



Keeyask Generation Project Environmental Impact Statement

Responses to Information Requests -
CEC, Round 1



July 2013



2013 07 15

Clean Environment Commission
305-155 Carlton Street
Winnipeg, MB R3C 3H8

Attention: Mr. Terry Sargeant, Commission Chair

Dear Mr. Sargeant:

**Re: KEEYASK GENERATION PROJECT - RESPONSES TO FIRST ROUND OF CEC
INFORMATION REQUESTS FROM HEARING PARTICIPANTS**

The Keeyask Hydropower Limited Partnership submitted the Keeyask Generation Project Environmental Impact Statement (EIS) on July 6, 2012. On November 14, 2012, the Minister of Conservation and Water Stewardship asked the Clean Environment Commission (CEC) to hold public hearings for the Keeyask Generation Project (the Project). Subsequent to this announcement, the Minister (based on recommendations from the CEC) approved the formal, funded involvement of seven Hearing Participants, representing various community groups and organizations interested in the Project.

As part of this hearings process, the CEC provides all Hearing Participants the opportunity to ask the Partnership Information Requests to provide further clarity on the Partnership's EIS Filing. The deadline for the first round of Information Requests to be provided to the Partnership was May 31, 2013; the Partnership had until July 15, 2013 to respond. All Information Requests were sent directly to the Partnership by Hearing Participants. The Partnership accepted responsibility for determining those questions it believed to be outside the scope of the CEC Hearings process, based on the Terms of Reference issued by the Minister for the CEC review of the Keeyask Generation Project.

The Partnership is pleased to provide its responses to this first round of Information Requests in the attached binder titled *Responses to Information Requests - CEC, Round 1*. The contents of this binder are also available on the Partnership's Website at <http://www.keeyask.com>.

Should you have any questions or require additional assistance, please feel free to contact Vicky Cole at 204 360-4621.

Yours truly,

5900345 Manitoba Ltd.
as general partner of the
Keeyask Hydropower Limited Partnership

A handwritten signature in blue ink, appearing to read 'K.R.F. Adams', with a long horizontal line extending from the end of the signature.

K.R.F. Adams, P. Eng
President

KRFA/
Enclosure

c: Ms. Tracey Braun

Comment Number	Department	Volume / Document	Line Number / Table Number / Figure Number	Page	Topic	Context / Preamble e.g., provide applicable background/rationale for providing the comment	Specific Department Comment / Request for Additional Information:	Proponent Response
Consumers Association of Canada								
1	CAC	PE SV	4.3.1.3.1 Spring Break-up on the Nelson River	4-42	Physical Environment	Some researchers have hypothesized that the northern range limits of sedentary (boreal) caribou coincide with the availability of open water on large lakes at calving in springtime. It is reported (Physical Environment, Section 4.3.1.3.1, p. 4-42) that the study reach along the Nelson River attains "open water levels" by mid-May, but no precise information is provided.	• Please provide summary observations (e.g., approximate mean or range) of the date of spring break-up on one or more large lakes (with islands) in the Project area – for example, Stephens Lake or Split Lake.	CAC-0001
2	CAC	TE SV	Photo 7-3	N/A	Terrestrial Environment	The sedentary caribou ecotype can sometimes be distinguished from the migratory ecotype on the basis of pelage characteristics and antler morphology.	In addition to Photo 7-3 (Terrestrial Environment), please provide copies or access to good-quality photographs of adult summer resident caribou taken with remote trail cameras in Caribou Local Study Area.	CAC-0002
3	CAC	TE SV	7.2.6.2 Intactness	7-10	Terrestrial Environment	On page 7-10 of Section 7.2.6.2 (Terrestrial Environment), some elements in the following passage are unclear: "Benchmark values for intactness indicated a low magnitude adverse effect where core area, as a percentage of land area, is greater than 65%, a moderate magnitude adverse effect where core area percentage is between 45% and 65%, and a high magnitude adverse effect where core area percentage is lower than % ... Benchmark values for intactness indicated a low magnitude adverse effect where less than 35% of the range is undisturbed, a moderate magnitude adverse effect when 35% to 45% of the range is undisturbed, and a high magnitude adverse effect when more than 45% of the range is disturbed ..."	In the first sentence, please confirm that the final percentage value, which is missing, is 45% In the second sentence, please confirm that "undisturbed" should be replaced with "disturbed".	CAC-0003
4	CAC	R-EIS Guidelines	6.5.3.3 Intactness	6-322	Terrestrial Environment	To depict core areas, it is stated (Response to EIS Guidelines, p. 6-94) that low-use linear features were buffered by 200 m, rather than 500 m for high-use features. Later in this volume (Section 6.5.3.3, p. 6-322), however, it is stated that a core area "... is reduced by Project features that ... occur within 500 m."	Please clarify what buffer width(s) were used.	CAC-0004
5	CAC	R-EIS Guidelines	6.2.3.4.2 Terrestrial Ecosystems and Habitat	6-93	Terrestrial Environment	Zone 6 is deemed the Regional Study Area (RSA) for caribou, but Zone 5 is the RSA to estimate intactness, even though caribou are identified as particularly sensitive to fragmentation (Response to EIS Guidelines, p. 6-93). Given that the extent of these two zones differ substantially, the results for intactness at a regional scale are not wholly applicable to caribou.	Please provide an estimate of proportion of the area undisturbed in Zone 6 (the Caribou RSA) following the Environment Canada protocol for boreal caribou – i.e., after subtracting burns (40 or 50 years old), linear features and other anthropogenic disturbances, buffered by 500 m, while not removing waterbodies.	CAC-0005
6	CAC	R-EIS Guidelines	5.3.1 Assessment Framework Steps	N/A	Response to EIS Guidelines	EIS Chapter 5, pg 5-6, states: "The cumulative effects assessment focuses on VECs (as described in Step 2) that may be adversely affected by the Project (after mitigation) and considers likely adverse effects caused by the other projects or human activities that overlap in space and time with those of the Project". Based on Fig 5-1 "Regulatory significance Step 1 Assessment", only "VECs that have an adverse effect and meet the criteria for Step 2...are examined further. The effects of the Project on VECs that do not proceed beyond the above Step 1 assessment are determined to be not significant for the purposes of this regulatory assessment." If a Project has no effect on a VEC, it may be reasonable that it not be considered further in a cumulative effects assessment. However, a cumulative effect on a VEC is not defined solely by the size of a project's contribution – a cumulative effect is the total effect on a VEC. Good practice indicates that if the effects of a project on a VEC are minor, but there are effects from other projects on the same VEC, those effects should be included in the cumulative effects assessment. Based on sec 5.3.1, a VEC subject to a "medium" (defined by geographic extent) and "moderate" impact (defined by magnitude) is not carried forward for further consideration in the cumulative effects assessment. Albeit small, such effects may be cumulatively significant when considered in combination with the effects of other present and future activities. A Project's effect could be "minimum", "below a threshold" or have "minimum impairment of an ecosystem component's function." In such cases, the conclusion is NOT that there is no effect, but that it is a small or minor one. However, such 'small effects' effects could be significant from a cumulative effects perspective when considering the effects of other present and future actions. When considering the decision rules for determining regulatory significance as described in sec 5.3.1 and Fig 5-1, project effects that are "minimum", "below a threshold" or have "minimum impairment of an ecosystem component's function" are not carried forward to the cumulative effects assessment.	How is the cumulative significance of these 'small' (i.e. medium and moderate) project effects captured or accounted for if they are not carried forward to the cumulative effects analysis for future activities?	CAC-0006
7	CAC	R-EIS Guidelines	6.5.3.1.4 Terrestrial Habitat - Residual Effects of Operation; 6.5.3.1.5 Terrestrial Habitat - Conclusion about Residual Effects on Ecosystem Diversity; Chapter 7	N/A	Terrestrial Environment	EIS Chapter 6, sec 6.5.3.1.4 states: "Project operation is expected to affect less than 1% of total terrestrial habitat area and areas of the common broad habitat types. After considering these remaining Project effects in combination with the effects of other past and existing projects and activities, it is predicted that the Project operation could increase the affected amounts of total terrestrial habitat and the common habitat types of almost 6% of historical area, which is a moderate magnitude residual effect." Section 6.5.3.1.5 states that the "residual Project effects on terrestrial habitat are expected to be adverse but regionally acceptable..." But, on pg 6-318 it reads as follows: "As terrestrial habitat is not a VEC, it is not carried forward to the CEA with future projects in Chapter 7."	Given that the EIS claims to adopt an ecosystem approach (see, for example, Terrestrial Ecosystem Supporting Volume): • How are potential cumulative effects to terrestrial habitat accounted for in the cumulative effects analysis with regard to VECs of concern: i) water quality (specifically sedimentation), ii) ecosystem diversity iii) intactness and iv) caribou, if the Project's impacts on terrestrial habitat are not carried forward and modeled with respect to the cumulative effects in combination with future projects?	CAC-0007

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8	CAC	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Response to EIS Guidelines	EIS Chapter 7, Table 7-3, identifies the potential Conawapa GS as a project that overlaps with the proposed Keeyask project, having a potential to cumulatively affect water quality. No other activities or disturbances in the area are identified as acting cumulatively with the Project's impacts to water quality. Sedimentation (an impact to water quality) is identified in the EIS (Chapter 6, sec. 6.4) and in the Aquatic Environment Supporting Volume (sec 2) as "large for all aspects of shoreline erosion." The cumulative effects analysis is focused on in-stream and shoreline disturbance. Sedimentation caused by terrestrial disturbances receives limited (if any) attention in the cumulative effects analysis. The cumulative effects of land uses/clearing (e.g. forestry, access roads, transmission lines) can significantly increase the cumulative amount of sediment loading to that expected from natural processes. Sediment loading can have adverse effects on spawning areas and food production for fish. Active stream crossings are often a key source of sediments and in-stream and riparian habitat changes. This can be either directly from the crossing construction, or indirectly from delivery of sediments along the right-of-way.	<ul style="list-style-type: none"> What are the predicted or modeled cumulative impacts to water quality (sedimentation) in the regional study area caused by the Project in combination with other terrestrial disturbances caused by: i) forestry; ii) stream crossings (e.g. Bipole III); access roads and trails? Some of these disturbances are outside the study area but affect the same aquatic processes.	CAC-0008
9	CAC	R-EIS Guidelines	5.3.1 Assessment Framework Steps, 6.5.8 Mammals, 7.0 Cumulative Effects Assessment	N/A	Response to EIS Guidelines	With regard to flooding in the Local Study Area, for example, two islands will be lost on Gull Lake, one of which was occupied by caribou during field data collection. The EIS makes the following claim: "...islands comprise less than 1% of the primary calving and rearing habitat in the Regional Study Area" and the initial loss of this habitat will likely be "negligible." The EIS, sec. 7.5.2.2.3, further indicates: "Past and current project effects have resulted in moderate regional habitat losses and alterations but most of these changes are limited to habitat near the Nelson River. In comparison, habitat effects over large migratory caribou ranges are negligible to small." The EIS goes on to state that: "Small changes in habitat are expected compared to its widespread regional availability and use by caribou." Interestingly, with regard to spatial bounding and significance determination, Chapter 5 of the EIS, sec 5.3.1, states: "The study areas selected are large enough to capture the effects of the Project, but not so large as to mask the effects of the Project (by making the effect of the Project as a percent of the area appear unreasonably small."	What is the local significance of this habitat loss considering: <ul style="list-style-type: none"> Observations of the local Cree that caribou are moving back into the area? The increasing cumulative effects on habitat (fragmentation) outside the Local Study Area due to current and future transmission lines, mineral leases, forestry and access roads? 	CAC-0009
10	CAC	R-EIS Guidelines	7.5.2.2.3 Summary of Cumulative Effects of the Project with Past and Current Projects/Activities	N/A	Terrestrial Environment	EIS Chapter 7, sec 7.5.2.2.3 7 states: "Potentially, and with moderate scientific certainty, habitat effects, additive mortality from resource harvest and increased predator access, accidental mortality, and localized movement effects, which cumulatively affect the regional caribou population, have occurred only to a small degree in the Regional Study area."	Clarification and quantification are requested on the following: <ul style="list-style-type: none"> What is considered "moderate scientific uncertainty" in this regard? What is considered a "small degree" in the Regional Study Area (i.e. what is the benchmark or comparison)? 	CAC-0010
11	CAC	TE SV	EIS Executive Summary; 7.0 Mammals (TE SV)	N/A	Terrestrial Environment	Terrestrial Environment Supporting Volume Section 7, sec 1.1 states: the Keeyask impact assessment adopts an ecosystem approach and that an ecosystem "is a functional unit comprised of the living and non-living things in a geographic are, as well as the relationships between all of these things." It further recognizes that an ecosystem has patterns, structures, dynamics, and performs functions (p.1-3). There are four common categories of ecosystem services: (i) supporting services; (ii) provisioning services; (iii) regulating services; and (iv) cultural services, each of which is dependent on specific aspects and relationships of the physical environment to exist and are phenomena of importance in themselves. Supporting services (e.g. nutrient dispersal and cycling, seed dispersal, primary production) are regarded as the basis for the services of the other three categories. However, according to the Executive Summary (p.21) "no valued ecosystem components were identified for the physical environment" (p.21).	<ul style="list-style-type: none"> Why are no valued ecosystem components identified for the physical environment, given the above definition of an ecosystem and ecosystem services? What specific ecosystem services (at minimum, regulating services) are represented in the biophysical VEC selection for the Project? How are cumulative effects to specific ecosystem services quantified and/or qualified? 	CAC-0011
12	CAC	TE SV	7.0 (TE SV); EIS Executive Summary; 2.0 (AE SV)	N/A	Terrestrial Environment	The Project is located on the Nelson River, which "has been substantially altered over the past 55 years by the development of the Lake Winnipeg Regulation, the Churchill River Diversion and construction of five generating stations" (Exec Summary p. 36). Manitoba Hydro acknowledges that these changes have altered the aquatic and terrestrial environments (Exec Summary). Good practice cumulative effects assessment suggests that the significance of cumulative effects be measured against a past reference condition, i.e. pre-disturbance conditions for in the project area region. With respect to the Project, this is approximately 55 years ago (the late 1950s). However, the Terrestrial Environment Supporting Volume Section 7, sub-sec 1.3.6, for example, states that in the impact assessment, the temporal scope for historical conditions was "as far into the past as needed to describe historical conditions and trends" (p. 1-21) but not necessarily as far back as needed to clearly describe residual impact significance. The Aquatic Environment Supporting Volume Section 2, sub-sec 2.3.4.3 similarly states that an evaluation of potential temporal changes in water quality within the study area was undertaken to determine if conditions have been undergoing recent change (p. 2-9) that could affect impact predictions. To this end, a statistical analysis was undertaken for "a recent 20 year period", literature was consulted to assess recent temporal changes in water quality, and an assessment of water quality data from Stephens Lake since the 1970s was undertaken. In other words, impact analyses seem focused on characterizing recent conditions and changes rather than also pre-disturbance conditions which would be necessary to fully understand the significance of the incremental addition of the Project's impacts. The Terrestrial Environment Supporting Volume Section 7 outlines the approach taken to evaluating residual effects of the Project on terrestrial VECs. Sub-sec 1.4.4 (p. 1-24) states "current and future trends in key topic indicators and contextual factors were considered in the residual effects assessment." There is no statement made about "past or historic trends" as a key factor in determining residual effects significance. Lack of focus on pre-disturbance conditions as a key factor in determining significance of residual effects of Project may mean some of the incremental effects of the Project are minimized and can this can later obscure determination of cumulative impact significance.	How were pre-disturbance conditions factored into both the residual impact significance determination of the Project's effects, and later the significance determination of the Project's cumulative effects?	CAC-0012

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13	CAC	TE SV	2.10.1 Cumulative Effects with Future Projects	2-199	Terrestrial Environment	Terrestrial Environment Supporting Volume Section 7, sec 1.1 states: the Keeyask impact assessment adopts an ecosystem approach and that an ecosystem "is a functional unit comprised of the living and non-living things in a geographic are, as well as the relationships between all of these things." The Terrestrial Environment Supporting Volume Section 7, Section 2: Habitat and Ecosystems, sub-sec 2.10.1 contradictorily states: "By focusing on individual environmental components, the VEC approach does not capture the broader concept of the Cree worldview, which emphasizes that all things are interconnected and should be viewed as a whole" (p. 2-199). This same statement is repeated numerous times throughout the Supporting Volumes for the EIS.	If the impact assessment adopts an ecosystem approach, which is by definition focused on relationship dynamics, then why is the holistic Cree worldview presented as at odds with it via the valued ecosystem component approach? (Particularly when the latter may be used to designate ecosystem services as key topics of investigation?)	CAC-0013
14	CAC	TE SV	7.4.8 Cumulative Effects	N/A	Terrestrial Environment	Terrestrial Environment Supporting Volume Section 7, sec 7.4.8.1 presents a number of conclusion statements about cumulative impacts on beaver seemingly in absence of supporting evidence. Examples of such statements include: "Regional beaver populations are highly likely to maintain viable levels." (p. 7-144) "Beaver populations are most likely to remain sustainable because beaver are widely distributed and abundant in creeks..." etc. (p. 7-144) "The system will most likely remain as it is today." (p. 7-144)	Are these claims based on population modeling or some other form of modeling or scenario analysis? If not, what methods or methodology was used to predict impacts on beaver populations? What specific quantitative and/or qualitative evidence supports such claims about cumulative effects on beaver?	CAC-0014
15	CAC	TE SV	7.4.8.3 Moose	N/A	Terrestrial Environment	In the Terrestrial Environment Supporting Volume Section 7, sub-sec 7.4.8.3.2 states with respect to moose that "moose abundance, distribution, and movements are likely to be changed by the Project during construction and operation", but that "small changes in habitat are expected compared to the regional availability" (p. 7-147). Good practice cumulative effects assessment is that a Project's effects are not minimized by comparing them against the effects of other Projects or diluted through manipulations of scale. Sub-sec 7.4.8.3.3 further notes recent decline in the abundance of moose in western and southeastern Manitoba, where it is thought that access and harvesting are the main activities affecting the moose. Sub-sec 7.4.8.3.3 goes on to acknowledge that "residual Project effects on moose are expected to overlap with reasonably foreseeable future projects", and presumably also activities such as access and harvesting.	What are the total effects of past, current, and reasonably foreseeable projects and activities on the sustainability of the moose VEC, and what is the significance of the Project's incremental contribution to this total effect?	CAC-0015
16	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment	N/A	Socio-Economy	It is stated in the introduction of the HHRA that the risk assessment addresses mercury concentrations in the environment that may result if the proposed Keeyask Generation Project is approved. In section 4.2.1 it is stated that the HHRA focus on mercury as the main chemical of potential concern. The risk assessment should identify and address all chemicals of potential concern (COPC) that humans may be directly, indirectly, or accidentally be exposed to during both construction and operation of the proposed Keeyask Generation Project.	Please identify and assess COPC other than mercury, and update the HHRA with this information.	CAC-0016
17	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment	N/A	Socio-Economy	Typical sources of mercury exposures to humans are listed in Section 2.2 of the HHRA. This listing contains several potential exposure pathways and sources other than eating of fish from the lakes that will be impacted by the Keeyask Generation project. In Section 4.3 it is stated that human receptors were assumed to consume country (wild) foods including wild game, fish and plants. In addition, receptors were assumed to be exposed to surface water.	• The HHRA should consider the combination of mercury exposures from both the proposed project as well as from other "background" sources to arrive at total mercury exposure. Total mercury exposure would then be compared to exposure limits (tolerable daily intake) to determine potential health risks. Please update the HHRA accordingly.	CAC-0017
18	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment	N/A	Socio-Economy	On page 5C-38, the toxicological reference values (TRVs) that were used in the assessment are described: • Methyl mercury: Tolerable Daily Intake (TDI) of 0.2 µg/kg bw-day (children and women of child bearing age), and a TDI of 0.47 µg /kg-day (general population), based on Health Canada 2010. • Total mercury: TDI of 0.57 µg /kg bw-day (general population), based on WHO 2010. On page 5C-38 it states that it was assumed the mercury concentrations in fish and waterfowl were all methyl mercury, while in wild game, plants and surface water it was assumed that it was total mercury. Also it was assumed that surface water concentrations were total mercury. In Appendix 5C-14, it is noted that " the WHO (2010) Committee established a PTWI for inorganic mercury of 4 µg /kg bw-day. WHO (2010) indicated that this PTWI for inorganic mercury was considered applicable to dietary exposure to total mercury from foods other than fish and shellfish. WHO (2010) also indicated that this was applicable to the whole population and did not indicate that risks would be additive with methyl mercury exposures". Further, Appendix 5C-14 notes that the toxicological basis of the TDIs for total/inorganic mercury and methyl mercury are based on different endpoints. The basis of the total/inorganic mercury TDI is kidney effects (WHO 2010), based on chronic exposures in rats, while the methyl mercury TDI is based on the incidence of neurological impairment in children of mothers with elevated methyl mercury intake from fish. In Tables 5-10 and 5-11, risk estimates for various foods (fish and non-fish foods) are combined into a single table. The text within pages 5C-61 to 5C-64 relate to the addition of the predicted hazard quotients (HQs) for mercury in relation to different food exposures (fish and non-fish), and also surface water ingestion.	Given that the toxicological endpoints upon which the TDIs for total/inorganic mercury and methyl mercury are different (kidney effects vs. developmental neurotoxicity), the target organs and mechanisms of effect appear to be different, is the addition of the HQ values in Section 5.6 justifiable? Please provide additional rationale, or a revised Section 5.6, where the potential risks associated with total/inorganic mercury are summed (water, game) and interpreted separately from methyl mercury risks (fish, waterfowl).	CAC-0018
19	CAC	R-EIS Guidelines	Appendix 5C-1-4, Human Health Risk Assessment	N/A	Socio-Economy	Appendix 5C-1-4 provides information regarding the TRVs selected for use in the HHRA. This section does not appear to provide a discussion of other available TRVs from relevant jurisdictions. The US EPA (2013, 2001) has derived an oral reference concentration for methyl mercury of 0.1 µg/kg-day, which is more conservative than the Health Canada value of 0.2 µg/kg-day selected for use in the HHRA.	Please provide information as to why the lower US EPA TRV was not selected for use in the assessment?	CAC-0019
20	CAC	R-EIS Guidelines	Appendix 5C-1-4, Human Health Risk Assessment, Table 5-2	N/A	Socio-Economy	Table 5-2 presents the risk estimates for present conditions from consumption of fish for various fish size classes. The risks are based on a fixed consumption rate for each receptor group (i.e., toddler, child bearing woman and adult male) assessed in the HHRA.	Is it reasonable to assume that the risk estimates presented in Table 5-2 are representative of all individuals in the KCN community or are there portions of the community where risk estimates are predicted to be lower or higher?	CAC-0020a

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							What are the risk estimates for post-impoundment conditions from consumption of fish for various fish size classes?	CAC-0020b
21	CAC	R-EIS Guidelines	Appendix 5C-1-4, Human Health Risk Assessment, Table 5-2	N/A	Socio-Economy	The results of the HHRA are based on two critical assumptions: 1) mercury concentrations in fish; and 2) consumption rates for receptors. Detailed information is available regarding observed distribution of mercury in various species of fish and fish sizes. However, consumption rates are fixed in the HHRA.	What is the variability or distribution of consumption rates (i.e., portion size and frequency) observed in the KCN community?	CAC-0021
22	CAC	AE SV	7.3.1 Trace Elements	N/A	Aquatic Environment	The fish quality assessment indicates that trace metal concentrations in existing fish tissue concentrations are lower than tissue residue guidelines for the protection of human health.	<p>Apart from mercury, trace metal tissue guidelines are only available for arsenic and lead. What assurance does the assessment provide that metals without tissue residue guidelines are safe?</p> <p>Will the post-impoundment fish tissue concentrations change for metals other than mercury?</p>	CAC-0022a CAC-0022b
23	CAC	R-EIS Guidelines	Appendix 5C-1-4, Human Health Risk Assessment, Table 3-1	N/A	Socio-Economy	The results of the HHRA are based on a standardized fish concentration for lake whitefish, northern pike, walleye and lake sturgeon. Further, the standard lengths used in the HHRA are based on the approximate size of fish that would typically be caught and eaten. It is unclear what exposure point concentration was selected from Table 7H-1 in the Fish Quality assessment for each species and lake assessed in the HHRA.	Please provide additional information that describes how the mercury concentrations in fish tissue were calculated or selected from the Fish Quality assessment. For example, were the exposure point concentrations based on the average of the annual standard or based on the 95% confidence intervals?	CAC-0023
24	CAC	R-EIS Guidelines	Appendix 5C-1-4, Human Health Risk Assessment	N/A	Socio-Economy	The results of the HHRA present risk quotient values above 1 and indicated that Manitoba Health and Health Canada have committed to working with the KCN and Manitoba Hydro on consumption advisories in a separate process. In addition, Section 7.2.1 in the Fish Quality assessment indicated that mercury concentrations can remain above preimpoundment levels for 20-30 years.	<p>Are Manitoba Health and/or Health Canada committed to issuing consumption advisories for up to 30 years?</p> <p>The project reservoir impoundment is predicted to reduce the quality of a food source to the extent where it could impact health. The creation of the reservoir could affect both food security and food quality for the First Nations communities in the region. How does the Partnership plan to address this issue?</p>	CAC-0024a CAC-0024b
25	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 3.2	N/A	Socio-Economy	Section 3.2 of the HHRA refers the reader to the Terrestrial Environment Supporting Volume (TE SV) (Section 8) for full details of the measured and predicted concentrations of mercury in wild game. The HHRA does not give a reference to the specific subsection of Section 8 where this information is provided. Upon review, it appears that the relevant information is presented, in part, in subsections 8.4.3.2.2, 8.4.3.3, and 8.4.4.2. Subsection 8.4.4.2 states that "based on scientific literature, a surrogate model, and scientific judgment, estimated post-Project mercury levels in mammals are predicted to increase over baseline conditions (Table 8-16) and peak about three to seven years after the reservoir is impounded. The predicted mercury concentrations are presented in Table 8-16.	<p>Please confirm that the wildlife mercury concentrations used in the HHRA are those presented in the referenced sections above.</p> <p>Limited information is provided on how mercury concentrations in wild game were calculated. Please provide additional detail on how the mercury concentrations were predicted, including a worked example.</p> <p>The footnote to Table 3-3 of the HHRA indicates that mercury concentrations in moose and snowshoe hare were literature values. Section 8 presents information on mercury concentrations in moose. However, no information is presented for snowshoe hare. Please provide a reference for the snowshoe hare mercury concentrations.</p>	CAC-0025a CAC-0025b CAC-0025c
26	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 3.2	N/A	Socio-Economy	Page 5C-20 of the HHRA states that "as described in the TE SV (Section 8), Stantec has estimated that concentrations of mercury in ducks would be similar to or less than concentrations measured in whitefish".	Please provide rationale along with references for why mercury concentrations in mallards are expected to be similar or less than concentrations measured in whitefish.	CAC-0026
27	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 3.1	N/A	Socio-Economy	Tables 3-1 and 3-2 of the HHRA present existing and post-impoundment (i.e., predicted) concentrations of mercury in fish.	Please explain why mercury concentrations in lake sturgeon are not expected to increase to the same extent as for the other fish species in Gull Lake under post-impoundment conditions.	CAC-0027
28	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 3.4	N/A	Socio-Economy	Section 3.4 of the HHRA states that "there was no information available on present mercury concentrations in these plants. Nor future concentration estimates provided for post-impoundment conditions. Consequently, these would need to be directly measured in the field if further information was required".	Please indicate whether or not the Partnership plans to collect wild plants and to test these for mercury concentrations?	CAC-0028
29	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 4.2.3	N/A	Socio-Economy	The country food consumption rates used in the HHRA are based on a 2009 memo provided by the InterGroup Consultants.	Please provide this memo.	CAC-0029
30	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 4.3.1	N/A	Socio-Economy	Page 5C-34 describes the mercury concentrations in wild game.	Please provide the rationale why consumption of moose and caribou organs was not assessed in the HHRA.	CAC-0030
31	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 5.1	N/A	Socio-Economy	The HHRA assumed that people would eat whitefish, walleye and northern pike three times per week.	Please explain how the health risks would change if a person would eat walleye three times in a week, but the other types of fish for the remainder of the week?	CAC-0031
32	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 5.2	N/A	Socio-Economy	Table 5-1 presents the risk estimates for fish consumption. The hazard quotient for walleye for women of childbearing age is presented as 4.7 for the present conditions in Stephens Lake (Table 5-1). However, based on the measured mercury concentration in walleye of 0.29 ppm (Table w3-1), body weight of 60 kg, serving size of 400 g, consumption frequency of three times per week (Table 4-1), and tolerable daily intake of 0.2 ug/kg/day (Section 4.4.), the hazard quotient should be 4.1.	Please explain this discrepancy. Also, please confirm that the other hazard quotients are correct.	CAC-0032
33	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 6.0	N/A	Socio-Economy	Section 6.0 describes uncertainty related to mercury concentrations in the environment, toxicity reference values, and food consumption rates. Page 5C-66 states that "the prediction of the magnitude and extent of the changes in environmental concentrations was considered to be beyond the scope of the HHRA".	<ul style="list-style-type: none"> Please provide the relevant sections where the uncertainty related to the prediction of the post-impoundment mercury concentrations was described in detail. Please comment on the uncertainty associated with using predictive models to estimate methyl mercury concentrations in fish for the post-impoundment conditions. Please explain how the Partnership plans to address the long-term uncertainty associated with the predicted mercury concentrations in fish. 	CAC-0033
34	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 7.0	N/A	Socio-Economy	Page 5C-70 states that "muskrat is the only mammal that was predicted to have increased tissue concentrations of mercury following impoundment".	Please explain why mercury concentrations are expected to increase in no mammals other than muskrat.	CAC-0034

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35	CAC	R-EIS Guidelines	Appendix 5C, Human Health Risk Assessment, Section 4.4	N/A	Socio-Economy	Page 5C-38 indicates that mercury in wild game was estimated as total mercury and that mercury in wild game and wild plants was assumed to be present as total mercury since information is not readily available on the mercury form in muscle tissue. The apportionment of inorganic and organic mercury in meats and vegetables are available from US EPA (1997). Table 3-23 presents 11 to 57% of total mercury measured in wild deer is in the form of methyl mercury. In addition, Table 3-24 presents 11 to 36% of total mercury in tuberous plants is in the form of methyl mercury.	How would risk estimates change in the HHRA by increasing methyl mercury exposures from wild game and wild plants? Reference US EPA (1997). United States Environmental Protection Agency. 1997. Mercury Study Report to Congress. Volume III. United States Environmental Protection Agency. Office of Air Quality Planning & Standards and Office of Research and Development. EPA-452/R-97-003 to EPA-452/R-97-010. December 1997.	CAC-0035
36	CAC	R-EIS Guidelines	Parameters Considered for Turbines to Increase Fish	N/A	Aquatic Environment	Entrapment of fish through turbines has been proposed as a reasonable method of providing downstream passage for fish. Measures have been taken by the proponent to reduce mortality associated with injury and mortality. Trash racks will exclude the largest of fish. The turbine design is expected to result in 90% survival in fish greater than 500 mm in length.	<ul style="list-style-type: none"> Given that most adult lake sturgeon can be expected to pass through the trash racks, and that most of these will be in the 800 to 1200 mm range (considerably larger than 500 mm), and given that in general the risk of injury is greater for larger fish, can it really be expected that a considerable portion of these (very important) individuals will not be injured or killed? Given that this proportion is unknown, please give detailed information on the planned monitoring program for establishing injury and mortality rates for large fish that are expected to pass through the trash racks. 	CAC-0036
37	CAC	R-EIS Guidelines	Parameters Considered for Turbines to Increase Fish	27	Aquatic Environment	Entrapment of fish through turbines has been proposed as a reasonable method of providing downstream passage for fish. Measures have been taken by the proponent to reduce mortality associated with injury and mortality. Trash racks will exclude the largest of fish. The turbine design is expected to result in 90% survival in fish greater than 500 mm in length.	Given that the very largest (and therefore perhaps the most "valuable") lake sturgeon that might encounter a trash rack may become impinged (the fact that burst swim capacity may exceed approach velocity does not necessarily mean impinged fish will be able to escape – once impinged, the animal needs to be able to "jump" off the screen and clear it so as to be able to initiate normal swimming for escape – once fish are impinged on screens, water velocity almost always needs to be lowered to allow them to escape, especially if they are exhausted from multiple attempts to clear the screen – the biomechanics of burst swimming and escape from impingement are fundamentally different), please provide details of a monitoring plan (if present) to directly determine the frequency of large fish impingements, so that mitigation can be planned if needed.	CAC-0037
38	CAC	R-EIS Guidelines	Keeyask Lake Sturgeon Stocking Strategy	27	Aquatic Environment	"It is important to note that lake sturgeon year class strength and the proportion of hatcheryreared versus wild fish that comprise each year class will be monitored annually."	Given that (a) the proponents suggest that stocking of larval lake sturgeon may be a common practice, and (b) that the only way (that I can think of) to identify a captured sturgeon as coming initially coming from the hatchery as a larvae is through genetic means, and (c) that the only way to assess the success of stocking larval fish is to carry out "blind" (and expensive) DNA testing on large numbers of captured juvenile, sub-adult, and adult fish once stocking has been carried out for a number of years, is DNA analysis of larval fish really a feasible means of evaluating the efficacy of stocking larval fish?	CAC-0038
39	CAC	R-EIS Guidelines	Keeyask Lake Sturgeon Stocking Strategy	27	Aquatic Environment	"It is important to note that lake sturgeon year class strength and the proportion of hatcheryreared versus wild fish that comprise each year class will be monitored annually."	If DNA analysis is the only way to reliably determine if a sturgeon caught during monitoring was originally stocked as a larvae, and given that broodstock will ideally be taken from the local populations and that sturgeon are multiple spawners, are there concerns regarding the potential inability to determine if a fish is actually wild or hatchery reared?	CAC-0039
40	CAC	R-EIS Guidelines	Keeyask Lake Sturgeon Stocking Strategy	27	Aquatic Environment	"It is important to note that lake sturgeon year class strength and the proportion of hatcheryreared versus wild fish that comprise each year class will be monitored annually."	If it is decided that an evaluation of the success of larval stocking cannot be realistically monitored, should they ever be used in stocking, given that it will not be possible to distinguish a wild fish from one that was stocked as a larvae?	CAC-0040
41	CAC	R-EIS Guidelines	Keeyask Lake Sturgeon Stocking Strategy	N/A	Aquatic Environment	Stocking is the key mitigative strategy proposed by the proponent to offset lake sturgeon losses due to the Project and bolster the populations. The proponents should be commended for the scope of the research that has been invested in, and in terms of their willingness to incur costs associated with rearing lake sturgeon. However, the proponents have understated the difficulties associated with rearing this species in Manitoba, even once the obstacles of getting viable gametes has been surmounted. Although lake sturgeon appear easy to rear in facilities like the White Rose Hatchery in Wisconsin, the hatchery workers at Grand Rapids (and others who have tried), even with years of experience, will readily admit to massive and inexplicable die offs of fish without warning. Survival rates have been wildly erratic over the past decade and complete losses of cohorts have not been uncommon.	Please comment on the uncertainty associated with rearing success of lake sturgeon, and how that relates to stocking as a mitigative strategy.	CAC-0041
42	CAC	R-EIS Guidelines	6.4.6.1 Walleye, Northern Pike, Lake Whitefish and other Scale Fish	6-270	Aquatic Environment	Upstream fish passage will be provided by a trap and transport program that will target key fish species during the initial period of station operation"	Please provide details and rationale for the details related to the initial program, before it is evaluated and modified post-implementation. How many fish of each species and sex per year? How will fish be sexed in the field? What time of year for each species? Methods used to minimize injury and mortality (e.g. lake whitefish are susceptible to post capture mortality).	CAC-0042
43	CAC	AE SV	6.4.2.4 Net Effects of Operation with Mitigation	6-46	Aquatic Environment	"The Project will be designed and constructed in a manner that would allow it to be retrofitted to accommodate other upstream and/or downstream fish passage options if required in the future..."	Has the design of the Project allowed for all options of alternative fish passage structures to be retrofitted (i.e. fish ladder, fish lock, fish elevator, nature-like bypass channel etc.) and if not, which of the possibilities actually could be feasibly installed after the fact.	CAC-0043
44	CAC	AE SV	6.4.2.2.6 Net Effects with Mitigation	6-39	Aquatic Environment	"...it may be necessary to create compensatory YOY habitat via strategic placement of sand in the reservoir..." Much data has shown that YOY lake sturgeon prefer a sandy substrate; however, this preference must certainly be indirect, as sand cannot in itself directly contribute to YOY survival. It is most likely that the sand provides suitable habitat for benthic macroinvertebrates that YOY prefer (e.g. Dipterans). As such, the proponents should adjust their mitigative plans to create sandy habitats that are suitable habitat for YOY prey items and the subsequent monitoring and evaluation program should include benthic and drift sampling to ensure that the new habitat contains sufficient food, and does not merely attract YOY to an "empty table".	Please respond to the proposed adjustment to the mitigative plan.	CAC-0044

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45	CAC	R-EIS Guidelines	6.4.6.1 Walleye, Northern Pike, Lake Whitefish and Other Scale Fish	6-270	Aquatic Environment	"This would include both an assessment of the success in capturing the fish for transport and whether transported fish are better able to fulfil their life history requirements than fish that remain below the generating station."	Please describe exactly how a monitoring program could quantitatively determine whether transported fish might be better able to fulfil their life history requirements than those that remain below the generating station.	CAC-0045
46	CAC	R-EIS Guidelines	6.2.3.4.7 Mammals, 6.2.3.2 Physical Environment (R to EIS); CNP Environmental Evaluation Report; FLCN Environmental Evaluation Report	N/A	Terrestrial Environment	Within the Keeyask Study Area, FLN members actively hunt moose along the shoreline of Stephens Lake, and near the (proposed) south access road close to Kettle and Cache Lakes, while TCN members have moose hunting areas on the south shore of the Nelson River between Split Lake and Birthday Rapids, and on the north and south shores of the Nelson River downstream of Birthday Rapids to Stephens Lake. These hunters observe that moose are more abundant now than they were previously and believe this is due, in part, to existing hydro developments – with moose displaced from Split Lake into the Keeyask Study Area as a result of shoreline habitat loss and fluctuating water levels caused by hydroelectric development at the Kettle GS.	Do the other Partners, and Manitoba Hydro in particular, believe this to be the case? If not, why not?	CAC-0046
47	CAC	N/A	6.2.3.2 Physical Environment, 6.5.8.2.1 Moose - Construction Effects and Mitigation (R to EIS); CNP Environmental Evaluation Report; FLCN Environmental Evaluation Report; 7.3.6.4 Moose, 7.4.6.3 Moose (TE SV); Results of Mammal, Reptile & Amphibian Investigations in the Keeyask Study Area 2002, 2003, 2004.	N/A	Terrestrial Environment	FLCN members point to the importance of willow, alder and hazel along current shorelines on Stephens Lake and Gull Lake as good moose feeding areas, all of which will be lost to flooding. TCN/WL members indicate that local veneer bogs, also set to be flooded, are used as important calving areas. CNP Members have indicated that veneer bogs (peatlands less than 1.5 m deep that generally occur on slopes) are occupied in wet seasons and are used as calving areas. FLCN members make mention of other key calving areas and in particular islands in both Stephens Lake and Gull Lake (of which 42% had moose present when surveyed in summer).	<ul style="list-style-type: none"> Given the important role that specific shorelines, veneer bogs and islands play as prime moose habitat within the Local Study Area, please comment on the significance of their loss through Project construction and operation, and reconcile those comments with the finding in the EIS that because "peatlands are low quality habitat for moose, the predicted habitat composition trend for moose is likely to be neutral". Similarly, please reconcile the environmental assessment of the KCNs, that point to declines in moose numbers sufficiently high to force their hunters to travel further afield, with the regulatory finding that the "effect on moose will likely be negligible to small". 	CAC-0047
48	CAC	N/A	6.5.8.3 Beaver (R to EIS); YFFN Our Voices Evaluation Report; FLCN Environmental Evaluation Report; 7.3.6.2 Beaver and 7.4.6.1 Valued Environmental Components – Beaver (TE SV)	N/A	Terrestrial Environment	Moose rely on beaver for the creation of high quality habitat. According to technical science reports and KCN environmental assessments, a combination of shoreline changes, the seasonal reversal of water flow from system operations, flooding, changes in winter water levels and unpredictable ice conditions will all contribute to the direct mortality of beaver and/or impede individual home range reestablishment in the Local Study Area.	Given these predictions, please provide information on the expected impact that such declines in the local beaver population, as a keystone species, will have on local moose populations.	CAC-0048a
							It is expected that between 20 to 30 active beaver colonies will be removed during clearing in Zone 1. While this is less than 10% of the estimated population in the Regional Study Area, what percentage does it constitute of the estimated population in the Local Study Area (Terrestrial Zones 1-4)? In terms of impact on the Local Study Area, would the effect of removing this many beaver colonies still be considered "small". If not, what would the predicted magnitude be?	CAC-0048b
49	CAC	N/A	EIS Exec Sum; YFFN Environmental Evaluation Report; FLCN Environmental Evaluation Report; CNP Keeyask Environmental Evaluation Report; Appendix 9A (PE SV); 6.3.8.2 Sedimentation (R to EIS)	N/A	Physical Environment	While the cycling of sediments and nutrients is essential to a healthy aquatic ecosystem, too much sediment and nutrient entering a waterway can have negative impacts on water quality and aquatic life. For the KCNs, the importance of water and water quality to local people is readily apparent. When the Executive Summary states that "water quality will always be suitable for aquatic life in the main part of the reservoir", this appears to contradict the KCN environmental evaluation reports that stress: (i) the impact that previous dam construction and reservoir impoundment have had on the declining quality and health of aquatic life in affected water bodies, with declines in water quality seen as a key cumulative impact/effect of hydro development in the region; and, (ii) how the release of peat and other sediment, along with increased mercury levels, is expected to negatively impact water quality in the study area, especially in places such as Gull Lake and Stephens Lake where fish habitat is predicted to be negatively impacted to the point of no longer being viable.	<p>In light of the observations and views of the KCNs, and an acknowledgement of uncertainty as to the magnitude of subsequent changes in sediments, nutrients, and metals, and decreases in dissolved oxygen, please provide information to support the validity of this statement on water quality and in doing so respond to the discrepancies apparent upon comparing the EIS technical science findings with the KCN environmental evaluation reports. What, for example, constitutes the "main part" of the reservoir and is water quality indeed expected to decline in Gull Lake and Stephens Lake to the point whereby aquatic life is negatively impacted? Not all organic sediment will be suspended in water bodies. Much will be deposited on the bottom of the river channel. For areas that will become depositional environments, please explain fully any negative effects associated with such deposits, and particularly for the area between Gull Lake and the Keeyask GS.</p> <p>Lastly, if monitoring shows that water quality in the main part of the reservoir is not suitable for some or all aquatic life, what adaptive measures are being considered in response to such an eventuality?</p>	CAC-0049
50	CAC	R-EIS Guidelines	6.3.7.2 Shoreline Erosion Processes, 6.3.8 Sedimentation (R to EIS); Executive Summary	N/A	Physical Environment	While the EIS predicts that the magnitude of residual operation effects "associated with shoreline erosion processes" are expected to be large, subsequent discussions shift the emphasis to the observation that sediment loads will decrease rapidly over time, including the observation that "the overall amount of organic suspended sediment in the reservoir will be very low after the first few years of operation and will continue to be very low". However, given that sediment loads will fall only after a year one increase in annual organic sediment that is 1300 times greater than the current annual figure, while 30 years after inundation (Year 30 being "considered a reasonable model for the long-term condition of the reservoir") they will still be 18 times that of current annual levels, the above-quoted statement about decreasing sediment loads and future levels appears inaccurate.	Please provide more compelling evidence to validate the statement and prove its accuracy.	CAC-0050

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51	CAC	N/A	PE SV; AQ SV; YFFN Environmental Evaluation Report; FLCN Environmental Evaluation Report; R to EIS 6.2.3.2.1 Physical Environment	N/A	Physical Environment		<p>Given the complex interactions that link shoreline erosion processes, organic and mineral sedimentation, debris, surface water temperature and dissolved oxygen, water quality and their individual and cumulative impact on human health and aquatic life, please provide the rationale for an environmental assessment that tackles each of these as separate components.</p> <p>Explain how the ecosystem approach to environmental assessment adopted for this project accounts for and reflects (in practice) said interactions and interrelationships?</p> <p>Please include information about the extent of communication and collaboration between the different teams of specialists who prepared the reports for each of these areas.</p>	CAC-0051a CAC-0051b CAC-0051c
52	CAC	N/A	6.4.2.1.5 Peat Resurfacing and Floating Peat Mat Mobility, 7.1.1.2 Peat Sedimentation, 10.4.2.1 Debris due to Reservoir Expansion (PE SV); 6.2.3.2.11 Debris, 6.3.8.2 Sedimentation, 6.3.11 Debris (R to EIS); 3.2 Keeyask Forebay Clearing Plan Draft 2006	N/A	Physical Environment	Peat-lands make up a significant portion of the 45km2 area that will be cleared and then flooded by the Project. Reservoir impoundment is predicted to expand by a further 7-8 km2 over the first three decades due to shoreline erosion, leading to more peat-land disintegration and break-up.	<p>Projected peat debris has been assessed to be “small in magnitude and short term”. Yet a discrepancy exists in regards to estimates of how much flooded peat will become mobile. While one section of the EIS points to 10-20% of flooded peat-land being expected to break-up and resurface, elsewhere the figure is considerably higher at around 35% (or approximately 15km2 to 16km2). Please respond to and explain this discrepancy.</p> <p>Even at the lower estimate, this still suggests the equivalent of 5-10km2 of peat resurfacing as debris. If this is considered small in magnitude, what amounts of peat debris would have to be seen in order to be considered medium or large in magnitude? Do these figures account for areas beyond the initial impoundment (159 masl) at risk to erosion and peatland disintegration after flooding?</p> <p>In light of the above, and given how variability in debris amounts can be increased due to fluctuations in water flow and levels, as well as variable ice conditions, please provide information about the capacity of the Waterways Management Program to cope with the removal of peat mats/blocks/islands etc. (in addition to woody debris) if levels are higher than expected, and given the current context where “minor amounts of organic sediment and floating peat are generated”. In particular, how is the Program expected to deal with the fact that two-thirds of peat break-up and resurface is expected to happen in the first year? Similarly, how does the Program plan to manage debris removal adaptively given the uncertainty about how much debris may be mobile at any one time since it can go through “many cycles of being mobilized and immobilized as conditions on the waterway change over time”? On this issue, please provide evidence that supports the claim that “there is not expected to be any additional mobile peat after 15 years of operation”. One scientific report (Keeyask Forebay Clearing Plan) states that there is “uncertainty regarding the full extent and rate of peatland disintegration and erosion. It is also impossible at this time to predict annual clearing requirements as numerous variables will affect the extent and rate of peatland disintegration and erosion from year to year”. What guarantees are there that those requirements can be met?</p> <p>Lastly, please provide an estimate of the number of pieces of woody debris expected on an annual basis for years 1 through 30 post-inundation (following the report that between 2002 and 2008, the Program removed between 13 to 177 pieces per year). If the range is expected to be significantly higher than this, what measures will be taken to ensure the capacity of the Program to cope with such an increase?</p>	CAC-0052a CAC-0052b CAC-0052c CAC-0052d
53	CAC	N/A	6.3.3.1 and 6.3.3.2 Climate (R to EIS); 2.4.1 Effect of the Project on Climate Change; EIS Executive Summary 2012:42; Technical Memorandum GN-9.5.5 (A Life Cycle Assessment of Greenhouse Gases and Select Criteria Air Contaminants) 2012	N/A	Physical Environment	Consistent with federal and provincial government efforts to reduce GHG emissions, the EIS states that the Project will “significantly displace coal-or-gas generated electricity that could produce over 200-times more greenhouse gas” and “while the construction and operation of the Project will result in short, small increases in regional GHG emissions, the operation of the Project will result in large reductions regionally over the long-term”.	<p>The net implication of the Project on GHG emissions must consider both the life-cycle GHG emissions resulting from the construction and operation of the Project, as well as the avoided GHG emissions that result from delivery of the energy (less transmission losses) to markets outside of Manitoba that currently depend on alternative fossil-fuel sources of generation. As such, please clarify whether the calculation of life-cycle GHG emissions takes into account the breakdown and disintegration of peat – both an important GHG source and sink – through flooding and increased shoreline erosion? If so, please provide these calculations because they appear to be missing from the EIS. If they are not available, please explain the rationale for their omission given that significantly more carbon is stored in the world’s soils—including peat-lands—than is present in the atmosphere, with undisturbed peat-lands known to accumulate carbon from the air at a rate of up to 0.7 tons per hectare per year (Pearce, F. 1994, ‘Peat Bogs hold the bulk of the Britain’s carbon’ New Scientist).</p> <p>• In answering the above, please explain the data shown in Table 2 and Table 14 in Technical Memorandum GN-9.5.5 (A Life Cycle Assessment of Greenhouse Gases and Select Criteria Air Contaminants). In Table 2, over half of all GHG emissions for the Keeyask generating stations are tied to land use change. What of this calculation correspond to peat disintegration and break-up through flooding? In Table 14, what does the peatland figure of 146 tonnes DM/ha correspond to? Is that the carbon content of these lands or the amount of carbon that will be emitted through peatland disintegration?</p> <p>Do the Project Partners expect peat breakup in some areas to be offset by peat formation in others? If so, please provide details. Does the Project classify peat as a renewable biomass? How long does Hydro estimate it takes for peat to reaccumulate (convert to new peatland types) in the Local and Regional Stud Areas post-impoundment?</p>	CAC-0053a CAC-0053b

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54	CAC	R-EIS Guidelines	Executive Summary; 6.0 Environment Effects Assessment	6, 33	Response to EIS Guidelines		<ul style="list-style-type: none"> Please provide evidence to show how the regulatory test for significance (of residual adverse effects) for the 38 VECs, a test that lies at the heart of the Keeyask environmental assessment process, provides "equal consideration to both technical/scientific studies and ATK [...] creating a thorough and comprehensive planning and environmental assessment process". Specifically, explain how the assessment process, as well as the negotiations and discussions that took place between the Partners, supports the claim of an "integrated and collaborative approach". Please stipulate the nature and extent of this "integration" (i.e. provide concrete examples across all aspects of the assessment process, as well as mitigation and adaptive management strategies). Please also describe the nature and extent of the efforts made to bridge the gap between what the regulations required and their synergy (or lack thereof) with the beliefs and views of the KCN partners? 	CAC-0054
55	CAC	KCN-EVRPTs	YFFN Environmental Evaluation Report; FLCN Environmental Evaluation Report	N/A	Terrestrial Environment		For some among the KCN Partners, the VEC process was very difficult to accept, given that its very nature "ignores the interrelatedness of people, animals, water, landscape and plants". Please describe and provide details about the extent and nature of discussions held between Manitoba Hydro and the KCNs with regards to the selection of the VECs and/or the modification of selected VECs in order to reflect the Cree Worldview, and specifically the interrelatedness of people, animals, water landscape and plants. What was the outcome of these discussions?	CAC-0055a
							Similarly, did any discussions take place between Manitoba Hydro and the four KCNs about making 'value' a designation of significance (in addition to those of 'nature', 'magnitude', 'geographical extent' and 'duration'), in order to better reflect Cree perspectives of the Keeyask homeland ecosystem (as stated in the respective environmental evaluation reports)? If these did take place, what was the nature and outcome of the discussions and what efforts made to modify the assessment process and test criteria in order to integrate Cree perspectives?	CAC-0055b
56	CAC	N/A	YFFN Our Voices Report 2012; FLCN Environmental Evaluation Report 2012; Response to EIS Guidelines, Chapter 6.	N/A	Terrestrial Environment		<ul style="list-style-type: none"> Please provide information about the nature and extent of discussions between the Project Partners about the use of biodiversity offsetting as a principle mitigation tool. Specifically, did any of the Partners question whether biodiversity offsetting was consistent with a Cree Worldview, given that it circumvents the role that 'place' plays in the homeland ecosystem? If concerns were raised, how were these resolved? 	CAC-0056
57	CAC	N/A	YFFN Our Voices Report 2012:71; FLCN Environmental Evaluation Report 2012:35; YFFN Our Voices Report 2012:69-94; Response to EIS Guidelines, Chapter 8.	N/A	KCN Environmental Evaluations	The Project is located in a region that has been greatly altered over the past five to six decades by development of the Lake Winnipeg Regulation Project (LWR), the Churchill River Diversion Project (CRD) and five generating stations. When KCN members spoke about Keeyask, many took the view that Keeyask is simply a continuation of one large development project, with their evaluation reports all detailing the impacts that previous Hydro developments have had on their homeland ecosystems and way of life. The EIS makes clear that the monitoring of changes and impacts will be measured against current conditions (i.e. prior to construction and operation of the Keeyask Dam and Generating Station). This is not consistent with the views of members of at least two of the KCNs, who believe that baseline conditions should be those that existed prior to the construction of the first dam in the region in the late 1950s.	Please respond to the difference in viewpoint between Manitoba Hydro and the KCN Partners around the issue of baseline data. If discussions took place between the Partners about this apparent discrepancy, please provide information about the nature and outcome of those discussions, and explain how collaborative monitoring is expected to function successfully in light of these differences - for "situations where ATK and technical assessments differ" how will monitoring be carried out and decisions made if the KCNs and Manitoba Hydro are working off of different sets of baseline data?	CAC-0057
58	CAC	R-EIS Guidelines	6.0 Environmental Effects Assessment; 7.0 Cumulative Effects Assessment	N/A	Response to EIS Guidelines		Please comment on the decision to separate the cumulative effects and residual environmental effects assessments, explaining how the significance of any given residual adverse effect can be accurately determined without incorporating the associated cumulative adverse effects that stem from prior Hydro development in the region. In choosing not to incorporate cumulative adverse effects in this way, please explain how this reflects the stated commitment to combining technical science and ATK as part of an integrated and collaborative assessment approach. If cumulative effects were to be included in the determination of residual adverse effects, please estimate for which of the 38 VECs Step 2 analyses would have been required/triggered?	CAC-0058
59	CAC	N/A	PE SV: AQ SV; TE SV: KCN Evaluation Reports	N/A	KCN Environmental Evaluations		How were local Cree observations and experiences regarding the impact of previous Hydro development projects on the region's biophysical environment integrated into the modeling of projected impacts for Keeyask? In other words, to what degree did modeling integrate ATK in order to reduce uncertainty around predictions for how Keeyask would impact the physical and biophysical environments in the study area?	CAC-0059
60	CAC	N/A	6.0 (R to EIS); Executive Summary; YFFN Environmental Evaluation Report; FLCN Environmental Evaluation Report	N/A	KCN Environmental Evaluations		<ul style="list-style-type: none"> The EIS states that the Project will have "major unavoidable effects", that the landscape will be "permanently changed", and the homeland ecosystem "transformed by the project". Please reconcile these statements and predictions with the environmental assessment results that found that for all 38 VECs the residual adverse effects were not deemed significant after Step 1 of the regulatory test. The KCNs make use of the word 'substantial' rather than 'significant' on multiple occasions in their Evaluation Reports. Similarly, Section 6 of the 'Response to EIS Guidelines' makes use of the word 'substantial' 126 times in reference to predicted adverse effects on a range of VECs. Given that the Merriam-Webster dictionary defines 'substantial' as meaning considerable in quantity: significantly great, please explain how 'substantial' is different from 'significant' in terms of determining the severity and importance of residual adverse effects? 	CAC-0060

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61	CAC	PD SV	7.0 Glossary	7-1	Response to EIS Guidelines	As stated in the glossaries listed above, AM includes mitigation measures to address unanticipated environmental effects. However, at other points in the impact statement, AM is identified as a means of dealing with unforeseen effects (e.g., Response to EIS Guidelines, page 5-6), which we interpret as potentially includes a range of uncertainties, an explanation congruent with AM literature. AM is referenced throughout the document as an element of monitoring. For example AM is one of four key principles of the Monitoring Plans submitted for the Project (Response to EIS Guidelines, 8-7). Executive Summary (Volume I p. 39) commits that the Environmental Protection Program will set out the process for addressing unanticipated effects. "If unexpected effects are detected, the program will also define processes for determining appropriate adaptive management programs and practices." In addressing this commitment, the Sediment Management Plan, for example, explains the steps involved should the TSS reach certain thresholds (Section 4).	Please confirm that Adaptive Management is designed to address unanticipated and unforeseen effects, thus including the broadest definition of uncertainty.	CAC-0061a
		R-EIS Guidelines	Sediment Management Plan (Section 4)	N/A	Physical Environment		Similar to the procedure identified in Section 4 of the Sediment Management Plan, please describe the general process in place for determining appropriate adaptive management programs and practices for unforeseen effects. This should include the timing between observation and action, the role of the MAC, and the communication plan for the Cree communities, government and public.	CAC-0061b
62	CAC	R-EIS Guidelines	8.0 Monitoring and Follow-up	N/A	Response to EIS Guidelines	Experimentation is considered to be at the core of Adaptive Management (AM). That is, actions should be designed to test ideas about the behaviour of an ecosystem impacts by human use. The literature identifies two types of purposeful experimentation: passive AM, and active AM. Passive AM is should desired objectives not be met, one remediation is proposed, implemented and evaluated at a time. Active AM focuses on deliberately probing the system to test competing hypothesis, by implementing more than one strategy concurrently. Section 8.6 outlines examples of predetermined AM measures	· To what degree will active AM be employed? · Can you provide examples of potential active AM strategies. A. For example, are there several competing prescriptions for vegetation rehabilitation that would be employed should the terrestrial habitat not respond to the EIS mitigation measures? B. For example, are there competing designed for lake sturgeon spawning structures that might be employed should the structure not be as effective as anticipated?	CAC-0062
63	CAC	R-EIS Guidelines	8.0 Monitoring and Follow-up	N/A	Response to EIS Guidelines	The Joint Keeyask Development Agreement (JKDA) provides for a Monitoring Advisory Committee (MAC). The Terms of Reference for this Committee are described in Schedule 4-7 of the JKDA. In addition to providing a means of communication with KCNs (2a), the MAC will "provide input into monitoring activities and planning" (2(b) (ii)).	Please clarify the role of the MAC in the development and implementation of the monitoring programs.	CAC-0063a
						Section 8 of the Response to EIS Guidelines notes that through the MAC, the Keeyask Cree Nations "will be actively involved in the development of scientific monitoring programs in the Partnership."	Should KCN request a report be issued to the General Partner (and thus appended to the board of the General Partner) as per section 9, what, if any, is the process for resolving outstanding concerns?	CAC-0063b
						The response to information request CAC-001 notes that "KCNs will play a role in monitoring and follow-up plans (including ATK) through mechanism established through governance structures of the JKDA"	Is there potential for the MAC to have a greater role in monitoring, for example having on-site visits to evaluate project impacts, or implement select independent monitoring studies?	CAC-0063c
64	CAC	R-EIS Guidelines	Section 4	N/A	Response to EIS Guidelines	The impact statement notes, in several locations, that Manitoba Hydro's EMS system is ISO 14001 registered, and it anticipates that this project will be included in that registration (eg., Project Description 4-11; Response to EIS Guidelines 4-49; 8-1). For example, certification is cited as evidence of Hydro's "continual improvement of environmental performance." (Response to EIS Guidelines 8-1)	· Please explain how certification demonstrates continual improvement of environmental performance, with specific examples. · Please include a copy of the most recent ISO-14001 audit. If this is not possible, please summarize the outcomes of this audit, including areas where improvement was suggested.	CAC-0064
65	CAC	R-EIS Guidelines	8.0 Monitoring and Follow-up	N/A	Response to EIS Guidelines	The Environmental Protection Plan for the Bi-Pole III Project included: 1. An Environmental Protection Information Management System (EPIMS): an electronic system for compiling and managing results of environmental monitoring; and 2. A community liaison (in addition to an environmental monitor) who would be on-site 1-2 days per week during construction.	Does the Environmental Protection Plan for Keeyask include the use of an EPIMS?	CAC-0065a
						However, I could not find reference to either in the Environmental Protection Program for Keeyask.	Will there be a Manitoba Hydro Position termed "environmental monitor"?(as this is not specified in section 1.4 of the Generating Station Construction Environmental Protection Plan)	CAC-0065b
							Will there be a community liaison positions? (as this is not specified in section 1.4 of the Generating Station Construction Environmental Protection Plan)	CAC-0065c
						Rationale In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that require enhancement of the natural environment, for which the proposed project is claimed to meet. Two examples are Goal 6 of Federal Sustainable Development Goals - Ecosystem / Habitat Conservation and Protection Goal – Maintain productive and resilient ecosystems with the capacity to recover and adapt; and protect areas in ways that leave them unimpaired for present and future generations. EIS Response – "Special efforts have been undertaken to avoid or minimize Project effects to habitat and ecosystem intactness and to replace the loss of important habitat types; for example, sensitive terrestrial habitat sites were avoided to the extent feasible when routing roads and locating borrow and excavated material placement areas. Overall, the likely Project related effects on ecosystem diversity are expected to be adverse but regionally acceptable because no stand level habitat types are lost, the distribution of area amongst the stand level habitat types is not expected to change substantially and the cumulative area losses for all of the priority habitat types remains below 10% (Keeyask HLP 2012, 9.5)"	Please describe how the proposed EIS will have positive impacts on the environment as opposed to minimizing adverse harm. Please provide attention to: <ul style="list-style-type: none">• climate change mitigation• enhancement of long-term ecological resilience• appropriate land-use planning• the avoidance of adverse effects	

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66	CAC	R-EIS Guidelines	C.9-4,5 and 11	N/A	Response to EIS Guidelines	<p>Principle 1 of Manitoba Hydro's Sustainable Development Principles – Stewardship of the Economy and the Environment</p> <p>Principle – Recognize its responsibility as a caretaker of the economy and the environment for the benefit of present and future generations of Manitobans. Meet the electricity needs of present and future Manitobans in a manner that ensures the long-term integrity and productivity of our economy, our environment and our natural resources, and safeguards our human health.</p> <p>EIS Response – Consistent with the KCNs' commitment to caring for Askiy and Manitoba Hydro's commitment to sustainable development, the Project has been designed to minimize adverse effects and maximize benefits to local and regional residents. Manitoba Hydro and the KCNs have planned the Project together and completed more than a decade of both ATK and technical studies to predict and mitigate adverse effects and enhance Project benefits. (Keeyask HLP 2012, 9.11).</p> <p>In general, there are few to no mentions of enhancing the natural environment and improving ecological resilience. Where there are attempts described as improvements (such as a habitat and fish-stocking program (Keeyask HLP 2012, 9.4) there are concerns regarding whether such actions will in fact lead to long-term improvement.</p> <p>Given the historically negative impact of hydro development on the natural environment (as well as First Nations ways of living, etc.) it is imperative that future actions by Manitoba Hydro lead to improved environmental outcomes rather than simply avoiding adverse effects. Furthermore, given the proponents' claims to have met various sustainability goals, principles, policies and guidelines, many of which require environmental enhancement, it is necessary for the proponent to better describe and justify how its actions will lead to such enhancement.</p>		CAC-0066

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67	CAC	R-EIS Guidelines	C.9-6 and 12	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that require integrated decision-making, for which the proposed project is claimed to meet. Two examples are:</p> <p>Government of Manitoba Sustainable Development Principle – Integration of Environmental and Economic Decisions Principle – Economic decisions should adequately reflect environmental, human health and social effects. Environmental and health initiatives should adequately take into account economic, human health and social consequences.</p> <p>EIS Response – The proponent argues the project will provide clean affordable energy in comparison to coal and gas (Keeyask HLP 2012, 9.6).</p> <hr/> <p>Manitoba Hydro Policy/Principle 3 – Integration of Environmental and Economic Decisions: Policy/Principle – Treat technical, economic and environmental factors on the same basis in all corporate decisions, from initial planning to construction to operations to decommissioning and disposal. To the extent practical, include environmental costs in economic and financial analysis.</p> <p>EIS Response – A major example of this integration is the Project design. The Project incorporates mitigation, compensation and enhancement measures to reduce adverse environmental and social impacts and maximize benefits. By incorporating these measures into the Project’s capital and operating budgets, the Project costs closely reflect the full societal cost of the Project (Keeyask HLP 2012, 9.12).</p> <p>Both responses by the proponent are noteworthy insofar as they illustrate attempts to increase positive outcomes from the project. However, it is unclear to what extent the EIS represents a serious attempt at integration. The intent of integration is not simply to look at mitigation or enhancement of effects in economic, social and biophysical areas, but rather to consider the entire full suite of requirements for progress towards sustainability, including their interrelations, covering interactive effects as well as effects in particular areas. Likewise, the impacts of the project - both good and bad, on the natural environment, First Nation communities, the people of Manitoba, etc. both and now and in the future – cannot be separated into social, ecological, and economic components without losing much, if not all, that many consider valuable in this world. Given the scale of this proposed project, and the possibility of the project providing long-term lasting benefits, if properly undertaken, it is important to ensure that the decision-making framework is appropriated integrated.</p>	<p>Please describe how the proposed EIS represents an integrated approach to decision-making and planning, particularly with regards to sustainable development. Please provide attention to:</p> <ul style="list-style-type: none"> • applying integrated assessment to seek the best alternative • the achievement of mutually reinforcing positive gains through all of Manitoba Hydro’s activities • the avoidance of tradeoffs 	CAC-0067

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68	CAC	R-EIS Guidelines	9-10 and 13	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that relate to the development of a sustainable society. Two examples are:</p> <p>Manitoba Guidelines for Sustainable Development – Waste Minimization and Substitution: Guideline - (a) Encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and (b) Reducing, reusing, recycling and recovering the products of society.</p> <p>EIS Response – While opportunities to recycle wastes in remoter northern areas are limited, waste generated by the Project will be minimized and waste materials will be recycled to the extent practical, and the remaining waste will be disposed of in accordance with license and regulatory requirements (Keeyask HLP 2012, 9.10).</p> <p>Manitoba Hydro Sustainable Development Policy/Principles – Conservation Policy/Principle – To the extent practical, plan, design, build, operate, maintain and decommission Corporate facilities in a manner that protects essential ecological processes and biological diversity. Give preference, where practical, to projects and operating decisions that use renewable resources or that extend the life of supplies of non-renewable resources.</p> <p>Response – Hydropower utilizes a renewable resource, thus assisting in the conservation of non-renewable resources such as gas or coal that otherwise would be used to generate the electricity being produced at the Project (Keeyask HLP 2012, 9.13).</p> <p>The responses by the proponent indicate positive steps, but much more is evidently needed. Both the guideline and the policy/principle provided above need to be understood more broadly in society. Neither of them relates solely, nor even primarily, to the environmental impacts of supplying electricity, but rather to the broader consumption of resources and production of wastes in society. Furthermore, this broader understanding of sustainability is illustrated in Manitoba Hydro’s full set of sustainable development policy/principles (Manitoba Hydro n.d.). The proposed project represents an important opportunity for Manitoba to take steps in a transition towards a more sustainable society. For such a transition to take place, however, planning for future energy undertakings must take proactive measures to address both the supply of electricity as well as the end-uses of the electricity. At this point, however, it is unclear how the proposed project plays a role in the transition to a sustainable society beyond reducing GHG emissions.</p>	<p>Please provide as background an explanation of how the comparative assessment of alternatives leading to the project proposal included attention to sustainability principles including the one noted above in determining that the proposed project would be preferable to demand management alternatives.</p> <p>Please also describe how the proposed project will help Manitoba transition to a sustainable society that uses energy and resources in an efficient, benign and renewable manner. Please provide attention to:</p> <ul style="list-style-type: none"> • the reduction of overall energy and resource consumption • the promotion of appropriate uses of energy and matching of energy supply quality to final needs • the development of a resilient energy system in Manitoba • the avoidance of resource conflicts 	CAC-0068

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69	CAC	R-EIS Guidelines	C.9 – 6 and 14	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that relate to the need for fostering and maintaining livelihood opportunities. Two examples are:</p> <p>Government of Manitoba Principles of Sustainable Development – Shared Responsibility and Understanding</p> <p>Principle – Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation. Manitobans share a common economic, physical and social environment. Manitobans should understand and respect differing economic and social views, values, traditions and aspirations. Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including Aboriginal peoples, to facilitate equitable management of Manitoba's common resources (Manitoba 1998).</p> <p>EIS Response – The processes for developing the Project have included the development of a partnership that is intended, in part, to meet the societal, cultural, economic and employment aspirations of the local KCNs communities, which include the continuation of traditional and cultural practices, as well as a deeper integration into the regional and provincial economy. Discussions leading to the formation of the Partnership and the planning and environmental assessment activities have led to a growing understanding and respect for the different values, and worldviews of Manitoba Hydro and the KCNs. (Keeyask HLP 2012, 9.6).</p> <p>Manitoba Hydro Sustainable Development Policy/Principles – Understanding and Respect</p> <p>Policy/Principle – Strive to understand and respect differing social and economic views, values, traditions and aspirations when deciding upon or taking action. Give preference to those alternatives that best fulfil Corporate objectives while minimizing infringement on the ability, rights, and interests of others to pursue their aspirations.</p>	<p>Please describe how the proposed project will ensure sufficient and desirable livelihood opportunities both now and in the future. Please provide attention to:</p> <ul style="list-style-type: none"> • basic livelihood foundations (e.g. skills and education, social capital) • protection of the most vulnerable • lasting local economic development • maintenance of First Nations ways of living; and • prevention of boom and bust cycles <p>Please describe how the proposed project compares with alternatives to and alternative means of the project with regards to fostering livelihood opportunities.</p>	CAC-0069
						<p>EIS Response – The Project proponent is a partnership comprising Manitoba Hydro and the KCNs. Considerable effort has been made in forging constructive relationships between Manitoba Hydro and the KCNs, including facilitating community studies aimed at understanding history, community history, and more importantly the Cree worldview and ATK. This growing understanding has had a major impact on Project design, construction and operation. It has also led to specific arrangements through community-specific [adverse effects agreements]” (Keeyask HLP 2012, 9.14).</p> <p>Both responses are notable insofar as they recognize the shared responsibility of the project proponents to ensure lasting and desirable livelihood opportunities and foundations, particularly among the First Nation communities. While the EIS contains significant discussion relating to livelihood opportunities, no overall picture emerges from the discussions with regards to the overall and integrated effects on livelihood opportunities, especially lasting ones. A project of this scope may provide Manitoba Hydro an important opportunity to meet the goals of sustainable livelihood foundations over the entire lifecycle of the project (e.g. construction, operation, end-use of the electricity). To obtain these benefits requires a proactive and integrated approach to decisionmaking.</p>		

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70	CAC	R-EIS Guidelines	C.9-8 and 15	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that relate to the need to leave a positive legacy for future generations. Two examples are:</p> <p>Government of Manitoba Principles of Sustainable Development – Stewardship</p> <ul style="list-style-type: none"> • Principle – The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations. Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations. Today's decisions are to be balanced with tomorrow's effects. • EIS Response – Partnership income will be beneficial to generations of KCNs community Members, and will provide sustained revenues to the broader Manitoba economy. (Keeyask HLP 2012, 9.6). <p>Government of Manitoba Guidelines for Sustainable Development –Integrated Decision Making and Planning</p> <ul style="list-style-type: none"> • Guideline – Encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral and which incorporate an inter- generational perspective of future needs and consequences. • EIS Response – “The Partnership has established a governance structure that includes KCNs representation. As part of this structure, the communities have had direct involvement in the environmental assessment and will continue to have a strong role with their Aboriginal traditional knowledge (ATK) in the monitoring and follow-up programs. Each partner concerns itself with the short and long-term benefits and costs of the Project. Multi-generational benefits are key to the commitment of the KCNs’ participation in the Project (Keeyask HLP 2012, 9.9). <p>The responses by the proponent are commendable insofar as they outline various attempts to ensure a positive legacy, particularly with regards to First Nations communities. However, there is a need to broaden the scope of analysis when considering what a positive legacy entails. With reference to the guideline and principle provided above, as a crown corporation Manitoba Hydro has a duty to ensure a positive legacy more broadly in society. Some relevant – although non-exhaustive – issues include the extent to which future concerns will be met by present savings (e.g. setting aside money and resources for successful adaptive environmental management), as well as ensuring that future generations have sufficient resources and capital (social, financial, natural, etc.) to meet their needs. A project of this scope provides Manitoba Hydro an important opportunity to ensure that future generations are left with such a positive legacy, and this is something the EIS should explicitly and fully address.</p>	<p>Please describe how the proposed project will leave a positive legacy for future generations. Please provide attention to:</p> <ul style="list-style-type: none"> • the long-term availability of energy and other resources • the potential for future generations to live sustainability (including maintenance of First Nations ways of living) • how future needs will be met by present savings 	CAC-0070

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71	CAC	R-EIS Guidelines	C.9-8 and 15	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that relate to the need to leave improved equity outcomes. Two examples are:</p> <p>Government of Manitoba Guidelines for Sustainable Development –Global Responsibility Guideline – Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.</p> <p>Response – “A detailed Life Cycle Assessment was conducted by the Pembina Institute in order to estimate the GHG emissions resulting from the construction, land use change, operation, and decommissioning of the Project. The resulting emissions are extremely low relative to other forms of generation. An equivalent amount of electricity, produced by a combined cycle natural gas generating station during one year of operation would result in more than double the entire life cycle emissions estimated associated with the Keeyask Project over a 100 year period. Since the Project will displace gas and coal generation, primarily in the U.S. Midwest, it will contribute to substantial GHG reductions. The Project is estimated to displace 30 million tonnes carbon dioxide equivalent during the first 10 years of operation” (Keeyask HLP 2012, 9.8).</p> <p>Manitoba Hydro’s Sustainable Development Principle – Global Responsibility:</p> <p>Principle – Recognize there are no political and jurisdictional boundaries to our environment, and that there is ecological interdependence among provinces and nations. Consider environmental effects that occur outside of Manitoba when planning and deciding on new developments and major modifications to facilities and to methods of operation</p> <p>Response – “The Project will contribute to substantial reductions in greenhouse gases (GHG) by displacing fossil fuel electricity generation” (Keeyask HLP 2012, 9.15).</p> <p>As has been previously noted, the reduction in GHG emissions is important and commendable. However, the Government of Manitoba’s Guideline notes the economic, ecological and social interdependence among provinces and nations, and this interdependence requires extending considerations of equity well beyond GHG emissions.</p> <p>The proposed Keeyask project – along with Manitoba Hydro’s other projects – may present an opportunity to continue building a foundation for a more just and equitable Manitoba, from the construction phase through final use of the electricity over the long anticipated lifetime of the project. The process of striving for greater equity must begin at the planning stage. At this point, however, it is unclear what steps are being taken to promote both inter- and intra-generational equity in their various manifestations.</p>	<p>Please describe how the proposed project will promote greater equity. Please provide attention to</p> <ul style="list-style-type: none"> • the fair distribution of benefits and risks • the fair access to resources and opportunities • the accounting of impacts from previous developments • the shared responsibility amongst all partners to seek equitable outcomes and processes • the promotion of equity both between and within generations 	CAC-0071

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72	CAC	R-EIS Guidelines	9 – 6 and 13	N/A	Response to EIS Guidelines	<p>In several instances the project proponent outlines principles, policies, guidelines and goals for sustainable development that relate to the long-term capacity to respond. Two examples are</p> <p>Government of Manitoba Guidelines for Sustainable Development –Stewardship</p> <p>Guideline – The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations. Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations. Today's decisions are to be balanced with tomorrow's effects.</p> <p>Response – Stewardship of the environment will continue through ongoing monitoring and follow-up programs involving KCNs communities and Manitoba Hydro, and AEA programs will enhance the cultural identity and connection to the land of present and future generations which in turn will contribute to social well being. (Keeyask HLP 2012, 9-6).</p> <p>Manitoba Hydro's Sustainable Development Principle – Prevention and Remedy</p> <p>Principle – To the extent practical, anticipate and prevent adverse environmental and economic effects that may be caused by Corporate policies, programs, projects and decisions rather than reacting to and remedying such effects after they have occurred. Purchase, where practical, environmentally sound products taking into account the life cycle of the products. Address adverse environmental effects of Corporate activities that cannot be prevented by: (1) endeavouring, wherever feasible, to restore the environment to predevelopment conditions or developing other beneficial uses through rehabilitation and reclamation; (2) striving to replace the loss with substitutes that would enhance the environment and/or associated resource uses while offsetting the type of damage experienced; (3) making monetary payments for compensable damages on a fair, equitable and timely basis. Give preference, where practical, to projects and operating decisions that use renewable resources or that extend the life of supplies of nonrenewable resources.</p> <p>Response – “A number of measures have been taken to prevent and minimize adverse effects, the most substantial being to reduce the size of the Project. At one time, a high head project with 180 km2 of initial flooding was under consideration; in contrast, the current Project that will result in 45 km2 of initial flooding. As another example, a combination of habitat enhancement measures and a fish stocking program that includes a fish hatchery will enhance the population of lake sturgeon in the Project area. As another example of anticipating and remedying effects before they occur, AEAs with the KCNs were negotiated as proactive measures in advance of the development, and programs under those agreements will address effects on resource users” (Keeyask HLP 2012, 9.13).</p> <p>The responses by the project proponents are commendable. However, the responses do not sufficiently indicate the capacity of the project proponents to respond to both foreseen and unforeseen events. For example, an analysis of climate change scenarios by Manitoba Hydro forecasted an increase in average temperature by 4.1°C and an increase in precipitation of 14% by the 2080s (Manitoba Hydro 2012, iv). Such increases in temperature and precipitation will have major interacting implications for Manitoba's social, economic and ecological conditions, and for the proposed project. If only for this reason, it is imperative that a project with such a long lifespan be designed from early stages to be adaptable to change. Furthermore, it is imperative for reasons of equity and long-term ecological integrity, among other things, that sufficient resources are secured to provide future generations the ability to respond appropriately to future circumstances. At this point it is unclear the extent to which the proposed project will be designed in a manner to ensure the full capacity to respond.</p>	<p>Please describe how the proposed project will ensure the long-term capacity to respond to both foreseen and unforeseen challenges and opportunities. Please provide attention to:</p> <ul style="list-style-type: none"> • the adaptability of the design • the development of responsive monitoring and adaptive management plans • the resources (financial and otherwise) and ability to act upon foreseen and unforeseen challenges and opportunities (esp. climate change) • the development of appropriate baseline data • the attention to uncertainty, including irreducible uncertainty • the ability to avoid lock-in 	CAC-0072
73	CAC	R-EIS Guidelines	C. 9-4 and 8	N/A	Response to EIS Guidelines	<p>Rationale</p> <p>In several instances of the EIS, the proponent argues the proposed project is promoting sustainable development by avoiding the GHG emissions from the coal-fired and natural gas-fired electricity that would otherwise be providing the electricity (e.g., Keeyask HLP 2012, 9.4 and 9.8). The amount of GHG offsetting is both significant and commendable. However, there are certain issues that add complexity to the matter.</p> <p>First, it is not clear that the electricity produced by the proposed Keeyask project will replace existing electricity demand or facilitate additions to it (i.e. it is latent demand). If the goal is to promote sustainable development by reducing GHG emissions, it is important to ensure the project effects will reduce overall GHG emissions from current levels, as opposed to reducing the rate of increase of GHG emissions. Meeting the higher test of reducing current GHG emissions requires a proactive approach, but one that is within the potential of an electricity provider as important and large as Manitoba Hydro.</p> <p>Second, it is not clear how the anticipated GHG displacement attributable to the proposed project compares with alternatives to the project, such as enhanced conservation options and energy efficiency. It may be that increased generating capacity is not the preferred means of reducing GHG emissions in both the near term (e.g. the upfront GHG emissions related to the flooding and construction of the dam) and the long-term.</p>	<p>Please elaborate further on how the proposed project will reduce GHG emissions in both the nearterm and long-term. Please provide attention to:</p> <ul style="list-style-type: none"> • the extent to which the proposed project would be replacing existing coal-fired and natural gas-fired supply, or adding to that supply • the extent to which the project would help to support rather than compete with demand management efforts and options • how the GHG emissions reduction of the proposed project compare with alternatives to the project (e.g. conservation and efficiency) 	CAC-0073

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74	CAC	R-EIS Guidelines	8-Sep	N/A	Response to EIS Guidelines	Rationale Manitoba Hydro has stated: "A detailed Life Cycle Assessment was conducted by the Pembina Institute in order to estimate the GHG emissions resulting from the construction, land use change, operation, and decommissioning of the Project. The resulting emissions are extremely low relative to other forms of generation. An equivalent amount of electricity, produced by a combined cycle natural gas generating station during one year of operation would result in more than double the entire life cycle emissions estimated associated with the Keeyask Project over a 100 year period. Insofar as the Project will displace gas and coal generation, primarily in the U.S. Midwest, it will contribute to substantial GHG reductions. The Project is estimated to displace 30 million tonnes carbon dioxide equivalent during the first 10 years of operation" (Keeyask HLP 2012, 9.8). The Fuel Switching report filed by Manitoba Hydro in the 2013/14 PUB General Rate Application provides additional information regarding displaced CO2.	<ul style="list-style-type: none"> If it is not otherwise on the record of this proceeding, please provide the detailed Life Cycle Assessment conducted by the Pembina Institute; Please provide any information within the possession of Manitoba Hydro relating to the growth of wind power and other renewables in MISO. If no such information is in the possession of Manitoba Hydro, please indicate whether that information is readily available and please explain why Manitoba Hydro has not sought this information from other sources such as the Midwest Independent System Operator; Please provide any information in the possession of Manitoba Hydro that discusses the possibility of Manitoba Hydro displacing wind generated power or other renewables in MISO during certain periods of time. If no such information is in the possession of Manitoba Hydro, please indicate whether that information is readily available and please explain why Manitoba Hydro has not sought this information from other sources such as the Midwest Independent System Operator Please provide the Fuel Switching report filed by Manitoba Hydro in the recent Manitoba Hydro General Rate Application. 	CAC-0074
75	CAC	R-EIS Guidelines	C. 6, C. 7-3 and 7-45	425, 426, 488	Response to EIS Guidelines	The project identified valued environmental components (VECs) and then analyzed the adverse residual affects of the project on the VECs, taking into consideration mitigation efforts. Then they determined the significance of the adverse effects based on guidance from regulatory authorities which the project admitted differs from Cree World Views. (C. 7-3)	How would the results vary if a Cree World View was used as the benchmark?	CAC-0075a
		R-EIS Guidelines	C. 7-3 and 7-45	N/A	Socio-Economy	The project has identified socio-economic cumulative affects and concluded that this project will not worsen them. (C.7-45)	Given that these cumulative affects have been very troublesome, is it sufficient to not create more damage to justify the project? What ethical principle is being used to make this decision, e.g. Pareto optimality?	CAC-0075b
76	CAC	R-EIS Guidelines	6.6.3.1 employment, 6.6.3.1.1 construction, 6.6.3.2, business opportunities, 6.6.3.3, income	N/A	Socio-Economy	Sections 6.6. addresses a variety of subjects including economy, employment, business opportunities and income. While some details are provided further information	How will higher waged/higher skilled jobs be created for Keeyask members?	CAC-0076a
							How will Keeyask Cree Nations (KCN) residents gain skills to take on these jobs?	CAC-0076b
							How will KCN residents get training and education needed to get other permanent jobs?	CAC-0076c
							How many permanent positions in Keeyask operations will be taken on by KCN residents?	CAC-0076d
77	CAC	R-EIS Guidelines	C.6.6, Chapter 9-9	N/A	Socio-Economy	Sections 6.6. addresses a variety of subjects including economy, employment and training opportunities and business development opportunities. In Chapter 9, Manitoba Hydro indicates that "the project is designed to . . . maximize economic and social benefits for the community." Additional information is requested on the following matters:	How is it ensured that the KCN will get the lucrative contracts that are to be publicly tendered? Regarding the KCN businesses that are established during the construction phase, what will be done to ensure that they are sustainable into the future?	CAC-0077a
							As KCN businesses are established please describe the mechanisms to ensure that they build management capacity, and accumulate capital?	CAC-0077b
							How will business development enforce a virtuous community economic development cycle whereby surpluses are reinvested locally?	CAC-0077c
78	CAC	R-EIS Guidelines	C. 6.6, S 6.6.5.2	N/A	Socio-Economy	Chapter 6.6 discusses a variety of activities expected to develop local businesses and improve employment opportunities. As businesses grow and employment opportunities improve, local tax revenue will increase.	Please elaborate on how associated plans for local governments (e.g., band councils) to increase their capacity to manage and effectively utilize these funds?	CAC-0078
79	CAC	R-EIS Guidelines	C. 6.6 socio economic environment, C. 8 Monitoring and Follow-up, S.8.2.4,	p. 8-27, table 5, p. 8-28-8-33	Response to EIS Guidelines	Funds will be made available for the offsetting programs.	Please elaborate on the mechanisms in place to ensure that these funds will be used for these program and done so efficiently and effectively?	CAC-0079a
							In terms of the offsetting programs themselves, please elaborate on the organization that will be put in place and whether it will be one organization or whether each community will create their own.	CAC-0079b
							Please elaborate on the role to be played by KCN residents in the offsetting programs and upon their training to participate in this program.	CAC-0079c
							Please elaborate on the ongoing monitoring and evaluation of all Keeyask programs –construction, operations, offsetting program– to ensure that programs are effective and meeting community interests? Please elaborate on the mechanism for adjustment if negative results are identified from the monitoring.	CAC-0079d
80	CAC	R-EIS Guidelines	C. 6.6 socio economic environment, C. 8 Monitoring and Follow-up, C. 9, Sustainable Development	9-9	Response to EIS Guidelines		<ul style="list-style-type: none"> As the project continues through construction and implementation, how will the Keeyask Hydropower Limited Partnership (KHLP) ensure that changes in local governance (e.g., band council) and popular opinion are reflected in program implementation? For instance if there is a change local leadership how will KHLP ensure continuity from one government to the next in order to ensure that transitions occur seamlessly? 	CAC-0080

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81	CAC	R-EIS Guidelines	6.6.5.2 Community Health, 6.6.4.2, Housing	N/A	Socio-Economy		KCN notes that there is a housing crisis in their communities. Please elaborate on how the project will assist in addressing this crisis.	CAC-0081a
							Community health care is limited in KCN communities. Please elaborate on how the project will assist in addressing this issue.	CAC-0081b
82	CAC	R-EIS Guidelines	6.7.3.1, domestic fishing, s. 6.7.3.2, Hunting and Gathering, s. 7.4.1, Commercial Trapping, s. 6.7.4.2 commercial fishing,	6-528, p. 6-536, p.6-544, p. 6-546	Socio-Economy	KHLP plans offsetting programs to hunt, fish and trap.	<ul style="list-style-type: none"> • Please discuss the long term sustainability of this approach? What are the implications of offsetting for domestic food security? • Please describe the expected take up for a program requiring people who used to use traditional territories to fish, hunt, or trap now to fly to offset sites? • Please elaborate on the organization of these offset arrangements? • Please provide any academic literature or research in the possession of the partnership that demonstrates that these offsetting programs are likely to be successful. • Please discuss alternatives plans in effect for the eventuality that offset programs do not work effectively and people face food insecurity and/or declining nutrition. • What are the consequences of these offsetting programs for these new geographic areas? 	CAC-0082
83	CAC	R-EIS Guidelines	6.7.1.2, residual effects of construction	6-532	Socio-Economy	“It is recognized that some resource users may be negatively affected.” (6-532)	KHLP plans to compensate the person unable to continue to pursue traditional livelihoods. Please elaborate on the form that compensation will take? To the degree that compensation is monetary, please elaborate on how these funds will truly compensate for livelihoods?	CAC-0083
84	CAC	R-EIS Guidelines	C. 9, 9.2.3.1.1	9-2	Socio-Economy		There are many asymmetries in this project. How will it be ensured that these asymmetries do not lead to dominance of one group’s interests over another groups? For instance, KCN communities are tiny in comparison to Manitoba Hydro and even regarding ownership shares, this imbalance holds. How can it be ensured that KCN communities have a fair voice in ongoing management of the project?	CAC-0084a
							Within KCN communities some people did not support the project. How will their interests be protected as the project is implemented?	CAC-0084b
							“In contrast to the past, the Project puts into practice the proposition of greater empowerment of local indigenous people.” It is claimed that the project will empower KCN communities. How does KHLP define empowerment? How does it expect that the project will lead to empowerment? Chapter 9, section 9.2.1, page 9-2.	CAC-0084c
85	CAC	R-EIS Guidelines	6.6.5.6	6-488	Socio-Economy		Given the project has stated that it will cause ‘sorrow’ to the communities regarding culture and spiritual issues, what ethical framework was used to weigh this against the benefits?	CAC-0085
86	CAC	SEE-RU-HR SV	3.12	N/A	Socio-Economy		Is there a literature indicating that the type of preferential treatment being used by the project for First Nation-owned businesses is effective? If so, please provide any literature in the possession of the partnership evaluating the success.	CAC-0086
87	CAC	SEE-RU-HR SV	3.2.3	N/A	Socio-Economy	It is noted that “Estimates of equity investment income to the KCNs are not presented since this is commercially sensitive information, and will depend on the nature and level of investment chosen by each of the KCNs communities” (page 3-13). Predicted equity investment income for the KCNs is a crucial piece of information and this should be shared with interested stakeholders, for various levels of investment by the KCNs.	Further, how will revenue be determined for all project partners? How will revenue be distributed within communities? Is there a contingency plan if U.S. demand or prices for Canadian hydroelectric power decreases significantly?	CAC-0087

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88	CAC	SEE-RU-HR SV	3.2.1	N/A	Socio-Economy		Why did the Hydro Northern Training Employment Initiative (HNTEI) cease in 2010?	CAC-0088a
							The HNTEI cost \$60.3 million and this cost was shared by Manitoba Hydro, Canada and the Province of Manitoba - what proportion did each contribute?	CAC-0088b
							How have community members' concerns regarding Wuskwatim training opportunities been addressed? Community members raised concerns regarding accessing funding for student training and proper notice of training opportunities.	CAC-0088c
							The Gillam KPI Program 2009-2010 found that 'community youth required additional motivation to pursue available opportunities' (pages 3-39) – have the Keeyask Partners considered additional incentives for youth to undertake training activities?	CAC-0088d
							Please elaborate on the role to be played by KCN residents in the offsetting programs and upon their training to participate in this program.	CAC-0088e
							Please elaborate on the ongoing monitoring and evaluation of all Keeyask programs – construction, operations, offsetting program– to ensure that programs are effective and meeting community interests? Please elaborate on the mechanism for adjustment if negative results are identified from the monitoring.	CAC-0088f
89	CAC	SEE-RU-HR SV	3.2.1	N/A	Socio-Economy		How was the concern raised regarding transportation to the construction site addressed?	CAC-0089a
							Will there be jobs for individuals with disabilities? If so, please describe these jobs.	CAC-0089b
							Community members raised concerns regarding employment (layoff) practices (page 3C- 43)– some implying that layoffs of Aboriginal workers were being used to circumvent preferential employment policies – how have such practices been altered to address such concerns?	CAC-0089c
							Are there anti-discrimination policies in place? Please describe them.	CAC-0089d
							Will job ad wording be altered to ensure some will not find it overly complex?	CAC-0089e
							Are applicants informed that they must renew their application every 6 months to prevent their file from going dormant?	CAC-0089f
							A number of factors are mentioned that are predicted to possibly affect employment of KCNs, CBNs and northern Aboriginal workers (Attraction, Availability and Qualifications) – have the Keeyask partners thought of ways to mitigate them? Please see examples immediately below: * Attraction e.g. flexible work schedule to ensure workers aren't away from families for too long (mentioned at many community consultations) * Availability e.g. sufficient notice of a job opportunity * Qualifications e.g. could apprenticeships be used to substitute for lack of experience?	CAC-0089g
							Table 3-1 lists employment estimates – these are likely calculated using the labour force as the denominator. As many workers may be discouraged from looking for work and therefore not show up in the labour force figures, it seems important to re-calculate these employment rates with the adult population as the denominator. Please discuss the merits of this suggestion.	CAC-0089h
							On pages 3-24, it was noted that factors such as a lack of daycare facilities, addictions, a lack of confidence or job experience and housing insecurity prevent individuals in the KCN communities from taking up jobs. Will the Keeyask Partners consider broader interventions to assist individuals in the KCNs to take advantage of new job opportunities?	CAC-0089i
90	CAC	SEE-RU-HR SV	3.2.4 and Appendix 3B	N/A	Socio-Economy		Please elaborate on the evidence supporting your conclusion of the predicted effect of the Keeyask project on the cost of living? Have the Keeyask partners thought of ways to minimize the negative impact of inflation?	CAC-0090
91	CAC	SEE-RU-HR SV	3.3.1 Employment and Training Opportunities - Local Study Area	N/A	Socio-Economy	Tables throughout this volume indicate the labour demand will fluctuate quite a bit, and be highest for the construction phase. This indicates that the KCN communities will experience volatile economic conditions (a 'boom bust' situation, figure 3-20). Given this, it is important that the project make an effort to support initiatives that could bring about long-term economic development opportunities that do not derive from hydroelectric power generation.	For example, Fox Lake, YFFN and WLFN seem to lack a high school so that students have to leave their communities for high school. This may be a barrier to high school completion for some children. Please discuss the merits of the Keeyask Partners contributing funds for a high school in these communities?	CAC-0091a
							The University College of the North in Thompson is also in need of funds for campus upgrading to support the increase in demand for its courses. Please discuss the merits of the Keeyask Partners support this institution which supports diversified long-term economic opportunities in the Regional Study Area?	CAC-0091b
92	CAC	PI SV	3.2.3	3-13	Public Involvement		Were the public consultations in the North advertised on the radio in all communities?	CAC-0092a
							Individuals in a number of communities complained that Hydro was starting a new development before old disputes had been settled. Please discuss the importance of Keeyask being put ahead of past grievances?	CAC-0092b

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93	CAC	KCN-EVRPTS	6.0 and 7.0 CNP	32	Socio-Economy		On page 32, it is noted that there was a Survey at Sam Cook school in TCN. Please indicate where the results of this survey can be found.	CAC-0093a
				37-39			On pages 37-39, a list of issues identified by community members is provided on pages 36-39. There is reference to community members' ranking of these issues. Please provide these aggregate rankings. Finally, 535 people responded to a community questionnaire. Please summarize the results.	CAC-0093b
				75			On page 75, the referenda were discussed. Please elaborate upon the information that community members were given before the referendum (especially concerning jobs, training, revenue sharing, adverse effects mitigation)?	CAC-0093c
94	CAC	N/A	N/A	N/A	Socio-Economy		Please indicate whether gender was a consideration in project design? If so, how was it taken into account?	CAC-0094
95	CAC	R-EIS Guidelines	2.2.2 Aboriginal Traditional Knowledge	N/A	KCN Environmental Evaluations		Aboriginal Traditional Knowledge "ATK" is described as "a cumulative body of knowledge, practice and belief about relationships among living beings that is handed down by Elders in each generation and is a way of life continuously adapted and added to by each generation." Questions: • To what extent is Cree/Ineniwak Indigenous Legal Tradition considered and/or included in the term ATK. • To what extent is Cree/Ineniwak Traditional Governance considered and/or included in the term ATK	CAC-0095
96	CAC	KCN-EVRPTS	N/A	N/A	KCN Environmental Evaluations		1. What if any resources were allocated to considering Indigenous Legal Traditions in advance of the KCNs preparation of the Environmental Evaluation Reports? 2. What if any resources were allocated to considering Indigenous Legal Traditions in the context of the KCNs preparation of the Environmental Evaluation Reports?	CAC-0096
97	CAC	KCN-EVRPTS	N/A	N/A	KCN Environmental Evaluations	FLCN Environmental Evaluation Report indicates that the "VEC approach tends to ignore the interrelatedness of people, animals, water, landscape and plants, which are inherent in the way FLCN and our people view and define Aski." (p. iv)	Please advise what has been done to reconcile this concern about FLFN's "difficulty to accept" VECs as an acceptable means to approach environmental assessment from the perspective of Fox Lake Cree worldview.	CAC-0097
98	CAC	R-EIS Guidelines	6.0 Environmental Effects Assessment; 10.5 Keeyask Cree Nations' Evaluations of the Project	N/A	KCN Environmental Evaluations	In addition to the government regulatory environmental assessment process, each of the KCNs conducted an environmental assessment process.	Please confirm the methodology that was employed by each of the KCNs for the environmental assessment process. · Please advise if the environmental assessment process was modeled on Cree/Ineniwak environmental decision making principles. · To what extent is Cree/Ineniwak Indigenous Legal Tradition considered and/or included in the environmental assessment process. · To what extent is Cree/Ineniwak Traditional Governance considered and/or included in the environmental assessment process.	CAC-0098
99	CAC	R-EIS Guidelines	Appendix 2A	N/A	KCN Environmental Evaluations	Appendix 2A sets out the "common" principles regarding the inclusion of Aboriginal Traditional Knowledge in the Keeyask Environmental Assessment.	• Who was responsible for the drafting of the principles? And what was the process? • What was the process for adopting the final "common" principles? • What methodology is employed to measure the "inclusion" of ATK in the Keeyask Environmental Assessment?	CAC-0099
100	CAC	KCN-EVRPTS	Kipekiskwaywinan: Our Voices (June 2012); Fox Lake Cree Nation Environmental Evaluation Report	N/A	KCN Environmental Evaluations	The Environmental Evaluation Reports of York Factory First Nation and Fox Lake Cree Nation were completed in June 2012 and September 2012 respectively.	How was the evaluation contained in those reports incorporated into the EIS subsequent to them being completed?	CAC-0100
101	CAC	R-EIS Guidelines	6.3 Effects and Mitigation Physical Environment	N/A	KCN Environmental Evaluations	Section 6.3.2 lists "ATK observations with respect to the physical environment". The observations are in the nature of particular concerns regarding the physical environment.	How were the "observations" identified and by whom? Please describe the methodology employed to consider and address each of the ATK "observation" in the corresponding subsections (e.g. Climate (6.3.3), Surface Water and Ice Regime (6.3.6)). Was ATK data, direct observation or technical knowledge of the physical environment considered?	CAC-0101
102	CAC	R-EIS Guidelines	6.4 Effects and Mitigation Aquatic Environment	N/A	Aquatic Environment	Section 6.4.2 lists "ATK observations with respect to the aquatic environment". The observations are in the nature of particular concerns regarding the aquatic environment.	How were the "observations" identified and by whom? Please describe the methodology employed to consider and address each of the ATK "observation" in the corresponding subsections. Was ATK data, direct observation or technical knowledge of the aquatic environment considered?	CAC-0102
103	CAC	R-EIS Guidelines	6.5 Effects and Mitigation Terrestrial Environment	N/A	Socio-Economy	Section 6.5.2 lists "ATK observations with respect to the terrestrial environment". The observations are in the nature of particular concerns regarding the terrestrial environment.	· How were the "observations" identified and by whom? · Please describe the methodology employed to consider and address each of the ATK "observation" in the corresponding subsections. · Was ATK data, direct observation or technical knowledge of the terrestrial environment considered?	CAC-0103

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104	CAC	R-EIS Guidelines	6.6 Effect and Mitigation Socio-Economic Environment	N/A	Socio-Economy	Section 6.6.2 lists "ATK observations with respect to the socio-economic environment". The observations are in the nature of particular concerns regarding the socio-economic environment.	· How were the "observations" identified and by whom? · Please describe the methodology employed to consider and address each of the ATK "observation" in the corresponding subsections. · Was ATK data, direct observation or technical knowledge of the socioeconomic environment considered?	CAC-0104
105	CAC	R-EIS Guidelines	6.7 Effect and Mitigation Resource Use	N/A	Socio-Economy	Section 6.7.2 lists "ATK observations with respect to resource use". The observations are in the nature of particular concerns regarding resource use.	· How were the "observations" or concerns identified and by whom? · Please describe the methodology employed to consider and address each of the ATK "observation" in the corresponding subsections. · Was ATK data, direct observation or technical knowledge of resource use considered?	CAC-0105
106	CAC	R-EIS Guidelines	6.8 Effect and Mitigation Heritage Resources	N/A	Socio-Economy	Section 6.8.2 lists ATK observations with respect to heritage resources. The observations are in the nature of particular concerns heritage resources.	· How were the "observations" or concerns identified and by whom? · Please describe the methodology employed to consider and address each of the ATK observations in the corresponding subsections. · Was ATK data, direct observation or technical knowledge of resource use considered?	CAC-0106
107	CAC	R-EIS Guidelines	6.8.2 Aboriginal Traditional Knowledge	N/A	Socio-Economy	Section 6.8.2 lists ATK observations with respect to heritage resources. The observations are in the nature of particular concerns heritage resources. KCNs noted the importance of certain areas that might experience effects on heritage resources. In particular, four key areas were identified as burial locations (see p. 6-563). The document then indicates:	Please advise as to the standard for "definitive evidence" as employed in relation to burial sites.	CAC-0107a
						"Despite discussions with KCN Elders and intensive archaeological investigations, no definitive evidence of burials was found at these four sites."	Please advise if the four identified burial locations, as identified by the ATK, may be impacted by the project.	CAC-0107b
108	CAC	R-EIS Guidelines	6.8.2 Aboriginal Traditional Knowledge	N/A	Socio-Economy	Section 6.8.2 lists ATK observations with respect to heritage resources. The observations are in the nature of particular concerns heritage resources. KCNs noted the importance of certain areas that might experience effects on heritage resources. In particular, "Gull Rapids has been noted by the KCNs as an important location for recalling memory, resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social cohesion." (see p. 6-563).	Please advise of method and conclusions related to these effects on recalling memory, resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social cohesion.	CAC-0108a
							Please advise of mitigation measures relating to recalling memory, resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social cohesion.	CAC-0108b
109	CAC	R-EIS Guidelines	6.9 Effects of the Environment on the Project	N/A	Socio-Economy		Please advise if ATK was considered with respect to effects of the environment on the Project.	CAC-0109
110	CAC	R-EIS Guidelines	6.10 Capacity of Renewable Resources	N/A	Socio-Economy		Please advise if ATK was considered with respect to the capacity of renewable resources.	CAC-0110
Clean Environment Commission								
1	CEC	R-EIS Guidelines	6.6.5.7 Aesthetics - The Way the Landscape Looks	N/A	Terrestrial Environment		Section 6.6.5.7 of the Environmental Effects Assessment addresses aesthetics but there are no specific examples of mitigations identified in terms of how solely construction period effects will be mitigated. Specifically, how would areas such as the temporary construction camps, temporary roads, borrow areas be re-vegetated/re-habilitated to restore aesthetic conditions?	CEC-0001
2	CEC	SEE-RU-HR SV	N/A	N/A	Socio-Economy	We were not able to find a discussion on fire protection services for the camps and project.	Will fire protection services be provided at the camp? If so how?	CEC-0002
3	CEC	SEE-RU-HR SV	Part 2 Resource Use - 1.3 Commercial Fishing	N/A	Socio-Economy		With increased mercury levels in fish in the proposed reservoir and the raising of Gull Lake won't fish with higher mercury levels be able to enter into the Clark and Split Lake commercial fishery? Please explain possible effects.	CEC-0003
4	CEC	R-EIS Guidelines	6.6.5.2.4 Residual Effects of Operation	6-471	Socio-Economy		With respect to Section 6.6.5.2.4 of the Environmental Effects Assessment (residual effects of operation, community health), it is not fully clear how the overall conclusion is arrived at with respect to community health. Is it possible that increased income may have an overall negative effect?	CEC-0004
5	CEC	R-EIS Guidelines	6.6.5.6.5 Conclusion about Residual Effects on Culture and Spirituality	6-494	Socio-Economy		On Page 6-494 of the Environmental Effects Assessment it is stated that cultural impacts are small. How was this conclusion arrived at? and/or provide explanation as to how a cultural impact is geographically small?	CEC-0005
6	CEC	R-EIS Guidelines	6.7.3.2.5 Conclusions about Residual Effects on Domestic Hunting and Gathering	6-543	Socio-Economy		With respect to Section 6.7.3.2.5 of the Environmental Effects Assessment it is stated that the effect on domestic hunting is to be neutral. Questions from the MCWS with respect to the moose harvest seem to question how this statement could be made when the moose harvest sustainability plan is not yet prepared? Since the time of inquiry has there been more progress on this harvest sustainability plan and/or on ATK related monitoring?	CEC-0006
7	CEC	SEE-RU-HR SV	Section 3 Economy - Appendix 3C Economic Impact Assessment	3C-1	Socio-Economy	The combination of approaches (direct estimate and economic impact model) used to determine the economic impact of the project at various geographical levels is considered appropriate.	However, there was little explanation on the provincial economic impact model used and its theoretical basis or practical use within Manitoba (i.e. is it widely used and regularly updated?). Some background information on the model should be provided. Some explanation of how the model derives indirect and induced employment (which appears high) would also be helpful.	CEC-0007
8	CEC	R-EIS Guidelines	6.6.5.2.1 Construction Effects and Mitigation	6-467	Socio-Economy		With respect to Section 6.6.5.2.1 of the Environmental Effects Assessment is financial counselling a potential mitigation measure that should be considered?	CEC-0008

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9	CEC	R-EIS Guidelines	N/A	N/A	Socio-Economy		Section 6.7.1.5.3 of the environmental effects assessment does not appear to address the fact that new roads and access to other areas via trails possibly created by construction workers or through the AEA offsetting programs may allow other users easier access and therefore degrade fishing and hunting opportunities. How would new visiting harvesters be addressed? Does Keeyask Hydropower Limited Partnership expect that increased vigilance will be required on the part of Manitoba Conservation and Water Stewardship?	CEC-0009
10	CEC	SEE-RU-HR SV	Part 3 Heritage Resources	N/A	Socio-Economy	Heritage resources are non-renewable resources governed by The Heritage Resources Act in Manitoba. Very extensive archaeological assessments were conducted on areas potentially affected by the Project and in the local area. While the local area wasn't necessarily impacted by the Project, KHLP did indicate that the deteriorated condition of some archaeological sites within the predicted hydraulic zone of influence did not allow for an in-depth understanding of past cultural occupations and therefore a plan to examine selected proxy locations within the Local Study Area was initiated. It was understood that this was supported by the KCNs.	While there were no major deficiencies found in the Heritage Resources work the conclusion should have perhaps better acknowledged the cumulative loss of heritage resources associated with the various Manitoba Hydro activities along the Nelson River.	CEC-0010
11	CEC	R-EIS Guidelines	6.6.3.2.1 Construction Effects and Mitigation	6-437	Socio-Economy		With respect to the commitment on pg. 6-437 of the Environmental Effects Assessment which identifies 182 target positions for KCN members, what are some of the measures that will be used to ensure this target is reached? As these positions would be across the KHLP system what percentage of these jobs are likely going to be local?	CEC-0011
12	CEC	SEE-RU-HR SV	N/A	N/A	Socio-Economy	Some concerns were expressed by KCNs about the social effects of the project and being employed at the site.	Will workers from First Nations living in commutable distances (specifically the Tatakweyak and Fox Lake Reserves and First Nations individuals living in Gillam) and Gillam be allowed to commute on a daily basis to the Project basis? Will they need to use their own transportation or will some sort of passenger shuttle service be organized?	CEC-0012
13	CEC	SEE-RU-HR SV	Part 1 Socio-Economic Environment	N/A	Socio-Economy		Does the Project expect to increase the demand on local RCMP services? If so, how and what is the proposed mitigation?	CEC-0013
14	CEC	R-EIS Guidelines	6.6.4.4 Land	6-459	Project Description		Page 6-459 of the Environmental Effects Assessment states there is no mention of the impact on the road in concert with Bipole/Keewatinooow construction. Will KHLP be assisting MIT with respect to road responsibilities?	CEC-0014
15	CEC	SEE-RU-HR SV	Part 2 Resource Use - 1.8 Lodges, Outfitters and Other Tourism	1-95	Socio-Economy	This section of the Resource Use Report addresses the commercial lodge and outfitting business which is generally targeted to non-residents and focus on sport hunting and fishing opportunities. It appears that there are no lodges or cabins in the immediate area of the Project and therefore are not directly affected by the Project's construction or operation activities. Most of the lodges and outfitters businesses would be more remote access (fly-in or more difficult land transport) in the regional study area. While these businesses are not directly affected by the Project's construction activities they could be affected by either the: workforce in their days off or by the shifting patterns of resource use to KCNs' AEA Offsetting Programs which involve improved access and utilization of fisheries and wildlife resources within the Split Lake RMA. TCN has indicated that they have established guidelines and principles for participants as part of their Access Program and this includes: Respect for the land and environment; firearms safety measures; conducting selective harvests; and, respect for others.	What mitigation measures are planned to prevent such effects from the workforce or from KCNs shifting pattern of use? The effect may not be simply the taking of fish and wildlife resources but increased access which will in turn allow other users into the area. The Resource Use Report indicates that: "Residual effects of Project construction on lodges and outfitters is expected to be adverse, small, or a small geographical extent (to tourist operations) and long term. No mitigation is planned." Will some of these tourism operations no longer be viable or challenged by these new patterns?	CEC-0015
16	CEC	SEE-RU-HR SV	Part 1 Socio-Economic Environment	N/A	Socio-Economy		Will all the workers associated with the Project's construction be housed in one of the two camps? What is the proportion of workers that won't be and where will they be housed?	CEC-0016
17	CEC	SEE-RU-HR SV	N/A	N/A	Socio-Economy	With respect to a wide variety of social considerations there are a number of basic facts about how the Project will be organized that appear to be missing and/or unclear. In turn, we are uncertain whether these aspects of the Project may produce negative effects. Major concerns were expressed in the Socio-Economic Volume for the potential of negative worker interaction issues, specifically: the increased availability of drugs and alcohol; potential for increased violence; and, risk of inappropriate sexual behaviour. This was also a concern expressed by the KCN's. This is acknowledged in the Socio-Economic Volume: "Since worker interaction issues have the potential to adversely affect individual and community mental health and well-being, mitigation measures have been proposed ... Mitigation measures focus on construction workers on site (e.g., measures to make it more attractive to stay on site)" (p. 5-179). It appears, though it is not entirely clear that the workers will have one day off during their on-rotation time at the site and thereby increasing the likelihood of opening up the paths to such effects. Page 5-183 of the Socio-Economic Environment, Resource Use and Heritage Resources Volume indicates that: The Burntwood Nelson Agreement indicates that most workers will work 10 to 12 hour days, six days a week and have only one day off, typically Sunday, although the exact working hours for the general civil contract will not be finalized until after the contract is awarded. This indicates that workers will have one day off at the construction site means that workers from areas of the Province south of Thompson would not be able to travel home for the day. This therefore increases the likelihood of the social effects that are identified in the Socio-Economic Report.	Given this potential work schedule, what measures will be put in place to prevent negative worker/local population interaction issues? Why not eliminate the day off at site and break the potential pathway of effects? Associated with this work schedule there are a wide variety of other potential socio-economic and resource effects that are somewhat described in the Socio-Economic Volume. Some of the questions with respect to possible effects include the following: • What will these workers be able to do on their day off and where will they be able to go? • Will there be any prohibitions on: hunting, fishing, access to remote areas or the First Nations Reserves, storage of hunting gear; use of ATVs and snowmobiles, etc? • How will workers be controlled so as not increase use of and open up access to areas where they could impact on lodge operators and outfitters or impact the KCN's healthy food resource programs. • How would KHLP control off construction site access and the consumption of alcohol? • What would be the estimate of the total workers and total worker days that would be spent locally with this day off? On a related issue, how often will workers be allowed to go home (i.e. what is the actual work schedule for labour and management)?	CEC-0017

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18	CEC	SEE-RU-HR SV	Part 2 Resource Use - 1.2 Domestic Resource Use	1-6	Socio-Economy	Domestic resource use is hunting, fishing, trapping and gathering for domestic/subsistence purposes. This section is devoted exclusively to Aboriginal peoples and touches on both historic and modern-day use. This section of the Report draws on the Environmental Evaluations conducted by the KCNs. An array of possible effects are identified that might lead to an effect on domestic resource use during both the construction and operation periods. One of the major mitigations for the potential effect on domestic resource use is the Adverse Effects Agreement (AEAs) specifically the off-setting programs. Essentially domestic fishing pressure will be re-distributed to a larger regional base.	The presence of the large workforce in the camp is identified as a possible cause of increased competition for resources and local and/or road accessible fishing areas; although no residual effect is predicted. How will the workforce be managed so that there will be no effects on fisheries; wildlife resources; trapping trails, traps and cabins, etc.?	CEC-0018
19	CEC	SEE-RU-HR SV	N/A	N/A	Socio-Economy	A concern is expressed about the large number of worker vehicles that will be put on highway and roads system. Potential socio-economic, resource and environmental effects include: vehicular accidents; increased negative interactions with KCNs; wildlife mortality; increased likelihood of workers stopping and exploiting local natural resources; increased likelihood of substance abuse on the drive home, etc.	Will there be transportation services (e.g., shuttle buss) provided for workers from outside of the local area to take these workers to and from the camp? (i.e. to and from Thompson, to and from Winnipeg)? How does the consideration for such shuttle services reduce the potential for traffic travel?	CEC-0019
20	CEC	R-EIS Guidelines	7.3 Past, Current and Future Projects and Activities	N/A	Terrestrial Environment	Attachment E of the Scoping Document for the EA of the Keeyask Generation Project provides a list of past, current and future projects and activities for the cumulative effects assessment (CEA): "The following are past and current (i.e., ongoing) projects and activities to be considered in the cumulative effects assessment: • Manitoba Hydro generation-related developments in the North: o Churchill River Diversion o Lake Winnipeg Regulation o Jenpeg, Kelsey, Kettle, Long Spruce, Limestone and Wuskwatin Generating Stations o Kelsey re-running o Keeyask Infrastructure Project • Linear development in the region (i.e., transmission lines and highways, including upgrades to PR 280) • Mining (e.g., Vale) • Commercial forestry • Commercial fishing of sturgeon • Other agents of change as may be identified in the assessment of specific VECs • The following are future projects to be considered in the cumulative effects assessment: • Gillam redevelopment • Bipole III Transmission • Keeyask Transmission Project • Conawapa Generation Project" In Section 9.8 "Cumulative Environmental Effects" of the Canadian Environmental Assessment Agency's Draft EIS Guidelines for the Keeyask Generation Project document, it is stated that: "The proponent shall provide a map that shows all the past, present and future projects it has considered in the cumulative effects assessment." Mapping is provided in Section 7.0 "Cumulative Effects Assessment" in the Keeyask EIS Map and Figure Folio and includes: • Hydro Development in Northern Manitoba (locations of proposed and existing projects); • Wuskwatin Transmission Project; • Manitoba Hydro Transmission Line Network; • Keeyask Infrastructure Project Site; • Provincial Road 280 Upgrade; • Northern Extents of Bipole III Transmission Project; • Keeyask Construction Power Project: Preliminary Transmission Corridors During Construction; and • Keeyask Construction Power Project: Preliminary Transmission Corridors During Operation. Map 7A-6 "Northern Extents of Bipole III Transmission Project" only shows the locations the Keewatinoow Converter Station (CS) and the Bipole III Transmission Line (Final Preferred Route). There is no indication of other proposed Bipole III Project components, e.g., Keewatinoow Ground Electrode Site, Ground Electrode Line, five AC collector lines from Henday CS to the Keewatinoow CS, etc. (see Section 2.0).	A map should be provided indicating the locations of all proposed Bipole III Project components, as well as the proposed Conawapa Generating Station (GS) and its likely project components. Note: The revised map provided by KHLP did not include all of the items identified above. A suggest study zone is shown below.	CEC-0020

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21	CEC	R-EIS Guidelines	7.5.2 Terrestrial Environment	N/A	Terrestrial Environment	<p>A quantitative residual effects assessment for the Local Study Areas was not provided for some of the VECs and supporting topics. Eastern expansion of the Study Zone 5 Regional Study Area will not affect the EA findings for the Local Study Areas (generally Study Zone 3, but Study Zone 2 for Terrestrial Habitat, Ecosystem Diversity, Soil Quantity and Quality, Wetland Function, Priority Plants and Invasive Plants).</p> <p>For example, it is stated in Section 2.6.4.1.1 of the Terrestrial Environment Supporting Volume that the "Project Footprint could remove or alter up to 6,872 ha, or 0.6%, of terrestrial habitat during construction, but this could increase to 6,952 ha if borrow area E-1 is used", or 0.7% of terrestrial habitat in the Regional Study Area (Study Zone 5 with area of 1,240,000 ha). Although not mentioned in Section 2.6.4.1.1, this loss of habitat areas with or without the use of borrow area E-1 would represent approximately 53% of the Local Study Area (Study Zone 2 with area of 13,043 ha).</p> <p>No data on percentage of core areas to be lost were provided for the Local Study Area. Rather, it was indicated in Section 2.4.4.1.1 that the number of core areas at least 200 ha in size that overlap the Local Study Area would decline from 13 to 12 and their combined area would decline from 115,308 ha to 106,754 ha. This is a decline of 7.4%, and would likely be significantly higher if only the areas of the core areas within the Local Study Area are taken into consideration.</p> <p>As stated in Section 6.5.3.3.1 "Construction Effects and Mitigation" of the Keeyask Generation Project EIS Response to EIS Guidelines, "the total number of core areas larger than 200 ha in the Regional Study Area is predicted to remain at 111 because, although a few core areas are completely removed, several other core areas are fragmented into smaller blocks. The total number of core areas larger than 1,000 ha would be reduced by one. None of the very large core areas would be lost."</p> <p>As stated in the Terrestrial Environment Supporting Volume (p. 2-120), "Project construction would have localized core area effects, primarily resulting from reservoir clearing, dyke construction and coffer dam diversion. One core area slightly larger than 1,000 ha and two core areas between 200 ha and 1,000 ha would be removed. In addition, several larger core areas on the north and south sides of the Nelson River would become smaller (Map 2-15). One of these latter core areas is on Caribou Island and is the largest core area on an island in the Keeyask reach of the Nelson River. The largest core area along the north side of the Nelson River would be reduced by 879 ha, or 36%."</p> <p>The total losses of core areas may not be significant within the Regional Study Area, but may be within the Local Study Area. However, no data are provided on percentage of total core area to be lost within the Local Study Area.</p>	<p>A quantitative residual effects assessment of each project component, e.g., reservoir clearing, dyke construction, coffer dam diversion, permanent and temporary infrastructure footprints, reservoir inundation, for the Local Study Area in tabular form and/or mapping, as appropriate, should be provided for each of the key topics:</p> <ul style="list-style-type: none"> • Intactness based on linear feature density (km/km²) and core area abundance (number and ha); • Terrestrial Habitat based on loss or alteration of terrestrial habitat (ha); • Ecosystem Diversity based on loss or alteration of the 43 priority habitat types (number and ha); • Wetland Function based on loss, creation or alteration of shoreline wetlands, off-system marsh and other wetland types (ha); • Mallard based on loss of habitat and reduction of staging habitat quality (ha); • Bald Eagle based on habitat alteration and loss of nests and perching trees (ha and number); • Olive-sided Flycatcher based on habitat loss (ha); • Rusty Blackbird based on habitat loss (ha); • Common Nighthawk based on habitat loss/gain (ha); • Yellow Rail based on habitat loss (ha); • Short-eared Owl based on habitat loss (ha); • Beaver based on habitat loss (ha), colony removal (number) and improved trapping access; • Caribou based on loss of significant caribou habitat, and relative to cumulative effects of Intactness, Terrestrial Habitat and Ecosystem Diversity; • Moose due to habitat loss and alteration (ha) and increased hunting access; and • American Marten based on habitat loss (ha) and Intactness. 	CEC-0021

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22	CEC	R-EIS Guidelines	7.5.2 Terrestrial Environment	N/A	Terrestrial Environment	<p>Section 1.3.5 of the Keeyask EIS Terrestrial Environment Supporting Volume presents the Local and Regional Study Areas, each generally consisting of three Study Zones (see Map 2-1 of the Keeyask EIS Terrestrial Environment Supporting Volume). It was stated that:</p> <p>“Due to the manner in which it was derived, the Regional Study Area was generally used as the cumulative effects assessment area.”</p> <p>The Local and Regional Study Areas for many of the VECs and supporting topics were Study Zones 3 and 5, respectively (see Map 1-1, Terrestrial Environment).</p> <p>The east-west axis of the Study Zone 5 Regional Study Area extends from Long Spruce GS to just west of Thompson. The length of the eastern axis from the proposed Keeyask GS to Long Spruce GS is approximately 50 km, whereas the length of the western axis from the proposed Keeyask GS to west of Thompson is approximately 190 km, i.e., 3.6 times longer.</p> <p>For most EAs, the Project Footprint is the centroid for the delineation of its study areas.</p> <p>With the truncation of the Study Zone 5 Regional Study Area at Long Spruce GS, an assessment of the terrestrial environment components further east that have been affected by existing developments or would be affected by future developments was not undertaken.</p> <p>Existing developments outside of Study Zone 5 include (for reference see Map 2 from the BiPole Transmission Project, called “Location of Existing and Proposed BiPole III Developments Outside Proposed Keeyask Project Terrestrial Study Areas”):</p> <ul style="list-style-type: none"> • Community of Bird; • Limestone GS; • transmission lines between Limestone GS and Henday CS; • transmission lines between Long Spruce GS and Henday CS; • Henday CS and the northern end of Bipole II; • further northern extension of the KN36 transmission line; • further northeastern extensions of the CN rail line and the abandoned rail line; • further northeastern extension of Highway 290; • Conawapa Road; • access roads and trails; • cutlines; and • cleared, borrow and other disturbed areas. <p>Proposed developments outside of Study Zone 5 include:</p> <ul style="list-style-type: none"> • many of the Bipole III Transmission Project components including: <ul style="list-style-type: none"> o the Keewatinoow Ground Electrode Site; o the Ground Electrode Line; o the Keewatinoow CS; o most of the AC collector line from Long Spruce GS to Henday CS; o the five AC collector lines from Henday CS to the Keewatinoow CS; o the construction power line from Henday CS to the construction camp site; o the start-up and main construction camp sites; o the work area site; o the borrow and excavated material placement areas; o an approximate 60-km section of the Bipole III HVdc Transmission Line from the Keewatinoow CS to the eastern limit of Study Zone 5; and • the Conawapa GS, with a smaller inundation area but likely larger construction and infrastructure footprint than the proposed Keeyask GS. <p>It should be noted that there is a westward indentation of Study Zone 5 resulting in additional exclusion of the proposed Bipole III transmission line (see Map below).</p> <p>An extension of the Study Zone 5 Regional Study Area approximately 60 km further northeast would have encompassed these existing and proposed developments (see Map below).</p> <p>There is an inset figure at the top left hand side of Map 1-1 of the Keeyask Terrestrial Environment volume which delineates the Keeyask Generation Project Area, which extends the eastern boundary further east to encompass the existing and proposed developments. A suggested extension of Study Zone 5 to encompass all existing and proposed developments is presented below.</p>	<p>The Study Zone 5 Regional Study Area should be extended approximately 60 km further northeast to encompass the existing and proposed developments listed above. A suggested extension of Study Zone 5 to encompass all existing and proposed developments is presented below.</p>	CEC-0022

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23	CEC	R-EIS Guidelines	7.5.2 Terrestrial Environment	N/A	Terrestrial Environment	<p>Based on the current Regional Study Areas, residual effects on a number of VECs and supporting topics have reached or are approaching the 10% level of significant impact or other metric. As indicated in the IR on Residual Effects Quantification, residual effects on total terrestrial habitat and the common habitat types are almost 6%. However, a CEA was not undertaken as terrestrial habitat was not considered to be a VEC.</p> <p>Ecosystem Diversity Based on Ecosystem Diversity, the residual effects ranged from 5.0 to 9.9% for the 40 priority habitat types. In Section 2.10.3 "Ecosystem Diversity" of the Terrestrial Environment Supporting Volume, it is stated that "based on the anticipated locations of the Gillam Redevelopment and the transmission projects (footprints plus 50 m buffer), these projects could affect an estimated 1,170 ha of terrestrial habitat in addition to that already affected by the Project. Regionally common habitat types comprise approximately half of this area. For all of the priority habitat types, the amounts of additional habitat affected are relatively small so that increases in the percentages of habitat area affected could (bold provided by SENES) remain below 10% of historical area for all affected priority habitat types, depending on the final locations of the transmission ROWs. Based on its anticipated location, Bipole III could affect approximately 3,700 (sic) of terrestrial habitat. Since detailed habitat mapping was not available for the Bipole footprint, the composition of the affected habitat was assumed to be similar to that of Zone 4. On that basis, approximately 70% of the affected habitat is not priority habitat. Although the increased amounts of additional habitat affected would be relatively high for some priority habitat types using this assumption, the increases in the percentage of affected habitat area could (bold provided by SENES) remain below 10% of historical area for all priority habitat types, depending on the final location of the ROW. Based on the anticipated locations of future projects, cumulative future effects could (bold provided by SENES) remain in the low end of the moderate range for total habitat area affected and the common habitat types and within the small to moderate range for all of the priority habitat types."</p> <p>Olive-sided Flycatcher In Section 6.4.1.4 of the Terrestrial Environment Supporting Volume, it is stated that approximately 4% (350 ha) of the regional olive-sided flycatcher breeding and foraging habitat will be lost or reduced in quality due to construction. It is further stated that a potential loss of up to 120 ha or 1% of regional olive-sided flycatcher habitat within the Regional Study Area will be lost during operation. There is no quantification of residual effects due to past and current projects and activities (see Sections 6.4.4.1.1 and 6.4.4.2.1), or for future projects/activities (see Section 6.4.4.3.1). For the CEA, it is stated that "it is expected that the Project in combination with other future developments will result in the additional loss of some (bold provided by SENES) olive-sided flycatcher breeding habitat. Losses are expected to be minimal as land clearing will be minimized to the extent possible" (bold provided by SENES).</p> <p>Other VECs With the exception of Intactness and to some extent wetland function, no quantitative CEA is provided for any of the other VECs, i.e., mallard, Canada goose, common nighthawk and rusty blackbird (Section 6.4.4.3.1), as well as beaver (Section 7.4.8.3), caribou (Section 7.4.8.2.3) and moose (Section 7.4.8.3.3).</p>	For the cumulative effects assessment of each key topic, each of the future projects and activities should be identified and their effects should be quantified and presented in tabular form. For the proposed Bipole III and Conawapa GS projects, their effects should be quantified by project component.	CEC-0023
24	CEC	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Terrestrial Environment	<p>Study Zone Land Cover Extrapolation to Study Zone 5</p> <p>In Section 2.2.4.4 "Habitat Mapping" of the Terrestrial Environment Supporting Volume, it is stated that "a 1:15,000 scale terrestrial map was created for Study Zone 4, the largest Local Study Area used for all but one of the terrestrial environment VECs and supporting topics." As indicated in Table 1-3 of the Terrestrial Environment Supporting Volume, Study Zone 4 was used as the Local Study Area only for caribou (a VEC) and mercury in wildlife (a supporting topic). This statement requires revision or clarification from KHLP. It is further stated in Section 2.2.4.4 of the Terrestrial Environment Supporting Volume that "for some key topics, the habitat composition of Study Zone 5 (Map 2-1) was estimated based on the existing proportions of each habitat type in Study Zone 4 since the Soil Landscapes of Canada map (Agriculture and Agri-Food Canada 1996) and coarse land cover mapping derived from classified satellite imagery suggested that the land cover composition of these two areas were similar (bold provided by SENES). Different extrapolation factors were used inland and shoreline wetland habitat. Inland habitat factors were based on Study Zone 5 to 4 total land area ratio whereas shoreline wetland factors were based (sic) Study Zone 5 to 4 total shoreline length ratio.</p>	To confirm that land cover composition of Study Zones 5 and 4 are similar, SENES suggests the use of the Land Cover Classification Enhanced for Bipole (LCCEB) mapping. The LCCEB cover classes were used to represent the communities and habitats within the proposed Bipole III Project study area. The proposed Bipole III Project study area overlaps much of the proposed Keeyask Project Study Zones 4 and 5. The LCCEB identifies five broad cover classes of native vegetation. Three of these occur within the two Study Zones: wetland, coniferous forest and mixed forest. The wetland class includes land with a high water table, that is inundated with water long enough to promote aquatic processes. Fens, bogs, swamps and marshes are included in the wetland cover class. Each forest class is separated into dense, open, and sparse forests or treed areas. Dense includes a crown closure of greater than 60%, open has 26 to 60% closure, whereas sparse has 10 to 25% closure. Quantification by area of the different cover classes in the two Study Zones would confirm whether the land cover composition of Study Zones 5 and 4 are similar.	CEC-0024

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25	CEC	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Terrestrial Environment	<p>Identification of VECs</p> <p>It was stated in Section 3.4 of the Keeyask Scoping Document for the EA of the Keeyask Generation Project that: “Valued environmental components (VECs) will be selected to focus the assessment of the significance of adverse effects. Selection of VECs will be based on the following criteria: • Overall importance/value to people; • Key for ecosystem function; • Umbrella indicators; • Amenable to scientific study in terms of the analysis of existing and post-construction conditions; • Potential for substantial Project effects; and • Regulatory requirements. The EIS will explain the rationale for the selection of each VEC.”</p> <p>It was further stated in Section 3.4.1 “VECs for the Cumulative Effects Assessment” of the Scoping Document that: “The cumulative effects assessment will utilize a subset of VECs studied throughout the environmental assessment. This subset will include any VEC, as set out in 3.4 (sic), for which it is determined that there may be a negative residual effect. The EIS will describe the approach and methods used to identify and assess the cumulative effects and provide a record of assumptions and analyses that support the conclusions, including the level of confidence in the data used in the analysis.”</p> <p>It is stated in Section 1.3.4 “Valued Environmental Components and Supporting Topics” of the Keeyask Terrestrial Environment Supporting Volume that: “the terrestrial assessment focused on the key ecosystem health and/or social issues of concern, or key topics. That is, the ecosystem components (i.e., patterns, processes and functions) that could potentially experience substantial Project effects and are especially important to maintaining overall ecosystem function and the benefits that these functions provide to present and future generations. The key topics collectively indicate how the Project is expected to affect terrestrial health. Key topics of particular high ecological and/or social interest became valued environmental components (VECs) while the remaining key topics became the supporting topics.”</p> <p>The 13 VECs selected were intactness, ecosystem diversity, wetland function, priority plants, Canada goose, mallard, bald eagle, olive-sided flycatcher, common nighthawk, rusty blackbird, caribou, moose and beaver.</p> <p>The nine supporting topics selected were fire regime, terrestrial habitat, soil quantity and quality, invasive plants, invertebrate community, priority amphibians, other priority birds, other priority mammals and mercury in wildlife.</p> <p>SENES generally concurs with the selection of the 13 VECs. However, to be consistent with the proposed Bipole III EIS, three additional VECs should be included in the CEA: yellow rail and short-eared owl, designated as Special Concern federally, as well as American marten, a species that is sensitive to forest fragmentation and loss of habitat, which has been shown to occur in high densities along the proposed Bipole III transmission line between Keewatinooow CS and Thompson (see Map 13 in the Mammals Technical Report of the proposed Bipole III EIS).</p> <p>SENES generally concurs with the selection of eight of the nine supporting topics, the exception being “terrestrial habitat” which should be elevated to VEC status. As indicated in Section 2.6.2.1, terrestrial habitat “serves as a proxy for many other pathways of effects on ecosystem health and on ecosystem components not directly addressed by assessment.” Moreover, as indicated in Section 2.6.4.2.3 “Residual Effects”, after taking into account mitigation and the effects of other past and existing projects and activities, it is predicted that the proposed Project “could increase the affected amounts of total terrestrial habitat and the common habitat types to almost 6% of historical area, which is considered to be a moderate magnitude effect”, i.e., between 1 and 10%.</p> <p>As indicated in Section 6.5.3.1.5 of the Keeyask Generation Project EIS Response to EIS Guidelines document, “as outlined in Chapter 5, the cumulative effects assessment step that deals with future projects and activities focuses on the VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As terrestrial habitat is not a VEC, it is not carried forward to the CEA with future projects in Chapter 7” (boldness provided by SENES).</p> <p>As indicated in Section 6 “Cumulative Effects of the Project” in the Keeyask Generation Project EIS Executive Summary, “the Partnership recognizes the valued environmental component approach as required by the regulatory process does not capture the broader concept of the Cree worldview, which places equal importance on all components of the environment, as all parts are important and interrelated. Further, a cumulative effects perspective is inherent to the Cree worldview, which considers the effects of the Project in the context of everything that has happened in the past and everything that is anticipated to happen in the future.”</p> <p>As the loss of terrestrial habitat due to past and current activities is “almost 6% of historical area” in current Study Zone 5, a CUE assessment should be undertaken to address the “Cree worldview”.</p>	<p>Residual effects assessments (past and existing projects, including the Keeyask Project) and CEAs (future projects) should be undertaken for the following key topics based on the expanded Study Zone 5 Regional Study Area (see Map 3):</p> <ul style="list-style-type: none"> • Intactness based on linear feature density (km/km2) and core area abundance (number and ha); • Terrestrial Habitat based on loss or alteration of terrestrial habitat (ha); • Ecosystem Diversity based on loss or alteration of the 43 priority habitat types (number and ha); • Wetland Function based on loss, creation or alteration of shoreline wetlands, off-system marsh and other wetland types (ha); • Mallard based on loss of habitat and reduction of staging habitat quality (ha); • Bald Eagle based on habitat alteration and loss of nests and perching trees (ha and number); • Olive-sided Flycatcher based on habitat loss (ha); • Rusty Blackbird based on habitat loss (ha); • Common Nighthawk based on habitat loss/gain (ha); • Yellow Rail based on habitat loss (ha); • Short-eared Owl based on habitat loss (ha); • Beaver based on habitat loss (ha), colony removal (number) and improved trapping access; • Caribou based on loss of significant caribou habitat, and relative to cumulative effects of Intactness, Terrestrial Habitat and Ecosystem Diversity; • Moose due to habitat loss and alteration (ha) and increased hunting access; and • American Marten based on habitat loss (ha) and Intactness. <p>Distribution mapping of modeled habitat is available for the Bipole III Project Study Area which encompasses the expanded Keeyask Regional Study Area for Beaver (Map 08 of the Mammals Technical Report), Moose (Map 10) and American Marten 09).</p> <p>Distribution mapping of modeled habitat is available for the Bipole III Local Study Area for Mallard (Map 1200-01), Bald Eagle (1500-01), Olive-sided Flycatcher (Map 2700-01), Rusty Blackbird (Map 3200-01), Common Nighthawk (Map 2400-01), Yellow Rail (Map 2000-01) and Short-eared Owl (Map 2300-01). Distribution mapping of modeled habitat for the Bipole III Project Study Area may also be available for these species but not presented in the proposed Bipole III EIS.</p> <p>The residual and cumulative effects should be quantified, i.e., % of habitat lost, linear feature density changes in km/km2, number of core areas lost, etc.</p>	CEC-0025
26	CEC	R-EIS Guidelines	Executive Summary	N/A	Aquatic Environment		A statement is made in the Executive Summary that fish passage will be provided to maintain connections among fish populations. This does not seem to be accurate. How will this be accomplished, specifically? Please comment.	CEC-0026
27	CEC	AE SV	6.0 Lake Sturgeon	N/A	Aquatic Environment	Cumulative effects with respect to sturgeon do not seem to have been addressed in the EA report which is a significant deficiency. The Nelson River has already been substantially altered by various flow manipulations and developments such as the: Churchill River Diversion; Lake Winnipeg Regulation; construction and operation of the existing hydro facilities (e.g., Limestone, Long Spruce, Kettle, Kelsey) and associated reservoirs on the Nelson; commercial fishing; and possible future facilities (e.g., Conawapa).	It is worthwhile for KHLP to consider advancing Lake Sturgeon into the cumulative effects assessment. Based on a preliminary assessment, we do question whether there will be no adverse residual effects on the Lake Sturgeon population given existing and proposed developments on the Nelson River.	CEC-0027
28	CEC	AE SV	1.0 Introduction; 1A.3.1.7.2 Appendix A	1A-13	Aquatic Environment		With Lake Sturgeon harvest prohibited, only a catch and release fishery can exist. Does one exist, because if it does not then under the new Fisheries Act, Lake Sturgeon may not contribute to a fishery. If this is the case, then their habitat would not be protected under the Fisheries Act? Can KHLP address this?	CEC-0028

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29	CEC	AE SV	6.0 Lake Sturgeon	N/A	Aquatic Environment	<p>A number of assumptions have been made regarding shifts in use from areas currently used for spawning, nursery and foraging habitat to other existing habitat or newly created habitat, particularly for spawning, young-of-the-year (YOY) and sub-adults. How confident is KHLP that sufficient habitat will be made available for all life stages of Lake Sturgeon? The Aquatic Environment Volume suggests that stocking appears to be the cornerstone of the prediction and that Lake Sturgeon numbers will increase regionally. However, stocking, in the absence of sufficient habitat of suitable quality will not create a viable self-sustaining population. This needs to be better addressed in the report.</p> <p>It would be important for KHLP to explain how there can be overall moderate to high certainty assessment for increases in population of Lake Sturgeon when there is a low to moderate statement specifically for YOY habitat? This is based on the following statement in Section 6.4.4.4 of the Aquatic Support Volume (p 6-48). "There is low to moderate certainty regarding the success of mitigation measures to create YOY habitat in the reservoir and moderate certainty regarding the success of mitigation measures to create spawning habitat in the reservoir and Stephens Lake. However, there is moderate to high certainty regarding effects to abundance following implementation of a stocking program, resulting in overall moderate to high certainty for the predicted increases in regional Lake Sturgeon numbers."</p> <p>There seems to be potential for significant loss of Lake Sturgeon habitat. From the MacDonnel thesis, the Kelsey rapids were an important spawning area historically (p. 122 and other around p. 56). Spawning was also reported to occur in the Grass River which appears to enter the Nelson from the west just downstream from Kelsey (and at Witchai Falls p. 122). Also spawning was evident in the Burntwood River and Odei River (Page 51, p. 119). Sturgeon were also abundant in Gull Lake (p. 119).</p>	If future monitoring shows that habitat to support all life stages of Lake Sturgeon is no longer available, replacement habitat will be developed. This assumes that the type of habitat that is missing can be created. How would KHLP address this?	CEC-0029
30	CEC	AE SV	6.0 Lake Sturgeon	6-38	Aquatic Environment		In this section it is indicated that Lake Sturgeon have been found to limit their movements to relatively short reaches of river even in the absence of physical barriers (READ APPENDIX 6A). Please confirm if this is the intended interpretation?	CEC-0030

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31	CEC	AE SV	6.0 Lake Sturgeon	N/A	Aquatic Environment		<p>It is indicated in Appendix 1A- Part 2, page 1 of the Aquatic Supporting Volume that the stocking of Lake Sturgeon is a proven method for increasing numbers and has been an important feature of many recovery plans. It is our opinion that this is likely only true where the habitat still exists and the decline was due to overfishing or pollution that has been rectified. We are not aware that this has been used as a proven mitigation method relative to hydroelectric development. Is there documentation to support this statement (i.e. can KHLP provide more details on where stocking has been used in hydroelectric offsets?)? Appendix 1 refers to stocking initiatives but none seem to be directed towards hydroelectric plants, and most are short term initiatives (usually less than 10 years not 25 years as proposed by KHLP).</p> <p>A concern is expressed that stocking should be the last mitigation option and not the first. A typical "Impact Management Hierarchy" would suggest that a sequential approach would first try to avoid impacts (through re-location or re-design of the project) and where this is not feasible, to mitigate impacts (through use of best available technology and practicable mitigation measures). Failing the availability of measures to mitigate impacts, the last resort is to offset the residual impacts through replacement of the natural capital that is damaged or lost as a result of the development project. It is felt that KHLP should consider Best Available Technology (BAT) for fish protection as part of the EIS.</p> <p>A concern is expressed that there should have been more consideration paid to both upstream and downstream fish passage technology and approaches especially for sturgeon. Recent work conducted in the US on diverting downstream migrating sturgeon (e.g., angled bar or trash racks) by the Alden Labs (e.g., Amaral 2008), and on upstream passage at the Conte Labs (e.g., Kynard et al. 2012) are not discussed. Furthermore, recent efforts by the USFWS on both upstream and downstream fish passage facilities for two hydro facilities in WI are also not referenced nor discussed (Utrup 2011). Both upstream and downstream systems proposed have been approved for implementation for Lake Sturgeon protection in WI by the Federal Energy Regulatory Commission (FERC). It is felt that protection options should be considered as part of this EIS rather than a follow-up program after the facility is constructed given the current status of Lake Sturgeon and potential cumulative effects issue which is discussed below. If a simple bypass structure and technology such as angled screens are not considered during the planning stage it may be too costly to install after the facility is constructed. The concern is a fragmented population of Lake Sturgeon on the Nelson River.</p> <p>Therefore, it is requested that KHLP provide some further analysis as to the feasibility and efficacy of fish passage technologies.</p> <p>A concern is expressed Recovery means re-establishing a self-sustaining population, and stocking in the absence of suitable habitat will not achieve that.</p> <p>References 1). Amaral, S., Taft, N. and D. Dixon. 2008. The Use of Angled Bar Racks and Louvers for Protecting Fish at Intakes. Presentation. A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Available at: http://water.epa.gov/lawsregs/lawguidance/cwa/316b/upload/2008_06_10_316b_meetings_symposium_amaral.pdf. 2). Kynard, B., Pugh, D. and T. Parker 2012. Passage and Behaviour of Cultured Lake Sturgeon in a Prototype Side-Baffle Fish Ladder: I.Ladder hydraulics and fish ascent. Journal of Applied Ichthyology 27(Suppl. 2):77-88. 3). Utrup, 2011. (USFWS contact). Final Environmental Assessment. Proposed Upstream and Downstream Fish Passage for Lake Sturgeon at Menominee River in the Cities of Marinette Wisconsin and Menominee Michigan. Prepared for US Department of Interior by NEW Hydro. WI.</p>	CEC-0031
32	CEC	R-EIS Guidelines	Executive Summary	25	Aquatic Environment		On page 25, it is proposed that walleye and whitefish spawning shoals will be constructed near existing spawning sites. Can KHLP indicate in the EIS or in supporting documentation where the existing spawning sites are?	CEC-0032
33	CEC	AE SV	1.0 Introduction; Appendix 1A Section 1A.3.1.7.2	1A-13	Aquatic Environment		The statement is made that: "Stocking effectively improves natural recruitment by ensuring survival through the very young life history stages, thereby bypassing a significant portion of mortality that occurs in wild fish populations. In the case of the Project, this will be particularly important as suitable habitat for rearing of YOY Lake Sturgeon may not exist initially in the reservoir." Can KHLP provide more details on YOY sturgeon habitat?	CEC-0033
34	CEC	SEE-RU-HR SV	Appendix 5C Human Health Risk Assessment	5C-1	Socio-Economy		The initial draft of the Human Health Risk Assessment was peer reviewed (Section 5.3.3.2, Socio-Economic/Resource Use Volume). Will this finalized version be/has been peer reviewed?	CEC-0034

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35	CEC	KCN-EVRPTS	N/A	N/A	KCN Environmental Evaluations	<p>FIRST NATIONS CUMULATIVE EFFECTS ASSESSMENTS OF THE PROPOSED KEYEYASK GENERATION PROJECT Manitoba Hydro, in collaboration with four Manitoba First Nations, i.e., Tataskweyak Cree Nation (TCN), York Factory First Nation (YFFN), Fox Lake Cree Nation (FLCN) and War Lake First Nation (WLFN), have formed the Keeyask Hydropower Limited Partnership (KHLPL) to develop the proposed Keeyask Generation Project and the Keeyask Infrastructure Project.</p> <p>In a letter dated June 6, 2012 from V. Spence, Manager of Future Development, TCN, to T. Sargeant, Chair, Manitoba Clean Environment Commission with regard to the proposed Bipole III Transmission Project, it was stated that substantial hydroelectric development has occurred within the Split Lake Resource Management Area (SLRMA). "Existing hydroelectric development includes 35 major projects which cover a footprint of 124,000 acres of land – an area comparable to the City of Winnipeg. It is TCN's position that Manitoba Hydro has not fully considered the cumulative effects of this development in the environmental impact statement. By limiting the spatial and temporal scale of their assessment, the Bipole III EIS fails to consider the impacts of past, existing, and future projects in their cumulative effects assessment, particularly those within the SLRMA and our Resource Area. Failure to consider these existing projects is failure to consider or fully understand the impacts on TCN and its Members. Furthermore, without a thorough understanding of the cumulative effects, it is difficult to identify and develop appropriate biophysical and socioeconomic mitigation strategies."</p> <p>In an Environmental Review of the proposed Keeyask Generation Project, SLCFN (1996) provided some details on the effects of hydroelectric development in the SLRMA, as indicated below:</p> <ul style="list-style-type: none"> • Kelsey Generating Station (GS), which came into operation in 1960, "flooded land for a distance of 150 kilometres upstream of Split Lake along the Nelson River, affecting 14,250 acres of northern boreal forest"; • The "massive hydroelectric developments" in the 1970s altered "the landscape in ways which were far more dramatic and profound than the effects of the Kelsey generating station"; • The Kettle GS, which began operation in 1970, resulted in the flooding of "over 54,000 acres of land including many First Nation traditional harvesting, recreational and cultural sites"; <p>• Long Spruce GS, which began operation in 1977, resulted in water level increases of 85 feet and the flooding of "over 3,400 acres of Nelson River shoreline and tributaries";</p> <p>In addition to the preparation of Environmental Impact Statement (EIS) for the proposed Keeyask Generation Project pursuant to the federal Canadian Environmental Assessment Act (CEAA) and the provincial The Environment Act, the four First Nations, collectively termed the Keeyask Cree Nations (KCNs), prepared separate Keeyask Environmental Evaluation Reports (CNP, 2012; FLCN, 2012; TCN, 2012).</p> <p>Although aware of the requirements of the CEAA and The Environment Act (Manitoba) in assessing the environmental effects of a major resource development project, the Keeyask Environmental Evaluation Reports were not prepared in compliance with these requirements (they did not need to be). Rather, the KCNs have selected their own approaches to the assessment of environmental effects on their communities that are based in their cultural identities and worldviews.</p> <p>The following was stated in the Executive Summary for the proposed Keeyask Generation Project EIS: "The cumulative effects assessment focuses on valued environmental components that will be adversely affected by the Project, based on the effects assessment summarized in Section 5 of this Executive Summary.</p> <p>The Partnership recognizes that the valued environmental component approach as required by the regulatory process does not capture the broader concept of the Cree worldview, which places equal importance on all components of the environment, as all parts are important and interrelated. Further, a cumulative effects perspective is inherent in the Cree worldview, which considers the effects of the Project in the context of everything that is anticipated to happen in the future."</p> <p>SENES had previously undertaken a review of the cumulative effects assessment undertaken for the terrestrial environment component of the proposed Keeyask Generation Project as presented in the Terrestrial Supporting Document, the EIS and the Executive Summary. This review identified a number of deficiencies particularly with respect to study area coverage of past, existing and future projects, as well as the selection of valued environmental components (VECs) and supporting topics and their carry over to cumulative effects assessment based on determination of negative residual effects.</p> <p>SENES has subsequently reviewed the Keeyask Environmental Evaluation Reports to determine how cumulative effects were assessed by the KCNs based on past, current and future projects, with an emphasis on the terrestrial environment. SENES also reviewed the TCN (2011) "Report on Keeyask Transmission Project" to determine whether cumulative effects were addressed.</p> <p>FLCN (2012) Environment Evaluation Report One of the objectives stated in the FLCN (2012) Environment Evaluation Report was: • "Describe the known cumulative impacts of successive hydroelectric projects on our people and Aski."</p> <p>As part of the environmental assessment (EA) of the proposed Keeyask Generation Project undertaken by the KHLPL pursuant to the federal CEAA and The Environment Act (Manitoba), VECs were selected to focus the assessment of the significance of adverse effects. Subsequently, the cumulative effects assessment utilized a subset of VECs for which it was determined that there may be a negative residual effect.</p>	<p>Table 2 should be completed by Manitoba Hydro and combined with Table 1 to determine the total land area affected or to be affected by Manitoba Hydro projects and related activities in the SLRMA and FLRMA. This would provide a quantitative basis for determining the cumulative effects of past, existing and future projects/activities on the KCNs and the resource areas.</p> <p>References Cree Nation Partners (CNP) 2012. Keeyask Environmental Evaluation. A Report on the Environmental Effects of the Proposed Keeyask Project on Tataskweyak Cree Nation and War Lake First Nation. 129 p. Fox Lake Cree Nation (FLCN) 2012. Environment Evaluation Report. 89 p. Split Lake Cree First Nation (SLCFN) 1996. Analysis of Change. Split Lake Cree Post Project Environmental Review. Volume One. 96 p. Tataskweyak Cree Nation (TCN) 2012. Report on Keeyask Transmission Project. 46 p. Tataskweyak Cree Nation (TCN) 2012. Submission by Tataskweyak Cree Nation (TCN) to the Manitoba Clean Environment Commission Public Hearing on the Bipole III Transmission Project. 4 p. York Factory First Nation (YFFN) 2012. KIPEKISKWAYWINAN. Our Voices. 133 p.</p>	CEC-0035

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35	CEC	KCN-EVRPTS	N/A	N/A	KCN Environmental Evaluations	<p>FLCN (2012) stated that it was “difficult to accept” the VEC process. “The VEC approach of identifying and studying key issues of importance operates on the basis of selecting a number of species for study, often determined by their “at-risk” or “endangered” status”...</p> <p>“By its very nature, the VEC approach tends to ignore the interrelatedness of people, animals, water, landscape and plants, which are inherent in the way FLCN and our people view and define Aski. Our people do not place greater importance on certain species and all are valued equally. The entire Kischi Sipi including Inninuwak, fish, bird, plants and wildlife all of who use, inhabit and benefit from the river would constitute a VEC.”</p> <p>It is further stated that “Our people define baseline as the condition of the land, waters and people prior to hydroelectric development which began in the early 1960s. This is in contrast to Manitoba Hydro’s baseline defined as the existing condition of the terrestrial, aquatic, and socioeconomic environments. Accepting the baseline as the conditions prior to any hydro development in FLCN’s view of how best to understand and assess how our people and our land and waters will be further impacted by the proposed Keeyask project.”</p> <p>It is also stated that “Our people have been greatly impacted by fifty years of hydro development and the Keeyask project will further disturb, fragment, and destroy lands and waters that have been and continue to be used by our Members. FLCN views all hydro projects, including Keeyask, as one continuous staged process of development with impacts that are cumulative and long-term.”</p> <p>In the section entitled “Brief History of Hydroelectric Development in Northern Manitoba”, FLCN (2012) identifies the various hydroelectric and transmission developments, and in some instances, their direct impact on the terrestrial environment, e.g., the flooding of 54,000 acres of land by Kettle GS, over 3,400 acres by Long Spruce GS and approximately 500 acres by Limestone GS. The Conawapa Generation Project and Bipole III Transmission Project are also identified as future projects.</p> <p>Similarly, in the section entitled “Description of the Keeyask Generation Project”, FLCN (2012) identifies the various proposed Project components, and in some instances, their direct impact on the terrestrial environment, e.g., flooding of 45 km2 of lands with reservoir expansion by approximately 7 to 8 km2 during the first 30 years of hydroelectric generation, and use of borrow areas with a potential surface area of approximately 1,300 ha.</p> <p>In the “Summary of Cumulative Impacts on Fox Lake’s Aski”, of the 16 cumulative impacts listed (most of which are aquatic-related), the only impact on the terrestrial environment listed is:</p> <ul style="list-style-type: none"> • “The permanent loss or transformation of biologically unique areas.” <p>CNP (2012) Keeyask Environmental Evaluation The CNP (2012) report presents a similar approach to the EA of the proposed Keeyask as FLCN (2012) as quoted below:</p> <p>“In evaluating any new development such as the Keeyask Project and in determining the resulting impacts, our holistic worldview requires that all of our relationships with Mother Earth be considered. Particular species of plants and animals or individual relationships cannot be singled out from the remainder when assessing the overall impact on harmony and balance in our homeland ecosystem, and subsequently on our culture.”</p> <p>The CNP (2012) report provides little information on cumulative effects. It is stated in Appendix 2 that the “current state of our homeland ecosystem is the result of many post-contact events acting cumulatively on the state of harmony and balance that existed at the time of our first contact with Europeans”. It is further stated that “of all the changes imposed from the outside, the dams, regulation and diversion brought about the largest changes to our physical environment and caused the most severe impacts on our culture by permanently altering the land and waterscapes found in our homeland ecosystem”.</p> <p>YFFN (2012) Our Voices YFFN (2012) is primarily a colloquial document presenting comments of First Nation members on their worldview, history, changes and damage to water, land and people due to previous hydro development and the proposed Keeyask Generation Project, the Keeyask partnership, hopes and expectations.</p> <p>There are a few references to cumulative effects as listed below:</p> <ul style="list-style-type: none"> • “Our people have been cumulatively impacted. Over the last 60 years, we have been impacted by our dislocation from York Factory, residential schools, and hydro-development. These impacts have built upon each other and continue today.” • “As hydro-electric development now proceeds towards Keeyask, Conawapa and the Bipole projects, we find ourselves living in an ever more compromised and uncertain natural environment – one changed forever and still adapting to the effects of past development.” • “When our members talk about Keeyask, we don’t see this project as any different from the changes brought by the overall Churchill/Nelson/Burntwood hydro-electric program. We see Keeyask as a continuation of a larger development project. We are not confident that the exact effects of a new development can be predicted, but we expect Keeyask to add to the changes that we have already experienced – to further destabilize our increasingly compromised environment”. 		CEC-0035
						<ul style="list-style-type: none"> • “We have experienced the cumulative changes caused by numerous past” (this sentence on pg. 89 does not carry over to pg. 90). <p>TCN (2011) Report on Keeyask Transmission Project TCN (2011) states that “current estimates suggests that 567 hectares of land will be required for the construction of all transmission lines, the Keeyask switching station, future expansion of the switching station, and the construction power transformer station.”</p>		

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35	CEC	KCN-EVRPTS	N/A	N/A	KCN Environmental Evaluations	<p>The only reference to cumulative effects is as follows: "To date, Manitoba Hydro has built 35 major projects including 13 high voltage power lines, 4 generating stations, roads, rail spurs, 2 airports, and other facilities. We have not only seen but also suffered the immeasurable effects that these projects have had on our traditional lifestyles, which permeates throughout our social, economic, spiritual, and cultural customs and practices." Summary Overall, cumulative effects assessment of the proposed Keeyask Generation Project undertaken by the KCNs was qualitative. This is in contrast to the information provided on past hydroelectric projects by the TCN in their submission to the Manitoba CEC Public Hearing on the Bipole III Transmission Project, specifically in Attachment 1. This document provides a breakdown of the land areas that have been affected by 35 Manitoba Hydro and related projects between 1955 and 1994 in the Split Lake Cree Study Area, which corresponds with the SLRMA (see Table 1). Over this time span, 36,322 ha of land were flooded due to hydroelectric generation and other water-related projects and 13,817 ha of land were cleared/alterd by transmission line and other infrastructure projects. This has resulted in a total of 50,139 ha of lands affected by Manitoba Hydro projects and other related activities. Table 1 Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area by Project, 1955 to 1994 Table 2 is an extension of Table 1 listing additional existing and future developments in the SLRMA and the Fox Lake Resource Management Area (FLRMA). Table 2 Lands Affected or to be Affected by Manitoba Hydro Projects and Related Activities in the SLRMA and FLRMA</p>		CEC-0035
36	CEC	TE SV	N/A	N/A	Terrestrial Environment		<p>The assessment is deficient in providing a thorough rationale for the selection of valued ecosystem components (VECs). This is of particular importance because the significance of residual effects are not assessed for "priority species" that are not VECs. In addition, cumulative effects were only assessed for VECs, and only those VECs with significant residual effects. This may lead to an underestimation of potential impacts given that the larger undertaking was divided into separate EAs for the Keeyask Generation Project, Keeyask Transmission Project, Keeyask Infrastructure Project, and Bipole III. Selection criteria (TE-SV, Appendix 1a) do not appear to have been consistently applied across taxa e.g., all confirmed bird species present in the RSA are considered VECs but not all mammal SAR. The rationale for excluding the following species needs to be provided:</p> <ul style="list-style-type: none"> • Wolverine is present in RSA (25 observations) including LSA (7 observations) but no detail provided for observations. This species is a federal SAR but not considered VEC and is sensitive to development and anthropogenic disturbance. The federal SARA prohibits the killing, harming or harassing of SAR such as wolverine, the damage and destruction of their residence and the destruction of critical habitat. • Culturally significant ruffed grouse are not included as VECs even though upland habitat for ruffed grouse is limited in the RSA and monitoring is proposed for ruffed grouse • Species that are considered VECs in other related EAs (e.g., Keeyask Transmission, Bipole III) including yellow rail, short-eared owl, and American marten. • Gull and terns (see separate IR). 	CEC-0036
						<p>The conclusion that residual effects from the Keeyask Generation Project on caribou are "expected to be adverse, small to medium in extent, long term in duration, and small in magnitude." and that "there is a moderate to high degree of certainty in the assessment" is not supported by the evidence presented in the EA, which has significant deficiencies with respect to:</p> <ol style="list-style-type: none"> 1. Evaluation of status of summer resident caribou; 2. Assessment of effects of summer resident caribou and their habitat; 3. Assessment of effects on migratory caribou and their habitat; and 4. Proposed Mitigation. <p>Status of Summer Resident Caribou The Response to EIS Guidelines (R-EIS) and the Terrestrial Environment Supporting Volume (TE-SV) characterize the caribou that use the RSA as:</p> <ol style="list-style-type: none"> 1. Barren-ground caribou from the Beverly-Qamanirjuaq herd 2. Coast caribou from the Cape Churchill and Pen Islands 3. Summer resident caribou. <p>According to the TE-SV (p.7-60) these "summer resident caribou are "a type of woodland caribou whose exact range and herd association is uncertain". The Project is north of the currently defined boundary of forest-dwelling woodland caribou ecotype in Manitoba (Manitoba Conservation 2006), however these summer resident caribou exhibit calving behaviour typical of forest-dwelling woodland caribou, calving singly instead of in large aggregations. According to the TE-SV, the summer resident caribou are conservatively estimated to number 20 -50 individuals, which is similar in size to the Owl-Flintstone Range that Manitoba Conservation (MC) is actively trying to conserve (Environment Canada 2012; Manitoba Conservation 2011). According to FLCN (2101, p. 48) caribou were historically abundant in the local area and were harvested year round, and were the primary source of red meat. FLCN Traditional Knowledge Report (2010) recognizes the three ecotypes and has separate names for them based on behaviour, distribution, and morphology. The summer resident caribou may belong to the previously described Nelson-Hayes population of boreal woodland caribou, and that this herd has not completely amalgamated with the coastal Pen Island population. Genetic studies indicated that most barren-ground caribou genotypes were found north of the Nelson River from 2004 to 2006 (Ball and Wilson; TE-SV 7-63), but the relationship between coastal woodland caribou ecotype and summer resident caribou remains to</p>	<p>Effects on Summer Resident Caribou Regardless of how they are classified, there is potential for Project-related effects on summer resident caribou at the range level and below, and for calving/nursery habitat. A number of major deficiencies in analysing potential impacts on habitat of forest-dwelling are identified:</p> <ol style="list-style-type: none"> 1. The southern portion of the Zone 6 RSA does overlap with portions of the ranges of two identified forest-dwelling woodland caribou ranges i.e. Wapisi (MB8) and Manitoba North (MN9). Potential direct or indirect impacts of this project on these ranges is not discussed or assessed. 2. No annual range has been delineated for the summer resident caribou using Stephens and Gull Lakes and the EA lacks sufficient supporting evidence is to determine the adequacy of the RSA (Zone 6) for characterizing such a range, particularly given that some forest-dwelling woodland caribou females move 200-500 km from wintering areas to calving sites (Environment Canada 2011, p. 74). Furthermore, although the RSA for caribou is listed as Zone 6 (TE-SV, p 1-21), cumulative effects on intactness were calculated for Zone 5 (TE-SV, p 1-20) not Zone 6, so the level of overall disturbance in the caribou RSA is unclear. 3. Calving and winter habitat modeling was conducted for forest-dwelling woodland caribou calving habitat and winter habitat for Bipole III and includes the northern half of the Keeyask GS caribou RSA. This modelling could presumably have been extended to include the entire Keeyask caribou RSA and been incorporated in the TE-SV. No justification is given for the summer resident caribou habitat models presented in the TE-SV i.e., primary calving/rearing islands defined as >10 ha. Was this based on data collected for Stephens and Gull Lakes? Attributes of used and unused calving islands in the RSA are not presented e.g., size, forest type, distance from shore, proximity to other islands, terrain, etc. This information is required to evaluate the statement in the CE-SV (p. 7-30) that "The small loss of calving habitat that will occur in the Local Study Area will in part be offset by an increase in the number of smaller islands in the Keeyask reservoir." 	

