Keeyask Generation Project

Environmental Impact Statement

Cumulative Effects Assessment Summary

KEEYASK

July 2013

KEEYASK GENERATION PROJECT

Cumulative Effects Summary

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INTRODUCTION

The Keeyask Hydropower Limited Partnership (KHLP) has developed this Keeyask Cumulative Effects Assessment Summary to assist reviewers in their understanding of the cumulative effects findings for the Keeyask Generation Project (the Project). It was developed to respond to questions raised by participants involved in the Clean Environment Commission (CEC) review process.

1.0 STRUCTURE OF THIS SUMMARY DOCUMENT

This summary document is organized into two distinct parts:

1. **Introductory Text:** An overview of the approach to the cumulative effects assessment undertaken by the Partnership for the Project, the other projects and activities considered in the cumulative effects assessment, examples of three Valued Environmental Components (VECs) where collaborative solutions are addressing ongoing concerns of the Partnership, Manitoba Hydro, the KCNs and others, and a summary of the overall findings for each of the 28 VECs included in the cumulative effects assessment. Also included with this introductory text are a detailed, visual timeline of the projects and activities considered in the cumulative effects assessment and a series of mylar maps demonstrating change over time in the Lower Nelson River region.
2. **VEC Summaries:** Short visual summaries of the cumulative effects assessment for each VEC that has the potential to experience residual adverse effects as a result of developing and operating the Project are attached in separate tabs. The summaries are organized into three categories - aquatic, terrestrial and socio-economic. For each VEC, a summary of cumulative effects has been provided by describing the historical and current context, potential Project effects, overlap with other future projects and activities, and significance findings. All of the information and analysis presented in this summary document can be found in publicly available documents previously submitted to regulators, including:
    - Keeyask Generation Project: Response to EIS Guidelines(EIS) and Supporting Volumes filed with regulators on July 6, 2012
    - Responses to Requests for Additional Information from the Technical Advisory Committee and the Public filed with regulators on November 19, 2012 (Round 1) and on April 26, 2013 (Round 2).
    - Supplemental Filing #1 filed with regulators on April 26, 2013
    - Preliminary Environmental Protection Program documents filed with regulators on April 26, 2013 and on June 28, 2013
    - Responses to Information Requests – CEC Round 1 filed on July 15, 2013.

Where updates are available regarding the status of committed management measures, these are provided and clearly noted.

2.0 KHLP APPROACH TO CUMULATIVE EFFECTS

The Project was subject to two different types of evaluations. The first was conducted by the Keeyask Cree Nations (KCNs) for their internal purposes; the second was prepared to comply with the federal and provincial environmental regulatory process:

- KCNs Evaluation Process: The KCNs evaluation process took place over the course of a decade with the support of Manitoba Hydro. The process assisted the KCNs to understand the Project and its impacts on their communities and Members, and to determine the conditions under which they would approve the Joint Keeyask Development Agreement and support the Project. The Project was evaluated by each of the KCNs in terms of their own worldview, values and experience with past hydroelectric development, as well as their relationships with Mother Earth.
- Government Regulatory Assessment Process: Work by Manitoba Hydro and the KCNs on the government regulatory assessment process also took place over many years. The Keeyask environmental impact assessment was prepared in accordance with the EIS guidelines, guidance provided by federal and provincial regulatory agencies, and standard environmental assessment practice. The effects assessment, as well as identified mitigation and long-term monitoring were developed based on scientific methods (referred to as "technical information" in the EIS), Aboriginal traditional knowledge (ATK) and local knowledge.

This summary document provides an overview of the cumulative effects assessment undertaken for the government regulatory assessment. Chapter 2, Partners' Context, Worldviews and Evaluation Process (Section 2.2) of the Response to EIS Guidelines and each of the KCNs' Environmental Evaluation Reports provide discussion about cumulative effects of the Keeyask Generation Project from the perspectives of each community based on their Cree Worldview.

The cumulative effects assessment for the government regulatory process was undertaken based on a consideration of the guidance provided in the EIS Guidelines, and other guidance documents for cumulative effects assessment (e.g., Cumulative Effects Assessment Practitioners Guide, Hegmann et al 1999; Operational Policy Statement, CEAA 2007). Consistent with guidance provided in these documents, the cumulative effects assessment was undertaken specifically for the Keeyask Generation Project. It focuses exclusively on the incremental adverse effects on each VEC of building and operating the Keeyask Generation Project when other past, current and reasonably foreseeable projects are taken into consideration.

The cumulative effects assessment for Keeyask, like the rest of the environmental assessment, used a 'VEC-based' approach. This means the spatial and temporal scope for the assessment of Project effects to each VEC is based on a consideration of the potential for there to be overlapping and cumulative effects on that VEC from other projects and activities. VECs were selected to focus the assessment on key environmental and social topics, based on the following criteria:

- Overall importance/value to people;
- Key for ecosystem function;

- Umbrella indicator;
- Amenable to scientific study in terms of the analysis of existing and post-construction conditions;
- Potential for substantial Project effects; and
- Regulatory requirements.

The cumulative effects assessment undertaken for each VEC is documented throughout both Chapters 6 and 7 of the Response to EIS Guidelines and, in some cases, in the related Supporting Volumes as follows:

- Chapter 6, Environmental Effects Assessment: Focuses on a consideration of the effects of building and operating the Keeyask Generation Project in combination with other past projects and activities. Section 6.2 provides information on historical and current conditions for each VEC, including the effects of past and current projects and activities, as well as future conditions without the Project. The remainder of Chapter 6 provides an assessment of the effects of building and operating the Keeyask Generation Project, in combination with the effects of past and current project and activities. Chapter 6 also identifies key mitigation measures and assesses the regulatory significance of identified residual adverse effects on a VEC as a result of Keeyask . Additional information to support the analysis in Chapter 6 can be found in the related Supporting Volumes.
- Chapter 7, Cumulative Effects Assessment: Those VECs that have the potential to experience residual adverse effects after mitigation as a result of building and/or operating the Project receive further consideration in Chapter 7. This chapter focuses on the potential for residual adverse effects on these VECs to be magnified, beyond an acceptable point, when combined with the potential effects of other reasonably foreseeable future projects and activities. To assist the reader, Chapter 7 also includes a summary of the residual adverse effects of the Project for each VEC in combination with other past and current projects and activities, as identified in Chapter 6. For VECs that have the potential to experience further adverse effects when the effects of Keeyask are combined with other future projects and activities, the following analysis for these VECs is provided in Chapter 7:
    - A prediction of the residual adverse effects of the Project in combination with the adverse effects of identified future projects and activities;
    - A determination of what, if any, additional mitigation may be required to address the adverse residual effects of the Project when combined with those of the identified future projects and activities; and
    - A determination of whether the conclusions with respect to the regulatory significance of the Project's residual adverse effects changes when combined with the effects of identified future projects and activities.

For each VEC, the regulatory significance of residual effects was evaluated using a two-step approach, based on the criteria outlined in the EIS guidelines. This two-step approach was applied for each VEC considered

in Chapter 6, and again for those VECs with the potential to experience residual adverse project effects that were further assessed in Chapter 7.

In Step 1, each VEC was initially evaluated using the following criteria from the EIS Guidelines:

- Direction or nature (i.e., positive, neutral or adverse) of the effect;
- Magnitude (i.e., severity) of the effect;
- Spatial boundaries (i.e., geographic extent); and
- Temporal boundaries (i.e., duration).

VECs with the potential to experience an adverse effect and that meet the criteria for Step 2 (see below) were examined further. The effects of the Project on VECs that did not meet these criteria were determined to be not significant for the purposes of this regulatory assessment.

For Step 2, VECs that have an adverse effect and meet the following criteria were examined further:

- A species at risk listed as threatened or of special concern under Species at Risk Act (SARA) (or is being considered for such listing today based on a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recommendation); or
- Small in geographic extent, large in magnitude and long-term in duration; or
- Medium in geographic extent and either large in magnitude (regardless of duration) or moderate in magnitude and long-term in duration; or
- Large in geographic extent and either moderate or large in magnitude (regardless of duration).
- In Step 2, the additional criteria considered include:
- Frequency (i.e., how often the predicted residual environmental effect is expected to occur);
- Reversibility (i.e., the potential for recovery from an adverse effect); and
- Ecological and Social Context (i.e., whether the VEC is particularly sensitive to disturbance and has the capacity to adapt to change).

Following Step 2 analysis for a VEC, a determination is provided on whether the adverse effects of the Project on the VEC are significant for the purposes of the regulatory assessment (see Table 3).

All VECs with **any** detectable residual adverse effect from the Project, either during construction or operation (as per Step 1), received further consideration in Chapter 7, where the potential overlap of these Project effects with those of other reasonably foreseeable future projects was considered.

Table 1 below identifies the 38 VECs considered in the environmental assessment included in Chapter 6. It also identifies the 28 VECs that have the potential to experience residual adverse effects as a result of developing and operating Keeyask. For these 28 VECs, individual summaries are attached to this CEA Summary and synthesize the relevant information presented in Chapters 6 and 7, as well as in the Supporting Volumes.

Table 1: VECs Considered - Keeyask Generation Project Cumulative Effects Assessment

All VECs – Cumulative Effects Assessment of Keeyask in Combination with Past Projects/Activities (Chapter 6)	**VEC Adversely Affected by Keeyask Construction and/or Operation – Consideration of Possible Cumulative Effects with Future Projects/Activities (Chapter 7)[1]**
Aquatic	
Aquatic Ecosystems & Habitat	
Water Quality	Yes
Fish	
Pickerel (Walleye)	Yes (no potential future project overlaps identified)
Jackfish	Yes (no potential future project overlaps identified)
Lake Whitefish	Yes (no potential future project overlaps identified)
Lake Sturgeon	Yes (no potential future project overlaps identified)
Terrestrial	
Terrestrial Ecosystems & Habitat	
Ecosystem Diversity	Yes
Intactness	Yes
Wetland Function	Yes
Terrestrial Plants	
Priority Plants	Yes
Birds	
Canada Goose	Yes
Mallard	Yes
Bald Eagle	Yes (no potential future project overlaps identified)
Olive-Sided Flycatcher	Yes
Common Nighthawk	Yes
Rusty Blackbird	Yes
Mammals	
Caribou	Yes
Moose	Yes
Beaver	Yes

Table 1: VECs Considered - Keeyask Generation Project Cumulative Effects Assessment

All VECs – Cumulative Effects Assessment of Keeyask in Combination with Past Projects/Activities (Chapter 6)	**VEC Adversely Affected by Keeyask Construction and/or Operation – Consideration of Possible Cumulative Effects with Future Projects/Activities (Chapter 7)[1]**
Socio-economic	
Economy	
Employment & Training Opportunities	No
Business Opportunities	No
Income	No
Cost of Living	No
Resource Economy	No
Population, Infrastructure & Services	
Housing	Yes
Infrastructure & Services	Yes
Transportation Infrastructure	Yes
Land	No
Personal, Family & Community Life	
Governance Goals & Plan	No
Community Health	Yes
Mercury & Human Health	Yes (no potential future project overlaps identified)
Public Safety & Worker Interaction	Yes
Travel, Access & Safety	Yes
Culture & Spirituality	Yes
The Way the Landscape Looks (Aesthetics)	Yes
Resource Use	
Domestic Fishing	No
Domestic Hunting & Gathering	No
Commercial Trapping	No
Heritage Resources	
Heritage Resources	Yes

VEC summaries are provided for all VECs with the potential to be adversely affected by the Keeyask Generation Project

3.0 PROJECTS & ACTIVITIES CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT

The cumulative effects assessment for the Project considered past, current and reasonably foreseeable future projects and activities with the potential for effects that overlap with those of the Project. A listing of these other projects and activities, and a summary of their effects, is outlined in Table 2 below. This table is an amalgamation of Tables 7-1 and 7-2 of the Response to EIS Guidelines. The projects considered for each VEC are identified in Table 2. All of the identified projects are also documented in the visual timeline of projects and activities included with this summary document and in the attached Map 1. A series of mylar maps has also been included with this summary to demonstrate changes on the landscape over time in the lower Nelson River region for those projects in the cumulative effects assessment for which spatial data were readily available and/or applicable. The mylar map series includes the following:

- Historical (pre-Kettle Generating Station) as a base map. Pre-Kelsey data were not available for mapping.
- Existing conditions as mylar 1, including all past and present projects and activities in this area considered in the cumulative effects assessment (a full mapping of all projects, including those outside of the area shown in these maps is provided in Map 1).
- Keeyask Generation Project as mylar 2, representing the footprint of the Project.
- Future projects as mylar 3, showing reasonable foreseeable future projects and activities.

As noted in the Response to EIS Guidelines, the Project is located in a region that has been greatly altered over the past 55 years by the development of the Lake Winnipeg Regulation Project (LWR), the Churchill River Diversion Project (CRD) and five generating stations. The Project is located on a reach of the Nelson River between the Kettle Generating Station and the Kelsey Generating Station where flows are regulated by the CRD and LWR. These alterations have replaced large rapids with dams, changed stretches of the river into reservoirs, diverted flows from the Churchill River into the Nelson River and reversed the seasonal flow pattern such that higher flows now occur in winter and lower flows in spring and summer. Past and current linear developments in the region, mining, commercial forestry, commercial fishing of sturgeon and other activities also have the potential to overlap with Project effects, depending on the specific VEC.

Looking forward, there are also a number of reasonably foreseeable future projects and activities that have the potential to be developed in the region. These projects and activities were also considered in the cumulative effects assessment and include those that are in the regulatory review process, or for which there is a strong likelihood they will proceed.

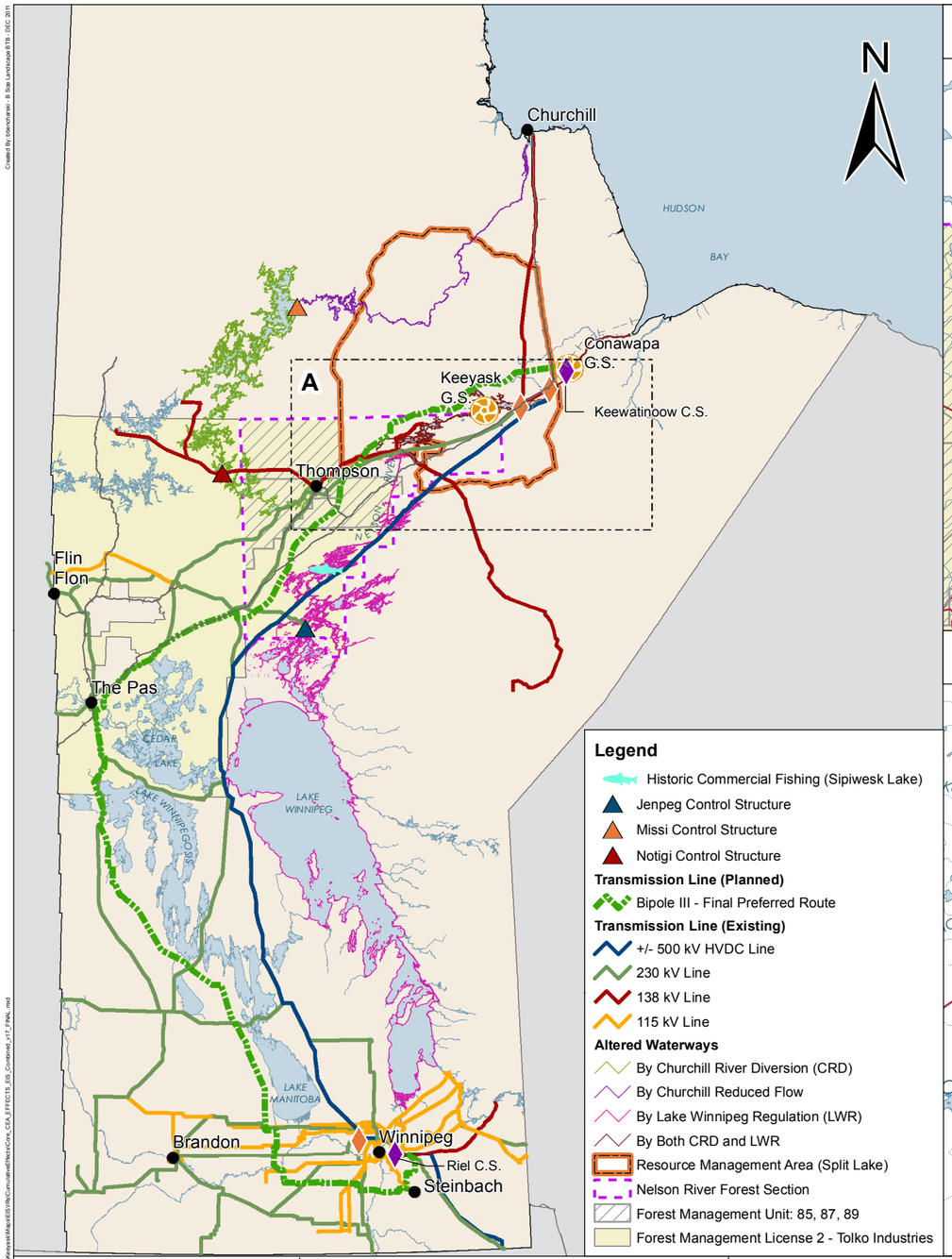
Table 2: Summary of Past, Present & Reasonably Foreseeable Future Projects included in the Cumulative Effects Assessment

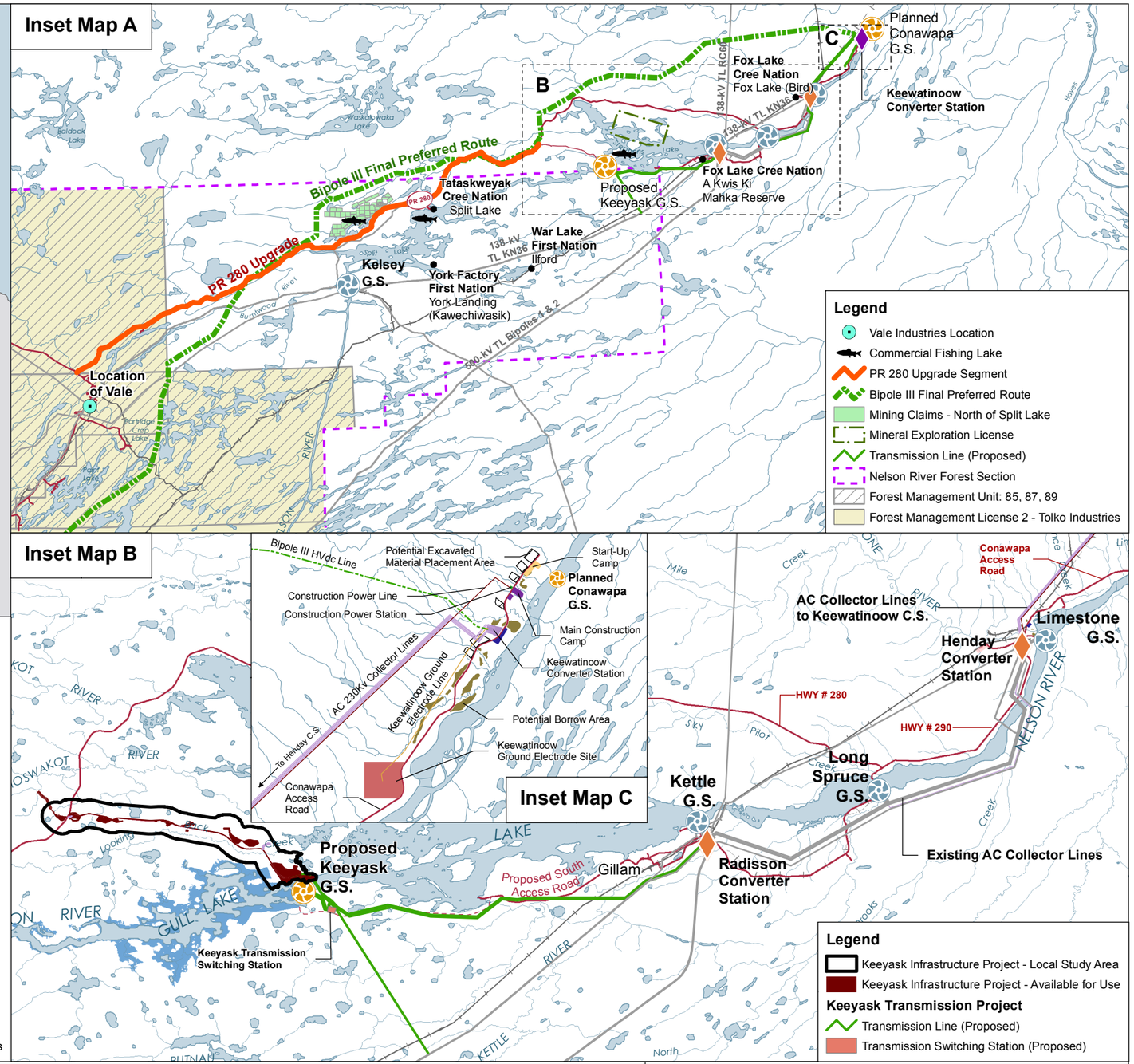
Category	Projects / Components Included	Summary Effects
PAST & CURRENT PROJECT & ACTIVITIES (Review primarily in Chapter 6)		
Manitoba Hydro Generation related developments	• Churchill River Diversion (CRD), including the Augmented Flow Program • Lake Winnipeg Regulation (LWR) • Jenpeg, Kelsey, Kettle, Long Spruce, Limestone and Wuskwatim GSs (on Nelson and Burntwood rivers) • Kelsey re-runnering • Keeyask Infrastructure Project (KIP)	CRD and LWR as established in the 1970s have ongoing effects that overlap with Keeyask Project effects on the water regime, the related environment and local communities and peoples. Other generating stations, control structures and activities on the Nelson and Burntwood rivers (including Kelsey re-runnering) also have ongoing effects that potentially overlap with the Project's effects. The north access road to the Keeyask Project, including related temporary camp and work areas, that was licensed and constructed as part of KIP prior to the start of Keeyask construction have effects that overlap with the Project's effects on some components of the environment.
Linear development in the region	• Transmission lines, rail lines and highways, including upgrades to PR 280	Existing linear developments in the vicinity of the Project, including upgrades to PR 280, have ongoing effects (e.g., habitat disruption, fragmentation effects, increased access to resources, transportation safety) that overlap with the Project's effects on some components of the environment.
Other	• Mining (e.g., Vale) • Commercial forestry • Commercial fishing, including sturgeon • Other agents of change as may be identified in the assessment of specific VECs	Other agents of change are identified in the assessment of specific VECs (see Chapter 6). Mining related effects overlap with Project socio-economic effects in the Thompson area; minimal overlap of Project effects is expected with commercial forestry; commercial fishing has the potential to affect fish populations, and historically had a large effect on Lake Sturgeon populations prior to closure of the Lake Sturgeon commercial fishery in 1992.
FUTURE PROJECTS & ACTIVITIES		
Bipole III Transmission Project	• Bipole III Transmission Northern Segment #1 • Keewatinoow Converter Station and Ground Electrode and Camp/Construction Power • Collector Lines and Existing Station Upgrades	The Bipole III Transmission Project being planned and developed by Manitoba Hydro is currently being reviewed by regulators for a potential construction start in 2013 and in-service in 2017. Bipole III components in the Gillam area will have effects during construction and operation that overlap with Keeyask Generation Project effects on some components of the environment.

Table 2: Summary of Past, Present & Reasonably Foreseeable Future Projects included in the Cumulative Effects Assessment

Category	Projects / Components Included	Summary Effects
Keeyask Transmission Project	• Construction power to the Keeyask Generation Project • Generation Outlet Transmission lines with switching station and three new transmission lines to convey power from Keeyask GS to Radisson Converter Station	The Keeyask Transmission Project is being planned and developed in the Gillam area by Manitoba Hydro, with construction power development planned between mid-2014 and mid-2015 and other component developments planned between early 2017 and early 2020. Keeyask Transmission Project components will have effects during construction and operation that overlap with Keeyask Project effects on some components of the environment.
Gillam Redevelopment	• New housing & infrastructure projects • Updates to some existing infrastructure	Gillam redevelopment (2013 to 2019) includes the potential for new and updated housing and infrastructure within the Town of Gillam.
Conawapa Generation Project (includes Camp)	• Conawapa Generating Station • Construction Camp	Conawapa Generation Project is a potential development by Manitoba Hydro. If developed for initial in-service in 2025/26, construction could start in early 2017 for completion by late 2027. Conawapa Generation Project components may have effects during construction and operation that overlap with Keeyask Project effects on some components of the environment.

