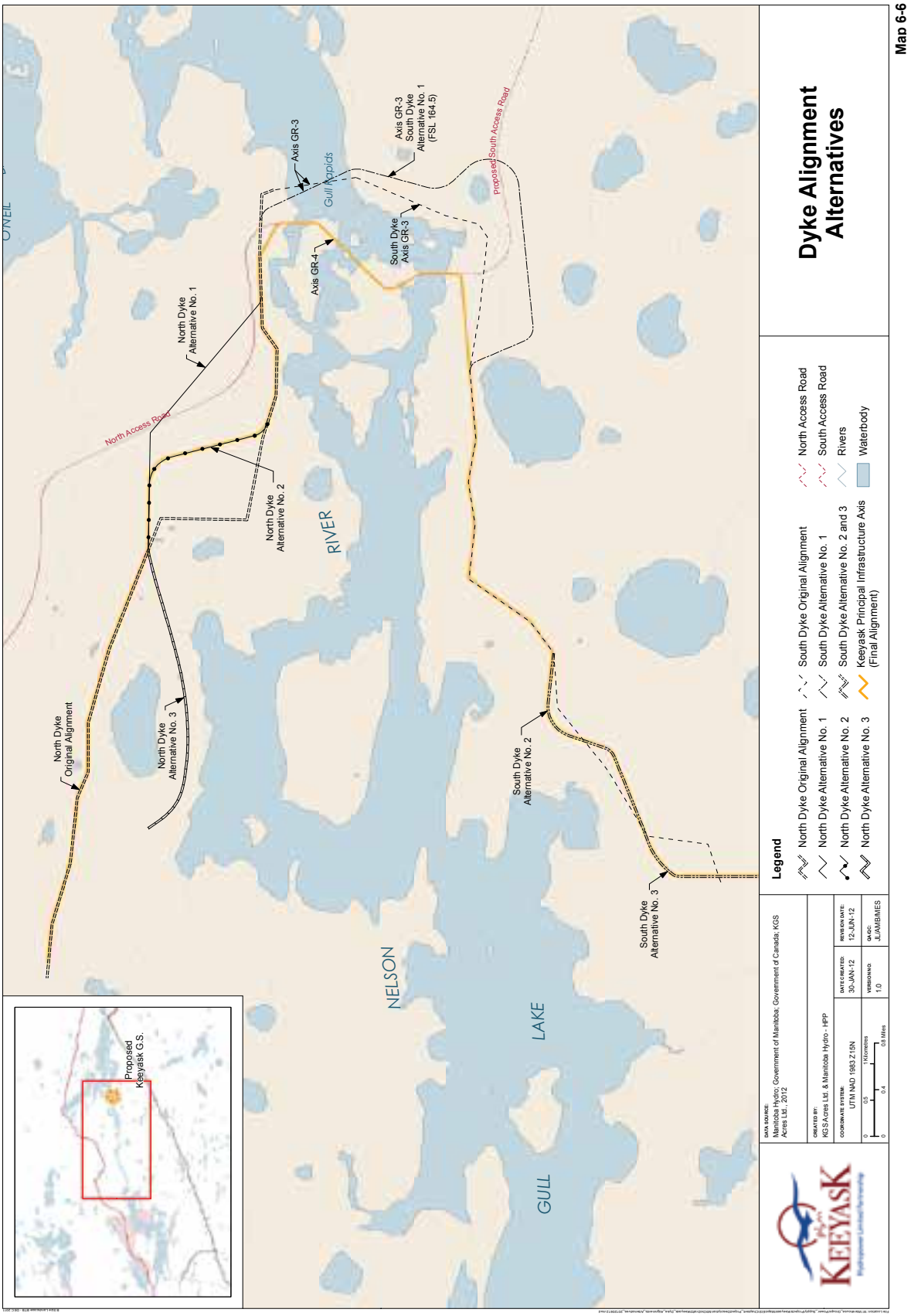
Source: Project Description Supporting Volume, *Environmental Impact Statement,* Map 6-3.

Figure A-3: Alternatives for Gull Rapids Infrastructure Axis



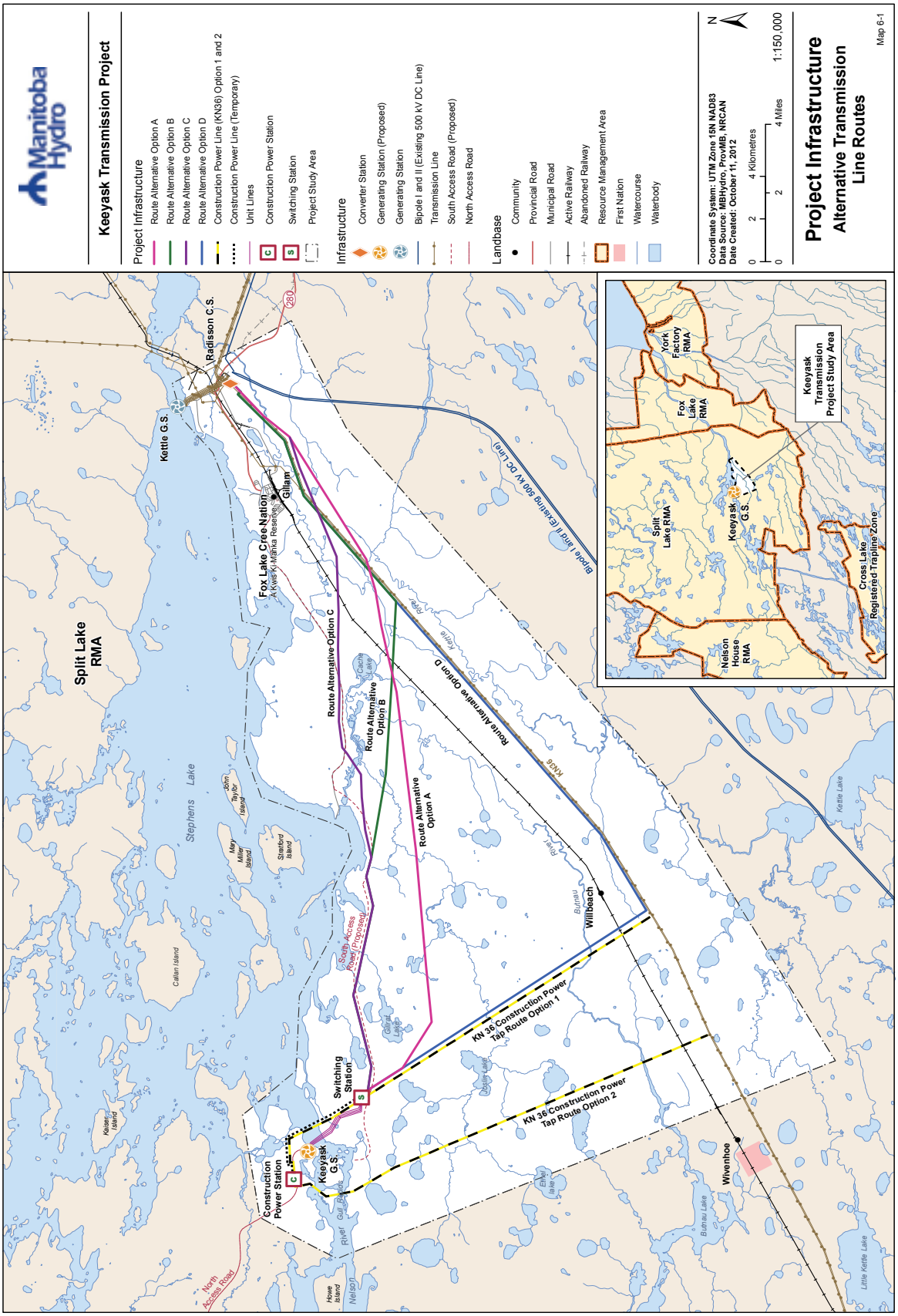
Source: Project Description Supporting Volume, *Environmental Impact Statement*, Map 6-1.

Figure A-4: Alternatives for North and South Dyke Alignments



Source: Project Description Supporting Volume, *Environmental Impact Statement*, Map 6-6.

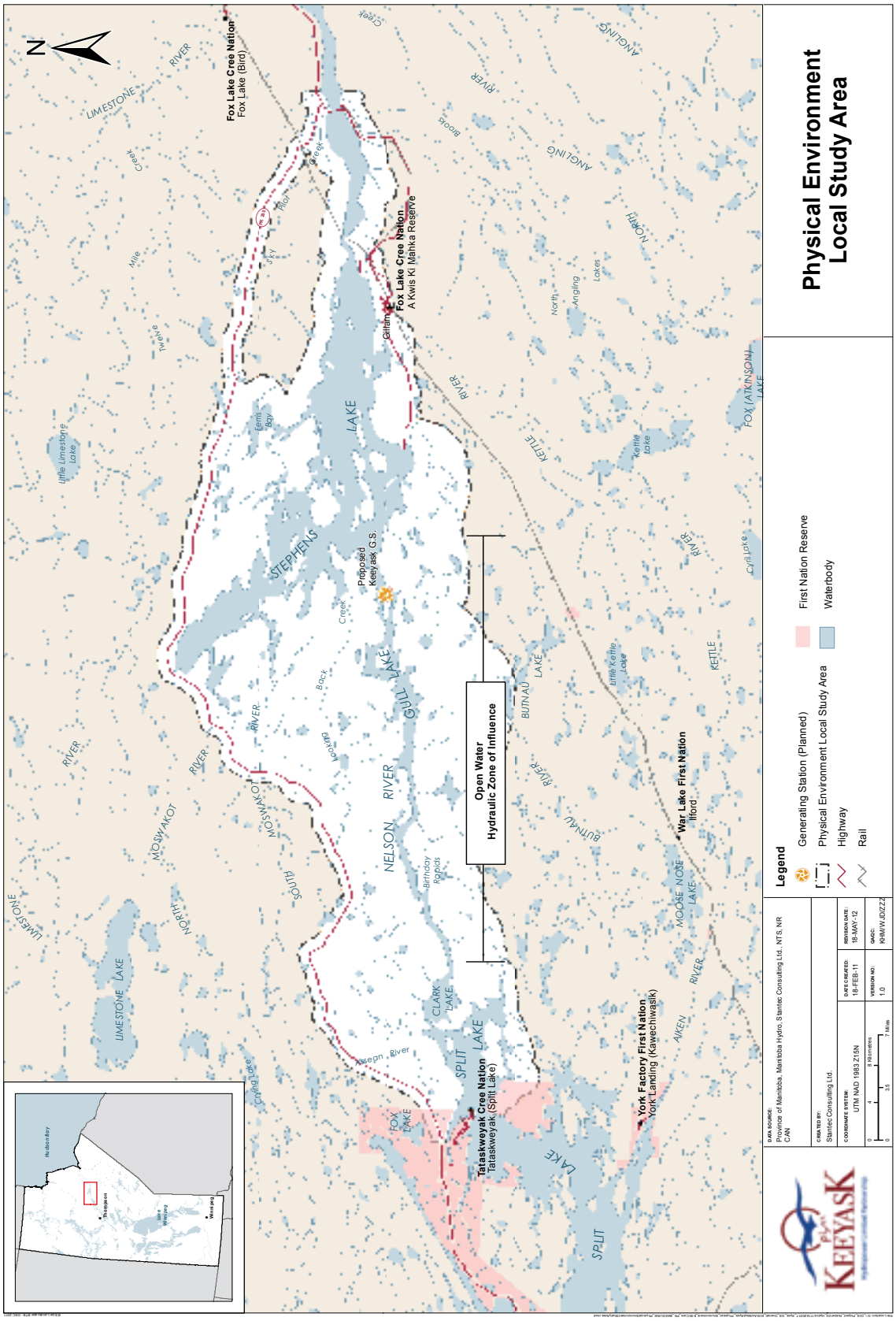
Figure A-5: Alternatives for Transmission Line Routing, Generation Outlet and Construction Power



Source: Manitoba Hydro (2012). Keeyask Transmission Project *Environmental Assessment Report*, Map 6-1.

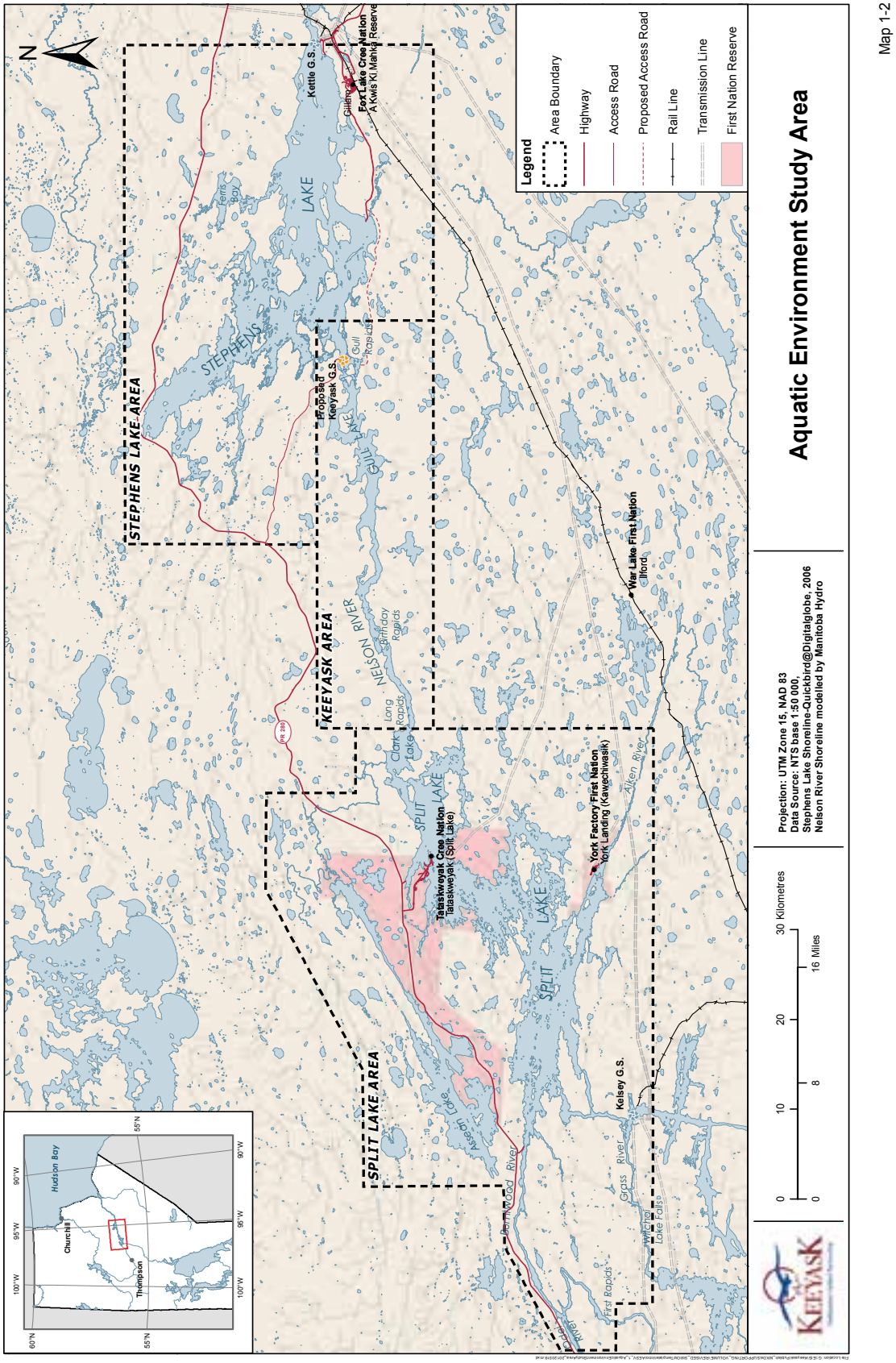
Appendix B
Study Areas

Figure B-1: Physical Environment Study Area



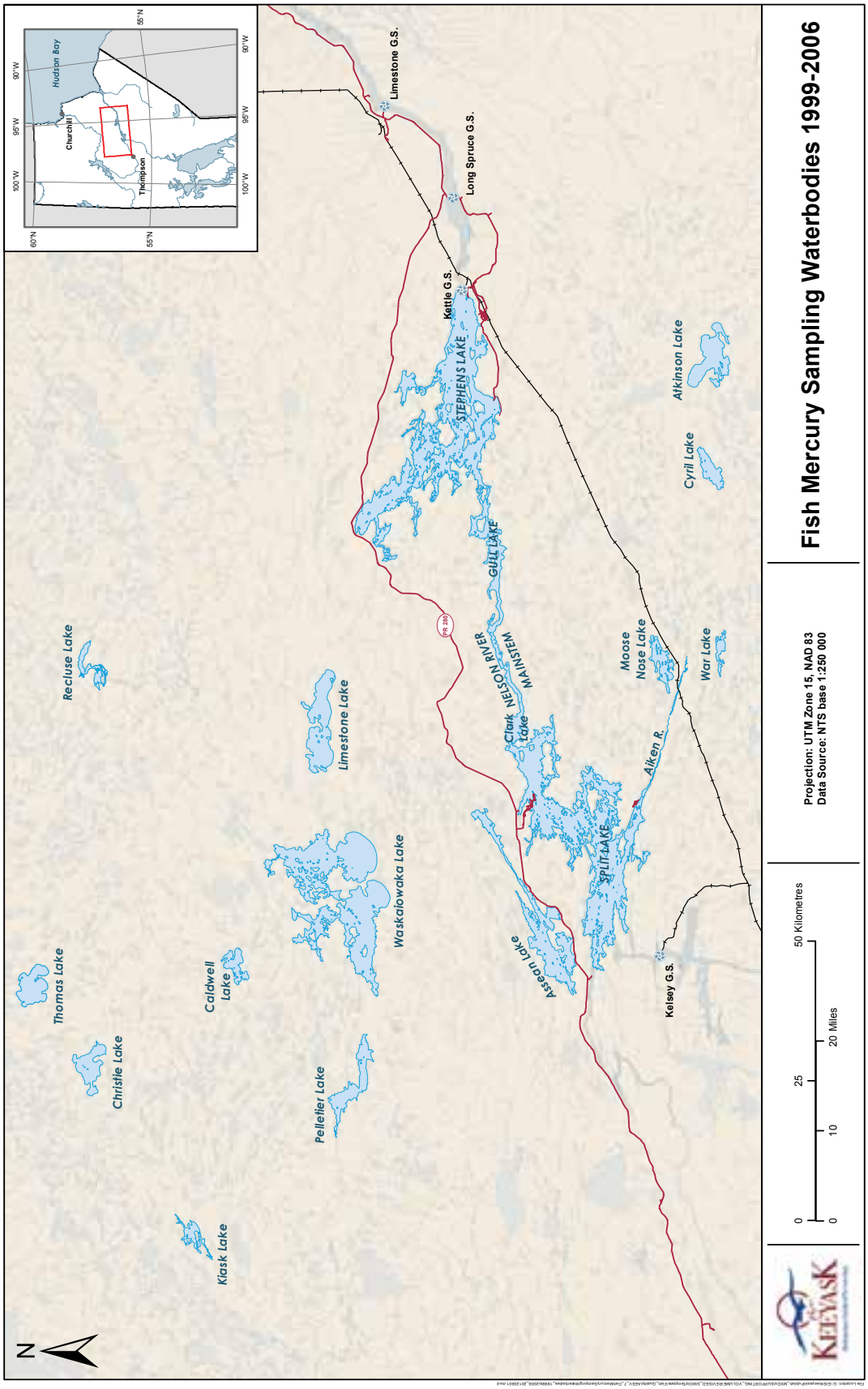
Source: Keeyask Hydropower Limited Partnership (2012). PhysicalEnvironment Supporting Volume, *Environmental Impact Statement.* Map 1.1-1.

Figure B-2a: Aquatic Environment Study Areas



Source: Keeyask Hydropower Limited Partnership (2012). Aquatic Environment Supporting Volume, *Environmental Impact Statement*. Map 1-2.