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37	CEC	TE SV	N/A	N/A	Terrestrial Environment	<p>be clarified. There is some evidence from collaring data that some individuals may calve in the RSA but not in all years, potentially calving near the coast in subsequent years and no results yet available from preliminary DNA work conducted by MC and partners (S. Vick, Manitoba Conservation, pers. comm.). No collaring or genetic work appears to have been conducted by the proponent for the Keeyask GS, particularly summer collaring of resident caribou (i.e. those calving on Stephens Lake). Recent collaring data conducted by Manitoba Conservation, Bipole III, or the Ontario Ministry of Natural Resources are generally not discussed in any detail in the Keeyask EIS.</p> <p>The status of these summer-resident caribou has potential implications with respect to relevant legislation i.e., SARA, MESA and associated recovery strategies/plans.</p>	<p>4. Environment Canada (2011) has shown that the probability of persistence of forest-dwelling woodland caribou population can be predicted by the proportion of anthropogenic disturbance on a range using a 500 m buffer. In the TE-SV (p 131), low use linear features were buffered only 200 m (Mace et al 1996) whereas Environment Canada uses 500 m for all anthropogenic disturbance. Existing, disturbance levels for Keeyask might therefore be underestimated.</p> <p>5. The TE-SV (pp. 6-370) states that that "because changes to intactness will be negligible" and that "The Project will not contribute to measurable changes in caribou intactness of the RSA". The TE-SV predicts cores being >80% in Zone 5, but Zone 6 is the caribou RSA (and it may not accurately reflect the range) and the buffers used in the analysis were not consistent with Environment Canada (2011a). No benchmark or threshold for acceptable level of existing disturbance and additional level of disturbance was identified. EC (2011a) indicates that landscapes with more than 35% disturbed have a lower probability of persistence.</p> <p>6. The TE_SV states that "because changes to intactness will be negligible, effects on caribou will likely be negligible". Although disturbance is associated with lower probability of persistence, impacts can still potentially occur below the range level. Although 500 m was used for EC persistence models, other studies have shown disturbance effects at much greater (e.g. 10 km) from anthropogenic activities. Potential impacts on caribou from project activities e.g. sensory disturbance during construction, potential increases in hunter mortality from increased access, changes in predator prey dynamics from linear disturbance</p> <p>7. Calving islands. The TE-SV states (7-61) "potential calving habitats are common in the Regional Study Area, and habitat does not appear to be limiting to the summer resident cows and calves". The fact that only a small proportion of available habitat is used is not the point, since the anti-predator strategy of forest-dwelling woodland caribou is to spread out a low density across the landscape (i.e., one would expect low numbers and low densities). It appears Stephens Lake is a regionally significant calving lake, with some on calving on Gull Lake as well. Caribou are potentially most sensitive during calving/nursery; impacts from construction and increased boat access on both Gull and Stephens Lake are poorly quantified and it is unsure if mitigation is sufficient.</p> <p>8. Cumulative impacts from all foreseeable projects are not adequately addressed. The EA states that the Keeyask Generation Project will reduce linear feature density (Response to EIS 6-325). However, it is clear that the Keeyask Transmission Project, the Bipole III Transmission Project, and the Keeyask Infrastructure Project are dependent upon each other and are part of the same overall undertaking. The net effect will be increased linear feature density in the RSA which needs to be clear in the cumulative effects section since it will negatively impact caribou. The statement in the Cumulative Effects Assessment (TE-SV p 7-29) "most effects of the Project will be negligible to small, particularly since habitat currently appears to be underutilized" is unsubstantiated and does not reflect the current understanding of woodland caribou ecology (e.g., bottom-up up versus top-down population regulation).</p>	CEC-0037a
						<p>Effects on Migratory Caribou</p> <p>The Project has the potential to impact winter habitat of migratory barren-ground caribou (Qamanirjuaq) and forest-tundra woodland caribou (i.e. coastal caribou – Cape Churchill and Pen Island) and traditional crossing sites on the Nelson River. According to the TE-SV (p 7-63) there are generally about 300 Pen Island caribou and less than 50 Cape Churchill caribou in the RSA during a typical winter, although larger numbers (100s to 1000s) are observed in some years. Approximately 10,000 Qamanirjuaq caribou have been estimated to reach the RSA in some winters, although this type of occurrence is "infrequent". Although infrequent, their use of the RSA could be ecologically and culturally significant.. The TE SV (7-146) states that the Project is not anticipated to "measurable affect" caribou in the RSA; however, "measurable affecting" is not the criterion used to determine significance of residual or cumulative effects.</p> <p>Several main deficiencies are identified:</p> <p>1. Assessment of disturbance impacts to winter habitat. One of the factors cited as potentially contributing to the potential decline in the Qamanirjuaq herd is loss of winter habitat from forest fires; anthropogenic disturbance could also affect winter habitat use, particularly if other portions of their winter range are unavailable due to snow conditions, fire or other disturbance. Resource Selection Function (RSF) models for BiPole III were not used to assess winter habitat in the RSA.</p>		

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37	CEC	TE SV	N/A	N/A	Terrestrial Environment		<p>2. Traditional crossing sites for migratory caribou. Although the Nelson River generally serves as an extra-limital boundary for Qamanirjuaq barren-ground caribou in the Keeyask region, river crossing locations have been reported in the RSA and lower Nelson River. FLCN (2012, p. 25) states that fluctuating water levels can affect caribou since caribou cannot cross the river safely until the levels are low enough. Drowning has been observed along the Kischee Sipi. (Nelson River) according to FLCN (2012). The TE-SV (pp. 7-62) states "after the construction of the Kettle GS, there were virtually none south of the Nelson River". It is not clear whether a causal relation is implied. Potential impacts on crossing sites needs a more complete analysis (e.g. comparison with other sites on the Nelson) since the earlier formation of thin ice across the reservoir coincides with arrival of caribou in the LSA.</p> <p>3. Cumulative effects from other related projects as well as other existing or reasonably foreseeable projects in the RSA on winter habitat and traditional crossing sites. Monitoring was conducted for the other related projects (e.g., Bipole III, Keeyask Transmission, Road and Infrastructure) should be better incorporated in this EA. In particular, the impacts of linear corridors such as transmission rights-of-way and the upgraded provincial highway (PR 280) need to be examined in more detail for disturbance effects and increased hunter mortality.</p> <p>4. The rationale for the Caribou Access Program and an annual hunt needs to be justified given: a) the report states that there are no measurable effects on caribou (TE-SV 7-35) and b) migratory coastal (Pen Island, Cape Churchill) and barren-ground (Qamanirjuaq) caribou do not winter every year in the Keeyask area and c) given that access to the LSA will increase due to the road upgrades and transmission ROW. The statement that "Recreational fishers and hunters may [bold added] make use of the new boat launch facilities up and downstream of the GS in the operation phase" is inconsistent with existing resource use patterns where access is a key issue and appears to understate the issue since it is likely that there will be increased recreational hunting and angling upstream and downstream of the GS. The statement "that residual effects to recreational resource users are expected to be neutral Resource Use SV pp. 1-94)" is questionable and the lack of proposed mitigation a potential risk to caribou. The potential impact of the Caribou Access Program on caribou outside the RSA also needs to be analyzed and presented in the TE-SV.</p>	CEC-0037b
37	CEC	TE SV	N/A	N/A	Terrestrial Environment		<p>Proposed Mitigation The following measures were proposed for mitigation potential Project-related impacts on caribou, with deficiencies noted:</p> <ol style="list-style-type: none"> 1. Minimizing blasting from May 15-June 30 (p. 6-370). It is not clear if any modeling of noise impacts on caribou in Stephens Lake and the LSA has been undertaken, and on what basis these dates were derived, nor the justification for minimize vs. no blasting during that time period. 2. Implementing an access management plan, including locked gates at the north and south dykes from May 15 to June 30, as well as during other sensitive time determined through monitoring (6-371). Shouldn't these "sensitive times" be determined pre-construction to mitigate access effects prior to and during construction as well? It is not clear how effective these actions will be to prevent improved access by hunters to Stephens Lake during the operations phase. 3. Blocking and revegetating project-related cutlines and trails within 100 m of project footprint (p. 6-374). The rationale for 100 m compared to 500 m (as used in EC disturbance analysis) is not provided. 4. Long-term monitoring of caribou and predators in the project area (p. 8-23, 8-26). It is unclear from if there is sufficient commitment to monitoring, particularly with respect to summer resident caribou e.g. collaring, genetic analyses. <p>It is not clear if mitigation for other potential impacts was considered, such as reduced speed limits to minimize risk of collisions, any mitigation for lights, and reducing sight lines on corridors.</p>	CEC-0037c

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38	CEC	TE SV	N/A	N/A	Terrestrial Environment		<p>Wetlands make up approximately 90% of the RSA, however most of these are peatlands such as bogs, fens, and conifer swamps. Marshes represent represents only 1% of Study Zone 4 and 2.8% of wetland function LSA (6-99), and marshes along the Nelson River a fraction of those. Existing and Nelson River marshes were assessed as being lower quality compared to off-system marshes (p. 6-100). The EIS considers Nelson River wetlands "non-native" (TE-SV 2-85) since they are "already highly disrupted by water level regulation". However, "wetland function" is considered a VEC and Nelson River marshes provide significant habitat for other ecologically and culturally significant VECs such as staging and nesting waterfowl, muskrat and other furbearers, and fish.</p> <p>The assessment of potential project effects on Nelson River wetlands is considered deficient in the following areas:</p> <p>1. Timing of wetland re-establishment. The Response to EIS Guidelines (6-329) states "Based on observations from Stephen Lake (the Kettle GS reservoir), it is expected that Nelson River shoreline wetlands that were removed or altered by the Project would be replaced by wetlands that develop along the reservoir shoreline during the operation phase." However, peatland disintegration is expected to occur mainly during the first 30 years in the Gull Reservoir, with additional losses continuing for 50 to 100 years and declining rates (TE-SV 2-94). Potential response of riparian wetlands and peatland disintegration on Gull Lake are predicted based upon those observed in the Stephens Lake reservoir, but it has a different water management regime than proposed for Gull Reservoir.</p> <p>2. Cumulative impact assessment on riparian wetlands from past, proposed and future hydroelectric development along the Nelson River. TE-SV (p. 2-166) states that "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". Although currently degraded compared to historical wetlands, the remaining wetlands on Gull Lake may be significant given the cumulative effects of water level regulation and reservoir creation elsewhere along the Nelson River system. The extent of historical loss and alteration of wetlands along Nelson River from past hydroelectric development needs to be better characterized and quantified to allow the proposed and future developments to be put into context. Comparison with pre-development baseline monitoring (if available) or comparable unregulated systems in northern Manitoba should be undertaken, as well as an assessment of wetland development elsewhere along the Nelson River system with respect to time since development (e.g. reservoir) and water level management regimes (e.g. timing of drawdown, peaking, annual variation).</p>	CEC-0038
39	CEC	TE SV	6.4.3.2 Landbirds	6-88	Terrestrial Environment		<p>Despite the predicted displacement of 45,000 songbirds (TE SV pp. 6-88), nest destruction or "incidental take" is not discussed in the report, although "disturbance" to breeding birds is mentioned. Clearing outside the main breeding season is proposed as mitigation "where practicable" but "where practicable" is not defined. The Migratory Birds Convention Act (MCBA) prohibits incidental take (Environment Canada 2012) and Section 5(1) of the MCBA prohibits harassing migratory birds. Incidental take needs to be more explicitly described in the EIS and mitigation identified to avoid incidental take as per EC guidelines (e.g. avoidance, timing restrictions for wetland and upland nesters, nest surveys, setbacks, etc.) and protocols in place if active nests are found within the Project footprint.</p>	CEC-0039

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40	CEC	TE SV	6.3.2.5.3 Colonial Waterbirds; FLCN Environmental Report	N/A	Terrestrial Environment	<p>Gull and tern nesting habitat was identified as a 'priority species' despite fitting many of the stated criteria for a VEC including:</p> <ul style="list-style-type: none"> Nesting habitat for gulls and terns in Gull Rapids was considered "unique" in the RSA (TE-SV, pp. 6-30). Gull eggs although they were identified by FN as important food source of concern in workshop Comment 4 Part 4. 5-214 to 5-442 and gulls have traditionally been important diet items (FLCN p. 50). There will be a complete loss of nesting habitat in the Gull Rapids, as well as flooding of additional gull and tern nesting habitat in the Birthday Rapids and Gull Lake. Nesting habitat on islands in rapids is considered rare along the Kischi Sipi (Nelson River) due to the development of past rapid areas (FLCN p. 83). 	<p>There is insufficient description in the TE-SV of existing nesting habitat and proposed mitigation to assess the suitability of proposed measures and significance of residual effects. The following information/clarification are required to address these deficiencies:</p> <ul style="list-style-type: none"> Presumably (although the characteristics are not explained in the TE-SV) the rapids prevent terrestrial predators (e.g. red fox, American mink) from readily accessing to the nesting islands in Gull Rapids. It is not explained how artificial islands placed in Gull Lake will prevent them from swimming to the islands. Presumably, seasonal flooding and/or ice scouring prevents dense vegetation from establishing on the nesting islands. It is not clear how artificial islands will be maintained in a suitable condition for colonial-nesting birds. Suitability of floating platforms for common terns and ring-billed gulls which typically nest on low, exposed islands near the water level, as opposed to floating mats of vegetation as in black terns If predator exclusion fencing is used, how will it be maintained and monitored? How variability in the water level below the generation station and in Gull Lake will be considered in the design compared to the current variability? The monitoring plan states that monitoring will occur during the first 3 years of operations, but timing of the construction of these islands need to be addressed, with respect to the timing of the GS construction and how long it will take the reservoir to fill. The TE-SV states that "over the course of construction, if there is overlap of scheduled construction activities that could affect the breeding colonies at Gull Rapids with the bird breeding period (April 1-July 31), measures will also be taken to avoid or minimize disturbance to active nesting colonies to the extent possible" (p. 6-361). It is unclear what potential measures are being contemplated and how replacement habitat will be provided during construction, especially once Gull Rapids are dewatered. Environment Canada requests that blasting be avoided within 1600 m of active colonies. <p>Supporting evidence or case studies of successful use of the proposed mitigation measures for the colonial nesting waterbird species affected by the Project should be provided.</p> <p>Information in the design and location of the proposed measures needs to be provided for the various options, and the criteria that will be used to select which one(s) is implemented.</p> <p>It is not clear from the current reports that the area proposed for mitigation is equivalent to the area of the natural islands that will be lost, such that equivalent breeding populations will be maintained.</p> <p>Based on these deficiencies, the evidence presented in the EIS does not support the conclusion (Response to EIS, p 6-364) that the "overall potential Project-related residual effects on colonial waterbirds are expected to be adverse but regionally acceptable, primarily because implementation of mitigation measures is expected to largely offset the long-term effects of the Project."</p>	CEC-0040
41	CEC	TE SV	6.5.7.2.5 Conclusion about Residual Effects on Mallard	6-345	Terrestrial Environment		<p>It is not clear how riparian wetlands on smaller tributaries and constructed wetlands will replace those on the Nelson River used by VECs, particularly mallards and Canada geese. YFFN has indicated fewer geese and ducks in the Split Lake area because the shoreline habitat that they use has been flooded and eroded, and FLCN stated that after hydro flooding and the loss of stable shoreline, the number of nesting waterfowl declined (Response to EIS guidelines p. 6-13). The number of nesting and staging mallards is much higher on Nelson River, Gull Lake, Clark Lake, than inland lakes or Stephens Reservoir but impacts are not well quantified. The TE-SV (6-347) states that there is currently limited breeding habitat within the Project effects area; if this is true (only 3% of the breeding habitat is affected), the rationale for creating mallard nesting platforms is questionable. The conclusion on residual effects (TE-SV 6-347) makes no mention of foraging habitat in riparian wetlands even though there will be a long-term loss of these areas due to the flooding of the reservoir. It is also not clear how impacts were measured against thresholds to determine significance of effects. Effects on mallards were characterized as "small" in magnitude and within the range of natural variability. However, no evidence was presented on the range of natural variability in mallard populations in the RSA nor what the population-level effect was predicted to be (e.g. # of nesting pairs/individuals), and it is not clear how the long-term loss in riparian wetlands on the Nelson River could be characterized as within the range of natural variation. Overall potential Project-related residual effects on Canada geese are also expected to be adverse but regionally acceptable, "largely because there is considerable amount of other available staging habitat in the region" but the evidence presented for staging habitat elsewhere in the RSA does not support that statement.</p>	CEC-0041

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							<p>The TE-SV states that "It is expected that until suitable shoreline wetland vegetation re-establishes in the reservoir, geese use of the reservoir during the migration periods will be minimal during operation". Given that Stephens Lake does not support many staging Canada geese compared to Gull Lake, this suggests staging habitat has not recovered over 20 years since the construction of the Kettle GS. According to the Response to EIS Guidelines (6-113) "the quality of inlets and bays along the Nelson River and Gull Lake as staging habitat for mallards will to continue to vary depending upon river water levels. How proposed changes to water management (e.g., peaking, seasonal timing, etc.) on Gull Reservoir will affect wildlife compared to the current regime needs to be more fully assessed.</p>	

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42	CEC	TE SV	N/A	N/A	Terrestrial Environment	Several deficiencies are noted with respect to potential noise impacts on wildlife, notably summer resident caribou on Stephens Lake, nesting and migrating waterfowl, nesting gulls and terns, and breeding songbirds (including SAR).	<p>These deficiencies include:</p> <ul style="list-style-type: none"> • The study area for noise includes “the general footprint of the principal generating station structures and reservoir, as well as access roads and other supporting infrastructure” (PE-SV, p. 3-4). Given that Gull Rapids can be heard as far away as 18 km (PE-SV p. 3-6) and construction noises can extend far beyond the footprint, it is not clear that this LSA is adequate for characterizing baseline conditions or assessing potential impacts. • No baseline monitoring of existing noise levels noise at the Project site, reservoir, and access roads was conducted. The characterization of the LSA that “it is expected that the ambient noise profile would be consistent with isolated, remote northern geographic areas” with “the expected outdoor average sounds levels in the range of 35 dB to 45 dB” is unsupported. Gull Rapids is a significant noise source and there will be spatial variation in the LSA depending upon local topography and vegetation. • No predictive modelling for construction and operational phase of the project was undertaken for blasting, traffic, or general construction activities. Potential noise impacts vary depending on a number of factors including taxa, distance from source, noise frequency (kHz) and magnitude, and type (percussive vs. continuous), but these are not addressed. • The construction noise is described as “construction activity will cause elevated noise levels within the immediate construction site, with sound propagating away from the origin of the noise and attenuating with distance back to normal ambient noise levels for the local study area”. No supporting data or values are provided for the magnitude, frequency (kHz), or distance. <p>• Characterization of the noise impacts is inconsistent. For example, Table 3.4-5 (PE-SV, p. 3-19) indicates that noise will be “intermittent” but the text (p 3-18) mentions “continuous” noise. The duration is described as “short” although construction activities will take place over multiple years, variously described as 6 to 8.5 years (PE-SV, p. 3.7, 3-11, 3-13), which is longer than the typical lifespan of some potentially affected species.</p> <p>• Information provided on mitigation measures is inadequate to assess their effectiveness, particularly timing windows and the criteria for assessing when and how mitigation will be applied. The Proponent indicates that blasting will be undertaken outside of the sensitive breeding period (April 1-July 31) for birds “to the extent practicable” to minimize disturbance to breeding birds (TE-SV, p. 6-341, 343; PE-SV p.3-13) and from May 15 to June 30 for calving woodland caribou. However, “to the extent practicable” is not defined, minimizing impacts is not equivalent to having no impacts. The proposed mitigation measures do not address other, non-blasting, construction noise.</p>	CEC-0042

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43	CEC	TE SV	8.0 Mercury and Wildlife	N/A	Terrestrial Environment		<p>1. The method used to predict peak tissue concentrations in birds is essentially to compare bird and fish diets for similarities, and to assume that birds will have the same peak MeHg levels as fish with similar diets. Currently, this methodology has not been adequately supported in the discussions here. For example, if this approach is to be used there should be more discussion of bioaccumulation: how does assuming equal concentrations in birds and fish account for bioaccumulation?</p> <p>Another possible approach is to perform intake calculations using transfer factors (TFs) or bioaccumulation factors (BMFs) and based on concentrations in their food. Calculations should account for all contaminated dietary components (e.g. fish and shellfish for otter) and for MeHg transfer and biomagnifications via food chain elements. This type of approach would rely on concentration data for fish and water, from the Aquatic Environment Supporting Volume.</p> <p>Alternatively, if a model is available for calculating tissue concentrations in mammals (it is mentioned though not presented in the document), presumably this model could be used to provide tissue concentration estimates for birds as well.</p> <p>2. It would be beneficial to examine exposure estimates for osprey and discuss why it is appropriate to assume an on-site occupancy factor (referred to as "Fsite" in the report) of 0.5. This type of exposure averaging (i.e. assuming a migratory species occupies a site for only 50% of the year, and thus receives only 50% of the dose) must be reviewed in conjunction with the time scales for effects upon which the Toxicity Reference Values (TRVs) are based. A review of the TRV derivations in NALCOR 2009 would clarify whether the TRVs are in keeping with the 0.5 occupancy factor assumption.</p> <p>3. The study predicts peak tissue concentrations but does not compare these predictions to measured tissue concentration data obtained from other hydroelectric projects. If such information is available, it should be used to form a comparison. If such information is not available, it would be beneficial to have this clearly stated. Is not clear how concentration data (tissue concentrations in particular) from other hydroelectric projects are used to inform the predictions made in this study. In particular, comparison to values from Quebec hydroelectric studies (which typically show much higher levels of MeHg in fish compared to Manitoba hydroelectric studies) may not be relevant.</p> <p>4. Tables 8-2 and 8-3 present mean total background mercury levels in birds from past Quebec hydroelectric projects, and from a Canada-wide summary. It would be beneficial to show data from other Manitoba hydroelectric projects in these tables as it is likely more relevant to the current project. If such information is not available, it would be beneficial to have this clearly stated.</p>	CEC-0043
44	CEC	TE SV	8.0 Mercury and Wildlife	N/A	Terrestrial Environment		<p>Mercury in Wildlife</p> <p>The report describes a number of receptors and pathways in both the terrestrial and aquatic ecosystems. It would be beneficial to include a visual depiction of the Conceptual Model (CM) for the study. The CM diagram should include all relevant species and exposure pathways and ensure that ingestion calculations adequately encompass all food chain elements.</p> <p>A generic example from the US EPA (1997) is provided below. The example is clearly based on a generic environment, whereas the CM for Keeyask Reservoir would need to be developed specifically for the site, and include all relevant site-specific exposure pathways. Among exposure pathways the Keeyask CM should pay particular attention to clearly depicting bioaccumulation through the food chain, particularly for the different trophic levels of fish and birds.</p>	CEC-0044
45	CEC	TE SV	8.0 Mercury and Wildlife	N/A	Terrestrial Environment	Mercury in Wildlife – EPC Values	<p>Appendix B (Table 8B-1) indicates that HQ calculations for birds and mammals are based on Exposure Point Concentrations (EPCs) which are geometric means of fish concentrations for 'Baseline', 'Project', and 'Project + Baseline' conditions (referring the reader to the AE SV). The AE SV however, discusses predicted maximum concentrations for northern pike and walleye in Table 7-2 and in Sections 7.2.4.2.2 and 7.2.4.3.2; these sections do not show 'Baseline', 'Project' and 'Project + Baseline' conditions or geometric mean calculations. The specific reference to the AE SV should be stated, to refer the reader to the correct location showing the derivation of these EPC values for 'Baseline', 'Project' and 'Project + Baseline' conditions.</p>	CEC-0045

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46	CEC	TE SV	8.0 Mercury and Wildlife	N/A	Terrestrial Environment	Mercury in Wildlife – Mammals	<p>Four issues are raised with respect to mercury in mammals.</p> <p>1. The method used to predict peak tissue concentrations is described as a “Surrogate Approach”. The details of this approach are not clear. Key assumptions are documented in Appendix 8B but rationale, formulas, input parameters, and calculations are not presented. It is therefore not clear how the predicted values in Table 8-16 are derived. One possible approach is to perform intake calculations using transfer factors (TFs) or bioaccumulation factors (BMFs) and based on concentrations in their food. Calculations should account for all contaminated dietary components (e.g. fish and shellfish for otter) and for MeHg transfer and biomagnifications via food chain elements. This type of approach would rely on concentration data for fish and water, from the Aquatic Environment Supporting Volume</p> <p>It is possible that the model is based on these elements, but the derivation/calculations should be clearly presented in the document.</p> <p>2. For otters, an HQ was calculated. HQ results are very close to 1, but the calculation only accounts for fish intake. If other dietary components are included (i.e. shellfish), the HQ could reasonably extend beyond 1 (according to discussions in Section 8.4.4.2). Given that invertebrates (shellfish) account for 46% of the otter’s diet whereas fish account for 40% (according to information presented in section 8.4.3.1.2), shellfish should be included as an ingestion pathway in HQ calculations.</p> <p>3. The dietary composition of mink is not described explicitly, though some dietary information is inferred from analysis of fecal samples. The US EPA’s Wildlife Exposure Factors Handbook (US EPA 1993) discusses averages from different studies representing a diet of about 22% mammals, 54% fish and amphibians, 7% birds and eggs, 9% vegetation and 8% invertebrates and other items. Diet component information such as this should be included in the report.</p> <p>If one assumes that only fish contain elevated levels of MeHg (i.e. that other dietary components such as mammals do not contain elevated levels of MeHg), then calculating the mink’s HQ based on a diet of 100% fish will result in conservative risk estimates.</p> <p>Is not clear how concentration data (tissue concentrations in particular) from other hydroelectric projects are used to inform the predictions made in this study. In particular, comparison to values from Quebec hydroelectric studies (which typically show much higher levels of MeHg in fish compared to Manitoba hydroelectric studies) may not be relevant.</p> <p>4. The study predicts peak tissue concentrations for mammals but does not compare these predictions to tissue concentration data obtained from other hydroelectric projects. If such information is not available, it would be beneficial to have this clearly stated.</p>	CEC-0046
47	CEC	TE SV	8.0 Mercury and Wildlife	N/A	Terrestrial Environment	Mercury in Wildlife – Toxicity Reference Values	<p>Two issues are raised with respect to toxicity reference values.</p> <p>1. Appendix 8B-3 (lines 12-15) discuss TRVs. It is mentioned that TRVs for otters were derived based on mink TRVs which were scaled by body weight. Scaling of TRVs is no longer considered to be a generally accepted practice in ecological risk assessment. Please explain.</p> <p>2. The toxicity reference values (TRVs) used in this study are not clear. The TRVs appear to be derived values for MeHg, their derivation is referenced to a NALCOR 2009 document. The derivation of these TRVs (in NALCOR 2009) should be reviewed to ensure that the chosen values are appropriate. Please provide this Report.</p> <p>For example, based on the discussion available in the document, it is not known how many studies were consulted in order to derive the TRVs, whether or not the lowest LOAEL was used, what compounds were used in the various underlying studies, etc.</p> <p>The table below provides a brief comparison between the NALCOR 2009 TRVs to TRVs from Sample et al. 1996, specifically from studies using MeHg compounds.</p> <p>From this comparison, the NALCOR 2009 TRV’s (Lowest Observable Adverse Effect Levels [LOAELS]) for mammals appear to be greater (less conservative) than the values determined by Sample et al. (1996). For birds, the NALCOR 2009 TRVs appear to be more than 10x greater (less conservative) than the value from Sample et al. (1996). This emphasizes the fact that the NALCOR 2009 TRV derivations should be reviewed.</p>	CEC-0047
48	CEC	AE SV	N/A	N/A	Aquatic Environment	Overall, the analysis of potential increases in fish mercury concentrations in Keeyask Reservoir reaches reasonable conclusions. Baseline fish mercury concentrations are adequately characterized and fish mercury concentrations are predicted to increase, consistent with observations from existing reservoirs after flooding occurs. The predicted peak concentrations, and the duration of increased concentrations (up to 30 years) are within the range observed for other reservoirs on the Canadian Shield. Fish mercury concentrations are also predicted to increase in Stephens Lake, although significantly less than in Keeyask Reservoir.	The downstream limit of increased fish mercury concentrations appears to be Stephens Lake. A clear rationale for this limit would be useful. As well, little information was found on the expected upstream limit of increased fish mercury concentrations (e.g., if fish move upstream of the reservoir). Even if the effects beyond the Reservoir and Stephens Lake are expected to be nil/negligible the rationale should be discussed.	CEC-0048
49	CEC	AE SV	N/A	N/A	Aquatic Environment	No serious deficiencies were identified with respect to baseline mercury concentrations in the study area in water, sediments or fish. However, no baseline (or post-flood) information was included for methylmercury levels in the lower aquatic food web (plankton, benthic organisms). Some models would require such data in order to predict methylmercury concentrations in fish, but the models used for the Keeyask project predicted fish mercury concentrations on the basis of physical characteristics (e.g. extent of flooding), not methylmercury exposure through the food web. Lower food web methylmercury concentrations could also be important if they represented important dietary pathways for uptake by humans or wildlife.	The proponent should describe why post-flooding predictions for methylmercury concentrations are limited to fish.	CEC-0049

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50	CEC	AE SV	N/A	N/A	Aquatic Environment	Mitigation options are discussed in terms of reducing the increase in fish mercury concentrations after flooding, and in reducing human exposure via consumption advisories, communications programs, and agreements to provide access to alternative supplies of fish. No serious deficiencies were identified in this regard.	A minor deficiency is the lack of discussion of options that have been considered to reduce the increase in fish mercury concentrations in new reservoirs, with the exception of reservoir clearing. While this may be because no such mitigation measures have been established for full scale reservoirs, a discussion of this issue would be beneficial to inform readers of the options, or lack thereof.	CEC-0050
51	CEC	AE SV	7.2.4.2.2	7-19	Aquatic Environment	Predicted peak mercury concentrations in fish Keeyask Reservoir were estimated and the predictions were reasonable, although the methods used had shortcomings. A few of these identified below along with associated questions. The predictive tools did not consider the effects of flow, as noted by the authors in AE SV p. 7-19 (Section 7.2.4.2.2). The relatively rapid throughput of water for Keeyask Reservoir has the potential to dilute increases in Hg concentrations in the water column, and reduce MeHg exposure for fish. At the same time, more rapid flow would tend towards greater downstream transport of methylmercury.	What is the expected average hydraulic residence time in the proposed Gull Lake Reservoir?	CEC-0051a
			N/A	7E-3			It is not clear that the modifications to the regression model for fish Hg burden described on AE SV p. 7E-3 are valid. Specifically, the authors replaced the original intercept coefficient of the regression line for fish Hg burden with a value meant to reflect site-specific conditions for the Keeyask study area. The slope of the line was not changed. The overall result is a lower predicted fish Hg burden (and concentration) than if the original regression model was used. Are the slope and intercept of the regression equation only valid however as a combination that optimizes the model fit to the data? If the intercept is forced to change, should the regression line be re-fitted to the overall set of observations from reservoirs, which would produce a different slope, and different predicted fish Hg level than presented here?	CEC-0051b
			N/A	7E-5			Initial predictions of peak fish Hg concentrations for Stephens Lake, downstream of Keeyask Reservoir, produced a value of 1.5 ug/g for northern pike, which was deemed unrealistic (AE SV p. 7E-5). Further justification of this statement should be provided. The proponent then modified the approach by applying the model to predict fish Hg in a manner that is inconsistent with the original development of the model (at least to the knowledge of this reviewer after reviewing the 1991 publication of the model by Johnston et al.). Specifically, the proponent added the areas of Keeyask Reservoir and Stephens Lake to estimate the effects of the proposed flooding as though it represented a smaller fraction of a much larger reservoir (Keeyask Reservoir and Stephens Lake combined). While the area of Keeyask Reservoir would be roughly 50% flooded terrain, the hypothetical Keeyask-Stephens reservoir would only have roughly 11% flooded area. Because the model used by the proponent predicted increases in fish Hg on the basis of the percent flooding involved, the resulting prediction for Stephens Lake was that fish would increase from 0.26 ug/g currently to 0.41 ug/g (rather than 1.5 ug/g). Some explanation should be provided.	CEC-0051c
			N/A	N/A			Recognizing uncertainty in the predictions, the proponent increased the predicted peak concentration for northern pike in Stephens Lake to 0.5 ug/g. The validity of the combined waterbody approach is questionable, because the original model coefficients were not derived using this approach. Some explanation should be provided. Overall however, this reviewer recognizes that it is indeed difficult to accurately predict fish Hg concentrations downstream of new reservoirs. It is therefore essential that sufficient monitoring be carried out after flooding to determine fish Hg concentrations in Stephens Lake to provide information needed for consumption advisories.	
			N/A	N/A			Predictions regarding the duration of increased fish mercury concentrations are reasonable: peak concentrations 3-7 years after flooding, returning to background levels over 30 years (EIS Executive Summary p. 31). These predictions are largely based on observations from existing reservoirs. Mercury concentrations were predicted for the water column in Keeyask Reservoir and Stephens Lake, but a description of the modeling analysis that yielded these predictions could not be found. Furthermore, confusion arose from two tables that presented different values for changes in water column mercury concentrations (Table 2-20 and Table 2F-8 in the Aquatic Effects Supporting Volume), and from a third table with similar information (but different values again) that was not referenced in the main text (Table 2F-9). It appears that text could be missing. Please investigate and explain.	CEC-0051d
			N/A	N/A			No predictions were identified for post-flood concentrations for methylmercury in any media except fish.	CEC-0051e

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52	CEC	AE SV	2.6.4.4	N/A	Aquatic Environment		Proposed monitoring for fish mercury concentrations after flooding in Keeyask Reservoir and Stephens Lake is reasonable. Monitoring will be conducted annually until peak levels are reached, and every 3 years thereafter until concentrations stabilize (Response to EIS guidelines Chapter 8, Table 8-3, p. 8-17). It is not clear whether additional pre-flood baseline monitoring is proposed for fish mercury levels. Given the year-to-year natural variability in fish mercury concentrations, additional pre-flood fish mercury data would be useful to help quantify existing concentrations. It is also not clear if fish monitoring (for mercury) is planned upstream of Keeyask Reservoir or downstream of Stephens Lake. Some monitoring of fish in Clark and Split Lakes is likely necessary to ascertain whether or not fish with higher mercury levels are entering these waterbodies from the Reservoir. This information should be provided with supporting rationale. No post-flooding monitoring appears planned in sediments (AE SV 2.6.4.4). It is also unclear if monitoring is proposed for concentrations of total mercury and methylmercury in the water column or lower food web in Keeyask Reservoir or downstream. While it is not expected that mercury concentrations in these compartments will rise to levels presenting significant risks to humans, this information would improve the ability to predict increases in mercury concentrations in fish for future hydroelectric developments, both in new reservoirs and downstream. For example, it is known that fish mercury concentrations increase downstream of new reservoirs, but the factors controlling the distance downstream that this occurs are not well known. Post-flood data on mercury concentrations in downstream waters would facilitate predictions in the future.	CEC-0052
53	CEC	AE SV	7.2.3.2	N/A	Aquatic Environment		The mercury text was confusing in some cases, e.g. Aquatic Effects Supplemental Volume (AE SV) Section 7.2.3.2, in terms of whether fish mercury concentrations were adjusted to a standard length, or instead represented the mean value for a sample. For example, the text referring to Figures 7-3 to 7-5 mentions "mean mercury concentrations" while the graph captions state "mean standardized". The text and figures should be consistent, indicating standard lengths if that was the case.	CEC-0053
54	CEC	AE SV	N/A	2-19	Aquatic Environment		Detection limits used to analyze water column samples collected in the fall of 2011 (1 ng/L for total mercury, 0.05 ng/L for methylmercury) were sufficient to demonstrate that existing concentrations of total mercury and methylmercury are well below the Manitoba water quality guidelines for the protection of aquatic life (26 and 4 ng/L respectively) (Aquatic Effects Supplemental Volume (AE SV) p. 2-19, Appendix 2), but greater precision would have been preferable to more accurately describe concentrations. Improved analytical methods should be considered in the future.	CEC-0054
55	CEC	PE SV	N/A	4-85	Physical Environment		With respect to the report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012, there were a question about back-bay residence time. <input type="checkbox"/> First paragraph (page 4-85): "With the exception of the more sheltered and shallower areas farthest from the mainstem of the river [...]" <input type="checkbox"/> What is the residence time in these areas?	CEC-0055
56	CEC	PE SV	N/A	4-51, 4-52, 4-55, 4-62	Physical Environment		With respect to the report Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following questions on construction: CONSTRUCTION DESIGN FLOWS <input type="checkbox"/> Last paragraph (page 4-51): "Water levels expected during winter conditions were also considered for flows ranging from 1:20 years mean monthly winter low flows [...] to 1:20 mean monthly winter maximum flows" <input type="checkbox"/> What was the downstream water level used for the calculation? Hanging ice dam issues downstream of Gull Rapids should be limited and the water level should be lower at this site because of the ice boom. STAGE I DIVERSION <input type="checkbox"/> Seventh paragraph (page 4-52): "it is expected that the water will stay within Gull Lake during the annual 1:20 CDF." <input type="checkbox"/> A flood map for this scenario should be provided and the locations of potential overflows should be highlighted. <input type="checkbox"/> Figures 4.4-3 and 4.4-4 (page 4-55) <input type="checkbox"/> What is the pixel resolution of these maps? <input type="checkbox"/> The scale should be provided. <input type="checkbox"/> What is the mesh density of the 2D model in the vicinity of the Keeyask GSProject site? STAGE II DIVERSION <input type="checkbox"/> Figure 4.4-9 (page 4-62) <input type="checkbox"/> Very high velocities up to 12 m/s were computed for this scenario. Have mitigation measures been planned to limit erosion and potential damages to the structures located downstream of the spillway? <input type="checkbox"/> What are the computed velocities right next to the tailrace cofferdam? How could this structure be protected?	CEC-0056

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57	CEC	PE SV	N/A	N/A	Physical Environment		<p>With respect to the report Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following questions on creek hydrology and hydraulics:</p> <p>First paragraph (page 4-17): "Four specific creeks of interest were selected for detailed analysis."</p> <p><input type="checkbox"/> How were these creeks selected?</p> <p><input type="checkbox"/> Backwater distances for these creeks are given in Section 4.4.2.2.7 (page 4-86).</p> <p>Sixth paragraph (page 4-19): "All roughness values chosen were between 0.035 and 0.04"</p> <p><input type="checkbox"/> These Manning roughness coefficients are low compared to usual normal values for riverbanks with trees (0.040 to 0.150, from HEC-RAS Reference Manual). Please explain.</p> <p>Figure 4.2-3 (page 4-20)</p> <p><input type="checkbox"/> What is the type of background image, DTM or satellite?</p> <p><input type="checkbox"/> The "Nap Length Mark" and "Backwater Boundary" elements are unreadable.</p> <p><input type="checkbox"/> Indication of north, scale and legend should be provided.</p> <p><input type="checkbox"/> Flow around Caribou island (page 4-26) and in Gull Rapids (page 4-28)</p> <p><input type="checkbox"/> How were the multiples channels flows calculated? Are the proportions indicated based on site measurements or 2D modelling results?</p> <p><input type="checkbox"/> Third paragraph (page 4-37): "A rational method was used to estimate design discharges"</p> <p><input type="checkbox"/> Details on the calculations should be provided.</p> <p>Creek Hydraulics</p> <p><input type="checkbox"/> First paragraph (page 4-86): "Box creek and other small creeks located on Gull Lake, which are not included directly in the analysis, would be almost completely flooded out"</p> <p><input type="checkbox"/> These creeks should be shown on a map.</p>	CEC-0057
							<p><input type="checkbox"/> Bullets list (page 4-86)</p> <p><input type="checkbox"/> Backwater distances for the four creeks of interest should be summarized in a table. These distances may not be representative of the flooded zones for all the creeks.</p> <p><input type="checkbox"/> Figure 4.4-23 to 4.4-26 (pages 4-87 and 4-88)</p> <p><input type="checkbox"/> Acronyms "EE" and "FP" are not defined.</p> <p>Creek Hydraulics – South Access Road Creeks</p> <p><input type="checkbox"/> First paragraph (page 4-89): "The exception to this is Gull Rapids Creek, which will now outlet into an area downstream of the spillway, which will be dewatered when the spillway is not operating."</p> <p><input type="checkbox"/> According to the report, under existing environment conditions, the hydraulic connection between Gull Rapids Creek and the Nelson River is lot periodically.</p> <p><input type="checkbox"/> Gull Rapids Creek should be identified on a map.</p> <p><input type="checkbox"/> Will the project affect dewatering duration and frequency?</p> <p><input type="checkbox"/> Can this situation be improved somehow?</p> <p><input type="checkbox"/> Will the Gull Rapids Creek outlet be modified or moved?</p>	
							<p>Several hydraulic models (1D, 2D, 3D and physical models) were developed by Manitoba Hydro to simulate the hydraulic conditions of the Nelson River between Split Lake and Stephens Lake.</p> <p>Very few details are provided about the calibration of these models. Water level tolerances and overall water level absolute differences are included for 1D and 2D models. No specific calibration results are provided in the form of tables or figures to compare the measured data with the computed data within the study area. In addition, the scenarios used for the calibration of the various models are not defined. Therefore, there is not enough information in the report to properly assess the validity and accuracy of the flow calculations.</p> <p>Appendix 4B briefly describes the numerical and physical models used. However, the information does not permit an assessment of the models quality. The number and location of the 1D cross-sections, for example, are not provided, nor a map. Also, details about the 2D modelling mesh, such as location map, number of nodes and mesh density, are not included. Several questions about the models are highlighted below.</p> <p>Multiple channels reaches (Caribou Island and Gull Rapids) were modelled in 1D and large water level differences (0.3 m) were provided as results. This is not surprising due to the complex hydraulic conditions on those reaches, which cannot be reproduced by a 1D model. These reaches should have been modeled in 2D.</p> <p>The results of 2D simulations of the Construction Design Flood (CDF) during Stage II Diversion show very high flow velocities (up to 12 m/s) downstream of the spillway. Mitigation measures should be planned to limit erosion and potential damage to the downstream structures.</p>	

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58	CEC	PE SV	N/A	N/A	Physical Environment		<p>APPENDIX 4B-1 ONE-DIMENSIONAL OPEN WATER MODEL – HEC-RAS (PAGE 4B-1)</p> <p><input type="checkbox"/> Cross-sections</p> <ul style="list-style-type: none"> – How many cross-sections are included in the model? – A location map of the numbered cross-sections should be provided. – A transversal profile of each individual cross-section should be provided. <p><input type="checkbox"/> First paragraph (page 4B-1): "These one-dimensional models can be used to effectively simulate open-water hydraulic conditions for a range of flow between 1,000 m³/s to 6,000 m³/s as this is the range of flow the models were calibrated to."</p> <ul style="list-style-type: none"> – With what real values (not rounded numbers) were the models calibrated? – The results of all calibration scenarios should be presented in order to show the validity of the model. Computed water levels should be compared with measured water levels and presented in the form of a table or longitudinal river profile plot. – The Construction Design Flood (CDF: 6,358 m³/s) is out of range. Does this mean that the results of the simulations of the CDF are not valid? <p>APPENDIX 4B-2 TWO-DIMENSIONAL OPEN WATER MODEL – MIKE 21 (PAGE 4B-2)</p> <p><input type="checkbox"/> Model mesh (unstructured triangular elements)</p> <ul style="list-style-type: none"> – Details about the modelling mesh should be provided, i.e.: <ul style="list-style-type: none"> · Number of elements/nodes; · Mesh density by zones. – Maps of the 2D mesh: a general view and closer views next to Keeyask GS structures should be provided. – Was the model designed to represent the flow conditions only upstream of the future structures (intake and spillway)? – A figure similar to figure 4.4-9 should be presented for the velocity distribution in the north channel (future conditions). <p><input type="checkbox"/> Second paragraph (page 4B-2): "simulated water levels matched rating curves based on measured water levels within a tolerance of approximately 0.2 m"</p>	CEC-0058
58	CEC	PE SV	N/A	N/A	Physical Environment		<ul style="list-style-type: none"> – The results of all the calibration scenarios should be presented in order to show the validity of the model. The computed water levels should be compared with measured water levels and presented in the form of a table, longitudinal river profile plot or 2D layout map. <p>3</p> <p><input type="checkbox"/> Second paragraph (page 4B-2): "For verification, simulated velocities also compared well with measured velocity profiles collected at several specific locations along the reach."</p> <ul style="list-style-type: none"> – More details should be provided, i.e. locations of the verification spots, and comparisons between measured and computed velocities. <p>APPENDIX 4B-3 H01E BACKWATER MODEL (PAGE 4B-2)</p> <p><input type="checkbox"/> The specific need to use the H01E model is not fully explained.</p> <p><input type="checkbox"/> Was the H01E model used simply to validate the HEC-RAS model? HEC-RAS could probably have been used to perform all H01E simulations. In this context, the development of a second 1D model appears redundant.</p> <p><input type="checkbox"/> What was the water level tolerance for the H01E model? Was it the same as in HEC-RAS?</p> <p><input type="checkbox"/> Were the project cofferdams and diversion structures also simulated with HEC-RAS? Why was the H01E model preferred for this task?</p> <p>APPENDIX 4B-4 FLOW-3D MODEL (PAGE 4B-2)</p> <p><input type="checkbox"/> As stated, the FLOW-3D model was used to provide multi-dimensional estimates of flow velocity patterns. However, the extent of the 3D model is not given and the report does not include the model output (no results, no map, and no figures).</p> <p><input type="checkbox"/> The FLOW-3D model probably covers the Gull Rapids area and it was therefore used to design hydraulic structures, such as the spillway. However, this information is not stated clearly in the report.</p> <p><input type="checkbox"/> What was the water level tolerance in the FLOW-3D model?</p> <p><input type="checkbox"/> Was the model compared with the MIKE21 model?</p>	CEC-0058

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							<p>APPENDIX 4B-7 PHYSICAL MODELS (PAGE 4B4)</p> <p><input type="checkbox"/> The report does not include model results.</p> <p><input type="checkbox"/> Where were the major differences between the physical and numerical models located? What caused these differences?</p> <p><input type="checkbox"/> What was the water level tolerance in the physical models?</p> <p><input type="checkbox"/> Some river ice processes could have been modelled using the physical model. Was ice included in any way in the physical model?</p> <p>APPENDIX 4B-8 ONE-DIMENSIONAL WINTER MODEL – ICEDYN</p> <p><input type="checkbox"/> As mentioned, the ICEDYN model is a numerical model that is still under development. The model does not reproduce all ice processes, such as ice jams, ice breakups, ice runs, and ice cover cracking.</p> <p><input type="checkbox"/> Was the calibration of the ICEDYN model only based on water level?</p> <p><input type="checkbox"/> Was ice thickness used a calibration parameter? How do measured and modelled ice thicknesses compare?</p> <p><input type="checkbox"/> Was the presence/absence of ice a calibration parameter? How does the presence/absence of measured and modelled ice compare throughout the calibration of winter seasons?</p>	

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59	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to the report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012, there were a number of questions about: data and information sources; assumptions; and, description of numerical models and methods.</p> <p>Data and Information Sources</p> <ul style="list-style-type: none"> •First bullet (page 4-9): "Periodic water levels have been collected [...] at 35 locations" <ul style="list-style-type: none"> - The 35 locations should be shown on a map. •Second bullet (page 4-9): "Discharge measurements ..." <ul style="list-style-type: none"> - How were the measurements recorded in winter? - Was the discharge data corrected to take ice effects into account? •Third bullet (page 4-9): "Automatic water level gauge data collected at five locations ..." <ul style="list-style-type: none"> - These locations should be shown on a map. •Fourth bullet (page 4-9): "Discharge and water level data from the Kettle GS for the period 1977 to 2006" <ul style="list-style-type: none"> - Is this information the same as that of Environment Canada's station 05UF006 (Nelson River at Kettle GS)? - This information is crucial for surface water analysis. Thus, more detail should be provided about calculation methods and data reliability regarding all flow ranges. - The period after 2006 should be included in the analysis. •Eighth bullet (page 4-9): "Water velocity profiles collected at 36 locations in 2003." <ul style="list-style-type: none"> - How was this information used in the hydraulic analysis? - Was it used for model calibration? If so, how do data and models compare? - How were the locations selected? - The 36 locations should be identified on a map. <p>•Eleventh bullet (page 4-10): "Hydraulic reports and engineering design memoranda [...] included hydraulics relationships such as stage-discharge and stage-storage curves." <ul style="list-style-type: none"> - Complete references regarding these reports should be provided. - This information is required to calculate the projects inflows. </p> <p>•Last sentence (page 4-11): "...local knowledge was obtained through presentation and discussion of initial results." <ul style="list-style-type: none"> - Which local communities were involved and where are they located? - What knowledge was learned from them? - What were the "issues of concerns" related to river flow and river ice? </p> <p>Assumptions</p> <ul style="list-style-type: none"> •Second bullet (page 4-12): "The magnitude and variability of the monthly Project inflow record is assumed to be representative of future monthly Project inflows." <ul style="list-style-type: none"> - This assumption should be supported by an analysis of years 2006 to 2012. •Fourth bullet (page 4-12): "The current river morphology is assumed to be representative of the river in the future for all hydraulic studies." <ul style="list-style-type: none"> - This assumption should be supported by sedimentology observations. - Which are the areas where sedimentation is likely to modify the river's morphology and the hydraulic conditions? <p>Description of Numerical Models and Methods</p> <ul style="list-style-type: none"> • Third paragraph (page 4-13): "The accuracy of the numerical models [...] is best quantified by the level of calibration attained for each of the models" <ul style="list-style-type: none"> - Which calibration scenarios have been used? Were they steady state? - Appendix 4B provides some details about calibration. See comments on pages 11 and 12 of this document. • Third paragraph (page 4-13): "In some locations, such as Gull Rapids area, these differences can be 0.3 m due to the complex hydraulic conditions in this reach" <ul style="list-style-type: none"> - Is this the calibration result of the 1D HEC-RAS model? - Does the model overestimate or underestimate the water levels? - A 2D model is best suited to represent the flow conditions in multiple channel areas. What water level differences were obtained in these areas with the MIKE 21 model? •Fourth paragraph (page 4-13): "Some differences of up to 2 m exist at certain locations [...] for specific points in time." <ul style="list-style-type: none"> - Does the model overestimate or underestimate the water levels? - How do these errors affect the overall validity of the model? - Specific conditions leading to differences greater than 1 m should be analysed and discussed. 	CEC-0059

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60	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>The report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012. The historical period used to define the existing environment (including hydrology) ends in 2006. Therefore, five years (from 2007 to 2011) are not included in the analysis. This is surprising especially in the context of climate change. The report states, for example, that record flood and drought occurred within the last ten years. Therefore, flow data for the year 2006 and beyond should be included in the analysis, as well as how this data would modify the project inflows.</p> <p>Second paragraph (page 4-5): "The existing environment has been defined as the period of 1977 to 2006"</p> <ul style="list-style-type: none"> - Why does the analysis end in 2006? - The report was produced in 2012. Therefore, five more years (2007 to 2011) should be included in the analysis. - How do the "post-2006" events compare with the "pre-2006" events? - The report should show how the inclusion of post-2006 data modifies the project inflows. <p>•Second paragraph (page-4-21): "The flood of record (post-CRD) occurred in 2005 [...] while the drought of record was found to be 2 years earlier in 2003"</p> <ul style="list-style-type: none"> - How would flow data from 2006 and beyond (period not included in the analysis under review) compare with those flow records? - According to these values, record flood and drought were broken during the last ten years. This should be commented versus climate changes and observed hydrologic trends. Is the second assumption (page 4-12) still valid in this context? <p>• Figure 4.3-1 (page 4-22)</p> <ul style="list-style-type: none"> - Do the values shown correspond to average annual flow? 	CEC-0060
61	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to the report Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following comments on residual effects.</p> <ul style="list-style-type: none"> • Ice Regime (page 4-108) <ul style="list-style-type: none"> - The following residual effect should be added: <ul style="list-style-type: none"> · The breakup of an ice jam at Birthday Rapids may result in the release of a surge. The magnitude, extent, duration and frequency of this phenomenon need to be defined based on additional simulations. • Effect during operation - Downstream of Project Site (page 4-111) <ul style="list-style-type: none"> - The following residual effect should be added: <ul style="list-style-type: none"> · The duration and frequency of the dewatering of Gull Rapids Outlet will be increased. 	CEC-0061

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62	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>The report states that river ice processes on the lower Nelson River have been studied for many years by Manitoba Hydro. However, references to support this statement are not provided. In order, to anticipate ice-related issues at Keeyask GS, it would be interesting to detail the lessons learned over the years by Manitoba Hydro at neighbour hydropower sites.</p> <p>Local knowledge and issues of concern regarding river ice was obtained via presentations and discussions with local communities. However, the report does include details on this knowledge and the issues of concern.</p> <p>The numerical model used to simulate ice formation processes is ICEDYN, which is still under development and cannot simulate the processes involved during spring breakup. Very little detail is provided about the model and its calibration. The model was calibrated based on measured water level and very large differences (up to 2 m) were obtained at specific points along the reach under study. The validity of the model regarding other parameters (ice thickness or the presence/absence of ice) does not seem to have been assessed.</p> <p>It is expected that the average thickness of the reservoir's ice cover will be between approximately 0.8 to 1.2 m by the end of winter. This range of ice thickness is low, especially when compared with the operating range of the reservoir (1 m). This situation is likely to promote ice ridging.</p> <p>Results indicate that "velocities will also increase by up to 0.5 m/s or more over existing environment values in the north channel of Gull Rapids as this is where the intake to the powerhouse will be located". In these conditions, the ice cover is likely to be unstable near the intake. The risks associated with this situation require further analysis.</p> <p>As mentioned before, ICEDYN cannot simulate conditions during spring breakup. Therefore, the impacts related to the breakup of an ice jam located at Birthday Rapids have not been assessed. This should be added to the list of residual effects and analysed via an alternative method: either a physical model or a numerical model such as CRISSP2D.</p> <p>Specific Comment – References and Documentation Last paragraph (page 4-5): "ice formation on the Lower Nelson River [...] has been studied for many years by Manitoba Hydro." – Are there references to support this statement? – Based on the lessons learned over the years by Manitoba Hydro (MH), what are the main issues related to river ice and hydropower generation on the Lower Nelson River? – It would be interesting to document historical events of ice problems at MH dams on the Nelson River, such as ice jams that forced flow reduction and ice damages to civil and mechanical structures, e.g. turbines.</p> <p>Specific Comment – Satellite Imagery With respect to ice conditions, third paragraph, second bullet (page 4-8): "satellite imagery" – Typical images would have been interesting in appendix. – Which products were used: name, type of image, resolution?</p> <p>Specific Comment – Reservoir Reach • First paragraph (page 4-91): "The reservoir ice cover will be very similar to the lake ice cover that presently forms on Stephens Lake. It is expected that the average thickness of the reservoir ice cover will be between approximately 0.8 to 1.2 m by the end of winter." – This range of ice thickness is low, especially when compared with the operating range of the reservoir (1 m). This situation is likely to promote ice ridging. Please explain. • Last paragraph (page 4-95): "ICEDYN model cannot simulate the processes involved during the spring breakup period" – How were these processes taken into account in the analysis? – The breakup of an ice jam in Birthday Rapids may create a surge and an ice run. – The propagation of an ice breakup surge should be simulated.</p>	CEC-0062
63	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to The report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012 and Open Water Mainstream Travel Time.</p> <p>• First paragraph (page 4-34): "Travel times for flows along the mainstem [...] ranges from approximately 10 hours to 20 hours." – Where do these results come from? From the 2D model? – Details about the method used to assess these travel times should be provided.</p> <p>• Second paragraph (page-4-21): "The flood of record (post-CRD) occurred in 2005 [...] while the drought of record was found to be 2 years earlier in 2003" – How would flow data from 2006 and beyond (period not included in the analysis under review) compare with those flow records? – According to these values, record flood and drought were broken during the last ten years. This should be commented versus climate changes and observed hydrologic trends. Is the second assumption (page 4-12) still valid in this context?</p> <p>• Figure 4.3-1 (page 4-22) – Do the values shown correspond to average annual flow?</p>	CEC-0063

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64	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to the report Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following questions on spring breakup on the Nelson River.</p> <ul style="list-style-type: none"> • First paragraph (page 4-42): "the cover progressively breaks and reforms, at times possibly resulting in a temporary ice jam" – Where are the major ice jam formation sites? – How often do major ice jams occur? Every year? 	CEC-0064
65	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to the report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012, there were a number of questions about: water depths, shorelines and water surface areas.</p> <ul style="list-style-type: none"> • First paragraph (page 4-16): "The calibrated one-dimensional HEC-RAS model was used to establish water surface profiles" – How were the multiple channels reaches (such as Caribou Island and Gull Rapids) modelled in 1D? – How valid is the 1D model calibration on these reaches? – Tables and figures comparing 1D model results and observations for the calibration scenarios should be provided. • First paragraph (page 4-82): "Post-Project depth grids [...] are presented in map 4.4-5." – All flooding maps in Appendix show open-water delineation. – According to the report, the water level in the Gull Lake reach does not rise due to ice. • Fourth paragraph (page 4-83): "some of this flooding will be contained within dykes constructed around portions of the reservoir." – At what stage of construction will these dykes be built? This information is not included in Section 4.4.1 (Construction Period). According to Map 4.4-1, the dykes will not be built during Stage I diversion. 	CEC-0065
66	CEC	PE SV	4.0 Surface Water and Ice Regimes	N/A	Physical Environment		<p>With respect to the report, Keeyask Generation Project - Physical Environment Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012, there were a few questions on water velocities.</p> <ul style="list-style-type: none"> • Third paragraph (page 4-84): "Velocities will also increase by up to 0.5 m/s or more over existing environment values in the north channel of Gull Rapids as this is where the intake to the powerhouse will be located." – What will the post-project velocities be in this area? Will these velocities be low enough to create a stable ice cover? – Moderate to high velocities near the intake entrance may cause ice-related problems, such as dynamic ice pushes against dam structures, floating ice entrainment and potential damages to the trashrack. 	CEC-0066

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67	CEC	PE SV	7.0 Sedimentation	N/A	Physical Environment	The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project - Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed. The report is intended to describe the sedimentation processes operating in the project area and how the baseline environment will change under Project conditions. Some questions and further explanations are required and are identified below.	<p>The stated objectives of the Sedimentation section are:</p> <ul style="list-style-type: none"> • Characterization of historical and current sedimentation processes (bed material transport, suspended sediment transport, deposition). • Prediction of future sedimentation processes, mineral and organic suspended solids concentrations (nearshore and offshore), sediment transport (mineral and organic) and deposition rates, thickness, and volumes for (1) the construction period, (2) future conditions/trends, and (3) future environment with the Keeyask GS. <p>We have assumed that Item (2), future conditions/trends, refers to projections of what will happen in the future under no-Project conditions.</p> <p>The report and appendices contain considerable qualitative discussion about sedimentation processes and presents the results of the numerical modeling that was conducted to quantify these processes. An extended discussion of the modeling approach is presented in Appendix 7A, along with descriptions of the input data sources and the field data available for calibration. Unfortunately, the bulk of the input data are not provided and the descriptions are not of sufficient detail to perform a thorough review of the underlying models or the methods that were used to apply them. In addition, although the qualitative descriptions of sedimentation processes are generally correct, they neglect key processes that appear to have led to application of the models in a manner that is, at best, confused, and in many cases, may be inappropriate.</p> <p>The objectives include significant emphasis on the transport and deposition of bed and suspended (i.e., mineral) sediment and organic suspended solids; however, the modeling results focus primarily on suspended sediment concentrations. The focus on suspended sediment concentrations is appropriate for assessing water quality impacts; however, this focus is misplaced with respect to potential project effects on channel geomorphology, including bank erosion and in-channel erosion and deposition processes.</p>	CEC-0067a
							<p>As noted in Section 7.1.1.1, mineral sediment transport can be divided into two primary categories:</p> <ul style="list-style-type: none"> • Bed load, or the typically coarsest fraction of the load that moves in contact with the bed, and • Suspended load. <p>A key concept that is not mentioned is the distinction between bed material load and wash load. The failure to recognize this distinction appears to be largely responsible for the inappropriate approaches that were used for significant portions of the analysis.</p> <p>Bed material load refers to the portion of the total load that is made up of particles found in significant quantities in the bed, and it consists of two components: bed load and suspended bed material load (ASCE, 2007; Simons & Senturk, 1992). This portion of the load is primarily responsible for the geomorphic behavior of the channel(s), and it can be quantified using an appropriate equilibrium transport equation with hydraulic conditions estimated through numerical modeling and measured bed material size gradations.</p> <p>The wash load is made up of particle sizes that are not found in significant quantities in the bed (ASCE, 2007; Simons & Senturk, 1992). The wash load consists of particles that are much finer than the typical bed material, in most cases silts and clays, although even sand can fit into this category in coarse-grained rivers with a relatively low sand supply. By definition, the wash load is supply-limited, meaning that the amount being carried by the river at any given location and time is controlled by the supply, and not by the local hydraulic conditions and bed material characteristics. This is the most likely reason that the measured suspended sediment concentrations have poor correlation with instantaneous discharges (p 7-13, last paragraph). Because it is supply limited, the wash load component cannot be quantified with the type of numerical modeling that was employed in this study.</p> <p>Unfortunately, the vast majority of the sediment load that is considered in the study is in the wash load category. Please explain.</p>	
						The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project - Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed. The report is intended to describe the sedimentation processes operating in the project area and how the baseline environment will change under Project conditions. Some questions and further explanations are required and are identified below.	<p>Modeling of mineral sedimentation processes was conducted using a range of models, including the two-dimensional (2D) Mike-21 and the 1D HEC-RAS and HEC-6. The algorithms in these models were developed to quantify erosion and deposition of non-cohesive sediment based on mass conservation using semi-empirical sediment transport functions that were primarily developed for sand and coarser material. An important aspect of the sediment transport functions is that they were developed for equilibrium transport conditions; the predicted bed and suspended bed material loads represent the capacity of the river to carry the indicated sizes based on the local hydraulic conditions and bed material characteristics. The Limitations Section (7A1.1.4) discuss issues with simulating transport of cohesive material and includes the following statement: "...limitations of the model in computing relatively fine cohesive material were addressed by applying rigorous calibration procedures to confirm the applicability of the model... This section further states that only 10% to 20% of all suspended sediment has a mean diameter of less than 0.004, which is the upper limit of clay; thus, the majority of the suspended material is non-cohesive and a non-cohesive model formulation was considered to be appropriate and necessary.</p> <p>Unfortunately, the transport equations available in these models are also not applicable for silt that falls in the size range between 0.004 mm and 0.062 mm, and this appears to be the bulk of the material that is transported through the reach. Please explain.</p>	CEC-0067b

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67	CEC	PE SV	7.0 Sedimentation	N/A	Physical Environment		<p>For the Mike-21 modeling, the upstream boundary sediment concentrations were estimated in Clark Lake using the total load theory of Engelund and Hansen (1967) and ...transport of this sediment load was then simulated by the suspended sediment load theory of Galappatti (1983). The Engelund and Hansen (1967) equation is a semi-empirical bed material load equation that was developed for sand bed streams. This equation is not applicable to the silt/clay fraction (i.e., sizes finer than 0.062 mm). Galappatti (1983) is a numerical method of estimating a first-order adjustment to the sand concentrations derived from equilibrium transport equations to account for the phase-lag between the depth-averaged concentrations and depth-averaged velocities. This method could potentially be applied to the silt fraction, but it requires equilibrium transport conditions in which the suspended sediment load is being carried at capacity based on the hydraulic conditions and bed material sizes, a condition that is almost certainly not met in most, if not all, portions of the study reach. In spite of the calibration efforts, the model does not represent the sedimentation dynamics of the silt/clay size fractions, and the results are therefore not meaningful with respect to the questions that are being evaluated. Please explain.</p> <p>The HEC-RAS model was used to assess ...impacts from construction activities during river management [to predict] shoreline erosion and subsequent sedimentation... (Section 7.2.1.1, 2nd paragraph). Four of the 7 transport equations that are available in the software were used in the sedimentation modeling (Section 7A.2.1.2.1, last paragraph):</p> <ul style="list-style-type: none"> • Ackers and White • Engelund and Hansen • Laursen • Yang (sand). 	CEC-0067c
							<p>The equations were selected based on their relevance and appropriateness for use on the Nelson River...using hydraulic parameters that ...included the dimensionless particle diameter, dimensionless depth, Froude number, relative shear velocity, unit stream power and sediment load concentration. Neither the values of the parameters for the Nelson River nor the specific basis for concluding that these equations are appropriate were provided. Similar to the above discussion regarding the Mike-21 model, all of these equations were developed to represent the equilibrium transport capacity. Please explain.</p>	CEC-0067d
							<p>In rivers with fine-grained banks, bank erosion can be an important source of wash load. The study does correctly recognize that bank erosion will contribute to the suspended sediment loads at rates that are directly related to the bank erosion rates.</p> <p>It is noted in the Report that: shoreline erosion was predicted by conducting hydraulic and sedimentation modeling of the existing environments as well as for the different construction stages of the Project...using HEC-RAS 4.0. HEC-RAS 4.0 does not have the capability to model bank or shoreline erosion. Please explain.</p>	CEC-0067e
							<p>Section 6.2.4 indicates that one of the assumptions used in the modeling is that no catastrophic natural events (e.g., earthquake, flood, land-slides) will occur in the future. This seems like an unrealistic assumption, at least with respect to floods. Please explain.</p>	CEC-0067f
						<p>The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project - Physical Environment Supporting Volume – Shoreline Erosion Processes, June 2012" was reviewed. The report addresses shoreline erosion processes that include both the breakdown of peat and erosion of the shorelines that consist of mineral material, and makes projections of the baseline environment will change with the proposed Project. Some questions and further explanations are required.</p>	<p>In general, the report is well-written and organized. The qualitative descriptions of the two primary shoreline erosion processes (peatland disintegration and mineral erosion) provide good context for the analytical methods that were used in the analysis, and they appear to address the key processes that must be considered. The analysis of future conditions, with and without the project, was performed using a combination of historical information and numerical modeling tools.</p> <p>The historical trend analysis is a valuable part of the study because it provides a means of quantifying the changes that have been observed under pre-project conditions and provides context for projecting future changes, particularly under without-project conditions. The historical trends in peat bank erosion appear to have been assessed using data from aerial photographs taken in 1962 and 2006, a 55-year period that should be sufficient to detect systematic changes in the shorelines. The historical trends in mineral bank erosion appear to have been assessed by comparing aerial photographs taken in 1986 and 2006 and comparing transects surveyed in 2006 and 2007. The shorter, 22-year period encompassed by this information may not be sufficiently long to detect long-term trends, especially considering the relatively small changes that were indicated by these data. Please explain.</p>	CEC-0068a

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68	CEC	PE SV	6.0 Shoreline Erosion Process	N/A	Physical Environment		The overview of the analytical approach indicates that separate models were used in an integrated manner to assess peatland disintegration and mineral erosion, and that the reservoir expansion component of the peatland disintegration model incorporates mineral erosion setbacks...and [t]he mineral erosion model incorporates the effects of peat islands on effective wave energy, and ...the increased exposure of mineral banks to erosion resulting from peatland disintegration... (Section 6.2.1). Data from "proxy areas" were used in parameterizing the analytical shoreline erosion models, with the bulk of the data derived from a series of aerial photographs and chronosequence transects of Stephens Lake, located just downstream from the project, that were taken between 1962 and 2006. Although the report contains considerable discussion of the background data and assumptions used in the models and the results generally appear to be plausible, sufficient information is not provided about these models to verify the reasonableness of the algorithms or the manner in which they are applied. Is it possible to provide more information on the models?	CEC-0068b
							Although the model results appear to be qualitatively reasonable in the short-term, Manitoba Hydro (MH) indicates that the shoreline will continue to erode and the area of the affected waterbodies will continue to expand, ad infinitum, under both without- and with-project conditions, a condition that seems to be highly unlikely. Areas upstream from the generating station that will experience higher inundation levels will adjust to these higher levels under with-project conditions until a new equilibrium is reached; however, the reasons for the continued adjustment under without-project conditions is not explained, nor is it apparent. Natural shorelines in this environment erode and form in response to the flow, sediment supply and peat formation and disintegration processes. In the absence of systematic changes in the driving forces (i.e., hydrology, climate, sediment supply), they generally reach a state of dynamic equilibrium in which there is little net change over time within reach-wide areas. It is understood that the affected waterbodies may still be adjusting to the effects of previously-constructed hydropower projects; however, the results are presented in a manner that indicates that eroding areas will continue to erode at the historic rates under without-project conditions, which will result in continued increases in river width and/or expansion of the surface area of the lakes. At minimum, the report should acknowledge that the rate of change will decrease asymptotically to a new equilibrium under both without- and with-project conditions. The status of the adjustments with respect to this equilibrium under without-project conditions and the length of time required to substantially reach a new equilibrium under with-project conditions are questions that should be answered. Please explain.	CEC-0068c
69	CEC	PE SV	5.4.1.1.6 Assessing Environmental Sensitivity of Borrow and Quarry Rock Material	5-24	Physical Environment		The final paragraph in section 5.4.1.1.6 suggests that more work is required to assess potential impact of granular fill with respect to acidic metals leaching. Given the large volumes of material involved resolution of this issue is important. Please advise on the schedule for completion of testing to resolve this concern.	CEC-0069a
			5.4.1.1.6 Physiography	N/A			Are there any alkali aggregate concerns with the bedrock to be excavated, crushed and used as concrete aggregate? What testing will be done on the rock to confirm it is satisfactory?	CEC-0069b
70	CEC	PE SV	5.0 Physiography; PD SV	N/A	Physical Environment	Section 5.2.4 of the Physiography chapter indicates that climate change was not considered in this portion of the assessment. Some stakeholders may be concerned that with a warmer environment over the long-term (as described in the climate scenarios identified in Chapter 2 Climate) dykes based on peatlands may be more susceptible to failure. It would appear that the answer to this is in the Project Description SV, Section 2.3.7., which describes the construction of the North and South Dykes in a discontinuous permafrost region.	Can MH provide an explanation of how the proposed construction method for the dykes on discontinuous permafrost accounts for the potential thawing?	CEC-0070
71	CEC	PE SV	5.4.1.1.3 Permanent Structures	5-20	Physical Environment		Section 5.4.1.1.3 indicates that at the dam joints and fissures will be sealed with grout. The text indicates that "this will be a permanent alteration to the local geology", however, no further details are provided. This is an area of discontinuous permafrost in soil and bedrock. Fissures and joints may currently be ice filled and therefore not available to be grouted initially. Construction of a large reservoir may lead to changes to the depth of permafrost. With retreat of permafrost leakage of reservoir through rock may occur potentially changing geotechnical stability at specific locations and groundwater conditions. Further consideration of the influence of permafrost preparation and bedrock sealing is required. Please explain.	CEC-0071
72	CEC	PE SV	5.4.1.1.4 Excavated Material Placement Areas	5-21	Physical Environment		Section 5.4.1.1.4 indicates that 40 million m3 of unclassified material is surplus for construction, some of which will be placed within reservoir area. This material seems susceptible to be washed away and become suspended sediment. What measure will be taken to minimize the erosion of this material? Would there be less environmental impact if this was placed outside of the reservoirs? Could this material be used to backfill borrow pits?	CEC-0072
73	CEC	PE SV	N/A	Map 5.4.1	Physical Environment		What measures are to be undertaken in the "mitigation" areas? Or please refer us to volumes/chapters/sections where this is discussed? A "pink" area in the centre of the map near the word "river" is identified as a road corridor. Confirmation is requested that this is correct. Potential dewatered areas are identified in white. What mitigation measures are to be undertaken in these areas? Or please refer us to volumes/chapters/sections where this is discussed?	CEC-0073

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74	CEC	PE SV	N/A	Map 5.4.2	Physical Environment		A topographic map with contours at close intervals would be of assistance to the physiography section. Bedrock geology and structural geology maps of the study area would be of assistance.	CEC-0074a CEC-0074b
75	CEC	PE SV	5.0 Physiography	N/A	Physical Environment		Very little information is provided regarding the bedrock geology and the structural geology within both the regional and local study area. Additional information or the original reports are requested. Reference is made to thermo-karst features in bogs. Further information is requested regarding the size and frequency of these features and their significance to the site.	CEC-0075a CEC-0075b
76	CEC	PE SV	5.4.1.1.5 Local Borrow Material Resources	5-21	Physical Environment		With respect to local borrow resources: Will some stockpiles of granular material be set aside for future use so that no additional borrow pits will be required, at least in the near future? Will there be in place a monitoring system so that the contractor does not open more borrow pits and areas than is necessary? Are any special measures to be taken to rehabilitate future islands (which were lands subject to borrow excavation) which may be subject to different soil, groundwater and permafrost conditions than the general reservoir shoreline? Will borrow pit excavation depths take into consideration future changes to groundwater levels following reservoir filling? Some of the proposed borrow pit locations are on future islands. Will exhausted granular borrow pits be used to dispose of excavated unsuitable fill (Map 5.4.1.1)?	CEC-0076
77	CEC	PE SV	N/A	Map 5.3.7	Physical Environment		What will the influence of reservoir flooding and associated permafrost melting be on: <input type="checkbox"/> Slope stability at drumlins, future island or shoreline areas with steeper slopes? <input type="checkbox"/> How will earth dams and dykes perform after reservoir flooding influences underlying permafrost? <input type="checkbox"/> What will prevent significant settlement/consolidation of dykes, roads and similar areas due to the above influences?	CEC-0077
78	CEC	PE SV	8.0 Groundwater, Project Effects, Mitigation and Monitoring	N/A	Physical Environment		Upon completion of the project an additional 5.88 km ² of land with groundwater at surface will be generated. What environmental issues are associated with this new area? How susceptible is this new area to erosion?	CEC-0078
79	CEC	PE SV	8.0 Groundwater, Data and Information Sources	N/A	Physical Environment		It is indicated that field groundwater data from data loggers deployed in 8 groundwater wells within the study area, in 2007 and 2008, was used in the analyses. Given the 65 km length of the groundwater study area a rationale is requested to justify that the 8 groundwater wells provide sufficient data for the groundwater impact study. It is noted that some monitoring locations were too far from the river. Was there sufficient and meaningful data to permit representative modeling of the groundwater changes? Aquifer parameters were determined from a small number of falling head and packer tests. Some wells were completed in 1999 and 2003. Four wells were installed and tested in 2008. Given the limited aquifer data, has a sensitivity analyses been carried out to assess the influence of this limited data set on groundwater predictions?	CEC-0079
80	CEC	PE SV	8.0 Groundwater, Environmental Monitoring and Follow-Up	N/A	Physical Environment		The changes to groundwater conditions have been predicted based upon limited field data. There is no indication in Section 8 that further hydrogeological/groundwater study or analyses are to be carried out. Should confirmation be required that the predicted conditions are in fact reasonably accurate and that different conditions which could be of significance do not occur? Should further groundwater assessment and analyses as well as a program of groundwater monitoring be carried out?	CEC-0080
81	CEC	PE SV	8.0 Groundwater, Project Effects, Mitigation and Monitoring, Cross-Sections B-B' and C-C'	N/A	Physical Environment		These cross-sections show the dykes on each side of the reservoir, but little or no change to the groundwater conditions beyond the dykes. Clarification is requested as to how such a significant new surface water body could have such a limited influence immediately beyond the new dykes. Have influences of permafrost melting been considered? Have bedrock structural geology conditions been considered in predicting the connection between the reservoir and groundwater in the adjacent area?	CEC-0081
82	CEC	PE SV	8.0 Groundwater, Environmental Setting	N/A	Physical Environment		This section indicates that permafrost may be present beneath lakes within the study area which could be acting as a barrier to flow of water from the lakes to the groundwater. Has this issue been further examined taking into consideration the influence of the development of the new large reservoir?	CEC-0082

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83	CEC	PE SV	8.0 Groundwater, Environmental Setting	N/A	Physical Environment		The note at the base of Table 8.3-1 states "Hydraulic conductivity in the vertical direction is assumed to be 0.1x the coefficient of hydraulic conductivity in the horizontal direction." Hydraulic conductivity values are provided for 8 different stratigraphic materials ranging from clays to alluvium to diabase bedrock. This assumption regarding vertical permeability seems too general given the range of strata present and the lack of horizontal bedding associated with most of the strata. A rationale is requested as to the selection of the 0.1x value. What sensitivity analyses were carried out using alternative values and assessing the changes to the model outputs?	CEC-0083
84	CEC	PE SV	8.0 Groundwater, Project Effects, Mitigation and Monitoring	N/A	Physical Environment		Groundwater levels in the area surrounding the reservoir are predicted to rise from 0 m to approximately 7.5 m with an average increase of 2 m. What environmental concerns or issues will arise from this change in groundwater levels?	CEC-0084
85	CEC	PE SV	8.0 Groundwater	N/A	Physical Environment		The groundwater/surface water modeling approach did not permit assessment of effects from prolonged extreme events. Given that the dam and reservoirs are long term installations and that significant climate change influences are anticipated, modeling of more extreme conditions may be warranted. Please explain.	CEC-0085
86	CEC	PE SV	8.0 Groundwater, Environmental Setting	N/A	Physical Environment		Groundwater recharged is noted to be influenced by the presence of permafrost. The presence of new reservoir could be expected to significantly influence the extent of permafrost. Clarification is requested as to how these changes to permafrost have been utilized in the model and have influenced the groundwater regime.	CEC-0086
87	CEC	PE SV	8.0 Groundwater	N/A	Physical Environment		The scope of work for this groundwater study is provided. Is the scope of work sufficiently detailed? What other factors should have been considered? How have rapid drawdown events and resulting groundwater influences on reservoir shoreline slopes been considered? Groundwater conditions at greater distances from the reservoir should potentially be examined. What influences can be expected on groundwater flow or quality at distances beyond the identified groundwater study?	CEC-0087
88	CEC	PE SV	8.0 Groundwater	N/A	Physical Environment		The groundwater study area appears to be limited to quite close to the edge of the reservoir and dykes within the first 10km upstream of the powerhouse. An explanation is requested as to why groundwater evaluation to a greater extent has not been done in this area. What further study is to be done on groundwater impacts as part of the detailed design and assessment work?	CEC-0088
89	CEC	PE SV	8.0 Groundwater	Map 8.2.1	Physical Environment		On this map, the groundwater study area appears to match the surface water drainage basin and is quite close to the reservoir near the generating station. What groundwater influences would occur beyond these limits?	CEC-0089
90	CEC	PE SV	8.0 Groundwater	Maps 8.3.1 and 8.4.1	Physical Environment		Groundwater levels beyond dykes were frequently not simulated. Are significant influences potentially present in these areas?	CEC-0090

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Concerned Fox Lake Grassroots Citizens								
1	CFLGC	R-EIS Guidelines	6.8.4 Summary of Residual Effects and Significance	Table 6-69	Socio-Economy		In Table 6-69, it is stated that the geographic extent of the residual effects on heritage resources is small. Please explain how this was determined and if these characteristic assessment was calculated in collaboration with the First Nations. Ekosi.	CFLGC-0001
2	CFLGC	R-EIS Guidelines	1.4 Aboriginal Traditional Knowledge, Local Knowledge and Technical Sources	1-10 and 2-39	Socio-Economy		On page 1-10 of the EIS, it is stated that "KCNs have led their evaluations of the effects of the Project on their communities and Members, they have also collaborated in the preparation of this EIS". However, on p. 2-39, it is stated that the "Fox Lake Traditional Knowledge program emerged at a later stage of the environmental assessment process". Please provide an explanation to: 1) the contradiction on how the data was compiled to make up the EIS - especially since the TK data was documented at later stages. 2) provide examples how Fox Lake was collaborating on the writing of the EIS, the chapter components found within and the components of the "Cree world view" that are embedded in the EIS but not credited to any First Nation members specifically. Ekosi.	CFLGC-0002
3	CFLGC	R-EIS Guidelines	2.6.3 Community History Document: Ninan and Community History Video	2-39	Socio-Economy		Page 2-39 of the EIS discusses a draft version of the community history document called Ninan and community history video. Please provide us with a copy of Ninan, the written compilation of the community's history and of the visual component referred to as "community history video". Ekosi.	CFLGC-0003
4	CFLGC	R-EIS Guidelines	1.2 Scope of the Project	1-7	Socio-Economy		On page 1-7, please provide a detailed map of the area including the components that are part of the principal structures, including permanent and temporary infrastructures: North and south access roads, Cofferdams, Tower spur Rock groins Communication tower Boat launches and a portage Borrow areas, including roads to these areas Temporary and permanent (if any) work camps Work areas Landfill water, sewage treatment facilities Explosive magazines, Ice booms Placement for excavated materials Security gatehouses Dykes, causeways, culverts associated with the dam Which sites will be decommissioned Clearing/burning/timber areas Any streams where sewage will be released Any roads and transmission lines We would like a map of the phases and all infrastructure at the (1) start of the project, (2) middle of the project, and (3) after completion of the project. Ekosi.	CFLGC-0004
5	CFLGC	R-EIS Guidelines	8.0 Monitoring and Follow-up	4-50; 6-490 to 6-493	Socio-Economy		a) What processes are in place to ensure 'active participation' in "the development and implementation of monitoring and follow-up programs" (page 6-490)? b) Are First Nations like Fox Lake participating in the monitoring programs developed by Manitoba Hydro, or are they provided with funds and expert support to develop and implement own monitoring plans and programs? c) What steps are taken to ensure monitoring programs are according to the needs of each First Nation? d) With the new East Side Traditional Lands Planning and Special Protected Areas Act, will the participatory First Nation be provided with assistance to encourage the development for a similar Bill in Northern Manitoba to monitor their own traditional territories? Ekosi.	CFLGC-0005

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6	CFLGC	R-EIS Guidelines	6.6.5.6 Culture and Spirituality	6-490	Socio-Economy		Please explain what is meant by the statement on page 6-490: "Traditional knowledge is dynamic and interactive. While this interaction is notably in decline because of other factors, the process of loss may be accelerated". a). What is meant by "notably in decline because of other factors"? b). What data exists to support this statement? Please provide us with the data to support this claim in Fox Lake. Ekosi.	CFLGC-0006
7	CFLGC	R-EIS Guidelines	6.8 Effects and Mitigation Heritage Resources	6-561	Socio-Economy		On Page 6-561, it is stated that: "the approach taken to interpreting the effects and extending the appropriate mitigation to heritage resources known and unknown was based on the results of archeological field investigations, ATK...on archeological sites". Please explain how intangible cultural heritage, as defined by UNESCO's Convention for the Safeguarding of Intangible Cultural Heritage, will be affected and mitigation measures taken to ensure their protection. Ekosi.	CFLGC-0007
8	CFLGC	R-EIS Guidelines	6.4.2 Aboriginal Traditional Knowledge	6-239	Aquatic Environment		On Page 6-239, it is stated that: "the Keeyask dam is expected to negatively affect fish populations by blocking fish movements...and causing spillway and turbine mortality". Please provide us with the appropriate fish passage report on Keeyask and for BiPole 3 that helps portray this data. Ekosi.	CFLGC-0008
9	CFLGC	R-EIS Guidelines	2.6 Fox Lake Cree Nation Involvement in the Project	N/A	Project Description		In this section, the history and the diplomatic relationship of Fox Lake is presented. Please provide us with ALL the TK reports that have been done - completed, drafts, or pending, with Fox Lake Cree Nation. The reports we are requesting include all infrastructure in Makeso Sakahican including any converter, generating stations, transmission lines, dams, roads, lagoons, work camps, etc as they all are interconnected to each other in the eyes of members of FL. The presence of Manitoba Hydro in Makeso Sakahican has been long-standing and we would like to see all the TK reports done with Fox Lake First Nation. Ekosi.	CFLGC-0009
10	CFLGC	R-EIS Guidelines	2.6.2 Laying the Foundation for Diplomatic Relationships: Forgotten Nation in the Shadows of the Dams	N/A	Response to EIS Guidelines		In this section, there is mention of the report entitled: "The Forgotten Nation in the Shadows of the Dams" (1997). We would like a copy of this report. Ekosi.	CFLGC-0010
11	CFLGC	R-EIS Guidelines	6.4.3 Aquatic Ecosystems and Habitat	6-240	Aquatic Environment		In this section on "Aquatic Ecosystems and Habitat", there is discussion of numerous issues. We would like to have copies of all the reports done on the lower Nelson River through to the estuary. This list of reports includes (but is not limited to): -all biophysical reports -all hydraulic reports -all physical reports Ekosi.	CFLGC-0011
12	CFLGC	R-EIS Guidelines	6.8.2 Aboriginal Traditional Knowledge	6-563	Socio-Economy		On page 6-563, it is stated that "intensive archeological investigations" had taken place. We would like to see all the archeological reports completed and pending done in Makeso Sakahican for Keeyask and BiPole 3 and all other projects including the SAR, the generating and converting stations. Ekosi.	CFLGC-0012

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13	CFLGC	R-EIS Guidelines	4.6.14 Water and Wastewater Treatment	4-39 and 4-54	Project Description		<p>On page 4-39, it is stated that "Filtered backwash from the water treatment plant operations will be discharged to the Nelson River" This "effluent quality will meet or exceed Manitoba's standards..."</p> <p>Please explain how: 1) the community was informed of this process and their responses to the effluence, especially the Fishermen and Elders from FL 2) the data may exceed Manitoba's standards 3) the research was completed for alternative means of treating wastewater and fecal matter for current and future projects</p> <p>Ekosi.</p>	CFLGC-0013
14	CFLGC	R-EIS Guidelines	Executive Summary	21, 36, 38	Executive Summary		<p>Throughout the EIS executive summary, the term "regulatory test of/for significance" is used. Please provide more information as to the source of this test as well as the basic standards and data for determining the value of this test.</p> <p>Ekosi.</p>	CFLGC-0014
15	CFLGC	R-EIS Guidelines	Executive Summary	21, 36, 39	Executive Summary		<p>The EIs and the executive summary defines the Valued Environmental Components (VECs) as on the basis of cultural ideals or scientific concern.</p> <p>Please provide for us how the proponents of the Keeyask place intangible cultural heritage as defined by UNESCO's Convention for the Safeguarding of Intangible Cultural Heritage, in this understanding of cultural ideals and scientific concern.</p> <p>Ekosi.</p>	CFLGC-0015
16	CFLGC	R-EIS Guidelines	N/A	N/A	Response to EIS Guidelines		<p>Please provide us with a copy of the access management plan for Fox Lake Cree Nation.</p> <p>Ekosi.</p>	CFLGC-0016
17	CFLGC	R-EIS Guidelines	6.6.2 Aboriginal Traditional Knowledge	6-426	Socio-Economy		<p>On page 6-426, it is stated that adverse social economic effects have been identified. We would like more information on the discussions about these effects, so please provide us with all the reports and studies completed or not-yet-completed by Rachel Eni.</p> <p>Ekosi.</p>	CFLGC-0017
CFLGC-0018 does not exist.								
19	CFLGC	R-EIS Guidelines	N/A	N/A	Response to EIS Guidelines		<p>In the updated Keeyask Traffic Assessment, it is stated:</p> <p>"the updated traffic analysis examines the effects of construction traffic on public roads (PR 280 and PR 391). It does not include traffic effects on private roads or traffic experienced during the operation phase. As a result, the north and south access roads, which will be private during construction, have not been considered in this analysis" (page i)</p> <p>Please answer the following questions: 1) if the North and South Access Roads will be private during construction only, will they become public/provincial highways after construction is complete? 2) if so, when will that be? 3) if so, please provide us with a) a traffic report that discusses public involvement; terrestrial & aquatic & social/heritage effects b) monitoring during and post construction c) access to the road by MH workers as well as Fox Lake community members d) any and all compensation/access agreements of the trappers/resource users of all the areas that the North and South Access Roads will go through 4) Will the pr280 be decommissioned? 5) if so, please provide what "decommissioning" means and what it entails. 6) if so, will all concrete, pipes and man-made material be removed and will soil & trees be re-planted (ie. Will the area be rehabilitated?) 7). Please provide us with any benefits that exists for the Fox Lake community members to have the SAR. 8). Please explain how the First Nations and especially Fox Lake participated in the initiation, design and monitoring of the SAR and NAR.</p>	CFLGC-0019

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20	CFLGC	R-EIS Guidelines	N/A	N/A	Response to EIS Guidelines	Please provide us with a copy of poster-sized maps of:	1) Gillam area prior to any Manitoba Hydro development and any flooding	CFLGC-0020a
							2) Gillam area after Kettle dam and Stephen's Lake	CFLGC-0020b
							3) Nelson River after Long Spruce	CFLGC-0020c
							4) Nelson River after Limestone	CFLGC-0020d
							5) predictions of the submersions and flooding that was to occur after the construction of Kettle Dam in Gillam	CFLGC-0020e
							6) predictions of the submersions and flooding that was to occur after the construction of Limestone	CFLGC-0020f
							7) predictions of the submersions and flooding that was to occur after the construction of Long Spruce	CFLGC-0020g
21	CFLGC	R-EIS Guidelines	6.6	N/A	Socio-Economy	Section 6.6 describes the numerous benefits and employment opportunities that are available to First Nations. 1). Please provide us with a list of investments and business opportunities that will be created for the First Nations and those which will be assisting First Nations develop their own business opportunities. 2). How will challenges discussed on page 6-434 be resolved? 3). How will the percentage of the Aboriginal workforce be increased from the low numbers that are predicted to be in Keeyask on page 6-432? 4) Please explain why community enhancement through investments and training in leadership, governance, law and engineering are not part of Manitoba Hydro's mandates towards community members.	CFLGC-0021	
22	CFLGC	R-EIS Guidelines	6.4	N/A	Aquatic Environment	Please provide us with a description of research made into fish passages and fish ladders in Keeyask and in future developments. Ekosi.	CFLGC-0022	
23	CFLGC	R-EIS Guidelines	3.0	N/A	Response to EIS Guidelines	Please provide us with an explanation why Elders and other community members are not presenting /provided with the time to present their views and any support for the Keeyask project in any of the information sessions/public workshops along with the proponents.	CFLGC-0023	
24	CFLGC	R-EIS Guidelines	N/A	N/A	Response to EIS Guidelines	Please provide us with a report and data for the CUMULATIVE accumulation of mercury and the predictions of mercury increases from all the dams along the Nelson River, including Keeyask and Conawapa.	CFLGC-0024	
Kaweechiwasihk Kay-tay-a-ti-suk								
1	KK	N/A	N/A	N/A	Socio-Economy		Please detail the understanding of the Proponent of the potential adverse effects of the Keeyask Generation Project on the rights and interests of the Kaweechiwasihk Kay-tay-a-tisuk, including: a) Livelihood rights; b) Harvesting rights; c) Rights to protect and exercise cultural and spiritual rights; d) Existing Treaty Entitlement Parcels and areas for potential future selection e) Planning and management of the York Factory Resource Management Area	KK-0001
2	KK	N/A	N/A	N/A	Socio-Economy		Please detail the mechanisms and processes applied by the Proponent to ensure the engagement of the Kaweechiwasihk Kay-tay-a-ti-suk in the planning, design, construction, operation and monitoring of the Keeyask Generation Project.	KK-0002
3	KK	N/A	N/A	N/A	Socio-Economy		Please detail the mechanisms and processes applied by the Proponent to ensure the engagement of the Kaweechiwasihk Kay-tay-a-ti-suk in the pre-project studies, design, and business opportunities and training, employment and other benefits associated with the Keeyask Generation Project.	KK-0003
4	KK	N/A	N/A	N/A	Socio-Economy		Please detail the understanding of the Proponent of: a) the degree of engagement of Kaweechiwasihk Kay-tay-a-ti-suk by the province of Manitoba in a Crown-First Nation justification, consultation and accommodation process in respect of the Keeyask Generation Project; and b) the effect of the degree of such engagement on the consideration of mitigation and accommodation measures, including the consideration, identification and recommendation of proposed licence conditions related to such potential accommodation measures.	KK-0004
5	KK	N/A	N/A	N/A	Socio-Economy		Please describe the perspective and understanding of the Proponent of the importance of applying the Inneseewin – the Traditional Knowledge and wisdom - of Kaweechiwasihk Kay-tay-a-ti-suk to all aspects of the Keeyask Generation Project and of treating Inneseewin with equal importance and value to that accorded Western Scientific Knowledge.	KK-0005

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6	KK	N/A	N/A	N/A	Socio-Economy		Please describe the manner and degree to which the Proponent treats and has treated the Innineewin of Kaweechiwasihk Kay-tay-a-ti-suk with equal importance and value, with a particular discussion, as examples, of the consideration in the Environmental Impact Statement of: a) Lake Sturgeon; b) Pickerel; c) Whitefish; d) Northern Pike; e) Woodland caribou; f) Moose; g) Fur-bearing animals; and h) Other fish and wildlife.	KK-0006
7	KK	N/A	N/A	N/A	Response to EIS Guidelines		Where the Proponent asserts in the EIS that the identification, consideration or application of Aboriginal Traditional Knowledge (ATK) played a role in project design, please explain: a) how the referenced ATK was contributed or solicited; b) what ATK was considered; c) which elements of the project design took ATK into account; and d) how the final project design is different as a result of the consideration of the referenced ATK.	KK-0007a
							Where the Proponent asserts in the EIS that Aboriginal Traditional Knowledge (ATK) will play a role in future monitoring activities, to examine: a) how ATK was identified, documented, contributed or solicited; b) how ATK was considered; c) which elements of the project monitoring will or are expected to take ATK into account; d) in the context of project monitoring, how ATK is expected to assist in addressing any gaps in baseline information or the prediction of impacts; and e) in the context of regulatory requirements, including licence terms and conditions, how ATK is expected to assist in addressing gaps in baseline information or the prediction of impacts.	KK-0007b
8	KK	N/A	N/A	N/A	Terrestrial Environment		Where the EIS refers to effects on caribou, and in particular, to the effects related to the disruption or fragmentation of areas used by caribou during calving and to any suggestion in respect of the availability of alternative suitable caribou habitat, please describe: a) the analysis applied to arrive at any conclusion in respect of effects on caribou as a result of the presumed availability of alternative habitat and the sources of the information relied upon; b) whether the analysis and description of the location and nature of any suggested alternative caribou habitat makes a clear distinction between habitat used by caribou during non-calving periods and habitat used by caribou during calving periods; c) whether any conclusions set out in the EIS in respect of caribou rely upon an assumption as to the availability of alternative caribou calving habitat, and further rely on an assumption that any such alternative caribou calving habitat will actually be used, and if so, to describe the analysis applied and the sources of the information relied upon; and d) in the event that ATK is a source of the information relied regarding the conclusions of the Proponent in respect of the anticipated effect of the loss of caribou calving islands, to provide the explanations requested in KK-IR-007B (a) through (e), inclusive.	KK-0008
9	KK	N/A	N/A	N/A	Aquatic Environment		Where the EIS refers to effects of the Project on Lake Sturgeon or other fish species, including in the context of the monitoring of the effects of the Project on the populations of Lake Sturgeon and other fish species, please describe and provide: a) where ATK is a source of the information relied upon regarding the conclusions in respect of the effect on Lake Sturgeon and other fish species, the explanations requested in KK-IR-007A (a) through (d), inclusive; and b) where the EIS suggests and appears to rely upon the role of ATK in the monitoring of the effects on Lake Sturgeon and other fish populations, the explanations requested in KK-IR-007B (a) through (e), inclusive.	KK-0009
10	KK	N/A	N/A	N/A	Socio-Economy		Where the EIS refers to effects of the Project on historic, heritage and cultural resources, and in particular to the effects of the Project on historic, heritage and cultural resources of significance to First Nations, please describe and provide: a) in the event that ATK is a source of the information relied regarding the conclusions in respect of the effect on historic, heritage or cultural resources, the explanations requested in KK-IR-007A (a) through (d), inclusive; b) in the event that the EIS may suggest or rely upon the role of ATK in the monitoring of the effects on historic, heritage or cultural resources, the explanations requested in KK-IR-007B (a) through (e), inclusive.	KK-0010

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11	KK	N/A	N/A	N/A	Physical Environment		Where the EIS refers to effects of the Project on people, fish, wildlife, trees, plants, peatlands, waters, lands or other resources, please: a) identify the specific effect (such as the clearing or grubbing of forested lands, berries, medicines or peatlands); b) quantify the effect (such as by species, volume or area); and c) assign an economic value to the effect.	KK-0011
12	KK	N/A	N/A	N/A	Terrestrial Environment		Where the Proponent refers to Woodland Caribou which calve in the general area of the Project and in the general vicinity of Gillam, please describe and provide: a) the analysis applied to arrive at any conclusion in respect of "Gillam area" woodland caribou being "coastal caribou" and not a distinct herd of woodland caribou that is apart from the Pen Island herd of woodland caribou; and b) in the event that ATK is a source of the information relied regarding the conclusions of the Proponent described at a), above, the explanations requested in KK-IR-007A (a) through (d), inclusive.	KK-0012
13	KK	N/A	N/A	N/A	Aquatic Environment		Where the Proponent refers to consideration of options to provide fish passage at the Keeyask Generating Station, including consideration of potential measures to mitigate the direct and cumulative effects on sturgeon resulting from the Project, and to the conclusions of the Proponent in respect of the consideration of such options, please describe and provide: a) whether consideration was given to the design and installation of fish passage facilities at the location of the former rapids at the Kelsey Generating Station to restore the passage of Sturgeon between the Upper Nelson River and Lower Nelson River, and if so, the conclusions of such consideration, together with any studies or reports; and b) in the event that ATK is a source of the information relied regarding the conclusions of the Proponent in respect of the design and installation of fish passage facilities at the location of the former rapids at the Kelsey Generating station, to provide the explanations requested in KK-IR-007A (a) through (d), inclusive.	KK-0013
Manitoba Wildlands								
1	MB Wildlands	R-EIS Guidelines	4.3.3.2.3 Terrestrial Environment	N/A	Terrestrial Environment	On page 4-17, in Chapter 4, during mitigation discussions, the method employed for wetland mitigation will include the "Development of wetlands to offset potentially important wetlands". Wetlands serve many ecological functions which provide water quality ecological services such as the regulation of water flows, which purifies water; the filtering, retention and storage of fresh water; the maintenance of arable land and prevents water silting by lowering soil losses; and the removal, breakdown or abatements of pollution. In order to "offset" the important wetlands during mitigation, these specific services need to be assessed (preferably spatially and temporally quantified in GIS- mapped) in order to know what is being provided by the existing wetland function.	Which studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use to assess the ecosystem services and functions provided by wetlands to be mitigated? Please provide verification of the basis for the planned mitigation activities via studies, methodologies, etc employed.	MB Wildlands-0001a
			4.3.3.2.3 Terrestrial Environment				Are these studies available to participants? Where water quality related ecosystem services and functions of these wetlands have been identified, quantified and mapped. Explain how mitigation will be accomplished.	MB Wildlands-0001b
			4.0 Mitigation				Are there technical reports to support these wetlands assessments in the EIS contents?	MB Wildlands-0001c
2	MB Wildlands	R-EIS Guidelines	4.0 Mitigation	N/A	Terrestrial Environment	In Chapter 4, the overall mitigation strategy for Keeyask is discussed. Rationale for developing areas to compensate for losses of habitats and ecosystems is often a strategy employed in development.	Are no-net loss of biodiversity or water quality part of this discussion? This compensation terminology is often used as a means of replacing sensitive habitat such as wetlands and species (i.e., sturgeon) but should be used to demonstrate the maintenance of not just the habitat, species and wetlands, but it should demonstrate that ecosystem services and biodiversity are not lost. Was this approach used in the Keeyask EIS? If not, why not?	MB Wildlands-0002a
							Please indicate how Keeyask restoration/mitigation plans look at restoring biodiversity/water quality ecosystem services and the natural capital that these ecosystems provide to the project and surrounding area.	MB Wildlands-0002b
3	MB Wildlands	R-EIS Guidelines	4.0 Mitigation	4-16	Aquatic Environment	In Chapter 4, on page 4-16, it is stated that spawning habitat/ over wintering habitat channels will be created for fish movement, spawning feeding and overwintering. Every flow regime alters the biotic as well as abiotic aspect of the environment. It has been shown in studies testing flow regimes that habitat classification and recreation are often difficult to achieve under altered flow regimes when the optimum habitat has not been characterized for each flow.	1) If the recreation of habitat is a major mitigation strategy to replace lost habitat for several species of fish, have the characteristics of optimum habitats been quantified and mapped spatially at the different possible flow regimes of the project?	MB Wildlands-0003a
							2) Which studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use to assess the ecosystem services and functions biodiversity provided by habitat planned to be mitigated?	MB Wildlands-0003b
							3) Which on the development of habitat? Are these studies available to participants? Are there technical reports to support these assessments in the EIS contents? If so, which reports?	MB Wildlands-0003c
4	MB Wildlands	TE SV	N/A	N/A	Terrestrial Environment	Maintaining biodiversity includes the control of populations, pests and diseases through trophic dynamic processes. This is a regulating ecosystem service.	Have the dynamics of local and regional ecosystems within the Keeyask areas, and their natural biological control, been mapped or examined spatially or temporally?	MB Wildlands-0004
							Which studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use to assess biodiversity and specifically services to maintain biodiversity?	
							Where in the EIS is this addressed? Are there technical reports that support this assessment? If it was not done, what methodology was used instead? If Manitoba Hydro did not take any of these aspects into account, why not?	

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5	MB Wildlands	AE SV	Appendix 1A Aquatic Mitigation and Compensation Measures	1A-48, Table 1A-7	Aquatic Environment	The Keeyask Generation Station will prevent fish and other aquatic species from moving between Gull and Stephens Lakes. The Supporting Volume indicates that in order to assist fish movement from Stephens Lake to Gull Lake, fish will be manually transported.	The questions below pertain to the transport methodology: 1) How often will fish be captured from Stephens Lake and transported to Gull Lake? 2) How will fish be transported to Gull Lake to ensure minimal mortality? 3) What types of fish species will be captured/selected in Stephens Lake? 4) How many fish will be captured and transported on a weekly/monthly basis and are there minimum and maximum numbers required as targets? 5) Will the capture and transport program vary depending on the season, or will the program operate continuously without variation? 6) How will fish be captured in Stephens Lake? 7) Provide a complete fish capture and transport methodology, which outlines the process on a monthly basis, highlighting the above mentioned points, including species.	MB Wildlands-0005
6	MB Wildlands	TE SV	N/A	Map 3-1	Terrestrial Environment	According to Map 3-1, the local study area for terrestrial plants encompassed an area that was 150 m outside of the predicted flooding zone during construction phase. The 150 m study area did not encompass the expected additional zone of influence on terrestrial plants during operation phase.	Answer the following questions: 1) What was the rationale behind selection of the Terrestrial Plant study area, given that the majority of the terrestrial plant study area overlaps with the predicted initial flooding area? 2) Why was 150 m selected as the buffer zone? Why did the buffer zone not include the expected additional zone of flooding? Provide scientific basis for 150m buffer. 3) How specific were the plant studies conducted in zone 4 and within the terrestrial plants regional study area? Provide list of plants for each. 4) The additional zone of influence within the terrestrial plant study area is vague in its description of time line and duration of impact and area. A better description of this impacted area is needed to provide periods of impact and the amount of area being influenced.	MB Wildlands-0006
7	MB Wildlands	PE SV	N/A	Table 4.4-7	Physical Environment	Freshwater outflow from the Nelson River runs into Hudson Bay, creating an estuary. Salt water is comprised roughly of 35 parts per thousand (ppt) of dissolved salts. Compared to fresh water, salt water is denser, a better conductor of electricity and refracts light better. Increased outflow into Hudson Bay will inevitably change the water salinity, thereby altering the characteristics of the water in the bay, particularly when it comes to freezing, creating and impacts to marine life and their migratory patterns.	Answer the following questions: 1) What is the predicted volume of fresh water to flow into the Hudson Bay during low, medium and peak energy demand periods from the combined Manitoba Hydro generating stations along the Nelson River? 2) How are the dams along the Nelson River be coordinated to minimize outflow to Hudson Bay? 3) How will increased outflow into Hudson Bay from Keeyask alter ice flows and freezing regime? 4) Provide Manitoba Hydro monitoring information regarding fresh water flow into Hudson Bay (1980-2013)	MB Wildlands-0007
8	MB Wildlands	TE SV	Preliminary Environment Protection Program	N/A	N/A	The Environmental Protection Program (EnvPP) is referenced throughout the Keeyask EIS materials. Inspection of the EnvPP shows that many areas are incomplete, and program sections are separated, preventing assessment of the complete program and its overall efficacy.	Answer the following questions 1) When will a completed version of the EnvPP be available? 2) Will there be a component of the EnvPP that reviews all individual programs together to provide a thorough examination of program efficacy? 3) Will the EnvPP reports be available to public? 4) Will Manitoba Hydro bring detailed EnvPP information to the Keeyask CEC hearings?	MB Wildlands-0008
9	MB Wildlands	AE SV	2.5.1.1.1 Excavated Materials Disposal	N/A	Aquatic Environment	Excavated materials will be deposited in various areas within Gull and Stephens Lake. As indicated by KHL/Manitoba Hydro, excavated materials will be capped to prevent introduction of solids into surface waters leaching of minerals and heavy metals into the aquatic environment.	Answer the following questions: 1) How much excavated materials will be deposited in each of Gull and Stephens Lake? 2) What kind of material will be used to cap the excavated materials? 3) Will the capping material degrade in water, thereby contributing to contamination from construction activities? 4) What type of monitoring activities will be conducted to ensure that capped materials are not leaching any heavy metals, minerals or chemicals? 5) What is the source of the capping methods? Have other Hyrdo utilities successfully capped excavated materials?	MB Wildlands-0009
10	MB Wildlands	TE SV	2.11 Sensitivity of Predictions to Future Climate Change	2-202	Terrestrial Environment	Predicted future drivers of terrestrial climate change referenced within the Terrestrial Environment Supporting Volume include; longer growing seasons, higher evapotranspiration, droughts, extreme weather events, heat waves, large fires and accelerated permafrost melting. The impact of climate change on the terrestrial environment is regarded as small to moderate, as measured through changes to terrestrial VECs; intactness, fire regime, ecosystem diversity, wetland function and soil quantity and quality.	Provide information on the following questions; 1) How was each terrestrial VEC assessed for sensitivity to each type of climate change driver presented above? Provide results in a table. 2) What length of time does the terrestrial climate change analysis assess? 10, 30,100-years? Explain choice of time lines. 3) Conduct a terrestrial climate change analysis examining changes over 100 years of operation, assessing change at 10-year intervals, for the local project area. 4) Did the terrestrial climate change analysis include changes to the aquatic environment? If not, why not? Explain.	MB Wildlands-0010
11	MB Wildlands	PE SV	8.4.6 Environmental Monitoring and Follow-up	N/A	Physical Environment	Moderate, long-term and continuous residual effects to ground water are predicted in the EIS, particularly relating to ground water levels, affected shoreline, direction of ground water flow, water levels and contamination. Manitoba Hydro indicates that there is no need for a ground water monitoring and follow-up program, despite acknowledging the long-term and continuous residual effects to ground water.	Answer the following questions: 1) Explain why no ground water monitoring and follow-up program is intended? And when will one be developed? 2) Without a ground water monitoring and follow-up program, how will Manitoba Hydro know whether or not ground water has been compromised and how to properly resolve the situation?	MB Wildlands-0011

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12	MB Wildlands	PE SV	8.4.2.4 Depth to Groundwater	N/A	Physical Environment	Areas outside the reservoir are where the ground water levels are predicted to coincide with water surface levels. It is further indicated in the EIS that groundwater may become contaminated due to construction and operation related activities. Project features of the operation phase predicted to impact groundwater include; development of north and south dykes, reservoir creation, development of powerhouse, spillway and related structures. Project features of the construction phase that may impact groundwater are not discussed in the EIS.	Answer the following questions: 1) Provide a list of all the Keeyask construction related activities that may impact groundwater quality. 2) An analysis of all possible sources of groundwater contaminants is required, identifying both direct and indirect sources of contamination from the construction and operation phases of the Keeyask Generation Project. 3) Provide the analysis in order to complete the EIS.	MB Wildlands-0012
13	MB Wildlands	PE SV	6.4.2.1.1 –Shoreline Conditions, Shoreline Recession and Reservoir Expansion	N/A	Physical Environment	Inland lake habitats are critical for maintaining healthy lake ecosystems. Having an understanding of the five distinct inland lake zones and the habitats associated with those zones, is key to maintaining lake ecosystem health and restoring the ecosystem. Within the Aquatics or Terrestrial Environment EIS Supporting Volumes there is no discussion of current inland lake zones, nor how flooding will impact those zones and the habitats associated with them. Peatland areas are described, however their relationship with the aquatic environment is not discussed.	Answer the following questions: 1) Provide a complete description of the inland lake zones for the predicted flooding area, and describe how alteration of those habitats will influence aquatic ecosystem health and which species will be affected. 2) How will alteration of inland lake zones impact aquatic VECs? 3) Provide a complete description of the inland lake zones for the Keeyask/ Gull reservoir at 5,10,20,40 year intervals post flooding.	MB Wildlands-0013
14	MB Wildlands	AE SV	3.4.2.2.4 Evolution of the Reservoir –Year 1 to 15	N/A	Aquatic Environment	The degree of light penetration alters the zone characteristics within a water column, and impacts plant growth, phytoplankton and food web characteristics. Increased total suspended solids (TSS) into Stephens Lake combined with changing water levels as per the EIS, will alter the degree of light penetration, particularly in shallow regions of the lake.	Please answer the following questions: 1) Identify how changes in light penetration arising from increased TSS within Stephens Lake will impact lake ecosystem health 2) How will changes in light penetration/TSS levels alter the euphotic zone of the lake? 3) How will increased sedimentation and TSS impact the benthic zone of Stephens Lake?	MB Wildlands-0014
15	MB Wildlands	AE SV	2.5.1 – Water Quality	N/A	Aquatic Environment	There are a variety of effluent sources arising from the construction and operation phases of the project such as treated sewage effluent, concrete batch plant effluent, construction site run-off, road run-off, leaching from flooded peatlands, leaching from excavated materials, etc. (EIS contents) Increased effluent release impacts water quality characteristics by altering nutrient availability, pH levels, heavy metal content, mineral content, total dissolved solids, oxygen content and turbidity.	There is reference made to “Good Management Practices” in reducing effluent discharge, however those practices are not disclosed. 1) Disclose all good management practices employed or to be employed to reduce effluent release into the surrounding environment from the Keeyask Generation Project for both construction and operation phases of the project. 2) Advise if these management practices have been changed or improved due to the Waskwatim effluent management practices.	MB Wildlands-0015
16	MB Wildlands	TE SV	2.10 – Cumulative Effects with other projects	N/A	Terrestrial Environment	The cumulative impact of the Keeyask Generation project was assessed in conjunction with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III transmission line, Keeyask Transmission Project and the Conawapa Generation Project.	Why did this analysis not investigate the cumulative effects of future projects on the aquatic environment? If this study was conducted, provide.	MB Wildlands-0016a
						For the assessments examining combined future projects cumulative effects to intactness, ecosystem diversity and wetland function, no cumulative effect was reported. It was not discussed how the conclusions were arrived at, what baseline values or which parameters were evaluated to calculate the cumulative impacts.	Provide a table indicating the land quantum associated with each future Manitoba Hydro project.	MB Wildlands-0016b
							Explain methodology used to identify no cumulative effect for any future hydro project.	MB Wildlands-0016c
							Provide components in Gillam redevelopment and explain reasoning as to no cumulative effects.	MB Wildlands-0016d
17	MB Wildlands	PE SV	8.3.1.7 Groundwater quality	N/A	Physical Environment		It is indicated in the EIS that there are no known users of the groundwater in the groundwater study area. Answer the following questions: 1) Has Manitoba Hydro/KHLP evaluated whether there will be future users of the groundwater sources? 2) Given that Manitoba Hydro has no ground water monitoring and follow-up program in place or planned, what is the potential of the groundwater source becoming un-usable for potential future users? 3) Provide verification that no ground water users are likely, including the basis for the assumption. 4) Provide Manitoba hydro ground water contaminants list results for the local study area, and project area.	MB Wildlands-0017
18	MB Wildlands	PE SV	6.4.2.1.1 –Shoreline Conditions, Shoreline Recession and Reservoir Expansion	N/A	Physical Environment	Inland lake habitats are critical for maintaining healthy lake ecosystems. Having an understanding of the five distinct inland lake zones and the habitats associated with those zones, is key to maintaining lake ecosystem health and restoring the ecosystem. Within the Aquatics or Terrestrial Environment EIS Supporting Volumes there is no discussion of current inland lake zones, nor how flooding will impact those zones and the habitats associated with them. Peatland areas are described, however their relationship with the aquatic environment is not discussed	Answer the following questions: 1) Provide a complete description of the inland lake zones for the predicted flooding area, and describe how alteration of those habitats will influence aquatic ecosystem health and which species will be affected. 2) How will alteration of inland lake zones impact aquatic VECs? 3) Provide a complete description of the inland lake zones for the Keeyask/ Gull reservoir at 5,10,20,40 year intervals post flooding.	MB Wildlands-0018
19	MB Wildlands	AE SV	1A.3.1.5.2 Channel construction at the Little Gull Lake for Fish Egress	N/A	Aquatic Environment	According to the EIS materials: A channel between Little Gull Lake to Stevens Lake reservoir is proposed to allow for fish to migrate to areas where there is increased dissolved oxygen content during overwintering. The channels will be constructed to allow fish egress and minimize fish mortality in Little Gull Lake during overwintering. The channel will be 5 m wide, with a bottom elevation of 156 m ASL, allowing 1-2 m below the ice surface (depending on reservoir levels and ice thickness) for fish movement. The EIS materials do not address how the channel will be constructed, nor whether the channel will be sufficient of effective during peak operating periods in the winter when water levels fluctuate dramatically.	Answer the following questions: 1) Will a depth of 1-2 m be sufficient to allow for fish passage under variable water levels during winter months when temperatures are exceedingly cold and energy demands are high? 2) Are there other regions where channels are being planned to assist with fish passage? 3) Provide names and locations of successful fish channels in Manitoba Hydro system.	MB Wildlands-0019

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20	MB Wildlands	AE SV	1A.3.2.6.1 Measures to allow for Escape from Pools	N/A	Aquatic Environment	The EIS materials indicate that channels to allow for fish passage/escape from pools will be constructed during the operation period of the Keeyask Project during low flow periods. Rock will be excavated using drilling and dynamite and will be side cast into low lying areas within the river, outside the zone of influence of the spillway discharge. There are currently 1000 m channels (2 m by 2 m) planned to permit fish access to Stephens Lake. There is no further discussion regarding the specifics of how channel construction will be carried out.	Respond to the following questions 1) Will the use of dynamite and drilling fragment the rock bed, and lead to increased mineral leaching within the aquatic environment? 2) Where are the 1000 m of fish passage channels to be located? 3) Where will the excavated material, provide map. 4) Is 2 m sufficient to allow for fish passage given the variable water levels and ice thickness? Provide details by water levels, and seasonal fish passages. 5) Will plans for fish channel construction be available for the CEC hearings?	MB Wildlands-0020
21	MB Wildlands	TE SV	1.3.3 Project linkage identification	N/A	Terrestrial Environment	The EIS materials seek to understand ecosystem relationships and identify potential ecosystem health issues by evaluating linkages through modeling. The figures presented to describe modeling methods and linkages appear overly simplified. Ecosystem modeling is important in order to understand the true impacts of Project activities on ecosystem function. Despite the idea of ascribing importance and priority to various VECs, habitats and indicators, all components of an ecosystem impact other components directly and indirectly through horizontal and vertical mechanisms.	Answer the following questions 1) Was it even considered that in order to assess linkages between habitat destruction and species, numerous species must be consider simultaneous (food chain) and various habitat types included? If not, why not? Explain. 2) Complete a new set of linkage modeling for VECs of the aquatic and terrestrial environments, and include additional species and habits. 3) Also present data to show the direct and indirect linkages between species and environments, in the ecosystems affected by Keeyask.	MB Wildlands-0021
22	MB Wildlands	TE SV	1.3.5 Spatial Scope	Map 1-1 and Table 1-3	Terrestrial Environment	Each terrestrial VEC was evaluated in a local and regional study area, which corresponds to a particular study zone. However, assessment of individual VECs was carried out in different local and regional study areas. Therefore, VECs were not assessed within the same local and regional study areas, thus preventing comparative assessment of VECs within a given local or regional study area.	Please Answer the following questions: 1) What criteria were used to assign VECs to local and regional study areas? 2) What was the rationale behind assigning different local and regional study areas to VECs? 3) In what locations is the monitoring carried out during the construction and operation phase of the project for terrestrial VECs? a. Do the locations differ from where baseline measurements were taken? b. Are VECs compared to one another during monitoring? If so, explain.	MB Wildlands-0022
23	MB Wildlands	TE SV	2.8.4.2.2 Mitigation; 2.8.4.5 Environmental monitoring and follow-up	N/A	Terrestrial Environment	Wetland mitigation measures will include "additional wetland development to the extent practicable if monitoring determines that further measures are needed to achieve successful development of 12 ha of the off-system marsh wetland type." No further discussion on wetland mitigation is provided. Environmental monitoring and follow-up for wetlands is outlined within the Terrestrial Environment Monitoring Plan as indicated within the EIS materials, however no such plan is available. Instead the Environment Protection Program has a section entitled "Terrestrial Effects Monitoring Plan", which is also not available/incomplete.	Please answer the following questions: 1) How will mitigation activities for wetland protection be carried out, and how frequently will they be conducted? 2) The mitigation measures proposed for wetland protection are not clear: please provide a detailed description of the wetland mitigation program. 3) Provide a complete copy of the Terrestrial Effects Monitoring Plan. 4) What direct and indirect effects on wetland habitat will be measured within the monitoring program? 5) How can the mitigation program be proposed if the monitoring program is not developed? Explain.	MB Wildlands-0023
24	MB Wildlands	AE SV	Cooley, P.M. 2008. Carbon dioxide and methane flux from peatland watersheds and divergent water masses in a sub-arctic reservoir. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 45pp. Draft.	N/A	Physical Environment	Reservoirs can absorb or emit CO2 and methane (greenhouse gases: GHGs). Water originating from peatlands contains a high amount of dissolved organic carbon (DOC), which is broken down to form methane in the presence of oxygen: DOC depletes water oxygen content. Positive flux describes a state where there is a movement of gas from across the air-water interface, emitting gas into the environment. Independent scientific study reports that peatlands can emit GHGs for a minimum of 10 years after flooding. In 1974 Kettle Generation Station was complete, flooding approximately 22,055 ha of land to create Stephens Lake. In August 2006, a study was conducted by Manitoba Hydro to evaluate the flux of GHGs from Stephens Lake reservoir, 35 years post flooding. The results of the study reported the following: - Stephens Lake reservoir emits 466 tonnes of GHGs/day (equivalent to emissions from 77 cars over a one year period) - GHGs emissions were reported as being the highest in small tributaries and at the ends of flooded peatland bays.	Please respond to the following questions: 1) What will the total GHG emissions/day from the Keeyask reservoir arising from flooded peat land, over 40 years? 2) Calculate the cumulative GHGs released from flooded peatlands in the Keeyask reservoir from 30, 50 and 100 years of operation.	MB Wildlands-0024
25	MB Wildlands	R-EIS Guidelines	8.0 Monitoring and Follow-Up	N/A	Terrestrial Environment	In the relevant Ecosystem Services literature, it is demonstrated that a historic and current lack of data exists to support informed decision making regarding ecosystem goods, services and natural capital assets. These data should also be used to inform the monitoring and management of the project: 1) Does this long-term proposed monitoring program strive to adapt and correct this acknowledged scientific gap regarding natural capital within the project area? 2) Does it strive to change as the information needs change for local and regional decision makers with regard to intensively managed flow regimes? a. If yes, please verify this by providing plans, methodologies, etc. that demonstrate this. If not, why not?	MB Wildlands-0025	
						On page 2-2, it is stated "existing water quality conditions" are used as a baseline and foundation for assessing the potential effects of the Project on water quality. Given that the aquatic environment has already been substantially altered by hydroelectric developments, as described on page 6-54 in the Response to EIS Guidelines, please demonstrate 'existing' water conditions represent baseline conditions that are "suitable for aquatic life?"	How is it demonstrated in the EIS that the existing conditions reflect properly functioning aquatic systems that facilitate the necessary water quality services such as water regulation, water supply, erosion control and sediment retention, and waste treatment?	MB Wildlands-0026a

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26	MB Wildlands	AE SV	2.3 Water Quality: Approach and Methods	2-2	Aquatic Environment		Have pre-alteration/ impoundment/ settlement conditions been considered for an alternative baseline as has been done in the IISD Environment Canada report: An Ecosystem Services Assessment of the Lake Winnipeg Watershed? If not, can you justify why you chose not to examine these conditions?	MB Wildlands-0026b
27	MB Wildlands	R-EIS Guidelines	Executive Summary	Part 1 - Effects on the Biophysical Environment	Aquatic Environment		Water quality was selected as a VEC. In the Executive Summary, Part 1, page 24 it is stated that "water quality will always be suitable for aquatic life in the main part of the reservoir- and will be suitable at most locations and most time of the year in the flooded area." However, in section 2.4.3.4 Water Quality Trends: Synthesis, it is stated that "Overall then trend analysis information indicates that water quality may vary in the study area in the future in relation to discharges... however the reason for these observed increases are not known, making predictions of future conditions difficult." 1) Given the varying degree of water quality indicators in relation to discharge, why does the EIS state that "water quality will always be suitable for aquatic life in the main part of the reservoir - and will be suitable at most locations and most time of the year in the flooded area?" 2) What scientific basis, methodologies, comparative studies, etc. were used to come to this conclusion?	MB Wildlands-0027
28	MB Wildlands	TE SV	N/A	N/A	Terrestrial Environment		Indicators for ecosystem diversity were: habitat composition and priority habitat types. 1) Where it is shown that these indicators encompass the goods and services that are essential to the sustained health and survival of the VECs? 2) Were the indicators above categorized and analyzed by ecosystem services within the habitat composition and habitat types? 3) Did Manitoba Hydro take into account and complete an assessment on the ecosystem goods and services provided by the habitat composition for each habitat type defined? 4) If Manitoba Hydro did not take any of these aspects into account, why not?	MB Wildlands-0028
29	MB Wildlands	TE SV	N/A	N/A	Terrestrial Environment		Biodiversity is mentioned 2.7.1 Page 1. It refers to ecosystem, species and genetic diversity. 1) Have the genetic resources - such as medicine, products for materials, science, genes for plant resistance and crop pests been assessed and included in the EIS? 2) Have any data (point, spatial, etc.) been collected regarding these biodiversity goods and services? 3) Which studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use for the genetic diversity affected by the project? 4) What was scientific literature and methodology used in the assessment? Have these sources been made available to participants for review?	MB Wildlands-0029
30	MB Wildlands	TE SV	N/A	N/A	Terrestrial Environment		In 2.2.4, Habitat mapping, the attributes used to classify and map terrestrial habitats were vegetation type, vegetation age class, ecosite, topographic position, disturbance type, water depth duration zone. Mapping all of these attributes goes the first step in classifying ecosystems and ecosystem function, however, the next step is taking this information and mapping ecological services and biodiversity. 1) Has the next required step in the assessment has been conducted? 2) If it hasn't, how does Manitoba Hydro justify the gap in methodology?	MB Wildlands-0030
31	MB Wildlands	R-EIS Guidelines	8.0 Monitoring and Follow-Up	N/A	Response to EIS Guidelines		1) Do indicators exist within the monitoring programs that could inform a valuation of natural capital for the project area, including the non-market (or un-priced) benefits? 2) If so, please provide a comprehensive list, and provide evidence of how they could be used to inform a natural capital assessment/ valuation of the study area? 3) Does the Cost-Benefit Analysis/ or Cost-Benefit Loss Analysis of the project consider both the priced and unpriced benefits to society to understand how these costs/ benefits would impact the Project? 4) Has Manitoba Hydro included references to the methodologies or data used to complete this assessment (spatial, temporal, point, descriptive, etc.)? 5) If this was not done, please explain the gap in documentation.	MB Wildlands-0031
32	MB Wildlands	R-EIS Guidelines	4.4.1 Aboriginal and Reserve Lands	N/A	Socio-Economy		The EIS indicates that as of summer 2012 there are "no Treaty Land Entitlement selections extant or pending on these lands." 1) Has this changed in the last year? 2) How many First Nations in Manitoba have the option to select lands in the RSA, in the LSA?	MB Wildlands-0032
33	MB Wildlands	R-EIS Guidelines	6.3.5.2 Operation Effects and Mitigation	6-203	Project Description		1) What is the area size of Gull Rapids that will be submerged? 2) Is the 100 ha downstream rapids that will be dewatered the only area that will be dewatered?	MB Wildlands-0033

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34	MB Wildlands	R-EIS Guidelines	6.3.5.2 Construction Effects and Mitigation	N/A	Project Description		The EIS indicates “ residual effects associates with Project construction and its resulting post construction footprint on the physical landscape will be large in magnitude, small in geographic extent, long term and continuous on the physical environment.” 1) On this basis, what is Manitoba Hydro’s plan to reduce the effects of Keeyask on the physical landscape?	MB Wildlands-0034
35	MB Wildlands	R-EIS Guidelines	6.2.3.7.1 Archeological Classification	N/A	Socio-Economy		Where current archeological predictive modeling methods, as applies to aboriginal sites and regions, used in the assessment of archeological sites in the RSA and LSA ?	MB Wildlands-0035a
							How many known, acknowledged by government of Manitoba archeological sites are there in the RSA and LSA?	MB Wildlands-0035b
36	MB Wildlands	R-EIS Guidelines	4.3.2.6 Placement Areas for Excess Excavated Materials	N/A	Project Description		This section mentioned submerging excess and excess unclassified material. 1) Does Manitoba Hydro know how much material will be submerged, where it will be submerged, and what the effects on the reservoirs and lakes will be ? 2) Are the intended practices to submerge material for the Keeyask project different than Manitoba Hydro’s practices to submerge material for other generation projects?	MB Wildlands-0036
37	MB Wildlands	R-EIS Guidelines	4.3.2.6 Roads	N/A	Project Description		“Temporary, or permanent access roads or haul trails are also required...” 1) What is the estimate km length of these temporary and permanent access roads or haul trails? 2) Does Manitoba Hydro know what proportion of these access roads or haul trails will be permanent? 3) Please indicate the length of these causeways, and the length of time they will be in place. 4) Where will the material from any temporary causeway be placed upon decommissioning? 5) Are the materials for the causeways also from the LSA and RSA? 6) Are the causeways on the maps included in the EIS?	MB Wildlands-0037
38	MB Wildlands	R-EIS Guidelines	4.3.2.2 Additional Temporary Work Camp	N/A	Project Description		Have any plant studies, species studies, etc been undertaken now that this site will have a work camp on it?	MB Wildlands-0038a
							The EIS is almost a year old now. What is the likelihood now that this temporary work camp will become part of the switching station operation for the Keeyask Transmission Project?	MB Wildlands-0038b
39	MB Wildlands	R-EIS Guidelines	4.2 Needs for and Alternatives	4-5	NFAT	Pages 4-5 describes the attributes required for the energy sale contracts Manitoba Hydro has entered into.	Are there any conditions, mandates or policies for Manitoba Hydro to fulfill in any of the States whose utilities are entering into energy sale contracts with Manitoba Hydro regarding the Aboriginal People of northern Manitoba?	MB Wildlands-0039a
							The Manitoba government refers to ‘ new green power ’ when describing the new generation stations on the Nelson River, including Keeyask. Are there any assumptions that new green power includes First Nation business partners, and The approval of any new green power projects by First Nations in Manitoba?	MB Wildlands-0039b
40	MB Wildlands	R-EIS Guidelines	6.2 – Protected Areas and Scientific Sites	6-179	Terrestrial Environment		1) What protected areas are located in the RSA ? 2) What is the definition of a protected area in public and regulatory policy in Manitoba, as applied to designations, and regulations since 1993 ? 3) What did Manitoba Hydro leave that definition out of this section of the EIS ? 4) Why did Manitoba Hydro use a generic international definition for protected area in its EIS glossary ?	MB Wildlands-0040
41	MB Wildlands	R-EIS Guidelines	6.2 Existing environment	N/A	Terrestrial Environment		1) What further decrease in population of the common nighthawk does Manitoba Hydro expect from the Keeyask project effects ? 2) Does Manitoba Hydro have a recovery plan for the common nighthawk in the RSA and LSA ? 3) Does Manitoba Hydro acknowledge that data sets and information available for bird species for this region of Manitoba are not complete, and may represent minimal information about the bird populations in the region ?	MB Wildlands-0041a
							Olive Sided Flycatcher : 1) Has Manitoba Hydro updated its birds studies in the LSA for this bird species ? (as these studies are 10 years old)	MB Wildlands-0041b
42	MB Wildlands	R-EIS Guidelines	6.2 Existing Environment	6-97	Terrestrial Environment		1) Where does the Canadian Wetland Classification System “reflect conditions including water regulation on the Nelson River?” Please provide citation, page number etc.	MB Wildlands-0042
43	MB Wildlands	R-EIS Guidelines	6.2 Existing Environment	N/A	Terrestrial Environment		1) What is Manitoba Hydro’s source for their apparent definition of: intactness, fragmentation, edge, and ecosystem diversity, core areas ?	MB Wildlands-0043
							Does Manitoba Hydro know the mercury levels in plant, fish and other biota in Stevens Lake before and after it became a reservoir, including through the last 30 years?	MB Wildlands-0044a
							What effect on the fishery does Manitoba Hydro expect from Gull Lake becoming a reservoir ? Is Gull Lake fishery already affected by mercury ?	MB Wildlands-0044b

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44	MB Wildlands	R-EIS Guidelines	6.2.3.2.6 Surface Water and Ice Regime	N/A	Physical Environment		Most of the data on this page is 20 or 30 years old. Does Manitoba Hydro have more recent data regarding mercury in the Nelson River, in the RSA and LSA ? In the two Lakes one that is a reservoir and one that will become a reservoir ?	MB Wildlands-0044c
							Figure 6 – 7 shows mean mercury concentration in fish in Stephens Lake 1970 – 2005. Does Manitoba Hydro have data for fish harvest, fish population for the same three species over the same period of time in Stephens Lake ? Will Manitoba Hydro make that information available?	MB Wildlands-0044d
45	MB Wildlands	R-EIS Guidelines	5.3.1 Assessment Framework Steps	N/A	Response to EIS Guidelines		What is Manitoba Hydro's definition of cumulative effects ?	MB Wildlands-0045a
							Does Manitoba Hydro have a draft monitoring program, or planning in place for the project components, VECs, aquatic elements etc that are sure to be affected ? When will the monitoring plan be available ? Will Manitoba Hydro make the monitoring plan public ? Will Manitoba Hydro share the results of its monitoring plan(s) ?	MB Wildlands-0045b
							Page 5 – 12 Step 2 Does Manitob a Hydro mean that VECs have an adverse effect on the project ? What is Manitoba Hydro's definition of reversibility, and what methodology does Manitoba Hydro use to measure reversibility ? What are Manitoba Hydro definitions of rare, fragility, and uniqueness as applies to VECs ? Do these definitions agree with current conservation biology and ecological assessment standards?	MB Wildlands-0045c
46	MB Wildlands	R-EIS Guidelines	6.2 Existing Environment	N/A	Terrestrial Environment	Page 6 – 28 The EIS states that, "surface permafrost is widely distributed throughout the area, occurring in 78% of the LSA."	What is the relationship in definition and aquatic characteristics between peatlands, inland peatlands, bogs, fen, veneer bogs, blanket peatlands, plateau bogs and muskeg?	MB Wildlands-0046a
						How deep do peatlands or muskeg in the RSA and LSA become? Are they 10, 50, 100, or 200 feet deep, at different locations? Has Manitoba Hydro assessed the depths of peatlands and muskeg in the RSA and LSA?	MB Wildlands-0046b	
						Given that permafrost thickness within the RSA ranges from 10 m to 50 m, does Manitoba Hydro have a monitoring program for permafrost during the construction and operation periods for Keeyask ?	MB Wildlands-0046c	
						Has Manitoba Hydro taken into account in its planning, designing and engineering assumptions for Keeyask the potential for significant change in permafrost depth, Thickness and presence?	MB Wildlands-0046d	
47	MB Wildlands	R-EIS Guidelines	5.3.1 Assessment Framework Steps	N/A	Response to EIS Guidelines		The EIS indicates that "the study area for each environmental component is defined by the geographic extent of the direct and indirect effects of the project." 1) How does Manitoba Hydro determine the study area before knowing the results of studies to determine direct and indirect effects of the project, given the study areas already define the extent of the direct and indirect effects of the project ? 2) Which VECs are umbrella indicators ? 3) Which VECs are key for ecosystem function ? 4) Which VECs are regulatory requirements ?	MB Wildlands-0047
48	MB Wildlands	R-EIS Guidelines	6.9.3.2 Construction Phase	N/A	Project Description		1) What is the basis for the "Project structures to be designed to withstands flows and levels associated with a flood having an annual frequency of occurrence 1:20 years "? 2) Given 2005 flows were a 1:30 year event, with significant flooding in the Split Lake and Gillam region, is the 1:20 year design based on costs?	MB Wildlands-0048
49	MB Wildlands	R-EIS Guidelines	6.8.5 Sensitivity to Effects of Climate Change	N/A	Project Description		1) On what basis does the EIS state that climate change will not have any effect during the construction phase? 2) What proof of this statement does Manitoba Hydro hold?	MB Wildlands-0049
50	MB Wildlands	R-EIS Guidelines	6.3.12.1 Future Climate Change Scenarios	N/A	Physical Environment		1) Which Global Climate Models were 'used to project future climate change'? 2) What is the date of the Canadian Regional Climate Model version 4.2.3 (CRCM)? 3) Which model and scenario are the temperature increases used in the EIS from ? 4) Are these the conservative, moderate, or worse case scenarios 5) Did Manitoba Hydro leave out the change in temperature that has already occurred in the region, in northern Manitoba since 1970 from its models and scenarios ? 6) Are the increases in projected temperature in the region listed in this section of the EIS each an additional increase OR cumulative ? 7) What is the total temperature increase in the region the models and scenarios indicate, starting in 1970 – to include increases in temperature that have already occurred ? 8) Has Manitoba Hydro taken these temperature increase projections into account in its planning, engineering, and costing of Keeyask ? 9) What increase in precipitation has occurred for the region since 1970? 10) Has the increase in extreme weather events since 2007 been taken into account in Manitoba Hydro planning, engineering, and costing of Keeyask?	MB Wildlands-0050

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51	MB Wildlands	PD SV	N/A	N/A	Project Description		<p>Estimates for the Keeyask Generation Project required to conduct LCA:</p> <ol style="list-style-type: none"> 1. The service life of the Project, defined as beginning at the date of operation phase initiation (November 2019, as noted in Section 1.1 of the reference document), and ending at the start of infrastructure decommissioning. 2. The Project 's total electricity generation over its service life. 3. Average line losses, by season, to consumer for electricity generated by the Project over its service life. <p>This request for estimates is in IR format based on direction from the Keeyask project managers.</p>	MB Wildlands-0051
52	MB Wildlands	N/A	R to EIS; AE SV; TE SV 7.0; Exec Sum	N/A	Terrestrial Environment	<p>In several sections, habitat is mentioned either as a restoration and/or mitigation function. It is described that as long as the habitat is recreated, the important species or ecosystem, whether it be fish (spawning habitat) or geese (i.e., staging habitat) will be replaceable and thus in the operation stage of the project populations will not be adversely effected.</p>	<p>The spawning habitat for several species will be lost in Gull Rapids.</p> <ol style="list-style-type: none"> 1) On the basis of what scientific literature does Manitoba Hydro assume that the recreated habitat, which needs to provide everything needed for survival (i.e., food, water, shelter) for each given life stage of an animal, plant or fish, will support the maintenance of the genetic diversity needed to maintain healthy and resilient populations over space and time? 	MB Wildlands-0052a
							<p>Some habitats have more species, and thus more genetic diversity than others. One area of particular concern is genetic diversity of the lake sturgeon.</p> <ol style="list-style-type: none"> 2) Does the planned stocking program will take into account the need to preserve genetic diversity, and consequently biodiversity, of this endangered fish as per SARA and COSEWIC guidelines? Please and the methodology and supporting documentation used to come to these conclusions. 	MB Wildlands-0052b
53	MB Wildlands	N/A	All Volumes	N/A	N/A		<p>The loss of natural areas and the services provided by them may require substitution. These substitutes may be very expensive to build and operate.</p> <ol style="list-style-type: none"> 1) Has a baseline natural capital assessment been completed for the project area? 2) Have these cost-benefit analyses been conducted for the project area that assess the costs of replacing the natural capital in the project area? Where is this topic covered in the EIS? 	MB Wildlands-0053
54	MB Wildlands	PD SV	N/A	N/A	Project Description		<p>Operational stage of Keeyask facilities estimates required for LCA.</p> <ol style="list-style-type: none"> 1) Operational energy use estimates: <ul style="list-style-type: none"> • for facilities • for reserve power, including system testing 2) Operational material use estimates: <ul style="list-style-type: none"> • Need of oil, hydraulic fluids, and or fat, as well as potential emissions thereof to the waterways 3) Operational waste estimates: <ul style="list-style-type: none"> • Amount, by type • Transportation distance and modes to handling/treatment/disposition 4) Maintenance estimates: <ul style="list-style-type: none"> • Energy and materials use, eg. lubrication, inspection trips <p>These requested estimates are in the IR form at the request of Keeyask project managers.</p>	MB Wildlands-0054
55	MB Wildlands	PD SV	N/A	N/A	Project Description		<p>Worker Related Estimates (exclusive of aspects related to construction) to provide:</p> <ol style="list-style-type: none"> 1) Total # of flights to and from site and average per flight distance. 2) Total work related waste water flow <p>This request for estimates is in IR format based on direction from the Keeyask project managers.</p>	MB Wildlands-0055
56	MB Wildlands	PD SV	2.3 Principal Structures, 2.4 Supporting Infrastructure	N/A	Project Description		<p>Estimates requested for principal structures, and supporting infrastructures as noted in reference volume:</p> <ol style="list-style-type: none"> 1) Mix designed for ready mix concrete and grout. 2) Materials manufacturing locations, and transportation distance and mode to site. 3) Construction waste factors (% concrete, % structural steel,, etc) for initial construction and maintenance, repair, replacement. 4) End of life outcomes for materials (disposal, incineration, recycling, reuse) for initial construction (construction waste), maintenance/repair/replacement, and decommissioning. 5) Material transportation distance and mode to end of life facility (landfill, scrap yard, etc). <p>These requested estimates are in IR form at the request of the Keeyask project managers.</p>	MB Wildlands-0056

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57	MB Wildlands	AE SV	N/A	N/A	Aquatic Environment		<p>Food production by the local and regional area will be altered by changes in water quality.</p> <p>1) Has data been made available to quantify the change in freshwater fishery value associated with the change in water quality – nutrient concentrations in the project local or regional area?</p> <p>2) Has the financial Ecosystem Services/ biodiversity loss been quantified for subsistence fisheries? Have replacement costs been calculated?</p> <p>3) What is the cost of the price of the replacement food that it will take to bring in to the communities when the subsistence fishery declines, as predicted in the aquatic volume? Have these costs been quantified? This includes not only the price of food but the price of shipping the food and emissions of doing so, as well as the environmental costs of growing the food and bringing food into the territory in general (LCA of replacement food products?)</p> <p>4) Has this economic assessment been completed and appear in the EIS or supporting documents? Are they available to public? If this has not been done, explain.</p>	MB Wildlands-0057
58	MB Wildlands	PD SV	2.3 Principal Structures; 2.4 Supporting Infrastructure	N/A	Project Description		<p>To enable Life Cycle Assessment of each principal structure and supporting infrastructure of the Keeyask Generation project, provide estimate for:</p> <p>1) Material use quantities for initial construction, and then maintenance/repair/replacement over the project's service life;</p> <p>2) Construction, excavation and quarrying energy use for initial construction and the maintenance, repair, replacement construction;</p> <p>3) Demolition, excavation, and deconstruction energy use for maintenance, repair, replacement and decommissioning;</p> <p>4) Quantity of explosive, particulate matter emissions, and emissions to water for initial construction, maintenance/repair/replacement, and decommissioning;</p> <p>For each component of the Keeyask Generation project.</p> <p>These materials and energy use quantities to be provided for construction, and life of the project. As per section 2.4.17 this request includes KIP infrastructure in the LSA for Keeyask Generation</p> <p>These requests are in an IR at the request of Manitoba Hydro Keeyask project managers.</p>	MB Wildlands-0058
59	MB Wildlands	PD SV	N/A	Table 2-1	Project Description		<p>1) Provide annual carbon stock estimates for all lands listed in Table 2.1 – for the current year, and each year in the project life cycle.</p> <p>2) Provide volume of wood entering manufacturing streams, for all logs and fibre removed from the project area.</p> <p>3) Provide volume of wood material to be cleared from the project area, and then burned. Provide for project construction period and the first 30 years of operation.</p> <p>4) Provide annual carbon stock estimates for no build scenarios.</p> <p>5) Provide annual land cover descriptions (plant species) for all lands affected by the project listed in Table 2.1 (both build and no build scenarios) to support estimates for albedo changes. Provide these annual land cover descriptions by zone, for all construction years, 30 years into project operation, and project life cycle.</p> <p>6) Add to this information any lands/land uses not listed in Table 2.1 (Quarries, Blasting eg)</p> <p>7) What data was used for landscape, peatland and forest cover?</p> <p>Manitoba Hydro Keeyask project managers indicated these requests should be forwarded in IR format.</p>	MB Wildlands-0059
60	MB Wildlands	R-EIS Guidelines	6.3.12.1 Future Climate Change Scenarios	N/A	Response to EIS Guidelines		<p>1) Which Global Climate Models were 'used to project future climate change'?</p> <p>2) What is the date of the Canadian Regional Climate Model version 4.2.3 (CRCM)?</p> <p>3) Which model and scenario are the temperature increases used in the EIS from?</p> <p>4) Are these the conservative, moderate, or worse case scenarios?</p> <p>5) Did Manitoba Hydro leave out the change in temperature that has already occurred in the region, in northern Manitoba since 1970 from its models and scenarios?</p> <p>6) Are the increases in projected temperature in the region listed in this section of the EIS each an additional increase OR cumulative?</p> <p>7) What is the total temperature increase in the region the models and scenarios indicate, starting in 1970 – to include increases in temperature that have already occurred?</p> <p>8) Has Manitoba Hydro taken these temperature increase projections into account in its planning, engineering, and costing of Keeyask?</p> <p>9) What increase in precipitation has occurred for the region since 1970?</p> <p>10) Has the increase in extreme weather events since 2007 been taken into account in Manitoba Hydro planning, engineering, and costing of Keeyask?</p>	MB Wildlands-0060

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61	MB Wildlands	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Response to EIS Guidelines	In Chapter 7, page 7-20, members of the KCNs have acknowledged that they expect a decline in the numbers and health of most fish species as a result of the Keeyask Project and adverse effects will extend to Split Lake.	1) Has this cumulative loss of biodiversity been assessed? If so, how? a. If not, why not? 2) What will these combined declines represent in terms of quantitative financial loss of natural fisheries capital in the local and regional project area? 3) Has this information been mapped and quantified? 4) Has this cost information been evaluated in a financial way that considers non-market benefits of biodiversity and the fish species in the project area? a. If so, how? b. If not, why not? 5) Have these financial replacement costs- which will ultimately fall on the local communities been considered?	MB Wildlands-0061 filed on July 31, 2013
62	MB Wildlands	AE SV	6.2.3.9	N/A	Aquatic Environment	On page 6-48, it is noted that the relationship between water levels in the adjacent lakes and groundwater is "inconsistent". The "inconsistent" connections of groundwater to lake levels in the subject area suggest that a major knowledge gap exists and is described in the executive summary pertaining to water quality. Given that two major water quality ecosystem services are water supply (i.e., filtering, retention, and storage of fresh water) and water regulation (i.e., the regulation of water flows that entrains pollutants and purifies water) the current summation suggests that it is unknown how the altered flow regime will affect the services provided as described above.	1) Where are these affects discussed in regards to water quality services? 2) If Manitoba Hydro did not take any of these aspects into account, why not?	MB Wildlands-0062 filed on July 31, 2013
63	MB Wildlands	AE SV	4.0 Water Quality	N/A	Aquatic Environment	On page 4-17, in Chapter 4, during mitigation discussions, the method employed for wetland mitigation will include the "Development of wetlands to offset potentially important wetlands." Wetlands serve many ecological functions which provide water quality ecological services such as the regulation of water flows, which purifies water; the filtering, retention and storage of fresh water; the maintenance of arable land and prevents water silting by lowering soil losses; and the removal, breakdown or abatements of pollution. In order to "offset" the development of important wetlands during mitigation, these specific services need to be assessed (preferably spatially and temporally quantified in GIS-mapped) in order to know what is being provided by the existing wetland function.	1) What studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use to assess the ecosystem services provided by wetlands planned to be mitigated? 2) Are these studies available to participants? 3) Where, in the EIS, have these water quality related ecosystem services of the wetland been quantified and mapped? 4) Are there technical reports to support these assessments in the EIS contents?	MB Wildlands-0063 filed on July 24, 2013
64	MB Wildlands	R-EIS Guidelines	5.3.1 Regulatory Environmental Assessment Approach	N/A	Terrestrial Environment	Selection of 18 biophysical VECs was based on the following criteria: Overall importance, value to people; key for ecosystem function; umbrella indicator; amendable to scientific study in terms of analysis of conditions; potential for substantial project affects; and regulatory requirements. The main benefits that humans obtain from healthy ecosystem functioning are actually provided by ecosystem services, not VECs. In the Executive summary, it is stated "that following mitigation none of the residual adverse effects exceeded the regulatory test for significance."	How is it being proposed that the development of VECs and exceedance of adverse effects included assessments pertaining to the ecosystem services actually provided by the VEC?	MB Wildlands-0064 filed on July 24, 2013
65	MB Wildlands	PD SV	N/A	Table 2-1	Physical Environment		Manitoba Hydro has described the models and scenarios used to arrive at its climate change effects content in the EIS. 1) Does Manitoba Hydro use flows of all green house gasses from each of the land areas in Table 2.1 for their conclusions ? 2) Did Manitoba Hydro use green house gas flows (carbon dioxide, methane etc) from reservoirs, and build- no build scenarios ? 3) Which equations from IPCC documents, and others sources to calculate the emissions and scenarios in the EIS ? In particular, which equations were used to generate Figure 2A-1 in the Climate SV ? Provide data corresponding to the questions above. This request is in IR format at the request of the Keeyask project managers.	MB Wildlands-0065 filed on July 31, 2013
66	MB Wildlands	TE SV	N/A	N/A	Terrestrial Environment		1) Have the dynamics of local and regional ecosystems within the Project areas and their natural biological control been mapped or examined spatially or temporally? 2) Which studies, methodologies, data sets, and assessment approaches did Manitoba Hydro use to assess biodiversity and specifically this service of biocontrol? 3) Where in the EIS is this addressed? 4) Are there technical reports that support this assessment? 5) If it was not done, what methodology was used instead? Are these studies available to participants? 6) If Manitoba Hydro did not take any of these aspects into account, why not?	MB Wildlands-0066 filed on July 24, 2013
67	MB Wildlands	TE SV	2.0 Habitat and Ecosystems	N/A	Terrestrial Environment	In table 2-1 (page 2-11) fine quality habitat types are discussed. Fine habitat types were used to address specialized needs of VECs. The study documents that extensive habitat classification and mapping was conducted, and occasionally to a fine scale.	1) Did the assessment goes the next level and provides how these classifications were used for environmental assessment? The VECs may not actually encompass the necessary services needed to maintain ecosystem function and biodiversity and the services provided. 1) Specifically, were biodiversity and ecosystem services identified for the habitats classified? Was this is done, or it was not done, and why? Answer for both above. 2) Which assessment approaches did Manitoba Hydro use to classify these services and functions in order to address the specialized needs of the VECs? Are these studies available to participants?	MB Wildlands-0067 filed on July 24, 2013

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68	MB Wildlands	R-EIS Guidelines	5.3.1 Regulatory Environmental Assessment Approach	N/A	Terrestrial Environment	<p>Selection of 18 biophysical VECs was based on the following criteria: - Overall importance, value to people; - Key for ecosystem function; umbrella indicator; amendable to scientific study in terms of analysis of conditions; potential for substantial project affects; and regulatory requirements.</p> <p>The main benefits that humans obtain from healthy ecosystem functioning are actually provided by ecosystem services, not VECs.</p> <p>In the Executive summary, it is stated "that following mitigation none of the residual adverse effects exceeded the regulatory test for significance".</p>	Did the development of VECs and exceedance of adverse effects included assessments pertaining to the ecosystem services and functions actually provided by the VEC.	MB Wildlands-0068 filed on July 24, 2013
69	MB Wildlands	R-EIS Guidelines	4.0 Mitigation	N/A	Terrestrial Environment		<p>In Chapter 4, the overall mitigation strategy is discussed for the project. Rationale for developing areas to compensate for losses of habitats and ecosystems is often a strategy employed in development.</p> <p>1) Is there any mention of no-net loss of biodiversity or water quality Ecosystem Services or anything pertaining to this discussion? This terminology is often used as a means of replacing sensitive habitat such as wetlands and species (i.e., sturgeon) but should be used to demonstrate the maintenance of not just the habitat, species and wetlands, but actually it should demonstrate that ecosystem services and biodiversity are not lost and mitigated for as well.</p> <p>2) Was this approach used in the Keeyask EIS? If not, why not? 3) Explain what mitigation plans exist to restore Biodiversity/ Water Quality Ecosystem Services and the Natural Capital that these services provide to the project and surrounding area.</p>	MB Wildlands-0069 filed on July 24, 2013
70	MB Wildlands	AE SV	N/A	Table 2-5 Lake Trophic Status	Aquatic Environment	The trophic status of the majority of areas sampled from Split Lake through to Stephens Lake (in close proximity to area of Keeyask GS) are listed as eutrophic. Measurements for water quality were taken between 2001-2004 (10-9 years prior).	<p>Please respond to the following questions:</p> <p>1) Is the water quality data used to determine current day trophic levels still relevant? Explain. 2) What are all the sources contributing to eutrophication of the Keeyask reservoir, Split Lake and Stephens Lake? 3) What is the predicted time-frame for causing hyper-eutrophication of Split and Gull Lakes? 4) What mitigation and monitoring activities will be employed to minimize eutrophication? 5) How will the flooding of peatlands and peatland erosion contribute to eutrophication of Split, Gull and Stephens Lakes? Explain for both the construction and operation phases of the project.</p>	MB Wildlands-0070 filed on July 31, 2013
71	MB Wildlands	TE SV	1.3.4 VECs and Supporting Topics	Table 1-1	Terrestrial Environment	<p>VECs are selected in order to act as a measurable indicator of ecosystem health. When selecting VECs, it is necessary to include information discussing why those VECs were chosen, how they act as a representative marker of ecosystem health, their relationship to the environment and how alterations to the environment/ecosystem will impact the selected VEC. A group of VECs should include a variety of components within a selected ecosystem; aquatics, terrestrial, etc, in order to provide as complete a picture as possible of the ecosystem being evaluated and impacted.</p> <p>The rationale for selection of the terrestrial Supporting Topics in the Keeyask EIS materials is unclear.</p>	<p>Answer the following questions:</p> <p>1) What are Supporting Topics and how are they selected? 2) What are the criteria used to select the Supporting Topics? If there is no criteria, why not? 3) How are Supporting Topics being used to supplement the VECs? 4) Are there any guiding documents outlining the number, quality, species type, category of VECs required in order to adequately evaluate ecosystem health? If not, why not? And if so, please provide that information. 5) How are Supporting Topics measured in order to provide information about the environment, and how is the data interpreted to provide qualitative and quantitative conclusions and recommendations?</p>	MB Wildlands-0071 filed on July 24, 2013
72	MB Wildlands	TE SV	1.3.5 Spatial Scope	Map 1-1 and Table 1-3	Terrestrial Environment	Study zones 1-6 were applied to the terrestrial environment to define areas for field work, research and comparison. Around each study zone, an additional buffer was applied that has a variable width depending on the zone. Each terrestrial VEC was evaluated in a local and regional study zone, however the local and regional study zones varied between VECs.	<p>Answer the following questions:</p> <p>1) What criteria were used to establish each terrestrial study zone? If no criteria were used, why not? 2) What criteria were used to establish each terrestrial study zone buffer area? If no criteria were used, why not? 3) How was the area and amount of land determined for each study zone and corresponding buffer area? 4) Was there a model used to establish study zones and buffer areas? a. Is each zone/buffer area representative of a certain percent of the entire project study area? b. Are there certain terrestrial characteristics that were required within each zone and buffer area? c. How were the study zones and buffer areas determined and utilized to maximize/enhance VEC assessment?</p>	MB Wildlands-0072 filed on July 24, 2013
73	MB Wildlands	TE SV	1.3.6 Temporal Scope	N/A	Terrestrial Environment	<p>The flooding of Gull Lake to create the Gull Lake reservoir for the Keeyask project, is compared to the Kettle Generation Station reservoir; Stephens Lake. It is stated that the Kettle reservoir stabilized after 30 years. The Kettle Generation Station was completed in 1974, now 39 years prior. Studies comparing the Keeyask and Kettle reservoirs were conducted between 2001 and 2011.</p> <p>The Kettle Generation Station is only 39 years old (up to 2013). How can Manitoba Hydro claim that the reservoir has stabilized after 30 years, when the studies evaluating the stability of reservoir were conducted at the 30-year operational mark? An additional 10 years or more would be required in order to conclude that no additional changes occurred within the reservoir.</p>	<p>Answer the following questions:</p> <p>1) How are the Keeyask and Kettle reservoirs comparable, and give examples? 2) Please describe how a reservoir becomes stable, how is this measured, and are those measurements comparable to other reservoirs? Explain with regards to the Kettle reservoir. 3) What other Manitoba Hydro reservoirs can be compared with the Keeyask reservoir? 4) How long did it take other Manitoba Hydro reservoirs to stabilize, and what factors influence this? 5) What model was used to predict Keeyask reservoir stabilization? 6) Recalculate and provide the time required for the Keeyask reservoir to stabilize taking into account climate change, all other Manitoba Hydro current projects and future projects on the Nelson River, etc.</p>	MB Wildlands-0073 filed on July 31, 2013

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74	MB Wildlands	TE SV	1.4.3 Effect Benchmarks	N/A	Terrestrial Environment	The EIS materials indicate that there is no general or scientifically accepted benchmarks for assessing terrestrial VECs or Supporting Topics.	Answer the following questions: 1) If there are no general or scientifically accepted regulatory benchmarks for assessing terrestrial VECs or Supporting Topics, how are they assessed? a. Does Manitoba Hydro apply its own internal benchmarks? i. If so, what are those benchmarks and, how are they determined? b. Are the benchmarks used by Manitoba Hydro comparable between terrestrial VECs and Supporting Topics for Keeyask? Between other Manitoba Hydro projects? 2) What is a benchmark as it pertains to VECs and Supporting Topics?	MB Wildlands-0074 filed on July 24, 2013
75	MB Wildlands	TE SV	1.4.3 Effect Benchmarks	N/A	Terrestrial Environment	The EIS materials indicate that the term benchmark is used to describe areas within the study zones that are "relatively" unaffected by human activity. Benchmark areas are used to characterize patterns and dynamics in natural ecosystems being used as control areas. It is stated that there are no general or scientifically accepted regulatory benchmarks for assessing terrestrial VECs or supporting topics.	Please answer the following questions: 1) Define what is meant by "relatively" unaffected by human activity? 2) Are the benchmarks used to assess VECs and ecosystem zones the same? Explain. 3) Are the benchmarks used to evaluate control areas also applied to the study areas/zones?	MB Wildlands-0075 filed on July 24, 2013
76	MB Wildlands	TE SV	2.7.4 Project effects mitigation and monitorin	N/A	Terrestrial Environment	The EIS materials indicate there will be no net project effects to overall ecosystem diversity, stating that Keeyask activity will not change the total number of habitat types. The assessment for impacts to regional inland broad habitat composition of existing environment following construction is assessed for a 30 year period. Ecosystems are systems that do not draw lines between aquatic and terrestrial habitat types, meaning that a change to terrestrial ecosystems inevitably impacts aquatic ecosystems and vice versa.	Please answer the following questions: 1) Were the effects to ecosystem habitat diversity measured solely based on the number of habitats remaining after project construction? a. What are the baseline values used for ecosystem habitat diversity assessment? b. Did Manitoba Hydro review other measures of ecosystem diversity, aside from number of habitat types that are used for assessing effects to ecosystem diversity? c. Why was the study conducted to examine a 30-year period? 2) Did the terrestrial ecosystem effects mitigation and monitoring analysis incorporate changes and effects predicted for the aquatic environment? If not, why not? 3) Did Manitoba Hydro perform a project effects mitigation and monitoring analysis/report that includes both the terrestrial and aquatics information to assess future impacts, mitigation measures and monitoring practices for each terrestrial and aquatic ecosystem? a. Include information for 30, 50 and 100 years of the project lifespan.	MB Wildlands-0076 filed on July 24, 2013
77	MB Wildlands	TE SV	2.0 Habitat and Ecosystems	Table 2-34	Terrestrial Environment	After 30 years of Keeyask project operation it is predicted the composition of inland habitat will not dramatically change according to the EIS materials. The table shows that after 30 years of operation total percent of land area will change from 98.5% (existing regional study area habitat types) to 97.8% (year 30 of operation in regional study area).	Answer the following questions: 1) What is the percent change of inland habitat over 30, 50 and 100 years within the local study area, regional study area and project footprint? 2) Did the model used to predict change of the inland habitat factor in climate change, increased human activity (having 2000 workers on site and using the surround environment), waste deposit, altered flow of Nelson River, infrastructure development, linear fragmentation by development of transmission lines, access roads, dykes, shoreline erosion and changes to wildlife population? 3) Will Manitoba Hydro provide an updated table on the changes to inland habitat from the Keeyask project factoring in the above-mentioned parameters? 4) Does inland habitat include all, any habitat types?	MB Wildlands-0077 filed on July 24, 2013
78	MB Wildlands	AE SV	1.4.1 Introduction – Construction Period	N/A	Aquatic Environment	Assessment of construction effects references the inputs of materials to the aquatic environment through controlled discharges, instream construction, surface runoff, etc. It further indicates that the principle effluents from the construction phase are those from treated sewage and discharge from the concrete wastewater treatment ponds. Heavy metals are known to migrate from construction sites by attaching to soil sediments that erode aggressively due to disturbance of soils and vegetation. Furthermore, heavy metal runoff from access roads, buildings, excavation sites, landfill areas, bulk waste sites, etc, has the potential to pose a serious risk to heavy metal leachate in nearby waters.	Please respond to the following questions: 1) Has an increase in heavy metal contaminated sediments been considered when determining the amount of heavy metals released into the aquatic environment? If not, why not? 2) How will heavy metals within run-off effect ground water quality in the Keeyask region (regional and local study areas)? 3) What mitigation measures are being employed to reduce the amount of heavy metals released into the environment from Keeyask construction sites?	MB Wildlands-0078 filed on July 31, 2013
79	MB Wildlands	AE SV	1A.3 Keeyask Operation	N/A	Aquatic Environment	Over the operation period of the Keeyask Project, water levels will fluctuate to accommodate the peak mode operation mandate of the station. The Lake Winnipeg Water Regulation License is past due. Manitoba Hydro facilities are linked along the Nelson River and through the Churchill River Diversion (CRD) originating from Lake Winnipeg. The linked generation facilities impact one another, and therefore changes to Lake Winnipeg outflow is relevant to the operations of the Keeyask Generation Project.	Please respond to the following questions: 1) What are the intended min/max water levels within the Keeyask reservoir, spillway, Stephens Lake and forebay? 2) What are the anticipated 10, 20, 30, 40 and 50-year impacts of altered water levels on local topography and flooding? 3) How do the changing water levels within the Keeyask reservoir correlate with Lake Winnipeg Water Regulation requirements for water level regulation? 4) How will Keeyask affect other components of the CRD?	MB Wildlands-0079 filed on July 31, 2013

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80	MB Wildlands	AE SV	1.2 Keeyask Reservoir Sturgeon stocking	N/A	Aquatic Environment	The EIS is proposing the use of Ovaprim to facilitate collection of sturgeon eggs and milt, to promote fish spawning. Ovaprim (Salmon gonadotrophin releasing hormone analog) is a chemical hormone injected intraperitoneally or intramuscularly in fish to aid spawning. The chemical is not recommended for use in fish that are to be consumed as food products by humans or other animals and milt produced following exposure. The potential side effects of Ovaprim on fish health, egg quality, offspring viability and aquatic environment were not discussed. Manitoba Hydro has engaged a physiologist from University of Manitoba to investigate the impacts of Ovaprim on sturgeon sex hormone levels, influence of Ovaprim on endocrine stress levels and impacts on egg quality and fertilization success.	Respond to the following questions: 1) When will the sturgeon stocking program be implemented? 2) When will the study of Ovaprim on sturgeon be completed by the University of Manitoba and will those results be available to the public? 3) Will other fish species be subject to Ovaprim injection? 4) How will Manitoba Hydro monitor for impacts to sturgeon and other fish species following exposure to Ovaprim? 5) Will the public be notified to avoid eating sturgeon due to potential exposure to Ovaprim? 6) Provide information on the pharmacodynamics and pharmacokinetics of Ovaprim in lake sturgeon.	MB Wildlands-0080 filed on July 31, 2013
81	MB Wildlands	AE SV	2.0 Water and Sediment Quality	N/A	Aquatic Environment	The EIS materials state that a description of the residual effects on drinking water and recreational water quality are provided within the socio-economic supporting volume of the EIS. The socio-economic supporting volume discusses residual effects to drinking water that are scattered throughout the document and are primarily concerned with heavy metal concentrations; mercury. There is no single location that addresses all residual effects to drinking and recreational water quality.	Answer the following questions: 1) Will Manitoba Hydro provide a table of all possible residual effects to drinking water and recreational water quality? 2) Indicate how the provincial drinking water standards will be ensured. 3) What is the source of drinking water for the Keeyask work camp?	MB Wildlands-0081 filed on July 31, 2013
82	MB Wildlands	AE SV	2.3.3.2.1 Keeyask Environmental Studies	N/A	Aquatic Environment	The EIS materials state that additional baseline water quality data for the Keeyask study area was collected in 2009, but it was not incorporated into the description of the existing environment.	Please respond to the following questions: 1) Why was the additional baseline water quality data not incorporated into the description of the existing aquatic environment? Explain. 2) Provide the baseline aquatic data collected from 2009.	MB Wildlands-0082 filed on July 31, 2013
83	MB Wildlands	AE SV	N/A	Table 2-2	Aquatic Environment	Studies conducted to evaluate baseline water quality in the Keeyask study areas were conducted 10-9 years prior; 2001-2004. No indication provided within the materials of whether the baseline data is still relevant.	Please respond to the following questions: 1) Is the water quality data used to arrive at the conclusions in the Aquatics supporting volume still relevant according to Manitoba Conservation and water quality guidelines? 2) Provide current water quality data for the Keeyask study areas. 3) Does Manitoba Hydro hold current water quality data? If so, will it be filed as supplementary information?	MB Wildlands-0083 filed on July 31, 2013
84	MB Wildlands	AE SV	N/A	N/A	Aquatic Environment	Water bodies act as large natural sinks for sequestering anthropogenic carbon emissions. Carbon enters the aquatic environment in the form of dissolved carbon dioxide (CO ₂), which then binds to calcium carbonates for sequestering. Dissolved CO ₂ increases the acidity of the aquatic environment, which in turn slows calcium carbonate precipitation, thereby decreasing the ability of the water to absorb CO ₂ . Vertical deep mixing is a mechanism that then transports the sequestered carbon to the deeper layers of the water column Aquatic plants play a significant role absorbing dissolved carbon by converting it to organic material, and mitigating aquatic acidification by converting CO ₂ to oxygen during photosynthesis. In general, water bodies play a significant role in the carbon cycles of the earth and in local ecosystems, and must be considered when evaluating the impacts of carbon emissions on the environment (terrestrial and aquatic).	Answer the following questions: 1) How will carbon emissions produced by the Keeyask Project during both the construction and operation phases impact water carbon cycles? 2) What type of carbon inventory does Manitoba Hydro conduct regarding lakes, rivers, peatlands and reservoirs; its projects areas?	MB Wildlands-0084 filed on July 24, 2013
85	MB Wildlands	PD SV	4.2.1 - Peak Mode of Operation	N/A	Project Description		The EIS indicates it will take at least 30 years for the reservoir to reach maximum size. Questions to answer: 1) Explain what the effect on Peak Mode of Operation this 30 year expansion of the reservoir. 3) Given the intention to avoid any under water landscapes or forest, explain how the clearing of areas that are going to convert to waterways over 30 years will be anticipated and accomplished. 4) How will the reservoir monitoring program interact with the 30 year expansion of the reservoir, including waterway management program? Will the monitoring program for the reservoir continue for 30 years? 5) Peatland disintegration is referenced in several places regarding the 30 year expansion period for the Keeyask reservoir. What happens in peat lands disintegration? Describe. 6) What is the expected interaction between the dyke system for Keeyask and peatlands disintegration?	MB Wildlands-0085 filed on July 31, 2013
86	MB Wildlands	PD SV	2.0 – Project Component	N/A	Project Description	The Project Description indicates that the size of the Keeyask reservoir will continue to increase for at least 30 years after impoundment. The reasons provided for this are shoreline erosion and peat land disintegration.	1) Where is the shoreline erosion likely to be greatest? Provide mapping to show the expected pattern of shoreline erosion, over 30 years, increments. 2) Given peat lands are expected to disintegrate over a 30 year period, provide estimates as to GHG emissions from peat land disintegration over the 30 year period, in 5 year periods. 3) Will the reservoir stop expanding by 30 years? Provide basis for this assumption. 4) Have other impacts to; water quality, species habitat, access for traditional use, caribou winter and calving areas, medicinal plants, etc.been calculated in relation to this 30 year expansion period for the reservoir? Provide basis for answer. 5) With reservoir storage varying and increasing over a 30 year period, how does this variation show in calculations for operation of Keeyask Generation Station? Provide examples.	MB Wildlands-0086 filed on July 31, 2013

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Manitoba Metis Federation								
1	MMF	TE SV	1.4.6 Sources of Information; 7.5.1 Mammal Sign Surveys	1-27, 7A-7, 7-7, Map 7-2	Terrestrial Environment	<p>EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following attributes in the applicable study area(s): ..Species composition, distribution and relative abundance of small mammals, furbearers, large carnivores and ungulates, in relation to habitat including seasonal changes."</p> <p>The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the composition, distribution, and relative abundance of ungulates. Appendix 7A makes reference to "statistical comparisons" with collected data (TE-SV-7.0, Appendix 7A, p. 7A-7); however, no analyses or statistical comparisons are presented in TE-SV-7.0 or Appendix 7A. It appears the study design for the Project included both "proxy" and "benchmark" areas (TE-SV-1.0, Section 1.4.6, p. 1-27) which can be useful for comparison to areas that have experienced similar project impacts and relatively pristine areas that will presumably remain pristine. However, the mammals report (TE-SV-7.0) does not appear to contain any results of comparisons utilizing data from the proxy and benchmark areas. With sufficient sample size, analyses should demonstrate the effectiveness (or ineffectiveness) of mitigation measures applied to previous hydroelectric projects. Analyses should also demonstrate that benchmarks function effectively as control sites (i.e., not impacted by hydroelectric activity and similar in nature to Project study area at baseline).</p>	Describe what statistical analyses or comparisons were completed for ungulates for the Project and provide the results.	MMF-0001a
							Indicate if analyses performed provide support for proposed Project mitigation measures for ungulates.	MMF-0001b
							Provide power analyses demonstrating that sufficient sample sizes for tracking data were collected at baseline such that meaningful comparisons with future monitoring data can be made.	MMF-0001c
2	MMF	TE SV	7.2.5.1, 7.3.6, 7.4.6.2.1, 7.4.6.2.2, 7.5.1	7-7, 7-57, 7-75, 7-112, 7-120, 7-124	Terrestrial Environment	<p>EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following attributes in the applicable study area(s): ..Species composition, distribution and relative abundance of small mammals, furbearers, large carnivores and ungulates, Page 8 in relation to habitat including seasonal changes."</p> <p>The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the composition, distribution, and relative abundance of ungulates. The EIS states that additional efforts were made to design studies and collect sufficient data to construct and validate "statistically derived multivariate habitat models" for mammal VECs (TE-SV-7.0, Section 7.2.5, p. 7-7). Section 7.3.6.1 discusses "expert information models" that were used to estimate the abundance of habitat available pre- and post-Project. The expert information models are described as being based on scientific literature and expert information (not statistically derived). Section 7.3.6.3.4 contains a Caribou Habitat Model discussion and Section 7.3.6.4.4 contains a Moose Model discussion; however, neither appear to be "statistically derived", nor do they appear to be statistically validated. Appendix 6A of the Response to EIS Guidelines lists an Environmental Study Report titled "Habitat relationships and wildlife habitat quality models for the Keeyask region" but does not provide a status or date completed.</p> <p>The habitat model discussions require some additional information. It is critical to explain how suitability of islands and peatland complexes for calving caribou was determined as this information feeds into the impact assessment. The EIS states "Evidence of calving was documented on approximately 10% of the island in Gull and Stephens lakes and only 5% of the peatland complexes surveyed in 2010 and 2011, indicating that there is likely more habitat available than caribou are currently using." (TE-SV-7.0, Section 7.4.6.2, p. 7-112). Alternatively, this may indicate that the unused islands and peatland complexes may have characteristics that result in caribou avoidance of these sites. Since the EIS also identifies important moose calving and rearing habitat in the LSA to be similar to those used by summer resident caribou (TE-SV-7.0, Section 7.4.6.3.1, p. 7-124), the assumption that more calving habitat is available needs to be supported for moose as well. Project impact predictions require more consistent argumentation and clarity and support for assumptions made within the presented arguments.</p>	Provide the reference to sections where the details on how "statistically derived multivariate habitat models" for caribou and moose were generated and validated.	MMF-0002a
							Provide the status or date completed for the Environmental Study Report titled "Habitat relationships and wildlife habitat quality models for the Keeyask region". If available, please provide the report to the Métis for review.	MMF-0002b
							Provide support for the assumption that "there is likely more habitat available than caribou are currently using". How was suitability of islands and peatland complexes for caribou and moose calving determined?	MMF-0002c

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3	MMF	TE SV	Section 1.4.4; 5.5 (Response to EIS Guidelines)	Table 1-4, p. 1-24; Figure 5-1, p. 5-9 (Response to EIS Guidelines)	Terrestrial Environment	EIS Scoping Document Reference: 5.1.1 Criteria for Determining Significance: "The following criteria will be used to determine the significance of residual adverse environmental effects on each VEC: Nature (i.e., positive or negative) of the effect; Magnitude (i.e., severity) of the effect; Temporal boundaries (i.e., duration); and Spatial boundaries (i.e., geographic extent)...In assessing the significance of environmental effects on a VEC, the EIS may also discuss the frequency of effects, ecological context and the reversibility, where relevant." The EIS discusses the approach used to determining "Regulatory Significance" (R to EIS, Section 5.5, p. 5-9). As per the Keeyask Generation Project Scoping Document (hereafter Scoping Document) Section 5.1.1, the EIS uses the "Magnitude" criterion to assist in determination of impact significance. In the EIS, the definition of moderate magnitude is: "Moderate – Effects that could be measured and could be determined within a normal range of variation of a well designed monitoring program; or are generally below or only marginally beyond guidelines or established thresholds of acceptable change; or are marginally beyond the range of natural variability or marginally beyond minimal impairment of ecosystem component's function". The definition of large magnitude is: "Large – Effects that are easily observable, measured and described (i.e., readily detectable without a monitoring program), and well beyond guidelines or established thresholds of acceptable changes, are well beyond the range of natural variability, or are well beyond minimal impairment of an ecosystem component's functions". (R to EIS, Section 5.5, p. 5-11). This implies that the ranges of natural variability (RNV) of populations are known. The current presentation of data for moose and caribou does not clearly indicate the RNV. The "Reversibility" criterion is only considered in "Step 2" of the regulatory significance assessment for those VECs that have an adverse effect and meet particular criteria (R to EIS, Section 5.3.1; Scoping Document 5.1.1). Reversible is defined as an "Effect that is reversible during the life of the Project" (R to EIS, Section 5.3.1). All borrow areas (except portions of G-1 and G-3), all road footprints (except the north and south access roads and Butnau road upgrades), camp, work, and landfill areas would be decommissioned at the end of construction (TE-SV-1.0, Section 1.5.1, p. 1-30 to 1-31). Under operations, camp, work, borrow, other temporarily cleared areas (TE-SV-1.0, Section 1.5.2, p. 1-32), and material placement areas will undergo some degree of rehabilitation (R to EIS, Section 4.6.16, p. 4-40). Unfortunately, "a detailed decommissioning and rehabilitation plan for infrastructure not required for the operation of the Project will be developed during the construction phase and provided to regulators for review and approval" (R to EIS, Section 4.6.16, p. 4-41). Without a rehabilitation plan, it is difficult to evaluate whether those areas identified for rehabilitation will meet the reversibility criterion or whether the duration ("Step 1") of effects was accurately assessed.	Explain the concept of "regulatory significance" and provide reasoning and references for its use in environmental impact assessment.	MMF-0003a
						Present data outlining the range of natural variability (RNV) and thresholds in moose and caribou populations (i.e., provide upper and lower targets in moose and caribou populations, beyond which adaptive management action would need to be implemented) that are being used to determine magnitude. Explain how one determines whether effects are "marginally" vs. "well-beyond" guidelines or the range of natural variability.	MMF-0003b	
						Identify and describe the rehabilitation target (time frame and vegetation target) and demonstrate that this target has been achieved elsewhere. Clarify if sites that are to be rehabilitated are considered "reversible" and if they are "medium-term" or "long-term" (i.e., how was rehabilitation considered in the determination of impact significance). If no examples of successful rehabilitation can be provided, re-assess impacts considering that sites cannot be rehabilitated.	MMF-0003c	
4	MMF	TE SV	7.2.4.1 Aboriginal Traditional Knowledge, 7.4.6.2.2 Caribou - Operation	7-5, 7-114	Terrestrial Environment	EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions." The Scoping Document (Section 5.1) sets out that assumptions and analyses that support conclusions regarding Project effects will be described. With respect to conclusions about the impact of Project related disturbance on caribou, the EIS does not present or reconcile differing statements when making conclusions about Project impact. The EIS states that "They [caribou] will often return to disturbed areas once the disturbance ends" and "Caribou show a high level of site fidelity and do not readily abandon suitable areas due to disturbance unless they are actively pursued (Tucker and Mahoney 1990; Dyke 2008)" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-114). However, KCNs noted that caribou are only now just returning to the local region since Kettle GS was constructed and that the Kettle GS changed the landscape (TE-SV-7.0, Section 7.2.4.1, p. 7-5). Construction of the Kettle GS was completed in 1974 and the date of this KCN comment is 2012 (TE-SV-7.0, Section 7.2.4.1, p. 7-5). The Partnership has committed to monitoring to verify the prediction that impacts to calving and rearing habitat (and thereby caribou populations) in the RSA will likely be negligible to small. However, the impact assessment would benefit from any support that can be provided by existing monitoring data from other GS's in the same watershed given the discrepancy between KCN observations and The Partnership's impact assessment. There are at least four other GS's on the Nelson River that should have data that could be used to inform this impact assessment.	Demonstrate that previously disturbed sites would be in pre-disturbance condition as far as human and predator access is concerned such that caribou would exhibit site fidelity.	MMF-0004a
						Can monitoring data from other projects be used to support this prediction, particularly given the discrepancy between KCN observations and The Partnership's impact assessment? Longer term results from monitoring programs for existing GS's should be used to inform the impact assessment.	MMF-0004b	