Keeyask Generation Project Cumulative Effects





Legend

- Historic Commercial Fishing (Sipiwesk Lake)
- Jenpeg Control Structure
- Missi Control Structure
- Notigi Control Structure

Transmission Line (Planned)

- Bipole III - Final Preferred Route

Transmission Line (Existing)

- +/- 500 kV HVDC Line
- 230 kV Line
- 138 kV Line
- 115 kV Line

Altered Waterways

- By Churchill River Diversion (CRD)
- By Churchill Reduced Flow
- By Lake Winnipeg Regulation (LWR)
- By Both CRD and LWR
- Resource Management Area (Split Lake)
- Nelson River Forest Section
- Forest Management Unit: 85, 87, 89
- Forest Management License 2 - Tolko Industries

Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro; Government of Manitoba; Government of Canada

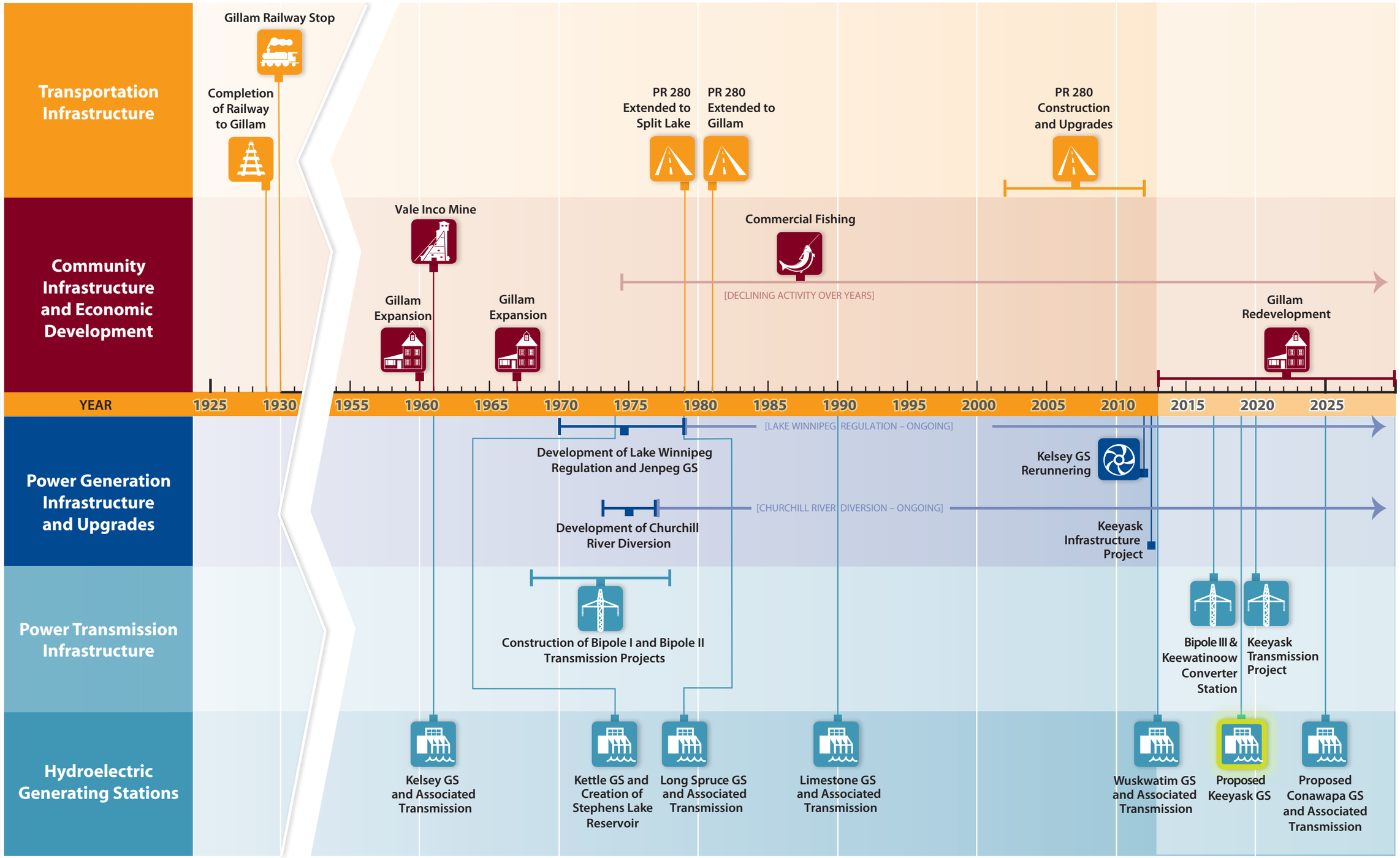
CREATED BY:
Manitoba Hydro - Hydro Power Planning - GIS & Special Studies

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	19-MAR-13	23-APR-13
0 60 120 Kilometres / 0 50 100 Miles	VERSION NO: 1.0	QA/QC: XXX/YYY/ZZZ

Overall Legend

- Generating Station (Existing)
- Generating Station (Planned)
- Converter Station (Existing)
- Converter Station (Planned)
- Highway
- Access Road
- Proposed Access Road
- Rail (Active)
- Rail (Abandoned)
- Transmission Line (Existing)
- Transmission Line (Proposed)
- First Nation Reserve
- Existing Water Level
- Initial Flooded Area (159 m)

Development Over Time in the Lower Nelson River Region



3.1 NEW PROJECTS SINCE FILING

Since filing the EIS, the Partnership has become aware of two potential new projects that may overlap spatially or temporally with the proposed Keeyask Generation Project: potential new hatchery facilities and the North-South AC Transmission System Upgrade Project. Each of these is described below for information purposes.

Both of these projects are in the preliminary planning stages and, as such, details on project components and possible project effects and mitigation are not well enough defined to fully assess the potential cumulative effects of these projects acting in combination with those of the Keeyask Generation Project. However, based on the details currently available, it is not anticipated that these projects will change the conclusions with respect to regulatory significance for the 28 VECs that have the potential to experience residual adverse effects as a result of developing and operating Keeyask. Since both of these projects are being proposed by Manitoba Hydro, the Partnership will be kept apprised of project details as they emerge and will work with Manitoba Hydro so that mitigation and monitoring measures are developed and implemented in a manner that responds to potential cumulative adverse effects.

Hatchery Facilities

The proposed construction of the Project will have effects on several fish species, including Lake Sturgeon (*Acipenser fulvescens*). Effects to Lake Sturgeon will be mitigated by the Partnership through habitat compensation work and stocking. The proposed stocking program for Keeyask includes stocking approximately 11,000 Lake Sturgeon fingerlings and 2,000 Lake Sturgeon yearlings annually into the lower Nelson River during project construction and for an extended period after it goes into operation. The EIS indicates that, as part of this stocking plan, there is "…a commitment by the Partnership to construct a hatchery and/or other facilities in northern Manitoba to provide the necessary Infrastructure (Section 6.4.6.2.2, page 6-284)". Since filing the EIS, Manitoba Hydro has decided to undertake the development of hatchery facilities as a separate project, independent from the Keeyask Generation Project; the Partnership will then obtain fingerlings and yearlings from these facilities.

A planning process is currently underway to evaluate the potential of building a new hatchery on the lower Nelson River (as committed to in the EIS) at either the Keeyask or Kettle generating station sites, or expanding the existing hatchery at Grand Rapids with satellite facilities near communities along the lower Nelson River. The hatchery will provide fish for the Keeyask Lake Sturgeon stocking strategy, as well as for initiatives related to the potential Conawapa Generation Project (if built) and Manitoba Hydro's existing operations. While the long term hatchery options are being assessed, the Grand Rapids hatchery will be used to produce Lake Sturgeon for stocking at the proposed start of construction in July 2014.

North-South AC Transmission System Upgrade Project:

The Conawapa Outlet Transmission Project will connect the Conawapa Generating Station to the Keewatinoow Converter Station and the rest of the Manitoba Hydro northern collector system. Conawapa energy will be converted to high voltage direct current (HVDC) and will then be transmitted on the HVDC system to Converter Stations in southern Manitoba, where it will be converted back to alternating current (AC). This system has the capacity to reliably transmit the majority of the power produced by Conawapa.

The remaining power will be transmitted on the existing northern 230kV AC system, which under the preferred development plan will require a range of 100 MW-300 MW enhancement. The improvements are still under study; however, at this time, it is expected the following AC lines will need to be upgraded, the first two of which may overlap with the potential effects of Keeyask on specific VECs:

- From Kelsey Generating Station to Birchtree Station (Thompson), a distance of approximately 80 kilometres;
- From Birchtree Station to Wuskwatim Generating Station, approximately 42 kilometres;
- From Herblet Lake Station (Snow Lake) to Overflowing River Station (The Pas), approximately 210 kilometres; and
- From Vermillion Station (Dauphin) to Neepawa Station, approximately 130 kilometres.

Manitoba Hydro will own and operate the facilities included in the North-South AC Transmission System Upgrades Project, which are scheduled to be in place in 2026.

4.0 COLLABORATIVE SOLUTIONS FOR THREE VECS

The Partnership takes seriously the potential for cumulative effects as a result of developing the Keeyask Generation Project. Of all the VECs considered, the three VECs of Lake Sturgeon, Caribou, and Worker Interaction and Public Safety provide particularly good examples of where collaborative solutions are addressing ongoing concerns of the Partnership, Manitoba Hydro, the KCNs and others. These approaches are outlined below.

4.1 LAKE STURGEON

Lake Sturgeon are culturally and spiritually important to the Cree people and have special status as a heritage species in Manitoba. The Partnership acknowledges that Lake Sturgeon have been substantially affected by past and present projects and activities, including commercial harvest and hydroelectric developments (see VEC Summary tab for Lake Sturgeon). Due to historic declines and concerns about a continuing decline in population numbers, COSEWIC designated Lake Sturgeon in the Nelson River as endangered, and this species is currently being considered for listing under the *Species at Risk Act* (SARA).

Technical studies have found that numbers of sturgeon have declined at locations on the Nelson River where the construction of generating stations has altered habitat for specific life history requirements such as spawning. However, healthy sturgeon populations have been documented in areas affected by hydroelectric development where habitat to support all life history stages continued to be available.

Given the current vulnerable state of Lake Sturgeon, the Partnership has placed a priority on designing the station and developing mitigation measures in a manner that addresses potential adverse effects to Lake Sturgeon habitat and supports the existing population. Measures will also be implemented by the Partnership to increase the regional population of Lake Sturgeon. The latter includes implementation of a large-scale stocking program targeting areas where sufficient habitat exists to support larger populations than currently exist in the reach of the Nelson River between the Kelsey and Kettle generation stations. Stocking is a proven method for increasing Lake Sturgeon numbers and has been an important feature of many recovery

programs. Overall, it is expected that this program will result in an overall increase in the number of sturgeon in the region, helping to address some of the effects of past developments and activities.

Apart from the programs implemented for the Project, there are also several initiatives underway to promote the protection and recovery of Lake Sturgeon on the lower Nelson River. Two key initiatives are outlined below. Both are designed to support the new Lake Sturgeon Management Strategy developed by Manitoba Conservation and Water Stewardship, which has among its goals, to ensure that existing populations are protected from depletion and that in areas with suitable habitat, Lake Sturgeon populations are restored to levels where they can be considered stable and self-sustaining.

- Lower Nelson River Lake Sturgeon Stewardship Committee: A legally-binding Lower Nelson River Lake Sturgeon Stewardship Agreement has recently been ratified among five First Nations (Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation, York Factory First Nation and Shamattawa First Nation), Manitoba Conservation and Water Stewardship and Manitoba Hydro. The stewardship agreement establishes a Lower Nelson River Sturgeon Stewardship Committee, which will provide a forum for all parties to work collaboratively to develop a regional Lake Sturgeon Stewardship Plan. The stewardship plan will set out comprehensive research, monitoring and enhancement measures, objectives, and strategies for the protection and enhancement of Lake Sturgeon populations in the lower Nelson River area. Manitoba Hydro and some of the KCNs also participate in the Nelson River Sturgeon Board, which focuses on Lake Sturgeon preservation and recovery in the upper Nelson River. The mandate of this Board, which was established in 1993, is "…to provide for the subsistence and cultural needs of the communities and to provide for the preservation of the declining lake sturgeon stock" (Nelson River Sturgeon Board. Website, 2002).
- Manitoba Hydro Lake Sturgeon Stewardship & Enhancement Program (LSSEP): Manitoba Hydro has organized its internal stewardship initiatives into a formal Lake Sturgeon Stewardship & Enhancement Program (LSSEP), which focuses on filling information gaps on population status, habitat availability, biology and ecology in the Nelson, Churchill, Saskatchewan and Winnipeg rivers. LSSEP activities also include rearing and stocking Lake Sturgeon from Manitoba Hydro's Grand Rapids Fish Hatchery in areas where the population status and habitat conditions are well understood, educational programs about the needs and vulnerability of Lake Sturgeon, and the development of measures to mitigate the impacts of hydroelectric development, e.g. constructed spawning shoals.

4.2 CARIBOU

Three groupings of caribou are found in the Caribou Regional Study Area – barren ground caribou, coastal caribou (a forest-tundra migratory woodland caribou ecotype) and summer resident caribou (a type of woodland caribou whose exact range is unknown and herd association is uncertain; although range behaviour indicates that some summer resident caribou are coastal caribou). With the exception of recognized population ranges near Thompson, Manitoba, SARA-listed boreal woodland caribou have not been identified by the Provincial or Federal Governments in the Regional Study Area.

KCNs Members have expressed concerns about the disappearance of large caribou herds in the region since the 1950s, and the limited return of caribou beginning in about the early 1990s and continuing today. There is evidence that the Beverly and Qamanirjuaq barren-ground caribou herds, although still plentiful (e.g., the

Qamanirjuaq caribou herd was estimated at 348,000 animals in 2008), may be in decline, mainly as a result of climate change, human activities, loss of winter habitat due to forest fires, harvesting and predation. The redistribution of Pen Islands coastal caribou has also been reported, as a result of a combination of causes including increased mortality of animals due to differences in predation and hunting pressure across the traditional range, nutritional stress due to range deterioration, and redistribution of animals in response to habitat change or to disturbance among other hypotheses.

The Project is not anticipated to measurably affect caribou in the Regional Study Area because habitat loss is small compared to its widespread regional availability, available habitat appears to be under-utilized and there is negligible change to intactness and mortality. However, cumulative effects associated with future projects, including habitat loss and/or alteration, fragmentation, and access-related mortality from hunting[1] and predation, could delay the cycle and recovery of wide-ranging caribou populations currently experiencing declines. The KCNs predict that with more development, caribou will likely disappear from the area again and not return for a long time.

A comprehensive Terrestrial Effects Monitoring Plan has been developed by the Partnership that includes monitoring of caribou in the region to assess effects of the Project and the effectiveness of project mitigation measures. Monitoring plans based on ATK are also being developed with each of the KCNs and may include community-based monitoring on the effects to caribou of Keeyask-related development.

The Partnership appreciates, however, that it is one among many who have ongoing and substantive management and/or monitoring roles with respect to caribou in the region. Range-wide management efforts by Provincial and Federal Governments, and stakeholder representation on resource boards, including the Beverly and Qamanirjuaq Management Board, the Northeastern Caribou Committee, and the Split Lake, Fox Lake, and York Factory Resource Management Boards, are working to manage and monitor the risks related to range-wide cumulative effects associated with harvestable caribou populations. In addition, other future developments in the region (primarily hydroelectric developments) are also proposed and will have associated caribou monitoring and mitigation programs.

The Partnership is working to develop a process that allows for coordination of its activities with those of others involved in long-term caribou monitoring and management in the region. At this time, it is anticipated that the process will involve a collaborative approach that brings together Partnership representatives, representatives of other northern hydroelectric developments, government authorities and existing caribou committees and management boards on at least an annual basis to review and discuss the results of monitoring and mitigation efforts, and to coordinate future monitoring activities. The intention is to create an environment where relevant information about regional caribou groupings is shared among all those involved in managing these populations, and efficiencies and synergies may be gained in the monitoring work planned by different organizations.

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[1] The management of access to and harvest of migratory coastal and barren-ground caribou in the lower Nelson River area has a high scientific and KCNs 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. Although this type of event is unlikely to occur under existing harvest regulations and the management of caribou populations by the Resource Management Boards and the Province, to decrease the risk of cumulative effects occurring, all Project-related caribou mortality in association with other effects will be monitored (see Chapter 8 of the Response to EIS Guidelines).

4.3 PUBLIC SAFETY AND WORKER INTERACTION

The KCNs have seen multiple hydroelectric development projects built within and/or criss-cross their homeland since the mid-1950s (see attached VEC Summary). Based on experience with past hydroelectric project construction, the KCNs, FLCN and TCN in particular, have identified potential adverse effects of non-local construction worker interaction with community Members, especially direct effects on women and youth, as an important concern.

The number of visits to Gillam and other communities (including Split Lake) by the Keeyask construction workforce is hard to predict, as is the nature of the interaction that may unfold. Mitigation measures to reduce the number of visits have been developed and will primarily be implemented at the Keeyask construction camp.

The Project is one among several new developments proposed in the Gillam area. The construction periods for these new developments are currently scheduled to overlap, meaning a large, camp-based, transient workforce will be in the region for a period of time that begins in advance of Keeyask construction and ends several years following the start of Keeyask operations.

Manitoba Hydro is involved in the development of Keeyask and in all of the future projects considered in the cumulative effects assessment, either as the primary developer or a partner. The corporation recognized that successfully addressing worker interaction would require a coordinated, multi-project approach that is developed and implemented through a strong partnership with Fox Lake Cree Nation, the Town of Gillam and others. A Harmonized Gillam Development (HGD) committee, made up of representatives from Fox Lake, the Town of Gillam, Manitoba and Manitoba Hydro was established several years ago as a forum to address grassroots community issues. From their work a HGD Worker Interaction Subcommittee is being established to deal with increased workforce in the Gillam area due to planned Manitoba Hydro projects. This Committee will include representatives from Fox Lake, the Town of Gillam, Manitoba Hydro and other relevant service providers. It is intended to be a forum for information sharing and communication related to the anticipated increased workforce in the Gillam area with the intent of: early identification of potential issues, preventing issues to the extent possible, and identifying ways and means to work cooperatively to address issues as they arise.

Manitoba Hydro (on behalf of the Partnership and as a proponent/partner in the other future projects) is also working directly with local health authorities and the RCMP to plan for these developments. This has included working with the Northern Regional Health Authority (NRHA) to secure an on-site public health care professional at Keeyask who would be responsible for the provision of and/or referral to health promotion and risk management programming (including communicable disease education and prevention measures, if required) and making referrals to appropriate and more comprehensive services at the community or regional level. In addition, this health care professional would work with the Medical Services providers at the camp, Project counseling services, the NRHA and the Partnership to identify and develop adaptive management measures, if required (e.g. expansion of on-site addictions counseling). The services will be available to all site staff, including KCNs members. Manitoba Hydro also continues to work closely with the NRHA to help it identify new health service requirements and priorities to be incorporated in its 5 year Strategic Plan, so that the NRHA can prepare for any additional service requirements that may be needed as the project unfolds.

Discussions have also has started with the RCMP to assess and respond to Project impacts on policing for the region including beyond the town of Gillam and into the rural areas around Gillam (Bird) and Thompson and surrounding areas (Split Lake).

5.0 SUMMARY OF FINDINGS

Table 3 below provides a summary of findings from the cumulative effects assessment for each VEC that has the potential to experience residual adverse effects as a result of developing and operating Keeyask. Additional text for each of these VECs is provided in the attached summaries.

The Partnership is confident that the cumulative effects assessment undertaken for the Keeyask Generation Project provides a thorough and comprehensive analysis of the potential effects of the Project acting in combination with other past, present and future projects and activities. The approach taken is consistent with environmental assessment practice throughout Canada and with the guidance provided by regulatory authorities. The Partnership and/or Manitoba Hydro have also taken additional steps to implement cross-cutting, collaborative solutions for three VECs with the greatest potential to experience cumulative effects.

Based on the full environmental assessment, including an assessment of cumulative effects, the Partnership concluded the following in Section 10.6 of the Response to EIS Guidelines:

> "The Keeyask Generation Project will cause numerous and widespread environmental and social effects, some of which would have had the potential to be significant. However, using past experience, Aboriginal traditional knowledge and leading scientific and engineering techniques, the Keeyask Hydropower Limited Partnership has mitigated, remediated and/or compensated for these effects, such that the Partnership is confident the Project should proceed. The Project will also produce substantial environmental, social and economic benefits, all of which are consistent with the principles of sustainability established by the Governments of Canada and Manitoba. The Project will contribute to reductions in greenhouse gases and increases in Lake Sturgeon populations; it will provide training and employment for hundreds of Aboriginal and northern workers; it will enable the Keeyask Cree Nations Partners to build capacity and profit from construction contracts and their investment as equity partners; and it will produce clean renewable energy for Manitobans and export markets. As such, the Partnership believes the Project should be granted regulatory approval to proceed."

References:

CEAA, 2007 Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act,* On the Internet at: http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1F77F3C2-1

Hegmann, G., Cocklin, C., Creasey, R., Dupuis, S., Kennedy, A., Kingsley, L., Ross, W., Spaling, H., and Stalker, D. 1999. Cumulative effects assessment practitioners guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency, Hull, QC. Available from the Canadian Environmental Assessment Agency. En106-44/1999E

Table 3a. 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	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
	CRD	LWR	Kelsey (& re-runnering)	Kettle	Long Spruce & Limestone	Transmission Lines	Mining Activities	Commercial Fishing	PR 280 Upgrades	Community 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)		Frequency (inf, freq, con)[5]	Reversibility (irr, rev)[6]	Ecological & Social Context (low, mod or high)[7]	Keeyask Transmission	Bipole III	Gillam Redevelopment	Conawapa	
Water quality	✓	✓	✓	✓	✓						✓			Application of sediment and effluent best management practices and spill response readiness.	C	-	sm-mo	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	-	mo-lg	sm-med	med-long	Y	con	irr	mod				✓	
Pickerel/Jackfish/ Lake Whitefish	✓	✓	✓	✓				✓				✓		Adherence to instream construction timing windows, blasting guidelines, creation of spawning shoals, construction of channels to prevent fish stranding.	C	-	mo	med	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	med	long	N	NA	NA	NA					
Lake Sturgeon	✓	✓	✓	✓				✓				✓		Constructed habitat for all life stages, trap and haul upstream passage, regional stocking program and collaborative monitoring and management efforts.	C	-	mo	med	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 expected Lake Sturgeon populations will increase as a result.
															O	+	mo	lg	long	N	NA	NA	NA					
Ecosystem Diversity	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	An access management plan will be in place and priority habitats will be rehabilitated.	C	-	sm-mo	med	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-mo	med	long	Y	con	irr	low	✓	✓	✓		
Wetland Function	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	New wetlands will be developed and erosion controlled.	C	-	sm-mo	med	long	Y	con	irr	low	✓	✓	✓		There will be no net loss of off-system marshes. No globally, nationally or provincially significant wetlands will be affected. Effects are considered regionally acceptable.
															O	-	sm-mo	med	long	Y	con	irr	low	✓	✓	✓		
Intactness	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	Planning and design has minimized disturbance.	C	-	sm	med	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	med	long	N	NA	NA	NA	✓	✓	✓		
Priority Plants	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	Very rare species, if identified, will be avoided/transplanted.	C	-	mo	med	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	-	mo	sm	long	Y	con	irr	low	✓	✓	✓	✓	
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.	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/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	med	long	N	NA	NA	NA	✓	✓	✓	✓	
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.	C	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	A small amount of habitat loss/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	med	long	N	NA	NA	NA	✓	✓	✓	✓	
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.	C	-	sm	sm	long	N	NA	NA	NA	✓	✓	✓		Although there will be habitat loss/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	✓	✓	✓		
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.	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	med	long	N	NA	NA	NA	✓	✓		✓	
Mallard	✓	✓	✓	✓	✓	✓							✓	See mitigation in Canada Goose.	C	-	sm	sm	long	N	NA	NA	NA	✓	✓		✓	Potential for increased harvest and additional loss/alteration of nesting cover. Overall, effects are expected to be small.
															O	-	sm	med	long	N	NA	NA	NA	✓	✓		✓	
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.	C	-	sm	sm	short	N	NA	NA	NA	✓	✓		✓	Potential for increased harvest and additional loss/alteration of nesting cover. Overall, effects are expected to be neutral to small.
															O	o	NA	NA	NA	N	NA	NA	NA					
Olive Sided Flycatcher		✓	✓	✓	✓	✓	✓		✓	✓			✓	Perching structures will be installed in decommissioned borrow areas that provide appropriate habitat. See mitigation in Canada Goose.	C	-	mo	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	✓	✓			
Common Nighthawk		✓	✓	✓	✓	✓	✓		✓	✓			✓	Retention of standing dead trees. Clearing will occur outside the breeding season.	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	-	mo	sm	long	Y	freq	rev	high	✓	✓			
Rusty Blackbird	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	See mitigation in Canada Goose.	C	-	mo	sm	long	Y	inf	rev	high	✓	✓			Additional loss of breeding habitat through land clearing. Overall, effects are expected to be minimal.
															O	-	mo	sm	long	Y	con	irr	high	✓	✓			

[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 special 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
[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 3b. 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)				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
	CRD	LWR	Kelsey (and re-rumnering)	Kettle	Longspruce & Limestone	Mining Activites	BRHA Temp Accomodation	All Linear Development	655 on Burntwood River	Wuskwatim	KIP				Direction[1] (0/-/+)	Magnitude[2] (s, mo, lg)	Spatial[3] (s, med, lg)	Duration[4] (sh, med, long)		Frequency (inf, freq, con)[5]	Reversibility (irr, rev)[6]	Ecological & Social Context[7] (low, mod or high)	Keeyask Transmission	Bipole III	Gillam Redevelopment	Conawapa	
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	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.
														O	0	0	0	0	N	NA	NA	NA	✓	✓	✓	✓	
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	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. Operation staff for Keewatinoow Converter Station and the potential Conawapa Generating Station project are 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 does not change.
														O	-	sm	sm	long	N	NA	NA	NA					
Transportation Infrastructure				✓	✓			✓				✓	PR 280 is being upgraded, including widening, grading and curve shaping	C	-	sm	med- lg	sh	N	NA	NA	NA	✓	✓	✓	✓	With the increased in traffic on PR 391 from Thompson to PR 280 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.
														O	0	0	0	0	N	NA	NA	NA					
Community Health				✓	✓								At main camp, 24/7 emergency medical and ambulance services, as well as on-site public health professional responsible for provision and/or 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. FLCN AEA programming for health and wellness at local level already included in Project.	C	-	sm	med	med	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 as youth. Operations phase cumulative effects stem from population growth in Gillam, and the potential for increase 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 does not change.
														O	+	sm	med	long	N	NA	NA	NA					
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 as well as 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	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.
														O	-	sm	med	long	N	NA	NA	NA					
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, and develop and monitor safe ice trails. Rerouting and upgrades to PR 280 will improve road conditions. Development of boat launches and portage will enable travel around the generating station.	C	-	s-mo	med	sh-long	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 PR 280 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.
														O	+	sm	med	long	N	NA	NA	NA					
Aesthetics	✓	✓		✓		✓		✓				✓	Reservoir Clearing Plan will reduce unsightly debris, construction site will be decommissioned, disturbed site reclamation construction areas (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	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 does not change.
														O	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	
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, counseling services; and inclusion of culturally appropriate protocols in Heritage Resources Protection Plan.	C	-	sm	med	long	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 minimizes 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.
														O	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	
Heritage Resources	✓	✓		✓				✓				✓	Archaeological salvage to recover/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	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. There will be potential loss of unknown heritage resources as well. 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 does not change.
														O	-	mo	s	long	N	NA	NA	NA	✓				
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/Water Stewardship re: consumption restrictions.	C	0	0	0	0	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 offsetting programs that permit KCNs to access country food from locations unaffected by the Project, as well as 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.
														O	-	mod	med	med	N	NA	NA	NA					