Figure B-3b: Aquatic Environment Study Areas



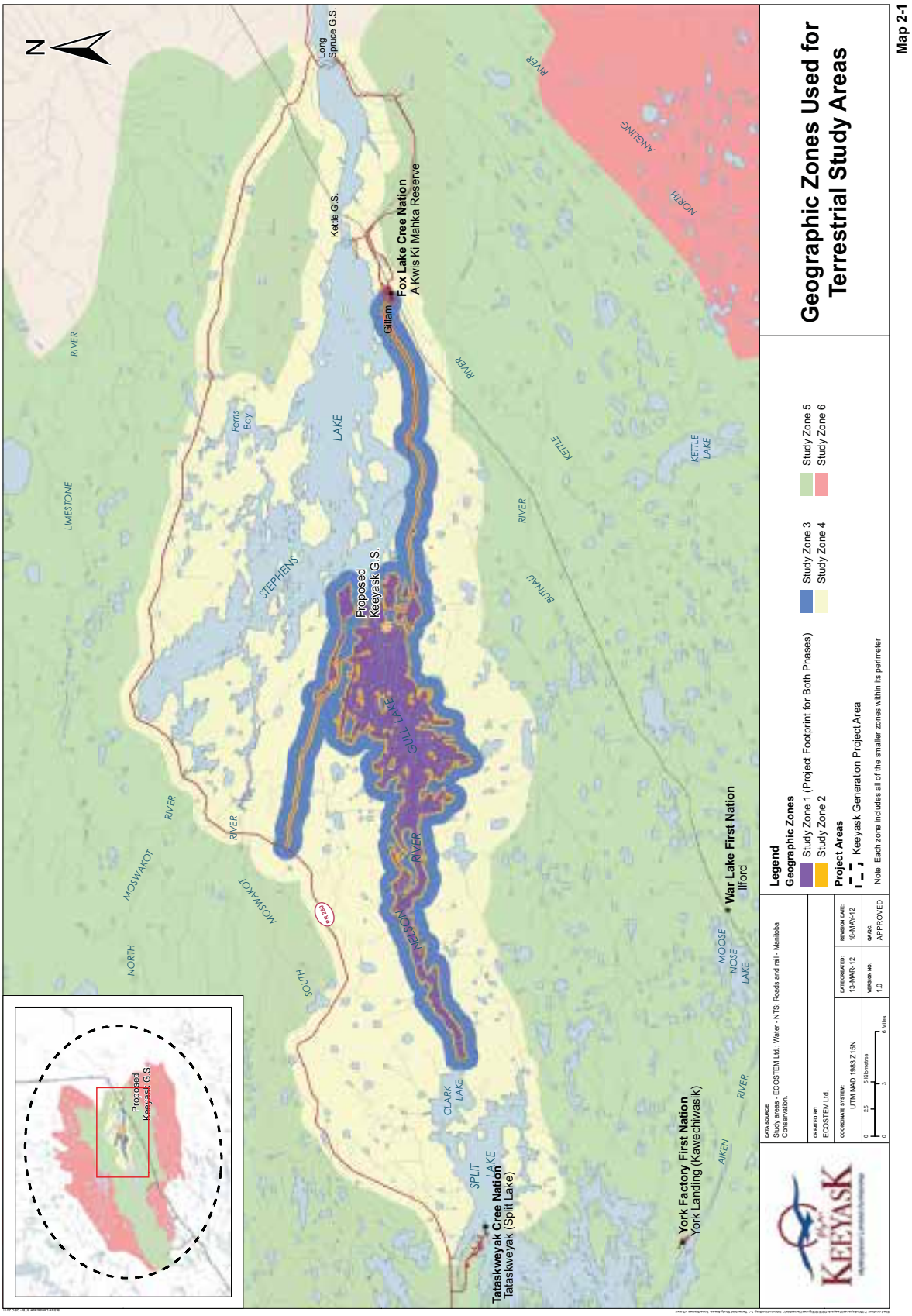
Source: Keeyask Hydropower Limited Partnership (2012). Aquatic Environment Supporting Volume, *Environmental Impact Statement*. Map 7-1

Table B-1: Study Areas, Aquatic Environment

Name	Valued Environmental Component	Description
Local Study Area		
Keeyask Area	Water quality Walleye (pickerel) Northern Pike (jackfish) Lake Whitefish Lake Sturgeon Fish habitat*	Upstream portion of the hydraulic zone of influence (direct project effects). Nelson River from the outlet of Clark Lake to the inflow of Stephens Lake, including small tributaries (Rabbit, Portage, and Two Goose Creeks). Divided upstream and downstream of the generating station. Includes the sites of the proposed Keeyask Generating Station and Keeyask reservoir. Includes zone of indirect project effects (upstream sections of Keeyask Area flooded tributaries where fish usage may be potentially affected by changes at tributary mouths).Includes the Fish Habitat Study Area assessed for the Keeyask Transmission Project, includes watercourses within and immediately adjacent to the Transmission Project footprint.
Local Study Area		
Split Lake to Stephens Lake Area	Water quality Walleye (pickerel) Northern Pike (jackfish) Lake Whitefish Lake Sturgeon	**Split Lake Area (upstream of Keeyask Area):** Includes zone of indirect project effects (Split Lake and adjoining waters potentially affected by changes in movement of fish to/ from the zone of direct effects).Split, Clark, and Assean Lakes, and tributaries to Split Lake (Nelson, Burntwood, and Aiken Rivers) are upstream of the Keeyask Generating Station and reservoir. Assean Lake is a lake outside the Keeyask hydraulic zone of influence that discharges to the Nelson River. Incorporated into the study area due to Keeyask Cree Nations' concerns and as a potential upstream reference area for post-Project monitoring.
		Stephens Lake Area (downstream of Keeyask Area): Contains the downstream portion of the hydraulic zone of influence. Includes zone of indirect project effects: Stephens Lake reservoir (including the southern area through which the main flow of the Nelson River passes and its northern, more isolated arm) and associated tributaries, including the North and South Moswakot rivers and Looking Back Creek. Stephens Lake reservoir is potentially affected by changes in movement of fish to/from the zone of direct effects and by water quality inputs from upstream generating station construction and operation; tributary channels are included for (i) potential downstream effects of Project on water quality, and (ii) stream crossings along the north and south access roads. Stephens Lake reservoir data used to support predictions of future conditions in Keeyask reservoir.
		Offset Lakes: 12 lakes proposed for alternate fisheries use: Caldwell, Christie, Kiask, Limestone, Thomas, Waskaiowaka, Cyril, Atkinson, Moose Nose, War, Pelletier, and Recluse lakes.
Downstream Area	Water quality	Nelson River downstream of Kettle generating station, potentially affected by downstream transport of Stephens Lake reservoir water including sediment load changes. Includes large tributaries (Limestone, Angling, and Weir rivers) and small tributaries (Beaver, Swift, Tiny, and Goose creeks and Creek #15).

*Valued environmental component defined and studied in the Transmission Project E*nvironmental Assessment Report* only.

Figure B-4: Geographical Zones Used for Terrestrial Study Areas



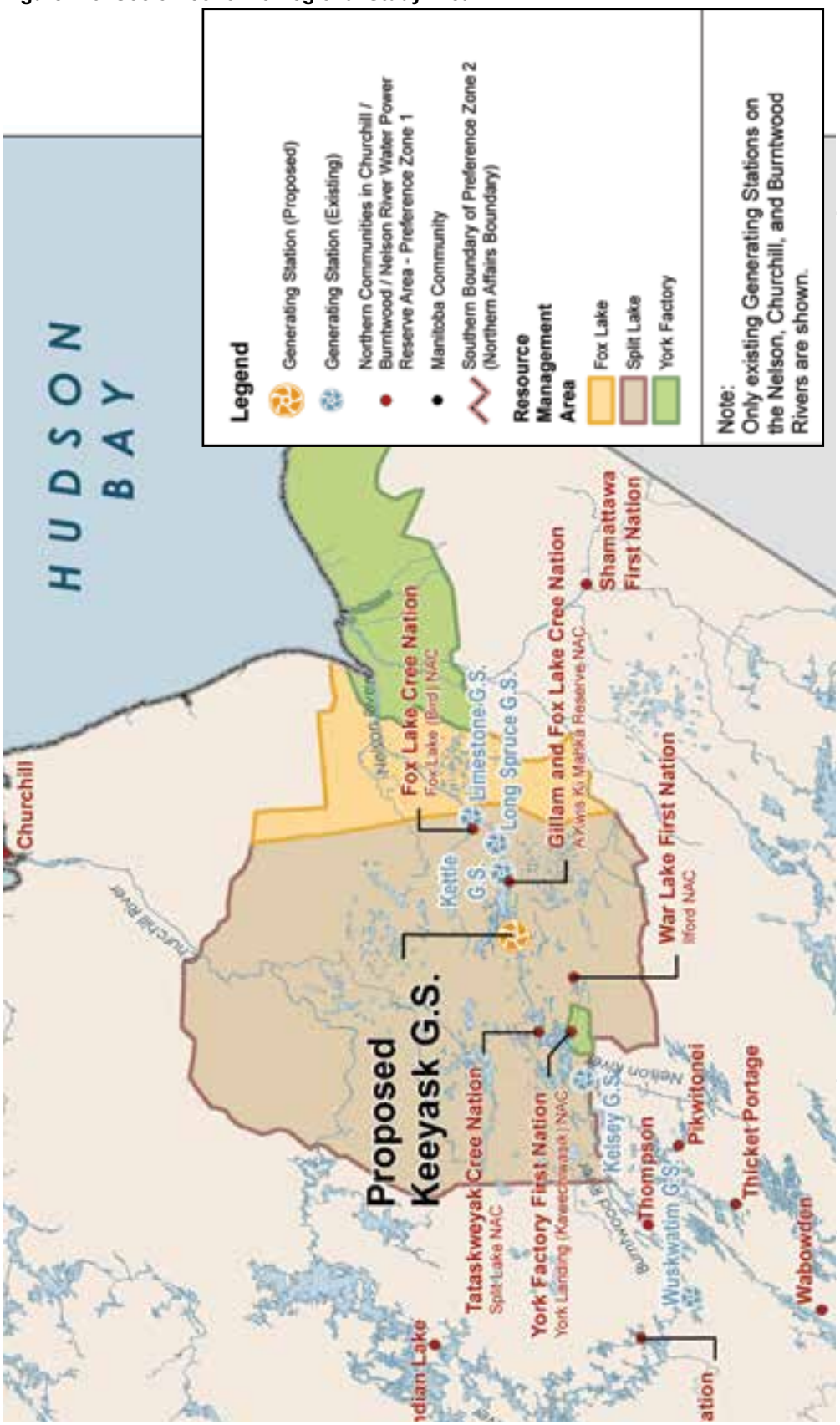
Source: Keeyask Hydropower Limited Partnership (2012). Terrestrial Environment Supporting Volume, *Environmental Impact Statement*. Map 2-1.

Table B-2: Study Areas, Terrestrial Environment

Study Area Name*	Valued Environmental Component	Study Area Description	Study Area Extent (square kilometres)	
Local Study Areas				
Study Zone 1	All	Project footprint, includes area to be disturbed as well as possible (may be) disturbed area	Project infrastructure	43
			Flooded terrestrial	45
			Flooded aquatic	52
			TOTAL	140
Study Zone 2	Local study area for ecosystem diversity, wetland function, and priority plants assessment	Potential Project influence on habitat	Terrestrial	130
			Aquatic	60
			TOTAL	190
Study Zone 3	Local study area for intactness / fragmentation, all birds, moose and beaver.	Potential Project influence on landscape	Terrestrial	330
			Aquatic	90
			TOTAL	420
Study Zone 4	Local study area for Caribou; regional study area for key components of the physical environment, beaver, and all birds except Canada Goose and raptors**/Bald Eagle.	Captures multiple landscape assemblages, home ranges of species requiring moderately large areas	Terrestrial	1700
			Aquatic	500
			TOTAL	2200
Regional Study Areas				
Study Zone 5	Regional study area for ecosystem diversity, wetland function, intactness / fragmentation, priority plants; Canada Goose, raptors/Bald Eagle, and moose.	Supports key boreal ecological processes and home ranges of most resident wildlife species	Terrestrial	12000
			Aquatic	2000
			TOTAL	14000
Study Zone 6	Regional study area for caribou.	Fire regime scale	Terrestrial	27000
			Aquatic	3000
			TOTAL	30000

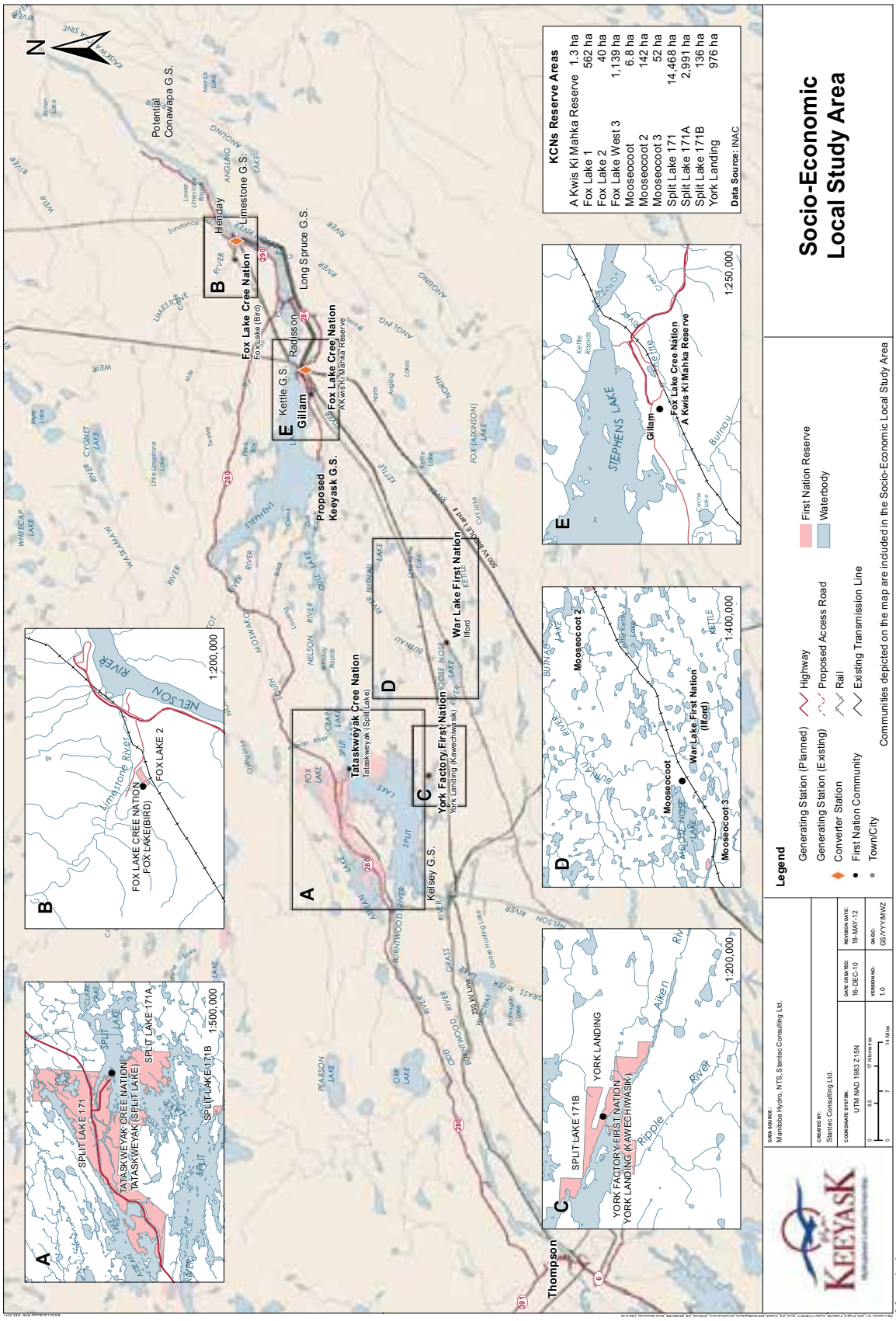
Notes: *Terrestrial Study Zones are geographically nested such that each Zone includes all the smaller, lower-numbered zones.
** Valued environmental component defined and studied in Transmission Project environmental assessment report only.

Figure B-5: Socio-Economic Regional Study Area



Source: Keeyask Hydropower Limited Partnership (2012). Part 1, Socio-Economic Environment, in: Socio-Economic, Resource Use, and Heritage Resources Supporting Volume, *Environmental Impact Assessment.* Map 1-2, p. 1-25 (plus revisions).

Figure B-6: Socio-Economic Local Study Area



Source: Keeyask Hydropower Limited Partnership (2012). Part 1, Socio-Economic Environment, in: Socio-Economic, Resource Use, and Heritage Resources Supporting Volume, *Environmental Impact Assessment*. Map 1-1, p. 1-24

Figure B-7: Heritage Resources Study Areas

Source: Keeyask Hydropower Limited Partnership (2012). Part 3, Hertitage Resources, in: Socio-Economic, Resource Use, and Heritage Resources Supporting Volume, *Environmental Impact Assessment*. Map 1-1. p. 1-42.

Table B-3: Study Areas, Resource Use and Heritage Resources

Purpose	Description
Resource Use	**Local Study Area**
	Land within Registered Traplines 7, 9, 15, and 25, bounded by the Provincial Road 280 to the northwest and the rail line to the southeast and encompassing Clark Lake to the Town of Gillam. Resource use was assessed for the Keeyask Transmission Project in a local Project Study Area, a triangular area extending west from the Radisson Converter Station (6 km north of the town of Gillam) along the south shore of Stephens Lake to the proposed Keeyask Generating Station, and southwest from Radisson parallel to the existing Hydro KN36 138 kV transmission line. This includes areas of Registered Traplines 7, 8, 9, 15, and 65.
	Regional Study Areas
	Broad geographic region where indirect environmental effects may be expected including the Split Lake Resource Management Area, the York Factory Resource Management Area, and the Fox Lake Resource Management Area. The Regional Study Area assessed for the Keeyask Transmission Project included the communities of Split Lake, Fox Lake, and Gillam.
Heritage Resources	**Core Study Area/ Local Study Area**
	Includes the core area, local waterbodies (Clark, Carscadden, Moose Nose, Stephens, Fox/Atkinson and Kettle lakes, and Aiken/Landing River) and the Nelson River extending further downstream to the Kettle Generating Station. The core area is the reach of the Nelson River between the outflow at Clark Lake and the inflow to Stephens Lake, including the project footprint and component roads, dykes and borrow areas.
	Regional Study Area
	A broad area that includes the local and core study areas and extends west to the junction of the Odei and Burntwood Rivers and downstream to the Long Spruce Generating Station.

Appendix C
Environmental Effects Analysis

Assessment of the Project's Residual Environmental Effects

In its effects assessment, the Agency focuses on residual effects, or the effects of the Project on Valued Ecosystem Components remaining after implementation of mitigation measures (see the proponent commitments to mitigation in Appendix F, and offsets for fish and fish habitat in Appendix H). Only adverse residual effects are carried forward for the Agency's analysis of potential significance (Tables C-1 to C-3).