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5	MMF	TE SV	7.4.6.2.1, 7.4.6.2.2 Valued Environmental Components - Caribou	7-113, 7-116, 7-121	Terrestrial Environment	EIS Scoping Document Reference: Attachment C: "The Keeyask Generation Project (the Project) involves the operation of the following permanent infrastructure constructed as part of the Keeyask Infrastructure Project (KIP): North access road, including a clear-span bridge over Looking Back Creek and an upgrade at the intersection of the road." (Attachment C, Scoping Document); 5.1 Project Effects: In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions." The Scoping Document (Attachment C) indicates that the Keeyask Project requires use of the North access road and that the EIS will describe the approach and methods used to identify and assess Project effects (Section 5.1). With respect to the assessment of sensory disturbance and mortality on caribou, the EIS does not adequately describe the linkages between caribou and the changes caused by the Project during construction and operations. During construction, the EIS considers sensory disturbance and mortality due to wildlife-vehicle collisions on the south access road (TE-SV-7.0, Section 7.4.6.2.1, p. 7-113). It does not appear that the north access road was considered as an impact on sensory disturbance and mortality for caribou during construction, even though it will be the main access route to the GS during construction and will likely receive higher human use than pre-Project (TE-SV-7.0, Section 7.4.6.2.1, p. 7-116). Under the operations scenario, both the north and south roads are considered and the EIS predicts that the risk of wildlife-vehicle collisions is unlikely to change (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121).	Re-assess the loss of effective habitat in the LSA considering the north access road during construction.	MMF-0005
6	MMF	TE SV	7.4.6.2.1 Valued Environmental Components - Caribou; Chapter 6, Section 6.5.8.1.1 Construction Effects and Mitigation - Caribou (Response to EIS Guidelines)	7-117; 6-369	Terrestrial Environment	EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions."" The Scoping Document (Section 5.1) sets out that assumptions and analyses that support conclusions regarding Project effects will be described. However, the EIS does not present adequate support for assumptions or premises when making predictions about Project impact on summer resident caribou. Furthermore, there is an inconsistency in the scale at which analyses are conducted and the scale at which conclusions are made. The EIS states that "Because some of the summer resident caribou are likely coastal caribou, caribou are not using all of the calving and rearing habitat currently available in the Regional Study Area, and the proportion of undisturbed habitat is greater beyond the Regional Study Area, the effect of habitat disturbance on summer resident caribou is predicted to be small" (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). The EIS discusses a 65% undisturbed habitat benchmark, as recommended in the draft caribou recovery strategy (Environment Canada 2011; final version now available: Environment Canada 2012), in reference to the above impact prediction on boreal woodland caribou. There are some assumptions in the above quote from the EIS that should be verified to support the prediction. Also, there is some confusion about the Zone being considered in this impact prediction. Zone 4 is the caribou LSA, Zone 6 is the caribou RSA, and Zone 5 was used to assess Intactness (the degree to which a geographic area has not been subdivided into smaller areas by human features (TE-SV-7.0, Section 7.2.6.2, p. 7-9)). According to the EIS, Zone 5 is currently 48% intact or undisturbed and 36% of Zone 5 is less than 40 years old (R to EIS, Section 6.5.8.1.1, p. 6-372), but no similar estimates are provided for the caribou LSA or RSA. Furthermore, reference is made to undisturbed area "beyond the RSA" in the above quote, but no estimate of undisturbed area is provided. With the information provided and using the 65% undisturbed habitat benchmark (Environment Canada 2012), it appears that an insufficient amount of undisturbed habitat is currently available to support a sustainable woodland caribou population in Zone 5 (48% undisturbed). The conclusion of "small" Project impact is based on a scale ("beyond the RSA") for which no measures were provided. Given that the amount of undisturbed habitat available in Zone 5 is below the recommended 65% in the recovery strategy, any contribution, however small, could have negative repercussions on the long-term viability of the population (See MMF IR #19 and 22).	Assumptions requiring verification: o Are all of the summer resident caribou actually coastal caribou? o Is the unused calving and rearing habitat in the RSA suitable? o Is the proportion of undisturbed habitat greater beyond the RSA such that the 65% benchmark of undisturbed habitat is met? (What is the estimate of undisturbed habitat beyond the RSA? What area beyond the RSA is measured and considered in this assessment on caribou?)	MMF-0006a
						Assess the effect of habitat disturbance on summer resident caribou for the defined caribou study areas. Alternatively, justify the selection of a larger study area than the caribou RSA as the basis for the predicted impact on summer resident caribou and provide associated measure of intactness.	MMF-0006b	
						Explain why no measures of undisturbed habitat are provided for the caribou LSA and RSA? (What data are used as the foundation of the impact assessment for habitat disturbance on summer resident caribou?)	MMF-0006c	

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7	MMF	TE SV	7.4.6.2.2 Valued Environmental Components - Caribou	7-121 to 7-122; 78-79 (FLCN 2012)	Terrestrial Environment	<p>EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions." The Scoping Document (Section 5.1) sets out that assumptions and analyses that support conclusions regarding Project effects will be described. With respect to conclusions about the impact of Project altered ice conditions on caribou, the EIS does not reconcile differing accounts using data or references when making conclusions about Project impact. Concerns about caribou falling through the ice and drowning due to altered ice conditions were raised by the FLCN (FLCN 2012, p. 78-79). The EIS concludes that caribou drowning is unlikely because "once the ice has formed...post-Project conditions include the formation of a stable ice cover on the reservoir..., including maintaining a steady reservoir level during freeze-up and monitoring ice thickness..., and less variation in water levels once the reservoir is established relative to current conditions" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The impact assessment would benefit from any support that can be provided by existing monitoring data from other GS's in the same watershed given the discrepancy between KCN observations and The Partnerships impact assessment. There are at least four other GS's on the Nelson River that should have data that could be used to inform this impact assessment. The EIS states that "There is no mitigation for dam failure" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-122), but does not indicate the likelihood of dam failure and does not describe the potential impact on caribou. This should be explained so that affected groups can have a complete understanding of potential Project effects.</p>	Describe any mitigation proposed to manage impacts of an altered ice regime (thin ice, air pockets under ice) on caribou mortality.	MMF-0007a
							Can monitoring data from other projects be used to support this prediction, particularly given the discrepancy between KCN observations and The Partnerships impact assessment?	MMF-0007b
							Explain the likelihood of dam failure and the potential impact on caribou.	MMF-0007c
8	MMF	TE SV	7.4.6.2.2 Valued Environmental Components - Caribou	7-121	Terrestrial Environment	<p>EIS Scoping Document Reference: 5.1 Project Effects: "Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation measures will be considered to be potential residual effects; The Scoping Document (Section 5.1) indicates that the EIS will describe the approach and methods used to identify and assess Project effects (Section 5.1). The EIS states that "This new section of PR 280 could increase local caribou hunting activity by domestic resource users" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The EIS concludes that harvest of LSA caribou populations is not expected to affect the broader regional harvest, and thus, the effect is expected to be small. It is not clear if the predicted Project impact is similar for the different caribou herds in the Keeyask region. The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects that are technically and economically feasible will be identified, but more specific details are required to understand how Project impacts might be managed. The EIS refers to Adverse Effects Agreements (AEA) offsetting programs that will result in alternate harvesting opportunities in the SLRMA to offset loss of TR due to the Project and to disperse harvest pressure in the LSA (TE-SV-7.0, Section 7.4.6.2.2, p.7-121). No details are provided of precisely how AEA offsetting programs will disperse existing harvest pressure. AEA offsetting programs mitigate impacts to First Nations Project partners by providing alternative harvesting opportunities. No reference was made to how other potential harvesters, such as Métis members, will be managed.</p>	Describe how the effect of harvest on caribou populations differs between barren-ground and summer resident caribou.	MMF-0008a
							Provide the details of the components of the AEA offsetting program that function as mitigation for harvesting effects on caribou populations. Do these programs give consideration to Métis harvest in the region? How will residual adverse effects on Métis be offset?	MMF-0008b

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9	MMF	N/A	Sections 7.4.2.1.4, 7.4.6.2.1, 7.4.6.2.2, 7.4.6.2.3 (TE SV); Section 6.5.8.1.1, 4.6.3, 6.5.8 (R to EIS); Section 3.3.2 (PD SV)	7-90, 7-117, 7-121 to 7-124, Map 7-27 (TE SV); 6-371, 4-34, 6-367 (R to EIS); 3-14 (PD SV)	Terrestrial Environment	<p>EIS Scoping Document Reference: 5.1 Project Effects: "Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation measures will be considered to be potential residual effects;"</p> <p>The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects that are technically and economically feasible will be identified, but more specific details are required to understand how Project impacts might be managed. The EIS indicates a "high confidence" (TE-SV-7.0, Section 7.4.6.2.3, p. 7-124) in the ability to mitigate and manage potential Project effects on caribou, yet the EIS provides little detail on proposed mitigation measures and does not appear to have provided the details of some plans intended to outline mitigation measures. It is difficult, if not impossible, to understand residual Project effects (and conclusions regarding the magnitude, extent, duration, and direction of residual effects) without a complete understanding of the proposed mitigation measures and the effectiveness of those measures. Details of how mitigation success will be measured, including targets or definitions of success, are not provided.</p> <p>The following proposed mitigation measures require more information in order to have a better understanding of how Project impacts might be managed:</p> <ul style="list-style-type: none"> • "Use of the access roads by resources users will be addressed in the Construction Access Management Plan" (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). During operations, the EIS indicates that Project-related cutlines and trails will be blocked and portions re-vegetated (Section 7.4.6.2.2, p. 7-123). The Preliminary Construction Access Management Plan (http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf) indicates that Manitoba Infrastructure and Transportation (MIT) will assume responsibility for the north and south access roads (with permanent river crossing) once construction is completed. It is not clear if any further mitigation measures are proposed to manage increased access created by the upgraded and permanent north and south roads once construction is complete. • "Roadside ditches will be rehabilitated with native plants with low quality food value for caribou where practicable, to minimize attraction and the risk of collisions and harvest opportunities" (TE-SV-7.0, Section 7.4.6.2.1, p. 7-118), but no description or list of the native plant species to be used is provided. • First Nations indicated concerns about hindered access by wildlife due to debris accumulation on shorelines upon flooding. The EIS concluded a negligible to small effect on local caribou movement along shorelines due to implementation of the Forebay Clearing Plan and Waterways Management Plan (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). A Reservoir Clearing Plan for the Keeyask Project (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_1_090529.pdf) and a Waterways Management Program for the Keeyask Project (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_2_090529.pdf) were found on-line. No measures specific to caribou (or wildlife) movement were included within either report. • The majority of reservoir clearing will be occurring in winter when caribou herds converge on the site (TE-SV-7.0, Section 7.4.2.1.4, p. 7-90, Map 7-27). It is not clear what mitigation measures are proposed to specifically address this scenario for caribou. • Blasting restrictions will be put in place with respect to caribou calving season (Project Description SV, Section 3.3.2, p. 3-14), but it is not clear what mitigation is in place for blasting during other times caribou are present in the Keeyask region. • "A plan is being developed to coordinate caribou mitigation and monitoring activities among MH's northern developments, as well as with government authorities and existing caribou committees and management boards" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be available for review by affected parties. 	Indicate if there will be any ongoing mitigation of increased access by resource users, created by the upgraded and permanent north and south roads, upon completion of construction. If so, please describe.	MMF-0009a
							Describe or list the native plant species to be used in roadside rehabilitation. Are these plant species a potential attractant for other species, such as moose?	MMF-0009b
							Describe proposed mitigation measures to address impacts on local caribou movement due to debris accumulation on shorelines.	MMF-0009c
							Describe the mitigation measures established to minimize impacts when the presence of caribou in the Keeyask region coincides with proposed reservoir clearing.	MMF-0009d
							Indicate if blasting will occur while caribou are present in the Keeyask region. If so, describe the mitigation measure established to minimize the impacts of blasting on caribou.	MMF-0009e
							Indicate when the details of the plan for coordination of caribou mitigation and monitoring activities will be available to the Métis for review.	MMF-0009f
							Indicate how the success of mitigation will be gauged.	MMF-0009g
10	MMF	TE SV	7.4.6.3.1 Valued Environmental Components - Moose; Section 6.5.8.2.1 Mammals - Moose	7-116 (TE SV); 6-378, Map 6-68 (R to EIS)	Terrestrial Environment	<p>EIS Scoping Document Reference: 5.1 Project Effects: In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions."</p> <p>The Scoping Document (Section 5.1) sets out that assumptions and analyses that support conclusions regarding Project effects will be described. More detail is required to understand how conclusions about the Project impact on moose were reached. The EIS concludes that sensory disturbance on moose in the LSA are expected to be negligible to small. This conclusion is partially based on results on the Mammal Monitoring Investigations for the Wuskwatim Generation Project Pre-construction and Construction Report (2004-2009), but no data was provided. The EIS also indicates that moose may avoid heavy traffic roads. The northern access road appears to be within the largest concentration of primary moose habitat in the LSA (R to EIS, Map 6-68) and will be the primary access during construction of the GS (TE-SV-7.0, Section 7.4.6.2.1, p. 7-116). It is not clear if this was factored into the assessment for the impact of sensory disturbance on moose.</p>	• Are the Mammal Monitoring Investigations for the Wuskwatim General Project available for review by the Métis? If so, please provide.	MMF-0010a
							• Was the association between the high levels of use of north access road and primary moose habitat in the LSA factored into the assessment for the impact of sensory disturbance on moose during construction? If not, re-assess the loss of effective habitat in the LSA considering the north access road during construction or add further justification for the negligible to small impact of sensory disturbance on moose during construction considering this information.	MMF-0010b

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11	MMF	TE SV	7.3.6.4.3 Moose - Split Lake Resource Management Area Abundance and Habitat, 7.4.6.3.2 Valued Environmental Components - Moose; Sections 6.5.8.2.1, 6.5.8.2.3 Mammals - Moose (R to EIS)	7-75, Table 7-26, 7-130 (TE SV); 6-379, 6-381	Terrestrial Environment	<p>EIS Scoping Document Reference:</p> <p>5.1 Project Effects: "Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation measures will be considered to be potential residual effects;"</p> <p>The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects that are technically and economically feasible will be identified, but more specific details are required to understand how Project impacts might be managed. The EIS refers to AEA offsetting programs that will result in alternate harvesting opportunities in the SLRMA to offset loss of TR due to the Project and to disperse harvest pressure in the LSA (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). No details are provided of precisely how AEA offsetting programs will disperse existing harvest pressure on moose. AEA offsetting programs mitigate impacts to First Nations Project partners by providing alternative harvesting opportunities. No reference was made to how other potential harvesters, such as Métis members, will be managed.</p> <p>The mean regional moose population is "extra low" according to aerial surveys conducted from 2002 to 2006 (mean 0.04 moose/km²; Table 7-26) and criteria provided in the EIS (Section 7.3.6.4.3, p. 7-75). The EIS concluded that moose harvest in the SLRMA will not likely exceed sustainable limits based on an estimate of current moose harvest (<10% of regional population) sourced from the Moose Harvest Sustainability Plan (MHSP). This information is used to support a prediction of negligible or small effect of moose harvest on the regional moose population. However, it does not appear that the Moose Harvest Sustainability Plan has been finalized or released for review. Understanding the details of the approach to moose management is critical for understanding if and how Project impacts are appropriately and successfully mitigated, particularly given the extra low regional moose population.</p>	<ul style="list-style-type: none"> Provide the details of the components of the AEA offsetting program that function as mitigation for harvesting effects on moose. Do these programs give consideration to Métis harvest in the region? How will residual adverse effects on Métis be offset? Provide the Moose Harvest Sustainability Plan or indicate when it will be available for review by the Métis. 	MMF-0011
12	MMF	TE SV	1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8, 6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV)	-31, 7-127, 7-130, 7-131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22 (PD SV)	Terrestrial Environment	<p>"EIS Scoping Document Reference:</p> <p>5.1 Project Effects: "Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation measures will be considered to be potential residual effects;"</p> <p>The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects that are technically and economically feasible will be identified, but more specific details are required to understand how Project impacts might be managed. The EIS indicates a "high confidence" (TE-SV-7.0, Section 7.4.6.3.3, p. 7-131) in the ability to mitigate and manage potential Project effects on moose, yet the EIS provides little detail on proposed mitigation measures and does not appear to have provided the details of some plans intended to outline mitigation measures. It is difficult, if not impossible, to understand residual Project effects (and conclusions regarding the magnitude, extent, duration, and direction of residual effects) without a complete understanding of the proposed mitigation measures and the effectiveness of those measures. Details of how mitigation success will be measured, including targets or definitions of success, are not provided.</p> <p>The following proposed mitigation measures require more information in order to have a better understanding of how Project impacts might be managed:</p> <ul style="list-style-type: none"> "Use of the access roads by resources users will be addressed in the Construction Access Management Plan" (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127). During operations, the EIS indicates that Project-related cutlines and trails will be blocked and portions re-vegetated (Section 7.4.6.3.2, p. 7-130). The Preliminary Construction Access Management Plan (http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf) indicates that Manitoba Infrastructure and Transportation (MIT) will assume responsibility for the north and south access roads (with permanent river crossing) once construction is completed. It is not clear if any further mitigation measures are proposed to manage increased access created by the upgraded and permanent north and south roads once construction is complete. The EIS indicated that access to the north and south roads will be restricted to "designated resource harvesters only" (TE-SV-1.0, Section 1.5.1, p.1-31). There is no definition of or explanation of how one becomes a "designated resource harvester". It is not clear if this includes Métis members. The EIS makes reference to a Moose Harvest Sustainability Plan developed by TCN to guide the management of their Adverse Effects Agreement Access Program. This Plan apparently contains mitigation to ensure the sustainability of the moose population in the SLRMA. The MHSP appears to be a primary piece of mitigation for moose, yet we are not able to review the detailed information in this report and do not know when we will be able to review the report. "Roadside ditches will be rehabilitated with native plants with low quality food value for moose where practicable, to minimize attraction of moose to the road and the risk of wildlife-vehicle collisions and harvest opportunities" (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127), but no description or list of the native plant species to be used is provided. "Continue to communicate and coordinate with TCN Members to verify that recommendations in the moose harvest sustainability plan are being implemented" (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). There is no indication that any plans are in place to communicate with Métis members regarding Project impacts on moose. The EIS indicates that mitigation for wetland function will benefit moose (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). Map 2-22 (Project Description SV) and Map 4-10 (R to EIS, Section 4.0) show Mitigation Areas and, more specifically, the location of Potential High Quality Wetlands. The route for the Proposed South Access Road runs directly through the Potential High Quality Wetland. It seems likely that this interaction would result in moose adjacent to the road which would increase mortality risk from collisions and/or hunting. It is not clear if this interaction was taken into consideration." 	<ul style="list-style-type: none"> Indicate if there will be any ongoing mitigation of increased access by resource users, created by the upgraded and permanent north and south roads, upon completion of construction. If so, please describe. 	MMF-0012a
						<ul style="list-style-type: none"> Define and explain how one becomes a "designated resource harvester". Does this designation include Métis members? 	MMF-0012b	
						Describe the mitigation measures or plans that are in place to address Métis-specific concerns regarding moose harvest (the Moose Harvest Sustainability Plan seems to be First Nation specific, although this would need to be confirmed once it is available for review).	MMF-0012c	
						Describe or list the native plant species to be used in roadside rehabilitation. Are these plant species a potential attractant for other species, such as caribou?	MMF-0012d	
						Are any plans proposed to communicate with the Métis community regarding moose harvest in Project area?	MMF-0012e	
						<ul style="list-style-type: none"> Indicate if and explain how the interaction between proposed potential high quality wetlands and the south access road was factored into the impact assessment. 	MMF-0012f	
						Indicate how the success of mitigation will be gauged.	MMF-0012g	

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13	MMF	R-EIS Guidelines	8.1.3 Adaptive Management	8-7	Response to EIS Guidelines	EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and Follow-up: "The monitoring programs will determine effects of the Project...To address relevant issues and concerns identified by KCN, other Aboriginal groups and other stakeholders; and To identify the role of KCN in implementing the plans." The EIS outlines numerous potential adaptive management measures for a range of VECs. However, there is no discussion of "action thresholds" or adaptive management triggers. Such triggers are necessary for understanding when to invoke the outlined adaptive management measures, or for modifying planned mitigation measures that are unsuccessful (CEAA 2009).	<ul style="list-style-type: none"> • Provide adaptive management triggers for all VECs considered in CEA, especially for those where the assessment is most uncertain. • Provide a table of adaptive management thresholds and triggers for VECs as a reference tool for use in follow-up and monitoring programs. • Provide potential management actions that would be triggered if thresholds are surpassed. 	MMF-0013
14	MMF	R-EIS Guidelines	8.2.3 Terrestrial Environment Monitoring	8-23, 8-24	Terrestrial Environment	EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and follow-up: "The EIS will describe a preliminary outline of an environmental protection program for monitoring and managing the effects of the Project on the biophysical and socio-economic environments arising from the construction, operation, and decommissioning of the Project". The EIS states that monitoring of caribou and moose VECs will occur "Regularly during construction and continuing for up to 30 years of operation, depending on results." (R to EIS, Section 8.2.3, Table 8-4, p. 8-23). Given the open ended lifespan of the Project, where hydroelectric generating stations can operate for a century or more, limiting the temporal scope of the monitoring program may cause important cumulative effects to be overlooked.	Provide an explanation for limiting the temporal scope of caribou and moose monitoring programs to 30 years post-construction given an expected lifespan of the Project of 100 years or more and the potential for cumulative effects resulting from the high level of development and disturbance already occurring and expected to increase in the region over the life of this Project.	MMF-0014
15	MMF	R-EIS Guidelines	8.0 Monitoring and Follow-up	8-26	Terrestrial Environment	EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and follow-up: "The EIS will describe a preliminary outline of an environmental protection program for monitoring and managing the effects of the Project on the biophysical and socio-economic environments arising from the construction, operation, and decommissioning of the Project". The EIS states that monitoring of predators will occur annually during construction, and then every 5 years, for only 30 years, during operations. Given the natural variability in population dynamics of potential prey species (e.g. caribou and moose), and the cumulative effects already impacting prey species, it would seem finer temporal scale data, over a longer period would be necessary to separate potential causal factors (e.g. density independent or dependent factors from anthropogenic factors) for prey species declines.	Provide an ecologically based explanation for limiting the temporal scope of gray wolf monitoring programs to every 5 years for only 30 years post-construction given the indeterminate lifespan of the Project.	MMF-0015
16	MMF	TE SV	7.4.10 (TE SV); 5.3.2.1, 8.2.7 (R to EIS)	7-152 (TE SV); 5-7, 8-39 (R to EIS)	Terrestrial Environment	EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and Follow-up: "The monitoring programs will determine effects of the Project...To address relevant issues and concerns identified by KCN, other Aboriginal groups and other stakeholders; and To identify the role of KCN in implementing the plans." The Scoping Document (Section 7.0) sets out that monitoring programs will address relevant issues and concerns identified by KCN, other aboriginal groups and other stakeholders. Unfortunately, neither the Scoping Document nor the EIS describe how relevant issues and concerns will be identified nor how Métis members will be involved. The EIS states that "Monitoring is outlined for situations where the ATK and technical assessments differ, where a prediction has substantial uncertainty or a difference between predicted and actual residual effects could substantially alter the effects assessment." (TE-SV-7.0, Section 7.4.10, p. 7-152; R to EIS, Section 5.3.2.1, p. 5-7). It is not clear how it would be determined that there is a potential for "substantial" alteration to the effects assessment. The EIS contains extensive discussion of the role the Keeyask Cree Nations (KCNs) will play in the monitoring and follow-up programs for the Project, including participation in their development and implementation which "will facilitate capacity building by providing employment and training opportunities" (R to EIS, Section 8.2.7, p. 8-39) for their members. The EIS also discusses plans to facilitate communications with KCN communities through forums such as open houses to keep "community Members updated on Project activities, adverse effects, and proposed mitigation strategies." (R to EIS, Section 8.2.7, p. 8-39). No mention is made in the EIS if these same opportunities for participation and capacity building will be extended to Manitoba Métis Federation members."	Explain how it is determined that there could be a substantial alteration to the effects assessment such that monitoring would be implemented.	MMF-0016a
							Will Manitoba Métis Federation members be invited to participate in the development and implementation of monitoring and follow-up programs related to the Project? If yes, explain to what extent the Métis will be involved. If no, explain why the Métis will not be involved.	MMF-0016b
							Will monitoring results be communicated on a regular basis to Manitoba Métis Federation members? If so, what approach to communication (frequency, venue, in person or in person meetings) would be taken?	MMF-0016c
17	MMF	R-EIS Guidelines	8.0 Monitoring and Follow-up	N/A	Response to EIS Guidelines	EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and follow-up: "The EIS will describe a preliminary outline of an environmental protection program for monitoring and managing the effects of the Project on the biophysical and socio-economic environments arising from the construction, operation, and decommissioning of the Project". The EIS provides a general outline of the terrestrial monitoring program, but contains no details on the sampling design for the monitoring and follow-up programs for terrestrial VECs including caribou and moose. The Preliminary Environmental Protection Program (EPP) document, released on April 26, 2013, states "The Partnership currently plans to file a preliminary draft of the Terrestrial Effects Monitoring Plan in the second quarter of 2013".	Is the draft terrestrial monitoring plan still scheduled to be released in the second quarter of 2013? If so, please provide a copy to the Métis for review.	MMF-0017

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18	MMF	R-EIS Guidelines	Chapters 6 and 7	N/A	Terrestrial Environment	EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects assessment will focus on VECs (as described in section 3.3.1) the may be adversely affected by the Project and will consider likely adverse effects caused by the other projects or human activities that overlap in time and space with those of the Project". The EIS lacks a description of pre-disturbance baseline conditions for VECs such as caribou and moose that can be used to assess the cumulative effects of development. A general description is provided of caribou and moose conditions in the past and, based on the qualitative descriptions from KCN members, it sounds like past development has already had a significant cumulative impact on caribou and moose. Better technical data on historical conditions is required to understand change in VEC condition from pre-hydro development to the current day and into the future. A similar issue was noted as part of the review process for the Bipole III project: "The development of a baseline for evaluation of cumulative effects is more than a description of current conditions, which alone can discount the effects of past changes as simply the 'new normal'. Baseline development requires a retrospective analysis of how VEC conditions have changed over time and whether that change is significant in terms of the sustainability of the VEC." (Gunn and Noble, 2012)	Include a retrospective analysis of the historical or reference state of caribou and moose VECs in order to establish baseline conditions from which to assess change in VECs over time due to cumulative impacts of development in the region.	MMF-0018
19	MMF	R-EIS Guidelines	6.5.8.1.1 Mammals - Caribou; Chapter 7	6-137	Terrestrial Environment	EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects assessment will focus on VECs (as described in section 3.3.1) the may be adversely affected by the Project and will consider likely adverse effects caused by the other projects or human activities that overlap in time and space with those of the Project". The qualitative nature of the CEA makes comparing VEC conditions from the past, present and into the future very difficult and highly subjective. The CEA does not present clear thresholds for understanding the significance of cumulative effects currently, or into the future. The only threshold we observed was the 65% undisturbed habitat threshold to sustain a caribou population from Environment Canada (2012), and currently only 48% of the caribou range in Zone 5 is undisturbed (R to EIS, Section 6.5.8.1.1, p. 6-371), suggesting caribou are already experiencing significant cumulative impacts in the region. Quantitative thresholds are necessary for understanding the significance of past cumulative effects and the significance of future impacts on the VECs (Gunn and Noble 2012).	<ul style="list-style-type: none"> • Provide relevant, quantitative, threshold values for assessing the significance of cumulative effects on caribou and moose VECs. • Cumulative effects for caribou and moose are variously determined in Chapter 7 to be 'small', 'relatively small', or 'negligible'. Define the scales used to determine the magnitude and significance of cumulative effects acting on VECs. 	MMF-0019
20	MMF	R-EIS Guidelines	7.5.2.2.3 Summary of Cumulative Effects on the Project with Past and Current Projects/Activities - Mammals	7-29, 7-30	Terrestrial Environment	EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects assessment will focus on VECs (as described in section 3.3.1) the may be adversely affected by the Project and will consider likely adverse effects caused by the other projects or human activities that overlap in time and space with those of the Project". The EIS states that the "main Project effects on intactness are predicted to include a slight reduction in total linear feature density (positive effect) due to existing cutlines being replaced by Project features" (Section 7.5.2.2.1, p.7-28). It is unclear how overlaying Project features on pre-existing cutlines equals a decrease in linear disturbance. At best should it not mean that no more linear disturbance will be created?	Clarify how overlaying Project features on pre-existing cutlines will reduce the amount of linear disturbance leading to a positive effect on cumulative impacts.	MMF-0020
21	MMF	R-EIS Guidelines	7.5.2.2.3 Summary of Cumulative Effects of the Project with Past and Current Projects/Activities - Mammals	7-29, 7-30	Terrestrial Environment	EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects assessment will focus on VECs (as described in section 3.3.1) the may be adversely affected by the Project and will consider likely adverse effects caused by the other projects or human activities that overlap in time and space with those of the Project". The manner in which Project related effects are discussed in the CEA downplays the significance of the total cumulative effects caused by past and current developments and the addition of any Project specific impacts to that total. For example, the Project is expected to have small or negligible impacts on cumulative effects for caribou, yet based on habitat disturbance thresholds provided in the EIS (See MMF IR# 19) it would appear that there already are significant cumulative effects of development on caribou in the region. When discussing the cumulative effects of the Project with past and current projects/activities as this section does, it would seem like the effect of the Project should be added to the pre-existing cumulative effects to determine total cumulative effects and then assess their significance. Instead this section primarily discusses Project specific effects relative to cumulative effects from past and current projects/activities, downplaying the importance of the total cumulative effect on the VEC in question.	Discuss the significance of total cumulative effects on caribou and moose in the presence and absence of the Project. Does significance of the cumulative effect change by adding or removing the Project?	MMF-0021
22	MMF	R-EIS Guidelines	7.5.2.2.3 Summary of Cumulative Effects of the Project with Past and Current Projects/Activities - Mammals	7-35	Terrestrial Environment	EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects assessment will focus on VECs (as described in section 3.3.1) the may be adversely affected by the Project and will consider likely adverse effects caused by the other projects or human activities that overlap in time and space with those of the Project". Linear disturbances are well known to have complex and significant impacts on caribou distribution and movement (Dyer et al. 2001; Scurrah and Schindler 2012). The EIS states that while "the Keeyask Transmission Project could result in one or more transmission line rights-of-way south of Stephens Lake, it is not likely to limit caribou from passing through the area and calving on islands in the lake" (R to EIS, Section 7.5.2.3.3, p. 7-35), but provides no evidence to support this statement. The EIS assumes there will be no significant cumulative effect of future projects.	Provide supporting literature or data for the assumption that future increases in linear disturbance will not hinder movement or restrict the distribution of caribou in the region.	MMF-0022

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23	MMF	R-EIS Guidelines	5.2, 6.6 (R to EIS); 1.0 (SE SV)	5-1, 5-6, 6-426 (R to EIS); 1-18 (SE SV)	Response to EIS Guidelines	<p>"EIS Scoping Document Reference: 3.5 Spatial and Temporal Boundaries. Spatial boundaries (i.e. the study areas) will be established for the Project effects assessment. Study areas may vary between various environmental components, as appropriate. The EIS will explain the rationale used to determine the study area for various environmental components. 5.1 Project Effects. The EIS will identify the potential positive and adverse environmental effects of the Project. Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation will be considered to be potential residual effects. The EIS states that the extent to which the Project would have an effect on people "...depends largely on their proximity to and level of involvement in the Project" (R to EIS, Section 6.6, p. 6-426). The Socio-economic Local Study Area is defined as consisting of "...the four partner First Nation communities of TCN, WLFN, FLCN and YFFN, the Town of Gillam and the City of Thompson..." (R to EIS, Section 6.6, p. 6-426). The EIS goes on to state that the four KCNs are affected by the Project through the following pathways of effect: <ul style="list-style-type: none"> 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 (Socio-economic SV, Section 1, p. 1-18). </p> <p>The Project was subject to two evaluations, "...the first of which was conducted by the Keeyask Cree Nations (KCNs) for their internal purposes and the second of which is a public review currently being conducted by federal and provincial environmental regulators" (R to EIS, Section 5.2, p. 5-1). As "in-vicinity" First Nations, the KCNs are described as having "...played an integral role, along with Manitoba Hydro, in directing and shaping the assessment" (R to EIS, Section 5.2, p. 5-6). There are Métis residing in the Local Study Area, including, , the Town of Gillam and some of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this, the Métis have not been considered or assessed as a distinct group in the Local Study Area."</p>	<ul style="list-style-type: none"> What criteria were used to define the KCNs in the Local Study Area as "in-vicinity"? What criteria were used to exclude the Métis from being defined as "in-vicinity", particularly those who reside in the Local Study Area? Why were the Métis not identified as a distinct group in the Local Study Area? Explain how the Métis in the Local Study Area will not be affected by the same pathways of effect as are identified for the KCNs. Why were impacts of the Project on Métis in the Local Study Area not considered and assessed, as a distinct group, and to the same level of assessment, as First Nations in the Local Study Area? Why was there no equivalent evaluation process provided to the Manitoba Métis Federation to evaluate the impacts of the project on the Métis residing in and using the Local Study Area, similar to the evaluation process that was provided to the First Nations in the Local Study Area? Explain how impacts on the Métis, as a distinct group in the Local Study Area, have been adequately assessed, without consideration of the Métis as a distinct group in the Local Study Area, and without the provision of this same evaluation process to the Métis." 	MMF-0023
24	MMF	R-EIS Guidelines	4.3.3 Environmental Mitigation/Compensation; 6.6.2 Aboriginal Traditional Knowledge	4-15, 6-430		<p>EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential positive and adverse environmental effects of the Project. Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation will be considered to be potential residual effects. Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro "...as a proactive approach... ..to address known and foreseeable adverse effects their traditional knowledge and past experience with hydro development was telling them would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and offsetting programs that are intended to provide replacements and opportunities to offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15). There are Métis residing in the Local Study Area, including, , the Town of Gillam and some of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this, the Métis have not been considered or assessed as a distinct group in the Local Study Area.</p>	At what point during the Project environmental assessment were the AEAs negotiated with the KCNs?	MMF-0024a
							How were "known and foreseeable adverse effects" accepted or validated by Manitoba Hydro or the KHLP?	MMF-0024b
							How were "known and foreseeable adverse effects" quantified by Manitoba Hydro or the KHLP for the AEAs?	MMF-0024c
							In addition to traditional knowledge and past experience, what information from the environmental and socioeconomic assessment (e.g. regarding potential impacts of the Project on the KCNs) informed the content of the AEAs?	MMF-0024d
							What efforts were undertaken to gather and document Métis past experiences with hydro development and Metis traditional knowledge, with the same purpose of addressing "known and foreseeable adverse effects" on the Métis?	MMF-0024e
							Describe any mitigation or offset programs that include or apply specifically to the Métis.	MMF-0024f
							Why was an AEA not negotiated with the Manitoba Métis Federation?	MMF-0024g
Explain how impacts on the Métis, as a distinct group in the Local Study Area, have been adequately mitigated, without consideration of the Métis as a distinct group in the Local Study Area, and without negotiation of an AEA with the Métis.	MMF-0024h							
25	MMF	R-EIS Guidelines	8.0 Monitoring and Follow-up	8-1, 8-3, 8-6, 8-27 - 8-33	Response to EIS Guidelines	<p>EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and Follow-up. The EIS will describe a preliminary outline of an environmental protection program for monitoring and managing the effects of the Project on the biophysical and socio-economic environments arising from the construction, operation, and decommissioning of the Project. ...The monitoring programs will determine effects of the Project, including: whether they are consistent with the analysis in the environmental impact assessment; whether they assess the effectiveness of remedial measures; and whether they allow for adaptive management and mitigation measures to be implemented if unforeseen impacts occur. The EIS states that an Environmental Protection Program will be developed to mitigate, manage and monitor potential environmental effects during the construction and operation phases of the Project. It will be comprised of three types of plans: protection plans, management plans, and monitoring plans (R to EIS, Chapter 8.0, p. 8-1). Environmental monitoring plans are designed "...to measure the actual effects of the Project, test predictions or identify unanticipated effects" (p. 8-6). A Socio-economic Monitoring Plan (SEMP) will be developed to monitor effects on components "...such as employment, business opportunities, traffic, and safety" (R to EIS, Chapter 8.0, p. 8-6). The EIS states that the SEMP will be developed by the Partnership, and it is expected that the KCNs will play a central role in its development and implementation (R to EIS, Chapter 8.0, p. 8-27). There are Métis residing in the Local Study Area, including, , the Town of Gillam and some of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this, the Métis have not been considered or assessed as a distinct group in the Local Study Area.</p>	<ul style="list-style-type: none"> Will the Métis, particularly those residing in and using the Local Study Area, be involved in the development and implementation of the SEMP? If yes, explain to what extent the Métis will be involved. If no, explain why the Métis will not be involved. 	MMF-0025a
							<ul style="list-style-type: none"> Where specific impacts on the Métis have not been identified, explain how the SEMP will "identify unanticipated effects" that are experienced by the Métis as a result of the Project. 	MMF-0025b
							<ul style="list-style-type: none"> Which of the "Supporting Topics or VECs" listed in Table 8-5 (p. 8-28) will have Métis-specific data gathered and documented as part of the monitoring activities? 	MMF-0025c

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26	MMF	R-EIS Guidelines	3.4.1.3 Manitoba Metis Federation (R to EIS); Appendix 1A - Public Involvement Plan (PIP SV)	3-2, 3-3 (R to EIS); 1A-7 (PIP SV)	Public Involvement	EIS Scoping Document Reference: 3.3.1 – Public Involvement – Aboriginal People. The EIS will describe the consultation and involvement processes with the Keeyask Cree Nations (KCN), other First Nations, and Metis related to the environmental assessment. The Public Involvement Plan is described as applying to “Potentially affected Aboriginal people”, but not to the four “in-vicinity” First Nations (the KCNs). It defines “Potentially affected Aboriginal people” as “Beyond the in-vicinity First Nations, other Aboriginal people (First Nation, Metis, and Inuit people) who may be affected by the Project...” (Public Involvement SV, Appendix 1A, p. 1A-7). There is therefore a distinction between Métis and First Nations who reside in the same communities in the Local Study Area, with the KCNs defined as “in-vicinity” to the project while the Métis are not.	How would the Métis have been engaged differently by Manitoba Hydro if they were defined and considered as “in-vicinity”, particularly those Métis residing in communities and using land in the Local Study Area?	MMF-0026
27	MMF	R-EIS Guidelines	6.2.3.5.2 Economy	6-144	Socio-Economy	EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...” The EIS presents information on the levels of educational attainment for the KCNs Members, the Town of Gillam, and the City of Thompson in the Local Study Area. It also presents this information for northern Aboriginal residents, comparing it to educational levels in the Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-144). It does not present information on the levels of educational attainment of the Métis population in the Local Study Area and Regional Study Area. This information would be useful for determining the potential Métis labour force, and would be necessary to measure changes in the levels of education for Métis in the Local and Regional Study Areas, particularly if these changes are to be attributed to the Project.	<ul style="list-style-type: none"> • Provide information on the current levels of educational attainment of the Métis population in the Local Study Area communities. • Provide information on the levels of educational attainment of the Métis population in the Regional Study Area communities. 	MMF-0027a
							<ul style="list-style-type: none"> • Provide information on the levels of educational attainment of the Métis population in the Regional Study Area communities. 	MMF-0027b
28	MMF	R-EIS Guidelines	6.2.3.5.2 Economy	6-145, 6-146	Socio-Economy	EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...” The Proponent produced an inventory of skills pertinent to Project construction employment to complement the Statistics Canada information that was gathered. For the KCNs, “...this provides a more direct estimate of individuals who may be qualified for Project construction jobs” (R to EIS, Section 6.2.3.5.2, p. 6-145). The EIS (Table 6-12) presents estimates of the number of KCNs Members with relevant skills according to broad job categories required for Project construction, for the years 2014 (construction start) and 2021 (construction end) (R to EIS, Section 6.2.3.5.2, p. 6-146). The EIS does not provide the equivalent information for the Métis population in the Local Study Area and the Regional Study Area. This information would be useful for determining the potential Métis labour force, and would be necessary to measure changes in the skill levels and employability of Métis in the Local and Regional Study Areas, particularly if these changes are to be attributed to the Project.	<ul style="list-style-type: none"> • Provide information on the current (i.e. 2014, construction start) levels of skills by occupational category for the Métis population in the Local Study Area communities and Regional Study Area. 	MMF-0028a
							<ul style="list-style-type: none"> • Provide information on the estimated levels of skills by occupational category for the Métis population in the Local Study Area communities and Regional Study Area in 2021 (construction end). 	MMF-0028b
29	MMF	R-EIS Guidelines	6.2.3.5.2 Economy (R to EIS); 3.3.1.1 Pre-Project Training - Hydro Northern Training and Employment Initiative (SE SV)	6-140 (R to EIS); Table 3-2, p. 3-20 (SE SV)	Socio-Economy	EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...” The EIS describes the Hydro Northern Training and Employment Initiative (HNTEI) as a pre-project training initiative, implemented to prepare Aboriginal northerners to participate in the construction employment and business opportunities available from northern hydroelectric development, including the Keeyask Projects (R to EIS, Section 6.2.3.5.2, p. 6-140). Ninety-one members of the MMF are reported to have completed courses or programs (2009, 2010) (Socio-economic SV, Table 3-2, p. 3-20).	<ul style="list-style-type: none"> • Provide information regarding the level of Métis enrollment in this initiative to compare to the numbers of course and program completions. • Provide information regarding the employment of Métis participants following completion of the courses and programs, as well as the number of Métis estimated to be employed on the Keeyask Project as a result of participation in this initiative. 	MMF-0029a
							<ul style="list-style-type: none"> • Provide information regarding the employment of Métis participants following completion of the courses and programs, as well as the number of Métis estimated to be employed on the Keeyask Project as a result of participation in this initiative. 	MMF-0029b

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30	MMF	R-EIS Guidelines	6.2.3.5.2 Economy	6-141, 6-142	Socio-Economy	<p>EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS presents information on the potential labour force in the KCNs communities, the Town of Gillam, the City of Thompson, and general labour force information for the Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-142). It does not present information on the Métis potential labour force in the Local Study Area and Regional Study Area.</p> <p>To estimate the extent to which KCNs Members and the Regional Study Area Aboriginal workforce would participate in construction employment opportunities, a labour supply/demand model was developed (R to EIS, Section 6.6.3.1.1, p. 6-433). It does not include data on the potential labour force of the Métis, and nor does it provide information specific to the estimated levels of Métis participation in construction employment.</p>	<ul style="list-style-type: none"> • Provide information on the potential labour force of the Métis in the Local Study Area communities, equivalent to the potential labour force information provided for the KCNs, Gillam, and Thompson. 	MMF-0030a
							<ul style="list-style-type: none"> • Provide information on the potential labour force of the Métis in the Regional Study Area. 	MMF-0030b
31	MMF	R-EIS Guidelines	6.6.3 Economy (R to EIS); 3.0 Economy (SE SV)	6-434, 6-435 (R to EIS); 3-98, 3-125 (SE SV)	Socio-Economy	<p>EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS states that the Project is expected to generate “...an estimated 235 to 600 person years of construction employment for KCNs Members, which equates to 6-14% of the total construction workforce” (R to EIS, Section 6.6.3, p. 6-434). During construction, the JKDA includes an employment target of 630 person-years of employment for the KCNs. The target includes their participation in construction of the Keeyask Generation Project as well as their participation in employment opportunities associated with the Keeyask Infrastructure Project (R to EIS, Section 6.2.3.5.2, p. 6-435; Socio-economic SV, Section 3, p. 3-98). With regard to “Aboriginal workers from the Regional Study Area” the EIS states that the Project “is expected to provide substantial construction employment... ..ranging from an estimated 550 to 1,700 person years. At these levels, between 13% and 40% of total construction employment would be filled by Aboriginal workers from the Regional Study Area” (R to EIS, Section 6.6.3, p. 6-435).</p> <p>Commitments in the JKDA also include 20-year targets for employment of KCNs Members during operations with Manitoba Hydro, across Manitoba Hydro’s entire system, not just for the Keeyask Generation Project. The target level of employment for all four KCNs is 182 jobs, with 100 jobs for TCN Members, 10 for WLFN Members, 36 for YFFN Members, and 36 for FLCN Members by 2029 (Socio-economic SV, Section 3, p. 3-125).</p> <p>The EIS distinguishes between the KCNs, Gillam, and Thompson in the Local Study Area, and Aboriginal workers from the Regional Study Area (which includes the KCNs). In doing so, it does not include specific information on estimated levels of employment of Métis in the Local Study Area and the Regional Study Area during construction and operations.</p>	<ul style="list-style-type: none"> • Provide information on the estimated (or anticipated) levels of employment for the Métis as follows: <ul style="list-style-type: none"> o What is the estimated level of construction employment for Métis in the Local Study Area? o What is the estimated level of construction employment for Métis in the Regional Study Area? o What is the estimated level of operations employment for Métis in the Local Study Area? o What is the estimated level of operations employment for Métis in the Regional Study Area? 	MMF-0031a
							<ul style="list-style-type: none"> • Why are no targets established for Métis participation in construction and operations employment? 	MMF-0031b
32	MMF	R-EIS Guidelines	6.6.4.1.1 Population	6-450	Socio-Economy	<p>EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).” 5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS states that KCNs Members would qualify for Project hiring preferences “...regardless of their home address within the province of Manitoba...” (R to EIS, Section 6.6.4.1.1, p. 6-450) and as such, would not need to move to communities in the Local Study Area. This measure is intended to address potential in-migration to, and crowding in, the Local Study Area communities; however, it has implications for the Métis in terms of hiring preferences.</p>	<ul style="list-style-type: none"> • Confirm whether KCN Members residing outside of the Local Study Area will be given employment preference to equally qualified Métis residing within the Local Study Area. 	MMF-0032a
							<ul style="list-style-type: none"> • If employment preference is given to KCN Members, provide a rationale for this provision. 	MMF-0032b

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33	MMF	R-EIS Guidelines	6.2.3.5.2 Economy, 6.6.3.2 Business Opportunities	6-146, 6-438-6-442	Socio-Economy	<p>EIS Scoping Document Reference:</p> <p>4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local Aboriginal and non-Aboriginal communities and the regional centre, with an emphasis on the labour force, employment, unemployment, income, and education and training, and with a profile of local business capacity (e.g., goods and services).”</p> <p>5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS presents information about the capacity of existing businesses to participate in opportunities that may arise from the Project, and states that “KCNs businesses are of particular interest given the direct negotiated contracts (DNCs) that will be made available to them as a result of the JKDA” (R to EIS, Section 6.2.3.5.2, p. 6-146). It provides a description of the range of KCNs Members’ businesses with the potential for participating in Keeyask-related contracts, and then describes the capacity of Gillam and Thompson to supply needed services to the Project (R to EIS, Section 6.2.3.5.2, p.6-146). The EIS concludes that “...the majority of business opportunities in the Local Study Area are expected to flow to the KCNs through DNCs” (R to EIS, Section 6.6.3.2, p. 6-439) and further, that “Business effects in the Regional Study Area are expected to be minimal in comparison to communities in the Local Study Area.” (R to EIS, Section 6.6.3.2, p. 6-438).</p> <p>It is not apparent whether any efforts were undertaken to determine the presence and capacity of Métis-owned businesses in the Local Study Area communities (i.e. including in Gillam and in Thompson) and the Regional Study Area. The extent to which Métis-owned businesses can be anticipated to participate in opportunities that may arise from the Project is also not known.</p>	<ul style="list-style-type: none"> Describe the efforts that were undertaken to determine the presence and capacity of Métis-owned businesses in the Local Study Area communities and the Regional Study Area that could participate in opportunities to supply services to the Project. 	MMF-0033a
							<ul style="list-style-type: none"> Provide information on the number of Métis-owned businesses in the Local Study Area communities and the Regional Study Area that provide services needed by the project, regardless of whether these can be met by existing KCNs Members’ businesses. 	MMF-0033b
							<ul style="list-style-type: none"> Provide an estimate of the extent to which the above-identified Métis-owned businesses can expect to participate in opportunities that may arise from the Project. 	MMF-0033c
34	MMF	R-EIS Guidelines	6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.1 Population (R to EIS); 4.0 Population, Infrastructure and Services (SE SV)	6-148 - 6-151, 6-449 - 6-451 (R to EIS); 4-34, 4-97 (SE SV)	Socio-Economy	<p>EIS Scoping Document Reference:</p> <p>4.2.2 – Population, Infrastructure, and Services: “The EIS will describe the following attributes in the relevant study area(s): Existing population distribution and demographics, ...”.</p> <p>5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>As stated in the EIS, “Population is a supporting topic that leads to an understanding of changes to housing, infrastructure and services” (R to EIS, Section 6.6.4.1, p. 6-449). Using Statistics Canada 2006 Census data, the EIS provides the populations of (1) the KCNs combined, including both on- and off-reserve Members, (2) Gillam, and (3) Thompson. The EIS then provides population projections to understand population growth both with and without the project. The analysis focuses on the Local Study Area; the Project is not expected to result in population changes in the Regional Study Area (R to EIS, Section 6.2.3.5.3, p.6-149, p. 6-150; R to EIS, Section 6.6.4.1, p. 6-449, p. 6-450).</p> <p>Forty-five percent of the population of Gillam self-identified as Aboriginal in the 2006 Census (Socio-economic SV, Section 4, p. 4-34), while 72% of the population of the Regional Study Area is identified as Aboriginal (Socio-economic SV, Section 4, p. 4-97). The EIS, however, does not present information regarding the Métis population in the Local Study Area communities, or the distribution of the Métis population in the Local and Regional Study Areas. This information would enable a better understanding of how the Métis residing in communities in the Local Study Area might experience impacts as a result of changes in population. This understanding is particularly critical, as the Métis are not specifically included in the mitigation and offsetting programs conducted as part of the Adverse Effect Agreements (AEAs) negotiated between the KCNs and Manitoba Hydro.</p>	<ul style="list-style-type: none"> Provide estimates of the Métis population in the Local Study Area, including, specific communities. 	MMF-0034a
							<ul style="list-style-type: none"> Provide estimates of the Métis population in the Regional Study Area, including, specific communities. 	MMF-0034b
35	MMF	R-EIS Guidelines	6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.2 Housing	6-152, 6-153, 6-453 - 6-455	Socio-Economy	<p>EIS Scoping Document Reference:</p> <p>4.2.2 – Population, Infrastructure, and Services: “The EIS will describe the following attributes in the relevant study area(s): Existing infrastructure and services of Aboriginal and other in-vicinity communities, including... ..housing/accommodation supply...”</p> <p>5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS describes the current availability of housing in the KCNs communities, Gillam, and Thompson (R to EIS, Section 6.2.3.5.3, p. 6-152), and predicts the residual effects of Project construction on housing in the KCNs communities, Gillam and Thompson to be adverse, in terms of the demand that will be created for housing, particularly temporary housing, during construction, and in the context of current levels of housing availability (R to EIS, Section 6.6.4.2, p. 6-453).</p> <p>It is necessary to understand how adverse impacts on housing during construction might be experienced by the Métis populations residing in Local Study Area communities. (To understand the magnitude of this impact, it is necessary to understand the size of the Métis populations in the Local Study Area communities. A previous IR requested that the Proponent provide an estimate of the Métis populations in the Local Study Area communities).</p>	<ul style="list-style-type: none"> Predict how the Métis population in the Local Study Area communities, particularly Gillam, might be anticipated to experience adverse effects on the availability of housing during construction. 	MMF-0035a
							<ul style="list-style-type: none"> Identify measures that could be implemented, and identify the party or parties responsible for their implementation, to lessen the predicted adverse effects to housing as specifically experienced by the Métis. 	MMF-0035b

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36	MMF	R-EIS Guidelines	6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.3 Infrastructure and Services	6-153 to 6-156, 6-455 to 6-459	Socio-Economy	<p>EIS Scoping Document Reference:</p> <p>4.2.2 – Population, Infrastructure, and Services: “The EIS will describe the following attributes in the relevant study area(s): Existing infrastructure and services of Aboriginal and other in-vicinity communities...”</p> <p>5.1 – Project Effects: “Based on the description of the Project... ..and the existing environment... ..the EIS will identify the effects of the Project on the environment...”</p> <p>The EIS describes existing infrastructure and service delivery in the KCNs, Gillam and Thompson (R to EIS, Section 6.2.3.5.3, p. 6-153 to 6-156), and predicts residual effects of Project construction on the infrastructure and services of the Local Study Area communities to be adverse (R to EIS, Section 6.6.4.3, p. 6-458). To address adverse effects, mitigation measures are provided for Local Study Area communities (R to EIS, Section 6.6.4.3, p. 6-458). As well, new infrastructure and services are included in the AEAs negotiated between each of the KCNs and Manitoba Hydro (R to EIS, Section 6.6.4.3, Table 6-45, p.6-457).</p> <p>It is necessary to understand how adverse impacts on infrastructure and services during construction might be experienced by the Métis populations residing in Local Study Area communities. (To understand the magnitude of this impact, it is necessary to understand the size of the Métis populations in the Local Study Area communities. A previous IR requested that the Proponent provide an estimate of the Métis populations in the Local Study Area communities). This understanding is particularly critical, as Manitoba Hydro has not negotiated an AEA with the Métis in the Local Study Area, and as such, several of the new infrastructure and services that will be available to the KCNs will not be available to the Métis in the Local Study Area communities.</p>	<ul style="list-style-type: none"> • Predict how the Métis population in the Local Study Area communities, particularly Gillam, might be anticipated to experience adverse effects on infrastructure and services during construction. • Identify measures that could be implemented, and identify the party or parties responsible for their implementation, to lessen the predicted adverse effects to infrastructure and services as specifically experienced by the Métis. 	MMF-0036

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37	MMF	R-EIS Guidelines	6.6.5.1 – Governance, Goals and Plans, 6.6.5.2 – Community Health, 6.6.5.3 – Mercury and Human Health, 6.6.5.6 – Culture and Spirituality	6-465 to 6-468, 6-468 to 6-473, 6-473 to 6-478, 6-490 to 6-497	Socio-Economy	<p>EIS Scoping Document Reference: 4.2.3 – Personal, Family and Community Life: The EIS will describe the following attributes in the relevant study area(s): public safety; travel, access and safety; aesthetics; health status and health issues; culture and spirituality; governance, goals and plans. Some of the VECs used to assess the effects of the Project on personal, family and community life in the Local Study Area include (1) Governance, Goals and Plans, (2) Community Health, and (3) Mercury and Human Health. The assessment results for each of these VECs are described below.</p> <p>“Overall, the expected and likely Project residual effects on the KCNs governance, goals and plans are expected to be positive due to existing provisions of the JKDA and AEAs and ongoing involvement in Project committees and the Board. Residual effects on Gillam and Thompson governance, goals and plans are expected to be neutral (due to the planning processes already in hand)” (R to EIS, Section 6.6.5.1, p. 6-468).</p> <p>Governance, Goals and Plans In the discussion for this VEC, a description of Métis governance, goals and plans, and how the Project could be expected to impact these, is not included. Furthermore, and as evident in the above text, the Proponent is relying on the JKDA and the AEAs to mitigate impacts to the KCNs. This has implications for the Métis, with whom Manitoba Hydro has not negotiated an AEA.</p> <p>“Overall, residual Project effects on community health are expected to be adverse for the construction phase due to the potential for increased alcohol and drug use, adverse worker interactions and worry about impending changes to the environment; and positive for the operation phase due to the implementation of AEA programs and the commitment to ongoing communication and planning” (R to EIS, Section 6.6.5.2, p. 6-473).</p> <p>Community Health In the discussion for this VEC, there is no description of Project effects on the community health of the Métis population in the Local Study Area communities. Furthermore, and as evident in the above text, the Proponent is relying on the JKDA and the AEAs to mitigate impacts to the KCNs. This has implications for the Métis, with whom Manitoba Hydro has not negotiated an AEA.</p> <p>Mercury and Human Health As part of the assessment, a human health risk assessment was conducted. “The human health risk assessment evaluated the potential exposure to methylmercury for the KCNs, as these are the communities at greatest risk due to their use of country foods. Although the human health risk assessment focused on the KCNs, the baseline conditions and results of the risk assessment are also generally applicable to non-First Nation individuals who use Stephens Lake and/or Gull Lake for resource harvesting in a similar capacity” (R to EIS, Section 6.6.5.3, p.6-474). The EIS predicted residual Project effects on mercury and human health to be adverse during the operation phase, “due to the elevated levels of methylmercury in country foods” (R to EIS, Section 6.6.5.3, p. 6-478). To mitigate adverse effects, the Proponent has referred to the AEAs. “Reduced use of country foods may have its own health effects. To address this concern, fish replacement programs have been included in each of the KCNs AEAs as a key measure to encourage continued use of country food from areas unaffected by the Project” (R to EIS, Section 6.6.5.3, p. 6-477). In the discussion for this VEC, and apparent in the above text, the Proponent is relying on the JKDA and the AEAs to mitigate impacts to the KCNs. This has implications for the Métis, with whom Manitoba Hydro has not negotiated an AEA.</p> <p>Culture and Spirituality The discussion of this VEC is restricted to the KCNs; there is no apparent consideration of the impacts of the Project on Métis culture and spirituality. Overall, the residual Project effects on culture and spirituality are expected to be adverse (R to EIS, Section 6.6.5.6, p.6-496). To address these adverse effects, the Proponent refers to the AEAs negotiated between Manitoba Hydro and the KCNs. “Within each agreement, a set of cultural and AEA offsetting programs were developed which deal directly with the potential adverse effects of the Project on culture and spirituality” (R to EIS, Section 6.6.5.6, p. 6-491).</p>	For each of the VECs described above, explain how adverse impacts on the Métis population residing in the Local Study Area communities will be identified and managed, particularly in the absence of an AEA between Manitoba Hydro and the Métis, and given the lack of mitigation and offset programs included in the AEAs between Manitoba Hydro and the KCNs.	MMF-0037

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38	MMF	R-EIS Guidelines	6.6.3.5 Resource Economy	6-444	Socio-Economy	<p>According to the summary contained in Section 1.2, Socio-Economic Environment, Resource Use and Heritage Resources, Supporting Volume 1, pages 1-3 to 1-6, the process to arrive at the conclusions presented in the EIS with respect to effects assessment, mitigation, and characterization of residual effects concerning Aboriginal use of land and resources for traditional purposes was carried out over an approximate 20-year period. This process culminated in an EIS that only assesses effects on Aboriginal groups collectively referred to as the KCN's.</p> <p>Chapter 6, Section 6.6.3.5, Page 6-444 states; "There is no evidence to date on effects on members of the Manitoba Metis Federation ...at the time this report was submitted. Manitoba Hydro has been working with the Manitoba Metis Federation ...to undertake studies identifying any effects of the Project related to resource use of the area by their members, these studies will be funded by Manitoba Hydro (see PIP Section 3.4.1.).</p> <p>Also, Supporting Volume, Socio-Economic Environment, Resource Use and Heritage Resources, Section 1.2.2.1, Page 1-7 states; "Use of the Local Study Area by other Aboriginal groups has not been identified through the Public Involvement Program or through direct consultations with Aboriginal groups and communities (see PIP SV). Therefore no effects to other Aboriginal groups have been identified. Ongoing discussions are occurring with the Manitoba Metis Federation..."</p> <p>To date, no arrangement has been concluded to enable the Manitoba Metis Federation to document the use of lands and resources for traditional purposes by Manitoba Metis in the Regional or Local Study Areas, which would provide the necessary foundational baseline in which to consider Project effects on this Aboriginal group.</p> <p>The assessment of Project impacts on KCN's traditional use prior to application of mitigation measures contained in the Adverse Effects Agreements is highly qualitative. The EIS findings are that the mitigation and compensation measures in these Adverse Effects Agreements, in combination with other identified mitigation will result in neutral residual effects on traditional use."</p>	Given the lack of quantitative assessment of project effects on traditional use in the absence of Adverse Effects Agreement mitigation and compensation measures, how does the Proponent intend to assess project effects on Manitoba Metis use of lands and resources for traditional purposes, when and if , the Manitoba Metis Federation is enabled to document current and future traditional use?	MMF-0038a
							In the event that the Manitoba Metis Federation is enabled to document Manitoba Metis traditional use in the Regional and Local Study Areas, how will the Proponent work with the Manitoba Metis Federation to assess project effects, develop appropriate mitigation measures, and assess and characterize residual effects, if any?	MMF-0038b
							In the event that the Manitoba Metis Federation is not enabled to document Manitoba Metis traditional use in the Regional and Local Study Areas, how will the Proponent address this gap in the EIS and address paragraph 9.1.3 of the CEAA Guidelines (March 2012), and paragraph 4.2.4 of the Scoping Document for the Environmental Assessment of the Keeyask Generation Project (December 2011)?	MMF-0038c
39	MMF	R-EIS Guidelines	6.6.3.5 Resource Economy	6-446 to 6-449	Socio-Economy	<p>"The EIS evaluates the effects of the Project on the "cash and in-kind income and livelihood" of resource users in the KCNs communities, and concludes that these are expected to be neutral during construction and operations as a result of mitigation. "Losses of in-kind income from reduced domestic resource use in the vicinity of the Project are expected to be mitigated by the AEA offsetting programs that provide access to resource harvesting at alternative and unaffected locations as well as to healthy fish for consumption in communities" (R to EIS, Section 6.6.3.5.1, p.6-447).</p> <p>There are Métis residing in the Local and Regional Study Areas. These Métis, as well as other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this, the EIS does not include an assessment of the impacts of the Project on the resource economy (i.e. the cash and in-kind income and livelihood) of the Métis. It states that the Proponent has been working with the MMF to undertake studies "...identifying any effects of the Project related to resource use of the area by their members..." but that "...there is no evidence to date of effects on members of the Manitoba Métis Federation... ..at the time this report was submitted" (R to EIS, Section 6.6.3.5, p.6-446).</p> <p>The Métis anticipate adverse effects as a result of the Project on their cash and in-kind income and livelihood. Furthermore, and as evident in the preceding text, the Proponent is relying on the AEAs to mitigate impacts to the KCNs. This has implications for the Métis, with whom Manitoba Hydro has not negotiated an AEA. As such, no mitigation is in place to address the adverse economic effects anticipated by the Métis as a result of changes in their resource use."</p>	In the absence of studies identifying the effects of the Project on resource use by the Métis, on what information did the Proponent base their conclusion that "...there is no evidence to date of effects on members of the Manitoba Métis Federation...?"	MMF-0039a
							• How will impacts on the resource economy of the Métis be identified and managed, particularly in the absence of an AEA between Manitoba Hydro and the Métis, and given the lack of mitigation and offset programs included in the AEAs between Manitoba Hydro and the KCNs?	MMF-0039b
Pimicikamak Okimawin								
1	PCN	N/A	Keeyask Transmission Project EA Report Appendix E	N/A	Aquatic Environment		Given that there will be more flow through turbines and less flow through the spillways following Kelsey re-running, are there any changes predicted in the effects of entrainment on various species and age classes of fish?	PCN-0001
2	PCN	N/A	TAC Public Rd 2 Aboriginal and/or Public Comments – 0002a	N/A	Terrestrial Environment		Please provide additional information that will aid in understanding the development of riparian habitats in the proposed new Keeyask reservoir. Specifically, what data exist that describe the vegetation in the proxy reservoirs including species richness and diversity, vegetation structure and wildlife utilization of riparian habitats compared to off reservoir shorelines.	PCN-0002
3	PCN	R-EIS Guidelines	6.4 Effects and Mitigation Aquatic Environment; TAC Public Rd 2 Aboriginal and/or Public Comments – 0003a	N/A	Aquatic Environment	<p>The results of the stocking programs described in the response to a previous request for information on sturgeon stocking programs suggests very preliminary, and mostly anecdotal results of efforts to stock sturgeon in other parts of the Nelson River, and in other river systems. Testing of artificial spawning shoals has had mixed results and is still in the early stages. Current initiatives are promising and should certainly be pursued in areas of the river system where stocks are severely depleted due to habitat loss.</p> <p>However, the environmental assessment suggests that a residual effect of the Project will be that stocking will increase the number of sturgeon in the reach of the Nelson River between the Kelsey Generating Station and the Kettle Generating Station. It concludes that: "During the operation period, no long-term adverse effects to lake sturgeon numbers in the area directly affected by the Project are expected due to mitigation measures that provide habitat for all life history stages both above and below the generating station, and an extensive stocking program."</p>	<ol style="list-style-type: none"> 1. Please clarify whether this conclusion refers primarily to the numbers of sturgeon that may be found in this reach of the river at any one time, regardless of their age or reproductive capacity. In other words, if an area is stocked regularly with several thousand hatchery raised fingerlings or age 1 individuals, the numbers would be high for a time whether or not these fish survived longer-term. 2. Discuss further whether these conclusions as expressed in the EIS are warranted when the evidence for success of stocking initiatives is acknowledged to be very limited. 3. Clarify whether this conclusion is warranted given the acknowledged uncertainties surrounding the access and eventual use of future habitats by sturgeon, including proposed artificial shoals. 4. Explain whether there is sufficient evidence to conclude that the longer-term sustainability of existing reproducing populations of lake sturgeon will not be affected by this Project. 	PCN-0003

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4	PCN	R-EIS Guidelines	6.2.2.3.4 Lake Winnipeg and Churchill River Diversion	N/A	Project Description		<p>A much more in depth understanding of the effects of the suite of hydroelectric projects on the region as a whole is important to an understanding of cumulative effects of additional developments.</p> <p>The description of the existing environment in the EIS section (6.2.2.3) includes some general information about past and ongoing hydroelectric development in this river basin, including some of the basic biophysical effects.</p> <p>In the section on Lake Winnipeg Regulation the only references to the Cree experience with this comes from the Cree Partners reports in the Keeyask area. There is no mention of Pimicikamak even existing downstream of Jenpeg, nor of the effects of the LWR on the upper reaches of the river.</p> <p>Please provide more information for the benefit of all reviewers about the broader range of biophysical, socio cultural, and economic effects that have been experienced by all Cree in the region due to the existing projects in this river system. This should not be considered beyond the scope of the EIS as it is relevant to cumulative effects for many VCs.</p>	PCN-0004
5	PCN	TE SV	2.8 (TE SV); TAC Public Rd 2 EC-0030	N/A	Terrestrial Environment	<p>The response to this information request states that:</p> <p>"... The vast majority of the potentially affected wetlands are inland bogs, which have relatively low overall ratings for their contributions to various wetland functions. ... It is anticipated that some degree of wetland loss can be absorbed without adversely affecting wetland function in regions where wetlands are abundant and remain in a relatively pristine condition [Terrestrial Environment SV 2.8.1.1] ...Given the high prevalence of peatlands in the region, and the absence of swamp in the Project zone of influence, off-system marsh was evaluated as being the only particularly important wetland type." (p.2)</p> <p>Given the importance of understanding the status of regionally rare habitat types in development decisions, and the fact that the Nelson River shoreline wetlands are the main exception to naturally functioning wetlands in the region, more information is needed about the effects of existing hydroelectric development on the fluvial wetlands of the Nelson River as a whole. This should include the Churchill River. This is important to the consideration of cumulative effects.</p>	<p>Specifically:</p> <ol style="list-style-type: none"> 1. What historical (pre-hydroelectric development) information exists about the existence, extent, species composition and structure of fluvial marshes and swamps in the Nelson River system? 2. Please comment on the utility and feasibility of mapping the pre-development riverine habitat complexes in the Keeyask reaches and throughout the Nelson River using historical air photos, and the contribution this could make to cumulative effects assessment. 	PCN-0005
6	PCN	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Terrestrial Environment	<p>The cumulative effects of multiple hydroelectric projects within a single river system is a topic of concern for Pimicikamak and for fluvial ecologists. Effects such as fragmentation of the river system, incremental conversion of fluvial habitats to reservoir habitats through series of impoundments, potential effects over time on regional populations of terrestrial and aquatic species due to incremental habitat loss and degradation are among the issues of concern.</p> <p>Effects of past and ongoing activities that overlap, spatially and temporally, with effects on VCs directly due to the proposed Project are expected to be assessed as cumulative effects. Many EAs have limited the scope of this requirement and have been criticised for this approach.</p> <p>Regional assessment areas are expected to have some ecological significance, such as the range of wide-ranging species. Rather than the range of individuals at present, the boundaries of metapopulations should be considered over longer periods of time as the lifespan of these projects is essentially without a foreseeable end.</p>	<p>In addition, using current environmental conditions as a baseline, does not necessarily "assess" the cumulative effects of past activities because the condition of the pre-development environment is not well understood. Nor are the mechanisms of change due to past development well explained or understood.</p> <ol style="list-style-type: none"> 1. Please explain how the effects of past projects are able to be assessed with only very limited reference to pre-development conditions. 2. Discuss the availability and quality of pre-hydroelectric development data that exist. 3. Explain how limiting the spatial boundaries of the assessment to the region immediately surrounding the Keeyask project can help us to understand the cumulative effects of river regulation on the same VCs throughout the watershed. 4. Please discuss how the public and regulatory authorities can gain an appreciation of the incremental cumulative effects of successive hydroelectric projects in the absence of a regional strategic environmental assessment. 	PCN-0006
7	PCN	R-EIS Guidelines	7.0 Cumulative Effects Assessment	7-3	Terrestrial Environment		<p>The Chapter discusses the potential for additional mitigation that may be required to address the adverse effects of the Project combined with the effects of future projects.</p> <p>There is some discussion in the EIS about mitigation for past (ongoing) projects such as sturgeon stocking initiatives, the caribou management plan, the Cross Lake Weir etc.</p> <p>Could the Proponent please provide a complete list of mitigation measures that have been implemented and/or planned throughout the Nelson and Churchill River systems to address the adverse effects of the existing hydroelectric projects.</p> <p>Please provide a discussion of each measure including the results to date regarding the effectiveness of these measures.</p> <p>Please provide a list of supporting documentation and any existing reports on implementation and monitoring of these mitigation measures.</p>	PCN-0007
8	PCN	R-EIS Guidelines	7.0 Cumulative Effects Assessment	N/A	Terrestrial Environment		<p>What information exists that can be used to develop a quantitative analysis of the aquatic habitats necessary for sturgeon life history that have been lost or degraded throughout the Nelson River system?</p>	PCN-0008

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Peguis First Nation								
1	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	3	Physical Environment	In deference to Aboriginal and Treaty rights for people of all ages to have access to the land, changes in water level make it difficult to land a boat and access land along altered shorelines. Shoreline erosion being predicted to carry on for many years confirms the road for access.	How will members of TCN, WLFN, FLCN and YFFN be supported to carry out monitoring of their lands and medicinal plants in areas above proposed new water levels during each phase of the project?	PFN-0001a
							What is the plan to coordinate with knowledge holders in each community to identify critical places where water access needs to be maintained? Does this plan include shoreline remediation, riparian buffer and bank stabilization, dock building, or other appropriate measures (detailed within a specific timeframe) to assure Aboriginal and Treaty rights are supported not infringed?	PFN-0001b
2	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	3	Terrestrial Environment	Trees and plants have already been destroyed by hydro developments. The EIS states people will have to go further to access intact (uncontaminated) medicinal plant areas.	Answer the following questions: 1) Have suitable alternative plant gathering areas been located by traditional knowledge keepers? Provide documents and/or plans to define "further" in distance and time. 2) Has Hydro made a formal commitment to provide travel services, available on demand, as the need to access medicinal plants is triggered by illness and accidental injury? What limitations will interfere or prohibit travel arrangements? 3) Are provision in place for access coordinated around plant life cycles and harvest times?	PFN-0002
3	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	5	Terrestrial Environment	Medicinal plants are gathered for personal use from areas identified by families who share that information within the bounds of personal relationships (plant location is not generally shared or mapped, YFFN was determined not to share mapping information at the 2012 workshop), and numerous areas of traditional harvest will be destroyed and/or degraded.	Answer the following questions: 1) Are people from TCN, WLCN, FLCN and YFFN who harvest medicinal plants afforded access to all newly identified medicinal plant locations? 2) Will communities share harvesting sites and coordinate within and between each other to protect and manage these sites? 3) How has Hydro documented and communicated their commitment to finding a solution regarding medicinal plants that is amenable to all parties?	PFN-0003
4	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	4	Terrestrial Environment	Borrow pits from Hydro development (past and present) have been raised as a concern in all three medicinal plant workshops, as they have been left in a degraded state and lay bare for opportunistic grass and weeds—workshop participants have proposed these areas be restored in a balanced way with useful plants, including berries. Doing this would alleviate scars that remain visible on the landscape and could serve as part of a field-based educational science program, an expressed goal for communities.	Answer the following questions: 1) In number and surface area, what amount of land has been degraded by borrow pits within the project area to date? And, amount planned over the next 10 years? 2) What percentage of that surface area has been restored to date in keeping with ATK and practices, repeatedly shared in workshops since the first in 2009? 3) Is there a commitment in place to restore borrow pits in culturally appropriate ways, going forward? What are the specific targets in scale and time. 4) Has Hydro dedicated funding specifically for classroom and field-based science curriculum with regard to medicinal plant knowledge and plant conservation?	PFN-0004
5	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	5-10	Terrestrial Environment	Vast areas where Weekis and Trappers Tea is currently picked will be lost to flooding, Weekis has been identified as the most important medicinal plant, an Elder from TCN states that medicines in areas subject to water fluctuation (not complete flooding) have already been lost, and all in the EIS presenting plants by species are qualified as being a partial, incomprehensive body of information.	Please answer the following questions: 1) Will a concerted/ongoing effort be made through community engagement with knowledge keepers in each community to monitor the loss of specific species of medicinal plants, given the gaps and generalizations in baseline data? 2) If known primary knowledge holders are not able to attend workshops outside their community (as was the case in October 2012), will future engagements take extra steps to follow up with individuals, giving them the opportunity to contribute and comment? 3) How will data gathering methods respect the inherent rights of individuals and communities to withhold cultural information yet ensure a full accounting of the affects of Hydro development in the project area?	PFN-0005
6	PFN	N/A	EIS Supplemental Filing 1 - 2012 Keeyask Traditional Plants Workshop Summary	2-10	Terrestrial Environment	A one-time field trip is set out as a goal shared by Hydro and the communities, to prompt interest in plants among the youth, a planning meeting was to have taken place in February 2013, August 2013 was identified as the ideal time for the event to take place. There is also consensus that this exchange of traditional knowledge should occur in the context of elder-youth relationships.	Please answer the following questions: 1) Are their quantifiable goals in terms of the number of students that will be involved, targeted levels of participation from each community? 2) Is there a plan to support elders in the delivery of knowledge to be prepared for the field-trip? 3) Is there a plan to foster elder involvement with teachers so that what "prompted" this experience connects young people to ongoing learning opportunities? 4) Did the planning meeting occur in February 2013?	PFN-0006
7	PFN	PE SV	2.1 Climate Change reference to IPCC 2001; 2.2.1.2 Future Climate Change Scenarios	N/A	Physical Environment		The references for both the Climate Change and Climate Change future scenarios are out of date. Climate science and modeling has advance significantly since 2007 (the date of the IPCC's 4th assessment report). The earth's GHG emissions have already suppressed the "worst case" emissions scenario outlined in the 4th assessment report. This out-dated science is a major shortcoming of the assessment of the sensitivity to climate impacts. 1) Provide updated climate modeling, include IPCC worst-case data.	PFN-0007
8	PFN	PE SV	2B-6 Greenhouse Gas Reporting and Commitments	N/A	Physical Environment	The EIS states it is feasible to propose site-specific adaptation strategies that deal with potential impacts of climate change on the local environment of Keeyask.	1) What are the site-specific adaptation strategies to deal with; a. Medicinal plant locations? b. Calving and wintering locations for caribou? c. Migration of habitat types due to climate change? d. Change in habitat locations for endangered species? e. Additional listed and endangered species?	PFN-0008

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9	PFN	R-EIS Guidelines	5.3.1- Assessment Framework Steps	N/A	Physical Environment	Study areas for each VEC's are variable and the reason given is to ensure that effects described as a percentage of the area appear small.	1) Which methods and metrics did Manitoba Hydro consider before using the study area per VEC approach in the EIS? 2) Why are affected areas (VECs) not calculated as part of the LSA and RSA?	PFN-0009
10	PFN	R-EIS Guidelines	6.0 Environmental Effects Assessment	Table 6-6	Terrestrial Environment	Summarized in relevant sections (of chapter 6) and in detail in the TE SV all of the hydrological systems as far as zone 6 and beyond are physically connected.	1) Did Manitoba Hydro test different methods to determine LSAs and RSAs? 2) Were these LSA and RSA identified specifically so thresholds for change in habitat would not be exceeded? 3) Will Manitoba Hydro provide a table for all VEC's showing total area lost, altered and disturbed by construction, operation including residual effects and cumulative effects across all 6 study zones (or at the very least for both LSA and RSA?)	PFN-0010
11	PFN	R-EIS Guidelines	6.3.12 Sensitivity of Project Effects to Climate Change	6-227	Physical Environment	The examination of the sensitivity to climate change focused on the operation phase as the construction period will take place in the near term and climate change is a longer-term phenomenon. The EIS references given are dated 2003 and 2007.	1) Why did Manitoba hydro ignore climate change scenarios and models available since 2007? 2) Did Manitoba Hydro compare recent climate science to 2003, 2007 references and choose older climate science?	PFN-0011
12	PFN	R-EIS Guidelines	6.3.12 Sensitivity of Project Effects to Climate Change	6-227	Physical Environment	The examination of the sensitivity to climate change focused on the operation phase as the construction period will take place in the near term and climate change is a longer-term phenomenon. The EIS references given are dated 2003 and 2007.	1) Which IPCC 2007 model or scenario did Manitoba hydro use for the EIS? 2) What System does Manitoba Hydro use to update its engineers managers and scientists regarding climate change?	PFN-0012
13	PFN	R-EIS Guidelines	6.7.7 Sensitivity of Effects to Climate Change	6-560	Physical Environment	An "adjustment period" of only a few years needed by resource users in the Local Study Area.	1) What is the adjustment period comprised of? Construction period and initial operation period? 2) How is this only a few years? Explain?	PFN-0013
14	PFN	R-EIS Guidelines	Section 6.9 – Effects of the Environment on the Project	N/A	Physical Environment	The Project has been designed to safely pass the probable maximum flood (PMF).	1) How many times have Manitoba Hydro reservoir water levels exceeded PMF levels? 2) How would climate change affect water levels for a 1:10,00 flood event for Keeyask? 3) Has Manitoba Hydro run climate change models specific to worst-case scenarios for both floods and droughts? 4) Do the conclusions in the EIS re: probable maximum flood correlate with recent climate change models—worst-case scenarios?	PFN-0014
15	PFN	TE SV	1.3.4 Valued Environmental Components and Supporting Topics	1-13	Terrestrial Environment	The proponent states that those VEC's and STs selected were those that could potentially experience substantial project effects yet the EIS Chapter 6 says all significant effects to VECs and Supporting Topics were ultimately described as being non-significant.	1) How did Manitoba Hydro decide whether a terrestrial concern was a ST or a VEC? 2) What is the technical and scientific basis for these determinations of non-significant effects?	PFN-0015
16	PFN	R-EIS Guidelines	6.5 Terrestrial Environment	N/A	Terrestrial Environment		The EIS indicates that effects of fragmentation and habitat losses are insignificant due to their being other habitat in the region. Significant, long term amphibious habitat losses (27%), within RSA is identified, yet it is stated that there are a lot of amphibians in the RSA since the project effects area represents small portion of regional study area. 1) What will Manitoba Hydro do to mitigate loss of 27% amphibian habitat? 2) The reference to amphibians in the RSA: did Manitoba Hydro use recent scientific data regarding the rapid decline of amphibians in North America?	PFN-0016
17	PFN	R-EIS Guidelines	6.5 Terrestrial Environment	N/A	Terrestrial Environment		Terrestrial habitat is not a VEC and isn't considered in Cumulative Effects Assessment. This helps maintain a degree of change <10% and therefore within natural range variability. This avoids having to account for the fact that there would indeed be cumulative effects to habitat at the regional scale potentially greater than 10% 1) Why did Manitoba Hydro leave terrestrial habitat out of VECs? 2) Did Manitoba Hydro consider peatlands as a VEC? 3) Did Manitoba Hydro identify that including habitat (terrestrial) as a VEC would indicate a cumulative effect of greater than 10%?	PFN-0017
18	PFN	R-EIS Guidelines	6.5 Terrestrial Environment	N/A	Terrestrial Environment		The range of natural variability appears to be used as a reassurance that significant effects whenever and wherever found, are natural. 1) How did Manitoba Hydro determined the natural range of variability, and why are they sure that changes to VEC's and supporting topics don't vary significantly? 2) Why did Manitoba hydro use different indicators for different VEC's without a technical explanation? 3) Provide a table for all VECs 4) Would Manitoba Hydro provide clear rationale for determinance of percent range or other predicted changes being insignificant or within natural range of variability?	PFN-0018

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19	PFN	R-EIS Guidelines	6.3.12 Sensitivity of Project Effects to Climate Change	N/A	Physical Environment		The examination of the sensitivity to climate change focused on the operation phase as the construction period will take place in the near term and climate change is a longer-term phenomenon. 1) Why did Manitoba Hydro conclude the construction period is not relevant to climate change effects, or GHGs? 2) Does Manitoba Hydro assume climate change effects are irrelevant for this 5-10 year period; a. From the project? b. On the project?	PFN-0019
20	PFN	R-EIS Guidelines	5.5 Approach to Determination of Regulatory Significance	N/A	Response to EIS Guidelines		Please answer the following questions: 1) What is Manitoba Hydro's definition of natural variability? 2) How is sensitivity to disturbance assessed? Methodology? 3) How is VEC capacity to change assessed? 4) Why were geese and ducks (pg. 630, 633) not evaluated further despite text describing adverse, long term impacts to their habitat?	PFN-0020
21	PFN	R-EIS Guidelines	7.5.2 Terrestrial Environment	N/A	Terrestrial Environment		The EIS says " Terrestrial environment ...substantially altered...continued to experience those effects today." In contrast, the Summary of Cumulative Effects of Project with Past and Current Activities (7.5.2.2), the proponent suggests that all of these previous (and significant) effects are no longer significant. 1) If all of these impacts of past projects are so significant, with long-term effects, how could the proponent be so sure that impacts of the Keeyask project will not be significant? How do you explain this? 2) What is the basis for this assumption? 3) Did the CN Partners agree that environmental effects from Keeyask are insignificant? 4) Was a list of effects of past and current projects and activities that have had significant, long-term effect on the terrestrial environment used for cumulative effects assessment?	PFN-0021
22	PFN	R-EIS Guidelines	7.3.2 Summary of Project Physical Effects	N/A	Response to EIS Guidelines		Sections in chapter 7 outline changes from a current condition (eg. % habitat change) due to the project, rather than from a historical baseline or pre-development condition across all developments in the hydrological region. Whereas Hegman et al (1999) refers to the need to assess whether an individual project is incrementally responsible for adversely affecting a VEC beyond an acceptable point. 1) How is the long term flooding expected taken into account? 2) Did Manitoba Hydro take into account any historic baseline for % habitat change data? 3) Did Manitoba Hydro include habitat change measurements from other generation station projects to establish methods to predict habitat change % for Keeyask?	PFN-0022
23	PFN	PE SV	2.1 Climate Change reference to IPCC 2001; 2.2.1.2 Climate Change future scenarios date to 2001	N/A	Physical Environment		The EIS makes an assumption of no change in variability or frequency of weather events compared to present day (pg. 100). "It is contradictory to use climate modeling that assumes no change in variability, yet changes in variability are predicted. This contradicts the IPCC that states, "type, frequency and intensity of extreme storm events are expected to change as earth's climates changes" (pg 111). 1) What does Manitoba Hydro see as the variability of weather and climate in the region, based on IPCC statement above?	PFN-0023
24	PFN	AE SV	2.5 Water Quality	N/A	Aquatic Environment	Water bodies act as large natural sinks for sequestering anthropogenic carbon emissions. Carbon enters the aquatic environment in the form of dissolved carbon dioxide (CO ₂), which then binds to calcium carbonates. Dissolved CO ₂ increases the acidity of the aquatic environment, which in turn slows calcium carbonate precipitation, thereby decreasing the ability of the water to absorb CO ₂ . Vertical deep mixing is a mechanism that then transports the sequestered carbon to the deeper layers of the water column. Aquatic plants play a significant role absorbing dissolved carbon by converting it to organic material, and mitigating aquatic acidification by converting CO ₂ to oxygen during photosynthesis. Water bodies play a significant role in the carbon cycles of the earth and in local ecosystems, and must be considered when evaluating the impacts of carbon emissions on the environment (terrestrial and aquatic). Within the EIS materials there is limited discussion on the role water plays in the carbon cycle, and how modification to the aquatic environment, terrestrial activities, effluent discharge and flooding of peatland as a result of the Keeyask Project, will influence carbon emissions.	Please respond to the following questions: 1) How will the Keeyask Project influence the process of vertical mixing and sedimentation within the Keeyask reservoir and Stephens Lake? 2) How will the flooding of peatlands increase the amount of dissolved carbon within the aquatic environment? 3) How will change in flow regime of the Nelson River impact carbon cycles? 4) Did Manitoba Hydro conduct a cumulative carbon cycle analysis for the construction and operation phases of the Keeyask Project, which incorporates both terrestrial and aquatic carbon cycle data and mechanisms?	PFN-0024

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25	PFN	AE SV	1.0 Introduction	N/A	Aquatic Environment	<p>The lake sturgeon stocking program is indirectly discussed in the EIS materials, using generalities; no actual program is proposed with time-lines, goals, objectives, methodology, etc. Various aspects of a stocking program are discussed, and the material provides context but no actual information on the program itself. Assessment of sturgeon stocking program success requires a minimum of 15-20 years (generation time for lake sturgeon) to obtain accurate results.</p> <p>What is proposed within the EIS materials is a plan that consists of the following stages; planning, pre-implementation phase and next-steps (2012-2037). The next steps phase involves conducting a preliminary lake sturgeon stocking trial in spring 2012. It states that following the preliminary trial, a ten-year plan to encompass the construction phase of the Keeyask project, would be developed.</p>	<p>Please respond to the following questions:</p> <ol style="list-style-type: none"> 1) Provide the results of the preliminary sturgeon stocking trial conducted in spring of 2012. 2) How will sturgeon populations be monitored to determine type or if a stocking program is required? 3) Provide a description of the sturgeon stocking program complete with time-lines, goals (long-term and short-term), objectives, methodology, safety information and reference materials. <ol style="list-style-type: none"> a. The program should be relevant for both the construction and operation phase of the project b. The program should plan for a stocking program that is in effect for 30, 50 to 100 years. c. Ensure that the program is sensitive to overall aquatic ecosystem health. d. Ensure that the program is in line with provincial strategies. 	PFN-0025
26	PFN	AE SV	1.0 Introduction	N/A	Aquatic Environment	<p>Lake sturgeon stocking programs are generally part of a larger management and recovery strategy that involves additional rehabilitation techniques, habitat restoration, harvest management, enforcement and public awareness. There is currently a Manitoba Lake Sturgeon Management Strategy (2012) available, developed by Manitoba Conservation and Water Stewardship. The strategy outlines provincial goals and objectives for lake sturgeon stocking programs.</p>	<p>Please respond to the following questions:</p> <ol style="list-style-type: none"> 1) Does the Manitoba Hydro lake sturgeon stocking program meet the goals and objectives of the Manitoba Lake Sturgeon Management Strategy (2012)? If so, please provide a comparative chart, clearly identifying how all the goals and objectives are met. If not, then why not? 2) Provide a table outlining all the additional methods employed to sustain the sturgeon population in the Nelson River region; <ol style="list-style-type: none"> a. Rehabilitation techniques b. Harvest management c. Enforcement d. Public awareness e. Aquatic environment mitigation and monitoring program 	PFN-0026
27	PFN	AE SV	1.2.2.4 Selection of VECs	Table 1-1	Aquatic Environment	<p>VECs are selected in order to act as indicators of ecosystem health. Aquatic VECs selected include; water quality, walleye, northern pike, lake sturgeon and lake whitefish. All other potential VECs were not selected on the basis that they were not deemed important for resource use by local people.</p> <p>The fish species selected as VECs are higher up in the foodchain, and therefore will take longer to respond to subtle changes in the aquatic environment compared to other ecosystem components. Furthermore, quantifying simply the number of fish in a given area is not a measure of ecosystem or VEC health. Specific parameters of the VEC aside from mercury concentrations must be assessed; reproductive capability, size, general health, etc, need to be measured and the culmination of those measured results be compared in a matrix to determine overall VEC health.</p>	<p>Please answer the following questions:</p> <ol style="list-style-type: none"> 1) Explain the rationale behind selecting only the ecosystem components that are regarded as important for resource as the aquatic VECs? <ol style="list-style-type: none"> a. How does this rationale support the purpose of selecting VECs to monitor and measure ecosystem health? 2) Are the VECs selected strong/appropriate indicators of ecosystem health? Explain. 3) What parameters of the VECs are being measured to determine the health and vitality of the VEC? <ol style="list-style-type: none"> a. Provide the data in matrix format off what particular biological parameters of each VEC are being measured and how those parameters are being quantified for comparison to baseline data? 	PFN-0027
28	PFN	PE SV	2.1 Climate Change reference to IPCC 2001; 2.2.1.2 Climate Change future scenarios date to 2001	N/A	Physical Environment		<p>The EIS makes an assumption of no change in variability or frequency of weather events compared to present day (pg. 100). "It is contradictory to use climate modeling that assumes no change in variability, yet changes in variability are predicted. This contradicts the IPCC that states, "type, frequency and intensity of extreme storm events are expected to change as earth's climates changes" (pg 111).</p> <ol style="list-style-type: none"> 1) What does Manitoba Hydro see as the variability of weather and climate in the region, based on IPCC statement above? 	PFN-0028
29	PFN	R-EIS Guidelines	6.2.3.4.8 Mercury in Wildlife	N/A	Terrestrial Environment		<ol style="list-style-type: none"> 1) What are the results from the 'historic records for mercury concentration in indicator species' near the RSA ? 2) Have any studies regarding mercury concentration in mink, or otter in the RSA, or LSA prior to filing the Keeyask EIS? 3) Have any studies regarding mercury concentration in these and other mammals been done sine those cited in this section of the EIS? 	PFN-0029
30	PFN	R-EIS Guidelines	6.2.3.2.6 Surface Water and Ice Regime	N/A	Physical Environment		<p>The EIS indicates on page 6 – 29 that " river flows to the LSA originate from the Upper Nelson River, the Burntwood River and the local inflow.</p> <ol style="list-style-type: none"> 1) Will Manitoba Hydro made available statistics or data for these rivers flows, over time? <p>This request is in an IR based on the preference of the Keeyask project managers and is to be used in the Land and Water Changes analysis, funded by CEC.</p>	PFN-0030

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31	PFN	R-EIS Guidelines	6.2.3.2.6 Surface Water and Ice Regime	N/A	Physical Environment		The pattern of discharge flows from Split Lake 1977 – 2006 are provided on Figure 6 – 3, and discussed on page 6 – 29. 1) Will Manitoba Hydro make available the statistics or data for this discharge flow information over time ? This request is in an IR based on the preference of the Keeyask project managers and is to be used in Land and Water Change analysis, funded by the CEC.	PFN-0031
32	PFN	PD SV	4.1 Overall System Effects	N/A	Physical Environment	The EIS materials state that the Churchill River Diversion (CRD) and the Lake Winnipeg Regulation (LWR) determine the seasonal flow patterns in the Nelson and Burntwood rivers, and consequently the flows available for all the generation stations along those rivers, including Keeyask.	Answer to the following questions: 1) Will there be no change in water levels to the Keeyask reservoir arising from the LWR and/or CRD. 2) Under special operating conditions or emergencies, can the CRD or LWR be used to augment river flows to support power generation for facilities along the Nelson River? 3) Confirm that there will be no increase to LWR water levels in order to support seasonal flows for Wuskwatim, Keeyask and Conawapa.	PFN-0032
33	PFN	AE SV	2.5.3.1 Construction Period	N/A	Aquatic Environment	EIS materials indicate that the greatest increase in total suspended solids (TSS) in Stephens Lake will occur during the construction phase of the Keeyask project. However in the materials that reference Stephens Lake TSS (2.5.2.3.4 total Suspended Solids/Turbidity), there is no reference to an increase in TSS during the construction period. The construction phase of the project involves dewatering areas within Stephens Lake, building cofferdams and other infrastructure. Even though large amounts of water will not be moving into Stephens Lake during the construction phase, it is unreasonable to state that there will be no disturbance to sediment nor introduction of TSS.	Please respond to the following questions: 1) Explain why TSS within Stephens Lake, was not considered as a contributing factor in causing turbidity during the construction phase of the Keeyask Project? 2) Provide a description of the water quality monitoring program for Stephens Lake during the construction period of the Keeyask Project. 3) How frequently will Stephens Lake be monitored during the construction phase of the project for increased TSS and sediment?	PFN-0033
34	PFN	PD SV	4.1 Overall System Operation	N/A	Project Description	The EIS materials state that the Churchill River Diversion (CRD) and the Lake Winnipeg Regulation (LWR) determine the seasonal flow patterns in the Nelson and Burntwood rivers, and consequently the flows available for all the generation stations along those rivers, including Keeyask.	Please respond to the following questions: 1) In order to conduct a land-water change over time analysis, as funded by the CEC, please provide the complete set of inflow files/records since the LWR and CRD have been in operation for the Burntwood-Nelson River system.	PFN-0034
35	PFN	AE SV	2.5 Water Quality	Table 2-13 Residual Effects on Water Quality	Aquatic Environment	Residual effects on water quality for Split Lake and Stephens Lake reservoir are predicted to be negligible for the construction and operation phases of the Keeyask project.	Please respond to the following questions: 1) Explain how these conclusions were arrived at? 2) Provide the water quality baseline data for the Split Lake and Stephens Lake. 3) How are the water levels in Stephens Lake predicted to fluctuate in response to the Keeyask Project?	PFN-0035
36	PFN	AE SV	2.5.1.3.3 Treated Sewage Effluent	N/A	Aquatic Environment	The EIS materials predict that since sewage effluent will be treated (limit Total phosphorous levels to 1mg/L) and due to high river discharge, there will be limited effects of nutrient loading in the lower Nelson River. Phosphorous is a limiting nutrient for macrophyte and phytoplankton growth. Increases in baseline P levels would inadvertently alter the density of plant and algae in the Stephens Lake reservoir.	Please respond to the following questions: 1) What is the predicted flow rate of treated effluent being released into Stephens Lake per hour, during the construction and operation phases of the project? Explain. 2) Where will the effluent from the Keeyask Project be released? Stephens Lake? 3) Will the phosphorous and nitrogen rich effluent released into Stephens Lake impact growth of blue-green algae and other phytoplankton. 4) Do the predicted phosphorous levels also include contributions from other nutrient rich effluent sources originating from the project; peatland flooding, waste water, concrete batch plant effluent, dewatering etc? 5) Has the impact to nitrogen and phosphorous ratios been investigated? If not, why not?	PFN-0036
37	PFN	AE SV	1A.2.1 Structures in Water - Construction Scheduling	N/A	Aquatic Environment	The construction of in-water structures will be scheduled to avoid sensitive periods for fish; spawning periods.	Please respond to the following questions: 1) How will the integrity of fish habitat be monitored throughout Keeyask construction and operation phases, and the different seasons? 2) How does the Environmental Protection Program for aquatic habitat make provisions to protect sensitive fish habitat? 3) What are the standards for maintenance and monitoring of sensitive fish habitat?	PFN-0037
38	PFN	TE SV	2.8.4.3 Residual Effects Conclusions (to Wetlands)	N/A	Terrestrial Environment	EIS materials indicate the overall residual effects of the project on wetland function are expected to be adverse, irreversible and continuous in frequency but low in ecological context. However on a global, national and provincial level, wetland impacts are considered nil, as significant amounts of wetlands on that scale are not impacted. Losses to native wetland types is predicted to be less than 10% in the historical area.	Please answer the following questions: 1) Why did Manitoba Hydro compare the loss of wetlands in Manitoba on a global and national scale? Why is that a relevant analysis? 2) What is the current state of wetlands in Manitoba? 3) Did Manitoba Hydro seek to incorporate aspects of peatland conservation outlined within the Manitoba Government Tomorrow Now – Green Plan? 4) For what length of time were the residual effects to wetlands calculated for? 30 years? 5) What model was used to assess for loss of wetlands over time, and did this model incorporate; a. Future Manitoba Hydro projects? b. Climate change? c. Anthropogenic activity?	PFN-0038

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39	PFN	TE SV	N/A	Figure 1-5 Nested Study area Methodology for Hypothetical Project	Terrestrial Environment	Methodology used to determine effect on terrestrial wildlife presents an oversimplified model to predict project impact on wildlife migratory patterns and population density in a specified area. In the diagram, moose were selected as the population in question, and depicted as having only 5 animals being impacted by the Keeyask Project.	Answer the following questions: 1) Outline the limitations of the methodology used to conduct the nested study analysis, and outline the limitations of the methodology? 2) What assumptions are used to conduct the nested study? a. Does the methodology assume a static migratory pattern for wildlife? b. Does the methodology account for change in migratory patterns induced by the Keeyask project for one species, influencing that of another; wolves?	PFN-0039
40	PFN	TE SV	2.9.4 Effects, Mitigation and Monitoring	N/A	Terrestrial Environment	Overall residual effects to soil quality and quantity are predicted to be adverse, but acceptable due to incremental additions of impacts such as; physical disturbance, altered depth to ground water or changes to the flows and/or nutrient status of surface and groundwater. No indication was provided with regard to time-frame for incremental changes/damages to soil. The soil quantity and quality monitoring program is referenced as being covered within the Terrestrial Environment Monitoring Plan. Currently there is no plan available within the EIS materials for review.	Respond to the following questions: 1) How do incremental impacts to soil quality and quantity ameliorate the cumulative adverse effects of the project to soil quantity and quality? 2) What was the time-frame used to determine residual impacts to soil quantity and quality? 3) What are the residual effects to soil quantity and quality for 30, 50 and 100 years of project operation. 4) Mitigation measures are proposed during the construction phase of the project, however mitigation measures during operation phase of the project are lacking. Does Manitoba Hydros have a description of soil quality and quantity mitigation measures proposed for the operation phase of the Keeyask project? Please Provide. 5) Provide a copy of the Terrestrial Environment Monitoring Plan for review.	PFN-0040
41	PFN	PD SV	3.3.1.2 Waste Water and Solid Waste	N/A	Project Description	The EIS materials do not discuss handling of hazardous waste materials; chemicals, explosives, corrosive materials, etc. It is clear explosives will be used, particularly for the construction phase of the Keeyask project.	Please respond to the following questions: 1) What materials will be used that are classified as hazardous? 2) How will hazardous materials be disposed of? Provide a description of hazardous waste disposal practices. 3) How will personnel and the environment be protected from exposure to hazardous materials and waste? a. Will employees and contractors be trained to handle hazardous waste materials?	PFN-0041
42	PFN	TE SV	2.10 Cumulative Effects with Other Projects	N/A	Terrestrial Environment	The cumulative impact of the Keeyask Generation project was assessed in conjunction with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III transmission line, Keeyask Transmission Project and the Conawapa Generation Project. For all assessments examining combined future project cumulative effects to intactness, ecosystem diversity and wetland function, no cumulative effect was reported. It was not discussed how the conclusions were arrived at, what baseline values or parameters were evaluated to calculate the cumulative impacts.	Answer the following questions; 1) How was it determined that there were no overall net cumulative effects from all projects combined on the terrestrial environment? 2) How were the terrestrial VECs evaluated during this assessment? 3) How will the terrestrial VECs be assessed during construction and operation phases of the Keeyask project? 4) The assessment needs to be repeated, using pre-Manitoba Hydro development data (1970s) as the baseline value. Qualitative and quantitative measures of change need to be established which are comparable/measurable between all project future projects. Finally, Manitoba Hydro will have to provide the results of the assessment, and include a geographic depiction of cumulative impacts over time.	PFN-0042
43	PFN	TE SV	2.9.3.3 Current Trends	N/A	Terrestrial Environment	EIS materials discuss the loss of ground ice peatland fine ecosite types, which will be replaced by wet peatland fine ecosite types and open water.	Respond to the following questions: 1) How will loss of ground ice peatland ecosites impact local ecology and ecosystem function? 2) What mitigation and monitoring strategies will be implemented to limit loss of ground ice peatland ecosite types? 3) Which species will be affected by loss of ground ice peatland fine ecosite types?	PFN-0043
44	PFN	N/A	Project Description Supporting Volume; Terrestrial Environment Supporting Volume	N/A	Terrestrial Environment	The Keeyask Generation EIS LSA and RSA have overlap with Forest Management Units 86, and 76. Manitoba Hydro has included assessment information that include habitat in these FMUs.	1) What data sources regarding the FMUs did Manitoba Hydro use? 2) Did Manitoba Hydro contribute to the Manitoba Forest Resource Inventory due to its technical and scientific studies? 3) Was the FRI data, or forest ecosystems data used in determining the Zones, which in turn are the context for analysis for VECs? 4) This request is in IR form, and includes a request for the data regarding the questions above. This IR is based on the request of the Keeyask Generation project managers.	PFN-0044
45	PFN	PD SV	N/A	N/A	Project Description	This IR is a series of requests for shape files, and / or data regarding elements needed to conduct the Life Cycle Assessment of the Keeyask Generation Project.	The requests are in IR format as the request of the project managers. 1) Shape files for project infrastructure locations in the Keeyask Generation Project RSA and LSA as identified in the EIS. 2) Shape files / data for the pre and post inundation polygons for project activities, including minimum, average and maximum water elevations. 3) Shape files for the six project study zones (Table 6 – 6) 4) Existing, and future hydro projects on the Nelson River, affecting Stephens Lake reservoir, or Gull Lake reservoir – shape files. (including all infrastructure)	PFN-0045

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46	PFN	N/A	Project Description Supporting Volume; Terrestrial Environment Supporting Volume	N/A	Project Description	Manitoba Hydro has indicated in text within the EIS the spatial and topography parameters of its information. The detail on Keeyask Generation project maps do not consistently show scale, or other data parameters. Often the data sources on these maps are secondary sources.	<p>1) What Digital Elevation Models were used for the Keeyask EIS maps, analysis, and conclusions ?</p> <p>2) What resolution, resolutions did Manitoba Hydro use ?</p> <p>3) Are the digital elevation models for water elevations use existing generation stations?</p> <p>4) How many water elevation locations were used – in the RSA and the LSA, and in the larger region ?</p> <p>5) Are data and shape files pertaining to the questions above available ?</p> <p>This request is in IR format due to the request of the Keeyask project managers.</p>	PFN-0046
47	PFN	PD SV	N/A	N/A	Project Description		<p>Manitoba Hydro has described the models and scenarios used to arrive at its climate change effects content in the EIS.</p> <p>1) Does Manitoba Hydro use flows of all green house gasses from each of the land areas in Table 2.1 for their conclusions ?</p> <p>2) Did Manitoba Hydro use green house gas flows (carbon dioxide, methane etc) from reservoirs, and build- no build scenarios ?</p> <p>3) Which equations from IPCC documents, and others sources to calculate the emissions and scenarios in the EIS ? In particular, which equations were used to generate Figure 2A-1 in the Climate SV ?</p> <p>Provide data corresponding to the questions above. This request is in IR format at the request of the Keeyask project managers.</p>	PFN-0047

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.7**
2 **Aesthetics - The Way the Landscape Looks; p. N/A**

3 **CEC Rd 1 CEC-0001**

4 **QUESTION:**

5 Section 6.6.5.7 of the Environmental Effects Assessment addresses aesthetics but there
6 are no specific examples of mitigations identified in terms of how solely construction
7 period effects will be mitigated. Specifically, how would areas such as the temporary
8 construction camps, temporary roads, borrow areas be re-vegetated/re-habilitated to
9 restore aesthetic conditions?

10 **RESPONSE:**

11 Section 6.6.5.7.1 Construction Effects and Mitigation states, "construction effects to the
12 way the landscape looks will be limited in duration, and in many instances,
13 decommissioning activities will rehabilitate disturbed area to the native habitat types (p.
14 6-498)". A Vegetation Rehabilitation Plan will be prepared after areas required for
15 construction are cleared and long term needs for operations of the cleared areas are
16 known. Implementation of the plan will commence during the construction phase of the
17 project.

18 As soon as is practicable, permanent access road ditches will be seeded to produce low
19 vegetation. In general, bare soil areas within other permanent Project features will be
20 vegetated with plants appropriate for the ultimate use of the site.

21 The condition of the areas such as temporary construction camps, temporary roads and
22 borrow areas and other areas that are no longer needed for construction or operation
23 of the station will be assessed and specific site preparation and revegetation
24 prescriptions will be developed for each site. Native plants will be used and where
25 conditions are suitable the most affected priority habitat types will be part of the
26 revegetation prescription for specific locations. Revegetation efforts will commence in
27 an area when it is known that it is no longer needed for construction.

28 Monitoring of the effectiveness of the re-vegetation efforts is conducted in the years
29 following revegetation. The monitoring program is outlined in the Preliminary Terrestrial
30 Effects Monitoring Plan Section 2.1.2, filed with regulators on June 28, 2013 and
31 available on the Partnership's website at Keeyask.com. Field monitoring data will be
32 collected and analyzed. Based on the survival and growth of the plants, modifications to
33 the planting prescription will be made, if required. Monitoring will continue until it
34 appears that the re-vegetation targets to be outlined in the plan are met and

35 maintained. Disturbed areas have the potential to be rehabilitated close to natural
36 conditions, within 70 years.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **N/A; p. N/A**

3 **CEC Rd 1 CEC-0002**

4 **PREAMBLE:**

5 We were not able to find a discussion on fire protection services for the camps and
6 project.

7 **QUESTION:**

8 Will fire protection services be provided at the camp? If so how?

9 **RESPONSE:**

10 Fire protection services will be provided at the camp. All camp buildings will include fire
11 detection systems, fire suppression equipment and fire extinguishers as per code
12 requirements. A fire truck will be on site and a fire department will be formed consisting
13 of volunteers from Manitoba Hydro and contractor site staff. They will be trained in the
14 use of fire suppression equipment and will be available to respond immediately to an
15 emergency.

16 A mutual aid agreement with local communities is being investigated to provide back-up
17 services.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **Part 2 Resource Use - 1.3 Commercial Fishing; p. N/A**

3 **CEC Rd 1 CEC-0003**

4 **QUESTION:**

5 With increased mercury levels in fish in the proposed reservoir and the raising of Gull
6 Lake won't fish with higher mercury levels be able to enter into the Clark and Split Lake
7 commercial fishery? Please explain possible effects.

8 **RESPONSE:**

9 There is no commercial fishery on Clark Lake. The Split Lake commercial fishery is
10 discussed in Resource Use Section 1.3.3.2.2 of the Socio-Economic Environment,
11 Resource Use and Heritage Resources Supporting Volume.

12 As discussed in the Aquatic Environment Supporting Volume (page 7-21):

13 "No or minimal effect are expected for Split/Clark Lake because the few fish that
14 might migrate into the area from the Keeyask reservoir (and thus may have
15 elevated mercury concentrations) will not measurably affect the average
16 mercury level in area fish. "

17 To confirm this prediction, monitoring of mercury levels in fish flesh will occur, as
18 described in the Aquatic Environment Supporting Volume (page 7-22):

19 "Mercury levels in the tissues of selected fish species (walleye, northern pike,
20 lake whitefish, and one-year old yellow perch) will be measured to continue
21 with pre-Project baseline monitoring and to verify post-Project predicted
22 increases for fish from the Keeyask reservoir and Stephens Lake including
23 uncertainties regarding the direction and magnitude of increases. In addition to
24 the Keeyask reservoir and Stephens Lake, a number of waterbodies not
25 predicted to experience increased fish mercury levels will be monitored. These
26 include Split Lake, Assean Lake, and the Aiken River (also to address the
27 concerns of the KCNs) and one off-system (reference) lake still to be
28 determined."

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.6.5.2.4 Residual Effects of Operation; p. 6-471**

3 **CEC Rd 1 CEC-0004**

4 **QUESTION:**

5 With respect to Section 6.6.5.2.4 of the Environmental Effects Assessment (residual
 6 effects of operation, community health), it is not fully clear how the overall conclusion is
 7 arrived at with respect to community health. Is it possible that increased income may
 8 have an overall negative effect?

9 **RESPONSE:**

10 Section 6.6.5.2.3, the section prior to that cited in the Information Request, outlines
 11 effects and mitigation to community health during the operation phase and does
 12 indicate that increased personal income could have an adverse effect if the income is
 13 used to make poor choices (e.g., spending on drugs or alcohol), but also a positive effect
 14 on standard of living. This section also notes that, from a 'determinants of health'
 15 perspective, during the operation phase possible effects to community health stem from
 16 a variety of factors including increased personal income, but also community-based
 17 equity income, population change affecting access to services, change in access to
 18 country foods and worry and skepticism about environmental changes and predictions
 19 of change. Each of these factors are discussed in turn on pages 6-471 and 6-472 of the
 20 Response to EIS Guidelines document, including the potential for positive and adverse
 21 effects depending on the factor.

22 Section 6.6.5.2.4 (that cited in the Information Request) provides an overall conclusion
 23 of the residual effects to community health from developing the Keeyask Generating
 24 Station based on a consideration of potential project effects (both positive and
 25 negative) and the implementation of Project mitigation. In this residual effects analysis,
 26 both the positive and negative effects associated with increased income are considered
 27 and balanced with the other possible effects to community health and proposed
 28 mitigation measures. Overall, it is concluded that:

29 "The residual effects of Project operation on community health for the KCNs
 30 and Gillam residents are expected to be positive due to employment and equity
 31 income providing the opportunity for a higher standard of living, of medium
 32 geographic extent, of long-term duration and small in magnitude.... There is high
 33 degree of certainty in the assessment for this [Valued Environmental
 34 Component] due to existing [Adverse Effects Agreement] programs and the

35 ongoing commitment to communication with service providers and planning in
36 the Town of Gillam.”

37 Given that the operational job opportunities are long-term in nature, there is an
38 expectation that there is more likelihood of seeing positive health effects associated
39 with increased income during operations (see pg. 6-470 of the Response to EIS
40 Guidelines document).

41 Similarly, equity income could positively affect community infrastructure and services
42 resulting in a positive overall effect on community health. Section 3.4.2.3.1 of the Socio-
43 Economic Supporting Volume indicates that the distribution of annual Project dividends
44 is expected to increase the amount of discretionary income the KCNs have to address
45 economic, infrastructure and social needs. Section 14.2.2 of the JKDA identifies a variety
46 of ways that project-related distributions may be used by the KCNs, including increased
47 viability of traditional resource pursuits, cultural support and social development
48 initiatives, and community infrastructure and housing development.

49 Funds provided to the KCNs through their Adverse Effects Agreements, which will
50 continue during operation, also support initiatives that are expected to contribute
51 positively to overall community health and well-being (e.g., traditional resource
52 programs, land stewardship and cultural programs).

53 The scope and magnitude of positive contributions that new income will make both to
54 the individual and to the community are viewed as outweighing any potential negative
55 effects: taken together, the initiatives and opportunities outlined above contribute to
56 the conclusion of overall improved community health.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.6.5.6.5 Conclusion about Residual Effects on Culture and**
3 **Spirituality; p. 6-494**

4 **CEC Rd 1 CEC-0005**

5 **QUESTION:**

6 On Page 6-494 of the Environmental Effects Assessment it is stated that cultural impacts
7 are small. How was this conclusion arrived at? and/or provide explanation as to how a
8 cultural impact is geographically small?

9 **RESPONSE:**

10 The conclusion on page 6-494 that the geographic extent of cultural impact is small is an
11 error.

12 The correct determination is medium in geographic extent. Table 6-62 on pg. 6-519
13 illustrates the correct assessment characteristics, which are consistent with the Socio-
14 Economic Supporting Volume, Section 5.5.

15 Geographic Extent is defined in Chapter 5, Section 5.5 on pg. 5-11 of the Response to EIS
16 Guidelines as “the spatial boundary within which the residual environmental effect is
17 expected to occur”. A geographic extent of medium is consistent with the definition
18 which states:

19 “Geographic Extent is defined in Chapter 5, Section 5.5 on pg 5-11 of the
20 Response to EIS Guidelines as the spatial boundary within which the residual
21 environmental effect is expected to occur. Geographic extent is described as:

- 22 • Small geographic extent – Effects that are confined to a small portion of one
23 or more small areas where direct and indirect effects can occur (e.g., rights-
24 of-way or component sites and adjacent buffer areas);
- 25 • Medium geographic extent – Effects that extend into local surrounding
26 areas where direct and indirect effects can occur; or
- 27 • Large geographic extent – Effects that extend into the wider regional area
28 where indirect or cumulative effects may occur.”

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.7.3.2.5 Conclusions about Residual Effects on Domestic Hunting**
 3 **and Gathering; p. 6-543**

4 **CEC Rd 1 CEC-0006**

5 **PREAMBLE:**

6 With respect to Section 6.7.3.2.5 of the Environmental Effects Assessment it is stated
 7 that the effect on domestic hunting is to be neutral. Questions from the MCWS with
 8 respect to the moose harvest seem to question how this statement could be made
 9 when the moose harvest sustainability plan is not yet prepared?

10 **QUESTION:**

11 Since the time of inquiry has there been more progress on this harvest sustainability
 12 plan and/or on ATK related monitoring?

13 **RESPONSE:**

14 Progress has been made on both the Moose Harvest Sustainability Plan and on ATK-
 15 related monitoring since responding to the noted Requests for Additional Information
 16 from MCWS.

17 The Moose Harvest Sustainability Plan is currently undergoing an internal review and
 18 approval process involving TCN and WLFN Members and Chiefs and Councils and is
 19 expected to be available in final form by August 1, 2013. Once ready, it will be presented
 20 to the Split Lake Resource Management Board (SLRMB) for review and discussion. As
 21 noted in TAC/Public Round 1 MCWS-WB-0001, the Moose Harvest Sustainability Plan is
 22 being developed by the Cree Nation Partners to provide relevant guidance for program
 23 managers responsible for running the Tataskweyak and War Lake Access Programs, and
 24 for use by the Split Lake Resource Management Board in providing management advice
 25 to the province. The Access Programs provide community members with substitute
 26 opportunities to pursue traditional activities within the Split Lake Resource
 27 Management Area in areas not affected by the Keeyask Project.

28 The intent of the Moose Harvest Sustainability Plan is to maintain a sustainable
 29 population of moose in the Split Lake Resource Management Area so that CNP
 30 Members' relationship with moose can continue forever. As stewards of their natural
 31 world, the CNP will continue to take responsibility (as they always have) for sustainable
 32 use of moose and other resources regardless of changes in their access to these
 33 resources. The plan supports the ongoing success of the Access Program and overall
 34 moose sustainability through a consideration of population parameters such as
 35 productivity, mortality and recruitment, including estimates of harvest by CNP and other

36 users of this resource. Effective monitoring is also an essential component of the Moose
37 Harvest Sustainability Plan.

38 Discussions between Manitoba Hydro and each of the KCNs continue with respect to the
39 development of community-specific ATK monitoring programs. It is anticipated that
40 initial ATK monitoring programs will be undertaken this summer/fall as part of the
41 Keeyask Infrastructure Project. As noted on p. 8-39 of the Response to the EIS
42 Guidelines, these programs will be based on Cree perspectives and understandings
43 about potential effects of the Project. Specific ATK monitoring programs will be
44 developed on an annual basis, based on construction and/or operational activities and
45 related community concerns about potential effects. It is possible that these plans may
46 include monitoring of a community's resource use activities, but that has yet to be
47 determined by each of the communities.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **Section 3 Economy - Appendix 3C Economic Impact Assessment; p.**
 3 **3C-1**

4 **CEC Rd 1 CEC-0007**

5 **PREAMBLE:**

6 The combination of approaches (direct estimate and economic impact model) used to
 7 determine the economic impact of the project at various geographical levels is
 8 considered appropriate.

9 **QUESTION:**

10 However, there was little explanation on the provincial economic impact model used
 11 and its theoretical basis or practical use within Manitoba (i.e. is it widely used and
 12 regularly updated?). Some background information on the model should be provided.
 13 Some explanation of how the model derives indirect and induced employment (which
 14 appears high) would also be helpful.

15 **RESPONSE:**

16 Model Background Information:

17 The economic modeling framework used for estimating economic impacts is the
 18 Manitoba Bureau of Statistics' (MBS) Economic Impact Assessment model, a provincial
 19 input-output model based on statistical information about the flow of goods and
 20 services among various sectors of Manitoba's economy. The Manitoba Bureau of
 21 Statistics model is updated annually and is currently based on Statistics Canada's Input-
 22 Output Tables for 2008. These tables contain detailed information on the inter-industry
 23 flow of goods and services within the economy of Manitoba.

24 As the central statistical agency of the provincial government, only MBS produces an
 25 economic impact model of the provincial economy. The model allocates project
 26 expenditures to economic sectors and generates estimates of direct, indirect and
 27 induced impacts of these expenditures on the economy of Canada and Manitoba.
 28 Estimates are produced of the Project's contribution to employment, labour income,
 29 gross domestic product and tax revenue in Manitoba and Canada.

30 The provincial input-output model has been used extensively for more than 20 years for
 31 requests by (or for) Treasury Board, other government departments and agencies, and a
 32 wide variety of industries including, mines, agriculture, entertainment, hospitality,
 33 manufacturing, social services and of course business consultants. Use of this model has

34 become standard practice for estimating economic impacts on Manitoba and Canada of
 35 new Manitoba-based major proposed projects, including Manitoba Hydro's.

36 Model derivation of indirect and induced employment

37 Total economic impacts, (be they GDP, Labour Income, Employment, etc.) are the sum
 38 of 1) Direct Exogenous impacts, 2) Direct Endogenous impacts, 3) Indirect impacts and
 39 4) Induced impacts.

40 "Direct Exogenous impacts" are outside/external to the model. They are the Manitoba
 41 economic impacts of the direct expenditures.

42 The remaining impacts are "Endogenous". They are estimates produced by the modeling
 43 process. Impact estimates are contingent on the model itself, the data run through it,
 44 and assumptions made in preparing and running the data.

45 "Direct Endogenous impacts" are derived from the direct suppliers to the project as they
 46 respond to the demand represented by the Direct Project Expenditures. In providing
 47 the goods and services required, direct suppliers consume energy, raw materials, and
 48 labour as required for their particular operations, and generate profits, labour income,
 49 jobs and tax revenue.

50 Indirect impacts are produced in the same way exactly; however, they are produced by
 51 suppliers to the direct suppliers. Hence they are indirectly supplying goods and services
 52 to the project being analyzed. Indirect impacts are much smaller than the direct
 53 endogenous impacts.

54 It is only in the employment impacts that MBS displays these impact levels separately.
 55 The question suggested that combined indirect and induced employment impacts seem
 56 high. This is primarily the result of the induced impacts, which are high in any economy.
 57 They represent the consumer or household side of the economy, where the assumption
 58 is that a large percentage of each dollar in labour income will be re-spent in the
 59 economy for food, furnishings, clothing, transportation, and shelter, everything in the
 60 real proportions tabulated for personal expenditures in Manitoba. The more labour
 61 income produced in the economy, the greater the impacts (including employment
 62 impacts) produced or sustained by household expenditures.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.6.5.2.1 Construction Effects and Mitigation; p. 6.467**

3 **CEC Rd 1 CEC-0008**

4 **QUESTION:**

5 With respect to Section 6.6.5.2.1 of the Environmental Effects Assessment is financial
 6 counselling a potential mitigation measure that should be considered?

7 **RESPONSE:**

8 As noted in Section 6.6.5.2.1, counselling and family support services will be available on
 9 site through the employee retention and support services contract (see pg. 6-469). The
 10 Direct Negotiation Contract (DNC) for employee retention and support services is a joint
 11 contract between York Factory First Nation and Fox Lake Cree Nation.

12 Schedule 13-1 of the JKDA (see abstract below) provides a description of the employee
 13 retention and support services contract – money management is included as one of the
 14 counselling and group services offered at site.

15 Extract from Schedule 13-1 of the JKDA – Identified Work Packages and Work
 16 Allocations:

Contract	Service Description	KCN Allocation
Employee Retention and Support Services	Provision of Employee Retention and Support services for project employees including Aboriginal awareness training, individual counseling and facilitated group sessions at the Keeyask Site to reduce attrition among all employees but particularly Northern Aboriginal of Cree Heritage by assisting them in dealing with problems directly affecting their work performance. The counseling and group session would focus on work adjustments problems, vocational and career issues, cross cultural adjustments, racial tensions, alcohol and drug abuse, marital stress, depression and anxiety, and money management.	Fox Lake and York Factory

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CEC-0009**

4 **PREAMBLE:**

5 Section 6.7.1.5.3 of the environmental effects assessment does not appear to address
6 the fact that new roads and access to other areas via trails possibly created by
7 construction workers or through the AEA offsetting programs may allow other users
8 easier access and therefore degrade fishing and hunting opportunities.

9 **QUESTION:**

10 How would new visiting harvesters be addressed? Does Keeyask Hydropower Limited
11 Partnership expect that increased vigilance will be required on the part of Manitoba
12 Conservation and Water Stewardship?

13 **RESPONSE:**

14 Section 6.7.1.5.3 could not be located in the document. It is assumed that this request
15 pertains to degradation of fishing and hunting opportunities for domestic (traditional)
16 resource users. This response is provided in two parts:

- 17 1. Implications for domestic hunting and fishing opportunities with respect to potential
18 for increased access on new roads/trails for (a) construction and (b) operation; and
- 19 2. The potential response required of Manitoba Conservation and Water Stewardship.

20 *1) Implications for domestic hunting and fishing opportunities with respect to potential*
21 *for increased access on new roads/trails (construction and operation)*

22 Construction

23 During the construction phase, the south access road will be constructed and the north
24 access road (constructed as part of the Keeyask Infrastructure Project) will be
25 operational. Temporary or permanent access trails / haul roads will be constructed to
26 access borrow areas, excavated material placement areas, boat launches and quarries
27 (Section 2.4.7 of the Project Description Supporting Volume [PD SV] and Map 2-1 of the
28 PD SV).

29 Access will be controlled by the Keeyask Construction Access Management Plan (AMP)¹.
30 Provisions in the AMP include 24/7 gated access at the north and south access roads.
31 The public will not have access to the Project site (Section 2.4.8 of the PD SV) and are

¹ Draft Keeyask Construction Access Management Plan filed April 2013

32 therefore not expected to make use of new roads or trails for hunting or fishing
33 activities.

34 Other AMP provisions are in place to limit construction workforce participation in
35 hunting including prohibition of personal firearms and recreational vehicles (ATVs,
36 boats, and snowmobiles) within the Project site. Construction workers will have neither
37 the permission nor means to build or use Project trails for hunting purposes.

38 Fishing by the Keeyask construction workforce is expected to be permitted in areas safe
39 to do so. Based on an interview with the Wuskwatim Environmental Inspector on
40 September 8, 2011, it was estimated that of the 1,000 workers on average at the
41 Wuskwatim camp, only 1% (~10) showed any interest in recreational fishing (see also
42 Resource Use Section 1.2.4.1.1 of the SE SV). The approximate Wuskwatim construction
43 workforce harvest is 20 fish per week during the open-water season and no harvest
44 during the ice-cover season. This level of harvest, if realized or even increased on
45 waterbodies near the Project site, would not be expected to lead to degraded fishing
46 opportunities for domestic fishers. Workers will have limited means to store or cook
47 fish, therefore a substantive harvest is not expected.

48 Given access restrictions in place, no increases in hunting and a limited level of fishing
49 by the workforce are expected in association with changes in access. Changes would not
50 be expected to degrade hunting and fishing opportunities. To test these predictions, the
51 Resource Use Monitoring Plan will conduct regular monitoring and annual reporting on
52 construction workforce harvest (if any). Though ATK monitoring activities are still in the
53 planning stages, it is expected that monitoring the opportunity to continue to practice
54 domestic hunting and fishing may form a component of ATK monitoring.

55 Adverse Effects Agreement offsetting programs primarily involve the use of aircraft to
56 operate, including the TCN Access Program (though a one-time payment for trail
57 restoration is available as part of this program), the TCN Healthy Food Fish Program, the
58 WLFN Community Fish Program and, if implemented, the YFFN Resource Access and Use
59 Program. Aircraft operated programs would not provide other users with improved
60 access to new areas.

61 Programs that are planned around or may use ground transportation include the WLFN
62 Improved Access Program, the TCN Access Program and, possibly, the FLCN Alternative
63 Resource Use Program. The WLFN Improved Access Program is directed at
64 improvements to the road from War Lake to Ilford and the winter trail to Atkinson Lake.
65 The degree to which improvements to these routes would benefit hunting or fishing
66 opportunities for people other than WLFN Members would be tenuous as Ilford is a
67 remote community with only rail and winter road access (that under normal
68 circumstances would limit the number of outside visitors). A majority of the TCN Access

69 Program trails are located north of Split Lake and funding is applied to upgrading
 70 existing trails and portages, developed through the 1992 Agreement, as opposed to
 71 creating new trails and/or portages. The destination and format for the FLCN Alternative
 72 Resource Use Program has not yet been determined. All four AEAs indicate that each
 73 KCN is responsible, without limitation, for obtaining all necessary permits, licences, or
 74 other approvals required to implement/operate their offsetting programs.

75 Operation

76 In the operation phase, non-permanent trails (and cutlines) used during construction
 77 will be blocked where they intersect with the Project Footprint and re-vegetated to
 78 minimize access-related effects on birds and animals.

79 Once the Project goes into operation, the north and south access roads will be
 80 connected by a permanent river crossing over the Project's north dam, powerhouse,
 81 central dam, spillway and south dam. Manitoba Infrastructure & Transportation (MIT)
 82 has indicated it will assume the responsibility to maintain these roads as part of the
 83 provincial transportation system. The presence and the public nature of these roads will
 84 provide increased access for both domestic and recreational harvesters. A proportion of
 85 the additional 120 to 150 people estimated to settle in Gillam (Section 4.4.2.1.2 of the
 86 SE SV) during operation also will add to overall resource use in the area.

87 Improved access and an increased number of people residing in Gillam are expected to
 88 be offset by two, possibly three, factors. This first is the AEA offsetting programs. These
 89 programs are expected to redistribute domestic harvest pressures over a larger land
 90 base and reduce pressures in existing areas of resource use concentration (Resource
 91 Use Section 1.2.4.1.1 of the SE SV). Secondly, harvest by recreational harvesters is
 92 expected to be constrained by existing provincial harvest restrictions (Resource Use
 93 Section 1.2.4.2.2 of the SE SV).

94 The third factor relates to the status of PR 280 from kilometer 174 (the Keeyask
 95 Junction) to PR 290 that is to be abandoned by Manitoba Infrastructure and
 96 Transportation (MIT). Clarification on the nature of the abandonment was received by
 97 the Partnership from MIT on June 21, 2013 (see also CEC Rd 1 CFLGS-0019) indicating
 98 that this section would be converted to a departmental road that would remain open
 99 (both legally and physically) to the public. A decision-making process will be initiated by
 100 MIT only after the new section of PR 280 goes into operation. Decision-making will
 101 involve a thorough analysis and assessment to determine if on-going public usage
 102 and/or access are still required on the proposed abandoned section of PR 280. As a
 103 result, it is difficult to predict whether resource use will shift from the old section of
 104 highway to the new section or be dispersed over both roads. If the road is abandoned,
 105 reductions in resource use in that area would be dependent on the timing of

106 abandonment and the condition of the road following abandonment (i.e., it is currently
107 unknown if the former highway section would be passable by ATVs, snowmobiles or
108 trucks).

109 In the operation phase, access associated with AEA offsetting programs would not be
110 expected to change.

111 *2) The potential response required of Manitoba Conservation and Water Stewardship.*

112 Manitoba Conservation and Water Stewardship (MCWS) is responsible for the allocation
113 of human resources to respond to its mandate, which includes overseeing the
114 management of provincial natural resources. The Keeyask Hydropower Limited
115 Partnership cannot comment explicitly on the existing and future capacity of MCWS to
116 meet its mandate.

117 Overall, the Project is expected to result in a minimal increase in resource use by the
118 construction workforce. Increased populations in Gillam and changed highway access to
119 resource harvesting areas will occur in the operation phase. MCWS would need to
120 decide, based on these small increases, whether additional vigilance is required.
121 Monitoring plans and their associated reporting products are expected to provide
122 MCWS with detailed and appropriate information to respond to Project-associated
123 changes. MCWS also participates in the Split Lake and Fox Lake Resource Management
124 Boards and would have access to relevant information collected for the offsetting
125 programs through these venues. These venues would also provide MCWS with the
126 opportunity to hear directly from community members about any issues or concerns
127 with respect to resource management in these areas.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **Part 3 Heritage Resources; p. N/A**

3 **CEC Rd 1 CEC-0010**

4 **PREAMBLE:**

5 Heritage resources are non-renewable resources governed by The Heritage Resources
6 Act in Manitoba. Very extensive archaeological assessments were conducted on areas
7 potentially affected by the Project and in the local area. While the local area wasn't
8 necessarily impacted by the Project, KHP did indicate that the deteriorated condition of
9 some archaeological sites within the predicted hydraulic zone of influence did not allow
10 for an in-depth understanding of past cultural occupations and therefore a plan to
11 examine selected proxy locations within the Local Study Area was initiated. It was
12 understood that this was supported by the KCNs.

13 **QUESTION:**

14 While there were no major deficiencies found in the Heritage Resources work the
15 conclusion should have perhaps better acknowledged the cumulative loss of heritage
16 resources associated with the various Manitoba Hydro activities along the Nelson River.

17 **RESPONSE:**

18 The Partnership thanks the CEC for its overall conclusion of no major deficiencies in the
19 Heritage Resources work. The field investigations associated with the Heritage
20 Resources Impact Assessment were conducted using best practice as identified by the
21 Registry of Professional Archaeologists, and by developing specific field techniques to
22 obtain as complete an archive as possible. The KCNs were instrumental in providing
23 guidance and direction during the investigations.

24 In the Response to EIS Guidelines document, the full understanding of cumulative
25 effects on Heritage Resources is understood by examining chapters 6 and 7 together.
26 Chapter 6 assessed effects of the Project in combination with effects of past projects
27 and activities. The effect of past projects on the heritage resources in the existing
28 environment is included in Section 6.2.3.7 and the effects of the Keeyask Project in
29 Section 6.8.3. Chapter 7 summarized those effects (Section 7.6.1.3 and 7.6.2.3) and then
30 discussed the effects in combination with future projects (Section 7.6.3.3). In addition,
31 Section 1.4.1 of the Heritage Resources portion of the Socio-Economic, Resource Use
32 and Heritage Resources Supporting Volume identifies the effect of past projects on
33 archaeological/heritage sites. The KCNs also had the opportunity to present their
34 perspectives on cumulative loss of heritage in their respective Evaluation Reports.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.6.3.2.1 Construction Effects and Mitigation; p. 6-437**

3 **CEC Rd 1 CEC-0011**

4 **QUESTION:**

5 With respect to the commitment on pg. 6-437 of the Environmental Effects Assessment
 6 which identifies 182 target positions for KCN members, what are some of the measures
 7 that will be used to ensure this target is reached? As these positions would be across the
 8 KHLP system what percentage of these jobs are likely going to be local?

9 **RESPONSE:**

10 The response to this question is provided in two parts:

- 11 1. Measures to reach target, and
- 12 2. Percentage of operational jobs filled locally

13 Measures to Reach Target

14 Section 6.6.3.1.2 Operation Effects and Mitigation (pg. 6-435) of the Response to EIS
 15 Guidelines notes the JKDA target of 182 positions for KCN Members across Manitoba
 16 Hydro's system over a 20-year timeframe. This target, from Section 12.7.1 of the JKDA,
 17 is also cited in the Socio-Economic Supporting Volume Section 3.4.2.1.1, where it notes
 18 that within the 20-year timeframe, "Manitoba Hydro and KCNs intend to work together,
 19 through a working group on operation jobs, to develop strategies to achieve this goal
 20 and to review and adjust these targets".

21 Section 12.7 of the JKDA is focused on Employment in Operational Jobs, including the
 22 development of the Working Group on Operational Jobs established after the signing of
 23 the JKDA. Section 12.7.3 states:

24 "The Working Group on Operational Jobs will work jointly and collaboratively to
 25 design and implement a successful employment framework, having regard to
 26 the matters set forth in the draft employment framework attached hereto as
 27 Schedule 12.8."

28 Schedule 12.8 of the JKDA outlines the framework and steps that the Working Group
 29 will follow to enable employment of KCNs Members in Hydro's ongoing operations. The
 30 framework includes seven stages for the Working Group, with associated actions for
 31 each stage to identify key activities that would support each stage. Each stage is
 32 described in the Schedule.

33 Examples include the following (please refer to JKDA Schedule 12.8 attached to this IR
34 response for details):

Stage	Actions
<i>Stage 5: Employment Preparation</i>	<ul style="list-style-type: none"> - Interview workshops/mock interviews - Student internship program - Student mentorship program - Summer employment - Academic upgrading/enrichment program
<i>Stage 6: PPT Employment Bridging</i>	<ul style="list-style-type: none"> - Gap training - Apprenticeship transitions
<i>Stage 7: Recruitment and Employment</i>	<ul style="list-style-type: none"> - Community-based recruitment drive - New hire orientation - New hire mentor/buddy match - Monitor and track success

35 Effective June 1, 2009, five-year contribution agreements were signed with each of the
36 Keeyask Cree Nations (KCN). These agreements expire March 31, 2014 and new five-
37 year agreements will be negotiated effective April 1, 2014.

38 As part of these agreements, each KCN community has at least one full-time community
39 employee dedicated to carrying out the activities of the Working Group. In the first
40 three years of the agreement, these working group employees, along with Manitoba
41 Hydro representatives, met monthly in action planning meetings to identify the
42 description, process, target audience, deliverables, measures of success and outcomes
43 for each action outlined in the Employment Framework (JKDA Schedule 12-8). These
44 documents lay the foundation for implementing the Employment Framework and are
45 referenced by Working Group employees to assist them in planning activities in their
46 communities. The Working Group now meets quarterly in either Winnipeg or the North.
47 During the last year of the agreement each community has taken the lead in planning
48 activities that will be the most beneficial for their community members.

49 Community working group members have developed skills over the past five years by
50 participating in planning meetings, developing annual work plans and budgets and
51 completing training in the areas of guiding circles, life skills and computer applications.
52 The work of this group has been completed with very little input from external
53 community advisors - a testament to the capacity building of community employees and
54 their commitment to the process.

55 Manitoba Hydro has dedicated one full time employee to work with each of the
56 communities. In addition, many other employees participate in working group activities
57 through presentations, hands-on sessions in the communities, facility tours and day-to-
58 day administration. Manitoba Hydro has provided training to working group employees

59 in the areas of resume preparation, mock interviewing, e-recruitment, how to conduct
 60 test workshops and career presentations. "Train-the-trainer" techniques are used when
 61 delivering these topics to working group employees so they can deliver these
 62 presentations and workshops to their members on and off reserve.

63 The activities of the working group are aimed at different segments of each community,
 64 from youth in elementary school (general awareness presentations) to teens in high
 65 school (career presentations and facility tours) to post secondary students
 66 (presentations on scholarships and bursaries and summer employment) to mature
 67 students (hands on sessions, education upgrading opportunities). The aim is to provide
 68 the information and assistance required by each of these segments so they can make
 69 optimal career decisions regarding employment with Manitoba Hydro.

70 On an annual basis, each community prepares a budget and schedule of activities to be
 71 undertaken in their respective communities (which reflects the distinct needs of each
 72 community). A number of activities and events are jointly undertaken (community &
 73 hydro representatives) on and off-reserve such as school visits, Manitoba Hydro facility
 74 tours, skill exploration workshops, hands-on sessions, life skills training, test taking
 75 workshops, resume building and interview workshops. Meetings are also held with post
 76 secondary students to promote Manitoba Hydro scholarships and bursaries and to
 77 explain the company's summer student program.

78 Percentage of jobs likely to be local

79 The JKDA identified target of 182 positions is for positions across all of Manitoba Hydro's
 80 operations in the Province; the positions are not confined to the Keeyask Generation
 81 Project. At this juncture, it is not feasible to determine the percentage of the 182
 82 positions that would be considered "local" (e.g., located in the vicinity of the Keeyask
 83 Project). Placement into positions will be dependent on a number of factors including
 84 individual career aspirations, qualifications and job opportunities.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **N/A; p. N/A**

3 **CEC Rd 1 CEC-0012**

4 **PREAMBLE:**

5 Some concerns were expressed by KCNs about the social effects of the project and being
 6 employed at the site.

7 **QUESTION:**

- 8 • Will workers from First Nations living in commutable distances (specifically the
 9 Tataskweyak and Fox Lake Reserves and First Nations individuals living in Gillam)
 10 and Gillam be allowed to commute on a daily basis to the Project basis?
 11 • Will they need to use their own transportation or will some sort of passenger
 12 shuttle service be organized?

13 **RESPONSE:**

14 A response is provided for each of these specific questions in turn.

15 *Will workers from First Nations living in commutable distances (specifically the*
 16 *Tataskweyak and Fox Lake Reserves and First Nations individuals living in Gillam) and*
 17 *Gillam be allowed to commute on a daily basis to the Project basis?*

18 Workers are allowed to commute to the work site on a daily basis. However, it is
 19 anticipated that virtually all construction workers, including those living in the nearest
 20 communities, will stay at the main camp for the following reasons:

- 21 • Accommodation, food and recreational facilities will be provided free of charge;
 22 workers who live offsite have to pay for their own accommodation and food;
 23 • Daily shifts will be long, with overtime often standard practice (see SE SV Section
 24 5.4.1.4). This means there is little time available to commute each day.
 25 • Safety is a priority of the Project. The availability of a Project shuttle service (see
 26 below) is a mechanism to enhance worker safety as well as reduce traffic congestion
 27 from use of personal vehicles.
 28 • Travel time between the construction site and Gillam, the nearest community, will
 29 be approximately one hour each way during the course of construction (the south
 30 access road will not be open to general traffic until construction is complete). Other
 31 communities are further away. At least two hours per day for commuting to and
 32 from the worksite is substantial.

33 *Will they need to use their own transportation or will some sort of passenger shuttle*
34 *service be organized?*

35 Section 5.4.1.4.4 of the Socio-Economic, Resource Use and Heritage Resources
36 Supporting Volume (SE SV), notes that there will be a shuttle service to and from
37 airports in Gillam and Thompson to transport workers to the Project site. Provision of
38 transportation services for project employees is governed by the Burntwood Nelson
39 Agreement (BNA). Under the conditions of the BNA, contractors are responsible to
40 provide transportation to and from the nearest point of public transportation or the
41 'Transportation Departure Point' to the Project site or the 'Project Transportation Point'.
42 In the case of KCNs communities, the contractor will provide transportation from
43 Thompson, Gillam, Split Lake, Ilford, and York Landing to the Project site. The shuttle
44 from Gillam will also stop at the junction of PR 280 and 290 (former Greyhound bus stop
45 location) for residents of Fox Lake Cree Nation (Bird); note that the Partnership will
46 establish a mechanism to safely transport FLCN workers to and from the community
47 and highway junction. This shuttle service is available for workers before and after their
48 isolation leave (i.e., work rotation).

49 If commuting, workers will be expected to make their own way to the construction site
50 and may claim mileage for isolation leave as per the BNA.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **Part 1 Socio-Economic Environment; p. N/A**

3 **CEC Rd 1 CEC-0013**

4 **QUESTION:**

5 Does the Project expect to increase the demand on local RCMP services? If so, how and
6 what is the proposed mitigation?

7 **RESPONSE:**

8 The questions above are answered in turn below.

9 *Does the Project expect to increase the demand on local RCMP services?*

10 Section 4.4.1.3.2 and 4.4.1.3.3 of the SE SV indicate there is potential for an increase in
11 demand for local RCMP services in Gillam and Thompson. It is difficult to predict if an
12 increase will occur and the extent of the increase if it does occur. To address this
13 uncertainty, Manitoba Hydro, on behalf of the Partnership, has committed to ongoing
14 discussions and working closely with the RCMP on project-related matters that could
15 affect demand for their services, including implications of visits by construction workers
16 to these communities.

17 *If so, how and what is the proposed mitigation?*

18 The RCMP and Manitoba Hydro meet regularly to discuss policing matters related to the
19 Town of Gillam. Manitoba Hydro, on behalf of the Partnership, has started discussions
20 with the RCMP to assess and respond to Project impacts on policing for the region
21 including beyond the town of Gillam and into the rural areas around Gillam (Bird) and
22 Thompson and surrounding areas (Split Lake). Furthermore, Manitoba Hydro has
23 worked with the Town of Gillam and Fox Lake Cree Nation to establish the Terms of
24 Reference for a worker interaction committee. This Committee will include
25 representatives from these three parties, as well as other stakeholders and service
26 providers, including the RCMP in Gillam and Thompson, and is intended to provide a
27 coordinated approach to addressing worker interaction issues across all of Manitoba
28 Hydro's Projects (SE SV Section 5.4.1.4.4). In conjunction with the above, this committee
29 would explore both preventative and responsive mitigation strategies.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.4.4**
2 **Land; p. 6-459**

3 **CEC Rd 1 CEC-0014**

4 **QUESTION:**

5 Page 6-459 of the Environmental Effects Assessment states there is no mention of the
6 impact on the road in concert with Bipole/Keewatinoow construction. Will KHLP be
7 assisting MIT with respect to road responsibilities?

8 **RESPONSE:**

9 Page 6-462 of the Response to EIS Guidelines indicates that adverse residual effects of
10 the Project on transportation infrastructure (including roads) during construction will
11 overlap or interact spatially and temporally with effects from Bipole III (which includes
12 Keewatinoow construction). This is consistent with Table 7-4 on pg. 7-38 in the
13 Cumulative Effects chapter; with further detail noted in Section 7.6.3.1.

14 MIT has the responsibility for maintaining and upgrading all provincial roads. To address
15 provincial safety requirements and accommodate increased traffic, MIT and Manitoba
16 Hydro identified areas between PR 391 and the north access road (KM 177) that
17 required improvements. Upgrades are being cost shared between MIT and Manitoba
18 Hydro, and include gravel stabilization, road widening and curve shaving.

19 As part of the mitigation measures for both the Bipole III and Keeyask Generation
20 projects, ongoing traffic monitoring will be undertaken. Furthermore, in the Response to
21 EIS Guidelines (pg 7-47), it is noted that Manitoba Hydro and MIT will continue to
22 maintain open dialogue during the construction period to identify requirements for road
23 improvement and traffic management.

24 Similarly, in response to CEC IR-6 (CEC/MH VI-265) raised during the Bipole III regulatory
25 review process, the Bipole III Transmission Project team indicated that, "any issues or
26 concerns that are raised during the construction phase will be addressed in a case-by-
27 case basis by the Project managers for the various Projects and adaptive management
28 measures will be implemented".

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **Part 2 Resource Use - 1.8 Lodges, Outfitters and Other Tourism; p.**
 3 **1-95**

4 **CEC Rd 1 CEC-0015**

5 **PREAMBLE:**

6 This section of the Resource Use Report addresses the commercial lodge and outfitting
 7 business which is generally targeted to non-residents and focus on sport hunting and
 8 fishing opportunities. It appears that there are no lodges or cabins in the immediate
 9 area of the Project and therefore are not directly affected by the Project's construction
 10 or operation activities. Most of the lodges and outfitters businesses would be more
 11 remote access (fly-in or more difficult land transport) in the regional study area. While
 12 these businesses are not directly affected by the Project's construction activities they
 13 could be affected by either the: workforce in their days off or by the shifting patterns of
 14 resource use to KCNs' AEA Offsetting Programs which involve improved access and
 15 utilization of fisheries and wildlife resources within the Split Lake RMA. TCN has
 16 indicated that they have established guidelines and principles for participants as part of
 17 their Access Program and this includes: Respect for the land and environment; firearms
 18 safety measures; conducting selective harvests; and, respect for others.

19 **QUESTION:**

20 What mitigation measures are planned to prevent such effects from the workforce or
 21 from KCNs shifting pattern of use? The effect may not be simply the taking of fish and
 22 wildlife resources but increased access which will in turn allow other users into the area.
 23 The Resource Use Report indicates that: "Residual effects of Project construction on
 24 lodges and outfitters is expected to be adverse, small, or a small geographical extent (to
 25 tourist operations) and long-term. No mitigation is planned." Will some of these tourism
 26 operations no longer be viable or challenged by these new patterns?

27 **RESPONSE:**

28 Tourist (lodges and outfitting) operations are typically located at considerable distance
 29 from the Project. Table 1-1 below lists the operations and their approximate distance
 30 from the Project. All lodges and outfitters listed lack road access and are typically
 31 accessed by aircraft, with the exception of ACE Wilderness Guiding. ACE Wilderness
 32 Guiding conducts bear hunting guiding for American clientele from late May to mid to
 33 late June adjacent to PR 280 from Stephens Lake to Gillam and adjacent to roads in the
 34 Gillam vicinity.

Table 1-1. Distance from the Project to Lodge and Outfitting Operations in the Split Lake Resource Management Area.

Lodge/Outfitter Operation	Status of Operation	Location of Operation	Aerial Distance from Project (km)
Dunlop's Fly-In	Active	Waskaiowaka Lake (main)	70
Fishing Lodge and Outposts		Pelletier Lake (outpost)	110
		Campbell Lake (outpost)	130
Holmes Lake Lodge	Inactive	Holmes Lake (main)	125
		Thomas Lake (outpost)	115
Mystery Country's Lodge and Outposts	Active	Dafoe Lake (outpost located 2 km outside of Split Lake RMA); (main lodge and other outposts outside of Split Lake RMA)	95
ACE Wilderness Guiding	Active	Gillam and area	30
Fox River Outfitters	Active	Fox River (south of Gillam)	85
All Terrain Bear Hunts	Active	Wernham Lake	150
Lea Meadows Outfitters	Active	Churchill River at Billard Lake	105

Notes: Distances are approximate. Distances are rounded to nearest 5 km and represent distance from the Generating Station site by air. If exact location of lodge/outfitting infrastructure unknown, distance was measured to waterbody.

35 As documented in Table 1-1, distances from the Project area to lodge and outfitting
 36 operations and the lack of road access (for all operations except ACE Wilderness
 37 Guiding) are expected to limit or prevent construction workforce access to these
 38 operations. Overland travel (at minimum, 70 km to the closest operation) is expected to
 39 be difficult and access is limited by the number of days off between shifts. The
 40 Burntwood Nelson Agreement indicates that workers will work 10-12 hours per day, six
 41 days a week with only one day off, though exact working hours will not be finalized until
 42 after contracts are awarded (SE SV Section 5.4.1.4; see also response to CEC Rd 1 CEC-
 43 0017). A 140 km overland round trip, at minimum, would deter construction workforce
 44 members from visiting lodge and outfitting allocation areas on days off. Between shift
 45 rotations, the workforce is likely to go to regional communities or home.

46 An alternate option for accessing lodge and outfitting areas (except ACE Wilderness
 47 Guiding) is by chartering an aircraft. This option is available with or without the Project
 48 and participation is generally limited by the high cost of air travel.

49 Though the construction workforce and ACE Wilderness Guiding's operation will be in
 50 relatively close proximity, a notable increase in bear hunting is not expected as it is

51 pursued by only a relatively small segment of the recreational hunting community
 52 (Resource Use Section 1.7.3.2 of the SE SV). Prohibitions on firearm and ATV storage at
 53 the construction site will further deter recreational hunting during time off. Provisions
 54 in the Construction Access Management Plan provide for worker orientation that
 55 includes respect for the surrounding area, fisheries and wildlife, and local communities.

56 All of the identified lodges and outfitters are only active in the Split Lake Resource
 57 Management Area (RMA). Therefore, offsetting programs operating in the Split Lake
 58 RMA are the only ones with the potential to affect these tourist operations through
 59 shifting patterns of resource use among the KCNs. Relevant offsetting programs include
 60 the TCN Access Program, the TCN Healthy Food Fish Program, the WLFN Improved
 61 Access Program, and the WLFN Community Fish Program. There are no lodges or
 62 outfitting operations at the destinations of the WLFN programs.

63 The TCN Healthy Food Fish Program has not commenced. It is planned to operate on
 64 Pelletier, Recluse, Waskaiowaka, Limestone and Myre Lakes, and such other lakes in the
 65 Split Lake Resource Management Area, as may be designated by TCN in consultation
 66 with the Split Lake Resource Management Board. Healthy Food Fish Program lakes that
 67 overlap with lodge/outfitting operations include Waskaiowaka and Pelletier where a
 68 lodge business and its outcamp operate. As noted in Resource Use Section 1.8.4.1 of the
 69 SE SV, increased competition for fish resources may occur in relation to the TCN Healthy
 70 Food Fish Program on Waskaiowaka and Pelletier. These lakes, in addition to three
 71 others, may be subject to a combined harvest of up to 62,142 kg of fish (round weight)
 72 annually beginning March 31, 2013. Though there is a high level of uncertainty with
 73 respect to the actual harvests expected on Waskaiowaka and Pelletier, reductions in the
 74 abundance of large trophy fish (i.e., large fish targeted by sports fishers) remain a
 75 possibility. Reductions in fish abundance, as well as observations of other resource
 76 users, could reduce returning clientele.

77 The TCN Access Program can operate anywhere within the Split Lake RMA. To provide
 78 additional perspective, the Split Lake RMA is 43,169 km² in area and amounts to
 79 approximately 6% of the province. The Access Program may cause some localized
 80 reductions in the moose resource and may also affect lodge and outfitter clientele if
 81 they observe other users of the resource.

82 To reduce the potential for adverse effects to tourism operations as a result of
 83 operating the offsetting programs, the following checks and balances are generally in
 84 place:

- 85 • Implementation of the TCN Access Program Guidelines and Principles to:
 - 86 ○ respect the land and environment;
 - 87 ○ use firearms safely;

- 88 ○ conduct selective harvest; and
- 89 ○ respect others;
- 90 ● Coordination with the Split Lake Resource Management Board to:
 - 91 ○ review and discuss annual reports on the management and administration of
 - 92 the AEA offsetting programs;
 - 93 ○ provide a forum for ongoing communication among resource users and
 - 94 provincial resource managers; and
 - 95 ○ consult with TCN on Healthy Food Fish Program lakes other than those named in
 - 96 the TCN AEA;
- 97 ● Commitment by TCN to:
 - 98 ○ operate offsetting programs within and only in the Split Lake RMA as per the
 - 99 TCN AEA agreement; and
 - 100 ○ work with other users of the resources to resolve concerns of mutual interest
 - 101 now and in the future as they have in the past.

102 Specifically with respect to the Healthy Food Fish Program, TCN expects to:

- 103 ● Conduct monitoring to determine whether any reductions in trophy fish are seen
- 104 and to determine the need for any adaptive management measures;
- 105 ● Adjust fishing pressure according to monitoring results to ensure that harvest
- 106 remains sustainable; and
- 107 ● Consider beginning the Healthy Food Fish Program on the west basin of
- 108 Waskaiowaka Lake separate (several kilometres away) from the lodge situated on
- 109 the east basin until monitoring results inform further decision-making.

110 In addition to the above, TCN has committed to developing and implementing Moose
 111 and Fish Harvest Sustainability Plans to assist program managers with the sustainable
 112 management of these resources into the future. These programs will be reviewed and
 113 discussed with the Resource Management Board once available and the results of
 114 ongoing program monitoring will be provided to the Board on an annual basis.

115 Together, these measures are expected to address, to the degree possible, potential
 116 Project-associated effects on tourist operations.

117 It should be noted that tourist operations are operating in areas where historically
 118 Treaty and Aboriginal Rights have been exercised and in areas where Aboriginal and
 119 Treaty Rights will continue to be exercised in perpetuity (regardless of whether the
 120 Project proceeds). The AEA offsetting programs are not providing new access to
 121 portions of the TCN ancestral homeland as all of these lakes and rivers have been
 122 hunted and fished since time immemorial. Rather, these programs have improved the
 123 ability of members to visit these areas in order to “substitute opportunities to hunt fish
 124 and trap for food and carry out associated customs, practices and traditions to their
 125 cultural identity within the Split Lake RMA”.

126 Lodge and outfitting allocations have always and will continue to be prioritized for
127 allocation only after Aboriginal and Treaty Rights and Manitoba resident use of the
128 resources have been satisfied. The Natural Resources Transfer Agreement (NRTA),
129 which forms part of the *Constitution Act, 1930*, provides that Indian people “have the
130 right, which the Province hereby assures to them, of hunting, trapping and fishing game
131 and fish for food at all seasons of the year on all unoccupied Crown lands and on any
132 other lands to which (they) may have a right of access.” Aboriginal and Treaty rights
133 relating to hunting, fishing and gathering are also recognized and affirmed as part of the
134 Constitution of Canada by Section 35 of *the Constitution Act, 1982*.

135 With respect to resident hunting, ‘non-draw’ resident moose licenses are available in
136 GHAs 9, 1, 3 and 3A (where some hunting outfitters are located). The non-draw nature
137 of these licences means that there is no limit to the total number of licences sold
138 (though there are restrictions on the number of moose harvested, harvesting cows, and,
139 in most cases, calf harvest is prohibited). The nature of these licences provides an
140 opportunity for interested Manitoba residents to hunt in these GHAs. This is in contrast
141 to other GHAs where a draw for licences is required to limit the moose harvested.
142 Allocations of moose tags to lodges or outfitters do not provide the right to prevent
143 others from hunting in the same area or from fishing on an allocated lake (Licensing
144 Advisory Committee, Manitoba Conservation n.d.). Non-resident big game hunting
145 licences (such as moose tags) allocated to tourist operations remain the property of the
146 Province of Manitoba (Licensing Advisory Committee, Manitoba Conservation n.d.).
147 While the cost of access by aircraft remains a major limiting factor to resident hunting in
148 tourist lodge and outfitting areas (as it does for the construction workforce), tourist
149 operations also can be susceptible to competition from the residential hunt.

150 **REFERENCES:**

151 Licensing Advisory Committee, Manitoba Conservation n.d. Licensing/Permitting
152 requirements for outfitters. Available from:
153 https://www.gov.mb.ca/conservation/susresmb/pdf/handbook_june_2008.pdf.
154 [accessed June 3, 2013].

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **Part 1 Socio-Economic Environment; p. N/A**

3 **CEC Rd 1 CEC-0016**

4 **QUESTION:**

5 Will all the workers associated with the Project's construction be housed in one of the
 6 two camps? What is the proportion of workers that won't be and where will they be
 7 housed?

8 **RESPONSE:**

9 Each of the questions noted above is answered in turn.

10 *Will all the workers associated with the Project's construction be housed in one of the*
 11 *two camps?*

12 Yes, construction workers associated with the Project will be housed in one of the two
 13 camps, with the majority being housed in the Main Camp on the north side of the river.
 14 Section 4.2.2.1 indicates that "during construction, Project workers, including Manitoba
 15 Hydro employees, would be housed in construction camps near the Project site".

16 Workers are allowed to commute on a daily basis; however, few, if any, are expected to
 17 adopt this approach. It is anticipated that virtually all construction workers, including
 18 those living in the nearest communities, will stay at project camps for the following
 19 reasons:

- 20 • Construction workers are provided with free accommodation and meals, as well as
 21 recreational facilities and activities at the construction camps (see Section 4.4.1.1);
 22 As per the Burntwood Nelson Agreement (BNA), the Contractor shall provide the
 23 employee who opts to provide his/her own housing with an allowance of fifteen
 24 dollars (\$15.00) per calendar day.
- 25 • Given daily shifts are long, with overtime often standard practice, and the commute
 26 to the Project site lengthy (e.g., close to an hour from Gillam or Split Lake – the
 27 closest communities to the Project site), there is little time available to commute
 28 each day (see SE SV Section 5.4.1.4 and CEC Rd1 CEC-0017). If commuting, a worker
 29 will be reimbursed at the kilometer rate (as per the BNA), for isolation leaves
 30 (work rotation) only and not for the daily commute.
- 31 • Safety is a priority of the Project. The availability of a Project shuttle service for
 32 isolation leave is a mechanism to enhance worker safety, as well as reduce traffic
 33 congestion from use of personal vehicles. Travel time between the construction site
 34 and Gillam, the nearest community, will be approximately 1 ½ hours each way

35 during the course of construction (the south access road will not be open to general
36 traffic until construction is complete). Other communities are further away. At least
37 three hours per day for commuting to and from the worksite is substantial.

38 *What is the proportion of workers that won't be and where will they be housed?*

39 All employees who visit the Project on a temporary basis (e.g., Manitoba Hydro
40 management/personnel) will be provided the opportunity to stay at the Main Camp. It
41 is expected that approximately 1% of this project labour force temporarily visiting the
42 area may choose to stay elsewhere, most likely in Gillam.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **N/A; p. N/A**

3 **CEC Rd 1 CEC-0017**

4 **PREAMBLE:**

5 With respect to a wide variety of social considerations there are a number of basic facts
 6 about how the Project will be organized that appear to be missing and/or unclear. In
 7 turn, we are uncertain whether these aspects of the Project may produce negative
 8 effects.

9 Major concerns were expressed in the Socio-Economic Volume for the potential of
 10 negative worker interaction issues, specifically: the increased availability of drugs and
 11 alcohol; potential for increased violence; and, risk of inappropriate sexual behaviour.
 12 This was also a concern expressed by the KCN's. This is acknowledged in the Socio-
 13 Economic Volume:

14 "Since worker interaction issues have the potential to adversely affect individual
 15 and community mental health and well-being, mitigation measures have been
 16 proposed ... Mitigation measures focus on construction workers on site (e.g.,
 17 measures to make it more attractive to stay on site)" (p. 5-179).

18 It appears, though it is not entirely clear that the workers will have one day off during
 19 their on-rotation time at the site and thereby increasing the likelihood of opening up the
 20 paths to such effects. Page 5-183 of the Socio-Economic Environment, Resource Use and
 21 Heritage Resources Volume indicates that: The Burntwood Nelson Agreement indicates
 22 that most workers will work 10 to 12 hour days, six days a week and have only one day
 23 off, typically Sunday, although the exact working hours for the general civil contract will
 24 not be finalized until after the contract is awarded. This indicates that workers will have
 25 one day off at the construction site means that workers from areas of the Province
 26 south of Thompson would not be able to travel home for the day. This therefore
 27 increases the likelihood of the social effects that are identified in the Socio-Economic
 28 Report.

29 **QUESTION:**

30 Given this potential work schedule, what measures will be put in place to prevent
 31 negative worker/local population interaction issues?

32 Why not eliminate the day off at site and break the potential pathway of effects?

33 Associated with this work schedule there are a wide variety of other potential socio-
 34 economic and resource effects that are somewhat described in the Socio-Economic
 35 Volume. Some of the questions with respect to possible effects include the following:

- 36 • What will these workers be able to do on their day off and where will they be able
 37 to go?
- 38 • Will there be any prohibitions on: hunting, fishing, access to remote areas or the
 39 First Nations Reserves, storage of hunting gear; use of ATVs and snowmobiles, etc?
- 40 • How will workers be controlled so as not increase use of and open up access to
 41 areas where they could impact on lodge operators and outfitters or impact the
 42 KCN's healthy food resource programs.
- 43 • How would KHLP control off construction site access and the consumption of
 44 alcohol?
- 45 • What would be the estimate of the total workers and total worker days that would
 46 be spent locally with this day off?
- 47 • On a related issue, how often will workers be allowed to go home (i.e. what is the
 48 actual work schedule for labour and management)?

49 **RESPONSE:**

50 Each of the questions identified above is answered in turn.

51 *Given this potential work schedule, what measures will be put in place to prevent*
 52 *negative worker/local population interaction issues?*

53 As noted in the background of the question, as well as in Section 5.4.1.4.4 of the Socio-
 54 Economic Supporting Volume, a series of mitigation measures have been confirmed by
 55 the Partnership at the construction site to prevent negative worker/local population
 56 interaction issues (see pg. 5-190 for full list). Key measures include the following:

- 57 • Lounge and recreational activities at the main camp;
- 58 • Cultural awareness training for all workers, including expectation of respectful
 59 behaviour;
- 60 • Restriction of unauthorized public visits to the camps (including 24/7 security);
- 61 • Discouraging non-northern workers from bringing personal vehicles to the site and
 62 providing a shuttle service from Gillam and Thompson airports (also see CEC Rd 1
 63 CEC-0019);
- 64 • Restrictions on the use of company vehicles for personal purposes; and
- 65 • Provision of Camp Rules as part of Contractor's responsibility.

66 When workers leave Project work sites and venture into neighbouring communities
 67 such as Gillam, Bird, Split Lake or Thompson, the Partnership can encourage respectful
 68 conduct but does not have the ability to control worker behaviour.

69 Manitoba Hydro, the Town of Gillam and Fox Lake Cree Nation have established a Terms
 70 of Reference for a worker interaction committee. This Committee will include
 71 representatives from these three parties, as well as other stakeholders and service
 72 providers in the Gillam area. This Committee is intended to provide a coordinated
 73 approach to addressing worker interaction issues across all of Manitoba Hydro's
 74 projects in the vicinity of the Gillam area and will determine the best mechanism for
 75 tracking and addressing such issues and concerns in the vicinity of Gillam (SE SV Section
 76 5.4.1.4.4).

77 The RCMP and Manitoba Hydro also meet regularly to discuss policing matters related
 78 to the Town of Gillam. Manitoba Hydro is committed to ongoing dialogue with the
 79 RCMP so that it can make its plans based on current construction schedules and the
 80 anticipated timing of the peak workforce (see also CEC Rd 1 CEC-0013).

81 *Why not eliminate the day off at site and break the potential pathway of effects?*

82 Contractors must adhere to provincial labour laws; however, work schedules are up to
 83 contractors' discretion. The work schedule noted in the EIS is based on provisions in the
 84 Burntwood Nelson Agreement with the understanding that exact working hours will not
 85 be finalized until after contracts are awarded (SE SV Section 5.4.1.4). It is possible that
 86 contractors may want to change the current work schedule to promote an attractive
 87 recruitment/retention package. This could include a request to amend the BNA in order
 88 to create scheduling arrangements that will permit workers to work seven days/week.

89 *What will these workers be able to do on their day off and where will they be able to go?*

90 If non-local construction workers have personal transportation at site, they will be able
 91 to drive off-site to communities such as Gillam or Thompson for a variety of activities
 92 including shopping, banking, sight-seeing and visiting friends or family. The Draft
 93 Construction Access Management Plan prohibits ATVs, boats and snowmobiles; workers
 94 will not have the ability to go 'off-road' into areas not accessible by car.

95 *Will there be any prohibitions on: hunting, fishing, access to remote areas or the First
 96 Nations Reserves, storage of hunting gear; use of ATVs and snowmobiles, etc?*

97 Provisions outlined in the Draft Construction Access Management Plan (AMP)
 98 (preliminary draft filed on April 26, 2013) are expected to limit hunting on the Project
 99 site by the construction workforce. Section 2.3 of the AMP includes the following
 100 measures:

- 101 • Project workers are prohibited to transport, use or store firearms on Project site;
- 102 • Project workers are prohibited to transport, use or store snowmobiles, ATVs or
 103 boats on the Project site; and

- 104 • Staff, under the direction of the Project Manager, at the control gate near PR 280
 105 and the South Access Road (24 hours per day, 7 days per week during the
 106 construction phase) will monitor that only authorized users access the area and
 107 communicate and distribute appropriate information to those entering the area.
 108 Other security staff will be responsible for patrolling the roadways and enforcement
 109 of camp rules and policies.

110 Furthermore, fishing will be permitted in safe areas (i.e., away from construction
 111 activities). The possession of, or use of boats, will be prohibited and therefore, net
 112 fishing (which typically increases catch) will not occur. Non-Aboriginal workforce
 113 members must possess a valid Manitoba fishing licence and adhere to the possession
 114 rules (see CEC Rd 1 CEC-0018 for additional information).

115 Other details in the Plan include enforcement and an education and communication
 116 strategy. The draft Plan can be found on the Keeyask Project's website at the following
 117 link:

118 [http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-
 119 environmental-protection-program](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program).

120 *How will workers be controlled so as not to increase use of and open up access to areas
 121 where they could impact on lodge operators and outfitters or impact the KCN's healthy
 122 food resource programs?*

123 The Project site is located in a generally remote portion of northern Manitoba. The main
 124 provincial road access is PR 280; and the north access road (part of the Keeyask
 125 Infrastructure Project) will be in place in 2014 starting at a junction with PR 280 and
 126 running approximately 25 km east to the Project site. The south access road will be an
 127 extension of the Butnau Road west of Gillam and will be built as part of the Project.
 128 Both the north and south access roads will have 24/7 security-controlled gates and only
 129 authorized users may travel on these roads during construction (see Draft Construction
 130 Access Management Plan, April 2013). There is no spatial overlap with existing lodge
 131 operators and outfitters and Project infrastructure (including the access roads);
 132 therefore, no new access associated with the Project is expected to affect existing lodge
 133 operators and outfitters.