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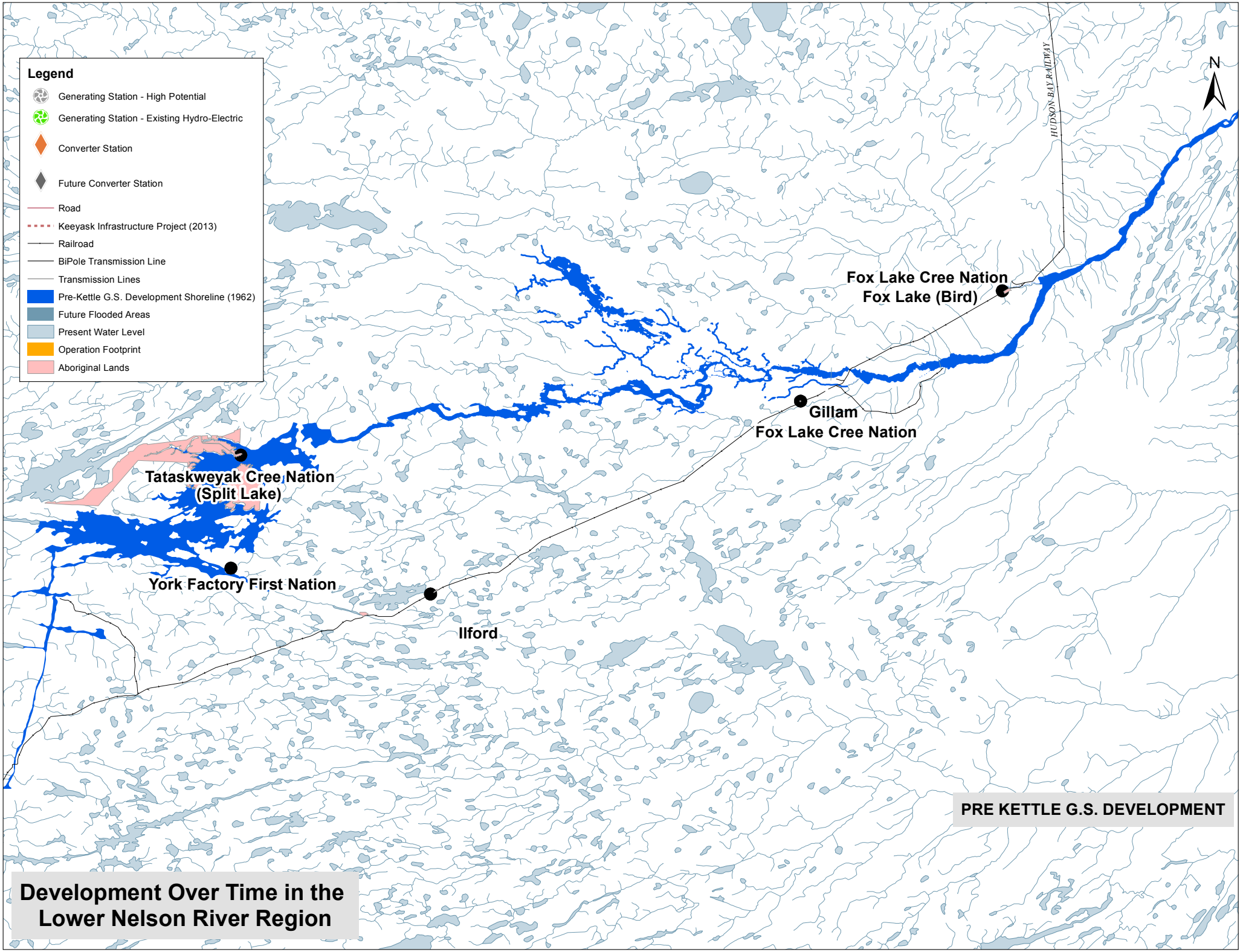
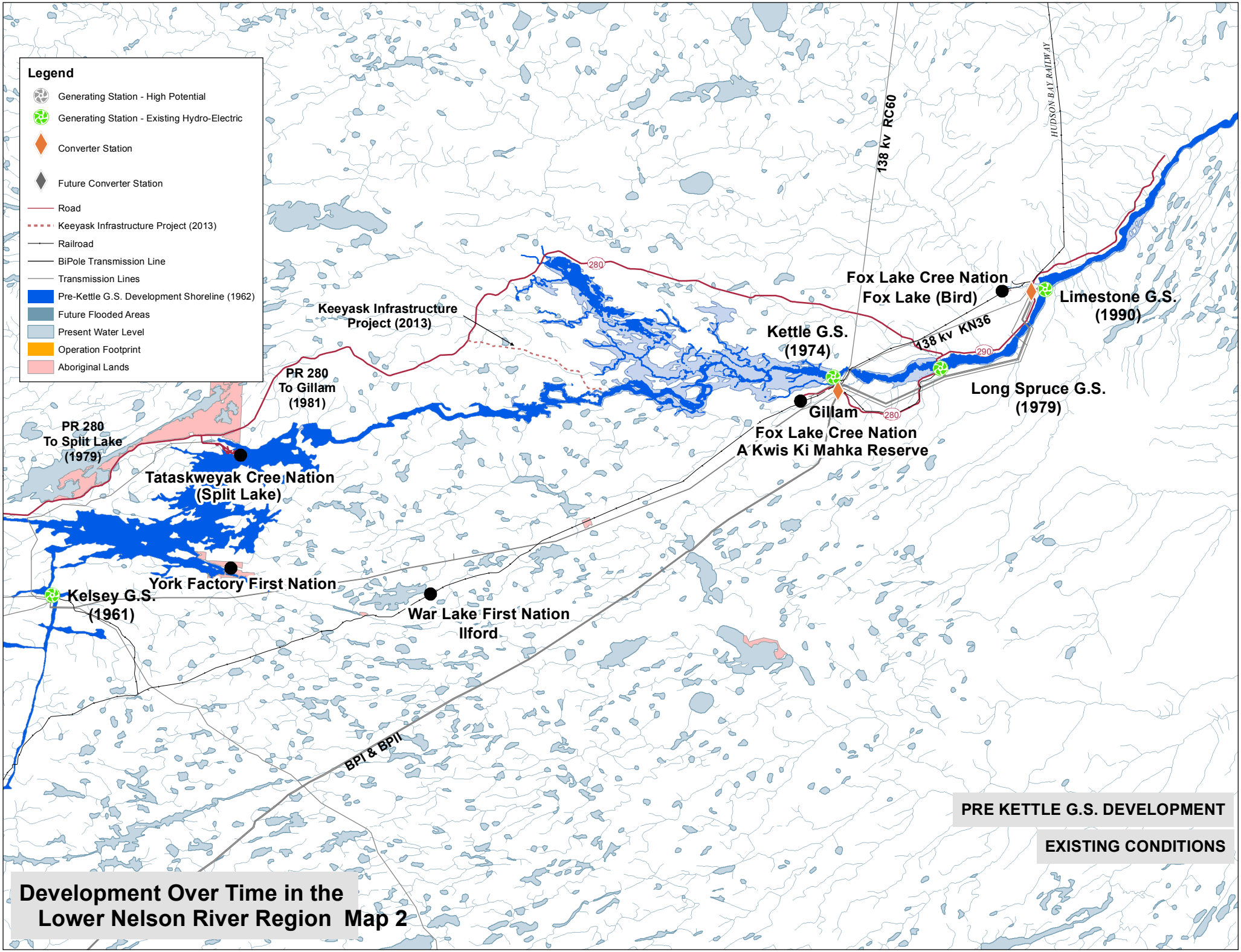
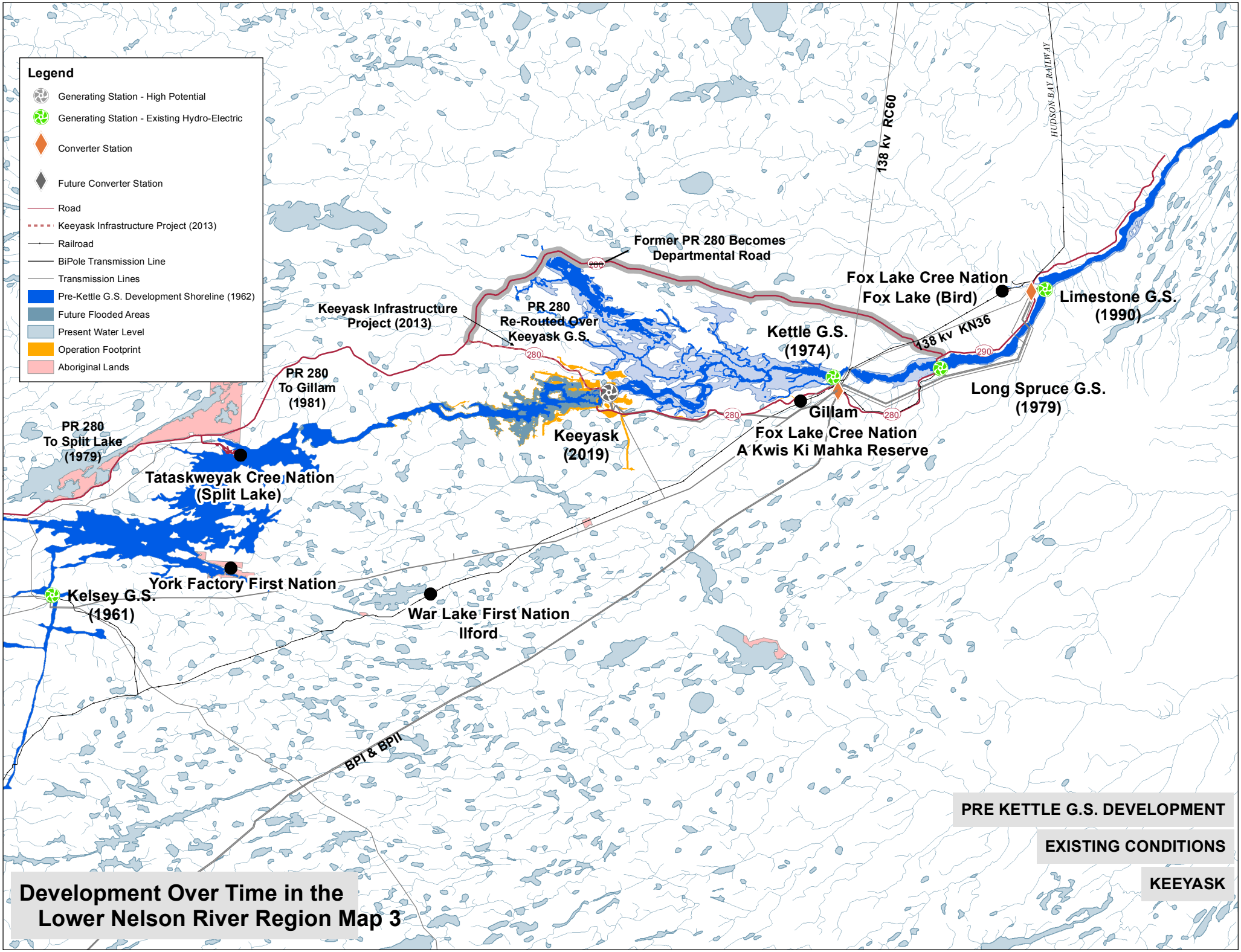
[4] Duration of effect is expressed as either: short (sh), medium (med), or long
[5] Frequency is expressed as either: infrequent (inf), frequent (freq) or continuous (con)
[6] Reversibility is expressed as either: reversible (rev) or irreversible (irr)
[7] Ecological and Social Context is expressed 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 area as a result of the Project (see CEC Rd 1 CAC 81b).

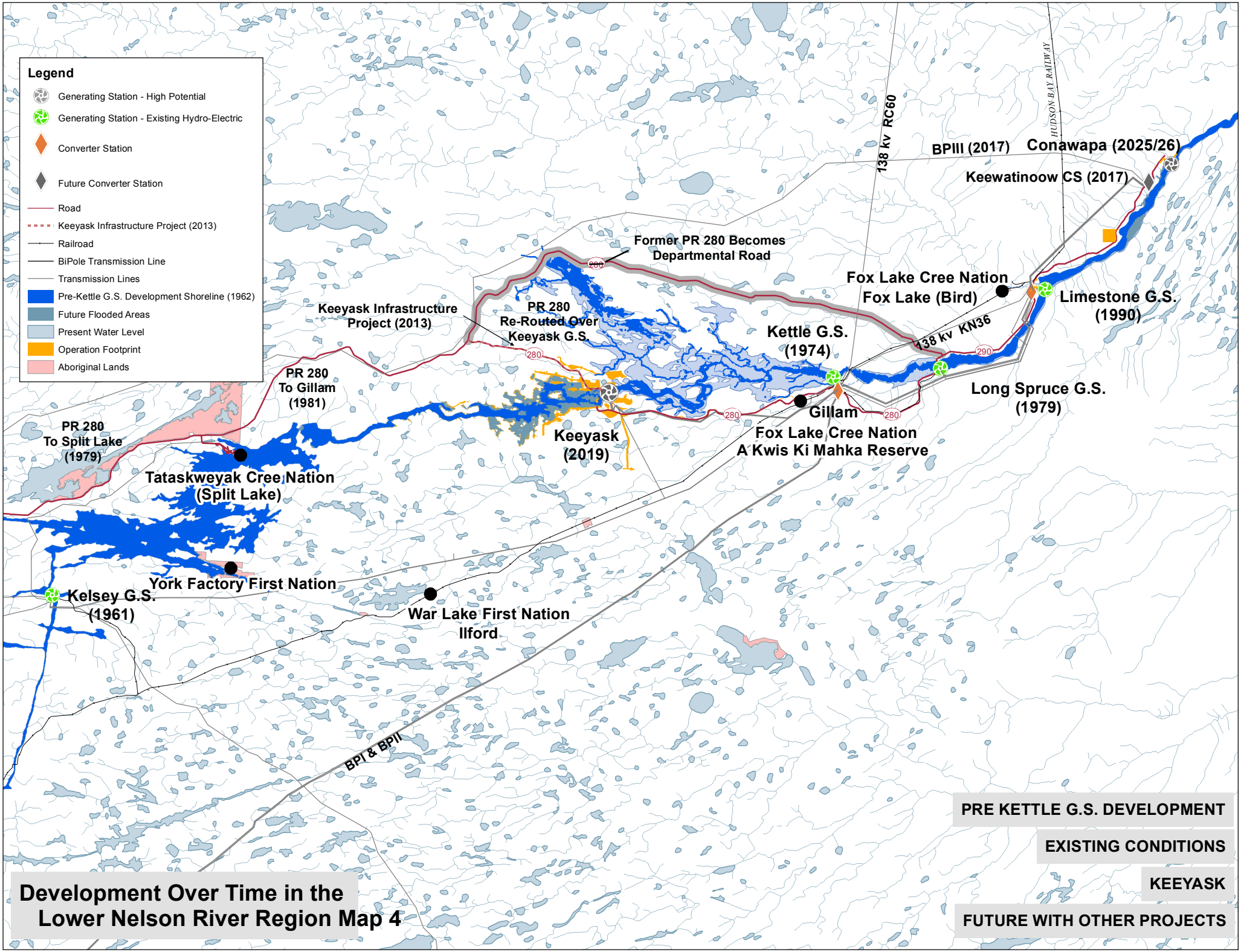
DEVELOPMENT OVER TIME MAP SERIES

The following four maps are intended to illustrate development over time in the Lower Nelson River region. In the printed version of this document Maps 2, 3 and 4 were printed on transparency paper to enable the reader to ability to see the landscape at different stages of development over time.


Legend
Generating Station - High Potential
Generating Station - Existing Hydro-Electric
Converter Station
Future Converter Station
Road
Keeyask Infrastructure Project (2013)
Railroad
BiPole Transmission Line
Transmission Lines
Pre-Kettle G.S. Development Shoreline (1962)
Future Flooded Areas
Present Water Level
Operation Footprint
Aboriginal Lands
HUDSON BAY RAILWAY
N
Fox Lake Cree Nation
Fox Lake (Bird)
Gillam
Fox Lake Cree Nation
Tataskweyak Cree Nation
(Split Lake)
York Factory First Nation
Ilford
PRE KETTLE G.S. DEVELOPMENT
Development Over Time in the
Lower Nelson River Region


Legend
Generating Station - High Potential
Generating Station - Existing Hydro-Electric
Converter Station
Future Converter Station
Road
Keeyask Infrastructure Project (2013)
Railroad
BiPole Transmission Line
Transmission Lines
Pre-Kettle G.S. Development Shoreline (1962)
Future Flooded Areas
Present Water Level
Operation Footprint
Aboriginal Lands
138 kv RC60
HUDSON BAY RAILWAY
280
Keeyask Infrastructure Project (2013)
Fox Lake Cree Nation
Fox Lake (Bird)
Limestone G.S. (1990)
Kettle G.S. (1974)
138 kv KN36
290
PR 280 To Gillam (1981)
Long Spruce G.S. (1979)
Gillam
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
PR 280 To Split Lake (1979)
Tataskweyak Cree Nation (Split Lake)
York Factory First Nation
Kelsey G.S. (1961)
War Lake First Nation
Ilford
BPI & BPII
PRE KETTLE G.S. DEVELOPMENT
EXISTING CONDITIONS
Development Over Time in the Lower Nelson River Region Map 2


Legend
Generating Station - High Potential
Generating Station - Existing Hydro-Electric
Converter Station
Future Converter Station
Road
Keeyask Infrastructure Project (2013)
Railroad
BiPole Transmission Line
Transmission Lines
Pre-Kettle G.S. Development Shoreline (1962)
Future Flooded Areas
Present Water Level
Operation Footprint
Aboriginal Lands
138 kv RC60
HUDSON BAY RAILWAY
Former PR 280 Becomes Departmental Road
Fox Lake Cree Nation
Fox Lake (Bird)
Limestone G.S. (1990)
Keeyask Infrastructure Project (2013)
PR 280 Re-Routed Over Keeyask G.S.
Kettle G.S. (1974)
138 kv KN36
PR 280 To Gillam (1981)
Long Spruce G.S. (1979)
PR 280 To Split Lake (1979)
Keeyask (2019)
Gillam
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Tataskweyak Cree Nation (Split Lake)
York Factory First Nation
Kelsey G.S. (1961)
War Lake First Nation
Ilford
BPI & BPII
PRE KETTLE G.S. DEVELOPMENT
EXISTING CONDITIONS
KEEYASK
Development Over Time in the Lower Nelson River Region Map 3


Legend
Generating Station - High Potential
Generating Station - Existing Hydro-Electric
Converter Station
Future Converter Station
Road
Keeyask Infrastructure Project (2013)
Railroad
BiPole Transmission Line
Transmission Lines
Pre-Kettle G.S. Development Shoreline (1962)
Future Flooded Areas
Present Water Level
Operation Footprint
Aboriginal Lands
138 kv RC60
HUDSON BAY RAILWAY
BPIII (2017)
Conawapa (2025/26)
Keewatinoow CS (2017)
Former PR 280 Becomes Departmental Road
Fox Lake Cree Nation
Fox Lake (Bird)
Limestone G.S. (1990)
Keeyask Infrastructure Project (2013)
PR 280 Re-Routed Over Keeyask G.S.
Kettle G.S. (1974)
138 kv KN36
PR 280 To Gillam (1981)
Long Spruce G.S. (1979)
PR 280 To Split Lake (1979)
Keeyask (2019)
Gillam
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Tataskweyak Cree Nation (Split Lake)
York Factory First Nation
Kelsey G.S. (1961)
War Lake First Nation
Ilford
BPI & BPII
PRE KETTLE G.S. DEVELOPMENT
EXISTING CONDITIONS
KEEYASK
FUTURE WITH OTHER PROJECTS
Development Over Time in the Lower Nelson River Region Map 4

OVERVIEW OF AQUATIC ENVIRONMENT CUMULATIVE EFFECTS ASSESSMENT

The assessment of effects to the aquatic environment considered a wide range of environmental components, as follows:

- Water quality is of fundamental importance to the aquatic ecosystem, as it determines the suitability of the environment for aquatic biota.
- Aquatic habitat provides the environment in which aquatic organisms live. The structure of the habitat is provided by water depth and velocity, bottom type, and the presence or absence of cover.
- Aquatic plants and algae are the primary producers within the ecosystem.
- Aquatic invertebrates form an important part of the aquatic food web.
- Fish form an important part of the aquatic ecosystem as they occupy many different trophic levels and a range of habitats in the aquatic ecosystem.

The assessment focused on five aquatic VECS:

- Water quality;
- Walleye;
- Northern Pike;
- Lake Whitefish; and
- Lake Sturgeon.

All of these aquatic VECs received further consideration in Chapter 7 of the "Response to EIS Guidelines" through the cumulative effects assessment.

SPATIAL SCOPE OF THE ASSESSMENT

The Aquatic Environment Study Area includes the reach of the Nelson River from downstream of the Kelsey GS to the Kettle GS, as well as waterbodies immediately adjacent to the Nelson River (Response to EIS Guidelines, Map 6-18).

Environmental studies were focused on the reach of the river from approximately 3 km downstream of the outlet of Clark Lake to the inlet of Stephens Lake approximately 3 km downstream of Gull Rapids, within which direct changes to water levels and flows are expected. Studies were also conducted upstream of this reach in Split Lake and adjacent waterbodies because fish may move between this area and the area directly altered by the Project. Additionally, Stephens Lake was studied because fish in Stephens Lake use aquatic habitat within the river reach up to Gull Rapids, and a few may move upstream into the habitat above Gull Rapids. Sample collection for the water quality component extended downstream to the mouth of the Nelson River to address concerns that inputs to the water at the Project site could be carried downstream (Response to EIS Guidelines Map 6-19).

TEMPORAL SCOPE OF THE ASSESSMENT

The temporal scope of the assessment includes historic conditions, in particular as they relate to the current condition of the environmental component of interest. Current conditions are generally described for the period of 1997–2006, based on work done under various technical programs, in particular field studies for

this assessment that were initiated in 1999. Additional information was collected after 2006 where analysis indicated data gaps, in particular in relation to Lake Sturgeon.

An analysis of on-going change was undertaken to determine if components of the current aquatic environment are relatively stable or are undergoing substantive changes. The effects assessment extended 30 years into the operation phase, by which point conditions in the reservoir are predicted to have stabilized.

N

STEPHENS LAKE AREA

CLARK LAKE TO STEPHENS LAKE AREA

SPLIT LAKE AREA

Little Limestone Lake

LIMESTONE LAKE

LIMESTONE RIVER

WASKAIOWAKA LAKE

NORTH MOSWAKOT RIVER

SOUTH MOSWAKOT RIVER

Crying Lake

PR 280

Ferris Bay

STEPHENS LAKE

Looking Back Creek

Kettle G.S.

Proposed Keeyask G.S.

Gull Rapids

Gillam

Fox Lake Cree Nation
A Kwis Ki Mahka Reserve

NELSON RIVER

GULL LAKE

Long Rapids

Birthday Rapids

FOX LAKE

Assean River

CLARK LAKE

SPLIT LAKE

Tataskweyak Cree Nation
Tataskweyak (Split Lake)

ASSEAN LAKE

BURNTWOOD RIVER

SPLIT LAKE

York Factory First Nation
York Landing (Kawechiwasik)

First Rapids

GRASS RIVER

Witchai Lake Falls

Kelsey G.S.

AIKEN RIVER

MOOSE NOSE LAKE

War Lake First Nation
Ilford

BUTNAU RIVER

BUTNAU LAKE

KETTLE RIVER

North Angling Lakes

Little Kettle Lake

Kettle Lake

KETTLE

Cyril Lake

FOX (ATKINSON) LAKE

WITCHAI LAKE

Goose Hunting Lake

KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Government of Canada, North/South Consultants

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-FEB-10	25-MAY-12
0 4 8 Kilometres / 0 3.5 7 Miles	VERSION NO: 2.0	QA/QC: APPROVED

Legend

- Area Boundary
- Generating Station (Planned)
- Generating Station (Existing)
- First Nation Community
- Highway
- Access Road
- Proposed Access Road
- Rail
- First Nation Reserve
- Waterbody

Aquatic Environment Study Area

Map 6-18

File Location: G:\EIS\Keeyask\Publish_MXD\CORE_VOLUME\Fr_Updated_Template\Core_6_AE_BASELINE_AquaticEnvironmentStudyArea_20120528.mxd

N

Weir Lake
Leochko Lake
WHITECAP LAKE
Myre Lake
RIVER
WEIR
CYGNET LAKE
WEIR RIVER
Broten Lake
WEIR RIVER
North Seal C reek
Seal Creek
Nelson River Estuary
WR-1
NR-7
NELSON RIVER
NR-8
Seal RIVER
NR-6
AR-1
NR-5
15C-1
GC-1
TC-1
SCK-1
Potential Conawapa G.S.
Lower Limestone Rapids
ANGLING RIVER
Merrick Lake
PENNYCUTAWAY RIVER
HAYES RIVER
LIMESTONE RIVER
Little Limestone Lake
LIMESTONE LAKE
WASKAIOWAKA LAKE
Twelve Mile Creek
Crying Lake
LR-1
BC-1
NR-4
Limestone G.S.
ANGLING LAKE
STL-3
Ferris Bay
PR 280
STEPHENS LAKE
STL-2
Kettle G.S.
NR-3
Long Spruce G.S.
GT-1
AL-2
FOX LAKE
Assean River
SPL-8
CLARK LAKE
SPLIT LAKE
CL-1
NR-1
Birthday Rapids
TRIB-1
TRIB-2
GL-1
GL-2
Proposed Keeyask G.S.
Camp-1
Gull Rapids
GULL LAKE
NR-2
TRIB-3
Camp-2
STL-1
RIVER
ASSEAN LAKE
AL-1
SPL-7
BUTNAU LAKE
KETTLE RIVER
BURNTWOOD RIVER
SPL-1
SPL-3
SPL-4
SPLIT LAKE
SPL-6
Little Kettle Lake
ANGLING
SPL-2
GRASS RIVER
Kelsey G.S.
SPL-9
YL-1
SPL-5
AIKEN RIVER
MOOSE NOSE LAKE
AK-1
Kettle Lake
Cyril Lake
FOX (ATKINSON) LAKE
NELSON RIVER

KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Government of Canada, Province of Manitoba, North/South Consultants

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	05-MAY-10	18-MAY-12
0 7 14 Kilometres 0 6 12 Miles	VERSION NO: 2.0	QA/QC: APPROVED

Legend

- Water Quality Sampling Sites
- Generating Station (Planned)
- Generating Station (Existing)
- Highway
- Rail
- First Nation Reserve
- Waterbody

Water Quality Sampling Sites

Map 6-19

WATER QUALITY

Why Water Quality Was Selected As a VEC

- Water quality and quantity affect the suitability of the aquatic environment to support life, and variables are indicative of many of the major pathways of energy and nutrient transfer within the ecosystem.
- Water quality is a major pathway for project effects on the aquatic ecosystem.
- Water quality is subject to regulatory guidelines and restrictions.
- Important to KCNs communities.