Table C-1: Environmental Effects Summary – Descriptions of Residual Effects Criteria Ratings

Factors considered in the assessment of residual adverse environmental effects			
Aspect	**Assessment Rating Scale**		
MAGNITUDE (describes the predicted severity or degree of disturbance to the environmental component)	**Low** – no definable, detectable or measurable effect; or below established thresholds of acceptable change; or within the range of natural variability; or minimum impairment of an ecosystem component's function.	**Moderate** – effects that could be measured and could be determined by a well-designed monitoring program; or are generally below or only marginally beyond guidelines or established thresholds of acceptable change; or are marginally beyond the range of natural variability or marginally beyond minimal impairment of an ecosystem component's function.	**High** – effects that are easily observable, measured and described (i.e., readily detectable without a monitoring program), or well beyond guidelines or established thresholds of acceptable change; or well beyond the range of natural variability; or well beyond minimal impairment of an ecosystem component's functions.
EXTENT (describes the spatial boundary within which the effect is expected to occur)	**Small extent** – effects that are confined to a small portion of one or more small areas where direct effects will occur.	**Medium extent** – effects that extend into local surrounding areas where direct and indirect effects can occur.	**Large extent** – effects that extend into the wider regional area where indirect effects can occur.
DURATION (describes the length of time that the predicted effect will last)	**Short-term** – effects that generally occur within the construction period or initial period of impoundment, or that occur within only one generation or recovery cycle of the environmental component.	**Medium-term** – effects that extend through a transition period during the operation phase, or that occur within one or two generations or recovery cycles.	**Long-term** – effects that extend for much or all of the operation phase, or that are permanent, or that extend for two or more generations or recovery cycles.
FREQUENCY (describes how often the predicted effect will occur)	**Infrequent** – effects that occur only once or seldom during the life of the Project.	**Sporadic/Intermittent** – effects that occur only occasionally and without any predictable pattern during the life of the Project.	**Regular/Continuous** – effects that occur continuously or at regular intervals during the life of the Project
REVERSIBILITY (describes the component's potential for recovery from an adverse effect)	**Reversible** – effect that is reversible during the life of the Project.		**Irreversible** – a permanent effect.
LIKELIHOOD/ CERTAINTY (chance that the effects and mitigations will be as predicted)	**Low certainty** – the effect is not certain. The effect may or may not occur or the magnitude/extent cannot be estimated with confidence. The environmental component requires monitoring and contingency plans for mitigation.	**Moderate certainty** – the predicted effect is somewhat certain but the magnitude cannot be estimated with confidence. Monitoring is required to confirm magnitude/ spatial extent/temporal duration of effect.	**High certainty** – the estimate of the effect is quite certain because predictive methods (models, proxy systems) are well established and closely resemble the area to be affected by Project.

Table C-1: Environmental Effects Summary – Descriptions of Residual Effects Criteria Ratings continued

Factors considered in the assessment of residual adverse environmental effects			
Aspect	**Assessment Rating Scale**		
ECOLOGICAL CONTEXT (describes whether the environmental component is particularly sensitive to disturbance or has the capacity to adapt to change. Ecological context includes consideration of the rarity, uniqueness and fragility of the component within the ecosystem)	**Low** – the component is not rare or unique, or is resilient to imposed change, or is not important to ecosystem function.	**Moderate** – the component has some capacity to adapt to imposed change, is moderately or seasonally fragile, or is somewhat important to ecosystem function.	**High** – the component is a protected/designated species, or fragile with low resilience to imposed change, or is very important to ecosystem function.
OVERALL SIGNIFICANCE	**Not significant (Minor or Low)** Residual effects that are generally low in magnitude, site-specific or local in extent, short- to long-term in duration, low in frequency (once or intermittent), reversible and of low ecological context. These effects are not distinguishable from effects resulting from background physical, chemical, and biological processes.	**Not significant (Moderate)** Residual effects that are generally moderate in magnitude, local to regional in extent, medium- to long-term in duration, may occur at all frequencies (once to continuous), reversible or irreversible, and of moderate ecological context. These effects and consequences are distinguishable at the level of populations, communities and ecosystems. Follow-up or monitoring of these effects may be required.	**Significant** Residual effects that are generally high in magnitude, regional in extent, long-term in duration, occur at all frequencies, irreversible, and of high ecological context. These effects and consequences bring structural and functional changes in populations, communities, and ecosystems. They may or may not be deemed justifiable in the circumstances. Significant residual effects, if accepted, require follow-up and monitoring.

Table C-2: Specific Threshold/Benchmarks for Assessing Magnitude

Valued Environmental Component	Indicators and Thresholds/Benchmarks for Magnitude	
	Indicators	**Thresholds/Benchmarks**
Aquatic Environment		
Water quality	Compliance with provincial and federal water quality standards, objectives, guidelines and regulatory standards for the protection of aquatic life for surface water quality parameters	**Low**: no measurable effects anticipated or effect is detectable but is within normal variability of baseline condition **Moderate**: effect would cause an increase over baseline but is within regulatory limits and objectives **High**: effect would singly, or as a substantial contribution in combination with other sources, cause objectives or standards within the RSA to be exceeded
Fish habitat and Freshwater fish • Walleye (pickerel) • Northern Pike (jackfish) • Lake Whitefish • Lake Sturgeon	Aspects of fish mortality, permanent alteration and destruction of fish habitat	Fisheries and Oceans Canada's goal of providing sustainable and ongoing fisheries and compliance with the *Fisheries Act*.
Terrestrial Vegetation and Habitat		
Ecosystem diversity	Native stand level habitat types: percent changes in area distribution amongst native stand level habitat types. Priority habitat types: cumulative percentage of area affected by human development and activities. These indicators were evaluated in the Regional Study Area.	**Low**: less than 1 percent change **Moderate**: percent change from 1 to 10 percent **High**: percent change greater than 10 percent
Wetland function	Assessed for maintenance of key wetland types, and net change to wetland area, by type. These indicators were evaluated in the Regional Study Area.	**Low**: change less than 1 percent **Moderate**: change from 1 to 10 percent **High**: change greater than 10 percent
Intactness/ fragmentation	Assessed for Project's contribution to change to linear feature density and core area. These indicators were evaluated in the Regional Study Area.	**Low**: below 0.40 kilometer per square kilometer and greater than 65% land area is core/intact **Moderate**: from 0.40 to 0.60 kilometer per square kilometer and from 40% to 65% land area is core/ intact **High**: greater than 0.60 kilometer per square kilometer and lower than 40% land area is core/ intact
Priority plants	Assessed for effects to endangered, threatened, globally rare, provincially very rare species and provincially rare species, or species valued by Keeyask Cree Nations; considering the percentage of known locations affected and the cumulative percentage area losses for native habitat types.	**Low**: changes below 1%; **Moderate**: from 1% to 5% (for rare plants); and from 1% to 10% for other priority plants **High**: changes greater than 5%[1] for rare plants; for other priority plants, changes greater than 10%.

1 Hegmann*et al*. 1999; Wagner 1991.

Table C-2: Specific Threshold/Benchmarks for Assessing Magnitude continued

Valued Environmental Component	Indicators and Thresholds/Benchmarks for Magnitude	
	Indicators	**Thresholds/Benchmarks**
Bird and Bird Habitat		
Waterbirds (Canada Goose, Mallard); **Colonial waterbirds;** **Raptors** (Bald Eagle); **Bird species at risk** (Olive-sided Flycatcher, Common Nighthawk, Rusty Blackbird)	Changes in the availability of bird habitat and other factors that could affect bird populations in the Regional Study Area including increased risk of mortality. Bird species at risk: considered project effects and potential harm to species and critical habitat before mitigation.	Compliance with federal legislation protecting birds listed under the *Migratory Birds Convention Act* and *Species at Risk Act*.
Wildlife and Wildlife Habitat		
Caribou, moose, beaver, wildlife species at risk	Changes in the availability of wildlife habitat and other factors that could affect wildlife populations including increased risk of mortality. Assessment of residual effects to wildlife species at risk: considered project effects and potential harm to species and critical habitat before mitigation, provincial management objectives for wildlife; compliance with federal legislation protecting wildlife listed on Schedule 1 of the Species at Risk Act in regional study areas.	**Low**: the residual alteration or loss is not expected to exceed a 1 percent change to physical habitat (all wildlife), a 10 percent increase of population harvest (moose). Grey wolf density would not increase by more than 4 wolves/1 000 km^2 (moose and caribou), and a low magnitude fragmentation/ intactness change (caribou) **Moderate**: the residual alteration or loss is expected to be between 1 to 10 percent loss to physical habitat (all wildlife), a 10 to 20 percent increase of population harvest (moose), an increase to grey wolf density of 4 to 6 wolves/1 000 km^2 (moose and caribou), and a moderate magnitude fragmentation/intactness change (caribou) **High**: the residual alteration or loss is expected to exceed 10 percent[2] loss to physical habitat (all wildlife), a greater than 20 percent increase of population harvest (moose), an increase to grey wolf density of 6 wolves/1 000 km^2 (moose and caribou), and a high magnitude fragmentation/ intactness (caribou)
Heritage Resources		
Archaeological and cultural resources	Changes to heritage resources, culturally valued sites	**Low**: modification of archaeological and cultural resources but with prior retrieval of the resource and associated information, and with all necessary regulatory approvals, or an indirect effect on a known archaeological and cultural resource that is of interest and concern to the associated community, but that will not reduce the overall integrity and cultural value of the site **Moderate**: disturbance or loss of a portion of archaeological and cultural resources, with retrieval of a portion of the resource and its associated information, or a direct effect on a known archaeological and cultural resource that is of interest and concern to the associated community, but that only partially reduce the overall integrity and cultural value of the site **High**: disturbance or loss of an archaeological and cultural resources, with no retrieval of the resource and its associated information, or a direct effect on archaeological and cultural resources, where the overall integrity and cultural value of the site is lost

2 Salmo et al. 2004

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components[3]

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
AQUATIC ENVIRONMENT					
WATER QUALITY					
Cofferdam, spillway, dyke construction Construction of access roads and borrow areas	• Increased concentrations of total suspended solids during instream construction, with the largest increases occurring immediately downstream instream construction areas (cofferdams, generating station) • Increased concentration of deleterious substances in the immediate receiving environment exposed to accidental spills	Low – moderate	Small-Large ((instream construction area to downstream area)	Short-term	
Reservoir operation	• Changes to total suspended solids, nutrients, DO, pH and metals in flooded areas for initial years of impoundment; long-term • Permanent decrease of total suspended solids in the mainstem of the reservoir and southwestern part of Stephens Lake • Increase in methylmercury in reservoir and downstream areas, with methylmercury levels peaking after impoundment and declining over time (see effects assessments in Freshwater Fish; Mercury in Wildlife)	Low-moderate	Small-medium	Medium to long-term	
FRESHWATER FISH (WALLEYE, NORTHERN PIKE, LAKE WHITEFISH, LAKE STURGEON)					
Construction, cofferdam installation, accidental spills, blasting	• Death of fish (fish, eggs, larvae by burial) during construction • Displacement of fish (including Lake Sturgeon) from spawning habitat during construction	Low-moderate	Small-medium	Short-term	
Operation of spillway and generating station (use of trashracks, turbines)	• Increased mortality to larger-bodied fish • Death of fish from mechanical strike (turbine), barotrauma (rapid pressure change effects), and impingement on trash racks during downstream movement from the Keeyask reservoir and passage through the spillway when it is in use	Low-moderate	Small-Medium	Long-term	
Operation of the reservoir	• Death of fish, including eggs and larvae from intermittent water level exposure and rapidly varying water levels in the reservoir and downstream of the generating station • Potential genetic alteration of Lake Sturgeon stock in the Keeyask area from stocked fish	Low-moderate	Small-Medium	Long-term	

3 See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance
	Frequency	Reversibility	Socio-Ecological Context		
	Continuous (during instream construction) / Intermittent	Reversible	Low-moderate	High	The project area includes a large river, numerous streams and wetlands. TSS increases are associated with instream work, but are not expected to result in decrease in productivity of fisheries or serious harm to fish.
	Continuous	Irreversible/ reversible		High	
	Continuous/ Intermittent	Reversible	Moderate-High	High	See Appendix H: Residual Impacts to Fish and Fish Habitat for detail of DFO's assessment of impacts to fish and proposed offsetting. Lake Sturgeon, a large-bodied, long-lived fish that is slow to mature and spawns infrequently is assessed by COSEWIC as endangered. The project area contains members of the Nelson River population.
	Continuous/ Intermittent	irreversible		Moderate	
	Intermittent	Irreversible		Moderate	

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
FISH HABITAT					
Generating station construction	• Potential loss of older sub-adults and adult lake sturgeon from Gull Lake due to emigration during construction. Overall population numbers will be maintained through stocking, but this strategy will not replace older year classes • Loss of natural recruitment downstream of the generating station due to loss of spawning habitat in Gull Rapids. Stocking of young-of-the-year and/or yearlings is expected to mitigate potential effects to the overall population • Potential interruption of fish movement upstream and downstream of the dam	Moderate	Small-Medium	Short-medium term	
Reservoir initial impoundment and ongoing operation	• Operation resulting in rapidly varying water levels reduce the value of near shore habitat • Short term loss of productive capacity of habitats while offsetting habitat establishes (newly flooded areas of the reservoir will be of lower quality habitat for fish due to low dissolved oxygen conditions, shoreline instability, and the absence of aquatic plants for five to ten years) • Aquatic organisms will bioaccumulate methyl mercury released to the water as a result of reservoir flooding • Isolation of fish in river segments (upstream and downstream; alteration of fish migration patterns • Potential shift in Lake Sturgeon spawning location from existing areas at or downstream of Birthday Rapids to other nearby habitat (e.g. Long Rapids) ; shift in use of young-of-the-year habitat from the river channel in Gull Lake to the river channel in the reservoir at the upstream end of Gull Lake	Low-moderate	Small-Medium	Long-term	

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance
	Frequency	Reversibility	Socio-Ecological Context		
	Continuous	Reversible	Moderate-High	Moderate	See Appendix H: Residual Impacts to Fish and Fish Habitat Need for fish passage will be monitored through construction (see Appendix G: Proponent commitments to follow-up and monitoring) Technically and economically feasible retrofit options will be included for the generating station and fish passage will be provided if monitoring demonstrates it is required to maintain productivity of fisheries and achieve fisheries management objectives.
	Continuous	Reversible		High	In the long-term, an overall increase in the regional number of lake sturgeon is predicted by the proponent due to augmentation of the currently depleted population by stocking (see Appendix H: Residual Impacts to Fish and Fish Habitat).

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
TERRESTRIAL VEGETATION AND HABITAT					
ECOSYSTEM DIVERSITY					
Construction of trails, access roads, and infrastructure; development of borrow areas and quarries Restoration and revegetation of areas disturbed by construction Operation of reservoir involving reservoir clearing, flooding and shoreline erosion	• Minor reduction in number of/size of/ stands of the habitat type on the Project landscape as a result of reservoir flooding: black spruce (loss of 0.2 percent), white birch mixedwood and jackpine mixture on shallow peatland (bog and fen) (loss of < 2 percent) , priority habitat area (loss of 0.04 percent)	Low - Moderate	Small-Medium	Long-term	
INTACTNESS/FRAGMENTATION					
Construction at transmission station sites, right of way land clearing, and tower placement; development of borrow areas and quarries Construction of trails, access roads, and infrastructure; development of borrow areas and quarries	• Minor reduction in core areas (number and size). One core area slightly larger than 1000 hectares (10 square kilometers) and two core areas between 200 and 1000 hectares (2 and 10 square kilometers) would be removed; another large core area reduced by 879 hectares (36 percent); but the number of core areas of at least 200 hectare size overlapping with the Local Study Area would only decline from 13 to 12 and their combined area would decline from 115 308 to 106 754 hectares. • Permanent, non-reversible increase of less than 0.1 percent in the linear feature density of the RSA.	Low	Medium	Long-term	
WETLAND FUNCTION					
Construction of trails, access roads, and infrastructure, clearing, excavation of borrow areas, placement of excavated material, flooding from coffer dam diversion Reservoir flooding Installation of towers, station sites, roads Vegetation maintenance	• Loss of up to 7765 ha (0.7 percent) of wetlands in the regional study area, where wetlands are a dominant land cover • Reduction in existing lower-quality (already disturbed by the altered hydrologic regime as a result of past hydro development) shoreline wetlands and riparian habitat along the Nelson River (441 ha) • Reduction from historical wetland area within the RSA of less than 1% for all wetland types, including off-system marshes	Low-Moderate	Medium	Long-term	
PRIORITY PLANTS					
Access roads and trails, borrow sites, rights-of-way and land clearing for Transmission Project station sites and tower placement Maintenance of transmission lines, use of herbicides to clear vegetation	• Reduction in small areas of habitat containing valued/ priority plants	Low	Small	Short-long term	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Continuous	Irreversible/ reversible (in some cases through rehabilitation)	Low	High	Ecosystem diversity monitoring is proposed and includes avoidance of sensitive sites, successful rehabilitation of native broad habitat types, documenting the actual direct and indirect effects on each of the priority habitat types. The proponent's Rehabilitation Plan is proposed to rehabilitate the most-affected priority habitat types.
	Continuous	Reversible/ Irreversible	Low	High	Routing follows existing disturbance to reduce fragmentation effects; revegetation of cutlines and trails where they intersect the Project footprint is feasible.
	Continuous	Irreversible	Low-moderate	High	Wetlands are the dominant land cover on the Project landscape; no net loss of priority habitat type (off-system marsh) is expected with compensation wetland proposed. However, while considered a lower quality wetland type, irreversible change is expected to Nelson River shoreline wetlands along the reservoir.
	Intermittent / Continuous	Reversible	Low	High	Permanent loss of Labrador tea locations on island to be flooded by the reservoir.

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
BIRDS AND BIRD HABITAT					
CANADA GOOSE					
Construction, land clearing and road development Operation of reservoir, involving impoundment, higher water levels, rapid water level fluctuations, shoreline erosion, peatland disintegration Spills or leaks of petroleum products during construction and operation	• Loss of Canada Goose staging habitat affected by construction noise • Small (negligible) increase in numbers of hunters • Small increase in traffic-related Canada Goose mortality • Fewer (negligible) Canada Geese in the LSA	Low	Small-medium	Short-term/ Long-term	
MALLARD					
Access roads, trails, borrow sources, Transmission towers and station Construction, land clearing and site preparation, road development, noise, spills and leaks of petroleum products Impoundment, higher water levels, shoreline erosion, and peatland disintegration	• Loss (negligible) of up to 7765 ha of wetlands in region with wetlands as a dominant land cover • Loss of 3% Mallard breeding and brood-rearing habitat • Reduced habitat available for Mallard nesting and foraging • Small increase in Mallard hunting • Risk of contamination of Mallard habitat by petroleum leaks and spills, affecting water quality and food • Long-term loss of some Mallard brood-rearing habitat, food, and resting habitat due to reservoir impoundment	Low	Small-medium	Short- to long-term	
COLONIAL WATERBIRDS					
Development of cofferdams and inundation of islands Noise – blasting at Gull Rapids Shoreline erosion and peatland disintegration	• Loss of island nesting and foraging habitat at the proposed generating station location, with cofferdam installation and rock blasting • Foraging efficiency will be interrupted and/ or birds will avoid portions of Keeyask (Gull) Rapids area where noise and blasting is most frequent and disruptive	Low – moderate	Small	Short- to Long-term	
BIRD SPECIES AT RISK: OLIVE-SIDED FLYCATCHER					
Land clearing and site preparation, transmission station site and right of way Construction and operation, Increased vehicular traffic; construction Noise Operation - shoreline erosion and peatland disintegration Installation of transmission towers and wires	• No measurable effects on local populations (low in the RSA) • Permanent loss of habitat for Olive-sided Flycatcher to land clearing for Transmission Project infrastructure, with reduction in the amount of nesting habitat available (tall trees in/adjacent to forest clearings) • Reduction in the amount of breeding and foraging habitat • Increased vehicle collision and hunting mortality to Olive-sided Flycatcher • Increased risk of infrastructure collision mortality to Olive-sided Flycatcher	Low	Small	Short- to long-term (collision mortality)	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Regular	Reversible/ Irreversible	Low - Moderate	High	Fewer Canada Goose may stop-over in the LSA as a result of long-term habitat loss of feeding and resting habitats with reservoir creation and operation. However, population-level changes to Canada Goose abundance or distribution in the regional study area are not expected to be affected by the Project.
	Regular, Continuous	Reversible/ Irreversible	Low	High	Reduced habitat may result for Mallard in the LSA; however, Mallard are common in the RSA and population-level effects are not anticipated.
	Continuous, Regular	Reversible/ Irreversible	Low	High	Mitigations are proposed to avoid harm to nesting colonies and avoid/reduce sensory disturbance from construction. Population-level effects are not anticipated to colonial waterbirds as a result of the Project.
	Regular	Reversible/ irreversible (mortality from tower collisions)	High	High	Mitigations are proposed to avoid harm to breeding birds, nests and eggs. Proposed mitigations to address potential sources of mortality include wire deflectors to increase visibility and reduce strikes, and habitat retention. Population-level effects are not anticipated to Olive-sided Flycatcher as a result of the Project.