134 As noted in the responses above, workers are prohibited from bringing ATVs, boats or
 135 snowmobiles on site; therefore, eliminating access into remote, 'off-road' areas (for
 136 additional information see CEC Rd CEC-0009 CEC Rd 1 CEC-0015).

137 *How would KHL P control off construction site access and the consumption of alcohol?*

138 Project workers will be discouraged from bringing their personal vehicles to the site and
139 will not have access to Project vehicles for personal use. Neither Manitoba Hydro nor
140 the Partnership has the ability to control construction workers activities or consumption
141 of alcohol when off the Project site. Nevertheless, mitigation, such as cultural awareness
142 training, will provide clear communication to construction workers about the behaviour
143 expected of them when in local communities.

144 *What would be the estimate of the total workers and total worker days that would be*
145 *spent locally with this day off?*

146 It is not feasible to estimate with any accuracy the total workers and total worker days
147 that would be spent locally as it remains a personal choice whether workers will go off-
148 site during their day off. Further, not all jobs are full-time or year-round. As
149 aforementioned, it is anticipated that the majority of workers will choose to work
150 without a day off, pending negotiated contractor schedule arrangements.

151 *On a related issue, how often will workers be allowed to go home (i.e., what is the actual*
152 *work schedule for labour and management)?*

153 Project workers' schedules are governed by the BNA. The work schedule for
154 management will be set and implemented by the various contractors on site,
155 particularly the General Civil Contractor.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **Part 2 Resource Use - 1.2 Domestic Resource Use; p. 1.6**

3 **CEC Rd 1 CEC-0018**

4 **PREAMBLE:**

5 Domestic resource use is hunting, fishing, trapping and gathering for
 6 domestic/subsistence purposes. This section is devoted exclusively to Aboriginal peoples
 7 and touches on both historic and modern-day use. This section of the Report draws on
 8 the Environmental Evaluations conducted by the KCNs.

9 An array of possible effects are identified that might lead to an effect on domestic
 10 resource use during both the construction and operation periods. One of the major
 11 mitigations for the potential effect on domestic resource use is the Adverse Effects
 12 Agreement (AEAs) specifically the off-setting programs. Essentially domestic fishing
 13 pressure will be re-distributed to a larger regional base.

14 The presence of the large workforce in the camp is identified as a possible cause of
 15 increased competition for resources and local and/or road accessible fishing areas;
 16 although no residual effect is predicted.

17 **QUESTION:**

18 How will the workforce be managed so that there will be no effects on fisheries; wildlife
 19 resources; trapping trails, traps and cabins, etc.?

20 **RESPONSE:**

21 The presence of a large workforce in camp has been identified as a possible cause of
 22 increased competition for resources and/or at road accessible fishing areas (Resource
 23 Use Sections 1.2.4.1.1 and 1.2.4.2.1 of the SE SV).

24 Areas that have the potential to be accessed are: a) on the Project site; and b) off the
 25 Project site.

26 On the Project site:

27 On the Project site, the Keeyask Construction Access Management Plan (a preliminary
 28 version was filed by the Partnership on April 26, 2013) contains the following provisions
 29 that will eliminate hunting and restrict fishing to local shore fishing:

- 30 • For safety and to limit new hunting pressure, restrictions will be in place regarding
 31 firearms (*e.g.*, high-powered rifles, handguns, shotguns, long bows and cross bows)
 32 which includes access roads. Project workers will be prohibited to transport, use or

- 33 store firearms on the Project site. All Project-related workers (including KCNs
 34 workers) will be made aware of this restriction at the time of hire. If a worker is
 35 found to have a firearm within the Project area, they will be disciplined up to and
 36 including dismissal.
- 37 • Restrictions will be in place regarding snowmobiles, all terrain vehicles (ATVs) and
 38 boats at the Project site (including access roads). Boat launching facilities will be
 39 accessible to the public for emergency purposes only. All Project-related workers
 40 (including workers from the KCNs) will be made aware of this restriction at the time
 41 of hire. If a worker is found to have a snowmobile, ATV or boat within the Project
 42 site area, they will be disciplined up to and including dismissal.
 - 43 • Staff, under the direction of the Project Manager, at the control gate near PR 280
 44 and the South Access Road (24 hours per day, 7 days per week during the
 45 construction phase) will be responsible for the following:
 - 46 ○ To monitor that only authorized users access the area;
 - 47 ○ To communicate and distribute appropriate information to those entering the
 48 area; and
 - 49 ○ To operate the traffic signaling device at the security gate.
 - 50 • Other security staff will be responsible for patrolling the roadways and enforcement
 51 of camp rules and policies.

52 These provisions are expected to limit hunting on the Project site by the construction
 53 workforce. Fishing will be permitted in safe areas (i.e., away from construction
 54 activities). The possession of, or use of boats, will be prohibited and therefore, net
 55 fishing (which typically increases catch) will not occur. Non-Aboriginal workforce
 56 members must possess a valid Manitoba fishing licence and adhere to the possession
 57 rules.

58 The lack of recreational vehicles such as ATVs are expected to reduce access to trapping
 59 trails, traps and cabins as access by the construction workforce would be on foot.
 60 Known cabins are located, at minimum, 20 km away.

61 Off the Project site:

62 Off the Project site, construction workers who have the potential to participate in
 63 resource harvesting are those that reside in Gillam and those that reside in camp. Net
 64 in-migration to Gillam is expected to be low during construction and therefore potential
 65 increases in hunting and fishing pressures from those residing in Gillam are expected to
 66 be nominal or very low.

67 Construction workers who are commuting to and from the construction site between
 68 shift rotations have the potential to participate in hunting and fishing activities. These
 69 areas (e.g., PR 280 between Thompson and the Keeyask Junction) are currently

70 patrolled by Manitoba Conservation and Water Stewardship. Long work hours and
71 limited time off is expected to limit construction workforce harvest on days off (see also
72 response to CEC Rd 1 CEC-0015). Harvests off-site and regulations restricting harvests
73 are managed by Manitoba Conservation and Water Stewardship. As part of the Keeyask
74 Construction Access Management Plan, worker orientation will be provided to
75 encourage respect of the surrounding area including fish and wildlife resources. As well,
76 because firearms and recreational vehicles are restricted onsite the workforce will lack
77 equipment to conduct resource harvest on shift rotation.

78 In addition to the above, and to respond to the KCNs' concerns, the Partnership has
79 committed to monitoring construction workforce harvest regularly during construction
80 as part of the Resource Use Monitoring Plan filed with regulators on June 28, 2013.
81 Monitoring is proposed to apply to both on-site and off-site locations. Annual reports
82 will be produced documenting the results of this monitoring.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **N/A; p. N/A**

3 **CEC Rd 1 CEC-0019**

4 **PREAMBLE:**

5 A concern is expressed about the large number of worker vehicles that will be put on
 6 highway and roads system. Potential socio-economic, resource and environmental
 7 effects include: vehicular accidents; increased negative interactions with KCNs; wildlife
 8 mortality; increased likelihood of workers stopping and exploiting local natural
 9 resources; increased likelihood of substance abuse on the drive home, etc.

10 **QUESTION:**

- 11 a. Will there be transportation services (e.g., shuttle bus) provided for workers from
 12 outside of the local area to take these workers to and from the camp? (i.e., to and
 13 from Thompson, to and from Winnipeg)?
 14 b. How does the consideration for such shuttle services reduce the potential for traffic
 15 travel?

16 **RESPONSE:**

17 A response to each of the above questions is provided below.

- 18 a. *Will there be transportation services (e.g., shuttle bus) provided for workers from*
 19 *outside of the local area to take these workers to and from the camp? (i.e., to and*
 20 *from Thompson, to and from Winnipeg)?*

21 Section 5.4.1.4.4 of the Socio-Economic, Resource Use and Heritage Resources
 22 Supporting Volume (SE SV), notes that there will be a shuttle service to and from
 23 airports in Gillam and Thompson to transport workers to the Project site. Provision of
 24 transportation services for project employees is governed by the Burntwood Nelson
 25 Agreement (BNA). Under the conditions of the BNA, contractors are responsible to
 26 provide transportation to and from the nearest point of public transportation or the
 27 'Transportation Departure Point' (e.g. Winnipeg, Thompson, Gillam) to the Project
 28 Transportation Point. For out-of-province workers, the contractor is bound to pay the
 29 travel costs of out-of-province workers to/from the nearest airport closest to their
 30 homes (also see response to CEC Rd 1 CEC-0012).

- 31 b. *How does the consideration for such shuttle services reduce the potential for traffic*
 32 *travel?*

33 Safety is a priority of the Project. The availability of a Project shuttle service is a
34 mechanism to enhance worker safety as well as reduce traffic congestion from use of
35 personal vehicles. Section 5.4.1.5.2 of the SE SV (pg. 5-196) notes the inclusion of
36 shuttle usage in the traffic volume estimates. This was further refined in Supplemental
37 Filing # 1 – Updated Keeyask Traffic Assessment on pg. 2-3 which states: “It has been
38 assumed that approximately 75% of the workforce will use the shuttle bus service to
39 and from the Project site.” Traffic estimates have been based on the inclusion of shuttle
40 usage, resulting in much lower overall Project traffic levels than if cars were used to
41 transport all workers between the Project site and airports in Gillam, Thompson or
42 Winnipeg.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.3**
2 **Past, Current and Future Projects and Activities; p. N/A**

3 **CEC Rd 1 CEC-0020**

4 **PREAMBLE:**

5 Identification of Past, Current and Future Projects and Activities

6 Attachment E of the Scoping Document for the EA of the Keeyask Generation Project
7 provides a list of past, current and future projects and activities for the cumulative
8 effects assessment (CEA):

9 *“The following are past and current (i.e., ongoing) projects and activities to be*
10 *considered in the cumulative effects assessment:*

- 11 • *Manitoba Hydro generation-related developments in the North:*
- 12 • *Churchill River Diversion o Lake Winnipeg Regulation*
 - 13 • *Jenpeg, Kelsey, Kettle, Long Spruce, Limestone and Wuskwatin Generating*
14 *Stations o Kelsey re-running*
 - 15 • *Keeyask Infrastructure Project*
 - 16 • *Linear development in the region (i.e., transmission lines and highways,*
17 *including upgrades to PR 280)*
 - 18 • *Mining (e.g., Vale)*
 - 19 • *Commercial forestry*
 - 20 • *Commercial fishing of sturgeon*
 - 21 • *Other agents of change as may be identified in the assessment of specific VECs*

22 *The following are future projects to be considered in the cumulative effects*
23 *assessment:*

- 24 • *Gillam redevelopment*
- 25 • *Bipole III Transmission*
- 26 • *Keeyask Transmission Project*
- 27 • *Conawapa Generation Project”*

28 In Section 9.8 “Cumulative Environmental Effects” of the Canadian Environmental
29 Assessment Agency’s Draft EIS Guidelines for the Keeyask Generation Project document,
30 it is stated that:

31 *"The proponent shall provide a map that shows all the past, present and future*
 32 *projects it has considered in the cumulative effects assessment."*

33 Mapping is provided in Section 7.0 "Cumulative Effects Assessment" in the Keeyask EIS
 34 Map and Figure Folio and includes:

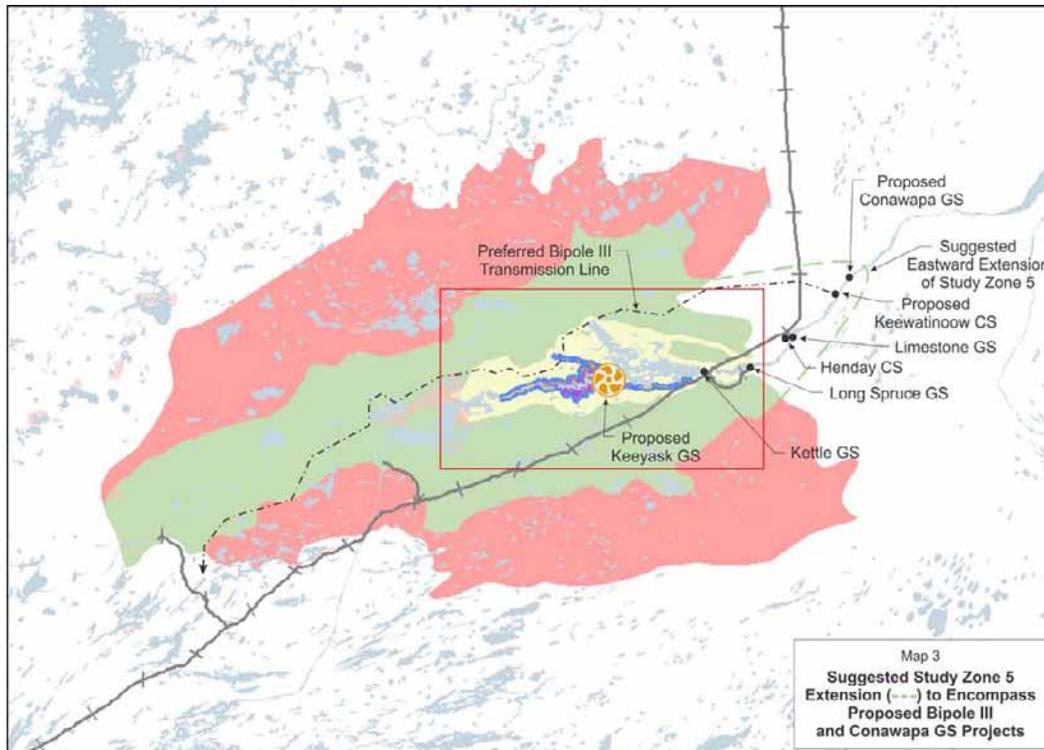
- 35 • Hydro Development in Northern Manitoba (locations of proposed and existing
 36 projects);
- 37 • Wuskwatim Transmission Project;
- 38 • Manitoba Hydro Transmission Line Network;
- 39 • Keeyask Infrastructure Project Site;
- 40 • Provincial Road 280 Upgrade;
- 41 • Northern Extents of Bipole III Transmission Project;
- 42 • Keeyask Construction Power Project: Preliminary Transmission Corridors During
 43 Construction; and
- 44 • Keeyask Construction Power Project: Preliminary Transmission Corridors During
 45 Operation.

46 Map 7A-6 "Northern Extents of Bipole III Transmission Project" only shows the locations
 47 the Keewatinoow Converter Station (CS) and the Bipole III Transmission Line (Final
 48 Preferred Route). There is no indication of other proposed Bipole III Project
 49 components, e.g., Keewatinoow Ground Electrode Site, Ground Electrode Line, five AC
 50 collector lines from Henday CS to the Keewatinoow CS, etc. (see Section 2.0).

51 **QUESTION:**

52 A map should be provided indicating the locations of all proposed Bipole III Project
 53 components, as well as the proposed Conawapa Generating Station (GS) and its likely
 54 project components.

55 Note: The revised map provided by KHLP did not include all of the items identified
 56 above. A suggest study zone is shown below.



57

58 **RESPONSE:**

59 Please find attached a consolidated Keeyask Generation Project Cumulative Effects Map.
 60 Also attached is a separate document which summarizes the findings of the cumulative
 61 effects assessment for the Keeyask Generation Project. This summary was developed to
 62 assist reviewers in their understanding of the cumulative effects findings for the Keeyask
 63 Generation Project (the Project), and to respond to questions raised by participants
 64 involved in the Clean Environment Commission (CEC) review process. The summary
 65 document also includes the attached, requested map.

66 The attached, consolidated map includes the content of the eight maps (7A-1 to 7A-8)
 67 that were located in Appendix 7A of the Keeyask Generation Project Response to EIS
 68 Guidelines (for easy of review, separate maps were provided in Appendix 7A). The
 69 following updates and additions have been made on the attached map. Please refer to
 70 CEC Rd 1 CEC-0022 for a response to the suggested updates to Study Zone 5.

71 The most recent information available for the following projects has been used:

- 72 1. Keeyask Generation Project – updated South Access Road approach into Gillam.
- 73 2. Keeyask Infrastructure Project (KIP) – project footprint has been updated to reflect
 74 access and clearing required to drill water wells for the main camp, use of additional
 75 borrow sources along the North Access Road (NAR), use of additional borrow from
 76 G5 and use of a rock outcrop at kilometer 11, along the North Access Road. All of

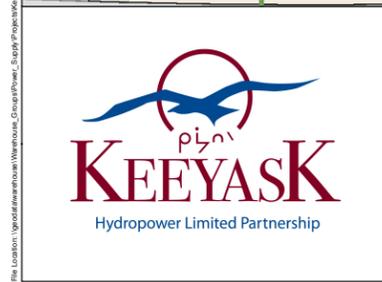
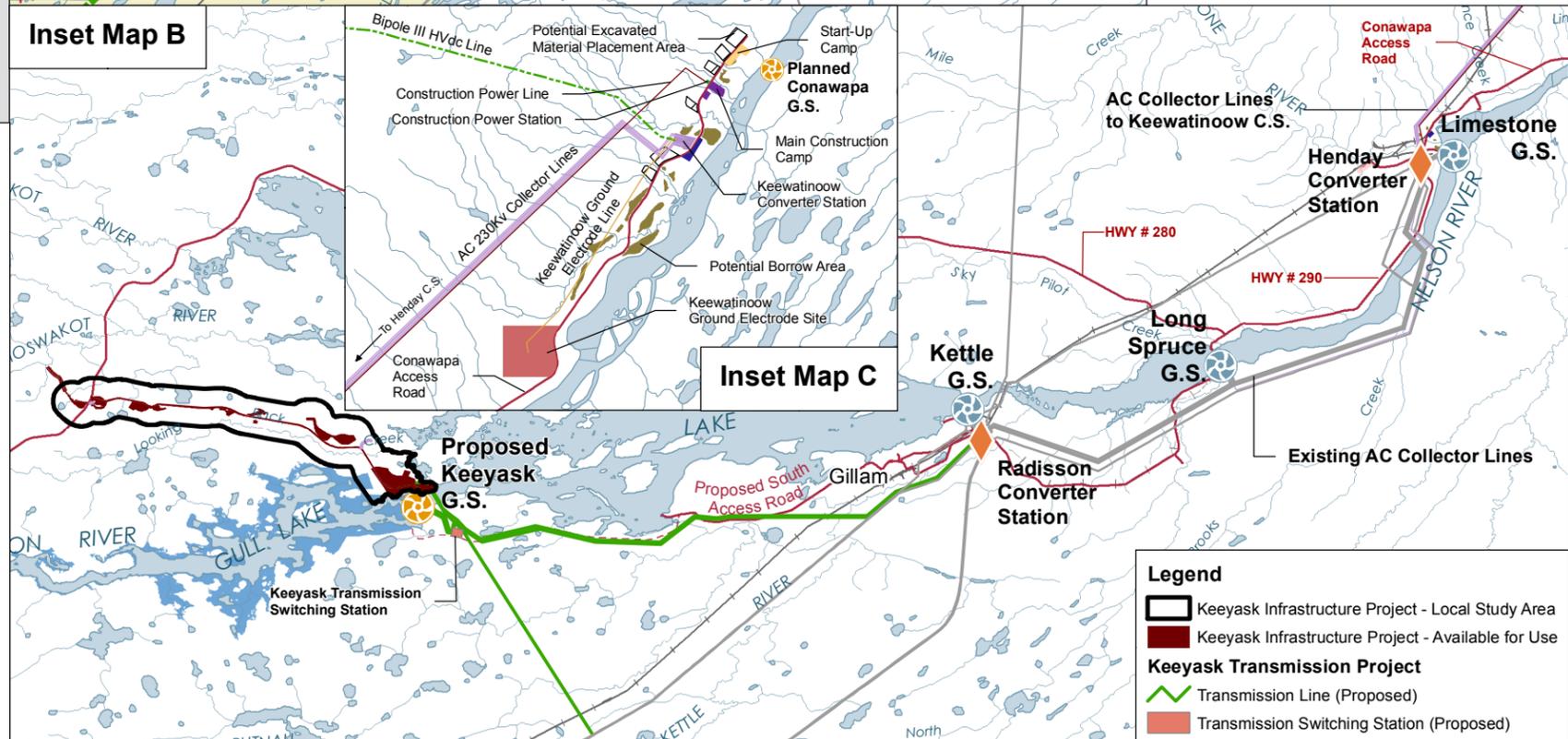
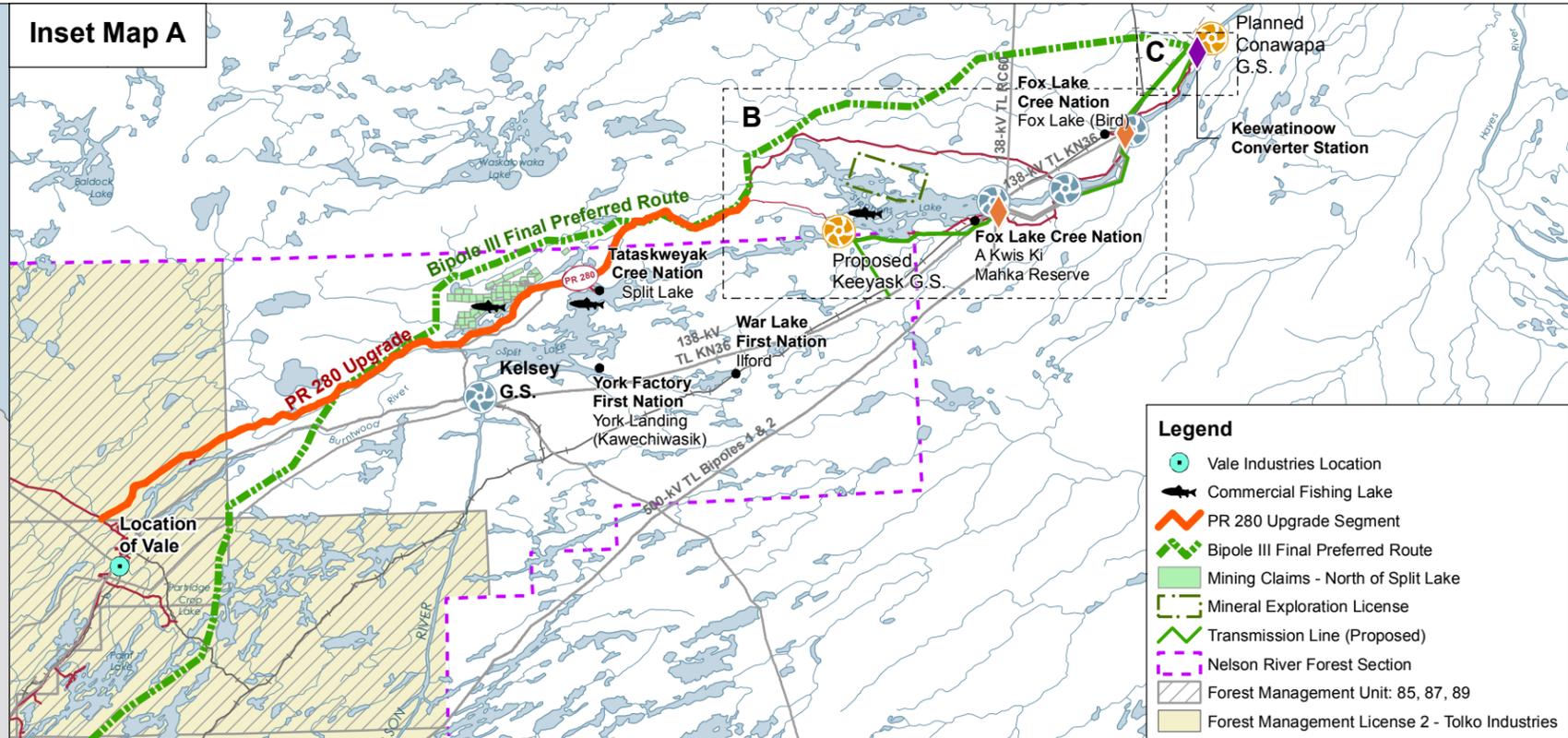
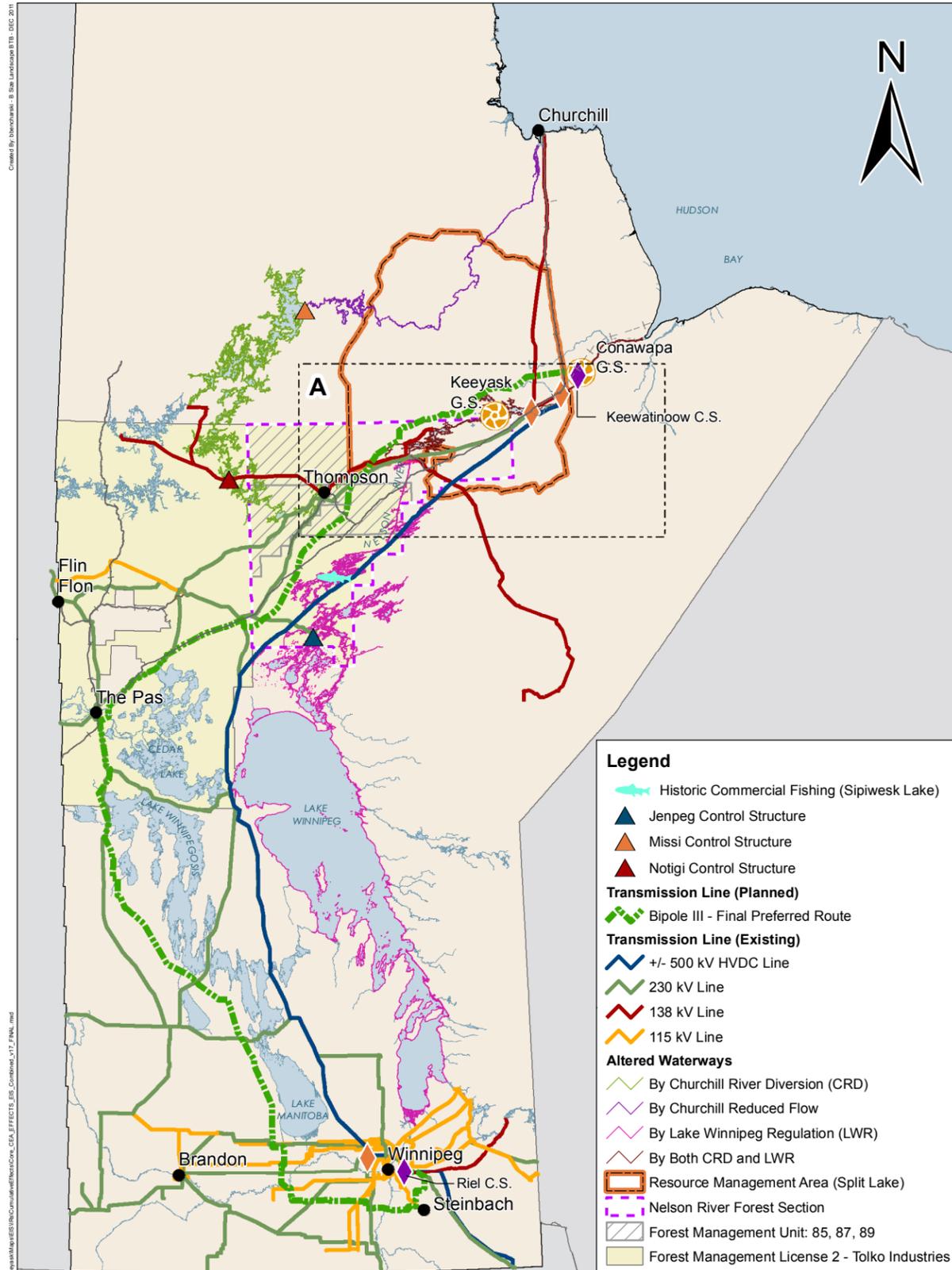
77 the aforementioned alterations to the KIP project footprint have been approved by
 78 Manitoba Conservation and Water Stewardship.
 79 3. Keeyask Transmission Project – final routing of the line is now known and is shown
 80 rather than the three alternative routes considered (A, B, C, displayed in Maps 7A-7
 81 and 7A-8).

82 The following information that was provided in text form in the Keeyask Generation
 83 Project Response to EIS Guidelines Appendix 7A has been converted to graphical form:

- 84 1. Mining Activities - the following information has been mapped:
 - 85 a. The location of Vale near Thompson, Manitoba (see Inset Map A);
 - 86 b. Mining claims north of Split Lake (see Inset Map A); and
 - 87 c. Exploration license on the north shore of Stephens Lake (Inset Maps A and B).
- 88 2. Commercial Fishing – the following information has been mapped:
 - 89 d. The location of active commercial fisheries (Split, Assean and Stephens lakes,
 90 Inset Map A); and
 - 91 e. Sipiwesk Lake (location of former commercial lake sturgeon fishing).
- 92 3. Commercial Forestry – the following information has been mapped:
 - 93 f. Forest Management License #2 (Provincial and Inset Map A);
 - 94 g. The Nelson River Forest Section (Provincial and Inset Map A); and
 - 95 h. Forest Management Units 85, 87 and 89 (Provincial and Inset Map A).
- 96 4. Kelsey re-runnery - The location of the Kelsey Generating Station has been
 97 mapped (Inset Map A). Further details can be found on this project in Appendix 7A
 98 of the Response to EIS Guidelines, page 7A-10.
- 99 5. Gillam Redevelopment and Expansion Program - The location of Gillam has been
 100 mapped (Inset Map B). Further details can be found on this project in Appendix 7A
 101 of the Response to EIS Guidelines, page 7A-13.

102 Additional information available for the Bipole III Transmission Project is displayed
 103 including the following components:

- 104 1. Keewatinoow Converter Station (Provincial and Inset Maps A and C);
- 105 2. Keewatinoow Ground Electrode Site (Inset Map C);
- 106 3. Keewatinoow Ground Electrode Line (Inset Map C);
- 107 4. AC collector line from Long Spruce Generating Station to Henday Converter
 108 Station (Inset Map B);
- 109 5. Five AC 230Kv collector lines from Henday Converter Station to the Keewatinoow
 110 Converter Station (Inset Map C);
- 111 6. Construction power line from Henday Converter Station to the construction camp
 112 site (Inset Map C);
- 113 7. Start-up and main construction camp sites (Inset Map C); and
- 114 8. Potential borrow and excavated material placement areas (Inset Map C).



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

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

COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 19-MAR-13	REVISION DATE: 23-APR-13
VERSION NO.: 1.0	QA/QC: XXX/YYY/ZZZ	

0 60 120 Kilometres
0 50 100 Miles

Overall Legend

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

Keyask Generation Project Cumulative Effects



Keeyask Generation Project

Environmental Impact Statement

Cumulative Effects Assessment Summary



July 2013

KEYYASK GENERATION PROJECT

Cumulative Effects Summary

Prepared by
Keeyask Hydropower Limited Partnership
Winnipeg, Manitoba

July 2013

Filed in Response to CEC Rd1 CEC-0020

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List of Attachments:

Overview of Aquatic Environment Cumulative Effects Assessment

- Water Quality
- Pickerel/Jackfish/Lake Whitefish
- Lake Sturgeon

Overview of Terrestrial Environment Cumulative Effects Assessment

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

- Caribou
- Moose

Overview of Socio-Economic Environment Cumulative Effects Assessment

- Housing
- Infrastructure and Services
- Transportation Infrastructure
- Mercury in Health
- Community Health
- Public Safety and Worker Interaction
- Travel, Access and Safety
- Culture and Spirituality
- Aesthetics
- Heritage Resources

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 <u>Possible</u> Cumulative Effects with Future Projects/Activities (Chapter 7) ¹
Aquatic	
<i>Aquatic Ecosystems & Habitat</i>	
Water Quality	Yes
<i>Fish</i>	
Pickereel (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	
<i>Terrestrial Ecosystems & Habitat</i>	
Ecosystem Diversity	Yes
Intactness	Yes
Wetland Function	Yes
<i>Terrestrial Plants</i>	
Priority Plants	Yes
<i>Birds</i>	
Canada Goose	Yes
Mallard	Yes
Bald Eagle	Yes (no potential future project overlaps identified)
Olive-Sided Flycatcher	Yes
Common Nighthawk	Yes
Rusty Blackbird	Yes
<i>Mammals</i>	
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 <u>Possible</u> Cumulative Effects with Future Projects/Activities (Chapter 7)¹
Socio-economic	
<i>Economy</i>	
Employment & Training Opportunities	No
Business Opportunities	No
Income	No
Cost of Living	No
Resource Economy	No
<i>Population, Infrastructure & Services</i>	
Housing	Yes
Infrastructure & Services	Yes
Transportation Infrastructure	Yes
Land	No
<i>Personal, Family & Community Life</i>	
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
<i>Resource Use</i>	
Domestic Fishing	No
Domestic Hunting & Gathering	No
Commercial Trapping	No
<i>Heritage Resources</i>	
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.

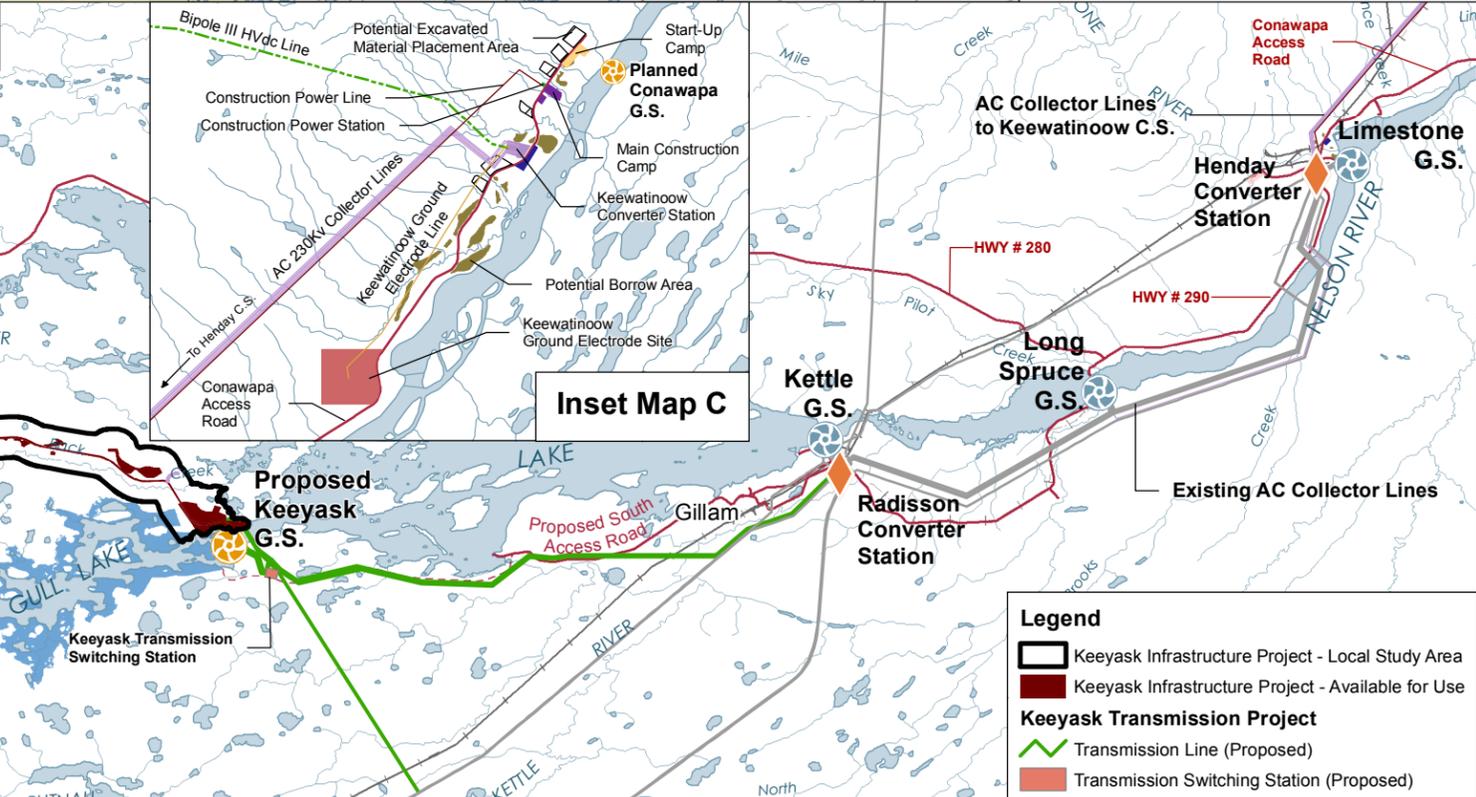
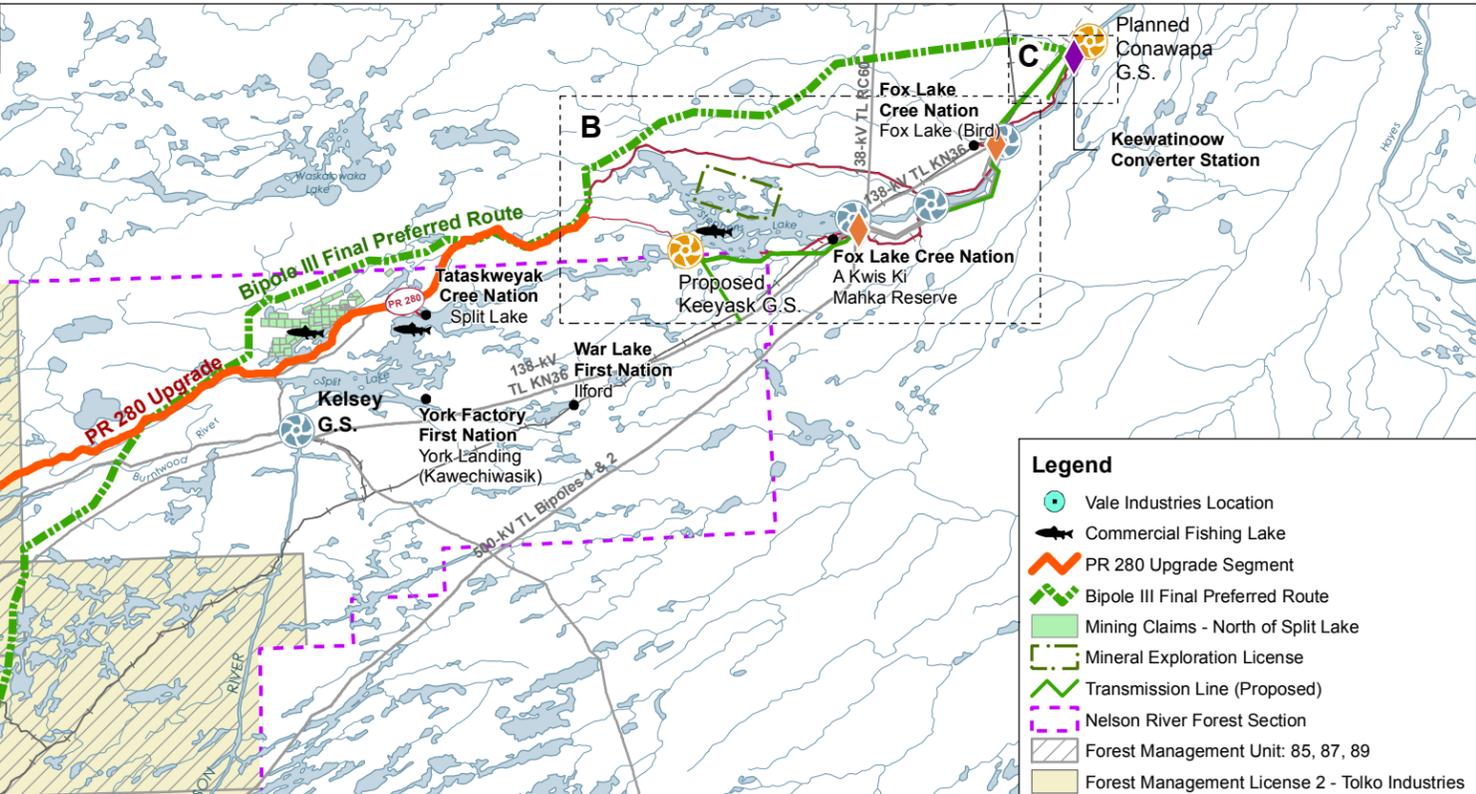
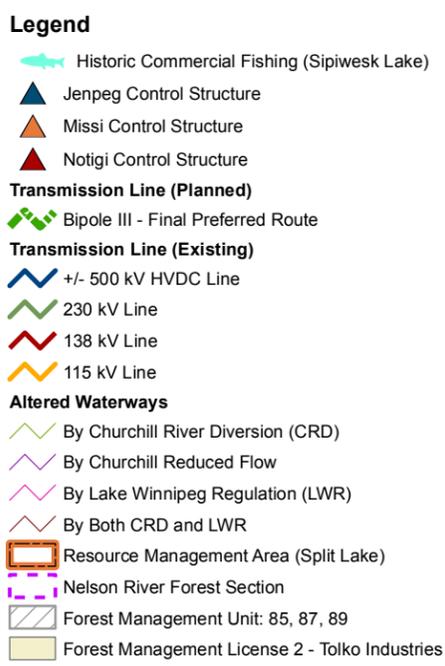
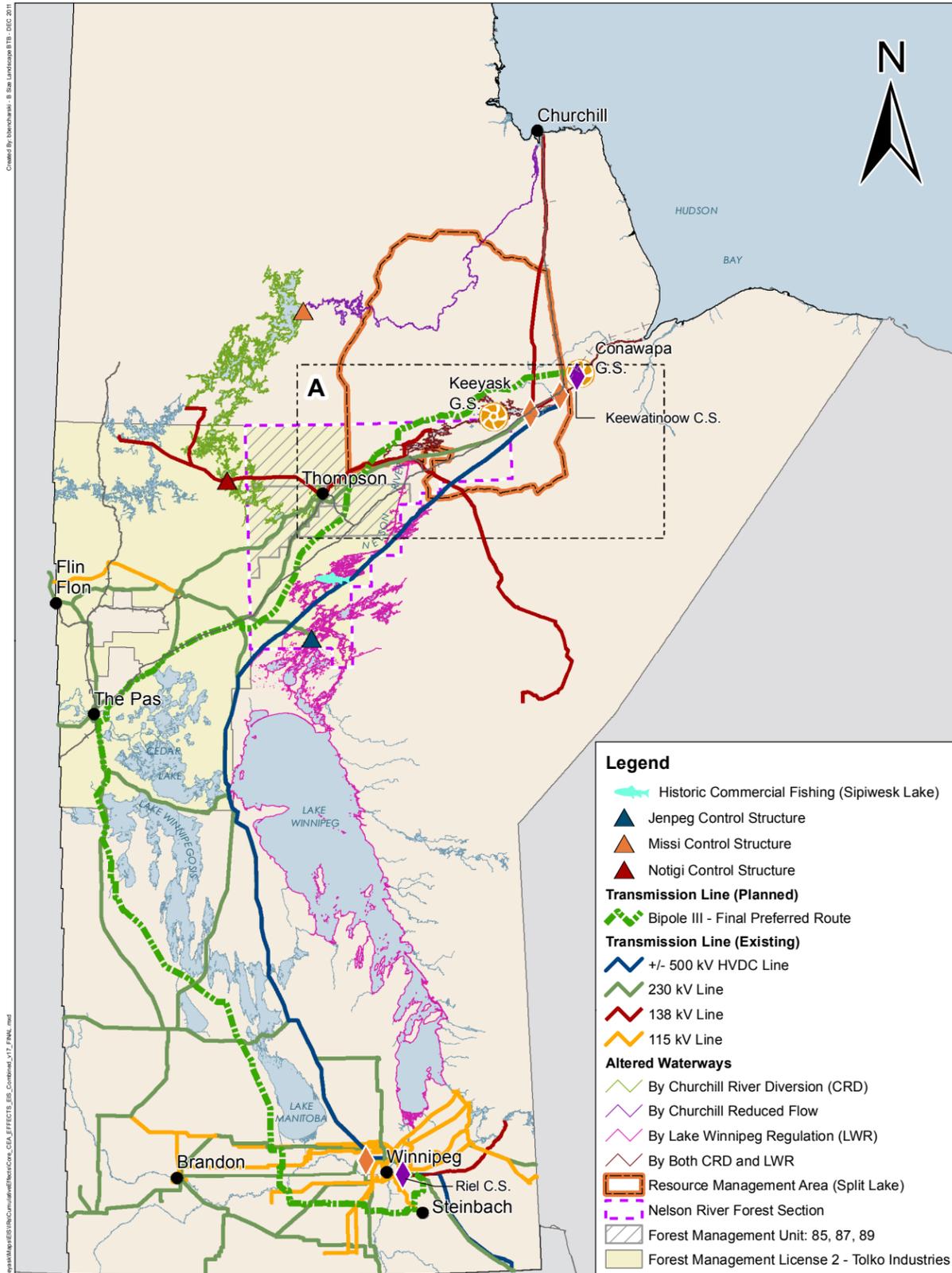
Looking forward, there are also a number of reasonably foreseeable future projects and activities that have the potential to be developed in the region. These projects and activities were also considered in the cumulative effects assessment and include those that are in the regulatory review process, 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	<ul style="list-style-type: none"> 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-running Keeyask Infrastructure Project (KIP) 	<p>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-running) also have ongoing effects that potentially overlap with the Project's effects.</p> <p>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.</p>
Linear development in the region	<ul style="list-style-type: none"> Transmission lines, rail lines and highways, including upgrades to PR 280 	<p>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.</p>
Other	<ul style="list-style-type: none"> Mining (e.g., Vale) Commercial forestry Commercial fishing, including sturgeon Other agents of change as may be identified in the assessment of specific VECs 	<p>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.</p>
FUTURE PROJECTS & ACTIVITIES		
Bipole III Transmission Project	<ul style="list-style-type: none"> Bipole III Transmission Northern Segment #1 Keewatinooow Converter Station and Ground Electrode and Camp/Construction Power Collector Lines and Existing Station Upgrades 	<p>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.</p>

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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.



Overall Legend



Keyask Generation Project Cumulative Effects



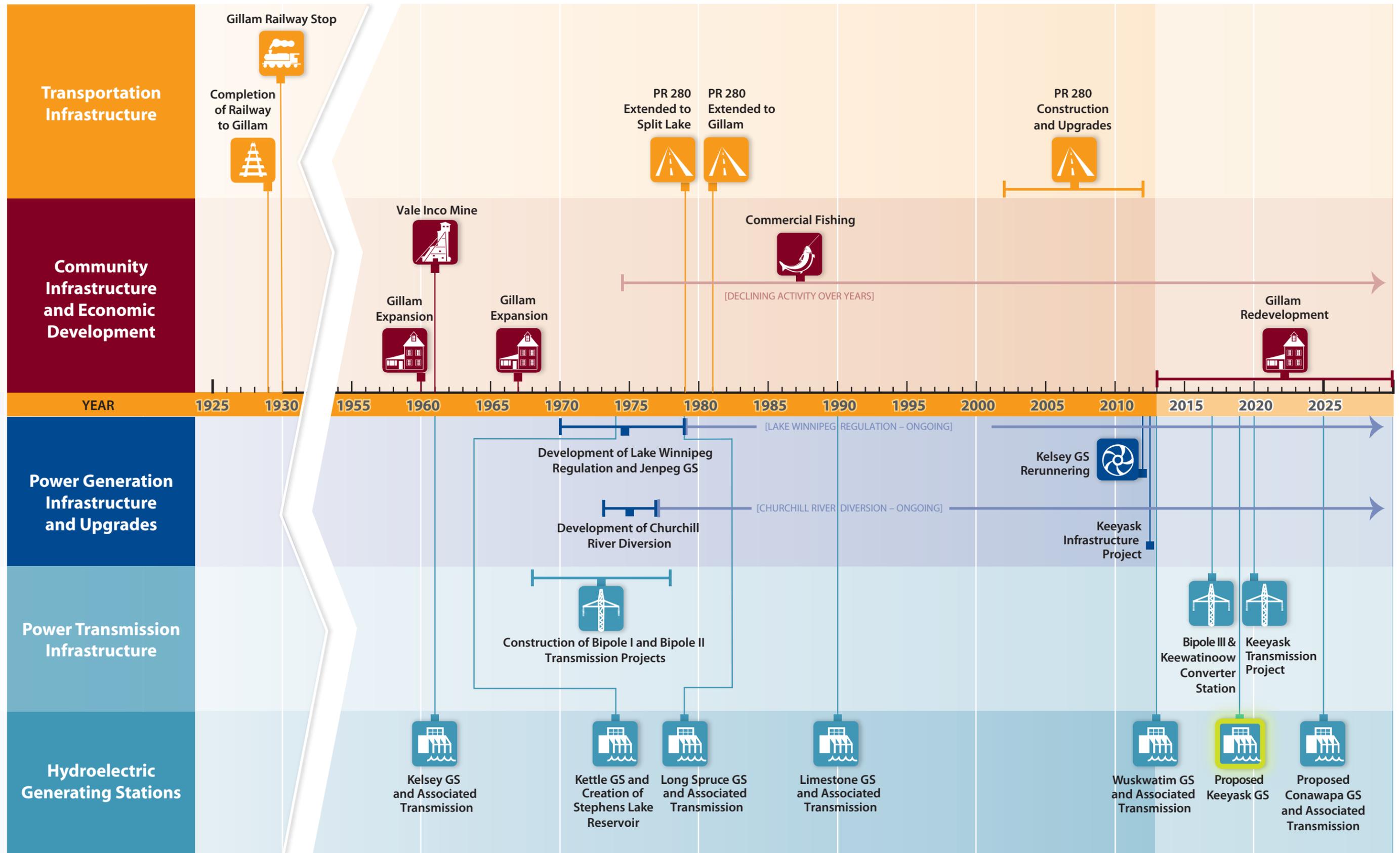
DATA SOURCE:
Manitoba Hydro; Government of Manitoba; Government of Canada

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

COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 19-MAR-13	REVISION DATE: 23-APR-13
VERSION NO: 1.0	QA/QC: XXX/YYY/ZZZ	

0 60 120 Kilometres
0 50 100 Miles

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 hunting¹ 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.

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 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	
	GRD	LWR	Kelsey (& re-running)	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	✓	✓	✓	✓	✓							✓		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	✓	✓	✓	✓				✓				✓		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	✓	✓	✓	✓				✓				✓		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	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓	✓	✓	✓	✓			✓			✓		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	✓	✓	✓	✓	✓	✓			✓			✓		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	✓	✓		✓	✓	✓			✓			✓		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	✓	✓	✓	✓	✓	✓						✓		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	✓	✓	✓	✓	✓	✓						✓		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	✓	✓	✓	✓	✓	✓			✓			✓		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		✓	✓	✓	✓	✓	✓		✓	✓		✓		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		✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		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	✓	✓				

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

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

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

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

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

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

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

⁸NA - 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	Step 1 Significance (Post-Mitigation)				Step 2 Significance (Post-Mitigation)				Overlap with Future Projects				Concluding Statements including Consideration of Future Projects and Activities														
	CRD	LWR	Kelsey (and re-runnings)	Kettle	Longspruce & Limestone	Mining Activities	BRHA Temp Accommodation	All Linear Development	GSS on Burntwood River	Wuskwatin		KIP	Construction (C) Operation (O)	Direction ¹ (0/+)	Magnitude ² (s, mo, lg)	Spatial ³ (s, med, lg)	Duration ⁴ (sh, med, long)	Carried Forward To Step 2? (Y/N)	Frequency (inf, freq, con) ⁵	Reversibility (rr, rev) ⁶	Ecological & Social Context (low, mod or high) ⁷	Keeyask Transmission	Bipole III		Gillam Redevelopment	Conawapa												
Housing												C	-	sm	med	sh	N	NA ⁸	NA	NA	✓	✓	✓	✓	O	0	0	0	0	N	NA	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.
												C	-	sm-mod	sm-med	sh	N	NA	NA	NA	✓	✓	✓	✓	O	-	sm	sm	long	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 Keewatinow 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.
Transportation Infrastructure											C	-	sm	med-lg	sh	N	NA	NA	NA	✓	✓	✓	✓	O	0	0	0	0	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.	
											C	-	sm	med	med	N	NA	NA	NA	✓	✓	✓	✓	O	+	sm	med	long	N	NA	NA	NA					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.	
Public Safety and Worker Interaction											C	-	mod	s-med	sh-med	N	NA	NA	NA	✓	✓	✓	✓	O	-	sm	med	long	N	NA	NA	NA					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	-	s-mo	med	sh-long	N	NA	NA	NA	✓	✓	✓	✓	O	+	sm	med	long	N	NA	NA	NA					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.	
Aesthetics											C	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	O	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	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	✓	✓	✓	✓	O	-	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.	
Culture and Spirituality											C	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	O	-	sm	med	long	N	NA	NA	NA	✓	✓	✓	✓	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	-	mo	s	sh	N	NA	NA	NA	✓				O	-	mo	s	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 minimize adverse effects as much as possible. Where appropriate, adverse effects agreements will negotiate adverse effects agreements. Based on these measures and those of Keeyask, the assessment of significance is not changed when other future projects are considered.	
Heritage Resources											C	-	mo	s	sh	N	NA	NA	NA	✓				O	-	mo	s	long	N	NA	NA	NA	✓				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	0	0	0	0	N	NA	NA	NA					O	-	mod	med	med	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.	
Mercury and Health											C	0	0	0	0	N	NA	NA	NA					O	-	mod	med	med	N	NA	NA	NA					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					O	-	mod	med	med	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.	

¹ Direction of effect is expressed as either: no effect (0), an adverse effect (-) or a positive effect (+)
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³ The special extent of effect is expressed as either: small (sm), medium (med), or large (lg)
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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
 -  Keyeyask 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

**Fox Lake Cree Nation
Fox Lake (Bird)**

**Gillam
Fox Lake Cree Nation**

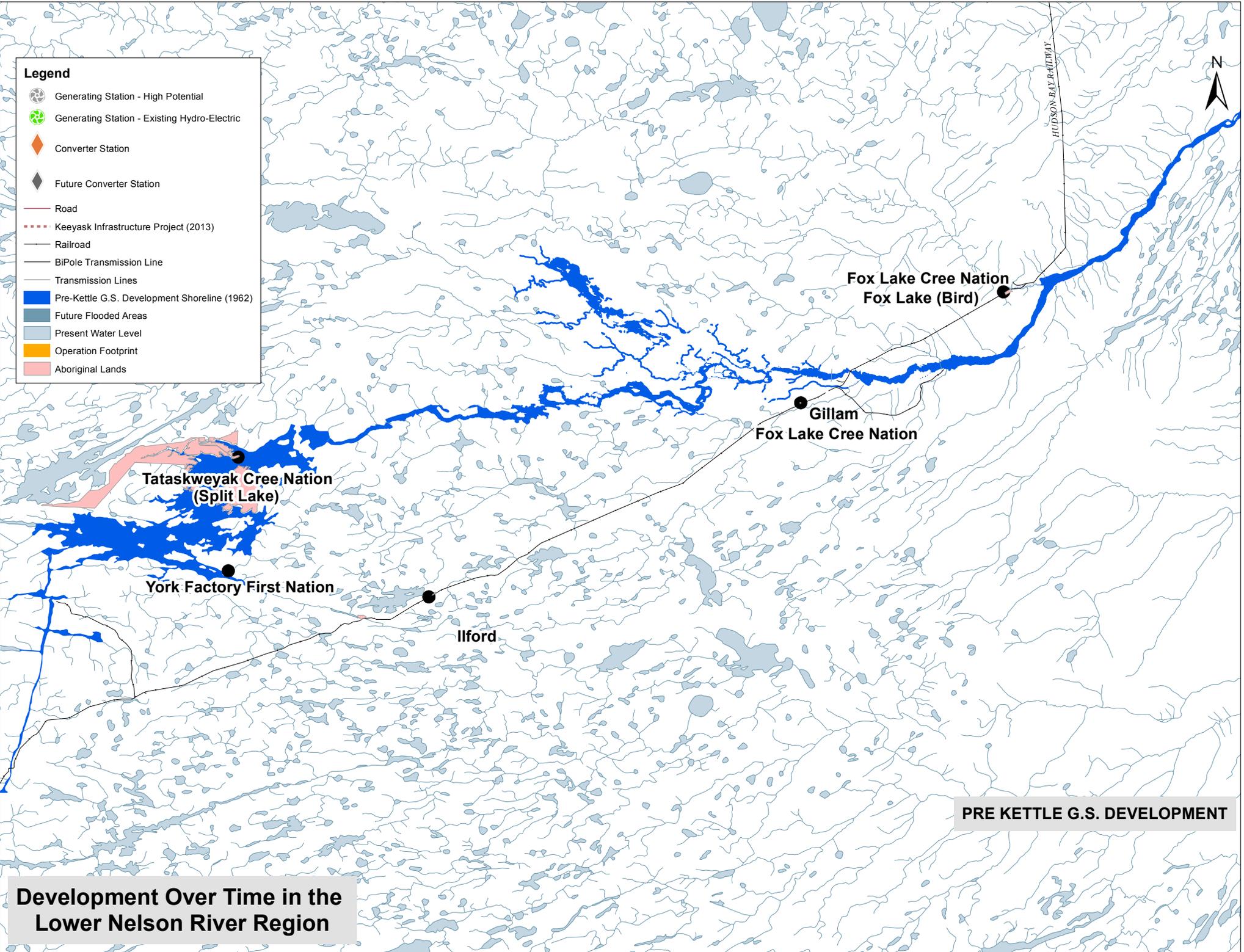
**Tataskweyak Cree Nation
(Split Lake)**

York Factory First Nation

Ilford

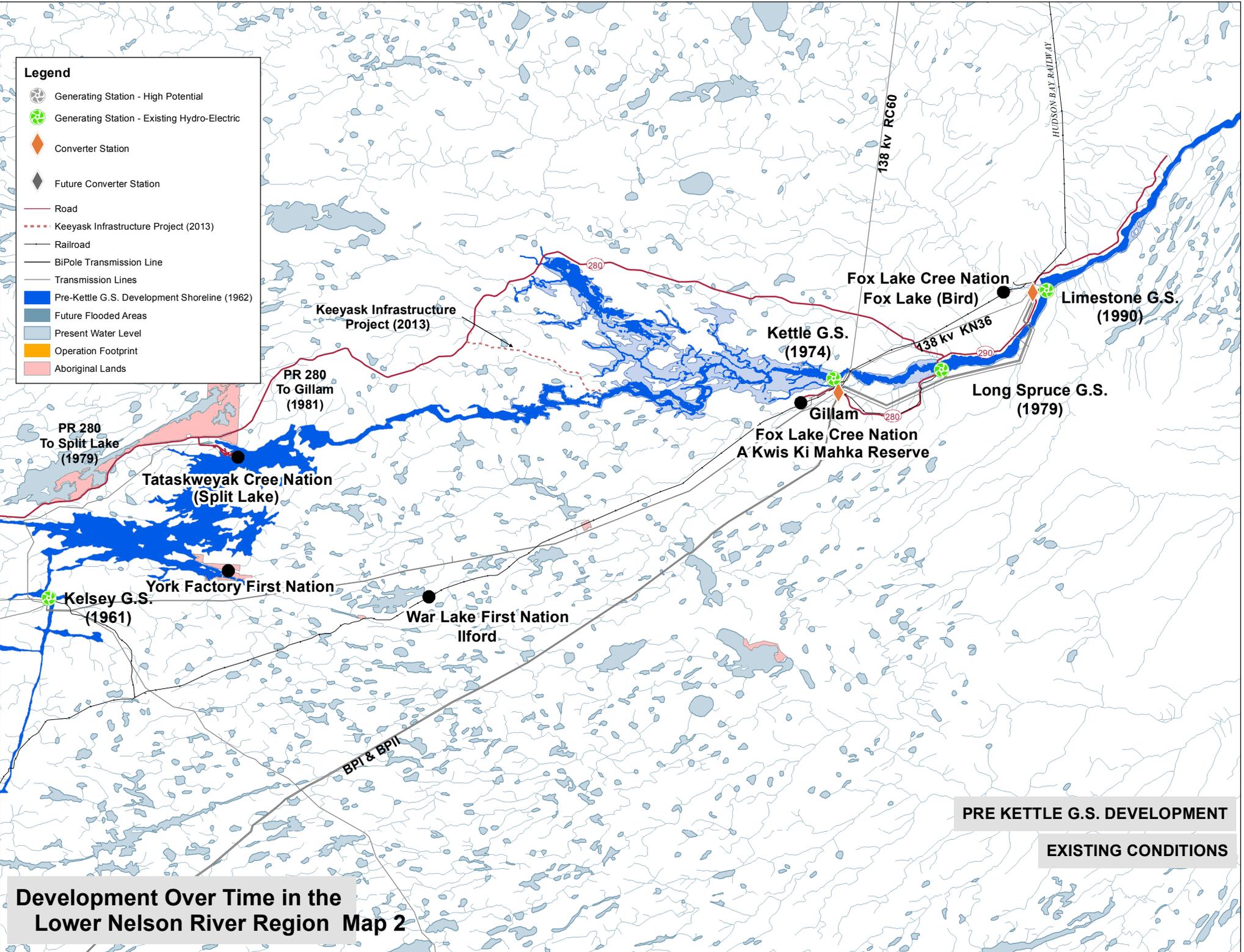
PRE KETTLE G.S. DEVELOPMENT

**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
-  Keyeyask 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



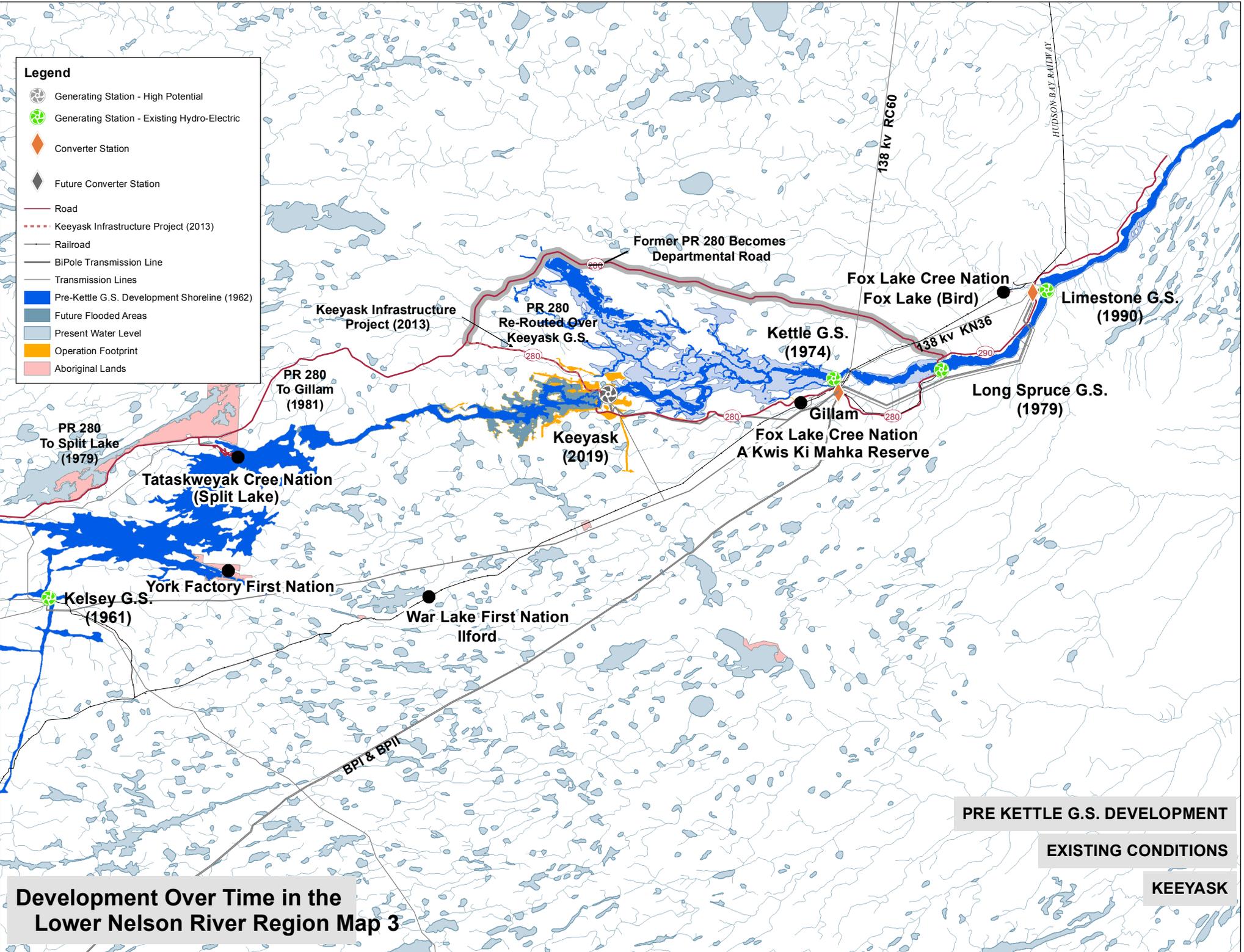
PRE KETTLE G.S. DEVELOPMENT

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
-  Keyeyask 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



PRE KETTLE G.S. DEVELOPMENT

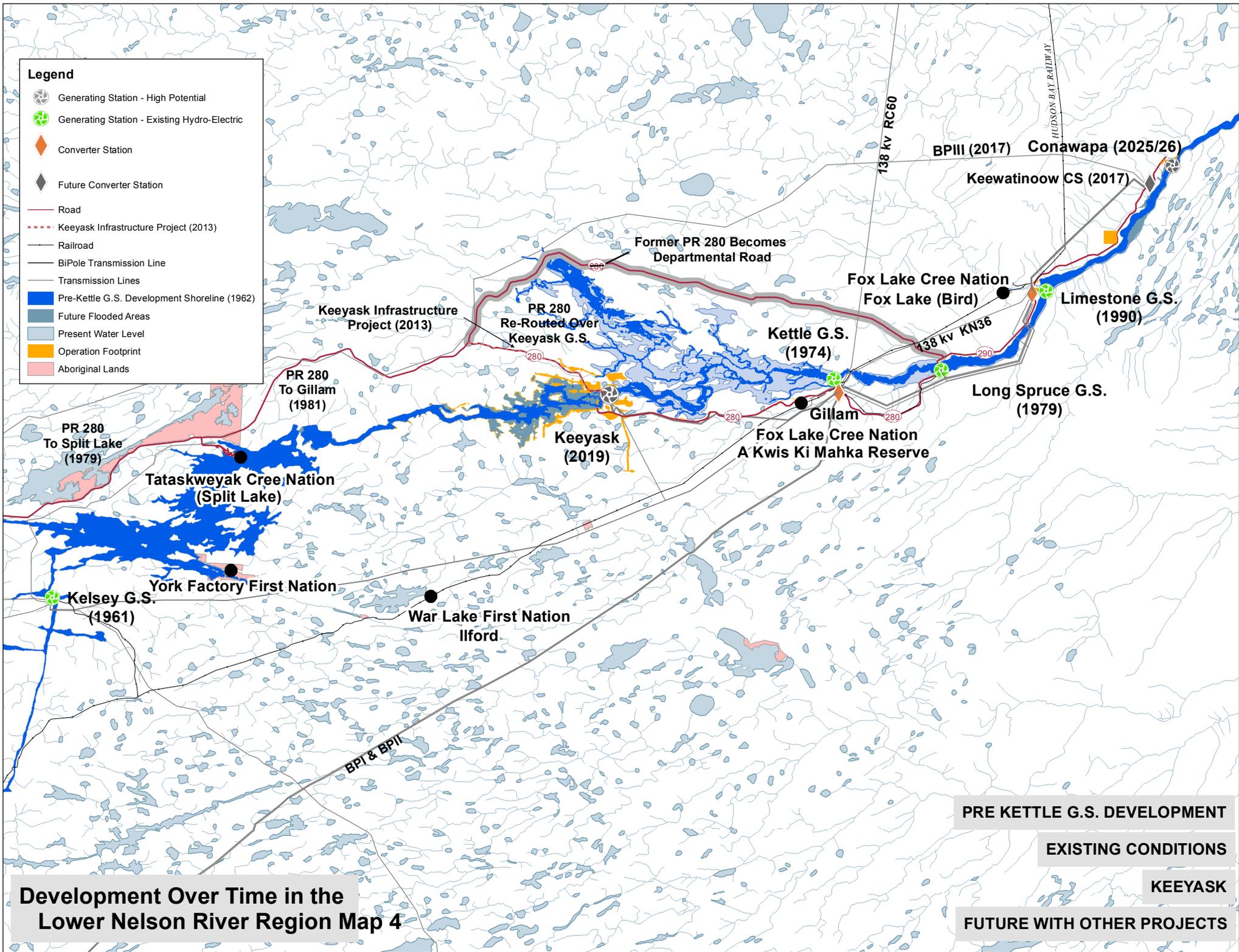
EXISTING CONDITIONS

KEYEYASK

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
-  Keyeyask 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



Development Over Time in the Lower Nelson River Region Map 4

PRE KETTLE G.S. DEVELOPMENT

EXISTING CONDITIONS

KEYEYASK

FUTURE WITH OTHER PROJECTS

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).

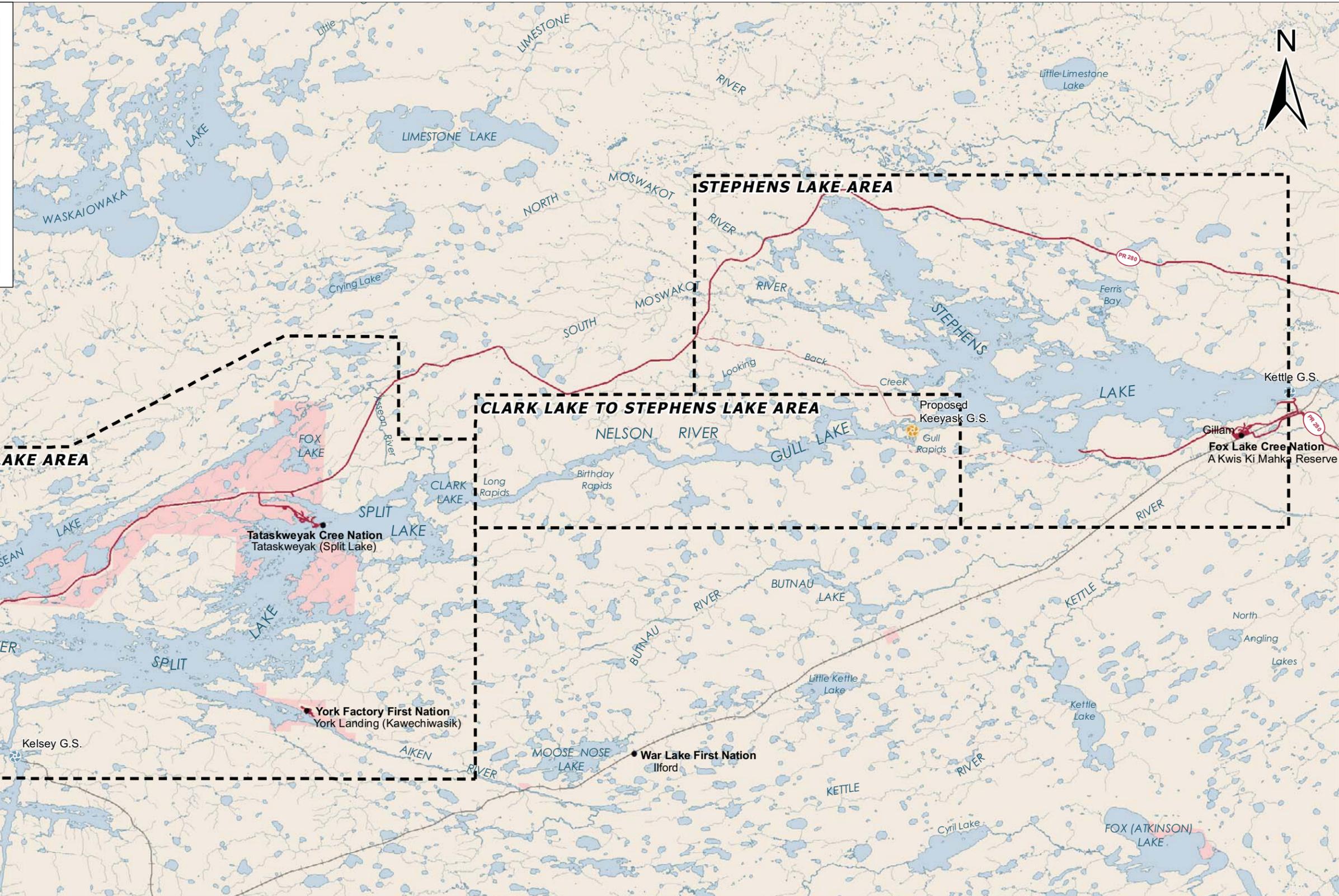
Environmental studies were focused on the reach of the river from approximately 3 km downstream of the outlet of Clark Lake to the inlet of Stephens Lake approximately 3 km downstream of Gull Rapids, within which direct changes to water levels and flows are expected. Studies were also conducted upstream 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.



File Location: G:\EE\Keeyask\Public\Map\Map\Map_V01\Map_V01\Map_V01_Aquatic_Environment_Study_Area_20101010.mxd
 Date Created: 26-FEB-10
 Version: 2.0
 QA/QC: APPROVED

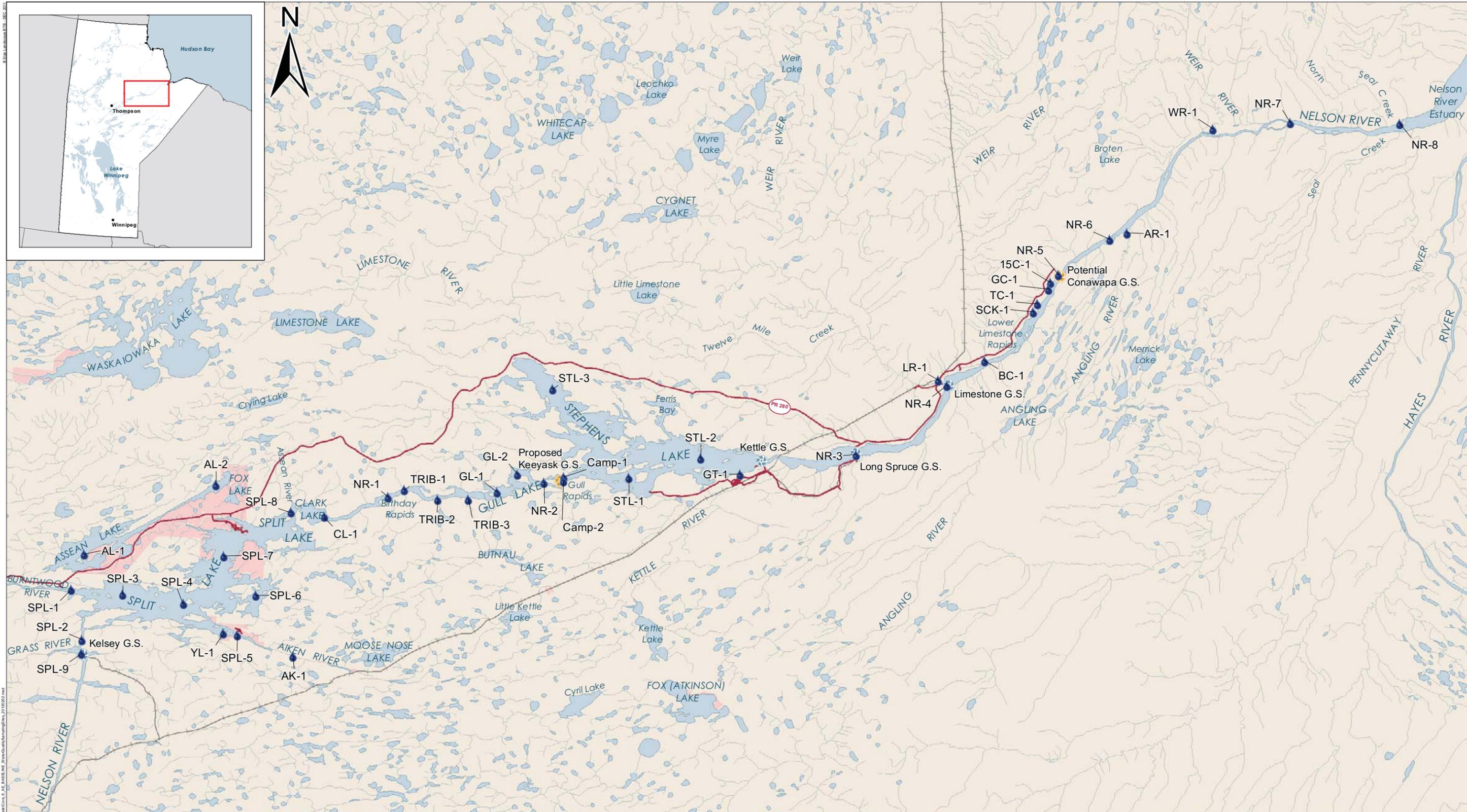
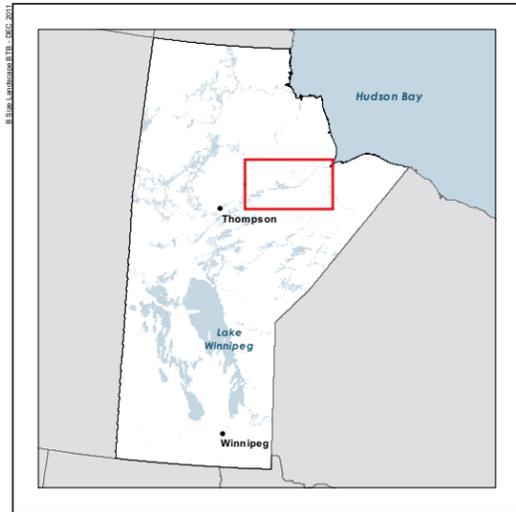


DATA SOURCE: Government of Canada, North/South Consultants		
CREATED BY: North/South Consultants		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 26-FEB-10	REVISION DATE: 25-MAY-12
		VERSION NO.: 2.0
		QA/QC: APPROVED

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



File Location: G:\EE\Keeyask\Public\Map\Map_06_19_2012.mxd
 Project Name: Keeyask Hydroelectric Project
 Date: 2012-05-18
 Author: [Name]
 Version: 2.0



DATA SOURCE: Government of Canada, Province of Manitoba, North/South Consultants		
CREATED BY: North/South Consultants		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 05-MAY-10	REVISION DATE: 18-MAY-12
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

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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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 1980¹. 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 populations¹. 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

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

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

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.

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

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

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

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

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.

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

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).

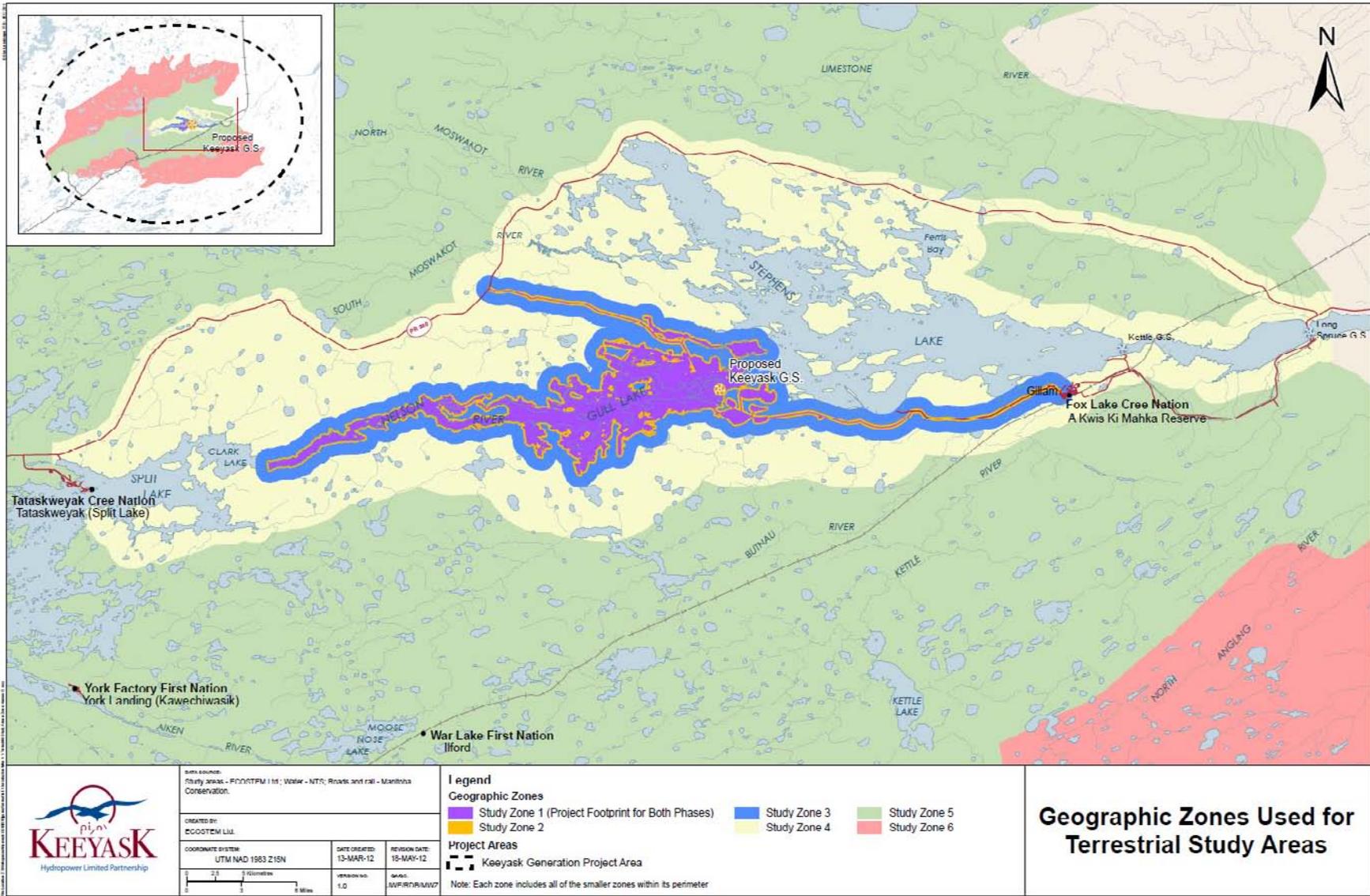
TEMPORAL SCOPE OF THE ASSESSMENT

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

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

June 2015

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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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/km², of mapped linear features as of 2010. Roads and rail lines combined to create a regional transportation density of 0.13 km/km². Transmission line density was 0.06 km/km². 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/km² to 0.15 km/km² 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/km² to 0.44 km/km² in the Regional Study Area (from 0.32 km/km² to 0.31 km/km² 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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/km² 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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 KCNs¹
- 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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 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.

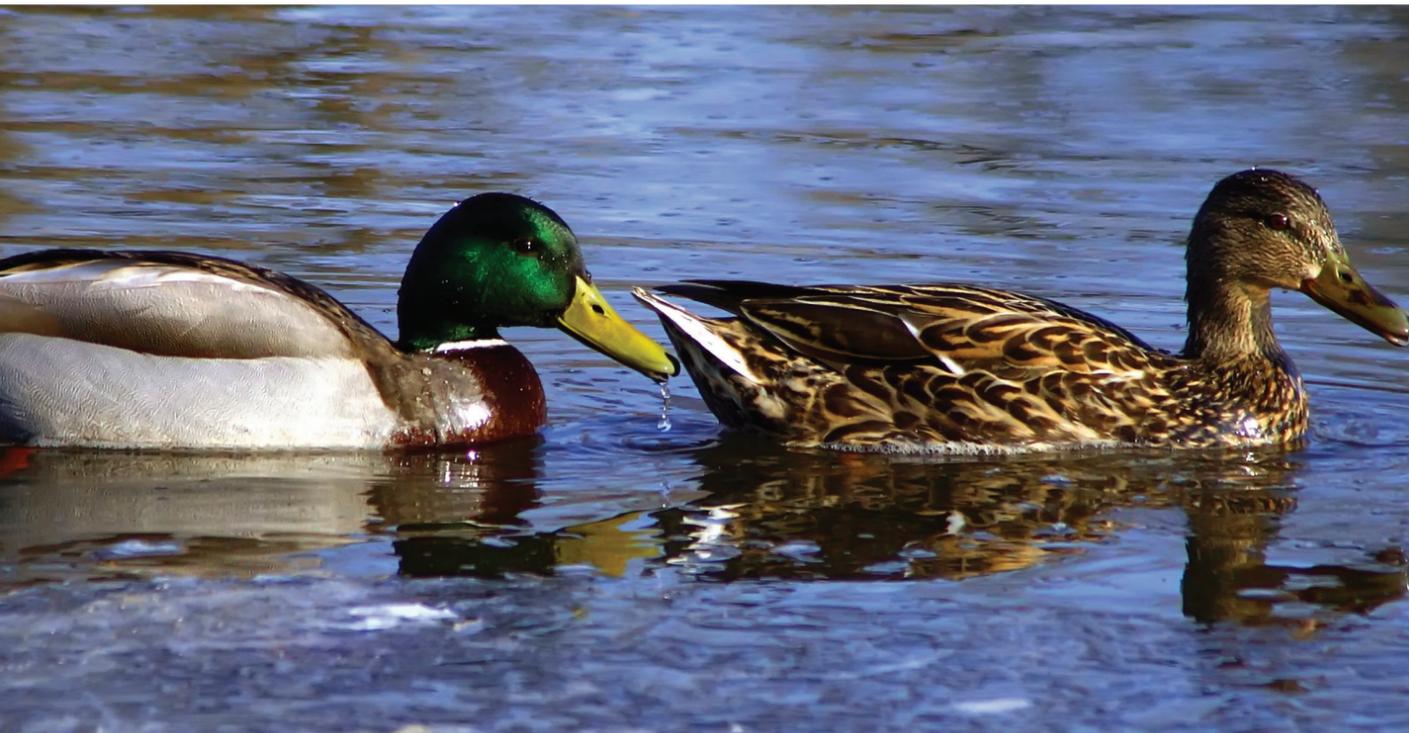
¹(CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report [Draft], (YFFN Evaluation Report [Kipekiskwaywinan]).

CHAPTER 7

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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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)

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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)

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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)

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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

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

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/1000km²).

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

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

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/1000km²) 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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.

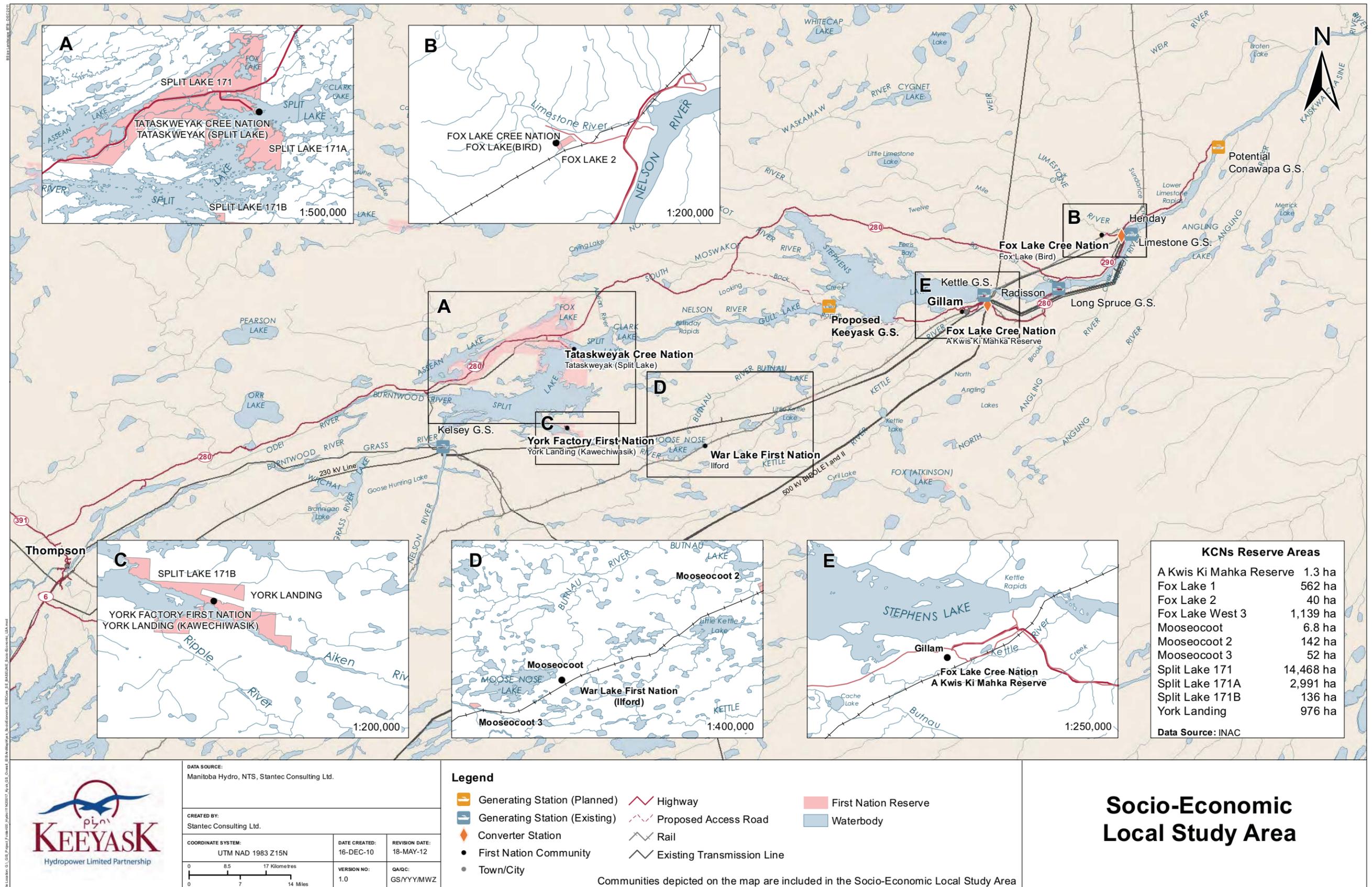
- Construction worker interaction, since some construction workers are likely to visit Gillam and Thompson and possibly Split Lake;
- Transportation/traffic for construction equipment, materials and people would flow primarily through Thompson, with some via Gillam; and
- The City of Thompson is the 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.

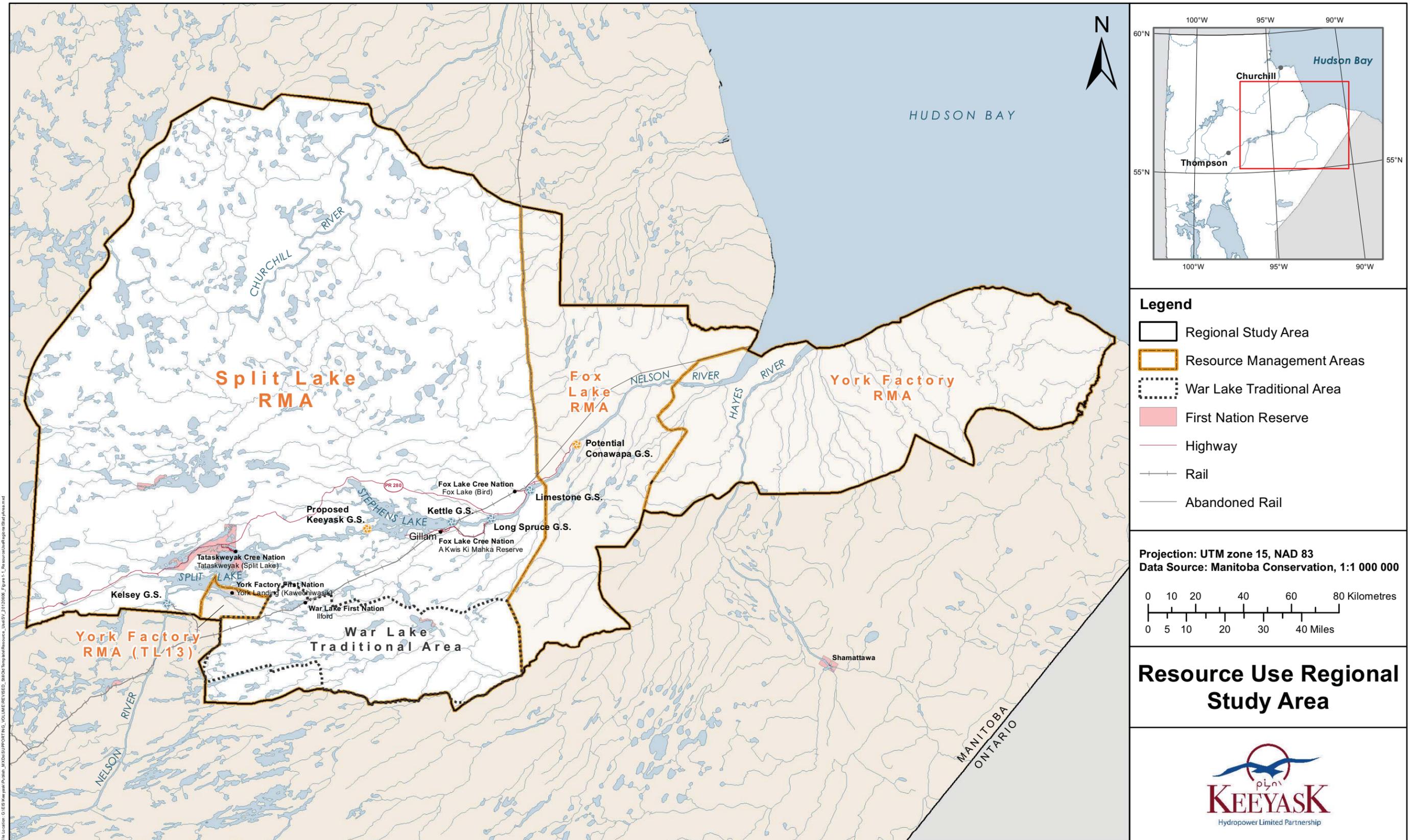
The Resource Use Regional Study Area included the Split Lake, Fox Lake, York Factory Resource Management Areas, including Trapline 13, comprising over 50,000 km². The Resource Use Local Study Area included the region within Traplines 07, 09, 15 and 25 bounded in the northwest by PR 280 and the rail line to the southeast and encompassing the Clark Lake and the town of Gillam (see Maps 1-1 and 1-2).

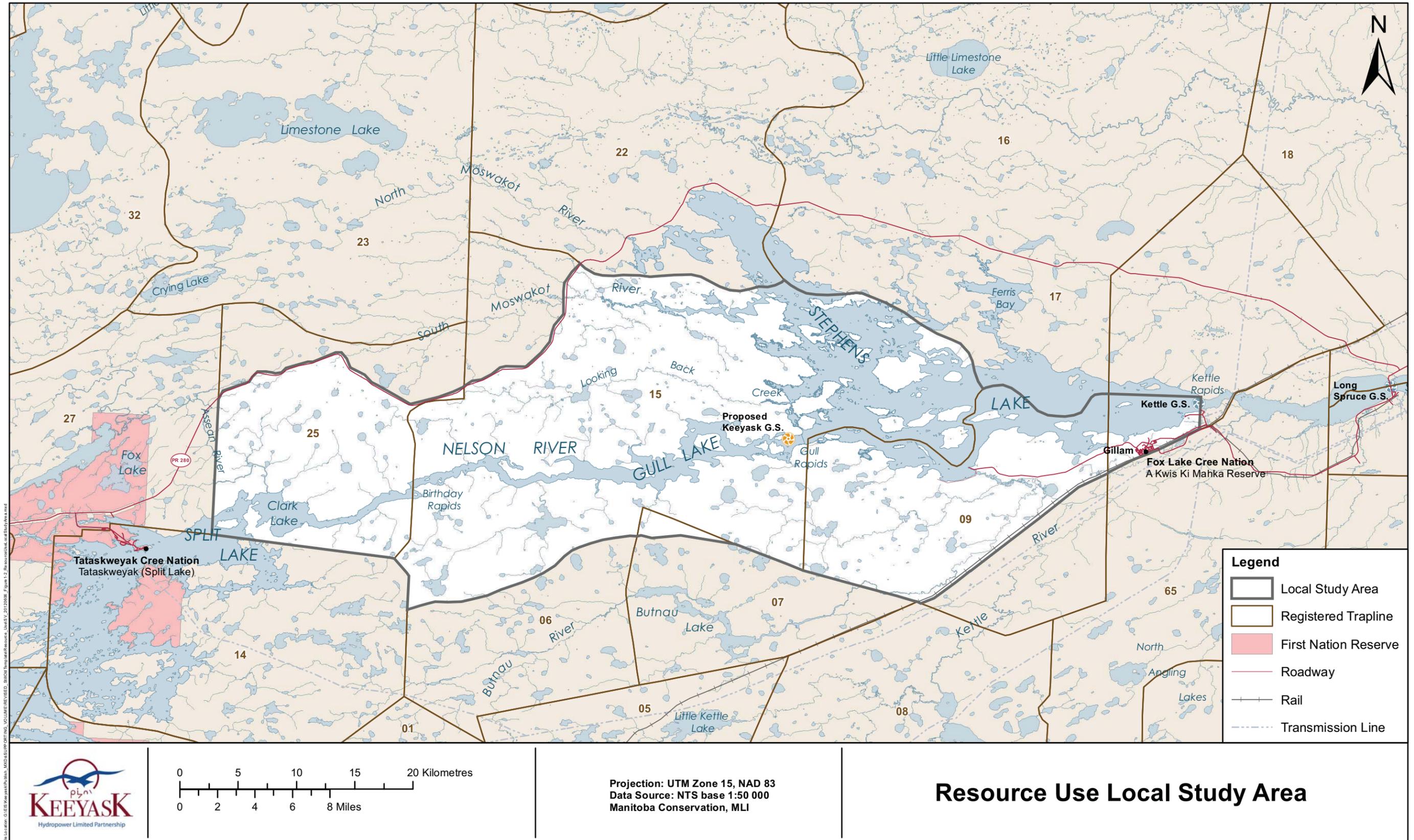
The Heritage Resources Regional Study Area included portions of the ancestral and traditional lands of the KCNs...to provide context within which heritage resources of discrete cultural affiliation and chronology were understood. The Heritage Resources Local Study Area includes the region that included 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.



Map 1-1





Legend

- Local Study Area
- Registered Trapline
- First Nation Reserve
- Roadway
- Rail
- Transmission Line



Projection: UTM Zone 15, NAD 83
Data Source: NTS base 1:50 000
Manitoba Conservation, MLI

Resource Use Local Study Area



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.



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

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

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

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.

4: CMHC 2008

5: Statistics Canada data

6: (TCN 2010c; FLCN Key Person Interview [KPI] Program 2009-2010; YFFN KPI Program 2009-2010)

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

INTERACTION WITH FUTURE PROJECTS/ACTIVITIES

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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.

CHAPTER 7

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

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 in 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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' AEA's 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' AEA's.
- 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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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.

CHAPTER 7

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

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

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

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.

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

CHAPTER 7

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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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

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 AEA, 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 AEA, 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

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



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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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 Keyyask Project and the Keyyask 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 Keyyask 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.

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

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

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

	KEYYASK CONSTRUCTION	KEYYASK OPERATION
KEYYASK 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.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.5.2**
2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 CEC-0021**

4 **PREAMBLE:**

5 A quantitative residual effects assessment for the Local Study Areas was not provided
6 for some of the VECs and supporting topics. Eastern expansion of the Study Zone 5
7 Regional Study Area will not affect the EA findings for the Local Study Areas (generally
8 Study Zone 3, but Study Zone 2 for Terrestrial Habitat, Ecosystem Diversity, Soil Quantity
9 and Quality, Wetland Function, Priority Plants and Invasive Plants).

10 For example, it is stated in Section 2.6.4.1.1 of the Terrestrial Environment Supporting
11 Volume that the "Project Footprint could remove or alter up to 6,872 ha, or 0.6%, of
12 terrestrial habitat during construction, but this could increase to 6,952 ha if borrow area
13 E-1 is used", or 0.7% of terrestrial habitat in the Regional Study Area (Study Zone 5 with
14 area of 1,240,000 ha). Although not mentioned in Section 2.6.4.1.1, this loss of habitat
15 areas with or without the use of borrow area E-1 would represent approximately 53% of
16 the Local Study Area (Study Zone 2 with area of 13,043 ha).

17 No data on percentage of core areas to be lost were provided for the Local Study Area.
18 Rather, it was indicated in Section 2.4.4.1.1 that the number of core areas at least 200
19 ha in size that overlap the Local Study Area would decline from 13 to 12 and their
20 combined area would decline from 115,308 ha to 106,754 ha. This is a decline of 7.4%,
21 and would likely be significantly higher if only the areas of the core areas within the
22 Local Study Area are taken into consideration.

23 As stated in Section 6.5.3.3.1 "Construction Effects and Mitigation" of the Keeyask
24 Generation Project EIS Response to EIS Guidelines, "the total number of core areas
25 larger than 200 ha in the Regional Study Area is predicted to remain at 111 because,
26 although a few core areas are completely removed, several other core areas are
27 fragmented into smaller blocks. The total number of core areas larger than 1,000 ha
28 would be reduced by one. None of the very large core areas would be lost."

29 As stated in the Terrestrial Environment Supporting Volume (p. 2-120), "Project
30 construction would have localized core area effects, primarily resulting from reservoir
31 clearing, dyke construction and coffer dam diversion. One core area slightly larger than
32 1,000 ha and two core areas between 200 ha and 1,000 ha would be removed. In
33 addition, several larger core areas on the north and south sides of the Nelson River
34 would become smaller (Map 2-15). One of these latter core areas is on Caribou Island
35 and is the largest core area on an island in the Keeyask reach of the Nelson River. The

36 largest core area along the north side of the Nelson River would be reduced by 879 ha,
37 or 36%."

38 The total losses of core areas may not be significant within the Regional Study Area, but
39 may be within the Local Study Area. However, no data are provided on percentage of
40 total core area to be lost within the Local Study Area.

41 **QUESTION:**

42 A quantitative residual effects assessment of each project component, e.g., reservoir
43 clearing, dyke construction, coffer dam diversion, permanent and temporary
44 infrastructure footprints, reservoir inundation, for the Local Study Area in tabular form
45 and/or mapping, as appropriate, should be provided for each of the key topics:

- 46 • Intactness based on linear feature density (km/km²) and core area abundance
47 (number and ha);
- 48 • Terrestrial Habitat based on loss or alteration of terrestrial habitat (ha);
- 49 • Ecosystem Diversity based on loss or alteration of the 43 priority habitat types
50 (number and ha);
- 51 • Wetland Function based on loss, creation or alteration of shoreline wetlands, off-
52 system marsh and other wetland types (ha);
- 53 • Mallard based on loss of habitat and reduction of staging habitat quality (ha);
- 54 • Bald Eagle based on habitat alteration and loss of nests and perching trees (ha and
55 number);
- 56 • Olive-sided Flycatcher based on habitat loss (ha);
- 57 • Rusty Blackbird based on habitat loss (ha);
- 58 • Common Nighthawk based on habitat loss/gain (ha);
- 59 • Yellow Rail based on habitat loss (ha);
- 60 • Short-eared Owl based on habitat loss (ha);
- 61 • Beaver based on habitat loss (ha), colony removal (number) and improved trapping
62 access;
- 63 • Caribou based on loss of significant caribou habitat, and relative to cumulative
64 effects of Intactness, Terrestrial Habitat and Ecosystem Diversity;
- 65 • Moose due to habitat loss and alteration (ha) and increased hunting access; and
- 66 • American Marten based on habitat loss (ha) and Intactness.

67 **RESPONSE:**

68 The Keeyask Generation Project (Keeyask) cumulative effects assessment for Terrestrial
69 Valued Environmental Components is provided in Chapter 6 (Keeyask in combination
70 with past and current projects and activities) and Chapter 7 (Keeyask in combination
71 with past, current and potential future projects and activities) of the Response to EIS
72 Guidelines and in the Terrestrial Environment Supporting Volume. Short summaries of
73 the cumulative effects assessment for each VEC that has the potential to experience

74 residual adverse effects as a result of developing and operating Keeyask are also
 75 included in the Keeyask Generation Project Cumulative Effects Assessment Summary
 76 provided with the response to CEC Rd 1 CEC-0020.

77 The regulatory significance of the residual adverse effects of Keeyask when acting in
 78 combination with other past, current and potential future projects and activities has
 79 been assessed based on guidance provided in the EIS Guidelines, and includes a
 80 consideration of the following:

- 81 • Direction or nature (i.e., positive, neutral or adverse) of the effect;
- 82 • Magnitude (i.e., severity) of the effect;
- 83 • Spatial boundaries (i.e., geographic extent);
- 84 • Temporal boundaries (i.e., duration) (see Section 5.5 of the Response to EIS
 85 Guidelines for further detail); and,
- 86 • Depending on the VEC, frequency, reversibility, and ecological and social context².

87 In undertaking the terrestrial cumulative effects assessment, quantitative measures
 88 have been used as required. This is especially the case for the spatial area affected in
 89 relation to each VEC, and as requested in this Information Request.

90 In response to this Information Request, a series of tables has been developed to
 91 summarize the detail requested above and in CEC Rd 1 CEC-0023 and CEC-0025 for each
 92 of the VECs, or VEC grouping, considered in the Project's terrestrial effects assessment.
 93 Table 1 provides information on ecosystem and terrestrial habitat VECs, and covers
 94 Intactness, Ecosystem Diversity and Wetland Function – the latter two include habitat
 95 composition and priority habitat types. Table 2 covers the Bird VECs, which include
 96 Common Nighthawk, Olive-sided Flycatcher, Rusty Blackbird, Bald Eagle, and Mallard.
 97 Table 3 covers the wildlife VECs, which included Beaver, Caribou and Moose. Yellow rail,
 98 Short-eared owl and American martin are not VECs and, as such, have not been included
 99 in these tables (for further detail, please see response to CEC Rd 1 CEC-0036).

100 For each of the tables noted above, indicator measures are provided for each VEC, with
 101 a primary focus on the amount of habitat available and/or affected (as requested), in
 102 each VEC's Local and Regional Study Areas as follows:

- 103 • Pre-development environment, which is defined here as environment prior to any
 104 industrialized development, and for which data only exist for the habitat and
 105 ecosystem VECs shown in Table 1;

² As reviewed in Section 5.5 of the Response to EIS Guidelines, all VECs were assessed based on the first four criteria (Step 1); seven of the terrestrial VEC's required Step 2 assessment that included consideration of three additional criteria (frequency, reversibility, and ecological and social context).

- 106 • Current environment based on a consideration of the other past and current
 107 projects included in the Keeyask cumulative effects assessment³;
- 108 • Keeyask project effects, including residual adverse effects after mitigation;
- 109 • Future environment with Keeyask in place, along with other past and current
 110 projects included in the Keeyask cumulative effects assessment; and
- 111 • Possible future environment with Keeyask in place, along with other past, current
 112 and future projects included in the Keeyask cumulative effects assessment. This
 113 analysis is only provided for the Regional Study Areas because the footprints of all
 114 future projects considered in the cumulative effects assessment are outside of the
 115 Local Study Area, with the exception of the Keeyask Transmission Project (KTP);
 116 note that the KTP overlap with the LSA is very small.

117 Several things are important to note as part of reviewing these tables:

- 118 • The details requested provide mostly the spatial component of the overall
 119 assessment. The full assessment of residual adverse effects also included a
 120 consideration of qualitative indicators, magnitude (includes the extent to which a
 121 VEC is vulnerable to any detectable adverse effect), duration and, for seven of the
 122 terrestrial VECs, reversibility, frequency, and ecological and social context. Coming
 123 to a final conclusion for a VEC has, in many cases, required an evaluation of the
 124 criteria used to assess significance based on professional judgment, past experience,
 125 current and potential future trends for these VECs and other non-quantifiable
 126 factors.
- 127 • As noted above, it was considered necessary for the assessment of Keeyask
 128 environmental effects to determine quantitative values for pre-development
 129 scenarios for the terrestrial habitat and ecosystem VECs of Intactness, Ecosystem
 130 Diversity and Wetland Function - and this information has been utilized for other
 131 terrestrial VECs to indicate overall habitat disturbance to date in study areas.
 132 However, data are not currently available to determine in any meaningful way the
 133 specific habitats that may have existed prior to industrialized development for bird
 134 and mammal VECs in the study areas. For this reason, the first column shown in the
 135 tables for the bird and mammal VECs quantifies the relevant habitat currently
 136 available within the LSA and RSA, rather than the habitat affected to date within
 137 these areas. Subsequent calculations show how the available habitat changes with
 138 Keeyask and other potential future developments. A qualitative description of
 139 historical changes over time for these VECs is provided in Chapter 6 of the Response
 140 to EIS Guidelines and in the VEC summaries provided with the response to CEC Rd 1
 141 CEC-0020.

³ For a detailed listing of the other past, current and future projects and activities considered in the Project's cumulative effects assessment, please see Chapter 7 of the Response to EIS Guidelines and the descriptions provided in Appendix 7-A.

- 142 • It is expected that a high proportion of the Local Study Area will be affected by the
143 Project due to the manner in which the Local Study Area was delineated. The Local
144 Study Area essentially represents the areas where Project effects are the most likely
145 to be visible (i.e., Project Footprint and areas in close proximity to it; Hegmann et al.
146 1999). These local effects were then placed into the broader regional context for the
147 purposes of assessing cumulative effects. These Regional Study Areas represented
148 an area large enough to capture the Keeyask population for a wildlife VEC or the
149 Keeyask regional ecosystem for an ecosystem VEC, but small enough to not
150 minimize the effects of Keeyask. When evaluating the regulatory significance of
151 Project effects, conclusions were drawn based on the effects experienced by a VEC
152 within its Regional Study Area. For this reason, and consistent with the EIS Filing, the
153 percentage of habitat affected or habitat available has only been presented for the
154 Regional Study Areas.
- 155 • Finally, the indicator measures presented for each project and activity, including for
156 the Keeyask Generation Project, have been presented for a project's total footprint
157 and not for each project's individual components. This has been done for two
158 reasons:
- 159 1. The ultimate purpose of an environmental assessment is to determine the
160 overall effect to each individual VEC based on the full project, as it is proposed
161 to be implemented. Effects, particularly to habitat area, evolve through time as
162 a project is implemented – for example, a cofferdam is a temporary
163 construction feature and many borrow areas are rehabilitated. Similarly, the
164 area cleared for the reservoir will eventually become part of the overall
165 reservoir. Capturing these areas twice would lead to a double-counting of the
166 area affected.
 - 167 2. A great deal of effort has already gone into designing the Keeyask Project,
168 including its individual components, in a manner that avoids or minimizes
169 potential adverse environmental effects as much as possible (for further detail,
170 see Section 4.3.3 of the Response to EIS Guidelines). For example, multi-
171 disciplinary workshops were held as part of determining the extent of borrow
172 areas and for routing access roads to avoid important features on the landscape
173 like calving and rearing habitat, rare terrestrial habitat types, wetland types that
174 are rare or provide high quality wildlife habitat, heritage resources and cultural
175 sites of importance. The Partnership has assessed the Keeyask Generation
176 Project and proposed that it be developed on the basis of these Project
177 components being implemented as planned.

Table 1. Terrestrial Habitat and Ecosystem VECs: Habitat Affected by Keeyask and Past, Present and Potential Future Projects

VEC	VEC Indicators and Indicator Measures			Pre-Development Total		Past & Current Project			Keeyask Project ¹			Keeyask and Past & Current Projects ¹			Keeyask & past, current & potential future projects ²								
	Indicator	Indicator Type	Indicator Measure	Local Study Area ⁴	Regional Study Area	Local Study Area	Regional Study Area	RSA % Affected	Local Study Area	Regional Study Area	RSA % Affected	Local Study Area	Regional Study Area	RSA % Affected	Conawapa	Bipole III ⁵	Keewatinow	Gillam Re-development	Keeyask Transmission	All Future Projects	Keeyask & All Future Projects	RSA % Affected	
Intactness	Linear Feature Density	QT	Total linear feature density (km/km ²)	0.00	0.00	1.29	0.45	-	0.09	0.00^B	-	1.23 ^C	0.44^C	-	-	0.04	-	-	0.00	0.04	0.48	-	
		QT	Transportation density (km/km ²)	0.00	0.00	0.13	0.07	-	0.03	0.00^B	-	0.17	0.07	-	-	-	-	-	-	-	-	0.07	-
		QT	Non-cutline density (km/km ²)	0.00	0.00	0.20	0.15	-	0.09	0.00^B	-	0.29	0.15	-	-	0.04	-	-	-	0.00	0.04	0.20	-
	Core Area	QT	Total number of core areas larger than 200 ha ⁶	3	n/a	18	111	-	12	111	-	12	111	-	-	- ^E	-	- ^E	- ^E	10	121	-	
		QT	Total number of core areas larger than 1,000 ha ⁶	2	n/a	5 ^A	57	-	3	56	-	3	56	-	-	- ^E	-	- ^E	- ^E	9	65	-	
QT		Total core area larger than 200 ha as a percentage of land area ⁶	100	100	49	84	-	25	84	-	25	84	-	-	- ^E	-	- ^E	- ^E	-1.0	83	-		
QT		Total core area larger than 1,000 ha as a percentage of land area ⁶	100	100	31	83	-	15	83	-	15	82	-	-	- ^E	-	- ^E	- ^E	-1.1	81	-		
Ecosystem Diversity	Habitat Composition	QT	Total terrestrial habitat area (ha)	13,220	1,269,907	1,028	61,108	4.8	9,416 ^D	9,416 ^D	0.74	9,895	66,650	5.2	0	3,700	0	165	1,000	4,865	71,515	5.6	
		QT	Number of native broad habitat types	53	53	51	53	-	43	53	-	43	53	-	53	53	53	53	53	53	53	53	-
	Priority Habitat Types	QT	Balsam poplar dominant on all ecosites (ha)	n/a	21	n/a	1	5.0	1	1	4.9	n/a	2	9.9	-	0	-	-	-	0	2	9.9	
		QT	Balsam poplar mixedwood on all ecosites (ha)	n/a	12	n/a	1	5.0	0	0	-	n/a	1	-	-	0	-	-	-	0	1	5.0	
		QT	Black spruce dominant on mineral (ha)	n/a	97,857	n/a	4,848	5.0	721	721	0.7	n/a	5,569	5.7	-	287	-	39	29	354	5,923	5.7	
		QT	Black spruce dominant on riparian peatland (ha)	n/a	8,522	n/a	422	5.0	36	36	0.4	n/a	458	5.4	-	25	-	-	3	28	486	5.4	
		QT	Black spruce dominant on wet peatland (ha)	n/a	26,802	n/a	1,328	5.0	102	102	0.4	n/a	1,429	5.3	-	78	-	-	33	111	1,541	5.3	
		QT	Black spruce mixedwood on mineral (ha)	n/a	3,099	n/a	154	5.0	18	18	0.6	n/a	172	5.5	-	9	-	1	10	20	192	5.5	
		QT	Black spruce mixedwood on shallow peatland (ha)	n/a	292	n/a	14	5.0	2	2	0.7	n/a	17	5.7	-	1	-	-	0	1	17	5.7	
		QT	Black spruce mixedwood on thin peatland (ha)	n/a	885	n/a	44	5.0	4	4	0.5	n/a	48	5.4	-	3	-	-	0	3	51	5.4	
		QT	Black spruce mixture on mineral (ha)	n/a	9,797	n/a	485	5.0	381	381	3.9	n/a	867	8.8	-	28	-	6	2	36	903	8.8	
		QT	Black spruce mixture on shallow peatland (ha)	n/a	5,757	n/a	285	5.0	74	74	1.3	n/a	360	6.2	-	16	-	12	12	41	400	6.2	
		QT	Black spruce mixture on thin peatland (ha)	n/a	8,132	n/a	403	5.0	185	185	2.3	n/a	588	7.2	-	22	-	13	11	47	635	7.2	
		QT	Black spruce mixture on wet peatland (ha)	n/a	1,759	n/a	87	5.0	5	5	0.3	n/a	92	5.2	-	5	-	-	1	6	97	5.2	
		QT	Jack pine dominant on mineral (ha)	n/a	15,584	n/a	772	5.0	107	107	0.7	n/a	879	5.6	-	47	-	12	28	87	966	5.6	
		QT	Jack pine dominant on shallow peatland (ha)	n/a	137	n/a	7	5.0	0	0	0.1	n/a	7	5.0	-	0	-	-	0	1	7	5.0	
		QT	Jack pine dominant on thin peatland (ha)	n/a	1,323	n/a	66	5.0	13	13	1.0	n/a	78	5.9	-	4	-	-	1	5	83	5.9	
		QT	Jack pine mixedwood on mineral (ha)	n/a	2,166	n/a	107	5.0	21	21	1.0	n/a	128	5.9	-	7	-	9	2	18	146	5.9	
		QT	Jack pine mixedwood on shallow peatland (ha)	n/a	103	n/a	5	5.0	1	1	0.9	n/a	6	5.9	-	0	-	-	0	0	6	5.9	
		QT	Jack pine mixedwood on thin peatland (ha)	n/a	1,415	n/a	70	5.0	23	23	1.6	n/a	93	6.6	-	4	-	-	0	4	98	6.6	
		QT	Jack pine mixture on shallow peatland (ha)	n/a	526	n/a	26	5.0	6	6	1.1	n/a	32	6.1	-	2	-	-	0	2	34	6.1	
		QT	Jack pine mixture on thin peatland (ha)	n/a	5,255	n/a	260	5.0	108	108	2.1	n/a	369	7.0	-	16	-	0	4	19	388	7.0	
		QT	Low vegetation on riparian peatland (ha)	n/a	23,495	n/a	1,164	5.0	204	204	0.9	n/a	1,368	5.8	-	69	-	-	10	79	1,447	5.8	
		QT	Low vegetation on shallow peatland (ha)	n/a	41,754	n/a	2,069	5.0	202	202	0.5	n/a	2,270	5.4	-	123	-	2	102	228	2,499	5.4	
		QT	Low vegetation on thin peatland (ha)	n/a	53,247	n/a	2,638	5.0	265	265	0.5	n/a	2,903	5.5	-	160	-	2	73	235	3,139	5.5	
		QT	Low vegetation on wet peatland (ha)	n/a	20,026	n/a	992	5.0	121	121	0.6	n/a	1,113	5.6	-	58	-	-	24	83	1,196	5.6	
		QT	Tall shrub on mineral (ha)	n/a	490	n/a	24	5.0	16	16	3.2	n/a	40	8.1	-	1	-	-	0	1	41	8.1	
		QT	Tall shrub on riparian peatland (ha)	n/a	7,606	n/a	377	5.0	232	232	3.0	n/a	608	8.0	-	22	-	-	0	22	630	8.0	
		QT	Tall shrub on shallow peatland (ha)	n/a	3,351	n/a	166	5.0	20	20	0.6	n/a	187	5.6	-	10	-	-	0	10	196	5.6	
		QT	Tall shrub on thin peatland (ha)	n/a	1,978	n/a	98	5.0	46	46	2.3	n/a	144	7.3	-	6	-	0	1	7	151	7.3	
		QT	Tall shrub on wet peatland (ha)	n/a	1,661	n/a	82	5.0	32	32	1.9	n/a	115	6.9	-	5	-	-	2	7	122	6.9	
		QT	Tamarack- black spruce mixture on riparian peatland (ha)	n/a	435	n/a	22	5.0	6	6	1.4	n/a	28	6.4	-	1	-	-	0	1	29	6.4	
		QT	Tamarack dominant on mineral (ha)	n/a	307	n/a	15	5.0	4	4	1.3	n/a	19	6.3	-	1	-	-	0	1	20	6.3	
		QT	Tamarack dominant on riparian peatland (ha)	n/a	82	n/a	4	5.0	0	0	-	n/a	4	-	-	0	-	-	0	0	4	5.0	
		QT	Tamarack dominant on shallow peatland (ha)	n/a	440	n/a	22	5.0	0	0	-	n/a	22	-	-	1	-	-	0	2	23	5.0	
		QT	Tamarack dominant on thin peatland (ha)	n/a	241	n/a	12	5.0	2	2	0.8	n/a	14	5.8	-	1	-	-	0	1	15	5.8	
		QT	Tamarack dominant on wet peatland (ha)	n/a	2,048	n/a	101	5.0	2	2	0.1	n/a	104	5.1	-	6	-	-	11	17	121	5.1	
QT	Tamarack mixture on mineral (ha)	n/a	1,067	n/a	53	5.0	28	28	2.6	n/a	81	7.6	-	3	-	-	2	5	86	7.6			
QT	Tamarack mixture on shallow peatland (ha)	n/a	3,494	n/a	173	5.0	53	53	1.5	n/a	226	6.5	-	10	-	-	10	20	246	6.5			
QT	Tamarack mixture on thin peatland (ha)	n/a	3,029	n/a	150	5.0	77	77	2.6	n/a	228	7.5	-	9	-	-	10	19	247	7.5			
QT	Tamarack mixture on wet peatland (ha)	n/a	9,648	n/a	478	5.0	26	26	0.3	n/a	504	5.2	-	28	-	-	5	33	537	5.2			
QT	Trembling aspen dominant on all ecosites (ha)	n/a	7,073	n/a	350	5.0	125	125	1.8	n/a	475	6.7	-	21	-	-	11	32	507	6.7			
QT	Trembling aspen mixedwood on all ecosites (ha)	n/a	5,872	n/a	291	5.0	68	68	1.2	n/a	359	6.1	-	17	-	-	16	34	392	6.1			
QT	White birch dominant on all ecosites (ha)	n/a	553	n/a	27	5.0	12	12	2.2	n/a	40	7.1	-	2	-	-	0	2	41	7.1			
QT	White birch mixedwood on all ecosites (ha)	n/a	446	n/a	22	5.0	17	17	3.8	n/a	39	8.8	-	1	-	-	0	1	40	8.8			
QT	Bay Lacustrine Marsh	n/a	426	n/a	7	1.7	-	-	-	n/a	7	1.7	-	-	-	-	-	-	-	7	1.7		
QT	Stream Riparian Marsh	n/a	108	n/a	2	1.7	-	-	-	n/a	2	1.7	-	-	-	-	-	0	0	2	1.8		

Table 1. Terrestrial Habitat and Ecosystem VECs: Habitat Affected by Keeyask and Past, Present and Potential Future Projects

VEC	VEC Indicators and Indicator Measures			Pre-Development Total		Past & Current Project			Keeyask Project ¹			Keeyask and Past & Current Projects ¹			Keeyask & past, current & potential future projects ² Regional Study Area ³								
	Indicator	Indicator Type	Indicator Measure	Local Study Area ⁴	Regional Study Area	Local Study Area	Regional Study Area	RSA % Affected	Local Study Area	Regional Study Area	RSA % Affected	Local Study Area	Regional Study Area	RSA % Affected	Conawapa	Bipole III ⁵	Keewatinow	Gillam Re-development	Keeyask Transmission	All Future Projects	Keeyask & All Future Projects	RSA % Affected	
Wetland Function	Wetland Types	QT	Shore and floating Riparian Fen	n/a	33,017	n/a	1,545	4.7	262	262	0.8	n/a	1,807	5.5	-	2	-	-	15	18	1,825	5.5	
		QT	Flat Swamp	n/a	4	n/a	0	5.0	-	-	-	n/a	0	5.0	-	-	-	-	-	-	0	5.0	
		QT	Horizontal and blank Fen/ Bog mixture	n/a	2,571	n/a	65	2.5	-	-	-	n/a	65	2.5	-	-	-	-	-	-	65	2.5	
		QT	Slope Fen	n/a	2,175	n/a	106	4.9	17	17	0.8	n/a	123	5.7	-	-	-	-	3	3	126	5.8	
		QT	Northern ribbed, ladder or net String Fen	n/a	160	n/a	8	5.0	-	-	-	n/a	8	5.0	-	-	-	-	-	-	8	5.0	
		QT	Shore and floating Riparian Bog	n/a	2,139	n/a	103	4.8	11	11	0.5	n/a	114	5.3	-	1	-	-	-	-	1	115	5.4
		QT	Basin Fen	n/a	12	n/a	1	5.0	-	-	-	n/a	1	5.0	-	-	-	-	-	-	-	1	5.0
		QT	Horizontal Fen	n/a	49,648	n/a	2,233	4.5	202	202	0.4	n/a	2,435	4.9	-	54	-	-	-	67	121	2,556	5.1
		QT	Peat plateau Bog	n/a	62,949	n/a	3,068	4.9	469	469	0.7	n/a	3,537	5.6	-	34	-	0	16	50	3,587	5.7	
		QT	Slope Bog	n/a	18,533	n/a	807	4.4	41	41	0.2	n/a	848	4.6	-	10	-	-	-	17	28	876	4.7
		QT	Flat Bog	n/a	7,770	n/a	377	4.8	50	50	0.6	n/a	427	5.5	-	8	-	-	-	14	22	448	5.8
		QT	BB/ CS Mixture Bog	n/a	17,428	n/a	536	3.1	-	-	-	n/a	536	3.1	-	4	-	-	-	-	4	540	3.1
		QT	PPB/ CS mixture Bog	n/a	127,932	n/a	5,968	4.7	909	909	0.7	n/a	6,877	5.4	-	73	-	-	-	133	210	7,087	5.5
		QT	Veneer Bog	n/a	31,871	n/a	816	2.6	128	128	0.4	n/a	944	3.0	-	23	-	28	7	58	1,003	3.1	
		QT	Blanket Bog	n/a	266,368	n/a	12,285	4.6	1,897	1,897	0.7	n/a	14,182	5.3	-	174	-	1	330	506	14,687	5.5	
QT	Strongly sloped Veneer Bog	n/a	497,669	n/a	21,013	4.2	3,852	3,852	0.8	n/a	24,865	5.0	-	191	-	75	375	640	25,505	5.1			

- = not applicable for this indicator measure.

n/a= Data not available. Would require photo-interpretation of all areas flooded by reservoirs.

¹ After Project mitigation.

² No mitigation for actions except for Keeyask GS.

³ All future actions except for Keeyask Transmission Project (KTP) are outside of the Local Study Area, and KTP overlap is small.

⁴ Includes KIP EA footprint and portions of Gillam, PR 280, borrow areas, Kettle reservoir flooding and expansion in the Local Study Area. Priority habitat values for the Local Study Area not available except for KIP. Where values are provided, most are approximate since they were derived from a number of different sources.

⁵ Habitat composition for the portion of Bipole III outside of Study Zone 4 is estimated from Study Zone 4 percentages.

⁶ Local Study Area values only includes those portions of the core areas that are in the Local Study Area, which is consistent with the Regional Study Area methodology.

^A Number of core areas increases because the two very large core areas are fragmented into smaller areas.

^B Incremental Project contribution only, which is nil because: (i) portions of Project linear features are on existing linear features; and, (ii) polygon features such as flooding and construction clearing cover portions of linear features.

^C Value declines from Past & Current Projects because Project features cover portions of existing linear features through flooding and construction clearing.

^D Total area affected before considering reductions due to potential construction areas not actually used (e.g., portions of borrow areas and potential disturbance areas) and habitat recovery through rehabilitation and natural processes.

^E Not reported by action because some actions have spatial overlap with others. Combined effects of all actions shown "All Future Projects" column.

Table 2. Bird VECs: Habitat Available and Habitat Affected by Keeyask and Past, Present & Potential Future Projects

VEC	VEC Indicators and Indicator Measures			Past & Current Project			Keeyask Project			Keeyask & Past and Current Projects			Keeyask & Past, Current and Future Projects							
	Indicator	Indicator Type ¹	Indicator Measure	Local Study Area (ha)	Regional Study Area (ha)	RSA % Habitat Available	Habitat Affected LSA ² (ha)	Habitat Affected RSA ² (ha)	% RSA Affected	Local Study Area (ha)	Regional Study Area (ha)	RSA % Habitat Available	Habitat Affected: Conawapa (ha)	Habitat Affected: Bipole III (ha)	Habitat Affected: Keewatinoow (ha)	Habitat Affected: Gillam Re-development (ha)	Habitat Affected: Keeyask Transmission (ha)	Habitat Affected: All Future Projects	Habitat Affected: Keeyask & All Future Projects	RSA % Habitat Available
Common Nighthawk	Availability of breeding habitat	QT	Direct habitat loss as a result of construction and operation	5712	19172	11	1,926	1,926	1.2	3786	17246	13	0	8	0	29	106	143	2,069	10
Olive-sided Flycatcher	Availability of breeding habitat	QT	Direct habitat loss as a result of construction and operation	1,646	9513	6	470	470	0.3	1176	9043	5	0	15	0	1	47	63	533	5
Rusty Blackbird	Availability of breeding habitat	QT	Direct habitat loss as a result of construction and operation	5,917	39,358	24	921	921	0.6	4996	38437	23	0	57	0	0	84	141	1,062	23
Bald Eagle	Availability of breeding and perching habitat	QT	Increase in the amount of shoreline habitat resulting from operation	10008	34284	3	92 (+)	92 (+)	0.01	10100	34376	3	0	0	0	0	0	0	10,100	3
Mallard⁴	Availability of breeding habitat	QT	Direct habitat loss as a result of construction and operation	11,707	69291	37	2,958	2,958	1.3	8749	66333	34	0	80	0	46	738	864	3,822	30

General note: primary and secondary habitat (as defined in the TE SV Section 6) are included in the area totals

¹ QT=quantitative; QL=qualitative; PJ=professional judgement; MX=mixture of QT, QL and PJ.

² After Project mitigation.

³ No mitigation for actions (except for Keeyask GS).

⁴ Calculations of mallard habitat loss for the Keeyask GS have been revised using more detailed information for waterbodies located within the RSA.

Table 3. Mammal VECs: Habitat Available and Habitat Affected by Keeyask and Past, Present & Potential Future Projects

VEC	VEC Indicators and Indicator Measures			Past & Current Project			Keeyask Project			Keeyask and Past & Current Projects			Keeyask & past, current & potential future projects Regional Study Area							
	Indicator	Indicator Type ¹	Indicator Measure	Local Study Area ²	Regional Study Area ²	RSA % Habitat Available	Habitat Affected LSA	Habitat Affected RSA	RSA % Affected	Local Study Area	Regional Study Area	RSA % Habitat Available	Conawapa	Bipole III	Keewatinoow	Gillam Re-development	Keeyask Transmission	All Future Projects	Keeyask & All Future Projects	RSA % Habitat Available
Beaver	Physical Habitat ^{3,5}	QT	Direct habitat loss as a result of construction and operation	2,219	14,157	8.5	689	689	0.4	1,530	13,468	8.1	NA	56	NA	15	106	177	13,291	8.0
Caribou	Winter habitat ^{3,6,8}	QT	Direct habitat loss as a result of construction and operation	112,545	849,079	68.1	6,825	6,825	0.6	105,720	842,254	67.6	NA	3,045	NA	171	903	4,119	838,135	67.3
	Intactness (EC model) ^{4,7}	QT	The degree to which summer resident caribou habitat remains unaltered by anthropogenic disturbances and fire	NA	2,015,340	66.1	NA	7,389	0.2	NA	2,007,951	65.9	NA	√	NA	√	√	16,153	1,991,798	65.3
	Intactness (EC model) ¹⁵	QT	The degree to which Pen Islands caribou summer range remains unaltered by anthropogenic disturbances and fire	NA	1,074,793	73.1	NA	7,389	0.5	NA	1,067,404	72.6	√	√	√	√	√	26,026	1,041,378	70.9
	Caribou Calving Islands ^{4,7}	QT	Direct habitat loss as a result of construction and operation	5,683	14,271	0.5	132	132	<0.1	5,551	14,139	0.5	NA	0	NA	0	0	0	14,139	0.5
	Caribou Calving Islands ^{4,7,10}	QT	Direct habitat loss as a result of construction and operation (after 30 years of operation)	5,551	14,139	0.5	233	233	<0.1	5,318	13,906	0.5	NA	0	NA	0	0	0	13,906	0.5
	Peatland Complexes ^{4,7,9,11}	QT	Direct habitat loss as a result of construction and operation	8,272	189,969	6.2	69	69	<0.1	8,203	189,901	6.2	NA	68	NA	0	24	92	189,809	6.2
	Caribou Calving Islands and Peatland Complexes combined ^{4,7,9}	QT	Direct habitat loss as a result of construction and operation	13,995	204,240	6.7	201	201	0.0	13,825	204,040	6.7	NA	68	NA	0	24	92	203,948	6.7
	Intactness (EIS model) ^{3,6}	QT	The degree to which hypothetical boreal woodland caribou habitat remains unaltered by anthropogenic disturbances and fire (terrestrial area)	NA	599,830	48.5	NA	7,389	0.6	NA	592,441	47.9	NA	√	NA	√	√	16,153	576,288	46.6
	Intactness (EC model) ^{4,6}	QT	The degree to which hypothetical boreal woodland caribou habitat remains unaltered by anthropogenic disturbances and fire (total area)	NA	911,891	64.4	NA	7,389	0.5	NA	904,502	63.9	NA	√	NA	√	√	16,153	888,349	62.7
	Gray Wolf Density ¹²	MX	Total regional density		1.4			1.4			1.4								1.4	
Core Area ¹⁴	QT																			
Linear Feature Density ¹⁴	QT																			
Moose	Physical Habitat ^{3,6}	QT	Direct habitat loss as a result of construction and operation	161,993	1,182,971	94.9	12,624	12,624	1.0	149,368	1,170,347	93.9	NA	3,574	NA	184	1,190	4,948	1,165,399	93.5
	Harvest ¹³	MX	Portion of moose population harvested		<10%			<10%			<10%								<10%	
	Gray Wolf Density ¹²	MX	Total regional density		1.4			1.4			1.4								1.4	

1 - QT = quantitative; QL = qualitative; PJ = professional judgement; MX = mixture of QT, QL and PJ

2 - All Local and Regional Study Area units reported in hectares (ha)

3 - Calculation of % RSA habitat available is based on total terrestrial area

4 - Calculation of % RSA habitat available is based on total geographic area; EC - Environment Canada

5 - Zone 4

6 - Zone 5

7 - Zone 6

8 - RSA for caribou is Study Zone 6; however for this indicator measure, habitat data and results are limited to Study Zone 5.

9 - Physical habitat loss for peatland complexes includes transmission line rights-of-way, which may not constitute actual habitat loss except for tower footprints

10 - Project effects 30 years after operation

11 - Mapping of peatland complexes is limited to 69% coverage in Zone 6. For future projects, 44 km of the Bipole III transmission line overlap the area without coverage.

12 - Number of gray wolves per 1000 km²

13 - General harvest benchmark reported. See Moose Harvest Sustainability Plan in the Split Lake RMA for other sustainable harvest benchmarks

14 - See Habitat and Ecosystem VEC of Intactness for relevant values applied to mammals

15 - RSA considered for this indicator based on minimum convex polygon for Pen Islands caribou summer range - 1,469,477 ha terrestrial area (adapted from Bipole)

NA - Not Applicable

√ - Captured elsewhere in All Future Projects combined

General Note: Primary and secondary habitat are included in the area totals

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.5.2**
2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 CEC-0022**

4 **PREAMBLE:**

5 Section 1.3.5 of the Keyyask EIS Terrestrial Environment Supporting Volume presents
6 the Local and Regional Study Areas, each generally consisting of three Study Zones (see
7 Map 2-1 of the Keyyask EIS Terrestrial Environment Supporting Volume).

8 It was stated that:

9 *“Due to the manner in which it was derived, the Regional Study Area was generally used*
10 *as the cumulative effects assessment area.”*

11 The Local and Regional Study Areas for many of the VECs and supporting topics were
12 Study Zones 3 and 5, respectively (see Map 1-1, Terrestrial Environment). The east-west
13 axis of the Study Zone 5 Regional Study Area extends from Long Spruce GS to just west
14 of Thompson. The length of the eastern axis from the proposed Keyyask GS to Long
15 Spruce GS is approximately 50 km, whereas the length of the western axis from the
16 proposed Keyyask GS to west of Thompson is approximately 190 km, i.e., 3.6 times
17 longer.

18 For most EAs, the Project Footprint is the centroid for the delineation of its study areas.

19 With the truncation of the Study Zone 5 Regional Study Area at Long Spruce GS, an
20 assessment of the terrestrial environment components further east that have been
21 affected by existing developments or would be affected by future developments was
22 not undertaken.

23 Existing developments outside of Study Zone 5 include (for reference see Map 2 from
24 the BiPole Transmission Project, called “Location of Existing and Proposed BiPole III
25 Developments Outside Proposed Keyyask Project Terrestrial Study Areas”):

- 26 • Community of Bird;
27 • Limestone GS;
28 • transmission lines between Limestone GS and Henday CS;
29 • transmission lines between Long Spruce GS Henday CS;
30 • Henday CS and the northern end of Bipole II;
31 • further northern extension of the KN36 transmission line;
32 • further northeastern extensions of the CN rail line and the abandoned rail line;
33 • further northeastern extension of Highway 290;

- 34 • Conawapa Road;
- 35 • access roads and trails;
- 36 • cutlines; and
- 37 • cleared, borrow and other disturbed areas.

38 Proposed developments outside of Study Zone 5 include:

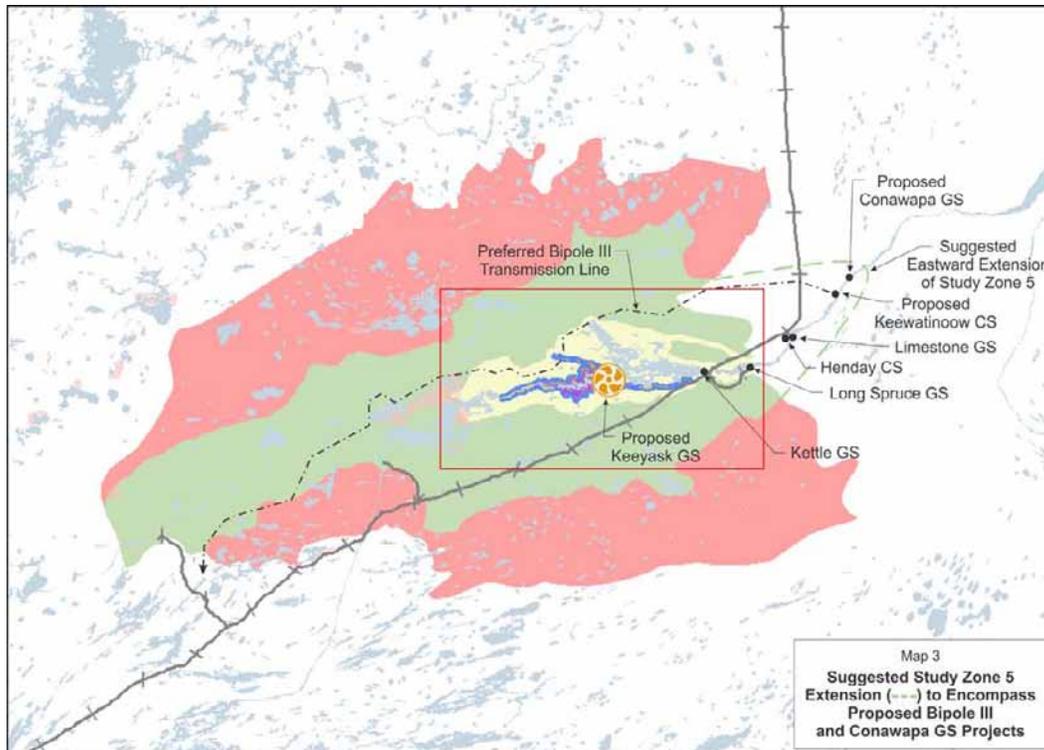
- 39 • many of the Bipole III Transmission Project components including:
 - 40 ○ the Keewatinoow Ground Electrode Site; o the Ground Electrode Line; o the
 - 41 Keewatinoow CS;
 - 42 ○ most of the AC collector line from Long Spruce GS to Henday CS;
 - 43 ○ the five AC collector lines from Henday CS to the Keewatinoow CS;
 - 44 ○ the construction power line from Henday CS to the construction camp site; o
 - 45 the start-up and main construction camp sites;
 - 46 ○ the work area site;
 - 47 ○ the borrow and excavated material placement areas;
 - 48 ○ an approximate 60-km section of the Bipole III HVdc Transmission Line from the
 - 49 Keewatinoow CS to the eastern limit of Study Zone 5; and
- 50 • the Conawapa GS, with a smaller inundation area but likely larger construction and
- 51 infrastructure footprint than the proposed Keeyask GS. It should be noted that there
- 52 is a westward indentation of Study Zone 5 resulting in additional exclusion of the
- 53 proposed Bipole III transmission line (see Map below).

54 An extension of the Study Zone 5 Regional Study Area approximately 60 km further
 55 northeast would have encompassed these existing and proposed developments (see
 56 Map below).

57 There is an inset figure at the top left hand side of Map 1-1 of the Keeyask Terrestrial
 58 Environment volume which delineates the Keeyask Generation Project Area, which
 59 extends the eastern boundary further east to encompass the existing and proposed
 60 developments. A suggested extension of Study Zone 5 to encompass all existing and
 61 proposed developments is presented below.

62 **QUESTION:**

63 The Study Zone 5 Regional Study Area should be extended approximately 60 km further
 64 northeast to encompass the existing and proposed developments listed above. A
 65 suggested extension of Study Zone 5 to encompass all existing and proposed
 66 developments is presented below.



67

68 **RESPONSE:**

69 For the reasons set out below, the Partnership believes that the current boundaries of
 70 Study Zone 5 and those of the other nested study zones are the most appropriate ones
 71 for the purposes of the Keeyask Generation Project terrestrial assessment. An extension
 72 of Study Zone 5 approximately 60 km northeast to encompass the existing and proposed
 73 developments listed in this question would be inconsistent with the ecosystem-based,
 74 VEC-centric approach undertaken by the Partnership for the terrestrial assessment. The
 75 primary justification offered in the question for the proposed extension is to encompass
 76 the identified existing and future developments in this area, however, such an extension
 77 is not required to ensure that these other existing and future projects are properly
 78 considered in the assessment of the Project's cumulative effects.

79 The Study Zone 5 boundaries are considered to be appropriate for use as the regional
 80 and cumulative effects assessment study areas for most of the terrestrial VECs because:

- 81 • Study Zone 5 boundaries follow ecosystem boundaries, which is a prerequisite for
 82 employing an ecosystem-based approach to Project and cumulative effects
 83 assessment;
- 84 • Following cumulative effects assessment guidance, the VEC local and regional study
 85 area boundaries are based on ecological criteria rather than the physical locations of
 86 all past, current and reasonably foreseeable future actions;

- 87 • The cumulative effects assessments considered effects from actions physically
 88 located outside of Study Zone 5, where effects from these actions have the potential
 89 to overlap spatially or temporally with those of the Project; and
- 90 • Where necessary to address the relevant population home range that may be
 91 affected by the Project, the cumulative effects assessment for certain VECs used
 92 additional study areas that extended outside Study Zone 5 and Study Zone 6. For
 93 example, the cumulative effects assessment study area for the Pen Islands caribou
 94 assessment extends through northeastern Manitoba and northwestern Ontario
 95 because this encompasses the range for this caribou population. Since this study
 96 area overlaps spatially with some effects from Conawapa, Bipole III (including
 97 Keewatinoow) and Gillam redevelopment (all east of Study Zone 5), the Pen Islands
 98 caribou assessment also considers effects from these developments even though
 99 they are outside of Study Zone 5.

100 To assist in the review of the terrestrial effects assessment for the Keeyask Generation
 101 Project, a summary is provided below that outlines the approach adopted to study area
 102 delineation in this environmental assessment.

103 Purpose of EA Study Areas

104 The key purpose of environmental assessment study areas is to focus the evaluation of
 105 Project effects to an appropriate scale that is neither too large nor too small, for the
 106 valued environmental component (VEC) of interest. A variety of approaches to
 107 delineating such study areas can be found in environmental impact statements (EISs).
 108 Some EISs draw a rectangle around the project impact areas, others draw an ellipse,
 109 some buffer the project impact areas and some use an ecological region that includes
 110 the project impact areas. In all approaches, Project impact areas may include non-
 111 physical impacts, such as noise or traffic, where relevant for the topic.

112 Approach Adopted for Terrestrial Study Areas

113 The Project terrestrial effects assessment takes a regional, ecosystem-based approach
 114 to identifying the environmental assessment study areas for a number of reasons, such
 115 as the desire to evaluate cumulative effects on biodiversity (Council on Environmental
 116 Quality 1997). Environmental assessment and land use management guidance literature
 117 also indicates that study area boundaries used to assess cumulative effects on VECs or
 118 other key topics of concern should be delineated using natural boundaries such as
 119 ecological regions (e.g., Beanlands and Duinker 1983; Council on Environmental Quality
 120 1997; Hegmann et al. 1999; Ecological Society of America Committee on Land Use 2000;
 121 Miller and Ehnes 2000; KAVIK-AXYS 2002; Indian Oil and Gas Canada 2011).

122 Section 1.3.5 of the Terrestrial Environment Supporting Volume, which provides details
 123 on how the various study areas were determined, describes how spatial scope was
 124 determined separately for each VEC using a nested, cause-effect approach (FEARO 1994;
 125 CEAA 1996; Milko 1998a, 1998b; Hegmann 1999; Manitoba Hydro 2003b). In the cause-
 126 effect approach, Project impacts such as clearing, flooding, noise and better access are
 127 evaluated for their direct and indirect effects on the VEC of interest. Project impacts
 128 have local effects in the form of direct and indirect effects on individual animals in the
 129 case of wildlife VECs (e.g., five moose are displaced) and individual ecosystem elements
 130 in the case of non-wildlife VECs (e.g., three jack pine stands are cleared; a core area is
 131 fragmented). The question of ultimate concern for the Project effects assessment is how
 132 effects on individual animals translate into long-term effects on population viability or
 133 how effects on individual ecosystem elements translate into long-term effects on
 134 components of regional ecosystem health (which is a synthetic measure of ecosystem
 135 functions). For example, how removing the habitat that supports five moose affects the
 136 overall moose population, or how removing three jack pine stands affects regional
 137 ecosystem diversity.

138 On this basis, an area that was large enough to capture the Keeyask population for
 139 wildlife VECs or the Keeyask regional ecosystem for ecosystem VECs was used to assess
 140 the potential significance of Project effects. For each VEC, this area became the Regional
 141 Study Area for that VEC. Because the Regional Study Area (Study Zone 4, 5 or 6
 142 depending on the VEC) generally represented the population home range or the
 143 regional ecosystem, it was generally used as the cumulative effects assessment area for
 144 that VEC. However, as noted above, there were cases where additional study areas
 145 located outside of the main Regional Study Area for a VEC were used to assess effects
 146 on the relevant population home range that may be affected by the Project. As well, the
 147 effects of actions physically located outside of a VEC's study areas are considered in the
 148 cumulative effects assessment, where there is a potential for these effects to overlap
 149 spatially or temporally with those of the Project. As noted in the Cumulative Effects
 150 Assessment Practitioner's Guide (Hegmann et al. 1999), it is not necessary for an action
 151 to be physically located within a VEC's regional study area for the effects of that action
 152 to be considered.

153 Spatial Application of Approach Adopted

154 Using the overall approach described above, the spatial application of the nested cause-
 155 effect approach for each VEC was as follows. The project impact areas are the cause,
 156 which create and are therefore nested within the potential local zone of influence (the
 157 Local Study Area), which is nested within the Regional Study Area used to evaluate the
 158 importance of effects on the VEC. Since the Regional Study Area was selected using

159 population or regional ecosystem considerations relative to the Keeyask area, it was
160 generally used as the cumulative effects assessment area for that VEC.

161 To implement the cause-effect and ecosystem based approach, study zones outside of
162 the project impact areas (Study Zone 1) and the potential local Project zone of influence
163 on terrestrial habitat (Study Zone 2) were delineated to correspond with nested
164 ecosystem levels. Study Zone 2 was included as a local zone of influence because
165 terrestrial habitat is a driver for many effects on the terrestrial ecosystem and the
166 species it includes.

167 This approach led to the creation of six nested study zones. Study Areas for each VEC
168 were selected from the six nested study zones based on what was appropriate for the
169 VEC. The following briefly describes each of the six nested study zones and the types of
170 VECs and supporting topics that used them (additional detail is provided for Study Zone
171 5 given the interest expressed in the Information Request):

- 172 • Study Zone 1: The geographic boundaries of the combined potential extent of the
173 Project Footprint during construction and operation, including areas that are
174 unlikely to be used and before considering mitigation, habitat rehabilitation and
175 natural habitat regeneration.
- 176 • Study Zone 2: Defined by the Project's maximum potential local zone of influence on
177 terrestrial habitat composition, which reflects potential effects on stand level
178 ecosystems. Delineated by a 150 m buffer around Study Zone 1. Since Study Zone 2
179 was the maximum potential extent of altered habitat composition, this zone was
180 used as the Local Study Area for terrestrial habitat and for species with the smallest
181 individual home range sizes (e.g., frogs, mice).
- 182 • Study Zone 3: Defined by the Project's maximum potential local zone of influence on
183 landscape elements, which reflects potential effects on landscape level ecosystems.
184 Delineated by a 1,150 m buffer around Study Zone 1. Study Zone 3 was used as the
185 Regional Study Area for species with the smallest population home range sizes (e.g.,
186 frogs, mice) and the Local Study Area for species with small to moderate sized
187 population home ranges (e.g., olive-sided flycatcher, beaver).
- 188 • Study Zone 4: An area large enough to capture a repeating sequence of landscape
189 types. Study Zone 4 was used as the Regional Study Area for species with small to
190 moderate sized population home ranges and as the Local Study Area for species
191 with large individual home range sizes.
- 192 • Study Zone 5: The region level ecosystem. Determined by the area large enough to
193 support key boreal ecological processes and populations of most resident wildlife
194 species. In practical application, Study Zone 5 was an area large enough to maintain
195 a relatively stable habitat composition in response to the wildfire regime; one large
196 fire is unlikely to substantially change the proportion of any habitat type, so that the

197 region is large enough to provide alternative habitat for species to move to when
 198 large fires occur. The eastern limit of Study Zone 5 is located along the boundary
 199 between the Boreal Shield and the Hudson Plains Ecozones⁴; extending Study Zone
 200 5 further eastward would have incorporated very different ecological conditions
 201 (e.g., surface deposits, wildfire regime, vegetation, soils). Within the same ecological
 202 conditions, Study Zone 5 was extended westward to Thompson to capture the area
 203 affected by Project-related increases in traffic on PR 280, since traffic increases are
 204 relevant for the intactness and wildlife assessments. Because Study Zone 5
 205 represented the Keeyask regional ecosystem, it was the Regional Study Area for
 206 most of the habitat and ecosystems VECs and supporting topics.

- 207 • Study Zone 6: The area needed to characterize the wildfire regime. This study zone
 208 was also used as the Regional Study Area for species with very large population
 209 home ranges.

210 Conclusion

211 In short, the boundaries for the study zones used in the terrestrial assessment are at an
 212 appropriate scale to identify potential effects (neither too small nor too large), are
 213 ecologically-based, and are suited to the needs of the Project assessment. Further, the
 214 study zones selected have not limited consideration – where applicable to the range of
 215 the VEC – of potential cumulative effects from current or future actions that may occur
 216 outside of Study Zone 5 (such as the proposed Conawapa Generation Project).

217 **REFERENCES:**

- 218 Beanlands and Duinker. 1983. Ecological framework for environmental impact
 219 assessment in Canada.
- 220 Council on Environmental Quality. 1997. Considering cumulative effects under the
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 222 Office of the President. 64 pp. plus appendices.
- 223 Ecological Society of America Committee on Land Use. 2000. Ecological principles for
 224 managing land use. Ecological Society of America. 12 pp.
- 225 Hegmann, G., Cocklin, C., Creasey, R., Dupuis, S., Kennedy, A., Kingsley, L., Ross, W.,
 226 Spaling, H., and Stalker, D. 1999. Cumulative effects assessment practitioner's
 227 guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working
 228 Group for the Canadian Environmental Assessment Agency, Hull, Quebec.

⁴ An ecozone boundary is a strong ecological criterion for delineating a regional ecosystem.

- 229 Indian Oil and Gas Canada. 2011. How to prepare an environmental assessment for
230 Indian Oil and Gas Canada: Interim Guidelines, March 31, 2011. Aboriginal
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237 Conservation and Health. Edited by D. Pimentel, L. Westra and R. F. Noss. Island
238 Press, Washington, D.C. pp. 157-176.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.5.2**
2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 CEC-0023**

4 **PREAMBLE:**

5 Based on the current Regional Study Areas, residual effects on a number of VECs and
6 supporting topics have reached or are approaching the 10% level of significant impact or
7 other metric. As indicated in the IR on Residual Effects Quantification, residual effects
8 on total terrestrial habitat and the common habitat types are almost 6%. However, a
9 CEA was not undertaken as terrestrial habitat was not considered to be a VEC.

10 Ecosystem Diversity

11 Based on Ecosystem Diversity, the residual effects ranged from 5.0 to 9.9% for the 40
12 priority habitat types.

13 In Section 2.10.3 "Ecosystem Diversity" of the Terrestrial Environment Supporting
14 Volume, it is stated that "based on the anticipated locations of the Gillam
15 Redevelopment and the transmission projects (footprints plus 50 m buffer), these
16 projects could affect an estimated 1,170 ha of terrestrial habitat in addition to that
17 already affected by the Project. Regionally common habitat types comprise
18 approximately half of this area. For all of the priority habitat types, the amounts of
19 additional habitat affected are relatively small so that increases in the percentages of
20 habitat area affected could (bold provided by SENES) remain below 10% of historical
21 area for all affected priority habitat types, depending on the final locations of the
22 transmission ROWs.

23 Based on its anticipated location, Bipole III could affect approximately 3,700 (sic) of
24 terrestrial habitat. Since detailed habitat mapping was not available for the Bipole
25 footprint, the composition of the affected habitat was assumed to be similar to that of
26 Zone 4. On that basis, approximately 70% of the affected habitat is not priority habitat.
27 Although the increased amounts of additional habitat affected would be relatively high
28 for some priority habitat types using this assumption, the increases in the percentage of
29 affected habitat area **could** (bold provided by SENES) remain below 10% of historical
30 area for all priority habitat types, depending on the final location of the ROW.

31 Based on the anticipated locations of future projects, cumulative future effects **could**
32 (bold provided by SENES) remain in the low end of the moderate range for total habitat
33 area affected and the common habitat types and within the small to moderate range for
34 all of the priority habitat types."

35 Olive-sided Flycatcher

36 In Section 6.4.1.4 of the Terrestrial Environment Supporting Volume, it is stated that
37 approximately 4% (350 ha) of the regional olive-sided flycatcher breeding and foraging
38 habitat will be lost or reduced in quality due to construction. It is further stated that a
39 potential loss of up to 120 ha or 1% of regional olive-sided flycatcher habitat within the
40 Regional Study Area will be lost during operation. There is no quantification of residual
41 effects due to past and current projects and activities (see Sections 6.4.4.1.1 and
42 6.4.4.2.1), or for future projects/activities (see Section 6.4.4.3.1). For the CEA, it is stated
43 that “it is expected that the Project in combination with other future developments will
44 result **in the additional loss of some** (bold provided by SENES) olive-sided flycatcher
45 breeding habitat. Losses are expected to be **minimal as land clearing will be minimized**
46 **to the extent possible**” (bold provided by SENES).

47 Other VECs

48 With the exception of Intactness and to some extent wetland function, no quantitative
49 CEA is provided for any of the other VECs, i.e., mallard, Canada goose, common
50 nighthawk and rusty blackbird (Section 6.4.4.3.1), as well as beaver (Section
51 7.4.8.3), caribou (Section 7.4.8.2.3) and moose (Section 7.4.8.3.3).

52 **QUESTION:**

53 For the cumulative effects assessment of each key topic, each of the future projects and
54 activities should be identified and their effects should be quantified and presented in
55 tabular form. For the proposed Bipole III and Conawapa GS projects, their effects should
56 be quantified by project component.

57 **RESPONSE:**

58 Please see the response to CEC Rd 1 CEC-0021.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
 2 **Cumulative Effects Assessment; p. N/A**

3 **CEC Rd 1 CEC-0024**

4 **PREAMBLE:**

5 **Study Zone Land Cover Extrapolation to Study Zone 5**

6 In Section 2.2.4.4 "Habitat Mapping" of the Terrestrial Environment Supporting Volume,
 7 it is stated that "a 1:15,000 scale terrestrial map was created for Study Zone 4, the
 8 largest Local Study Area used for all but one of the terrestrial environment VECs and
 9 supporting topics."

10 As indicated in Table 1-3 of the Terrestrial Environment Supporting Volume, Study Zone
 11 4 was used as the Local Study Area only for caribou (a VEC) and mercury in wildlife (a
 12 supporting topic). **This statement requires revision or clarification from KHLP.**

13 It is further stated in Section 2.2.4.4 of the Terrestrial Environment Supporting Volume
 14 that "for some key topics, the habitat composition of Study Zone 5 (Map 2-1) was
 15 estimated based on the existing proportions of each habitat type in Study Zone 4 since
 16 the Soil Landscapes of Canada map (Agriculture and Agri-Food Canada 1996) and coarse
 17 land cover mapping derived from classified satellite imagery **suggested that the land**
 18 **cover composition of these two areas were similar** (bold provided by SENES). Different
 19 extrapolation factors were used inland and shoreline wetland habitat. Inland habitat
 20 factors were based on Study Zone 5 to 4 total land area ratio whereas shoreline wetland
 21 factors were based (sic) Study Zone 5 to 4 total shoreline length ratio.

22 **QUESTION:**

23 To confirm that land cover composition of Study Zones 5 and 4 are similar, SENES
 24 suggests the use of the Land Cover Classification Enhanced for Bipole (LCCEB) mapping.
 25 The LCCEB cover classes were used to represent the communities and habitats within
 26 the proposed Bipole III Project study area. The proposed Bipole III Project study area
 27 overlaps much of the proposed Keeyask Project Study Zones 4 and 5. The LCCEB
 28 identifies five broad cover classes of native vegetation. Three of these occur within the
 29 two Study Zones: wetland, coniferous forest and mixed forest. The wetland class
 30 includes land with a high water table, that is inundated with water long enough to
 31 promote aquatic processes. Fens, bogs, swamps and marshes are included in the
 32 wetland cover class. Each forest class is separated into dense, open, and sparse forests
 33 or treed areas. Dense includes a crown closure of greater than 60%, open has 26 to 60%
 34 closure, whereas sparse has 10 to 25% closure. Quantification by area of the different

35 cover classes in the two Study Zones would confirm whether the land cover composition
36 of Study Zones 5 and 4 are similar.

37 **RESPONSE:**

38 Two clarifications are provided regarding the preamble of this Information Request:

- 39 • First, there is a typographical error in the EIS. As shown in Table 1-3, the sentence
40 quoted in the first paragraph should read: “a 1:15,000 scale terrestrial map was
41 created for Study Zone 4, the largest Local Study Area used for any of the terrestrial
42 environment VECs and supporting topics.”
- 43 • Second, the second paragraph correctly indicates that caribou (VEC) and mercury in
44 wildlife (supporting topic) used Study Zone 4 as their Local Study Area. Moose (VEC)
45 also used Study Zone 4 as the Local Study Area. Table 1-3 in the TE SV incorrectly
46 checked off Study Zone 3.

47 The similarity of the land cover composition of Study Zones 5 and 4 has been verified as
48 part of the EIS analysis using a classification of satellite data completed for the EIS, as
49 well as the Soil Landscapes of Canada dataset. The Land Cover Classification Enhanced
50 for Bipole (LCCEB) was predominantly derived from a classification of satellite data
51 produced for all of Canada (i.e., Landcover Classification for Canada; LCC) from many
52 Landsat tiles. The classification of satellite data completed for the Keeyask EIS is more
53 accurate than the LCCEB because: (i) the Keeyask EIS analysis focused more effort on
54 refining the land cover classification for the Landsat tile that overlaps Study Zone 5 than
55 would have been done for the LCC; (ii) more robust ground-truth data to refine a
56 satellite classification were available for the EIS analysis compared with the LCC; and,
57 (iii) individuals refining the EIS classification had considerable familiarity with the land
58 cover of the area given the degree of fieldwork needed to assess the more complex
59 pathways of Project effects compared with the Bipole III project. The methods and
60 results for the land cover similarity comparison are provided in the technical report
61 entitled Terrestrial Habitats and Ecosystems in the Lower Nelson River Region (see
62 Section 6.2.2.2.4) and is provided on the CD of technical reports provided with this filing.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
 2 **Cumulative Effects Assessment; p. N/A**

3 **CEC Rd 1 CEC-0025**

4 **PREAMBLE:**

5 Identification of VECs

6 It was stated in Section 3.4 of the Keyask Scoping Document for the EA of the Keyask
 7 Generation Project that: "Valued environmental components (VECs) will be selected to
 8 focus the assessment of the significance of adverse effects. Selection of VECs will be
 9 based on the following criteria:

- 10 • Overall importance/value to people;
 11 • Key for ecosystem function;
 12 • Umbrella indicators;
 13 • Amenable to scientific study in terms of the analysis of existing and post-
 14 construction conditions;
 15 • Potential for substantial Project effects; and
 16 • Regulatory requirements.

17 The EIS will explain the rationale for the selection of each VEC."

18 It was further stated in Section 3.4.1 "VECs for the Cumulative Effects Assessment" of
 19 the Scoping Document that:

20 "The cumulative effects assessment will utilize a subset of VECs studied
 21 throughout the environmental assessment. This subset will include any VEC, as
 22 set out in 3.4 (sic), for which it is determined that there may be a negative
 23 residual effect. The EIS will describe the approach and methods used to identify
 24 and assess the cumulative effects and provide a record of assumptions and
 25 analyses that support the conclusions, including the level of confidence in the
 26 data used in the analysis."

27 It is stated in Section 1.3.4 "Valued Environmental Components and Supporting Topics"
 28 of the Keyask Terrestrial Environment Supporting Volume that:

29 "the terrestrial assessment focused on the key ecosystem health and/or social
 30 issues of concern, or key topics. That is, the ecosystem components (i.e.,
 31 patterns, processes and functions) that could potentially experience substantial
 32 Project effects and are especially important to maintaining overall ecosystem

33 function and the benefits that these functions provide to present and future
 34 generations. The key topics collectively indicate how the Project is expected to
 35 affect terrestrial health. Key topics of particular high ecological and/or social
 36 interest became valued environmental components (VECs) while the remaining
 37 key topics became the supporting topics.”

38 The 13 VECs selected were intactness, ecosystem diversity, wetland function, priority
 39 plants, Canada goose, mallard, bald eagle, olive-sided flycatcher, common nighthawk,
 40 rusty blackbird, caribou, moose and beaver.

41 The nine supporting topics selected were fire regime, terrestrial habitat, soil quantity
 42 and quality, invasive plants, invertebrate community, priority amphibians, other priority
 43 birds, other priority mammals and mercury in wildlife.

44 SENES generally concurs with the selection of the 13 VECs. However, to be consistent
 45 with the proposed Bipole III EIS, three additional VECs should be included in the CEA:
 46 yellow rail and short-eared owl, designated as Special Concern federally, as well as
 47 American marten, a species that is sensitive to forest fragmentation and loss of habitat,
 48 which has been shown to occur in high densities along the proposed Bipole III
 49 transmission line between Keewatinoow CS and Thompson (see Map 13 in the
 50 Mammals Technical Report of the proposed Bipole III EIS).

51 SENES generally concurs with the selection of eight of the nine supporting topics, the
 52 exception being “terrestrial habitat” which should be elevated to VEC status. As
 53 indicated in Section 2.6.2.1, terrestrial habitat “serves as a proxy for many other
 54 pathways of effects on ecosystem health and on ecosystem components not directly
 55 addressed by assessment.” Moreover, as indicated in Section 2.6.4.2.3 “Residual
 56 Effects”, after taking into account mitigation and the effects of other past and existing
 57 projects and activities, it is predicted that the proposed Project “could increase the
 58 affected amounts of total terrestrial habitat and the common habitat types to almost
 59 6% of historical area, which is considered to be a moderate magnitude effect”, i.e.,
 60 between 1 and 10%.

61 As indicated in Section 6.5.3.1.5 of the Keeyask Generation Project EIS Response to EIS
 62 Guidelines document, “as outlined in Chapter 5, the cumulative effects assessment step
 63 that deals with future projects and activities focuses on the VECs that are adversely
 64 affected by the Project and vulnerable to the effects of future projects and activities. **As
 65 terrestrial habitat is not a VEC, it is not carried forward to the CEA with future projects
 66 in Chapter 7”** (boldness provided by SENES).

67 As indicated in Section 6 “Cumulative Effects of the Project” in the Keeyask Generation
 68 Project EIS Executive Summary, “the Partnership recognizes the valued environmental

69 component approach as required by the regulatory process does not capture the
 70 broader concept of the Cree worldview, which places equal importance on all
 71 components of the environment, as all parts are important and interrelated. Further, a
 72 cumulative effects perspective is inherent to the Cree worldview, which considers the
 73 effects of the Project in the context of everything that has happened in the past and
 74 everything that is anticipated to happen in the future.”

75 As the loss of terrestrial habitat due to past and current activities is “almost 6% of
 76 historical area” in current Study Zone 5, a CUE assessment should be undertaken to
 77 address the “Cree worldview”.

78 **QUESTION:**

79 Residual effects assessments (past and existing projects, including the Keeyask Project)
 80 and CEAs (future projects) should be undertaken for the following key topics based on
 81 the expanded Study Zone 5 Regional Study Area (see Map 3):

- 82 • Intactness based on linear feature density (km/km²) and core area abundance
 83 (number and ha);
- 84 • Terrestrial Habitat based on loss or alteration of terrestrial habitat (ha);
- 85 • Ecosystem Diversity based on loss or alteration of the 43 priority habitat types
 86 (number and ha);
- 87 • Wetland Function based on loss, creation or alteration of shoreline wetlands, off-
 88 system marsh and other wetland types (ha);
- 89 • Mallard based on loss of habitat and reduction of staging habitat quality (ha);
- 90 • Bald Eagle based on habitat alteration and loss of nests and perching trees (ha and
 91 number);
- 92 • Olive-sided Flycatcher based on habitat loss (ha);
- 93 • Rusty Blackbird based on habitat loss (ha);
- 94 • Common Nighthawk based on habitat loss/gain (ha);
- 95 • Yellow Rail based on habitat loss (ha);
- 96 • Short-eared Owl based on habitat loss (ha)
- 97 • Beaver based on habitat loss (ha), colony removal (number) and improved trapping
 98 access;
- 99 • Caribou based on loss of significant caribou habitat, and relative to cumulative
 100 effects of Intactness, Terrestrial Habitat and Ecosystem Diversity;
- 101 • Moose due to habitat loss and alteration (ha) and increased hunting access; and
- 102 • American Marten based on habitat loss (ha) and Intactness.

103 Distribution mapping of modeled habitat is available for the Bipole III Project Study Area
104 which encompasses the expanded Keeyask Regional Study Area for Beaver (Map 08 of
105 the Mammals Technical Report), Moose (Map 10) and American Marten 09).

106 Distribution mapping of modeled habitat is available for the Bipole III Local Study Area
107 for Mallard (Map 1200-01), Bald Eagle (1500-01), Olive-sided Flycatcher (Map 2700-01),
108 Rusty Blackbird (Map 3200-01), Common Nighthawk (Map 2400-01), Yellow Rail (Map
109 2000-01) and Short-eared Owl (Map 2300-01). Distribution mapping of modeled habitat
110 for the Bipole III Project Study Area may also be available for these species but not
111 presented in the proposed Bipole III EIS.