WATER QUALITY

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Water along the Nelson River is moderately nutrient-rich, well-oxygenated, moderately soft to hard, has a slightly alkaline pH, and alkalinity is moderate.
- Water quality has been generally stable along the mainstem over the last several decades and conditions have been stable in the north arm of Stephens Lake since the 1980s.
- The KCNs have noted a decline in water quality, stating that water was more murky, dirty, muddy, and undrinkable throughout the system, before and more intensely after the Kettle GS was completed. The overall decline in water quality was attributed, at least in part to CRD, LWR and the construction of individual generating stations.
- Water quality in Stephens Lake was affected in the initial years following construction of the Kettle GS, with increased concentrations of nutrients and total suspended solids, and periodic dissolved oxygen depletion, but improved over time.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Increased Total Suspended Solids (TSS) levels are expected during instream construction, with the largest increases occurring immediately downstream of construction. The predicted increase in TSS at the Kettle GS is less than 5 mg/L, but may be temporarily increased when the river is closed off. Point and non-point sources (e.g. sewage treatment effluent, concrete batch plant, site runoff) have the potential to reduce water quality.

OPERATION

- Short-term increases in TSS, nutrients, metals, Organic Carbon, true colour, conductivity/Total Dissolved Solids (TDS) in nearshore areas while pH and water clarity will decrease in nearshore areas; Dissolved Oxygen (DO) will decrease during ice-cover. Long-term decreases are expected in TSS in most areas of the reservoir and for several kilometers downstream.

PROPOSED MITIGATION

CONSTRUCTION

- TSS inputs will be reduced as described in the Environmental Protection Plan.
- Effluents will be treated and management practices will mitigate non-point source.
- Fisheries and Oceans Canada blasting guidelines will be followed.
- Hazardous materials will be safely stored and handled, and a spill response plan will be developed.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small to Moderate	Small to Moderate	Small to Large	Small to Medium	Short	Medium to Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	YES	N/A	Continuous	N/A	Irreversible	N/A	Moderate

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	NO	NO
BIPOLE III	NO	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

During the two years of project instream construction elevated TSS levels are expected to extend downstream to where Conawapa is being constructed. Sediment Management Plans for both projects will communicate to maintain an overall increase within levels that will have no measureable adverse effects effect to aquatic biota.

During operations there will be a minor decrease in TSS downstream with no adverse effects to aquatic biota.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

WALLEYE/NORTHERN PIKE/LAKE WHITEFISH

Why Walleye/Northern Pike/Lake Whitefish Were Selected As a VEC

- Walleye, Northern Pike, and Lake Whitefish were selected as VECs because they occupy different trophic levels and habitats and will be affected differently by the Project. They are all fish that contribute to local fisheries.
- **Walleye** (*Sander vitreus*) use a variety of habitats that will be substantially altered by the Project. This species is harvested in domestic, commercial, and recreational fisheries. As a top-level predator using both nearshore and offshore habitats, it provides a general indication of the condition of the aquatic environment.
- **Northern pike** (*Esox lucius)* sensitive to changes in littoral habitats and small tributary streams. This species is harvested in domestic and recreational fisheries. As a top level predator utilizing nearshore, vegetated habitats, changes to northern pike can be indicative of productivity of the littoral environment.
- **Lake whitefish** (*Coregonus clupeaformis*) are negatively affected by hydroelectric development due to sedimentation in spawning areas and overwinter drawdowns in reservoirs. This species harvested domestically and commercially. Due to its sensitivity to adverse environmental conditions (e.g., water quality), position in the mid-level of the food web, and use of open water lacustrine habitats, provide a good indicator of conditions in this portion of the ecosystem.

WALLEYE/NORTHERN PIKE/LAKE WHITEFISH

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The fish community has been affected by previous hydroelectric developments. Operation of CRD has been linked to a reduction in walleye and an increase in sauger in Split Lake from 1973 to 1980[1]. In Stephens Lake, construction of the Kettle GS combined with CRD are thought to have disturbed fish migration patterns and to have resulted in an increase in sucker populations[1]. Members of TCN and YFFN reported that hydroelectric development has resulted in fewer fish in Split and Clark lakes (except for sucker) and the Burntwood and Aiken rivers.
- Technical studies conducted for this EIS found that walleye, northern pike, and lake whitefish in Split Lake, Gull Lake and Stephens Lake were abundant, with densities comparable to many off-system lakes. The past and on-going commercial fishery in Split and Stephens lakes would have some effect on the populations of these species, though the extent is not known. However, given that catches are regulated by Manitoba Conservation and Water Stewardship, it is expected that harvest is sustainable.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Mortality or injury may result from stranding during cofferdam dewatering, exposure to blasting, entrainment on intake pipes, and increased harvest by workers.
- Health could be negatively affected by decreases in water quality resulting from instream activities construction or accidental spills.
- Habitat in Stephens Lake may be altered due to sediment deposition.
- Disruption of spawning in Gull Rapids due to disturbance by construction activities and habitat loss/alteration.

OPERATION

- Complete loss of spawning habitat in Gull Rapids.
- Potential for fish to become stranded in isolated pools after spillway operation.
- The generating station will act as a barrier to upstream movements.
- Changes in downstream movement due to the presence of the generating station.
- Loss of existing aquatic plant beds will reduce Northern Pike spawning habitat in the reservoir until the beds re-establish.
- Permanent decrease in the amount of Walleye and Lake Whitefish spawning habitat in the lower part of the reservoir.
- Long term increase in foraging habitat in the reservoir as the flooded area evolves.
- Increased upstream movements past Birthday Rapids due to decreased velocities.
- Winterkill of fish trapped in former Little Gull Lake due to anoxic conditions.
- Increased harvest due to increased access to the area.

PROPOSED MITIGATION

CONSTRUCTION

- Reduce mortality through measures listed in the Environmental Protection Plan including conduct of a salvage fishery during cofferdam dewatering, adhering to DFO blasting guidelines, timing instream activities to avoid critical periods, and implementing an Access Management Plan to address harvest by construction workers.
- Effects to health will be addressed by maintaining suitable water quality conditions (see water quality).
- Sediment deposition will be minimized by managing sediment inputs (Sediment Management Plan).

OPERATION

- Construct spawning habitat downstream of the generating station and near Stephens Lake.
- Construct channels to connect pools isolated after spillway operation, thereby allowing fish to escape into Stephens Lake.
- Make provision for upstream fish passage, such that passage can be provided if monitoring results indicate to regulators that this would benefit fish populations.
- Select turbine designs to reduce harmful effects to fish passing downstream through the generating station.
- Construct walleye and whitefish spawning habitat in the reservoir.
- Maintain access to small tributaries in the reservoir by removing debris accumulations.
- Escape channel will be constructed to connect present-day Little Gull Lake to deeper parts of the reservoir.

See Lake Sturgeon for construction mitigation and fish passage mitigation points identified by an (*) that apply to all fish communities.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

	Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Walleye	Adverse	Positive	Moderate	Small	Medium	Medium	Medium	Long
N. Pike	Adverse	Adverse	Small	Small	Medium	Medium	Short	Short
Whitefish	Adverse	Positive	Moderate	Small	Medium	Medium	Medium	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	NO	NO
BIPOLE III	NO	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

1: Split Lake Cree – Manitoba Hydro Joint Study Group 1996c.
2: Ayles et al. 1974.

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Walleye and Lake Whitefish in Stephens Lake will experience negative effects during construction due to the loss of spawning habitat, but effects will be neutral in the long-term due to habitat replacement. In the reservoir, both species will increase slightly due to increased foraging habitat. No construction-related effects are predicted for Northern Pike, but numbers will decline in the reservoir until appropriate habitat (aquatic plant beds) becomes established. There is no spatial or temporal overlap with reasonably foreseeable future projects.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

LAKE STURGEON

Why Lake Sturgeon Was Selected As a VEC

- Lake Sturgeon (*Acipenser fulvescens*) is a long-lived species that was historically relatively abundant and widespread in Manitoba.
- They are particularly vulnerable to effects of hydroelectric development as a result of their low population numbers and specific habitat requirements. They are culturally and spiritually important to the KCNs and as domestic harvest.
- They have special status as a heritage species in Manitoba, are designated as endangered under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and are being considered for protection under the federal Species at Risk Act (SARA).
- First Nations have identified Lake Sturgeon as a culturally important species.
- Effects to lake sturgeon may also be indicative of effects to other species dependent on riverine environments.

LAKE STURGEON

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Commercial fishing of Lake Sturgeon on the Nelson River began in 1907, and severely depleted populations before the fishery was permanently closed in 1992. Changes to the aquatic environment began with construction of the first hydroelectric station at Kelsey Rapids in the late 1950s. The CRD and LWR, completed in the mid-1970s, altered the aquatic environment of the entire Nelson River. The KCNs state that hydroelectric development caused a decline in sturgeon. Technical studies found that sturgeon numbers declined where habitat for specific life-history requirements such as spawning was lost. However, healthy populations persist in areas affected by hydroelectric development where habitat to support all life history stages is available.
- Lake sturgeon in the study area consist of three groups inhabiting: Split Lake and its tributaries; Clark Lake to Gull Rapids; and Stephens Lake. Although habitat in the Clark Lake to Gull Rapids reach (where the Project would be developed) currently supports all life history stages, numbers are low, and the long-term sustainability is uncertain. Numbers may be increasing in the Split Lake area, suggesting this population may persist. The extremely small number of spawning lake sturgeon at Gull Rapids makes it unlikely that the Stephens Lake group is presently self-sustaining.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Mortality or injury may result from stranding during cofferdam dewatering, exposure to blasting, entrainment on intake pipes, and increased harvest by workers.
- Health could be negatively affected by decreases in water quality resulting from instream construction or accidental spills.
- Disruption of spawning in Gull Rapids due to disturbance by construction activities and habitat loss/alteration.
- Increased noise and rapid changes in water levels and velocities may cause individuals from Gull Lake to emigrate upstream or downstream.
- Sediment deposition in Stephens Lake may alter sub-adult and young-of-the-year habitat.

OPERATION

- Complete loss of spawning habitat in Gull Rapids.
- Potential for fish to become stranded in isolated pools after spillway operation.
- The generating station will act as a barrier to upstream movements.
- Changes in downstream movements due to the presence of the generating station.
- Habitat alterations may reduce the amount of suitable spawning and young-of-the-year habitat in the reservoir.
- The amount of foraging habitat in the reservoir will increase in the long term
- Increased harvest due to increased access to the area.

PROPOSED MITIGATION

CONSTRUCTION

- Reduce potential mortality through measures listed in the Environmental Protection Plan including conduct of a salvage fishery during cofferdam dewatering, adhering to DFO blasting guidelines, timing instream activities to avoid critical periods, and implementing an Access Management Plan to address harvest by construction workers. *
- Effects to health will be addressed by maintaining suitable water quality conditions (see water quality).*
- Sediment deposition will be minimized by managing sediment inputs (Sediment Management Plan).*
- Stocking will offset losses due to emigration and reduced spawning during construction.

OPERATION

- Construct spawning habitat downstream of the generating station.
- Construct channels to connect pools isolated after spillway operation, thereby allowing stranded fish to escape into Stephens Lake.*
- Make provision for upstream fish passage, such that passage can be provided if monitoring results indicate to regulators that this would benefit fish populations.*
- Select turbine designs to reduce harmful effects to fish passing downstream through the generating station.*
- Monitor to determine whether Lake Sturgeon in the reservoir have suitable spawning and young-of-the-year habitat; if not, implement contingency plans for construction of suitable habitat.
- Develop a Lake Sturgeon conservation-awareness initiative to inform domestic resource users of the vulnerability of Lake Sturgeon populations in the Keeyask reservoir and Stephens Lake.
- Implement a stocking program to increase the currently depleted populations in Gull and Stephens lakes, offset losses of drifting larval fish entering Stephens Lake from upstream of Gull Rapids, and provide young fish to the population while replacement habitat is being refined and may not be fully functional.
- Implement a stocking program to target areas where sufficient habitat exists to support larger populations than currently exist in the reach of the Nelson River between the Kelsey and Kettle Generating Stations. This program is expected to create an overall increase in sturgeon numbers in the region.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Positive	Moderate	Moderate	Medium	Large	Medium	Long

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Yes	NO	Continuous	N/A	Reversible	N/A	High	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	NO	NO
BIPOLE III	NO	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

** Proposed mitigation also applies to Walleye/Northern Pike/Lake Whitefish communities.*

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

In the long-term, no adverse effects to lake sturgeon numbers in the area directly affected by the Project are expected due to mitigation measures to provide habitat for all life history stages and the implementation of an extensive stocking program. An overall increase in the number of sturgeon in the Kelsey GS to Kettle GS reach of the Nelson River is expected in the long-term as a result of population augmentation due to stocking. There would be a commitment to extensive monitoring and adaptive management to modify and supplement stewardship as required to meet this goal.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

OVERVIEW OF TERRESTRIAL ENVIRONMENT CUMULATIVE EFFECTS ASSESSMENT

The terrestrial environment effects assessment examined the effects of the Project on a wide range of terrestrial topics. An assessment of 13 different terrestrial VECs captured effects in key topic areas, including: terrestrial ecosystems and habitat; terrestrial plants; terrestrial invertebrates; amphibians and reptiles; birds; mammals; and, mercury in wildlife (Response to EIS Guidelines Section 7.6). All terrestrial VECs had potential for residual adverse effects and as a result of constructing and operating the Project, including:

- Ecosystem Diversity;
- Wetland Function;
- Intactness;
- Priority Plants;
- Canada Goose;
- Mallard;
- Bald Eagle;
- Olive-sided Flycatcher;
- Rusty Blackbird;
- Common Nighthawk;
- Caribou;
- Moose; and
- Beaver

The above listed terrestrial VECs received further consideration in Chapter 7 of the "Response to EIS Guidelines" through the cumulative effects assessment..

SPATIAL SCOPE OF THE ASSESSMENT

Spatial scope was determined separately for each VEC (Section 1.3.5 of the Terrestrial Ecosystem Supporting Volume). The scoping approach considered the hierarchical structuring of ecosystems and the potential pathways of Project effects on the VEC, including where these pathways could interact with other past, current and reasonably foreseeable future projects.

The spatial extent of potential direct and indirect effects defined a potential zone of influence on individuals (*i.e.*, the local zone of influence). This area became the Local Study Area for the VEC.

Although effects on individuals are of interest, the question of ultimate concern for the Project effects assessment was how effects on individual animals would translate into long-term effects on population viability or how effects on individual ecosystem elements would translate into long-term effects on components of regional ecosystem health. For example, how would removing the habitat that supports five moose affect the long-term viability of the moose population, or, how would removing ten jack pine stands affect regional ecosystem diversity? On this basis, an area that was large enough to capture the local "population" (*i.e.*, the regional zone of influence) was used to assess the potential significance of Project

effects. The spatial extent of the regional zone of influence became the Regional Study Area for the VEC (Terrestrial SV Part 1 Section 1.3.5 and 1.3.6).

For all the VECs, the ecologically appropriate Local and Regional Study Areas and context area were sufficiently similar that they were selected from six nested geographic areas referred to as the study zones (see Map 1.1 and Table 1.2). Each study zone captures an increasingly large area to represent important features from construction and operational footprint, to home ranges of wide ranging wildlife species. Using a common set of study zones for the key topic study areas facilitated linking results from different VECs (Terrestrial SV Part 1 Section 1.3.5 and 1.3.6).

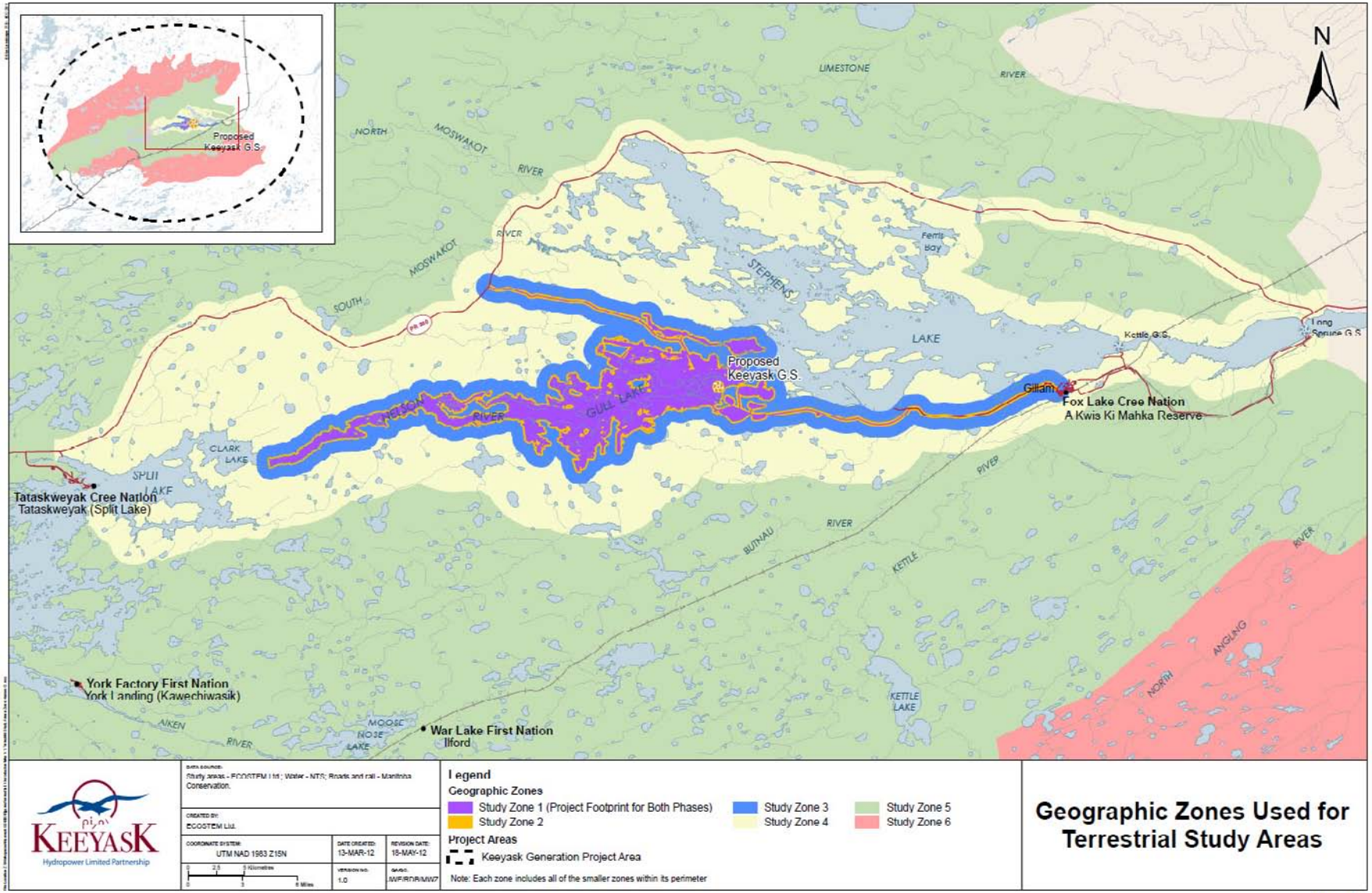
TEMPORAL SCOPE OF THE ASSESSMENT

Temporal scope was determined separately for each VEC based on potential pathways of Project effects, including where these interactions could overlap with other past, current and reasonably foreseeable future projects. An important consideration for temporal scoping was the time required for key topic indicators to return to pre-disturbance conditions. This was closely related to life cycle length for animal key topics and the length of the natural post-disturbance recovery cycle for habitat and ecosystem key topics. Where potential Project effects differed by season (*e.g.*, nesting or calving periods) or by Project phase (*e.g.*, construction, operation), these were separated in the assessment.

In general, the temporal scope for each key topic was as follows:

- For historical conditions, as far into the past as needed to describe historical conditions and trends, subject to the availability of relevant historical information;
- For current conditions, the 2001 to 2011 period, which is when the majority of the terrestrial EIS studies were conducted; and,
- For future with and without the Project conditions, as far into the future as needed to capture potential Project effects, but no less than 100 years after Project operation commences since this is the assumed life of the Project.

For key topic indicators where reasonable estimates could be developed, potential Project effects during the operation stage were examined using the following six prediction periods: Year 1, Years 2 to 5, Years 6 to 15, Years 16 to 30, Years 31 to 100. The length of the prediction periods increased with length of time from the start of Project operation since most Project-related changes are expected to decline in magnitude with time.



Map 1- 1 Geographic Zones Used for Terrestrial Study Areas

Table 1-1: Study Zones from Map 1-1 That are Used as the Local and Regional Study Areas for each of the Valued Environmental Components (bolded) and Supporting Topics, Organized by EIS Section

EIS Section and Topic	Study Zone[1] in Map 1-1				
	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Terrestrial Ecosystems and Habitat					
Ecosystem diversity	LSA			RSA	
Intactness		LSA		RSA	
Wetland function	LSA			RSA	
Terrestrial Plants					
Priority plants	LSA			RSA	
Birds					
Canada goose		LSA		RSA	
Mallard		LSA	RSA		
Bald eagle		LSA		RSA	
Olive-sided flycatcher		LSA	RSA		
Common nighthawk		LSA	RSA		
Rusty blackbird		LSA	RSA		
Mammals					
Caribou			LSA		RSA
Moose		LSA		RSA	
Beaver		LSA	RSA		

Notes: 1 Codes in the table indicate which of the study zones shown in Map 1-1 were used as the Local Study Area (LSA) and Regional Study Area (RSA) for each VEC and supporting topic. 2 Study areas vary too greatly by species to generalize in this table.

ECOSYSTEM DIVERSITY

Why Ecosystem Diversity Was Selected As a VEC

- Maintaining the natural variety of ecosystems is important for the health and resilience of ecosystems in the region, and for maintaining the benefits those ecosystems provide to present and future generations. Ecosystem diversity was selected as a VEC because maintaining the health, resilience and biodiversity of the region is fundamentally important to the Keeyask Hydropower Limited Partnership and the people of Manitoba and Canada.
- The condition of and trends in ecosystem diversity were evaluated based on indicators such as habitat composition and the amounts of priority habitat types. Priority habitat types were particularly important types because they are regionally rare or uncommon, include a relatively high number of plant species, structurally complex, highly sensitive to disturbance, had a high potential to support rare plants and/or were highly valued by people. Effects on the amounts of priority habitat affected were considered to be regionally acceptable if they were less than 10% of the pre-development area for the habitat type.

ECOSYSTEM DIVERSITY

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- By 2011, industrial development had removed approximately 39,200 ha of terrestrial habitat, which is approximately 3.1% of pre-development land area in the Regional Study Area. The indirect habitat alteration resulting from these developments was cautiously overestimated to increase effects from past and current developments to 4.8% of pre-development land area.
- Percentage of area losses were estimated at 5.0% for the upland priority habitat types since these are the usual places where infrastructure is built, and for types along the Nelson River that were affected by hydroelectric development.
- The terrestrial habitats found in the Regional Study Area are typical of those found in the boreal forest of northern Manitoba.
- In 2011, regional habitat composition was dominated by sparsely to densely treed black spruce vegetation growing on a variety of ecosite types.
- Of the 53 native habitat types in the region, 43 qualified as priority habitat types.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Project construction could remove or alter approximately 8,927 ha of terrestrial habitat, before considering mitigation and cautiously assuming that all of the potential Project footprint areas are used. This amounts to 0.7%of pre-development terrestrial habitat in the Regional Study Area.
- Three of the 43 priority habitat types will not be affected at all by the Project. The maximum amount of affected area for 39 of the priority habitat types is 3.8% of pre-development area. Nearly 8% of white birch mixedwood on all ecosites area could be affected before considering mitigation.

OPERATION

- The start of the Project operation phase is not predicted to increase terrestrial habitat effects because initial flooding would be entirely contained within areas already affected during construction.
- Reservoir expansion during the first 30 years of Project operation, is predicted to increase total habitat effects after construction mitigation to 9,416 ha, which is still 0.7% of pre-development terrestrial habitat areas.
- Project effects on most priority habitat types could increase slightly during operation based on cautious overestimates. The priority habitat types with largest increases by Year 30 include balsam poplar dominant on all ecosites (predicted to increase from 1.9% to 4.9% of area) and white birch mixedwood on all ecosites (from 1.8% after mitigation to 3.8%).