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
BIRD SPECIES AT RISK: COMMON NIGHTHAWK					
Construction and operation, land clearing and site preparation Transmission Project land clearing of station site and right of way; installation of transmission towers and wires Reservoir flooding, resulting in shoreline erosion and peatland disintegration	• Loss of habitat for Common Nighthawk to land clearing for Transmission Project infrastructure • Reduction in the amount of habitat available foraging. • Increased vehicle collision and hunting mortality to Common Nighthawk • Loss of some nesting habitat • Increased risk of infrastructure collision mortality to Common Nighthawk	Moderate	Small	Short- to long-term (collision mortality)	
BIRD SPECIES AT RISK: RUSTY BLACKBIRD					
Construction and operation Land clearing and site preparation; land clearing of transmission station site and right of way Operation - shoreline erosion and peatland disintegration Installation of transmission towers and wires	• Loss of habitat for Rusty Blackbird to land clearing for Transmission Project infrastructure; minor or negligible reduction in breeding and foraging habitat (3%), no measurable effects on local populations • Negligible increase vehicle collision/mortality to Rusty Blackbird • Permanent increased infrastructure collision mortality to Rusty Blackbird	Low	Small	Short- to long-term (collision mortality)	
RAPTORS (BALD EAGLE)					
Land clearing and site preparation for the generating station, transmission station sites and right of way Construction blasting at Gull Rapids Installation of transmission towers and wires Reservoir flooding; shoreline erosion and peatland disintegration	• Loss of nesting habitat but no measurable effects on local populations • Loss of habitat for Raptors due to land clearing for Transmission Project infrastructure • Minor vehicle collision and hunting mortality to Raptors • Negligible reduction in the amount of habitat available foraging • Increased infrastructure collision mortality to Raptors • Negligible loss of some brooding and rearing food and resting habitat; low level loss nesting habitat	Low	Small	Short-term	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Regular	Reversible/ Irreversible (mortality from tower collisions)	High	High	Mitigations are proposed to avoid harm to breeding birds, nests and eggs. Proposed mitigations to address potential sources of mortality include wire deflectors to increase visibility and reduce strikes, and habitat retention. Population-level effects are not anticipated to Common Nighthawk as a result of the Project.
	Regular	Reversible/ Irreversible (mortality from tower collision)	High	High	Mitigations are proposed to avoid harm to breeding birds, nests and eggs. Proposed mitigations to address potential sources of mortality include wire deflectors to increase visibility and reduce strikes, and habitat retention. Population-level effects are not anticipated to Rusty Blackbird as a result of the Project.
	Regular	Reversible/ Irreversible (mortality from transmission tower)	Low	High	No measureable effects to local populations are expected as a result of the project. The tailrace may provide feeding opportunities and alternate nesting platforms are proposed as mitigations for potential loss of nest sites along shoreline. Deflectors on wires and removal of road kill are proposed to reduce mortality risks increased by project structures and activities.

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
WILDLIFE AND WILDLIFE HABITAT					
MOOSE					
Land clearing for construction, station sites and transmission line right of way Increased access to predators and hunters following newly created trails and cutlines Increased noise and vehicle traffic during construction and operation Reservoir flooding, vegetation clearing for maintenance	• Minor habitat loss • Some mortality due to hunting • Some mortality due to vehicle collisions • Temporary displacement, moose expected to return once noise ends	Low	Small-Medium	Short-term	
CARIBOU					
Land clearing for construction, station sites and transmission line right of way Land clearing for generating station; reservoir clearing; reservoir flooding Caribou – human interactions from construction vehicle traffic, workers on site Vegetation clearing for maintenance Construction and operation noise	• Minor habitat loss (calving or rearing habitat) with Transmission Project footprint • Moderate to low loss of summer calving and rearing habitat (6% of LSA and 1% of RSA) from the generating station • Low increase in mortality due to changes in access for hunting and predation • Caribou will access area once noise ends • 9% of habitat could be temporarily unusable due to construction and operation noise (avoidance of some winter habitat within 2 kilometres of the construction zone, temporary abandonment of calving habitat with project disturbance)	Moderate	Small-Medium	Long-term	
BEAVER					
Habitat loss and removal of 30 beaver dens Construction and operation noise Increased access to predators and hunters Reservoir flooding	• Some mortality, minor habitat loss • Some increased mortality anticipated with increased access • 5% of habitat will be lost	Low	Small	Long-term	
OTHER WILDLIFE					
Reservoir flooding	• Reduced reproduction and survival is expected, and will likely result in a negligible to small decline in otter numbers in the Local Study Area	Low-moderate	Small to large	Medium to Long-term	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Intermittent/ Continuous	Reversible	Low	High	Seasonal timing of blasting noise increases sensitivity of wildlife (calving, nesting); however, alternative habitat is available within the regional study area.
	Intermittent/ Continuous	Reversible	Moderate:	Moderate-High	Project effects include change from natural ambient background; seasonal timing of blasting noise increases sensitivity of wildlife (calving, nesting); however, alternative habitat is available within the regional study area. TK suggests uncertainty in the type of caribou found in the project area – this is reflected in the moderate confidence rating noted.
	Continuous	Reversible	Low	High	Beaver is common in the Regional Study Area.
	Continuous	Reversible	Low	Low	River otter is common in the Regional Study Area.

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
RESOURCE USE					
DOMESTIC FISHING					
Mercury bioaccumulation in fishes	• Limitation on local fisheries resource use caused by increases in mercury	Moderate	Large	Medium-long-term	
Generation Station project footprint, reservoir flooding, Workers added to community	• Small increase in competition for fisheries resources from licenced recreational fisheries use • Elimination of fish harvest in reservoir due to methyl mercury generation and accumulation in fish muscle • Displacement of fishing pressure to offset lakes	Low	Medium	Medium-long-term	
waterbodies along gated access roads	• Displacement of use from existing preferred locations, increased travel time and costs for accessing fishing opportunities may pose barriers for traditional family and group activities	Moderate	Medium	Medium-long-term	
DOMESTIC HUNTING/GATHERING					
Project construction (noise, dust, and safety issues) Reservoir flooding, operation	• Displacement of use from existing preferred locations, increased travel time and costs for accessing fishing opportunities may pose barriers for traditional family and group activities • Hunting displacement to alternative locations outside of the LSA (limited or no hunting of caribou in the LSA; limited hunting of moose), including displacement into areas used by other Aboriginal groups. • Loss of plant harvest area in reservoir and construction sites from clearing and construction (Labrador tea harvest locations in the reservoir) • change to navigation routes, use of alternative trails, portages and boat launch areas in the project area	Moderate	Medium	Medium-long-term	
DOMESTIC HUNTING/GATHERING					
Site preparation, work areas, borrow areas, blasting, reservoir clearing Reservoir flooding of terrestrial habitat, increased access, Transmission Line Maintenance	• Displacement of use from existing preferred locations, increased travel time and costs for accessing opportunities may pose barriers for traditional family and group activities • Permanent alienation of use of trapline	Moderate	Medium	Medium-long-term	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Continuous	Reversible (over the medium-long-term)	Moderate	High	Fishing is a valued traditional use activity in the project area. Adverse Effects Agreements may create long-term positive distribution of fish harvest pressures to a larger land-base and increase fishing opportunities.
	Continuous	Reversible			Methylmercury increase in aquatic biota as a result of reservoir flooding poses a health risk through effects to food fish (see Human Health)
	Continuous	Reversible			
	Continuous	Reversible	Moderate	High	With Adverse Effects Agreements, long-term positive redistribution of wildlife and plant harvest country food, increases in cultural practices and traditions is predicted.
	Continuous	Reversible	Moderate	High	Negotiated compensation trapping agreements are expected to address Project effects to commercial trapping.

Table C-3: Environmental Effects Summary - Characterization of Residual Effects on Valued Environmental Components

VEC/ Phase/Activity	Adverse Residual Effects	Residual Effect Criteria Ratings			
		Magnitude	Extent	Duration	
HUMAN HEALTH					
HUMAN HEALTH (resulting from Project changes to physical and biophysical components, .e.g., water quality; air quality; fish, wildlife, vegetation quality)					
Reservoir clearing Reservoir flooding, operation	• Small increase in methylmercury to project area surface water and biota • Increase in exposure to methylmercury in project area surface water and biota • Community members (KCNs and Gillam residents) will not be able to consume some species of fish or reduce consumption levels.	Moderate	Medium-Large	Medium-long-term	
Electrical transmission, operation of the expanded converter station	• Noise effects close to right of way, transmission lines, and station; low magnitude, long-term duration, local extent • Permanent change to the culturally-important sound profile of Keeyask (Gull) Rapids	Low	Small	Long-term	
HERITAGE RESOURCES					
ARCHAEOLOGICAL AND HERITAGE RESOURCES					
Site preparation, work areas, borrow areas, blasting, reservoir clearing Reservoir flooding of terrestrial habitat	• Permanent loss of heritage resources site due to flooding and construction	Moderate	Small - Medium	Long-term	

* See Appendix F for a summary of the Proponent commitment to mitigations measures and Appendix G for a summary of the Proponent commitments to plans, follow-up and monitoring programs.

	Residual Effect Criteria Ratings			Certainty/ Likelihood	Additional Considerations for Significance*
	Frequency	Reversibility	Socio-Ecological Context		
	Continuous	Reversible	Moderate-High	High	Methylmercury increase in aquatic biota poses effects to food fish, increased risk to human health from the consumption of fish post-reservoir impoundment. Residual noise effects are a change from natural ambient background but sensitive receptors are some distance from site. It is unlikely that these effects will be detectable beyond the Local Study Area.
	Intermittent	Reversible/ irreversible (loss of rapids)			
	Continuous	Irreversible	Moderate	High	Not significant (moderate) since: Agreements in place for cultural ceremonies and most highly affected groups participate as proponents. Heritage Resources Plan to address salvage and respectful handling of sites, per the Manitoba *Heritage Resources Act*.

Appendix D

Summary of Key Aboriginal Consultation Concerns

Subject	Group	Comment/Concern	
Changes to Water flow and water levels	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Hydro development changes the seasonal flow of the river. Water levels peak in winter, rather than in spring. The spring freshet, which is important for the environment, will be lost. • Science can only provide so much information. Our lived experience tells us that despite what Hydro says, the flows and levels in our community will be affected. • There are no predictable patterns now. The whole system is erratic and Keeyask will only add to this problem. • The character of the river will change and this will alter the aesthetic value and cultural landscape of the river. • Water levels will be controlled but may change more rapidly. The drawbacks of keeping water levels within one meter have not been fully explained. • Concerns that impacts to Split Lake, the Aiken River and the Nelson River will be greater than predicted, and that the water level in Stephens Lake will rise. • Flooding loss to Gull rapids and nesting islands as a consequence of the Project leading to adverse impacts for the thousands of gulls and terns known to breed and nest there. Mitigations could include the building of floating islands and the enhancement of nesting areas to address this loss. • Recommend that the proponent consider maintaining seasonal variability in water flows. • Shoreline erosion continues to be a problem which affects access. What will be done to mitigate erosion?	
Travel on Water and Ice	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Norway House Cree Nation York Factory First Nation	• Travel will become unsafe due to floating debris in water, thin ice, or slush. Sediment in the water makes it harder to see hazards. • Fluctuating water levels and flows make ice navigation unpredictable and unsafe.	
Water Quality	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Norway House Cree Nation York Factory First Nation	• Each new dam increases pollution in the river. • Water quality poses an ongoing concern for our First Nation and we have concerns about the project effects to our water quality. Effects on water quality at York Landing may mean people might not be able to swim in the water or use it for laundry. • Water quality change in the Nelson River has impacted our traditional medicines.	

	Summary of Proponent Response	Agency Response
	Change in the pattern of seasonal water level fluctuation will be a result of the project. The project was redesigned so that there would be the lowest reservoir-level/lowest effect that was technically and economically feasible. The Reservoir Clearing Plan stipulates that selected locations will not be cleared of vegetation, to reduce erosion rates and provide a more stable shoreline. The Waterways Management Program stipulates that the shoreline will be stabilized at sensitive streams using low impact techniques, which will then be monitored and maintained. In addition, this Program includes operating a boat patrol, collecting remaining floating debris, marking safe travel routes using navigation and hazard markers, constructing and maintaining safe landing sites, docks, and shelters which will ensure safe access, and maintaining trails and portages. The proponent will monitor water levels and use adaptive management to address greater than predicted consequences.	The Agency is satisfied that the proponent has considered project effects to the physical environment and aquatic environment within the EIS. The proponent considered information regarding changes to water flow and water levels with respect to other VECs such as water quality, fish and fish habitat.
	The Reservoir Clearing Plan consists of clearing vegetation from the reservoir, in order to reduce large floating debris that present hazards to boating safety. The Waterways Management Program consists of operating a boat patrol, collecting remaining floating debris, marking safe travel routes using navigation and hazard markers, constructing and maintaining safe landing sites, docks, and shelters, maintaining trails and portages, and installation and monitoring of safe ice trails. A portage with docks will assist boaters to get around the Project. The In-stream Construction Sediment Management Plan will use construction techniques and monitoring in order to reduce the impacts of sediment during construction. Best management practices will confine most sediment effects to the reservoir during operation. Safety measures such as warning signs and fences will be implemented during construction and operation.	The Agency is satisfied that the proponent has considered navigation within the EIS. With implementation of the identified mitigation measures, the Agency concludes that there are not likely to be significant adverse environmental effects to navigation, including travel on water and ice, as a result of the Project.
	Management methods such as treating and testing effluent prior to discharge, controlling run off and preventing and managing accidental spills will be employed during construction. The project will comply with provincial water quality guidelines and licensing conditions. The Project's Sediment Management Plan implements protocols during in-stream construction to keep TSS levels within pre-determined limits. During operation, water quality monitoring and reporting will be completed as part of the project's Aquatic Effects Monitoring Program.	The Agency is satisfied that the proponent has considered project effects to water quality within the EIS. With implementation of the identified mitigation measures and follow-up/monitoring, the Agency concludes that there are not likely to be significant adverse environmental effects to water quality as a result of the Project. The Agency recommends that community based monitoring includes regular monitoring near York Factory First Nation's community recreation areas and domestic water sources.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Lake Sturgeon	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• The project will reduce the sturgeon population, destroy habitat, and prevent fish movement. Numbers are already low. • Mitigation measures (re-stocking, creation of new habitat) may not be successful or that stocking will take sturgeon from nearby rivers, leaving less for other users. Some mitigation measures are experimental. • Concerned with genetic risks of stocking to sustain Lake Sturgeon in the Nelson River. • Concerned with fish mortality as a result of the turbines. What research demonstrates the effectiveness of the proposed turbines? • Sturgeon from the LSA will migrate into areas where non-KCNs harvest and impact their traditional land use and pose potential risk of increased mercury levels. • Concerned with the management of accidental spills to land and water especially as it relates to the potential effects to fish and fish habitat. • Lake Sturgeon has been assessed by COSEWIC as endangered and species recovery planning identifies threats like alteration of flow regime that should be considered. • Lake Sturgeon mitigations from past projects have unacknowledged harms. • Sturgeon have cultural and spiritual significance. • Lower Nelson River Sturgeon Stewardship Committee is perhaps the most significant program for our First Nation allowing for our role in sturgeon stewardship.	
Caribou	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Construction activities, high water, unsafe ice conditions, the transmission line and roads will reduce caribou populations and change movement and migration patterns. • Caribou habitat, including Caribou Island and calving habitat will be lost. • The project-specific effects on caribou will be greater than predicted in the EIS. • The MAC Caribou Coordination Committee is very important for the long-term sustainability of caribou. • More information is needed to address the current uncertainty regarding identity, movement and numbers of Keeyask caribou. TK has an important role to play in this. • Western science and TK differ in understanding. TK suggests that there are Boreal Woodland Caribou in the Project area.	

	Summary of Proponent Response	Agency Response
	Adverse effects of construction will be addressed by adhering to instream construction timing windows, following blasting guidelines, screening water intakes and salvaging fish prior to de-watering Establishment of a Lake Sturgeon stocking program to offset lost year classes of Lake Sturgeon during the 8.5 years of construction. Lake Sturgeon stocking would be continued for at least one successful generation of Lake Sturgeon, which is approximately 25 years to assist persistence and recovery of Lake Sturgeon populations. Monitoring and contingency measures will ensure taking stock from nearby rivers does not threaten other Lake Sturgeon fish populations. A lake sturgeon conservation awareness program will be developed. Fish mortality resulting from impingement on trash racks and passage through turbines would be monitored and requirements for additional mitigation, including additional fish exclusion measures, would be determined by in consultation with the proponent and other stakeholders. For upstream fish passage, technically and economically feasible retrofit options to support fish passage will be incorporated in the design, and implemented if monitoring demonstrates it is needed. Spawning habitat will be created downstream of the generating station.	The Agency is satisfied that the proponent has considered project effects to Lake Sturgeon within the EIS. With implementation of the identified mitigation measures and follow-up/monitoring, the Agency concludes that there are not likely to be significant adverse environmental effects to Lake Sturgeon as a result of the Project.
	Access roads and construction activities have been planned to avoid calving habitat and remaining islands in the reservoir that could support calving will not be cleared. Blasting will be minimized during calving season. Firearms will be prohibited in camps, cut lines will be blocked or re-vegetated and measures taken to minimize collisions between vehicles and caribou. The proponent is developing a plan to coordinate caribou monitoring activities among northern hydroelectric developments, and with government authorities and existing caribou committees and management boards. (Caribou Coordination Committee). Details of these commitments are contained in the Construction Access Plan, Vegetation Rehabilitation Plan and Reservoir Clearing Plan, filed with the Environmental Impact Statement. It is expected that Manitoba Conservation and Water Stewardship will continue to manage the wildlife and fish resources through provincial harvest restrictions and through resource management board planning processes with the KCNs. It should be noted that, after conservation of the resources Aboriginal harvests are an existing constitutional right and are a priority for provincial resource allocation over all other uses of the resources. Community-specific Aboriginal Traditional Knowledge monitoring plans and other community-specific monitoring activities will be undertaken and overseen by the Monitoring Advisory Committee.	The Agency is satisfied that the proponent has considered project effects to caribou within the EIS. With implementation of the identified mitigation measures and follow-up/monitoring, the Agency concludes that there are not likely to be significant adverse environmental effects to caribou or adverse impacts on potential or established Aboriginal or treaty rights related to the harvesting of caribou as a result of the Project.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Ability to Eat Traditional Foods	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Norway House Cree Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Contamination of foods, particularly mercury levels in fish, is a concern. • People eat fish without paying attention to charts, therefore mitigation/ information and communication materials may not be effective. • Fish, game and eggs won't taste the same. • Caribou and moose are important for our diet. • Impact on health from loss of traditional foods and traditional medicines • Predictions around mercury levels in fish will be longer lasting that predicted by the proponent.	
Community Health and Safety	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Norway House Cree Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Risk of injury or death from increased road traffic. • Not enough is known about the impact of hydro development on human health and children's health in particular. • Emergency management is a concern, including what would happen to other dams and other downstream communities if the dam fails. • Need to look at health in a much broader perspective. Need to include health effects as a result of impacts to identity and culture. • It is important to consider the psychological and psycho-social impacts. • Need to consider the impacts on Thompson as a result of the influx of workers. • The impact of transient workers on community safety is a concern: higher rents, more drugs and alcohol, risk of abuse of women, less housing available, more demands on police.	