112 The residual and cumulative effects should be quantified, i.e., % of habitat lost, linear
113 feature density changes in km/km², number of core areas lost, etc.

114 **RESPONSE:**

115 Please see the response to see CEC Rd 1 CEC-0021 (for the additional detail requested
116 above).

117 The response to CEC Rd 1 CEC-0022 provides an overview of why the current Study Zone
118 5 Regional Study Area is appropriate for the Keeyask Generation Projects terrestrial
119 effects assessment and will not be expanded.

120 The response to CEC Rd 1 CEC-0036 indicates the rationale for not selecting Yellow rail,
121 Short-eared owl and American marten as VECs for the Keeyask Generation Project
122 environmental assessment.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Executive Summary; p. N/A**

3 **CEC Rd 1 CEC-0026**

4 **QUESTION:**

5 A statement is made in the Executive Summary that fish passage will be provided to
6 maintain connections among fish populations. This does not seem to be accurate. How
7 will this be accomplished, specifically? Please comment.

8 **RESPONSE:**

9 The EIS describes an approach to fish passage that has evolved since the EIS filing based
10 on conversations with Fisheries and Oceans Canada (DFO) and Manitoba Conservation
11 and Water Stewardship's Fisheries Branch. This response documents what is noted in
12 the EIS, as filed, and then describes the current situation based on the discussions that
13 have taken place with regulators since the EIS filing date.

14 EIS FILING INFORMATION

15 The approach to fish passage is described in the Project Description Supporting Volume
16 (PD SV) Section 6.10 Fish Passage (pages 6-20 to 6-21):

17 *“Based on several meetings and discussions with the federal Department of Fisheries and*
18 *Oceans (DFO) the Keeyask Hydropower Limited Partnership (KHLP) has made a*
19 *commitment to implement fish passage for the Keeyask Generation Project (the Project).*
20 *The intent of fish passage would be to maintain existing connections between upstream*
21 *and downstream populations in order to mitigate the uncertainty with respect to the*
22 *function and importance of these movements. It was noted during discussions with DFO*
23 *that providing fish passage may be counter-productive because: a) fish moving upstream*
24 *will encounter a reservoir rather than a riverine environment and may decide to move*
25 *back downstream through the turbines resulting in some fish mortality; and b) that*
26 *moving lake sturgeon upstream may further deplete the small stock of lake sturgeon in*
27 *Stephens Lake. Therefore, a precautionary, phased approach is being implemented, with*
28 *the initial phase consisting of a manual trap/catch and transport program. Appendix A1*
29 *in the Aquatic Environment Supporting Volume provides additional information on this*
30 *topic.*

31 *The following will be conducted in the initial phase:*

- 32 • *Undertaking a trap/catch and transport program for upstream fish passage for key*
 33 *fish species, including lake sturgeon coincident with the in-service date of the*
 34 *Project;*
- 35 • *Monitoring the results of the trap/catch and transport program, fish movements,*
 36 *and fish populations to determine the need for adjustments to the program to*
 37 *provide the greatest benefit to fish populations.*
- 38 • *Designing and constructing the GS in a manner that would allow it to be retrofitted*
 39 *to accommodate other upstream and/or downstream fish passage options, if*
 40 *required, in the future.*

41 *To assist in the long-term assessment of fish passage options, an analysis of alternatives*
 42 *will be undertaken. The Partnership will work closely with DFO and Manitoba*
 43 *Conservation and Water Stewardship (MCWS) Fisheries Branch during this process.*

44 *There are three main components to fish passage: upstream collection, upstream*
 45 *passage and downstream passage. Upstream collection defines the ability to collect fish*
 46 *from the Nelson River downstream of the generating station. Upstream passage defines*
 47 *the means to move fish from a fish collection facility to a release site upstream of the*
 48 *dam. The selected option for downstream passage for the Keeyask GS is via the turbines*
 49 *and spillway. The implementation of other downstream passage alternatives will be*
 50 *considered if monitoring indicates that the selected passage method is impeding*
 51 *downstream movements or is associated with unacceptable rates of injury and*
 52 *mortality.*

53 *Alternatives that will be evaluated for long term upstream fish passage include*
 54 *trap/catch and transport, fish lock/lift, nature-like bypass channel, and fish ladder.*
 55 *These are being designed and evaluated on the basis of criteria such as fish biology,*
 56 *engineering, operation and Maintenance requirements, Aboriginal Traditional*
 57 *Knowledge, stakeholder and regulatory input, cost, and benefit.*

58 *Biological information pertaining to Nelson River fish species will be an important input*
 59 *to the evaluation of fish passage alternatives at Keeyask. Biological information*
 60 *pertinent to the type, location, timing, and sizing of fishway components includes target*
 61 *species and life stages, timing of fish movements, fish size and abundance, movement*
 62 *behaviour and patterns, and fishway hydraulic design criteria.*

63 *As discussed above, lake sturgeon will be the primary target species when designing and*
 64 *evaluating the long term fish passage alternatives. The physical and hydraulic*
 65 *characteristics of the Project site and lake sturgeon swimming capabilities and behaviour*
 66 *will be evaluated to develop alternatives that provide the highest likelihood of passing*
 67 *lake sturgeon. Other species such as walleye, northern pike, and lake whitefish will also*
 68 *be considered through discussions with DFO and MCWS Fisheries Branch. Modifications*

69 *to fish passage alternatives for species other than lake sturgeon will be considered*
 70 *insofar that these modifications do not significantly impact expected passage*
 71 *performance for lake sturgeon.*

72 *A trap/catch and transport system will be implemented at the in-service of the Project.*
 73 *The details of the design and operation of this facility will be determined in discussions*
 74 *with DFO and MCWS over the next number of years.*

75 *A preliminary evaluation of alternatives indicates that a trap and transport program may*
 76 *be the best long term alternative for upstream fish passage at the Project site in*
 77 *comparison to other alternatives such as a fish/lock/life, nature-like-bypass channel or*
 78 *fish ladder. However, numerous long-term fish passage alternatives will be evaluated*
 79 *using a multi-criteria decision making process that applies various social, economic,*
 80 *environmental and engineering criteria to break down alternatives into discrete*
 81 *elements for comparison, evaluation and organization. Review of the evaluation of*
 82 *alternatives will take place with the fish passage expert consultants and input from the*
 83 *KCNs, stakeholders and regulatory agencies. It is anticipated that a decision on long-*
 84 *term fish passage will be made five years after the Project in-service date in consultation*
 85 *with DFO and MCWS."*

86 CURRENT STATUS – POST-EIS FILING INFORMATION

87 Subsequent to the submission of the Response to EIS Guidelines there have been a
 88 series of meetings between the KHLP, DFO and Manitoba Conservation and Water
 89 Stewardship (MCWS) Fisheries Branch. MCWS expressed concerns about uncertainties
 90 in committing to fish passage or any specific mechanism to transport fish without a
 91 better understanding of post-Project movement/behavior. In October 2012, MCWS
 92 developed Fisheries Management Objectives for the Keeyask region which state, in
 93 relation to fish passage:

94 *"Determination for the need for fish passage (types, timing, mechanisms and species) to*
 95 *support future stocks associated with the new ecosystem should be based on*
 96 *scientifically experimental and defensible assessment in conjunction with provincial*
 97 *management goals and in consultation with provincial fisheries managers."*

98 As a result, the approach to the implementation of fish passage has been modified, such
 99 that fish passage will not be installed at the in-service date of the generating station, but
 100 rather site-specific investigations will be used to gain a better understanding of the best
 101 approach to fish passage. The Partnership has identified several options for upstream
 102 fish passage and will take measures to allow for these to be installed at a later date (e.g.,
 103 by setting aside land). A report entitled *"Keeyask Fish Passage Identification of Design*

104 *Concepts Report, November 29th, 2012*" which assessed the feasibility of various fish
105 passage options was provided in TAC Public Round 2, and is attached to this submission.

106 The requirement for fish passage facilities will be determined by DFO, in consultation
107 with MCWS, based on the results of monitoring, established fisheries management
108 objectives and support for ongoing fisheries productivity. In the event that DFO, in
109 consultation with the MCWS, determines that all fish management objectives can be
110 met and ongoing productivity can be supported without the installation of fish passage
111 facilities, DFO will not require the installation of these facilities as part of the proposed
112 development.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.0 Lake Sturgeon; p. N/A**

3 **CEC Rd 1 CEC-0027**

4 **PREAMBLE:**

5 Cumulative effects with respect to sturgeon do not seem to have been addressed in the
6 EA report which is a significant deficiency. The Nelson River has already been
7 substantially altered by various flow manipulations and developments such as the:
8 Churchill River Diversion; Lake Winnipeg Regulation; construction and operation of the
9 existing hydro facilities (e.g., Limestone, Long Spruce, Kettle, Kelsey) and associated
10 reservoirs on the Nelson; commercial fishing; and possible future facilities (e.g.,
11 Conawapa).

12 **QUESTION:**

13 It is worthwhile for KHLP to consider advancing Lake Sturgeon into the cumulative
14 effects assessment. Based on a preliminary assessment, we do question whether there
15 will be no adverse residual effects on the Lake Sturgeon population given existing and
16 proposed developments on the Nelson River.

17 **RESPONSE:**

18 Cumulative effects with respect to Lake Sturgeon have been addressed in the Response
19 to EIS Guidelines.

20 The past effects of commercial fishing, various flow changes and existing hydro facilities
21 have been addressed, and the potential added cumulative effects of possible future
22 facilities have been considered. The basis for the conclusions of this cumulative effects
23 assessment is set out in the Response to EIS Guidelines. As summarized below, the
24 overall conclusion is as follows:

25 *"Overall, no adverse residual effects on lake sturgeon populations due to Project*
26 *operation are expected due to mitigation measures to provide habitat for all life*
27 *history stages and the implementation of a stocking program in the Keeyask*
28 *reservoir and Stephens Lake. In addition, the Partnership will implement a*
29 *stocking program targeting areas where sufficient habitat exists to support*
30 *larger populations than currently exist in the reach of the Nelson River between*
31 *the Kelsey and Kettle GSs. This program is expected to result in an overall*
32 *increase in the number of sturgeon in the region."* [copied from Section 7.5.1.2
33 of EA report at page 7-21 (copied also in Appendix 1 to this response); see also
34 pages 6-286 and 6-287 of the EA report for similar summary, including the
35 conclusion at page 6-287 that "there is also a high degree of certainty that

36 stocking and spawning habitat creation will in the long term offset any
37 temporary adverse effects."

38 A discussion of the potential cumulative effects of the Keeyask Project on Lake Sturgeon
39 in combination with the effects of other past, current and future projects is provided in
40 the Response to EIS Guidelines Section 7.5.1 (pages 7-6 to 7-23). Appendix 1 to this
41 response provides a copy of the portions of Section 7.5.1 relevant to Lake Sturgeon.
42 With respect to other future developments and activities (e.g., Conawapa), the EIS
43 concludes that there is no potential to result in additional cumulative adverse effects on
44 Lake Sturgeon (beyond those addressed in Chapter 6) that require further mitigation for
45 the Keeyask Project or that would alter the conclusions with respect to the regulatory
46 significance of adverse effects of the Project to Lake Sturgeon presented in Section
47 6.4.6.2.

48 **APPENDIX 1 - COPY OF RELEVANT PORTIONS OF SECTION 7.5.1 CUMULATIVE EFFECTS**
 49 **SUMMARY ANALYSIS RE LAKE STURGEON**

50 **Aquatic Environment**

51 The aquatic environment addresses environmental effects of the Project on the
 52 following VECs: water quality; walleye, northern pike, lake whitefish, and lake sturgeon.

53 ***Effects of Past and Current Projects and Activities***

54 The aquatic environment in the lower Nelson River, including the area to be affected by
 55 the Project, has been substantially altered by past hydroelectric developments and
 56 continues to experience those effects today.

57 As discussed in Section 6.2 and in greater detail in the AE SV and the KCNs'
 58 Environmental Evaluation Reports, changes to the aquatic environment began with the
 59 first hydroelectric station, completed in 1961 at the Kelsey Rapids on the Nelson River
 60 upstream of Split Lake. The CRD and LWR, completed in the mid 1970s, altered the
 61 aquatic environment of the entire Nelson River. The reach of the river between Gull
 62 Rapids and Kettle Rapids was converted to a reservoir environment by construction of
 63 the Kettle GS, which was completed in 1974.

64 The most recent additions and alterations to existing hydroelectric developments are
 65 the construction of the Wuskwatim GS on the Burntwood River and re-runnering at the
 66 Kelsey GS on the Nelson River, both of which are directly upstream of Split Lake. The
 67 Cree world view that all parts of the environment are connected indicates that these
 68 would overlap with the effects of the Keeyask Project. The technical assessment of the
 69 spatial extent of effects of the Keeyask Project (Section 6.4) indicates that there is no
 70 overlap with these recent developments.

71 The Keeyask Infrastructure Project, which is being constructed adjacent to the Keeyask
 72 Generation Project, has minimal potential to affect surface waters, as the only
 73 watercourse crossings are a small unnamed stream and Looking Back Creek. Effects to
 74 Looking Back Creek are being avoided through the use of a clear span bridge. Other
 75 measures to manage sediment inputs from surface runoff and prevent the input of
 76 contaminants to surface waters are being employed during construction to avoid effects
 77 to water quality and aquatic biota (Keeyask Hydropower Limited Partnership 2009).

78 The following effects of past and current projects and activities, as they relate to each
 79 aquatic VEC affected by the Keeyask Project are summarized in Section 6.2.3.3 and
 80 discussed in detail in the AE SV (Sections 2.4 (water quality), 5.3 (walleye, northern pike,
 81 and lake whitefish) and 6.3 (lake sturgeon). The KCNs' Environmental Evaluation Reports
 82 provide information on the effects of past and current developments on the
 83 environment as a whole, including these VECs.

84 **Water Quality**85 *Text not included*86 **Fish**87 *Text not included*88 ***Walleye, northern pike and lake whitefish***89 *Text not included*90 ***Lake sturgeon***

91 As summarized in Section 6.3.2.2.5, commercial fishing of lake sturgeon on the Nelson
 92 River severely depleted populations both upstream and downstream of the Kelsey GS.
 93 Precise estimates of commercial harvest for the area directly affected by the Keeyask GS
 94 are not available as catches were recorded by river reach, but interviews with resource
 95 users indicate a substantial commercial harvest in Gull Lake in the late 1950s and that
 96 harvest continued in Stephens Lake following construction of the Kettle GS into the
 97 1980s.

98 In addition to harvest, lake sturgeon in the Nelson River have been adversely affected by
 99 hydroelectric development. Both CRD and LWR were reported to have caused a decline
 100 in lake sturgeon numbers (Split Lake Cree – Manitoba Hydro Joint Study Group 1996c).
 101 FLCN members stated that critical habitats were lost with each dam and fish could no
 102 longer move as freely within their natural habitat, as they were able to prior to dam
 103 construction (FLCN 2009 Draft). Technical studies have found that numbers of sturgeon
 104 have declined at all locations on the Nelson River where the construction of generating
 105 stations has altered habitat for specific life history requirements such as spawning.
 106 However, healthy sturgeon populations have been documented in areas affected by
 107 hydroelectric development where habitat to support all life history stages continued to
 108 be available (see examples in Table 6-16).

109 Due to historic declines and concerns about a continuing decline in population numbers,
 110 COSEWIC designated lake sturgeon in the Nelson River as endangered, and this species
 111 is currently being considered for listing under the *Species at Risk Act* (SARA).

112 ***Summary of Cumulative Effects of the Project with Past and Current Projects***
 113 ***and Activities***

114 Predicted effects of the Keeyask GS project on the aquatic VECs in the context of past
 115 and current projects and activities are summarized in Section 6.4.3.1 (water quality),
 116 Section 6.4.6 (walleye, northern pike, lake whitefish and lake sturgeon). A detailed
 117 technical analysis is provided in the AE SV. The Cree worldview places equal importance
 118 on all components of the environment, as all parts are important and inter-related. A
 119 discussion of effects to the aquatic environment identified as particular concerns to the

120 KCNs is provided in Section 6.4.2 and greater detail is provided in the KCNs'
121 Environmental Evaluation Reports.

122 **Water Quality**

123 *Text not included*

124 **Fish**

125 Overall, it is expected that there will be negligible effects to fish from specific Project
126 construction activities, due to the use of management measures such as restrictions on
127 the timing of instream construction to avoid sensitive periods, control of adverse effects
128 to water quality, conduct of fish salvage during dewatering, and adherence to guidelines
129 for blasting and water withdrawal. There is the potential for increased harvest due to
130 the presence of a workforce, but the implementation of the Access Management Plan
131 during the construction phase is expected to limit the increase in harvest.

132 Effects related to habitat loss and alteration begin during construction and continue
133 during operation and are discussed below.

134 *Walleye, northern pike and lake whitefish*

135 *Text not included*

136 *Lake sturgeon*

137 Given the current vulnerable state of lake sturgeon and adverse effects of past
138 hydroelectric developments, considerable effort was expended in developing plans to
139 mitigate effects to lake sturgeon habitat and support the existing population in the area
140 that will be directly affected by the Project. In addition, measures will be implemented
141 to increase the regional population.

142 During Project construction, the loss of Gull Rapids as spawning habitat will affect the
143 lake sturgeon population in Stephens Lake. To avoid missing year classes, sturgeon will
144 be stocked during this time. Beginning during construction and during initial
145 impoundment to full supply level, sturgeon in Gull Lake may respond to the change in
146 depth and velocity by moving either upstream of Gull Lake or downstream past the
147 generating station. Although the loss of adults from the reservoir cannot be fully
148 mitigated, stocking will be used to maintain the population in the reservoir, if
149 emigration occurs. In addition, the trap/catch and transport program in Stephens Lake
150 during the operation phase may identify some downstream migrants from Gull Lake that
151 will be transported back upstream.

152 During Project operation, sturgeon in the Keeyask reservoir will be affected by habitat
153 alterations that may reduce the amount of suitable spawning and young-of-the-year
154 habitat. These effects will be addressed through the construction of suitable
155 replacement habitat, if monitoring indicates that available habitat is not suitable.

156 In Stephens Lake, the spawning habitat lost in Gull Rapids will be replaced by
157 constructed habitat below the tailrace of the generating station.

158 Overall, no adverse residual effects on lake sturgeon populations due to Project
159 operation are expected due to mitigation measures to provide habitat for all life history
160 stages and the implementation of a stocking program in the Keeyask reservoir and
161 Stephens Lake. In addition, the Partnership will implement a stocking program targeting
162 areas where sufficient habitat exists to support larger populations than currently exist in
163 the reach of the Nelson River between the Kelsey and Kettle GSs. This program is
164 expected to result in an overall increase in the number of sturgeon in the region.

165 Apart from the programs implemented for the Project, there are also several initiatives
166 that would affect the abundance of sturgeon in this area. Manitoba Hydro, TCN, WLFN,
167 YFFN, FLCN, SFN, and the KHLF have negotiated a Lower Nelson River Sturgeon
168 Stewardship Agreement, which has the goal to conserve and enhance the present
169 population of lake sturgeon in the lower Nelson River from Kelsey GS to Hudson Bay.
170 Aspects of this initiative should begin to be implemented in 2012. While the potential
171 listing of sturgeon under SARA would be expected to increase lake sturgeon numbers,
172 the implementation of the Lake Sturgeon Stewardship Agreement would provide a more
173 effective initiative for sturgeon recovery. The agreement focuses on enhancing the
174 overall population while considering existing and future uses for the river. In contrast,
175 reducing the mortality of individuals within an overall population has become the focus
176 of species listed under SARA in other jurisdictions.

177 ***Cumulative Effects of the Project including Future Projects and Activities***

178 The future projects and activities considered in the Project cumulative effects
179 assessment are listed in Table 7-2. With the exception of the potential Conawapa GS,
180 these are land-based developments with limited potential to affect the aquatic
181 environment, in particular if appropriate management measures are employed during
182 construction and operation. Potential cumulative effects of the Project including future
183 projects and activities are discussed below.

184 Overall, as described below, review of other projects that could overlap with the effects
185 of the Keeyask Project does not indicate any with the potential to result in cumulative
186 adverse effects that require further mitigation for the Keeyask Project or would alter the
187 conclusion with respect to the regulatory significance of adverse effects of the Project to
188 Aquatic VECs presented in Section 6.4.

189 **Water Quality**

190 Future developments that will occur concurrent with the construction of the Keeyask GS
191 are listed in Table 7-2. Primarily land-based developments, including the Keewatinoow
192 Converter Station and associated facilities (e.g., construction camp), Bipole III, Keeyask

193 Construction Power Station and Transmission Lines, Keeyask Switching Station and GOT
 194 Lines, and Gillam Redevelopment are not expected to affect water quality at Gull Rapids
 195 and in Stephens Lake because appropriate management measures will be applied to
 196 avoid releases of contaminants or inputs of other substances into streams that would
 197 eventually reach the Keeyask Project area.

198 In two years of Project instream construction, elevated TSS levels are expected to
 199 extend downstream past the Kettle GS and to the section of the river where the
 200 Conawapa GS is being constructed. During open water periods lasting 1-3 months
 201 (depending on year), the predicted increase in suspended sediment at the Kettle GS is
 202 less than 5 mg/L (typically less than 3mg/L), but may be somewhat higher for a few days
 203 when the river is closed off. Increases of similar or slightly less magnitude are expected
 204 to extend to the Conawapa site. It is expected that the cumulative effect of TSS inputs of
 205 the concurrent construction of the Keeyask and Conawapa projects will have no
 206 measureable adverse effects to aquatic biota at Conawapa and further downstream
 207 because inputs from both projects will be managed to maintain the overall increase
 208 within levels that would not have harmful effects. Construction personnel responsible
 209 for real-time monitoring of sediment increases from construction set out in the
 210 Sediment Management Plans for both Projects will communicate to achieve this
 211 objective.

212 As discussed in Section 6.4.3.1, the technical analysis of Project operation effects
 213 indicates short to medium term changes in the near shore environment of the reservoir
 214 and a long-term reduction in TSS levels in the mainstem of the reservoir and the south
 215 west section of Stephens Lake. None of the developments listed in Table 7-2 are
 216 expected to affect water quality in these areas as they are either downstream from the
 217 site (*i.e.*, the potential Conawapa GS), or management measures are expected to
 218 prevent effects to water quality (*i.e.*, transmission developments, Gillam
 219 Redevelopment).

220 **Fish**

221 As discussed for water quality, there is limited potential for the overlap of effects of the
 222 Project with future developments listed in Table 7-2.

223 Based on the technical analysis no adverse effects to fish populations are expected from
 224 the Project outside of the Keeyask reservoir and Stephens Lake. For lake whitefish,
 225 walleye and lake sturgeon, potential negative effects are restricted to the Project
 226 construction period, and are not expected to have a long-term effect on the population.
 227 Adverse effects to northern pike will occur during the first period of Project operation,
 228 but be of small magnitude and be restricted to the reservoir. Therefore, the technical
 229 analysis indicates that there are no adverse effects of the Project on fish populations
 230 that have the potential to overlap with those of other future developments.

231 Members of the KCNs at workshops to discuss Project effects and mitigation have stated
232 that they expect a larger spatial and temporal extent of effects than indicated in the
233 technical analysis summarized above, and also identified considerable uncertainty with
234 the effectiveness of planned mitigation measures. However, even when considering a
235 broader region (e.g., Kelsey GS to the Nelson River estuary), the only other major
236 instream project that would overlap with the effects of the Keeyask Project is the
237 construction and operation of the potential Conawapa GS. It is expected that
238 development of the potential Conawapa GS would be conducted to avoid significant
239 adverse effects to fish populations. FLCN has stated that the number of fish harvested in
240 the Conawapa area may increase. The mitigation plan for the potential Conawapa GS
241 project will need to ensure that harvest is appropriately monitored and controlled.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1.0 Introduction; 1A.3.1.7.2 Appendix A; p. 1A-13**

3 **CEC Rd 1 CEC-0028**

4 **QUESTION:**

5 With Lake Sturgeon harvest prohibited, only a catch and release fishery can exist. Does
6 one exist, because if it does not then under the new Fisheries Act, Lake Sturgeon may
7 not contribute to a fishery. If this is the case, then their habitat would not be protected
8 under the Fisheries Act? Can KHLP address this?

9 **RESPONSE:**

10 Lake Sturgeon is harvested as part of the domestic fishery. Therefore, the new *Fisheries*
11 *Act* and applicable measures to protect habitat, are applicable.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.0 Lake Sturgeon; p. N/A**

3 **CEC Rd 1 CEC-0029**

4 **PREAMBLE:**

5 A number of assumptions have been made regarding shifts in use from areas currently
6 used for spawning, nursery and foraging habitat to other existing habitat or newly
7 created habitat, particularly for spawning, young-of-the-year (YOY) and sub-adults. How
8 confident is KHL P that sufficient habitat will be made available for all life stages of Lake
9 Sturgeon? The Aquatic Environment Volume suggests that stocking appears to be the
10 cornerstone of the prediction and that Lake Sturgeon numbers will increase regionally.
11 However, stocking, in the absence of sufficient habitat of suitable quality will not create
12 a viable self-sustaining population. This needs to be better addressed in the report. It
13 would be important for KHL P to explain how there can be overall moderate to high
14 certainty assessment for increases in population of Lake Sturgeon when there is a low to
15 moderate statement specifically for YOY habitat? This is based on the following
16 statement in Section 6.4.4.4 of the Aquatic Support Volume (p 6-48). "There is low to
17 moderate certainty regarding the success of mitigation measures to create YOY habitat
18 in the reservoir and moderate certainty regarding the success of mitigation measures to
19 create spawning habitat in the reservoir and Stephens Lake. However, there is moderate
20 to high certainty regarding effects to abundance following implementation of a stocking
21 program, resulting in overall moderate to high certainty for the predicted increases in
22 regional Lake Sturgeon numbers." There seems to be potential for significant loss of
23 Lake Sturgeon habitat. From the MacDonnel thesis, the Kelsey rapids were an important
24 spawning area historically (p. 122 and other around p. 56). Spawning was also reported
25 to occur in the Grass River which appears to enter the Nelson from the west just
26 downstream from Kelsey (and at Witchai Falls p. 122). Also spawning was evident in the
27 Burntwood River and Odei River (Page 51, p. 119). Sturgeon were also abundant in Gull
28 Lake (p. 119).

29 **QUESTION:**

30 If future monitoring shows that habitat to support all life stages of Lake Sturgeon is no
31 longer available, replacement habitat will be developed. This assumes that the type of
32 habitat that is missing can be created. How would KHL P address this?

33 **RESPONSE:**

34 The Aquatic Environment Supporting Volume (AE SV) identified two types of Lake
35 Sturgeon habitat that may need to be created in the post-project environment:

- 36 1. Spawning; and
 37 2. Young-of-the-year/rearing.

38 Predicted post-Project availability and planned habitat creation are discussed for each
 39 habitat type below.

40 *1. Spawning habitat*

41 Predicted effects to spawning habitat and planned mitigation for the Keeyask reservoir
 42 are discussed in the AE SV Section 6.4.2.2.2. In the existing environment, Lake Sturgeon
 43 spawn in the reach of the Nelson River between Clark and Gull lakes at Long Rapids and
 44 Birthday Rapids. Impoundment of the reservoir will not alter Long Rapids but water
 45 depth will increase and whitewater will no longer be present at Birthday Rapids, though
 46 velocities and substrate will remain suitable for spawning. Sturgeon are expected to
 47 continue to spawn at Long Rapids but whether they will continue to use Birthday Rapids
 48 is uncertain. An option is being considered to create white water at Birthday Rapids to
 49 attract spawning fish if monitoring indicates that sturgeon no longer spawn in the
 50 vicinity of Birthday Rapids. The option entails adding large boulders/structures at
 51 locations slightly upstream of the current spawning site at Birthday Rapids. Placement of
 52 large boulders in this area would be difficult during the construction phase due to lack
 53 of access. However, access would be improved during the operation period. The
 54 structures would need to be designed so that they could not be removed by ice. The
 55 design of these measures cannot be developed until after an assessment of site
 56 conditions occurs during the operation phase. The following information is provided in
 57 AE SV Appendix 1A Section 1A.3.1.6.1, p. 1A-11:

58 "One option currently being considered is the addition of large
 59 boulders/structures at locations slightly upstream of the current spawning site
 60 at Birthday Rapids to create white water to attract spawning fish. Placement of
 61 large boulders in this area would be difficult during the construction phase due
 62 to lack of access. However, access would be improved during the operation
 63 period. The design would be such that the structures could not be removed by
 64 ice."

65 Such measures may not be required as sturgeon may continue to use flooded rapids for
 66 spawning. For example, Lake Sturgeon continued to spawn in flooded rapids on the
 67 upper Nelson River upstream of the Kelsey Generating Station (AE SV p. 6-35).

68 Predicted effects to spawning habitat and planned mitigation as a result of constructing
 69 the generating station on Gull Rapids are discussed in the AE SV Section 6.4.2.3.1. In the
 70 existing environment, Lake Sturgeon resident in the river immediately downstream of
 71 Gull Rapids and in Stephens Lake spawn in Gull Rapids. Construction of the generating

72 station will eliminate spawning habitat except in years of prolonged spillway operation
73 in spring, when some spawning habitat is expected to be available at the base of the
74 south channel of Gull Rapids. Sturgeon spawning habitat will be constructed
75 downstream of the generating station, along the north shore of the tailrace and
76 immediately downstream. Details of habitat construction are provided in AE SV
77 Appendix 1A Section 1A.3.2.3.1 (p. 1A-23 to 1A-25) and are reproduced below.

78 **1A.3.2.3.1 Creation of Artificial Spawning Habitat Downstream of the**
 79 **Powerhouse**

80 *The creation of artificial spawning habitat downstream of the powerhouse would ensure*
 81 *that lake sturgeon spawning habitat is available following development of the Project.*
 82 *Currently, the creation of spawning habitat in proximity to where it exists today appears*
 83 *to have the greatest probability of success. This spawning habitat would be designed*
 84 *specifically to attract lake sturgeon, but it could also be used by other species that spawn*
 85 *under similar conditions.*

86 *In addition, the spawning structures would provide habitat suitable for colonization by*
 87 *benthic invertebrates that inhabit high velocity rocky habitats, and will thereby partially*
 88 *compensate for the loss of foraging habitat in Gull Rapids.*

89 *Design Criteria*

90 *Criteria for the construction of lake sturgeon spawning habitat (Table 1A-9) are based on*
 91 *successful spawning structures that have been constructed for lake sturgeon in Québec*
 92 *and Russia (Verdon and Gendron 1991; DuMont et al. 2009 in LeHaye et al. 1992; Kerr et*
 93 *al. 2011). HSI modelling indicates that existing suitable spawning habitat within and*
 94 *below Gull Rapids tends to be found along the edges of the main channel (Section*
 95 *6.3.2.3). The spawning structure is proposed to be built on the north shore of the river*
 96 *below the powerhouse tailrace in order to ensure adequate and reliable flow and to be*
 97 *situated where lake sturgeon moving upstream in low velocity habitat along the river's*
 98 *edge would locate it.*

99 *Final Design Plans/Considerations*

100 *Design and evaluation of the spawning structure required detailed hydraulic modelling,*
 101 *and was conducted using a stepwise process.*

102 *The initial concept that was evaluated involved the creation of 3 ha of sturgeon*
 103 *spawning habitat along the north shore, north and east of the powerhouse tailrace for*
 104 *base loaded operation of four to seven units. Spawning habitat location, details and*
 105 *configuration of the boulder cluster microhabitats are shown in Figure 1A-1 and Map 1A-*
 106 *7. Key features to this spawning habitat are a minimum substrate thickness of 0.6 m*
 107 *(with 0.1 m to 0.6 m diameter rock) and water depths of 1 m to 10 m. Under this*
 108 *initiative, micro spawning sites will be created by placing three (1 m to 2 m) boulders in*
 109 *V-shape (upstream chevron) clusters as shown in Figure 1A-1.*

110 *Depending on Stephens Lake elevation and the Keeyask GS unit discharges, results of*
 111 *hydraulic modelling indicate that the area of spawning habitat, as defined by the*
 112 *criteria, ranged from 1.4 to 3.0 ha for discharges of 2,200 m³/s (four units) to 4,000 m³/s*
 113 *for (seven units). These areas overlap with each other (i.e., the 1.4 ha area is contained*

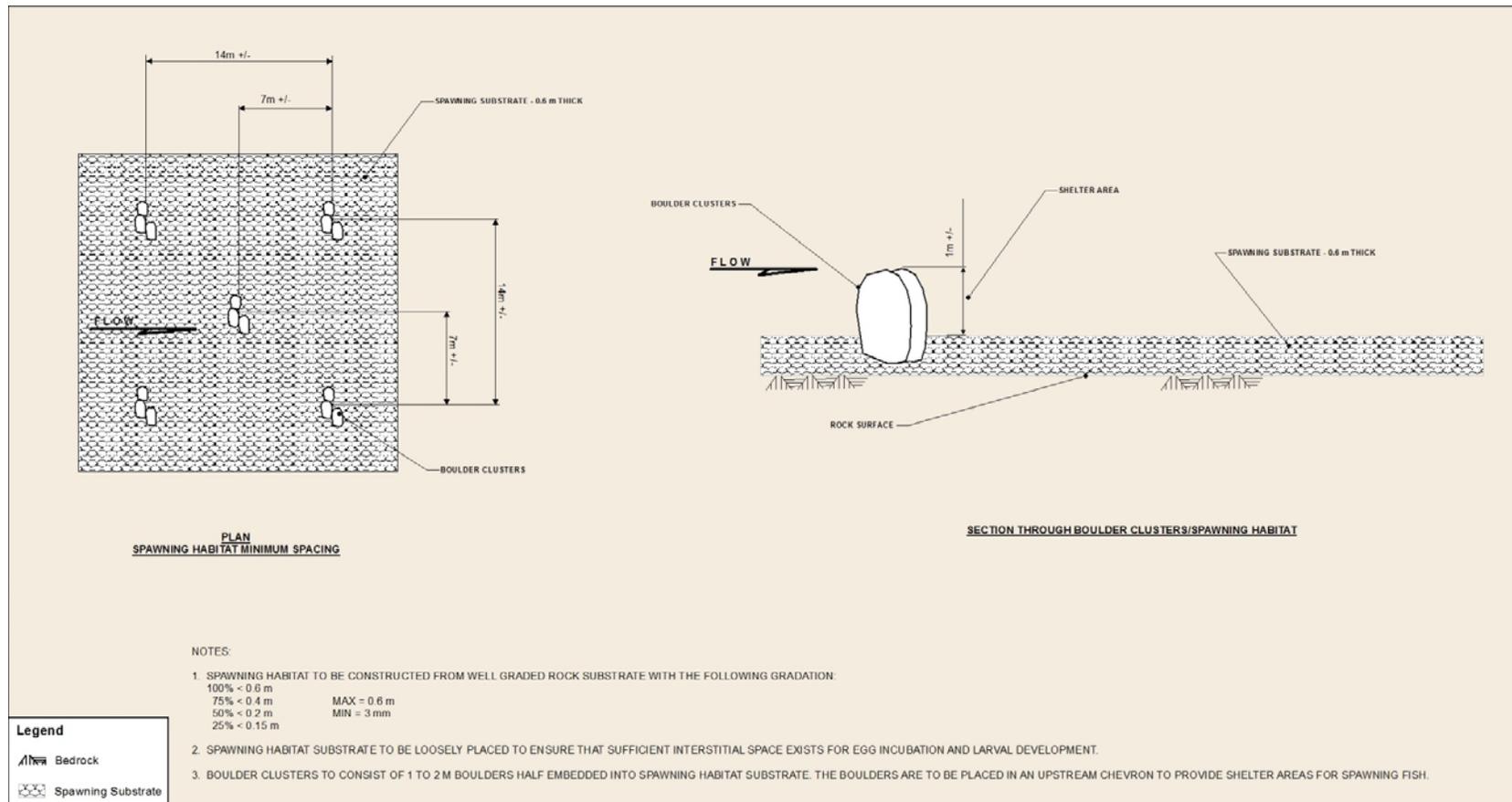
114 *within the 3.0 ha area), suggesting that under operational conditions of four to seven*
115 *units there will be a constant 1.4 ha that meet the prescribed suitability criteria. The*
116 *amount and location of spawning habitat area that meets the aquatic habitat criteria*
117 *are also dependent on the elevation of Stephens Lake. Sturgeon eggs that are distributed*
118 *over areas that are inconsistently exposed to optimal velocities may experience lower*
119 *incubation success owing to reduced water circulation in the interstices of the spawning*
120 *substrate, and hence reduced oxygenation. The changes in water depth that accompany*
121 *these sub-optimal velocities would be unlikely to affect incubation success.*

122 *The second concept expanded the evaluation to consider peaking operation of two units*
123 *to seven units, and a phased approach to the placement of spawning habitat (Map 1A-*
124 *8A and Map 1A-1). The design identified during the first concept was modified to include*
125 *refinements to the north wall of the powerhouse tailrace channel to incorporate a slope*
126 *in the channel and a bench along the north end of the tailrace channel near the*
127 *powerhouse parking lot as shown in Figure 1A-2. These design modifications were*
128 *included as studies at the Pointe du Bois GS have found that, under some flow*
129 *conditions, sturgeon move into the tailrace channel and that quiet waters next to*
130 *turbulent fast flow create preferred microhabitats. The changes to the vertical wall of*
131 *the tailrace channel are meant to guide sturgeon that move upstream past the*
132 *constructed spawning structure to an area of suitable substrate for spawning. In*
133 *addition, the potential to create more suitable substrate for spawning by leaving*
134 *remnants of the cofferdam, or side-casting, was evaluated (Map 1A-8A). Due to the*
135 *hydraulic effects of the cofferdam remnants, leaving a substantial amount of material is*
136 *not feasible. However, where practical, coarse materials from the remnants of the*
137 *tailrace summer level cofferdam may be spread to create conditions attractive to*
138 *spawning fish in areas where interference with the outflow from the GS will not be a*
139 *concern.*

140 *At the project in-service date, spawning habitat available to sturgeon downstream of the*
141 *GS will consist of the modified north bank of the tailrace channel, the first phase of the*
142 *constructed spawning habitat (up to 5.3 ha), and areas where coarse material remains*
143 *from cofferdam removal/side-casting (see Map 1A-8A). Use of these areas by spawning*
144 *sturgeon will be monitored and, if a requirement for other spawning habitat is identified*
145 *(e.g., if conditions in the initially created habitat are not suitable), then additional*
146 *habitat will be constructed in a phased approach. Potential areas downstream of the GS*
147 *adjacent to the initially created habitat have been identified based on hydraulic*
148 *modelling (creating up to 15.9 ha of spawning habitat); however, actual locations would*
149 *be adjusted depending on site-specific conditions and responses of sturgeon to the flows*
150 *downstream of the GS.*

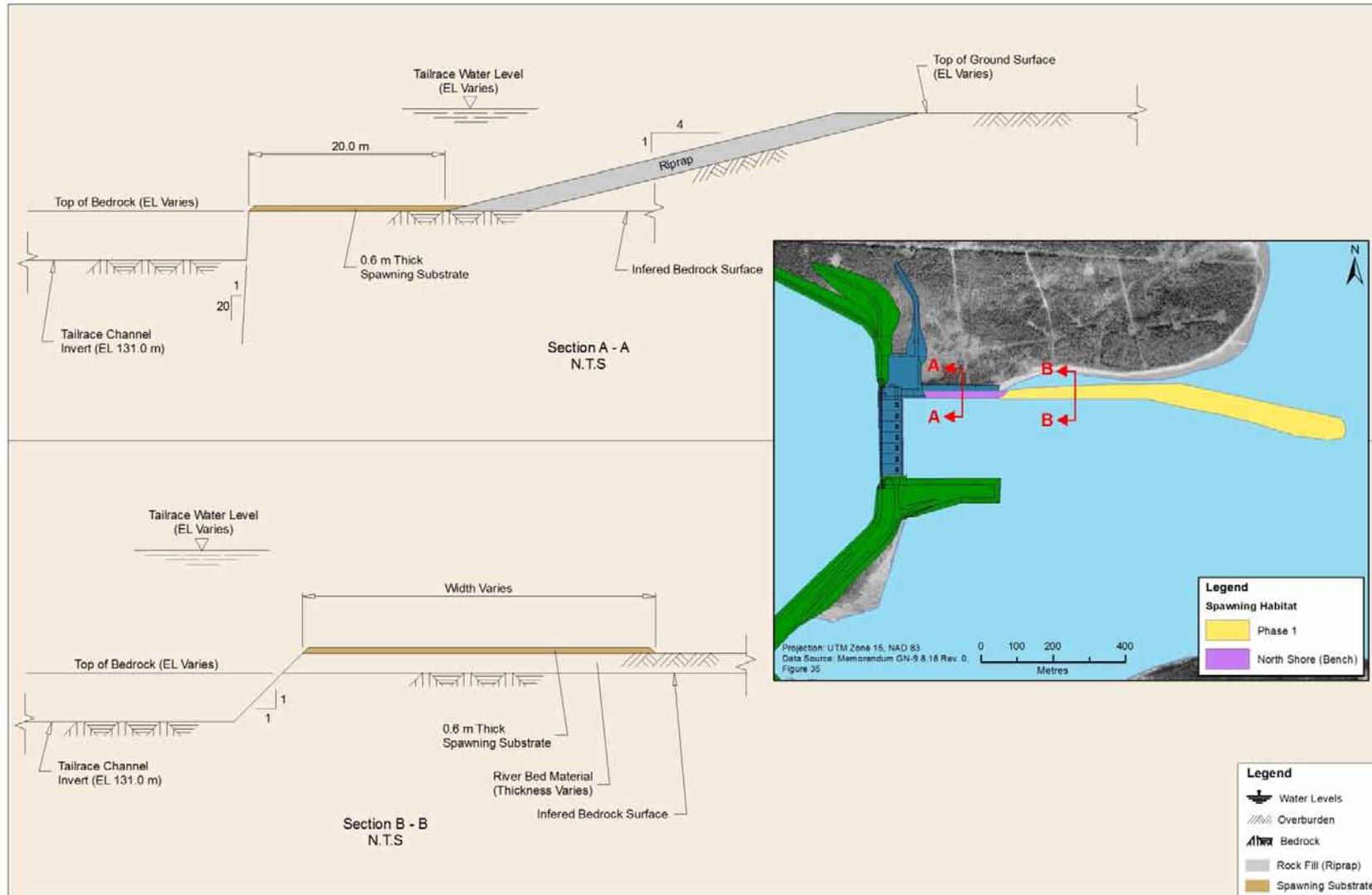
151 *The area of spawning habitat that meets the design criteria is dependent on the*
152 *discharge through the powerhouse and the water elevation of Stephens Lake. For*
153 *example, the first phase provides 0.4–4.7 ha for discharges of 1,100 m³/s (two units, 1*
154 *and 2) to 4,000 m³/s (seven units) respectively, while the third phase provides*
155 *approximately 3.0–7.9 ha for these same discharges.*

156 *During the spawning period, the operation of the Keeyask GS will be modified such that*
157 *flow from the two northernmost units is continuous to maintain appropriate hydraulic*
158 *conditions over the spawning structure. In addition, monitoring will be required to*
159 *determine if the cycling mode of operation adversely affects the behaviour of spawning*
160 *fish. As long as drawdowns on Stephens Lake do not cause spawning habitat velocity and*
161 *depth criteria to be violated, it is unlikely that the operation of the Kettle GS would have*
162 *to be modified.*

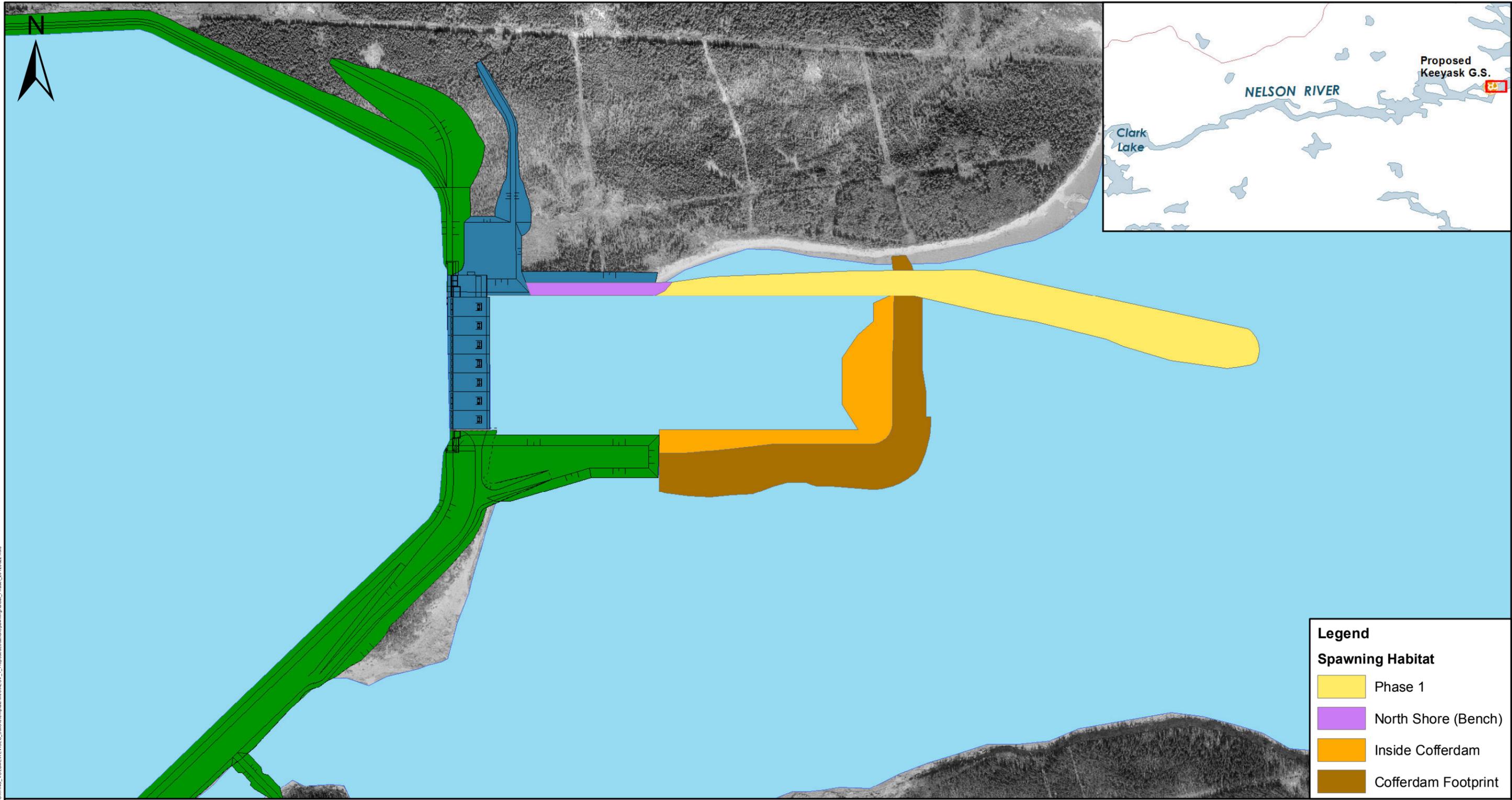


1

2 Figure 1A-1: Spawning habitat details showing the arrangement and spacing of boulder clusters



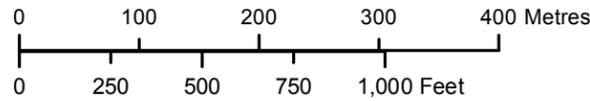
3
4 Figure 1A-2: Cross sections of modifications to north bank of tailrace channel to create sturgeon spawning habitat



Legend

Spawning Habitat

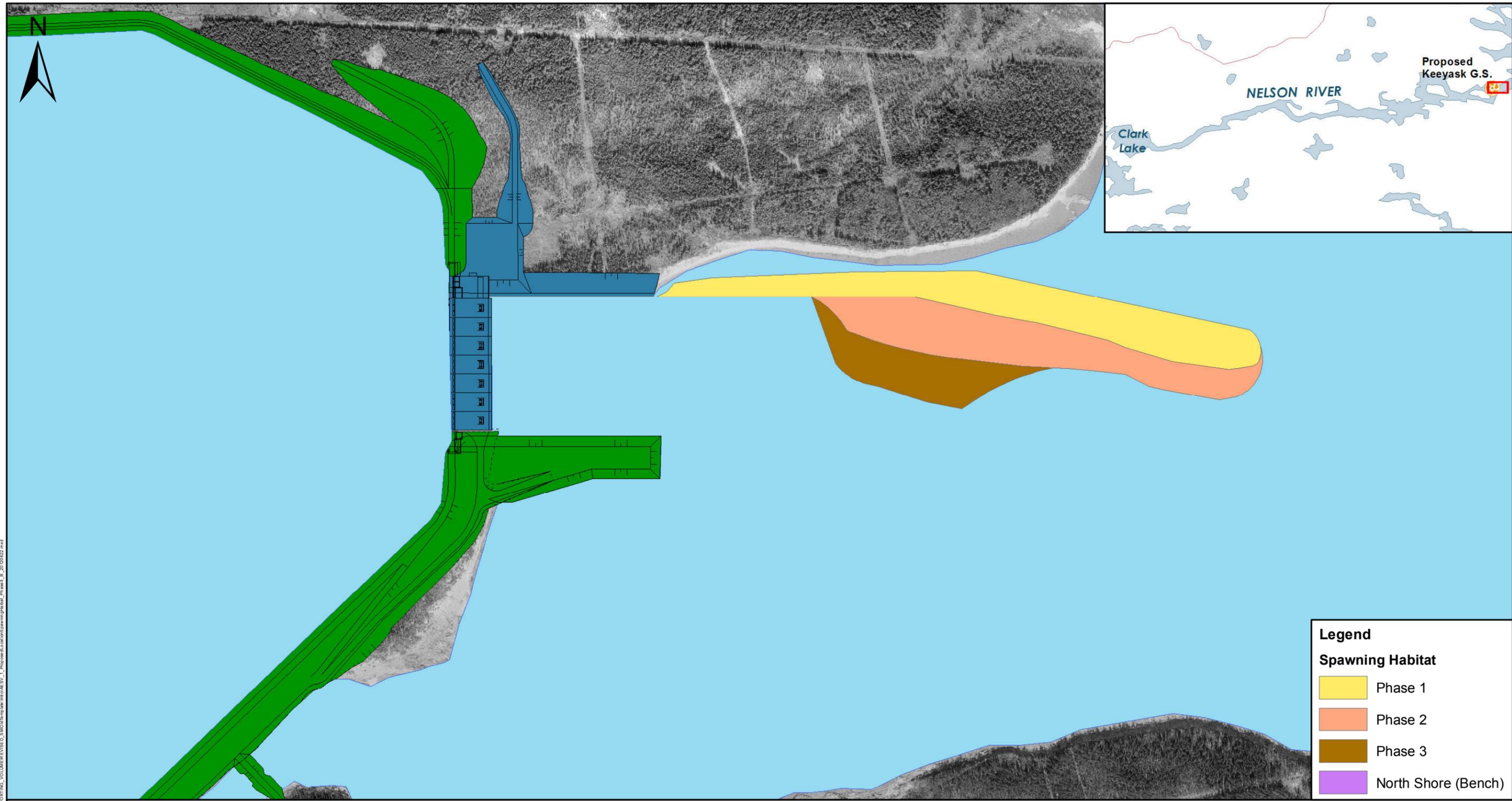
- Phase 1
- North Shore (Bench)
- Inside Cofferdam
- Cofferdam Footprint



Projection: UTM Zone 15, NAD 83
 Data Source: Memorandum GN-9.8.18 Rev. 0, Figure 26

Proposed Location of Spawning Habitat Phase I

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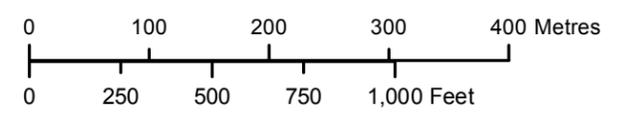


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Legend

Spawning Habitat

- Phase 1
- Phase 2
- Phase 3
- North Shore (Bench)



Projection: UTM Zone 15, NAD 83
 Data Source: Memorandum GN-9.8.18 Rev. 0, Figure 30

Proposed Locations of Spawning Habitat

Phase II and III

5 **2. Young-of-the-year/rearing habitat**

6 Predicted effects to rearing habitat for young-of-the-year (YOY) sturgeon in the Keeyask
 7 reservoir are provided in AE SV Section 6.4.2.2.2, p. 6-36. The existing YOY habitat in
 8 Gull Lake will no longer be available post-Project due to siltation over the sand substrate
 9 and a decline in water velocity, which is required to transport drifting larval sturgeon
 10 from the spawning to rearing habitat. After impoundment, larval Lake Sturgeon may
 11 settle where water velocity declines near the upper end of present-day Gull Lake in an
 12 area of suitable depth and velocity; monitoring will determine if substrate in this area is
 13 suitable. If monitoring indicates poor survival of YOY, then suitable substrate will be
 14 created through the deposition of sand on the river bottom. Details of habitat
 15 construction are provided in the AE SV Appendix 1A Section 3.1.7.1 p. 1A-12.

16 ***1A.3.1.7.1 Creation of YOY Lake Sturgeon Sandy Rearing Habitat***

17 *Predictions of post-impoundment changes to water velocity and related sediment*
 18 *transport conditions (Section 3.4.2.2; Map 3-34) suggest there will be a requirement to*
 19 *create compensatory YOY habitat. The initial selection of the preferred location for the*
 20 *construction of a sand blanket (2) was based on the most likely area where, in the post-*
 21 *impoundment setting, YOY lake sturgeon that emerge from spawning locations*
 22 *upstream (i.e., in the Birthday Rapids to Long Rapids reach) would settle to the bottom*
 23 *(i.e., in the transition zone of the river and the reservoir [Section 6.4.2.2; Map 3-31 and*
 24 *Map 3-32]). The selected areas are, as well, located in areas of minimal sediment*
 25 *deposition (PE SV) to maximize the success of the sand blanket as lake sturgeon YOY*
 26 *habitat.*

27 ***Phased Approach***

28 *Prior to constructing the sand blanket, a monitoring program would be undertaken to*
 29 *determine with greater certainty whether or not YOY lake sturgeon find sufficient and*
 30 *suitable rearing conditions in the near-term post-impoundment environment.*
 31 *Monitoring would include determination of YOY and juvenile lake sturgeon distribution*
 32 *and abundance in conjunction with key parameters of substrate depth, and velocity. It*
 33 *should be noted that although sand is widely believed to be an important substrate for*
 34 *YOY lake sturgeon, other substrates might also be suitable. Monitoring would also*
 35 *provide more precise post-impoundment substrate and velocity data to supplement the*
 36 *modelled results. This information would be used to refine locations where sand should*
 37 *be placed, if required. A three-year monitoring program would provide sufficient*
 38 *information to determine whether sand placement should be implemented.*

39 *If monitoring indicates that sand placement is necessary to create YOY lake sturgeon*
 40 *habitat, then placement of a sand blanket as a Phase I pilot program would provide an*
 41 *area of sandy habitat covering a 20 ha area. This area represents approximately one-*

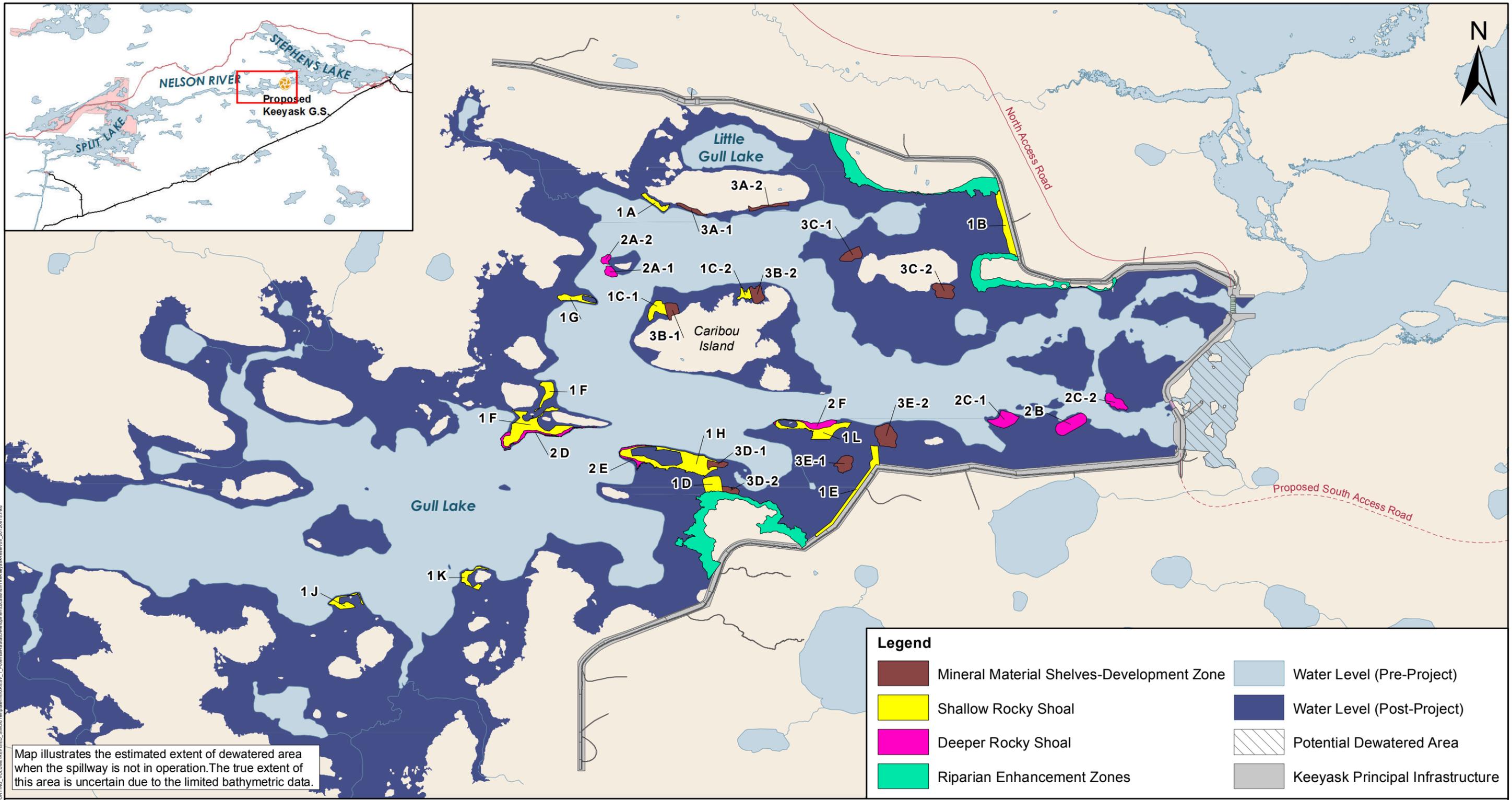
42 *half of the existing high suitability area north of Caribou Island (Appendix 6D).*
43 *Subsequent monitoring over one or more years to determine the success of the Phase I*
44 *pilot placement would be necessary before implementing a Phase II sand placement (up*
45 *to an additional 20 ha), which may or may not be adjacent to the pilot placement (Map*
46 *1A-2).*

47 *Sand Blanket Material*

48 *Modelling of the erosion potential of sand particles placed at the placement sites*
49 *suggest that sand particles greater than 1.0 mm and less than 2.0 mm in diameter sizes*
50 *can be used.*

51 *Sand Blanket Thickness*

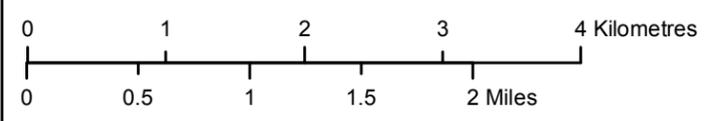
52 *In order to cover any boulders or cobbles present on the bed of the Nelson River, a sand*
53 *blanket thickness of approximately 0.20 m would be used.*



Map illustrates the estimated extent of dewatered area when the spillway is not in operation. The true extent of this area is uncertain due to the limited bathymetric data.

Legend

 Mineral Material Shelves-Development Zone	 Water Level (Pre-Project)
 Shallow Rocky Shoal	 Water Level (Post-Project)
 Deeper Rocky Shoal	 Potential Dewatered Area
 Riparian Enhancement Zones	 Keeyask Principal Infrastructure



Projection: UTM Zone 15, NAD 83
 Data Source: NTS base 1:50 000
 Stephens Lake Shoreline - Quickbird@Digitalglobe, 2006
 Nelson River Shoreline modelled by Manitoba Hydro
 Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Potential Habitat Development Locations in the Keeyask Reservoir

56 Technical information on the actual process of habitat creation was provided in TAC
57 Public Rd 2 DFO-0026, which is attached as Appendix 1 for the convenience of the
58 reviewer.

59 Predicted effects to YOY habitat in Stephens Lake are discussed in AE SV Section
60 6.4.2.3.1, p. 6-41. Existing YOY habitat is expected to persist following construction and
61 operation of the Keeyask Generating Station. If additional habitat is required or if
62 existing areas are adversely affected, habitat could be created using the same methods
63 as proposed for the reservoir.

64 **APPENDIX 1**

65 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 66 **Section: Appendix 1A Aquatic Mitigation and Compensation**
 67 **Measures: Evaluation of Alternatives and Rationale for Selected**
 68 **Measures; p. N/A**

69 **TAC Public Rd 2 DFO-0026**70 **ORIGINAL PREAMBLE AND QUESTION:**

71 Maps 6-48, 6-49

72 Unclear as to how sand/gravel habitat will be created post project in the forebay,
 73 particularly in years 1-5. Does this include compensatory measures proposed in
 74 Appendix 1A? Please provide detailed information/model which demonstrates the
 75 creation of sand post project.

76 **FOLLOW-UP QUESTION:**

77 Requested details on sand habitat creation not provided.

78 **RESPONSE:**

79 Impoundment of the Gull Lake area to create the forebay of the Keeyask Generating
 80 Station will flood a diverse variety of aquatic habitats. An existing area where Young-Of-
 81 Year Habitat (YOYH) sturgeon have been located has been identified north of Caribou
 82 Island, as shown in Figure 1. This document describes a phased approach for the
 83 development of the YOYH.

84 **Sand Blanket Criteria**

85 Using the information provided by North/South and a preliminary estimate of where the
 86 velocity drops below 0.5 m/s in the central channel, the approximate area that would be
 87 suitable for sand blanket deposition is shown on Figure 2. It should be noted that the
 88 selection of the preferred location for the construction of the sand blanket was not
 89 based on an area where young-of-year sturgeon have been located under current
 90 conditions, but rather on conditions that will exist once the Keeyask Generating station
 91 is operational. The preferred location was instead based on the most likely area in the
 92 post-impoundment setting where YOY lake sturgeon that emerge from upstream
 93 spawning locations in the reach from Birthday Rapids to Long Rapids would settle to the
 94 bottom of the river channel. The area was selected based on water velocity
 95 characteristics following impoundment.

96 The preferred location for the sand blanket is an approximately 400 m wide by 2 km
 97 long section (total area of 800,000 m²) in the central channel, as shown in Figure 2. The
 98 sand blanket would consist of dirty sand, ideally containing some silt, covering the
 99 existing cobbles by 5 cm.

100 An average cobble size of 7.5 inches, or 19 cm, would require a blanket depth of
 101 approximately 24 cm. Since the presence of cobbles and boulders will not require a
 102 continuous sand thickness of 24 cm, an approximate thickness of 20 cm has been used
 103 to estimate a volume of sand required for 160,000 m³. Some boulders and cobbles may
 104 not be covered by this thickness of sand and will provide cover for the fish. The outline
 105 of the proposed sand blanket is shown in Figure 2.

106 **Phased Approach for Sand Blanket Development**

107 **Phase I Sand Placement**

108 If monitoring indicates that sand placement is necessary, then the placement of a sand
 109 blanket as a Phase I pilot program would provide an area of sand habitat covering a
 110 200,000 m² area. This area represents approximately one-half of the existing high
 111 suitability area. The preliminary location of the Phase I sand blanket that is shown in
 112 Figure 2 may be refined based on observations made during the initial monitoring
 113 program prior to Phase I sand placement.

114 **Intermediate Monitoring Program**

115 The success of the Phase I pilot placement will be monitored over one or more years to
 116 assess the need for and location of the next phase of sand placement.

117 **Phase II Sand Placement**

118 Based on the observations made during the intermediate monitoring program, the
 119 Phase II sand placement would be implemented. The preliminary location of the Phase II
 120 sand blanket is shown on Figure 2; however, the location of the sand blanket would be
 121 refined based on observations made during the intermediate monitoring program. The
 122 Phase II sand blanket may be an extension of the Phase I sand blanket or a separate site,
 123 depending on the observations made during the intermediate monitoring program.

124 **Construction Methodology**

125 **Sand Blanket Material Sources**

126 The two material sources were reviewed to ensure that each could provide a sufficient
 127 quantity of clean sand for this project. Two locations have been identified as potential
 128 source of sand:

- 129 • Option 1 sources material from Deposit G-1.
- 130 • Option 2 sources material from Deposit B-1.

131 Options 1 and 2 can be seen on Figure 1. Deposit B-1 can be seen in detail in Figure 3.

132 **Sand Placement Methods**

133 Sand placement on river bottoms and lakebeds has been used to cover contaminated
134 material deposited in the water bodies. The sand placement methods used for these
135 projects can also be used for the placement of sand blanket material in the Nelson River.
136 The appendix at the end of this document provides figures that illustrate some of these
137 placement methods.

138 Surface release from a barge, dredge or pipeline would result in more TSS generation
139 than the placement of material from a barge using a sand spreader or tremie
140 equipment. The sand spreader and tremie placement methods are described below.

141 A sand spreader system can be used to place material on the bottom of a river. Sand is
142 transported to the placement area on a barge. Water is added to the sand to create a
143 slurry, which is pumped through a submerged pipe to the river bottom. A winch and
144 anchor system is used to move the submerged pipe to direct the placement of the sand
145 slurry. This gives a more accurate sand placement and less TSS generation than dumping
146 material from the surface of the river. In the same way, tremie equipment mounted on
147 a barge can be used to place material on the bottom of a river. When the barge is in the
148 placement area, the sand is moved to a hopper using a small front-end loader or
149 conveyor belt. The hopper feeds the sand into a large-diameter pipe mounted on the
150 side of the barge. The pipe extends vertically from the hopper to just above the river
151 bottom, isolating the sand from the upper water column. An anchor and winch system,
152 tugboat guidance or cable and winch system can be used to move the barge over the
153 sand blanket area. This method also results in more accurate sand placement and less
154 TSS generation than dumping material from the surface of the river. A conceptual
155 drawing of a tremie composed of a retractable nested plastic chute attached to the side
156 of a barge is shown in the appendix. Photos of a retractable plastic chute with a hopper
157 loading system are also shown in the appendix. Either the sand spreader or tremie
158 methods would be suitable for the placement of sand blanket material.

159 **Excavation and Transportation of Sand Material**

160 This is a significant construction operation in which 80,000 m³ of sand is to be placed on
161 the river bottom over two areas of 200,000 m² each. It is assumed that approximately
162 one metre of clay would be stripped from Deposit B-1 to access the poorly graded
163 gravelly sand. Stripping of clay and overburden would not be required at Deposit G-1, as
164 the sand would have already been exposed during the development of the Keeyask GS.
165 Some processing is required to isolate the material between 1.0 mm and 2.0 mm in
166 diameter. The material would be transported by truck from the deposit areas to the
167 river, and then transported to the sand blanket placement area by a tug towing a barge.
168 Depending on the source of material for this project a barge loading area would be

169 constructed at the North Dyke or near Deposit B-1 if Deposit B-1 was selected as the
170 source for the material.

171 These loading areas would be removed at the end of the project.

172 The proposed barge loading areas and barge routes are shown in Figures 1 and 2. Use of
173 Deposit B-1 would require construction of a winter road prior to the Phase I sand
174 blanket placement in order to allow access for equipment to clear and prepare the
175 deposit sites. This will ensure that the full summer construction season can be utilized
176 for the construction of YOYH.

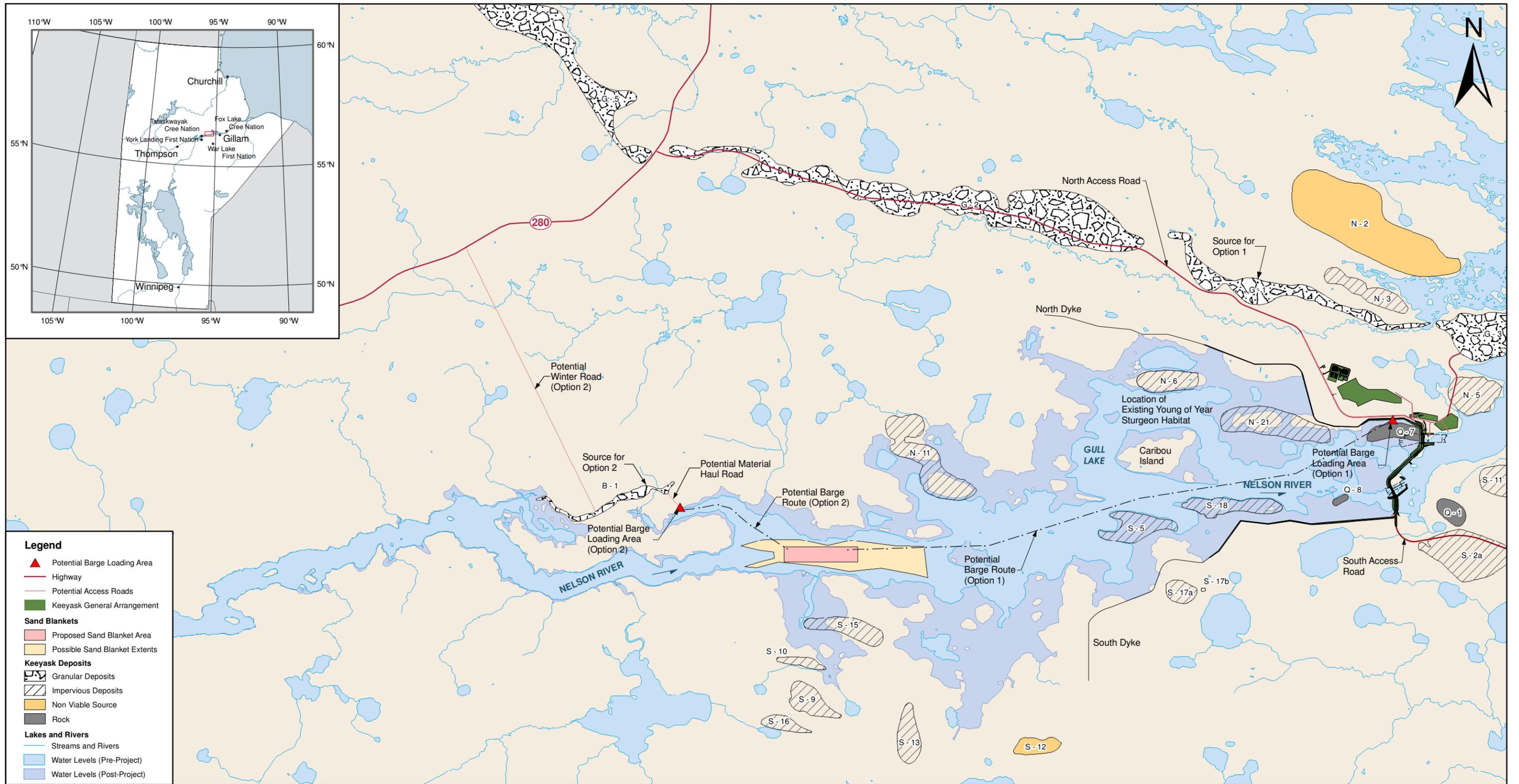
177 Five barge sections would be connected to be used for transportation of the sand
178 blanket material. An example of interconnected barge segments and a tug is shown in
179 the Appendix. One tug will be able to move the interconnected barge.

180 The sand blanket areas shown in Figure 2 would be revised based on observations from
181 the initial monitoring program. GPS technology would be used during sand placement,
182 and placement would be verified using a dive team. The marine staff would consist of
183 one tug operator and one small front-end loader operator to move the material into the
184 hopper. Three truck operators and two loader operators with one foreman comprise a
185 total staff of eight. Two divers would also be required for the diving program.

186 A fuel depot would be included at the site of the granular source.

187 **Scheduling Of Work**

188 This operation would require about 5 weeks each for Phase I and Phase II, with 60 hour
189 work weeks using Deposit B-1 as a source. Alternatively, the operation would require
190 about 10 weeks each for Phase I and Phase II using Deposit G-1 as a source. Placement
191 of the Phase I sand blanket would begin following a three-year initial monitoring
192 program after impoundment. An intermediate monitoring program would monitor the
193 success of the Phase I sand blanket for a minimum of one year. The Phase II sand
194 blanket placement would begin following this monitoring program.



Legend

- ▲ Potential Barge Loading Area
- Highway
- Potential Access Roads
- Keeyask General Arrangement
- Sand Blankets**
- Proposed Sand Blanket Area
- Possible Sand Blanket Extents
- Keeyask Deposits**
- Granular Deposits
- Impervious Deposits
- Non Viable Source
- Rock
- Lakes and Rivers**
- Streams and Rivers
- Water Levels (Pre-Project)
- Water Levels (Post-Project)

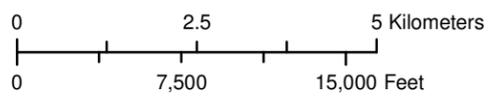
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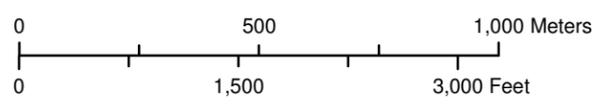
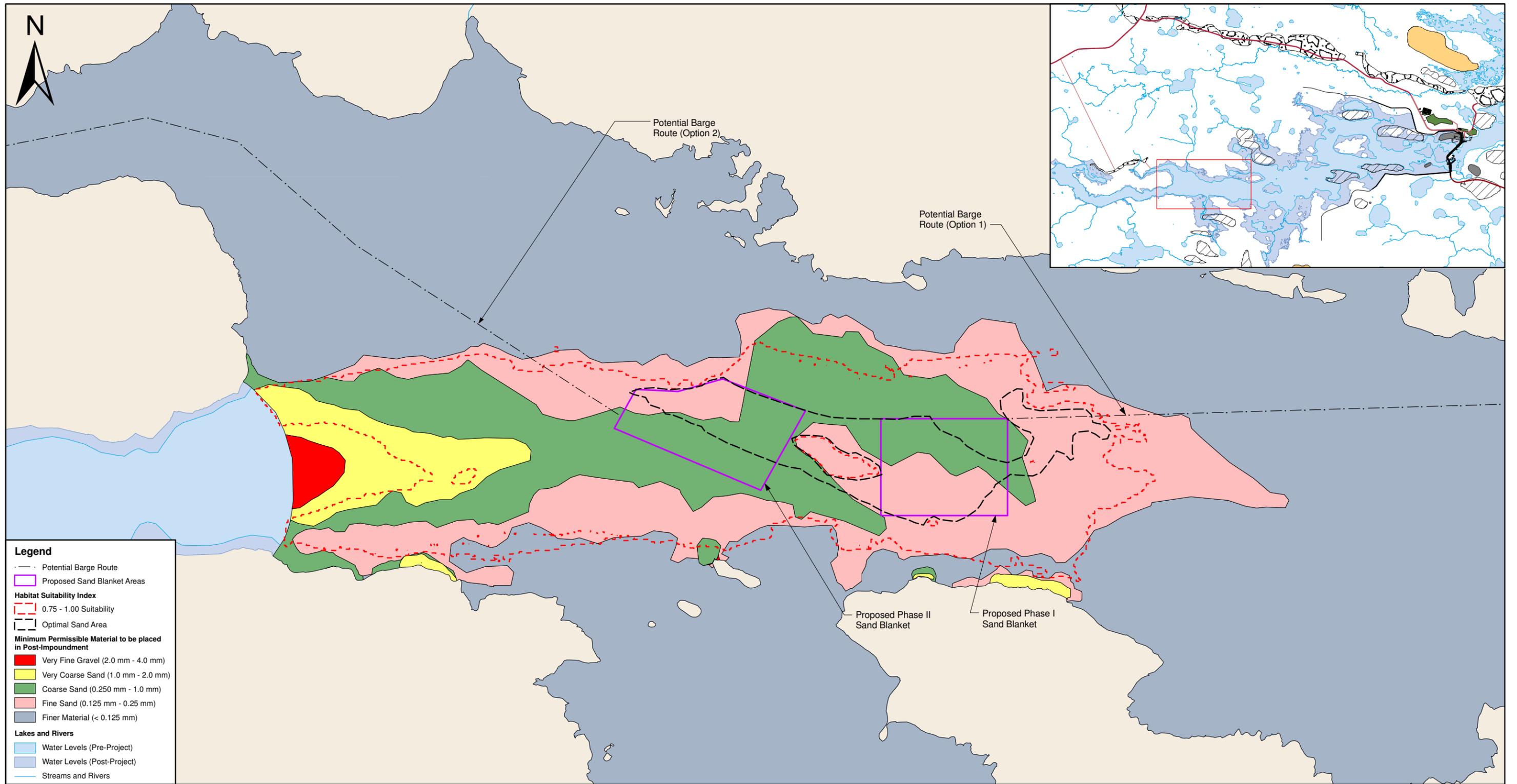
- Data Sources:
1. Post-project and pre-project shorelines provided by Manitoba Hydro, 2010
 2. Lakes, rivers, roads and toponyms provided by Geogratis, 2007.
 3. Infrastructure data and deposits provided by KGS Acres, 2010.
 4. Potential barge loading area, potential barge route, proposed sand blanket area, possible sand blanket extents and potential access roads provided by KGS Acres, 2009

FOR GENERAL REFERENCE ONLY

STAGE IV STUDIES AXIS GR-4 LOCATION OF DEPOSITS, SAND BLANKET AND ACCESS ROUTES - PART 1

Figure 2





Projection: Universal Transverse Mercator (UTM) Zone 15N, North American Datum 1983 (NAD 83)

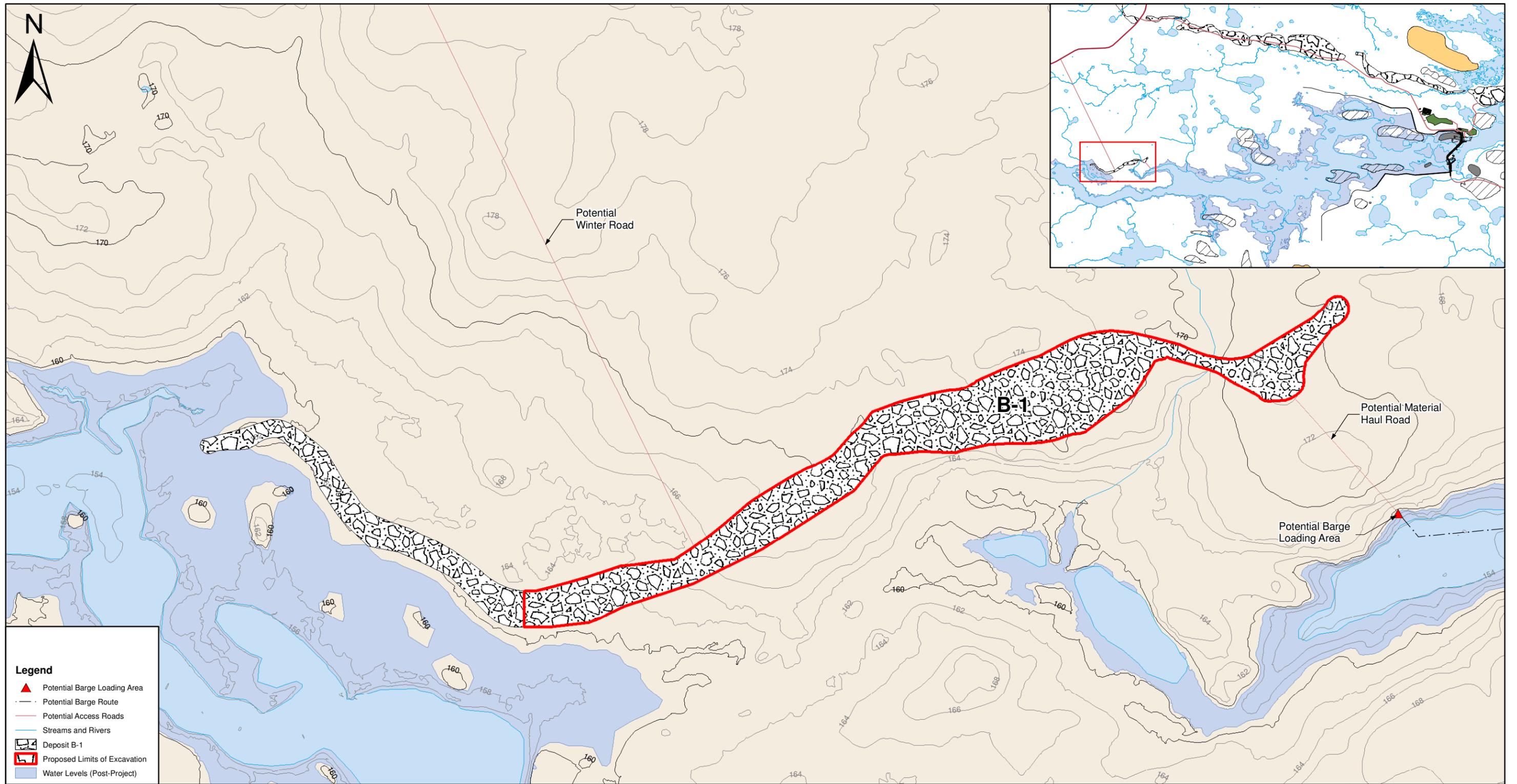
Data Sources:

1. Lakes, rivers, roads and toponyms provided by Geogratix, 2007.
2. Infrastructure data and deposits provided by KGS Acres, 2010.
3. Minimum permissible material data, potential barge route and proposed sand blanket area provided by KGS Acres, 2011
4. Water levels (pre-project) and water levels (post-project) provided by MB Hydro 2010
5. Habitat suitability index areas provided by North South Consultants, 2011

FOR GENERAL REFERENCE ONLY

STAGE IV STUDIES AXIS GR-4 LOCATION OF SAND BLANKETS AND ACCESS ROUTES - PART 2

Figure 4



Legend

- ▲ Potential Barge Loading Area
- Potential Barge Route
- Potential Access Roads
- Streams and Rivers
- Deposit B-1
- Proposed Limits of Excavation
- Water Levels (Post-Project)

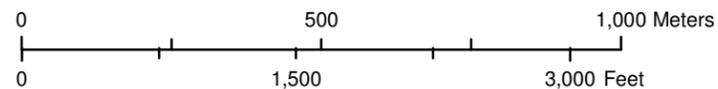
Projection: Universal Transverse Mercator (UTM) Zone 15N, North American Datum 1983 (NAD 83)

- Data Sources:
1. Post-project and pre-project shorelines provided by Manitoba Hydro, 2010
 2. Lakes, rivers, roads and toponyms provided by Geogratix, 2007.
 3. Deposits provided by KGS Acres, 2010.
 4. Potential barge loading area, potential barge route and potential access roads provided by KGS Acres, 2009

FOR GENERAL REFERENCE ONLY

STAGE IV STUDIES AXIS GR-4 PROPOSED LIMITS OF EXCAVATION FOR DEPOSIT B-1 (OPTION 2) - PART 1

Figure 3



Appendix

Photo 1: Typical Dump Scow Barge

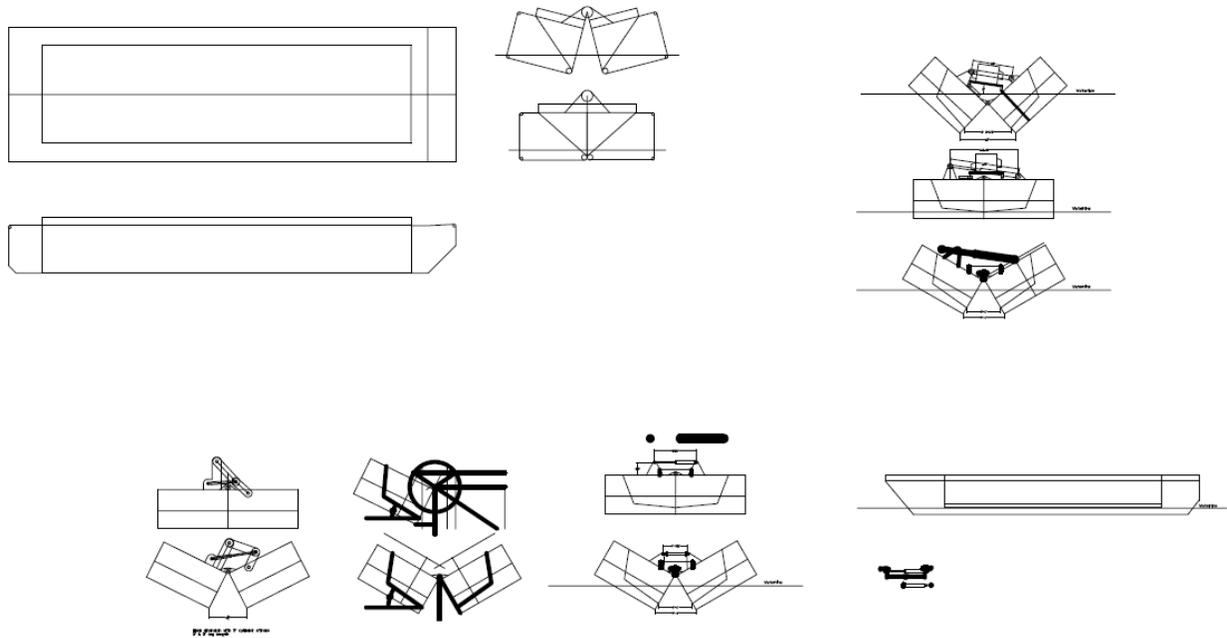


Photo 2: Transportation of Barge by Truck



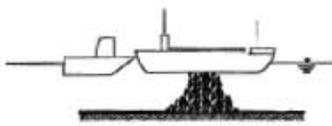
Source:

Stark, Joseph P. (Great Lakes Shipyard). Message to David Ranta (KGS ACRES) [Email]. "Truckable Workboat and Barges". November 19, 2009 2:28 PM.

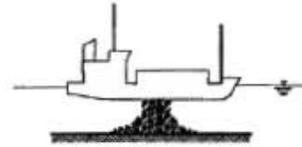
Photo 3: Typical Tugboat



Plate 1
Keyask GS, Stage IV Studies – Axis GR-4
Sand Placement Methods



Surface Release from Barge



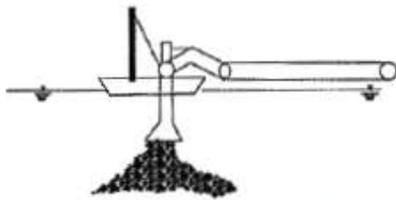
Surface Release from Hopper Dredge



Spreading with Pipeline and Baffle Plate or Box



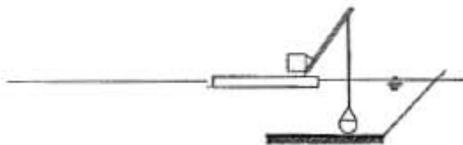
Surface Discharge with Pipeline



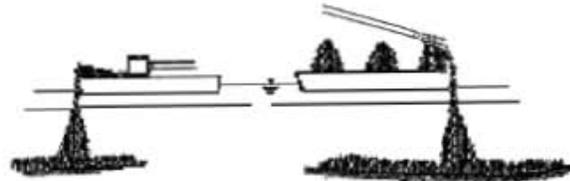
Submerged Diffuser with Pipeline



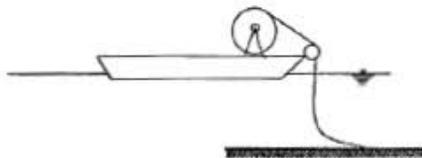
Spreading by Controlled Barge Release



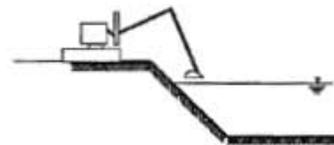
Direct Mechanical Placement



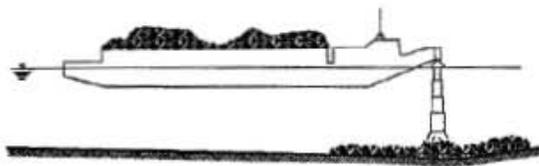
Spreading/Jetting from Barge



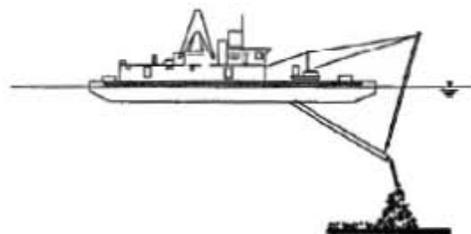
Barge Equipped for Geotextile Placement



Land - based Direct Placement

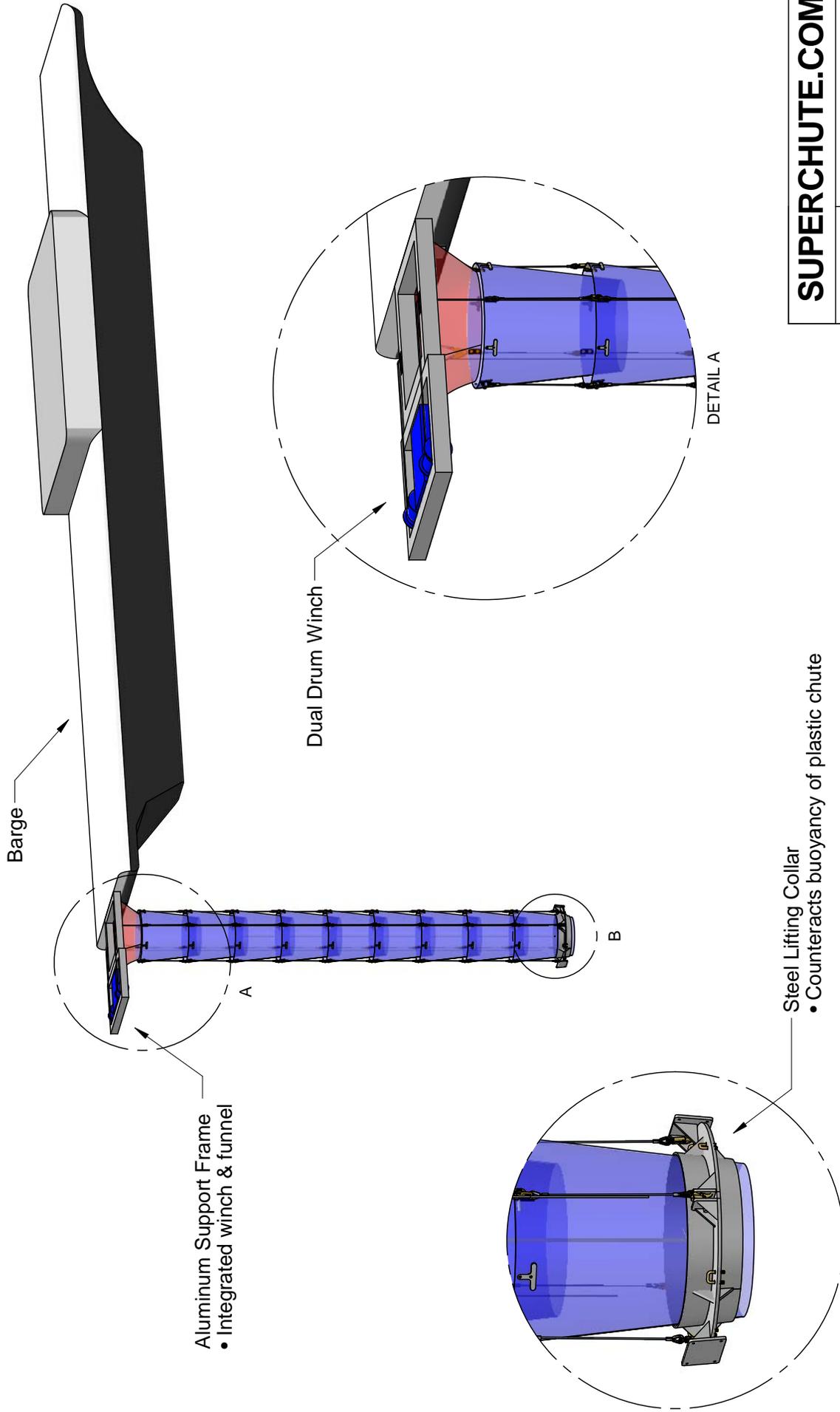


Barge with Tremie



Sand Spreader Barge

Nesting Chute for Sand



Barge

Aluminum Support Frame
 • Integrated winch & funnel

Dual Drum Winch

DETAIL A

Steel Lifting Collar
 • Counteracts buoyancy of plastic chute

DETAIL B

SUPERCROUTE.COM	
CUSTOMER	Great Lakes Towing
PROJECT	Nesting Chute for Sand
DRAWN BY	Lorin Spevack, B.Eng.
REV A	March 17, 2011

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Photo 1
Keyask GS, Stage IV Studies – Axis GR-4
Example of Retractable Plastic Chute with Hopper



Photo 2
Keyask GS, Stage IV Studies – Axis GR-4
Example of Hopper on Retractable Plastic Chute



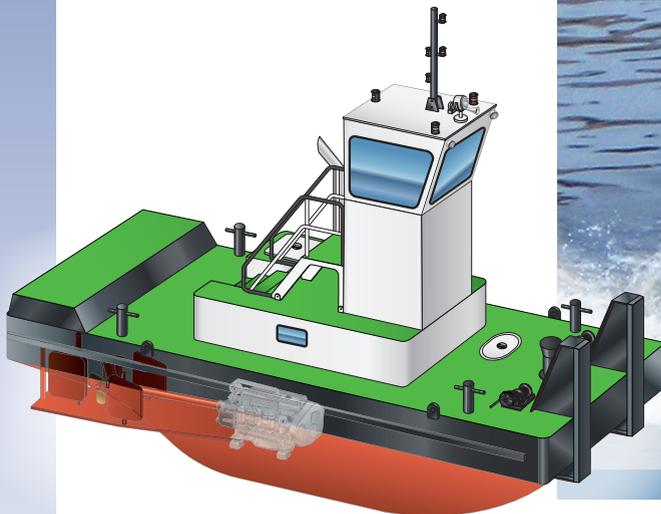
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Truckable workboats that pay for themselves. Again. Again. And again.

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WORKBOAT SPECIFICATIONS

Models	251 - Single Screw Truckable Work Boat 252 - Twin Screw Truckable Work Boat
Dimensions	25'11" x 10'0" x 4'6" single screw, Up to 300HP, approximately 20,000lbs 25'6" x 13'2" x 5'6" twin screw, Up to 600HP, approximately 25,000lbs

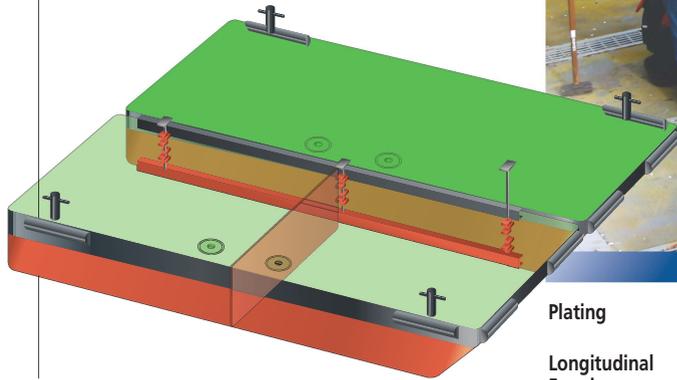
Construction	Deck and hull all 1/4" A36 through-out. All seams welded continuously. Bottom, sides and deck framed with 3" x 3" x 1/4" angle on 20" centers. 2 transverse frames of 4" x 5.4" channel installed 7'6" from bow and stern.
Pilot house	House is 4'0" x 4'0" x 7'0" and is constructed of 3/16" plate. All windows are of high quality aluminum construction, horizontal sliding type.

Power Train	Workboat engines, gears, and shafting to be selected by buyer from multiple manufacturers.
Custom Equipped	Buyer to select multiple available options such as generators, electronics, custom pilot houses, coatings, deck equipment and much more.

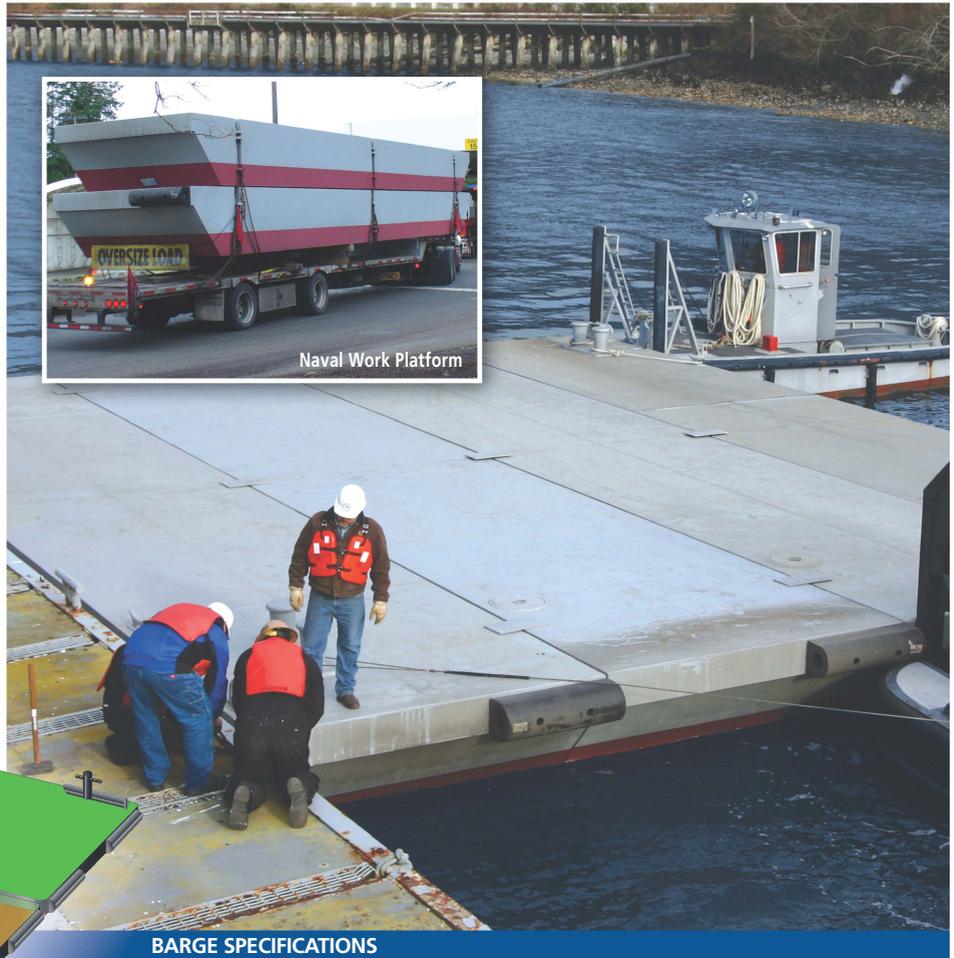
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Standard Sizes Widths 8', 10', or 12'.
Lengths 30', 40', or 50'.
Available as single rake, double rake or box-end units. Custom sizes and designs to meet special requirements are also available.



BARGE SPECIFICATIONS

Plating	1/4" A36 plate throughout	Pin Connections	3 - 2-1/2" 1045 steel pins with 3/4" x 6" retainer plates, which mate to pocketed pin bosses of 1-1/2" steel plate. The pin bosses are nested inside notched 8" x 20.0# ship channel and welded continuous inside and out.
Longitudinal Framing	Bottom and sides 3" x 3" x 1/4" angle, 20" maximum spacing Deck 3" x 4" x 1/4" angle, 20" maximum spacing. Transverser frames are 5" x 8# channels box framed with 3" x 3" x 1/4" angle verticals, frames on 5'0" centers.	Lifting Eyes	4 balanced lifting lugs or D-rings per barge, welded continuous and integral to the frames and pinning system.

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Great Lakes Shipyard has a long history of new construction, marine fabrication and vessel repair, serving the needs of government and commercial marine industry. Talk to one of our marine professionals today about your floating equipment requirements. Floating docks, tanks, ferries, pontoons, modules, and much more. Our engineers will personally work with you to design, build and equip a truckable unit to fit your working environment. Then, we will deliver it anywhere in the world - on time and on budget.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.0 Lake Sturgeon; p. 6-38**

3 **CEC Rd 1 CEC-0030**

4 **QUESTION:**

5 In this section it is indicated that Lake Sturgeon have been found to limit their
6 movements to relatively short reaches of river even in the absence of physical barriers
7 (READ APPENDIX 6A). Please confirm if this is the intended interpretation?

8 **RESPONSE:**

9 As stated in AE SV Appendix 6A, results of several mark-recapture and biotelemetry
10 studies have indicated that Lake Sturgeon exhibit relatively restricted movements, even
11 in the absence of physical barriers. However, as also noted in this section, much wider
12 ranging movements are exhibited by some individuals and at some times.

13 A memo updating the description of adult Lake Sturgeon movements in the Keeyask
14 area with results of pre-construction monitoring studies (initiated in 2011) will be
15 provided in early August. This memo will address movements observed in the Keeyask
16 area in the context of movements observed in other Lake Sturgeon populations.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.0 Lake Sturgeon; p. N/A**

3 **CEC Rd 1 CEC-0031**

4 **QUESTION:**

5 It is indicated in Appendix 1A- Part 2, page 1 of the Aquatic Supporting Volume that the
6 stocking of Lake Sturgeon is a proven method for increasing numbers and has been an
7 important feature of many recovery plans. It is our opinion that this is likely only true
8 where the habitat still exists and the decline was due to overfishing or pollution that has
9 been rectified. We are not aware that this has been used as a proven mitigation method
10 relative to hydroelectric development. Is there documentation to support this
11 statement (i.e. can KHLP provide more details on where stocking has been used in
12 hydroelectric offsets)? Appendix 1 refers to stocking initiatives but none seem to be
13 directed towards hydroelectric plants, and most are short term initiatives (usually less
14 than 10 years not 25 years as proposed by KHLP).

15 A concern is expressed that stocking should be the last mitigation option and not the
16 first. A typical "Impact Management Hierarchy" would suggest that a sequential
17 approach would first try to avoid impacts (through re-location or re-design of the
18 project) and where this is not feasible, to mitigate impacts (through use of best available
19 technology and practicable mitigation measures). Failing the availability of measures to
20 mitigate impacts, the last resort is to offset the residual impacts through replacement of
21 the natural capital that is damaged or lost as a result of the development project. It is
22 felt that KHLP should consider Best Available Technology (BAT) for fish protection as
23 part of the EIS.

24 A concern is expressed that there should have been more consideration paid to both
25 upstream and downstream fish passage technology and approaches especially for
26 sturgeon. Recent work conducted in the US on diverting downstream migrating
27 sturgeon (e.g., angled bar or trash racks) by the Alden Labs (e.g., Amaral 2008), and on
28 upstream passage at the Conte Labs (e.g., Kynard et al. 2012) are not discussed.
29 Furthermore, recent efforts by the USFWS on both upstream and downstream fish
30 passage facilities for two hydro facilities in WI are also not referenced nor discussed
31 (Utrup 2011). Both upstream and downstream systems proposed have been approved
32 for implementation for Lake Sturgeon protection in WI by the Federal Energy Regulatory
33 Commission (FERC).

34 It is felt that protection options should be considered as part of this EIS rather than a
35 follow-up program after the facility is constructed given the current status of Lake
36 Sturgeon and potential cumulative effects issue which is discussed below. If a simple

37 bypass structure and technology such as angled screens are not considered during the
 38 planning stage it may be too costly to install after the facility is constructed. The concern
 39 is a fragmented population of Lake Sturgeon on the Nelson River.

40 Therefore, it is requested that KHLP provide some further analysis as to the feasibility
 41 and efficacy of fish passage technologies.

42 A concern is expressed Recovery means re-establishing a self-sustaining population, and
 43 stocking in the absence of suitable habitat will not achieve that.

44 **REFERENCES:**

45 Amaral, S., Taft, N. and D. Dixon. 2008. The Use of Angled Bar Racks and Louvers for
 46 Protecting Fish at Intakes. Presentation. A Symposium on Cooling Water Intake
 47 Technologies to Protect Aquatic Organisms. Available at:
 48 [http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/2008_06_10_3](http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/2008_06_10_316b_meetings_symposium_amaral.pdf)
 49 [16b_meetings_symposium_amaral.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/2008_06_10_316b_meetings_symposium_amaral.pdf).

50 Kynard, B., Pugh, D. and T. Parker 2012. Passage and Behaviour of Cultured Lake
 51 Sturgeon in a Prototype Side-Baffle Fish Ladder: I.Ladder hydraulics and fish
 52 ascent. Journal of Applied Ichthyology 27(Suppl. 2):77-88.

53 Utrup, 2011. (USFWS contact). Final Environmental Assessment. Proposed Upstream
 54 and Downstream Fish Passage for Lake Sturgeon at Menominee River in the
 55 Cities of Marinette Wisconsin and Menominee Michigan. Prepared for US
 56 Department of Interior by NEW Hydro. WI.

57 **RESPONSE:**

58 The question encompasses several inter-related issues pertaining to the development of
 59 mitigation for effects on Lake Sturgeon. For greater clarity, the response has been
 60 divided into the following three components (quoted in italics below). A response is
 61 provided to each below.

62 **1.0 Stocking as mitigation and availability of habitat in systems affected by** 63 **hydroelectric development**

64 Question from reviewer:

65 *It is indicated in Appendix 1A- Part 2, page 1 of the Aquatic Supporting Volume that the*
 66 *stocking of Lake Sturgeon is a proven method for increasing numbers and has been an*
 67 *important feature of many recovery plans. It is our opinion that this is likely only true*
 68 *where the habitat still exists and the decline was due to overfishing or pollution that has*
 69 *been rectified. We are not aware that this has been used as a proven mitigation method*
 70 *relative to hydroelectric development. Is there documentation to support this statement*

71 *(i.e. can KHLP provide more details on where stocking has been used in hydroelectric*
 72 *offsets?)? Appendix 1 refers to stocking initiatives but none seem to be directed towards*
 73 *hydroelectric plants, and most are short term initiatives (usually less than 10 years not*
 74 *25 years as proposed by KHLP).*

75 The Partnership agrees with the reviewer that stocking, in the absence of habitat
 76 required to fulfill all life history requirements, is not an effective mitigation strategy to
 77 develop self-sustaining populations. The necessity for habitat is relevant regardless of
 78 the causes of sturgeon decline; therefore, the assessment of existing and post-Project
 79 habitat and an evaluation of the need to create replacement habitat has been a
 80 cornerstone of the development of mitigation for the Project. The response provided
 81 below firstly addresses the rationale for stocking and availability of habitat within each
 82 of the three areas that will be stocked, and secondly addresses the use of stocking in
 83 mitigation programs to address the effects of hydroelectric development.

84 **1.1 Rationale for Stocking as Mitigation for the Keeyask Project: Project Effects and** 85 **Habitat Availability**

86 As described in Aquatic Environment Supporting Volume (AE SV) Section 6.4.2, stocking
 87 is intended to offset specific Project-related effects as well as increase the overall
 88 number of Lake Sturgeon in the Nelson River between the Kelsey and Kettle generating
 89 stations (which includes the Keeyask Generating Station site). Stocking will be
 90 conducted in three general areas: Stephens Lake; the Keeyask reservoir (present-day
 91 Gull Lake); and upper Split Lake. Post-Project availability of habitat and measures to
 92 create replacement habitat are summarized below and presented in detail in AE SV
 93 sections 6.4.2.2.2 and 6.4.2.3.1, for the Keeyask reservoir and Stephens Lake,
 94 respectively.

95 Stephens Lake

96 Stocking in Stephens Lake will augment the existing population, which is believed to be
 97 below viable levels, and replace the input of drifting larval sturgeon from upstream of
 98 Gull Rapids. Stocking will also be a means to avoid missing year classes during
 99 construction, when existing habitat is no longer available and prior to the construction
 100 of replacement habitat. Analysis of multiple years of sampling for young (age 0 to 10)
 101 sturgeon indicates that the natural recruitment of sturgeon in Gull and Stephens lakes
 102 appears to be extremely low, with only one year class in approximately the last decade
 103 producing a substantial contribution. Therefore, it is expected that stocking will also
 104 increase the number of year classes present in the population.

105 The Project will eliminate all existing spawning habitat in Gull Rapids with the exception
 106 of years when prolonged operation of the spillway occurs during the spawning period.

107 As described in the AE SV Appendix 1A, a spawning structure will be developed below
 108 the generating station to replace this lost habitat. With the creation of spawning
 109 habitat, it is believed that habitat suitable for each life stage will exist post-Project (AE
 110 SV Section 6.4.2.3.1).

111 Gull Lake/newly formed reservoir

112 Stocking in the newly formed reservoir will augment the natural population and support
 113 population numbers in the event that a substantial number of adults leave in response
 114 to water elevation changes at impoundment (AE SV Section 6.4.2.2.3). It is not known
 115 whether sturgeon will leave the reservoir, but emigration of fish has been observed in
 116 some reservoirs (AE SV Section 6.4.2.1.2). In addition, it is expected that stocking will
 117 serve to avoid missing or weak year classes if spawning is reduced (i.e., at Birthday
 118 Rapids) or if young-of-the-year (YOY) habitat is not available. As with Stephens Lake,
 119 natural recruitment is intermittent; therefore, stocking will increase the number of year
 120 classes entering the population.

121 As discussed in the AE SV Section 6.4.2.2.2, the reservoir will provide habitat for sub-
 122 adult and adult Lake Sturgeon. It is predicted that spawning habitat will continue to be
 123 available at Long Rapids, immediately upstream of the reservoir, and possibly at
 124 Birthday Rapids, where water depths will increase and white water will likely be
 125 eliminated, but velocity, depth and substrate will remain within suitable ranges for
 126 spawning. An option is being considered to create white water at Birthday Rapids to
 127 attract spawning fish if monitoring indicates that sturgeon no longer spawn in the
 128 vicinity of Birthday Rapids. The option entails adding large boulders/structures at
 129 locations slightly upstream of the current spawning site at Birthday Rapids. Placement of
 130 large boulders in this area would be difficult during the construction phase due to lack
 131 of access. However, access would be improved during the operation period. The
 132 structures would need to be designed so that they could not be removed by ice. The
 133 design of these measures cannot be developed until after an assessment of site
 134 conditions occurs during the operation phase. Existing YOY habitat in Gull Lake will no
 135 longer be available to drifting larval sturgeon due to the decline in water velocity in the
 136 reservoir; substrate conditions at the upper end of present day Gull Lake, where larval
 137 sturgeon are expected to settle post-impoundment, may or may not be suitable. Given
 138 this uncertainty, if monitoring identifies that recruitment is not successful, measures to
 139 create sand habitat, known to be suitable for YOY sturgeon, will be implemented (see
 140 AE SV Appendix 1A Section 1A.3.1.7.1).

141 Upper Split Lake area

142 Lake Sturgeon will also be stocked in the Upper Split Lake area, which refers to the
 143 lower sections of four rivers near the western end of Split Lake: the Nelson River

144 (downstream of the Kelsey Generating Station to Split Lake); the Grass River (below
 145 Witchai Lake Falls to the confluence with the Nelson River); the Burntwood River (from
 146 First Rapids to Split Lake); and the Odei River (First Falls to the confluence with the
 147 Burntwood River). Sturgeon were historically present in this area and were substantially
 148 reduced by the commercial fishery (Manitoba Conservation and Water Stewardship
 149 Fisheries Branch 2012; MacDonell 1997).

150 Aquatic habitat in the upper Split Lake area will not be affected by the Keeyask
 151 Generation Project and there is an abundance of habitat in relation to the number of
 152 sturgeon present. During the development of the Keeyask stocking strategy a habitat
 153 inventory was conducted (Henderson et al. 2011). Specific objectives of the study were:

- 154 • to provide a coarse scale description of habitat by measuring basic habitat
 155 parameters (depth, water velocity, and substrate);
- 156 • to determine if habitat suitable for each life history stage exists within the
 157 aforementioned rivers; and
- 158 • to identify potential habitats suitable for stocking hatchery reared sturgeon.

159 The Nelson, Grass and Burntwood rivers contained a wide range of water depths,
 160 substrates, and water velocities. As a result, habitat characteristics required for each of
 161 the three main life stages (spawning, YOY/rearing, and foraging) were available,
 162 including suitable locations to stock larval, young-of-the-year, and/or one-year-old
 163 sturgeon. In the Odei River, one potential spawning location was present; however,
 164 habitat parameters throughout the remainder of the river were largely uniform, with
 165 substrates consisting almost entirely of clay/silt. Clay/silt habitats provide adequate
 166 foraging for juveniles and adults, but may not be suitable for larval or YOY sturgeon.

167 1.2 Use of Stocking as Mitigation for Hydroelectric Development

168 The reviewer is correct that many examples of stocking initiatives are not located at
 169 hydroelectric developments. Examples of successful stocking are provided in the AE SV
 170 Appendix 1A Part 2 Lake Sturgeon Stocking Strategy and in TAC Round 2 SDFO – 0093.
 171 Information on stocking in waterbodies affected by hydroelectric development or other
 172 developments similar to hydroelectric development (e.g., dam construction for flood
 173 protection or water level control) in Manitoba rivers and adjacent waters is provided
 174 below.

175 Lake Sturgeon stocking has been conducted in the Assiniboine, Nelson, Winnipeg, and
 176 Saskatchewan rivers (in Saskatchewan) (AE SV Section 6.4.2.4). Lake Sturgeon stocking
 177 has also been conducted in the Minnesota portion of the Red River, which subsequently
 178 flows through Manitoba.

179 From 1996 to 2008, the Assiniboine River was stocked with over 12,000 fingerlings and
180 4,000 fry at the City of Brandon. Water levels on the Assiniboine in this reach are
181 regulated by discharge from Lake of the Prairies upstream and impounded by a water
182 control structure downstream. At Brandon, several low weirs impound the river as it
183 flows through the city. Although a formal study has not been conducted to assess
184 stocking success, Lake Sturgeon captures are frequently reported by anglers (B.
185 Bruederlin, Manitoba Fisheries Branch, pers. comm.). A study is now being conducted to
186 determine if stocked fish have begun to reproduce naturally; reports from fishers of the
187 capture of small sturgeon suggests that natural reproduction may be occurring.

188 Lake Sturgeon stocking in the Nelson River was conducted intermittently from 1994 to
189 present by the Nelson River Sturgeon Board and Manitoba Fisheries Branch. Discharge
190 in this reach is controlled by the Jenpeg Generating Station as part of Lake Winnipeg
191 Regulation and water levels are affected by the Kelsey Generating Station. Spawn
192 collection typically occurred at the Landing River tributary, located 30 km upstream of
193 the Kelsey Generating Station. Lake Sturgeon fingerlings and some yearlings were
194 stocked back into various locations of the upper Nelson River. Until recently, success of
195 Nelson River stocking efforts has remained largely unknown. In fall 2012 an inventory
196 was conducted in the Sea Falls to Sugar Falls reach, which had been stocked with large
197 quantities of both fingerlings (n = 20,885) and yearlings (n = 1,107) from 1994 – 2011. A
198 total of 91 individuals (90 juvenile, 1 adult) were captured and 67 (74%) of these were
199 marked with pit tags, indicating that they had been stocked as yearlings (McDougall and
200 Pisiak 2012). It should be noted that this reach is part of a regulated system but water
201 levels and flows in this reach are not affected by a specific generating station.

202 Sturgeon (primarily fingerlings) were stocked in the reservoirs of selected generating
203 stations on the Winnipeg River most years from 1996 – 2010. Research suggests that
204 survival of stocked yearlings may far exceed survival of fingerlings in the Slave Falls to
205 Seven Sisters reach of the river, although data analysis is ongoing (C. Klassen, University
206 of Manitoba, pers. comm.). With those exceptions, Winnipeg River stocking was
207 conducted to supplement recruitment. As natural recruitment has now been
208 ascertained in all impoundments on the Manitoba side of the Winnipeg River, stocking
209 Winnipeg River populations does not appear to be necessary to rehabilitate these
210 populations.

211 Lake Sturgeon were stocked into the Saskatchewan River during 1999 and 2000, as well
212 as from 2003 – 2007. Spawning adults were captured from downstream of the EB
213 Campbell or Nipawin dams by Saskatchewan Environment staff. While considerable
214 numbers of Lake Sturgeon have been stocked into the Saskatchewan River as either fry
215 or fingerlings, the survival of stocked fish is uncertain.

216 The Minnesota Department of Natural Resources started a 20 year plan to restore Lake
 217 Sturgeon populations and has been releasing sturgeon from the Rainy River into the Red
 218 River drainage (Minnesota DNR 2002; Aadland et al. 2005). The 2002-2022 plan is to
 219 release 600,000 fry and 34,000 fingerlings per year at various locations throughout the
 220 Red River drainage in Minnesota. Anecdotal evidence (angler recaptures) suggests that
 221 Lake Sturgeon encounters in the Red River in Canada are increasing (Cleator et al. 2010).

222 **2.0 Development of Mitigation Strategies for the Keeyask Generation Project**

223 Question from the reviewer:

224 *"A concern is expressed that stocking should be the last mitigation option and not the*
 225 *first. A typical "Impact Management Hierarchy" would suggest that a sequential*
 226 *approach would first try to avoid impacts (through re-location or re-design of the*
 227 *project) and where this is not feasible, to mitigate impacts (through use of best available*
 228 *technology and practicable mitigation measures). Failing the availability of measures to*
 229 *mitigate impacts, the last resort is to offset the residual impacts through replacement of*
 230 *the natural capital that is damaged or lost as a result of the development project."*

231 The Partnership agrees with the reviewer that in developing a project the first priority
 232 should be given to avoiding effects, then to reducing effects to the degree practicable
 233 through mitigation, and finally providing compensation (or "offsets"). However, the
 234 primary issue with Lake Sturgeon in the Kelsey to Kettle reach of the Nelson River
 235 appears to be low population numbers as a result of the historic commercial fishery.
 236 Low population numbers as a result of past harvest are most effectively addressed
 237 through the addition of individuals to the population, to increase the number of adult
 238 spawners (in the long term) and the capacity of the population to maintain itself or
 239 grow. Information on the current state of the sturgeon populations in the Kelsey to
 240 Kettle reach of the Nelson River is provided below. A summary description of the
 241 approach employed in project design and the development of mitigation to address
 242 effects to Lake Sturgeon is also provided.

243 **2.1 Stocking to Recover Lake Sturgeon Populations**

244 As discussed in the AE SV, stocking is one of the key strategies that has been employed
 245 to recover Lake Sturgeon populations. Even in the absence of further hydroelectric
 246 development, the Partnership believes that recovery of the population of Lake Sturgeon
 247 in the reach of the Nelson River between the Kelsey and Kettle generating stations
 248 would be difficult without stocking. The AE SV describes what is known about current
 249 trends in populations in Section 6.3.3 (p. 6-28) as follows:

250 *"Certain characteristics of the lake sturgeon's life history, such as a variable*
 251 *spawning interval for males and females, long time to maturity, and longevity*

252 *(greater than 60 years), make it difficult to determine current population trends*
253 *over the relatively short period during which investigations were conducted. The*
254 *presence of young fish indicates that recruitment is occurring. However,*
255 *although habitat in the Clark Lake to Stephens Lake area currently supports all*
256 *the life history requirements for lake sturgeon, population estimates are low,*
257 *and the long-term sustainability of this population is uncertain. Numbers may be*
258 *increasing in the Split Lake area, increasing the likelihood of the persistence of*
259 *this population, if other factors (such as mortality) remain constant. The*
260 *extremely small numbers of spawning sturgeon at Gull Rapids makes it unlikely*
261 *that the Stephens Lake group is presently a self-sustaining population."*

262 Additional information on the status of these populations is provided below:

263 Total numbers of adults

264 The total numbers of adults in both the upper Split Lake areas and Gull Lake areas are
265 lower than in other areas where sturgeon populations appear to be more secure. AE SV
266 Table 6-1 (reproduced below) provides a summary of sturgeon population estimates at
267 various locations in Manitoba. Although it is difficult to estimate what a "healthy"
268 population would be for these reaches, the numbers for all but one of the other
269 populations are substantially larger.

AE SV Table 6-1. Adult¹ lake sturgeon population estimates with 95% confidence limits for the study area and water bodies in Northern and Southern Manitoba

Location	Year	Estimate	95% Confidence Limits	
			Lower	Upper
Study Area^a				
Keeyask Area (Birthday Rapids to Gull Rapids)	2001	406	330	638
	2002	344	246	666
	2003	550	429	861
	2004	481	316	876
	2005			
	2006	1,275	875	2,078
	2007			
	2008	643	384	1,178
	Split Lake Area	2001	183	122
2002		228	106	735
2003		-	-	-
2004		-	-	-
2005		592	245	1815
2006		505	325	947
2007		654	527	975
2008		-	-	-
2009		585	478	824
Other Manitoba locations				
Conawapa Area (Nelson River below Limestone GS) ^a	2004-2005	5,467	3,768	8,018
Churchill River (confluence of Churchill and Little Churchill rivers) ^{2,b}	2003	1,812	1,304	2,320
Fox River (Rainbow Falls to Great Falls) ^{3,b}	2004	646	312	980
Winnipeg River (Seven Sisters-Slave Falls) ^{4,c}	1997	2,998-	1,143	13,101
Winnipeg River (Slave Falls-Pointe du Bois) ^{5,c}	2007	2,205	921	4,095
1. Adult fish were ≥ 834 mm fork length. 2. After Maclean and Nelson (2005). 3. After Pisiak and Maclean (2007). 4. After Block (2001). 5. Estimates from data collected during Pointe du Bois Modernization Project studies (2007-2009). a. Estimated using the Robust Design (Kendall and Pollock 1992). b. Estimated using the Peterson Method (described in Krebs 1989). c. Estimated using the Jolly-Seber Method (described in Krebs 1989).				

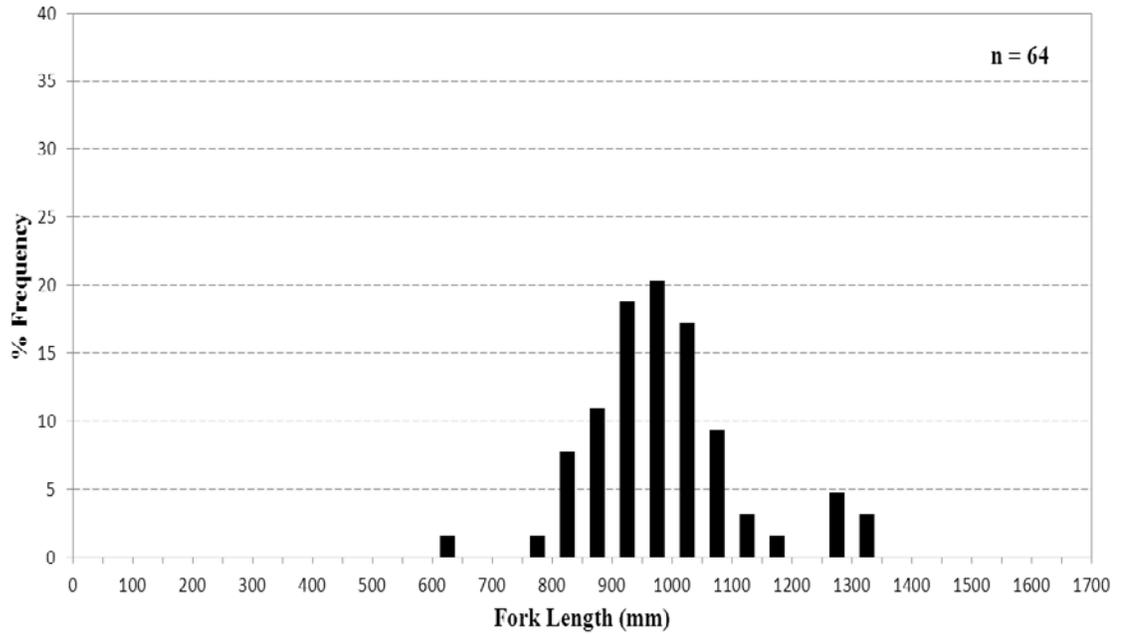
270

271 Number and length distribution of fish captured on spawning grounds

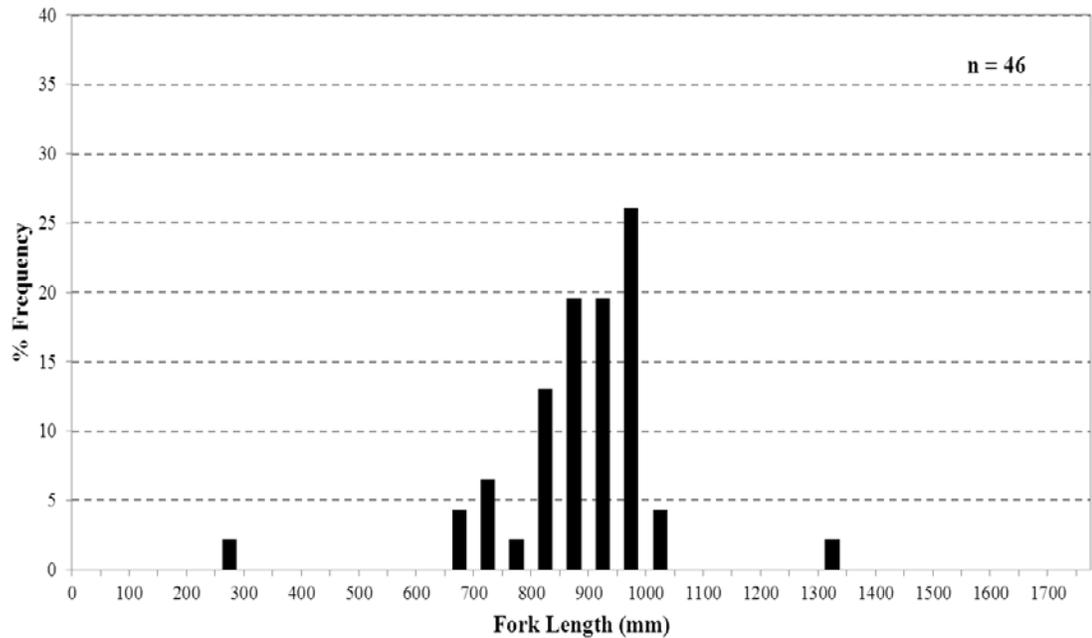
272 Figures 1 to 6 provide length frequency and total numbers of sturgeon captured during
273 gillnetting surveys conducted in spring on known spawning grounds on the Burntwood
274 River below First Rapids (Figure 1), the Nelson River below the Kelsey Generating Station
275 (Figure 2), near Long and Birthday Rapids (Figure 3), below Gull Rapids (Figure 4), below
276 Lower Limestone Rapids on the lower Nelson River (Figure 5), and at the rapids on the
277 Weir River, a tributary of the lower Nelson River (Figure 6).

278 The Weir River supports by far the largest number of spawners (305 captured) and a
279 substantial number of fish are over 1000 mm in length. Fewer fish were captured at
280 Lower Limestone Rapids (88) but many were larger than 1,000 mm. These are two
281 spawning locations used by the Conawapa area population and represent what is
282 considered to be a "healthy" population. In contrast, only 49 sturgeon were captured at
283 the three spawning locations sampled in the Clark to Stephens Lake reach, though it
284 should be noted that a few large (greater than 1000 mm) fish were present. With so few
285 fish distributed over several potential spawning locations (and not all fish were
286 spawning in the year of sampling), the total potential production of YOY is small.

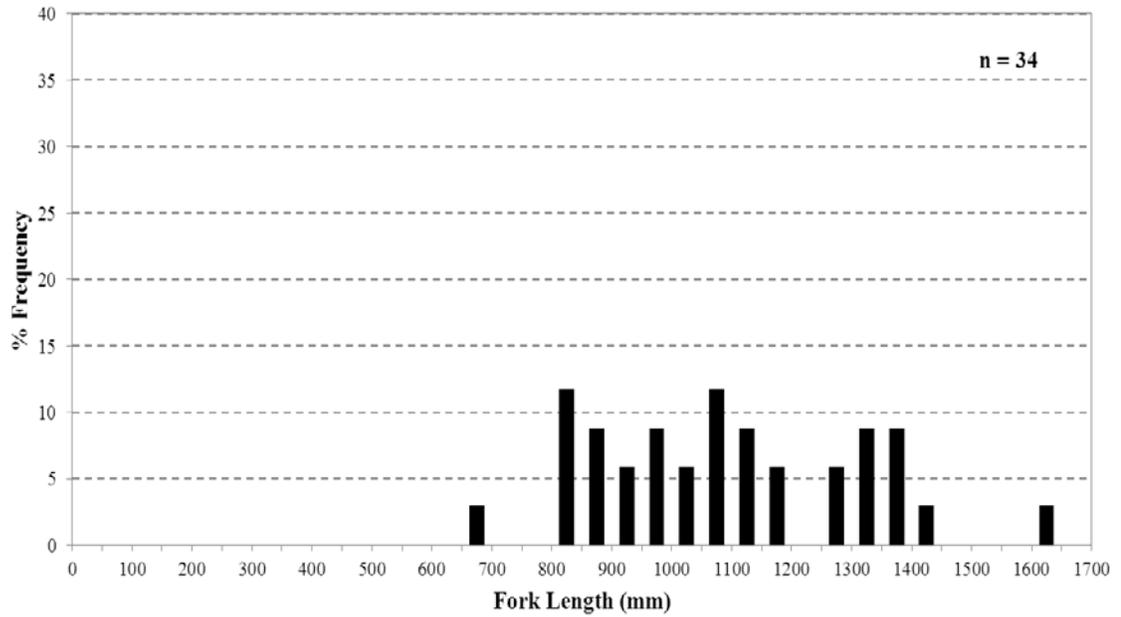
287 More sturgeon were captured in the Burntwood River (64) and in the Nelson
288 downstream of Kelsey (46) than in the Keeyask area, but few fish were larger than 1,000
289 mm, and almost all of the fish in the Burntwood were males (females generally take
290 longer to mature and so are larger) and no spawning fish were identified downstream of
291 Kelsey. Therefore, despite a greater abundance than in the Keeyask area, the current
292 potential production of YOY from the upper Split Lake area is small.



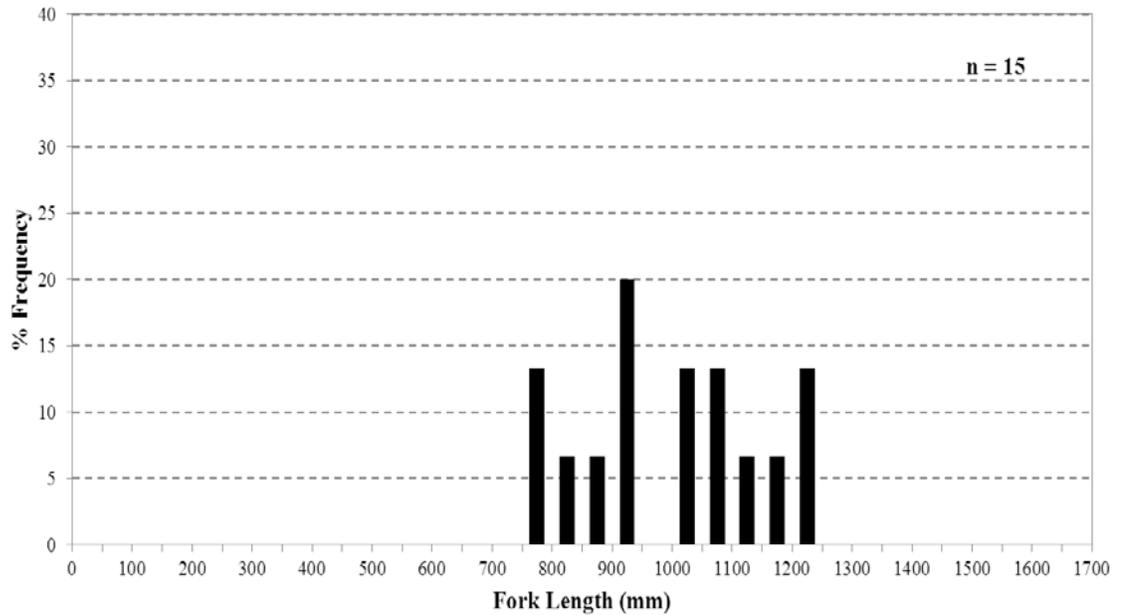
293
 294 Figure 1.Length-frequency distribution for Lake Sturgeon captured in large mesh gillnet gangs
 295 set in the Burntwood River during spring, 2011 (Hrenchuk and McDougall 2012).



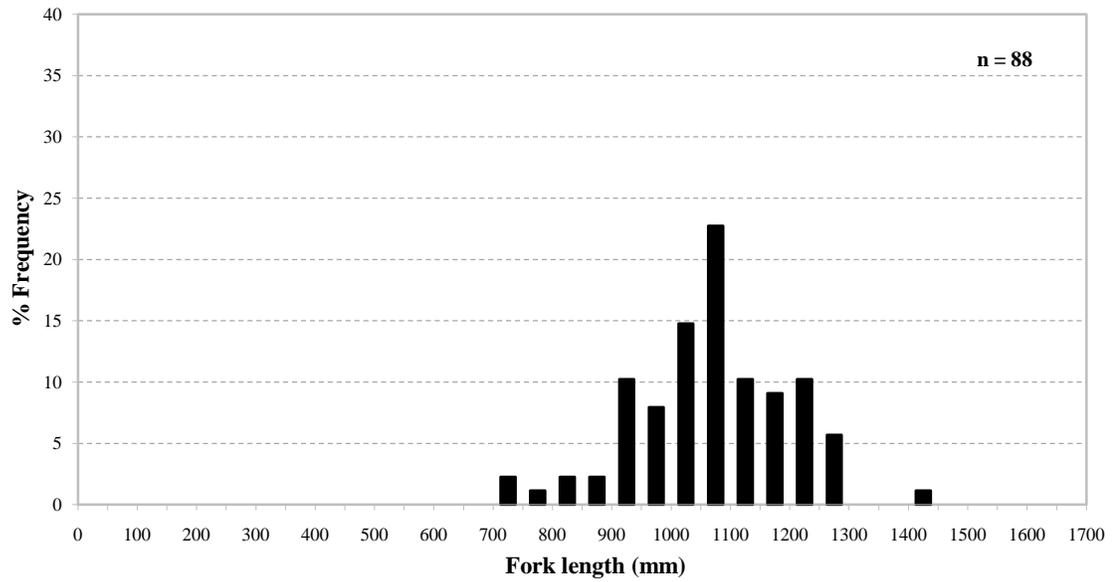
296
 297 Figure 2.Length-frequency distribution for Lake Sturgeon captured in large mesh gillnet gangs
 298 set in the Kelsey GS Area during spring, 2011 (Hrenchuk and McDougall 2012).



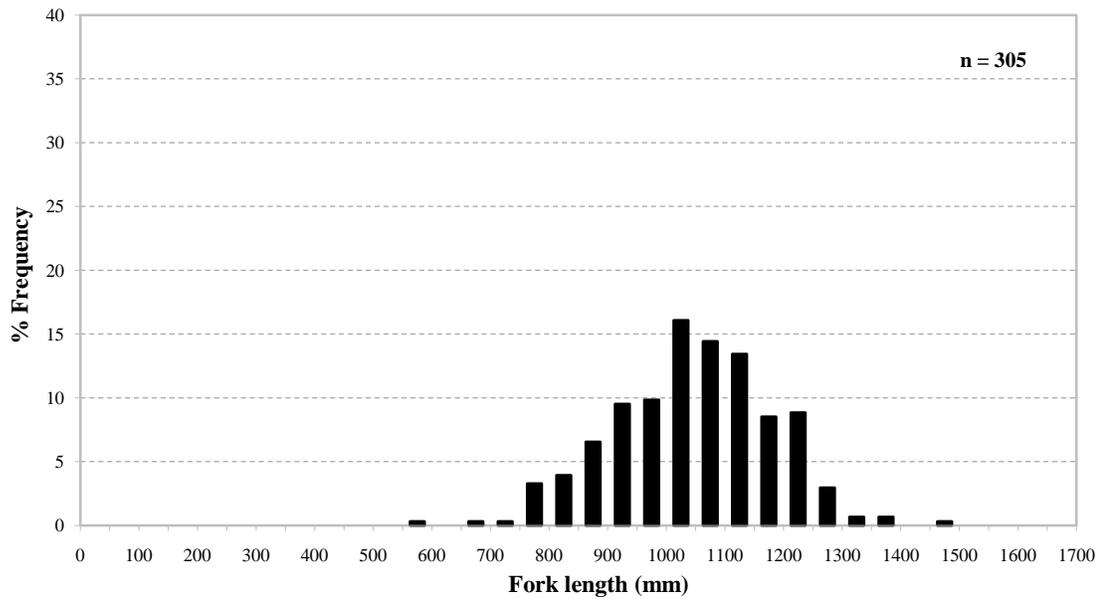
299
 300 Figure 3.Length-frequency distribution for Lake Sturgeon captured in large mesh gillnet gangs
 301 set in the Nelson River between Clark Lake and Gull Rapids during spring, 2011 (Hrenchuk and
 302 McDougall 2012).



303
 304 Figure 4.Length-frequency distribution for Lake Sturgeon captured in large mesh gillnet gangs
 305 set in Stephens Lake within 6 km of Gull Rapids during spring, 2011 (Hrenchuk and McDougall
 306 2012).



307
 308 Figure 5. Length-frequency distribution for lake sturgeon captured in gill net and set lines fished
 309 below the Lower Limestone Rapids in the Nelson River during spring 2006 (Ambrose et al.
 310 2008).



311
 312 Figure 6. Length-frequency distribution of lake sturgeon captured in gill nets fished within the
 313 Weir River during spring 2006 (Ambrose et al. 2008).

314 Year class strength

315 Intensive monitoring for young sturgeon in Gull and Stephens lakes has been conducted
 316 since 2008. In 2008, YOY sturgeon were captured in an area of suitable habitat in the
 317 northern channel of Gull Lake. The 2008 year class has been observed in subsequent
 318 years in surveys conducted in both Gull and Stephens lakes. However, few if any fish in
 319 other year classes have been observed, indicating that recruitment is absent or marginal
 320 in most years. In contrast, in the Slave Falls reservoir on the Winnipeg River, which
 321 supports a larger population, some recruitment was observed in every year when young
 322 fish (up to ten years of age) were sampled (Koga et al. 2013).

323 Taken together, the small total population size, the numbers and sizes of individuals
 324 present on the spawning grounds, and year-class strength indicate that the Lake
 325 Sturgeon populations in the upper Split Lake, Keeyask area, and Stephens Lake have
 326 limited potential to produce substantial numbers of young fish in the near future, and
 327 thus are vulnerable to decline in the absence of stocking, even if no further
 328 hydroelectric development occurs.

329 **2.2 Project planning and development of mitigation**

330 In developing plans for the Keeyask Generation Project, the Partnership considered
 331 economic, social and environmental factors. As indicated by the reviewer, consideration
 332 of environmental effects began in project design, then considered mitigation to reduce
 333 or eliminate harmful effects, and finally provided compensation where such effects
 334 could not be avoided or reduced.

335 The planning process extended over several decades and is summarized in the Response
 336 to EIS Guidelines Section 4.5 and described in detail in the Project Description
 337 Supporting Volume Section (PD SV) Section 6.0. In considering development options for
 338 the reach of the Nelson River between Split and Stephens lakes, one key consideration
 339 was avoiding effects to water levels on Split Lake. As described in the PD SV, Section
 340 6.3.3, the reservoir elevation and Project location that was ultimately selected flooded
 341 less land and existing aquatic habitat than the other options, and also maintained
 342 largely unaffected riverine habitat between Clark Lake and Birthday Rapids, providing
 343 for the preservation of some lake sturgeon spawning habitat immediately upstream of
 344 the future reservoir. As discussed in PD SV Section 6.4, several options for the axis of the
 345 generating station were considered. The proposed axis was selected for several reasons,
 346 and it was recognized that this option provided a better opportunity for developing
 347 replacement lake sturgeon spawning habitat than other options. At the request of
 348 Fisheries and Oceans Canada in 2012, alternate axes for the spillway were re-examined
 349 to determine whether existing lake sturgeon spawning habitat in Gull Rapids could be
 350 maintained; however, as discussed in Section 6.4, given the post-Project flow conditions,

351 it was felt that Lake Sturgeon would likely not be able to access spawning habitat
 352 further up Gull Rapids during spills, and there was a greater risk of fish stranding after
 353 spillway operation.

354 After the basic parameters of the Project were established, means by which effects of
 355 the Project could be mitigated were identified and evaluated (PD SV Section 6.13). For
 356 example, selection of the turbine specifications considered factors that reduced the
 357 injury and mortality of fish. Stranding of fish following spillway operation will be
 358 mitigated through the construction of channels to connect isolated pools to
 359 permanently wetted habitat in the main spillway channel that provides a connection to
 360 Stephens Lake. The approach to fish passage as mitigation is discussed in Section 3.0 of
 361 this response.

362 Plans to compensate for habitat lost due to the construction and operation of the
 363 Project focus on spawning and YOY habitat. These are described in detail in the AE SV
 364 Appendix 1A.

365 3.0 Fish Passage as mitigation

366 Question:

367 *It is felt that KHLP should consider Best Available Technology (BAT) for fish protection as*
 368 *part of the EIS. A concern is expressed that there should have been more consideration*
 369 *paid to both upstream and downstream fish passage technology and approaches*
 370 *especially for sturgeon. Recent work conducted in the US on diverting downstream*
 371 *migrating sturgeon (e.g., angled bar or trash racks) by the Alden Labs (e.g., Amaral*
 372 *2008), and on upstream passage at the Conte Labs (e.g., Kynard et al. 2012) are not*
 373 *discussed. Furthermore, recent efforts by the USFWS on both upstream and downstream*
 374 *fish passage facilities for two hydro facilities in WI are also not referenced nor discussed*
 375 *(Utrup 2011). Both upstream and downstream systems proposed have been approved*
 376 *for implementation for Lake Sturgeon protection in WI by the Federal Energy Regulatory*
 377 *Commission (FERC). It is felt that protection options should be considered as part of this*
 378 *EIS rather than a follow-up program after the facility is constructed given the current*
 379 *status of Lake Sturgeon and potential cumulative effects issue which is discussed below.*
 380 *If a simple bypass structure and technology such as angled screens are not considered*
 381 *during the planning stage it may be too costly to install after the facility is constructed.*
 382 *The concern is a fragmented population of Lake Sturgeon on the Nelson River.*

383 *Therefore, it is requested that KHLP provide some further analysis as to the feasibility*
 384 *and efficacy of fish passage technologies.*

385 *A concern is expressed Recovery means re-establishing a self-sustaining population, and*
 386 *stocking in the absence of suitable habitat will not achieve that.*

387 3.1 Identification of fish passage options

388 Best available technology (BAT) is taken to mean using the best methods available,
389 recognizing that technologies to address environmental effects are evolving as the
390 knowledge base for Lake Sturgeon in the Project area, as well as other areas, continues
391 to increase. Apart from continuing to gather data and develop mitigation measures
392 directly related to the Keeyask Project (e.g., updating Lake Sturgeon population
393 estimates, conducting movement studies with recently developed long term acoustic
394 tags, and conducting stocking trials), Manitoba Hydro supports many Lake Sturgeon
395 research projects and both Manitoba Hydro and its consultants stay abreast of the latest
396 developments in other jurisdictions through attendance at conferences (e.g., 7th
397 International Symposium on Sturgeon – 2013; Great Lakes Lake Sturgeon Coordination
398 Meetings) and through maintaining professional contacts with other sturgeon experts.

399 Fish passage has been discussed in relation to the Keeyask Project since the start of the
400 environmental studies (see AE SV Appendix 1A Section 1A.3.2.1 for a detailed
401 discussion). In 2004, a preliminary evaluation of existing approaches to upstream and
402 downstream passage was carried out to determine their feasibility, conceptual design,
403 and likelihood of success. Based on the results of this evaluation, six different options
404 for a “nature-like” bypass channel that would provide both passage and constructed
405 compensatory habitat were assessed. As discussed in Appendix 1A, this option was not
406 pursued further due to various technical issues and uncertainty that non-migratory
407 species of fish (e.g., Lake Sturgeon) would successfully pass.

408 The Partnership then undertook a second assessment of available upstream fish passage
409 design concepts, with the goal of identifying one that could be modified to meet the fish
410 passage needs of the Project. Manitoba Hydro retained a fish passage consulting team,
411 and working together they assessed existing methods for volitional upstream passage.
412 As a result of uncertainties associated with the Project, particularly in relation to how
413 fish will behave following its construction, the study recommended a phased approach
414 to upstream fish passage. Specifically, provisions would be made for the retrofit of
415 upstream fish passage alternatives in the future. While the study was not completed in
416 time for inclusion in the EIS, a report presenting potential passage options was provided
417 with the response to TAC Round 2 DFO-0048, and has been included with the CD of
418 technical reports provided with this submission.

419 Discussions with Fisheries and Oceans Canada (DFO) and Manitoba Conservation and
420 Water Stewardship (MCWS) following submission of the EIS have further clarified the
421 proposed approach to fish passage, highlighting the importance of obtaining
422 scientifically defensible data to form the basis of decisions. Additional information is
423 provided in CEC Rd 1 CEC-0026.

424 The reviewer listed several references to fish passage/exclusion that the reviewer felt
 425 should have been considered in the EIS; it should be noted that the draft supporting
 426 documents for internal review were completed in spring 2010 (with minimal additions
 427 thereafter) and that several of the publications were after this date. However, the
 428 Partnership is aware of the work that is being conducted. Mr. D. Pugh, one of the
 429 researchers involved in the study of cultured sturgeon on the prototype side-baffle fish
 430 ladder, presented the current status of the study at a workshop conducted by the
 431 Partnership in 2011. The Partnership is familiar with the concept of louvered trashracks
 432 to direct fish to bypass facilities; however, as discussed in AE SV Appendix 1A Section
 433 1A.3.1.9.1, the selected method of downstream passage is via the turbines and
 434 therefore trashracks are not being used to exclude fish. The Partnership is also aware of
 435 the fish passage work being conducted on the Menominee River. It should be noted that
 436 this is an experimental approach. As noted by the Coscarelli et al. (2011, p. 4) at a
 437 workshop to examine methods to enhance lake sturgeon passage at hydroelectric
 438 facilities on the Great Lakes:

439 *"Additionally, the design, development, and implementation of structures that*
 440 *pass lake sturgeon around hydroelectric facilities are comparatively lacking.*
 441 *More specifically, very few solutions for accomplishing successful upstream and*
 442 *downstream sturgeon passage have been tested through a systematic*
 443 *examination of variation in physical stream conditions and technical*
 444 *modifications that best interact with the complex behavior of migrating adults,*
 445 *juveniles, and larvae."*

446 In the absence of both established methods for providing upstream and downstream
 447 passage to Lake Sturgeon, and uncertainties at the Keeyask site in relation to the
 448 behavioral response of sturgeon to construction of the dam, the phased approach
 449 proposed by the Partnership (with input from DFO and MCWS) appears the best suited
 450 to the development of the best approach to fish passage in the long term.

451 While evaluating the suitability of available fish passage alternatives for the Project,
 452 Manitoba Hydro and its fish passage consultants also assessed existing downstream fish
 453 passage methods for their feasibility and likelihood of success. The study concluded that
 454 as a result of high uncertainty associated with the success of current downstream
 455 passage options, and because the Keeyask turbine designs had been modified to reduce
 456 mortality rates of fish passing through them, the best available approach to
 457 downstream fish passage would be through the turbines (and spillway, when in
 458 operation). If monitoring reveals that turbine passage is not as successful as predicted,
 459 alternative measures to permit downstream passage, such as catch/trap and transport
 460 and a nature-like bypass along the bank of the Nelson River, will be examined. Due to
 461 the technical difficulty and high cost associated with designing a downstream fish pass

462 system into the station itself, a downstream bypass within the station will not be
463 considered for this Project.

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1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Executive Summary; p. 25**

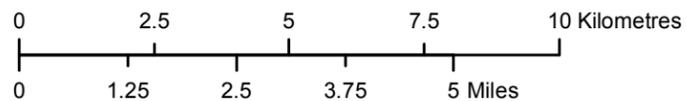
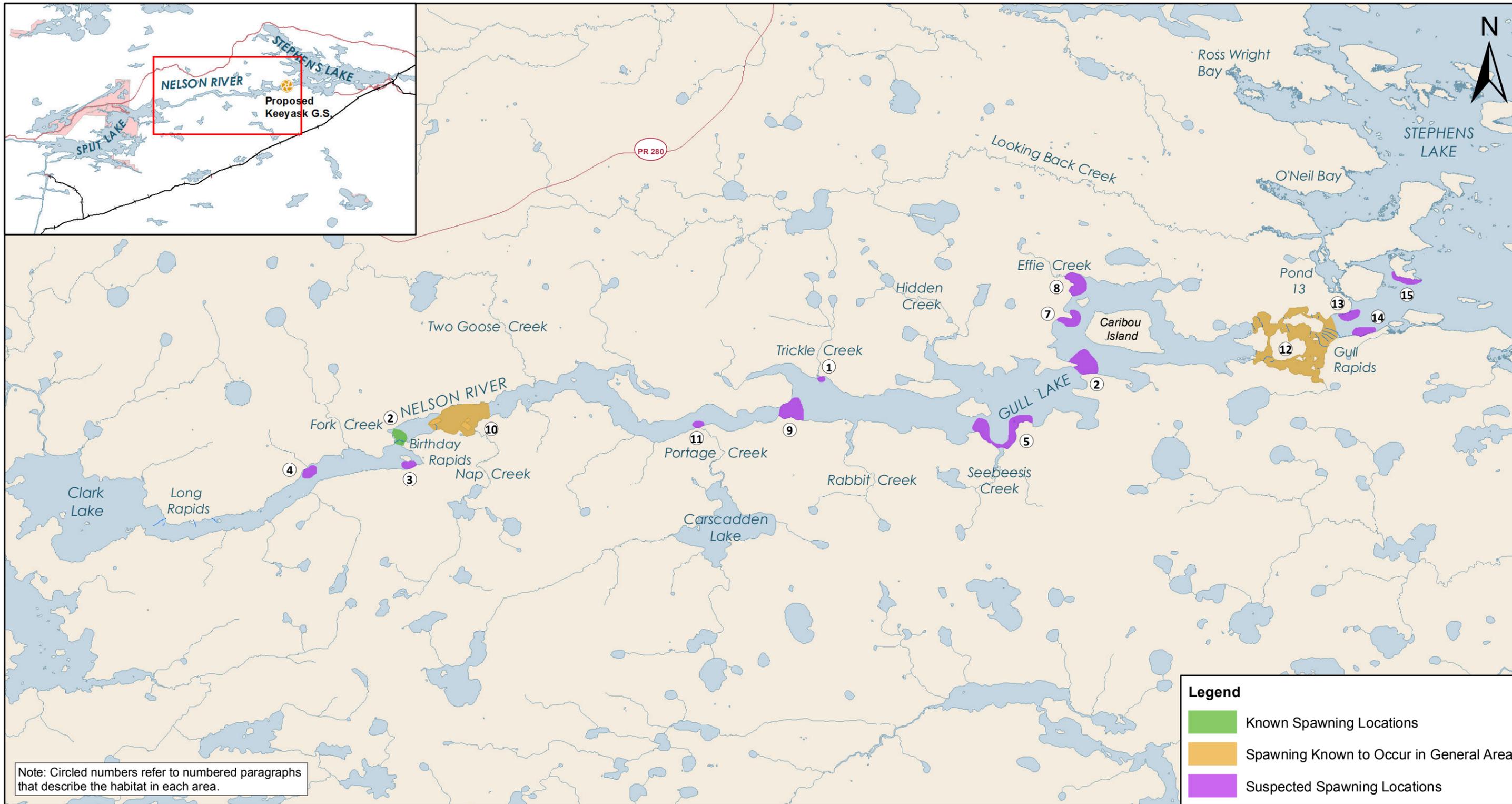
3 **CEC Rd 1 CEC-0032**

4 **QUESTION:**

5 On page 25, it is proposed that walleye and whitefish spawning shoals will be
6 constructed near existing spawning sites. Can KHLP indicate in the EIS or in supporting
7 documentation where the existing spawning sites are?

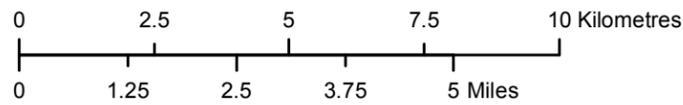
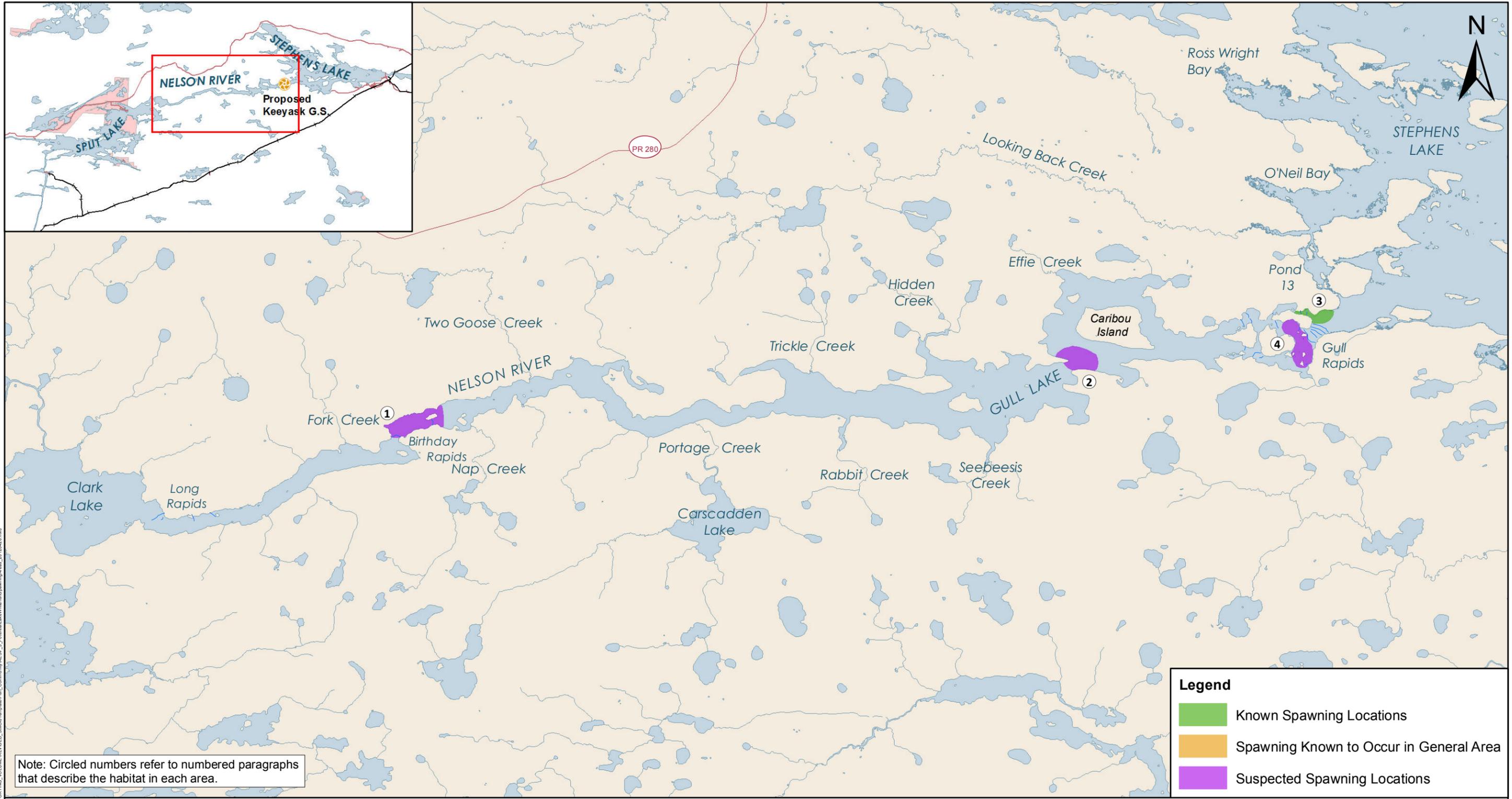
8 **RESPONSE:**

9 A description of the specific locations of spawning habitat and a summary of the
10 evidence to support this conclusion are provided in the Aquatic Environment Supporting
11 Volume Appendix 5D. The requested maps for the Keeyask area are Map 5D-2 (walleye)
12 and Map 5D-8 (lake whitefish) and are attached here for reference purposes.



Projection: UTM Zone 15, NAD 83
 Data Source: NTS base 1:50 000
 Stephens Lake Shoreline - Quickbird@Digitalglobe, 2006
 Nelson River Shoreline modelled by Manitoba Hydro

Potential Walleye Spawning Areas Keeyask Area



Projection: UTM Zone 15, NAD 83
 Data Source: NTS base 1:50 000
 Stephens Lake Shoreline - Quickbird@Digitalglobe, 2006
 Nelson River Shoreline modelled by Manitoba Hydro

Potential Lake Whitefish Spawning Areas Keeyask Area

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1.0 Introduction; Appendix 1A Section 1A.3.1.7.2; p. 1A-13**

3 **CEC Rd 1 CEC-0033**

4 **QUESTION:**

5 The statement is made that: "Stocking effectively improves natural recruitment by
6 ensuring survival through the very young life history stages, thereby bypassing a
7 significant portion of mortality that occurs in wild fish populations. In the case of the
8 Project, this will be particularly important as suitable habitat for rearing of YOY Lake
9 Sturgeon may not exist initially in the reservoir." Can KHLP provide more details on YOY
10 sturgeon habitat?

11 **RESPONSE:**

12 Lake Sturgeon spawn in rapids of large rivers and, after they hatch, larval fish remain in
13 the substrate for two to three weeks before emerging and drifting downstream until
14 they settle to the bottom again. Whether habitat suitable for rearing can be accessed by
15 drifting larval sturgeon is thought to be critical for determining reproductive success.
16 Young-of-the-year (YOY) is the least understood Lake Sturgeon life stage throughout its
17 range due to the challenge of sampling these small fish in the deep channels of rivers
18 that appear to provide preferred habitat. General information on YOY (rearing) habitat
19 is provided in AE SV Appendix 6A.2.3.

20 Information on YOY habitat in the existing environment in the Clark Lake to Gull Rapids
21 reach of the Nelson River (location of the proposed Keeyask reservoir) is provided in the
22 AE SV Section 6.3.2.3.1 (p. 6-16) and is reproduced below.

23 "Young-of-the-year lake sturgeon appear to have more specific habitat
24 requirements compared to sub-adult and adult sturgeon which, by virtue of
25 their larger size, can exploit a wider range of water velocities, substrates and
26 larger prey for feeding. Young-of-the-year lake sturgeon show a preference for
27 lower velocities with a sand or sand/gravel substrate (Appendix 6A).

28 Field studies have only located lake sturgeon rearing habitat in Gull Lake. Young-
29 of-the-year lake sturgeon were captured north of Caribou Island (the lake's
30 largest island) in habitats characterized by deep, low velocity water on soft
31 substrates (Table 6-6 and Table 6-8, Map 6-10 to Map 6-13). Average water
32 depth and velocity measured at YOY capture sites in 2008 ranged from 7.6 m to
33 10.4 m and 0.24 metres per second (m/s) to 0.51 m/s, respectively; substrate
34 consisted primarily of sand with some silt/clay. The most frequently occurring
35 prey items in a sub-sample of YOY sturgeon captured in 2008 were

36 Ephemeroptera, Trichoptera (caddisflies), Chironomidae, and Plecoptera
37 (stoneflies) larvae (Table 6-9). These are common diet items of YOY lake
38 sturgeon captured in other locations (Appendix 6A).

39 Under 5th, 50th, and 95th percentile flow scenarios, HSI models for lake sturgeon
40 rearing habitat in the existing environment indicate that there is a WUA of
41 between 199 ha and 220 ha from the outlet of Clark Lake down to Gull Rapids
42 (Map 6-14 to Map 6-16; Appendix 6D). High suitability habitat (HSI greater than
43 or equal to 0.5) accounts for 54–64 ha. Most high or very high suitability habitat
44 is located in the downstream portion of Gull Lake on the north side of Caribou
45 Island, where YOY were captured during environmental studies. Due to the
46 specific habitat requirements of larval lake sturgeon, survival of larvae hatched
47 at Birthday Rapids likely depends on their being transported by the currents into
48 this part of Gull Lake where velocities and substrates appear to be the most
49 suitable for feeding.”

50 Information on the effects of the Project and planned mitigation for the Keeyask
51 reservoir are presented in AE SV Section 6.4.2.2.2 (p. 6-36) and reproduced below:

52 “Different life history stages of sturgeon appear to have different requirements
53 for foraging habitat, with younger fish having more specific habitat needs than
54 older fish (Appendix 6A). In the Nelson River between Clark Lake and Gull
55 Rapids, YOY lake sturgeon were captured in deep, low velocity water over a
56 mostly sand substrate in the downstream portion of Gull Lake on the north side
57 of Caribou Island during environmental studies (Section 6.3.2.3.1). The existing
58 environment HSI model for lake sturgeon rearing habitat show the reach
59 between Clark Lake and Gull Rapids as having a WUA of between 199 and 220
60 ha (Section 6.3.2.3.1). However, almost all high quality habitat (HSI greater than
61 or equal to 0.5; 54–64 ha) is located in the downstream portion of Gull Lake on
62 the north side of Caribou Island, where YOY lake sturgeon were captured during
63 environmental studies. The post-Project HSI model predicts a total rearing
64 habitat WUA of between 445 and 637 ha. However, the amount of high quality
65 rearing habitat for the reservoir is predicted to be lower (WUA=16–19 ha; Map
66 6-47 to Map 6-49; Appendix 6D). Furthermore, YOY access to the high quality
67 habitat also is expected to be reduced given the increased area of the reservoir
68 and the loss of moderate currents on which larvae currently rely to transport
69 them to favourable rearing habitat in the lower end of Gull Lake. Because of
70 this, it is uncertain whether the post-Project rearing habitat will be accessible to
71 drifting larval sturgeon. Post-Project monitoring will be conducted to determine
72 YOY distribution and abundance and, if necessary, contingency works to create

73 sandy habitat suitable for YOY rearing in the reservoir would be implemented;
74 contingency measures are discussed further in Appendix 1A.”

75 Few YOY Lake Sturgeon were captured in Stephens Lake, so the majority of information
76 was derived from habitats where two year old Lake Sturgeon were captured.
77 Information on YOY in Stephens Lake is presented in the AE SV Section 6.3.2.4.2 (p. 6-22
78 to 6-23) and reproduced below.

79 “A habitat survey conducted during summer 2009 near the original Nelson River
80 channel in the western portion of Stephens Lake indicated that there is a large
81 area on the north side of Cabin Island with physical conditions considered
82 suitable for YOY foraging (sand or sand/gravel substrate and low velocity).
83 Gillnetting studies conducted in upper Stephens Lake during fall 2010 confirmed
84 the presence of relatively young (two-year-old) lake sturgeon within this area
85 (Map 6-39; see following section). These fish may have hatched at Gull Rapids
86 (or further upstream) and drifted into this part of Stephens Lake, or may have
87 previously occupied rearing habitat in the 4 km reach between Gull Rapids and
88 Stephens Lake and moved downstream into the area north of Cabin Island to
89 overwinter. Studies of YOY lake sturgeon in other systems have documented a
90 pattern of downstream movement during fall, potentially to locate more
91 suitable (lower) water velocities for overwintering (Appendix 6A). Prior to 2010,
92 limited gillnetting had been conducted in this part of Stephens Lake with mesh
93 sizes small enough, or in water deep enough, to capture YOY lake sturgeon. The
94 absence of YOY from the gillnet catch in this area in 2010 may have been due to
95 too few larval sturgeon being produced that year to be detected; to larval
96 sturgeon not drifting into this portion of the lake; or to other biotic factors (e.g.,
97 predation) that might make this area unsuitable for YOY.

98 Under 5th, 50th, and 95th percentile flow scenarios, HSI models for lake
99 sturgeon rearing habitat in the existing environment indicate that there is a
100 WUA of between 48 ha and 122 ha in upper Stephens Lake with more habitat
101 available under higher flow conditions (Reach 12; Map 6-14 to Map 6-16;
102 Appendix 6D). High suitability habitat (HSI greater than or equal to 0.5) accounts
103 for 14–50 ha, with more habitat available under high flow conditions.”

104 Information on the effects of the Project and planned mitigation is provided in AE SV
105 Section 6.4.2.2.2, p. 6-36 and is reproduced below.

106 “Young-of-the-year lake sturgeon are generally found in shallow or deep water
107 in areas of low velocity over a sand or sand/gravel substrate (Appendix 6A). The
108 existing environment HSI model for lake sturgeon rearing habitat suggests that
109 there is no high suitability habitat (HSI greater than or equal to 0.5) for YOY

110 between Gull Rapids and Stephens Lake (Section 6.3.2.3.2). The capture of 3-
111 month-old (approximate) YOY sturgeon over cobble/boulder substrate along the
112 south shore between the rapids and the lake, suggests that older YOY can
113 survive in what is thought to be less than optimal habitat, or that YOY in this
114 area are occupying microhabitats (e.g., sand/gravel patches behind boulders)
115 that were not detected at the scale that bottom typing sonar data were
116 collected (Section 3).

117 Habitat suitable for YOY sturgeon is present in the western portion of Stephens
118 Lake north of Cabin Island (Section 6.3.2.4.2); analysis of post-Project
119 sedimentation indicates that this area will not be subject to silt deposition
120 during construction or operation (PE SV).

121 Because the number of lake sturgeon residing downstream of Gull Rapids is
122 considerably reduced compared to historic levels, a stocking program will be
123 implemented to avoid possible effects of a temporary reduction in rearing
124 habitat should it occur (Appendix 1A) and potentially increase lake sturgeon
125 abundance in Stephens Lake.

126 Post-Project monitoring of physical conditions (water velocity and substrate
127 development) will be conducted in conjunction with an assessment of YOY and
128 yearling distribution and abundance downstream of the Keeyask GS to ensure
129 that there is sufficient rearing habitat. Should monitoring indicate that high
130 quality rearing habitat is lacking, contingency works to create sandy habitat
131 within the reservoir downstream of the GS would be implemented (Appendix
132 1A)."

133 Detailed information on planned habitat creation for YOY sturgeon is provided in the AE
134 SV Appendix 1A and discussed in CEC Rd 1 CEC-0029.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **Appendix 5C Human Health Risk Assessment; p. 5C-1**

3 **CEC Rd 1 CEC-0034**

4 **QUESTION:**

5 The initial draft of the Human Health Risk Assessment was peer reviewed (Section
6 5.3.3.2, Socio-Economic/Resource Use Volume). Will this finalized version be/has been
7 peer reviewed?