PROPOSED MITIGATION

- A portion of borrow area N-6 will be avoided to reduce effects on the white birch priority habitat types, and protection measures will be implemented to ensure that soil alteration or accidental disturbance within this site does not occur.
- Clearing and disturbance within the potential Project Footprint will be minimized to the extent practicable.
- Disturbance of areas adjacent to the actual Project Footprint will be avoided to the extent practicable.
- A rehabilitation plan that gives preference to rehabilitating the most affected priority habitat types using approaches that "go with nature" will be developed and implemented.
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of habitat disturbance, invasive plant spreading, accidental fires and access-related effects.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	*	*	Medium	Medium	Long	Long

** Nil/Small or Moderate, depending on the indicator*

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
YES	YES	Continuous	Continuous	Irreversible	Irreversible	Low	Low

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Based on the anticipated locations of the future projects, cumulative area losses for all priority habitat types are expected to remain below 10% of pre-development area. Effects are considered regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

INTACTNESS

Why Intactness Was Selected As a VEC

- Intactness is the degree to which an ecosystem remains unaltered by human development and activities that remove habitat and increase fragmentation at the landscape level. Fragmentation reduces the size of interior areas, isolates habitat and creates edges, producing conditions (e.g., noise) that cause some animals to either partially or completely avoid areas that would otherwise be habitat for them.
- Intactness was selected as a VEC to provide an overall assessment of Project effects on intactness for species and ecosystems.
- The condition of and trends in intactness are evaluated using linear feature (e.g., road, transmission line) density and core area measures. Core area, which is the area left after buffering human features, essentially indicates how much habitat is available for species that are sensitive to human disturbance.

INTACTNESS

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The human linear features and other infrastructure present in 2010 were constructed after 1900, starting with the completion of the rail line to Churchill in 1929. Most of the features were constructed after 1957, with the communities of Gillam and Split Lake being the largest of these in the area. Hydroelectric development, including dams, reservoirs, converter stations and transmission lines have removed terrestrial habitat, broken up habitat blocks into smaller blocks and reduced total core area in the Regional Study Area.
- The Regional Study Area included 5,628 km, or 0.45 km/km^2, of mapped linear features as of 2010. Roads and rail lines combined to create a regional transportation density of 0.13 km/km^2. Transmission line density was 0.06 km/km^2. Cutlines, which are expected to have lesser ecological effects than other types of linear features, made the highest contribution to total linear feature density. Total linear feature density declined from 0.45 km/km^2 to 0.15 km/km^2 when cutlines were removed from the calculations.
- Core areas larger than 1,000 ha accounted for 83% of the regional land area in 2010. The three largest core areas contributed over half of the total core area. Both of these measures indicate that the Regional Study Area is largely intact. Most of the development is concentrated near the Nelson River and along PR 280.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Clearing, physical disturbance, borrow pit excavation and excavated material placement will be the primary pathways for adverse Project effects on intactness during construction. Total linear feature density declines from 0.45 km/km^2 to 0.44 km/km^2 in the Regional Study Area (from 0.32 km/km^2 to 0.31 km/km^2 for the portion outside of the Thompson area) during construction because existing cutlines would be covered by Project features such as borrow areas and reservoir clearing. Most of the roads used by the Project during construction are either already existing or would be built on existing cutlines.
- The percentage of the Regional Study Area in core areas larger than 1,000 ha is predicted to decrease from 83% to 82% using cautious overestimates of terrestrial habitat loss.

OPERATION

- Flooding and reservoir expansion during Project operation would cover portions of cutlines and temporary access roads. However, this change is so small during the first 30 years of operation that the reductions to the various linear feature density values are negligible. Core area percentage would remain at 82%.

PROPOSED MITIGATION

- Clearing and disturbance within the Project Footprint will be minimized to the extent practicable.
- Disturbance of areas adjacent to the Project Footprint will be avoided to the extent practicable.
- A rehabilitation plan will be developed that gives preference to rehabilitating the most affected priority habitat types using approaches that "go with nature".
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of habitat disturbance, invasive plant spreading, accidental fires and access-related effects.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Medium	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Based on the anticipated locations of future projects, cumulative changes to total linear feature density would remain in the lower half of the moderate magnitude effects range for the Regional Study Area, and within the small magnitude range for the Regional Study Area outside of the Thompson area. The percentage of the Regional Study Area in core area is expected to remain higher than 80% of land area, which is well within the range for low magnitude core area effects.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

WETLAND FUNCTION

Why Wetland Function Was Selected As a VEC

- Wetland functions are the natural properties or processes that are associated with wetlands, stated in ways that describe what they do for the ecosystem. Among other things, wetlands convert sunlight into vegetation, create soil, protect shorelines, contribute to biodiversity and provide high quality habitat not otherwise available for some plant and animal species. Wetlands also provide benefits to people.
- Wetland function was selected as a VEC because maintaining wetland function is fundamentally important to the Partnership and the people of Manitoba and Canada.
- The condition of and trends in wetland function were evaluated based on wetland type and effects on the particularly important wetlands. Any wetland sites identified as being globally, nationally or provincially significant by Ramsar, the North American Waterfowl Management Plan, Ducks Unlimited and/or the Manitoba Heritage Marsh Program that are located in the Regional Study Area were considered to be particularly important wetlands. Off-system marsh was the only regionally important wetland type.

WETLAND FUNCTION

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The ecosystem diversity summary describes total terrestrial habitat change resulting from industrial development, which is also relevant for wetlands since they are terrestrial habitat. Hydroelectric and public infrastructure development have reduced total wetland area, as well as the amounts of some wetland types. Wetland composition was also altered by those roads and other infrastructure that changed hydrology. All of the natural Nelson River shoreline wetlands in the Regional Study Area were either lost to flooding or have been altered by modified water and ice regimes. Off-system wetlands with hydrological connections to the Nelson River may have also been affected.
- Natural climate warming that began about 150 years ago has already dramatically altered some peatland types, primarily through permafrost melting and fire regime changes. Analysis of historical air photos from the Regional Study Area indicated that permafrost melting in a recent 44 year period eliminated approximately 20% of the total area of peat plateau bogs, the most pronounced permafrost wetland type in the Regional Study Area. Throughout much of the boreal forest, ongoing past climate change has also altered the fire regime, which is thought to have shifted habitat composition towards younger vegetation and vegetation types with higher proportions of plant species that regenerate quickly after fire and reduced proportions of the permafrost-affected wetland types.

POTENTIAL PROJECT EFFECTS

- The KCNs' perspective on potential Project effects on wetland function is that a large land area will be affected by the Project. Within this area, many important habitats will be permanently affected, while the quality and size of many other habitats will be reduced. As a result of past hydroelectric projects, considerable inland and shoreline wetland habitat was either lost to flooding or was rendered unusable to people and wildlife.
- The technical perspective is that project construction is predicted to directly and indirectly affect up to 7,765 ha of wetlands in the Regional Study Area (<1% of total wetland area), before considering mitigation and cautiously assuming that all of the potential Project footprint areas are used. The first 30 years of Project operation are predicted to increase the amount of affected wetlands to 8,285 ha (still <1% of total wetland area).
- The affected wetland area includes approximately 12 ha of off-system marsh, the regionally important wetland type. Effects on Nelson River shoreline wetlands are expected to be negligible because it appears they were virtually eliminated by 2011 due to prolonged high water levels and flows, and would not have sufficient time to redevelop prior to construction.
- The Project will not affect any globally, nationally and/or provincially significant wetlands because none occur in the Local Study Area.

PROPOSED MITIGATION

- Choosing a low-head option considerably reduced the amount of wetland loss. Other design measures selected to reduce impact are avoiding some wetland patches with high and moderate wetland quality through south access road routing, relocating some of the excavated material placement areas, and refining the boundaries of the borrow areas and excavated material placement areas.
- Measures to protect against erosion, siltation and hydrological alteration will be implemented in utilized construction areas that are within 50 m of any off-system marsh that is outside of the Project Footprint.
- 12 ha of the off-system marsh wetland type will be developed within or near the Local Study Area to offset those lost by the project.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	*	*	Medium	Medium	Long	Long

** Nil or Moderate depending on the wetland type*

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
YES	YES	Continuous	Continuous	Irreversible	Irreversible	Low	Low

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

No globally, nationally or provincially significant wetlands will be affected with the Project, and residual effects on off-system marshes are negligible after mitigation. For Bipole III, even if the route overlaps with off-system marshes, effects are likely to be negligible since clearing occurs in winter, clearing is minimized in riparian zones and buffers are typically maintained where transmission rights-of-way overlap riparian zones. The affected areas of the remaining wetland types are expected to be relatively small so that cumulative area losses remain in the small to moderate magnitude range, depending on the final locations of the transmission ROWs. Effects are considered regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

PRIORITY PLANTS

Why Priority Plants Were Selected As a VEC

- Terrestrial plants perform key functions in Keeyask ecosystems. Among other things, they provide food and shelter for wildlife, contribute to soil development, and ultimately are the source for most life because they convert sunlight into vegetation.
- Priority plants are plant species that are particularly important for ecological reasons (e.g., they are rare species) and/or social reasons such as food and cultural importance to KCNs. Some plants are federally and/or provincially important, and are listed as endangered or threatened, or are classified as globally rare, provincially very rare or provincially rare species.
- Each of the globally rare, nationally rare and provincially very rare plant species were assessed individually, with particularly high emphasis on those that are endangered, threatened or provincially rare. Effects on priority plants were generally assessed in two ways. First, the percentage of known locations affected by the Project was used for species that were found during field studies. Second, species that were essentially as common as their habitats were indirectly assessed through the terrestrial habitat supporting topic and the ecosystem diversity and wetland function VECs.

PRIORITY PLANTS

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Human-related priority plant effects are attributed to the combined effects of the settlements, infrastructure and hydroelectric projects developed over the past 50 to 100 years. In brief, past and existing human features have removed individual plants and their habitat and altered plant populations. Based on historical habitat effects (see ecosystem diversity summary), it is likely that plant species associated with mineral sites, the Nelson River shore zone and Nelson River shoreline wetland plants were more affected than species located in other areas.
- Endangered or threatened plants are not expected to occur in the Regional Study Area.
- None of the 13 provincially very rare species that could potentially occur in the Regional Study Area were found during field studies which collected plant data at over 800 habitat plots and transects, and along approximately 1,130 km of rare plant transects. The species with rarest provincial or federal ranking found during field studies was elegant hawk's-beard (*Crepis elegans*).
- Eleven plant species were identified as being of particular interest to the KCNs. Most of these species were common in their preferred habitats. Exceptions were sweet flag (*Acorus americanus*), which was not found during extensive field studies, and northern Labrador tea (*Rhododendron tomentosum*) which was found at seven locations in the Regional Study Area.

POTENTIAL PROJECT EFFECTS

- The KCN's perspective on potential Project effects, as expressed primarily through terrestrial habitat changes is that a large land area will be affected by the Project. Within this area, many important habitats will be permanently affected, while the quality and size of many other habitats will be reduced. The Project would flood plants that are used for food and medicine and are culturally important. The combination of improved access to the area and greater numbers of resource harvesters will, at the very least, result in key plant and animal populations becoming stressed.
- The technical perspective is that the Project is not anticipated to affect plant species that are endangered, threatened or provincially very rare since none of these species are either known or expected to occur within the Local Study Area.
- Three provincially rare to uncommon plant species were found in the Local Study Area. Project effects on these species are expected to be low because: (i) field data showed that these species were more regionally common than suggested by their provincial conservation concern rank; (ii) and, only a small percentage of the known locations for these species would be affected by the Project.
- Substantial Project effects on species identified as being of particular interest to the KCNs are not expected because most are either generally widespread or widespread in their preferred habitat, and the percentages of known locations and available habitat affected by the Project are low.
- For the remaining priority plant species, the Project is expected to affect a small percentage of their known locations and/or their habitat.

PROPOSED MITIGATION

- Because it is possible that existing locations of provincially very rare or provincially rare species were not found, mitigation for these species will include the following:
  - Pre-construction rare plant surveys will be conducted in the Project Footprint and nearby areas that were not previously surveyed and have the highest potential for supporting provincially very rare to rare species.
  - In the unlikely event that a provincially very rare to rare species is discovered and there are not at least 20 known healthy patches outside of the terrestrial plants zone of influence, then the discovered locations will be avoided where practicable. Where avoidance is not practicable, the plants will be transplanted outside of the terrestrial plants zone of influence.
  - Minimizing clearing and disturbance in the proposed Project Footprint.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Medium	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

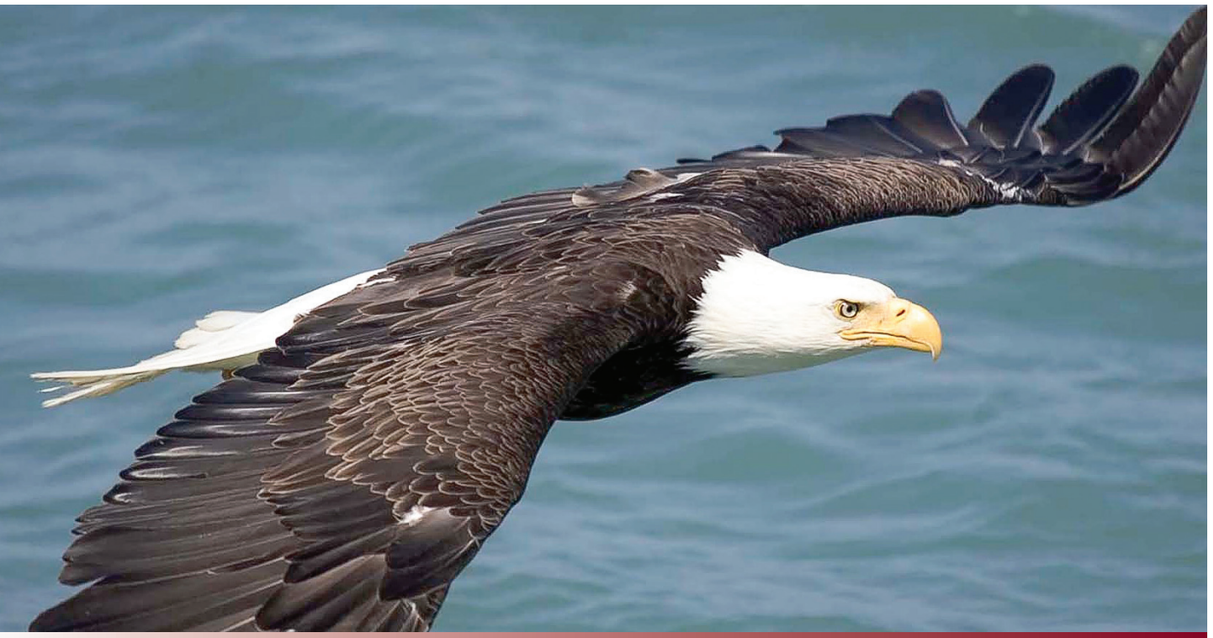
All of the future projects, except for the potential Conawapa Generation Project, are expected to remove individual plants and their habitat and alter plant populations. Transportation and increased activity along Highway 280 for the Conawapa Generation Project could spread invasive plants. Based on the low potential for species of high conservation concern to occur in the Regional Study Area, and on the known locations of the remaining priority plant species and their habitats, cumulative losses for all priority plants are predicted to remain in the nil to moderate magnitude range, depending on the species.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

BALD EAGLE

Why the Bald Eagle Was Selected As a VEC

- Bald Eagle was selected as a VEC because they are very important to people, they have potential for Project effects, are key for ecosystem function, have a regulatory requirement, and suitable information for bald eagle could be compiled.
- Bald eagles (*Haliaeetus leucocephalus*) are fish-eating birds that nest at the top of tall, deciduous or coniferous trees in proximity to waterbodies.



BALD EAGLE

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The historic distribution of bald eagles extends throughout most of the province except the southwest corner and the far north, with the highest densities occurring within the boreal forest.
- Bald eagle populations experienced a mean annual increase of approximately 4.3% nation-wide and 12.2% provincially since 1966. During the last decade, populations have experienced a mean annual increase of approximately 9.1% nationally and 14% provincially.
- Bald eagles tend to use the Local Study Area most during the summer months. Overall eagle densities observed within the Project Study Area during the spring, summer, and fall seasons (approximately 0.8 eagles/km^2 between and including Split Lake to Kettle Generating Station) were comparable to those observed in other boreal areas, including along the Burntwood River near Wuskwatim Lake.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Potential construction-related effects on bald eagles include habitat loss and alteration, and Project-related disturbances (e.g., noise). Land clearing for developing the reservoir, access roads, trails and Generating Station will result in loss of some potential bald eagle perching and/or nesting trees. Reservoir clearing is expect to require removal of up to five nests located along the Nelson River shores.

OPERATION

- Developing and operating the reservoir will cause the loss of some fast-flowing riverine areas used by foraging bald eagles. Creating the tailrace will partly offset loss of these areas, since tailraces at existing generating stations along the Nelson River typically attract a large number of bald eagles.

PROPOSED MITIGATION

- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- Bald eagle nests removed with reservoir clearing will be replaced by artificial nesting platforms located in suitable areas along the new reservoir shoreline.
- Bald eagle nests located in trees at risk of eroding into the reservoir will be removed during the fall or winter and replaced by artificial nesting platforms located in suitable adjacent sites outside the predicted erosion zone.
- Periodically removing road-killed mammals that attract eagles along access roads may mitigate the risk of vehicle-related bald eagle mortality.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Step One Not Required	Small	N/A	Small	N/A	Short	N/A

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	YES	NO

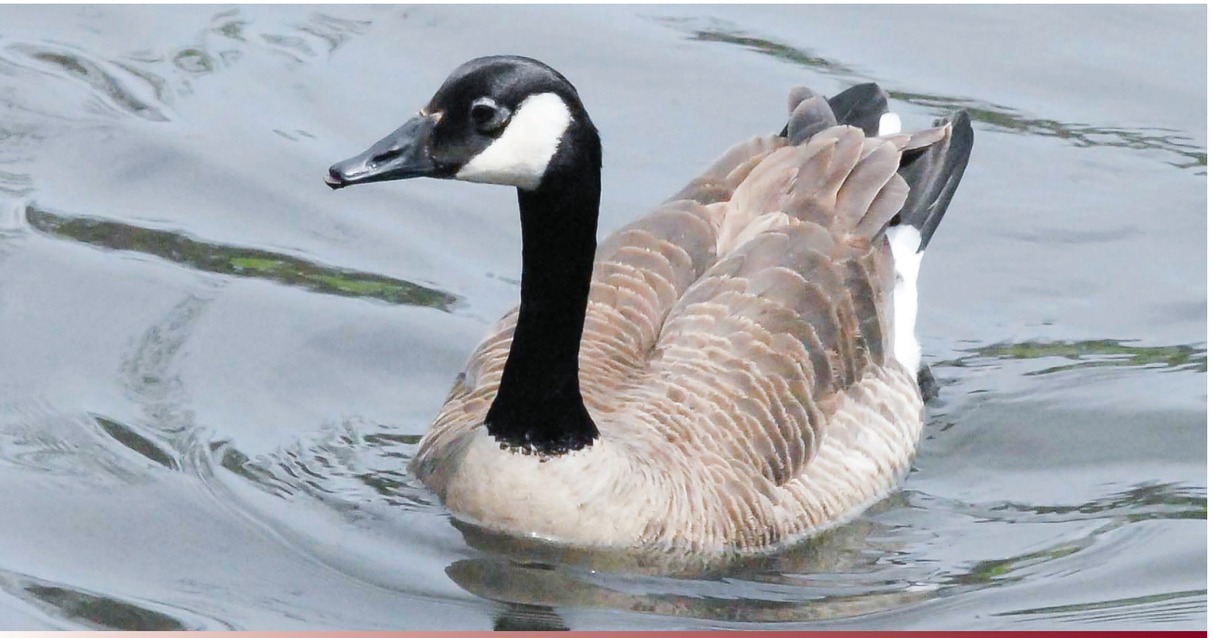
CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Residual effects of the project on bald eagle will overlap temporally and spatially with the Keeyask transmission and Conawapa Generation projects; there is only a small potential for any overlap with the Bipole III project. Since Conawapa is expected to have a neutral effect and Keeyask transmission a very small residual effect, the conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

CANADA GOOSE

Why the Canada Goose Was Selected As a VEC

- The Canada Goose was selected as a VEC because Canada geese are very important to people, have the potential for Project effects, are key for ecosystem function, have a regulatory requirement and suitable information for this species can be compiled.
- Canada geese are grazers of upland plants (e.g., grasses) and occasional emergent (e.g., sedges) and submergent plants and seeds.
- They migrate through the Regional Study Area in May, stopping over on Gull Lake and parts of the Nelson River before making their way northward to their preferred breeding grounds (e.g. the Hudson Bay Lowlands).



CANADA GOOSE

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The highest densities of breeding Canada geese in the province have been recorded in the Hudson Bay Lowlands Ecoregions.
- Canada geese are a historically important game species traditionally hunted during the spring and fall migration periods by all KCNs[1]
- Effects of past Projects on Canada goose include lost or altered habitat and mortality increases from resource harvesting. Past and existing Projects have contributed to increased water levels along the Nelson River, which has led to reduced availability of suitable Canada goose staging habitat in back bays, inlets and creek mouths. The availability and quality of potential Canada goose staging habitat is highly variable along the Nelson River. In some rivers, low water levels have resulted in increased abundance of Canada geese in shallow back bays, inlets and creek mouths where suitable forage is available. In high water years, the quality of these areas is reduced due to lack of exposed preferred shoreline forage sources.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- During the construction phase, sensory disturbances (e.g., construction equipment and blasting noise) that occur near lakes and/or along the Nelson River, will indirectly and temporarily reduce some goose-staging habitat. Construction noise is expected to be at or above thresholds known to cause behavioural responses in waterfowl (i.e., 80 to 85 dBA; Goudie and Jones 2004). Displaced birds will seek alternate habitats available throughout the Regional Study Area.

OPERATION

- Shoreline flooding and inundation of uplands will occur as the reservoir fills. Increased Gull Lake water levels will have a long-term adverse effect on the quality of local migratory staging habitats for geese. Creating the reservoir will inundate shallow areas (e.g., back bays, inlets and creek mouths in Gull Lake) that in some years provide optimal staging habitat for migrating geese. While a negligible amount of marginal Canada goose breeding habitat will be lost (e.g., islands in inland lakes) during reservoir filling, loss of suitable Canada goose breeding habitat is not expected since their preferred breeding habitat (e.g., ribbed fens) does not occur within the Local Study Area.

PROPOSED MITIGATION

- Site was selected to minimize flooding and clearing.
- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- A construction Avian Management Plan will be in place.
- 100 m of vegetated buffer will be retained wherever practicable around lakes, wetlands and creeks located next to infrastructure sites to minimize loss of Canada Geese upland nesting habitat and limit noise-related disturbances to Canada Geese.
- Mitigation for wetland function will benefit Canada geese through development of wetlands in the Local Study Area and could off-set some losses in habitat for geese.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Small	Medium	Small	Medium

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	YES	YES

[1](CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report [Draft], (YFFN Evaluation Report [Kipekiskwaywinan]).

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

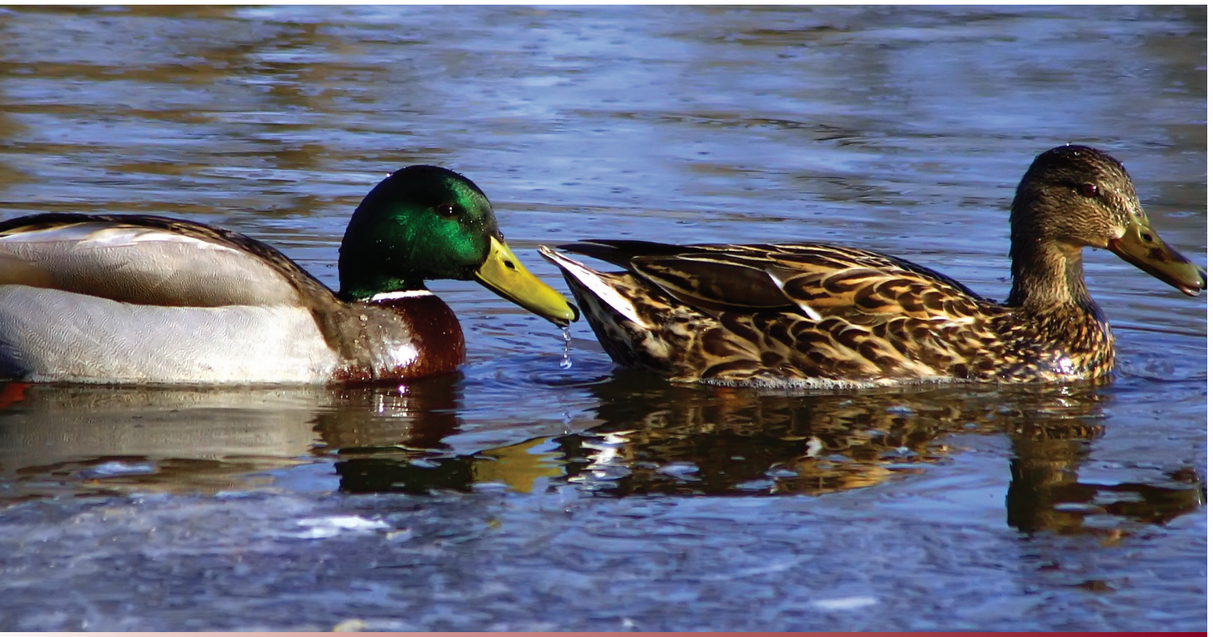
With future projects there is increased potential for mortality from hunter access and presence of transmission lines near areas where geese concentrate. Effects are not expected to be measurable based on mitigation measures and will be regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

MALLARD

Why the Mallard Was Selected As a VEC

- Mallard was selected as a VEC because Mallards are very important to people, have a potential for Project effects, are key for ecosystem function, have a regulatory requirement and suitable information for mallard could be compiled.
- Mallard are the most abundant duck species in the Gull Lake area. Although mallards feed on plant material (e.g., pondweed, sedges) and aquatic insects (e.g., amphipods) in shallow water, they are considered an upland-nesting species that use creeks and creek mouths for brood-rearing and foraging. They are primarily a ground-nesting species that frequently nest away from water.