	Summary of Proponent Response	Agency Response
	Through the Keeyask Cree Nations Adverse Effects Agreements Offsetting Programs, KCN members will be able to eat fish from unaffected lakes and be supported in their cultural traditions associated with hunting and gathering. The Project's human health risk assessment evaluated Keeyask Cree Nations potential exposure to methyl mercury from country food consumption. The assessment baseline conditions and results are also generally applicable to other aboriginal people and the public who fish in Stephens Lake reservoir or Gull Lake. This assessment considered Manitoba's Guidelines for Consumption of Fish (frequency of fish consumption depending on size and contamination), based on Health Canada's provisional tolerable daily intakes of 0.47 milligrams of methyl mercury per kilogram of body weight per day for adults and 0.2 milligrams per kilogram of body weight per day for women of childbearing age. This human health risk assessment will be updated every five years after peak mercury levels have been reached to determine if adjustments can be made to the consumption recommendations, until mercury levels return to pre-Project conditions. A communication strategy and information materials providing recommended guidelines for safe consumption of fish and other country food will be provided to the public (including Aboriginal groups), KCN communities, and health providers. Mercury levels in fish and other wildlife will be monitored and results shared publicly with local resource users and health providers. The proponent commits to producing a Risk Management Plan, including consumption advisories and risk communications, to provincial and federal health authorities (Health Canada) for their review prior to beginning reservoir impoundment.	With implementation of the Adverse Effects Agreements and identified mitigation measures, including those associated with country foods safety and mercury monitoring, the Agency concludes that there are not likely to be significant adverse environmental effects to human health from methylmercury in fish as a result of the Project. The Agency concludes that there are not likely to be significant adverse effects on current use of land and resources as a result of the Project. The Agency has recommended the proponent include monitoring of Lake Sturgeon for mercury under the Aquatic Effects Monitoring Plan so that environmental assessment effects predictions for mercury in Lake Sturgeon tissue could be verified.
	PR 280 is being upgraded including widening, grading and curve shaping. Canadian Dam Safety Guidelines have been applied to the design of the Keeyask generating station. These, address safe construction, operation, and maintenance of dams, emergency preparedness for dam failure, safe passage of the probable maximum flood, and include independent reviews. The Keeyask generating station is designed to pass a flood twice as large as any on record, which is less than a 1: 10 000 year frequency. While the effect of the worst case scenario dam failure is assessed as being large in magnitude and geographic extent, variable in timing, duration and frequency , irreversible, of moderate to high ecological/social context, it is has very low probability of occurring and is mitigated during design and through emergency planning. Shuttles will take workers to and from the Gillam and Thompson airports. Manitoba Hydro and Fox Lake Cree Nation have established terms of reference for a worker interaction committee with the Town of Gillam. This committee is intended to track and coordinate response to issues relating to worker interactions with Aboriginal communities during project construction. Cultural training will be provided for all workers. Construction workers will be housed in a camp with recreational facilities and a health clinic. Public visits to camp will be restricted. Ongoing dialogue with communities, RCMP and First Nations will identify issues and assess how they should be addressed	The Agency is satisfied that the proponent has considered effects on health due to environmental changes caused by the Project and effects of accidents and malfunctions within the EIS. This report presents the assessment of the following key valued environmental components: key aspects of the physical environment; fish and fish habitat, including water quality; terrestrial vegetation communities, wetlands, and priority plants; terrestrial wildlife and wildlife habitat; and human health (including country foods). The Agency's assessment also considered the effects of the Project and its impacts on the current use of land and resources by Aboriginal groups for traditional purposes, and on archaeological and heritage resources. Concerns related to road safety and transient workers are outside the scope of the federal EA and have been forwarded to the Province for consideration in provincial licensing for the project.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Use of Land and Resources for Traditional Purposes	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• The project may affect wildlife, birds, fish and plants important for food and culture, such as moose, muskrat, fish, berries, medicinal plants, Canada geese and gull eggs. • Changing water levels or changes in ice will destroy traditional hunting, fishing or harvesting areas, including berry patches, camps and cabins. • Debris and sediment in the water may damage nets and make fishing more difficult. • The dam will impact the ability to travel on the Nelson River, which is part of Aboriginal culture. It is a time-honoured place, culturally important for travel. • Lake Sturgeon are an important traditional and cultural resources that will be affected by alteration of water regimes. Other fish and wildlife, such as whitefish walleye, may also be affected by these changes. One such change is the increased levels of mercury expected in fish consumed, including sturgeon. This has adverse impacts on the ability to exercise the treaty right to fish. • People will have to go further to hunt, fish and harvest, increasing costs, making it less enjoyable and putting pressure on traditional areas used by other groups. • Increased access to traditional areas and an influx of workers could lead to overharvesting or conflict. • Loss of firewood, which is used as a traditional heat source/fuel, is a concern due to flooding. • Impacts to caribou represent a loss of resource for traditional arts/crafts. • Project will disturb, fragment and destroy lands and waters used by members. • The Manitoba Metis Federation, Shamattawa First Nation, Cross Lake First Nation and Pimicikamak suggested that information contained in the Environmental Impact Statement regarding the potential impacts of the Project on their ability to exercise their Aboriginal or treaty rights is incomplete or inaccurate. • We are losing our ability to exercise our treaty rights to hunt, fish, trap and gather in the project area. • Caribou are central to our traditional lifestyle and livelihood and any impacts to them will adversely impact our traditional land use. • The character of the river will change and this will alter the timing of uses of the river and adjacent lands for hunting, trapping, and travel. • Fluctuating water levels affects caribou, geese and fur-bearers and our ability to hunt. • Fluctuating water levels and shoreline erosion will impact our ability to harvest traditional medicines.	

	Summary of Proponent Response	Agency Response
	Nesting structures will be installed for bald eagles and mallards, some breeding habitat will be retained for common nighthawk and olive-sided flycatcher. Land clearing will be avoided to the extent possible during bird breeding season. Vegetated buffers will be established and maintained at most water bodies to reduce construction noise and protect beaver, bird habitat. Beaver will be trapped by licensed trappers in the area where the reservoir will be created prior to impoundment. Measures will be applied to prevent or reduce erosion, siltation and other effects to off-system marshes. New marshes will be developed. The Keeyask Cree Nations' Adverse Effects Offsetting Programs will provide access to alternative hunting and gathering areas, and assist with losses to personal property and cabins. The offsetting programs with each of the Partner First Nations have been negotiated based on community perspectives about the potential for resource harvesting activities to be affected, and each community's desire to support and enhance the exercise of its customs, practices and traditions. The project was redesigned so that there would be the lowest reservoir-level/ lowest effect that was technically and economically feasible. According to the Proponent, caribou hunting is not expected to occur in Project affected areas due to provincial harvest restrictions in GHA 9 (i.e. licensed caribou hunting is prohibited). If plant surveys identify very rare plant species the site will be avoided or plants transplanted. Priority habitats will be rehabilitated in some construction areas not needed for operation Construction mitigation methods for sturgeon also apply to other fish. Spawning habitat will be created for lake whitefish and pickerel. Channels will be created in the spillway and reservoir to prevent fish stranding, winter kill. A fish harvest sustainability plan will be in place for the Split Lake RMA. Manitoba Hydro, on behalf of the Keeyask Hydropower Limited Partnership, has committed to providing fish passage if monitoring demonstrates that it is required to support fish populations. Construction Access Management plan will restrict access to the Project area by the public. Firearms will be prohibited in camp, construction sites will be rehabilitated, roadside ditches will be re-vegetated with plants not normally eaten by moose. A moose harvest sustainability plan will assist in long term sustainability of the moose population in the Split Lake Resource Management Area. Ongoing monitoring of moose and caribou populations and harvest will be undertaken by Tataskweyak Cree Nation and by the Split Lake Resource Management Board. The Reservoir Clearing Plan and Waterways Management Program will reduce the impact of the project on waterway travel in the project area and contribute to safe use and enjoyment of the waterway from Split Lake to Stephens Lake. The Partnership remains open to examining further mitigation if at any time new information is provided. Project mitigation and monitoring designed for all resource users, and all types of resource use, including that for moose management, is appropriate for other Aboriginal groups including Métis harvesters. Partnership remains committed to further dialogue with the MMF so that it can determine how best to incorporate this new information into planning and development processes for the Keeyask Generation Project where required.	The Agency is satisfied that the proponent has considered the potential effects of the project on the current use of land and resources by Aboriginal people and impacts on Aboriginal or treaty rights. With implementation of the identified compensation and mitigation measures and follow-up/monitoring, the Agency concludes that there are not likely to be significant adverse effects on current use of land and resources as a result of the Project. The Agency is satisfied that the Project's impact on potential or established Aboriginal or treaty rights related to use of land and resources for traditional purposes will be low after mitigation and follow-up. The Agency is satisfied with the proponent's efforts to engage Aboriginal groups potentially impacted by the Project and with the proponent's commitment to continue those efforts. The proponent has committed to Aboriginal Traditional Knowledge monitoring with the Keeyask Cree Nations partners, which will support the evaluation of cumulative impacts to hunting, fishing, gathering and trapping. Follow-up monitoring for biophysical VECs, such as fish and fish habitat or methylmercury and human health, will also evaluate cumulative impacts on current use of lands and resources for traditional purposes, including fishing, hunting, gathering and trapping. The proponent has also committed to mitigating effects to Aboriginal traditional uses beyond the Keeyask Cree Nations and to make efforts to determine whether effects can be avoided through changes to the project and existing project mitigation measures.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Culture	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Hydro development impacts the vitality and preservation of culture and alters the historical connection to land and water. The loss of land to flooding is an emotional loss for Aboriginal people. • Culturally important sections of the river, such as Gull Rapids, Birthday Rapids, and the waters between Keeyask and Conawapa, will be altered or lost. • The Project will result in permanent alteration of the landscape affecting the cultural heritage value and historical context of the area. • Fewer people will be able to live a traditional lifestyle or participate in traditional activities. • Important places, such as hunting and gathering areas, beaches, boat landings, and traditional meeting places, will be lost or altered. • Without these places, it will be harder to practice traditional activities, pass down traditional knowledge, preserve language and culture, and maintain a sense of community. • The loss of important traditions or celebrations, such as spring hunting is a concern. • Decreasing use of Aboriginal languages in the area and the workplace is a concern. • Harming the land and water will eventually bring harm to the Cree People, because when a person does harm, it will come back to him. • Caribou are important for cultural permanence. • Impacts to fish and fish habitat impact the treaty right to fish and interfere with culture and our way of life. • Loss of Trapline 15. We are losing our cabin and our ability to teach our traditions. Traditional practices are destroyed due to changes in physical characteristics of the environment. • Effects to caribou affect our ability to teach hunting to our children. • The intangible effects on our culture need to be better understood and reflected. • Impacts to our culture affect our health.	
Archaeological and Heritage Sites, Burial Grounds	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Archaeological sites, sacred sites and burials sites will be destroyed or disturbed. • Culturally important places and objects need to be identified and protected. Aboriginal methods and TK should be used to find sites. • Concerned about treatment of human remains that may be disturbed. • Recommend no winter construction and ground truthing before the use of heavy equipment to identify and preserve archaeological, heritage and heritage sites. • Heritage is not just archaeology. It also includes the intangible aspects such as the cultural significance of particular locations, natural features and our relationship with the earth. The impacts on these intangibles must but be taken into account.	

	Summary of Proponent Response	Agency Response
	The KHLP EIS assessed project effects to socio-economic factors, including culture and spirituality. As partners, the KCN's brought the Cree worldview and members' perspectives to project planning and design and will continue to bring these perspectives into project decision making and post-Project monitoring. Adverse Effects Agreements for the Project include cultural programming components, access programs for increased traditional activities, traditional lifestyle programs and other initiatives to maintain and enhance Cree culture and language within the KCN. Appropriate ceremonies and rituals will be conducted at key project milestones to assist in addressing the long term loss of landscape elements. Counseling services will be available at the project site during construction. Other initiatives include a video on the existing environment, an interpretive display, cultural training for operation staff, construction of a park/rest area at boat launches, commemorative plaques, and nature trails for workers at the site.	The Agency is satisfied that the proponent has considered project effects to physical and cultural heritage within the EIS. With implementation of the Adverse Effects Agreements and identified mitigation measures, the Agency concludes that there are not likely to be significant adverse effects as a result of Project to physical and cultural heritage of the Aboriginal groups most highly affected by the Project – the Keeyask Cree Nations (Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, and York Factory First Nation).
	During construction of the generating station or impoundment of the reservoir, the proponent predicts permanent disturbance or loss of seven recorded sites. Two possible burial locations and 17 additional sites may be permanently disturbed or lost through flooding or shoreline erosion caused by fluctuating water levels. As the proponent continues to catalogue new sites, permanent disturbance or loss of still-uncatalogued sites is also predicted. Increased Project traffic may also affect sites and cause permanent change in the interpretive capacity of the site location. A Heritage Resources Protection plan will be developed to protect heritage resources that may be discovered during construction. Shoreline will be monitored. If new sites are exposed, controlled artifact collection will occur. A consecrated cemetery for the reburial of human remains will be provided on the North side of the Nelson River. Tataskweyak Cree Nation's Adverse Effects Agreement Offsetting programs provide for a Cultural Centre Museum and Oral Histories Program that will repatriate, display and interpret heritage resources found within the area. The proponent commits to compliance with provincial regulations regarding protection and management of archaeological and heritage resources as directed by the Manitoba Heritage Resources Act. Northern Lights Heritage Services, on behalf of the KHLP, has photographed and documented all of the identified heritage resource sites.	The Agency is satisfied that the proponent has considered this issue within the EIS and, taking into account the identified mitigation measures, concludes that there are not likely to be significant adverse environmental effects to historic and heritage resources (including archaeological resources) as a result of the Project.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Socio Economics	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Loss of income for local artisans, trappers, and harvesters will result if they cannot access resources. • Compensation for impacts to Trapline 15 were negotiated when not all family members were present – not everyone is receiving compensation. • Loss of Trapline 15, taking our livelihood away. • Generations of trappers will be affected. How will they be compensated? • Caribou are central to livelihood. • Loss of timber resource has an economic impact. • Concerned about how benefits and costs are distributed. People who lose money from trapping might not be the ones to get jobs. • Concerned that there won't be as many business or employment opportunities for Aboriginal people as predicted. • Proponent should assess impacts on housing and provide mitigation measures for people displaced due to increased costs for housing. • It is important to consider socio-economic impacts as health impacts. • Benefits from Hydro are good but they should be spaced out over a hundred years. • There are impacts to the non-KCN's but there are impacts.	

	Summary of Proponent Response	Agency Response
	Reductions in cash income from commercial fishing and trapping will be addressed through compensation agreements. Reduction of in-kind income from domestic resources acquired near the project is expected to be offset by opportunities to harvest country food through Offsetting Programs of the Adverse Effects Agreements. Manitoba Hydro has committed to the application of their Trapper Notification and Compensation Policy for New Transmission Development to compensate trapline holders. Manitoba Hydro provides compensation to registered trappers for disturbances (noise, aircraft and ground activities) during exploration, environmental investigations and other ongoing Keeyask activities in the area. The factors that are considered in arriving at these payments include past fur production on the trapline and the estimated amount of disturbance over the time period in question typically on an annual basis. The Trapline 15 disturbance agreement expired on December 31, 2013 and it is anticipated a new disturbance agreement for the coming year will be signed shortly. These agreements address disturbances of the Project to the trappers' commercial fur harvest production and lost incidental domestic production (including, but not limited to, country foods, crafts, baiting, etc.). These agreements are negotiated with trappers; provisions of the agreements may include trapline improvements (trail cutting), employment opportunities with Manitoba Hydro, equipment replacement and/or monetary settlement. Once there is greater certainty that the Keeyask Generation Project will proceed, Manitoba Hydro, on behalf of the partnership, will provide an offer of compensation to any Member, who is a licensed trapper, to enter into an agreement over a longer term to address any existing or anticipated loss of net revenue from commercial trapping, and for any anticipated direct loss or damage to any buildings, structures or other infrastructure located on a Registered Trapline used by the member, resulting from the construction and operation of the Keeyask Generation Project, as per the processes in the AEA. In the case of Trapline 15, the current agreement includes a monetary settlement as well as funding for the trapper to construct a length of trail within the trapline, in order to improve access to alternative areas of Trapline 15. Such agreements have been in place on Trapline 15 since 2008; it is noted that the 2008 arrangement provided compensation for any prior adverse effects associated with Keeyask environmental study and other activities on Trapline 15. Pre project training to develop construction skills. Collective bargaining agreement provides preferences for northern Aboriginal and northern Manitoba workers. KCN's can hire their members directly, without going through the job referral process. Targets have been established for KCN members to work across the province with Manitoba Hydro. Directly negotiated contracts with KCN-owned businesses, as outlined in the JKDA. The proponent has initiated the development of a plan to coordinate caribou monitoring activities among northern hydroelectric developments, as well as with government authorities and existing caribou committees and management boards. Manitoba Hydro is developing plans for new housing in Gillam for its permanent staff.	The Agency is satisfied that the proponent has considered the effects of biophysical Project changes on socio-economics related to the exercise of current uses of lands and resources for traditional purposes and commercial trapping within the EIS. With implementation of the Adverse Effects Agreements and identified mitigation measures, the Agency concludes that there are not likely to be significant adverse environmental effects to resource-based commercial activities as a result of the Project The effects of distribution of benefits within the Adverse Effects Agreements, housing and employment are considered outside of the scope of the EA and concerns have been forwarded to the Province for consideration in provincial licensing for the project.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Cumulative Effects of Hydro Development	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Concerned about how hydro development is affecting wildlife populations, waterfowl, fish, sturgeon, water safety, water quality and levels, habitat and the right to hunt, fish, gather and travel. • Our 52 commercial fishers experience on-going impacts to fishing and their livelihood as a result of the environmental impacts of hydro development. • All Cree people should be considered together. All are impacted as much as the KCNs. • Proximity should not be the test of significance. • Concerned about the incremental degradation and alienation of traditional territory because of sequential hydro development. • Hydro development has affected the taste of fish, eggs and wildlife. • People already aren't eating fish because they worry they are contaminated. • Past development has decreased family connections and resulted in loss of traditional languages. • Cumulative impacts of hydro development have negatively impacted cultural identity. • Concerned about the incremental loss of archaeological and heritage sites. • Everything is inter-related. What affects one part affects the whole. Effects of this project can't be compartmentalized. • Cumulative effects of hydro development minimized in the EIS. • Include impacts of past hydro development on Aboriginal workforce/ employment. • The cumulative effects assessment is too narrow. It should include the entire river system, or at least to Lake Winnipeg and the Churchill River. The assessment should also include changes caused by previous hydro development and include future activities and projects, such as Bipole III. • The cumulative effects assessment does not take into account how the incremental loss of habitat affects the exercise of Aboriginal and treaty rights. • The EIS underestimates the impact of the project on caribou and caribou habitat and the cumulative effects of development on caribou. • There is no mechanism for the participation in management of water resources. • Shoreline erosion and water level changes limit access to plants used as traditional medicines. • Natural rhythm of our environment that knowledge was based on was destroyed. • Traditional knowledge is the only baseline data there is that dates back to the beginning of hydro development. Project effects are longer lasting than was predicted.	