8 **RESPONSE:**

9 The final version of the Human Health Risk Assessment (HHRA), as filed in Supplemental
10 Filing # 1 on April 26, 2013, will not be peer reviewed as there was no alternation or
11 modification to its methodology, analysis of risk assessment or conclusions. Upon
12 request from Health Canada, the Final HHRA removed text related to consumption
13 recommendations (see response to TAC Public Rd 2 HC-0002).

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: N/A; p.**
 2 **N/A**

3 **CEC Rd 1 CEC-0035**

4 **PREAMBLE:**

5 **FIRST NATIONS CUMULATIVE EFFECTS ASSESSMENTS OF THE PROPOSED**
 6 **KEYYASK GENERATION PROJECT**

7 Manitoba Hydro, in collaboration with four Manitoba First Nations, i.e., Tataskweyak
 8 Cree Nation (TCN), York Factory First Nation (YFFN), Fox Lake Cree Nation (FLCN) and
 9 War Lake First Nation (WLFN), have formed the Keeyask Hydropower Limited
 10 Partnership (KHLPP) to develop the proposed Keeyask Generation Project and the
 11 Keeyask Infrastructure Project

12 In a letter dated June 6, 2012 from V. Spence, Manager of Future Development, TCN, to
 13 T. Sargeant, Chair, Manitoba Clean Environment Commission with regard to the
 14 proposed Bipole III Transmission Project, it was stated that substantial hydroelectric
 15 development has occurred within the Split Lake Resource Management Area (SLRMA).
 16 “Existing hydroelectric development includes 35 major projects which cover a footprint
 17 of 124,000 acres of land – an area comparable to the City of Winnipeg. It is TCN’s
 18 position that Manitoba Hydro has not fully considered the cumulative effects of this
 19 development in the environmental impact statement. By limiting the spatial and
 20 temporal scale of their assessment, the Bipole III EIS fails to consider the impacts of
 21 past, existing, and future projects in their cumulative effects assessment, particularly
 22 those within the SLRMA and our Resource Area. Failure to consider these existing
 23 projects is failure to consider or fully understand the impacts on TCN and its Members.
 24 Furthermore, without a thorough understanding of the cumulative effects, it is difficult
 25 to identify and develop appropriate biophysical and socioeconomic mitigation
 26 strategies.”

27 In an Environmental Review of the proposed Keeyask Generation Project, SLCFN (1996)
 28 provided some details on the effects of hydroelectric development in the SLRMA, as
 29 indicated below:

- 30 • Kelsey Generating Station (GS), which came into operation in 1960, “flooded land
 31 for a distance of 150 kilometres upstream of Split Lake along the Nelson River,
 32 affecting 14,250 acres of northern boreal forest”;
 33 • The “massive hydroelectric developments” in the 1970s altered “the landscape in
 34 ways which were far more dramatic and profound than the effects of the Kelsey
 35 generating station”;

- 36 • The Kettle GS, which began operation in 1970, resulted in the flooding of “over
37 54,000 acres of land including many First Nation traditional harvesting, recreational
38 and cultural sites”;
- 39 • Long Spruce GS, which began operation in 1977, resulted in water level increases of
40 85 feet and the flooding of “over 3,400 acres of Nelson River shoreline and
41 tributaries”;
- 42 • “Only three years after Lake Winnipeg Regulation – Churchill River Diversion, spring
43 and summer flooding in 1979 produced some of the highest water levels on record,
44 with particularly severe impacts on shorelines, wildlife habitat, and domestic
45 harvesting”;
- 46 • “The Churchill River Diversion increased flows down the Burntwood River more than
47 eight-fold, permanently flooding shorelines and adding additional flow down the
48 Nelson River. Over 1500 acres of Split Lake reserve land were taken for Hydro water
49 storage purposes. The opposite effect occurred on the Churchill River, in the north
50 of the resource area, where over 17,000 acres of formerly rugged wilderness
51 shoreline were dewatered and Billard and Fidler Lakes were substantially reduced in
52 size”; and
- 53 • “The spring and early summer flood of 1986, not totally unusual in a state of nature,
54 also caused consternation, as had the earlier flood of 1979, since such floods were
55 contrary to the intended effects of the Hydro regulation scheme. Both domestic and
56 commercial harvesting practices were seriously disrupted as unnatural ice effects
57 and flooding up to five to six feet beyond the norm took their toll. Extreme events
58 such as these also caused many ‘hidden’ effects on plants, insects and wildlife
59 struggling to adapt to the regulated water regime. These are difficult to describe
60 and impossible to quantify”.

61 In addition to the preparation of Environmental Impact Statement (EIS) for the proposed
62 Keeyask Generation Project pursuant to the federal Canadian Environmental
63 Assessment Act (CEAA) and the provincial The Environment Act, the four First Nations,
64 collectively termed the Keeyask Cree Nations (KCNs), prepared separate Keeyask
65 Environmental Evaluation Reports (CNP, 2012; FLCN, 2012; TCN, 2012).

66 Although aware of the requirements of the CEAA and The Environment Act (Manitoba)
67 in assessing the environmental effects of a major resource development project, the
68 Keeyask Environmental Evaluation Reports were not prepared in compliance with these
69 requirements (they did not need to be). Rather, the KCNs have selected their own
70 approaches to the assessment of environmental effects on their communities that are
71 based in their cultural identities and worldviews.

72 The following was stated in the Executive Summary for the proposed Keeyask
73 Generation Project EIS:

74 “The cumulative effects assessment focuses on valued environmental
75 components that will be adversely affected by the Project, based on the effects
76 assessment summarized in Section 5 of this Executive Summary.

77 The Partnership recognizes that the valued environmental component approach
78 as required by the regulatory process does not capture the broader concept of
79 the Cree worldview, which places equal importance on all components of the
80 environment, as all parts are important and interrelated. Further, a cumulative
81 effects perspective is inherent in the Cree worldview, which considers the
82 effects of the Project in the context of everything that is anticipated to happen
83 in the future.”

84 SENES had previously undertaken a review of the cumulative effects assessment
85 undertaken for the terrestrial environment component of the proposed Keeyask
86 Generation Project as presented in the Terrestrial Supporting Document, the EIS and the
87 Executive Summary. This review identified a number of deficiencies particularly with
88 respect to study area coverage of past, existing and future projects, as well as the
89 selection of valued environmental components (VECs) and supporting topics and their
90 carry over to cumulative effects assessment based on determination of negative
91 residual effects.

92 SENES has subsequently reviewed the Keeyask Environmental Evaluation Reports to
93 determine how cumulative effects were assessed by the KCNs based on past, current
94 and future projects, with an emphasis on the terrestrial environment. SENES also
95 reviewed the TCN (2011) “Report on Keeyask Transmission Project” to determine
96 whether cumulative effects were addressed.

97 **FLCN (2012) Environment Evaluation Report**

98 One of the objectives stated in the FLCN (2012) Environment Evaluation Report was:

- 99 • “Describe the known cumulative impacts of successive hydroelectric projects on our
100 people and Aski.”

101 As part of the environmental assessment (EA) of the proposed Keeyask Generation
102 Project undertaken by the KHLP pursuant to the federal CEEA and The Environment Act
103 (Manitoba), VECs were selected to focus the assessment of the significance of adverse
104 effects. Subsequently, the cumulative effects assessment utilized a subset of VECs for
105 which it was determined that there may be a negative residual effect.

106 FLCN (2012) stated that it was “difficult to accept” the VEC process. “The VEC approach
107 of identifying and studying key issues of importance operates on the basis of selecting a
108 number of species for study, often determined by their “at-risk” or “endangered”

109 status"... "By its very nature, the VEC approach tends to ignore the interrelatedness of
 110 people, animals, water, landscape and plants, which are inherent in the way FLCN and
 111 our people view and define Aski. Our people do not place greater importance on certain
 112 species and all are valued equally. The entire Kischee Sipi including Inninuwak, fish, bird,
 113 plants and wildlife all of who use, inhabit and benefit from the river would constitute a
 114 VEC."

115 It is further stated that "Our people define baseline as the condition of the land, waters
 116 and people prior to hydroelectric development which began in the early 1960s. This is in
 117 contrast to Manitoba Hydro's baseline defined as the existing condition of the
 118 terrestrial, aquatic, and socioeconomic environments. Accepting the baseline as the
 119 conditions prior to any hydro development in FLCN's view of how best to understand
 120 and assess how our people and our land and waters will be further impacted by the
 121 proposed Keeyask project."

122 It is also stated that "Our people have been greatly impacted by fifty years of hydro
 123 development and the Keeyask project will further disturb, fragment, and destroy lands
 124 and waters that have been and continue to be used by our Members. FLCN views all
 125 hydro projects, including Keeyask, as one continuous staged process of development
 126 with impacts that are cumulative and long-term."

127 In the section entitled "Brief History of Hydroelectric Development in Northern
 128 Manitoba", FLCN (2012) identifies the various hydroelectric and transmission
 129 developments, and in some instances, their direct impact on the terrestrial
 130 environment, e.g., the flooding of 54,000 acres of land by Kettle GS, over 3,400 acres by
 131 Long Spruce GS and approximately 500 acres by Limestone GS. The Conawapa
 132 Generation Project and Bipole III Transmission Project are also identified as future
 133 projects.

134 Similarly, in the section entitled "Description of the Keeyask Generation Project", FLCN
 135 (2012) identifies the various proposed Project components, and in some instances, their
 136 direct impact on the terrestrial environment, e.g., flooding of 45 km² of lands with
 137 reservoir expansion by approximately 7 to 8 km² during the first 30 years of
 138 hydroelectric generation, and use of borrow areas with a potential surface area of
 139 approximately 1,300 ha.

140 In the "Summary of Cumulative Impacts on Fox Lake's Aski", of the 16 cumulative
 141 impacts listed (most of which are aquatic-related), the only impact on the terrestrial
 142 environment listed is:

- 143 • "The permanent loss or transformation of biologically unique areas."

144 **CNP (2012) Keeyask Environmental Evaluation**

145 The CNP (2012) report presents a similar approach to the EA of the proposed Keeyask as
146 FLCN (2012) as quoted below:

147 *“In evaluating any new development such as the Keeyask Project and in*
148 *determining the resulting impacts, our holistic worldview requires that all of our*
149 *relationships with Mother Earth be considered. Particular species of plants and*
150 *animals or individual relationships cannot be singled out from the remainder*
151 *when assessing the overall impact on harmony and balance in our homeland*
152 *ecosystem, and subsequently on our culture.”*

153 The CNP (2012) report provides little information on cumulative effects. It is stated in
154 Appendix 2 that the “current state of our homeland ecosystem is the result of many
155 post-contact events acting cumulatively on the state of harmony and balance that
156 existed at the time of our first contact with Europeans”. It is further stated that “of all
157 the changes imposed from the outside, the dams, regulation and diversion brought
158 about the largest changes to our physical environment and caused the most severe
159 impacts on our culture by permanently altering the land and waterscapes found in our
160 homeland ecosystem”.

161 **YFFN (2012) Our Voices**

162 YFFN (2012) is primarily a colloquial document presenting comments of First Nation
163 members on their worldview, history, changes and damage to water, land and people
164 due to previous hydro development and the proposed Keeyask Generation Project, the
165 Keeyask partnership, hopes and expectations.

166 There are a few references to cumulative effects as listed below:

- 167 • “Our people have been cumulatively impacted. Over the last 60 years, we have been
168 impacted by our dislocation from York Factory, residential schools, and hydro-
169 development. These impacts have built upon each other and continue today.”
- 170 • “As hydro-electric development now proceeds towards Keeyask, Conawapa and the
171 Bipole projects, we find ourselves living in an ever more compromised and uncertain
172 natural environment – one changed forever and still adapting to the effects of past
173 development.”
- 174 • “When our members talk about Keeyask, we don’t see this project as any different
175 from the changes brought by the overall Churchill/Nelson/Burntwood hydro-electric
176 program. We see Keeyask as a continuation of a larger development project. We are
177 not confident that the exact effects of a new development can be predicted, but we
178 expect Keeyask to add to the changes that we have already experienced – to further
179 destabilize our increasingly compromised environment”.

- 180 • “We have experienced the cumulative changes caused by numerous past” (this
181 sentence on pg. 89 does not carry over to pg. 90).

182 **TCN (2011) Report on Keeyask Transmission Project**

183 TCN (2011) states that “current estimates suggests that 567 hectares of land will be
184 required for the construction of all transmission lines, the Keeyask switching station,
185 future expansion of the switching station, and the construction power transformer
186 station.”

187 The only reference to cumulative effects is as follows:

188 “To date, Manitoba Hydro has built 35 major projects including 13 high voltage
189 power lines, 4 generating stations, roads, rail spurs, 2 airports, and other
190 facilities. We have not only seen but also suffered the immeasurable effects that
191 these projects have had on our traditional lifestyles, which permeates
192 throughout our social, economic, spiritual, and cultural customs and practices.”

193 **Summary**

194 Overall, cumulative effects assessment of the proposed Keeyask Generation Project
195 undertaken by the KCNs was qualitative. This is in contrast to the information provided
196 on past hydroelectric projects by the TCN in their submission to the Manitoba CEC
197 Public Hearing on the Bipole III Transmission Project, specifically in Attachment 1. This
198 document provides a breakdown of the land areas that have been affected by 35
199 Manitoba Hydro and related projects between 1955 and 1994 in the Split Lake Cree
200 Study Area, which corresponds with the SLRMA (see Table 1).

201 Over this time span, 36,322 ha of land were flooded due to hydroelectric generation and
202 other water-related projects and 13,817 ha of land were cleared/alterd by
203 transmission line and other infrastructure projects. This has resulted in a total of 50,139
204 ha of lands affected by Manitoba Hydro projects and other related activities.

Table 1: Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area by Project, 1955 to 1994

Project	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)
1955-59			
Kelsey Rail Spur		184	184
1960-69			
Kelsey GS	5,767	47	5,814
Kelsey GS Airstrip		121	121
Kelsey GS to Thompson 138 kV Transmission Line		559	559
Kelsey GS to Radisson Converter Station (CS) 138 kV Transmission Line		594	594
Tap to Gillam, Kettle GS 138 kV Transmission Line		61	61
Gillam Townsite Expansion		148	148
Split Lake Diesel GS		2	2
1970-79			
Kettle GS (incl. Butnau Diversion)	22,066	408	22,474
Long Spruce GS Rail Spur		103	103
Long Spruce GS to Gillam Road (1971)		157	157
Radisson CS		18	18
Kettle GS to Radisson CS 138 kV Transmission Lines (7 lines)		159	159
HVDC Bipole #1&2 +/-500 kV Transmission Line		4,079	4,079
Kelsey GS to Mystery Lake 230 kV Transmission Line		37	37
Iford to Split Lake Transmission Line		162	162
Kelsey GS to Radisson CS 230 kV Transmission Line		594	594
Sundance Townsite		83	83
Long Spruce GS to Sundance Road (1976)		157	157
Limestone GS Rail Spur		15	15

Table 1: Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area by Project, 1955 to 1994

Project	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)
Henday CS		16	16
Long Spruce GS to Henday CS 230 kV T.L. (3 lines)		206	206
Long Spruce GS to Radisson CS 230 kV T.L. (3 lines)		177	177
Lake Winnipeg Regulation (NFA Easement Land)		790	790
Churchill River Diversion (dewatering)	6,904		6,904
Long Spruce GS	1,376		1,728
Henday CS to Radisson CS HVDC Bipole #2 +/-500 kV		1,594	1,594
Thompson to Split Lake Road		608	608
1980-89			
Split Lake to Long Spruce GS Road		667	667
Radisson CS to Churchill 138 kV Transmission Line		712	712
Radisson CS to Limestone GS138 kV Transmission Line		366	366
Henday CS Collector Lines		60	60
1990-94			
Limestone GS	209	277	486
HVDC Bipole #2 HVDC backup +/-500 kV Transmission Line		69	69
Kelsey GS to Split Lake 138 kV Transmission Line		235	235
Total	36,322	13,817	50,139

205

206 Table 2 is an extension of Table 1 listing additional existing and future developments in
 207 the SLRMA and the Fox Lake Resource Management Area (FLRMA).

Table 2 Lands Affected or to be Affected by Manitoba Hydro Projects and Related Activities in the SLRMA and FLRMA.

Project/Development	Flooding/Dewatering (ha)	Surface Land Use (ha)	Total (ha)
Bipole III Transmission Project			
Keewatinoow Ground Electrode Site			
Ground Electrode Line			
Keewatinoow CS			
Long Spruce GS to Henday CS ac Collector Line			
Henday CS to Keewatinoow CS Collector			
Lines (5 lines)			
Henday CS to Construction Camp Site Power Line			
Start-up Construction Camp Site			
Main Construction Camp Site			
Work Area Site			
Borrow Areas			
Excavated Material Placement Areas			
HVDC Bipole #3 +/-500 kV Keewatinoow CS to western limit of SLRMA			
Keeyask Generation Project/Keeyask Infrastructure Project			
Expanded Reservoir		5200	
North and South Dyke			
Temporary Work Camp			
Construction Camp			
Borrow Areas			
North and South Access Roads			
Other Access Roads			
Excavated Material Placement Areas			
Transmission Tower Spur			
Keeyask Transmission Project			
Construction Power Line and Substation			
Keeyask GS to Radisson CS (3 lines)			
Switching Station			

Conawapa GS

Reservoir

Work/Construction Camp

Borrow Areas

Excavated Material Placement
Areas

Access Roads

Transmission/Construction
Power Lines

Other Infrastructure

Other Developments/Projects

Community of Bird

CN and Abandoned Rail lines

PR 280 Upgrade

Conawapa Road

Access Roads and Trails

Cleared, Borrow and Other
Disturbed Areas

Gillam Redevelopment

Other Developments/Projects

1 **QUESTION:**

2 Table 2 should be completed by Manitoba Hydro and combined with Table 1 to
3 determine the total land area affected or to be affected by Manitoba Hydro projects and
4 related activities in the SLRMA and FLRMA. This would provide a quantitative basis for
5 determining the cumulative effects of past, existing and future projects/activities on the
6 KCNs and the resource areas.

7 **REFERENCES:**

- 8 Cree Nation Partners (CNP) 2012. Keeyask Environmental Evaluation. A Report on the
9 Environmental Effects of the Proposed Keeyask Project on Tataskweyak Cree
10 Nation and War Lake First Nation. 129 p.
- 11 Fox Lake Cree Nation (FLCN) 2012. Environment Evaluation Report. 89 p. Split Lake Cree
12 First Nation (SLCFN) 1996. Analysis of Change
- 13 Split Lake Cree Post Project Environmental Review. Volume One. 96 p.
- 14 Tataskweyak Cree Nation (TCN) 2012. Report on Keeyask Transmission Project. 46 p.
- 15 Tataskweyak Cree Nation (TCN) 2012. Submission by Tataskweyak Cree Nation (TCN) to
16 the Manitoba Clean Environment Commission Public Hearing on the Bipole III
17 Transmission Project. 4 p.
- 18 York Factory First Nation (YFFN) 2012. KIPEKISKWAYWINAN. Our Voices. 133 p.

19 **RESPONSE:**

20 The question states that compilation of the requested information "...would provide a
21 quantitative basis for determining the cumulative effects of past, existing and future
22 projects/activities on the KCNs and the resource areas." This statement is not accurate:

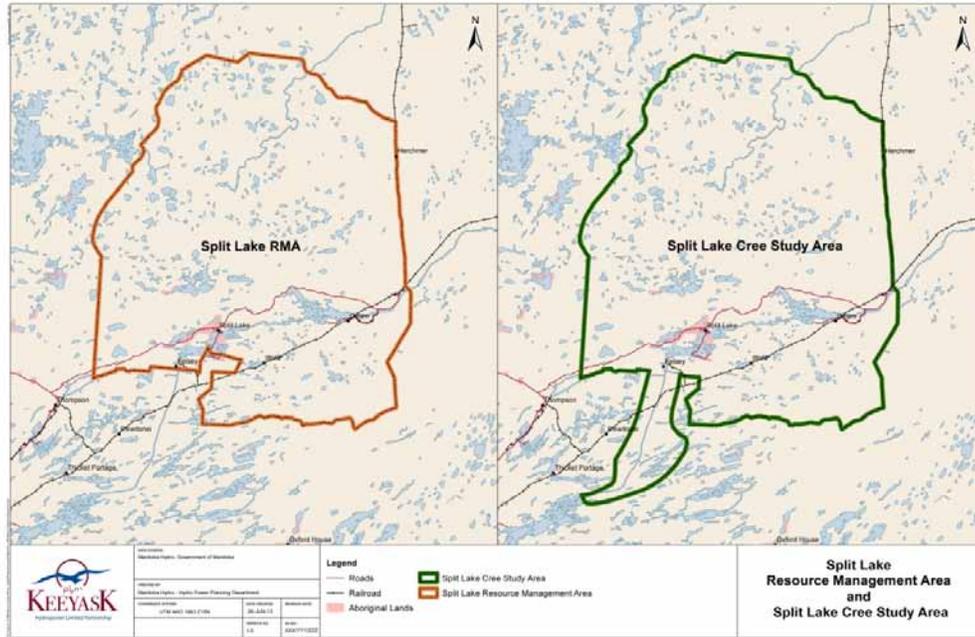
- 23 • The Split Lake Resource Management Area and the Fox Lake Resource Management
24 Area were developed and agreed to as part of negotiated settlement agreements
25 among Manitoba Hydro, Tataskweyak Cree Nation, Manitoba and Canada (in the
26 case of the 1992 Split Lake Comprehensive Implementation Agreement) and among
27 Manitoba Hydro, Fox Lake Cree Nation and Manitoba (in the case of the 2005 Fox
28 Lake Impact Settlement Agreement). The boundaries of these Resource
29 Management Areas are administrative only (based largely on Registered Trapline
30 boundaries) and do not reflect the full traditional territories used by either
31 Tataskweyak Cree Nation or Fox Lake Cree Nation. The traditional territory of York
32 Factory First Nation is also not reflected within the boundaries of these RMAs.
- 33 • The requested information only reflects changes to land area in these specific
34 Resource Management Areas as a result of Manitoba Hydro projects and related
35 activities. Lands affected by other projects in these Resource Management Areas

36 (e.g., development of PR 280 or the CN Rail Line) have not been included, nor have
 37 other activities/policies that may have affected KCNs use of these areas (e.g.,
 38 implementation of the *Natural Resources Transfer Act*). In addition, the information
 39 requested does not capture the nature and magnitude of the subsequent effects to
 40 the biophysical or socio-economic environments, or the integral relationships to
 41 *Askiy* that were affected by past and existing projects and activities (including hydro-
 42 electric developments) or that may be affected by future developments. A full
 43 description of the cumulative effects of past and current projects and activities, as
 44 well as the potential effects of future projects and activities is provided in Chapters
 45 6 and 7 of the Response to EIS Guidelines and documented, from the perspective of
 46 the Cree, in Chapter 2 of the Response to EIS Guidelines and in each of the KCNs
 47 Evaluation Reports. These references also provide an assessment of the potential
 48 for the residual adverse effects of Keeyask to act in combination with those of other
 49 past, current and potential future project and activities.

50 It is asserted that the CNP Environmental Evaluation Report (2012) “provides little
 51 information on cumulative effects.” On the contrary, it is arguable that the entire
 52 Report, based as it is on the Cree worldview, is all about cumulative effects and the
 53 resulting fissures on harmony and balance in THE cnp’S traditional homeland.

54 it is also asserted that cumulative effects assessment of the proposed Keeyask
 55 Generation Project conducted by the KCNs was “qualitative”, in contrast to the
 56 information provided by TCN in its submission to the CEC in 2012. Not only is this an
 57 objectionable characterization of the Reports, and is western centric, but erroneously
 58 implies that, in the TCN CEC submission, the simple addition of a table showing the
 59 physical extent of lands affected by Hydro development somehow makes it a
 60 “legitimate” western style approach to cumulative effects assessment.”

61 Despite the above, the requested information for each of the Resource Management
 62 Areas has been compiled and is provided in the tables below. It is important to clarify
 63 that the Split Lake Cree Study Area, for which information in Table 1 of the question is
 64 summarized, is not the same area as the Split Lake Resource Management Area (RMA).
 65 The Split Lake Cree Study Area is a term defined as part of the report: *History and First
 66 Order Effects: Split Lake Cree Post Project Environmental Review* (Split Lake Cree –
 67 Manitoba Hydro Study Group. 1996a). The area is shown in Figure 3 of that report (and
 68 Table 2 in the report corresponds to the information summarized in Table 1 of the
 69 above question). Although the areas are similar, the Split Lake Cree Study Area has an
 70 area of 4,968,967.90 ha, while the Split Lake RMA has an area 4,316,866.57 ha, or
 71 652,101.33 ha less. The attached figure shows the comparison.



72

73 This discrepancy is explained because Table 2 in the question is not a direct extension of
 74 Table 1 in the question. Therefore, in order to fully address this question two tables
 75 have been produced. Table 3 below provides the requested information on lands
 76 affected by previous Manitoba Hydro projects/activities in the Split Lake Cree Study
 77 Area and Split Lake Resource Management Area and Table 4 displays areas previously or
 78 potentially affected by Manitoba Hydro projects/activities in the SLRMA and FLRMA.

Table 3: Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area and Split Lake Resource Management Area by Project, 1955 to 1994							
	Supplied Area in SLCSA from TCN			Area in SLRMA			Comments
	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	
1955-59							
Kelsey Rail Spur		184	184		31	31	
1960-69							
Kelsey GS	5,767	47	5,814	500	47	547	
Kelsey GS Airstrip		121	121		23	23	
Kelsey GS to Thompson 138 kV Transmission Line		559	559		32	32	
Kelsey GS to Radisson Converter Station (CS) 138 kV Transmission Line		594	594		593	593	
Tap to Gillam, Kettle GS 138 kV Transmission Line		61	61		21	21	
Gillam Townsite Expansion		148	148		85	85	
Split Lake Diesel GS		2	2		2	2	
1970-79							
Kettle GS (incl. Butnau Diversion)	22,066	408	22,474	22,066	408	22,474	WPA Class III lands flooded area
Long Spruce GS Rail Spur		103	103		65	65	CNR siding agreement, no longer used
Long Spruce GS to Gillam Road (1971)		157	157		157	157	Now PR290
Radisson CS		18	18		18	18	
Kettle GS to Radisson CS 138 kV Transmission Lines (7 lines)		159	159		111	111	
HVDC Bipole #1&2 +/-500 kV Transmission Line		4,079	4,079		2,518	2518	

Table 3: Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area and Split Lake Resource Management Area by Project, 1955 to 1994							
	Supplied Area in SLCSA from TCN			Area in SLRMA			Comments
	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	
Kelsey GS to Mystery Lake 230 kV Transmission Line		37	37		37	37	
Iford to Split Lake Transmission Line		162	162		162	162	It is a winter road now
Kelsey GS to Radisson CS 230 kV Transmission Line		594	594		593	593	
Sundance Townsite		83	83		83	83	Now is rehabilitated land
Long Spruce GS to Sundance Road (1976)		157	157		157	157	Now PR290
Limestone GS Rail Spur		15	15		15	15	
Henday CS		16	16		16	16	
Long Spruce GS to Henday CS 230 kV T.L. (3 lines)		206	206		206	206	
Long Spruce GS to Radisson CS 230 kV T.L. (3 lines)		177	177		177	177	
Lake Winnipeg Regulation (NFA Easement Land)		790	790		790	790	
Churchill River Diversion (dewatering)	6,904		6,904	6904		6904	
Long Spruce GS	1,376		1,728	1,376	352	1728	
Henday CS to Radisson CS HVDC Bipole #2 +/-500 kV		1,594	1,594		1,594	1594	
Thompson to Split Lake Road		608	608		608	608	Now PR280
1980-89							
Split Lake to Long Spruce GS Road		667	667		667	667	Now PR280

Table 3: Lands Affected by Manitoba Hydro Projects and Related Activities in the Split Lake Cree Study Area and Split Lake Resource Management Area by Project, 1955 to 1994							
	Supplied Area in SLCSA from TCN			Area in SLRMA			Comments
	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total (ha)	
Radisson CS to Churchill 138 kV Transmission Line		712	712		712	712	
Radisson CS to Limestone GS138 kV Transmission Line		366	366		110	110	
Henday CS Collector Lines		60	60		60	60	
1990-94							
Limestone GS	209	277	486	210	277	487	
HVDC Bipole #2 HVDC backup +/- 500 kV Transmission Line		69	69		69	69	
Kelsey GS to Split Lake 138 kV Transmission Line		235	235		160	160	
Total (ha)	36,322	13,817	50,139	31,056	10,956	42,012	

79

Table 4 Lands Affected or to be Affected by Manitoba Hydro Projects and Related Activities in the SLRMA and FLRMA				
Project/Development	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total(ha)	Comments
Bipole III Transmission Project				
Keewatinow Ground Electrode Site		408.73	408.73	
Ground Electrode Line		46.82	46.82	
Keewatinow CS		120.8	120.8	
Long Spruce GS to Henday CS ac Collector Line		159.82	159.82	
Henday CS to Keewatinow CS Collector Lines (5 lines)		832.6	832.6	
Henday CS to Construction Camp Site Power Line				
Start-up Construction Camp Site		13.8	13.8	
Main Construction Camp Site		27.63	27.63	
Work Area Site		32.15	32.15	
Borrow Areas		259.55	259.55	
Excavated Material Placement Areas		143.45	143.45	
HVDC Bipole #3 +/-500 kV Keewatinow CS to western limit of SLRMA		1584.13	1584.13	
Keeyask Generation Project/Keeyask Infrastructure Project				
Expanded Reservoir	5,159.04		5,159.04	Predicted expanded reservoir at year 30
North and South Dyke	9.94	86.91	96.85	
Temporary Work Camp		11	11.00	
Construction Camp		35.31	35.31	
Borrow Areas	546.70	1,483.96	2,030.65	
North and South Access Roads		585.25	585.25	
Other Access Roads	18.88	129.45	148.33	
Excavated Material Placement Areas	508.01	415.10	923.11	
Transmission Tower Spur		2.71	2.71	
Keeyask Transmission Project				
Construction Power Line and Substation		162.7	162.7	

Table 4 Lands Affected or to be Affected by Manitoba Hydro Projects and Related Activities in the SLRMA and FLRMA				
Project/Development	Flooding/ Dewatering (ha)	Surface Land Use (ha)	Total(ha)	Comments
Keeyask GS to Radisson CS (3 lines)		745.7	745.7	
Switching Station		35.0	35.0	
Conawapa Generation Project				
Reservoir	507		507	
Work/Construction Camp		121	121	
Borrow Areas		748	748	
Excavated Material Placement Areas (EMPAs)		205	205	
Cleared, Borrow and Other Disturbed Areas			0	included in borrow areas, EMPAs and gs and camp data sets
Access Roads		149	149	
Access Roads and Trails			0	included in access roads above
Conawapa Road			0	included in roads above
Other Infrastructure Generating Station (GS)		321	321	
Other Developments/Projects			0	It is included above in Bipole III Transmission Project
Community of Bird			132.5	Reserve = 38.5 ha AirStrip + Townsite around Reserve = 94 ha
CN and Abandoned Rail lines			0	The line is no longer CNR. It is the Hudson Bay Railway.
PR 280 Upgrade			80.26	
Gillam Redevelopment			N/a	Additional area to be used not currently available
Other Developments/Projects				
Total			20706.5	

80

81 **REFERENCES:**

82 Split Lake Cree – Manitoba Hydro Joint Study Group. 1996a. Analysis of Change: Split
83 Lake Cree Post Project Environmental Review. Support from William Kennedy
84 Consultants Ltd. and InterGroup Consultants Ltd. Split Lake Cree – Manitoba
85 Hydro Joint Study Group. Volume 1 of 5

86 Split Lake Cree – Manitoba Hydro Study Group. 1996b. History and First Order Effects:
87 Split Lake Cree Post Project Environmental Review. Support from William
88 Kennedy Consultants Ltd. and InterGroup Consultants Ltd. Split Lake Cree –
89 Manitoba Hydro Joint Study Group: Volume 2 of 5.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0036**

4 **PREAMBLE:**

5 The assessment is deficient in providing a thorough rationale for the selection of valued
 6 ecosystem components (VECs). This is of particular importance because the significance
 7 of residual effects are not assessed for "priority species" that are not VECs. In addition,
 8 cumulative effects were only assessed for VECs, and only those VECs with significant
 9 residual effects. This may lead to an underestimation of potential impacts given that the
 10 larger undertaking was divided into separate EAs for the Keeyask Generation Project,
 11 Keeyask Transmission Project, Keeyask Infrastructure Project, and Bipole III. Selection
 12 criteria (TE-SV, Appendix 1a) do not appear to have been consistently applied across
 13 taxa e.g., all confirmed bird species present in the RSA are considered VECs but not all
 14 mammal SAR.

15 **QUESTION:**

16 The rationale for excluding the following species needs to be provided:

- 17 • Wolverine is present in RSA (25 observations) including LSA (7 observations) but no
 18 detail provided for observations. This species is a federal SAR but not considered
 19 VEC and is sensitive to development and anthropogenic disturbance. The federal
 20 SARA prohibits the killing, harming or harassing of SAR such as wolverine, the
 21 damage and destruction of their residence and the destruction of critical habitat.
- 22 • Culturally significant ruffed grouse are not included as VECs even though upland
 23 habitat for ruffed grouse is limited in the RSA and monitoring is proposed for ruffed
 24 grouse
- 25 • Species that are considered VECs in other related EAs (e.g., Keeyask Transmission,
 26 Bipole III) including yellow rail, short-eared owl, and American marten.
- 27 • Gull and terns (see separate IR).

28 **RESPONSE:**

29 The following are clarified at the outset with regard to statements made in the question:

- 30 • The term "VEC" in the Keeyask EIS (as well as in the other referenced EISs) refers to
 31 Valued Environmental Components;
- 32 • In accordance with guidelines pertaining to each referenced EIS, environmental
 33 effects (including cumulative effects) were only assessed (in the full sense of this
 34 term, including determination of significance) for VECs. However, in the Keeyask EIS,

35 as well as in the other referenced EISs, it is incorrect to state that cumulative effects
 36 were assessed only for "those VECs with significant residual effects". Cumulative
 37 effects assessment (CEA) of the Keeyask Project in combination with other past and
 38 current projects was carried out in Chapter 6 for all VECs. For those VECs indicated
 39 in Chapter 6 to have *any* residual adverse effects from the Project, CEA was
 40 summarized in Chapter 7 with respect to other past and current projects and was
 41 expanded to include future projects and activities where adverse effects of the
 42 Project overlap in space and time with the effects of one or more future projects or
 43 activities [Keeyask Project EIS, Chapter 7, page 7-11]; and

- 44 • Wolverine in the areas affected by the Keeyask Project is not listed by SARA or
 45 MESA and is not afforded protection under these statutes (see below).

46 The number and species of Valued Environmental Components (VECs) selected for each
 47 project (Bipole III, Keeyask Transmission, Keeyask Infrastructure, and Keeyask
 48 Generation) reflect the spatial scale and location of the relevant project, the class of
 49 development, differences in habitat availability, and differences in the potential effects
 50 associated with each independent project. The VECs for the Keeyask Transmission and
 51 Generation Projects (both located in the boreal region) are similar; however, the
 52 Keeyask Generation Project has four additional VECs (wetland function, Canada goose,
 53 mallard and beaver). The Bipole III Transmission Project traverses a high proportion of
 54 the province, so it would be expected that the VECs would not mirror the VECs of
 55 projects located only in the boreal region. Since the projects are different, the VECs for
 56 them are also different.

57 **Valued Environmental Component Selection Process**

58 The process of identifying VECs for the Keeyask EIS involved collaboration with First
 59 Nation Partners, Manitoba Hydro and a team of consultants as well as engagement of
 60 the public and regulators through the Project's Public Involvement Program. As
 61 indicated in Section 5.3.1 of the Response to EIS Guidelines, key issues of importance to
 62 regulatory authorities and people who may be affected by or have an interest in the
 63 Keeyask Generation Project were identified during the scoping step. The VECs selected
 64 included the components with high ecological importance and/or social interest. The
 65 remaining components became the supporting topics (e.g., priority birds, which include
 66 colonial waterbirds). As indicated in the TE SV Appendix 1A, Section 1.6, a potential key
 67 topic in Table 1A-3 became a VEC if:

- 68 • There was potential for substantial Project effects (column A);
- 69 • It is feasible to compile suitable information with a reasonable level of effort
 70 (column B); **and**,

71 **One** of the following was satisfied:

- 72 • The high importance to local people identified in column D includes particularly high
 73 importance to KCNS (two checkmarks in column D); or
 74 • The potential for substantial Project effects in column A refers to a species group
 75 with numerous potentially affected species that are not adequately represented by
 76 another key topic; or
 77 • It was thought to be especially important to terrestrial ecosystem function in the
 78 Keeyask study area (two check marks in column E); or
 79 • It was thought to be a strong indicator for a number of species and/or ecosystem
 80 functions (i.e., an umbrella indicator) (two check marks in column F).

81 The reasoning for not including the following Bipole III Transmission Project VEC species
 82 - wolverine, American marten, ruffed grouse, yellow rail, short-eared owl, and gulls and
 83 terns as VECs for the Keeyask Generation Project is provided below.

84 American Marten

85 Of the selection criteria identified above, American marten met two: it is important to
 86 people and is amenable to scientific study. American marten is not key for ecosystem
 87 function, an umbrella indicator, or a listed species, and while Project effects were
 88 anticipated for this species, including habitat fragmentation, they were not anticipated
 89 to be substantial because it is a common species whose population abundance has
 90 increased since the 1980s in the Keeyask region (Socioeconomic Environment, Resource
 91 Use, and Heritage Resources Supporting Volume (SE SV), Part 3 Heritage Resources
 92 Section 1.4.3.4). Habitat fragmentation and intactness are addressed in Terrestrial
 93 Environment Supporting Volume Section 2.1. In addition, the understanding gained
 94 about habitat fragmentation and intactness for caribou (as an indicator species) is also
 95 applicable to marten.

96 American marten was not a VEC for the Keeyask Transmission Project.

97 Wolverine

98 Wolverine met few criteria for VEC selection. Few are harvested in the Keeyask region
 99 (Resource Use Supporting Volume Section 1.4.3.3), there is limited information about
 100 this species in the Project area, and they are not key for ecosystem function. Wolverine
 101 home ranges are very large (Section 7.4.7.1.1 of the TE SV) and, as such, this species
 102 may qualify as an umbrella indicator. Wolverine, however, does not lend itself to habitat
 103 effects assessment, in part, because it is such a generalist. Similar to marten, habitat
 104 fragmentation concerns are captured by the caribou assessment. Because the Project
 105 Footprint represents a very small portion of the average wolverine home range and only
 106 a few individuals could be affected in the Local Study Area, no substantial Project effects
 107 are anticipated for this species.

108 Mammal species at risk are considered those listed by the federal *Species at Risk Act*
109 (SARA) and/or Manitoba's *The Endangered Species Act* (MESA). As indicated in Section
110 7.3.5.4.5 of the TE SV, the western population of wolverine is not listed under SARA
111 (Schedule 1), nor is it listed by MESA. Wolverine is considered a species of Special
112 Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC),
113 and is recognized as a rare species in the Keeyask region (Section 6.2.3.4.7 on p. 6-126
114 Response to EIS Guidelines). Wolverine are trapped in the Split Lake RMA (SE SV, Part 3
115 Heritage Resources Section 1.4.3.4 Section 1.4.3.3).

116 Ruffed Grouse

117 Ruffed grouse are at the northern extent of their range relative to the Keeyask Regional
118 Study Area. The species is captured under 'other priority bird species', consistent with
119 application of the criteria established for VECs. As outlined in Table 1A-3, ruffed grouse
120 were seen to have the potential for substantial Project effects, although it was thought
121 that suitable information could be compiled. However, due to their low numbers in the
122 area and breeding range limitations they were not considered to have particularly high
123 importance to local people, including the KCNs. Ruffed grouse are also not key to
124 ecosystem function, and not an umbrella indicator. As a species near the outer limit of
125 its range and one dependent on uncommon environmental conditions, it was selected
126 as a priority bird, and one that would be monitored during Project construction and
127 operation.

128 Yellow Rail

129 Although the breeding range of Yellow rail (special concern, SARA Schedule 1 and
 130 COSEWIC) includes the Regional Study Area, none have been detected despite
 131 conducting over 10 years of breeding bird surveys and two years of nocturnal surveys in
 132 potential yellow rail habitat. Yellow rail breeding habitat is considered limited within the
 133 Regional Study Area. Marginal habitat occurs in bogs, which in the Keeyask Regional
 134 Study Area includes open areas of low vegetation on peatlands. This habitat type is
 135 considered marginal for yellow rail due to the invasion of woody vegetation such as
 136 tamarack. In the north, large coastal fens are considered preferred habitat for yellow rail
 137 (COSEWIC 2009). Due to weak Project linkages (low potential to be affected by the
 138 project), the yellow rail was screened out of the VEC selection process. Instead, it was
 139 discussed in detail as a supporting topic (priority birds⁵).

140 Short-eared Owl

141 The short-eared owl (special concern, SARA Schedule 3 and COSEWIC) is a ground
 142 nester, known to breed in large open habitats such as grasslands, wet meadows, and
 143 fens. Short-eared owl is uncommon in the region and considered a migrant or non-
 144 breeding visitor (Manitoba Naturalists Society 2003). Suitable breeding habitat for short-
 145 eared owl does not occur within the Local Study Area. Potential short-eared owl
 146 breeding habitat occurs in the large areas of low vegetation located along the peripheral
 147 boundaries of the Regional Study Area. Since no suitable nesting habitat occurs within
 148 the Local Study Area (where Project effects are expected to occur) weak Project linkages
 149 screened the short-eared owl out of the VEC selection process. This species was
 150 discussed in detail as a supporting topic (priority birds).

151 Gulls and Terns

152 Gulls and terns are captured as colonial waterbirds under 'other priority bird species'
 153 due to their dependence on 'uncommon environmental conditions' (i.e., sparsely
 154 vegetated islands and reefs). There is potential for substantial Project effects to the
 155 nesting colonies within Gull Rapids. However, they are not viewed as essential to
 156 terrestrial ecosystem function, are not seen as a strong indicator species, and recent
 157 trends indicate that populations are increasing in Manitoba (Sauer et al. 2012). While
 158 they are recognized as being important to local people, they were not found to have
 159 particularly high importance to the KCNs. The EIS examined in detail the potential

⁵ Priority birds are defined as those native species that are rare, ecologically sensitive in some way, near the outer limit of its range, a keystone species, critical to the survival or reproduction of another species and/or valued by people. A species is considered to be ecologically sensitive if it has low reproductive capacity, dependent on uncommon environmental conditions, dependent on the natural disturbance regime or highly sensitive to disturbance.

160 effects of the Project on gulls and terns during construction and operation, and set out
161 mitigation measures that will be implemented to minimize or avoid potential effects on
162 these priority birds.

163 **REFERENCES:**

164 COSWEIC. 2009. COSEWIC assessment and status report on the Yellow Rail *Coturnicops*
165 *noveboracensis* in Canada. Committee on the Status of Endangered Wildlife in
166 Canada. Ottawa. vii +32pp.(www.sararegistry.gc.ca/status/status_e.cfm).

167 Manitoba Naturalists Society. 2003. The Birds of Manitoba. Friesens Printers, Altona,
168 Manitoba, Canada. pp.504.

169 Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link.
170 2012. The North American Breeding Bird Survey, Results and Analysis 1966 -
171 2011. Version 07.03.2013 USGS Patuxent Wildlife Research Center, Laurel, MD

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0037a**

4 **PREAMBLE:**

5 The conclusion that residual effects from the Keeyask Generation Project on caribou are
 6 "expected to be adverse, small to medium in extent, long term in duration, and small in
 7 magnitude." and that "there is a moderate to high degree of certainty in the
 8 assessment" is not supported by the evidence presented in the EA, which has significant
 9 deficiencies with respect to:

- 10 1. Evaluation of status of summer resident caribou;
- 11 2. Assessment of effects of summer resident caribou and their habitat;
- 12 3. Assessment of effects on migratory caribou and their habitat; and
- 13 4. Proposed Mitigation.

14 **Status of Summer Resident Caribou**

15 The Response to EIS Guidelines (R-EIS) and the Terrestrial Environment Supporting
 16 Volume (TE-SV) characterize the caribou that use the RSA as:

- 17 1. Barren-ground caribou from the Beverly-Qamanirjuaq herd
- 18 2. Coast caribou from the Cape Churchill and Pen Islands
- 19 3. Summer resident caribou.

20 According to the TE-SV (p.7-60) these "summer resident caribou are "a type of
 21 woodland caribou whose exact range and herd association is uncertain". The Project is
 22 north of the currently defined boundary of forest-dwelling woodland caribou ecotype in
 23 Manitoba (Manitoba Conservation 2006), however these summer resident caribou
 24 exhibit calving behaviour typical of forest-dwelling woodland caribou, calving singly
 25 instead of in large aggregations. According to the TE-SV, the summer resident caribou
 26 are conservatively estimated to number 20 -50 individuals, which is similar in size to the
 27 Owl-Flintstone Range that Manitoba Conservation (MC) is actively trying to conserve
 28 (Environment Canada 2012; Manitoba Conservation 2011).

29 According to FLCN (2101, p. 48) caribou were historically abundant in the local area and
 30 were harvested year round, and were the primary source of red meat. FLCN Traditional
 31 Knowledge Report (2010) recognizes the three ecotypes and has separate names for
 32 them based on behaviour, distribution, and morphology. The summer resident caribou
 33 may belong to the previously described Nelson-Hayes population of boreal woodland

34 caribou, and that this herd has not completely amalgamated with the coastal Pen Island
35 population.

36 Genetic studies indicated that most barren-ground caribou genotypes were found north
37 of the Nelson River from 2004 to 2006 (Ball and Wilson; TE-SV 7-63), but the
38 relationship between coastal woodland caribou ecotype and summer resident caribou
39 remains to be clarified. There is some evidence from collaring data that some individuals
40 may calve in the RSA but not in all years, potentially calving near the coast in
41 subsequent years and no results yet available from preliminary DNA work conducted by
42 MC and partners (S. Vick, Manitoba Conservation, pers. comm.). No collaring or genetic
43 work appears to have been conducted by the proponent for the Keeyask GS, particularly
44 summer collaring of resident caribou (i.e. those calving on Stephens Lake). Recent
45 collaring data conducted by Manitoba Conservation, Bipole III, or the Ontario Ministry of
46 Natural Resources are generally not discussed in any detail in the Keeyask EIS.

47 The status of these summer-resident caribou has potential implications with respect to
48 relevant legislation i.e., SARA, MESA and associated recovery strategies/plans.

49 **QUESTION:**

50 **Effects on Summer Resident Caribou**

51 Regardless of how they are classified, there is potential for Project-related effects on
52 summer resident caribou at the range level and below, and for calving/nursery habitat.
53 A number of major deficiencies in analysing potential impacts on habitat of forest-
54 dwelling are identified:

- 55 1. The southern portion of the Zone 6 RSA does overlap with portions of the ranges of
56 two identified forest-dwelling woodland caribou ranges i.e. Wapisu (MB8) and
57 Manitoba North (MN9). Potential direct or indirect impacts of this project on these
58 ranges is not discussed or assessed.
- 59 2. No annual range has been delineated for the summer resident caribou using
60 Stephens and Gull Lakes and the EA lacks sufficient supporting evidence to
61 determine the adequacy of the RSA (Zone 6) for characterizing such a range,
62 particularly given that some forest-dwelling woodland caribou females move 200-
63 500 km from wintering areas to calving sites (Environment Canada 2011, p. 74).
64 Furthermore, although the RSA for caribou is listed as Zone 6 (TE-SV, p 1-21),
65 cumulative effects on intactness were calculated for Zone 5 (TE-SV, p 1-20) not Zone
66 6, so the level of overall disturbance in the caribou RSA is unclear.
- 67 3. Calving and winter habitat modeling was conducted for forest-dwelling woodland
68 caribou calving habitat and winter habitat for Bipole III and includes the northern
69 half of the Keeyask GS caribou RSA. This modelling could presumably have been
70 extended to include the entire Keeyask caribou RSA and been incorporated in the

- 71 TE-SV. No justification is given for the summer resident caribou habitat models
 72 presented in the TE-SV i.e., primary calving/rearing islands defined as >10 ha. Was
 73 this based on data collected for Stephens and Gull Lakes? Attributes of used and
 74 unused calving islands in the RSA are not presented e.g., size, forest type, distance
 75 from shore, proximity to other islands, terrain, etc. This information is required to
 76 evaluate the statement in the CE-SV (p. 7-30) that "The small loss of calving habitat
 77 that will occur in the Local Study Area will in part be offset by an increase in the
 78 number of smaller islands in the Keeyask reservoir."
- 79 4. Environment Canada (2011) has shown that the probability of persistence of forest-
 80 dwelling woodland caribou population can be predicted by the proportion of
 81 anthropogenic disturbance on a range using a 500 m buffer. In the TE-SV (p 131),
 82 low use linear features were buffered only 200 m (Mace et al 1996) whereas
 83 Environment Canada uses 500 m for all anthropogenic disturbance. Existing,
 84 disturbance levels for Keeyask might therefore be underestimated.
 - 85 5. The TE-SV (pp. 6-370) states that that "because changes to intactness will be
 86 negligible" and that "The Project will not contribute to measurable changes in
 87 caribou intactness of the RSA". The TE-SV predicts cores being >80% in Zone 5, but
 88 Zone 6 is the caribou RSA (and it may not accurately reflect the range) and the
 89 buffers used in the analysis were not consistent with Environment Canada (2011a).
 90 No benchmark or threshold for acceptable level of existing disturbance and
 91 additional level of disturbance was identified. EC (2011a) indicates that landscapes
 92 with more than 35% disturbed have a lower probability of persistence.
 - 93 6. The TE_SV states that "because changes to intactness will be negligible, effects on
 94 caribou will likely be negligible". Although disturbance is associated with lower
 95 probability of persistence, impacts can still potentially occur below the range level.
 96 Although 500 m was used for EC persistence models, other studies have shown
 97 disturbance effects at much greater (e.g. 10 km) from anthropogenic activities.
 98 Potential impacts on caribou from project activities e.g. sensory disturbance during
 99 construction, potential increases in hunter mortality from increased access, changes
 100 in predator prey dynamics from linear disturbance.
 - 101 7. Calving islands. The TE-SV states (7-61) "potential calving habitats are common in
 102 the Regional Study Area, and habitat does not appear to be limiting to the summer
 103 resident cows and calves". The fact that only a small proportion of available habitat
 104 is used is not the point, since the anti-predator strategy of forest-dwelling woodland
 105 caribou is to spread out a low density across the landscape (i.e., one would expect
 106 low numbers and low densities). It appears Stephens Lake is a regionally significant
 107 calving lake, with some on calving on Gull Lake as well. Caribou are potentially most
 108 sensitive during calving/nursery; impacts from construction and increased boat
 109 access on both Gull and Stephens Lake are poorly quantified and it is unsure if
 110 mitigation is sufficient.

111 8. Cumulative impacts from all foreseeable projects are not adequately addressed. The
 112 EA states that the Keeyask Generation Project will reduce linear feature density
 113 (Response to EIS 6-325). However, it is clear that the Keeyask Transmission Project,
 114 the Bipole III Transmission Project, and the Keeyask Infrastructure Project are
 115 dependent upon each other and are part of the same overall undertaking. The net
 116 effect will be increased linear feature density in the RSA which needs to be clear in
 117 the cumulative effects section since it will negatively impact caribou. The statement
 118 in the Cumulative Effects Assessment (TE-SV p 7-29) "most effects of the Project will
 119 be negligible to small, particularly since habitat currently appears to be
 120 underutilized" is unsubstantiated and does not reflect the current understanding of
 121 woodland caribou ecology (e.g., bottom-up up versus top-down population
 122 regulation).

123 **RESPONSE:**

124 The conclusions in the Response to EIS Guidelines regarding Project effects on summer
 125 resident caribou are fully supported by the evidence. Review of this evidence, which is
 126 provided below, does not support the assertions in the above text that there are
 127 significant deficiencies with regard to the evaluation of status of summer resident
 128 caribou (topic 1) or the assessment of effects of summer resident caribou and their
 129 habitat (topic 2).

130 Each of the items identified in the topic 2 question above is repeated (in italics) and
 131 addressed in turn below (any material topic 1 issues are addressed in the process).

132 1. *The southern portion of the Zone 6 RSA does overlap with portions of the ranges of*
 133 *two identified forest-dwelling woodland caribou ranges i.e. Wapisu (MB8) and*
 134 *Manitoba North (MN9). Potential direct or indirect impacts of this project on these*
 135 *ranges is not discussed or assessed.*

136 Please refer to TAC Public Rd 1 EC-0032b (appended below for reference) for
 137 information regarding the Project effects assessment on boreal woodland caribou that
 138 include Wapisu and Manitoba North ranges. The assessment confirms that the Project
 139 will have no habitat loss, fragmentation, caribou harvest or predation effect on the
 140 portions of the Wapisu and Manitoba North ranges that overlap the Regional Study
 141 Area.

142 2. *No annual range has been delineated for the summer resident caribou using*
 143 *Stephens and Gull Lakes and the EA lacks sufficient supporting evidence to*
 144 *determine the adequacy of the RSA (Zone 6) for characterizing such a range,*
 145 *particularly given that some forest-dwelling woodland caribou females move 200-*
 146 *500 km from wintering areas to calving sites (Environment Canada 2011, p. 74).*
 147 *Furthermore, although the RSA for caribou is listed as Zone 6 (TE-SV, p 1-21),*

148 *cumulative effects on intactness were calculated for Zone 5 (TE-SV, p 1-20) not Zone*
149 *6, so the level of overall disturbance in the caribou RSA is unclear.*

150 The available evidence explains why the annual range could not be delineated, the basis
151 for selecting Study Zone 6 as the regional study area for caribou, and that calculation of
152 cumulative effects on intactness for Zone 6 results in a lower level of overall disturbance
153 in the caribou RSA than the Response to EIS Guidelines calculations for Zone 5.

154 Project-specific study zones were delineated to assess potential Project effects on the
155 terrestrial environment. The boundaries of Study Zones 1 to 3 were defined relative to
156 potential Project effects, and those of Study Zones 4 to 6 were defined by repeating
157 sequences of landscapes, key boreal ecological processes and populations of most
158 resident wildlife species, and the fire regime area, respectively (see pp. 1-17 of the TE
159 SV). As indicated in Section 1.3.5 of the TE SV, an area that was large enough to capture
160 the local population (i.e., the regional zone of influence) was used to assess potential
161 Project effects on caribou. The spatial extent of the regional zone of influence became
162 the Caribou Regional Study Area (Study Zone 6). Study Zone 6 was the area needed to
163 characterize the fire regime, and was large enough to include a target population in the
164 order of hundred(s) of animals so that population viability could be considered.

165 Based on caribou detections and the use of calving habitat over the lower Nelson River
166 area, more caribou are expected to calve in Study Zone 6 compared to the conservative
167 estimate of 20-50 individuals that was identified mainly using Study Zone 4. There is a
168 higher degree of confidence in the local estimate of this sub-population based on the
169 number of individuals identified using trail cameras. Assuming that there is a similar
170 quality of calving habitat distributed throughout the landscapes in study zones, if the
171 density of 20-50 summer resident caribou in Study Zone 4 is extrapolated to Zones 5
172 and 6, the total summer resident population would be estimated at 128-320, and 275-
173 688 animals, respectively. Another estimate that may be derived from Manitoba North
174 density and range estimates (Environment Canada 2011), and extrapolated to Zones 5
175 and 6, produces more conservative estimates (Table 1).

Table 1 - Caribou population estimates using Zone 4 data and the 'Manitoba' range estimate extended to Zones 5 and 6

	Size (ha)	20 animals	50 animals
Zone 4	221509	20	50
Zone 5	1420000	128	320
Zone 6	3050000	275	688
	Size (ha)	775 animals	1585 animals
Manitoba*	14958322	775	1585
Zone 4	221509	11	23
Zone 5	1420000	73	150
Zone 6	3050000	158	323

* Environment Canada 2011 estimate of boreal woodland caribou identified as "Manitoba" are not defined by radio-collaring range estimates.

176 Study Zone 6 was chosen as the regional study area for all caribou to account for the
 177 large ranges of migratory herds, and to include Pen Islands and potentially Cape
 178 Churchill animals that calve in the general region, but was not intended to represent
 179 their entire ranges. Radio-collaring data indicate that the annual range size of summer
 180 resident Pen Islands caribou is roughly 40,000 km², which is larger than the Regional
 181 Study Area (Study Zone 6 is 30,500 km²). However, the Regional Study Area is larger
 182 than 11 of the 13 currently identified boreal woodland caribou ranges in Manitoba,
 183 including the Wapisu range. As indicated in Section 5.3.1 of the Response to EIS
 184 Guidelines (EIS), the study areas selected were large enough to capture the effects of
 185 the Project, but not so large as to mask the effects of the Project (by making the effects
 186 of the Project as a percent of the area appear small). While Study Zone 6 may not reflect
 187 the actual winter range of summer residents, it is sufficient to assess Project effects on
 188 calving and rearing and winter habitat in the Keeyask region.

189 If the overall level of disturbance in Study Zone 6 is calculated using linear feature
 190 density and Environment Canada's critical habitat model for boreal woodland caribou,
 191 both linear feature density and the amount of disturbed caribou habitat are reduced.
 192 Linear feature density, a benchmark measure of the level of disturbance, declines from
 193 0.45 km/km² (Study Zone 5) to 0.23 km/km² (Study Zone 6). Cumulatively, with other
 194 future projects, linear feature density would decline from 0.48 km/km² (Study Zone 5) to
 195 0.24 km/km² (Study Zone 6).

196 Using the Environment Canada (2012) method for calculating critical caribou habitat,
 197 the level of disturbance declines from 35.6% disturbed (Study Zone 5) to 33.9%
 198 disturbed habitat (Study Zone 6). Cumulatively, with other future projects⁶, the level of
 199 disturbance declines from 37.3% disturbed (Study Zone 5) to 34.7% disturbed habitat
 200 (Study Zone 6). As the size of the study areas increase, or if the geographic location of

⁶ Considers Keeyask GS, Gillam Redevelopment, Bipole III, and Keeyask Transmission Project

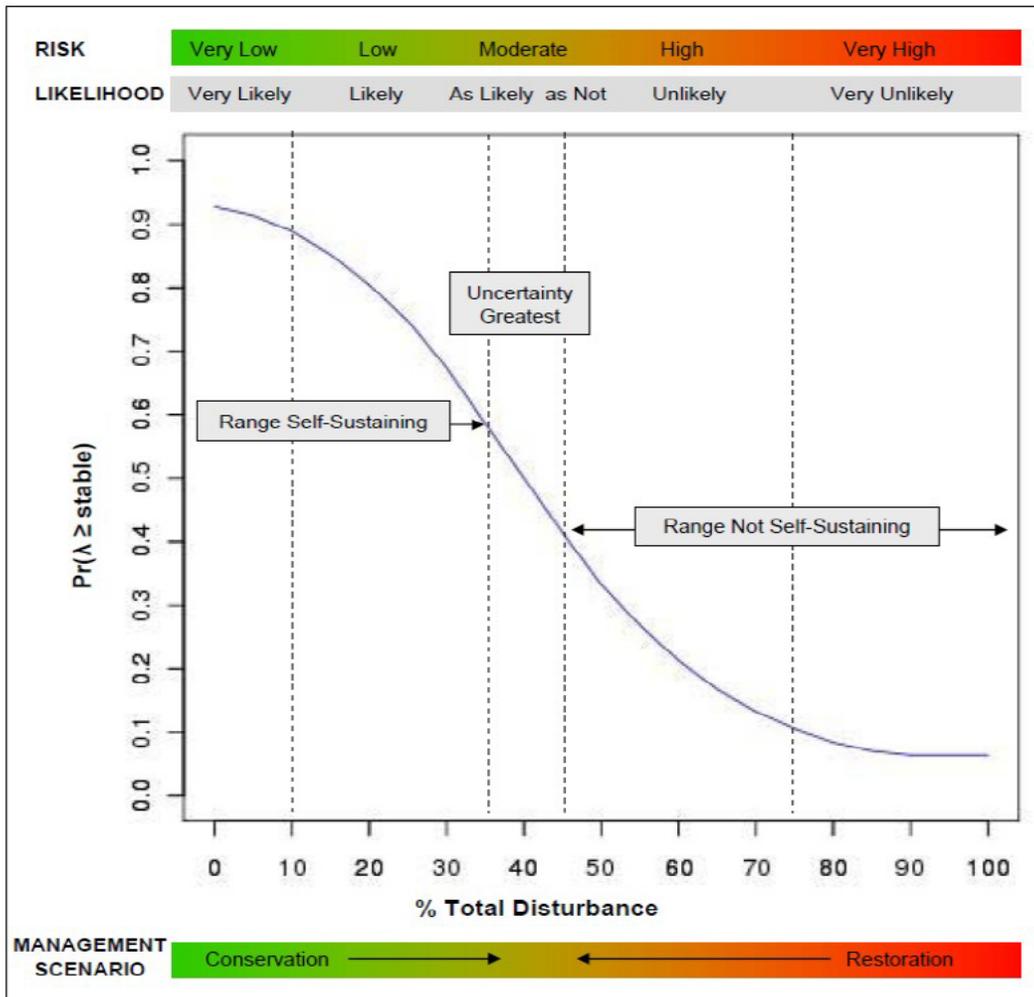
201 the study areas shift (e.g., radio-collared Pen Island caribou summer core ranges, which
 202 are shifted east of Study Zone 6 (see CEC Rd 1 CEC-0037b)), the overall level of
 203 disturbance tends to decrease. This indicates that intactness (i.e., undisturbed caribou
 204 habitat) improves when considering a broader region in northern Manitoba. Using the
 205 most conservative estimate of 158 animals in the Caribou Regional Study Area (Zone 6),
 206 it is important to note that in both cases, and hypothetically, if all the caribou were
 207 classified in Zone 6 as boreal woodland caribou, together with the broader conservative
 208 population estimate, this group of animals would likely be defined as Self-Sustaining⁷.

209 Study Zone 5, the Intactness Regional Study Area, was developed to include a boreal
 210 woodland caribou core range scenario that could support a population of animals. As
 211 stated in Section 7.2.6.2 of the TE SV, a reasonable estimate for the range determination
 212 of the caribou in the Keeyask region may be defined by Study Zone 5. Study Zone 5 is
 213 14,200 km², which is larger than 9 of the 13 boreal woodland caribou ranges identified
 214 in Manitoba (Environment Canada 2012). The population estimates of these nine ranges
 215 are all similar to or greater than the estimated population of summer residents (20 to 50
 216 individuals, TE SV p. 7-65), and as defined further by table 1. As such, Study Zone 5 is a
 217 more appropriate area to assess changes in intactness on a summer resident caribou
 218 hypothesized as a boreal woodland caribou population, and using the most conservative
 219 population estimate along with the intactness estimates, this group of animals would
 220 likely be defined by Environment Canada as Likely as Not Self-sustaining (see footnote
 221 below). If intactness were assessed over a larger area, linear feature density would be
 222 lower due to the relatively low level of development in northern Manitoba.

223 The annual range for summer resident caribou has not been delineated. Collaring
 224 caribou in summer, which would have provided more information specific to summer
 225 resident caribou, was not conducted for two key reasons. Firstly, it was not approved by
 226 Manitoba Conservation and Water Stewardship (MCWS) in the interests of protecting
 227 caribou during a sensitive time period. Secondly, and consistent with the views of
 228 MCWS, it was not supported by some KCNs Members who felt it was disrespectful and
 229 who were concerned it could harm the animals. However, an indication of the area
 230 used by these animals was included in the TE SV. As described in Section 7.4.4.2.1 of the
 231 TE SV and on p. 6-130 of the EIS (EIS), recent radio-collaring data have shown some Pen
 232 Islands caribou spent a summer in the Keeyask region and migrated to the coast the
 233 following year. Other radio-collared Pen Islands caribou have a considerably broader

⁷ Environment Canada (2012) defines a self-sustaining local population of boreal woodland caribou as one that on average demonstrates stable or positive population growth over the short term (≤ 20 years), and is large enough to withstand stochastic events and persist over the long term (≥ 50 years), without the need for ongoing active management intervention. In the population and distribution objectives “not self-sustaining local population” includes both the local populations assessed as “as likely as not self-sustaining” and those assessed as “not self-sustaining.” See Figure E-1 below.

234 range. As such, some of the summer residents are animals that can be more sedentary,
 235 more migratory, or less likely, coastal caribou that have switched to solitary calving
 236 behaviour. Radio-collaring data have also shown large migratory movements nearing
 237 Shamattawa, which are not consistent with the shorter migratory movements of forest-
 238 dwelling woodland caribou populations found elsewhere in Manitoba. These
 239 movements indicate the actual range of collared caribou extends beyond the Regional
 240 Study Area Zone 6.



241
 242 Figure E-1. Disturbance management thresholds: The probability of observing stable or positive
 243 growth ($\lambda \geq \text{stable}$) of boreal caribou local populations over a 20-year period at varying levels
 244 of total range disturbance (fires ≤ 40 years + anthropogenic disturbances buffered by 500 m).
 245 Certainty of outcome, ecological risk, and management scenarios are illustrated along a
 246 continuum of conditions (Environment Canada 2012).

247 3. Calving and winter habitat modeling was conducted for forest-dwelling woodland
 248 caribou calving habitat and winter habitat for Bipole III and includes the northern
 249 half of the Keeyask GS caribou RSA. This modelling could presumably have been

250 *extended to include the entire Keeyask caribou RSA and been incorporated in the TE-*
 251 *SV. No justification is given for the summer resident caribou habitat models*
 252 *presented in the TE-SV i.e., primary calving/rearing islands defined as >10 ha. Was*
 253 *this based on data collected for Stephens and Gull Lakes? Attributes of used and*
 254 *unused calving islands in the RSA are not presented e.g., size, forest type, distance*
 255 *from shore, proximity to other islands, terrain, etc. This information is required to*
 256 *evaluated [sic] the statement in the CE-SV (p. 7-30) that "The small loss of calving*
 257 *habitat that will occur in the Local Study Area will in part be offset by an increase in*
 258 *the number of smaller islands in the Keeyask reservoir."*

259 Evidence provided in the filing is reviewed below on the justification for models utilized
 260 and the attributes of used and unused calving islands in the RSA.

261 Before dealing with this evidence, it should be noted that differences in habitat
 262 modeling methodologies between the Bipole III Transmission Project and the Keeyask
 263 Generation Project were mainly due to the different size and scope of the projects. The
 264 Keeyask Generation Project study area is limited to a relatively small area in northern
 265 Manitoba, while the Bipole III study area runs from southern to northern Manitoba. The
 266 applicable models were developed primarily for known ranges of boreal woodland
 267 caribou in other areas of Manitoba. Please see CEC Rd 1 CEC-0037b for further
 268 information.

269 When calving in the Keeyask study area, summer residents inhabit clusters of islands in
 270 lakes or islands of black spruce surrounded by expansive wetlands (peatland
 271 complexes) to avoid predators. Primary calving and rearing habitat was defined as
 272 islands in lakes greater than 10 ha in size or peatland complexes greater than 200 ha.
 273 Secondary calving and rearing habitat was defined as islands in lakes between 0.5 and
 274 10 ha in size or peatland complexes between peatland complexes between 30 and 200
 275 ha in size (TE SV p. 7-65; EIS p. 6-131). The evidence reviewed to support these
 276 definitions is reviewed below.

277 Use of islands in lakes by caribou was determined with data from mammal sign surveys
 278 in 2003, 2010, and 2011. Use of peatland complexes was determined with data from
 279 2010 and 2011 mammal sign surveys. Various features associated with island in lakes
 280 and peatland complexes were explored. Habitat was similar on the islands in lakes
 281 sampled (i.e., most of the study area consists of black spruce or coniferous-dominated
 282 tree cover types), and factors such as the number of islands within a peatland complex
 283 were considered. Ultimately, the size of islands and peatland complexes was identified
 284 as the factor determining whether these areas are of primary or secondary importance
 285 for calving and rearing. Other factors tested to explain the use of peatland complexes
 286 for calving and rearing included the number of islands within a complex and the
 287 proportion of islands to total land area. The influence of fire events on the potential for

288 islands in lakes and peatland complexes to be used for calving and rearing was also
289 evaluated.

290 Identification of primary habitat was based on the presence of adults approximately
291 90% of the time and calves more than 45% of the time in peatland complexes or more
292 than 25% of the time on islands in lakes. The identification of secondary calving and
293 rearing habitat was based on the presence of adults approximately 65% of the time and
294 calves less than 45% of the time in peatland complexes or less than 25% of the time on
295 islands in lakes.

296 Calving and rearing habitat models were validated in 2012 with tracking data collected
297 in 2012 via mammal sign surveys and trail camera photos. Data from 57 islands in
298 Stephens Lake and 49 peatland complexes were analyzed for the presence of caribou
299 calves and adults. The numbers of calves on islands and in peatland complexes were
300 tabulated and they were categorized as primary or secondary calving and rearing
301 habitat based on the predefined size thresholds. The proportions of adults and calves on
302 islands and in peatland complexes were then compared with anticipated results based
303 on the original model.

304 The results of the analysis indicated that there was more use of larger islands in lakes
305 and peatland complexes for caribou calving and rearing than smaller islands and
306 peatland complexes. Small islands in lakes (<0.5 ha) were also occupied by adult caribou
307 and used for calving, although to a lesser extent than islands greater than 0.5 ha -
308 indicating that while not primary calving and rearing habitat, they could still be used for
309 calving and rearing.

310 4. *Environment Canada (2011) has shown that the probability of persistence of forest-*
311 *dwelling woodland caribou population can be predicted by the proportion of*
312 *anthropogenic disturbance on a range using a 500 m buffer. In the TE-SV (p 131),*
313 *low use linear features were buffered only 200 m (Mace et al 1996) whereas*
314 *Environment Canada uses 500 m for all anthropogenic disturbance. Existing,*
315 *disturbance levels for Keeyask might therefore be underestimated.*

316 Adoption of Environment Canada's model as proposed in this comment would indicate
317 that disturbance levels for Keeyask as provided in the Response to EIS Guidelines were
318 overestimated, not underestimated, for Study Zone 5.

319 Estimates of the amount of undisturbed habitat in Study Zone 5 from the TE SV
320 indicated that 48% of this area is intact (52% disturbed). This was calculated using a
321 500m buffer. Based on the application of Environment Canada (2012) protocols to
322 estimate habitat quality for boreal woodland caribou, including a 500 m buffer around

323 all linear and polygonal features, a revised habitat intactness estimate of 64.4% (35.6%
324 disturbed) is calculated for Study Zone 5, where total area was 1,416,193 ha.

325 The estimates of intactness differ due to two differences in methods. Firstly, the TE SV
326 estimate used only land area. The inclusion of lakes and other waterbodies in the
327 Environment Canada (2012) model increases the area from 1,237,402 ha to 1,416,193
328 ha. The smaller area used in the TE SV model resulted in higher disturbance levels
329 because, while the amount of burned habitat is similar for each model, the portion of
330 the range affected in the Environment Canada model with waterbodies included is
331 30.4% , compared to 34% for the TE SV model, which only accounts for terrestrial
332 habitat.

333 Secondly, the amount of disturbed habitat calculated also differs based on the
334 anthropogenic features included and buffered in the two models. For the TE SV model,
335 these features were examined at a finer spatial scale, and several types of linear
336 features (e.g., trails) not included in the Environment Canada model were identified and
337 buffered. A greater proportion of Study Zone 5 was affected by anthropogenic
338 disturbances in the TE SV model (210,214 ha) than in the Environment Canada model
339 (155,135 ha). When the TE SV model was recalculated to conform closer to the
340 Environment Canada model (i.e., with a 500 m buffer, the total area of Study Zone 5,
341 and with fewer linear features, and with water included in the total area), the results
342 indicated that disturbance levels were overestimated, not underestimated, in Study
343 Zone 5 in the EIS filing. Both the old and the new Environment Canada models used a
344 500 m buffer for all linear features.

345 5. *The TE-SV (pp. 6-370) states that that "because changes to intactness will be*
346 *negligible" and that "The Project will not contribute to measurable changes in*
347 *caribou intactness of the RSA". The TE-SV predicts cores being >80% in Zone 5, but*
348 *Zone 6 is the caribou RSA (and it may not accurately reflect the range) and the*
349 *buffers used in the analysis were not consistent with Environment Canada (2011a).*
350 *No benchmark or threshold for acceptable level of existing disturbance and*
351 *additional level of disturbance was identified. EC (2011a) indicates that landscapes*
352 *with more than 35% disturbed have a lower probability of persistence.*

353 Contrary to the above comments, the Response to EIS Guidelines specifically included
354 reference to Environment Canada's suggested benchmark of landscapes with more than
355 35% disturbed. This is reviewed below, along with other evidence that addresses the
356 above comments.

357 As indicated in response to items 1 and 2 above, Study Zones 5 and 6 are larger than
358 most of the boreal woodland caribou ranges in Manitoba. Study Zone 5 is appropriate
359 for the assessment of Project effects on a boreal woodland-type caribou. As indicated in

360 point 4, the current and future intactness of Study Zone 5 was calculated in the TE SV
 361 and these values were re-calculated to conform to the Environment Canada (2012)
 362 model. As there is less disturbance in Study Zone 6 than Study Zone 5 (see point 3
 363 above), Project effects on intactness would be smaller in Study Zone 6.

364 Two sets of benchmarks are used in consideration of mammal effects: general habitat
 365 intactness, and caribou-specific intactness for the summer resident caribou population.
 366 As described in Section 7.2.6.2 of the TE SV, benchmark values for intactness indicated a
 367 low magnitude effect where core area, as a percentage of land area, is greater than
 368 65%, a moderate magnitude adverse effect where core area percentage is between 45%
 369 and 65%, and a high magnitude adverse effect where core area percentage is lower than
 370 45%. For the summer resident caribou population specifically, benchmark values for
 371 intactness indicated a low magnitude adverse effect where less than 35% of the range is
 372 disturbed, a moderate magnitude adverse effect when 35% to 45% of the range is
 373 disturbed, and a high magnitude adverse effect when more than 45% of the range is
 374 disturbed.

375 The Response to EIS Guidelines also indicates (with specific reference to Environment
 376 Canada, 2011 as source) that “[a] minimum of 65% of habitat should remain
 377 undisturbed in order to sustain a population” (p. 6-371). As such, Environment Canada’s
 378 indication that “landscapes with more than 35% disturbed have a lower probability of
 379 persistence” was included in the assessment of Project effects on caribou⁸.

380 Zone 6 is the study area used for all caribou, including Pen Islands caribou that are
 381 known to calve in the region. As described in Point 2 above, using the most conservative
 382 estimate of 158 animals in the Caribou Regional Study Area (Zone 6), and hypothetically,
 383 if all the caribou were classified as boreal woodland caribou, together with the broader
 384 conservative population estimate, this group of animals would likely be defined as Self-
 385 Sustaining.

386 Study Zone 5 was used as the most appropriate area to assess changes in intactness on
 387 the summer resident caribou considered as a hypothetical boreal woodland caribou
 388 population. Using the most conservative population estimate along with only
 389 Environment Canada’s intactness estimates, this group of animals would be defined as
 390 Likely as Not Self-sustaining. As this particular conservative benchmark measured in

⁸ The text at page 6-371 and 6-372 goes on to state: “Currently, 48% of the estimated range for caribou in Zone 5 is undisturbed (Map 6-67). Fire has the largest effect on caribou habitat in the Keeyask region; 36% of Zone 5 is less than 40 years old. Based solely on this criterion, the Keeyask region is unsuitable for a sustainable boreal woodland caribou population, especially a small one that ranges from 20–50 animals. Because changes to intactness will be negligible, effects on caribou will likely be negligible. The Project will not contribute to measurable changes in caribou habitat intactness of the Regional Study Area.”

391 2012 neared a threshold (Environment Canada 2012), and where initially, it appeared to
 392 be well below it⁹, when the same consideration used in the EIS for measuring other
 393 benchmarks¹⁰ are applied again, the confidence in the overall effects conclusion for
 394 caribou is improved. It should also be noted that if the population in Zone 5 was higher
 395 as three of four population estimates in Point 2 are, this would further improve the
 396 sustainability assessment of the hypothetical boreal woodland caribou population.
 397 Please also refer to Point 6 below.

398 6. *The TE-SV states that “because changes to intactness will be negligible, effects on*
 399 *caribou will likely be negligible”. Although disturbance is associated with lower*
 400 *probability of persistence, impacts can still potentially occur below the range level.*
 401 *Although 500 m was used for EC persistence models, other studies have shown*
 402 *disturbance effects at much greater (e.g. 10 km) from anthropogenic activities.*
 403 *Potential impacts on caribou from project activities e.g. sensory disturbance during*
 404 *construction, potential increases in hunter mortality from increased access, changes*
 405 *in predator prey dynamics from linear disturbance.*

406 The statement “because changes to intactness will be negligible, effects on caribou will
 407 likely be negligible” (p. 6-372 of the Response to EIS Guidelines) refers specifically to
 408 effects of Project-related intactness on caribou, as intactness was the subject of this
 409 particular paragraph in the effects assessment. However, intactness was only one of
 410 several factors considered in the assessment.

411 Other factors considered in the assessment and reviewed in the evidence include
 412 physical habitat loss, linear feature density, and gray wolf density, for which
 413 benchmarks were established (TE SV Section 7.2.6). The effect of increased harvest due
 414 to increased access was considered, and the expected loss of effective habitat was
 415 quantified.

416 Disturbance levels beyond 500 m were also considered in the effects assessment. As
 417 stated in Section 7.4.6.2.1 of the TE SV, “Wapisi woodland caribou activity decreased
 418 approximately 80% within 4 km of the Wuskwatim generating station site after
 419 construction began (WRCS unpubl. data). Similar effects could be expected for caribou
 420 in the Local Study Area, as caribou activity is reported to decrease within 1 to 10 km of
 421 industrial developments (e.g., Vors *et al.* 2007)”.

422 Potential effects of habitat loss, sensory disturbance, potential increases in mortality
 423 from increased harvest due to increased access, changes in predator prey dynamics
 424 from linear disturbance, and habitat fragmentation on caribou were described in

⁹ i.e., from the application of a terrestrial habitat only model that excluded water

¹⁰ physical habitat loss, linear feature density, and gray wolf density where the magnitude of these effects on caribou was negligible to small.

425 Section 7.4.6.2 of the TE SV. Residual effects of the Project, which consider all combined
 426 project effects after mitigation, were summarized individually in the Construction
 427 (Section 7.4.6.2.1 of the TE SV and Section 6.5.8.1.2 of the Response to EIS Guidelines))
 428 and Operation (Section 7.4.6.2.2 of the TE SV and Section 6.5.8.1.4 of the Response to
 429 EIS Guidelines) sections of the effects assessment, and conclusions about residual
 430 Project effects were presented in Section 7.4.6.2.3 of the TE SV and Section 6.5.8.1.5 of
 431 the Response to EIS Guidelines.

432 7. *Calving islands. The TE-SV states (7-61) "potential calving habitats are common in*
 433 *the Regional Study Area, and habitat does not appear to be limiting to the summer*
 434 *resident cows and calves". The fact that only a small proportion of available habitat*
 435 *is used is not the point, since the anti-predator strategy of forest-dwelling woodland*
 436 *caribou is to spread out a low density across the landscape (i.e., one would expect*
 437 *low numbers and low densities). It appears Stephens Lake is a regionally significant*
 438 *calving lake, with some on calving on Gull Lake as well. Caribou are potentially most*
 439 *sensitive during calving/nursery; impacts from construction and increased boat*
 440 *access on both Gull and Stephens Lake are poorly quantified and it is unsure if*
 441 *mitigation is sufficient.*

442 As reviewed below, the issues raised in these comments are addressed and resolved in
 443 the evidence.

444 Overall, it is well understood that the anti-predator strategy of forest-dwelling (boreal)
 445 woodland caribou is to spread out across the landscape to calve. In addition to
 446 maintaining a low density, the quality and quantity of areas for predator avoidance is
 447 also an important consideration. Based on the highest rate of annual use of islands for
 448 calving observed in some years but not in others, this evidence indicates that a
 449 consistently higher annual use of these islands or peatland complexes can be supported.
 450 Because not all suitable calving and calf-rearing islands are occupied within a year, there
 451 is at least some potential for population growth, or flexibility for distributional shifts. As
 452 such, the area should be sufficiently large enough with potentially some under-utilized
 453 habitat where more calving activities can be supported.

454 The importance of islands in Stephens Lake and Gull Lake for calving and rearing was
 455 noted in Section 7.3.6.3.3 of the TE SV and in Section 6.2.3.4.7 of the Response to EIS
 456 Guidelines. The islands in Stephens Lake were identified as important calving and
 457 rearing habitat and it was stated that approximately 55% of the islands sampled in
 458 Stephens and Gull lakes were occupied by adult caribou during at least one summer
 459 between 2003 and 2011 (p. 7-65 in the TE SV). Calving and rearing was documented on
 460 10% of the islands in lakes surveyed in 2010 and 2011 (p. 7-65 to 7-66 in the TE SV).

461 Effects of construction on calving and rearing habitat in the Local Study Area, including
 462 in Gull and Stephens lakes, were assessed. The temporary, although long-term (i.e.,
 463 affecting two or more generations) loss of effective calving and rearing habitat due to
 464 construction noise was quantified on page 7-114 of the TE SV:

465 “Sensory disturbance could result in a temporary loss of effective calving and
 466 rearing habitat and altered movements (Mahoney and Schaefer 2002) in the
 467 Local Study Area. About 510 ha (5%) of the primary calving and rearing habitat
 468 in the Local Study Area is expected to be affected by sensory disturbance, all
 469 on islands in Gull Lake. Additionally, 695 ha (24%) of secondary calving rearing
 470 habitat in the Local Study Area will likely be affected, including 23% of
 471 peatland complexes and less than 1% of islands in Gull Lake. In all, 1,205 ha
 472 (9%) of primary and secondary calving and rearing habitat will be affected in
 473 the Local Study Area. Of this, 5% will be in peatland complexes and 4% will be
 474 on islands in lakes. Given the large amount of calving and rearing habitat,
 475 particularly peatland complexes, available on the landscape (Map 7-45), less
 476 than 1% of effective primary and secondary calving and rearing habitat in the
 477 Regional Study Area is expected to be affected by sensory disturbance.”

478 The loss of effective habitat was also quantified on p. 6-369 of the EIS. Additionally,
 479 effects of sensory disturbance on caribou, such as becoming more susceptible to
 480 increased predation or environmental stress when choosing less favourable habitat,
 481 were considered (Section 7.4.6.2.1 of the TE SV).

482 Potential effects of increased boat access due to the provision of boat launches above
 483 and below the generating station were considered in Section 7.4.6.2.2 of the TE SV and
 484 in Section 6.5.8.1.3 of the Response to EIS Guidelines, in the context of increased
 485 harvest by resource users. For further information please refer to CEC Rd 1 CEC-0037b.
 486 Effects of sensory disturbances from boats on calving and rearing habitat in Gull and
 487 Stephens lakes are as follows:

- 488 • The caribou calving period is from May 15 to June 30. Accessibility to calving islands
 489 by boat may be limited at times until early June. Ice remnants frequently persist into
 490 June (Physical Environment Supporting Volume p. 4-42), making boating conditions
 491 less favourable in the early calving and rearing season. Recreational fishing is closed
 492 in the area from May 1 up to and including May 17 (Manitoba Anglers’ Guide 2013),
 493 and lakes in the region are closed to commercial fishing from May 1 to May 31
 494 (Resource Use Supporting Volume p. 1-46), which also overlaps the early portion of
 495 the calving period.
- 496 • As indicated in the Socio-Economic Environment, Resource Use and Heritage
 497 Resources Supporting Volume (SE SV), boat travel is currently limited upstream of
 498 Gull Rapids (p. 5-129, 5-131) and boat access will be restricted in areas where

499 construction activity is occurring (p. 5-191). No effects of boat traffic on caribou
 500 calving and rearing on islands in Gull Lake are anticipated during construction.
 501 Stephens Lake is already accessible by boat and is travelled by resource users. As
 502 there is a very small increase in recreational hunting and fishing anticipated during
 503 construction (Resource Use Section 1.7.4.4 of the SE SV), no additional boat traffic
 504 is anticipated during this phase, and no disturbance to caribou calving and rearing
 505 on islands in Stephens Lake beyond current levels is expected.

- 506 • As the Keeyask reservoir becomes suitable for boating during operation, there may
 507 be some disturbance near calving and rearing habitat, depending on the increase in
 508 boat traffic. It is uncertain how much additional boat traffic can be anticipated in
 509 the Keeyask reservoir and in Stephens Lake during the calving and rearing season;
 510 however, only a small proportion of the 120 to 150 new residents of Gillam
 511 (associated with 46 Keeyask operation jobs) would be expected to fish, hunt or boat
 512 recreationally (Resource Use Section 1.7.4.2 of the SE SV). As such, a nominal
 513 increase in boat traffic would be expected during operation, and a corresponding
 514 increase in disturbance of caribou during the calving and rearing period would be
 515 expected in the Keeyask reservoir and on Stephens Lake.
- 516 • Finally, the upstream boat launch may be used by domestic hunters to access the
 517 reservoir, however, the Adverse Effects Agreement (AEA) programs are expected to
 518 disperse overall hunting pressure away from local areas (Resource Use Section
 519 1.2.4.2.2 of the SE SV).

520 For the reasons above, the effect of sensory disturbances related to boats during the
 521 caribou calving and rearing season is expected to be negligible.

522 8. *Cumulative impacts from all foreseeable projects are not adequately addressed. The*
 523 *EA states that the Keeyask Generation Project will reduce linear feature density*
 524 *(Response to EIS 6-325). However, it is clear that the Keeyask Transmission Project,*
 525 *the Bipole III Transmission Project, and the Keeyask Infrastructure Project are*
 526 *dependent upon each other and are part of the same overall undertaking. The net*
 527 *effect will be increased linear feature density in the RSA which needs to be clear in*
 528 *the cumulative effects section since it will negatively impact caribou. The statement*
 529 *in the Cumulative Effects Assessment (TE-SV p 7-29) "most effects of the Project will*
 530 *be negligible to small, particularly since habitat currently appears to be*
 531 *underutilized" is unsubstantiated and does not reflect the current understanding of*
 532 *woodland caribou ecology (e.g., bottom-up up versus top-down population*
 533 *regulation).*

534 Although assessed and approved as separate projects, all of these undertakings have
 535 been considered in the cumulative effects assessment for the Keeyask Generation

536 Project for summer resident caribou as summarized in Section 7.5.2.3.3 of the Response
537 to EIS Guidelines.

538 It is not correct to state (as is stated above) that the Keeyask Generation Project, the
539 Keeyask Transmission Project, the Keeyask Infrastructure Project and the Bipole III
540 Transmission Project are all dependent on each other and part of the same overall
541 undertaking. In particular, the Bipole III Transmission Project is being developed for the
542 purposes of reliability and will proceed regardless of whether the Keeyask Generation
543 Project is constructed.

544 The Keeyask Infrastructure Project was included in the calculation of current linear
545 feature density (Section 2.4.3.2.1 of the TE SV) and, as such, was included in the initial
546 assessment of Project effects on summer resident caribou.

547 A small loss of additional terrestrial habitat for summer resident caribou is anticipated in
548 the Regional Study Area due to the Bipole III, Keeyask Transmission and Gillam
549 redevelopment projects. There will be no additional habitat loss in the Regional Study
550 Area associated with the Conawapa Generation Project, as this project is beyond Study
551 Zone 6 (Please see CEC Rd 1 CEC-0022 for further information about cumulative effects
552 study areas).

553 Section 7.5.2.3.3 of the Response to EIS Guidelines notes that incremental habitat
554 fragmentation effects for summer resident caribou from the Project in combination with
555 future projects are a concern within the Regional Study Area because of the scientific
556 uncertainty associated with this group's abundance and range use. For summer
557 residents, the cumulative reduction in intactness (1%) as a result of the Project will be
558 small compared to the Regional Study Area, and is highly unlikely to result in a
559 measurable change in the population. Cumulatively, other projects would increase
560 linear feature density in Study Zone 5 from 0.44 km/km² to 0.48 km/km², and from 0.31
561 km/km² to 0.36 km/km² if the Thompson area is excluded (Section 2.10.2 of the TE SV),
562 indicating a small magnitude effect based on the benchmark (TE SV Section 7.2.6.3)
563 established for the effects of linear feature density on boreal woodland caribou.

564 Further, as indicated in 7 above, there is more calving and rearing habitat in the region
565 than summer resident caribou are currently using, meaning there will be other habitat
566 for displaced females to occupy. The area is sufficiently large and with enough suitable
567 habitat for the small population of summer resident caribou to continue to space away
568 from each other when calving.

569 To clarify, the statement quoted in this question from page 7-29 (*TE-SV p 7-29*) was a
570 very brief summary of Project effects based on the assessment of Project effects in
571 combination with the effects of other past and current projects (i.e., as described in the

572 TE SV, in Chapter 6 of the Response to EIS Guidelines, and summarized in Section
 573 7.5.2.2.3 of the Response to EIS Guidelines), and did not include consideration of the
 574 additional effects of other future projects as addressed above.

575 In summary, the criteria on which the assessment of negligible to small Project effects
 576 was based were noted as follows in the Chapter 6 conclusions about residual effects on
 577 caribou (see Response to EIS Guidelines p. 6-376):

578 “Overall, the likely Project residual effects are expected to be adverse but
 579 regionally acceptable because [these are bulleted here – in the quote the
 580 criteria were set out in one continued sentence]:

- 581 • less than 1% of region’s calving and rearing habitat and winter habitat will
 582 be lost;
- 583 • only a negligible change in intactness is expected in Study Zone 5 [and as
 584 described in 3 above, is less when Study Zone 6 is considered];
- 585 • additive residual Project effects on caribou mortality will likely remain small
 586 and below established benchmarks; and,
- 587 • because altered movements and distributional shifts are most likely limited
 588 only to habitat near the Project infrastructure, these are unlikely to affect
 589 the landscape-level movements and distribution of caribou in the region.”

590 **REFERENCES:**

591 Environment Canada. 2011. Scientific assessment to inform the identification of critical
 592 habitat for woodland caribou (*Rangifer tarandus caribou*), boreal population, in
 593 Canada: 2011 update. Ottawa, Ontario, Canada. 102 pp. + Appendices.

594 Environment Canada. 2012. Recovery strategy for the woodland caribou (*Rangifer*
 595 *tarandus caribou*), Boreal population, in Canada. *Species at Risk Act Recovery*
 596 *Strategy Series*. Environment Canada, Ottawa, ON. Xi + 138 pp.

597 Manitoba Anglers’ Guide 2013. Available from
 598 [http://www.gov.mb.ca/waterstewardship/fisheries/recreation/pdf/2013_anglers](http://www.gov.mb.ca/waterstewardship/fisheries/recreation/pdf/2013_anglers_guide.pdf)
 599 [s guide.pdf](http://www.gov.mb.ca/waterstewardship/fisheries/recreation/pdf/2013_anglers_guide.pdf) [accessed May 17, 2013].

600 Manitoba Hydro. 2012. Bipole III Transmission Project supplemental caribou technical
 601 report. Prepared for Manitoba Hydro by Joro Consultants Inc. Winnipeg, MB.
 602 108 pp.

603 **APPENDIX:**

604 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 605 **6.5.8.1.1 Construction Effects and Mitigation; p. 6-370**

606 **TAC Public Rd 2 EC-0032b**607 **PREAMBLE:**

608 In addition to the previous comments provided by EC regarding caribou in the project
 609 area, EC notes that the southwest corner of the Regional Study Area overlaps with parts
 610 of two ranges of boreal woodland caribou as delineated in the Final Recovery Strategy:
 611 Wapisi (MB8) and Manitoba North (MB9). While it does not appear that the project will
 612 have any direct effects on these herds, there is potential for indirect effects on these
 613 SARA-listed species. The effects analysis in the EIS appears to focus on project effects on
 614 the non-SARA-listed caribou (the migratory ecotype of woodland caribou and the barren
 615 ground caribou), and predominantly on caribou in the local study area. The EIS report
 616 states the following regarding the potential impact on boreal caribou: "Because changes
 617 to intactness will be negligible, effects on caribou will likely be negligible. The Project
 618 will not contribute to measurable changes in caribou intactness of the RSA." (p. 6-370) It
 619 is not clear from the information provided however, what indirect effects on boreal
 620 woodland caribou may occur (e.g., sensory disturbances, loss of habitat, habitat
 621 degradation, increased access, indirect mortality, etc.), or the nature of cumulative
 622 impacts on boreal woodland caribou when considered with all other foreseeable
 623 projects in the area. Additionally it is unclear how the proponent has determined effects
 624 for boreal woodland caribou specifically, to be "negligible".

625 **QUESTION:**

626 EC suggests that the proponent provide clarification on the above points. EC also
 627 encourages the Canadian Environmental Assessment Agency to discuss the potential for
 628 indirect effects on boreal woodland caribou with both the proponent and provincial
 629 caribou experts.

630 **RESPONSE:**

631 The current range of boreal woodland caribou extends into the southwest corner of the
 632 Regional Study Area (Study Zone 6, Map 6-28) near Thompson, as described in Section
 633 7.3.6.3.3 of the Terrestrial Environment Supporting Volume and Section 6.2.3.4.7 of the
 634 Response to EIS Guidelines (see Map 6-38 for caribou ranges). The range of SARA-listed
 635 boreal woodland caribou does not extend to the Local Study Area (Study Zone 4, Map 6-
 636 28), where the direct and most of the indirect Project impacts are expected to occur. No

637 effects on boreal woodland caribou were assessed directly, as the northernmost portion
638 of their ranges is located about 100 km from Gull Lake.

639 The effects assessment described potential Project effects on barren-ground caribou
640 from the Qamanirjuaq herd, coastal caribou from the Pen Islands and Cape Churchill
641 herds, and the small group of summer resident caribou that remain in the Keeyask
642 region year-round. The herd association of the summer residents is unclear, and it was
643 stated that this group could be coastal caribou, boreal woodland caribou, or a mixture
644 of both. For the purposes of the assessment of potential Project effects, the group of
645 summer resident caribou was treated as an independent population that uses a smaller
646 range than the migratory groups and is more likely to use calving and rearing habitat
647 that occurs within the Keeyask region (Section 7.3.6.3.3 of the Terrestrial Environment
648 Supporting Volume and Section 6.2.3.4.7 of the Response to EIS Guidelines). Effects of
649 changes to intactness on these three groups of caribou (barren-ground, coastal, and
650 summer resident), none of which are listed by SARA, were determined to be negligible
651 based on benchmarks established for boreal woodland caribou (Section 7.2.6.2 of the
652 Terrestrial Environment Supporting Volume), which were based in part on
653 recommendations by Environment Canada (2012)¹¹. Other benchmarks used to
654 describe Project effects for all caribou included predation and linear feature density.

655 Environment Canada (2012) indicates that the population of the Wapisi (MB8) range is
656 estimated at 110-125 individuals, the population trend is stable, and the population is
657 likely self-sustaining. The population estimate for the Manitoba North (MB9) range is
658 not available, the population trend is not available, and the population is as likely as not
659 self-sustaining (Environment Canada 2012). If the change in habitat intactness were
660 assessed for these two ranges of boreal woodland caribou, which overlap a portion of
661 the Regional Study Area, the measureable effect would be none or negligible for the
662 same reasons as for other types of caribou. For example, as defined by Environment
663 Canada, the total habitat disturbance reflecting the loss of functional habitat for the
664 Wapisi range is currently at 24%, and the undisturbed habitat is greater than 65% of
665 this range. For the Manitoba North range, the current total range disturbance is 28%,
666 and the undisturbed habitat is greater than 65% of this range. Neither of these two
667 ranges are expected to change as a result of the Project.

668 A small decrease in linear feature density, from 0.45 km/km² to 0.44 km/km², is
669 anticipated in the Intactness Regional Study Area (Zone 5) as a result of the Project, of
670 which a small portion overlaps boreal woodland caribou range (Section 6.5.3.3.1 of the
671 Response to EIS Guidelines). Because there will be no increase in linear feature density

¹¹ Environment Canada. 2012. Recovery strategy for the woodland caribou (*Rangifer tarandus caribou*), Boreal population, in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa, ON. Xi + 138 pp.

672 as a result of the Project, there will be no effect on the portions of Wapisi and
 673 Manitoba North ranges that overlap the Regional Study Area. The Project will have
 674 localized core area effects for other caribou in and near the Keeyask segment of the
 675 Nelson River (Section 6.5.3.3.1 of the Response to EIS Guidelines), which is well beyond
 676 the recognized range of boreal woodland caribou.

677 Considering project linkage pathways, and the spatial separation between boreal
 678 woodland caribou range and the Local Study Area, reasonably foreseeable indirect
 679 effects on boreal woodland caribou could be related to increased traffic on the portions
 680 of PR 391 and PR 280 that overlap both the Regional Study Area and boreal woodland
 681 caribou range. Potential effects would be limited mainly to the construction period.
 682 Increased traffic will temporarily increase sensory disturbance and reduce effective
 683 habitat for boreal woodland caribou. However, the nearest boreal woodland caribou
 684 core use area identified in Section 3.13 of the Bipole III Transmission Project Caribou
 685 Technical Report (2011)¹² does not overlap the portion of PR 391 from Thompson to PR
 686 280 referred to as Road Section 1 in the Socio-Economic Environment, Resource Use and
 687 Heritage Resources Supporting Volume.

688 Boreal woodland caribou distribution in this area is influenced by the existing roads and
 689 other development near the City of Thompson. The Project is expected to increase
 690 traffic on Road Section 1 between 1% and 6% from 2014 to 2021 (Section 5.4.1.5.2 of
 691 the Socio-Economic Environment, Resource Use and Heritage Resources Supporting
 692 Volume). Effects of increased traffic will be limited to individuals whose home ranges
 693 overlap Road Section 1. These individuals may reduce their use of habitat or may
 694 increase their movement rates near the road (Leblond *et al.* 2013)¹³. However,
 695 considering the incrementally small increase in traffic that is already located on an
 696 existing highway, any further loss of habitat effectiveness, or behavioral responses such
 697 as increased rates of movement (Leblond *et al.* 2013) are still expected to be minimal,
 698 and likely not measureable with such a small increase in traffic.

699 The risk of caribou-vehicle collisions could also increase with increased traffic volume;
 700 however, collisions with vehicles are not considered an important threat to boreal
 701 woodland caribou (Environment Canada 2012). Caribou-vehicle collisions are rare in
 702 Manitoba. While three or four areas on PTH 60 near The Pas have been identified as
 703 locations for caribou-vehicle collisions, most of the people interviewed for Environment
 704 Canada's Aboriginal Traditional Knowledge report on boreal caribou had not heard of

¹² Joro Consultants Inc. 2011. Bipole III Transmission Project Caribou Technical Report. Prepared for Manitoba Hydro November 2011. 205 pp.

¹³ Leblond, M., Dussault, C., and Ouellet, J.-P. 2013. Avoidance of roads by large herbivores and its relation to disturbance intensity. *Journal of Zoology* 289: 32-40.

705 such incidents (Boreal Caribou Aboriginal Traditional Knowledge Reports 2010-2011).¹⁴
 706 From 2007 to 2010, no caribou injured by vehicles were dispatched by Manitoba
 707 Conservation in the Gillam area (L. Meyers pers. comm.)¹⁵. To date, no collisions have
 708 been reported during construction of the Wuskwatim Generating Station, and of 217
 709 reported collisions with wildlife in the Thompson area from 2008 to 2012, two were
 710 reported with caribou (Manitoba Public Insurance unpubl. data). Collision data are
 711 limited by what claimants reported (i.e., species may not have been specified in each
 712 case) and are affected by people's ability to correctly identify wildlife species..

713 Other indirect Project effects on boreal woodland caribou could include habitat loss,
 714 habitat degradation, and access-related mortality due to hunting and predation. These
 715 effects on caribou are discussed in Section 7.4.6.2 of the Terrestrial Environment
 716 Supporting Volume and Section 6.5.8.1 of the Response to EIS Guidelines. No Project-
 717 related habitat loss or fragmentation will affect Wapisiu or Manitoba North range
 718 (Section 2.4.4.1.1 of the Terrestrial Environment Supporting Volume). Because access
 719 (i.e., new roads, trails or highway upgrades) will not increase in these two ranges as a
 720 result of the Project, neither will caribou harvest and predation.

721 Manitoba Hydro, on behalf of the Partnership, is willing to meet with the CEAA, EC and
 722 the provincial caribou experts to discuss the potential for indirect effects on boreal
 723 woodland caribou. As described in TAC Public Rd 2 EC-0032, Manitoba Hydro consults
 724 regularly with the Province concerning caribou, and is an active partner participating on
 725 regional caribou committees and resource management boards.

¹⁴ Boreal Caribou Aboriginal Traditional Knowledge (ATK) Reports. 2010-2011. Compiled June 2011. Ottawa: Environment Canada.

¹⁵ Meyers, Lisa. 2010. District Supervisor, Gillam District, Manitoba Conservation, Gillam, Manitoba. Email correspondence with Andrea Ambrose, Wildlife Resource Consulting Services MB Inc. August 26, 2010.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0037b**

4 **PREAMBLE:**

5 The conclusion that residual effects from the Keeyask Generation Project on caribou are
 6 "expected to be adverse, small to medium in extent, long term in duration, and small in
 7 magnitude." and that "there is a moderate to high degree of certainty in the
 8 assessment" is not supported by the evidence presented in the EA, which has significant
 9 deficiencies with respect to:

- 10 1. Evaluation of status of summer resident caribou;
- 11 2. Assessment of effects of summer resident caribou and their habitat;
- 12 3. Assessment of effects on migratory caribou and their habitat; and
- 13 4. Proposed Mitigation.

14 **QUESTION:**

15 **Effects on Migratory Caribou**

16 The Project has the potential to impact winter habitat of migratory barren-ground
 17 caribou (Qamanirjuaq) and forest-tundra woodland caribou (i.e. coastal caribou – Cape
 18 Churchill and Pen Island) and traditional crossing sites on the Nelson River. According to
 19 the TE-SV (p 7-63) there are generally about 300 Pen Island caribou and less than 50
 20 Cape Churchill caribou in the RSA during a typical winter, although larger numbers (100s
 21 to 1000s) are observed in some years. Approximately 10,000 Qamanirjuaq caribou have
 22 been estimated to reach the RSA in some winters, although this type of occurrence is
 23 "infrequent". Although infrequent, their use of the RSA could be ecologically and
 24 culturally significant. The TE SV (7-146) states that the Project is not anticipated to
 25 "measureable affect" caribou in the RSA; however, "measurable affecting" is not the
 26 criterion used to determine significance of residual or cumulative effects.

27 Several main deficiencies are identified:

- 28 1. Assessment of disturbance impacts to winter habitat. One of the factors cited as
 29 potentially contributing to the potential decline in the Qamanirjuaq herd is loss of
 30 winter habitat from forest fires; anthropogenic disturbance could also affect winter
 31 habitat use, particularly if other portions of their winter range are unavailable due
 32 to snow conditions, fire or other disturbance. Resource Selection Function (RSF)
 33 models for BiPole III were not used to assess winter habitat in the RSA.

- 34 2. Traditional crossing sites for migratory caribou. Although the Nelson River generally
 35 serves as an extra-limital boundary for Qamanirjuaq barren-ground caribou in the
 36 Keeyask region, river crossing locations have been reported in the RSA and lower
 37 Nelson River. FLCN (2012, p. 25) states that fluctuating water levels can affect
 38 caribou since caribou cannot cross the river safely until the levels are low enough.
 39 Drowning has been observed along the Kischi Sipi. (Nelson River) according to FLCN
 40 (2012). The TE-SV (pp. 7-62) states "after the construction of the Kettle GS, there
 41 were virtually none south of the Nelson River". It is not clear whether a causal
 42 relation is implied. Potential impacts on crossing sites needs a more complete
 43 analysis (e.g. comparison with other sites on the Nelson) since the earlier formation
 44 of thin ice across the reservoir coincides with arrival of caribou in the LSA.
- 45 3. Cumulative effects from other related projects as well as other existing or
 46 reasonably foreseeable projects in the RSA on winter habitat and traditional
 47 crossing sites. Monitoring was conducted for the other related projects (e.g., Bipole
 48 III, Keeyask Transmission, Road and Infrastructure) should be better incorporated in
 49 this EA. In particular, the impacts of linear corridors such as transmission rights-of-
 50 way and the upgraded provincial highway (PR 280) need to be examined in more
 51 detail for disturbance effects and increased hunter mortality.
- 52 4. The rationale for the Caribou Access Program and an annual hunt needs to be
 53 justified given: a) the report states that there are no measurable effects on caribou
 54 (TE-SV 7-35) and b) migratory coastal (Pen Island, Cape Churchill) and barren-ground
 55 (Qamanirjuaq) caribou do not winter every year in the Keeyask area and c) given
 56 that access to the LSA will increase due to the road upgrades and transmission
 57 ROW. The statement that "Recreational fishers and hunters may [bold added] make
 58 use of the new boat launch facilities up and downstream of the GS in the operation
 59 phase" is inconsistent with existing resource use patterns where access is a key
 60 issue and appears to understate the issue since it is likely that there will be
 61 increased recreational hunting and angling upstream and downstream of the GS.
 62 The statement "that residual effects to recreational resource users are expected to
 63 be neutral Resource Use SV pp. 1-94)" is questionable and the lack of proposed
 64 mitigation a potential risk to caribou. The potential impact of the Caribou Access
 65 Program on caribou outside the RSA also needs to be analyzed and presented in the
 66 TE-SV.

67 **RESPONSE:**

68 The ecological importance of ungulates in general is described in Section 7.3.5.3 of the
 69 Terrestrial Environment Supporting Volume (TE SV) and on p. 6-125 of the Response to
 70 EIS Guidelines (EIS), and migratory caribou (Qamanirjuaq barren-ground caribou and
 71 Pen Islands and Cape Churchill coastal woodland caribou) are described in Sections
 72 7.3.6.3.1 and 7.3.6.3.2 of the TE SV and in the Section 6.2.3.4.7 of the EIS, beginning on
 73 p. 6-127. The cultural importance of caribou is described in the Keeyask Cree Nations'

74 (KCNs) Environmental Evaluation reports, and in the Resource Use Section of the Socio-
 75 Economic Environment, Resource Use and Heritage Resources Supporting Volume (SE
 76 SV).

77 The conclusions about residual effects on caribou (Response to EIS Guidelines p. 6-376)
 78 note the following:

79 “Overall, the likely Project residual effects are expected to be adverse but regionally
 80 acceptable because [these are bulleted here – in the quote the criteria were set out
 81 in one continued sentence]:

- 82 • less than 1% of the region’s under-utilized calving and rearing habitat and
 83 winter habitat will be lost;
- 84 • only a negligible change in intactness is expected in Study Zone 5;
- 85 • additive residual Project effects on caribou mortality will likely remain small and
 86 below established benchmarks; and
- 87 • altered movements and distributional shifts are most likely limited only to
 88 habitat near the Project infrastructure, and these are unlikely to affect the
 89 landscape-level movements and distribution of caribou in the region.”

90 These were the criteria on which the assessment of negligible to small Project effects
 91 was based. The statement quoted from page 7-146 of the Cumulative Effects section of
 92 the TE SV at the beginning of this question was a very brief summary of anticipated
 93 Project effects based on the entire effects assessment (i.e., as described in the TE SV
 94 and in Chapter 6 of the Response to EIS Guidelines), and the statement that the Project
 95 is not anticipated to measurably affect caribou in the Regional Study Area was based on
 96 the four points above. As it was a brief statement to provide context to the cumulative
 97 effects assessment, it was not intended to determine the significance of residual or
 98 cumulative effects based on methods outlined in Section 5.5 of the Response to EIS
 99 Guidelines.

100 The following provides a response, in order, to the four specific items noted in the
 101 Information Request above.

- 102 1. *Assessment of disturbance impacts to winter habitat. One of the factors cited as*
 103 *potentially contributing to the potential decline in the Qamanirjuaq herd is loss of*
 104 *winter habitat from forest fires; anthropogenic disturbance could also affect winter*
 105 *habitat use, particularly if other portions of their winter range are unavailable due to*
 106 *snow conditions, fire or other disturbance. Resource Selection Function (RSF) models*
 107 *for BiPole III were not used to assess winter habitat in the RSA.*

108 Fire is a natural and important process in the boreal forest, and caribou are well
 109 adapted to fire disturbance on their ranges. The potential decline of the Qamanirjuaq

110 herd and the possible causes, including loss of winter range due to fire, were described
 111 in Sections 7.3.6.3.1 and 7.4.8.2.3 of the TE SV. Effects of fire on the ranges of migratory
 112 caribou were also summarized in Section 7.5.2.2.3 of the Response to EIS Guidelines. As
 113 indicated on p. 7-112 of the TE SV and on p. 6-368 of the Response to EIS Guidelines, it is
 114 estimated that the Project will result in the loss of 6% of winter habitat in the Local
 115 Study Area, 1% of winter habitat in Study Zone 5, and by extrapolation, less than 1% of
 116 winter habitat in the Regional Study Area. This will have a small effect in the Keeyask
 117 region, particularly since the loss of habitat will be localized (centred on Gull Lake), and
 118 use of the Regional and Local Study Areas by Qamanirjuaq barren-ground caribou is
 119 infrequent. Given that a fraction of 1% of the entire winter range will be affected, the
 120 effect will be much smaller over the range than in the Regional Study Area. Habitat
 121 intactness, which includes caribou habitat lost to fire for Pen Islands caribou, is
 122 described further in 3 below. The total available undisturbed habitat in this area is 71%
 123 of the landscape. With or without the Project, fire will continue to affect winter habitat
 124 beyond the Regional Study Area and caribou will continue to alter their movements and
 125 foraging patterns based on fires and other factors such as snow conditions.

126 Resource Selection Function models used for the Bipole III Transmission Project were
 127 not used to assess habitat in the Regional Study Area. Differences in habitat modeling
 128 methodologies between the Bipole III Transmission Project and the Keeyask Generation
 129 Project were mainly due to the different size and scope of the two projects. The Keeyask
 130 Generation Project study area is limited to a relatively small area in northern Manitoba,
 131 while the Bipole III study area runs from southern to northern Manitoba. Habitat
 132 information is classified differently for the Keeyask Generation Project than for the
 133 Bipole III Transmission Project, including more available information at a finer scale and
 134 mapping over a much smaller area that can allow for a higher degree of model
 135 precision, if required.

136 2. *Traditional crossing sites for migratory caribou. Although the Nelson River generally*
 137 *serves as an extra-limital boundary for Qamanirjuaq barren-ground caribou in the*
 138 *Keeyask region, river crossing locations have been reported in the RSA and lower*
 139 *Nelson River. FLCN (2012, p. 25) states that fluctuating water levels can affect*
 140 *caribou since caribou cannot cross the river safely until the levels are low enough.*
 141 *Drowning has been observed along the Kischi Sipi. (Nelson River) according to FLCN*
 142 *(2012). The TE-SV (pp. 7-62) states "after the construction of the Kettle GS, there*
 143 *were virtually none south of the Nelson River". It is not clear whether a causal*
 144 *relation is implied. Potential impacts on crossing sites needs a more complete*
 145 *analysis (e.g. comparison with other sites on the Nelson) since the earlier formation*
 146 *of thin ice across the reservoir coincides with arrival of caribou in the LSA.*

147 As there is no reference to caribou drowning on p. 7-62 of the TE SV, the statement “[a]
 148 substantial decline in barren-ground caribou numbers began in the 1950s, and after
 149 construction of the Kettle GS, there were virtually none south of the Nelson River (FLCN
 150 2010 Draft),” was not intended to imply that drowning caused this decline. No
 151 interpretation of its meaning was provided in the TE SV. The original statement (“[A
 152 FLCN Member] also stated that after Kettle Generating Station, there were virtually no
 153 barren ground caribou south of the Nelson River (personal communication, May 20
 154 2009)” is from the Keeyask Traditional Knowledge Report Draft (FLCN 2010). Caribou
 155 drowning as a result of water level fluctuations during open water is referred to in the
 156 FLCN Evaluation Report (p. 45). There was no mention of drowning as the specific cause
 157 of the decline in barren-ground caribou in the area; however, a passage in the FLCN
 158 Environment Evaluation Report (p. 56) does refer to Pen Islands caribou drowning in the
 159 Kettle forebay:

160 “[A FLCN Member} provided context for both migratory and population changes
 161 when he described the spring and fall migrations during the 1940s and 1950s:
 162 *There were many. Split [Lake], around the bend, they literally filled the lake, the*
 163 *herd. The caribou would stand out in the lake because of the wolves. They would*
 164 *stand way out in the lake watching out for the wolves... Then they go south in*
 165 *the spring [Pen Island], the caribou are on the run, going home. They were*
 166 *numerous. Some never came back, perhaps drowning in the bay [Kettle forebay],*
 167 *that’s what they say. They go far. There are other caribou, namowin [coming*
 168 *from the north-east, probably Pen Island] caribou, those are the ones that come*
 169 *here, they are larger... North, they go north. They are numerous. The ones from*
 170 *namowin [did] not return; they went into the water [drowned] (FLCN 2012).”*

171 Known crossing sites were identified in the TE SV (Map 7-22) and the sites on the Nelson
 172 River are shown in greater detail in Map 1 below. Crossing sites were also identified
 173 during an aerial survey of the eastern portion of Study Zone 5 in February 2013 (see
 174 Map 2 below). These sites are all upstream of Caribou Island. Based on aerial
 175 reconnaissance surveys between 2003 and 2008, Pen Islands caribou appear to move
 176 west into the Regional Study Area in late December and early January, with the greatest
 177 number of caribou occurring in late January and early February. Potential Project effects
 178 on crossing sites were discussed in Section 7.4.6.2.2 of the TE SV and on p. 6-375 of the
 179 Response to EIS Guidelines. Because caribou appear to cross upstream of Gull Rapids
 180 more frequently than they cross at the rapids, and because they tend to arrive when the
 181 ice will likely be fully formed and thick, no large increase in caribou drowning is
 182 expected with the development of Keeyask. However, there is uncertainty associated
 183 with this prediction, and Project-related caribou mortality will be monitored during
 184 operation. Caribou drowning reports will be investigated and reported, including the
 185 location, timing, and ice conditions.

186 3. *Cumulative effects from other related projects as well as other existing or reasonably*
 187 *foreseeable projects in the RSA on winter habitat and traditional crossing sites.*
 188 *Monitoring was conducted for the other related projects (e.g., Bipole III, Keeyask*
 189 *Transmission, Road and Infrastructure) should be better incorporated in this EA. In*
 190 *particular, the impacts of linear corridors such as transmission rights-of-way and the*
 191 *upgraded provincial highway (PR 280) need to be examined in more detail for*
 192 *disturbance effects and increased hunter mortality.*

193 The effects of increased access to the Local Study Area, including re-routing PR 280,
 194 traffic disturbance, and increased harvest, were assessed as Project effects and
 195 discussed in Sections 7.4.6.2.1 and 7.4.6.2.2 of the TE SV and Sections 6.5.8.1.1 and
 196 6.5.8.1.3 of the EIS. The Keeyask Infrastructure Project was included in the calculation of
 197 current linear feature density (Section 2.4.3.2.1 of the TE SV) and, as such, was included
 198 in the assessment of Project effects.

199 Additional details of the cumulative effects of other projects in the area are as follows. A
 200 small loss of additional terrestrial habitat, some of which may be winter habitat, is
 201 anticipated in the Regional Study Area due to the Bipole III and Keeyask Transmission
 202 projects. There will be no additional habitat loss associated with the Conawapa
 203 Generation Project in the Regional Study Area, as this project is beyond Study Zone 6.
 204 However, the Conawapa Generation Project and the Bipole III Transmission Project
 205 (includes Keewatinoow Converter Station and Ground Electrode and Camp/Construction
 206 Power, Collector Lines and Existing Station Upgrades, Bipole III Transmission Northern
 207 Segment #1) would likely result in a small loss of additional habitat near the Nelson
 208 River, and small habitat fragmentation effects in a fraction of the large winter ranges of
 209 large migratory caribou herds. Construction could overlap a portion of the Keeyask
 210 Project construction period. Increased traffic between the Keeyask Generating Station
 211 and the construction sites beyond Zone 6 could result in a loss of effective habitat near
 212 the Conawapa access road, and could increase the risk of caribou-vehicle collisions.
 213 Sensory disturbances from construction in the Conawapa area could result in altered
 214 movements of caribou that move through the area, mainly Cape Churchill and Pen
 215 Islands coastal caribou, and occasionally some Qamanirjuaq barren-ground caribou. As
 216 with Keeyask, these animals are expected to use other portions of their ranges during
 217 construction periods. Please refer to CEC Rd 1 CEC-0020 for a map of the Projects
 218 described that extend beyond Study Zone 6.

219 Incremental habitat fragmentation effects for summer resident caribou from the Project
 220 in combination with future projects are a concern within the Regional Study Area
 221 because of the scientific uncertainty associated with this group's abundance and range
 222 use. For summer residents, the reduction in intactness (1%) as a result of the Project will
 223 be small compared to the Regional Study Area, and is highly unlikely to result in a

224 measurable change in the population. Cumulatively, the transmission projects would
 225 increase linear feature density in Study Zone 5 from 0.44 km/km² to 0.48 km/km², and
 226 from 0.31 km/km² to 0.36 km/km² if the Thompson area is excluded (Section 2.10.2 of
 227 the TE SV), indicating a small magnitude effect based on the benchmark established for
 228 the effects of linear feature density on boreal woodland caribou. While the transmission
 229 lines could create a barrier to caribou movements, there was no apparent effect of the
 230 Wuskwatim Transmission Line on boreal woodland caribou movement (Manitoba Hydro
 231 2012). It is possible however, that large roads parallel to multiple linear features may
 232 result in avoidance and habitat fragmentation (Manitoba Hydro 2011). The additional
 233 rights-of-way will not necessarily limit caribou passing through the area and calving on
 234 islands in the lakes, as demonstrated by the movements of radio-collared Pen Islands
 235 across multiple transmission lines to the south and PR 280 north of Stephens Lake
 236 (Manitoba Hydro 2012).

237 Beyond Study Zone 5, a summer core use area for radio-collared summer resident Pen
 238 Islands caribou was delineated as part of the Bipole III Transmission Project cumulative
 239 effects assessment (Manitoba Hydro 2012). This area included Stephens Lake and the
 240 area east of the lake (see Map 3 below). When anthropogenic developments and
 241 burned areas are considered, 28% of this area is currently disturbed. When all potential
 242 future projects within five years were considered, it was estimated that 29% of the
 243 range would be disturbed, an increase of less than 1% (Manitoba Hydro 2012; see Map
 244 3). This is below the threshold of 35% disturbed habitat established by Environment
 245 Canada (2012) for boreal woodland caribou, which are considered to be especially
 246 sensitive to habitat disturbance. The application of this threshold is considered
 247 reasonable for a sedentary population that have become more migratory and range
 248 more broadly or, in the less likely event, where Pen Islands caribou have adopted a
 249 solitary calving behaviour similar to that of boreal woodland caribou.

250 Project-related effects and cumulative effects with other reasonably foreseeable
 251 projects were generally described for a small portion of migratory caribou ranges. These
 252 effects will be in addition to other impacts in their annual ranges, such as fire, harvest,
 253 predation, and anthropogenic disturbances including other hydroelectric developments.
 254 A plan is being developed to coordinate caribou monitoring activities among northern
 255 hydroelectric developments, as well as with government authorities and existing caribou
 256 committees and management boards.

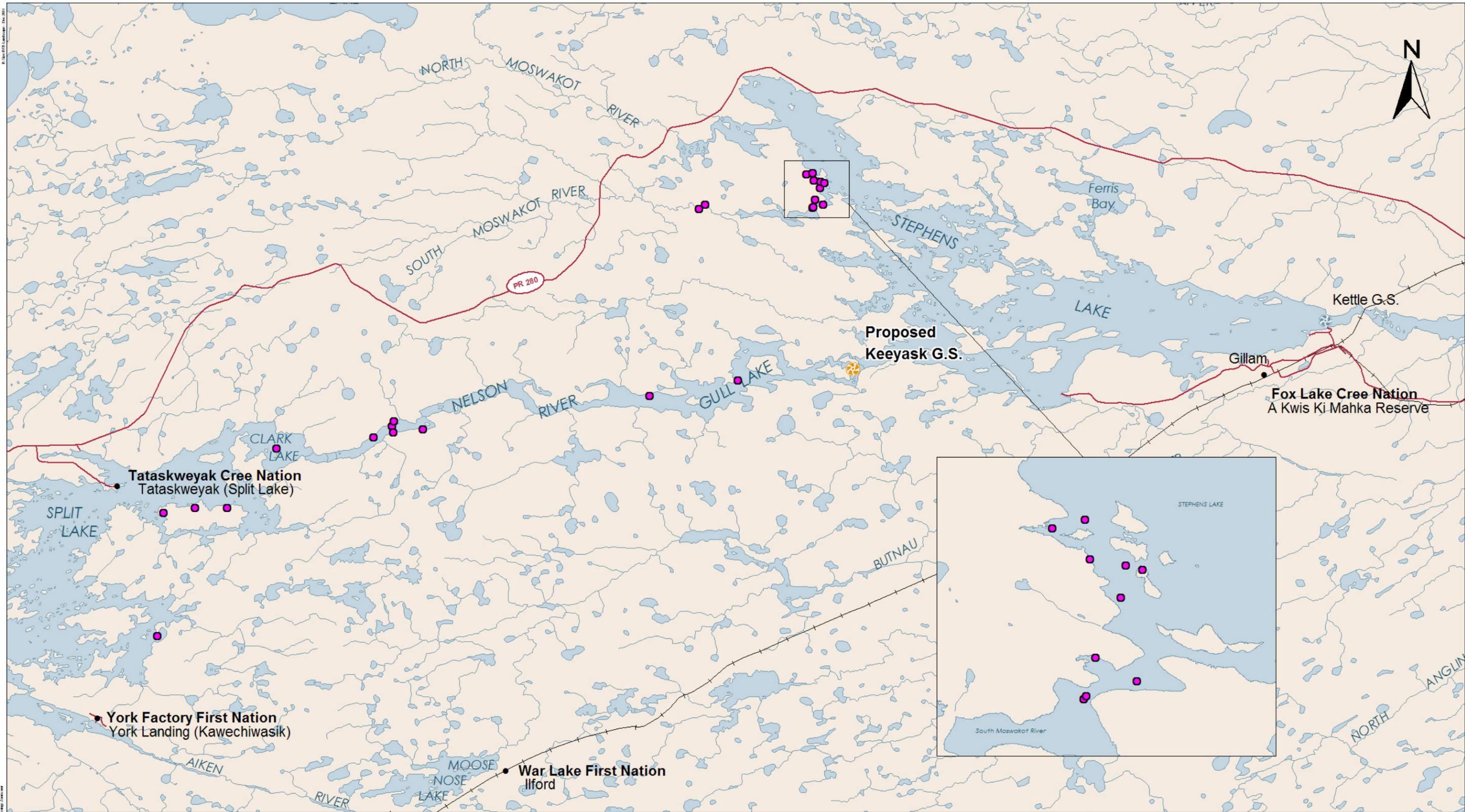
257 4. *The rationale for the Caribou Access Program and an annual hunt needs to be*
 258 *justified given: a) the report states that there are no measurable effects on caribou*
 259 *(TE-SV 7-35) and b) migratory coastal (Pen Island, Cape Churchill) and barren-ground*
 260 *(Qamanirjuaq) caribou do not winter every year in the Keeyask area and c) given*
 261 *that access to the LSA will increase due to the road upgrades and transmission ROW.*

262 *The statement that "Recreational fishers and hunters may [bold added] make use of*
 263 *the new boat launch facilities up and downstream of the GS in the operation phase"*
 264 *is inconsistent with existing resource use patterns where access is a key issue and*
 265 *appears to understate the issue since it is likely that there will be increased*
 266 *recreational hunting and angling upstream and downstream of the GS. The*
 267 *statement "that residual effects to recreational resource users are expected to be*
 268 *neutral Resource Use SV pp. 1-94)" is questionable and the lack of proposed*
 269 *mitigation a potential risk to caribou. The potential impact of the Caribou Access*
 270 *Program on caribou outside the RSA also needs to be analyzed and presented in the*
 271 *TE-SV.*

272 There is no "Caribou Access Program". This was previously addressed in the response to
 273 TAC/Public Rd 2 MCWS-LB-0012, which has been attached for reference purposes.
 274 Under Tataskweyak Cree Nation (TCN's) Adverse Effects Agreement, a number of
 275 offsetting programs are established to provide appropriate replacements, substitutions
 276 or opportunities to offset unavoidable Keeyask adverse effects on practices, customs
 277 and traditions integral to its distinctive cultural identity. Among its Offsetting Programs,
 278 TCN has an Access Program through which Members are provided services to enable
 279 them to travel to areas in the Split Lake Resource Management Area not affected by the
 280 Keeyask Generation Project. The Access Program does not specifically target caribou –
 281 they are, however, hunted opportunistically. Access Program reports from 2005 to date
 282 indicate that a total of four (4) caribou have been harvested under the TCN spring and
 283 fall Access Programs. With the Access Programs occurring in the spring and fall, very few
 284 caribou are harvested because, typically, they are much more abundant and accessible
 285 during the winter season.

286 The effect of increased access due to the provision of boat launches on caribou is
 287 described in Section 7.4.6.2.2 of the TE SV and on p. 6-375 of the EIS. No effect on
 288 migratory caribou is anticipated, as they are absent from the Local Study Area in
 289 summer. As indicated in the Resource Use Section of the Socio-Economic, Resource Use
 290 and Heritage Resources SV, boat travel is currently limited upstream of Gull Rapids (p.
 291 5-129, 5-131) and boat access will be restricted in areas where construction activity is
 292 occurring (p. 5-191). No effect on caribou harvest is anticipated during construction. The
 293 boat launches will provide access to the Keeyask reservoir and Stephens Lake during
 294 operation. However, the traditional harvest of caribou by the KCNs occurs in winter and
 295 focuses on migratory caribou populations. Stephens Lake is already accessible by boat
 296 and is travelled by resource users. Although there is some uncertainty regarding how
 297 much additional harvest can be anticipated in the Keeyask reservoir if it becomes more
 298 suitable for boating during operation, it will likely remain small as the traditional harvest
 299 season of caribou is in winter. While resource users may access Gull and Stephens lakes
 300 via the new boat launches, it is unlikely that this access will increase the number of KCNs

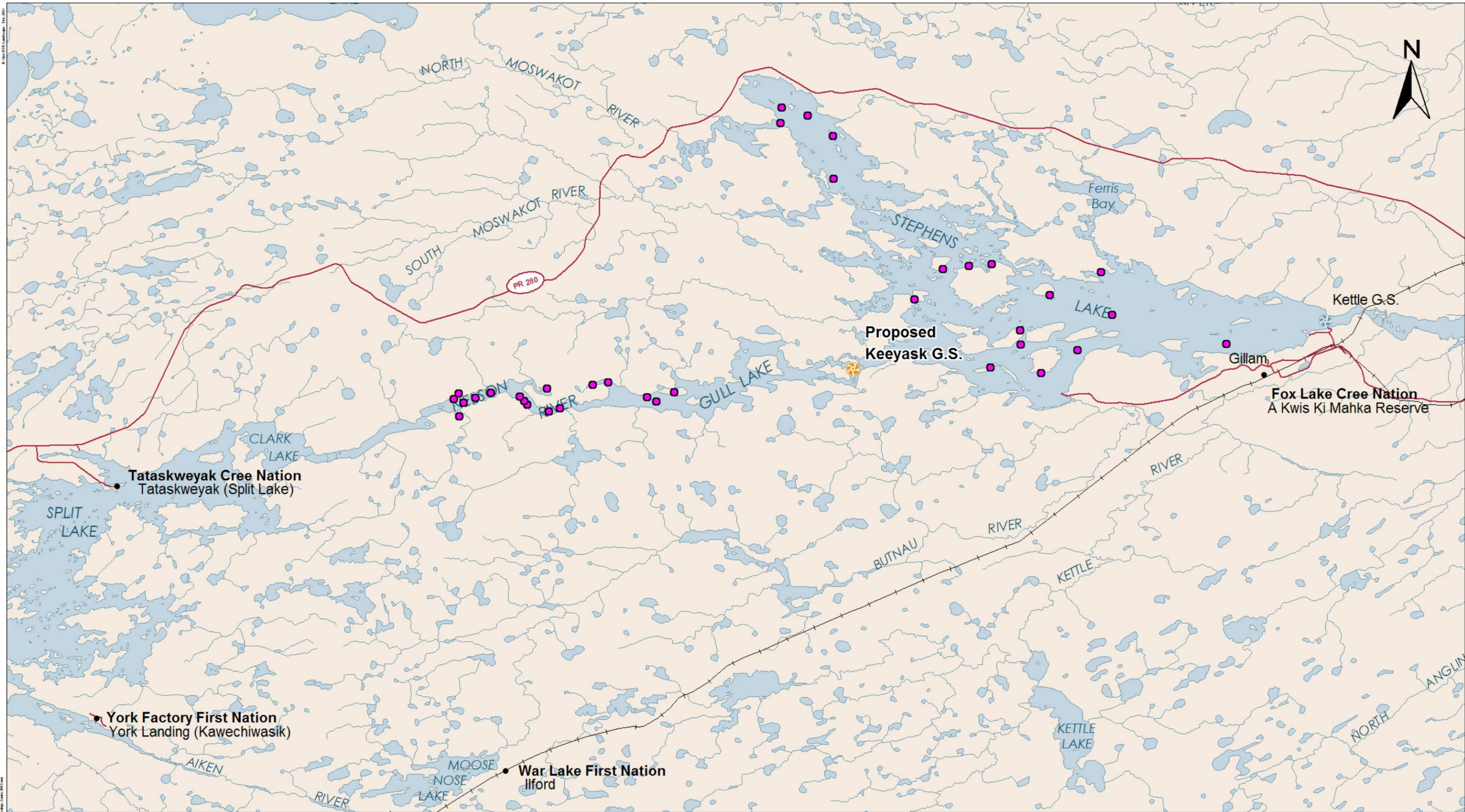
301 Members harvesting caribou in summer, and AEA access programs are expected to
302 disperse overall hunting pressure away from local areas (Resource Use Section 1.2.4.2.2
303 of the SE SV). As there is no anticipated increase in recreational hunting during
304 construction (Resource Use Section of the SE SV p. 1-93), and because there is no
305 licensed harvest of caribou in Game Hunting Area 9, in which Gull and Stephens lakes
306 are located, no licensed harvest of caribou on these lakes is expected as a result of the
307 new boat launches.



DATA SOURCE: Caribou crossings - WRCS; Water - NTS; Roads and rail - Manitoba Conservation		
CREATED BY: ECOSTEM Ltd.		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 13-MAY-13	REVISION DATE: 13-MAY-13
	VERSION NO: 1.0	QA/QC: RPB/YYY/ZZZ

- Legend**
Caribou River Crossings by Season
- Winter
- Infrastructure**
- Highway
 - Rail

Caribou River Crossings



DATA SOURCE: Caribou crossings - WRCS; Water - NTS; Roads and rail - Manitoba Conservation		
CREATED BY: ECOSTEM Ltd.		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 22-MAY-13	REVISION DATE: 22-MAY-13
	VERSION NO: 1.0	QA/QC: RPB/YYY/ZZZ

Legend

Caribou River Crossings by Season

- Winter

Infrastructure

- Highway
- +— Rail

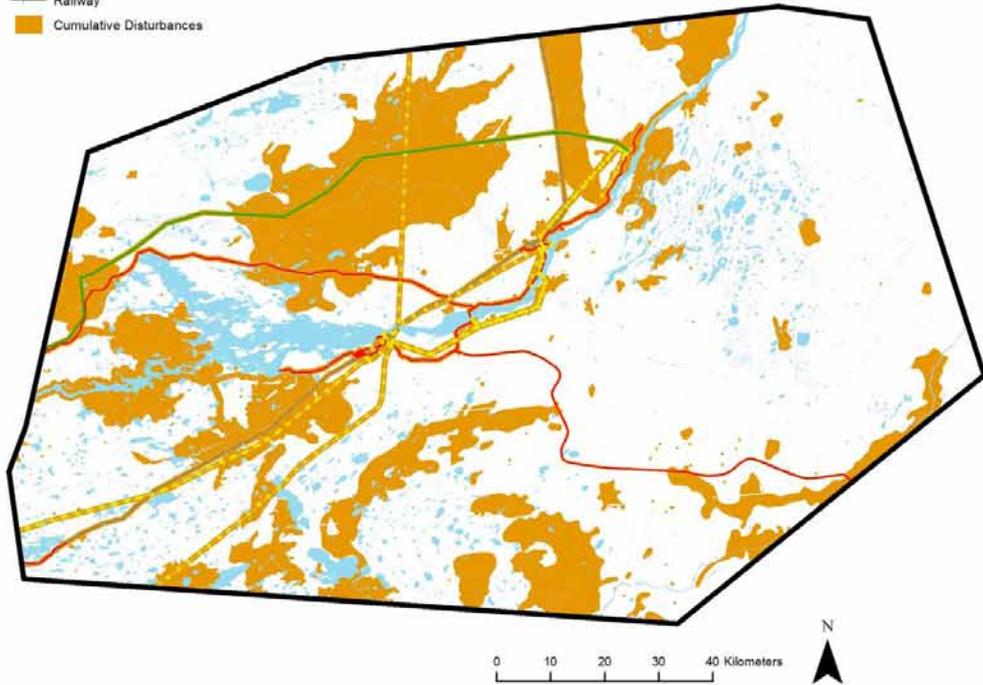
Caribou River Crossings

Winter 2013

Cumulative Disturbance Across the Pen Island Evaluation Area

Legend

- Final Preferred Route
- - - Transmission Line
- Road
- Railway
- Cumulative Disturbances



Pen Island		
Evaluation Area Attributes	Evaluation Area Size*	14,695 km ²
	Population Size**	N/A
	Current Habitat Disturbance	4,043 km ²
Determination of Habitat Amount	Evaluation Area Area*	14,695 km ² (100%)
	Total Cumulative Disturbance	4,281 km ² (29%)
	Total Available Undisturbed Habitat	10,414 km ² (71%)

*Range Area excludes water

**Population size is not currently available within current evaluation range

315

316 Map 3. Cumulative Disturbance Across the Pen Island [sic] Evaluation Area (from
 317 Manitoba Hydro 2012)

318 **REFERENCES:**

- 319 Environment Canada. 2012. Recovery strategy for the woodland caribou (*Rangifer*
320 *taranudus caribou*), Boreal population, in Canada. *Species at Risk Act Recovery*
321 *Strategy Series*. Environment Canada, Ottawa, ON. Xi + 138 pp.
- 322 Manitoba Hydro. 2011. Bipole III Transmission Project Caribou Technical Report.
323 Prepared for Manitoba Hydro by Joro Consultants Inc. Winnipeg, MB. 205 pp.
- 324 Manitoba Hydro. 2012. Bipole III Transmission Project Supplemental Caribou Technical
325 Report. Prepared for Manitoba Hydro by Joro Consultants Inc. Winnipeg, MB.
326 108 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0037c**

4 **PREAMBLE:**

5 The conclusion that residual effects from the Keeyask Generation Project on caribou are
 6 "expected to be adverse, small to medium in extent, long term in duration, and small in
 7 magnitude." and that "there is a moderate to high degree of certainty in the
 8 assessment" is not supported by the evidence presented in the EA, which has significant
 9 deficiencies with respect to:

- 10 1. Evaluation of status of summer resident caribou;
- 11 2. Assessment of effects of summer resident caribou and their habitat;
- 12 3. Assessment of effects on migratory caribou and their habitat; and
- 13 4. Proposed Mitigation.

14 **QUESTION:**

15 **Proposed Mitigation**

16 The following measures were proposed for mitigation of potential Project-related
 17 impacts on caribou, with deficiencies noted:

- 18 1. Minimizing blasting from May 15-June 30 (p. 6-370). It is not clear if any modeling of
 19 noise impacts on caribou in Stephens Lake and the LSA has been undertaken, and on
 20 what basis these dates were derived, nor the justification for minimize vs. no
 21 blasting during that time period.
- 22 2. Implementing an access management plan, including locked gates at the north and
 23 south dykes from May 15 to June 30, as well as during other sensitive time
 24 determined through monitoring (6-371). Shouldn't these "sensitive times" be
 25 determined pre-construction to mitigate access effects prior to and during
 26 construction as well? It is not clear how effective these actions will be to prevent
 27 improved access by hunters to Stephens Lake during the operations phase.
- 28 3. Blocking and revegetating project-related cutlines and trails within 100 m of project
 29 footprint (p. 6-374). The rationale for 100 m compared to 500 m (as used in EC
 30 disturbance analysis) is not provided.
- 31 4. Long-term monitoring of caribou and predators in the project area (p. 8-23, 8-26). It
 32 is unclear from if there is sufficient commitment to monitoring, particularly with
 33 respect to summer resident caribou e.g. collaring, genetic analyses.

34 It is not clear if mitigation for other potential impacts was considered, such as
 35 reduced speed limits to minimize risk of collisions, any mitigation for lights, and
 36 reducing sight lines on corridors.

37 **RESPONSE:**

38 The following provides a response for each of the mitigation topics identified above.

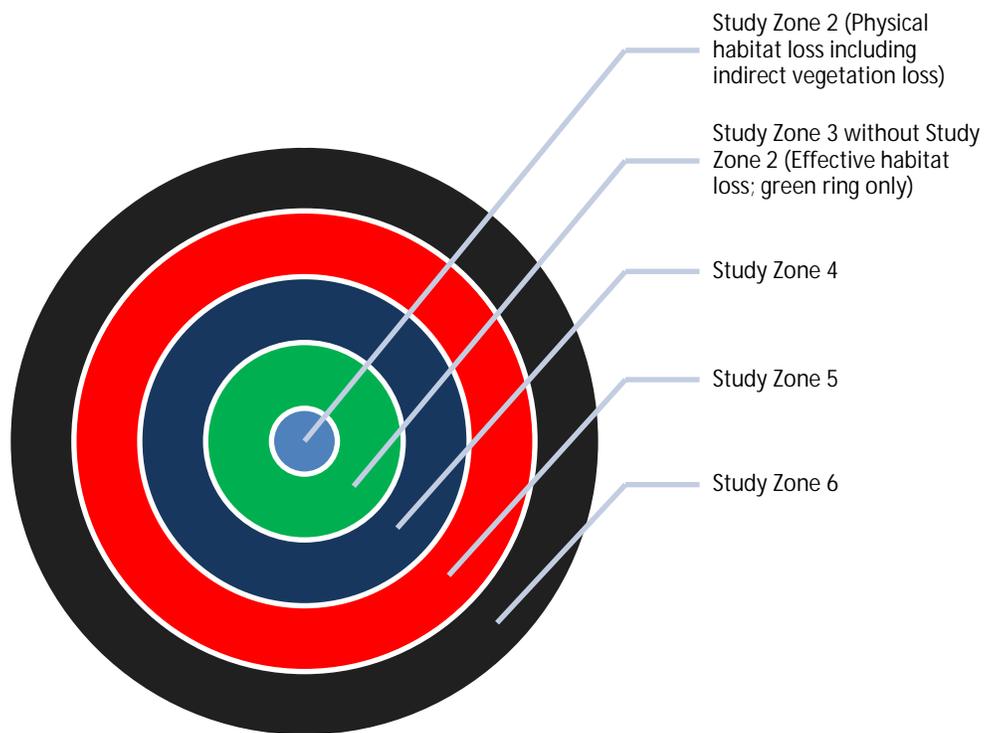
39

40 1. *Minimizing blasting from May 15-June 30 (p. 6-370). It is not clear if any modeling of*
 41 *noise impacts on caribou in Stephens Lake and the LSA has been undertaken, and on*
 42 *what basis these dates were derived, nor the justification for minimize vs. no*
 43 *blasting during that time period.*

44 As described in CEC Rd 1 CEC-0042, noise models were not used to measure impacts on
 45 mammals VECs, including caribou. The degree to which noise conditions were
 46 characterized was primarily determined based on the requirements for evaluating
 47 Project effects on terrestrial VECs. The terrestrial VEC assessments consider three
 48 general categories of effects during construction: habitat change (e.g., gain, loss,
 49 alteration); Project-related disturbances (e.g., noise, traffic, construction activity,
 50 accidental spills and fires); and changes in access (e.g., human, predator). Noise is one
 51 factor considered in assessing sensory disturbance-related construction effects.

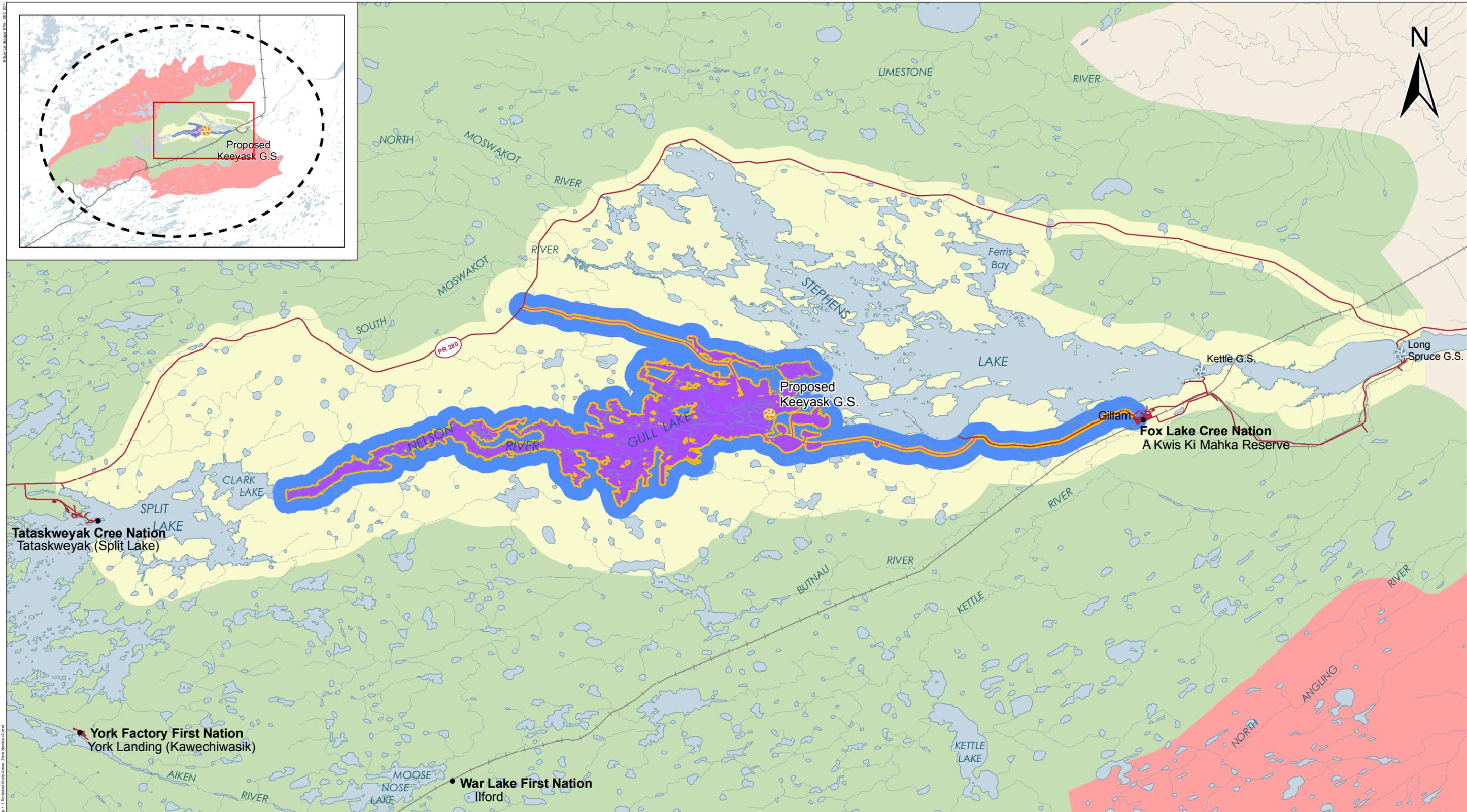
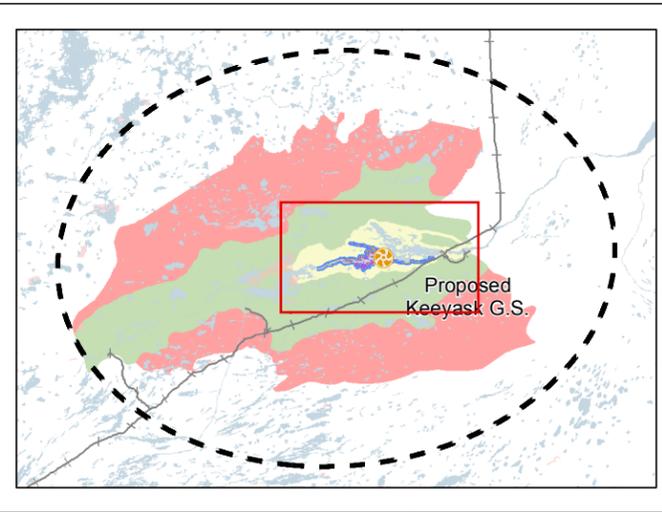
52 The nested study areas approach was designed, in part, to assess effects including
 53 sensory disturbances. The assessment of sensory disturbances (e.g., noise, vibrations,
 54 dust, presence of people and machinery) on caribou is based on the project description
 55 and literature, and extrapolated to the Project study zones. The nested study areas
 56 approach was also preferred over noise only models to measure an area potentially
 57 affected by disturbances because few studies are available that investigate the effects of
 58 particular noise levels on caribou. For example, a recent study has indicated that it is
 59 difficult to separate the effects of noise from other disturbances, as noise disturbance
 60 comes from a source that can also affect an animal's behaviour (Brown et al. 2012).

61 The effects of sensory disturbances were measured as the loss of effective calving and
 62 rearing and winter habitats in the Local and Regional Study Areas. The amount of
 63 caribou habitat (winter or calving and rearing) in Study Zone 2 (i.e., physical habitat loss)
 64 was subtracted from the amount of habitat in Study Zone 3 and the difference was
 65 expressed as a percentage of the habitat available in Study Zone 4 (the Local Study Area)
 66 and Study Zone 5 and extrapolated further into Study Zone 6. Habitat in Zone 2 was not
 67 included in the assessment of the effects of sensory disturbance because this habitat
 68 was already considered to be physical habitat loss, and was not counted twice (Figure
 69 1). The Local Study Area (Study Zone 4) also considered noise-related effects that could
 70 occur along PR 280 with increased construction traffic.



71
72 **Figure 1. Loss of effective habitat**

73 In heavy construction areas, some caribou activity will likely decline within 2 km of the
74 access road and up to at least 4 km from the generating station site (Manitoba Hydro
75 2011). Similar effects were anticipated in the Local Study Area, as caribou activity is
76 reported to decrease within 1 to 10 km of industrial developments (Vors *et al.* 2007; TE
77 SV Section 7.4.6.2.1). Study Zone 3 encompasses the Project Footprint, including the
78 north and south access roads and most of the area within 4 km of the generating station
79 (Map 1). As such, the pre-determined Zone 3 buffer appeared to be a reasonable size to
80 assess sensory disturbance-related effects (including noise), and was selected for this
81 purpose. Although a few caribou may habituate to small levels of noise disturbance and
82 not all will be affected, blasting is unpredictable and could scare animals away from the
83 blasting zone (TE SV Section 7.4.6.2.1). The effects assessment notes that not all
84 individual caribou are affected equally by Project-related sensory disturbances, which
85 may vary in their intensity, timing, duration, and frequency in the Local Study Area over
86 time. During operations, the effects of sensory disturbances as measured by effective
87 habitat loss are expected to decline.



DATA SOURCE:
Study areas - ECOSTEM Ltd.; Water - NTS; Roads and rail - Manitoba Conservation.

CREATED BY:
ECOSTEM Ltd.

COORDINATE SYSTEM:
UTM NAD 1983 Z15N

DATE CREATED:
13-MAR-12

REVISION DATE:
18-MAY-12

VERSION NO.:
1.0

QA/QC:
JWE/RDB/MWZ

Legend

Geographic Zones

- Study Zone 1 (Project Footprint for Both Phases)
- Study Zone 2
- Study Zone 3
- Study Zone 4
- Study Zone 5
- Study Zone 6

Project Areas

- Keeyask Generation Project Area

Note: Each zone includes all of the smaller zones within its perimeter

Geographic Zones Used for Terrestrial Study Areas

File Location: Z:\Work\Keeyask\GIS\Map\Map\11_Therrestrial_Study_Areas_Zone_Shapes_V2.mxd

92 The period for minimizing blasting was derived from accounts of calving from the
 93 literature and knowledge of calving in the Local Study Area. Calving begins in mid-May
 94 (Banfield 1987) and 80% to 90% of calves are typically born in a 10-day period in late
 95 May or early June (Miller 2003). The calving period used for mitigation was
 96 corroborated using site data, where the first appearance by calves was on June 8, and
 97 corroborated further with Pen Islands coastal caribou radio-collaring data, which
 98 indicated a calving initiation date of May 24. Minimizing blasting to the extent
 99 practicable from May 15 to June 30 spans the calving period in the Local Study Area.
 100 Blasting will be required at some sites year round during the first few years of
 101 construction and cannot be restricted at some locations without significantly affecting
 102 the construction schedule (Section 6.13.2 of the Project Description Supporting
 103 Volume). The effects assessment considers this possibility, however, and indicates that
 104 there will be a loss of effective habitat up to at least 4 km from the generating station
 105 due to the range of sensory disturbances associated with project construction. Overall,
 106 potential disturbances will be limited to areas near those lands identified for the
 107 Project. Sensory disturbance during construction will result in less than a 1% loss of
 108 winter and calving and rearing habitats in the Regional Study Area (EIS p. 6-368), and
 109 will not affect long-distance movements of migratory caribou (Response to EIS
 110 Guidelines, p. 6-370), that in most years, do not come near the Project footprint. In
 111 some years, as in winter 2013, a larger number of migratory caribou could be affected
 112 by sensory disturbances related to the Project. Alternate and suitable winter habitat is
 113 available elsewhere in the region. Sensory disturbances are anticipated to be
 114 considerably less during operation compared to construction.

115 2. *Implementing an access management plan, including locked gates at the north and*
 116 *south dykes from May 15 to June 30, as well as during other sensitive time*
 117 *determined through monitoring (6-371). Shouldn't these "sensitive times" be*
 118 *determined pre-construction to mitigate access effects prior to and during*
 119 *construction as well? It is not clear how effective these actions will be to prevent*
 120 *improved access by hunters to Stephens Lake during the operations phase.*

121 As indicated above, the calving period has been described as May 15 to June 30. Other
 122 potentially sensitive time periods, such as the arrival of migratory caribou cited as an
 123 example on p. 6-373 of the Response to EIS Guidelines, are more unpredictable and
 124 cannot be determined in advance. The frequency of spatial overlap of migratory caribou
 125 herds with the Project in Zone 4 is usually low, but there have been two winter events
 126 reported in the last 12 years of study, where relatively large numbers of caribou
 127 occupied Zone 4. Reduced vehicle speeds and warning signs can be used if this type of
 128 event occurs in the future to minimize potential accidents.

129 The Construction Access Management Plan (a preliminary version was filed by the
 130 Partnership on April 26, 2013) includes security gates on the south access road and
 131 locking gates at the north and south dykes, as well as measures to limit access during
 132 construction. As part of the Keeyask Infrastructure Project Access Management Plan, a
 133 security gate was installed on the north access road. Trail rehabilitation is proposed to
 134 mitigate access during operation (see 3. below).

135 3. *Blocking and revegetating project-related cutlines and trails within 100 m of project*
 136 *footprint (p. 6-374). The rationale for 100 m compared to 500 m (as used in EC*
 137 *disturbance analysis) is not provided.*

138 As described in the response to TAC Public Rd 2 EC-0029, cleared areas (including new
 139 trails) will be rehabilitated to native habitat types as quickly as is practicable after it is
 140 determined they are not required for Project operation. Except for cases when the
 141 Project follows existing resource-use trails (Response to EIS Guidelines Section
 142 6.5.3.1.1), Project-related trails will be blocked where they intersect the Project
 143 Footprint and the portions of these features within 100 m of the Project Footprint will
 144 be revegetated. This is anticipated to minimize hunting and predator access, reduce
 145 sightlines and allow the remainder of the trail to revegetate naturally over time.
 146 Eventually, this linear feature would be removed from the overall area of disturbance
 147 (as may be measured by the 500 m Environment Canada (2012) disturbance analysis).

148 The 500 m buffer of anthropogenic features proposed by Environment Canada (2012)
 149 was selected to best represent the combined effects of increased predation and
 150 avoidance on caribou (p. 14). The buffer would be on either side of a linear feature,
 151 running its length. Because avoidance of a linear feature is included in this buffer, it is
 152 not a guideline for the portion of a trail that should be blocked and revegetated to
 153 mitigate access effects. It should be noted further, that blocking and revegetating
 154 Project-related cutlines and trails was not proposed exclusively as a mitigation measure
 155 for caribou (see Section 2.4.4.1.2 of the Terrestrial Environment Supporting Volume).
 156 The success of the revegetation efforts will be monitored and additional efforts will be
 157 applied to areas not meeting objectives.

158 4. *Long-term monitoring of caribou and predators in the project area (p. 8-23, 8-26). It*
 159 *is unclear from if there is sufficient commitment to monitoring, particularly with*
 160 *respect to summer resident caribou e.g. collaring, genetic analyses. It is not clear if*
 161 *mitigation for other potential impacts was considered, such as reduced speed limits*
 162 *to minimize risk of collisions, any mitigation for lights, and reducing sight lines on*
 163 *corridors.*

164 Proposed project-related monitoring for caribou is outlined in Chapter 8 of the
 165 Response to EIS Guidelines. In addition, the Terrestrial Effects Monitoring Plan includes

166 detailed plans for monitoring caribou in the Keeyask region. Caribou populations,
167 calving and rearing habitat use, and mortality will be monitored.

168 The KHLP is also developing an approach for coordinating its caribou monitoring
169 activities and for sharing the outcomes of its monitoring with other key stakeholders in
170 the lower Nelson region, including Manitoba Hydro's other proposed northern
171 hydroelectric developments, local communities, Resource Management Boards and,
172 possibly, government.

173 On-going regional monitoring efforts include genetic studies by Environment Canada (in
174 collaboration with other partners including universities and MCWS), and radio-collaring
175 studies of Pen Islands and Cape Churchill coastal caribou by MCWS with the support of
176 Resource Management Boards. Manitoba Hydro currently provides support to these
177 existing research and monitoring initiatives and is fully informed about their outcomes.

178 Mitigation for Other Potential Effects

179 As described in the response to TAC Public Rd 2 EC-0032, mitigation measures to
180 minimize disturbance of caribou in the Project area are discussed in the Terrestrial
181 Environment Supporting Volume (Section 7.4.6.2) and Response to EIS Guidelines
182 (Section 6.5.8.1). This CEC Information Request concludes by asking whether mitigation
183 for other potential effects was considered, such as reduced speed limits to minimize risk
184 of collisions, any mitigation for lights, and reducing sight lines on corridors. These are
185 discussed, in turn, below.

186 Speed limits will be based on design criteria engineered to safely operate machinery and
187 vehicles on access roads and temporary haul trails during construction. Minimizing the
188 use of these roads and trails by the public during construction via a Construction Access
189 Management Plan is expected to reduce traffic noise and exhaust during construction.
190 Although lights cannot be turned off for safety reasons, shielded and downward-
191 directed lighting will be placed where feasible on the outside of the generating station if
192 it does not interfere with operations safety.

193 As described in the response to TAC Public RD 2 EC-0032, best management guidelines
194 (Government of Alberta 2011) recommend that in forested areas, line-of-sight should be
195 limited to 200 m on non-roadway, cross-country linear features. The Project does not
196 include any cross-country access trails (all trails are within or near other Project
197 Footprint components). In the event that additional access trails are identified during
198 construction, any cross-country access trails through forested areas will be designed to
199 either be less than 200 m long or cleared in a manner such that sight lines are no greater
200 than 200 m. Access trails will be blocked when they are no longer needed for
201 construction (see above). Additionally, it is anticipated that vegetation regeneration will

202 generally be adequate to reduce sight lines on access trails. A study conducted in the
 203 Project region found that approximately 35% of trails and cutlines previously created for
 204 a variety of purposes had regenerated to the degree that they likely no longer
 205 functioned as travel corridors within 10 years of clearing (Terrestrial Environment
 206 Supporting Volume Section 2.4.3.2.1).

207 **REFERENCES:**

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1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0038**

4 **QUESTION:**

5 Wetlands make up approximately 90% of the RSA, however most of these are peatlands
 6 such as bogs, fens, and conifer swamps. Marshes represent represents only 1% of Study
 7 Zone 4 and 2.8% of wetland function LSA (6-99), and marshes along the Nelson River a
 8 fraction of those. Existing and Nelson River marshes were assessed as being lower
 9 quality compared to off-system marshes (p. 6-100). The EIS considers Nelson River
 10 wetlands "non-native" (TE-SV 2-85) since they are "already highly disrupted by water
 11 level regulation". However, "wetland function" is considered a VEC and Nelson River
 12 marshes provide significant habitat for other ecologically and culturally significant VECs
 13 such as staging and nesting waterfowl, muskrat and other furbearers, and fish.

14 The assessment of potential project effects on Nelson River wetlands is considered
 15 deficient in the following areas:

- 16 1. Timing of wetland re-establishment. The Response to EIS Guidelines (6-329) states
 17 "Based on observations from Stephen Lake (the Kettle GS reservoir), it is expected
 18 that Nelson River shoreline wetlands that were removed or altered by the Project
 19 would be replaced by wetlands that develop along the reservoir shoreline during
 20 the operation phase." However, peatland disintegration is expected to occur mainly
 21 during the first 30 years in the Gull Reservoir, with additional losses continuing for
 22 50 to 100 years and declining rates (TE-SV 2-94). Potential response of riparian
 23 wetlands and peatland disintegration on Gull Lake are predicted based upon those
 24 observed in the Stephens Lake reservoir, but it has a different water management
 25 regime than proposed for Gull Reservoir.
- 26 2. Cumulative impact assessment on riparian wetlands from past, proposed and future
 27 hydroelectric development along the Nelson River. TE-SV (p. 2-166) states that "All
 28 of the natural Nelson River shoreline wetlands in the Regional Study Area were
 29 either lost to flooding or have been altered by modified water and ice regimes".
 30 Although currently degraded compared to historical wetlands, the remaining
 31 wetlands on Gull Lake may be significant given the cumulative effects of water level
 32 regulation and reservoir creation elsewhere along the Nelson River system.

33 The extent of historical loss and alteration of wetlands along Nelson River from past
 34 hydroelectric development needs to be better characterized and quantified to allow the
 35 proposed and future developments to be put into context. Comparison with pre-
 36 development baseline monitoring (if available) or comparable unregulated systems in

37 northern Manitoba should be undertaken, as well as an assessment of wetland
 38 development elsewhere along the Nelson River system with respect to time since
 39 development (e.g. reservoir) and water level management regimes (e.g. timing of
 40 drawdown, peaking, annual variation).

41 **RESPONSE:**

42 The first paragraph of the question states "...Nelson River marshes provide significant
 43 habitat for other ecologically and culturally significant VECs such as staging and nesting
 44 waterfowl, muskrat and other furbearers, and fish." It is noted that habitat values were
 45 considered when rating Nelson River marshes. Nelson River marsh types in the Keeyask
 46 and Stephens Lake reaches were assigned lower wildlife habitat quality ratings than
 47 analogous off-system marsh types (considerably lower in most cases). This is because
 48 they are used less by the key shoreline wetland wildlife species (e.g., waterfowl,
 49 muskrat, moose and olive-sided flycatcher), since there is very little emergent
 50 vegetation in the Nelson River shallow water zone.

51 Specific wetlands-related issues raised in the questions above are addressed separately
 52 below to explain how the concerns are addressed in the EIS.

53 *1. Timing of Wetland Re-establishment*

54 There are two components to the question regarding the timing of wetland
 55 reestablishment. One component relates to water regime and the other relates to how
 56 wetlands reestablish in the context of ongoing peatland disintegration.

57 Generalizations in the Response to EIS Guidelines about the relative importance of
 58 physical factors such as water regime, and how they are expected to influence future
 59 Keeyask reservoir shore zone habitat development, are based on six northern Manitoba
 60 proxy areas for flooding and/or water regulation, some northern Quebec reservoirs and
 61 the relevant scientific literature. This information indicates that, although water regime
 62 is one of the factors that can typically have a strong influence on shoreline wetland
 63 distribution and abundance, relief and the proportion of reservoir area that is peatland
 64 are expected to be the most important physical factors for shore zone habitat
 65 development in the Keeyask reservoir. Reservoir flooding in peatland dominated areas
 66 essentially converts existing riparian peatlands and a high proportion of inland
 67 peatlands to reservoir riparian peatlands because the new shoreline forms in these
 68 peatlands. These peatlands already have established wetland vegetation that is adapted
 69 to the new conditions and can persist over the long-term. Relief is important because
 70 flooded areas that are generally flatter tend to have more of the wetter peatland types,
 71 which already have vegetation that is similar to what develops along reservoir
 72 shorelines. Please see the response to TAC Public Rd 2 PCN-0001 for a comparison of
 73 physical factors in the proxy areas and the proposed Keeyask reservoir, as well as an

74 explanation of how the various proxy areas and relevant literature were used to predict
75 shoreline wetland development on the Keeyask reservoir.

76 The previous paragraph and the response to TAC Public Rd 2 PCN-0001 partially explain
77 how shoreline wetlands can establish in the context of ongoing peatland disintegration.
78 That is, shoreline wetlands are already present along the newly formed reservoir
79 shoreline, and in some locations are able to either move with the expanding shoreline
80 or develop on it. The other important factor for the explanation is that most of the
81 shoreline is not undergoing peatland disintegration after the first fifteen years, even in
82 the Gull Lake reach where most of the peatland disintegration occurs (PE SV Section
83 6.4.2.1.2, p. 6-51).

84 *2. Cumulative Impact Assessment on Riparian Wetlands*

85 Regarding wetlands on Gull Lake, the Terrestrial Environment Supporting Volume
86 (Section 2.8.4.1.1) notes that vegetated shallow water wetlands (what is commonly
87 called marsh) were not present on Gull Lake in 2012 due to prolonged high water levels
88 and flows starting in 2005. Marsh is not expected to reestablish to any substantial
89 degree prior to the proposed construction start date due to continued high water levels.
90 The potential area loss would be very low even using what was there prior to the recent
91 high water levels as a potential future condition without the Project. There was less
92 than 8 ha of mapped marsh (which is less than 1% of the shallow water areas with
93 suitable water depths) on Gull Lake prior to 2005, and this marsh was less diverse than
94 the marsh found in the Stephens Lake proxy area.

95 The Project is expected to improve shoreline wetland conditions by increasing the
96 quantity and quality of Nelson River marsh in the Keeyask reach. This prediction is based
97 on results from the northern Manitoba proxy areas used to examine the effects of
98 flooding and/or water regulation and a review of relevant literature. Additional details
99 can be found in the response to TAC Public Rd 2 PCN-0001.

100 Historical wetland loss and alteration are characterized in the TE SV Sections 2.3.3,
101 2.8.3.1 and a forthcoming Project technical report (Responses of Terrestrial Habitats to
102 Reservoir Flooding and Water Regulation in Northern Manitoba). The degree of
103 quantification varies with wetland attribute and Nelson River reach, depending on
104 factors such as historical data availability and whether the reach was used as a proxy
105 area for the effects of flooding and/or water regulation on shore zone habitat. In some
106 cases, only qualitative information is available. For example, quantification of historical
107 wetland alteration in the Kelsey and Kettle proxy areas confirmed that shore zone
108 habitat alteration typically does not extend more than 50 m from the reservoir
109 shoreline.

110 The degree of quantification included in the TE SV and technical report is considered
111 adequate for the effects assessment because there is no existing mapped marsh on the
112 Nelson River within the Project zone of influence, there is little potential for substantial
113 marsh to develop without the Project and the Project is expected to increase the
114 quantity and quality of shoreline wetlands.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 6.4.3.2 Landbirds; p. 6-88**

3 **CEC Rd 1 CEC-0039**

4 **QUESTION:**

5 Despite the predicted displacement of 45,000 songbirds (TE SV pp. 6-88), nest
6 destruction or "incidental take" is not discussed in the report, although "disturbance" on
7 breeding birds is mentioned. Clearing outside the main breeding season is proposed as
8 mitigation "where practicable" but "where practicable" is not defined. The Migratory
9 Birds Convention Act (MCBA) prohibits incidental take (Environment Canada 2012) and
10 Section 5(1) of the MCBA prohibits harassing migratory birds. Incidental take needs to
11 be more explicitly described in the EIS and mitigation identified to avoid incidental take
12 as per EC guidelines (e.g. avoidance, timing restrictions for wetland and upland nesters,
13 nest surveys, setbacks, etc.) and protocols in place if active nests are found within the
14 Project footprint.

15 **RESPONSE:**

16 An Avian Management Plan will be prepared to address incidental take under the
17 Migratory Birds Convention Act for the Keeyask Generation Project. It will be
18 submitted to regulators once complete.

19 Recognizing that the Project will cause disturbance to birds, the objectives of the Avian
20 Management Plan will include:

- 21 a. limiting the risk of the occurrence of incidental take;
22 b. managing and mitigating avian issues arising from Project construction; and
23 c. developing an educated workforce that has the information to identify and initiate
24 action on potential avian issues.

25 The Avian Management Plan will discuss issues such as responsibilities under the MBCA,
26 timing windows, pre-clearing nest surveys, and setback distances. General education
27 measures such as types of birds known to nest in the project area, timing of nesting,
28 nest types and habitat preference will also be included in the Avian Management Plan.

29 For further information on the Partnership's specific commitments, please see the
30 responses to TAC Public Rd 2 EC-0026, EC-0027 and EC-0031.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 6.3.2.5.3 Colonial Waterbirds; FLCN**
3 **Environmental Report; p. N/A**

4 **CEC Rd 1 CEC-0040**

5 **PREAMBLE:**

6 Gull and tern nesting habitat was identified as a 'priority species" despite fitting many of
7 the stated criteria for a VEC including:

- 8 • Nesting habitat for gulls and terns in Gull Rapids was considered "unique" in the RSA
9 (TE-SV, pp. 6-30).
- 10 • Gull eggs although they were identified by FN as important food source of concern
11 in workshop Comment 4 Part 4. 5-214 to 5-442 and gulls have traditionally been
12 important diet items (FLCN p. 50).
- 13 • There will be a complete loss of nesting habitat in the Gull Rapids, as well as
14 flooding of additional gull and tern nesting habitat in the Birthday Rapids and Gull
15 Lake.
- 16 • Nesting habitat on islands in rapids is considered rare along the Kischi Sipi (Nelson
17 River) due to the development of past rapid areas (FLCN p. 83).