MALLARD

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The historic distribution of mallards extends throughout northern Manitoba, including as far north as Churchill. During formal and informal interviews, members of First Nation communities have identified mallards as being an important historic game species.
- Effects of past projects on mallard include lost or altered habitat and increased mortality from resource harvesting. Past and existing projects have combined to increase water levels along the Nelson River, which led to reduced availability of suitable mallard breeding and staging habitat in Nelson River back bays, inlets and creek mouths. YFFN has indicated fewer geese and ducks in the Split Lake area since flooding and erosion have reduced availability of shoreline habitat. While mallard breeding and staging habitat is limited along the Nelson River, suitable habitat is widespread and abundant throughout inland areas of the Bird Regional Study Area.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- During construction, sensory disturbances (e.g. construction-equipment and blasting noise) occurring near wetlands, creeks and lakes may temporarily reduce the amount of habitat available for mallard nesting and foraging. Construction noise is expected to be at or above thresholds known to cause behavioural responses in waterfowl (i.e., 80 to 85 dBA). Mallards disturbed by construction activity are expected to seek alternate habitats in unaffected areas.

OPERATION

- As the reservoir fills, inundated inland lake and wetland areas cause the long-term loss of approximately 2.8% (1,896 ha) of the total available mallard brood-rearing habitat (e.g., sluggish, sedge-filled creeks and wetlands) within the Regional Study Area. Along the Nelson River, flooding bays, inlets, creek mouths and shorelines will have a long-term adverse effect on the quality of local migratory staging habitats for mallards. The quality decrease will result from lost emergent vegetation, which provides food, shelter and cover for mallards. Staging-habitat quality along parts of the Nelson River varies annually and seasonally with changes in water levels.

PROPOSED MITIGATION

- 100 m of vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located next to infrastructure sites to minimize loss of mallard upland nesting habitat and limit noise-related disturbances to mallards.
- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- Increases in local waterfowl harvest will be minimized by implementing a Construction Access Management Plan.
- Mitigation measures for wetland function will benefit mallard by developing wetlands in the Local Study Area and is expected to off-set some losses in habitat for mallard.
- Mallard nesting platforms will be installed in suitable wetlands to offset some losses in upland nesting cover.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Small	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

With future projects there is potential for increased harvest and additional loss/alteration of upland nesting habitat and nesting cover. Overall, effects are expected to be small.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

COMMON NIGHTHAWK

Why the Common Nighthawk Was Selected As a VEC

- The common nighthawk is a migratory bird that was selected as a VEC primarily because it is listed as threatened under the federal *Species at Risk Act*.
- This insect-eating bird migrates to the Keeyask area in the spring from wintering grounds in South America and nests on bare ground or recent burn areas.
- Populations in Manitoba declined substantially between the late 1970s and late 1990s, although numbers appeared to increase more recently.

COMMON NIGHTHAWK

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The species was in decline (75%) between 1976 and 1997, although numbers did begin to increase again between 2000 and 2005.
- These data are based mainly on visual counts from the Pinawa, Manitoba area that are thought to represent numbers migrating through from the northern boreal forest, including the Regional Study Area.

POTENTIAL PROJECT EFFECTS

- As land is cleared, 925 ha of available breeding habitat will be lost or reduced in quality. Approximately 3,689 ha will be temporarily created through reservoir clearing, resulting in a 14.8% net increase (2,764 ha) in breeding habitat within the Regional Study Area.
- Construction-related noise may cause common nighthawks to avoid some areas within or adjacent to Project footprints. Birds displaced from breeding habitat will likely relocate to alternate available habitats not affected by construction.
- Floodlights may enhance the quality of infrastructure sites as foraging habitats for common nighthawks, since insects will be attracted to the light.
- Reservoir filling will cause the long-term loss of 4,210 ha (522 ha of pre-Project habitat plus the 3,688 ha created during reservoir clearing) of suitable common nighthawk breeding habitat.
- Ongoing shoreline erosion, peatland disintegration and changes to vegetation resulting from changes in groundwater are processes that could lead to an additional loss of up to 480 ha of common nighthawk habitat over the long-term.
- Development of borrow areas will likely result in small areas of open bare ground that will provide suitable nesting habitat for common nighthawk.

PROPOSED MITIGATION

- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- Some areas of open and flat habitat will be retained at locations deemed to be suitable nesting habitat for common nighthawks.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Positive	Adverse	Large	Moderate	Small	Small	Short	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	YES	N/A	Frequent	N/A	Reversible for some areas	N/A	High (listed species)

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

CONCLUSION OF ASSESSMENT

A relatively small amount of additional habitat would be affected by development of the transmission projects in combination with the Project. Suitable breeding habitat will be lost to infrastructure development; however, some breeding and foraging habitat will be gained and maintained through land clearing and vegetation control associated with the transmission line Right of Ways. The cumulative effects on the local common nighthawk population of the Project in combination with transmission line projects are therefore expected to be positive.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

OLIVE-SIDED FLYCATCHER

Why the Olive-Sided Flycatcher Was Selected As a VEC

- The olive-sided flycatcher is a migratory bird that was selected as a VEC primarily because it is listed as threatened under the federal *Species at Risk Act*.
- This insect-eating songbird arrives in the Keeyask area in the spring to breed in forested areas (usually coniferous forest edges) and moves to wintering grounds in the early fall.
- Large population declines in the latter part of the 20th century may be a result of the loss or alteration of habitat on wintering grounds and along migratory flyways.

OLIVE-SIDED FLYCATCHER

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The Olive-sided Flycatcher population has undergone a 4% mean annual decline through the latter half of the 20th century.
- Reduced numbers may be a result of loss or alteration of habitat on wintering grounds and along migratory flyways.
- Suitable olive-sided flycatcher breeding habitat (e.g., forest edge adjacent to bogs, beaver floods, and burns) is widespread throughout the Bird Regional Study Area.

POTENTIAL PROJECT EFFECTS

- Potential Project-related effects on olive-sided flycatcher are due to habitat alteration, loss of perching trees, noise and other disturbance during Generating Station construction and operation.
- About 3.6% (350 ha) of the regional olive-sided flycatcher breeding and foraging habitat will be lost or reduced.
- Construction-related noise from heavy equipment is short-term and temporary and not expected to have an effect on territorial use or reproductive success of olive-sided flycatcher.

PROPOSED MITIGATION

- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- Some treed areas located within the future reservoir back bays may be retained to off-set some losses in olive-sided flycatcher habitat.
- Perching structures will be created in open, decommissioned borrow areas that retain water.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Moderate	Small	Small	Small	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
YES	YES	Infrequent	Infrequent	Irreversible	Irreversible	High (listed species)	High (listed species)

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

It is expected that the Project in combination with other future developments will result in the additional loss of some olive-sided flycatcher breeding habitat. Losses are expected to be minimal as land clearing will be minimized to the extent possible.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

RUSTY BLACKBIRD

Why the Rusty Blackbird Was Selected As a VEC

- The rusty blackbird is a migratory bird that was selected as a VEC primarily because it is listed as threatened under the federal *Species at Risk Act*.
- This robin-sized bird breeds in the Keeyask region in the spring in riparian vegetation near water bodies and returns to wintering areas in the central USA in the fall.

Photo: Jeff Nadler

RUSTY BLACKBIRD

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Rusty blackbird populations have been declining since the early 1900s with a 90% decline in populations over the past 40-50 years.
- Past hydroelectric projects, transmission line and road developments have contributed to habitat loss due to flooding of riparian habitats and land clearing.
- Suitable rusty blackbird breeding habitat is widespread throughout the Bird Regional Study Area.

POTENTIAL PROJECT EFFECTS

- Construction noise may cause some blackbirds to avoid areas adjacent to infrastructure sites for the short-term.
- Approximately 3.4% (547 ha) of the regional rusty-blackbird breeding and foraging habitat will be lost or reduced in quality for the long-term.
- Long-term loss of additional breeding habitat will occur due to shoreline erosion and peatland disintegration.
- An additional 374 ha or 3% of total available rusty blackbird habitat within the Regional Study Area may be affected during the operation phase.

PROPOSED MITIGATION

- Clearing will be undertaken outside the sensitive breeding period (April 1–August 30) to the extent practicable to minimize disturbance to breeding birds. Surveys for active nests if clearing occurs outside the breeding bird period, and placement of species-appropriate setbacks, wherever feasible.
- A minimum 100 m vegetated buffer will be retained wherever practicable around lakes, wetlands and creeks located adjacent to infrastructure sites to minimize the loss of nesting habitat and limit noise-related disturbances.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Moderate	Moderate	Small	Small	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
YES	YES	Infrequent	Continuous	Reversible	Irreversible	High (listed species)	High (listed species)

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Residual Project effects on rusty blackbird are expected to overlap with the effects of future projects in the Bird Regional Study Area. Future projects in combination with the Project will result in the additional loss of some breeding habitat through land clearing. Losses are expected to be minimal.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

BEAVER

Why Beaver Were Selected As a VEC

- Beaver was selected as a VEC because beaver are very important to people, there is potential for Project effects, they are key for ecosystem function, have a regulatory requirement, and because suitable information could be compiled.
- Beaver (*Castor canadensis*) inhabit waterbodies in forested areas throughout Canada, where suitable habitat exists.
- By building dams and through feeding activities, beaver alter aquatic ecosystems, increase the diversity of species and habitat on a landscape, and create habitat for other species that use wetlands.
- Beaver were evaluated on the condition of physical habitat loss.

BEAVER

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Beaver have been heavily trapped in the past for their fur and their populations were depleted in the 1930s; consequently, there is considerable documentation of their presence in the Regional Study Area.
- Effects of past and present projects on beaver include the loss and alteration of wetland habitat on the Nelson River system and increased mortality from resource harvesting and predator access along linear features.
- Historically, beaver were present on the Nelson River. Following hydroelectric development, their presence was diminished considerably because of changes to shoreline wetland habitat, inland wetland habitat loss from flooding and fluctuating water levels – these factors continue to affect beaver today. The density of active beaver colonies is low on Gull Lake, Stephens Lake, and the Nelson River downstream of Kettle GS mainly because of water-level fluctuations.
- Field studies indicate that beaver are still very common in the Beaver Regional Study Area ponds, creeks and rivers with about 250 colonies. There are an estimated 23 active colonies in the future Keeyask reservoir.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Project effects on beaver during construction include habitat loss and mortality in the Project footprint. About 23 active colonies will be removed during clearing activities in the Keeyask reservoir, which is less than 10% of the estimated Regional population.

OPERATION

- Fluctuation in water levels in the reservoir area will make any potential habitat unsuitable, as in Stephens Lake, where the density of beaver lodges is very low.
- Physical habitat available in the Regional Study area decreases from 8.5% to 8.1% with the Project.

PROPOSED MITIGATION

- A minimum 100 m buffer will be left at creeks, streams, ponds and lakes to the extent practicable 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.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Small	Small	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Residual Project effects on beaver are expected to overlap with the effects of the transmission line projects and Gillam Redevelopment. Cumulative habitat effects are in the moderate range. Even with the removal of colonies, the regional beaver population is highly likely to maintain a viable level. Beaver are widely distributed and abundant in creeks, streams, ponds and lakes, they create their own habitat in most areas where water occurs, can breed quickly, and are under harvest management regulations. Cumulative effects are considered to be regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

CARIBOU

Why Caribou Was Selected As a VEC

- Caribou was selected as a VEC because they are very important to people, there is potential for substantial Project effects, there is a regulatory requirement, and suitable information for this species could be compiled.
- Three groupings of caribou are described for the Caribou Local and Regional Study Areas: barren-ground caribou (*Rangifer tarandus groenlandicus*); coastal caribou (*R. t. caribou*), which is a forest-tundra migratory woodland caribou ecotype; and summer resident caribou (summer residents), a type of woodland caribou whose exact range and herd association is uncertain.
- Caribou are important to resource users, especially the KCNs, and are harvested by residents and non-residents of the Keeyask region.
- Caribou were evaluated on the condition of indicators including physical habitat loss, intactness (where the two main drivers are fire and anthropogenic disturbance), linear feature density, and gray wolf density. See intactness Summary for detail concerning linear feature density.

CARIBOU

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Effects since hydroelectric development began on caribou have included habitat loss and alteration, changes in habitat fragmentation, changes in herd size, migration routes, and river crossings. Islands in lakes and peatland complexes have changed since hydroelectric development. Although the number of islands in lakes has increased above historical levels, the quality and quantity of habitat change is uncertain. Calving in the Regional Study Area was noted since the return of caribou in the 1990s.
- Field studies from 2001 to 2011 indicate that large numbers of caribou occur infrequently in the Local Study Area, but are more common in the Regional Study Area.
- Signs of caribou activity were very common in the Local Study Area in summer, and usually sparse in winter. Calving habitat including islands in lakes and peatland habitat is important today. Extreme annual variability in the number of animals was observed in winter, along with the use of winter habitat due to differences in migration routes and the timing of movements.
- Summer resident caribou habitat intactness estimates in the Regional Study Area are above the 65% Environment Canada benchmark.
- Gray wolf density in the region is low (1.4 wolves/1000km^2).

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Habitat loss and alteration of food and cover, and fragmentation related to the development of Project infrastructure. Short-term effects from sensory disturbances (blasting, machinery, and people).
- Potential increases in predation, harvest by the workforce, and wildlife-vehicle collisions due to increased traffic on the access roads.

OPERATION

- Habitat loss and alteration due to flooding, shoreline erosion, peatland disintegration, and reservoir-related groundwater and edge effects.
- Project-related disturbances due to sensory effects from traffic, potential changes in river crossings due to altered ice conditions, and reduced movements along shorelines due to woody debris.
- Access and mortality effects from potential increases in predation, harvest by resource users and potential wildlife-vehicle collisions due to increased traffic on the access roads.
- The total area of caribou calving habitat alteration is negligible compared to regional availability.
- Summer resident caribou intactness estimates for undisturbed habitat in the Regional Study Area with Keeyask will remain above the 65% Environment Canada benchmark.
- Gray wolf will continue to affect local and regional caribou populations, but wolf density is not expected to change and therefore, project effects related to predators should remain small.

PROPOSED MITIGATION

- Potential effects of specific construction activities will be mitigated through:
  - avoiding caribou calving complexes and reduce habitat loss.
  - potential future calving islands in the reservoir will be protected from forebay clearing disturbances.
  - blasting will be minimized to the extent practicable from May 15 to June 30, a Construction Access Management Plan will be implemented to reduce the effects of increased access to the Local Study Area.
  - Gates will be added to the north and south dykes, Firearms will be prohibited in camps and at work sites to reduce mortality due to hunting during construction.
  - Warning signs will be placed along the access roads near caribou travel corridors and high-quality habitats to reduce the potential of wildlife-vehicle collisions.
  - Fire prevention measures will be employed in remote working environments to minimize the risk of habitat loss for caribou.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Small	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Calving habitat loss in area will be small (<1%) with the Project and future projects and the Environment Canada benchmark of 65% undisturbed habitat will remain in the Caribou Regional Study Area and beyond. Changes to intactness and mortality are negligible, altered movements and distribution are likely limited to habitat near the Project and future Projects/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 for the Project and reasonably foreseeable future projects. Cumulative effects are considered regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

MOOSE

Why Moose Was Selected As a VEC

- Moose was selected as a VEC because moose are very important to people, there is potential for Project effects, they are key for ecosystem function, have a regulatory requirement, and because suitable information could be compiled.
- Moose (*Alces alces*) are a large bodied ungulate that ranges throughout northern Manitoba.
- Moose are important to resource users, especially the KCNs, and are harvested by residents and non-residents of the Keeyask region.
- Moose were evaluated on the condition of indicators including physical habitat loss, harvest, and gray wolf density.

MOOSE

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Historically moose were distributed throughout the Regional Study Area, possibly at lower densities. Caribou were harvested more frequently in the past than moose.
- Following hydroelectric development, their presence on the shores of Split Lake was diminished because of shoreline habitat loss and fluctuating water levels. Moose moved inland.
- In the mid-1990s, the population was estimated at 1,639 moose, and today, moose are either stable or have increased. The current moose population is estimated at 2,600 animals. Licensed harvest is managed by the Province, and domestic harvest is very important to the KCNs.
- Although shoreline habitat was altered, moose habitat is still prevalent throughout the Regional Study Area in burns, and along creeks and lakeshores that provide food and cover. Moose calving islands on lakes and peatland complexes is also important.
- Gray wolf density in the region today is low (1.4 wolves/1000km^2) because moose density is low.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Less than 1% of moose habitat in the Regional Study Area is expected to be lost during construction, and therefore, the effect on moose will likely be negligible to small.
- Fragmentation of habitat by the access roads could affect the moose population in the Local Study Area; however, moose are often found along highways and roads where edge habitat is preferred. Moose are adapted to survival in edge habitats, and overall intactness is unlikely to change much with the Project.

OPERATION

- Effects on moose will likely include further alteration of habitat in the Local Study Area and the permanent loss of habitat in the reservoir and along shorelines similar to Stephens Lake.
- 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.
- Access effects from potential increases in predation, hunting mortality and increased potential for wildlife-vehicle collisions are limited to the Local Study Area. The Offsetting Programs redistribute harvest pressure from the Local Study Area to the Split Lake Resource Management Area.
- Gray wolf will continue to affect local and regional moose populations, but wolf density is not expected to change and therefore, project effects related to predators should remain small.

PROPOSED MITIGATION

- A Moose Harvest Sustainability Plan has been prepared by the CNP to guide the management of their Adverse Effects Agreement Access Programs and to ensure the sustainability of the moose population in the Split Lake Resource Management Area. Roadside ditches will be rehabilitated with native plants with low quality food values for moose where practicable, to minimize attraction of moose to the road and the risk of wildlife-vehicle collisions and harvest opportunities.
- Information about wildlife awareness will be provided for workers to reduce the risk of wildlife-vehicle collisions.
- Firearms will be prohibited in camps and at work sites to reduce mortality due to hunting during construction.
- Except for existing resource-use trails (see Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of habitat disturbance, invasive plant spreading, accidental fires and access-related effects.
- Mitigation for wetland function will benefit moose through the development of wetlands in the Local Study Area and could off-set some of the losses in habitat for moose; and Fire control precautions such as roving fire patrols and fire detection sensors in the GS construction area, maintaining fire suppression equipment in the generating station area, water trucks, as well as fire procedure manuals and emergency response crews will benefit moose.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Medium	Medium	Medium to Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

A small amount of habitat loss/alteration (<1%), sensory disturbance and increased predation, harvest and vehicle mortality is expected with the Project. Future projects may increase habitat loss and mortality with increased human presence and access. Predator density should continue to remain low if there is no change in moose biomass. Overall, and considering CNP Moose Harvest Sustainability Plan, effects are expected to be negligible to small and regionally acceptable.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

OVERVIEW OF SOCIO-ECONOMIC, RESOURCE USE AND HERITAGE RESOURCES CUMULATIVE EFFECTS ASSESSMENT

The Socio-Economic VECs that were considered for the cumulative effects assessment are those VECs with an adverse effect from the Project (as assessed in Chapter 6 of the Response to EIS Guidelines) that overlap spatially and temporally with effects from past/current projects or activities identified in Table 7-1 [of Chapter 7 in the Response to EIS Guidelines], and/or with future projects and activities identified in Table 7-2 [of the Response to EIS Guidelines]. Those that were either positive (economy VECs) or neutral (resource use VECs) were not considered for CEA.

The VECs considered for cumulative effects assessment are:

- Housing (construction phase);
- Infrastructure and Services (construction phase);
- Transportation Infrastructure (construction phase);
- Mercury and Human Health1 (operation phase);
- Community Health (construction phase);
- Public Safety and Worker Interaction (construction phase);
- Travel, Access and Safety (construction phase);
- Culture and Spirituality (construction and operation phases); and
- The Way the Landscape Looks (aesthetics) (construction and operation phases).

The spatial scope related to socio-economic VECs focused on a Local Study Area and a Regional Study Area, with the majority of effects within the Local Study Area.

The socio-economic Local Study Area (see Map 1-1) focused on the four KCNs communities of TCN, WLFN, YFFN and FLCN. These communities are affected by the Project through the following pathways of effect (Socio-Economic Supporting Volume, Section 1.3 pg. 1-18).

- Physical/biophysical effects on resource use/ traditional use areas and heritage resources;
- Employment and business effects;
- Construction worker-interaction within the partners' home communities; and
- Investment income (KCNs).

In addition, the Town of Gillam and the City of Thompson are included in the Local Study Area for the following reasons:

- The Town of Gillam is Manitoba Hydro's northern operations base and operational staff would be located in Gillam. Gillam is also home to FLCN Members living both on- and off-reserve;

[1] Included due to adverse effect; however, there is no spatial overlap with past, current or future projects.

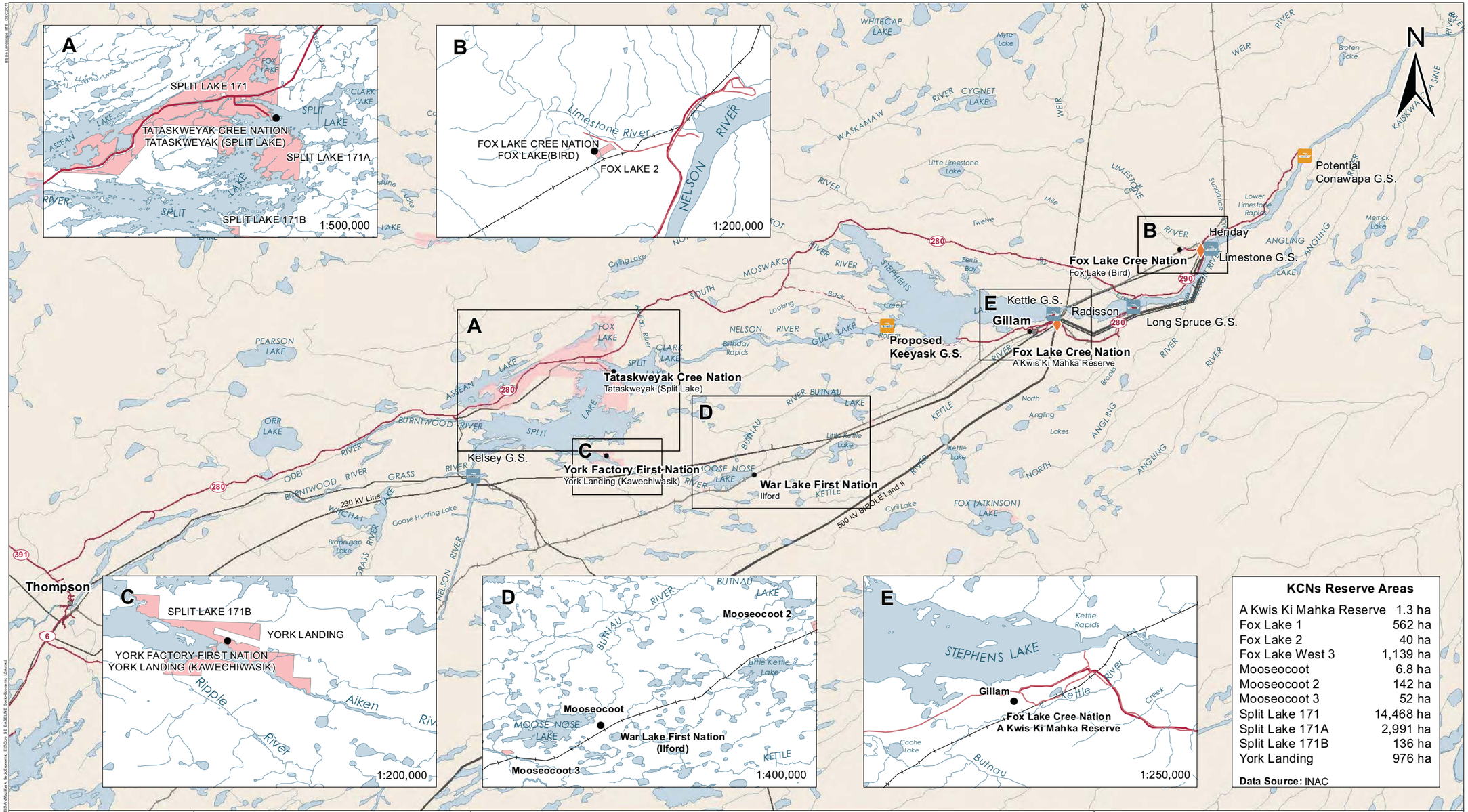
- Construction worker interaction, since some construction workers are likely to visit Gillam and Thompson and possibly Split Lake;
- Transportation/traffic for construction equipment, materials and people would flow primarily through Thompson, with some via Gillam; and
- The City of Thompson is the regional centre for the Project and as such, can be expected to experience increased expenditures on retail goods and services, as well as some increased demand for commercial and industrial services, and on regional health and social services.

See page 1-19 of the Response to EIS Guidelines for a description of the Regional Study Area which is primarily pertinent to economy VECs that were not considered for cumulative effects assessment.

The Resource Use Regional Study Area included the Split Lake, Fox Lake, York Factory Resource Management Areas, including Trapline 13, comprising over 50,000 km^2. The Resource Use Local Study Area included the region within Traplines 07, 09, 15 and 25 bounded in the northwest by PR 280 and the rail line to the southeast and encompassing the Clark Lake and the town of Gillam (see Maps 1-1 and 1-2).

The Heritage Resources Regional Study Area included portions of the ancestral and traditional lands of the KCNs…to provide context within which heritage resources of discrete cultural affiliation and chronology were understood. The Heritage Resources Local Study Area includes the region that included Clark, Carscadden, Moose Nose, Stephens, Fox and Kettle lakes and Landing River. The Heritage Resources Assessment also included a Core Study Area (Map 1-42). The Core Study Area was defined by the hydraulic zone of influence and actual footprint of the generating station, borrow areas, quarries, dykes and access roads associated with the Project.

In most cases the cumulative effects assessments considered effects from the prehydroelectric period (beginning in the late 1950's and 1960s) to a future condition including reasonable foreseeable future projects (typically extending to the height of construction of the proposed Conawapa GS). Where available, local and Aboriginal traditional knowledge, and in some cases the archaeological record, was included to provide a broader view of historical conditions and future concerns. For example Heritage resources studies for the Project provided evidence of an archaeological record that extends to *ca.* 4,800 BP. In other cases, such as infrastructure and services, historical information is not included in the EIS due to lack of information.