	Summary of Proponent Response	Agency Response
	Cumulative effects assessment responds to guidelines provided by regulatory authorities. The Partnership recognizes that the VEC approach does not capture the concept of Cree worldview, which considers the project in the context of everything that has happened in the past and everything that is anticipated to happen in the future.	The proponent assessed the cumulative effects of the Keeyask Generation Project in combination with other known projects or activities that have been or will be carried out. No likely significant adverse environmental effects were identified to the VECs assessed within the spatial and temporal scale of the Project. However, the federal review identified several areas where potential project effects are uncertain or mitigations proposed are untested and where value may come through consideration of cumulative effects at a regional scale. The Proponent has committed to monitoring for residual project effects to VECs including Lake Sturgeon, caribou, and mercury and human health. The proponent's analysis is consistent with the Agency's Operational Policy Statement - Addressing Cumulative Effects under the Canadian Environmental Assessment Act (2007); and Cumulative Effects Assessment Practitioners Guide (1999). The Agency is satisfied with the proponent's approach. With respect to the regional assessment of cumulative effects, in 2013, the Province of Manitoba responded to the provincial Clean Environment Commission hearings on Manitoba Hydro's Bipole III project and their recommendation that future hydro development in Manitoba be considered in a regional cumulative effects assessment. The province and Manitoba Hydro began an assessment process that is expected to be completed in 2015 The proponent has committed to Aboriginal Traditional Knowledge monitoring with the Keeyask Cree Nations partners, which will support the evaluation of cumulative impacts to hunting, fishing, gathering and trapping. Follow-up monitoring for biophysical VECs, such as fish and fish habitat or methylmercury and human health, will also evaluate cumulative impacts on current use of lands and resources for traditional purposes, including fishing, hunting, gathering and trapping. The proponent has also committed to mitigating effects to Aboriginal traditional uses beyond the Keeyask Cree Nations and to make efforts to determine whether effects can be avoided through changes to the project and existing project mitigation measures.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
EA Methodology	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Nisichawayasihk Cree Nation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• The western science-based approach and the practice of focusing on VECs does not match the Cree world view. For example, in terms of the VEC fish species approach, it does not consider the larger fish community and interactions among the species that are important in their consideration of sustainable fisheries. • TK reflects people's lived experiences and often differs from the western science perspective. • From a western science approach the potential impacts may not be significant but from an Aboriginal perspective these impacts affect our culture and way of life and are very significant to us. • Where western science and TK do not agree, analysis should reflect the uncertainty this reveals. • The cultural, spiritual and traditional use of plants, fish, birds and mammals should be considered in the evaluation of effects on VC's. • The contribution of traditional knowledge should be recognized and given greater weight in the EIS, including in the determination of residual effects and significance. TK is based on hundreds of years of experience. Western science is more recent. • TK should be used in project implementation, monitoring and adaptive management. • TK with respect to habitat change as a factor in sturgeon decline should be more fully reflected in the EIS. • Social, spiritual and cultural cost should be considered when discussing alternatives to the project. • The regional study area used to assess environmental impacts is not big enough, and should include Gillam, Bird and the area where effects of Wuskwatim and Keeyask overlap. • Projects that appear incidental to the Project should be included in the Project (such as Bipole III and South Access Road Highway conversion). • The EIS does not adequately consider impacts on Aboriginal groups living outside the Regional Study Area, who may not live in the project area, but may use it for traditional activities or be affected by changing migration patterns of wildlife that move through it. • The EIS does not distinguish between calving and non-calving habitat and indicate whether alternative habitat will be used. • The EIS does not explain the uncertainty around the success of some mitigation measures or the assessment of cumulative effects. • Experience from past projects should be considered when determining mitigation measures • Aboriginal groups should be involved in the identification of mitigation measures and in follow up programs, particularly youth and Elders • Government oversight is necessary to ensure that mitigation measures are implemented. • Support adaptive management as mitigation; TK should be involved in adaptive management of mitigation plans. Agency should assess technical and economic feasibility not the proponent. • There is uncertainty in the effects predictions and uncertainty in the mitigations yet there is certainty in the conclusions drawn.	

	Summary of Proponent Response	Agency Response
	Each of the KCNs is working with Manitoba Hydro (on behalf of the Partnership) to develop community-specific ATK monitoring programs for the Keeyask generation Project. These ATK monitoring programs will be based on Cree perspectives and understanding about the potential effects of the Project, and related activities will take place at key milestones during the Project's construction and operation phases. As partners, the KCN's have jointly planned and assessed the Project and are directly involved in the regulatory approvals process. KCNs have also undertaken their own community specific processes to review and approve the project. KCNs' Environmental Evaluation Reports, submitted as part of the EIS, describes Members' understanding of impacts and decision to be proponents. The proponent selected study areas to include direct and indirect project effects and different study areas were defined for different aspects of the project, Both Gillam and Bird were considered by the proponent in the Socio-economic Local Study Area. Bird was included in the resource use Regional Study Area. Gillam, because of its closeness to the Project was also included in local physical, terrestrial and aquatic environment study areas.. Potential for overlap of project effects with existing projects, like Wuskwatim (upstream of Thompson), was considered in the proponents' cumulative effects assessment. . Uncertainty in mitigation was considered by the proponent and informed their commitments to follow-up and monitoring programs where uncertainty existed, to confirm expected effects and success of proposed mitigation. Mitigation selection considered past experience of the proponent and proposed to include ATK monitoring programs to evaluate project effects based on Cree perspectives.	The Agency is satisfied that the proponent has made use of Aboriginal traditional knowledge to the extent it was made available for incorporation in the EA process and resulting documents. The Agency accepted the RSA as proposed by the proponent which includes areas of direct and indirect project effects. While the Agency reviews all information that comes into the project, according to the EIS Guidelines for the project, the proponent is responsible for assessing the technical and economic feasibility of the project. The Agency considers proponent commitments to monitoring and follow-up and may require additional monitoring programs to address uncertainty in the effects assessment or uncertainty in the potential for mitigation success.

Appendix D: Summary of Key Aboriginal Consultation Concerns continued

Subject	Group	Comment/Concern	
Consultation	Cross Lake First Nation and Pimicikamak Fox Lake Cree Nation Manitoba Metis Federation Norway House Cree Nation Shamattawa First Nation Tataskweyak Cree Nation War Lake First Nation York Factory First Nation	• Funding to help Aboriginal groups participate in consultation is not sufficient. • Funding should be provided to interpret western science for Aboriginal communities. • Concerns from the KCN partners may be given less weight because they are involved in the project. • The KCN partners are not being considered as separate entities, each with its own views. • Federal approval for Keeyask should not be granted since Crown consultation with the Manitoba Métis community remains outstanding and the Keeyask Partnership has not assessed the Project's effects as required by the EIS scoping document. Any federal decision with respect to the Project's Comprehensive study review remains premature and would be vulnerable to judicial review. • Decisions shouldn't be made without the completion of a Cross Lake First Nation and Pimicikamak TLUS. • Concerned about how governments determine who to consult with and the level of consultation • Concerned about how First Nation members living in other communities, such as Thompson and Churchill, will be included in consultation. • Consultation needs to include people who traditionally used the area around the project, not just those who live near the project today. • Time allowed to review documents is not sufficient. • Aboriginal groups are overwhelmed by the multiple consultation and regulatory processes for this project. There should be more coordination. Need a more streamlined process. • Shamattawa has been excluded from consultation. • Object to the fact that the EIS Guidelines allow information on Aboriginal traditional land use to be collected from "other sources" rather than from the Aboriginal groups themselves. • If the project will have an impact on the rights and interest of the Manitoba Métis Community, the process set out in resolution 8 would need to be followed. • How can you have meaningful consultation in this power structure? Manitoba, federal Crown and First Nations need to be equal participants. • Consultation should be ongoing "as long as the water flows". • Time for government to step up and do what is right.	

	Summary of Proponent Response	Agency Response
	The Agency consulted with, and considered effects to all potentially impacted Aboriginal groups, regardless of whether or not they are partners in the project. The proponent has committed to on-going consultation and engagement with Aboriginal groups to minimize the Project's effects on potential or established Aboriginal and treaty rights and on the current use of lands and resources for traditional purposes.	The Participant Funding Program (PFP) is administered by the Agency. It is a limited fund to support the participation of interested individuals, not-for-profit organizations and Aboriginal groups in key stages of the federal environmental assessment review process. Six Aboriginal groups applied for, and received, funding to support their participation in the federal EA process. The Agency has considered the Proponent commitments to mitigation measures to address the potential effects to traditional use, water quality, fish and fish habitat, wildlife and wildlife habitat, wetlands and other VECs. As a result, the Agency is satisfied that adverse impacts of the Project on the continued exercise of potential or established Aboriginal or Treaty rights will be appropriately avoided, mitigated or accommodated. In assessing who to consult, the Agency examines the following factors; the projected eographic area of the project and what the otential impacts may be (i.e., environmental ffects, adverse impacts on potential or stablished Aboriginal or Treaty rights); the traditional territory of each Aboriginal group and the exercise or practice of their potential or established Aboriginal or Treaty rights; and any potential adverse impacts of the project on each Aboriginal group's potential or established Aboriginal or Treaty rights. Impacts are not tied to residency. The Agency coordinates its consultation activities, to the extent possible with the province. The Agency honours "Resolution 8" by acknowledging that the Manitoba Metis Federation Provincial home office is the lead on Aboriginal consultation with the Métis community. The Agency is satisfied with the proponent's efforts to engage Aboriginal groups potentially impacted by the Project and with the proponent's commitment to continue those efforts. The Agency takes a whole of government approach to consultation. Although not all relevant federal departments are able to participate in all consultation activities, they are briefed accordingly and continue to be engaged throughout the EA process.

Appendix E
Potential Accidents and Malfunctions

Table E-1: Potential Effects to the Environment due to Accidents and Malfunctions

Accident/ Malfunction	Potential Effects	Prevention and Mitigation	Potential Residual Effect
Dam/Dyke failure (Construction/ Operation)	Failure of Keeyask could contribute to a possible cascading failure of one or more earth embankments at each of the downstream generating stations (Kettle, Long Spruce, and Limestone). Under this scenario, a large portion of Manitoba Hydro's generation system could be lost and there would be very substantial environmental impacts along the Lower Nelson River, including increased shoreline erosion, water quality degradation, and alteration of fish habitat and fisheries	• Design of project infrastructure to pass the probable maximum flood safely, in accordance with the Canadian Dam Safety Dam Safety Guidelines (2007) • Consideration of seismic risk in design	The effects to aquatic resources resulting from dam or dyke failure are assessed as having high to severe magnitude, large geographic extent, short-long term duration, and as reversible over a long-term, but are not likely (low likelihood) to occur and are not considered significant given the proponent's design and construction assurance
Sewage and wastewater spills (Construction)	Construction camp operation requires management of liquid and solid wastes. Spills of sewage or wastewater on the ground or in surface waterbodies may occur during wastewater hauling if transport vehicles are involved in an accident or if valves are unintentionally left open	• Compliance with existing license terms and conditions in Schedule B, Manitoba Environment Act Licence No. 2952R	The effects on soil/water quality and biota resulting from accidental spills of sewage and wastewater are assessed as having moderate magnitude, small geographic extent, mainly short-term (during construction) duration, and reversible in most instances. Residual effects are not considered significant given the proposed mitigation measures

Table E-1: Potential Effects to the Environment due to Accidents and Malfunctions continued

Accident/ Malfunction	Potential Effects	Prevention and Mitigation	Potential Residual Effect
Hazardous material spills (Construction)	A number of construction activities that use hazardous materials are proposed including the manufacture of concrete for the generating station and transmission tower sites, the use of blasting compounds, and instream construction for the generating station. Surface water impacts have the potential to be more severe than terrestrial impacts. Spill magnitude depends on material, concentration, quantity, and proximity to sensitive environmental conditions	• Preparation of an emergency (spill) response plan and appropriate spill clean-up equipment for each hazardous material • Training of on-site personnel in spill response • If a spill should occur that is of reportable quantity, the contractor would be responsible to provide notification through the emergency response line • If a spill should occur, appropriate clean up would be determined according to the quantity of category of contaminant • Larger spills would be assessed and delineated following Phase III Environmental Site Assessment standards and a remediation program would be developed • Handling and storage of all fuel or hazardous materials on site will be in accordance with the Environmental Protection Plan and all federal and provincial standards and protocols • Restricting construction to areas greater than 30 metres from open water unless explicitly required for the work to occur • Refueling and equipment maintenance activities will occur at least 100 metres away from a water body, or conducted in a manner to prevent the release of deleterious substances to a water body • All equipment and vehicles are to be maintained and regularly monitored for leaks	Effects to soil/water quality and biota from hazardous spills are assessed as having moderate magnitude, small geographic extent, and mainly short-term (during construction) duration in most instances. There is a moderate to high likelihood for a malfunction or accident to occur resulting in a spill or release during the construction phase of the Project, based on the number of activities that would be occurring simultaneously There is a low to moderate likelihood during typical operation of the facility due to the reduced number of activities creating risks of spills The likelihood of a non-reversible impact from an accidental spill or release is very low, particularly since clean-up and restoration procedures will be followed in response to any such occurrence

Table E-1: Potential Effects to the Environment due to Accidents and Malfunctions continued

Accident/ Malfunction	Potential Effects	Prevention and Mitigation	Potential Residual Effect
Accidental Forest Fires (Construction)	Forest fires could be caused by equipment (particularly associated with clearing, grubbing and road construction), explosive and rock cutting, welding materials, environmental causes (lightning), or anthropogenic causes (cigarettes, arson or uncontrolled camp fires). Expected effects include alteration of terrestrial habitats and vegetation community composition, releases of sediment and erosion following the fire, change to intactness and potential loss or increase of priority plant communities, depending on the species response to fire	A variety of measures to minimize the risk that a wildfire or peat fire will occur including, but not limited to: • Flammable waste will be disposed of on a regular basis • Cleared material that is piled during reservoir clearing will be burned in the winter in locations selected to minimize the risk of peat fires • A burn permit will be obtained from Manitoba Conservation and Water Stewardship prior to burning between April 1 and November 15 of any year • A slash free firebreak zone at a minimum of six metres wide or greater will be maintained between the right of way (ROW) being cleared and standing timber • A 15 metre (minimum) fire break will be created in slash windrows every 100 metres, or alternately, the placement of windrows will be varied from side to side along the ROW • Burning will take place within the cleared ROW at least 15 metres from standing trees • Littering of solid waste tobacco products will be prohibited • Every off-road vehicle, including ATVs and 4-wheel drive trucks used for off-roading purposes, will be equipped with a working spark arrester that will be in operation while the engine is running to prevent the possibility of a fire hazard to the terrain • Personnel will be trained in the use of fire suppression equipment and will be available to respond immediately to an emergency • Firefighting equipment will be kept in working condition and at the Project site during clearing and construction operations and in accordance with work permit conditions for the Project	There is some variability in characterizing the effects of an accidental fire. As indicated, if a fire was to occur, weather, time of year, terrain, fuel loads, and fuel moisture would determine the magnitude, geographic extent, and duration and frequency of effects. With careful monitoring of conditions and implementation of the emergency response measures described above the effects are not expected to be significant

Table E-1: Potential Effects to the Environment due to Accidents and Malfunctions continued

Accident/ Malfunction	Potential Effects	Prevention and Mitigation	Potential Residual Effect
		• All occurrences of fire spreading beyond a slash pile will be reported to the Resident Manager or delegate immediately, who will report them to the Manitoba Hydro Corporate Fire Marshal, at (204) 360-4177 • The contractor will confirm that proper firefighting practices are established and that adequate firefighting equipment is installed and maintained in all buildings, vehicles and work areas under their ownership • Storage tanks will provide storage capacity requirements to meet fire-protection requirements stipulated by the National Fire Protection Association • Project emergency response/ evacuation procedures will be adhered to in case of forest fires Measures to minimize the risk that people using the area will accidentally start a fire include: • Restricting public access to the Project construction areas (from PR 280 to the Butnau Dam) during construction • Project-related cut lines and trails within 100 m of the Project foot print will be blocked and revegetated (does not include existing resource-use trails as described in the Construction Access Management Plan) • The camp and work area buildings will contain fire detection	

Table E-1: Potential Effects to the Environment due to Accidents and Malfunctions continued

Accident/ Malfunction	Potential Effects	Prevention and Mitigation	Potential Residual Effect
Wildlife Mortality Due to Vehicular Accidents (Construction)	Vehicle-wildlife collisions will likely increase due to increased traffic on the north and south access roads during the construction and operation phases of the project. Collisions with vehicles on the access roads could result in increased moose and caribou mortality. Collisions with moose are most likely to occur during the periods of peak moose activity at dusk, night, and dawn	Measures to minimize the potential for wildlife-vehicle collisions include the following: • Warning signs will be placed in areas along the access roads near caribou travel corridors and high-quality habitats to reduce the potential of wildlife-vehicle collisions • Roadside ditches will be rehabilitated where practical with native plants with low quality food value for caribou and moose, to minimize attraction and the risk of collisions and harvest opportunities • Information about wildlife awareness will be provided for workers to reduce the risk of wildlife-vehicle collisions • To minimize the potential of vehicle collisions with colonial water birds and raptors, traffic signage will be installed indicating reduced vehicle speed over the generating station and at other potentially sensitive water body crossing sites where practicable	The effects of wildlife mortality due to vehicular accidents are assessed as having low to moderate magnitude, small geographic extent, mainly short term duration, reversible for the population during the life of the project, likely to occur and are not considered significant given the proposed mitigation measures

Appendix F
Summary of Mitigation Measures

The following list includes measures that the Canadian Environmental Assessment Agency considers necessary to mitigate the environmental effects of the Keeyask Generation Project (the Project). Additional mitigation measures may also be articulated in authorizations that may be issued by the federal or provincial governments.

Physical Environment

Physiography

1. Avoid permafrost, construct under dry or frozen ground conditions, use temporary ground cover or matting in problem areas, retain ground cover, allow for natural re-vegetation, and avoid removal of the insulating active layer.
2. Use existing access routes and site temporary work areas in natural openings, retain ground cover and allow for natural re-vegetation.
3. Limit work site access to rights of way, existing winter roads, and existing access trails where available.
4. Avoid sensitive terrain (permafrost, steep or erodible slopes, and stream banks etc.) for access trail development outside of right of way or existing winter roads and access trails.
5. Apply herbicides in accordance with Manitoba Pesticide Use Permits (*Environment Act*) and Manitoba Hydro guidelines Management Practices for Transmission Line and Transformer Station (Manitoba Hydro 2003).
6. Avoid application of herbicides within 100 metres of any provincially very rare or rare species.
7. Manage riparian vegetation within the right of way in accordance with Fisheries and Oceans Canada measures to avoid serious harm to fish and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
8. Obtain aggregate material from approved established and newly approved borrow sites and transport material along the right of way access trail; use Manitoba Hydro standard environmental protection practices for use of borrow pits; conduct work in accordance with federal environmental and safety guidelines for the use of explosives (DFO Measures to Avoid Causing Harm to Fish and Fish Habitat); and prepare and implement rehabilitation plans for borrow sites to be abandoned.

Groundwater (in addition to mitigation measures above)

9. Comply with Manitoba Hydro standard environmental protection practices for materials storage, spill containment measures, spill response procedures, and use of herbicides under applicable permits, regulations, and guidelines.

Air Quality and Noise (in addition to mitigation measures above)

10. Follow Canadian Standards Association (CSA) standards respecting transformers, noise levels, measurements, and hearing protection.

Aquatic Environment: Water Quality, Fish, and Fish Habitat

Water Quality (in addition to mitigation measures above)

11. Conduct in stream construction behind cofferdams.
12. Install riprap on cofferdams.
13. Treat seepage and collected water before release.
14. Establish buffer zones adjacent to watercourses including a zone of riparian habitat vegetation within 30 metres of the high-water mark.
15. Treat construction camp sewage in a wastewater treatment facility to meet the requirements of the Manitoba *Environment Act* licence.

16. Avoid surface water contact with ammonium nitrate and fuel oils.
17. Minimize clearing and disturbance, clearing in sensitive areas and limit grubbing to areas where required (e.g. road embankments, ditches) within and adjacent to the project footprint.
18. Apply sediment and erosion control measures to reduce sediment inputs from runoff.
19. Construct stream crossings in accordance with Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
20. Implement bank protection measures prior to machinery use.
21. Stabilize all waste materials above the high-water mark, as determined in consultation with Fisheries and Oceans Canada.
22. Implement temporary stream crossings in accordance with Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
23. Construct overhead transmission line crossings in accordance with Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
24. Use clean materials in the construction of temporary crossings.
25. Progressively remove all construction materials not required and all construction materials upon project completion within the instream work window or as advised by Fisheries and Oceans Canada.
26. Ford flowing waters in appropriate fisheries timing windows.
27. Licensed applicators will apply herbicides.
28. Clear all vegetation from areas that will be newly flooded during impoundment.
29. Maintain reservoir full supply level at (159 metres above mean sea level).
30. Install a clear span bridge on Looking Back Creek.