18 **QUESTION:**

19 There is insufficient description in the TE-SV of existing nesting habitat and proposed
20 mitigation to assess the suitability of proposed measures and significance of residual
21 effects. The following information/clarification are required to address these
22 deficiencies:

- 23 • Presumably (although the characteristics are not explained in the TE-SV) the rapids
24 prevent terrestrial predators (e.g. red fox, American mink) from readily accessing to
25 the nesting islands in Gull Rapids. It is not explained how artificial islands placed in
26 Gull Lake will prevent them from swimming to the islands.
- 27 • Presumably, seasonal flooding and/or ice scouring prevents dense vegetation from
28 establishing on the nesting islands. It is not clear how artificial islands will be
29 maintained in a suitable condition for colonial-nesting birds.
- 30 • Suitability of floating platforms for common terns and ring-billed gulls which
31 typically nest on low, exposed islands near the water level, as opposed to floating
32 mats of vegetation as in black terns
- 33 • If predator exclusion fencing is used, how will it be maintained and monitored?

- 34 • How variability in the water level below the generation station and in Gull Lake will
35 be considered in the design compared to the current variability?
- 36 • The monitoring plan states that monitoring will occur during the first 3 years of
37 operations, but timing of the construction of these islands need to be addressed,
38 with respect to the timing of the GS construction and how long it will take the
39 reservoir to fill.
- 40 • The TE-SV states that “over the course of construction, if there is overlap of
41 scheduled construction activities that could affect the breeding colonies at Gull
42 Rapids with the bird breeding period (April 1-July 31), measures will also be taken to
43 avoid or minimize disturbance to active nesting colonies to the extent possible” (p.
44 6-361). It is unclear what potential measures are being contemplated and how
45 replacement habitat will be provided during construction, especially once Gull
46 Rapids are dewatered. Environment Canada requests that blasting be avoided
47 within 1600 m of active colonies.
- 48 • Supporting evidence or case studies of successful use of the proposed mitigation
49 measures for the colonial nesting waterbird species affected by the Project should
50 be provided.
- 51 • Information in the design and location of the proposed measures needs to be
52 provided for the various options, and the criteria that will be used to select which
53 one(s) is implemented.
- 54 • It is not clear from the current reports that the area proposed for mitigation is
55 equivalent to the area of the natural islands that will be lost, such that equivalent
56 breeding populations will be maintained. Based on these deficiencies, the evidence
57 presented in the EIS does not support the conclusion (Response to EIS, p 6-364) that
58 the “overall potential Project-related residual effects on colonial waterbirds are
59 expected to be adverse but regionally acceptable, primarily because
60 implementation of mitigation measures is expected to largely offset the long-term
61 effects of the Project.”

62 **RESPONSE:**

63 The preamble in this Information Request questions the decision to treat gulls and terns
64 (colonial waterbirds) as a priority species rather than as a Valued Environmental
65 Component (VEC). The response to CEC Rd 1 CEC-0036 provides an overview of the VEC
66 selection process and how this decision was made.

67 Conclusions cited in the Response to EIS Guidelines with respect to the regional
68 acceptability of Project -related residual effects on gulls and terns (colonial waterbirds)
69 rely on implementation of mitigation measures outlined on p.6-362 of the Response to
70 EIS Guidelines, p. 6-362:

71 *"Deployment of artificial gull and tern nesting platforms (e.g., reef rafts),*
 72 *breeding habitat enhancements to existing islands, (e.g., predator fencing or*
 73 *placement of suitable surface substrate), and/or development of an artificial*
 74 *island, or a combination of these measures, will be implemented to off-set the*
 75 *loss of gull and tern nesting habitat at Gull Rapids and areas upstream."*

76 Details regarding the design specifications and site locations of specific mitigation
 77 measures are currently being developed by the Partnership, and will be documented in
 78 a Terrestrial Mitigation Implementation Plan. The Terrestrial Mitigation Implementation
 79 Plan will be developed once construction is underway, and the actual extent of
 80 disturbance caused by construction of the Keeyask Generation Project is known. The
 81 draft plan will be provided to the regulator for review prior to finalization.

82 This Plan will answer many of the questions posed above, as it will include detailed
 83 design, placement, development, and implementation and maintenance information for
 84 the gull and tern-nest habitat creation and /or enhancement.

85 The Partnership remains confident that the specific mitigation measures to be
 86 implemented in the Terrestrial Mitigation Implementation Plan will lead to overall
 87 Project-related residual effects on gulls and terns that are regionally acceptable.

88 The following responds, in turn, to each of the specific issues raised in the question
 89 above.

- 90 • *Presumably (although the characteristics are not explained in the TE-SV) the rapids*
 91 *prevent terrestrial predators (e.g. red fox, American mink) from readily accessing to*
 92 *the nesting islands in Gull Rapids. It is not explained how artificial islands placed in*
 93 *Gull Lake will prevent them from swimming to the islands.*

94 Waterbird colonies are susceptible to both avian and mammalian predators, and it is
 95 recognized that access to the reefs at Gull Rapids by land-based predators is currently
 96 impeded by the fast flowing turbulent waters that surround nesting islands. Accordingly,
 97 any artificial island or enhanced island located in a lake or lake-like environment (i.e.,
 98 the Keeyask GS reservoir) could be accessed by land predators. Given this, it is
 99 recommended in the Response to EIS Guidelines that island placement consider factors
 100 such as distance from shore and predator fencing in order to minimize the potential for
 101 nest predation by land predators.

- 102 • *Presumably, seasonal flooding and/or ice scouring prevents dense vegetation from*
 103 *establishing on the nesting islands. It is not clear how artificial islands will be*
 104 *maintained in a suitable condition for colonial-nesting birds.*

105 Details regarding the design of artificial islands and/or enhancement of existing islands
 106 are currently being developed by the Partnership and will be documented in the
 107 Terrestrial Mitigation Implementation Plan.

108 As noted below, Manitoba Hydro has successfully developed an artificial island on the
 109 Lower Churchill River System for the primary purpose of providing nesting habitat for
 110 Arctic terns and gulls (Manitoba Hydro and The Town of Churchill 1997). The island was
 111 built to a 1:20 year flood level to accommodate seasonal flooding and/or ice scouring.
 112 Follow-up monitoring of the island revealed the presence of nesting birds including
 113 Arctic tern, herring gull and mallard (TetrES 2000; TetrES 2001).

- 114 • *Suitability of floating platforms for common terns and ring-billed gulls which*
 115 *typically nest on low, exposed islands near the water level, as opposed to floating*
 116 *mats of vegetation as in black terns*

117 Floating platforms have been used as replacement nesting habitat for common terns in
 118 a variety of locales, the most notable program initiated by the Canadian Wildlife Service
 119 (CWS) and the Metropolitan Toronto and Region Conservation Authority (MTRCA) in the
 120 Toronto Harbor (Dunlop et al. 1991; Jarvie et al. 1996). Floating nest platforms for
 121 common terns and other species (Forster's tern, black tern, least tern) have been used
 122 successfully in other jurisdictions, including Lake Ontario (Lampman et al. 1996), British
 123 Columbia (Chapman 1986), Wisconsin (Techlow and Linde 1983), California (Brennan
 124 2009), and Great Britain (British Trust for Conservation 2009). Barges have also proved
 125 successful for terns on the Upper Mississippi River in Illinois (US Army Corps of
 126 Engineers 2013) in California (Ross 2007), and Washington (Collis et al. 2002). Both gulls
 127 and terns have successfully bred on artificial islands located in the Hamilton Harbour
 128 (Pekarik et al. 1997; Quinn et al. 1996).

129 The literature provides evidence verifying that common terns breed successfully on
 130 floating structures. In the Keeyask Local Study Area, they have proven to be versatile
 131 nesters, as indicated by their use of resurfaced peat islands. In 2011, summer surveys in
 132 Stephens Lake revealed the use of resurfaced peat islands by 160 common terns
 133 (Stantec 2013).

134 Manitoba Hydro has previously had success in developing an artificial island on the
 135 Lower Churchill River System for the primary purpose of providing nesting habitat for
 136 Arctic terns and gulls (Manitoba Hydro and The Town of Churchill 1997). The island was
 137 built to a 1:20 year flood level to accommodate seasonal flooding and/or ice scouring.
 138 Follow-up monitoring of the island revealed the presence of nesting birds including
 139 Arctic tern, herring gull and mallard (TetrES 2000; TetrES 2001).

- 140 • *If predator exclusion fencing is used, how will it be maintained and monitored?*

141 These details will be provided in the Terrestrial Mitigation Implementation Plan
142 currently being developed by the Partnership.

- 143 • *How variability in the water level below the generation station and in Gull Lake will
144 be considered in the design compared to the current variability?*

145 Following impoundment, water level variability will be reduced to approximately a 1 m
146 fluctuation in the upstream reservoir. Potential effects of water level variability will be
147 factored into the design of any islands enhanced, or developed, as part of the proposed
148 mitigation measures for off-setting habitat loss.

- 149 • *The monitoring plan states that monitoring will occur during the first 3 years of
150 operations, but timing of the construction of these islands need to be addressed,
151 with respect to the timing of the GS construction and how long it will take the
152 reservoir to fill.*

153 Details on the timing of island construction and/or enhancement will be outlined in the
154 Terrestrial Mitigation Implementation Plan, and will be determined based on what is
155 most practical in the context of the overall construction schedule. It is anticipated that
156 islands constructed or enhanced will be in place prior to reservoir impoundment.

- 157 • *The TE-SV states that “over the course of construction, if there is overlap of
158 scheduled construction activities that could affect the breeding colonies at Gull
159 Rapids with the bird breeding period (April 1-July 31), measures will also be taken to
160 avoid or minimize disturbance to active nesting colonies to the extent possible” (p. 6-
161 361). It is unclear what potential measures are being contemplated and how
162 replacement habitat will be provided during construction, especially once Gull Rapids
163 are dewatered. Environment Canada requests that blasting be avoided within 1600
164 m of active colonies.*

165 The Partnership is aware of Environment Canada’s recommendations with respect to
166 blasting and clearing in order to protect migratory and other sensitive bird species. The
167 Partnership is currently developing an Avian Management Plan that will outline
168 measures to avoid or minimize potential construction-related effects to migratory birds
169 during the breeding bird period. Details of this plan are documented in the responses to
170 TAC Public Rd 2 EC-0026, EC-0027 and EC-0031. The Partnership will file this plan with
171 regulators and make it publicly available once it is ready.

- 172 • *Supporting evidence or case studies of successful use of the proposed mitigation
173 measures for the colonial nesting waterbird species affected by the Project should be
174 provided.*

175 Large populations of gulls and other waterbirds are known to form productive,
 176 traditional nesting colonies on lakes in Manitoba (e.g., Koonz and Rakowski 1985,
 177 McMahon and Koonz 1991). It is well documented that colonial waterbirds, including
 178 gulls and terns, nest on near-shore islands located in Lake Winnipeg, Lake Manitoba,
 179 and Lake Winnipegosis (McMahon and Koonz 1991, McMahon unpublished data 1991,
 180 IBA Canada 2012). Spruce Island Reef (Lake Winnipegosis), Duck Island (Lake Manitoba),
 181 and Sand Reef Island (Lake Manitoba) are recognized for their ability to support
 182 breeding populations of colonial waterbirds (e.g., common tern, Caspian tern, ring-billed
 183 gull) and as such are designated as Important Bird Areas (IBA Canada 2012).

- 184 • *Information in the design and location of the proposed measures needs to be*
 185 *provided for the various options, and the criteria that will be used to select which*
 186 *one(s) is implemented.*

187 As noted above, details regarding the design specifications and site locations of specific
 188 mitigation measures are currently being developed by the Partnership, and will be
 189 documented in a Terrestrial Mitigation Implementation Plan.

- 190 • *It is not clear from the current reports that the area proposed for mitigation is*
 191 *equivalent to the area of the natural islands that will be lost, such that equivalent*
 192 *breeding populations will be maintained. Based on these deficiencies, the evidence*
 193 *presented in the EIS does not support the conclusion (Response to EIS, p 6-364) that*
 194 *the "overall potential Project-related residual effects on colonial waterbirds are*
 195 *expected to be adverse but regionally acceptable, primarily because implementation*
 196 *of mitigation measures is expected to largely offset the long-term effects of the*
 197 *Project."*

198 The Environmental Impact Statement Response to EIS Guidelines (Section 6.5.7.7.3)
 199 currently outlines an approach to mitigate for the potential loss of habitat used by terns
 200 and gulls for nesting (additional details can be found in the Response to EIS Guidelines,
 201 Section 6.5.7.7.3, and Terrestrial Environment Supporting Volume, Section 6.4.2.3). The
 202 Response to EIS Guidelines (p. 6-360) notes in this regard that development of the
 203 Project will result in the removal and/or degradation of approximately 2.7 ha of
 204 potential gull and tern breeding habitat (i.e., reefs; PD SV Section 3.3.5), and that less
 205 than 50% of this available habitat is typically used to support gull and tern colonies (TE
 206 SV Section 6).

207 The Partnership is currently in the process of determining the exact design specifications
 208 and site locations for the identified various mitigation measures, and these will be
 209 documented in the Terrestrial Mitigation Implementation Plan. Based on observations
 210 of habitat use during the course of the eight-year study period, the proposed area (ha)
 211 of replacement habitat developed will be large enough to support the local gull and tern

212 populations that would be displaced from traditional nesting reefs and islands, i.e., the
 213 Plan will replace that portion of the potentially affected habitat that is used annually by
 214 gull and tern colonies. This includes colonies located in Gull Rapids and in areas
 215 upstream (e.g., the island near Birthday Rapids). Additional relevant information can be
 216 found in the Partnership's response to TAC Public Rd 2 EC-0019, which raised a similar
 217 question with respect to bird-related mitigation measures.

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1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 6.5.7.2.5 Conclusion about Residual Effects on**
3 **Mallard; p. 6-345**

4 **CEC Rd 1 CEC-0041**

5 **QUESTION:**

6 It is not clear how riparian wetlands on smaller tributaries and constructed wetlands will
7 replace those on the Nelson River used by VECs, particularly mallards and Canada geese.
8 YFFN has indicated fewer geese and ducks in the Split Lake area because the shoreline
9 habitat that they use has been flooded and eroded, and FLCN stated that after hydro
10 flooding and the loss of stable shoreline, the number of nesting waterfowl declined
11 (Response to EIS guidelines p. 6-13).

12 The number of nesting and staging mallards is much higher on Nelson River, Gull Lake,
13 Clark Lake, than inland lakes or Stephens Reservoir but impacts are not well quantified.

14 The TE-SV (6-347) states that there is currently limited breeding habitat within the
15 Project effects area; if this is true (only 3% of the breeding habitat is affected), the
16 rationale for creating mallard nesting platforms is questionable.

17 The conclusion on residual effects (TE-SV 6-347) makes no mention of foraging habitat
18 in riparian wetlands even though there will be a long-term loss of these areas due to the
19 flooding of the reservoir.

20 It is also not clear how impacts were measured against thresholds to determine
21 significance of effects.

22 Effects on mallards were characterized as "small" in magnitude and within the range of
23 natural variability. However, no evidence was presented on the range of natural
24 variability in mallard populations in the RSA nor what the population-level effect was
25 predicted to be (e.g. # of nesting pairs/individuals), and it is not clear how the long-term
26 loss in riparian wetlands on the Nelson River could be characterized as within the range
27 of natural variation.

28 Overall potential Project-related residual effects on Canada geese are also expected to
29 be adverse but regionally acceptable, "largely because there is considerable amount of
30 other available staging habitat in the region" but the evidence presented for staging
31 habitat elsewhere in the RSA does not support that statement.

32 The TE-SV states that "It is expected that until suitable shoreline wetland vegetation re-
33 establishes in the reservoir, geese use of the reservoir during the migration periods will

34 be minimal during operation". Given that Stephens Lake does not support many staging
 35 Canada geese compared to Gull Lake, this suggests staging habitat has not recovered
 36 over 20 years since the construction of the Kettle GS.

37 According to the Response to EIS Guidelines (6-113) "the quality of inlets and bays along
 38 the Nelson River and Gull Lake as staging habitat for mallards will to continue to vary
 39 depending upon river water levels. How proposed changes to water management (e.g.,
 40 peaking, seasonal timing, etc.) on Gull Reservoir will affect wildlife compared to the
 41 current regime needs to be more fully assessed.

42 **RESPONSE:**

43 Riparian Wetlands for Waterfowl

44 The loss of Nelson River riparian wetlands is captured in the discussions of how the
 45 Project will affect waterfowl staging habitat (TE SV Sections 6.4.1.2, 6.5.7.1 and 6.5.7.2).

46 Approximately 1% of the Nelson River shoreline wetlands (located between Clark Lake
 47 and Stephens Lake; TE SV Section 2, Map 2-21) consist of low quality, disturbed marsh
 48 habitat (TE SV Section 2.8.3.2.1). The remaining shoreline wetland areas, consisting of
 49 shallow water wetland and fen, are also considered to be of low quality for mallards,
 50 geese and other waterfowl. Monthly and annual fluctuations in river water levels and
 51 ice-scour are some of the factors contributing to the marginalization of Nelson River
 52 riparian habitats for waterfowl in general.

53 For mallards, these riparian wetlands provide marginal brood-rearing habitat. While
 54 mallards were observed using the Nelson River (e.g., Clark Lake, Gull Lake) during July
 55 2001-2003 surveys, very few broods were detected. Use of the river by mallards is
 56 highly variable and dependent upon the availability of suitable forage and cover (e.g.,
 57 emergent vegetation). In recent years (i.e., 2005-2011), the quality of the Nelson River
 58 riparian wetlands as mallard summer foraging, brood-rearing and migration staging
 59 habitat has been marginalized by high water levels due to high flows on the Nelson
 60 River. In 2001 and 2005-2011, high water levels in Gull Lake inundated regulated marsh
 61 and riparian fen that was present in back bays, inlets, and creek mouths. In response,
 62 few mallards were observed during summer and fall surveys (e.g., during the highest
 63 ever recorded flows on the Nelson River in 2011, eight mallards were observed during
 64 July aerial surveys and four during September aerial surveys).

65 With the Project, approximately 443 ha of shoreline wetland habitat (marsh and riparian
 66 fen) will be lost along the Nelson River (TE SV Section 2, Table 2-48). This is a loss of 9%
 67 of the total available shoreline wetland habitat within Study Zone 4 (4,723 ha; Table 2-
 68 42). Natural marsh habitat for mallards, geese and other waterfowl occurs in off-system
 69 areas as lacustrine bay marsh and riparian stream marsh (Section 2.8.3.2.1). These areas

70 along with other off-system riparian fens provide suitable habitat for waterfowl
71 throughout Study Zone 4.

72 With the Project, the loss of Nelson River riparian wetlands is considered within the
73 range of variability observed within Zone 3. Over the past seven years, prolonged high
74 water levels have caused most of the marsh habitat to disappear along the Nelson River.
75 In response, local populations of mallards and Canada geese have had to use alternate,
76 suitable foraging/staging habitat located in off-system areas. Some of these include off-
77 system inland lakes, while others include lakes that occur outside of the Regional Study
78 Area. Use of the reservoir by geese is anticipated to be low until aquatic plants re-
79 establish in shallow areas. The re-establishment of aquatic plant beds (e.g., pondweed)
80 is expected to begin to develop in the downstream portion of the Keeyask reservoir
81 between 5 and 15 years after impoundment (AQ SV section Section 3.4.2.2, Table 4-16).

82 Enhancement of off-system wetlands may benefit mallard and Canada goose by
83 improving foraging habitat. However, it is recognized that these enhancements are not
84 a replacement for waterfowl habitat lost along the Nelson River, which has not been
85 productive in recent years. Riparian habitat associated with inland creeks and lakes,
86 including wetlands, provides suitable breeding habitat for mallards. As off-system
87 wetlands, they are not affected by Nelson River levels and therefore provide better
88 quality mallard habitat that is available on a more consistent basis.

89 Mallard Habitat

90 To clarify, mallard breeding habitat (defined as upland nesting and brood-rearing
91 habitat) is widespread throughout both the Regional (64,425 ha) and Local Study Areas
92 (11,000 ha). Of the approximately 67,132 ha of potential mallard breeding habitat found
93 within the Regional Study Area, 5% is expected to be lost with the Project. Based on
94 thresholds presented in the TE SV Table 6.2-2, a 5 % loss is considered a low magnitude
95 of effect as it is well below the 10% benchmark for habitat loss. The use of mallard
96 nesting platforms have proven to be successful in southern locales (e.g., prairie pothole
97 region); deployment in the Keeyask region may have value in enhancing some of the
98 mallard habitat located outside of affected areas.

99 Baseline information for mallard density during the summer nesting and brood rearing
100 period is 3.2 birds/10 km². Less than 20 breeding pairs would be displaced through the
101 loss of 2,958 ha of potential breeding habitat (largely comprised of inland lakes and
102 creeks, and adjacent upland habitats).

103 "According to the Response to EIS Guidelines (6-113) *'the quality of inlets and*
104 *bays along the Nelson River and Gull Lake as staging habitat for mallards will to*
105 *continue to vary depending upon river water levels. How proposed changes to*

106 *water management (e.g., peaking, seasonal timing, etc.) on Gull Reservoir will*
107 *affect wildlife compared to the current regime needs to be more fully assessed."*

108 Without the Project, the quality of mallard staging/foraging habitat will vary depending
109 upon river water levels. Following impoundment, river water levels will remain high and
110 vary within a 1-m range. A reduction in monthly and annual variability in water levels
111 will facilitate development of marsh and riparian fen habitat along shorelines of the
112 reservoir in the longer term. Development of riparian wetland habitat will benefit
113 mallard through the creation of forage and cover.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0042**

4 **PREAMBLE:**

5 Several deficiencies are noted with respect to potential noise impacts on wildlife,
 6 notably summer resident caribou on Stephens Lake, nesting and migrating waterfowl,
 7 nesting gulls and terns, and breeding songbirds (including SAR).

8 **QUESTION:**

9 These deficiencies include:

- 10 • The study area for noise includes “the general footprint of the principal generating
 11 station structures and reservoir, as well as access roads and other supporting
 12 infrastructure” (PE-SV, p. 3-4). Given that Gull Rapids can be heard as far away as 18
 13 km (PE-SV p. 3-6) and construction noises can extend far beyond the footprint, it is
 14 not clear that this LSA is adequate for characterizing baseline conditions or assessing
 15 potential impacts.
- 16 • No baseline monitoring of existing noise levels noise at the Project site, reservoir,
 17 and access roads was conducted. The characterization of the LSA that “it is expected
 18 that the ambient noise profile would be consistent with isolated, remote northern
 19 geographic areas” with “the expected outdoor average sounds levels in the range of
 20 35 dB to 45 dB” is unsupported. Gull Rapids is a significant noise source and there
 21 will be spatial variation in the LSA depending upon local topography and vegetation.
- 22 • No predictive modelling for construction and operational phase of the project was
 23 undertaken for blasting, traffic, or general construction activities. Potential noise
 24 impacts vary depending on a number of factors including taxa, distance from source,
 25 noise frequency (kHz) and magnitude, and type (percussive vs. continuous), but
 26 these are not addressed.
- 27 • The construction noise is described as “construction activity will cause elevated
 28 noise levels within the immediate construction site, with sound propagating away
 29 from the origin of the noise and attenuating with distance back to normal ambient
 30 noise levels for the local study area”. No supporting data or values are provided for
 31 the magnitude, frequency (kHz), or distance.
- 32 • Characterization of the noise impacts is inconsistent. For example, Table 3.4-5 (PE-
 33 SV, p. 3-19) indicates that noise will be “intermittent” but the text (p 3-18) mentions
 34 “continuous” noise. The duration is described as “short” although construction
 35 activities will take place over multiple years, variously described as 6 to 8.5 years

36 (PE-SV, p. 3.7, 3-11, 3-13), which is longer than the typical lifespan of some
 37 potentially affected species.

- 38 • Information provided on mitigation measures is inadequate to assess their
 39 effectiveness, particularly timing windows and the criteria for assessing when and
 40 how mitigation will be applied. The Proponent indicates that blasting will be
 41 undertaken outside of the sensitive breeding period (April 1-July 31) for birds “to
 42 the extent practicable” to minimize disturbance to breeding birds (TE-SV, p. 6-341,
 43 343; PE-SV p.3-13) and from May 15 to June 30 for calving woodland caribou.
 44 However, “to the extent practicable” is not defined, minimizing impacts is not
 45 equivalent to having no impacts. The proposed mitigation measures do not address
 46 other, non-blasting, construction noise.

47 **RESPONSE:**

48 The existing environment and construction phase noise conditions were characterized
 49 to a degree sufficient for the assessment of Project effects on bird and mammal Valued
 50 Environmental Components (VECs). Noise is one source of disturbance within the
 51 broader context of Project-related disturbances that may affect these VECs. Detailed
 52 quantification of ambient and potential Project noise levels would not change the
 53 assessed residual effects of Project construction on the terrestrial VECs.

54 The degree to which noise conditions were characterized was primarily determined
 55 based on the requirements for evaluating Project effects on terrestrial VECs (i.e., Canada
 56 Goose, Mallard, Bald Eagle, Olive-sided Flycatcher, Rusty Blackbird, Common
 57 Nighthawk, Caribou, Moose, Beaver). The terrestrial VEC assessments consider three
 58 general categories of effects during construction: habitat change (e.g., gain, loss,
 59 alteration); Project-related disturbances (e.g., noise, traffic, construction activity,
 60 accidental spills and fires); and changes in access (e.g., human, predator). Noise is only
 61 one factor among many considered in assessing construction effects on the VECs as
 62 discussed in the Terrestrial Environment Supporting Volume (TE SV, Sec. 6.2.4.1 and
 63 7.2.6.1).

64 While no ambient noise monitoring was conducted, it is reasonable to believe that
 65 ambient noise levels are consistent with a relatively remote geographic area lacking
 66 residential, commercial and industrial development. The EIS acknowledges there is
 67 intermittent anthropogenic noise from sources such as snowmobiles, ATVs and
 68 helicopters. The sound of Gull Rapids is a unique feature of the local noise conditions
 69 that may be heard at considerable distance under favourable conditions when other
 70 ambient noise is low and does not mask the sound of the rapids. The sound of the rapids
 71 will be lost once the Project is operating.

72 During construction, much of the larger concentrated noise sources such as blasting and
 73 operation of heavy equipment will be in the general vicinity of the Generating Station

74 (GS). The Physical Environment Supporting Volume (PE SV, Pg. 3-18) noted that there
75 will be localized continuous sources of noise, such as at the main work areas near the
76 powerhouse or the contractor work area on the north side of Gull Rapids. Overall,
77 however, the noise sources within the Project footprint will typically be intermittent: for
78 example, regular but intermittent vehicle traffic on the North or South access roads,
79 clearing activities at different times and locations, and periodic blasting.

80 It is understood that noise is one of a number of sensory disturbances that may affect
81 the terrestrial VECs and that impacts can vary depending on factors such as landscape,
82 taxa, proximity, frequency, magnitude and type. The TE SV notes that Canada Goose and
83 Mallard VECs may show a behavioral response at noise levels of about 80-85 dBa (TE SV,
84 Sec. 6.4.1.1 and 6.4.1.2), which will occur as a result of construction activities (e.g., use
85 of heavy equipment, PE SV, Figure 3.4-1). Noise and other disturbances due to regular
86 activity at the site are expected to displace some individuals to alternate suitable
87 habitats that are readily available for both of these VECs within the regional study area
88 (TE SV, Sec. 6.4.1.1 and 6.4.1.2).

89 For terrestrial VECs, literature on effects of human activity (e.g., construction, traffic,
90 military jet flights) including noise was considered (TE SV, Sec. 9 References). The
91 mammal assessments included consideration of observed effects from the Wuskwatim
92 GS construction project (e.g., caribou displacement near the site and access road, TE SV
93 Sec. 7.4.6.2.1). While information is available in the literature, there are no readily
94 available predictive models by which noise levels alone (i.e., absolute or changes
95 relative to ambient) may be connected to specific responses of individual VECs.
96 Additionally, noise is only one factor among other Project-related disturbances (e.g.,
97 vibrations, smells, movement, presence of humans, dust) and specific effects of noise
98 are not clearly separable from these other factors. Animals will respond to the
99 combined effects of these various disturbances. Therefore, the terrestrial VEC
100 assessments consider Project-related disturbances as an overall suite of potential
101 factors that can affect the VECs within and beyond the footprint. Thus, for the purposes
102 of assessing Project effects on terrestrial VECs, it was considered sufficient to use
103 literature values to generally describe the likely ambient noise levels (PE SV, Sec. 3.3.2,
104 Table 3.3-1) and noise levels associated with typical construction activities taking place
105 within the Project footprint (PE SV, Sec. 3.4.1.3, Figure 3.4-1). The terrestrial
106 assessments consider the expected overall effects of Project-related disturbances (e.g.,
107 noise, human activity, etc.) within the Project footprint, in addition to habitat and access
108 changes, on the VECs both within and beyond the footprint area.

109 Mitigation strategies to minimize potential effects of blasting on breeding birds and
110 caribou involve timing windows in which blasting will be avoided to the extent
111 practicable, as noted in the Response to EIS Guidelines (Sec. 6.5.10); the TE SV (various

112 VEC sections); the Project Description Supporting Volume (PD SV, Sec. 2.5.1.2.3 and
113 6.13.2); the Generating Station Construction Environmental Protection Plan (Sec. 5.19);
114 the South Access Road Environmental Protection Plan (Sec. 5.19); and in the responses
115 to TAC Public Rd 2 EC-0026, EC-0027 and EC-0031. Among the various activities that will
116 take place to construct the Project, clearing (habitat change) and blasting were
117 identified as the activities most likely to cause disturbance to birds and caribou if they
118 take place during the breeding or calving seasons. Mitigation strategies were developed
119 through discussions among Manitoba Hydro and the KCNs, engineers, biologists and
120 others, including discussions at the multi-lateral Keeyask Mammals Working Group (PD
121 SV, Sec. 6.13.2). Additionally, plans for avian management will be included as a
122 component of the final Environmental Protection Plans for Project construction. The TE
123 SV notes that, with respect to songbirds, the degree of disturbance due to blasting, or
124 other noise and activity, would be lower if these activities begin before breeding starts
125 and continue into the breeding period (TE SV, Sec. 6.4.3.2.1). An ongoing disturbance,
126 such as regular activity at the site, would discourage birds from breeding nearby and
127 displace them to other areas, resulting in fewer breeding birds being affected than
128 would occur if the activity began after breeding was initiated.

129 As indicated in the PD SV (Sec. 6.13.2), blasting will be avoided to the extent practicable
130 during the sensitive periods for bird breeding and caribou calving to minimize effects.
131 The preliminary construction schedule does show some activity during the sensitive
132 timing windows at certain times because major schedule delays would result if the work
133 does not occur at that time (PD SV, Table 6-4). How this will be handled to minimize
134 disturbance as much as possible is documented in the responses to TAC Public Rd 2 EC-
135 0026, EC-0027 and EC-0031. The terrestrial VEC assessments took the preliminary
136 construction schedule into consideration and recognize that minimizing effects is not
137 equivalent to having no effect. Potential effects due to construction activities within the
138 sensitive periods is factored into the residual effects conclusions for terrestrial VECs,
139 which concluded there were no significant residual effects on the VECs due to
140 construction (Response to EIS Guidelines, Table 6-33 (pg. 6-411) to Table 6-41 (pg. 6-
141 421)). More detailed quantification of ambient and potential Project noise levels would
142 not change the assessed residual effects of the Project on the terrestrial VECs.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 8.0 Wildlife and Mercury; p. N/A**

3 **CEC Rd 1 CEC-0043**

4 **PREAMBLE:**

5 Mercury in Wildlife – Birds

6 Four issues are raised with respect to mercury in birds.

7 **QUESTION:**

- 8 1. The method used to predict peak tissue concentrations in birds is essentially to
9 compare bird and fish diets for similarities, and to assume that birds will have the
10 same peak MeHg levels as fish with similar diets. Currently, this methodology has
11 not been adequately supported in the discussions here. For example, if this
12 approach is to be used there should be more discussion of bioaccumulation: how
13 does assuming equal concentrations in birds and fish account for bioaccumulation?
14 Another possible approach is to perform intake calculations using transfer factors
15 (TFs) or bioaccumulation factors (BMFs) and based on concentrations in their food.
16 Calculations should account for all contaminated dietary components (e.g. fish and
17 shellfish for otter) and for MeHg transfer and biomagnifications via food chain
18 elements. This type of approach would rely on concentration data for fish and
19 water, from the Aquatic Environment Supporting Volume. Alternatively, if a model is
20 available for calculating tissue concentrations in mammals (it is mentioned though
21 not presented in the document), presumably this model could be used to provide
22 tissue concentration estimates for birds as well.
- 23 2. It would be beneficial to examine exposure estimates for osprey and discuss why it
24 is appropriate to assume an on-site occupancy factor (referred to as “Fsite” in the
25 report) of 0.5. This type of exposure averaging (i.e., assuming a migratory species
26 occupies a site for only 50% of the year, and thus receives only 50% of the dose)
27 must be reviewed in conjunction with the time scales for effects upon which the
28 Toxicity Reference Values (TRVs) are based. A review of the TRV derivations in
29 NALCOR 2009 would clarify whether the TRVs are in keeping with the 0.5 occupancy
30 factor assumption.
- 31 3. The study predicts peak tissue concentrations but does not compare these
32 predictions to measured tissue concentration data obtained from other
33 hydroelectric projects. If such information is available, it should be used to form a
34 comparison. If such information is not available, it would be beneficial to have this
35 clearly stated. Is not clear how concentration data (tissue concentrations in
36 particular) from other hydroelectric projects are used to inform the predictions

37 made in this study. In particular, comparison to values from Quebec hydroelectric
 38 studies (which typically show much higher levels of MeHg in fish compared to
 39 Manitoba hydroelectric studies) may not be relevant.

40 4. Tables 8-2 and 8-3 present mean total background mercury levels in birds from past
 41 Quebec hydroelectric projects, and from a Canada-wide summary. It would be
 42 beneficial to show data from other Manitoba hydroelectric projects in these tables
 43 as it is likely more relevant to the current project. If such information is not
 44 available, it would be beneficial to have this clearly stated.

45 **RESPONSE:**

46 A response for each of the questions above is provided below.

47 1. *Peak Tissue Concentrations in Birds*

48 Predicting mercury levels in birds using the Keeyask Regional Study Area was based on
 49 mercury levels modeled for local fish species (See AE SV Appendix 7E) that share similar
 50 diets. Support for this approach is based on evidence from a number of studies that
 51 found similarities between the measured levels of methyl mercury in birds and fish that
 52 consumed similar diets (DesGranges et al. 1999; Gerrard and St-Louis 2001). The models
 53 used to predict post-Project fish mercury concentrations (See AE SV Appendix 7E) are
 54 empirical models based on the relationship of mercury concentration and percentage of
 55 reservoir flooding. The fish mercury concentrations used in the model-building process
 56 are from actual lakes and reservoirs, and, thus, reflect all components that affect
 57 mercury concentrations in fish, including bioaccumulation. For higher trophic level birds
 58 (e.g., bald eagle) that would consume larger-bodied fish (e.g., walleye, pike), predicted
 59 mercury levels are indicated as being greater than those modeled for walleye and pike
 60 due to the bioaccumulation of mercury that would occur between trophic levels (TE SV
 61 Section 8, Table 8-5) .

62 The surrogate model used for identifying mercury levels in mammal species occurred
 63 through an evaluation of mercury levels sampled through past hydroelectric projects
 64 and applying these to the Keeyask Project (page 8-20 of Terrestrial Environment
 65 Supporting Volume (TE SV)). See CEC Rd 1 CEC-0046 for more information on the
 66 approach used for predicting mercury effects on mammals, and CEC Rd 1 CAC-0025b
 67 and CEC Rd 1 CEC-0046 for the empirical approach used for herbivores including moose,
 68 muskrat and snowshoe hare used for the HHRA assessment. This approach was not used
 69 for birds due to the lack of available information on mercury levels in birds using
 70 Manitoba reservoirs. While mercury data are available for birds using reservoirs located
 71 in other provinces (e.g., Quebec), reported levels are variable and may not be suitable
 72 indicators for birds using different areas (e.g., the Keeyask area; Schetagne *pers comm.*
 73 2009). As such, the use of mercury concentration predictions for fish as predictors of

74 mercury levels in birds is recommended over the approach to using bird-related data
75 from other hydroelectric reservoirs (e.g., Quebec; Schetagne *pers comm.* 2009).

76 *2. Osprey Exposure Estimates*

77 In the Hazard Quotient (HQ) analysis for osprey, an on-site occupancy factor of 0.5 was
78 used to reflect the 6 months, or half a year, that osprey is present within the Keeyask
79 Bird Regional Study Area. It is during these months that osprey inhabiting the RSA would
80 be exposed to elevated levels of mercury resulting from Project operation. This
81 approach is consistent with the approach taken by Nalcor (2009). Toxicity reference
82 values (TRV) used in the HQ analysis for osprey were also those used by Nalcor (2009),
83 which based TRVs on the lowest observed adverse effect level (LOAEL) for mallard (i.e.,
84 0.0694 (Heinz 1979)).

85 *3. Comparisons to Other Hydroelectric Reservoirs*

86 Aside from mercury concentrations reported for osprey (e.g., 1.79 ppm in muscle
87 tissues; Desgranges et al. 1998) and bald eagle (e.g., 0.33 ppm in feathers [Allen 1992];
88 >0.5 ppm [Bechard et al. 2009]), mercury concentrations in birds (e.g., waterfowl) using
89 other hydroelectric reservoirs are not available.

90 The bird mercury concentrations reported in the TE SV Section 8, Table 8-2 and 8-4
91 include pre-development/baseline levels for Quebec hydroelectric project areas, and
92 average levels in birds sampled across Canada. These levels were initially going to be
93 used as a proxy for background levels in birds inhabiting the Keeyask region. However
94 due to differences in site characteristics it was recommended that mercury levels in
95 Keeyask fish be used as an approximation for background levels in birds inhabiting the
96 LSA (Schetange *pers comm.* 2009).

97 *4. Available Manitoba Data*

98 Studies measuring mercury levels in birds using Manitoba reservoirs have not been
99 conducted and therefore are not available for comparative purposes.

100 **REFERENCES:**

101 Bechard, M., Perkins, D., Kaltenecker, G., and S. Alsup. 2009. Mercury Contamination in
102 Idaho bald eagles, *Haliaeetus leucocephalus*. Bulletin of Environmental
103 Contamination and Toxicology. 83:698-702.

104 DesGrange, J., Rodrigue, J., Tardif, B. and M. Laperle. 1998. Mercury Accumulation and
105 Biomagnification in Ospreys (Pandio Haliaeetus) in the James Bay and Hudson
106 Bay Regions of Quebec. Archives of Environmental Contamination and
107 Toxicology 35(2): 330-341.

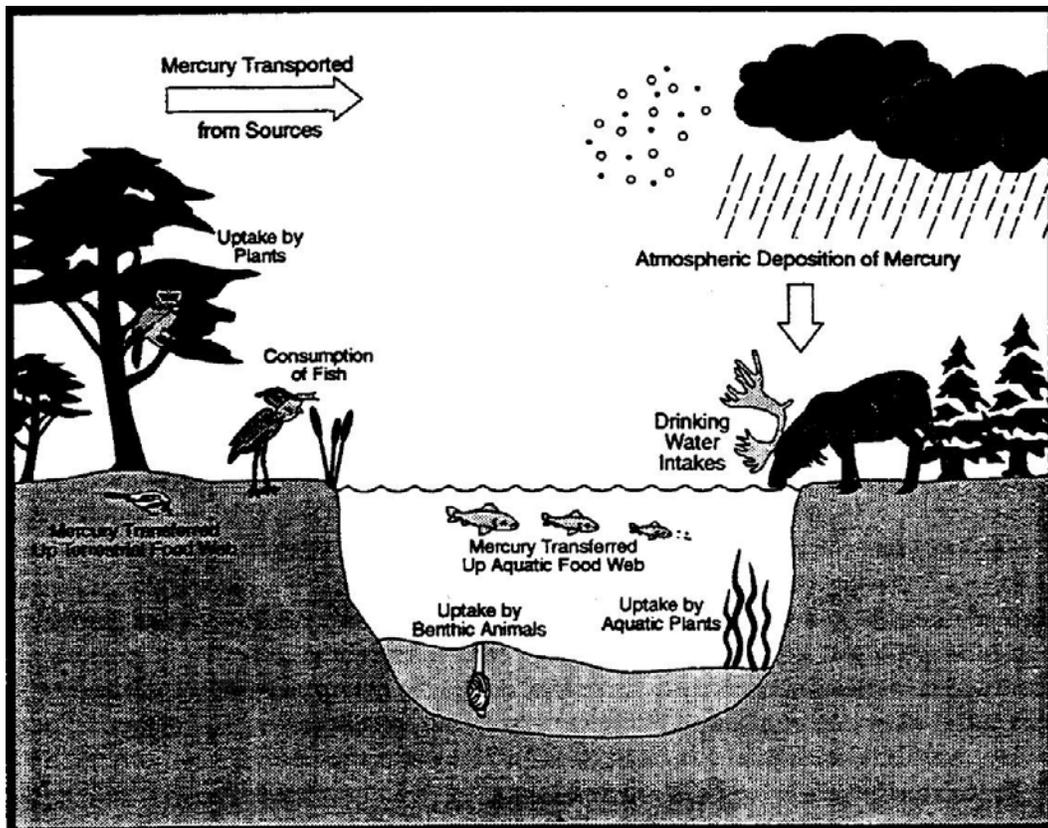
- 108 DesGrange, J., Rodrigue, J., Tardif, B. and M. Laperle. 1999. Breeding Success of Osprey
109 under High Seasonal Methylmercury Exposure. In Lucotte, M., Schetagne, R.,
110 Therien, N., Langlois, C., and A. Tremblay (Eds). Mercury in the Biogeochemical
111 Cycle. Natural Environments and Hydroelectric Reservoirs of Northern Quebec.
112 Springer, New York. Pp.334.
- 113 Gerrard, P.M., and V.L. St. Louis. 2001. The effects of experimental reservoir creation on
114 the bioaccumulation of methylmercury and reproductive success of tree
115 swallows (*Tachycineta bicolor*). Environ. Sci & Technol. 35:1329 – 1338.
- 116 **Personal Communications:**
- 117 Schetange, Roger. 2009. Email correspondence between Stantec and R. Schetange
118 (Mercury Program Manager, Hydro Quebec) regarding mercury, birds and
119 hydroelectric developments.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 8.0 Mercury and Wildlife; p. N/A**

3 **CEC Rd 1 CEC-0044**

4 **QUESTION:**

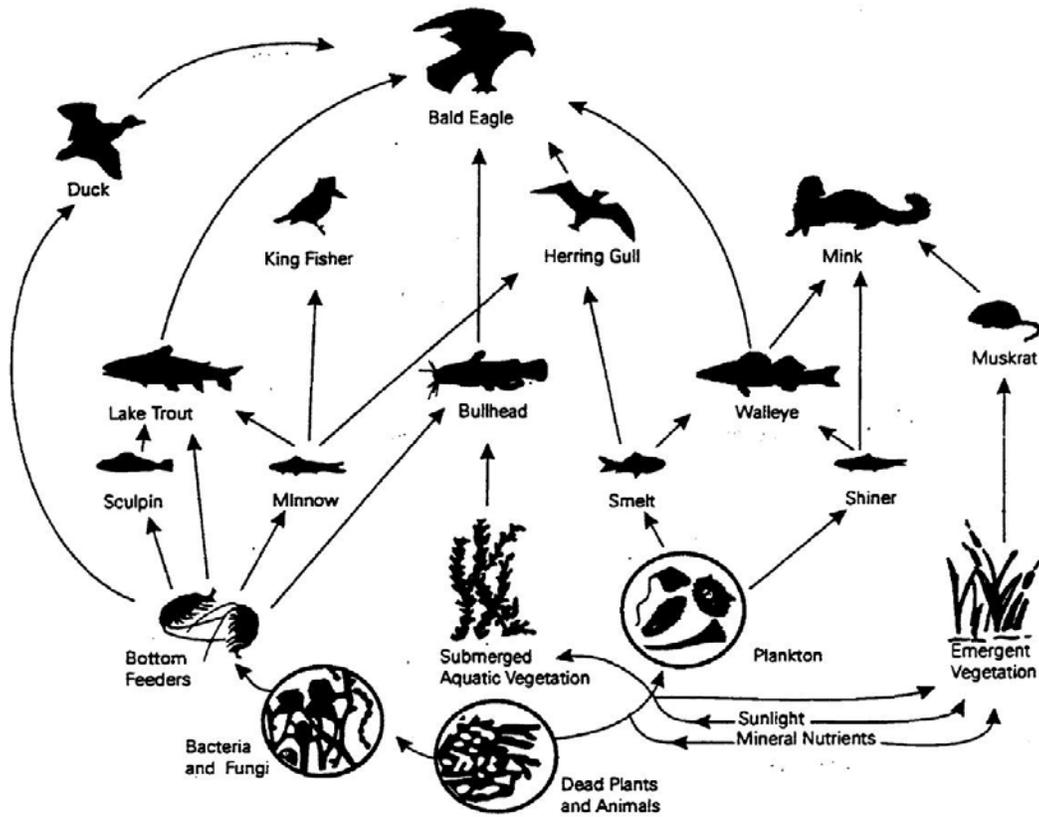
5 Mercury in Wildlife The report describes a number of receptors and pathways in both
6 the terrestrial and aquatic ecosystems. It would be beneficial to include a visual
7 depiction of the Conceptual Model (CM) for the study. The CM diagram should include
8 all relevant species and exposure pathways and ensure that ingestion calculations
9 adequately encompass all food chain elements. A generic example from the US EPA
10 (1997) is provided below. The example is clearly based on a generic environment,
11 whereas the CM for Keeyask Reservoir would need to be developed specifically for the
12 site, and include all relevant site-specific exposure pathways. Among exposure pathways
13 the Keeyask CM should pay particular attention to clearly depicting bioaccumulation
14 through the food chain, particularly for the different trophic levels of fish and birds.



15

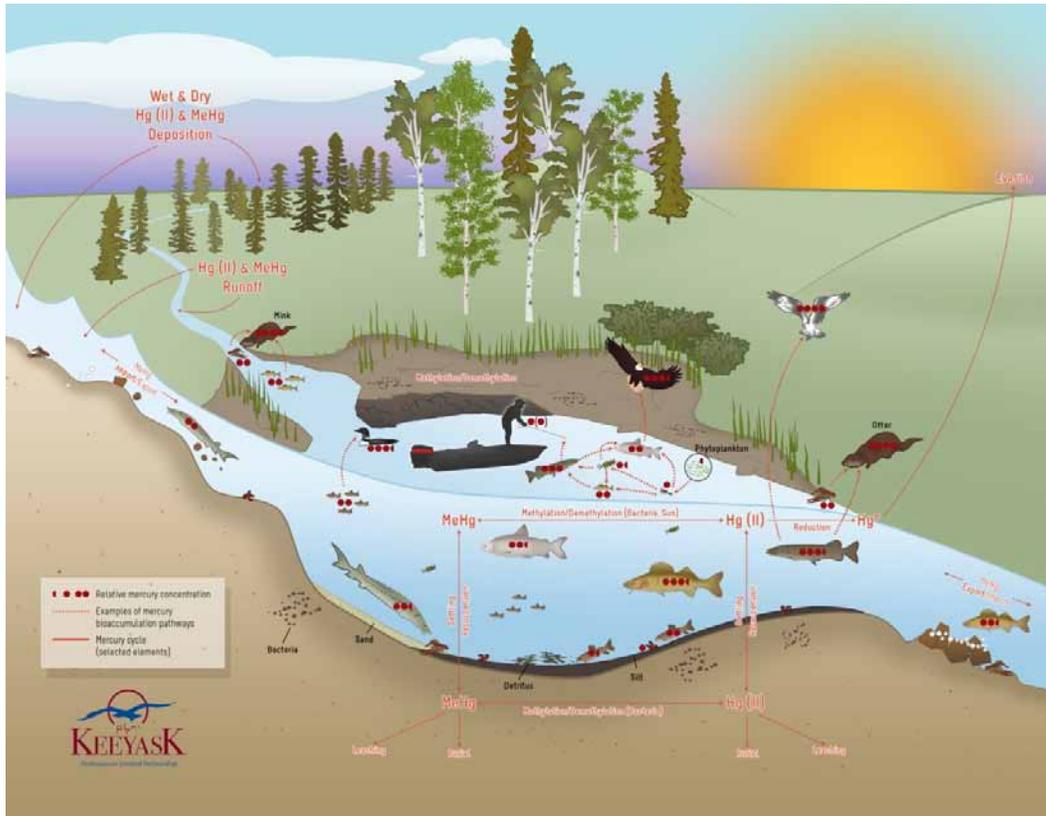
16

17 Example CSM Figure 2 US EPA (1997):



18

19 **RESPONSE:**



20
 21 Figure 1: Conceptual model of the main exposure pathways to mercury of fish, wildlife, and
 22 humans in the Keyask Project Area, including selected elements of the mercury cycle and
 23 relative mercury concentrations in biota.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 8.0 Mercury and Wildlife; p. N/A**

3 **CEC Rd 1 CEC-0045**

4 **PREAMBLE:**

5 Mercury in Wildlife – EPC Values

6 **QUESTION:**

7 Appendix B (Table 8B-1) indicates that HQ calculations for birds and mammals are based
8 on Exposure Point Concentrations (EPCs) which are geometric means of fish
9 concentrations for 'Baseline', 'Project', and 'Project + Baseline' conditions (referring the
10 reader to the AE SV). The AE SV however, discusses predicted maximum concentrations
11 for northern pike and walleye in Table 7-2 and in Sections 7.2.4.2.2 and 7.2.4.3.2; these
12 sections do not show 'Baseline', 'Project' and 'Project + Baseline' conditions or
13 geometric mean calculations. The specific reference to the AE SV should be stated, to
14 refer the reader to the correct location showing the derivation of these EPC values for
15 'Baseline', 'Project' and 'Project + Baseline' conditions.

16 **RESPONSE:**

17 Calculation of exposure point concentration (EPC) for mammal and bird species was
18 undertaken based on average calculations of mercury (in µg/g) for whitefish and
19 northern pike. Other fish species including sucker and walleye were also considered to
20 generate the EPC value, but these species were excluded due to having mercury levels
21 similar to those of whitefish and pike, respectively.

22 Mercury levels in fish in µg/g in wet muscle, followed those values indicated in Table 1
23 below. These values were based on model-derived estimates provided in Table 7-2 of
24 the Aquatic Environment Supporting Volume (AE SV) where the proxy model was used
25 for mercury values in the Keeyask Reservoir and the Percent Flooded (PF) regression
26 model (AE SV Table 7-2) was considered for Stephens Lake. The baseline value reported
27 is equivalent to current conditions, and Baseline + Project is equivalent to the mean
28 maximum mercury concentrations (ppm) five years post flooding. The 'Project' column
29 in Table 1 below is the net difference between the baseline and the five year post
30 project maximum. It should be noted that these values are reportedly higher than
31 expected for fish as described further in the AE SV (Section 7.2.4.2.2 pg 7-19), and as
32 such, HQ values that were derived for otter, mink, osprey and bald eagle are considered
33 to be conservative.

34 Errors were noted in Table 8B-1 and have been corrected in the attached version. EPC
35 values for the project and baseline + project were reversed for Stephens Lake and have

36 been corrected. Similarly, the ADD project and project + baseline values for bald eagle in
 37 the Keeyask Reservoir were reversed. This resulted in altered ADD and HQ calculations
 38 for the project and baseline + project values. These values have been adjusted
 39 accordingly. Other minor changes to values included corrections in rounding numbers to
 40 the hundredth decimal point. Adjustments to Table 8B-1 are provided below. Revisions
 41 to these values do not affect the effects assessment conclusions, where, with the
 42 exception of bald eagle, HQ values only declined slightly by 0.02. For bald eagle, the HQ
 43 value was elevated from 0.23 to 0.27.

44 Table 1. Mercury concentrations (µg/g) used in the calculation of exposure point
 45 concentrations. GM (Geometric Mean) values are those used in Table 8B-1 of Terrestrial
 46 Environment Supporting Volume.

LOCATION	SPECIES	BASELINE	PROJECT	BASELINE + PROJECT
Keeyask Reservoir	Whitefish	0.07	0.12	0.19
	Pike	0.22	1.11	1.33
	GM	0.12	0.38	0.50
Stephens Lake	Whitefish	0.09	0.03	0.12
	Pike	0.26	0.15	0.41
	GM	0.15	0.07	0.22

47 GM indicates calculation of geometric mean following those methods outlined by
 48 NALCOR (2009) in the calculation of EPC. The average quantities of mercury in whitefish
 49 and in northern pike were calculated using the formula:

50 Geometric Mean = (mercury quantity in whitefish (µg/g)) X mercury quantity in
 51 pike(µg/g)^{0.5}

1 Table 8B-1: Corrected Parameters used in Risk Characterization Approach for Mammals and Birds

Location	Receptor	IF kg/kg- day	AF	EPC µg/g			IR kg/day	f _{site}	BW kg	ADD mg/kg-day		TRV mg/kg- day	HQ			
				Baseline	Project	Baseline + Project				Baseline	Project		Baseline + Project	Baseline	Project	Baseline + Project
Keeyask Reservoir	River Otter	0.13	1	0.12	0.36	0.49	1.02	1	8	0.02	0.05	0.06	0.07	0.23	0.67	0.91
	Mink	0.10	1				0.10	1	1	0.01	0.04	0.05	0.08	0.16	0.45	0.61
	Osprey	0.10	1				0.30	0.50	1.50	0.01	0.04	0.05	0.07	0.18	0.51	0.70
	Bald Eagle	0.05	1				0.40	0.6	5	0.01	0.02	0.02	0.09	0.07	0.20	0.27
Stephens Lake	River Otter	0.13	1	0.15	0.07	0.22	1.02	1	8	0.02	0.01	0.03	0.07	0.28	0.13	0.41
	Mink	0.10	1				0.10	1	1	0.02	0.01	0.02	0.08	0.19	0.09	0.28
	Osprey	0.10	1				0.30	0.50	1.50	0.02	0.01	0.02	0.07	0.22	0.10	0.32
	Bald Eagle	0.10	1				0.40	0.6	5	0.02	0.01	0.02	0.09	0.17	0.08	0.24

2 *Note: Values for ADD Baseline + Project are rounded to the nearest hundredth decimal point

1 **REFERENCES:**

- 2 NALCOR. 2009. Existing mercury concentrations in osprey and ecological risk
3 assessment. Mercury, Report 3 of 5, Environmental Impact Statement for the
4 Lower Churchill Hydroelectric Generation Project. 30 p. plus appendices.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 8.0 Mercury and Wildlife; p. N/A**

3 **CEC Rd 1 CEC-0046**

4 **PREAMBLE:**

5 Mercury in Wildlife – Mammals

6 **QUESTION:**

7 Four issues are raised with respect to mercury in mammals.

- 8 1. The method used to predict peak tissue concentrations is described as a “Surrogate
 9 Approach”. The details of this approach are not clear. Key assumptions are
 10 documented in Appendix 8B but rationale, formulas, input parameters, and
 11 calculations are not presented. It is therefore not clear how the predicted values in
 12 Table 8-16 are derived. One possible approach is to perform intake calculations
 13 using transfer factors (TFs) or bioaccumulation factors (BMFs) and based on
 14 concentrations in their food. Calculations should account for all contaminated
 15 dietary components (e.g. fish and shellfish for otter) and for MeHg transfer and
 16 biomagnifications via food chain elements. This type of approach would rely on
 17 concentration data for fish and water, from the Aquatic Environment Supporting
 18 Volume It is possible that the model is based on these elements, but the
 19 derivation/calculations should be clearly presented in the document.
- 20 2. For otters, an HQ was calculated. HQ results are very close to 1, but the calculation
 21 only accounts for fish intake. If other dietary components are included (i.e.
 22 shellfish), the HQ could reasonably extend beyond 1 (according to discussions in
 23 Section 8.4.4.2). Given that invertebrates (shellfish) account for 46% of the otter’s
 24 diet whereas fish account for 40% (according to information presented in section
 25 8.4.3.1.2), shellfish should be included as an ingestion pathway in HQ calculations.
- 26 3. The dietary composition of mink is not described explicitly, though some dietary
 27 information is inferred from analysis of fecal samples. The US EPA’s Wildlife
 28 Exposure Factors Handbook (US EPA 1993) discusses averages from different studies
 29 representing a diet of about 22% mammals, 54% fish and amphibians, 7% birds and
 30 eggs, 9% vegetation and 8% invertebrates and other items. Diet component
 31 information such as this should be included in the report. If one assumes that only
 32 fish contain elevated levels of MeHg (i.e. that other dietary components such as
 33 mammals do not contain elevated levels of MeHg), then calculating the mink’s HQ
 34 based on a diet of 100% fish will result in conservative risk estimates. Is not clear
 35 how concentration data (tissue concentrations in particular) from other
 36 hydroelectric projects are used to inform the predictions made in this study. In

37 particular, comparison to values from Quebec hydroelectric studies (which typically
38 show much higher levels of MeHg in fish compared to Manitoba hydroelectric
39 studies) may not be relevant.

40 4. The study predicts peak tissue concentrations for mammals but does not compare
41 these predictions to tissue concentration data obtained from other hydroelectric
42 projects. If such information is not available, it would be beneficial to have this
43 clearly stated.

44 **RESPONSE:**

45 A response to each of the issues identified in the question is outlined, in turn, below.

46 1. *Peak Tissue Predictions and Surrogate Approach*

47 Surrogate model use for identifying mercury levels in mammal species occurred through
48 an evaluation of mercury levels sampled for past hydroelectric projects and applying
49 these to the Keeyask Project (page 8-20 of Terrestrial Environment Supporting Volume
50 (TE SV)). The surrogate approach involved using mercury concentrations obtained from
51 areas close to other hydroelectric projects as a substitute for what could be expected to
52 occur in the Keeyask area 3 to 7 years after the completion of the station (Table 8-16).
53 Alternately, those methods outlined in Appendix 8B of the TE SV, indicating formulas for
54 the calculation of average daily dose, intake factor and hazard quotient, provide a
55 means of indicating how expected maximum tissue mercury levels will affect the health
56 of mammal species following Project construction.

57 Calculation of values for current and future mercury levels, as indicated in Table 8-16
58 also followed a surrogate approach. Mercury levels identified for Day 1 were based on
59 measured median, maximum and minimum values for liver samples taken from beaver,
60 muskrat, mink and river otter located in the Regional Study Area and consisting of on-
61 system, off-system and comparison area samples (Tables 8-10 and 8-11 of the TE SV).
62 Minimum values for Day 1 mercury concentrations differed slightly from those indicated
63 in Tables 8-10 and 8-11 of the TE SV for mink and river otter respectively, because low-
64 value outlier samples were removed.

65 Mercury concentration levels determined for species 3 to 7 years following Project
66 construction were based on recorded mercury levels for these species following the
67 completion of other hydroelectric projects or based on mercury levels documented in
68 other studies.

69 The median and maximum mercury levels for mink and otter were based on values
70 measured for these species following several years of operation of the Churchill River
71 Diversion and the Kettle and Kelsey Hydroelectric Projects (Tables 8-8 and 8-9 of the TE
72 SV, respectively). Minimum mercury concentration for this period were based on Day 1

73 minimum mercury concentration to correspond with animals sampled in the Regional
74 Study Area that have not been exposed to the high mercury levels.

75 It is noted that the Regional Study Area as opposed to the Local Study Area was selected
76 for Day 1 and years 20-30 values to more accurately reflect the methods used for the
77 voluntary submission of samples from Southern Indian Lake, and Split Lake/Upper
78 Nelson River traplines that was used to develop peak (i.e., years 3-7) concentrations in
79 this model. As may be derived from 5 traplines directly connected to the Nelson River
80 (i.e., on-system versus off-system), Day 1 and years 20-30, or from the single trapline
81 located in the Local Study Area, the median mercury concentrations are about twice as
82 high for mink and otter compared to the regional values used in the model.

83 Mercury concentration values for beaver and muskrat in years 3 to 7 were based on
84 alternate studies of mercury levels (Table 8-12 of the TE SV). Calculated mercury
85 concentration in muskrat was identified as doubling in the 3 to 7 year period compared
86 to Day 1 measurements, while those amounts for beaver remained the same. For all
87 species, those mercury levels indicated as occurring in the long-term, i.e. years 20-30
88 following project completion, are the same as those values indicated for Day 1,
89 indicating a return to baseline mercury levels in the Regional Study Area.

90 Initially, it was assumed mercury concentrations in muskrat for both the Local and
91 Regional Study areas would not increase for this trophic level 2 herbivore. The Local
92 Study Area muskrat mercury concentration was not expected to increase because
93 muskrat actually living in the Nelson River are very rare in the existing environment due
94 to poor habitat conditions. In the long-term, few muskrat are expected to live in and
95 consume plants or occasionally animal matter in the future reservoir. The mean mercury
96 concentration in muscle for animals collected near the Nelson River for example, was
97 0.01 µg/g ww (n=3), and was below detectable limits in the region.

98 Although an increase was not expected for the Regional muskrat population, a very
99 conservative approach was used to indicate that the mercury concentration might
100 double. This prediction assumed that a moderate-sized local muskrat population will
101 recolonize the reservoir in bays containing shoreline peatlands for a short period of
102 time. Once the peatlands break down, these muskrat are expected to abandon the
103 reservoir (TE SV Section 7.4.2.2.1). The conservative values reported here for the effects
104 predictions are generally consistent, albeit higher, than the values reported from the
105 literature (TE SV Table 8-12).

106 2. *Otter HQ Calculation*

107 Testing the inclusion of invertebrates as dietary items reduced the calculated peak
108 mercury concentration and hazard quotient values. Table 1 calculations were done
109 considering fish and invertebrates as making up 90% of the diet of river otter and mink
110 (initial calculations were based on a 75% fish diet). Hazard quotient values were reduced
111 for otter and mink from 0.91 to 0.79 and from 0.61 to 0.56, respectively.

112 The treatment of invertebrates as an additional dietary item in the calculation of
113 exposure point concentrations was done following those methods outlined in the
114 response to CEC Rd 1 CEC-0045. Revised geometric mean values were calculated where
115 mercury values for whitefish were treated as a proxy value for invertebrates which are a
116 lower trophic level species. As mercury levels for invertebrate species in the Regional
117 Study Area were unavailable, this was considered a reasonable approach as whitefish
118 are identified as a species which feeds mainly on invertebrates (pg 7-10 of Aquatic
119 Environment Supporting Volume). Through the bioaccumulation of mercury with
120 increasing trophic level, whitefish should have higher mercury levels than the
121 invertebrate species it feeds on (Environment Canada 2010), making the use of
122 whitefish mercury values as a proxy value for invertebrates species fed on by mink and
123 otter a reasonable approximation.

Table 1 - Risk characterization approach modified to include the consumption of invertebrates in addition to whitefish and northern pike.

Location	Receptor	IF kg/kg-d	AF	EPC µg/g			IR kg/d	f _{site}	BW kg	ADD mg/kg-d			TRV mg/kg-d	HQ		
				Baseline	Project	Baseline + Project				Baseline	Project	Baseline + Project		Baseline	Project	Baseline + Project
Keeyask Reservoir	River Otter	0.15	1	0.10	0.25	0.36	1.02	1	8	0.02	0.04	0.06	0.07	0.22	0.55	0.79
	Mink	0.12	1				0.10	1	1	0.01	0.03	0.04	0.08	0.16	0.39	0.56
	Osprey	0.10	1				0.30	0.50	1.50	0.01	0.03	0.04	0.07	0.15	0.36	0.52
	Bald Eagle	0.05	1				0.40	0.6	5	0.01	0.01	0.02	0.09	0.06	0.14	0.21
Stephen's Lake	River Otter	0.15	1	0.13	0.05	0.18	1.02	1	8	0.02	0.01	0.03	0.07	0.28	0.11	0.40
	Mink	0.12	1				0.10	1	1	0.02	0.01	0.02	0.08	0.20	0.08	0.28
	Osprey	0.10	1				0.30	0.50	1.50	0.02	0.01	0.02	0.07	0.18	0.07	0.26
	Bald Eagle	0.10	1				0.40	0.6	5	0.02	0.01	0.02	0.09	0.15	0.06	0.20

1 3. *Mink Diet*

2 Based on analyzed mink fecal samples, it was indicated that small mammals (92%), fish
3 (2%), invertebrates (1%), vegetation (1%), birds (1%) and unknown items (3%) were
4 consumed by this species (page 8-28 of TE SV). These items match those listed in US EPA
5 (1993) although in different proportions. This may have been reflective of the difficulty
6 in collecting fecal samples from mink which fed on higher quantities of species other
7 than small mammals although it is also reasonable to expect some regional variation in
8 the consumption of forage and prey species.

9 Calculated peak mercury concentrations in mink were based on the consumption of 0.1
10 kg of fish per day, or, approximately 75% of the 0.136 kg of food items consumed by this
11 species on a daily basis (Bleavins and Aulerich 1981). Accordingly, calculated peak
12 mercury concentrations could still be seen as conservative as the contribution of fish to
13 a mink's diet, based on the breakdown of dietary items provided in the TE SV or by US
14 EPA (1993), indicate the consumption of fish ranges from 2 -54% of a mink's diet,
15 respectively. As noted in response (2) above, calculated hazard quotient values
16 decreased as a result of the inclusion of lower trophic level species into a mink's diet.

17 4. *Comparisons of Peak Concentrations to Other Hydroelectric Projects*

18 As mink and otter are piscivorous species, it is expected that their mercury levels will
19 increase based on their consumption of fish which will have increased mercury levels
20 through hydroelectric development (Bodaly et al. 1984). For beaver, muskrat, moose
21 snowshoe hare and caribou, however, this link is not apparent for herbivores, and
22 consequently there are few research publications which address the specifics of
23 mercury exposure for these species, especially in relation to hydroelectric
24 developments.

25 The uptake of mercury by mink and river otter is well-studied and has been associated
26 with factors which, in the wild, can contribute to levels of mercury toxicity. Reviewed
27 explanatory variables include the age and sex of sampled animals (Mierle et al. 2000,
28 Yates et al. 2005) as well as local geology (Fortin et al. 2001) and sampling location
29 (Yates et al. 2005, Strom 2008). These factors make the comparison of mercury values
30 between sampling locations problematic.

31 While studies indicate that mercury levels in fish increase following hydroelectric
32 developments (Bodaly et al. 1984), such information is more limited for mammalian
33 species, except for humans. A study of mink and river otter mercury levels in an area
34 where there was a hydroelectric project indicated no significant difference compared to
35 areas where there was no hydroelectric project (Fortin et al. 2001). Spencer et al. (2011)
36 alternately did find differences in mercury concentration for river otter in areas with

37 hydroelectric development but also identified other explanatory factors as potential
 38 contributors to mercury levels, including the distance of sampled watersheds from the
 39 coast, as well as local geology.

40 Increases in mercury levels associated with other hydroelectric projects were
 41 considered and, furthermore, used to inform the extent that mercury levels are
 42 expected to increase in mink and otter as a result of the Keeyask project (TE SV Section
 43 8.4.3.1). For mink and otter, hydroelectric projects considered included the Churchill
 44 River Diversion and the Kelsey and Kettle Hydroelectric Projects (Kucera 1982, 1983,
 45 Environment Canada 1987).

46 For beaver there were no historic data indicating the effects of mercury exposure
 47 resulting from hydroelectric projects in Manitoba or elsewhere; consequently, the
 48 results of alternate studies were considered (Table 8-12 of the TE SV). For muskrat there
 49 was only a single study based on species collections occurring in Manitoba where
 50 mercury levels were established, resulting in mercury levels from other studies also
 51 being considered (Table 8-12). For moose and caribou, mercury levels were obtained
 52 from a variety of sources which are not reflective of hydroelectric projects and
 53 additional samples were taken from the Keeyask Regional Study Area to inform on
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1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 8.0 Mercury and Wildlife; p. N/A**

3 **CEC Rd 1 CEC-0047**

4 **PREAMBLE:**

5 Mercury in Wildlife – Toxicity Reference Values

6 **QUESTION:**

7 Two issues are raised with respect to toxicity reference values.

- 8 1. Appendix 8B-3 (lines 12-15) discuss TRVs. It is mentioned that TRVs for otters were
 9 derived based on mink TRVs which were scaled by body weight. Scaling of TRVs is no
 10 longer considered to be a generally accepted practice in ecological risk assessment.
 11 Please explain.
- 12 2. The toxicity reference values (TRVs) used in this study are not clear. The TRVs
 13 appear to be derived values for MeHg, their derivation is referenced to a NALCOR
 14 2009 document. The derivation of these TRVs (in NALCOR 2009) should be reviewed
 15 to ensure that the chosen values are appropriate. Please provide this Report.

16 For example, based on the discussion available in the document, it is not known how
 17 many studies were consulted in order to derive the TRVs, whether or not the lowest
 18 LOAEL was used, what compounds were used in the various underlying studies, etc.

19 The table below provides a brief comparison between the NALCOR 2009 TRVs to TRVs
 20 from Sample et al. 1996, specifically from studies using MeHg compounds.

Receptor	(NALCOR 2009) TRV	Sample et al. 1996 TRVs
Otter	0.07 mg/kg-d	Wobeser et al. 1976 (mink): <i>NOAEL:</i> 0.015 mg/kg-d
Mink	0.08 mg/kg-d	<i>LOAEL:</i> 0.025 mg/kg-d
Osprey	0.07 mg/kg-d	Heinz 1979 (mallard duck): <i>NOAEL:</i> 0.0064 mg/kg-d
Eagle	0.09 mg/kg-d	<i>LOAEL:</i> 0.064 mg/kg-d

21 From this comparison, the NALCOR 2009 TRV's (Lowest Observable Adverse Effect
 22 Levels [LOAELS]) for mammals appear to be greater (less conservative) than the values
 23 determined by Sample et al. (1996). For birds, the NALCOR 2009 TRVs appear to be
 24 more than 10x greater (less conservative) than the value from Sample et al. (1996).

25 This emphasizes the fact that the NALCOR 2009 TRV derivations should be reviewed.

26 **RESPONSE:**

27 A response to each of the items raised in the question is provided below.

28 *1. Body Weight Scaling*

29 The use of allometric body weight scaling of toxicity reference values (TRVs) has support
 30 across reviewed sources (Sample et al. 1996; Sample and Arenal, 1999) and in the
 31 performance of ecological risk assessments (US EPA 1997, NALCOR 2009). Alternatives
 32 to the use of TRV have been proposed (Allard et al. 2010) although are still not widely
 33 used (Mayfield and Fairbrother 2013).

34 The extrapolation of values for biological studies, such as the scaling of the effects of
 35 mercury on otter, is less preferable than the use of sampled values that are species-
 36 specific but are a suitable proxy where species-specific information is unavailable (Caro
 37 and O'Doherty 1998). In this case, river otter and mink should be considered as closely
 38 related species with extrapolation of values between them consistent with the
 39 methodology applied by Sample et al. (1996) which uses laboratory animals to detail, in
 40 part, the extent of effects of mercury exposure on physiological function for other
 41 species. For the purpose of the Project analysis, while the scaling of values may
 42 introduce some variability into the estimation of peak mercury concentrations, it is not
 43 expected that calculated hazard quotient values are incorrect, particularly to the extent
 44 that mercury exposure could lead to deleterious effects when no effects are currently
 45 predicted.

46 *2. Toxicity Reference Values*

47 Toxicity reference values (TRVs) used for mink and otter were those reported by
 48 NALCOR (2009). The NALCOR (2009) TRV for mink was derived based on those values
 49 reported by Sample et al. (1996) which were from the Wobeser et al. (1976) study of the
 50 effects of mercury toxicity on mink. Wobeser et al. (1976) and Sample et al. (1996)
 51 report a lowest observable adverse effects level (LOAEL) of 0.247 mg/kg BW/day. The
 52 derived TRV used by NALCOR (2009) is 0.08 mg/kg BW/day based on the application of
 53 an uncertainty factor value of 3 to adjust the results for a chronic level of exposure as
 54 the Wobeser et al. (1976) experiment was done at a subchronic level (NALCOR 2009).

55 Rather than the uncertainty factor used by Nalcor (2009), Sample et al. (1996) used an
 56 uncertainty factor of 10. While this resulted in more conservative TRV values this level
 57 of uncertainty is often applied across various scenarios as a means of diminishing the
 58 risks of exposure to environmental contaminants by humans and animals and not based
 59 on physiological thresholds (Sample et al. 1996). The United States Environmental
 60 Protection Agency (2002) indicates that scientific and professional judgment also play a
 61 role in the consideration of uncertainty factors where values of 1, 3 and 10 are the most
 62 frequently applied. The European Chemicals Agency proposes the use of an assessment
 63 factor (i.e., uncertainty factor) equal to 2 in identifying chronic LOAEL levels based on
 64 experiments that assessed subchronic exposure levels (ECHA 2012). In the field of
 65 ecological risk assessment, the conversion of subchronic to chronic threshold levels
 66 using an uncertainty factor of 3 has been applied by NALCOR (2009) as well as by
 67 Jacques Whitford (2009).

68 The TRV value for river otter was calculated based on an allometric body weight scaling
 69 measure, also used by NALCOR (2009), but follows those methods outlined elsewhere
 70 (Sample et al. 1996; Sample and Arenal 1999). The allometric body weight scaling
 71 measure for mammals follows the form:

$$72 \quad \text{Mammal Body Weight SF} = (BW_t / BW_r)^{0.06}$$

73 Where SF is a scaling factor, BW_t is the mean body weight for the test species and BW_r is
 74 the mean body weight for the receptor species. By applying the calculated SF to the TRV
 75 value derived for mink, above, the calculated TRV for otter is 0.07 mg/kg-BW/day.
 76 Larger TRV values can be associated with lower calculated hazard quotient values as the
 77 calculation of hazard quotient (HQ) follows the form:

$$78 \quad \text{HQ} = \text{the ratio of predicted exposure (ADD)/TRV}$$

79 The indication that, for birds, the NALCOR (2009) TRVs are 10x greater than those values
 80 indicated by Sample et al. (1996) is not suggested through the Project-based review of
 81 this data source which calculated the Sample et al. (1996) LOAEL at 0.064 mg/kg
 82 BW/day for mallard, and the NALCOR (2009) estimate of 0.0694 mg/kg BW/day for
 83 osprey. The reason for the difference between the two LOAEL estimates is due to a
 84 scaling factor applied to the mallard number (0.064 mg/kg BW/day) based on the larger
 85 weight for osprey. The scaling factor (SF) formula used to calculate osprey TRV was as
 86 follows:

$$87 \quad \text{Bird Body Weight SF} = (BW_t / BW_r)^{-0.20}$$

88 Where BW_t is the body weight of the test species (mallard) and BW_r is the body weight
 89 of the receptor species (NALCOR 2009). This scaling factor was also applied to calculate
 90 an eagle TRV and which resulted in a calculation of 0.088 (rounded to 0.09).

91 Calculated no observable adverse effects levels (NOAEL) for mallard are 10X lower than
 92 calculated LOAEL estimates because this was the adjustment factor used in its initial
 93 calculation where LOAEL levels were not directly measured in the Heinz (1979)
 94 experiment.

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1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0048**

4 **PREAMBLE:**

5 Overall, the analysis of potential increases in fish mercury concentrations in Keeyask
6 Reservoir reaches reasonable conclusions. Baseline fish mercury concentrations are
7 adequately characterized and fish mercury concentrations are predicted to increase,
8 consistent with observations from existing reservoirs after flooding occurs. The
9 predicted peak concentrations, and the duration of increased concentrations (up to 30
10 years) are within the range observed for other reservoirs on the Canadian Shield. Fish
11 mercury concentrations are also predicted to increase in Stephens Lake, although
12 significantly less than in Keeyask Reservoir.

13 **QUESTION:**

14 The downstream limit of increased fish mercury concentrations appears to be Stephens
15 Lake. A clear rationale for this limit would be useful. As well, little information was
16 found on the expected upstream limit of increased fish mercury concentrations (e.g., if
17 fish move upstream of the reservoir). Even if the effects beyond the Reservoir and
18 Stephens Lake are expected to be nil/negligible the rationale should be discussed.

19 **RESPONSE:**

20 The response will first address why effects to mercury in fish downstream of Stephens
21 Lake are expected to be negligible, and then address why increases in mean mercury
22 levels in fish in Split Lake are also not expected.

23 Mercury concentrations in fish downstream of Stephens Lake could become elevated
24 due to the export (and subsequent bioaccumulation) of methylmercury in water and
25 drifting invertebrates from the Keeyask reservoir and Stephens Lake, and/or the
26 movement of fish with elevated mercury concentrations from Stephens Lake further
27 downstream. Mercury concentrations in fish in Stephens Lake are expected to increase
28 as a result of the export of methylmercury in water and biota from the Keeyask
29 reservoir. The downstream export of methylmercury from the Keeyask reservoir may
30 occur to a similar extent as has been documented for other Canadian reservoirs
31 (Schetagne et al. 2000; Schetagne et al. 2003). As these authors have shown, the vast
32 majority of the export is in the form of methylmercury dissolved in the reservoir water.
33 Fish acquire mercury primarily from their food and not from the water (Hrenchuk et al.
34 2011; Hall et al. 1997), and water column methylmercury concentrations are usually not
35 well correlated with fish mercury concentrations, which are primarily determined by

36 food web processes (Bodaly et al. 2004). Substantial export of methylmercury from
37 reservoirs also occurs via suspended particular matter and zooplankton (Schetagne et al.
38 2000; Schetagne et al. 2003), components more closely associated with fish mercury
39 bioaccumulation rates. Suspended particular matter will settle and/or be consumed by
40 filter-feeders and zooplankton will move into more lentic habitat and/or be consumed
41 by predators in large lacustrine downstream waterbodies such as Stephens Lake. Thus,
42 methylmercury export via suspended particular matter or invertebrates from Stephens
43 Lake to further downstream will likely be much reduced, limiting the potential for post-
44 Project increases in fish mercury concentrations beyond Stephens Lake. These
45 conclusions are supported by empirical results for reservoirs in Québec and Labrador
46 (summarized by Schetagne et al. 2003).

47 The number of adult large-bodied fish moving from Stephens Lake downstream is very
48 small compared to the resident population(s) downstream and is not expected to be
49 sufficient to increase the mean mercury concentration of fish in downstream
50 environments. Mercury concentrations in fish in Split Lake could only be increased as a
51 result of the Keeyask Project if a substantial number of large-bodied fish emigrate from
52 the reservoir a number of years after impoundment when mean mercury levels have
53 increased. The area of Split Lake is approximately six times greater than present day Gull
54 Lake and adjoining river reaches and three times greater than the proposed Keeyask
55 reservoir. The catch-per-unit-effort values of Walleye and Northern Pike presently are
56 comparable between Split and Gull lakes. Consequently, it can be assumed that the
57 number of Walleye and Northern Pike in Split Lake is much larger than that in Gull Lake
58 or the Keeyask reservoir within the initial years of impoundment. Based on the results of
59 tagging studies, the number of Walleye and Northern Pike moving between Split and
60 Gull lakes is small. As described below, impoundment may result in an initial (i.e., first
61 year) emigration of fish from the reservoir to Split Lake, but this would occur prior to
62 marked increases in mercury levels of large-bodied fish. In the longer term during
63 operation no detectable effect to the Split Lake population is expected. Therefore,
64 although individual fish with elevated concentrations of mercury may move upstream
65 from the Keeyask reservoir to Split Lake, the number of fish moving is not expected to
66 be sufficient to cause a detectable change in mean mercury levels (due to the small
67 number of fish moving overall and the much greater number of fish in Split Lake).

68 The assessment of potential effects to fish populations in Split Lake, with emphasis on
69 movements between the Keeyask reservoir and Split Lake is provided in the Aquatic
70 Environment Supporting Volume (AE SV) Section 5.4.2.1 p. 5-50:

71 "Operation-related pathways that could affect the fish community in this area are
72 limited to effects to fish movements. Presently, it is not believed that this upstream
73 reach contains critical habitat for fish populations in the Nelson River below Birthday

74 Rapids and that immigration of fish to the reach from downstream areas is minimal.
 75 Changes in aquatic habitat in the Keeyask reservoir could result in increased fish
 76 movements upstream into Split/Clark lakes. In particular, there could be a mass influx of
 77 fish to this reach in the first year of impoundment as fish move upstream away from
 78 disturbed habitat in the reservoir, as has been seen during impoundment of the
 79 Desaulniers River, Québec (Boucher 1982).

80 Over the long-term, decreases in water velocity at Birthday Rapids resulting from
 81 operation of the Project could facilitate the movement of some large-bodied species
 82 upstream over Birthday Rapids. However, the small number of fish that currently move
 83 between the Split and Keeyask areas is not expected to increase substantially as Long
 84 Rapids, which are located downstream of Clark Lake, will still have white water post-
 85 Project and would be expected to continue to function as an impediment to upstream
 86 movements (Section 3.4.2.2). Based on the limited swimming ability of many forage
 87 species, it is believed that movements upstream over Birthday and Long rapids would be
 88 minimal.

89 The effects of immigration of fish from the Keeyask reservoir are not expected to be
 90 detectable in this reach over the long-term. Habitat changes in the Keeyask reservoir are
 91 not expected to affect fish in Split/Clark lakes since they are not dependent on habitat in
 92 that reach.”

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1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0049**

4 **PREAMBLE:**

5 No serious deficiencies were identified with respect to baseline mercury concentrations
6 in the study area in water, sediments or fish. However, no baseline (or post-flood)
7 information was included for methylmercury levels in the lower aquatic food web
8 (plankton, benthic organisms). Some models would require such data in order to predict
9 methylmercury concentrations in fish, but the models used for the Keeyask project
10 predicted fish mercury concentrations on the basis of physical characteristics (e.g.
11 extent of flooding), not methylmercury exposure through the food web. Lower food
12 web methylmercury concentrations could also be important if they represented
13 important dietary pathways for uptake by humans or wildlife.

14 **QUESTION:**

15 The proponent should describe why post-flooding predictions for methylmercury
16 concentrations are limited to fish.

17 **RESPONSE:**

18 While the proponent acknowledges that knowledge of mercury concentrations in
19 aquatic organisms at lower trophic levels than fish would be desirable from a scientific
20 perspective, it must be emphasized that the EIS covers all components relevant to an
21 effects assessment.

22 Mercury exposure and its potential health effect on most wildlife predators relevant to
23 the Keeyask Project (e.g., otter, bald eagle, loon, osprey) is to a large extent due to fish
24 consumption; and aquatic invertebrates contribute only marginally to the exposure of
25 these and other wildlife species (e.g., mink; TE SV, p.8-28; Evers et al. 2008;
26 Scheuhammer et al. 2007; Depew et al. 2012). At least in North America, fish also
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1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0050**

4 **PREAMBLE:**

5 Mitigation options are discussed in terms of reducing the increase in fish mercury
6 concentrations after flooding, and in reducing human exposure via consumption
7 advisories, communications programs, and agreements to provide access to alternative
8 supplies of fish. No serious deficiencies were identified in this regard.

9 **QUESTION:**

10 A minor deficiency is the lack of discussion of options that have been considered to
11 reduce the increase in fish mercury concentrations in new reservoirs, with the exception
12 of reservoir clearing. While this may be because no such mitigation measures have been
13 established for full scale reservoirs, a discussion of this issue would be beneficial to
14 inform readers of the options, or lack thereof.

15 **RESPONSE:**

16 The Partnership acknowledges that mitigation options for increased fish mercury
17 concentrations were primarily discussed in relation to the construction and operation of
18 the Keeyask GS. Mitigation was considered throughout the planning stages of the
19 Project, particularly in terms of site selection and station configuration, as these
20 represent the most efficient ways to reduce the extent of increases in mercury
21 concentrations of reservoir fish (Mailman et al. 2006). In particular, the area of newly
22 flooded soils and vegetation was minimized for the Keeyask Project. As the reviewer
23 indicates, other mitigation options for full-size reservoirs are largely unproven,
24 associated with environmental risks, and/or are cost prohibitive.

25 One additional mitigation option considered during the planning stages of Keeyask was
26 the large-scale removal of wetland and peatland soils within the reservoir flood zone to
27 reduce the amount of organic materials available to methylating bacteria. The plan was
28 not implemented because the removal and disposal of millions of cubic metres of
29 organic soils and vegetation would have been very costly and logistically challenging.

30 Other mitigation options that have been developed mainly on theoretical grounds (for a
31 list see Mailman et al. 2006) are unlikely to be practicable, effective, and/or
32 environmentally sound if implemented for full-size reservoirs. For example, the burning
33 of organic materials (to reduce methylation potential in the flood zone) has been
34 shown, at least in mesocosm experiments (Mailman and Bodaly 2006), to be less

35 effective in reducing mercury concentrations in biota than expected. Please see the
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1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 7.2.4.2.2; p. 7-19**

3 **CEC Rd 1 CEC-0051a**

4 **PREAMBLE:**

5 Predicted peak mercury concentrations in fish Keeyask Reservoir were estimated and
6 the predictions were reasonable, although the methods used had shortcomings. A few
7 of these identified below along with associated questions. The predictive tools did not
8 consider the effects of flow, as noted by the authors in AE SV p. 7-19 (Section 7.2.4.2.2).
9 The relatively rapid throughput of water for Keeyask Reservoir has the potential to
10 dilute increases in Hg concentrations in the water column, and reduce MeHg exposure
11 for fish. At the same time, more rapid flow would tend towards greater downstream
12 transport of methylmercury.

13 **QUESTION:**

14 What is the expected average hydraulic residence time in the proposed Gull Lake
15 Reservoir?

16 **RESPONSE:**

17 As described in the Physical Environment Supporting Volume p. 4-85, for flows between
18 the 5th and 95th percentile range, the travel time for water flowing in the mainstem of
19 the river will be approximately 15 to 30 hours. With the exception of the more sheltered
20 and shallower areas farthest from the mainstem of the river, the residence time of
21 water within the newly formed backbays of the reservoir will be up to approximately 1
22 month, though times will vary among bays.

23 As noted in the AE SV Section 7.2.4.2.2, one of the limitations to the Johnston *et al.*
24 (1991) model that must be considered when interpreting its predictions for fish mercury
25 levels in the Keeyask reservoir and Stephens Lake is that the model does not incorporate
26 the effect of flow rate. This would tend to over-estimate effects to Keeyask, as discussed
27 in the AE SV p. 7-19:

28 "The last issue may be of particular relevance for the Keeyask reservoir, which is
29 expected to have a relatively short hydraulic residence time of up to 30 hours
30 within the mainstem, approximately 30 days within the newly formed back-bay,
31 and only longer in more sheltered, shallower areas farthest from the river
32 mainstem (PE SV, Section 4.4.2.2). Fast flows and a short reservoir residence
33 time have the potential to dilute and/or remove newly generated
34 methylmercury in the water column before it enters the food web and is
35 biomagnified in consumers at higher trophic levels. For a given amount of

36 flooding, fish mercury concentrations will be lower where flow through the
37 reservoir is high. Although most reservoirs used to build the Johnston et al.
38 (2001) models were riverine in nature, the hydraulic residence times and the
39 ratios of lacustrine to riverine areas were likely larger than is expected for the
40 Keeyask reservoir. Such differences in hydrology also apply to the Stephens Lake
41 proxy model, and suggest that based on flow rates alone, the predicted fish
42 mercury concentrations for the Keeyask reservoir tend to be an overestimate.”

43 **REFERENCES:**

44 Johnston, T.A., Bodaly, R.A., and Mathias, J.A. 1991. Predicting fish mercury levels from
45 physical characteristics of boreal reservoirs. Canadian Journal of Fisheries and
46 Aquatic Sciences. 48: 1468–1475 pp.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. 7E-3**

3 **CEC Rd 1 CEC-0051b**

4 **QUESTION:**

5 It is not clear that the modifications to the regression model for fish Hg burden
6 described on AE SV p. 7E-3 are valid. Specifically, the authors replaced the original
7 intercept coefficient of the regression line for fish Hg burden with a value meant to
8 reflect site-specific conditions for the Keeyask study area. The slope of the line was not
9 changed. The overall result is a lower predicted fish Hg burden (and concentration) than
10 if the original regression model was used. Are the slope and intercept of the regression
11 equation only valid however as a combination that optimizes the model fit to the data?
12 If the intercept is forced to change, should the regression line be re-fitted to the overall
13 set of observations from reservoirs, which would produce a different slope, and
14 different predicted fish Hg level than presented here?

15 **RESPONSE:**

16 The slope of the regression line of the Johnston et al. (1991) models represents the rate
17 of increase in fish mercury (Hg) burden (concentration times fish weight) for a percent
18 of flooding, whereas the intercept represents the baseline mercury burden for the
19 combined data set of all 21 lakes and reservoirs used in the model building. Thus, the
20 expected mercury burden for a certain percentage of flooding is composed of two
21 additive components, the base portion (as represented by the intercept) and the
22 increase portion (as represented by the slope). To arrive at predictions specific for the
23 Keeyask reservoir, the baseline concentration is represented by the current (pre-Project)
24 conditions at Gull Lake to which the "increase" due to flooding is added. The mercury
25 burden represents a combination of the mean mercury concentration and the average
26 weight of fish at their species specific standard length. Both these values were taken
27 from Lake Whitefish, Northern Pike, and Walleye from Gull Lake to represent their
28 current mercury body burden. The reason why the predicted body burdens of the three
29 species from Gull Lake are lower than those calculated using the generic equations in
30 Johnston et al. (1991) is due to both the lower current mercury concentrations and the
31 lower mean weight of the Gull Lake fish compared to the mean for the 21 whitefish,
32 pike, and Walleye populations used in the Johnston et al. (1991) models. It should be
33 noted that the difference in estimated maximum mercury burdens (and concentrations)
34 between the generic equations and those using the intercept specific to Gull Lake is
35 much smaller than might be expected by just looking at the differences in model
36 intercepts. For all three species, the difference is less than 10% of the predicted burden,

37 and would not have affected the final conclusions regarding the predicted post-Project
38 fish mercury concentrations.

39 **REFERENCES:**

40 Johnston, T.A., Bodaly, R.A., and Mathias, J.A. 1991. Predicting fish mercury levels from
41 physical characteristics of boreal reservoirs. Canadian Journal of Fisheries and
42 Aquatic Sciences. 48: 1468–1475 pp.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. 7E-5**

3 **CEC Rd 1 CEC-0051c**

4 **QUESTION:**

5 Initial predictions of peak fish Hg concentrations for Stephens Lake, downstream of
6 Keeyask Reservoir, produced a value of 1.5 ug/g for northern pike, which was deemed
7 unrealistic (AE SV p. 7E-5). Further justification of this statement should be provided.
8 The proponent then modified the approach by applying the model to predict fish Hg in a
9 manner that is inconsistent with the original development of the model (at least to the
10 knowledge of this reviewer after reviewing the 1991 publication of the model by
11 Johnston et al.). Specifically, the proponent added the areas of Keeyask Reservoir and
12 Stephens Lake to estimate the effects of the proposed flooding as though it represented
13 a smaller fraction of a much larger reservoir (Keeyask Reservoir and Stephens Lake
14 combined). While the area of Keeyask Reservoir would be roughly 50% flooded terrain,
15 the hypothetical Keeyask-Stephens reservoir would only have roughly 11% flooded area.
16 Because the model used by the proponent predicted increases in fish Hg on the basis of
17 the percent flooding involved, the resulting prediction for Stephens Lake was that fish
18 would increase from 0.26 ug/g currently to 0.41 ug/g (rather than 1.5 ug/g). Some
19 explanation should be provided.

20 Recognizing uncertainty in the predictions, the proponent increased the predicted peak
21 concentration for northern pike in Stephens Lake to 0.5 µg/g. The validity of the
22 combined waterbody approach is questionable, because the original model coefficients
23 were not derived using this approach. Some explanation should be provided. Overall
24 however, this reviewer recognizes that it is indeed difficult to accurately predict fish Hg
25 concentrations downstream of new reservoirs. It is therefore essential that sufficient
26 monitoring be carried out after flooding to determine fish Hg concentrations in
27 Stephens Lake to provide information needed for consumption advisories.

28 **RESPONSE:**

29 The justifications for considering 1.5 ppm an unrealistic estimate of a maximum post-
30 Project mercury concentration in pike from Stephens Lake noted that the Johnston et al.
31 (1991) "upstream flooding" models did not include a scenario in which the receiving
32 waterbody: a) does not experience flooding; and b) is located very closely (~4 km) to a
33 flooded upstream reservoir. Furthermore, the Johnston et al. (1991) models weigh
34 upstream variables equally to within-lake variables, which was acknowledged by the
35 authors as an unrealistic assumption.

36 Because of the close proximity of Stephens Lake to the Keeyask reservoir, the
 37 Partnership considered it more realistic to treat both waterbodies as one to estimate
 38 increases in fish mercury concentrations in Stephens Lake using a Johnston et al. (1991)
 39 model that only uses *in situ* flooding. More detailed explanations considering this
 40 approach were provided on AE SV pages 7E-5 and 7E-6 (reproduced below). The
 41 Johnson et al. (1991) models were not applied in an inconsistent manner; the most
 42 appropriate model was selected to reflect the conditions of methylmercury inputs and
 43 bioaccumulation in Stephens Lake, acknowledging that the specific geographical
 44 relationship between the Keeyask reservoir and Stephens Lake is not well represented
 45 in any of the Johnston et al. (1991) models.

46 AE SV pages 7E-5 and 7E-6 are reproduced below.

47 "7E.2.2 Model to Predict Fish Mercury Concentrations Downstream of the
 48 Keeyask Reservoir

49 The export of methylmercury in water and biota from flooded lakes resulting in
 50 elevated fish mercury concentrations downstream is known from Manitoba
 51 (Bodaly *et al.* 2007) and Québec (Schetagne and Verdon 1999b; Schetagne *et al.*
 52 2000; Schetagne *et al.* 2003) hydroelectric reservoirs. Significant increases in
 53 downstream transport of methylmercury have also been observed during the
 54 experimental flooding studies of the ELA reservoir projects (Kelly *et al.* 1997; St.
 55 Louis *et al.* 2004; Hall *et al.* 2005). The geographical extent of downstream
 56 effects in large reservoirs is highly variable (Bodaly *et al.* 2007), but has been
 57 observed as far as 275 km on downstream river sections without large, deep
 58 bodies of water that promote biological uptake of mercury-rich particles
 59 originating from the reservoir (Schetagne and Verdon 1999b). In order to
 60 estimate downstream export of mercury from the Keeyask reservoir, maximum
 61 fish mercury concentrations in Stephens Lake were first estimated using the
 62 Johnston *et al.* (1991) two-variable model, which considers percent *in situ*
 63 flooding and upstream flooding:

$$64 \quad (3) \quad \text{MERC} = b_0 + b_1 \%F + b_2 \text{U}\%F$$

65 where: MERC = mean peak mercury burden calculated as the product of fish
 66 wet weight and muscle mercury concentration;

67 $\%F$ = the percentage of reservoir flooding (*i.e.*, flooded area/total area);

68 b_0 = regression constant related to the baseline mercury burden without
 69 flooding;

70 b_1 = regression constant related to the flooding contribution to the
71 burden

72 U%F = percentage of upstream (*i.e.*, Keeyask reservoir) flooding
73 (flooded
74 area/total area); and

75 b_2 = regression constant related to the upstream contribution of fish
76 mercury burden.

77 The resultant estimates of maximum mercury concentrations in Stephens Lake
78 were unrealistically high (*e.g.*, 1.5 ppm for pike). A probable explanation for the
79 inability of the %F/U%F model (3) to reasonably predict downstream export of
80 mercury from the Keeyask reservoir into Stephens Lake is that the within-lake
81 and upstream variables are given the same relative importance, such that
82 upstream effects have a much larger effect on mercury burdens than within-
83 reservoir effects (Johnston *et al.* 1991). Moreover, upstream flooding in
84 Johnston *et al.* (1991) did not consider the distance between and the relative
85 sizes of the flooded and downstream waterbody, and thus potential dilution
86 effects. Finally, Stephens Lake (*i.e.*, the receiving waterbody) will experience no
87 flooding due to the Project, a scenario that was not part of the Johnston *et al.*
88 (1991) model building. Because of the apparent inadequacies of the 2-variable
89 model (3) and the close proximity of the Keeyask reservoir and Stephens Lake
90 (less than 4 km), the two waterbodies were treated as one and the %F model (1)
91 was used to predict downstream mercury concentrations. Thus, the area
92 flooded by the Keeyask GS (45.9 km² on Day 1, 48.8 km² in Year 5) (PE SV,
93 Section 6 [Shoreline Erosion Processes]) was apportioned to the combined area
94 of the Keeyask reservoir (92.5 km² on Day 1, 95.4 km² in Year 5) and the
95 Stephens Lake water area of 332.02 km² (TE SV), resulting in a percentage
96 flooding of 10.8% at day 1 and 11.4% at Year 5 post-impoundment. This
97 approach likely represents a worst-case scenario as Stephens Lake may
98 experience only downstream transport of water (see Section 2.5) and biota with
99 elevated methylmercury concentrations rather than *in situ* increases in mercury
100 methylation due to the Project."

101 Monitoring of mercury levels in Walleye, Northern Pike, and Lake Whitefish will occur in
102 Stephens Lake. The current plan is for annual monitoring until peak levels are reached
103 and then monitoring every three years until mercury levels stabilize.

104 **REFERENCES:**

105 Bodaly, R.A., Jansen, W.A., Majewski, A.R., Fudge, R.J.P., Strange, N.E., Derksen, A.J., and
106 Green, D.J. 2007. Post-impoundment time course of increased mercury

- 107 concentrations in fish in hydroelectric reservoirs of northern Manitoba, Canada.
108 Archives of Environmental Contamination and Toxicology 53: 379–389 pp.
- 109 Hall, B.D., St. Louis, V.L., Rolfhus, K., Bodaly, R.A., Beaty, K.G., Paterson, M.J., and
110 Cherrewyk, K.A.P. 2005. Impacts of reservoir creation on the biogeochemical
111 cycling of methylmercury and total mercury in boreal upland forests.
112 Ecosystems 8: 248–266 pp.
- 113 Johnston, T.A., Bodaly, R.A., and Mathias, J.A. 1991. Predicting fish mercury levels from
114 physical characteristics of boreal reservoirs. Canadian Journal of Fisheries and
115 Aquatic Sciences 48: 1468–1475 pp.
- 116 Kelly, C.A., Rudd, J.W.M., Bodaly, R.A., Roulet, N.P., St. Louis, V.L., Haynes, A., Moore, T.R.,
117 Schiff, S., Aravena, R., Scott, K.J., Dyck, B., Harris, R., Warner, B., and Edwards, G.
118 1997. Increases in fluxes of greenhouse gases and methylmercury following
119 flooding of an experimental reservoir. Environmental Science and Technology
120 31: 1334–1344 pp.
- 121 Schetagne, R. and Verdon, R. 1999b. Post-Impoundment evolution of fish mercury levels
122 at the La Grande Complex, Québec, Canada (from 1978 to 1996). In Mercury
123 and Biochemical Cycle. Edited by M. Lucotte, R. Schetagne, N. Thérien, C.
124 Langlois, and A. Trembley. Springer, Berlin, 235–258 pp.
- 125 Schetagne, R., Therrien, J., and Lalumiere, R. 2003. Environmental monitoring at the La
126 Grande complex. Evolution of fish mercury levels. Summary report 1978–2000.
127 Direction Barrages et Environnement, Hydro-Québec Production and Groupe
128 conseil GENIVAR Inc., 185 pp.
- 129 Schetagne, R., Doyon, J.F., and J. J. Fournier, J.J. 2000. Export of mercury downstream
130 from reservoirs. Science of the Total Environment 260:135 - 145 pp.
- 131 St. Louis, V.L., Rudd, J.W.M., Kelly, C.A., Bodaly, R.A., Paterson, M.J., Beaty, K.G.,
132 Hesslein, R.H., Heyes, A., and Majewski, A.R. 2004. The rise and fall of mercury
133 methylation in an experimental reservoir. Environmental Science and
134 Technology 38: 1348–1358 pp.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0051d**

4 **QUESTION:**

5 Recognizing uncertainty in the predictions, the proponent increased the predicted peak
6 concentration for northern pike in Stephens Lake to 0.5 ug/g. The validity of the
7 combined waterbody approach is questionable, because the original model coefficients
8 were not derived using this approach. Some explanation should be provided. Overall
9 however, this reviewer recognizes that it is indeed difficult to accurately predict fish Hg
10 concentrations downstream of new reservoirs. It is therefore essential that sufficient
11 monitoring be carried out after flooding to determine fish Hg concentrations in
12 Stephens Lake to provide information needed for consumption advisories.

13 **RESPONSE:**

14 This question is addressed in the response to CEC Rd 1 CEC-0051c.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0051e**

4 **PREAMBLE:**

5 Predictions regarding the duration of increased fish mercury concentrations are
6 reasonable: peak concentrations 3-7 years after flooding, returning to background levels
7 over 30 years (EIS Executive Summary p. 31). These predictions are largely based on
8 observations from existing reservoirs.

9 **QUESTION:**

10 Mercury concentrations were predicted for the water column in Keeyask Reservoir and
11 Stephens Lake, but a description of the modeling analysis that yielded these predictions
12 could not be found. Furthermore, confusion arose from two tables that presented
13 different values for changes in water column mercury concentrations (Table 2-20 and
14 Table 2F-8 in the Aquatic Effects Supporting Volume), and from a third table with similar
15 information (but different values again) that was not referenced in the main text (Table
16 2F-9). It appears that text could be missing. Please investigate and explain.

17 **RESPONSE:**

18 The methods applied for predicting effects of the Project operation on mercury (and
19 other substances) are presented and described in the Aquatic Environment Supporting
20 Volume (AE SV) Appendix 2F “Modelling approach and detailed results for the
21 assessment of effects to water quality: Project operation period.”, specifically on pages
22 2F1 through 2F5. In brief, the water quality assessment estimated changes in mercury
23 (and other metals) due to two key pathways of potential effect: changes in organic total
24 suspended solids (TSS); and flooding of terrestrial organic materials. The model utilized
25 output from the organic TSS model (described in the PE SV Section 7) in conjunction
26 with measured peat chemistry to address the first pathway. Effects of flooding were
27 estimated using several pieces of information including flooded area, water
28 volumes/residence times, existing water quality data, and soil quality data. A brief
29 overview of modeling methods/approach are provided on p. 2-10 and 2-11 (AE SV
30 Section 2.3.4.4.1), and the text presented in this section refers the reader to Appendix
31 2F for a detailed description of the methods.

32 Regarding the question pertaining to Tables 2-20, 2F-8 and 2F-9, each table presents
33 different data/information. Table 2F-8, as noted in the table caption (“Summary of
34 estimated changes in concentrations of metals associated with organic total suspended
35 solids ...”) presents predictions associated with changes to organic TSS; Table 2F-9, as

36 noted in the table caption (“Summary of estimated changes in concentrations of metals
37 associated with flooding...”) presents predictions associated with flooding; and Table 2-
38 20, also as noted in the table caption (“Summary of estimated changes in
39 concentrations of metals associated with organic total suspended solids (TSS) and
40 flooding ...”, presents predictions associated with both pathways collectively.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0051f**

4 **PREAMBLE:**

5 Predicted peak mercury concentrations in fish Keeyask Reservoir were estimated and
6 the predictions were reasonable, although the methods used had shortcomings. A few
7 of these identified below along with associated questions.

8 **QUESTION:**

9 No predictions were identified for post-flood concentrations for methylmercury in any
10 media except fish.

11 **RESPONSE:**

12 Predictions for post-flood concentrations for methylmercury were provided for birds in
13 the Terrestrial Environment Supporting Volume, Section 8: Wildlife and Mercury. 8.3.4.2
14 Operation Effects and Mitigation Table 8-5:

Table 0-1: Predicted Total Mercury Concentrations in the Muscle Tissue of Waterbirds Based on Peak Total Mercury Levels Modeled-Predicted for Fish Inhabiting the Keeyask Reservoir

Waterbird Species	Bird Feeding Group	Comparable Fish Feeding Group	Fish Species	Mercury Levels in Fish¹ (ppm)	Estimated Mercury Levels in Birds (ppm)
Canada goose	Strictly Herbivorous	N/A	N/A	N/A	~0.03
Mallard, green-winged teal, northern pintail, ring-necked duck	Herbivorous/benthivorous	Benthivorous	Whitefish	<0.19	<0.19
Black scoter, surf scoter, common goldeneye, Scaup	Benthivorous	Benthivorous	Whitefish	0.19	0.19
Tern	Piscivorous-insectivorous	Piscivorous	Northern pike and walleye	1.0	1.0
Herring gull	Piscivorous-omnivorous	Piscivorous	Northern pike and walleye	1.0	1.0
Common merganser, red-breasted merganser, loon , osprey	Piscivorous	Piscivorous	Northern pike and walleye	1.0	1.0+
Bald eagle	Piscivorous-omnivorous	Piscivorous	Northern pike and walleye	1.0	1.0+

¹-Source: Aquatic Environment Supporting Volume, Section 7.2.4.2.2

- 16 Estimated concentrations of mercury for aquatic furbearers was provided in Section
 17 8.4.4.2 Operation Effects and Mitigation, Table 8 16.

Table 0-2: Model Estimates of Median and Most-likely Range of Total Mercury Concentrations ($\mu\text{g/g}$)¹ in the Liver of Mammals that Forage Within the Keeyask Reservoir and/or Stephens Lake

Species	Peak		Long-term
	Day 1 ²	Year 3 to 7	Years 20-30
Beaver	0.01 (<0.01–0.05)	0.01 (<0.01–0.05)	0.01 (<0.01–0.05)
Muskrat	0.02 (<0.01–0.06)	0.04 (<0.01–0.12)	0.02 (<0.01–0.06)
Mink	1.52 (0.56–3.16)	4.00 (0.56–30.60)	1.52 (0.56–3.16)
River otter	0.55 (0.28–3.97)	6.00 (0.28–17.63)	0.55 (0.28–3.97)

¹ $\mu\text{g/g}$ = parts per million (ppm)

² Represents the existing environment and uses the first time the initial fill level is in effect

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.6.4.4; p. N/A**

3 **CEC Rd 1 CEC-0052**

4 **QUESTION:**

5 Proposed monitoring for fish mercury concentrations after flooding in Keeyask Reservoir
 6 and Stephens Lake is reasonable. Monitoring will be conducted annually until peak
 7 levels are reached, and every 3 years thereafter until concentrations stabilize (Response
 8 to EIS guidelines Chapter 8, Table 8-3, p. 8-17). It is not clear whether additional pre-
 9 flood baseline monitoring is proposed for fish mercury levels. Given the year-to-year
 10 natural variability in fish mercury concentrations, additional pre-flood fish mercury data
 11 would be useful to help quantify existing concentrations. It is also not clear if fish
 12 monitoring (for mercury) is planned upstream of Keeyask Reservoir or downstream of
 13 Stephens Lake. Some monitoring of fish in Clark and Split Lakes is likely necessary to
 14 ascertain whether or not fish with higher mercury levels are entering these waterbodies
 15 from the Reservoir.

16 This information should be provided with supporting rationale.

17 No post-flooding monitoring appears planned in sediments (AE SV 2.6.4.4). It is also
 18 unclear if monitoring is proposed for concentrations of total mercury and
 19 methylmercury in the water column or lower food web in Keeyask Reservoir or
 20 downstream. While it is not expected that mercury concentrations in these
 21 compartments will rise to levels presenting significant risks to humans, this information
 22 would improve the ability to predict increases in mercury concentrations in fish for
 23 future hydroelectric developments, both in new reservoirs and downstream. For
 24 example, it is known that fish mercury concentrations increase downstream of new
 25 reservoirs, but the factors controlling the distance downstream that this occurs are not
 26 well known. Post-flood data on mercury concentrations in downstream waters would
 27 facilitate predictions in the future.

28 **RESPONSE:**

29 Fish mercury concentrations in waterbodies upstream of the Keeyask reservoir will be
 30 collected in Split Lake and the Aiken River as part of the monitoring program for the
 31 Keeyask Generation Project. Fish mercury concentrations in Split Lake (since 2010) and
 32 Stephens Lake (since 2009) have been monitored on a 3-year rotational basis under the
 33 Coordinated Aquatic Monitoring Program (CAMP)¹⁵ and will provide additional pre-

¹⁵ CAMP is a program conducted jointly by Manitoba and Manitoba Hydro and includes monitoring on over 30 waterbodies both on regulated and natural waterways.

34 Project information on fish mercury concentrations prior to Project construction.
35 Walleye and Northern Pike from the Aiken River are measured tri-annually with the next
36 sampling scheduled for 2015 to address concerns from the York Factory First Nation
37 (although not predicted in the technical assessment, First Nation Members are
38 concerned that mercury concentrations in fish in the Aiken River will increase following
39 development of the Keeyask Project). Monitoring of fish mercury concentrations in the
40 Nelson River downstream of Stephens Lake (i.e., in the Long Spruce Forebay) will
41 proceed only if fish mercury concentrations within Stephens Lake increase
42 “substantially” (e.g., >0.5 ppm, the maximum post-Project concentrations predicted in
43 the EIS for Pike and Walleye) during Project operations. It should be noted that the
44 exact spatial extent and timing of fish mercury monitoring under the Keeyask Project is
45 still being discussed with regulators and may change.

46 While the knowledge of mercury concentrations in the water, sediment, and aquatic
47 organisms at lower trophic levels than fish would be desirable from a scientific
48 perspective, it must be emphasized that the EIS covers all components relevant to the
49 prediction of mercury concentrations in fish. As outlined in the response to CEC Rd 1
50 CEC-0048, fish mercury concentrations are usually not well correlated with water
51 column methylmercury concentrations but are primarily determined by food web
52 processes. Similarly, several studies have documented a lack of relationship between
53 mercury concentrations in lake sediments and in fish (e.g., Bodaly et al. 1993; Munn and
54 Short 1997) or have found a negative correlation (Harris and Claverkamp 1990).

55 **REFERENCES:**

- 56 Bodaly, R. A., J. W. M. Rudd, R. J. P. Fudge, and C. A. Kelly. 1993. Mercury
57 concentrations in fish related to size of remote Canadian shield lakes. *Can. J.*
58 *Fish. Aquat. Sci.* 50:980-987.
- 59 Harrison, S. E., and J. F. Klaverkamp. 1990. Metal contamination in liver and muscle of
60 northern pike (*Esox lucius*) and white sucker (*Catostomus commersoni*) and in
61 sediments from lakes near the smelter at Flin Flon, Manitoba. *Environ. Toxicol.*
62 *Chem.* 9:941 956.
- 63 Munn, M. D., and T. M. Short. 1997. Spatial heterogeneity of mercury bioaccumulation
64 by walleye in Franklin D Roosevelt Lake and the upper Columbia River,
65 Washington. *Trans. Amer. Fish. Soc.* 126:477 487.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 7.2.3.2; p. N/A**

3 **CEC Rd 1 CEC-0053**

4 **QUESTION:**

5 The mercury text was confusing in some cases, e.g. Aquatic Effects Supplemental
6 Volume (AE SV) Section 7.2.3.2, in terms of whether fish mercury concentrations were
7 adjusted to a standard length, or instead represented the mean value for a sample. For
8 example, the text referring to Figures 7-3 to 7-5 mentions “mean mercury
9 concentrations” while the graph captions state “mean standardized”. The text and
10 figures should be consistent, indicating standard lengths if that was the case.

11 **RESPONSE:**

12 In order to make the text less wordy and easier to read, the phrase “mean mercury
13 concentration(s)” was used to describe “mean length standardized mercury
14 concentrations”. In those cases where mercury concentrations referred to arithmetic
15 concentrations or concentrations from commercial samples, the term “arithmetic” or
16 “commercial” was always included in the text. Table and Figure captions always
17 included a detailed description of the type of mean presented (i.e., standardized
18 mercury concentrations).

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. 2-19**

3 **CEC Rd 1 CEC-0054**

4 **QUESTION:**

5 Detection limits used to analyze water column samples collected in the fall of 2011 (1
6 ng/L for total mercury, 0.05 ng/L for methylmercury) were sufficient to demonstrate
7 that existing concentrations of total mercury and methylmercury are well below the
8 Manitoba water quality guidelines for the protection of aquatic life (26 and 4 ng/L
9 respectively) (Aquatic Effects Supplemental Volume (AE SV) p. 2-19, Appendix 2J), but
10 greater precision would have been preferable to more accurately describe
11 concentrations. Improved analytical methods should be considered in the future.

12 **RESPONSE:**

13 The analytical detection limits employed for total mercury and total methylmercury in
14 the fall of 2011 (as noted above and described in Aquatic Environment Supporting
15 Volume (AE SV) p. 2-19 and Appendix 2J) are notably lower than the current Manitoba
16 and CCME guidelines for the protection of aquatic life (PAL) and the Manitoba and
17 Health Canada drinking water quality guidelines (DWQG; see Table 1 below). The
18 detection limit for total mercury is approximately 4% of the PAL guideline and 0.1% of
19 the DWQG. As PAL and DWQGs are applied as a measure of risk to either aquatic life or
20 human health (i.e., thresholds for potential effects) in the EIS and in standard practice,
21 and will be considered for monitoring potential effects post-Project, these detection
22 limits are adequate for the application. While use of lower analytical detection limits
23 may provide a higher level of precision, this exercise would be largely academic and
24 would not provide additional information respecting potential risks to either aquatic life
25 or humans (i.e., human health).

Table 1: Comparison of analytical detection limits to water quality guidelines for the protection of aquatic life (PAL) and drinking water quality guidelines (DWQG).

	Total Mercury	Total Methylmercury
Manitoba PAL Guideline (ng/L)	26	4
CCME PAL Guideline (ng/L)	26	4
Manitoba DWQG (ng/L)	1000	-
Health Canada DWQG (ng/L)	1000	-
ALS Laboratories Detection Limit (ng/L)	1	0.05
ALS Laboratories Detection Limit as % of PAL Guidelines	4	1
ALS Laboratories Detection Limit as % of DWQG	0.1	-

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. 4-85**

3 **CEC Rd 1 CEC-0055**

4 **QUESTION:**

5 With respect to the report, Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012,
 7 there were a question about back-bay residence time.

- 8 · First paragraph (page 4-85): "With the exception of the more sheltered and
 9 shallower areas farthest from the mainstem of the river [...]"
 10 ○ What is the residence time in these areas?

11 **RESPONSE:**

12 Being more sheltered and away from the mainstem of the Nelson River, these areas are
 13 not influenced by main river flows as much as other newly formed back-bays that are
 14 closer to the original channel boundaries. Consequently, the residence time in these
 15 sheltered areas is a function of many other factors including actual flow conditions
 16 within the Nelson River, the exact flow patterns around various islands and in the
 17 specific back-bays, distance from the mainstem of the river, and volume and shape of
 18 the back-bay (Physical Environment Supporting Volume - Surface Water and Ice
 19 Regimes, Section 4.4.2.2.6 (page 4-85)). Other factors affecting the residence time in a
 20 specific back-bay also include: wind, waves, groundwater inflows, and local runoff.
 21 Factors such as these are variable and dependant on local conditions which means that
 22 the residence times of the more sheltered and shallow areas farthest from the
 23 mainstem will also be variable and dependant on specific local conditions. Because
 24 these factors are variable and difficult to accurately predict, they could not be
 25 comprehensively included in the model.

26 An analysis of a typical back-bay indicated that local inflow and wind are major factors
 27 affecting the current within these back-bays furthest away from the mainstem of the
 28 river. Typical residence times for these back-bays could be in the order of 1-2 months
 29 and even longer for the most isolated and sheltered back-bays. This would be expected
 30 for back-bays in lakes or rivers that are sheltered and receive little groundwater or
 31 surface water inflow and where episodic wind and rainfall events can substantially affect
 32 circulation patterns and residence times in these areas.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. 4-51, 4-52, 4-55, 4-62**

3 **CEC Rd 1 CEC-0056**

4 **QUESTION:**

5 With respect to the report Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following
 7 questions on construction:

8 CONSTRUCTION DESIGN FLOWS

- 9 · Last paragraph (page 4-51): "Water levels expected during winter conditions were
 10 also considered for flows ranging from 1:20 years mean monthly winter low flows
 11 [...] to 1:20 mean monthly winter maximum flows"
 12 ○ What was the downstream water level used for the calculation? Hanging ice
 13 dam issues downstream of Gull Rapids should be limited and the water level
 14 should be lower at this site because of the ice boom.

15 STAGE I DIVERSION

- 16 · Seventh paragraph (page 4-52): "it is expected that the water will stay within Gull
 17 Lake during the annual 1:20 CDF."
 18 ○ A flood map for this scenario should be provided and the locations of
 19 potential overflows should be highlighted.
 20 · Figures 4.4-3 and 4.4-4 (page 4-55)
 21 ○ What is the pixel resolution of these maps?
 22 ○ The scale should be provided.
 23 ○ What is the mesh density of the 2D model in the vicinity of the Keeyask GS
 24 Project site?

25 STAGE II DIVERSION

- 26 · Figure 4.4-9 (page 4-62)
 27 ○ Very high velocities up to 12 m/s were computed for this scenario. Have
 28 mitigation measures been planned to limit erosion and potential damages
 29 to the structures located downstream of the spillway?
 30 ○ What are the computed velocities right next to the tailrace cofferdam? How
 31 could this structure be protected?

32 **RESPONSE:**

33 Response to the above questions are outlined below.

34 CONSTRUCTION DESIGN FLOWS

35 The downstream boundary condition used was the Stephens Lake water level. A range
36 of Stephens Lake water levels was used, including the 5th percentile (139.3 m), 50th
37 percentile (140.4 m), and 95th percentile (141.0 m) winter water levels.

38 STAGE I DIVERSION

39 Map 4.4-2 shows the Stage I Diversion shoreline polygons for the 95th percentile flow of
40 4379 m³/s. The areas of potential overland flooding are the same for this scenario as the
41 1:20 construction design flood. The three potential areas of flooding are the three large
42 bays along the south shore of Gull Lake between Gull Rapids and the western end of the
43 south dyke. As noted in the Project Description Supporting Volume (PD SV, Sec. 3.4.3),
44 subsurface water levels in these lower lying areas will be monitored by the Project
45 Manager (Manitoba Hydro) and general contractor during construction and actions will
46 be taken, if required, to contain the seepage and/or overland flow southward out of Gull
47 Lake. A potential mitigation measure to contain the seepage and overland flow would
48 be to construct additional containment dykes prior to the completion of the south dyke.

49 The pixel resolution of Figures 4.4-3 and 4.4-4 is about 8.33 m. These figures were
50 generated from the Flow-3D model which has a resolution of 8.33 m, 8.33 m, and 1 m in
51 the X (east-west), Y (north-south), and Z (vertical) directions respectively. The 2D model
52 was not used for the figures above but the mesh density for the 2D model through the
53 Gull Rapids area is about 20-30 m. Additional details regarding the numerical models
54 can be found in the response to CEC Rd 1 CEC-0058.

55 STAGE II DIVERSION

56 Due to the high velocities near the spillway and river diversion structures, some erosion
57 of the riverbed may occur with time. The riverbed in the Keeyask GS area (Gull Rapids) is
58 primarily comprised of bedrock that is assessed to be strong to very strong and of
59 sufficient quality to preclude the requirements for mitigation measures (PD SV, Sec.
60 2.3.3.1). However, this will be reviewed based on an examination of bedrock geology at
61 the time of construction of the Stage II river diversion structure and spillway discharge
62 channel.

63 The computed velocities right next to the tailrace cofferdam under the 1:20
64 construction design flood range from < 1 m/s in sheltered areas to approximately 5 m/s
65 along the south-east corner. The requirement for riprap protection along vulnerable
66 shorelines will be assessed at the time of construction and, if required, will be placed to
67 minimize shoreline erosion. Riprap requirements will also be designed for the spillway
68 and powerhouse cofferdams to prevent erosion of these structures. The Physical
69 Environment Supporting Volume (Sec. 13 Glossary, page 13-16) defines riprap as: A layer

70 of large stones, broken rock, boulder, or other suitable material placed on the upstream
71 and downstream faces of embankments, dams or other land surfaces to protect them
72 from erosion or scour caused by current, wind, wave, and/or ice action.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0057**

4 **QUESTION:**

5 With respect to the report Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following
 7 questions on creek hydrology and hydraulics:

8 First paragraph (page 4-17): "Four specific creeks of interest were selected for detailed
 9 analysis."

- 10 . How were these creeks selected?
 11 . Backwater distances for these creeks are given in Section 4.4.2.2.7 (page 4-86).

12 Sixth paragraph (page 4-19): "All roughness values chosen were between 0.035 and
 13 0.04"

- 14 . These Manning roughness coefficients are low compared to usual normal values for
 15 riverbanks with trees (0.040 to 0.150, from HEC-RAS Reference Manual). Please
 16 explain.

17 Figure 4.2-3 (page 4-20)

- 18 o What is the type of background image, DTM or satellite?
 19 o The "Nap Length Mark" and "Backwater Boundary" elements are
 20 unreadable.
 21 o Indication of north, scale and legend should be provided.
 22 . Flow around Caribou island (page 4-26) and in Gull Rapids (page 4-28)
 23 o How were the multiples channels flows calculated? Are the proportions
 24 indicated based on site measurements or 2D modelling results?
 25 . Third paragraph (page 4-37): "A rational method was used to estimate design
 26 discharges"
 27 o Details on the calculations should be provided.

28 Creek Hydraulics

- 29 . First paragraph (page 4-86): "Box creek and other small creeks located on Gull Lake,
 30 which are not included directly in the analysis, would be almost completely flooded
 31 out"
 32 o These creeks should be shown on a map.

- 33 · Bullets list (page 4-86)
- 34 ○ Backwater distances for the four creeks of interest should be summarized in
- 35 a table. These distances may not be representative of the flooded zones for
- 36 all the creeks.
- 37 · Figure 4.4-23 to 4.4-26 (pages 4-87 and 4-88)
- 38 ○ Acronyms "EE" and "PP" are not defined.

39 Creek Hydraulics – South Access Road Creeks

- 40 · First paragraph (page 4-89): "The exception to this is Gull Rapids Creek, which will
- 41 now outlet into an area downstream of the spillway, which will be dewatered when
- 42 the spillway is not operating."
- 43 ○ According to the report, under existing environment conditions, the
- 44 hydraulic connection between Gull Rapids Creek and the Nelson River is lot
- 45 periodically.
- 46 ○ Gull Rapids Creek should be identified on a map.
- 47 ○ Will the project affect dewatering duration and frequency?
- 48 ○ Can this situation be improved somehow?
- 49 ○ Will the Gull Rapids Creek outlet be modified or moved?

50 **RESPONSE:**

51 Responses to each of the above questions are provided below.

52 *Reference to first paragraph (page 4-17):*

53 Selection of the four creeks of interest was based on the recommendations of the

54 aquatic environment specialists. These were the most prominent and consistent creeks

55 in the reservoir area that had the potential for aquatic habitat to be available all year

56 round. Other creeks in the area were more intermittent and had the potential to freeze

57 completely over the winter season.

58 *Reference to sixth paragraph (page 4-19):*

59 Manning's roughness coefficients for the creek HEC-RAS models are the same for the

60 main river channel, as well as the overland areas. The majority of the creek flow is

61 confined to the main channel and limited field measurements in these creeks prevented

62 separate calibration of the roughness coefficients for the main channel and overland

63 areas. Given the backwater effects from the reservoir and the small discharges observed

64 in these creeks¹⁶, the incorporation of separate Manning's roughness coefficients for
65 overland areas would not change the conclusions of the effects assessment.

66 *Reference to Figure 4.2-3 (page 4-20):*

67 The image used as a background for Figure 4.2-3 is an aerial photograph taken on
68 August 16th, 1999 (Digital Ortho Image with a pixel size of 1 m).

69 *Reference to Flow around Caribou Island (page 4-28):*

70 HEC-RAS has the capability to combine or split flows from multiple reaches using
71 junctions (see HEC-RAS reference manual for more information,
72 [http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-](http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS_4.1_Reference_Manual.pdf)
73 [RAS_4.1_Reference_Manual.pdf](http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS_4.1_Reference_Manual.pdf)). It was in this way that multiple channel reaches
74 (including around Caribou Island and Gull Rapids) were included in the 1D model. The
75 amount of flow to pass through each channel was calibrated from historical hydrometric
76 measurements.

77 *Reference to use of rational method (page 4-37):*

78 **Derivation of the Rational Method**

79 The Rational Method formula used in the south access road creek hydrology study is
80 expressed as:

$$81 \quad Q = 0.00278ciA$$

82 Where;

83 Q = estimated daily peak discharge (in m³/s) for a return period r .

84 c = peak-runoff coefficient for a return period, r .

85 A_i = drainage area (in ha)

86 i = rainfall intensity (mm/hr) of a storm whose duration is equal to the
87 time of concentration of the basin

88 This method assumes that the rainfall intensity is uniform over the entire watershed
89 during the duration of the storm. The Intensity Duration Frequency (IDF) data used for
90 this study was provided by Environment Canada for the Gillam Airport station
91 (<ftp://arcdm20.tor.ec.gc.ca/pub/dist/IDF/>).

¹⁶ Estimated summer mean monthly flows of less than 0.5 m³/s on three creeks, and about 1 m³/s or less in the fourth – see PE SV Figures 4.3-4 to 4.3-7, and Table 4.3-7

92 The length of the main stream (L) is estimated based on Gray's formula. In small
 93 watersheds, the drainage area A , and the length of the main stream L , are highly
 94 correlated **Invalid source specified..**

$$95 \quad L = 0.816 A^{0.568}$$

96 Where;

97 L = Length of main stream (in Km)

98 A = Drainage Area (km²).

99 For natural watersheds, the time of concentration can be estimated empirically. The
 100 Kirpich formula was used for calculating the time of concentration.

$$101 \quad t_c = 0.0195 L^{0.77} S^{-0.385}$$

102 Where;

103 t_c = time of concentration (minutes)

104 L = maximum length of travel of a particle of water, (m), and

105 S = average slope, equal to H/L where H is the difference in elevation between
 106 the most remote point of the basin and the outlet (m/m).

107 Drainage area and basin slope were determined using Canadian Digital Elevation Data
 108 (CDED) and digital topographic maps obtained from the Natural Resources Canada
 109 (NRCAN) National Topographic Database (NTDB).

110 The peak design discharges were estimated for the crossings for a design rainfall event
 111 with a return period of 33 years (3%) in order to meet Manitoba Infrastructure and
 112 Transportation (MIT) requirements.

113 Creek Hydraulics:

114 Please refer to Map 3-33 of the Aquatic Environment Supporting Volume for additional
 115 creek locations and creek habitat. The backwater distances for the four creeks of
 116 interest can be found in the following table (Physical Environment Technical
 117 Memorandum – GN 9.1.14; listed in Appendix 6A of the Response to EIS Guidelines):

Creek	Backwatered Length EE	Backwatered Length PP
Nap Creek	550m	1400m
Portage Creek	650m	950m
Two Goose Creek	325m	370m
Rabbit (Broken Boat) Creek	4800m	6000m

EE = Existing Environment, PP = Post Project

118 **Creek Hydraulics – South Access Road Creeks:**

119 The location of Gull Rapids Creek is shown on Map 3-33 of the Aquatic Environment
120 Supporting Volume.

121 The Project will increase the dewatering duration and frequency of the outlet of Gull
122 Rapids creek. From the Aquatic Environment Supporting Volume, section 3.4.2.3.1:

123 *“Following construction of the generating station, Gull Rapids Creek will flow into the*
124 *portion of the South Channel of Gull Rapids that will be dewatered. After the Project, the*
125 *lower reaches of the creek will no longer experience intermittent flooding. Although Gull*
126 *Rapids Creek itself will experience little effect, habitat within Gull Rapids Creek will*
127 *become isolated from that of the Nelson River.”*

128 Conceptual plans to mitigate effects of the potential loss of access to Gull Rapids Creek,
129 as well as maintain some of the dewatered riverbed as wetted habitat, were developed
130 and evaluated. The concepts considered are described in more detail in Section 1A.3.2.4
131 of the Aquatic Environment Supporting Volume.

132 **REFERENCES:**

133 Gray, D. M. (1961). Interrelationships of Watershed Characteristics. *Journal of*
134 *Geophysical Research.*

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. N/A**

3 **CEC Rd 1 CEC-0058**

4 **QUESTION:**

5 Several hydraulic models (1D, 2D, 3D and physical models) were developed by Manitoba
 6 Hydro to simulate the hydraulic conditions of the Nelson River between Split Lake and
 7 Stephens Lake.

8 Very few details are provided about the calibration of these models. Water level
 9 tolerances and overall water level absolute differences are included for 1D and 2D
 10 models. No specific calibration results are provided in the form of tables or figures to
 11 compare the measured data with the computed data within the study area. In addition,
 12 the scenarios used for the calibration of the various models are not defined. Therefore,
 13 there is not enough information in the report to properly assess the validity and
 14 accuracy of the flow calculations.

15 Appendix 4B briefly describes the numerical and physical models used. However, the
 16 information does not permit an assessment of the models quality. The number and
 17 location of the 1D cross-sections, for example, are not provided, nor a map. Also, details
 18 about the 2D modelling mesh, such as location map, number of nodes and mesh
 19 density, are not included. Several questions about the models are highlighted below.

20 Multiple channels reaches (Caribou Island and Gull Rapids) were modelled in 1D and
 21 large water level differences (0.3 m) were provided as results. This is not surprising due
 22 to the complex hydraulic conditions on those reaches, which cannot be reproduced by a
 23 1D model. These reaches should have been modeled in 2D.

24 The results of 2D simulations of the Construction Design Flood (CDF) during Stage II
 25 Diversion show very high flow velocities (up to 12 m/s) downstream of the spillway.
 26 Mitigation measures should be planned to limit erosion and potential damage to the
 27 downstream structures.

28 **APPENDIX 4B-1 ONE-DIMENSIONAL OPEN WATER MODEL – HEC-RAS (PAGE 4B-1)**

29 • **Cross-sections**

- 30 ○ How many cross-sections are included in the model?
 31 ○ A location map of the numbered cross-sections should be provided.
 32 ○ A transversal profile of each individual cross-section should be provided.

- 33 · First paragraph (page 4B-1): "These one-dimensional models can be used to
 34 effectively simulate open-water hydraulic conditions for a range of flow between
 35 1,000 m³/s to 6,000 m³/s as this is the range of flow the models were calibrated to."
 36 ○ With what real values (not rounded numbers) were the models calibrated?
 37 ○ The results of all calibration scenarios should be presented in order to show
 38 the validity of the model. Computed water levels should be compared with
 39 measured water levels and presented in the form of a table or longitudinal
 40 river profile plot.
 41 ○ The Construction Design Flood (CDF: 6,358 m³/s) is out of range. Does this
 42 mean that the results of the simulations of the CDF are not valid?

43 APPENDIX 4B-2 TWO-DIMENSIONAL OPEN WATER MODEL – MIKE 21 (PAGE 4B-2)

- 44 · Model mesh (unstructured triangular elements)
 45 ○ Details about the modelling mesh should be provided, i.e.:
 46 § Number of elements/nodes;
 47 § Mesh density by zones.
 48 ○ Maps of the 2D mesh: a general view and closer views next to Keeyask GS
 49 structures should be provided.
 50 ○ Was the model designed to represent the flow conditions only upstream of
 51 the future structures (intake and spillway)?
 52 ○ A figure similar to figure 4.4-9 should be presented for the velocity
 53 distribution in the north channel (future conditions).
 54 · Second paragraph (page 4B-2): "simulated water levels matched rating curves based
 55 on measured water levels within a tolerance of approximately 0.2 m"
 56 ○ The results of all the calibration scenarios should be presented in order to
 57 show the validity of the model. The computed water levels should be
 58 compared with measured water levels and presented in the form of a table,
 59 longitudinal river profile plot or 2D layout map.
 60 · Second paragraph (page 4B-2): "For verification, simulated velocities also compared
 61 well with measured velocity profiles collected at several specific locations along the
 62 reach."
 63 ○ More details should be provided, i.e. locations of the verification spots, and
 64 comparisons between measured and computed velocities.

65 APPENDIX 4B-3 H01E BACKWATER MODEL (PAGE 4B-2)

- 66 · The specific need to use the H01E model is not fully explained.
 67 · Was the H01E model used simply to validate the HEC-RAS model? HEC-RAS could
 68 probably have been used to perform all H01E simulations. In this context, the
 69 development of a second 1D model appears redundant.

- 70 · What was the water level tolerance for the H01E model? Was it the same as in HEC-
 71 RAS?
 72 · Were the project cofferdams and diversion structures also simulated with HEC-RAS?
 73 Why was the H01E model preferred for this task?

74 APPENDIX 4B-4 FLOW-3D MODEL (PAGE 4B-2)

- 75 · As stated, the FLOW-3D model was used to provide multi-dimensional estimates of
 76 flow velocity patterns. However, the extent of the 3D model is not given and the
 77 report does not include the model output (no results, no map, and no figures).
 78 · The FLOW-3D model probably covers the Gull Rapids area and it was therefore used
 79 to design hydraulic structures, such as the spillway. However, this information is not
 80 stated clearly in the report.
 81 · What was the water level tolerance in the FLOW-3D model?
 82 · Was the model compared with the MIKE 21 model?

83 APPENDIX 4B-7 PHYSICAL MODELS (PAGE 4B4)

- 84 · The report does not include model results.
 85 · Where were the major differences between the physical and numerical models
 86 located? What caused these differences?
 87 · What was the water level tolerance in the physical models?
 88 · Some river ice processes could have been modelled using the physical model. Was
 89 ice included in any way in the physical model?

90 APPENDIX 4B-8 ONE-DIMENSIONAL WINTER MODEL – ICEDYN

- 91 · As mentioned, the ICEDYN model is a numerical model that is still under
 92 development. The model does not reproduce all ice processes, such as ice jams, ice
 93 breakups, ice runs, and ice cover cracking.
 94 · Was the calibration of the ICEDYN model only based on water level?
 95 · Was ice thickness used a calibration parameter? How do measured and modelled
 96 ice thicknesses compare?
 97 · Was the presence/absence of ice a calibration parameter? How does the
 98 presence/absence of measured and modelled ice compare throughout the
 99 calibration of winter seasons?

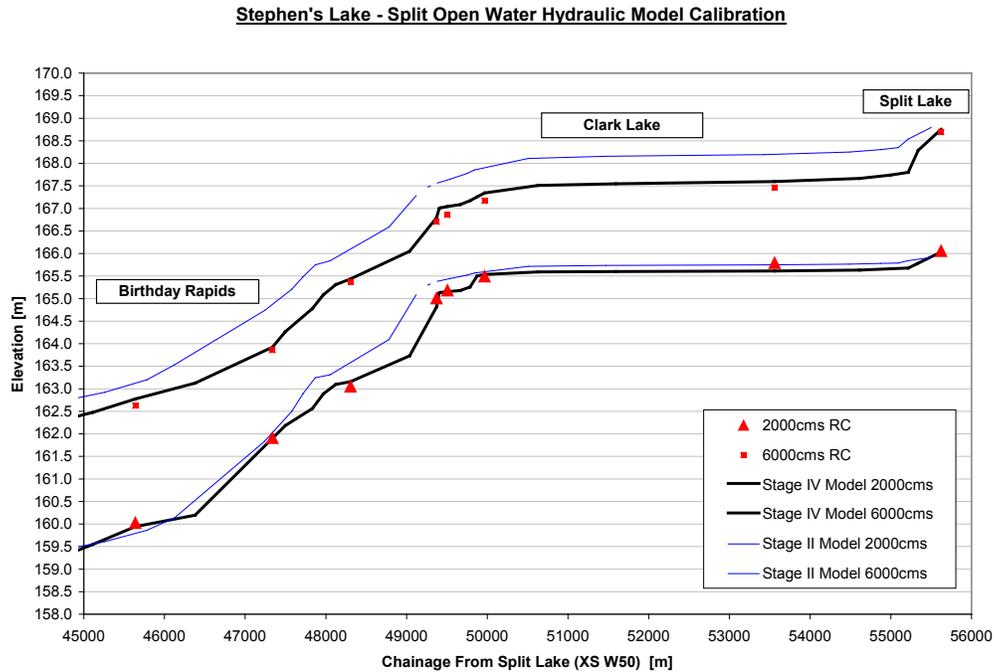
100 **RESPONSE:**

101 A response to each of the above questions is provided below.

102 *APPENDIX 4B-1 ONE-DIMENSIONAL OPEN WATER MODEL – HEC-RAS (PAGE 4B-1)*

103 Approximately 650 cross sections were extracted from a digital terrain model (DTM)
104 that was developed for the Keeyask engineering and environmental studies using
105 numerous topographic and bathymetric data sources (Map 4.2-2 from the Physical
106 Environment Supporting Volume). Additional details regarding the development of the
107 DTM can be found in the Physical Environment Technical Memorandum GN 9.1.5 (listed
108 in Response to EIS Guidelines, Appendix 6A). In addition, about 100 cross sections were
109 added by interpolation during the model calibration process in the Gull Rapids area
110 where the flow was spilt to the various channels. Additional details regarding the one-
111 dimensional HEC-RAS model can be found in physical environment Technical
112 Memorandums GN 9.1.3 and GN 9.1.13 (listed in Appendix 6A, Response to EIS
113 Guidelines).

114 Periodic water levels have been collected since 1978 at 35 locations along the study
115 reach. The frequency of data collection varies both between the different locations and
116 through the years and targeted a range of flow conditions. Rating curves were
117 developed based on the observed flow and water level data. The HEC-RAS model was
118 then calibrated to these rating curves for a range of flows between 1000 m³/s to 6000
119 m³/s. A sample of this water level calibration for the reach between Birthday Rapids and
120 the Split Lake is shown below in Figure 1. The rating curve points are shown in red and
121 the calibrated model results are shown with the solid black line. The thin blue line shows
122 the previously modeled water surface profile prior to final calibration of the model used
123 in the environmental assessment.



124
125 **Figure 1: Sample water surface profile calibration**

126 Where calibration data do not exist, it is acceptable to use engineering judgment to
127 extrapolate a rating curve beyond the data available. This is often done for scenarios
128 that occur relatively infrequently and measured data do not exist, such as the scenario
129 of a construction design flood. This is common practice and does not mean the results
130 of the simulation are invalid.

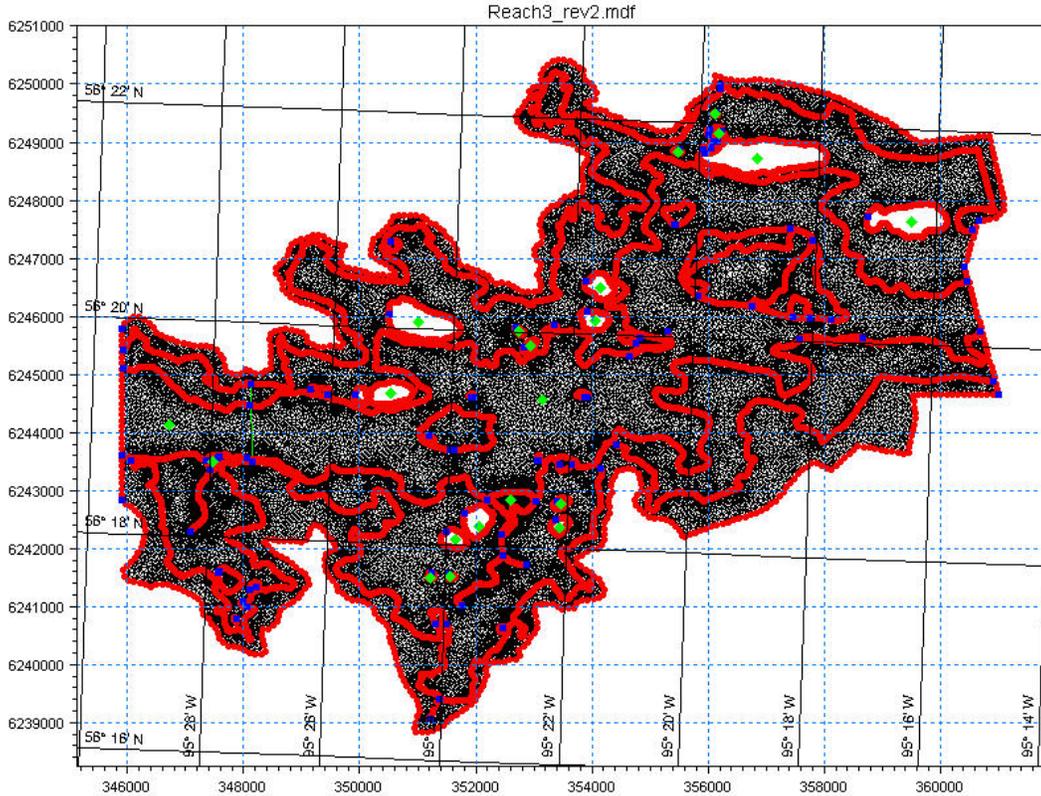
131 *APPENDIX 4B-2 TWO-DIMENSIONAL OPEN WATER MODEL – MIKE 21 (PAGE 4B-2)*

132 Additional information about the two-dimensional MIKE21 hydraulic model
133 development and calibration can be found in the Physical Environment Technical
134 Memorandum GN 9.1.4.

135 In summary, a variety of mesh sizes were applied in the model as detailed below:

- 136 • Lakes (Split lake, Reservoir) – 100 m mesh resolution
- 137 • Riverine area – 90 m mesh resolution
- 138 • High velocity areas – 50 to 60 m mesh resolution
- 139 • Control Sections (rapids) – 20 to 30 m mesh resolution
- 140 • Creek/Tributary areas – 10 m mesh resolution

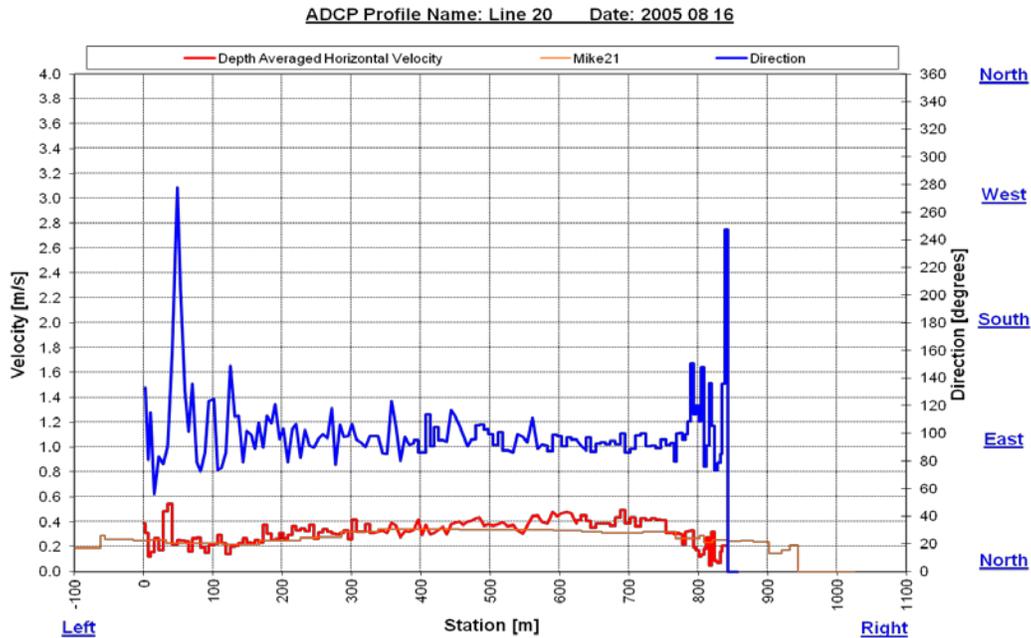
141 A sample of the mesh resolution in the vicinity of Gull Lake (existing environment) is
142 shown below in Figure 2:



143
 144 **Figure 2: Sample Mike21 mesh density in the vicinity of Gull Lake (UTM northing and easting**
 145 **shown on vertical and horizontal axes respectively)**

146 The two-dimensional MIKE 21 model was also developed for the reach downstream of
 147 the Keyask GS to the inlet of Stephens Lake. Water velocity distributions for the
 148 existing environment are found in Maps 4.3-5 and 4.3-6 of the Physical Environment
 149 Supporting Volume. Water Velocity distributions for the post-project environment are
 150 found in Maps 4.4-8 and 4.4-9 and the water velocity changes are shown in Map 4.4.-10
 151 of the Physical Environment Supporting Volume.

152 The water levels from the two-dimensional model were calibrated to the same open
 153 water rating curves mentioned above and similar calibration tolerances were obtained
 154 for the 5th, 50th, and 95th percentile flows. A sample water velocity profile comparison
 155 between measured (Acoustic Doppler Current Profiler, ADCP) and modeled data is
 156 shown below in Figure 3:



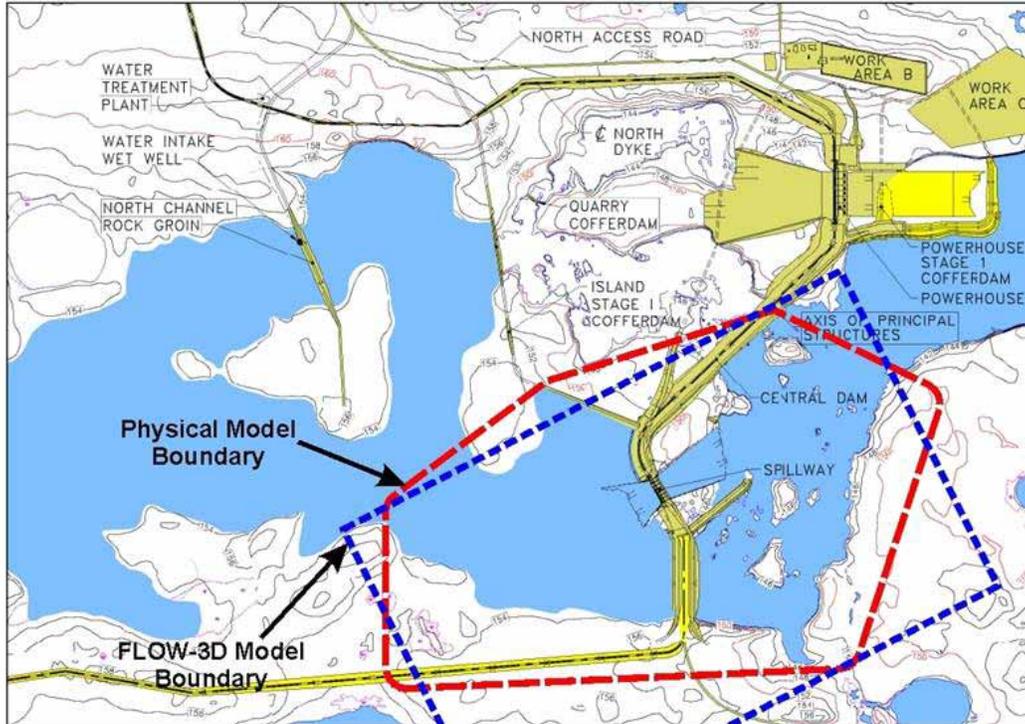
157
158 **Figure 3: Sample water velocity profile comparison**

159 *APPENDIX 4B-3 H01E BACKWATER MODEL (PAGE 4B-2)*

160 The H01E model was the original one-dimensional model developed by Acres Manitoba
161 Limited and was used for the early engineering studies related to the Keeyask GS. This
162 included the initial studies related to the general arrangement and river diversion
163 schemes, which is why the cofferdams and diversion structures were modeled.
164 Subsequent to the development of the H01E model, HEC-RAS has become the standard
165 one-dimensional backwater model and was developed to refine and complete the Stage
166 IV engineering and environmental studies. HEC-RAS and H01E are models that can
167 perform the same tasks and were calibrated to very similar tolerances. HEC-RAS also has
168 the significant advantage of linking directly with HEC-GeoRAS to produce shoreline
169 polygons quickly and efficiently. All H01E model scenarios have since been superseded
170 by an equivalent HEC-RAS model run.

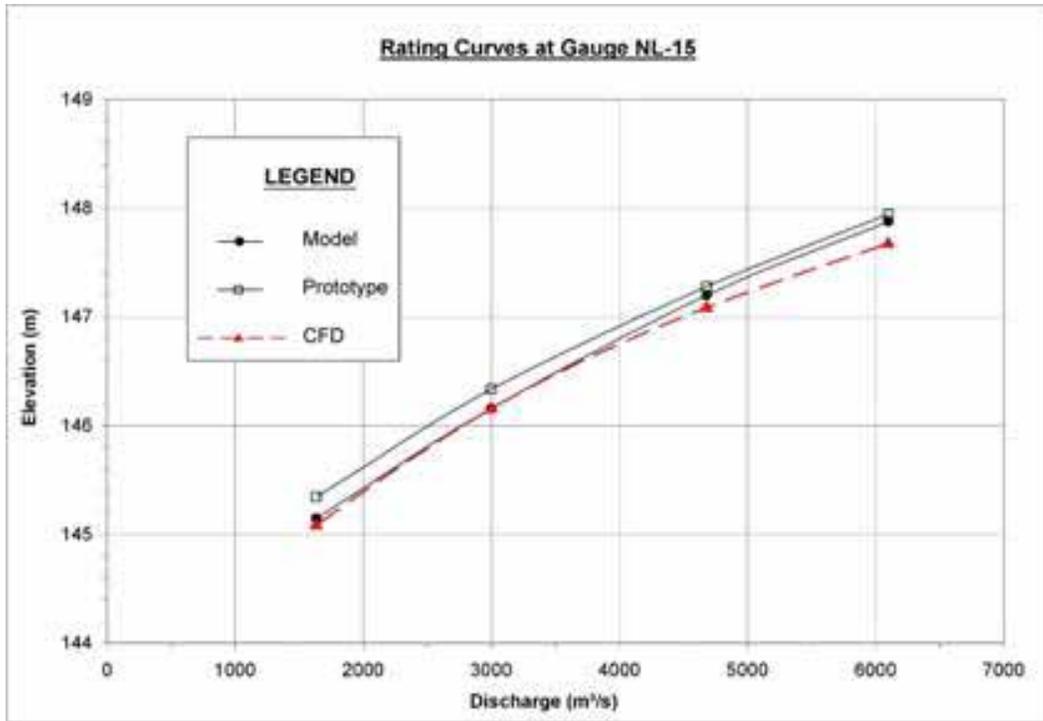
171 *APPENDIX 4B-4 FLOW-3D MODEL (PAGE 4B-2)*

172 Three dimensional FLOW-3D models were developed for the purposes of engineering
173 design, however the results were used in the environmental assessment where it was
174 desirable to do so. The FLOW-3D models simulate the complex flow patterns in the
175 vicinity of the spillway stage I cofferdam, during river closure, and in the vicinity of the
176 hydraulic structures such as the powerhouse and spillway structures. The extents of the
177 FLOW-3D model in the vicinity of the spillway stage I cofferdam and the comprehensive
178 physical model is shown below in Figure 4.



179
 180 Figure 4: Extents of the comprehensive physical model and Flow-3D model near the stage I
 181 spillway cofferdam

182 Water level tolerances in the FLOW-3D models range from 0.10 to 0.20 m. A sample
 183 comparison between the rating curve (prototype), physical model (model), and
 184 numerical model (CFD) are shown below in Figure 5:



185
186 Figure 5: Sample calibration comparison the rating curve (prototype), physical model (model),
187 and numerical model (CFD)

188 FLOW-3D results were not directly compared with MIKE21 as both models were
189 calibrated to the rating curves whenever possible and the MIKE21 model was developed
190 after the FLOW-3D model. The two models are also generally used for different
191 purposes. MIKE21 is a depth-averaged model used to assess water velocities over a
192 relatively large domain whereas FLOW-3D is employed at very specific locations to
193 simulate more complex flow fields where they exist.

194 *APPENDIX 4B-7 PHYSICAL MODELS (PAGE 4B-4)*

195 The physical models were primarily used for the Stage IV engineering design studies
196 related to the hydraulic structures and river diversion schemes. The physical models
197 were not employed directly for any of the environmental studies or effects assessment.
198 The results from the physical models helped to validate and verify the numerical models
199 that were developed (see Figure 5 above) where measured data were less
200 comprehensive and hydraulic conditions were more complex. The results of the
201 validated numerical models were then used in the environmental assessment studies.

202 Substantial differences between the numerical and physical models were not found but
203 the largest differences that did exist were in the areas where bathymetric data was not
204 be collected in the south channel of Gull Rapids due to safety and access concerns.
205 Water level tolerances in the physical model were about 0.1 to 0.2 m at most of the

206 gauge locations and at some locations under lower flow, the tolerance was as much as
207 0.3 m.

208 The simulation of ice processes was not included in the physical model testing
209 completed for the Keeyask project.

210 *APPENDIX 4B-8 ONE-DIMENSIONAL WINTER MODEL – ICEDYN*

211 The calibration of the ICEDYN model was based on measured water levels during the
212 winter season. Additional details on the setup and calibration of the ICEDYN model can
213 be found in the Physical Environment Technical Memorandums GN 9.1.6 and GN 9.1.7.

214 Ice thickness was not used as a calibration factor in the ICEDYN model.

215 The presence and absence of ice obtained from the hydrometric monitoring reports was
216 used to evaluate the results of the ICEDYN simulations (where applicable) but were not
217 used as a direct calibration parameter. This was due to the limitations of the numerical
218 model itself and the ice processes occurring in the reach. The advancement of the ice
219 front was compared to the observed data and helped to guide model development but
220 the primary calibration parameter was the water level measurements.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0059**

4 **QUESTION:**

5 With respect to the report, Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012,
 7 there were a number of questions about: data and information sources; assumptions;
 8 and, description of numerical models and methods.

9 Data and Information Sources

- 10 • First bullet (page 4-9): "Periodic water levels have been collected [...] at 35
 11 locations"
- 12 ○ The 35 locations should be shown on a map.
- 13 • Second bullet (page 4-9): "Discharge measurements ..."
- 14 ○ How were the measurements recorded in winter?
- 15 ○ Was the discharge data corrected to take ice effects into account?
- 16 • Third bullet (page 4-9): "Automatic water level gauge data collected at five locations
 17 ..."
- 18 ○ These locations should be shown on a map.
- 19 • Fourth bullet (page 4-9): "Discharge and water level data from the Kettle GS for the
 20 period 1977 to 2006"
- 21 ○ Is this information the same as that of Environment Canada's station
 22 05UF006 (Nelson River at Kettle GS)?
- 23 ○ This information is crucial for surface water analysis. Thus, more detail
 24 should be provided about calculation methods and data reliability regarding
 25 all flow ranges.
- 26 ○ The period after 2006 should be included in the analysis.
- 27 • Eighth bullet (page 4-9): "Water velocity profiles collected at 36 locations in 2003."
- 28 ○ How was this information used in the hydraulic analysis?
- 29 ○ Was it used for model calibration? If so, how do data and models compare?
- 30 ○ How were the locations selected?
- 31 ○ The 36 locations should be identified on a map.
- 32 • Eleventh bullet (page 4-10): "Hydraulic reports and engineering design memoranda
 33 [...] included hydraulics relationships such as stage-discharge and stage-storage
 34 curves."
- 35 ○ Complete references regarding these reports should be provided. – This
 36 information is required to calculate the projects inflows.

- 37 · Last sentence (page 4-11): "...local knowledge was obtained through presentation
 38 and discussion of initial results."
 39 ○ Which local communities were involved and where are they located?
 40 ○ What knowledge was learned from them?
 41 ○ What were the "issues of concerns" related to river flow and river ice?

42 Assumptions

- 43 · Second bullet (page 4-12): "The magnitude and variability of the monthly Project
 44 inflow record is assumed to be representative of future monthly Project inflows."
 45 ○ This assumption should be supported by an analysis of years 2006 to 2012.
 46 · Fourth bullet (page 4-12): "The current river morphology is assumed to be
 47 representative of the river in the future for all hydraulic studies."
 48 · This assumption should be supported by sedimentology observations.
 49 · Which are the areas where sedimentation is likely to modify the river's morphology
 50 and the hydraulic conditions?

51 Description of Numerical Models and Methods

- 52 · Third paragraph (page 4-13): "The accuracy of the numerical models [...] is best
 53 quantified by the level of calibration attained for each of the models"
 54 ○ Which calibration scenarios have been used? Were they steady state?
 55 ○ Appendix 4B provides some details about calibration. See comments on
 56 pages 11 and 12 of this document.
 57 · Third paragraph (page 4-13): "In some locations, such as Gull Rapids area, these
 58 differences can be 0.3 m due to the complex hydraulic conditions in this reach"
 59 ○ Is this the calibration result of the 1D HEC-RAS model?
 60 ○ Does the model overestimate or underestimate the water levels?
 61 ○ A 2D model is best suited to represent the flow conditions in multiple
 62 channel areas. What water level differences were obtained in these areas
 63 with the MIKE 21 model?
 64 · Fourth paragraph (page 4-13): "Some differences of up to 2 m exist at certain
 65 locations [...] for specific points in time."
 66 · Does the model overestimate or underestimate the water levels?
 67 · How do these errors affect the overall validity of the model?
 68 · Specific conditions leading to differences greater than 1 m should be analysed and
 69 discussed.

70 **RESPONSE:**

71 A response to each of the above questions is provided below.

72 Data and Information Sources

73 Reference to first bullet (page 4-9)

74 Figures 1-4 below show the water level monitoring locations (blue dots on the maps).

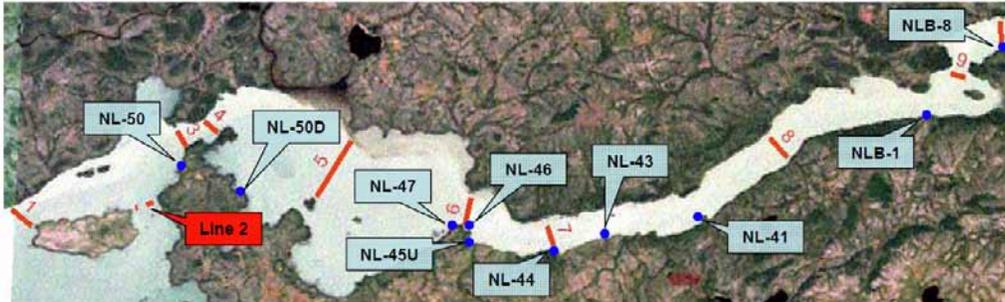


Figure 1.1
Reach 1 Site Locations

75

76 Figure 1 – Water level and velocity monitoring locations (Split Lake outlet to Birthday Rapids)

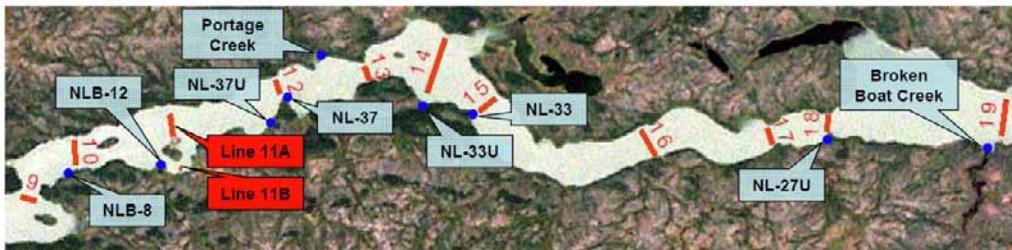


Figure 1.2
Reach 2 Site Locations

77

78 Figure 2 – Water level and velocity monitoring locations (Birthday Rapids to upstream of Gull
79 Lake)

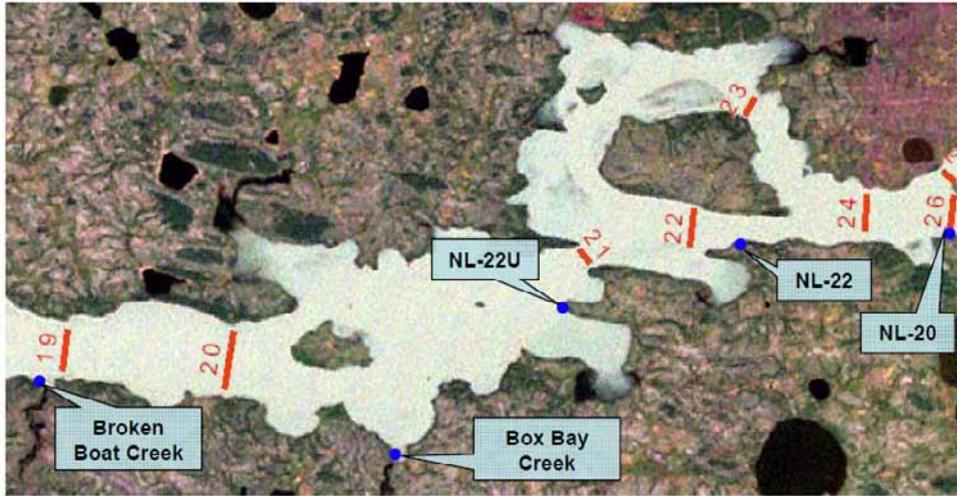


Figure 1.3

Reach 3 Site Locations

80

81

Figure 3 – Water level and velocity monitoring locations (Gull Lake area)

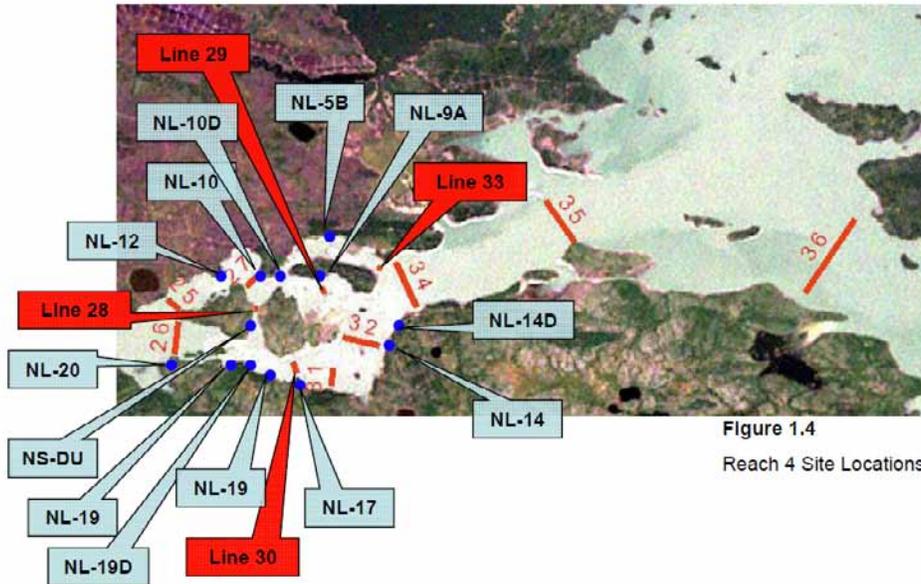


Figure 1.4

Reach 4 Site Locations

82

83

Figure 4 – Water level and velocity monitoring locations (Gull Rapids area)

84

Reference to second bullet (page 4-9)

85

Discharge measurements were not recorded during the winter period and therefore collected discharge data did not need to be corrected for ice effects. The inflow to the Keyask site was calculated during all seasons by routing the Kettle GS outflow with consideration of the storage on Stephens Lake and the local inflow between Split Lake

88

89 and the Kettle GS (see Physical Environment Technical Memorandum GN 9.1.1, listed in
90 Appendix 6A of the Response to EIS Guidelines).

91 *Reference to third bullet (page 4-9)*

92 See Figures 1-4 above for velocity monitoring locations (red lines on the maps).

93 *Reference to fourth bullet (page 4-9)*

94 Manitoba Hydro provides water level and discharge information to Water Survey of
95 Canada under the Canada-Manitoba Hydrometric Agreement, which is part of a National
96 Hydrometric Program. "National standards and guidelines are developed by all the
97 partners in this program. All data must be collected in such a way as to conform to
98 national standards so that data from across the country are comparable, compatible,
99 and of sufficient accuracy." The following link provides access to the Water Survey of
100 Canada site where data may be obtained free of charge:

101 <http://www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=5C5A992B-1>

102 The consideration of hydrologic data after 2006 is discussed in the response to CEC Rd 1
103 CEC-0060.

104 *Reference to eighth bullet (page 4-9)*

105 The water velocity profile data were used in the calibration of the MIKE21 models (for
106 additional references on the 2D models and calibration see the response to CEC Rd 1
107 CEC-0058, Physical Environment Support Volume – Appendix 4B, and Physical
108 Environment Technical Memorandum GN 9.1.4).

109 The locations of the water velocity profiles were chosen in order to best represent the
110 hydraulic characteristics of the study reach. Some of the water velocity profiles were
111 located just upstream and downstream of a control section in the river, others were
112 identified by the environmental team to facilitate aquatic environment studies, and
113 others were chosen due to accessibility and safety considerations.

114 *Reference to eleventh bullet (page 4-10)*

115 All information regarding the calculation of the project inflows to the Keeyask site, can
116 be found in the Physical Environment Supporting Volume (PE SV), Sections 4.2.5.1 and
117 4.2.5.2, and a comparison of existing environment and post-project flow files is provided
118 in Section 4.4.2.1.1 of the PE SV.

119 *Reference to last sentence (page 4-11)*

120 The locations of the four partner Cree Nations (i.e., the Keeyask Cree Nations (KCNs))
121 are shown on Map 1.1-1 of the PE SV.

122 Local knowledge of the Keeyask region and issues of concern related to various aspects
123 of the Keeyask project (including river flow and ice conditions) can be found in the
124 Public Involvement Supporting Volume (to the extent such information was raised).
125 Also, each of the Keeyask Cree Nations prepared their own Environmental Evaluation
126 Reports, which are an integral part of the Keeyask EIS. KCN concerns regarding Project
127 effects on the physical environment are summarized in the Response to EIS Guidelines
128 (Sec. 6.3.2).

129 **Assumptions**

130 *Reference to second bullet (page 4-12)*

131 The consideration of hydrologic data after 2006 and discussion around the assumption
132 identified on page 4-12 can be found in the response to CEC Rd 1 CEC-0060.

133 *Reference to fourth bullet (page 4-12)*

134 As stated in the Physical Environment Supporting Volume (Section 7B.2.1), channel
135 morphology of the Nelson River in the study area has been stable for at least the last
136 two decades. The substantial presence of bedrock helps the river maintain its near
137 equilibrium condition. As discussed in the Physical Environment Supporting Volume
138 Section 6, the shorelines have also remained generally stable. Large changes in the
139 channel geometry are not expected in the future, as discussed in the consideration of
140 future shoreline conditions without the Project in the shoreline erosion section of the PE
141 SV (Sec. 6.3.1.4).

142 Please see the response to interrogatory CEC-0068c, which provides further discussion
143 around the question of river morphology.

144 **Description of Numerical Models and Methods**

145 *Reference to third paragraph (page 4-13)*

146 The calibration scenarios that were run for the models were steady state. For additional
147 information and references for the calibration of the numerical models please see the
148 response to interrogatory CEC-0058.