KCNs Reserve Areas

A Kwis Ki Mahka Reserve	1.3 ha
Fox Lake 1	562 ha
Fox Lake 2	40 ha
Fox Lake West 3	1,139 ha
Mooseocoot	6.8 ha
Mooseocoot 2	142 ha
Mooseocoot 3	52 ha
Split Lake 171	14,468 ha
Split Lake 171A	2,991 ha
Split Lake 171B	136 ha
York Landing	976 ha

Data Source: INAC

KEEYASK Hydropower Limited Partnership

DATA SOURCE: Manitoba Hydro, NTS, Stantec Consulting Ltd.

CREATED BY: Stantec Consulting Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	16-DEC-10	18-MAY-12
0 8.5 17 Kilometres / 0 7 14 Miles	VERSION NO: 1.0	QA/QC: GS/YYY/MWZ

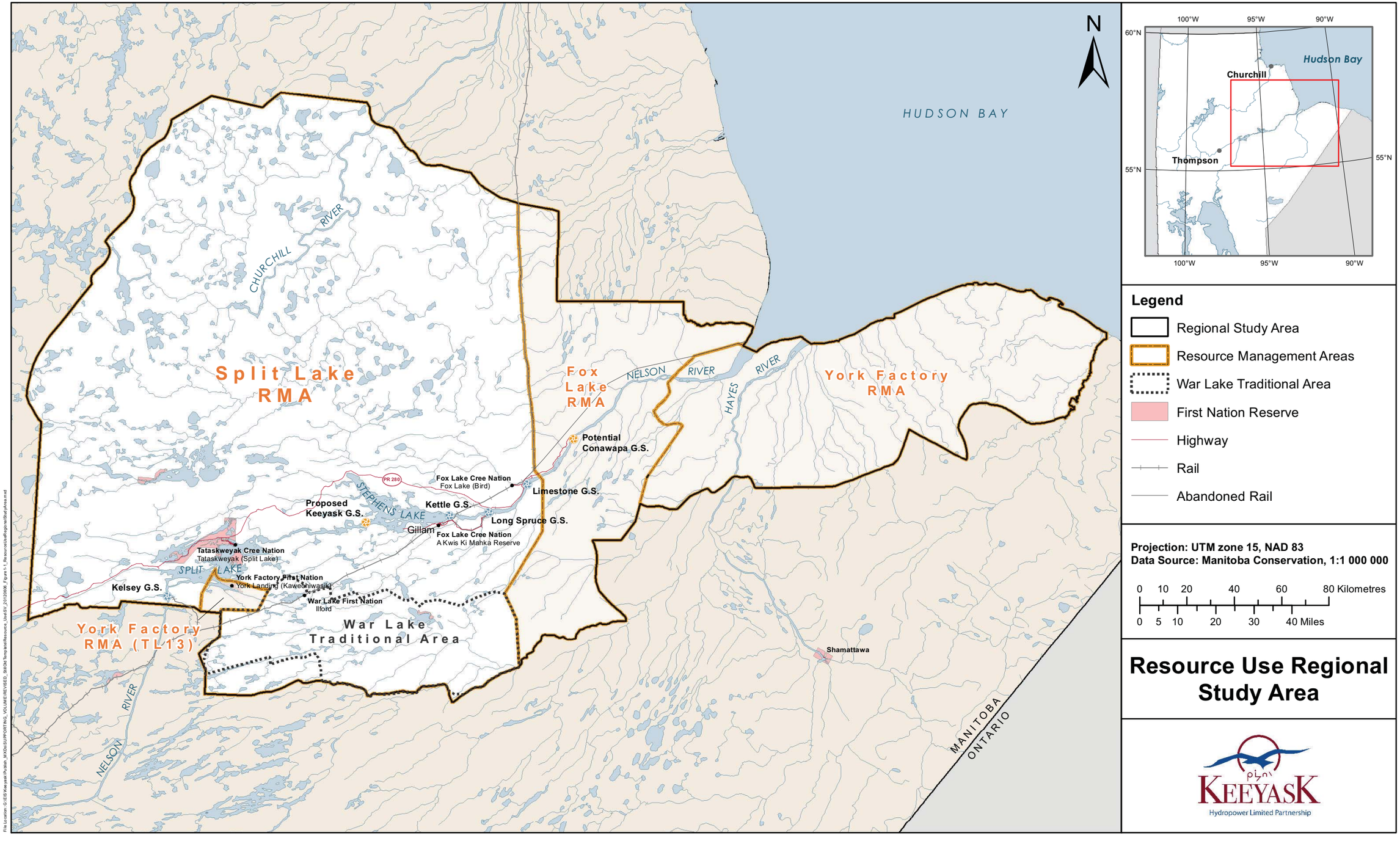
Legend

- Generating Station (Planned)
- Generating Station (Existing)
- Converter Station
- First Nation Community
- Town/City
- Highway
- Proposed Access Road
- Rail
- Existing Transmission Line
- First Nation Reserve
- Waterbody

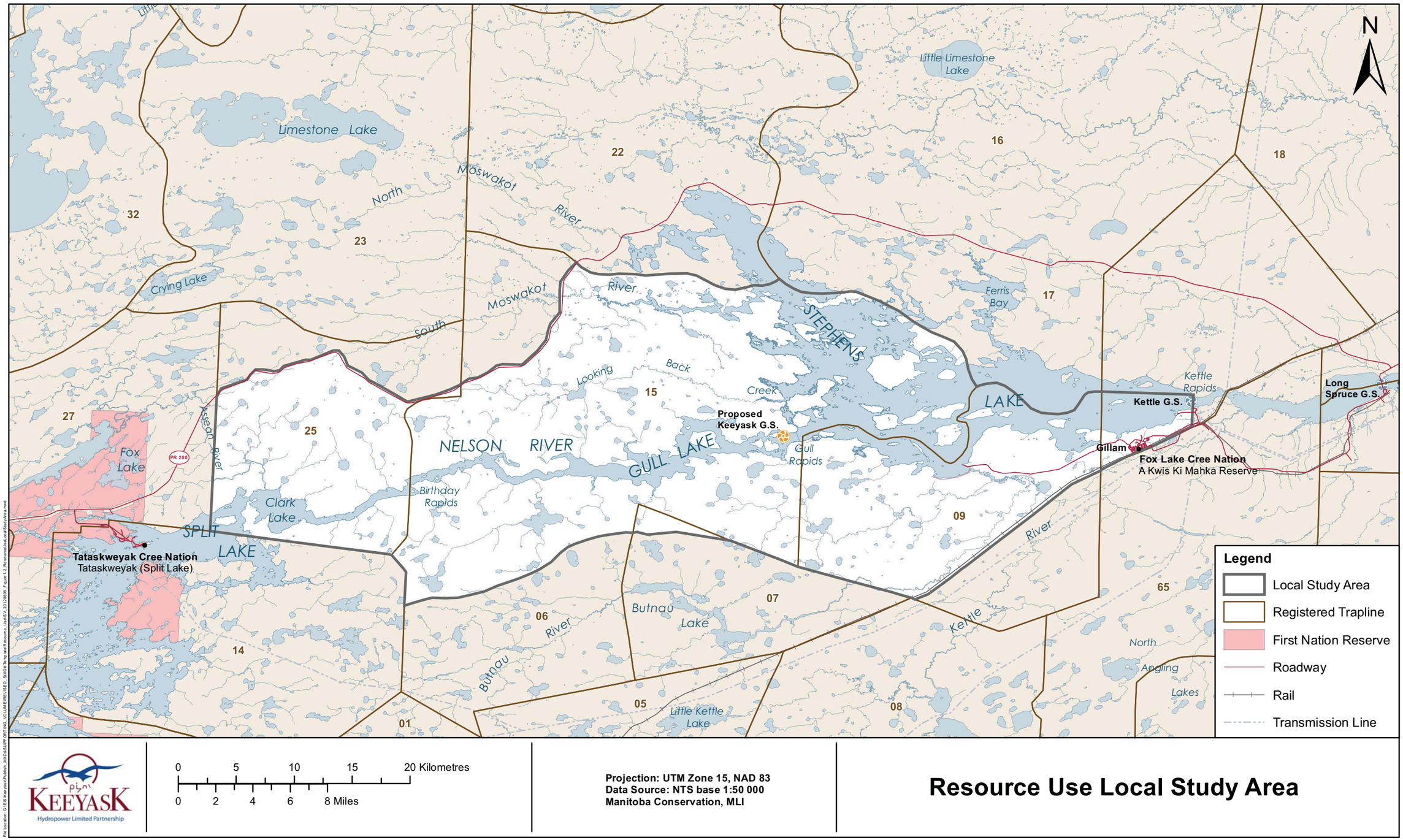
Communities depicted on the map are included in the Socio-Economic Local Study Area

Socio-Economic Local Study Area

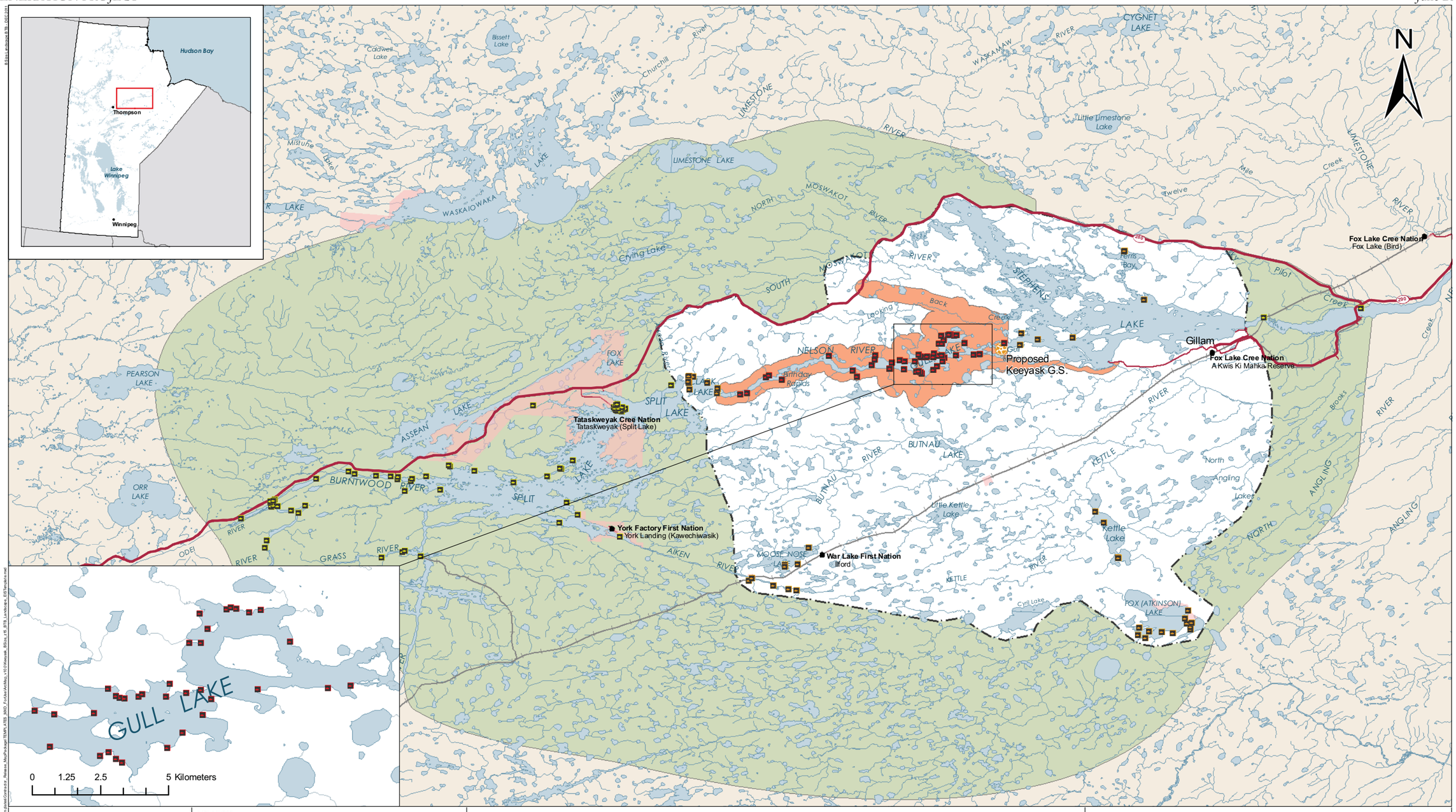
Map 1-1


HUDSON BAY
N
Split Lake RMA
Fox Lake RMA
York Factory RMA
York Factory RMA (TL13)
War Lake Traditional Area
CHURCHILL RIVER
NELSON RIVER
HAYES RIVER
STEPHENS LAKE
SPLIT LAKE
Potential Conawapa G.S.
Limestone G.S.
Kettle G.S.
Long Spruce G.S.
Proposed Keeyask G.S.
Kelsey G.S.
Gillam
Fox Lake Cree Nation
Fox Lake (Bird)
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Tataskweyak Cree Nation
Tataskweyak (Split Lake)
York Factory First Nation
York Landing (Kaweechiwasihk)
War Lake First Nation
Ilford
PR 280
Shamattawa
MANITOBA
ONTARIO
100°W
95°W
90°W
60°N
55°N
Hudson Bay
Churchill
Thompson
Legend
Regional Study Area
Resource Management Areas
War Lake Traditional Area
First Nation Reserve
Highway
Rail
Abandoned Rail
Projection: UTM zone 15, NAD 83
Data Source: Manitoba Conservation, 1:1 000 000
0 10 20 40 60 80 Kilometres
0 5 10 20 30 40 Miles
Resource Use Regional Study Area
KEEYASK
Hydropower Limited Partnership

Map 1-1


N
Limestone Lake
Little Limestone Lake
North Moswakot River
Moswakot River
South Moswakot River
Looking Back Creek
Crying Lake
Fox Lake
Asseau River
PR 280
NELSON RIVER
GULL LAKE
STEPHENS LAKE
Ferris Bay
Kettle Rapids
Proposed Keeyask G.S.
Gull Rapids
Kettle G.S.
Long Spruce G.S.
Gillam
Fox Lake Cree Nation
A Kwis Ki Mahka Reserve
Birthday Rapids
Clark Lake
SPLIT LAKE
Tataskweyak Cree Nation
Tataskweyak (Split Lake)
Butnau River
Butnau Lake
Little Kettle Lake
Kettle River
North Angling Lakes
22
16
18
32
23
17
27
25
15
09
14
06
07
65
05
08
01
Legend
Local Study Area
Registered Trapline
First Nation Reserve
Roadway
Rail
Transmission Line
0 5 10 15 20 Kilometres
0 2 4 6 8 Miles
Projection: UTM Zone 15, NAD 83
Data Source: NTS base 1:50 000
Manitoba Conservation, MLI
Resource Use Local Study Area

Map 1-2



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro
Historic Resources Branch, Culture, Heritage and Tourism

CREATED BY:
Northern Lights Heritage Services Inc.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	24-MAY-12	24-MAY-12
0 5 10 Kilometres / 0 4 8 Miles	VERSION NO: 1.0	QA/QC: VPP/MKW/ZZZ

Legend

- Archaeological Site (Core), 50
- Archaeological Site (Local), 100
- Archaeological Site (Regional), 162
- Generating Station (Planned)
- First Nation Community
- Town
- Highway
- Rail
- Core Study Area
- Local Study Area
- Regional Study Area
- First Nation Reserve

Note: the number of archaeological sites in each Study Area is cumulative and incorporates sub-regions.

Heritage Resources Study Areas

with Registered Archaeological Sites

Map 1-1
SOCIO-ECONOMIC ENVIRONMENT, RESOURCE USE AND HERITAGE RESOURCES
HERITAGE RESOURCES

HOUSING

Why Housing Was Selected As a VEC

- Housing is one of the basic necessities of life. The housing VEC considers housing types, housing conditions and whether communities face a shortage of housing. Housing also includes temporary accommodations.
- A rapidly growing population and limited availability of on-reserve housing are driving the need for more housing in many areas; a trend expected to continue for some time.[3] There is limited capacity in most communities to handle growth in housing demand, including the ability to accommodate KCNs community Members who may wish to return to their home reserve.
- Given the proximity of KCN communities to the Project, and the potential for in-migration associated with the Project, this VEC was considered important by Manitoba Hydro and the KCNs.

3: Steffler 2008; CMHC 2007.

HOUSING

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Affordable housing for First Nation residents is an ongoing concern in northern reserve communities in Canada. Overcrowding and difficult conditions in which to construct and maintain housing make housing a challenge to provide to residents.[4]
- The average number of people living in houses in KCNs communities is between 2.6 and 4.9, higher than the Canadian national average of 2.6 people per household.[5] Some KCN Members interviewed suggest that the number is much higher (6-12 people per home).[6]
- It is expected that the current shortage of housing units is likely to continue into the near future under existing conditions.
- The majority of homes in Gillam are owned by Manitoba Hydro and rented to local employees.
- Housing capacity is at maximum in Gillam and waiting list is currently full.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Limited new Project-related population means it is expected that there will be little new demand for housing in the KCNs communities as a result of the Project and existing housing capacity issues will remain largely unchanged.
- Some KCNs communities may experience some short-term crowding if KCNs Project workers choose to visit and stay with family/friends during their rotation time off.
- Demand for temporary accommodation in nearby communities, especially Gillam and Thompson, could increase.

OPERATION

- The addition of 49 permanent jobs during the operation phase will increase demand for housing in Gillam.
- The Project is predicted to have little effect on housing in Split Lake, York Landing and War Lake since there are no substantial population changes anticipated in these communities. Some FLCN Members may return to Gillam and to a lesser extent to Bird.

PROPOSED MITIGATION

- Construction workers will be housed in a construction camp.
- Manitoba Hydro has plans to upgrade and build houses in Gillam over the next 10 years for staff employed on current and future projects in the region and has recently established an alternative housing program to address barriers to home ownership in Gillam.
- Income earned by the KCNs through their project investment could be used to invest in community housing.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

	Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
KCN Communities	Adverse	No Effect	Small	No Effect	Medium	No Effect	Short	Neutral
Gillam/ Thompson	Adverse	Neutral	Small	Neutral	Medium	Neutral	Short	Neutral

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

4: CMHC 2008
5: Statistics Canada data
6: (TCN 2010c; FLCN Key Person Interview [KPI] Program 2009-2010; YFFN KPI Program 2009-2010)

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

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, although the Gillam Redevelopment program will offset some of that demand. Existing housing shortages in KCNs 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.

INFRASTRUCTURE & SERVICES

Why Infrastructure and Services Was Selected as a VEC

- A wide range of essential human needs are fulfilled by infrastructure and services in communities. For this assessment, infrastructure is considered to include:
  - public infrastructure (such as potable water treatment facilities, waste handling facilities, roads, airports, rail, electricity and communications);
  - public facilities (such as schools, health centres, recreation facilities, government offices); and
  - public services (such as education, health care, recreation, day care, social services and other government services).

INFRASTRUCTURE & SERVICES

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- In many northern communities the availability of infrastructure and services is often hampered by limited financial resources. This is often coupled with rapid population growth and increasing demand for services.
- Schools: Overcrowding and lack of space is a challenge in some KCNs communities. In three of the four KCNs communities, students must leave their home community to complete high school. Given the young and growing on-reserve populations in the KCNs communities, school capacity is expected to be a concern in the future.
- Childcare: In most KCNs communities, child care centres are already operating at capacity, and cannot accept more children. In 2011, a new childcare centre was built in Gillam to address capacity concerns.
- Health Care Facilities: Facilities and services offered in KCNs communities are described as inadequate and underfunded. TCN, WLFN and YFFN Members must often travel to Thompson to access services, while FLCN Members obtain their services in Gillam. Gillam has a hospital and sufficient space to handle current patient volume.
- Social Services: The Awasis Agency of northern Manitoba provides child and family services to the KCNs communities, as well as to Members living in Gillam and Thompson.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Both Gillam and Split Lake may experience effects on infrastructure and services associated with short-term influxes of workers, although the extent of this is anticipated to be greater in Gillam due to the broader range of amenities provided. During project construction, lifestyle changes and worker interaction may increase demand on community-run social services that are already at capacity in the KCNs communities, resulting in increased demands placed on childcare, health care facilities and other social services.
- KCNs communities have also expressed concern that the Project may draw skilled individuals away from local jobs in the community (e.g., social services, construction, local government) to work at the Project's construction camp, thereby reducing in-community capacity in these areas.
- Each of the KCNs has negotiated its own Adverse Effects Agreement with Manitoba Hydro. These agreements and equity income from project investment have the potential to improve community infrastructure and services, including things like new infrastructure and social services.

OPERATION

- In Gillam, infrastructure and services already experiencing capacity challenges may be placed under additional stress as a result of population growth associated with the operation phase. Effects on water and waste management, emergency services, social services and daycare facilities are of particular concern.

PROPOSED MITIGATION

- Ongoing communication with local service providers to allow for effective and timely planning of service delivery, including with the RCMP.
- The Gillam Land Use Planning Process will consider increased need for infrastructure services and the town is expected to respond to this increased demand.
- Emergency medical and ambulance services, as well as a health clinic, will be available for workers at the camp. The Partnership is also working with the Northern Regional Health Authority to secure an on-site public health care professional, and to inform and provide support for implementation of its five-year strategic plan.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

	Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
KCN Communities	Adverse	No Effect	Small to Moderate	No Effect	Medium	No Effect	Short	No Effect
Gillam	Adverse	Adverse	Small	Small	Small	Small	Short	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	YES	NO
CONAWAPA	YES	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

It is anticipated that the influx of non-local construction workers from future projects will add to the pressure on community-based infrastructure and services, particularly emergency (i.e. RCMP) and social services in Gillam. 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. Collaborative mitigation measures are in place to address these concerns.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

8: CNP 2010c.

TRANSPORTATION INFRASTRUCTURE

Why Transportation Infrastructure Was Selected as a VEC

- The transportation infrastructure and Services VEC examined the effect from increased use of rail, air and road networks related to the transportation of people, equipment and material to the Project site.

TRANSPORTATION INFRASTRUCTURE

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The three principal all-weather roads to be used during construction of the Project are PTH 6, PR 391 and PR 280. PR 391 connects Thompson with PR 280, which in turn is used to access the communities of Split Lake, Fox Lake (Bird) and Gillam. PR 280 is a two-lane, undivided, gravel roadway and is designated as a secondary arterial by Manitoba Infrastructure and Transportation (MIT). PR 280 has been described by many KCNs users as poor in condition and hard on vehicles, with dangerous visibility conditions due to dust. Upgrades to PR 280 between Thompson and Gillam have been initiated by MIT as part of its 2012 infrastructure projects.
- The communities of War Lake First Nation and York Landing have no permanent road access but can be accessed by a winter road that connects the communities to PR 280 and is in use from mid-January to mid-April, depending on weather conditions.
- Members of WLFN and YFFN are concerned about not having all-weather road access to their communities, resulting in feelings of isolation and higher costs of goods and services (especially during freeze-up and break-up of the lake). YFFN have expressed concerns about the reliability and safety of the winter road, and have noted that accessing the community, particularly in the shoulder seasons where neither the winter road nor the ferry is capable of operating, is a major concern.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

Gillam: There will be increased vehicular traffic from construction workers and contractors and increased wear on the road networks, including PR 280.

Both Gillam and Thompson will experience increased air travel by construction workers and contractors en route to the Project site. Thompson will experience increased use of the railway and siding for a small portion of equipment shipped to site.

Thompson and area: there will be increased use of the city road network within Thompson.

OPERATION

- Once the Project is commissioned, MIT will re-route PR 280. This will create a shorter route between the Project site and Gillam and between Thompson and Gillam. The road will be transferred from a private road to the provincial road system. At the same time, MIT plans to change the northeastern section of PR 280 to a departmental road. This will reduce travel time between Gillam and Thompson by about an hour.
- The operation of the Project is not expected to affect the water level on Clark Lake or Split Lake during open water conditions; however, YFFN have expressed skepticism with predicted water level calculations for Clark Lake and Split Lake and are concerned that future water fluctuations on Split Lake may affect ferry service and landing sites, as well as the winter road on Split Lake." No change to existing open water levels as a result of the project on Split Lake is a fundamental feature of the JKDA.

PROPOSED MITIGATION

- No mitigation is required due to the upgrades to PR 280.
- During the operation phase, monitoring of water levels at Split Lake will occur; monitoring of ferry landing sites and the Split Lake winter road will continue to be done by MIT.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	No Effect	Small	No Effect	Medium to Large	No Effect	Short	No Effect

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	YES	NO
CONAWAPA	YES	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

With future projects and activities traffic is expected to increase sizably; however, due to road and service upgrades the significance of effects is not expected to increase.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

MERCURY AND HEALTH

Why Mercury in Health Was Selected As a VEC

- The Mercury and Health VEC considers the potential effect of methylmercury (mercury) on human health resulting from the Project.
- This VEC was identified, in part, due to past experience of the KCNs and Manitoba Hydro with the mercury effects of hydroelectric development. Once the Project is in operation, mercury is expected to increase in Gull and Stephens lakes.
- Canadian Environmental Assessment Agency Final Environmental Impact Statement Guidelines call for examination of health issues and of mercury in fish and wildlife (the pathway to human health through the food chain).

MERCURY AND HEALTH

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Based on previous experience with hydroelectric developments, including testing through the Federal Ecological Monitoring Program, the KCNs became aware of the issue of mercury and human health.
- Publicly available results from Health Canada testing between 1976 and 1990, which included York Landing and Split Lake, indicated that approximately 98% of residents who were tested fell within the "normal" range. The remainder of those tested fell within concentrations at increasing risk range. Women of childbearing age from Split Lake and York Landing fell within the normal range.
- Mercury levels in fish species in Stephens Lake are currently at levels that fall within the range of those seen in several off-system lakes in the Keeyask area.

POTENTIAL PROJECT EFFECTS

- Increased methylmercury levels, especially in jackfish and pickerel in Gull Lake and to a lesser extent in Stephens Lake, are expected during the period after impoundment. These levels are estimated to peak about 3 to 7 years after impoundment and then return to current levels over about 30 years.
- Risks from consumption are estimated to be acceptable with mitigation.
- No unacceptable health risks due to mercury are posed by drinking, bathing in or swimming in Gull and Stephens Lake.
- TCN and WLFN established a Healthy Food Fish Program and Community Fish Program under their respective AEAs. YFFN and FLCN also have off-system resource use programs in their AEAs to address the concern with methylmercury in fish.