Fish and Fish Habitat
(in addition to mitigation measures above)

31. Develop and adhere to the Instream Construction Sediment Management Plan during work in and around watercourses, including taking measures to direct river flows away from construction, and working in the dry where possible.
32. Construct appropriately-sized and positioned culverts in accordance with Manitoba Stream Crossing Guidelines.
33. Avoid the use of ammonium nitrate fuel oils in accordance with Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
34. Implement and follow procedures for the safe storage and handling of hazardous materials.
35. Construct a 5.3 hectare spawning shoal along the north shore of the tailrace for Lake Sturgeon and Walleye spawning and provide required flow (un-interrupted by continually turbine operation) and water levels during spawning, incubation, hatching, and larval dispersal.
36. Construct a 0.1 hectare spawning reef along the south shore downstream of the tailrace for Lake Whitefish and Walleye spawning and provide required flow and water levels during spawning, incubation, hatching, and larval dispersal.
37. Construct 3 hectares of replacement Lake Whitefish and Walleye spawning habitat by coarse material placement in areas between the former Gull Rapids and Birthday Rapids.
38. Provide, at Birthday Rapids, turbulent water conditions for Lake Sturgeon, allowing suitable function for up to 6.59 hectares of the rapids habitat.
39. Leave access causeway construction remnants in the Stephens Lake reservoir to enhance 1.02 hectares of Walleye spawning habitat.
40. Monitor, capture, and safely relocate fish for spawning downstream of the spillway when it is used and provide sufficient flow throughout spawning, hatching, and larval dispersal as required for spawning success.

41. Offset fish habitat loss through the implementation of a Fisheries and Oceans Canada approved Offsetting Plan.
42. Monitor and rescue fish during cofferdam dewatering.
43. Design screen intake pipes according to Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
44. Conduct blasting outside the Lake Whitefish spawning period.
45. Meet fish habitat setback distances for blasting for all fish species at the powerhouse tailrace channel and spillway discharge channel.
46. Conduct blasting in accordance with Fisheries and Oceans Canada measures to avoid serious harm and any other standards and guidelines that may be required by Fisheries and Oceans Canada.
47. Restrict workforce fishing in all construction areas as defined in the Construction Access Management Plan.
48. Use existing stream crossings where possible.
49. Construct crossings perpendicular to the channel in a straight section of the watercourse.
50. Provide Aboriginal domestic fishery access to low-mercury fish during the period of elevated mercury levels in Project affected fish.
51. Design and construct two channels to facilitate fish escape from low dissolved oxygen shallow vegetated habitat conditions during ice cover in the area of the present day Little Gull Lake.
52. Remove accumulations of debris to maintain fish access to small tributaries in the reservoir.
53. Design economically and technically feasible fish passage elements to facilitate retrofits, as determined in consultation with stakeholders.
54. Adhere to provincial timing windows for in-water activities.
55. Excavate channels to prevent winterkill of fish in the former Little Gull Lake area with recent Fisheries and Oceans Canada advice.
56. Use trashracks that prevent entrainment of larger fish and reduce approach velocities.
57. Provide sufficient flow throughout spawning, hatching, and larval dispersal as required for spawning success when spillway is in use.

Lake Sturgeon
(in addition to measures outlined above)

58. Implement the Lake Sturgeon Stocking Program, including young-of-the-year and yearlings.
59. Implement a Fisheries and Oceans Canada approved Offsetting Plan, including, replacement, as required, of 20 to 45 hectares of young-of-the-year rearing habitat in the Keeyask reservoir.

Terrestrial Habitats and Vegetation

Ecosystem Diversity (retaining intactness, reducing fragmentation) (in addition to mitigation measures above)

60. Reduce borrow pit areas and avoid borrow pits in area N-6.
61. Prioritize the rehabilitation of the most affected priority habitat types as in the Rehabilitation Plan.
62. Block Project-related cutlines and trails where they intersect the project footprint.
63. Re-vegetate Project-related cutlines and trails that are within 100 metres of the project footprint when no longer used.
64. Select transmission line routing option with lesser fragmentation effects.
65. Select transmission line routing option with lowest hunter access effects (e.g. close to already disturbed areas).

Wetland Function
(in addition to mitigation measures above)

66. Prevent erosion, siltation, and hydrological alteration in construction areas within 50 metres of marshes outside of the Keeyask hydraulic zone of influence.

67. Develop 12 hectares of marsh outside of the Keeyask hydraulic zone of influence.
68. Establish 100 metre setbacks from 12 hectare marsh, with the exception of two locations where a portion of the right of way is within the 100 metre buffer.
69. Map off-system marsh locations to direct any temporary access trails to be located 100 metres from wetland.
70. Locate towers at least 100 metres from riparian wetland locations

Priority Plants
(in addition to mitigation measures above)

71. Locate access trails to avoid swamp lousewort locations and site transmission towers outside of the area where the construction power transmission line the right of way crosses the fen.
72. Transplant, outside the Local Study Area, any provincially very rare to rare plants identified by pre-construction surveys of the project footprint.
73. Wash equipment and machinery before entering within 150 of the terrestrial Local Study Area.
74. Educate and manage employees with regard to their responsibilities for invasive plants mitigation (cleaning vehicles, equipment, and footwear before entering the protected area).
75. Implement containment, eradication, and control programs if monitoring identifies invasive plant problems.

Wildlife and Wildlife Habitat

Caribou
(in addition to mitigation measures above)

76. Avoid placement of excavated material in caribou calving complexes.
77. Prior to construction flag future calving islands greater than 0.5 ha in the reservoir area and leave undisturbed (e.g avoid vegetation clearing).
78. Route access roads to avoid caribou calving complexes and reduce loss of effective habitat.
79. Control access through implementation of Construction Access Management Plan.
80. Retain vegetative buffers along access routes and transmission line rights of way.
81. Prohibit firearms in camps and at work sites.
82. Decommission right of way access trails, unless required for on-going maintenance.
83. Provide wildlife awareness training to staff working on site.
84. Reduce speed limits on access roads.
85. Post wildlife crossing signs along access roads in areas of high-quality caribou habitat and travel corridors.
86. Prohibit feeding or harassing wildlife on-site.
87. Conduct daily safety briefings to advise workers about caribou movements in the area when large numbers of caribou are known to be moving through the project area.
88. Implement traffic control measures (crossing signs and stop signs) when large numbers of migratory caribou are located near the construction site.
89. Rehabilitate roadside ditches with native plants with low quality food value for caribou.
90. Avoid blasting between May 15 and June 30.
91. Install gates to the north and south dyke accesses, to be kept closed and locked from May 15 to June 30 and during other sensitive periods as may be determined by monitoring.

Moose
(in addition to mitigation measures above)

92. Construct the transmission lines, route access trails, time clearing activities, and site borrow areas to avoid moose calving and rearing complexes, reduce loss of effective habitat, and to avoid noise effects.
93. Provide wildlife information to workers on avoidance of wildlife-vehicle collisions.
94. Install moose crossing signs.
95. Avoid using helicopters for maintenance activities on the transmission lines near calving and rearing habitat from May 15 to June 30.

Beaver (furbearers)
(in addition to mitigation measures above)

96. Maintain a minimum of a 100 m of vegetated buffer at creeks, streams, ponds and lakes.
97. Install beaver baffles where culverts and control structures are repeatedly blocked due to beaver dam construction.
98. Maintain access for beaver trappers along the main access roads.
99. Trap beavers from affected areas prior to and during reservoir clearing, and periodically until the reservoir reaches maximum capacity.

Birds
(in addition to mitigation measures above)

100. Apply construction setback distances of 300 metres for Olive-sided Flycatcher, 200 metres for Common Night, and 100 metres for Rusty Blackbird at any breeding locations during sensitive time periods for breeding.
101. Maintain low woody vegetation along the right of way for bird habitat.
102. Retain 100-metre wide vegetated buffers around lakes, wetlands and creeks adjacent to infrastructure and access roads.
103. Install avian visibility deflectors on wires.
104. Undertake project activities outside of the sensitive breeding period from April 1 to August 31.
105. Install Mallard nesting platforms in suitable wetlands to offset some upland nesting cover losses.
106. Locate right of way corridor away from sensitive receptors and residences.
107. Comply with Manitoba noise guidelines at right of way edge.
108. Implement a spill response plan that will:
    - store and transport all materials in accordance with dangerous goods transportation legislation and regulations;
    - train site personnel in spill response protocols;
    - maintain spill response equipment at the generating station site;
    - provide spill containment equipment in powerhouse petroleum product storage areas; and
    - monitor and document petroleum product inventory.
109. Remove road-killed mammals along access roads.
110. Replace removed bald eagle nests with artificial nest platforms located in an adjacent area not at risk to shoreline erosion.
111. Deploy artificial gull and tern (e.g. reef raft) nesting platforms and breeding habitat enhancements to existing islands and development of artificial island(s).
112. Prevent establishment of active nesting colonies adjacent to blasting sites. Activities must be compliant with the *Migratory Bird Convention Act* and associated regulations.
113. Retain treed areas located within the future reservoir back bays to offset some of the losses in Olive-sided Flycatcher habitat.
114. Leave patches of bare ground in portions of the decommissioned borrow areas to provide suitable nesting habitat for Common Nighthawk.
115. Educate workers to recognize and avoid bird nesting sites.
116. Use of 100 metre buffers on wetland and riparian areas to avoid disturbance of Rusty Blackbird and amphibians.
117. Retain natural open and flat areas in the project footprint to provide Common Nighthawk nesting habitat.
118. Apply construction setback distances of 100 metres for Rusty Blackbird at any breeding locations during sensitive time periods for breeding.
119. Avoid night time activities.

Current Use of Land and Resources for Traditional Purposes

Domestic Fishing
(in addition to mitigation measures above)

120. Implement the Fisheries and Oceans Canada offsetting program, Reservoir Clearing Plan, Waterways Management Program, and Fish Harvest Sustainability Plan.

Commercial Fishing
(in addition to mitigation measures above)

121. Communicate when commercial fishing opportunities might be resumed or again be available for consideration.

Domestic Hunting and Gathering
(in addition to mitigation measures above)

122. Implement speed reductions and dust control measures on north and south access roads.

Archaeological and Heritage Resources

Heritage Resources
(in addition to mitigation measures above)

123. Conduct archaeological salvage (controlled artefact collection, shovel testing, and excavation) at existing archaeological sites.
124. Construct a cemetery prepared and consecrated for the reburial of human remains found during construction and operation of the Project, including a memorial marker, in an area selected by Tataskweyak Cree Nation, in consultation with the other project partners.
125. Provide awareness training to project workers regarding the nature of heritage resources and management of any heritage resources that may be encountered.

Human Health

Mercury and Human Health
(in addition to mitigation measures above)

126. Undertake mercury concentration monitoring in fish as in the Aquatic Ecosystem Monitoring Plan and the Risk Management Plan.
127. Place signage at Gull Lake to identify the recommendations for fish consumption.
128. Prepare and distribute communication products (e.g. poster, place mat, fish yardstick, maps, and video) to inform Keeyask Cree Nation communities and Gillam about increases in mercury concentrations post-impoundment, and implementation of monitoring.

Appendix G

Summary of Proponent Commitments to Plans, Monitoring and Follow-up

The Keeyask Generation Project proponent commits to mitigations outlined in proposed plans, monitoring activities and a follow-up program (Table G-1) to verify the accuracy of effects predictions and to support proposed adaptive management of project effects for certain VECs. Additional requirements for monitoring and follow up may be articulated in authorizations that may be issued by the federal or provincial governments.

Table G-1. Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up

VEC or Key Indicator	Description	
All Components		

Plans	The following plans will describe the specific monitoring and follow-up commitments that will be implemented for the Project including measures stipulated by government as conditions of approval:
	• Environmental Management Plans (EMP), including the *Generating Station Environmental Protection Plan*, *South Access Road Environmental Protection Plan*, and *Keeyask Transmission Environmental Protection Plan*
	• Environmental Protection Plans (EPP), including *Sediment Management Plan (Instream Construction Sediment Management Plan), Fish Offsetting (formerly Habitat Compensation) Plan, Access Management Plan, Heritage Resources Protection Plan, Vegetation Rehabilitation Plan, Terrestrial Mitigation Implementation Plan, Waterways Management Plan, and Reservoir Clearing Plan*
	• Environmental Monitoring Plans, including the *Physical Environment Environmental Monitoring Plan, Aquatic Effects Environmental Monitoring Plan, Terrestrial Effects Environmental Monitoring Plan, Socio-economic Environmental Monitoring Plan, and Resource Use Environmental Monitoring Plan.*
	• Aboriginal Traditional Knowledge (ATK) Environmental Monitoring Plans, including the *Tataskweyak Cree Nation ATK Environmental Monitoring Plan, the War Lake First Nation ATK Environmental Monitoring Plan, the York Factory First Nation ATK Environmental Monitoring Plan, and the Fox Lake Cree Nation ATK Environmental Monitoring Plan.*
	• Other Plans, identified by the federal review, including the:
	  • *Emergency Response and Contingency Plan/Spill Prevention and Response Plan*, to address environmental risks associated with accidents and malfunctions of the Project.
	  • *Wetland Habitat Compensation Plan*, to address construction and monitoring of wetland function in proposed compensation wetland habitat.
	  • Construction *Avian Management Plan*, to address potential effects of construction on birds listed under the *Migratory Birds Conservation Act* and *Species at Risk Act*.
	  • Risk Management Plan, to address human health concerns related to Project effects to mercury in country foods.
	  • *Heritage Resources Protection Plan.*
	  • Resource management plans referenced in the Keeyask Cree Nations' Adverse Effects Agreements including the *Moose Harvest Sustainability Plan*.
	  • Plans listed in Sections 4.7, 4.12, and 5.	

Physical Environment		
Climate	Verify GHG emissions from the project. • CO_2 and CH_4 GHG emissions from the reservoir will be monitored once the reservoir is fully impounded	
Water regime	Verify results of water level predictions. • Monitor water levels at various locations upstream and downstream of Keeyask and compare to predicted levels • Monitor water depth and velocity under a variety of flow conditions during open water upstream and downstream of Keeyask and compare to predicted levels	
Ice regime	Verify results of ice regime predictions. • Observe ice formation and breakup upstream and downstream annually and compare to predicted levels	
Shoreline erosion (peat & mineral)	Verify results of erosion modeling, rates and locations of peat resurfacing, shoreline peat land breakdown, and shoreline recession. • Monitor shoreline erosion and peat breakdown and compare to predicted levels	

	Timing/Duration	Location	Reporting to
	All project phases	All project areas	TBD
	During the initial operating period.	Reservoir	Environment Canada
	During construction and operation. During the initial operating period.	Upstream and downstream of Keeyask	Transport Canada
	During construction and initial operating period.	Upstream and downstream of Keeyask	Transport Canada
	During construction and the initial operating period.	Reservoir	Transport Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Woody debris	Verify the risk posed by debris to potential risk to the safety of river travel and other activities • Record the following; amounts, types and quantities of floating debris removed from waterways, categorizing by approximate size and type; locations of debris accumulation; substantial debris removal activities; and incidences of tree clearing along eroding shorelines to prevent debris.	
Total dissolved gas pressure	Verify the predicted effect of the project on total dissolved gas pressure • Monitor total dissolved gas pressure upstream and downstream of Keeyask under a variety of flow conditions	
Aquatic Environment		
Water quality	Verify the effectiveness of management measures (e.g., sediment management plan) during construction. Verify predicted effects and their geographic extent in the reservoir • Sample at sites along the Nelson River from immediately downstream of the Kelsey GS to downstream of the Kettle GS • Targeted sampling programs in relation to specific activities (instream construction) and site-specific effects (e.g., inputs from flooded terrain)	
Dissolved oxygen and water temperature	Verify predictions of dissolved oxygen and water temperatures in backbays • Monitor DO and water temperature in the reservoir mainstem and flooded backbays and downstream of Keeyask	
Sedimentation	Verify sedimentation predictions. • Monitor sediment parameters (e.g., suspended sediment, turbidity, bedload) upstream and downstream of Keeyask • Monitor sediment deposition upstream and downstream of Keeyask	
Fish Habitat	Confirm construction of all stream crossing sites complies with prescribed mitigation and recommend additional remediation. • Monitor stream crossings affected by project components during the post-construction phase to ensure that rehabilitation works and stability of the watercourse is least equal to the pre-construction condition.	
Aquatic vegetation, phytoplankton, zooplankton and macro-invertebrates	Confirm predicted response of biota to construction activities (e.g., sediment inputs). Determine whether plants and invertebrates colonize the flooded areas as predicted. • Sampling downstream on in-stream construction activities • Sample all habitat types in the reservoir after full supply level is reached, in particular in flooded areas	
Fish (aquatic) habitat	Verify predictions for post Project habitat creation and these habitats are maintained (e.g., sedimentation reduces habitat quality overtime). Monitoring sites should focus on sensitive or highly altered habitats (eg. Lake Sturgeon spawning and young-of-habitat, terrestrial flooded areas) • Sample flooded terrestrial and aquatic habitat for changes in substrate and the development of rooted aquatic plant beds • Monitor the main channel and on constructed habitats for changes in substrate type	
Fish community	Verify responses to specific construction activities (e.g., sediment inputs, blasting). Determine effectiveness of mitigation and compensation measures within the reservoir, and in Split and Stephens Lake. Address concerns of the Keeyask Cree Nations, all fish species (as well as general fish health) in the reservoir will be monitored. • Sample in relation to specific environmental changes during construction (e.g., fish would be sampled upstream and downstream of the construction site for analysis of gill histology if peak sediment inputs exceed target levels) • Monitor the relative abundance and composition of the fish community, as well as indicators of fish health after full supply level reached	

	Timing/Duration	Location	Reporting to
	During construction and operation.	Waterways	Transport Canada
	During the initial operating period.	Upstream and downstream of Keeyask	Environment Canada
	Multiple times each year during construction and during the initial 10 years after full supply level is reached; less frequently for the following 20-30 years, depending on results.	Nelson River from immediately downstream of the Kelsey GS to downstream of the Kettle GS	Environment Canada
	During the initial operating period.	Reservoir, backbays and downstream of Keeyask	Environment Canada
	During construction and the initial operating period.	Upstream and downstream of Keeyask	Fisheries and Oceans Canada
	Post-Construction	All transmission line stream crossing sites	Fisheries and Oceans Canada
	Annually of selected components during instream construction and the first three years after full supply level is reached and then at least every five years for the following 20-30 years, depending on results.	Downstream of Keeyask reservoir	Fisheries and Oceans Canada
	Annually for the first three years after full supply level is reached, and then at least every five years for the following 20-30 years, depending on results.	Project Footprint	Fisheries and Oceans Canada
	During construction, in relation to specific activities that may affect fish distribution and health. Annually during the first three years after full supply level is reached and then at least every five years for the following 20-30 years, depending on results.	Split and Stephens Lake reservoir	Fisheries and Oceans Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Lake sturgeon	Verify predicted Lake Sturgeon response to construction disturbances and the initial period of reservoir creation. Assess the need for implementation of retrofit options to maintain fish passage. Verify predicted effects to spawning activity and young-of-the-year survival during construction and after full supply level is reached. Verify performance of constructed habitat and whether the reservoir and Stephens Lake provide suitable habitat for sub-adult and adult Lake Sturgeon. Determine the survival of stocked fish and levels of regional Lake Sturgeon populations. • Monitoring movement of adult Lake Sturgeon using long-term telemetry tags, including individuals transported from Stephens Lake to the reservoir • Monitoring of fish behaviour immediately downstream and upstream of the GS to determine if modification of upstream and downstream fish passage methods, is required • Monitoring of the frequency and survival of fish passing the station via the turbines or spillway • Sampling for spawning and young-of-the-year sturgeon in predicted locations after full supply level is reached, including constructed habitats. Continue year-class strength monitoring in Gull and Stephens Lake • Sampling of sub-adult and adult lake sturgeon and measurement of relative abundance, condition and other indicators of fish health, and population size • Marking and sampling of stocked fish • Sampling to estimate population size in the region (Kelsey GS to Kettle GS)	
Lake whitefish, walleye (pickerel), and northern pike (jackfish)	Verify spawning habitat is available in the reservoir and downstream, and that constructed habitat is functioning as intended. Assess the need for implementation of retrofit options to maintain fish passage. • Monitor for spawning activity/larval fish, at locations where these would be expected to occur post-project, including on constructed habitats • Monitor fish movements, including individuals transported from Stephens Lake to the reservoir • Monitor fish behaviour immediately downstream and upstream of the GS to provide information for the modification of upstream and downstream fish passage methods, if required • Monitor the frequency and survival of fish passing the station via the turbines or the spillway	
Mercury in fish flesh	Verify predicted increases in mercury levels (duration and magnitude) in fish in the Keeyask reservoir and Stephens Lake. • Monitor mercury levels in selected fish species in the Keeyask reservoir and Stephens Lake • Address concerns of the Keeyask Cree Nations, sampling will also be conducted in Split Lake and tributaries such as the Aiken River where no increase is predicted	
Terrestrial Habitat and Ecosystems		
Terrestrial habitat	Verify predicted amounts and composition of direct and indirect habitat loss, alteration and disturbance during construction and operation. Verify the effectiveness of rehabilitation efforts in temporarily cleared or modified areas. • Measure direct habitat loss and disturbance, by habitat type, in the project footprint • Measure indirect habitat loss and change, by habitat type, in areas where indirect effects are predicted to occur • Monitor under storey vegetation and soil effects in areas where indirect effects are predicted to occur • Collect vegetation and soils data in the rehabilitated areas to assess degree of habitat recovery	