PROPOSED MITIGATION

- In addition to the KCNs' AEA programs the following measures have been put in place:
  - Monitoring of mercury in fish under the Aquatic Effects Monitoring Plan.
  - Voluntary collection of samples of wild game, waterfowl and plants for mercury testing to confirm that mercury concentration remain acceptable for domestic consumption under the Terrestrial Environment Monitoring Plan.
  - Preparation of a risk communication strategy for the KCNs, Gillam and other users of affected lakes, including communication products and a monitoring program.
  - Communication of mercury monitoring results as they become available.
  - Completion of the Human Health Risk Assessment that will be updated every five years after peak mercury levels are reached to determine if adjustments can be made to consumption recommendations.
  - Liaison between the Project Monitoring Advisory Committee and provincial and federal health authorities and Manitoba Conservation and Water Stewardship regarding preparation of consumption recommendations for fish from Gull and Stephens lakes.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
No Effect	Adverse	No Effect	Moderate	No Effect	Medium	No Effect	Medium

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	NO	NO
BIPOLE III	NO	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

There is no spatial overlap between effects on mercury and health from the Keeyask Project and effects of other relevant future projects.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

COMMUNITY HEALTH

Why Community Health Was Selected As a VEC

- Community health goes beyond the simple absence of disease and includes a full understanding of a community's social, physical and economic environments as well as individual factors that contribute to overall health. Project effects on health associated with mercury and human health, public safety and travel safety are treated as separate VECs in this assessment. Other determinants of health (e.g., employment, education, income) are also separate VECs.
- The KCNs understand community health through the Cree concept of living a good and honourable life or *mino-pimatisiwin*. From a Cree perspective, health has as much to do with social relations, land and cultural identity as it does with individual physiology.[9]
- Community health represents a socio-economic VEC that is highly valued by the KCNs, Manitoba Hydro and government departments.

9: (Adelson 2000).

COMMUNITY HEALTH

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- *Mino-pimatisiwin* has strong ties to people's ability to pursue activities on the land. Traditional foods, which have sustained communities over the centuries, are acknowledged today as providing a better diet than typically is provided from store-bought food.[10] The ties between health and well-being and the land have been experienced first-hand by the KCNs, who indicate that the advent of hydroelectric development in northern Manitoba resulted in profound changes on peoples' abilities to pursue traditional activities on the land.
- The KCNs demonstrate the following trends with respect to selected indicators:
  - Diabetes among KCNs Members has increased dramatically since the mid 1980s, with a 637% increase in the number of people treated between 1984 and 2006, the highest rate of change when compared to BRHA and Manitoba First Nations on-reserve data.
  - Potential years of life lost is a measure that emphasizes causes of death that tend to be more common among younger persons, such as injuries and inherited health issues. For the KCNs, injury and poisoning, accounted for 2,106 or approximately 52% of all PYLL between 1980 and 2005.
  - Mental health disorders among all KCNs residents increased markedly since the mid 1980s. This rate of change is higher than for the BRHA but lower than for Manitoba First Nations on-reserve population.
  - KCNs have all expressed concerns about addiction-related issues in their communities.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION

- Since none of the communities use Gull Lake as their drinking water source, there are no direct effects on health related to water quality from this source. Drinking water at the camp will undergo appropriate water treatment as per regulations.
- Increased employment income could have positive effects on the level of living or could have adverse effects if income is used unwisely.
- Increased income may result in increased opportunity for drug and alcohol use and associated gang activity. These could lead to an increase in violence.
- There are effects of worker interaction, including potential increases in sexually transmitted infections.
- The KCNs' AEAs provide the opportunity to increase access to country foods. For those people participating in the harvesting, the ability to spend more time on the land undertaking traditional pursuits also could have positive benefits to health and wellness.
- KCNs Members have expressed worry about the impending changes expected in their environment, as well as skepticism and mistrust of the predicted changes. This could cause an increase in anxiety and have potential adverse indirect effects on health.

OPERATION

- Equity income can be used to provide infrastructure and services in the communities, having an overall positive effect on community health.

PROPOSED MITIGATION

- Programs noted in each of the KCNs' AEAs.
- Counselling, including addictions counselling, and family support services through the employee retention and support services contract and emergency medical and ambulance services
- On-site health care provision, including a health clinic, onsite public healthcare professional (under discussion with Northern Regional Health Authority) responsible for provisional and/or referral to health promotion and risk management programming (including sexually transmitted diseases, if required), and 24/7 emergency medical and ambulance services.
- On-going communication between the Partnership and local service providers (*e.g.*, Awasis, Northern Health Region, NNADAP, RCMP) to allow for timely and effective planning of support services.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Positive	Small	Small	Medium	Medium	Medium	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	YES	NO
CONAWAPA	YES	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

Effects on community health services are expected to be adverse during construction of the Project due to potential increased demand. These effects are expected to increase with the construction of future projects and the presence of a larger workforce in the region, but be managed through ongoing collaboration with service-providers and measures at camp.

Operational phase employment on Keeyask and other future projects and increased population in Gillam could indirectly increase community health issues.

Ongoing planning with the Northern Regional Health Authority should moderate effects such that adverse indirect cumulative effects will be small to negligible during operation phase.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

10: CINE 2006

PUBLIC SAFETY AND WORKER INTERACTION

Why Public Safety and Worker Interaction Was Selected As a VEC

- Public safety refers to the overall prevention and protection of people from issues that affect their personal and collective safety and security (e.g., acts or activities that may cause harm). As a socio-economic VEC, the focus of public safety and worker interaction is analysis of the effects related to interaction between non-local Project workers and local residents.
- Interaction with non-local construction workers is of particular concern to local Aboriginal people, especially Fox Lake Cree Nation, because of their negative experiences associated with past hydroelectric developments in the Gillam area.

PUBLIC SAFETY AND WORKER INTERACTION

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- KCNs' community residents have expressed three main concerns about safety in their communities: misuse of alcohol, safety-related concerns related to the lack of recreation opportunities and options for youth, and the accelerated rate at which new issues can become apparent in a community (e.g., the availability of illegal hard drugs).
- The KCNs' experiences with past hydroelectric projects, particularly for FLCN, have resulted in a long history of adverse interactions with construction workers because of their proximity to Gillam, beginning with the development of the Kettle GS in the late 1960s.
- Among the issues identified by FLCN were harassment, racist comments, enticement to alcohol and drug use, sale of drugs, physical abuse, violence, infidelity, pregnancy, and paternal abandonment.[11]
- FLCN Members typically list the impacts of the influx of workers into the Town of Gillam, as the main socio-economic impact resulting from hydroelectric development.[12]
- Given the experiences on previous hydroelectric projects and FLCN's desire to be a more recognized part of Gillam, FLCN and MH signed a Joint Statement on Harmonized Gillam Development (HGD) in 2007. This is an important foundation for addressing potential public safety issues resulting from interaction with Keeyask workers.

POTENTIAL PROJECT EFFECTS

CONSTRUCTION:

- Construction phase effects focus on two main factors: 1) the influx of non-local construction workers into a community, and 2) the availability of new disposable income for residents employed during construction that could result in the potential adverse interaction of construction workers and local community Members. The KCNs have also noted that their Members residing in Gillam and Thompson have the potential to come into contact with non-local construction workers. The total number of visits to each community is difficult to predict and the number and type of interactions during visits are not possible to forecast with any accuracy; however, given that past experiences with hydroelectric development often have been adverse, even a single incident could have a damaging effect on KCNs Members.

OPERATION

- Project effects to public safety and worker interaction during the operation phase are expected to be minimal since the number of workers involved in the operational workforce is small, workers may be a combination of KCNs Members as well as non-local people, and workers will be living in Gillam long-term and will have a stake in the community.

PROPOSED MITIGATION

- Lounge and recreational activities at the main camp.
- Cultural awareness training for all workers, including expectation of respectful behaviour on-site and in neighbouring communities.
- Restriction of unauthorized public visits to the camps (including 24/7 security).
- Discouraging non-northern workers from bringing personal vehicles to the site and providing a shuttle service from Gillam and Thompson airports.
- Restrictions on the use of company vehicles for personal purposes.
- Provision of Camp Rules as part of Contractor's responsibility.
- Manitoba Hydro, the Town of Gillam and Fox Lake Cree Nation have established a Terms of Reference for a worker interaction committee. This Committee will include representatives from these three parties and other relevant stakeholders and service providers in the Gillam area. This Committee is intended to provide a coordinated approach to addressing worker interaction issues across all of Manitoba Hydro's projects in the vicinity of the Gillam area and will determine the best mechanism for tracking and addressing such issues and concerns in the vicinity of Gillam.
- The RCMP and Manitoba Hydro meet regularly to discuss policing matters related to the Town of Gillam, Thompson and the region. Manitoba Hydro is committed to ongoing dialogue with the RCMP so that it can make its plans based on current construction schedules and the anticipated timing of the peak workforce.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

	Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
KCN Communities	Adverse	-	Moderate	-	Medium	-	Short to Medium	Long
Thompson	Adverse	Adverse	Moderate	Small	Medium	Medium	Short to Medium	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	YES	NO
CONAWAPA	YES	NO

11: FLCN KPI Program 2009-2011
12: FLCN Evaluation Report

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

There is a potential for adverse effects during construction of the Project due to potential worker interactions. Future projects will further increase the number of non-local, temporary construction workers to Gillam, increasing the potential for adverse effects. As many as 2,300 local and non-local workers will be required at the peak of the proposed Conawapa construction.

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.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.

TRAVEL, ACCESS AND SAFETY

Why Travel, Access and Safety Were Selected as a VEC

- Travel, access and safety considers water and ice-based transportation, including the land-based trails used to access traditional resource use areas; and road travel in relation to traffic volumes, access and safety.
- The Project will affect water and ice-based travel during construction and operation.
- During construction, there will be increased vehicular traffic on PR 280 and PR 391.

TRAVEL, ACCESS AND SAFETY

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Since time immemorial, the KCNs have used the rivers and lakes of the Local Study Area as a travel corridor, as a means of communication and trade, and for gathering food and medicinal plants. Although the Nelson River was known for its swift and fierce rapids, before the river was developed as a part of Manitoba Hydro's generating system, the KCNs people from the Split Lake territory would travel back and forth between Gillam and Split Lake, and further downstream on the Nelson River. Over the course of time, certain land-based trails and paths used to access traditional resources have become travel corridors for snowmobiles and all-terrain vehicles.
- The Nelson River immediately upstream from Gull Rapids is rarely traveled by boat in the summer time, as the rapids are fast, dangerous and difficult to navigate. Historically, there were portages on both the north and south sides of the river to bypass Gull Rapids; however, due to infrequent use, these portages have become overgrown and are not currently used. Most of the downstream travel to Gull Rapids by TCN Members is by boat and snowmobile.
- A Waterways Management Program (WMP) provides clean-up and removal of debris in waterways affected by the LWR and CRD, as well as identifying other navigation hazards such as debris and deadheads.
- PR 391 and PR 280 are the main provincial roads in the Local Study Area. PR 391 experiences an Average Annual Daily Traffic ranges between 760 and 1230 vehicles, while PR 280 experiences a range of 130 to 186 vehicles daily.

POTENTIAL PROJECT EFFECTS

WATER AND ICE-BASED TRAVEL:

- Alteration of water levels and flows will restrict shoreline access and flooding within the hydraulic zone of influence, thus changing navigation and travel routes upstream of the generating station and immediately downstream in the outlet to Stephens Lake.

ROAD-BASED TRAVEL

- During construction, there will be increased vehicular traffic on PR 280 and 391, thus having the potential to affect overall safety of the public traveling on these provincial roads. During operation, PR 280 will be rerouted along the north and south access roads and across the generating station (see also Transportation Infrastructure).

PROPOSED MITIGATION

- The mitigation measures outlined in the Reservoir Clearing Plan and the Waterways Management Program include pre-flooding clearing along shorelines and areas of access; construction and maintenance of one or more safe haven cabins; installation and monitoring the condition of safe ice trails and the nature and extent of use; and a multi-purpose boat patrol to monitor waterways activities and to liaise with users of the Nelson River. Warning signs, installation of buoys, installation of an ice boom and other safety booms will warn people of the construction zone. Operational provisions include collecting floating debris; preparing reservoir depth charts and identifying safe travel routes; navigation and hazard markers; safe landing sites; and an ice monitoring and safe trails program.
- MIT is undertaking road improvements on PR 280 prior to the Project, including widening, curve shaping and grade improvements. During the operation phase, and once the Project is complete, MIT will re-route PR 280 along the north access road, across the Keeyask GS and along the south access road to Gillam. This will reduce the travel time between Thompson and Gillam by about an hour.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Positive	Small to Moderate	Small	Medium	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	NO
BIPOLE III	YES	NO
GILLAM RE-DEVELOPMENT	YES	NO
CONAWAPA	YES	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

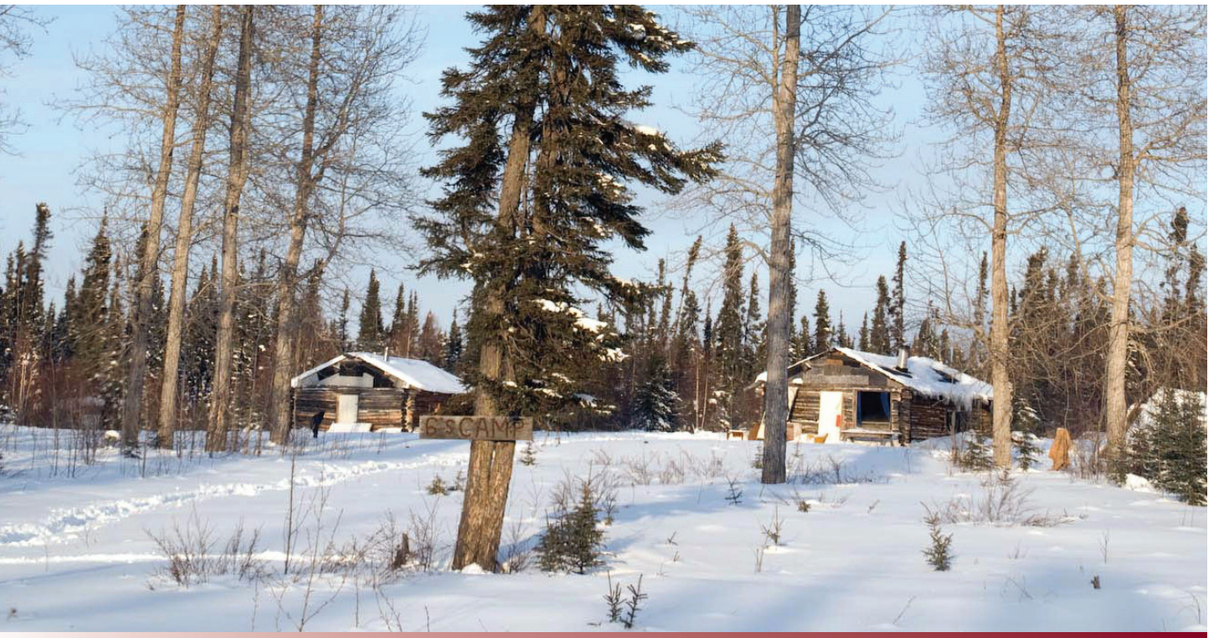
Other future projects are not expected to overlap spatially with water or ice-based travel.

In terms of road travel safety, the expected increases in traffic due to cumulative effects of the Project (during the construction phase) with other future projects may result in overall moderate to large residual effects for a short period of project overlap; however, the conclusion from the residual effects significance assessment in Chapter 6 remains unchanged.

CULTURE AND SPIRITUALITY

Why Culture and Spirituality Was Selected As a VEC

- Culture and spirituality are dynamic and interactive processes, which are commonly celebrated through the oral tradition as traditional knowledge, and are constantly being shaped and re-shaped through experience, information, knowledge and wisdom. Culture and spirituality are especially relevant to understanding the KCNs' worldview since together they represent their values, beliefs, perceptions, principles, traditions and religion that are based on Cree individual and collective history, experience and interpretation. Culture and spirituality for the KCNs inherently places them in a relationship to the land and all of nature.
- Culture and spirituality was identified in the final Environmental Impact Statement Guidelines for the Keeyask Generation Project prepared by the Canadian Environmental Assessment Agency.



CULTURE AND SPIRITUALITY

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- All four communities trace their ancestral roots to the York Factory region and self-identify as being Cree. The Cree as a people are part of *Askiy*. *Askiy* means the whole of the land, water, animals, plants, people and all other living and non-living things, including the interconnection between them (*i.e.,* all things are related). *Ininewak* culture and spirituality are part of *Askiy*.
- Culture and spirituality of the KCNs are directly affected by the history of and experience with outside influences. These interactions date as far back as historical records of the fur trade, and include factors the KCNs identify as important, including the influence of colonization and the introduction of a Christian faith, Treaty 5, construction of the railway, the establishment of the registered trapline system and eventually industrial and hydroelectric development. Each of these influences has shaped the KCNs communities, although the experience of each community is also unique.

POTENTIAL PROJECT EFFECTS

- 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 moderate and offset potential effects on culture and spirituality that are expected to be experienced.
- The following effects could occur during construction: to worldview (loss of cultural landscape, especially the falls), traditional knowledge (loss of knowledge linked to the landscape that will be changed), cultural practices (inability to access certain areas), health and wellness (change in country food diet), kinship (traditional kinship rules and obligations disrupted through employment), leisure (being away from community leisure activities while at the camp), law and order (rules at work site different than customary law) and cultural products (changes to opportunities to make cultural products).
- The following effects could occur during Project operation: worldview (questioning becoming partners), traditional knowledge (loss of knowledge related to landscape that will change), cultural practices (related to changes to physical landscape), health and wellness (increase in country foods, wilderness camps and traditional activities through AEA programs), kinship (strengthened through AEA programs), and cultural products (altered areas for obtaining resources).

PROPOSED MITIGATION

- In addition to the importance of being partners in the Project and of the cultural, access and traditional programs in the AEAs, the following additional measures are included:
  - During construction, the Employee Retention and Support Services direct negotiation contract includes cross-cultural training of construction workers, counseling for construction workers and, importantly, conducting ceremonies at key Project milestones.
  - Preparing a video of Gull Rapids and the river, including the sound of the rapids, to be available in a visitor space at the generating facility.
  - Being partners in the Project has enabled the Cree worldview to be incorporated in the planning, assessment and development of monitoring and follow-up programs and will continue to play a role in implementation of monitoring during operation.
  - Cultural training to be provided to Keeyask operation staff.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Medium	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

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 the KCNs and others to plan construct and develop future projects in a way that minimizes adverse effects as much as possible. Where appropriate, adverse effects agreements will also be negotiated.

Based on these measures and those of Keeyask, the assessment of significance is not changed when other future projects are considered.

AESTHETICS

Why Aesthetics Was Selected As a VEC

- Aesthetics provide a sense of what people consider beautiful or suitable, and may vary between individuals and cultural groups. 'The essence of aesthetics is that humans experience their surroundings with multiple senses'.[13] The KCNs, in particular, characterize aesthetics as 'the way the landscape looks.'
- Aesthetics, or the way the landscape looks, is a VEC having overall importance to people and was identified by the Canadian Environmental Assessment Agency in the Final Environmental Impact Statement Guidelines for the Project.

13: BEST 2007

AESTHETICS

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- The KCNs have strong ties to the Nelson River, and their relationship to the land is reflected in statements such as "Locations or features in the landscape, connected by routes travelled historically, act as memory tools for stories about people's relationships with their environment".[14]
- The Nelson River has been substantially altered by numerous past hydroelectric developments, beginning in the south with the Jenpeg Generating Station, and travelling downstream to the Kelsey, Kettle, Long Spruce and Limestone generating stations. For the KCNs, in particular, the area is no longer a pristine environment, it is an altered river environment.
- The Local Study Area features gently sloping terrain with lakes of various sizes scattered across the landscape. Bogs and peatlands occur throughout much of the area, and the shorelines around Gull Lake and Gull Rapids are gently sloping with rocky outcroppings in some areas.
- The appearance of the town of Gillam has changed over time, as the community evolved from a seemingly-temporary trailer town to a permanent community, housing Manitoba Hydro's northern operation headquarters and home to many Fox Lake Cree Nation Members.

POTENTIAL PROJECT EFFECTS

- Construction activities will result in physical alteration of the landscape, noise, dust, and increased human presence. Changes to the landscape that affect aesthetics include the excavation and development of identified borrow areas, as well as development of the construction site. The construction of cofferdams will change the overall flow of the Nelson River, diverting water into other channels of the river. There may be temporary visible changes to water quality during certain phases of construction.
- Several permanent changes to the way the landscape looks are expected during operation:
  - Changes from a riverine to a reservoir environment;.
  - Ongoing shoreline erosion.
  - Loss of the rapids, including the loss of the sound of the rapids and replacement of the rapids with a physical barrier resulting in a transition from a natural to a built environment.
  - Re-routing of PR 280 via the north access road, over the dam, and via the south access road into Gillam.

PROPOSED MITIGATION

- The JKDA includes a Reservoir Clearing Plan in order to minimize the overall amount of debris resulting from flooding (see Schedule 11-1).
- Reclamation of site construction areas such as borrow areas are to follow the principles set out in Schedule 7-1 of the JKDA.
- A park and/or rest area associated with boat launches both upstream and downstream of the generating station on the north side of the Nelson River is planned. As well, a commemorative plaque or memorial is planned to recognize people who have used and continue to use the Gull Lake area.
- Additional mitigation includes a video taken of the stretch of the Nelson River between Birthday Rapids and Gull Rapids prior to construction and available for viewing in a visitor space at the generating station once the station is in operation.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Small	Small	Medium	Medium	Long	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	YES	YES
GILLAM RE-DEVELOPMENT	YES	YES
CONAWAPA	YES	YES

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

There is spatial and temporal overlap between the Keeyask Project and the Keeyask Transmission Project for both the construction and operation phases.

While other future projects will affect the way the landscape looks, their effects should be less prominent, albeit more geographically dispersed, than the Keeyask Project. Given an already highly disturbed visual landscape and the prospect of rehabilitation after decommissioning, the significance of effects on this VEC is not changed after considering the potential cumulative effects of other future projects.

14: CNP 2010b, 2010e

HERITAGE RESOURCES

Why Heritage Resources Was Selected As a VEC

- Heritage resources are tangible objects that provide temporal and spatial evidence of past human activities. Heritage resources are included as a VEC because they are protected under the *Manitoba Heritage Resources Act* (1986). Heritage resources provide identity to people, and were identified in the Final Environmental Impact Statement Guidelines for the Keeyask Generation Project prepared by the Canadian Environmental Assessment Agency.
- The Heritage Resources VEC includes categories of: (i) heritage site, (ii) heritage object, and/or (iii) any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific or aesthetic features, and may be in the form of sites or objects or a combination of the two.

HERITAGE RESOURCES

CHAPTER 6

HISTORICAL AND CURRENT CONTEXT

- Several major hydroelectric developments along the Nelson River have been constructed over the past 50 years. Although no construction activity occurred within the Keeyask area, the seasonal reversal of water levels, increased water levels and altered flows resulted in many changes to the environment, such as extensive debris, shoreline erosion and altered ice conditions. These projects resulted in effects to heritage resources.
- Prior to the Keeyask Project, 42 archaeological sites in the Regional Study Area were registered with the Province. Between 2001 and 2010, 120 archaeological sites were recorded through heritage resource impact assessment investigations for Keeyask. Of these, 100 sites are within the Local Study Area with 59 sites affiliated with the pre-contact cultural period, 16 within the historic period, 24 were multi-component sites, and one had no cultural affiliation. Fifty of these sites are within the hydraulic zone of influence.

POTENTIAL PROJECT EFFECTS

- Project effects to heritage resources during construction and operation include:
  - Permanent disturbance/destruction of heritage resources including objects, sites, and burial sites.
  - Permanent loss of future heritage resources data, objects.
  - Permanent changes in the interpretive capacity of the region, thus reducing the ability to have a complete Cree and provincial historical record.
  - Reservoir impoundment will affect 43 known heritage resources within the heritage Core Study Area.
  - Shoreline erosion caused by flooding or fluctuating water levels will affect heritage resources.
  - Permanent loss of historically-known cultural landscapes and the ability of the KCNs to orally recount their history.
  - Increased traffic over areas of unknown and known heritage resources.

PROPOSED MITIGATION

- During construction and operation mitigation will consist of the following:
  - Archaeological salvage of seven archaeological sites affected by construction then annual monitoring to ensure all components have been fully recovered.
  - Archaeological salvage of known heritage sites affected by operation prior to inundation to the extent practicable.
  - Identification and development of a cemetery and memorial marker for the reburial of human remains.
  - Implementation of the Heritage Resources Protection Plan
  - Education and awareness of Project workers on the nature of heritage resources when walking or driving in Project areas.
- In addition to the above, TCN's AEA program includes repatriation, display and interpretation of heritage resources found within the area in the Keeyask Cultural Centre's Museum and Oral History Program.

RESIDUAL EFFECTS: SIGNIFICANCE ASSESSMENT

STEP-ONE

Direction of Effects		Magnitude of Effects		Spatial Area		Duration of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Adverse	Adverse	Moderate	Moderate	Small	Small	Short	Long

STEP-TWO

Required ?		Frequency of Effects		Reversibility of Effects		Ecological/Social Context of Effects	
Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
NO	NO	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 7

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES (SPATIAL OR TEMPORAL OVERLAP)

	KEEYASK CONSTRUCTION	KEEYASK OPERATION
KEEYASK TRANSMISSION	YES	YES
BIPOLE III	NO	NO
GILLAM RE-DEVELOPMENT	NO	NO
CONAWAPA	NO	NO

CONCLUSION OF THE CUMULATIVE EFFECTS ASSESSMENT

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 Generation Project and the future Keeyask Transmission Project, no additional mitigation or monitoring will be required.

The conclusion from the residual effects significance assessment undertaken in Chapter 6 does not change.