	Timing/Duration	Location	Reporting to
	Varying frequency depending on the program. Annually of selected components during in-stream construction and the first three years after full supply level is reached and the at least every five years for the following 20-30 years, or longer, depending on the program results. Monitoring lake sturgeon populations will continue in conjunction with mitigation programs such as stocking until/habitat mitigation create self-sustaining populations.	Stephens Lake to the reservoir Immediately downstream and upstream of the GS Turbines and spillway Gull and Stephens Lake Kelsey GS to Kettle GS	Fisheries and Oceans Canada
	Sampling for spawning and larval fish would occur at a minimum every two years during construction and annually during the first three years after full supply is reached and then at a minimum every five years for the following 20-30 years, depending on the results. Fish movement studies would occur for the first five years after full supply level is reached; further monitoring would depend on results and subsequent development of fish passage.	Stephens Lake to the reservoir Immediately downstream and upstream of the GS Turbines or the spillway	Fisheries and Oceans Canada
	Annually after full supply levels are reached until maximum levels are recorded and them every three years thereafter until concentrations reach stable levels.	Reservoir Stephens Lake Split Lake Tributaries	Fisheries and Oceans Canada Support as necessary: Health Canada
	Once at the end of construction. Periodically during the first 30 years of operation, with frequency decreasing over time. Periodically during the first 30 years of operation, with frequency decreasing over time. Periodically after regeneration is implemented, until vegetation is successfully established.	Project Footprint	Environment Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Ecosystem Diversity	Verify that the priority habitat patches that are avoided and not disturbed. • Monitor to confirm avoidance of priority habitat patches Verify the predicted amounts and composition of direct and indirect habitat loss, alteration and disturbance during construction. • Delineate the project footprint and conduct a spatial analysis of direct and indirect habitat loss	
Intactness	Verify that portions of trails are blocked and re-vegetation is occurring successfully. Verify predicted effects on linear feature density and core area abundance. • Collect vegetation data in the rehabilitated portions of linear features to assess degree of vegetation regeneration • Measure linear features associated with project development • Monitor the contribution of habitat recovery to increased core area using terrestrial habitat monitoring data	
Fragmentation	Verify the predicted effects on linear feature density and core area abundance. • Measure post-construction linear features will be measured along with the final project footprint relative to core areas.	
Fire regime	Verify the Project does not create large accidental fires. • In the event that any accidental project-related fires occur, document the amount and composition of affected habitat and subsequent regeneration	
Wetland function	Verify predicted effects on wetlands. • Monitor the amount and composition of inland wetland loss and alteration • Sample shoreline wetlands in areas that may be indirectly affected by groundwater changes and edge effects • Collect vegetation, soils and other environmental data in the wetland mitigation areas to assess degree of wetland development	

Priority plants	Verify priority plant patches are avoided and not disturbed. Verify predicted effects on priority plant species.
	• Monitor to confirm avoidance of priority plant patches
	• Monitor effects on priority plants and their habitat using terrestrial habitat monitoring data
	  • Pre-clearing surveys for priority plants will be focused in areas of the project footprint likely to support species of conservation concern not previously assessed. A representative number of sample plots will be established during pre-construction surveys for follow up during the post construction phase.
	  • Areas previously identified as requiring mitigation (i.e., minimization of shrub and herb disturbance) will be investigated to determine success of measures used to minimize project effects on priority plants.	

Invasive plants and non-native species	Verify invasive non-native plants are not introduced or spread. • Conduct invasive plant surveys within and near to the project footprint • Locate permanent sampling units at rrepresentative sites to record any changes in vegetation resulting from project construction (i.e. introduction of non-native and invasive species). The collection of vegetation information will occur at a similar time during the growing season to maximize the comparability of data.	

	Timing/Duration	Location	Reporting to
	Construction, regularly during clearing activities. Post construction	Project Footprint	Environment Canada
	Periodically after regeneration is implemented. Once at the end of construction. Once after re-vegetation is successfully established.	Project Footprint	Environment Canada
	Post-Construction	Project Footprint and Core Areas	Environment Canada
	Contingent upon the nature of the event, if it occurs.	Project Footprint	Environment Canada
	See Terrestrial Habitat Monitoring Section. Periodically during the first 30 years of operation, with frequency declining as reservoir expansion slows. Periodically after measures are implemented, as needed to assess success of wetland establishment.	Shoreline wetlands Wetland mitigation areas	Environment Canada
	Pre-construction and regularly during clearing activities. See Terrestrial Habitat Monitoring Section (post-construction) .	Project Footprint Areas requiring mitigation (e.g., Keeyask Transmission)	Environment Canada
	Periodically during construction and post-construction, during the first five years of operation.	Within and near to the Project Footprint	Environment Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Birds		
Mallard and Canada Goose	Verify predicted effects on waterfowl. Verify success of nesting platforms/boxes to enhance mallard breeding habitat in suitable wetlands. • Monitor to assess abundance and distribution of waterfowl within the Regional Study Area • Monitor success of nesting platforms/boxes	
Olive-sided Flycatcher, Rusty Blackbird, Common Nighthawk, and Other Species at Risk	Verify predicted effects on bird species at risk. • Monitor listed species' abundance and distribution within the Regional Study Area. Employ inaccordance with Environment Canada guidelines, pre-construction surveys to identify the location of active nests and any additional sensitive sites or habitats that may require the implementation of mitigation measures including species-appropriate set-back distances or buffers. Threatened and endangered species will be monitored at locations where species at risk were observed. Effectiveness of buffer zones and set-back distances for species at risk will be assessed where construction occurs during the breeding season (April 1- August 31). If suggested sizes of buffer zones or set-back distances are determined to be inadequate, and measurable effects found, or where unanticipated effects have occurred, adaptive management will be employed to modify their sizes to eliminate any nest abandonment and to minimize potential effects to fledging success.	
Colonial waterbirds	• Verify predicted effects on colonial waterbirds Monitor abundance and distribution of colonial waterbirds and use of alternate nesting and staging habitat within the Regional Study Area • Monitor the effectiveness of mitigation measures implemented for colonial waterbirds	
Bald Eagle	Verify predicted effects on bald eagle. Verify success of any nesting platforms established to replace nests disturbed by the Project. • Monitor to assess the distribution and abundance of bald eagles along the Nelson River • Monitor to assess the effectiveness of any installed nesting platforms	
All birds	Verify predicted effects for bird-wire collisions near the Keeyask Transmission lines and associated structures. • Monitor/search for dead or injured birds at a selection of representative sites during peak periods of bird activity in order to determine the efficacy of bird deflectors in higher risk-of-collision habitats. Searches will also occur at a select number of sites where effects were not anticipated and bird deflectors were not implemented if unanticipated effects are encountered such as high numbers of bird-wire strikes, or collisions.	
	Verify presence of active bird nests to protect nests, birds and eggs • Use pre-project nest searches in areas where summer construction is anticipated (i.e., in the southern portion of the Keeyask transmission line footprint) and where habitat for bird species at risk occurs, to identify the location of active nests and any additional sensitive sites or habitats that may require the implementation of mitigation measures including species-appropriate setback distances or buffers. In areas where habitat for species at risk occurs (common nighthawk, olive-sided flycatcher and rusty blackbird), pre-clearing surveys would occur if any clearing is proposed between April 1 and August 31).	

	Timing/Duration	Location	Reporting to
	Annually during the first three years of operation, and periodically until shoreline wetland habitat re-establishes. Annually during the first two years of employment.	Regional Study Area	Environment Canada
	Annually during construction and for the first three years of operation. Pre-construction/construction	Regional Study Area Project Footprint	Environment Canada
	Annually during the first three years of operation. Annually during the first three years of operation or until mitigation measures are deemed to be successful.	Regional Study Area	Environment Canada
	Annually during the first three years of operation. Annually for the first three years following platform installation.	Nelson River	
	Post-Construction	Project Footprint	Environment Canada
	Pre-Construction	Project Footprint	Environment Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Wildlife		
Caribou	Verify direct and indirect predicted effects to summer resident caribou and habitat and evaluate performance of mitigation measures. Verfiy predictions of productivity, distribution, movements and accidental caribou mortality. • Monitor vital measures of caribou populations including productivity, mortality, and recruitment using sample counts and records from the lower Nelson River Area • Sample site records and mapping for summer resident caribou calving and rearing habitat effects in areas associated with project effects • Collect caribou activity, movements, and mortality data in areas where effects are predicted to occur	
Moose	Verify predicted effects to moose habitat and evaluate performance of mitigation measures. Verify predicted productivity, distribution and accidental moose mortality. Verify predicted effects to the redistribution of harvest effort within in the Split Lake Resource Management Area. • Sampling site records and mapping for moose habitat effects in predicted locations • Collect moose activity, movements, and mortality data in areas where effects may occur • Monitor vital measures of moose population including productivity, mortality and recruitment using sample counts, and records from the Split Lake Management Area • Use special moose management units, harvest strategies and models to project the future population and adjust protocols as needed	
Beaver	Verify predicted effects on regional beaver population. • Monitor beaver population in locations within the project footprint and the Regional Study Area post-impoundment using counts • Monitor the removal of beaver (and muskrat) during reservoir clearing and adjusting protocol as needed • Monitor habitat changes during operation using mapping	
Rare or Regionally Rare Species	Verify predicted behavioural response of little brown myotis and wolverine associated with project disturbances. • Monitor little brown myotis and wolverine abundance in the Gull and Stephens lakes area using sample counts and making measures	
Grey Wolf and Other Predators	Verify predicted behavioural response of predators to linear features and habitat effects. • Monitor gray wolf and black bear distribution and abundance using sample counts and marking measures	
Other Mammals	Verify predicted wildlife control measures in construction camps and worksites. • Monitor relocation and mortality of black bear, gray wolf, red fox, arctic fox and beaver using site records	
Priority amphibians	Verify predicted effects on amphibians. • Monitor changes in the distribution of amphibians within the Regional Study Area	
Mercury in Wildlife	Verify predicted duration of mercury levels in country foods and the top-level predators during operation. • Monitor mercury levels in beaver, muskrat, river otter and mink, and in other wild game samples voluntarily supplied in the Keeyask and Stephens Lake areas, and in nearby off-system areas where no increase in mercury level is predicted	

	Timing/Duration	Location	Reporting to
	Regularly during construction and continuing for up to 30 years of operation depending on results.	Lower Nelson River Area	Environment Canada
	Regularly during construction and continuing for up to 30 years of operation, depending on results.	Split Lake Resource Management Area, Project Footprint	Environment Canada
	Regularly during construction and continuing for up to 15 years of operation, depending on results. Regularly during reservoir clearing activities. Periodically during operation, for up to 15 years.	Reservoir, wetland mitigation areas, and adjacent creeks	Environment Canada
	Annually during construction, annually during the first five years of operation, and then every five years for up to 30 years of operation, depending on results.	Gull and Stephens lakes area	Environment Canada
	Annually during construction, annually during the first five years of operation, and then every five years until caribou and moose monitoring is concluded.	Project Footprint	Environment Canada
	Regularly during construction.	Construction camps and worksites	Environment Canada
	Annually during the first three years of operation and periodically until shoreline wetland habitat re-establishes.	Regional Study Area	Environment Canada
	Annually during operation until maximum levels are reached and then every three years until concentrations reach pre-impoundment levels (up to 30 years).	Keeyask and Stephens Lake areas Nearby off-system areas where no increase in mercury level is predicted	Environment Canada/Health Canada

Table G-1: Keeyask Generation Project - Proponent Commitments to Monitoring and Follow-up continued

VEC or Key Indicator	Description	
Human Health		
Mercury and Human Health	Verify implementation of Risk Management Plan to address predicted adverse health risks/ effects of the project related to mercury exposure in country foods, including fish. • Monitor predicted changes in mercury in the post-Project environment to verify the effect predictions through mercury monitoring undertaken under the Aquatic and Terrestrial Monitoring Programs • Collect on voluntary basis of samples of wild game, waterfowl and plants for mercury testing to confirm mercury concentrations remain acceptable for domestic consumption. • Conduct periodic survey of consumption of country food in KCNs communities.	
	• Incorporate monitoring results into fish consumption recommendations in a timely manner. • Work with provincial and federal health regulatory agencies to prepare appropriate consumption advisories; amend if monitored fish mercury levels are higher than human health risk assessment-predicted maximum levels. • Monitor annually post-impoundment, annual monitoring within Keeyask reservoir and Stephens Lake reservoir until fish mercury concentrations do not increase over a three-year period, an indicator that they have stabilized; subsequent monitoring every three years until variations in fish mercury concentrations in three consecutive sampling periods are not statistically significant. • Monitor fish mercury levels upstream and downstream of both water bodies if maximum fish mercury concentrations in either Keeyask reservoir or Stephens Lake reservoir increase exceed predicted levels. • Complete a human health risk assessment every five years starting in 2022 after peak mercury levels have been reached.	
Mercury in the Environment	Characterize baseline aspects (organic carbon and mercury) of soils and vegetation in the area to be flooded by the reservoir. • Apply results would inform the development of adaptive management measures to reduce the expected mercury increase in the aquatic environment.	

	Timing/Duration	Location	Reporting to
	Annually before impoundment. Post-impoundment: on annual basis or until mercury levels return to baseline conditions. For food consumption survey, every five years starting in 2022.	Local communities	Health Canada
	Every five years starting in 2022. Post-impoundment: annually.	Keeyask reservoir and Stephens Lake	Health Canada/Fisheries and Oceans Canada
	Prior to reservoir clearing, during construction of the generating station.	Keeyask reservoir	Natural Resources Canada

Appendix H

Residual Impacts to Fish and Fish Habitat

Table H-1: Residual impacts to fish and fish habitat

Type of Impact	Description
Death of Fish	Cofferdam installation and subsequent isolation and dewatering would result in the death of fish eggs, larvae, and the loss of food items by burial.
	Mechanical strike (turbine), barotrauma (rapid pressure change effects), and impingement on trash racks during downstream movement from the Keeyask reservoir and passage through the spillway when it is in use would result in the death of fish.
	Intermittent water level exposure and rapidly varying water levels in the reservoir and downstream of the generating station would result in the death of fish, including eggs and larvae.
Permanent Alteration of Fish Habitat	Alteration of the 488 ha Gull Rapids includes change of • 83.29 ha for temporary cofferdam installation and dewatering with a final disposition as forebay (reservoir); • 195.63 ha for creation of forebay (reservoir) with minimal or no bottom modification; • 9.97 ha for tailrace channel including bottom deepening and smoothing; • 11.99 ha of rapids during construction due to cofferdam placement; and • 63.54 ha of area converted to non-rapid type flow.
	Convert 4062.4 ha of riverine and river and lake habitat of Gull Lake and Little Gull Lake (0.3 ha) to a reservoir between Gull Rapids and Birthday Rapids, resulting in deeper, more slowly moving water with more rapidly varying water levels resulting in lower spawning and rearing suitability and reduced cover value.
	Convert 6.59 ha of Birthday Rapids to modified rapid and reservoir due to flooding, resulting in lower velocities, and loss of white water resulting in lower spawning suitability (to be confirmed through monitoring).
	Convert 463.17 ha of riverine habitat to modified riverine and reservoir habitat following impoundment between Birthday and Long rapids, resulting in deeper, more slowly moving water with more rapidly varying water levels, with sedimentation, resulting in lower spawning, and rearing suitability.
	Add 5112.08 ha of flooded terrestrial land to reservoir habitat upstream of generating station resulting in generation of methylmercury, rapidly varying water levels leading to an intermittently exposed zone, shoreline erosion, sediment deposition, debris deposition, and reduction in aquatic plants leading to lower value for spawning, rearing, cover, food, and movement corridors.
	Modify substrate and flow in 560.23 ha of modified river and reservoir habitat between Gull Rapids and Stephens Lake (Kettle reservoir) resulting in more rapidly varying flows and water levels, erosion and sedimentation, and poorer suitability for spawning and rearing.
	Alter Stephens Lake (Kettle reservoir) through deposition of 0.1 to 0.6 cm sediment resulting in potential reduction in food (likely not long-term) and potential reduction in spawning success.
	Inundate 10.52 ha of tributary streams between Gull Rapids and Birthday Rapids resulting in conversion from riverine to reservoir conditions including deeper, more slowly moving water with more rapidly varying water levels leading to reduced spawning and rearing suitability and lower quality cover.
	Infilling for causeways (with culverts for fish passage) in Stephens Lake followed by re-establishment of reservoir habitat post-construction with some substrate improvement (coarse substrate over bedrock causeway remnants).
Destruction of Fish Habitat	Destruction of 488 ha of Gull Rapids includes -14.9 ha destroyed for the Keeyask GS powerhouse, ancillary facilities, spillway, dams, and dykes resulting in lost spawning, cover, and food producing habitat; loss of upstream fish passage; and narrower, more hazardous downstream fish passage. -101.34 ha destroyed due to permanent dewatering due to construction of spillway, resulting in lost spawning, cover, and food producing habitat; loss of upstream fish passage; and narrower, more hazardous, downstream fish passage.
	Permanent dewatering of stream channel at the lower end of Gull Rapids Creek (near downstream end of Gull Rapids) resulting in lost forage fish passage corridor and isolation of 0.53 ha of the creek and headwaters resulting in the loss of access to spawning, cover, and food producing areas; and loss of upstream and downstream fish passage.

Table H-2: Measures to mitigate or offset impacts to fish and fish habitat

Measures to Mitigate or Offsetting Measure	Description
Stocking	Lake Sturgeon stocking into Stephens Lake to replace year classes lost to construction (disruption of spawning), to offset lost immigration of larval and young-of-year fish from upstream to Stephens Lake (reservoir) due to settling out in the reservoir, to offset any time when replacement spawning habitat is insufficient, and to assist long-term population recovery from endangered levels. Stocking of Lake Sturgeon into the newly formed Keeyask Reservoir and adjacent area to offset any young-of-year habitat disruption and loss, replace fish lost by moving out of area during construction, and to assist long-term population recovery from endangered levels.
Spawning Habitat Restoration	Replacement Lake Sturgeon and Walleye spawning habitat along north shore of tailrace. Two turbines would be operated to provide continuous flow over spawning areas if and when needed.
	Replacement Lake Whitefish and Walleye spawning habitat along south shore downstream of the tailrace. Appropriate flows to support spawning, rearing, and larval dispersal would be provided as required.
	Replace Whitefish and Walleye spawning habitat by coarse material placements in areas between Gull and Birthday rapids - likely in former Gull Lake area.
	If required, replacement of lost Lake Sturgeon spawning function at Birthday Rapids by re-creating white water conditions with large boulders or other structures slightly upstream of present spawning sites.
	Replace Walleye spawning habitat by leaving construction causeway remnants (boulder) over former bedrock bottom habitat in Stephens Lake.
	Provision of minimum spillway discharge to allow survival and hatch of eggs and larval drift in years when spillway operates during spawning season and fish spawn in the spillway area.
Reduction in fish mortality	If required, additional mitigation implemented to reduce mortality of fish resulting from turbine entrainment and impingement on trash racks.
Rearing Habitat Restoration	Replacement of young-of-year Lake Sturgeon sand habitat in former Gull Lake or adjacent area (if required).
Fish Movement Restoration	Research prior, during, and after construction to develop appropriate up and downstream fish passage facilities as needed to maintain populations.
	Removal of debris from flooded tributary stream channels to allow fish access to remnant stream channels and headwaters.