149 *Reference to third paragraph (page 4-13)*

150 Yes, it is the calibration results of the 1D HEC-RAS model.

151 Depending on the flow condition being simulated and the specific location within the
152 study reach, the water levels may be either overestimated or underestimated by the
153 model but typically within 0.1 to 0.2 m of the open water measured data / rating curves.
154 For additional information and references for the calibration of the numerical models
155 please see the response to CEC Rd 1 CEC-0058.

156 It is acknowledged that a 2D model is better suited to represent flow conditions in
157 multiple channel areas. During the initial stages of the water regime studies, it was not
158 feasible to run a 2D model for the entire study area so a 1D model (HEC-RAS) was used.
159 Measured discharge data at the flow splits allowed the HEC-RAS model to be adequately
160 calibrated for this more complex flow scenario (see response to CEC Rd 1 CEC-0065).
161 This approach was also deemed acceptable because a direct comparison of the water
162 levels showed that the 1D and 2D models produced very similar results (see response to
163 interrogatory CEC-0058 and Appendix 4B of the Physical Environment Supporting
164 Volume). The 2D model was necessary to obtain the depth averaged velocity
165 distributions where required.

166 *Reference to fourth paragraph (page 4-13)*

167 Depending on the flow conditions, the meteorological parameters over the winter, the
168 time step within the simulation, and the specific location within the study reach, the
169 water levels may be either overestimated or underestimated by the model.

170 As stated on page 4-13 of the Physical Environment Supporting Volume (with additional
171 details found in the Physical Environment Technical Memorandum GN 9.1.6), these 2 m
172 deviations are localized and typically occurred downstream of Birthday Rapids or at the
173 Clark Lake outlet for specific points in time. This can be partially attributed to the timing
174 of the ice bridge that forms most years on Gull Lake and to anchor ice formation at the
175 outlet of Clark Lake. Overall, the ice models were typically calibrated to within 0.5 m to
176 0.75 m of the measured data which is very good considering the complex hydraulic and
177 ice processes occurring in the study reach. These localized differences would not affect
178 the overall performance or validity of the model and the calibration tolerances are
179 appropriate given the dynamic hydraulic and ice conditions in the reach that can cause
180 the water levels to vary over a considerable range over the winter.

181 Additional details on the river ice processes and the numerical river ice model used in
182 the Keeyask study area can be found in the Physical Environment Technical
183 Memorandum GN 9.1.6.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0060**

4 **QUESTION:**

5 The report, Keeyask Generation Project - Physical Environment Supporting Volume -
 6 Surface Water and Ice Regimes, June 2012 was published in 2012. The historical period
 7 used to define the existing environment (including hydrology) ends in 2006. Therefore,
 8 five years (from 2007 to 2011) are not included in the analysis. This is surprising
 9 especially in the context of climate change. The report states, for example, that record
 10 flood and drought occurred within the last ten years. Therefore, flow data for the year
 11 2006 and beyond should be included in the analysis, as well as how this data would
 12 modify the project inflows.

- 13 · Second paragraph (page 4-5): "The existing environment has been defined as the
 14 period of 1977 to 2006"
 - 15 ○ Why does the analysis end in 2006?
 - 16 ○ The report was produced in 2012. Therefore, five more years (2007 to 2011)
 17 should be included in the analysis.
 - 18 ○ How do the "post-2006" events compare with the "pre-2006" events?
 - 19 ○ The report should show how the inclusion of post-2006 data modifies the
 20 project inflows.
- 21 · Second paragraph (page-4-21): "The flood of record (post-CRD) occurred in 2005 [...]
 22 while the drought of record was found to be 2 years earlier in 2003"
 - 23 ○ How would flow data from 2006 and beyond (period not included in the
 24 analysis under review) compare with those flow records?
 - 25 ○ According to these values, record flood and drought were broken during the
 26 last ten years. This should be commented versus climate changes and
 27 observed hydrologic trends. Is the second assumption (page 4-12) still valid
 28 in this context?
- 29 · Figure 4.3-1 (page 4-22)
 - 30 ○ Do the values shown correspond to average annual flow?

31 **RESPONSE:**

32 Although the EIS report was finalized in 2012, information and analysis pertaining to the
 33 water regime was required to be completed years in advance as this information was a
 34 primary input to several other components of the EIS and had to be completed before
 35 the analysis in other sections could commence. Because of this dependence, water
 36 regime data from the more recent flow years could not be included in the analysis.

37 The water regime dataset considered in the physical environment effects assessment
38 contains both the flood of record as well as the drought of record. This would not
39 change with the inclusion of additional years of recent data. The effects assessment
40 considered the range of flows expected to be found at the Keeyask Project (5th
41 percentile to 95th percentile) and since the range of flows would not change appreciably
42 with the inclusion of additional data, it would not be expected to change the results of
43 the effects assessment.

44 A sensitivity analysis of the EIS effects assessment to climate change is discussed in the
45 Physical Environment Supporting Volume (Section 11) which considered a +/- 10%
46 change across all flow percentiles in the Keeyask inflows. The results obtained in this
47 analysis would similarly apply to changes in the Keeyask inflows resulting from the
48 inclusion of additional data.

49 While record flood and low flow events were exceeded in the last 10 years, with only 5
50 additional years of data, it cannot be commented with certainty as to whether or not
51 these recent events are due to climate change or natural variability. Statistical tests on
52 change in extreme events due to climatic non-stationarity requires a sufficient length of
53 record to have a reasonable level of confidence in the results. In the context of our
54 water regime assessment, we have not found any reason to suggest that the assumption
55 referenced on page 4-12 is no longer valid if one was to include additional years of data.

56 The values shown on Figure 4.3.1 correspond to daily average streamflow.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0061**

4 **QUESTION:**

5 With respect to the report Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following
 7 comments on residual effects.

- 8 • Ice Regime (page 4-108)
- 9 ○ The following residual effect should be added:
- 10 § The breakup of an ice jam at Birthday Rapids may result in the
 11 release of a surge. The magnitude, extent, duration and frequency
 12 of this phenomenon need to be defined based on additional
 13 simulations.
- 14 • Effect during operation - Downstream of Project Site (page 4-111)
- 15 ○ The following residual effect should be added:
- 16 § The duration and frequency of the dewatering of Gull Rapids Outlet
 17 will be increased.

18 **RESPONSE:**

19 The breakup of an ice jam (or hanging ice dam) at Birthday Rapids is an ice process that
 20 presently occurs in the existing environment. The surge released (if any) during this
 21 breakup process would be small in magnitude relative to typical Nelson River flows. In
 22 the post-project environment, water levels will be increased in the vicinity of Birthday
 23 Rapids approximately 1-2 m which will reduce the water velocities in the area. This will
 24 reduce the magnitude of the hanging ice dam that could potentially form at Birthday
 25 Rapids, which would also reduce the magnitude of any surge that might subsequently
 26 be released. The reduced water velocities in the area and downstream would also
 27 reduce the frequency of a surge developing in this reach. The response to CEC Rd 1 CEC-
 28 0062 provides some additional discussion regarding a potential surge event.

29 Dewatering of the Gull Rapids Creek outlet is captured in the Aquatic Environment
 30 Supporting Volume (Table 3-11, Residual effects on aquatic habitat: operation period;
 31 page 3-58).

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0062**

4 **QUESTION:**

5 The report states that river ice processes on the lower Nelson River have been studied
6 for many years by Manitoba Hydro. However, references to support this statement are
7 not provided. In order, to anticipate ice-related issues at Keeyask GS, it would be
8 interesting to detail the lessons learned over the years by Manitoba Hydro at neighbour
9 hydropower sites.

10 Local knowledge and issues of concern regarding river ice was obtained via
11 presentations and discussions with local communities. However, the report does include
12 details on this knowledge and the issues of concern.

13 The numerical model used to simulate ice formation processes is ICEDYN, which is still
14 under development and cannot simulate the processes involved during spring breakup.
15 Very little detail is provided about the model and its calibration. The model was
16 calibrated based on measured water level and very large differences (up to 2 m) were
17 obtained at specific points along the reach under study. The validity of the model
18 regarding other parameters (ice thickness or the presence/absence of ice) does not
19 seem to have been assessed.

20 It is expected that the average thickness of the reservoir's ice cover will be between
21 approximately 0.8 to 1.2 m by the end of winter. This range of ice thickness is low,
22 especially when compared with the operating range of the reservoir (1 m). This situation
23 is likely to promote ice ridging.

24 Results indicate that "velocities will also increase by up to 0.5 m/s or more over existing
25 environment values in the north channel of Gull Rapids as this is where the intake to the
26 powerhouse will be located". In these conditions, the ice cover is likely to be unstable
27 near the intake. The risks associated with this situation require further analysis.

28 As mentioned before, ICEDYN cannot simulate conditions during spring breakup.
29 Therefore, the impacts related to the breakup of an ice jam located at Birthday Rapids
30 have not been assessed. This should be added to the list of residual effects and analysed
31 via an alternative method: either a physical model or a numerical model such as
32 CRISSP2D.

33

34 **Specific Comment – References and Documentation**

35 Last paragraph (page 4-5): "ice formation on the Lower Nelson River [...] has been
36 studied for many years by Manitoba Hydro."

- 37 ○ Are there references to support this statement?
- 38 ○ Based on the lessons learned over the years by Manitoba Hydro (MH), what
39 are the main issues related to river ice and hydropower generation on the
40 Lower Nelson River?
- 41 ○ It would be interesting to document historical events of ice problems at MH
42 dams on the Nelson River, such as ice jams that forced flow reduction and
43 ice damages to civil and mechanical structures, e.g. turbines.

44 **Specific Comment – Satellite Imagery**

45 With respect to ice conditions, third paragraph, second bullet (page 4-8): "satellite
46 imagery"

- 47 ○ Typical images would have been interesting in appendix.
- 48 ○ Which products were used: name, type of image, resolution?

49 **Specific Comment – Reservoir Reach**

50 · First paragraph (page 4-91): "The reservoir ice cover will be very similar to the lake
51 ice cover that presently forms on Stephens Lake. It is expected that the average
52 thickness of the reservoir ice cover will be between approximately 0.8 to 1.2 m by
53 the end of winter."

- 54 ○ This range of ice thickness is low, especially when compared with the
55 operating range of the reservoir (1 m). This situation is likely to promote ice
56 ridging. Please explain.

57 · Last paragraph (page 4-95): "ICEDYN model cannot simulate the processes involved
58 during the spring breakup period"

- 59 ○ How were these processes taken into account in the analysis?
- 60 ○ The breakup of an ice jam in Birthday Rapids may create a surge and an ice
61 run.
- 62 ○ The propagation of an ice breakup surge should be simulated.

63 **RESPONSE:**

64 Responses to the specific comments and related questions are provided below.

65 **Specific Comment – References and Documentation**

66 The Physical Environment Technical Memorandum GN 9.1.6 - Existing Environment Ice
 67 Processes, provides additional references and information regarding the ice processes in
 68 the vicinity of the Keeyask GS. Specifically, it describes that:

69 "To understand and document ice formation processes on the Nelson River, a
 70 comprehensive hydrometric monitoring program was established, with data
 71 collected during the winter months from November through to April. The winter
 72 program was initiated in the mid 1970's. Data collected each winter as part of
 73 the hydrometric monitoring program includes:

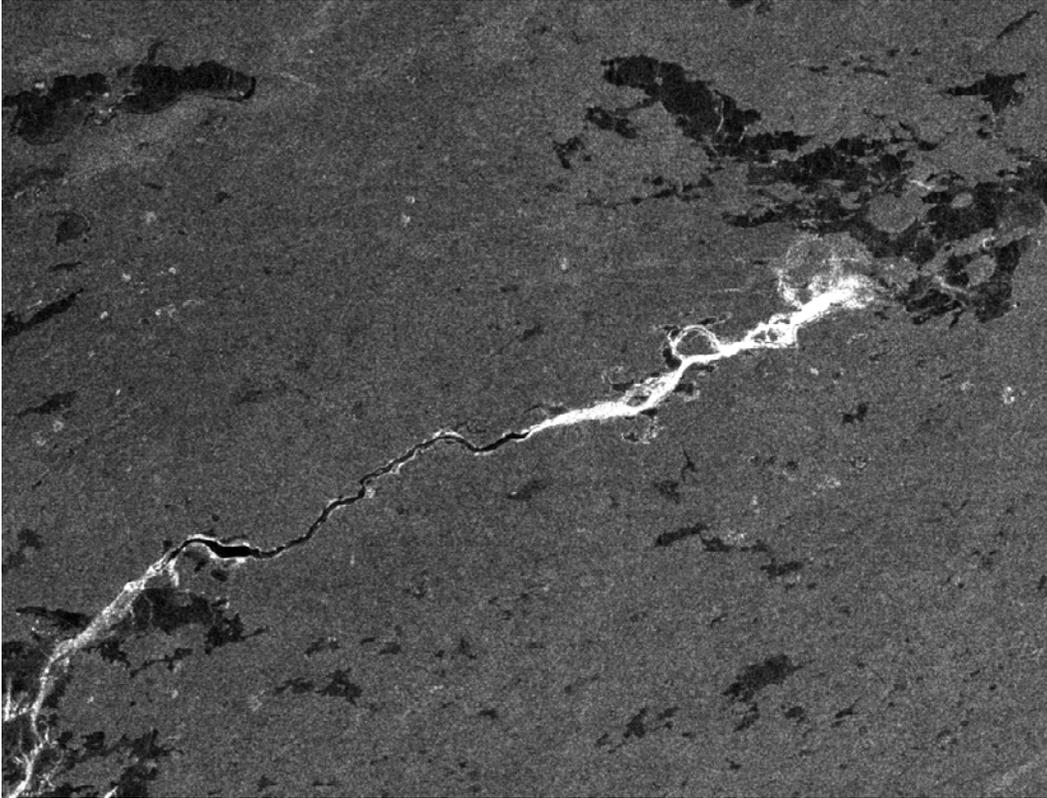
- 74 . photographic/video records of ice cover development and advancement.
 75 These videos and photos are taken periodically during the winter during
 76 helicopter reconnaissance flights,
- 77 . satellite imagery,
- 78 . periodic observations of ice cover progression and anchor ice formation
 79 along the reach,
- 80 . periodic survey measurements of water surface profiles,
- 81 . ice thickness measurements"

82 Possibly the most important ice issue related to operating a generating station on the
 83 Nelson River is the ability to create a stable ice cover upstream of the generating
 84 station. A stable ice cover minimizes many ice related issues and virtually eliminates the
 85 potential for ice to be entrained into the turbines which has been shown in the past to
 86 have the potential to cause a large impact on hydropower operations.

87 When considering historical events, there are two main ice-related phenomena that
 88 have shown the potential to have a large impact on operations within Manitoba Hydro's
 89 system. The first is related to creating a stable ice cover upstream of Jenpeg GS (which
 90 is partially mitigated by the presence of an ice boom and an ice stabilization program),
 91 and the second is anchor ice formation on Sundance Rapids just downstream of
 92 Limestone GS. Both of these issues are related to specific geographic features and
 93 channel characteristics found in the vicinity of these generating stations. As these
 94 geographic features are not present with the Keeyask Project and the approach and
 95 intake channels at Keeyask will be designed to facilitate the formation of a stable ice
 96 cover, ice- related operational issues are not expected at Keeyask.

97 **Specific Comment – Satellite Imagery**

98 Images from the ENVISAT satellite were collected at a 1-2 week frequency from
 99 December to May for the years 2004 to 2010. Each image included the Nelson River
 100 reach from the Split Lake to Stephens Lake at a resolution of approximately 75m. A
 101 sample of one of these images taken January 28 2005 is shown below.



102
103 Figure 1 – Sample ENVISAT satellite image taken January 28 2005.

104 **Specific Comment – Reservoir Reach**

105 *Reference to first paragraph (page 4-91):*

106 The range of ice thicknesses is consistent with historical measurements of ice
107 thicknesses on lake environments in the project study area. Although there may be
108 some localized ice thickening and hinge cracks along the shoreline, ice ridges across the
109 forebay are not expected to occur. Much larger operating ranges exist for other
110 reservoirs in the vicinity of Keeyask area (Kettle, Long Spruce, and Limestone) and
111 excessive ice ridging has not been observed in these ice covers which would be of a
112 similar thickness to that found on the Keeyask reservoir.

113 *Reference to last paragraph (page 4-95):*

114 Although the ice processes were not modeled during the breakup period, the return of
115 water levels to open water conditions was approximated. The method used to
116 approximate the water levels during the breakup period is described in the last
117 paragraph of page 4-95 of the Physical Environment Supporting Volume and in Appendix
118 4B of the same document.

119 When considering the hydraulic and ice conditions in the post-project environment, it is
120 anticipated that there would not be a sufficient volume of water and ice stored
121 upstream of an ice jam at Birthday Rapids to result in a large enough surge that would
122 break up the downstream ice cover and into the Keeyask reservoir. Due to the
123 unlikelihood of a ice breakup surge, this ice process was not modeled.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0063**

4 **QUESTION:**

5 With respect to The report, Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012
 7 and Open Water Mainstream Travel Time.

- 8 · First paragraph (page 4-34): "Travel times for flows along the mainstem [...] ranges
 9 from approximately 10 hours to 20 hours."
 10 ○ Where do these results come from? From the 2D model?
 11 ○ Details about the method used to assess these travel times should be
 12 provided.
 13 · Second paragraph (page-4-21): "The flood of record (post-CRD) occurred in 2005 [...] while the drought of record was found to be 2 years earlier in 2003"
 14 while the drought of record was found to be 2 years earlier in 2003"
 15 ○ How would flow data from 2006 and beyond (period not included in the
 16 analysis under review) compare with those flow records?
 17 ○ According to these values, record flood and drought were broken during the
 18 last ten years. This should be commented versus climate changes and
 19 observed hydrologic trends. Is the second assumption (page 4-12) still valid
 20 in this context?
 21 · Figure 4.3-1 (page 4-22
 22 ○ Do the values shown correspond to average annual flow?

23 **RESPONSE:**

24 **Where do these results come from? From the 2D model?**

25 Estimates of the existing environment travel time through the mainstem of the Nelson
 26 River from Split Lake to the proposed location of the Keeyask GS (Gull Rapids) come
 27 from the 2D hydraulic model results.

28 **Details about the method used to assess these travel times should be provided.**

29 The MIKE21 2D hydraulic model used for the environmental assessment studies has a
 30 module, called Ecolab, that employs the use of tracer particles to track water movement
 31 and this module was used to determine the travel time.

32 The questions asked regarding information on PE SV pages 4-21 and 4-22 were also
33 asked in CEC Rd 1 CEC-0060. Please refer to the response to CEC-0060 which addresses
34 these questions.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0064**

4 **QUESTION:**

5 With respect to the report Keeyask Generation Project - Physical Environment
6 Supporting Volume - Surface Water and Ice Regimes, June 2012, we had the following
7 questions on spring breakup on the Nelson River.

- 8 · First paragraph (page 4-42): "the cover progressively breaks and reforms, at times
9 possibly resulting in a temporary ice jam"
- 10 ○ Where are the major ice jam formation sites?
 - 11 ○ How often do major ice jams occur? Every year?

12 **RESPONSE:**

13 The referenced text on page 4-42 describes the existing environment ice processes
14 during the spring breakup period. As the ice cover continues to deteriorate and retreat
15 down the river, the combination of river geometry, hydraulic conditions, and ice
16 conditions may result in the temporary formation and release of ice jams. These ice
17 jams would primarily occur in the river reach between Gull Lake and Birthday Rapids and
18 would typically be small and temporary in nature.

19 In the existing environment, as the ice cover leading edge retreats from its most
20 upstream location to the stronger lake ice on Gull Lake, temporary ice jam events would
21 be expected to occur every year. The magnitude, location, and frequency of these ice
22 jams would vary from year to year and would be dependent on the same factors listed
23 above.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0065**

4 **QUESTION:**

5 With respect to the report, Keeyask Generation Project - Physical Environment
 6 Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012,
 7 there were a number of questions about: water depths, shorelines and water surface
 8 areas.

- 9 • First paragraph (page 4-16): "The calibrated one-dimensional HEC-RAS model was
 10 used to establish water surface profiles"
- 11 ○ How were the multiple channels reaches (such as Caribou Island and Gull
 12 Rapids) modelled in 1D?
- 13 ○ How valid is the 1D model calibration on these reaches?
- 14 ○ Tables and figures comparing 1D model results and observations for the
 15 calibration scenarios should be provided.
- 16 • First paragraph (page 4-82): "Post-Project depth grids [...] are presented in map 4.4-
 17 5."
- 18 ○ All flooding maps in Appendix show open-water delineation.
- 19 ○ According to the report, the water level in the Gull Lake reach does not rise
 20 due to ice.
- 21 • Fourth paragraph (page 4-83): "some of this flooding will be contained within dykes
 22 constructed around portions of the reservoir."
- 23 ○ At what stage of construction will these dykes be built? This information is
 24 not included in Section 4.4.1 (Construction Period). According to Map 4.4-1,
 25 the dykes will not be built during Stage I diversion.

26 **RESPONSE:**

27 Responses to each of the questions are provided below.

28 *Reference to first paragraph (page 4-16):*

29 HEC-RAS has the capability to combine or split flows from multiple reaches using
 30 junctions (see HEC-RAS reference manual for more information, available online¹⁷).

31 It was in this way that multiple channel reaches (including around Caribou Island and
 32 Gull Rapids) were included in the 1D model. The amount of flow to pass through each

¹⁷ http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS_4.1_Reference_Manual.pdf

33 channel was calibrated from historical hydrometric measurements. When comparing
34 the model outputs to discharge measurements in the south channel of Gull Rapids,
35 almost all of the modeled and measured values are within 5% of one another which is a
36 very good matchup for such a complex flow regime.

37 The accuracy of the model calibration is summarized on page 4-B1 in Appendix 4B of the
38 Physical Environment Supporting Volume which includes the areas of the model with
39 multiple channels. Additional details regarding the numerical models are summarized in
40 CEC-0058 and further description of the HEC-RAS models can be found in the Physical
41 Environment Technical Memorandum 9.1.3.

42 *Reference to first paragraph (page 4-82):*

43 In the post-project environment, Gull Lake will become a part of the Keeyask reservoir
44 and the water level will rise 5-7 m, depending on the reference flow condition, to the
45 Full Supply Level (FSL) of 159 m. The reservoir will form a smooth and stable ice cover
46 and the water level will be the same for open water and winter conditions (at or near
47 the FSL of 159 m). Under a baseloaded mode of operation, where the outflow from the
48 reservoir will be approximately equal to the reservoir inflow, winter water level in the
49 reservoir will be maintained at or near the full supply level. However, under a peaking
50 mode of operation, 1.0 m variations (corresponding to the proposed operating range of
51 the Keeyask forebay) are expected during the winter season.

52 *Reference to fourth paragraph (page 4-83):*

53 Based on the preliminary construction schedule, the construction of the north dyke will
54 begin in spring 2016 which is during Stage I river diversion (Section 3.5.4 of the Project
55 Description Supporting Volume) and is reflected in Map 4.4-1 along the north shore of
56 Gull Rapids. Clearing and grubbing for the south dyke will commence in 2016 and
57 construction of the south dyke will start in the fall of 2017 during Stage II river diversion.
58 Construction of the north and south dykes will be completed prior to forebay
59 impoundment.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 4.0 Surface Water and Ice Regimes; p. N/A**

3 **CEC Rd 1 CEC-0066**

4 **QUESTION:**

5 With respect to the report, Keeyask Generation Project - Physical Environment
6 Supporting Volume - Surface Water and Ice Regimes, June 2012 was published in 2012,
7 there were a few questions on water velocities.

- 8 • Third paragraph (page 4-84): "Velocities will also increase by up to 0.5 m/s or more
9 over existing environment values in the north channel of Gull Rapids as this is where
10 the intake to the powerhouse will be located."
11 ○ What will the post-project velocities be in this area? Will these velocities be
12 low enough to create a stable ice cover?
13 ○ Moderate to high velocities near the intake entrance may cause ice-related
14 problems, such as dynamic ice pushes against dam structures, floating ice
15 entrainment and potential damages to the trashrack.

16 **RESPONSE:**

17 The post project water velocities can be found in the Physical Environment Supporting
18 Volume, Maps 4.4-8 and 4.4-9. The water velocity changes are shown in Map 4.4-10.
19 While the post-project increases may be up to 0.5 m/s higher than the existing
20 environment water velocities in the north channel of Gull Rapids, the absolute water
21 velocity magnitude will only be slightly more than 0.5 m/s during full powerhouse flow.
22 These water velocities are primarily a function of the powerhouse flow, the reservoir
23 level, and the approach channel design. The ability to create a stable ice cover upstream
24 of the powerhouse is a fundamental design feature of the approach channel that will
25 minimize head losses and ice-related problems.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067a**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
7 The report is intended to describe the sedimentation processes operating in the project
8 area and how the baseline environment will change under Project conditions. Some
9 questions and further explanations are required and are identified below.

10 **QUESTION:**

11 The stated objectives of the Sedimentation section are:

- 12 · Characterization of historical and current sedimentation processes (bed material
13 transport, suspended sediment transport, deposition).
- 14 · Prediction of future sedimentation processes, mineral and organic suspended solids
15 concentrations (nearshore and offshore), sediment transport (mineral and organic)
16 and deposition rates, thickness, and volumes for (1) the construction period, (2)
17 future conditions/trends, and (3) future environment with the Keeyask GS.

18 We have assumed that Item (2), future conditions/trends, refers to projections of what
19 will happen in the future under no-Project conditions.

20 The report and appendices contain considerable qualitative discussion about
21 sedimentation processes and presents the results of the numerical modeling that was
22 conducted to quantify these processes. An extended discussion of the modeling
23 approach is presented in Appendix 7A, along with descriptions of the input data sources
24 and the field data available for calibration. Unfortunately, the bulk of the input data are
25 not provided and the descriptions are not of sufficient detail to perform a thorough
26 review of the underlying models or the methods that were used to apply them. In
27 addition, although the qualitative descriptions of sedimentation processes are generally
28 correct, they neglect key processes that appear to have led to application of the models
29 in a manner that is, at best, confused, and in many cases, may be inappropriate. The
30 objectives include significant emphasis on the transport and deposition of bed and
31 suspended (i.e., mineral) sediment and organic suspended solids; however, the
32 modeling results focus primarily on suspended sediment concentrations. The focus on
33 suspended sediment concentrations is appropriate for assessing water quality impacts;
34 however, this focus is misplaced with respect to potential project effects on channel

35 geomorphology, including bank erosion and in-channel erosion and deposition
36 processes.

37 As noted in Section 7.1.1.1, mineral sediment transport can be divided into two primary
38 categories:

- 39 · Bed load, or the typically coarsest fraction of the load that moves in contact with
40 the bed, and
- 41 · Suspended load.

42 A key concept that is not mentioned is the distinction between bed material load and
43 wash load. The failure to recognize this distinction appears to be largely responsible for
44 the inappropriate approaches that were used for significant portions of the analysis.

45 Bed material load refers to the portion of the total load that is made up of particles
46 found in significant quantities in the bed, and it consists of two components: bed load
47 and suspended bed material load (ASCE, 2007; Simons & Senturk, 1992). This portion of
48 the load is primarily responsible for the geomorphic behavior of the channel(s), and it
49 can be quantified using an appropriate equilibrium transport equation with hydraulic
50 conditions estimated through numerical modeling and measured bed material size
51 gradations. The wash load is made of up of particle sizes that are not found in significant
52 quantities in the bed (ASCE, 2007; Simons & Senturk, 1992).

53 The wash load consists of particles that are much finer than the typical bed material, in
54 most cases silts and clays, although even sand can fit into this category in coarse-grained
55 rivers with a relatively low sand supply. By definition, the wash load is supply-limited,
56 meaning that the amount being carried by the river at any given location and time is
57 controlled by the supply, and not by the local hydraulic conditions and bed material
58 characteristics. This is the most likely reason that the measured suspended sediment
59 concentrations have poor correlation with instantaneous discharges (p 7-13, last
60 paragraph). Because it is supply limited, the wash load component cannot be quantified
61 with the type of numerical modeling that was employed in this study. Unfortunately, the
62 vast majority of the sediment load that is considered in the study is in the wash load
63 category. Please explain.

64 **RESPONSE:**

65 The discussion of future conditions/trends does refer to a future condition without the
66 Project.

67 **Discussion regarding existing conditions and future conditions without the Project:**

68 As stated in the Physical Environment Supporting Volume (PE SV), Section 7B.2.1,
69 channel morphology of the Nelson River in the study area has been stable for at least

70 the last two decades. The extensive presence of bed rock helps the river to maintain its
71 near equilibrium condition. As discussed in the PE SV (Section 6: Shoreline Erosion), the
72 shorelines have also remained generally stable (i.e., erosion rates have generally
73 reached very low long-term rates). The Nelson River is not a fully alluvial river; ice
74 processes have an influence and its sediment inflow is impacted by upstream lakes. The
75 suspended sediment concentrations in the study area are generally low and the
76 particles in suspension are generally fine (mostly silt with some clay) with the presence
77 of some sand particles (PE SV, Sec 7.3.1.1.1 and Figures 7B.1-5 and 7B.1-6). This is an
78 indication that the suspended sediments are generally composed of washload as
79 opposed to suspended bed material. There is also little consistent trend in TSS
80 concentration with depth. This is expected for washload of fine particulate, which
81 should be well-mixed in fluvial environments, and is further indication that the
82 suspended material is wash load and not transported bed material (PE SV, Sec.
83 7.3.1.1.1). Based on the field measurements that included about 350 bed load sampling
84 attempts that yielded few measureable samples, even during a high flow period, the
85 river carries a very small bed load in the study area (Sec. 7.3.1.1.2 and 7B.1.1.2).

86 The sediment supply into the study area consists of the suspended sediment coming
87 from Split Lake and Clark Lake, and the eroded shore material from both shores. The
88 sediment load, which is primarily the suspended load of finer particles, generally flows
89 through the study area without any appreciable deposition (PE SV, Sec. 7.3.1.1.3). The
90 contributions from the shore material, which is generally coarse (sand and coarser),
91 either settles in the nearshore shallow areas or is transported into the main river flow,
92 depending upon the local hydraulic and bed conditions.

93 The sedimentation processes discussed above, which consider conditions without the
94 Project, describe the morphological condition of the river, but these processes do not
95 necessarily control/define the morphology of the river. Ice dynamics and the spring
96 freshet, and their impacts on shore erosion and material transport, also influence the
97 morphology. The Shoreline Erosion section of the PE SV discusses the influence of ice
98 with respect to erosion along different reaches of the study area under existing
99 conditions (Section 6.3.1.2.2). Predictions of future shoreline erosion without the
100 Project showed that limited shoreline recession would be expected over much of the
101 study reach between Clark Lake and Stephens Lake (PE SV, Maps 6.3-3, 6.3-4 and 6.3-5),
102 consistent with the observed generally stable conditions. Predicted erosion is generally
103 in localized areas that are more affected by ice, particularly in the Birthday and Gull
104 Rapids areas. While ice plays a role in the Nelson River morphology, it does not cause
105 large changes with respect to the shorelines or the river channel in the overall reach. It
106 is worth noting again that the river's morphology has been generally stable over the
107 past 20 years due to the presence of bedrock.

108 The study attempted to collect sedimentation data under winter conditions. Due to
109 safety concerns and logistical challenges, however, only a limited amount of winter data
110 could be successfully collected. No past studies could be identified that addressed the
111 sedimentation environment in the study area during winter and spring freshet to any
112 greater extent.

113 **Discussion regarding Post-Project conditions:**

114 The study of future conditions with the Project included assessments of both the
115 suspended sediment concentrations and deposition in both the nearshore and offshore
116 areas. The focus of the modeling results is on the suspended sediment concentration.
117 These results are an important input to the assessment of Project effects on water
118 quality, which is a valued environmental component considered in the aquatic
119 environment assessment. However, deposition potential also received due attention in
120 the study. The PE SV discusses downstream deposition during the construction phase
121 (Sec. 7.4.1.1.2 and 7.4.1.2.2) and upstream and downstream deposition for the
122 operation phase (Sec. 7.4.2.1.5 and 7.4.2.2.4). Specific analysis of deposition potential
123 downstream of the Project was also performed to support aquatic environment
124 assessments of a habitat area downstream of the Project in the entrance to Stephens
125 Lake (PE SV, Map 7.4-26 and 7.A-3). Information regarding the nearshore deposition
126 analysis can be found in Appendix 7A of the PE SV (Sec. 7A.1.1.3). Offshore deposition
127 was determined using the suspended sediment results, where deposition occurs when
128 the inflow TSS into the reach is greater than the outflow TSS (i.e. using the reach as a
129 control volume). The sedimentation analyses used results from the shoreline erosion
130 analyses, which are discussed in the Shoreline Erosion section of the PE SV (Sec. 6).

131 For future conditions with the Project, the flow driven erosion of the river was not
132 modeled since the existing environment studies showed that the river morphology is
133 generally stable. Within the open-water hydraulic zone of influence, the dominant
134 process affecting shoreline erosion with the Project, and thus sediment input, will be
135 wave-induced erosion, which was assessed using a GIS-based wave-erosion model (PE
136 SV, Sec. 6.2.1.5.3). The ice processes will be much less influential in the post-Project
137 environment with respect to shoreline erosion, particularly in the reservoir areas where
138 the newly created shorelines will be more vulnerable to erosion than existing shorelines
139 (PE SV Sec. 6.4.2.1.2). Additionally, with the Project, the erosion of banks downstream
140 of the generating station will be substantially reduced due to reduced effects of ice (PD
141 SV, Sec. 6.4.2.2.1). The transport of suspended sediment and the deposition in both the
142 nearshore areas and the main channel were modeled using the MIKE21 computer
143 model. The question of the applicability of the model and the challenges associated with
144 it has been addressed in the response provided for CEC Rd 1 CEC-0067b.

145 As noted above, the sedimentation modeling results (suspended sediment, deposition)
146 are an input to the assessment of Project effects on the aquatic environment, which
147 includes water quality.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067b**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
7 The report is intended to describe the sedimentation processes operating in the project
8 area and how the baseline environment will change under Project conditions. Some
9 questions and further explanations are required and are identified below.

10 **QUESTION:**

11 Modeling of mineral sedimentation processes was conducted using a range of models,
12 including the two-dimensional (2D) Mike-21 and the 1D HEC-RAS and HEC-6. The
13 algorithms in these models were developed to quantify erosion and deposition of non-
14 cohesive sediment based on mass conservation using semi-empirical sediment transport
15 functions that were primarily developed for sand and coarser material. An important
16 aspect of the sediment transport functions is that they were developed for equilibrium
17 transport conditions; the predicted bed and suspended bed material loads represent the
18 capacity of the river to carry the indicated sizes based on the local hydraulic conditions
19 and bed material characteristics. The Limitations Section (7A1.1.4) discuss issues with
20 simulating transport of cohesive material and includes the following statement:
21 ...limitations of the model in computing relatively fine cohesive material were addressed
22 by applying rigorous calibration procedures to confirm the applicability of the model...
23 This section further states that only 10% to 20% of all suspended sediment has a mean
24 diameter of less than 0.004, which is the upper limit of clay; thus, the majority of the
25 suspended material is non-cohesive and a non-cohesive model formulation was
26 considered to be appropriate and necessary. Unfortunately, the transport equations
27 available in these models are also not applicable for silt that falls in the size range
28 between 0.004 mm and 0.062 mm, and this appears to be the bulk of the material that
29 is transported through the reach. Please explain.

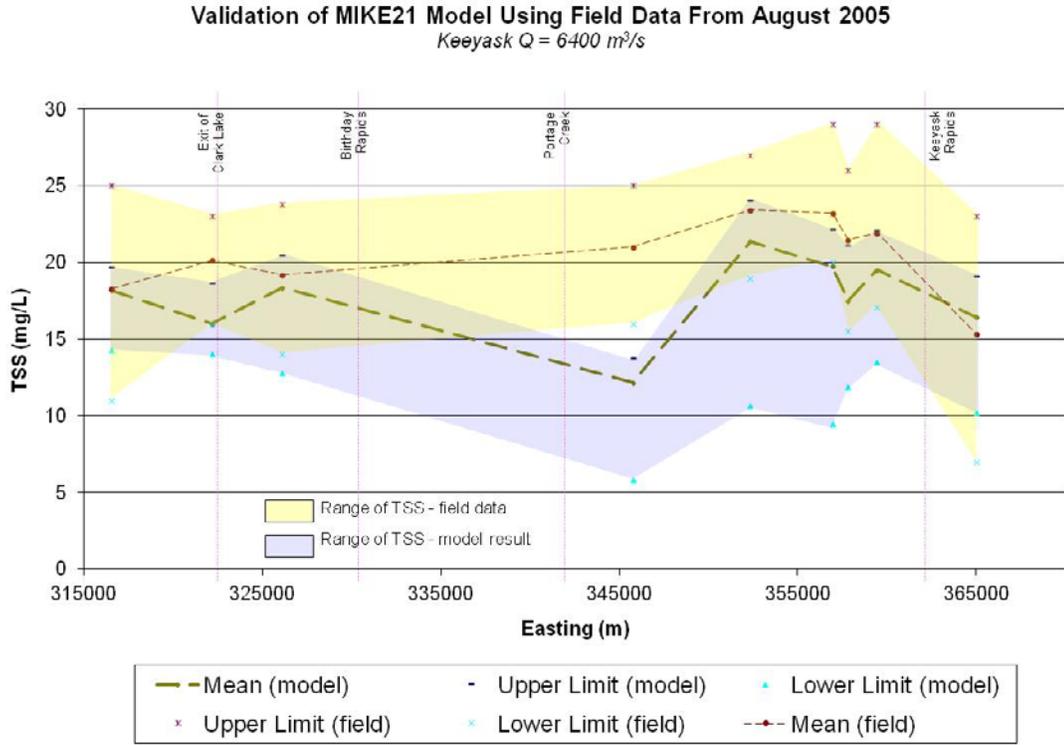
30 **RESPONSE:**

31 The MIKE21 numerical model was developed to simulate the suspended sediment
32 concentrations from upstream that flow through the study area, and includes the
33 eroded shore material that would contribute to the nearshore concentration as well as
34 the deposition potential. Therefore, the model would deal with fine material transport
35 from the upstream and coarse material transport from the shore throughout the study
36 reach. The equilibrium conditions used with the total load theory of Engelund and

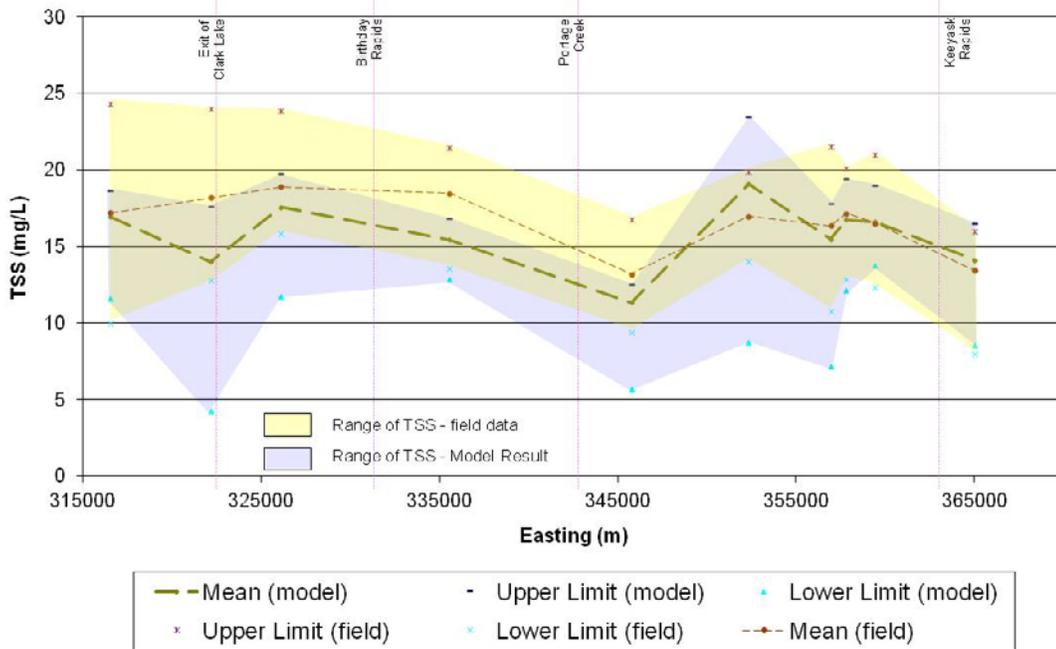
37 Hansen (1967), which divides the sediment transport into bed load and suspended load
38 using a calibration factor, was primarily applied in the model to simulate the
39 concentration of suspended sediment within Clark Lake, which is located upstream and
40 outside of the open water hydraulic zone of influence. As noted in the question, this
41 equilibrium boundary condition will compute a sediment load equal to the carrying
42 capacity of the river at the location of the boundary. The inflow sediment into the
43 Nelson River study area is a function of the suspended sediment coming from the
44 upstream lakes (Split Lake and Clark Lake) and is much lower than the actual carrying
45 capacity of the river. In addition, the predominantly coarse material and bedrock river
46 bed is not a substantial source of sediment load within the study area. However, since
47 the MIKE21 model's upstream boundary is located upstream of Clark Lake, it was found
48 that when applying the equilibrium boundary condition, Clark Lake acted as a sink and
49 regulated the inflow TSS into the Nelson River (the upstream end of our study area).
50 The TSS is then transported throughout the reach based on the advection-dispersion
51 process, which is based on the work of Galapatti (1983).

52 It is true that both theories (Engelund and Hansen; Galapatti) deal with non-cohesive
53 material only. As noted in the EIS, only 10-20% of the suspended sediment is less than
54 0.004 mm, which is the upper limit for clay particles that are cohesive. Most of the
55 remaining sediment is silt in the particle size range of 0.004-0.0062 mm, which is the
56 range between cohesive clay and non-cohesive sand. However, based on the field data,
57 there is a variable presence of sand in suspension as well. Due to the low TSS
58 concentrations and the relatively small presence of clay, several factors that
59 differentiate cohesive sediment from non-cohesive sediment (such as flocculation) are
60 negligible. Therefore, while the suspended sediment is fine, it mostly behaves as a non-
61 cohesive material where the transport is generally due to advection and dispersion. As
62 discussed in Physical Environment Supporting Volume (Sec. 7A.1.1.4), the formulations
63 applied in the model were not developed to simulate the combinations of non-cohesive
64 and cohesive particles and the transport of very fine to coarse particles. However, given
65 that the eroded shore material being injected in the model is mostly non-cohesive and
66 coarse, the study selected a non-cohesive total-load formulation (Engelund and Hansen)
67 and a suspended sediment load theory (Galapatti). Limitations were addressed through
68 the calibration and verifications of the model. The model was tested against sediment
69 concentrations measured in five different months covering a range of flows and it was
70 able to acceptably reproduce the TSS field data (see calibration/verification figures
71 below from technical memorandum GN 9.2.9, which is listed in Appendix 6A of the
72 Response to EIS Guidelines). As noted in the Physical Environment Supporting Volume
73 (Sec. 7A.1.1.1), the variations between mean field and modeled concentrations
74 remained within +/-15%. According to Ganasut (2005) a discrepancy between computed
75 and observed concentrations of +/-50% is generally accepted. In addition, the Project's
76 impact (i.e., the model results for the Keeyask reservoir) are similar to what has been

77 observed in Stephens Lake (which has similar hydraulics) where TSS is generally low
 78 there is a small decrease in TSS as it travels from the upstream to the downstream end
 79 of the lake.

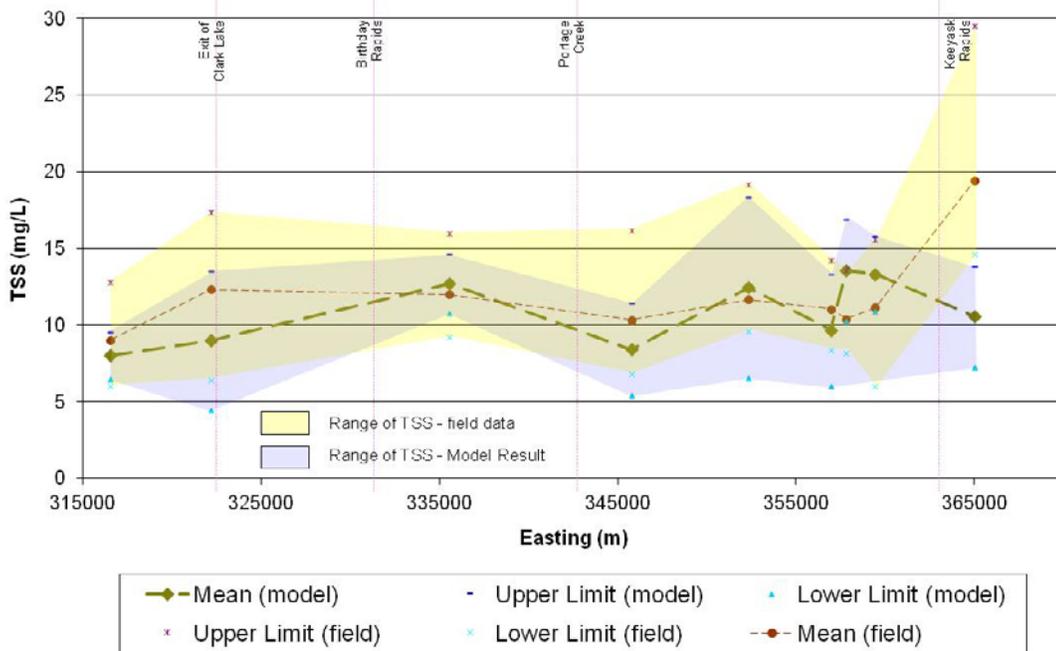


Calibration of MIKE21 Model Using Field Data From June 2006
Keeyask Q = 5340 m³/s



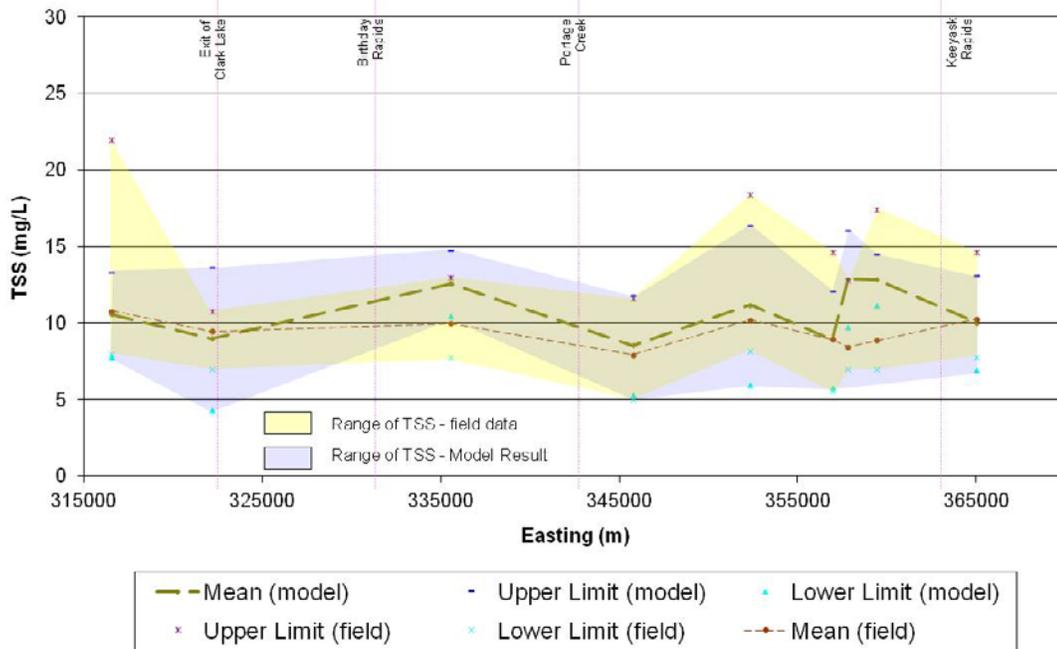
81

Validation of MIKE21 Model Using Field Data From July 2006
Keeyask Q = 4521 m³/s



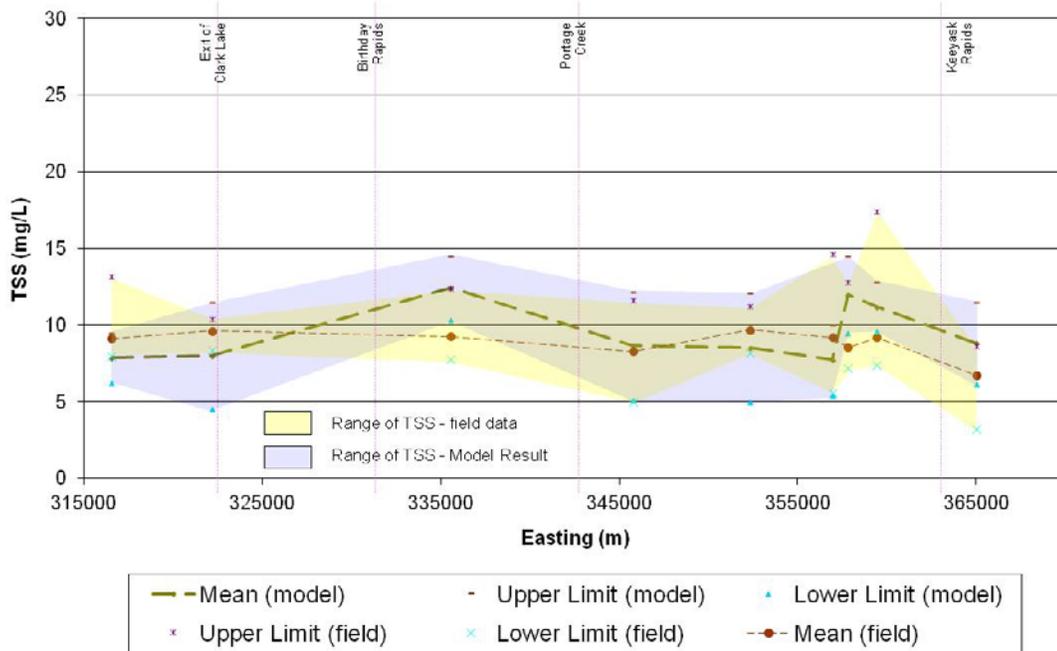
82

Validation of MIKE21 Model Using Field Data From August 2006
Keeyask Q = 4290 m³/s



83

Validation of MIKE21 Model Using Field Data From September 2006
Keeyask Q = 3842 m³/s



84

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067c**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
7 The report is intended to describe the sedimentation processes operating in the project
8 area and how the baseline environment will change under Project conditions. Some
9 questions and further explanations are required and are identified below.

10 **QUESTION:**

11 For the Mike-21 modeling, the upstream boundary sediment concentrations were
12 estimated in Clark Lake using the total load theory of Engelund and Hansen (1967) and
13 ...transport of this sediment load was then simulated by the suspended sediment load
14 theory of Galappatti (1983). The Engelund and Hansen (1967) equation is a semi-
15 empirical bed material load equation that was developed for sand bed streams. This
16 equation is not applicable to the silt/clay fraction (i.e., sizes finer than 0.062 mm).
17 Galappatti (1983) is a numerical method of estimating a first-order adjustment to the
18 sand concentrations derived from equilibrium transport equations to account for the
19 phase-lag between the depth-averaged concentrations and depth-averaged velocities.
20 This method could potentially be applied to the silt fraction, but it requires equilibrium
21 transport conditions in which the suspended sediment load is being carried at capacity
22 based on the hydraulic conditions and bed material sizes, a condition that is almost
23 certainly not met in most, if not all, portions of the study reach. In spite of the
24 calibration efforts, the model does not represent the sedimentation dynamics of the
25 silt/clay size fractions, and the results are therefore not meaningful with respect to the
26 questions that are being evaluated. Please explain.

27 **RESPONSE:**

28 The information requested in this interrogatory is related to the request in CEC Rd 1
29 CEC-0067b. Please see the response provided for CEC Rd 1 CEC-0067b, which addresses
30 both requests.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067d**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
 6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
 7 The report is intended to describe the sedimentation processes operating in the project
 8 area and how the baseline environment will change under Project conditions. Some
 9 questions and further explanations are required and are identified below.

10 **QUESTION:**

11 The HEC-RAS model was used to assess ...impacts from construction activities during
 12 river management [to predict] shoreline erosion and subsequent sedimentation...
 13 (Section 7.2.1.1, 2nd paragraph). Four of the 7 transport equations that are available in
 14 the software were used in the sedimentation modeling (Section 7A.2.1.2.1, last
 15 paragraph):

- 16 · Ackers and White
- 17 · Engelund and Hansen
- 18 · Laursen
- 19 · Yang (sand).

20 The equations were selected based on their relevance and appropriateness for use on
 21 the Nelson River...using hydraulic parameters that ...included the dimensionless particle
 22 diameter, dimensionless depth, Froude number, relative shear velocity, unit stream
 23 power and sediment load concentration. Neither the values of the parameters for the
 24 Nelson River nor the specific basis for concluding that these equations are appropriate
 25 were provided. Similar to the above discussion regarding the Mike-21 model, all of these
 26 equations were developed to represent the equilibrium transport capacity. Please
 27 explain.

28 **RESPONSE:**

29 As presented in the Physical Environment Supporting Volume (PE SV, Section
 30 7A.2.1.2.1), six dimensionless parameters (dimensionless particle diameter, relative
 31 depth, Froude number, relative shear velocity, dimensionless unit stream power,
 32 sediment concentration) were considered to select the most applicable equations to use
 33 on the Nelson River. This selection was based on the method introduced by Yang and
 34 Huang (2001). Yang and Huang (2001) used a large data set (6,200 sets of sediment
 35 transport and hydraulic data) to assess the sensitivities of 13 commonly used sediment

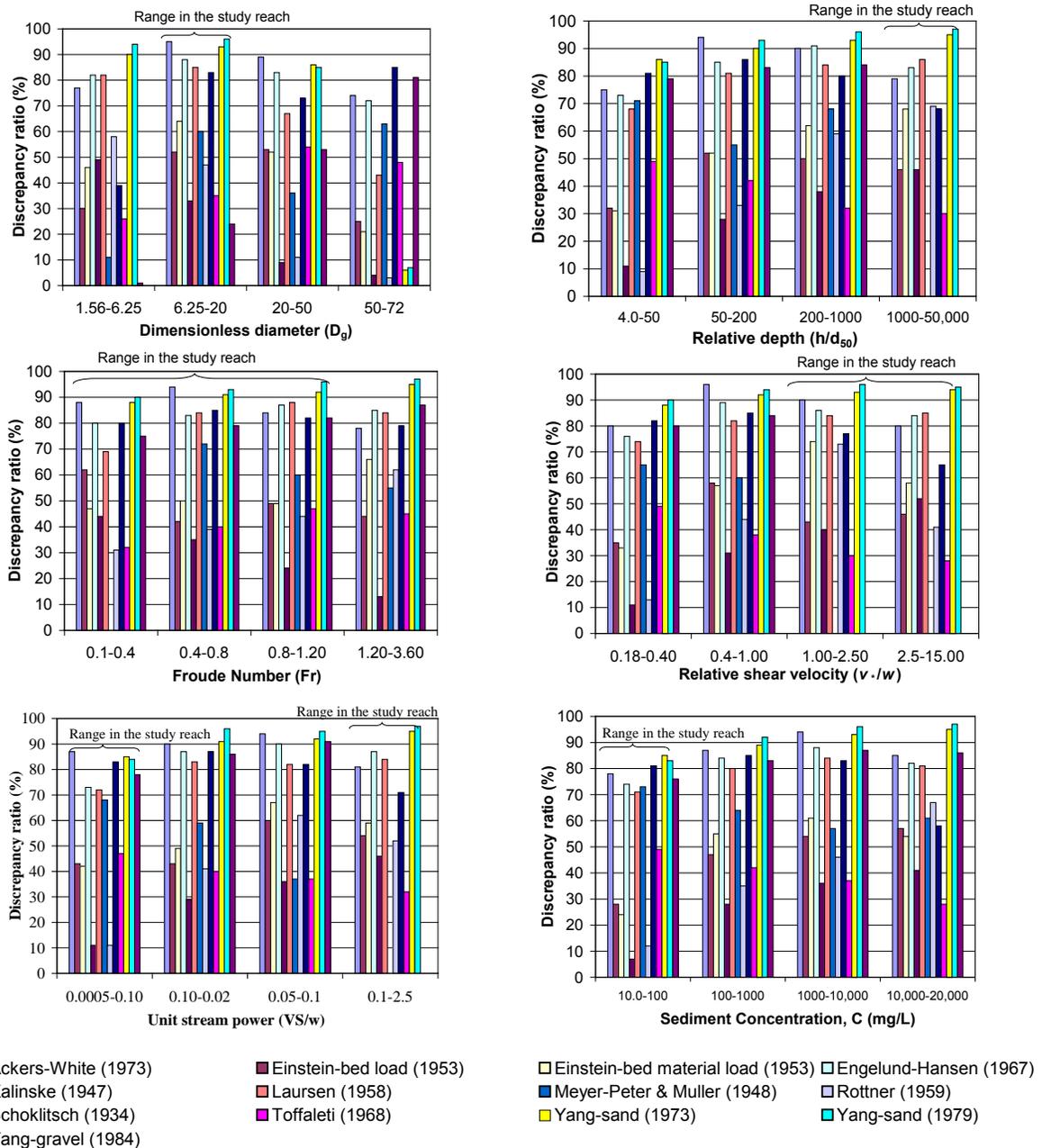
36 transport equations to these six dimensionless parameters. A discrepancy ratio (R) was
 37 then calculated for these 13 sediment transport equations. This ratio is defined as the
 38 ratio between computed sediment concentration (C_c) and measured concentration (C_m).
 39 The results of this assessment and the values for discrepancy ratio for each parameter
 40 are presented in Tables 3.11 to 3.17 in the *USBR- Erosion and Sedimentation Manual*
 41 (2006). These tables summarize the sensitivity of these sediment transport equations as
 42 a function of the six dimensionless parameters. In other words, the limits of application
 43 of these sediment equations in various flow and sediment conditions can be determined
 44 from this comparison. These results are also shown graphically in Figure 1.

45 The values of these six dimensionless parameters for the study reach of the Nelson River
 46 are presented in Table 1. Since the flow and sediment parameters vary along the study
 47 reach of the Nelson River, a range is presented for each dimensionless parameter in this
 48 table. These ranges are marked in Figure 1 where the discrepancy ratios of sediment
 49 transport equations are shown for different values of the dimensionless parameters.
 50 Only sediment transport functions with discrepancy ratio higher than 70% for all six
 51 dimensionless parameters were selected in this study. As an example, when
 52 dimensionless diameter of sediment particles is considered, Ackers-White, Englund-
 53 Hansen, Laursen, and Yang (sand) equations show an accuracy higher than 70%. The
 54 applicability ($R > 70\%$) of the 13 commonly used sediment equations for each of the six
 55 dimensionless parameters is summarized in Table 2 (Table 4 in Technical Memorandum
 56 GN.9.2.10, listed in Response to EIS Guidelines, Appendix 6A). According to this table,
 57 the most applicable functions for calculating the sediment transport rate in the Nelson
 58 River are: Ackers-White (1973), Englund-Hansen (1967), Laursen (1958), and Yang
 59 [sand] (1979).

Table 3: Dimensionless parameters applied in selecting the sediment transport equations in the Nelson River

D_g	h/d_{50}	Fr	VS/w	v_* / w	C
100~3000	2.5~18	0.02~1.03	$10^{-6} \sim 10^{-2}$	0.2~9.8	10-100

60



61 Figure 1 Discrepancy ratio of six dimensionless parameters for 13 sediment transport equations
 62 (from USBR- Erosion and Sedimentation Manual (2006)).

63 If the lowest acceptable discrepancy ratios were set to 60%, only Schoklitch (1934)
 64 function could be added to the above list. This equation was developed in flows carrying
 65 sediment larger than 0.25 mm which is not applicable in the Nelson River. Considering
 66 the complexity of sediment transport processes, particularly in natural rivers, expecting
 67 a discrepancy ratio larger than 80% for all six dimensionless parameters would be
 68 unrealistic. Only the Yang (sand) function has a discrepancy ratio higher than 80% for all

69 six dimensionless parameters of the Nelson River. Therefore, in this study it was decided
70 to consider a minimum of 70% discrepancy ratio in selecting the sediment equations.

71 **Table 2: Summary of applicability of sediment transport equations in the Nelson River**

Sediment Transport Function	D_{gr}	h/d_{50}	Fr	v_* / w	VS/w	C
Ackers-White (1973)	●	●	●	●	●	●
Einstein-bed load (1953)						
Einstein-bed material load (1953)						
Engelund-Hansen (1967)	●	●	●	●	●	●
Kalinske (1947)						
Laursen (1958)	●	●	●	●	●	●
Meyer-Peter & Muller (1948)						●
Rottner (1959)						
Schoklitsch (1934)	●		●		●	●
Toffaletti (1968)						
Yang-sand (1973)	●	●	●	●	●	●
Yang-sand (1979)	●	●	●	●	●	●
Yang-gravel (1984)			●		●	●

72
73 As correctly stated in the Information Request, most of the sediment transport
74 equations were derived for “under equilibrium” conditions with a constant rate of
75 vertical sediment flux from and towards the channel bed, i.e. no scour or deposition.
76 The computed sediment load or concentration in a river from these sediment equations
77 is the river’s sediment carrying capacity (Yang 2003, USBR 2006). In rivers with very
78 coarse bed materials, stiff clay and bedrock control (such as the Nelson River), the
79 sediment transport capacity of fine fractions calculated from the sediment transport
80 equations far exceeds the sediment supply from upstream supply of sediment (Julien
81 1998).

82 In HEC-RAS, sediment transport capacity of a channel is computed with one of the seven
83 sediment transport equations available in the program. The computed sediment
84 carrying capacity is compared to the sediment supply at each cross section and a surplus
85 or deficit is determined applying continuity equation. In general, surplus becomes
86 deposition and deficit is translated into erosion. However, the difference between
87 supply and capacity cannot be directly converted into a bed change because there are
88 physical constraints (HEC-RAS Reference Manual).

89 In setting up the Nelson River HEC-RAS model to assess construction activity impacts on
90 the shoreline erosion, the following was considered:

- 91 I. The “Equilibrium Load” option in HEC-RAS was turned off; otherwise HEC-RAS would
92 have computed sediment transport capacity, for each time step, as the sediment
93 inflow. Instead, an inflowing sediment load was introduced to the model based on
94 sediment conditions observed on the Nelson River during baseline environmental
95 studies.

96 II. Only the riverbanks were introduced as movable area in the model. Since the
 97 Nelson River bed material at the Project site ranges from non-erodible bedrock to
 98 boulder and cobble, any erosion along the river would occur at the shoreline and
 99 banks areas (PE SV, Appendix 7E). The response to CEC-0067e provides additional
 100 discussion regarding the movable bed.

101 With these two considerations, the sediment loads calculated for the “during
 102 construction” period were much less than the river carrying capacity (under an
 103 equilibrium condition) and were limited to the inflowing load and local contribution
 104 from shoreline erosion. The amount of erosion predicted by the HEC-RAS model is
 105 conservatively overestimated. This is because the average cross-section flow velocity
 106 obtained from the 1D model is applied to the shoreline to calculate shoreline erosion
 107 even though the nearshore velocity is expected to be less than the centerline or average
 108 velocity: the higher velocity results in greater erosion.

109 **REFERENCES:**

- 110 USACE (2010), *HEC-RAS River Analysis System- User's Manual*, US Army Corps of
 111 Engineers, Institute for Water Resources, Hydrologic Engineering Center, Davis,
 112 CA, USA.
- 113 Julien, P. Y., (1998). *Erosion and Sedimentation*. Cambridge University Press, New York,
 114 USA.
- 115 U.S. Department of Interior, Bureau of Reclamation (2006). *Erosion and Sedimentation*
 116 *Manual*, Denver, Colorado.
- 117 Yang, C.T., and Huang, C. (2001). *Applicability of sediment transport formulas*.
 118 *International Journal of Sediment Research*, 16 (3), Beijing, China, 335-343.
- 119 Yang, C, T. (2003). *Sediment Transport - Theory and Practice*. Krieger Publishing Malabar,
 120 Florida, USA.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067e**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
7 The report is intended to describe the sedimentation processes operating in the project
8 area and how the baseline environment will change under Project conditions. Some
9 questions and further explanations are required and are identified below.

10 **QUESTION:**

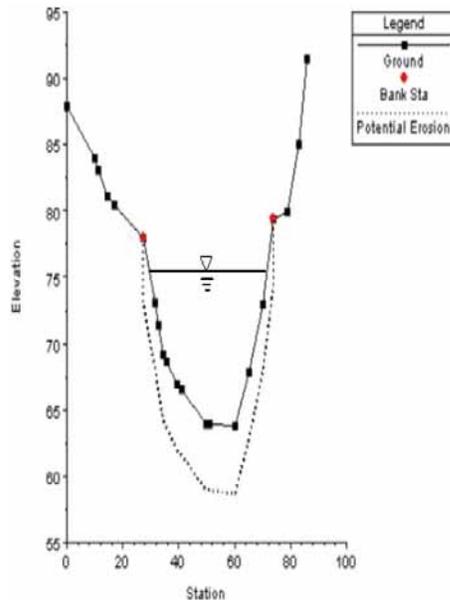
11 In rivers with fine-grained banks, bank erosion can be an important source of wash load.
12 The study does correctly recognize that bank erosion will contribute to the suspended
13 sediment loads at rates that are directly related to the bank erosion rates.

14 It is noted in the Report that: shoreline erosion was predicted by conducting hydraulic
15 and sedimentation modeling of the existing environments as well as for the different
16 construction stages of the Project...using HEC-RAS 4.0. HEC-RAS 4.0 does not have the
17 capability to model bank or shoreline erosion. Please explain.

18 **RESPONSE:**

19 As presented in the Sedimentation section of the Physical Environment Supporting
20 Volume (Section 7, Appendix 7E), the Nelson River bed material at the Project site
21 ranges from non-erodible bedrock to boulder and cobble. For this reason, erosion along
22 the river occurs at the shoreline and bank areas. Therefore, only the riverbanks were
23 introduced as a "movable" (i.e., erodible) area in the HEC-RAS model.

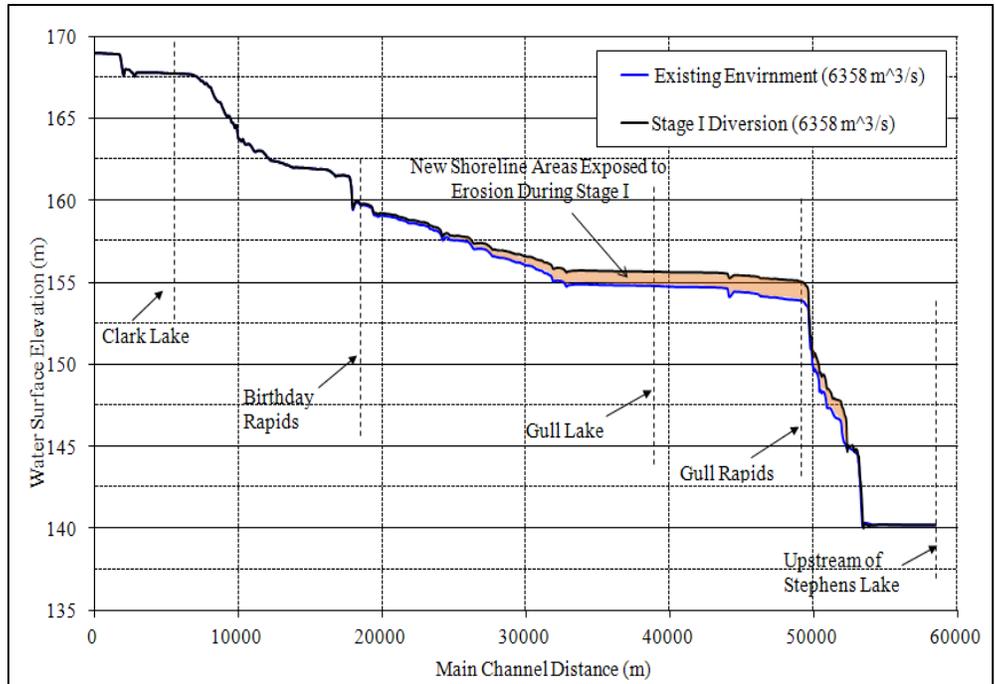
24 In the sediment module of HEC-RAS, once the geometry data are introduced to the
25 model, a segment of each cross-section may be introduced as "movable". The geometry
26 of the river may change vertically in the model within the movable area of the cross-
27 section due to the flow action as shown in Figure 1 (HEC-RAS Reference Manual).



28

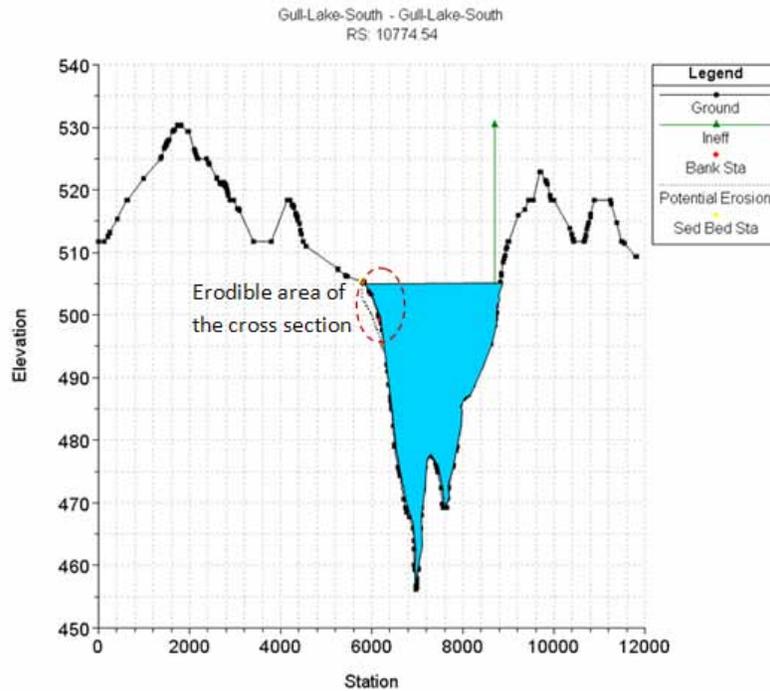
29 **Figure 1 Movable bed definition in HEC-RAS model**

30 As discussed in Technical Memorandum GN-9.2.10 (listed in Response to EIS Guidelines,
 31 Appendix 6A), for open-water conditions in the existing environment (pre-construction),
 32 the amount of sediment load in the river due to the action of flow on the shoreline
 33 materials is not significant. The river shoreline has historically experienced high flows
 34 and ice action over many years and has been eroded during extreme events. However,
 35 during construction activities and due to narrowing the flow passage in the south
 36 channel, a backwater profile will form. As an example, Figures 2 (and Figures 11 and 12
 37 in GN-9.2.10) compare the water surface profile during Stage I Diversion with the profile
 38 from the existing environment. The increase in water level along the river will expose
 39 areas of the river shoreline (with higher elevation) to the flow action. The extent of
 40 these new areas along each cross section was determined and introduced as a
 41 “moveable area” of that cross section where erosion could occur (Figure 3). More detail
 42 on introducing movable areas along the shoreline to the model is presented in GN-
 43 9.2.10.



44

45 Figure 2 Water Surface Elevation in the Nelson River in Existing Environment and during Stage I
 46 Diversion (1:20 year flood flow, $Q=6358 \text{ m}^3/\text{s}$)



47

48 Figure 3 Defining erodible shoreline area in the Nelson River HEC-RAS model

49 **REFERENCES:**

50 USACE (2010), *HEC-RAS River Analysis System- User's Manual*, US Army Corps of
51 Engineers, Institute for Water Resources, Hydrologic Engineering Center, Davis,
52 CA, USA.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 7.0 Sedimentation; p. N/A**

3 **CEC Rd 1 CEC-0067f**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Sedimentation, June 2012" was reviewed.
7 The report is intended to describe the sedimentation processes operating in the project
8 area and how the baseline environment will change under Project conditions. Some
9 questions and further explanations are required and are identified below.

10 **QUESTION:**

11 Section 6.2.4 indicates that one of the assumptions used in the modeling is that no
12 catastrophic natural events (e.g., earthquake, flood, land-slides) will occur in the future.
13 This seems like an unrealistic assumption, at least with respect to floods. Please explain.

14 **RESPONSE:**

15 The post-Project sedimentation modeling was performed to assess suspended sediment
16 concentrations over a wide range of representative flows, from the 5th percentile low
17 flow to the 95th percentile high flow. The 95th percentile flow is representative of a high
18 flood flow scenario that does not occur frequently: only 5% of flows in the flow record
19 are higher. The flow range considered covers not just average conditions, but also
20 infrequent low and flood flow conditions. This is consistent with the approach taken in
21 other EIS studies (e.g., aquatic habitat conditions assessed from 5th to 95th percentile
22 flows). The flood flows assessed would not be considered catastrophic flood events,
23 which is referring to rare extreme floods.

24 Relatively rare flood flows were also considered in the modeling of potential shoreline
25 erosion and subsequent sedimentation during the construction phase. The assessment
26 considered a 1:20 year flood event (6,358 m³/s), which is greater than the 95th
27 percentile flow (4,855 m³/s), and is the same return period used for the construction
28 design flood (Project Description Supporting Volume, Sec. 2.2.3.2). This 1:20 year flood
29 was deemed to be a good representation of an extreme flood having a low probability
30 of occurrence during the 5-year construction period prior to reservoir impoundment.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 6.0 Shoreline Erosion Process; p. N/A**

3 **CEC Rd 1 CEC-0068a**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Shoreline Erosion Processes, June 2012" was
7 reviewed. The report addresses shoreline erosion processes that include both the
8 breakdown of peat and erosion of the shorelines that consist of mineral material, and
9 makes projections of the baseline environment will change with the proposed Project.
10 Some questions and further explanations are required.

11 **QUESTION:**

12 In general, the report is well-written and organized. The qualitative descriptions of the
13 two primary shoreline erosion processes (peatland disintegration and mineral erosion)
14 provide good context for the analytical methods that were used in the analysis, and they
15 appear to address the key processes that must be considered. The analysis of future
16 conditions, with and without the project, was performed using a combination of
17 historical information and numerical modeling tools.

18 The historical trend analysis is a valuable part of the study because it provides a means
19 of quantifying the changes that have been observed under pre-project conditions and
20 provides context for projecting future changes, particularly under without-project
21 conditions. The historical trends in peat bank erosion appear to have been assessed
22 using data from aerial photographs taken in 1962 and 2006, a 55-year period that
23 should be sufficient to detect systematic changes in the shorelines. The historical trends
24 in mineral bank erosion appear to have been assessed by comparing aerial photographs
25 taken in 1986 and 2006 and comparing transects surveyed in 2006 and 2007. The
26 shorter, 22-year period encompassed by this information may not be sufficiently long to
27 detect long-term trends, especially considering the relatively small changes that were
28 indicated by these data. Please explain.

29 **RESPONSE:**

30 The objective of assessing historical trends in mineral bank erosion rates was to
31 determine a reliable estimate of erosion rates that are occurring in the existing
32 environment. Existing erosion rates, in this case, were defined to be erosion rates that
33 are representative of the post-Lake Winnipeg Regulation (LWR) and Churchill River
34 Diversion (CRD) period, which began in 1976. Due to LWR and CRD, the annual flow
35 patterns are altered from their pre-development state, with CRD increasing flows on the

36 lower Nelson River by about 400 m³/s to 1000 m³/s seasonally and annually (Physical
37 Environment Supporting Volume (PE SV), Sec. 4.3). In order to incorporate whatever
38 effect LWR and CRD may have had on erosion rates in the study area (i.e., altered water
39 and ice regime), the existing mineral erosion environment has been based on post-1986
40 erosion rates as determined from historical air photos and surveyed transects (PE SV,
41 Sec. 6.3). The 1986 aerial photographs were used in this analysis because they are the
42 earliest air photos taken after LWR/CRD that are at a scale suitable for locating the top-
43 of-bank, which is required to measure the recession of the bank over time. The period
44 from 1986-2006 represents the majority of the post-LWR/CRD period.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.0 Shoreline Erosion Process; p. N/A**

3 **CEC Rd 1 CEC-0068b**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
 6 Physical Environment Supporting Volume – Shoreline Erosion Processes, June 2012" was
 7 reviewed. The report addresses shoreline erosion processes that include both the
 8 breakdown of peat and erosion of the shorelines that consist of mineral material, and
 9 makes projections of the baseline environment will change with the proposed Project.
 10 Some questions and further explanations are required.

11 **QUESTION:**

12 The overview of the analytical approach indicates that separate models were used in an
 13 integrated manner to assess peatland disintegration and mineral erosion, and that the
 14 reservoir expansion component of the peatland disintegration model incorporates
 15 mineral erosion setbacks...and [t]he mineral erosion model incorporates the effects of
 16 peat islands on effective wave energy, and ...the increased exposure of mineral banks to
 17 erosion resulting from peatland disintegration... (Section 6.2.1). Data from "proxy areas"
 18 were used in parameterizing the analytical shoreline erosion models, with the bulk of
 19 the data derived from a series of aerial photographs and chronosequence transects of
 20 Stephens Lake, located just downstream from the project, that were taken between
 21 1962 and 2006. Although the report contains considerable discussion of the background
 22 data and assumptions used in the models and the results generally appear to be
 23 plausible, sufficient information is not provided about these models to verify the
 24 reasonableness of the algorithms or the manner in which they are applied. Is it possible
 25 to provide more information on the models?

26 **RESPONSE:**

27 Mineral Erosion Model:

28 An overview of the mineral erosion model is provided in Section 6.2 of the Shoreline
 29 Erosion section in the Physical Environment Supporting Volume (PE SV), with additional
 30 detail provided in Appendix 6A of that section. The mineral erosion model is described
 31 in greater detail in pages 8-21 of Technical Memorandum GN 9.2.8 (listed in Appendix
 32 6A of the Response to EIS Guidelines and Appendix 1A of the PE SV). The technical
 33 memorandum provides an overview of the model background, similar to what is
 34 provided in the PE SV, and a detailed description of the mineral shore erosion processes
 35 that form the basis for the model. The main model components are described and the

36 model inputs are discussed, including determination of: 1) effective wave energy; 2)
37 erodibility coefficients; 3) volumetric erosion rates; and 4) bank recession distances.
38 Delineation of representative shoreline segments and associated attributes and
39 validation of the model are also described in GN 9.2.8.

40 Peatland Disintegration Model:

41 Section 6.2 of the Shoreline Erosion section also provides an overview of the peatland
42 disintegration model, with additional detail provided in Appendix 6A of the Shoreline
43 Erosion section. The peatland disintegration model is discussed in greater detail in
44 Technical Memorandum GN 9.2.7, which presents the key drivers and pathways for
45 peatland disintegration, the approach to model development, results from studies
46 conducted to support model parameterization, the model specification, model
47 validation, sensitivity analysis and Project effects predictions. Section 8 of GN 9.2.7
48 describes the peatland disintegration model in some detail.

49 Integration of Mineral Erosion and Peatland Disintegration Models:

50 The two models were integrated to develop predictions of shoreline recession and
51 peatland disintegration, which is discussed in Appendix 6A (Section 6A.4) of the PE SV
52 Shoreline Erosion section, and in both GN 9.2.7 and GN 9.2.8.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 6.0 Shoreline Erosion Process; p. N/A**

3 **CEC Rd 1 CEC-0068c**

4 **PREAMBLE:**

5 The Report, "Keeyask Hydropower Limited Partnership, Keeyask Generation Project -
6 Physical Environment Supporting Volume – Shoreline Erosion Processes, June 2012" was
7 reviewed. The report addresses shoreline erosion processes that include both the
8 breakdown of peat and erosion of the shorelines that consist of mineral material, and
9 makes projections of the baseline environment will change with the proposed Project.
10 Some questions and further explanations are required.

11 **QUESTION:**

12 Although the model results appear to be qualitatively reasonable in the short-term,
13 Manitoba Hydro (MH) indicates that the shoreline will continue to erode and the area of
14 the affected waterbodies will continue to expand, ad infinitum, under both without- and
15 with-project conditions, a condition that seems to be highly unlikely. Areas upstream
16 from the generating station that will experience higher inundation levels will adjust to
17 these higher levels under with-project conditions until a new equilibrium is reached;
18 however, the reasons for the continued adjustment under without-project conditions is
19 not explained, nor is it apparent. Natural shorelines in this environment erode and form
20 in response to the flow, sediment supply and peat formation and disintegration
21 processes. In the absence of systematic changes in the driving forces (i.e., hydrology,
22 climate, sediment supply), they generally reach a state of dynamic equilibrium in which
23 there is little net change over time within reach-wide areas. It is understood that the
24 affected waterbodies may still be adjusting to the effects of previously-constructed
25 hydropower projects; however, the results are presented in a manner that indicates
26 that eroding areas will continue to erode at the historic rates under without-project
27 conditions, which will result in continued increases in river width and/or expansion of
28 the surface area of the lakes. At minimum, the report should acknowledge that the rate
29 of change will decrease asymptotically to a new equilibrium under both without- and
30 with-project conditions. The status of the adjustments with respect to this equilibrium
31 under without-project conditions and the length of time required to substantially reach
32 a new equilibrium under with-project conditions are questions that should be answered.
33 Please explain.

34 **RESPONSE:**

35 Development of peatland disintegration and mineral erosion models was informed and
36 validated by proxy data that represent time periods consistent with the quantitative

37 model results presented in the Physical Environment Supporting Volume (PE SV): that is,
38 quantitative predictions of Project effects over 30 years of operation. While Project
39 effects beyond 30 years are commented on in the PE SV (Sec. 6.4.2.1.7), it is
40 acknowledged that predictions over this longer time period are more difficult to make
41 and subject to greater uncertainty.

42 That said, we agree with the general concept expressed in the Information Request (IR)
43 and this is reflected in our predictions for the first 30 years of operation. That is, both
44 peatland disintegration and mineral erosion rates in the reservoir are predicted to
45 decrease exponentially during the first 30 years of reservoir operation and, in the case
46 of mineral erosion rates, reach an asymptote that approaches historical erosion rates in
47 the existing environment by the end of the first 30 years of operation. At this point, the
48 question raised is: will these rates (both without- and with-Project) continue to decline
49 over the long term, remain much the same, or increase? The view expressed in the IR is
50 that rates would be expected to decrease further over the long-term towards "a state of
51 dynamic equilibrium with little net change over reach wide areas."

52 With respect to without-Project conditions, we expect that existing erosion rates have
53 likely already declined to their ultimate long-term "asymptotic" rates, or at least nearly
54 so. While further reductions in erosion rates may occur, we expect that the 37 years
55 that have passed since implementation of the Lake Winnipeg Regulation and Churchill
56 River Diversion is sufficient time for long-term adjustments to have been made. While
57 not riverine environments, observations from several reservoirs that are in the range of
58 30-50 years in age (Lake Diefenbaker SK, 47yr; Williston Lake BC, 42yr; Stephens Lake
59 MB, 42yr) suggest that while erosion continues, rates have declined greatly from their
60 original values and are currently at fairly stable long-term values. Moreover, current
61 erosion rates estimated for the Keeyask environment are quite low already, so the
62 potential for further reductions is small. We also acknowledge that methods used to
63 estimate historical erosion rates are limited by errors in the visual interpretation of the
64 top-of-bank position and air photo distortion. Air photo errors are discussed on pages
65 15 and 16 of the Technical Memorandum GN 9.2.2 (as cited in Appendix 1A of the PE
66 SV).

67 With respect to with-Project predictions, Fig. 6.4-10 of the PE SV suggests that mineral
68 erosion rates reach long-term asymptotic levels by about Year 15 of operation. Factors
69 that could result in further reductions include a reduction in erodibility due to the
70 buildup of coarse lag deposits on beaches (i.e., self armouring) and changes in material
71 type as banks recede. However, it is difficult to predict when, where and to what extent
72 these factors will influence erosion in the future. So while we acknowledge this as being
73 possible, the assessment is based on the assumption that erodibility and material type
74 remain the same in the future. Based on observations in other reservoirs (several listed

75 in the previous paragraph) one might expect that erosion rates could continue to
76 decline a small amount up to 40-50 years after the start of reservoir operation with a
77 decreasing amount of change after that. The model assumptions are precautionary in
78 the sense that they overestimate the anticipated amount of shoreline recession (i.e., no
79 reduction in erodibility) and this remains true even when considering the difference
80 between the with and without-Project scenarios.

81 Regarding peatland disintegration, the EIS indicates that peat banks subject to peatland
82 disintegration processes are stable in the existing environment since measurable bank
83 recession was not observed in the 41 year period extending from 1962 to 2003
84 (Response to EIS Guidelines, Section 6.2.3.2.7, p. 6-45), and that these peat banks are
85 expected to generally remain stable in the future (PE SV Section 6.3.1.4.1).

86 With respect to with-Project conditions, the shoreline erosion section of the EIS predicts
87 that peatland disintegration is expected to continue beyond Year 30 but at declining
88 annual rates (PE SV Section 6.4.2.1.7). As noted in PE SV Section 6.1.1, a more detailed
89 description of peatland formation is provided in the Terrestrial Environment Supporting
90 Volume, in recognition of the key role that vegetation performs in soil formation and
91 peatlands. The use of low-lying peatlands adjacent to the year 30 reservoir shoreline to
92 define the limits of reservoir expansion beyond Year 30 (TE SV Section 2.3.6.3.1 p. 2-
93 102) is implicit recognition that a balance between peatland breakdown and formation
94 is expected to eventually occur on back bay shore segments (which is where most of
95 these segments occur after Year 30) subject to peatland disintegration processes.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 5.4.1.1.6 Assessing Environmental Sensitivity of Borrow**
3 **and Quarry Rock Material; p. 5-24**

4 **CEC Rd 1 CEC-0069a**

5 **QUESTION:**

6 The final paragraph in section 5.4.1.1.6 suggests that more work is required to assess
7 potential impact of granular fill with respect to acidic metals leaching. Given the large
8 volumes of material involved resolution of this issue is important. Please advise on the
9 schedule for completion of testing to resolve this concern.

10 **RESPONSE:**

11 The final paragraph in section 5.4.1.1.6 does not imply any additional testing, but it
12 states that additional effects of granular materials on water quality could be considered
13 with respect to potential metals of concern. It should be noted that potential metals of
14 concern were identified based on exceedances of the lowest (i.e., most stringent) CCME
15 Guidelines for the Protection of Aquatic Life based on test results from the Shake Flask
16 Extractions (SFE) without consideration of site-specific conditions such as hardness of
17 water and baseline concentrations of elements in water. The metals of concern were
18 identified if at least one of the 25 granular samples tested exceeded the CCME
19 guideline. Each sample exceeded the aluminum and copper guideline, seven exceeded
20 the cadmium guideline, while iron and chromium guidelines were only exceeded in two
21 samples each. Site-specific conditions are considered in the discussion below.

22 Neutral and slightly alkaline conditions in all 25 SFE (pH generally >8) test results
23 indicate that granular material will not generate acidic runoff. Maximum concentrations
24 of aluminum (0.63 mg/L) and iron (0.53 mg/L) from the SFE tests are lower than mean
25 baseline concentrations of these metals in most monitoring stations shown in Figures
26 2H-10 and 2H-11 respectively of the Aquatic Environment Supporting Volume (Appendix
27 2H), which are copied below. This observation indicates that seepage and runoff from
28 the granular materials is unlikely to result in the increase of these metals in the aquatic
29 environment.

30 Mean and median concentrations of copper (0.0040 and 0.0034 mg/L) from the SFE test
31 results are in the same range as mean and median concentrations (0.003 to 0.004 mg/L)
32 measured in the Gull Lake and Stephens Lake area (sites NR-2, Camp-1, Camp-2, and
33 STL-1; see AE SV Map 2-2 for locations of sites; Appendix 2H, Table 2H-2 for water
34 quality data)..

35 As noted above, of the 25 samples tested, the SFE results exceeded the minimum CCME
36 guidelines for cadmium in seven samples and chromium in two samples. Cadmium
37 values of 0.00002-0.00005 mg/L exceeded the minimum guideline of 0.00001 mg/L
38 ranged, while chromium values of 0.0011-0.0012 mg/L exceeded the minimum guideline
39 of 0.001 mg/L. The guidelines however are dependent on ambient hardness. Two
40 samples each for cadmium and chromium marginally exceeded respective CCME water
41 quality guidelines (less than 2 times guideline) when calculated for a Nelson River
42 hardness of 100 mg/L. For both metals, the SFE test results are well below the
43 calculated provincial guidelines (Manitoba Water Quality Standards, Objectives and
44 Guidelines) for protection of aquatic life based on observed hardness in the Nelson River
45 (AE SV, Table 2B-7). For measured hardness in the vicinity of the Project (Clark Lake to
46 Stephens Lake) ranging from about 103-114 mg/L as CaCO₃ (AE SV, Table 2-2), the
47 provincial guideline for cadmium is about 0.0015-0.0033 mg/L and for chromium about
48 0.05-0.12 mg/L. The potential for cadmium and chromium exceedances of ambient
49 CCME guidelines in the receiving environment is considered to be low and exceedances
50 of provincial guidelines would not be expected. Exceedances of CCME guidelines, where
51 they may occur, are likely to be confined to localized areas as dilution of seepage and
52 runoff in the receiving environment is expected to be greater than would be indicated
53 by the SFE test results.

54 Additional testing is not proposed based on the consideration of SFE test results in the
55 context of site-specific conditions, which indicate that the use of these granular
56 materials is unlikely to pose an environmental concern.

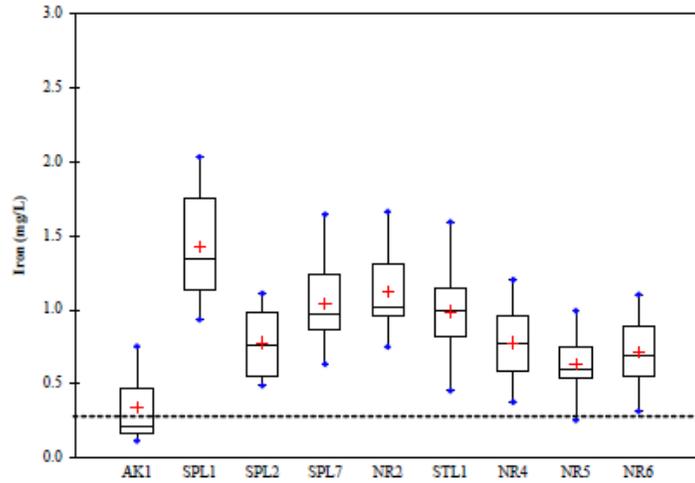


Figure 2H-10: Total iron box plots for data collected in the study area in the open water seasons 2001–2004. Data represent surface measurements. Dashed line indicates the Manitoba and Canadian Council of Ministers of the Environment water quality guideline for the protection of aquatic life and the aesthetic drinking water quality guideline

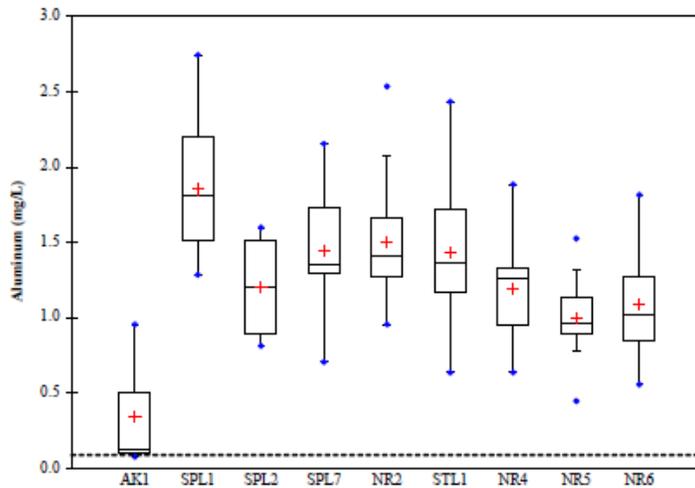


Figure 2H-11: Total aluminum box plots for data collected from the study area in the open water seasons 2001–2004. Data represent surface measurements. Dashed line indicates the Manitoba and Canadian Council of Ministers of the Environment water quality guideline for the protection of aquatic life

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Figure 1: Copy of Figures 2H-10 and 2H-11 from the Aquatic Environment Supporting Volume, Appendix 2H.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 5.4.1.1.6 Physiography; p. N/A**

3 **CEC Rd 1 CEC-0069b**

4 **QUESTION:**

5 Are there any alkali aggregate concerns with the bedrock to be excavated, crushed and
6 used as concrete aggregate? What testing will be done on the rock to confirm it is
7 satisfactory?

8 **RESPONSE:**

9 Fine concrete aggregate will be sourced from granular borrow areas. Coarse concrete
10 aggregate will be produced by crushing rock sourced from Gull Rapids. Gull Rapids has a
11 number of different types of rocks with varying alkali aggregate reactivity (AAR)
12 characteristics. AAR testing of material to be used as fine and coarse concrete aggregate
13 was conducted on samples obtained between 1988 and 2013 based on the following
14 two standard tests:

- 15 1. CSA A23.2-25A (Short Term Test) – This test provides a means of screening
16 aggregates for their potential reactivity by testing the material under aggressive
17 conditions promoting the reaction between the aggregate and the alkali
18 environment. This test can produce a false failing result (when compared to results
19 from CSA A23.2-14A), as there are factors other than the presence of deleteriously
20 reactive alkali aggregate that can contribute to the expansion of the mortar bar in
21 the aggressive test environments. This test suggests that when excessive expansion
22 develops, supplementary information should be sought to confirm that the
23 expansion is actually due to alkali reactivity. The results of this test can only be used
24 to determine if the aggregate is non-reactive, highly reactive, or extremely reactive.
25 There is no moderately reactive aggregate classification from this test.
- 26 2. CSA A23.2-14A (Long Term Test) – This test is used to develop further information
27 on the potential reactivity of aggregate. The test is conducted over a two year
28 period. This is the preferred test since it is more reliable and allows for a
29 classification of moderately reactive aggregate. If the results from this test indicate
30 a different reactivity level than CSA A23.2-25A, the CSA A23.2-14A results shall be
31 used.

32 Results of the testing indicate that the concrete aggregate is non-reactive to moderately
33 reactive. The use of moderately reactive aggregate is acceptable since it can be

34 mitigated with techniques described in CSA-23.2-27A¹⁸ which is planned for the Keeyask
35 Project. Potential methods to mitigate the detrimental effects of AAR include the use of
36 slag or fly ash. Testing requirements of CSA A223.2-28A¹⁹ will be used to determine
37 concrete mix design suitability. Portland cement replacement by approximately 50%
38 slag or 35% fly ash has been recommended by the code considering the level of
39 reactivity of the aggregate and the importance and service life of the structure. The use
40 of the moderately reactive aggregate and the concrete mix design will be evaluated
41 based on CSA requirements.

42 Note that consideration of the suitability of rock for the production of concrete is a
43 design consideration and not an environmental consideration. For this reason it is
44 beyond the scope of what is considered in the Physiography section of the Physical
45 Environment Supporting Volume.

¹⁸ CSA A23.2-27A is a standard practice to identify degree of alkali-reactivity of aggregates and to identify measures to avoid deleterious expansion in concrete. This standard practice provides requirements for the determination of the degree of alkali-aggregate reactivity of aggregates, the risk level associated with structure size and environment, the level of prevention related to service life requirements, and the determination of the appropriate preventative measures.

¹⁹ CSA A223.2-28A is a standard practice for laboratory testing to demonstrate the effectiveness of supplementary cementing materials and lithium-based admixtures to prevent alkali-silica reaction in concrete. This standard practice describes the procedures to be followed to demonstrate the effectiveness of supplementary cementing materials and lithium-based admixtures or combination thereof, in preventing excessive expansion caused by alkali-silica reaction. The supplementary cementing materials are as defined in CSA A3001.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 5.0 Physiography; PD SV; p. N/A**

3 **CEC Rd 1 CEC-0070**

4 **PREAMBLE:**

5 Section 5.2.4 of the Physiography chapter indicates that climate change was not
 6 considered in this portion of the assessment. Some stakeholders may be concerned that
 7 with a warmer environment over the long-term (as described in the climate scenarios
 8 identified in Chapter 2 Climate) dykes based on peatlands may be more susceptible to
 9 failure. It would appear that the answer to this is in the Project Description SV, Section
 10 2.3.7., which describes the construction of the North and South Dykes in a discontinuous
 11 permafrost region.

12 **QUESTION:**

13 Can MH provide an explanation of how the proposed construction method for the dykes
 14 on discontinuous permafrost accounts for the potential thawing?

15 **RESPONSE:**

16 Based on preliminary engineering studies the method of construction for a large
 17 majority of the dyke sections at Keeyask is to remove post glacial clays and glacial till
 18 layers encountered at the foundation level that contain visible ice lenses. This is
 19 intended to minimize settlement caused by thaw consolidation beneath the dykes. To
 20 accommodate the settlements associated with the thawing of the permafrost affected
 21 clays, a 1.2 m foundation settlement allowance has been used in the preliminary design
 22 of the granular dykes. The settlement allowance will be further reviewed and refined, if
 23 necessary, during final design.

24 Short sections (185 m total length) of the dykes will be granular dykes. These will be
 25 constructed in areas where permafrost affected overburden is relatively thick and it
 26 would be uneconomical to excavate completely. The design and construction method
 27 for granular dykes is based on previous experience in northern Manitoba and accounts
 28 for the potential thawing of the foundation soils. The following design features account
 29 for the permafrost foundation:

- 30 1. The granular dyke sections are designed as thawed embankments with a self-
 31 healing capability because it is assumed that the permafrost foundation will thaw
 32 during construction and/or during the life of the structure. Thawed embankments
 33 with a self-healing capability consist of semi-pervious granular core/zones. The
 34 granular materials are engineered such that the upstream portion of the central
 35 granular core will contain a higher content of fine granular materials. In addition,

- 36 the granular materials will accommodate differential foundation settlement which
37 will occur due to thaw consolidation of the permafrost affected foundation. A
38 fissure or crack that develops through the granular core due to the consolidation of
39 the thawing foundation will settle in on itself resulting in the self-healing capability.
- 40 2. The granular dyke sections will be constructed 1.2 m higher to accommodate the
41 settlement associated with the thawing of the permafrost affected foundation clays.
42 The granular fine material in the dyke is intended to limit the amount of seepage
43 through the dyke.
- 44 3. Construction of the granular dykes will begin in the winter and will involve the
45 stripping of the surficial organic cover. Vertical sand drains will then be installed
46 every 3 m on centre upstream of the center line of the dyke, and 5 m on center
47 downstream of the centerline of the dyke. The sand drains are designed to dissipate
48 the pore-water pressures in the foundation, increase the consolidation rates and
49 improve the embankment stability when the permafrost affected clays thaw. These
50 drains will extend for the entire width of the granular dyke foundations and the
51 drains will be drilled vertically to the base of the post glacial clays.
- 52 4. A layer of granular material will be placed over the surface of the excavation of the
53 sand drains to prevent thawing of the foundation prior to the completion of the
54 construction of the dyke in the summer season.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 5.4.1.1.3 Permanent Structures; p. 5-20**

3 **CEC Rd 1 CEC-0071**

4 **QUESTION:**

5 Section 5.4.1.1.3 indicates that at the dam joints and fissures will be sealed with grout.
6 The text indicates that "this will be a permanent alteration to the local geology",
7 however, no further details are provided. This is an area of discontinuous permafrost in
8 soil and bedrock. Fissures and joints may currently be ice filled and therefore not
9 available to be grouted initially. Construction of a large reservoir may lead to changes to
10 the depth of permafrost. With retreat of permafrost leakage of reservoir through rock
11 may occur potentially changing geotechnical stability at specific locations and
12 groundwater conditions. Further consideration of the influence of permafrost
13 preparation and bedrock sealing is required. Please explain.

14 **RESPONSE:**

15 Permanent alterations to the local geology will include cleaning of the rock surface,
16 pressure cleaning of surficial joints, cracks and features. Examples of permanent
17 alterations to rock features are provided below.

18 The preparation of the bedrock foundation will be limited to the foundations for the
19 impervious core sections of the North, Central and South Dams and the contact area
20 between the concrete and rock at the Powerhouse and Spillway structures. Of the total
21 project footprint, which is approximately 13,980 hectares, the bedrock foundation area
22 is a small proportion because it would encompass approximately 14 hectares. Of the
23 major and minor joint sets and geological features observed at Gull Rapids , it is
24 important to note that there has been no observation of permafrost affected bedrock
25 and that ice filled joints or frozen mineral deposits within the joints have not been
26 observed. However, should permafrost be present in the bedrock it is not anticipated to
27 be problematic for the design of the structures or for their intended function during
28 operation phase. The thawing of potentially frozen bedrock is not expected to impact
29 the stability of the structures.

30 For areas immediately upstream of the axis of the principal structures (including along
31 the alignment of the North and South Dykes), consideration was given to thawing of
32 permafrost resulting from the reservoir impoundment. Based on knowledge and
33 understanding of Keeyask and other hydroelectric projects in Northern Manitoba the
34 permafrost in the bedrock underlying the reservoir is not expected to be problematic.

35 The retreat of permafrost and the probability of leakage of the reservoir through rock (if
36 it were to occur) is not expected to change the geotechnical stability of the rock mass.

37 Details for foundation treatments and grouting have not been finalized because they are
38 site specific treatments that require geological mapping of the exposed and excavated
39 rock faces which will be completed during the construction phase. The following are
40 some of the bedrock foundation treatments that are expected:

- 41 · Remove loose materials and clean cavities, cracks and seams and then fill with slush
42 grout or dental concrete
- 43 · Remove bedrock overhangs by trimming rock or fill underneath with dental
44 concrete
- 45 · Remove points and promontories
- 46 · Fill bedrock depressions and cavities with dental concrete
- 47 · Installation of the grout curtain

48 **Definitions:**

49 **Slush Grout** - Slush Grout will be used to treat narrow surface cracks and surface
50 irregularities. Slush Grouting is the application of cement slurry to surface rock as a
51 means of filling narrow surface cracks and surface irregularities. The cement slurry will
52 consist of a neat cement grout (cement and water) or a sand-cement grout (sand,
53 cement and water). Generally the maximum particle size in the slush grout is smaller
54 than one third the dimension of the crack width. This will ensure adequate penetration
55 of the crack.

56 **Dental Concrete** – Dental concrete is the placement of a thick slab of concrete over
57 jagged rock surface or infilling holes, grooves extensive areas of vertical surfaces, and
58 saw teeth created by bedding planes, joints, and other irregularities such as previously
59 cleaned depressions, shear zones, large joints or buried channels. The cement type used
60 should be the same as used in structural concrete mix. The dental concrete may be
61 formed and used to fillet steep slopes and fill overhangs. Shaping the foundation with
62 dental concrete may be appropriate when the smoothing of irregularities requires
63 excessively large quantities of excavation, or when it requires blasting that may damage
64 the foundation.

65 **Protuberance or Protrusions (points and promitories)** - A protuberances are points of
66 bedrock that are projecting, usually tapering bedrock, or a sharp prominence over the
67 rock mass. A Protrusion is a prominent rock point that overlooks lower-lying bedrock .

68 **Grout Curtain** - Grout curtains are barriers that protect a dam from seepage and can be
69 used in initial construction or repair. Additionally, they can be used to strengthen
70 foundations and contain spills. A grout curtain usually consists of a row of vertically

- 71 drilled holes filled with pressurized grout. The holes are drilled in intervals and in such a
72 way that they cross each other, creating a curtain.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 5.4.1.1.4 Excavated Material Placement Areas; p. 5-21**

3 **CEC Rd 1 CEC-0072**

4 **QUESTION:**

5 Section 5.4.1.1.4 indicates that 40 million m³ of unclassified material is surplus for
 6 construction, some of which will be placed within reservoir area. This material seems
 7 susceptible to be washed away and become suspended sediment. What measure will be
 8 taken to minimize the erosion of this material? Would there be less environmental
 9 impact if this was placed outside of the reservoirs? Could this material be used to
 10 backfill borrow pits?

11 **RESPONSE:**

12 The total unclassified excavated materials are estimated to be in the order of
 13 4.2 million m³ and not 40 million m³ as stated in the question.

14 The excavated material placement areas (EMPAs) that would be located in the reservoir
 15 have been designed to prevent the material from being washed away because of the
 16 following measures:

- 17 1. Siting – The majority of EMPAs have been sited within back bay areas so that they
 18 are located away from the main flow of the river. There is generally little to no river
 19 flow in the back bay areas which minimizes the water velocities in these areas, thus
 20 reducing the potential to erode the material.
- 21 2. Elevation – The maximum elevations to which material can be placed in the EMPAs
 22 has been set to an elevation that minimizes the potential for erosion based on the
 23 estimated water velocities at each of the EMPAs. The maximum elevation of
 24 material placement varies among the EMPAs because the water velocity at each
 25 EMPA also varies. The contractor will be permitted to fill the EMPA to an elevation
 26 that cannot exceed the maximum permissible elevation. EMPAs may be filled to
 27 elevations lower than the maximum permissible elevation.

28 One option to prevent the erosion of the material placed in the reservoir is to cap the
 29 EMPA by placing granular or rock material over the finer material that would be
 30 susceptible to erosion however this would be costly. Based on the siting, the maximum
 31 permissible elevation to which EMPAs can be filled and the estimated flow velocities at
 32 the EMPAs, capping is not expected to be required to prevent the erosion of excavated
 33 materials placed in the reservoir.

34 With respect to environmental impacts the environmental impacts of 50 preliminary
35 EMPAs were assessed. All sites were ranked on the basis of least cost, construction
36 logistics and environmental impacts. Of the 50 preliminary EMPAs considered, 35
37 EMPAs were selected for use based on the highest ranking sites, which were ranked
38 highest to minimize the environmental impacts and maximize the environmental
39 opportunities, such as creating aquatic or terrestrial habitat that would be deemed as a
40 net benefit to the project. (i.e. creation of mineral soil shelves, capping peat that has a
41 resurfacing potential). The boundaries of some EMPAs were also adjusted and the
42 extent of some EMPAs were reduced to avoid impacting sensitive terrestrial habitats.
43 Section 6.12.3 of the Project Description Supporting Volume provides further details of
44 the assessment of alternatives for the EMPAs.

45 Some of the unclassified excavated material may be placed within Excavated Material
46 Placement Area (EMPA) D35(1)-E which is located within the limits of borrow area N-5,
47 which is presently a large island.. It is also noted that some of the unclassified excavated
48 materials will be used for construction where practical and provided that the material
49 meets the project specifications and requirements and are approved for use by the Site
50 Engineer.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. Map 5.4.1**

3 **CEC Rd 1 CEC-0073**

4 **QUESTION:**

5 What measures are to be undertaken in the "mitigation" areas? Or please refer us to
 6 volumes/chapters/sections where this is discussed? A "pink" area in the centre of the
 7 map near the word "river" is identified as a road corridor. Confirmation is requested
 8 that this is correct. Potential dewatered areas are identified in white. What mitigation
 9 measures are to be undertaken in these areas? Or please refer us to
 10 volumes/chapters/sections where this is discussed?

11 **RESPONSE:**

- 12 1. The mitigation areas shown in Map 5.4.1 Project Footprint Construction Phase – Site
 13 Level, refer to the environmental mitigation and compensation measures described
 14 in the Project Description Supporting Volume Section 2.5.1.2 Biophysical and Socio-
 15 Economic Mitigation Measures.
- 16 2. The pink area in the center of Map 5.4.1 Project Footprint Construction Phase – Site
 17 Level is a road corridor for the access road to the construction phase boat launch.
 18 The corridor was established to provide the contractor flexibility to locate the road
 19 at any location within the corridor. The road would not occupy the entire road
 20 corridor. The location of the road is dependent on the location of the construction
 21 phase boat launch which also had not been finalized at the time when the Response
 22 to EIS Guidelines was submitted.
- 23 3. With regard to the dewatered areas identified in white, the Aquatic Environment
 24 Supporting Volume Appendix 1A Section 1A.3.2.4 describes one potential
 25 compensation measure that would involve the development of a series of pools,
 26 small dams and fishways to convert the dewatered area into fish habitat. This would
 27 substantially reduce the area that that would be permanently dewatered. This
 28 measure is also described in the Project Description Supporting Volume (Table 6- 3
 29 Summary Table –Aquatic Environment – Alternative Means and Mitigation
 30 Measures – Downstream of Generating Station). However, this is one of multiple
 31 options being considered. Whether or not this particular measure is implemented
 32 will depend on discussions with the Department of Fisheries and Oceans and
 33 Manitoba Conservation and Water Stewardship in terms of the suitability of this
 34 mitigation measure for meeting fish habitat compensation objectives. Another
 35 option for the dewatered area could involve the development of wetland habitat
 36 involving placement of mineral soils in this area and planting vegetation.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: N/A; p. Map 5.4.2**

3 **CEC Rd 1 CEC-0074a**

4 **QUESTION:**

5 A topographic map with contours at close intervals would be of assistance to the
6 physiography section.

7 **RESPONSE:**

8 Topographic contour maps are provided as an attachment to the interrogatory
9 responses.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. Map 5.4.2**

3 **CEC Rd 1 CEC-0074b**

4 **QUESTION:**

5 Bedrock geology and structural geology maps of the study area would be of assistance.

6 **RESPONSE:**

7 Please note that a request for similar information from Natural Resources Canada was
 8 addressed in the first and second rounds of information requests in the TAC/Public
 9 review process (information request NRCAN-0016).

10 **The following is the response to TAC/Public Round 1, NRCAN-0016:**

11 Following are the requested definitions:

- 12 · Greywacke gneiss: a foliated or banded metamorphic rock that is the result of the
 13 metamorphic recrystallization of greywacke.
- 14 · Greywacke: a clay rich, poorly sorted sandstone. Sand grains are commonly quartz,
 15 feldspar and volcanic rock fragments, and are usually angular to subangular.
- 16 · Metagreywacke; interlayered pelite (metamorphosed mudstone) and psammite
 17 (metamorphosed siltstone/sandstone), medium to dark grey, Fe-rich, composed of
 18 quartz+biotite+/-feldspar+/-garnet+/-amphibolite+/-staurolite+/-cordierite; locally
 19 arkosic with calc-silicate layers; contains up to 80% granitoid injection pegmatite
 20 (unit 4).
- 21 · Unit 2a Banded oxide-, sulphide- and silicate-facies iron formation; composed of
 22 quartz-chert-magnetite+/-hematite+/-garnet+/-biotite+/-amphibolite+/-sulphide;
 23 form discontinuous boudinaged layers in unit 2 metasedimentary rocks.

24 **REFERENCES:**

25 Bohm, C.O., Bowerman, M.S. and Downey, M.W. 2006: Bedrock geology of the geology
 26 of the Gull Rapids area, Manitoba (part of NTS 54D6); Manitoba Science,
 27 Technology, Energy and Mines, Manitoba Geological Survey, Open File Report
 28 OF2006-32, digital map on DVD.

29 **Geological Overview**

30 The Keeyask project area is underlain by Precambrian crystalline bedrock of the
 31 Canadian Shield. It is located at the northern margin of the Archean Superior Geological
 32 Province; proximal to the boundary with the adjacent Proterozoic Churchill Geological
 33 Province to the north. The Churchill-Superior boundary is a poorly defined zone of

34 cataclastic rocks which resulted from the collision of two tectonic plates. Based on field
 35 investigations in 2003 and 2004 the understanding is that the Churchill–Superior
 36 boundary occurs to the east of the Keeyask site.

37 Regional mapping by the Manitoba Geological Survey indicates that the rocks forming
 38 the Superior Geological Province comprise a wide variety of metasedimentary,
 39 metavolcanic, intrusive rocks which trend east-west and are of Archean age. The rocks
 40 forming the Churchill Geological Province in the area proximal to the Keeyask site
 41 comprise intrusive and metasedimentary rocks of Proterozoic age. The contact between
 42 the two structural provinces occurs close to the Keeyask project area.

43 Sedimentary rocks of Paleozoic age cover the Precambrian bedrock to the east and
 44 southeast of the Keeyask site.

45 The area has undergone multiple glaciations during the Pleistocene Era, i.e., last two
 46 million years. The present topography is largely the result of the latest Wisconsinan
 47 glaciation. The area is largely covered by overburden consisting of glacial till or other
 48 glacial related deposits.

49 Recent mapping by Manitoba Geological Survey presents similar information as previous
 50 mapping , but with more detail. The major subdivisions are also shown, including the
 51 Superior – Assen Lake Boundary Zone which is the main contact zone between the
 52 Churchill Geological Province to the north and the Superior Geological Province to the
 53 south. The Keeyask site is located proximal to the northern fault contact of this zone.

54 **Detailed Description of Local Bedrock**

55 The Keeyask site is located at the margin of the Superior Geological Province near the
 56 Churchill–Superior boundary. The rocks that occur at Keeyask are significantly different
 57 compared to the dominantly meta-igneous amphibolite and granulite rocks of the Split
 58 Lake Block of the Superior Geological Province to the west and the Kiskeynew type
 59 metasedimentary rocks of the Churchill Geological Province to the east.

60 The Keeyask project area is underlain by a sequence of rocks consisting primarily of
 61 Archean supracrustal and intrusive rocks. The bedrock at the Keeyask site has
 62 undergone polyphase metamorphism and deformation. The supracrustal rock are
 63 identified as Archean amphibolites-grade rocks consisting of amphibolite (metabasalt),
 64 and Fe-rich metagreywacke, with interlayered banded oxide-, sulphide and silicate-
 65 facies iron formation. Immediately to the west of the Keeyask site is a sequence of
 66 granodiorite gneisses. Leucocratic felsic injections intrude both the supracrustal and
 67 granodiorite rocks, and major east-trending Paleoproterozoic mafic dikes crosscut all
 68 rock types.

69 At the Keeyask site, the bedrock is predominantly metagreywacke. The bedrock in
70 the powerhouse area is predominantly amphibolite.

71 **Local bedrock Conditions Observed During Exploration Programs**

- 72 · Bedrock in the Keeyask GS area is typically fresh, strong to very strong with
73 moderately spaced jointing, averaging approximately 300 mm. Most of the joints
74 appear tight with little or no alteration.
- 75 · Typically the joints in the bedrock in the powerhouse and spillway areas are
76 moderately spaced, tight, with little or no alteration. Those open joints which are
77 present are typically widely to very widely spaced, slight to faintly altered and may
78 be infilled with clay. Carbonate, chlorite and limonite coatings were frequently
79 observed on joint surfaces.
- 80 · Open joints are typically widely to very widely spaced, slightly to faintly altered and
81 may be infilled with clay. Carbonate and chlorite coatings were frequently observed
82 on joint surfaces. Generally the open joints are subhorizontal and not confined to a
83 particular joint set.
- 84 · Within the powerhouse and spillway areas proper, a total of 50 joints were noted to
85 be slickensided. Based on the information available, it appears that the movements
86 which produced these slickensides are not confined to a particular joint set.
- 87 · Within the powerhouse and spillway areas proper, a total of 41 joints were noted as
88 having clay or kaolinite coatings. Based on the information available, it appears that
89 the clay coatings are not confined to a particular joint set.
- 90 · Core losses during drilling were generally less than 70 mm at any single location
91 within drill holes and were associated with drill action and/or closely spaced joints.
- 92 · The rock quality of the bedrock is considered to be good to excellent as indicated by
93 an average RQD value of 90%. Local zones of low RQD are associated with narrow
94 ones of closely spaced joints.
- 95 · The average Lugeon (Lu) value determined by the Water Pressure Tests (WPT) is
96 generally below 3, indicating that the bedrock has a low permeability. Local zones
97 of medium permeability, generally with Lugeon values less than 20 Lu, are
98 associated with open or partly open joints. Testing results suggests tighter bedrock
99 conditions exist at depth.
- 100 · Rock Mass Rating (RMR) and the (GSI) values were determined to assist with rock
101 classification. The bedrock encountered at Gull Rapids area is classified as fair to
102 good quality rock.
- 103 · Fracture/shear zones were observed within the bedrock outcrops to the south and
104 west of the Powerhouse area. These zones are generally less than 0.5 m in width,
105 inactive, and are typically healed or recrystallized and strong.

106 **Powerhouse Area**

- 107 · The bedrock lithology encountered in the drill holes located in the powerhouse area
 108 consist of greywacke gneiss, amphibolite, granitic intrusions, and diabase dykes,
 109 which is consistent with the regional bedrock geological interpretation.
- 110 · In the powerhouse area, four major and two minor joint sets were identified from a
 111 total of 708 oriented core measurements, not including discontinuities described as
 112 healed. Jointing trends are summarized in the Table below.
- 113 · Within the powerhouse area, the majority of the joint sets will dip away from the
 114 excavations.

Keyask GS - Stage IV Investigation Program, Axis GR-4 - Summary of Joint Trend Measurements in Powerhouse Area

Powerhouse Joint Set	Orientation			Description
	Strike (deg)	Dip ⁽¹⁾ (deg)	Dip Direction (deg)	
J1	198	1	288	Major, subhorizontal joint set
J2	320	30	50	Major
J3	60	23	150	Major
J4	237	25	327	Major
J5	335	80	65	Minor, subvertical joint set
J6	65	53	155	Minor

Note:

(1) Dip from horizontal. Dip direction is 90 deg right of the strike.

115 **Spillway Area**

- 116 · The bedrock lithology encountered in the drill holes located in the spillway area
 117 consists of greywacke gneiss, iron formation, granitic intrusions, and diabase dykes,
 118 which is consistent with the regional bedrock geological interpretation.
- 119 · In the spillway area, two major and two minor joint sets were identified from a total
 120 of 364 oriented core measurements, not including discontinuities described as
 121 healed. Jointing trends are summarized in the Table below.
- 122 · Within the spillway area, the majority of the joint sets will dip away from the
 123 excavations.

Keyyask GS – Stage IV Studies, Axis GR-4 - Summary of Joint Trend Measurements in Spillway Area

Spillway Joint Set	Orientation			Description
	Strike (deg)	Dip ⁽¹⁾ (deg)	Dip Direction (deg)	
J1	25	32	115	Major
J2	126	30	216	Major
J3	210	25	300	Minor
J4	103	72	193	Minor

Note:
(1) Dip from horizontal. Dip direction is 90 deg right of the strike.

124 **The following is the response to TAC/Public Round 2 NRCAN-0016:**

125 The following reports, which were given to NRCAN as part of the TAC Public round 2,
126 provide additional information about geologic conditions in the Keyyask study area. The
127 DVD accompanying the responses to CEC round 1 interrogatories includes digital copies
128 of these reports.

129 **Keyyask Stage IV Engineering Design Memoranda**

130 • **GN-1.5.4 Rev0 - Bedrock Geology – Review of Bedrock Conditions in the**
131 **Powerhouse Area by KGS/Acres (2009)**

132 This memorandum discusses the preliminary results of the 2003 powerhouse
133 investigations and the overall interpretation of the findings of all the investigations
134 undertaken within this area. This review includes the following results:

- 135 ○ general bedrock lithology
- 136 ○ core losses/recovery
- 137 ○ Rock Quality Designation (RQD) and rock mass characteristics
- 138 ○ Water Pressure Testing (WPT)
- 139 ○ dominant joint orientation trends
- 140 ○ Rock Mass Rating (RMR) and Geological Strength Index (GSI).

141 • **GN-1.5.5 Rev0 - Bedrock Geology – Review of Bedrock Conditions in the Spillway**
142 **Area by KGS/Acres (2009)**

143 This memorandum discusses the preliminary results of the 2003 spillway
144 investigations and the overall interpretation of the findings of all the investigations
145 undertaken within this area. This review includes the following results:

- 146 ○ general bedrock lithology

- 147 ○ core losses/recovery
- 148 ○ Rock Quality Designation (RQD) and rock mass characteristics
- 149 ○ Water Pressure Testing (WPT)
- 150 ○ dominant joint orientation trends

151 Rock Mass Rating (RMR) and Geological Strength Index (GSI).

152 Manitoba Geological Survey Reports

- 153 · **Open File Report OF2006-32, Bedrock Geology of the Gull Rapids Area, Manitoba**
- 154 **(part of NTS 54D6) by C.O. Bohm, M.S. Bowerman and M.W. Downey (2006)**

155 **Reproduced from Government of Manitoba with permission from Manitoba**
 156 **Innovation, Energy and Mines. It is strictly forbidden to reproduce, adapt, or**
 157 **distribute this document without prior written consent from the Author(s).**

158 The document aims to:

- 159 ○ provide part of a new framework for the geology of the northern margin of the
- 160 Superior Province in Manitoba;
- 161 ○ improve the understanding of an economically important but insufficiently
- 162 studied area between the exposed portions of the Thompson Nickel and Fox
- 163 River belts; and
- 164 ○ provide Manitoba Hydro with detailed geological information necessary for the
- 165 bedrock assessment of the Keeyask hydroelectric dam site.

- 166 · **GS-13 Bedrock mapping in the Gull Rapids area, northern Manitoba (NTS 54D6) by**
- 167 **C.O. Böhm, M.S. Bowerman¹ and M.W. Downey (2006).**

168 In the summer of 2003, the Manitoba Geological Survey, in collaboration with the
 169 Universities of Alberta and Waterloo, started a three-year integrated bedrock-
 170 mapping program with the aim of documenting the geology in great detail, to
 171 unravel the nature and age of the rocks and to resolve the timing and kinematics of
 172 structures at Gull Rapids. Mapping at 1:1000 scale, undertaken this summer,
 173 identified an Archean amphibolite-facies supracrustal assemblage consisting of
 174 amphibolite (metabasalt) and Fe-rich metagreywacke, with interlayered banded
 175 oxide-, sulphide- and silicate-facies iron formation

- 176 · **GS-15 Split Lake Block revisited: new geological constraints from the Birthday to**
- 177 **Gull rapids corridor of the lower Nelson River (NTS 54D5 and 6) by R.P. Hartlaub,**
- 178 **L.M. Heaman, C.O. Böhm and M.T. Corkery (2003).**

179 This report presents the preliminary results from a two-week field study of the
 180 Birthday to Gull rapids section of the lower Nelson River and marks the beginning of

181 a new multiyear project to examine the age and tectonic setting of crustal domains
182 along the northwest margin of the Superior Province.

183 · **GS-08 Structural geology of the Mystery-Apussigamasi lakes area, Manitoba (parts**
184 **of NTS 63P13 and 14) by Y.D. Kuiper¹, C.O. Böhm and S. Lin (2005)**

185 This report summarizes new structural data for the Mystery-Apussigamasi lakes
186 area. A major shear zone, trending ~030°, was found along Mystery Lake. It shows
187 east-southeast-side-up sinistral movement and it crosscuts folds in the hostrocks to
188 the east and west. A minor northwest-side-up dextral shear/fault zone exists along
189 the northeastern part of Apussigamasi Lake and the southwestern part of the
190 Burntwood River

191 · **GS-07 Northwestern Superior craton margin, Manitoba: an overview of Archean**
192 **and Proterozoic episodes of crustal growth, erosion and orogenesis (parts of NTS**
193 **54D and 64A) by R.P. Hartlaub¹, C.O. Böhm, L.M. Heaman, and A. Simonetti**
194 **(2005).**

195 This paper presents a summary of results from three years of mapping and
196 geochronology along the northwestern Superior Boundary Zone between
197 Paleoproterozoic rocks of the Trans-Hudson Orogen and Archean rocks of the
198 Superior craton

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 5.0 Physiography; p. N/A**

3 **CEC Rd 1 CEC-0075a**

4 **QUESTION:**

5 Very little information is provided regarding the bedrock geology and the structural
6 geology within both the regional and local study area. Additional information or the
7 original reports are requested.

8 **RESPONSE:**

9 Please refer to the response to CEC Rd 1 CEC-0074b, in which the same information was
10 requested.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 5.0 Physiography; p. N/A**

3 **CEC Rd 1 CEC-0075b**

4 **QUESTION:**

5 Reference is made to thermo-karst features in bogs. Further information is requested
 6 regarding the size and frequency of these features and their significance to the site.

7 **RESPONSE:**

8 Thermokarst features refer to landforms associated with peatlands containing thick
 9 ground ice, where melting ice has produced water-filled sinkholes called collapse scars.
 10 These features are dynamic because ground ice melts and forms in response to a
 11 number of factors such as wildfires, changing vegetation cover and climate.

12 Collapse scars in the project region are represented by several of the peatland types in
 13 the ecosite mapping (see Table 2B-3 in Appendix 2B of the TE SV for mapping criteria).
 14 Collapse scars larger than 400 m² were mapped as the collapse scar fen or collapse scar
 15 bog ecosite types. Smaller collapse scars were included in the peat plateau bog/ collapse
 16 scar mosaic and blanket bog/ collapse scar mosaic ecosite types. Peat plateau bogs also
 17 represent potential future locations for collapse scars as ground ice melts, although
 18 some of this area will simply subside over large areas rather than form collapse scars.
 19 Peat plateau bogs undergoing ground ice melting are classified as "peat plateau bog
 20 transitional stage" in the ecosite mapping.

21 Areas for each of the ecosite types that represent collapse scars, or peatland types that
 22 may produce collapse scars, are provided for Study Zone 4 in the TE SV Section 2.9.3.2,
 23 Table 2-49 (p. 2-193) (terrestrial study zones are shown on Map 1-1 of the TE SV). The
 24 distribution and frequency of these peatland types is shown in Map 5.3-6 of the PE SV.
 25 The total area of these ecosite types is approximately 26,900 ha, or 16% of the Study
 26 Zone 4 land area. Mapped collapse scar fens and bogs account for 249 ha of this total
 27 area.

28 Regarding their significance to the site, collapse scars have not been identified as a
 29 priority habitat type. The Project effects on collapse scars and other ecosite types are
 30 discussed in the TE SV (Sec. 2). To the extent that Project effects on collapse scars are
 31 relevant, they are considered in conjunction with other Project impacts to identify the
 32 significance of Project effects on terrestrial VECs. The terrestrial assessments did not
 33 identify any significant residual effects of the Project on terrestrial VECs. Collapse scars,
 34 and the ground ice peatlands where they form, are gradually disappearing as an ongoing

35 response to a climate warming that occurred approximately 150 years ago (PE SV
36 Section 5.3.7.1, p. 5-15).

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 5.4.1.1.5 Local Borrow Material Resources; p. 5-21**

3 **CEC Rd 1 CEC-0076**

4 **QUESTION:**

5 With respect to local borrow resources:

- 6 1. Will some stockpiles of granular material be set aside for future use so that no
7 additional borrow pits will be required, at least in the near future?
- 8 2. Will there be in place a monitoring system so that the contractor does not open
9 more borrow pits and areas than is necessary?
- 10 3. Are any special measures to be taken to rehabilitate future islands (which were
11 lands subject to borrow excavation) which may be subject to different soil,
12 groundwater and permafrost conditions than the general reservoir shoreline?
- 13 4. Will borrow pit excavation depths take into consideration future changes to
14 groundwater levels following reservoir filling?
- 15 5. Some of the proposed borrow pit locations are on future islands. Will exhausted
16 granular borrow pits be used to dispose of excavated unsuitable fill (Map 5.4.1.1)?

17 **RESPONSE:**

- 18 1. *Will some stockpiles of granular material be set aside for future use so that no*
19 *additional borrow pits will be required, at least in the near future?*

20 Some granular material will be stockpiled for use during the operation phase. Some
21 granular borrow sources that will be used during the construction phase will not be
22 closed and decommissioned and will remain available for use during the operation
23 phase.

- 24 2. *Will there be in place a monitoring system so that the contractor does not open*
25 *more borrow pits and areas than is necessary?*

26 As described in the Keeyask EIS PD SV Section 3.3.2 *"the decision with respect to the*
27 *selection and development of borrow sites and quarries will be the responsibility of the*
28 *contractors, subject to appropriate approvals and the Environmental Protection Plan".*

- 29 3. *Are any special measures to be taken to rehabilitate future islands (which were lands*
30 *subject to borrow excavation) which may be subject to different soil, groundwater*
31 *and permafrost conditions than the general reservoir shoreline?*

32 There are no special measures to rehabilitate borrow deposits located on islands.

33 4. *Will borrow pit excavation depths take into consideration future changes to*
34 *groundwater levels following reservoir filling?*

35 Borrow deposits for the project are located both inside the dyke lines and outside the
36 dyke lines. The borrow pits situated inside the dyke lines fall into two categories; those
37 that will eventually be inundated (Q-7, Q-8 and most of S-5 and S-18) and those that are
38 located in areas which will become islands as the reservoir is impounded (N-6 and N-21).
39 For borrow areas that will eventually be inundated, groundwater levels will not be an
40 issue in planning for their development. For the borrow deposits within areas that will
41 become islands, limitations will be placed on the depth of excavation in consultation
42 with the contractor once their material utilization plan has been submitted for review.

43 With the exception of borrow S17a, all other borrow deposits located outside of the
44 dyke lines are situated well away from the areas where there are effects of the reservoir
45 impoundment on groundwater. These borrows are not expected to be impacted by post
46 project groundwater levels in their immediate vicinity. Borrow S17a may experience
47 localized changes to groundwater because of the south dyke. The potential future
48 groundwater level increases and subsequent impacts in the vicinity of this borrow area,
49 arising from the reservoir impoundment, will be taken into consideration as the
50 contractor's material utilization and borrow area de-commissioning plans are being
51 developed and approved.

52 5. *Some of the proposed borrow pit locations are on future islands. Will exhausted*
53 *granular borrow pits be used to dispose of excavated unsuitable fill (Map 5.4.1.1)?*

54 Some of the unclassified excavated material may be placed within Excavated Material
55 Placement Area (EMPA) D35(1)-E which is located within the limits of borrow area N-5,
56 which is presently a large island. All of the EMPAs will be made available for the
57 contractor to determine which EMPAs they will use and the extent to which they will be
58 used. No other EMPAs are located on existing or future islands or within other borrow
59 areas.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: N/A; p. Map 5.3.7**

3 **CEC Rd 1 CEC-0077**

4 **QUESTION:**

5 What will the influence of reservoir flooding and associated permafrost melting be on:

- 6 · Slope stability at drumlins, future island or shoreline areas with steeper slopes?
 7 · How will earth dams and dykes perform after reservoir flooding influences
 8 underlying permafrost?
 9 · What will prevent significant settlement/consolidation of dykes, roads and similar
 10 areas due to the above influences?

11 **RESPONSE:**

- 12 · *Slope stability at drumlins, future island or shoreline areas with steeper slopes?*

13 Steeper shorelines in the study area are generally associated with drumlins and
 14 drumlinoid landforms that are characterized by dense mineral material (primarily glacial
 15 till) where permafrost may or may not be present. Where permafrost is present in these
 16 soils, it is typically ice-poor in that that free ice is not present (e.g., lacks lenses of solid
 17 ice). Because the material forming drumlins is very dense and ice-poor, thawing is not
 18 expected to substantially affect its stability. The potential presence and thawing of
 19 permafrost is one of a number of factors influencing erosion in steeper slopes. This is
 20 factored into the assessment of shoreline erosion through the development of the
 21 shoreline erosion model based on the study of proxy sites in Stephens Lake, as noted in
 22 the following text from the Shoreline Erosion section of the Physical Environment
 23 Supporting Volume:

24 "A number of shoreline sites in Stephens Lake were selected to develop calibration data
 25 for the mineral erosion model. In particular, information on erodibility of mineral shore
 26 materials and nearshore and bank slopes that are likely to develop along shorelines was
 27 gathered. Sites were selected with a range of wave energy, shoreline geometry and
 28 bank materials that are representative of conditions and materials likely to be
 29 encountered in the proposed Keeyask reservoir. Proxy sites in Stephens Lake include
 30 sites where the mineral materials are affected by permafrost. Therefore, data from
 31 these sites incorporate the effects of permafrost on the erodibility of shoreline
 32 materials." (Sec. 6.2.1.5.1)

- 33 · *How will earth dams and dykes perform after reservoir flooding influences*
 34 *underlying permafrost?*

35 The impervious core of the earthfill dams will be founded on bedrock. The impact of
36 permafrost affected bedrock or thawing bedrock is provided in CEC-IR-071. The design
37 and construction approach for the dykes to account for the influence of permafrost
38 affected foundation soils is provided in CEC-IR-070.

39 • *What will prevent significant settlement/consolidation of dykes, roads and similar*
40 *areas due to the above influences?*

41 The design and construction approach for the dykes and the influence of permafrost
42 affected zones is provided in the response to CEC-IR-070. The Project Description
43 Supporting Volume Section 3.3.5 indicates that the south access road traverses an area
44 of discontinuous permafrost, soils affected by permafrost which will likely be
45 encountered sporadically throughout the length of the south access road. The south
46 access road is being designed according to Manitoba Infrastructure and Transportation
47 (MIT) Geometric Design Criteria for Secondary Arterial Roadways. The road will be
48 constructed according to the latest revision of the Manitoba Infrastructure and
49 Transportation (MIT) Standard Construction Specifications for Grading and Surfacing
50 Works. The roadbed within areas of discontinuous permafrost will be constructed by
51 placing a layer of geotextile material on top of the unstripped peat and then placing
52 granular fill material on top. To mitigate the anticipated subsidence (settlement) of
53 these sections of the road, additional granular fill will be placed as required during
54 construction and operations.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Project Effects, Mitigation and**
3 **Monitoring; p. N/A**

4 **CEC Rd 1 CEC-0078**

5 **QUESTION:**

6 Upon completion of the project an additional 5.88 km² of land with groundwater at
7 surface will be generated. What environmental issues are associated with this new
8 area? How susceptible is this new area to erosion?

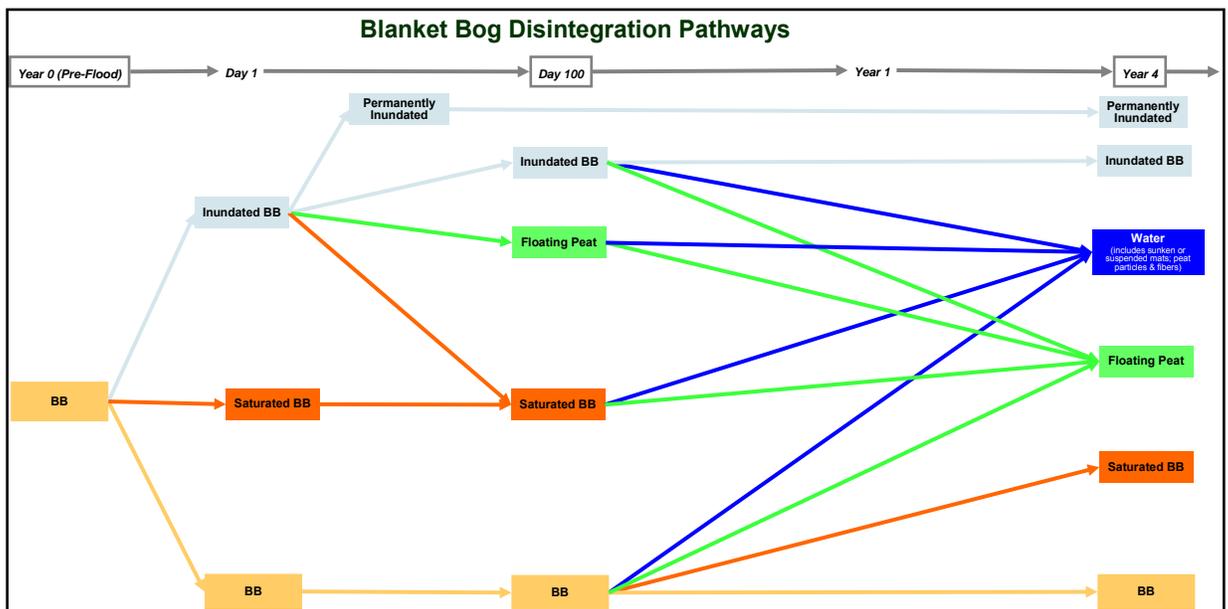
9 **RESPONSE:**

10 As a clarification to what is mentioned in the question, it is noted that the 5.88 km²
11 referenced above represents the difference between the post-Project (10.8 km²) and
12 existing environment (5.0 km²) areas with groundwater at surface. However, because
13 the existing areas will be flooded, the post-Project area represents new areas affected
14 by groundwater at the surface, rather than an addition of 5.8 km² to the 5.8 km² that is
15 present in the existing environment.

16 The groundwater model for the Keeyask project is a regional model that was primarily
17 developed to support the overall assessment of the potential Project effects on the
18 terrestrial environment. The primary effect of concern is that raising groundwater level
19 into the root zone could result in vegetation and habitat changes in terrestrial areas
20 around the reservoir shoreline, which may then affect valued environmental
21 components assessed in the terrestrial environment section of the EIS. The Terrestrial
22 Environment Supporting Volume discusses Project effects on the terrestrial
23 environment, including those that may result due to groundwater changes. Please see
24 Terrestrial Environment Supporting Volume Section 2.3.6.3, which explains how Project-
25 related groundwater changes were incorporated into the terrestrial habitat predictions.
26 These predictions were then considered as a pathway for Project effects on the VECs.

27 The shoreline erosion section of the PE SV (Section 6) discusses development of the
28 erosion and peatland disintegration models. The shoreline erosion section of the PE SV
29 (Section 6) discusses development of the erosion and peatland disintegration models.
30 For the erosion of mineral shorelines, the effect of increased groundwater would be
31 relatively small due to the low erodibility of the mineral material, which is accounted for
32 through the erodibility coefficients used in the mineral erosion model. These
33 coefficients are based on an assessment of historic erosion in proxy areas in Stephens
34 Lake, immediately downstream of Gull Rapids, which is the reservoir formed more than
35 30 years ago for the Kettle Generating station.

36 Saturation of peatlands is an important factor for the peatland disintegration modeling
 37 as the peat may be more susceptible to erosion, although other factors such as waves
 38 are also important. Pathways for groundwater effects are captured in several ways. The
 39 pathway of Project effects from an unaffected to a disintegrated peatland includes a
 40 “saturated” state, along with flooded, floating and unaffected states as shown in the
 41 example pathway below (PE SV, Figure 6A.1-1). The shoreline erosion and peatland
 42 disintegration modeling therefore incorporates potential effects of changes in
 43 groundwater. On the peat plateau bog disintegration pathway, massive ground ice is an
 44 important control on the rate of shoreline erosion.



45 (PE SV, Section 6) Figure 6A.1-1: Schematic Peatland Disintegration Pathway Model Derived
 46 from Proxy Area Data
 47

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 8.0 Groundwater, Data and Information Sources; Page**
 3 **No.: N/A**

4 **CEC Rd 1 CEC-0079**

5 **QUESTION:**

6 It is indicated that field groundwater data from data loggers deployed in 8 groundwater
 7 wells within the study area, in 2007 and 2008, was used in the analyses. Given the 65 km
 8 length of the groundwater study area a rationale is requested to justify that the 8
 9 groundwater wells provide sufficient data for the groundwater impact study. It is noted
 10 that some monitoring locations were too far from the river. Was there sufficient and
 11 meaningful data to permit representative modeling of the groundwater changes?
 12 Aquifer parameters were determined from a small number of falling head and packer
 13 tests. Some wells were completed in 1999 and 2003. Four wells were installed and
 14 tested in 2008. Given the limited aquifer data, has a sensitivity analyses been carried out
 15 to assess the influence of this limited data set on groundwater predictions?

16 **RESPONSE:**

17 With respect to the question regarding sensitivity analysis, please refer to the response
 18 for CEC Rd 1 CEC-0083, which addresses a similar inquiry.

19 The response to an information request in the Requests for Additional Information from
 20 TAC Public Rd 1 (see NRCan-0004) discusses consideration of the number of monitoring
 21 wells and additional information used to develop the regional groundwater model. For
 22 convenience, the response is copied below:

23 While a limited number of monitoring wells were used in the groundwater assessment,
 24 the information obtained is considered sufficient and meaningful to fulfill the intended
 25 purpose and level of detail for which the groundwater assessment was performed. The
 26 assessment is based on a substantial amount of information in addition to the data from
 27 the eight monitoring wells drilled on site.

28 The groundwater model for the Keeyask project is a regional model that was primarily
 29 developed to support an overall assessment of the potential Project effects on
 30 terrestrial valued ecosystem components (VECs). The groundwater study area
 31 considered in the model is extensive, covering approximately 565 km² (Physical
 32 Environment Supporting Volume, Section 8.2.2 and Map 8.2-1), which is about 20%
 33 larger than the area of the City of Winnipeg (about 464 km²). Because of the large size of
 34 the model area, it is not reasonably practical to develop the model to a level of detail

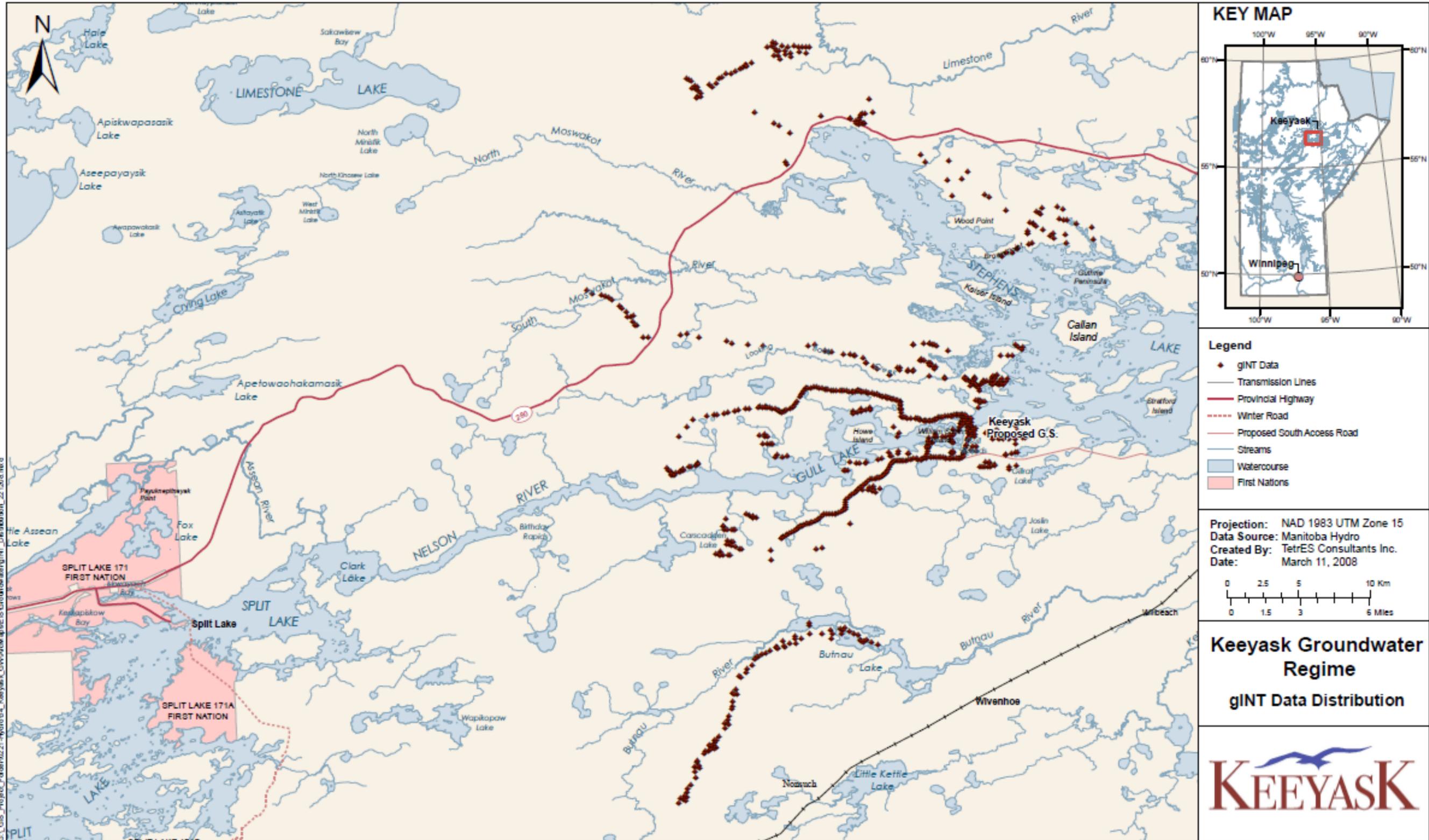
35 that might be used in a more typical assessment for projects that, relatively speaking,
 36 affect a much smaller area (e.g., sewage lagoon). Rather, the approach taken was to
 37 develop an understanding of the general groundwater regime in the study area. In
 38 addition to the eight monitoring wells referenced, the model drew upon multiple
 39 sources of information to characterize the study area for modeling purposes including:

- 40 • stratigraphy/geology from more than 850 boreholes drilled for various engineering
 41 studies across and beyond the groundwater study area (Figure 1);
- 42 • data from over 500 soil sampling locations (from terrestrial environment studies)
 43 along current and future shorelines and within future flooded areas, which
 44 identified surficial soil layers, and at most locations identified the depth to mineral
 45 material such as till or bedrock (Figure 2);
- 46 • surface terrain classifications which, in conjunction with data from the soil sampling
 47 studies, can provide an estimate of depth to mineral material in areas not sampled
 48 (Figure 3);
- 49 • shoreline material classifications, which provide an indication of material type at the
 50 existing shoreline boundary (Figure 4);
- 51 • topography from a digital terrain model based on various surface elevation data sets
 52 extending beyond the groundwater study area (Figure 5);
- 53 • water level time series data at 23 sites along the Nelson River under different flow
 54 conditions (Figure 6);
- 55 • water level time series data from eight monitoring wells (Figure 6, 'diver' locations)
 56 and 12 surface water locations (Figure 6, 'hobo' locations);
- 57 • information from geotechnical studies (see NRCan-0011);
- 58 • bathymetry of the river in the study reach; and
- 59 • environmental data including precipitation.

60 While the monitoring wells do not extend across the breadth of the study area, they are
 61 located in areas that are well characterized with respect to surficial soils and subsurface
 62 geology. Monitoring results from these wells were used to calibrate the model (see also
 63 NRCan-0013), which provides confidence that the groundwater characteristics are being
 64 reasonably reproduced for surface/subsurface materials that are generally
 65 representative of those within the groundwater study area. The model was peer
 66 reviewed by two independent, outside parties who concluded it was appropriately
 67 constructed as a regional model and suitable for the intended use.

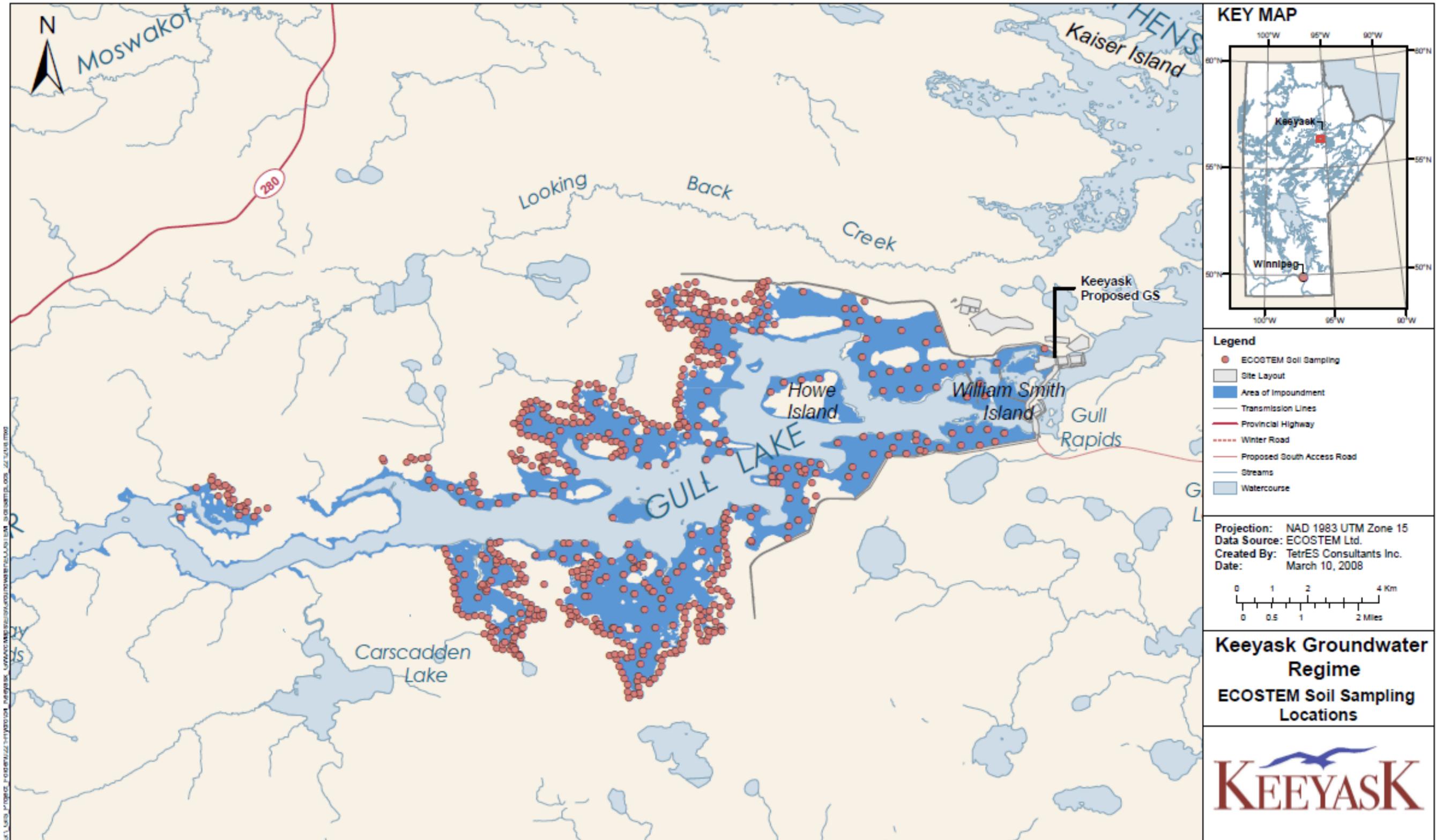
68 Predicted effects of the Project on groundwater were found to be laterally localized,
 69 extending outward from the reservoir shoreline. Predicted indirect groundwater effects
 70 on the terrestrial environment were identified as occurring along the edges of the
 71 Keeyask reservoir and not inland areas (Terrestrial Environment Supporting Volume
 72 Section 2.3.6.3.1, p. 2-101). These results are consistent with observations from proxy

73 study areas on the Kettle reservoir (i.e., Stephens Lake immediately downstream of
74 Keyask), where shoreline conditions are similar to those that would be present in the
75 Keyask reservoir (Terrestrial Environment Supporting Volume Section 2.3.6.3.1
76 p. 2-101).

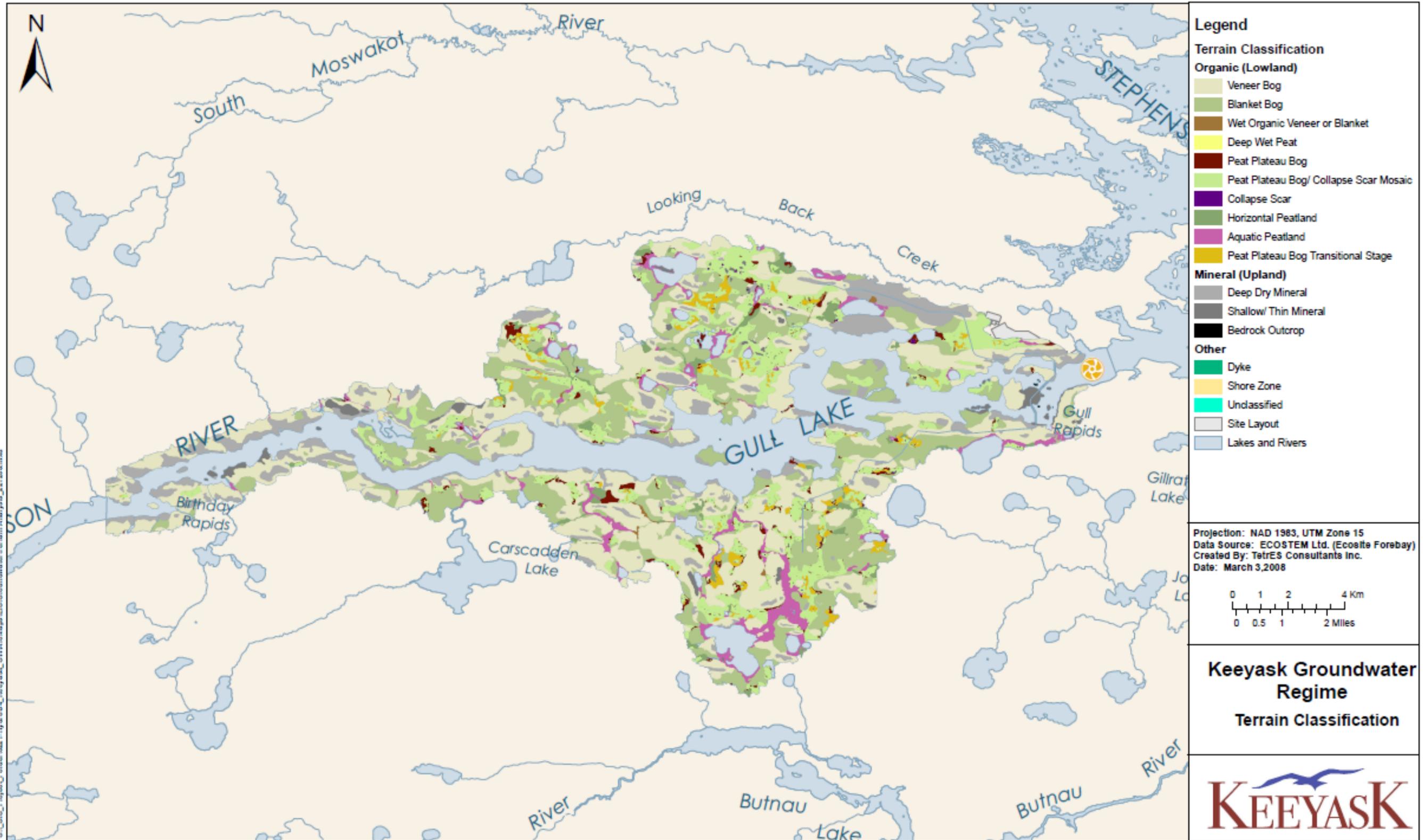


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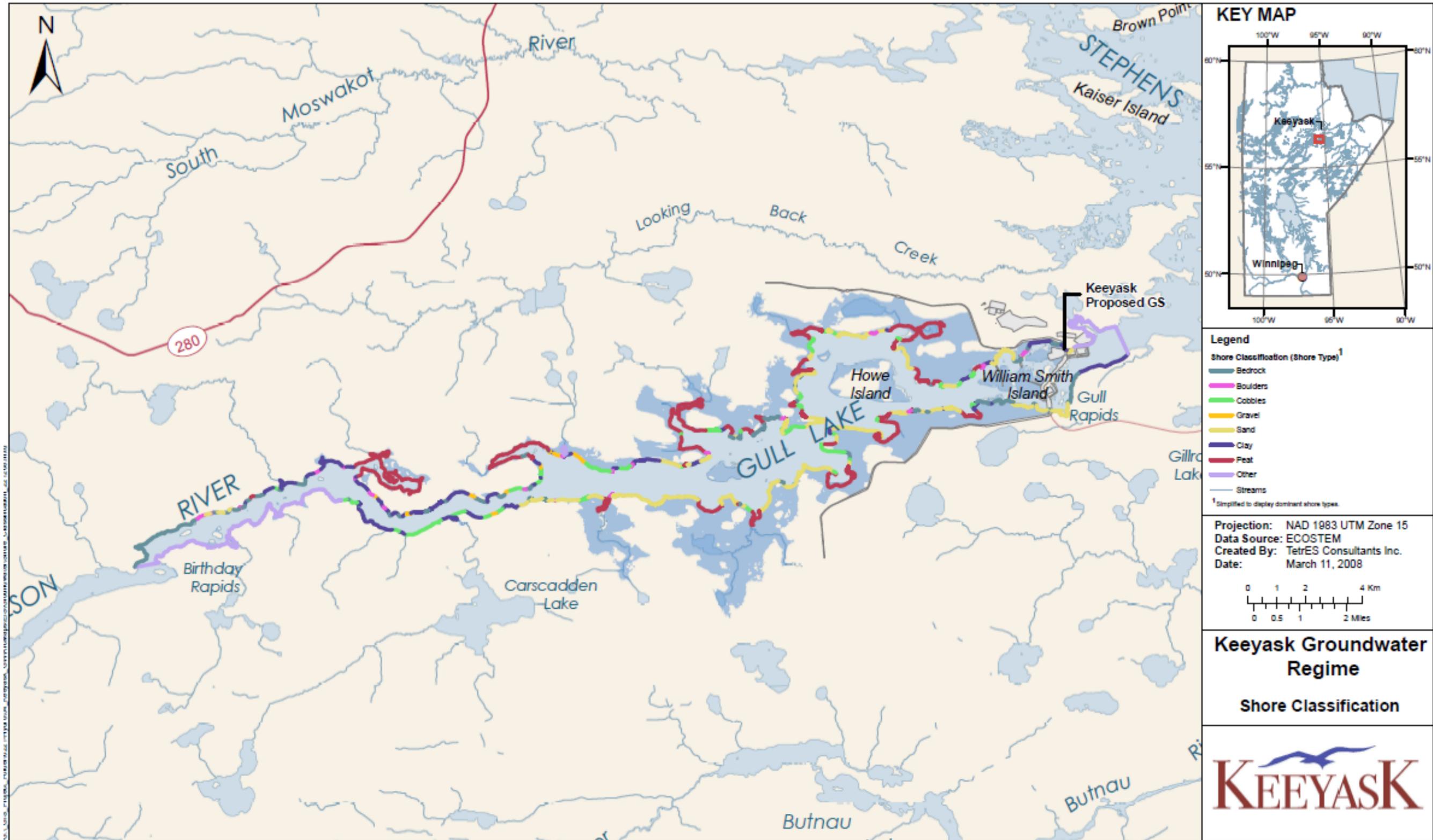
Figure 1 – Borehole locations in the Keeyask area



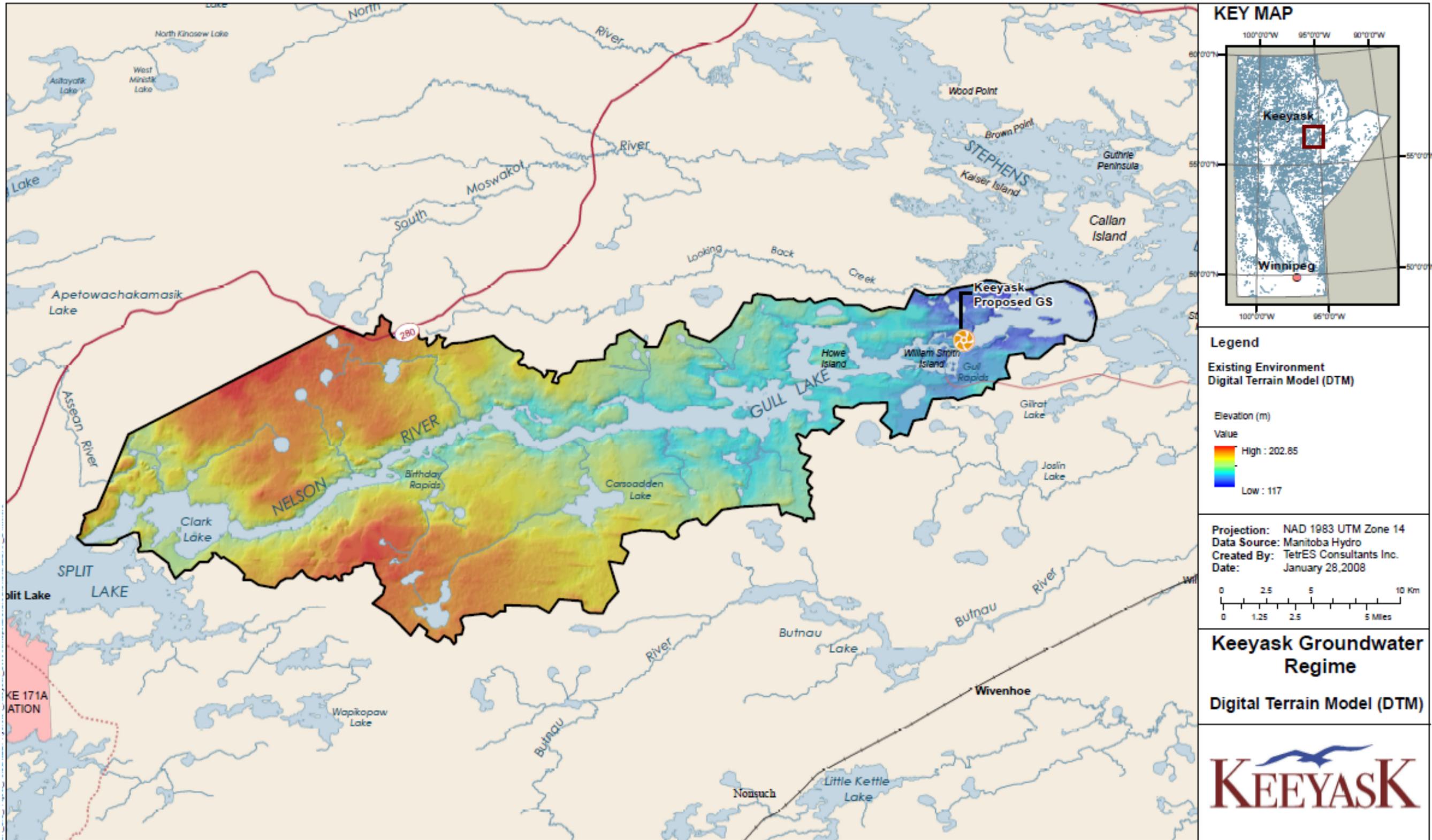
79
80 Figure 2 –Terrestrial Environment Soil Sampling Locations



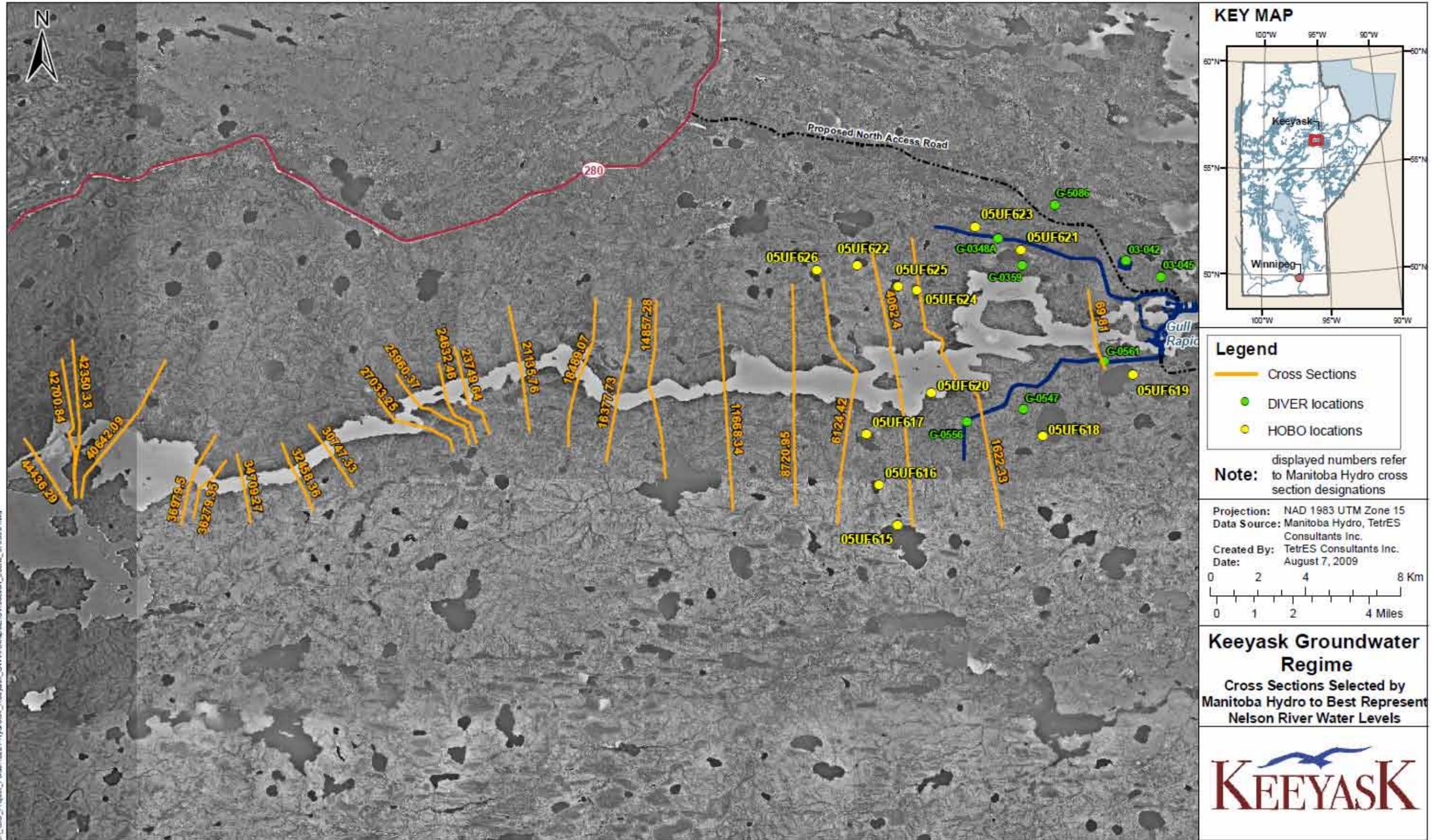
81
82 Figure 3 – Terrain Classification



83
84 Figure 4 – Shoreline Material Classification



85
86 Figure 5 – Digital Terrain Model



87
88 Figure 6 –Locations at which Nelson River water levels were defined (i.e., river level time series)

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Environmental Monitoring and Follow-**
3 **Up; p. N/A**

4 **CEC Rd 1 CEC-0080**

5 **QUESTION:**

6 The changes to groundwater conditions have been predicted based upon limited field
7 data. There is no indication in Section 8 that further hydrogeological/groundwater study
8 or analyses are to be carried out. Should confirmation be required that the predicted
9 conditions are in fact reasonably accurate and that different conditions which could be
10 of significance do not occur? Should further groundwater assessment and analyses as
11 well as a program of groundwater monitoring be carried out?

12 **RESPONSE:**

13 A substantial amount of data was used to develop the groundwater assessment for the
14 purpose that it was required, as discussed more completely in the response to CEC Rd 1
15 CEC-0079. The groundwater model for the Keeyask Project is a regional model that was
16 primarily developed to support an overall assessment of the potential Project effects on
17 the terrestrial environment. Predicted effects of the Project on groundwater were found
18 to be laterally localized, extending outward from the reservoir shoreline. Predicted
19 indirect groundwater effects on the terrestrial environment were identified as occurring
20 along the edges of the Keeyask reservoir and not inland areas (Terrestrial Environment
21 Supporting Volume Section 2.3.6.3.1, p. 2-101). These results are consistent with
22 observations from proxy study areas on the Kettle reservoir (i.e., Stephens Lake
23 immediately downstream of Keeyask), where shoreline conditions are similar to those
24 that would be present in the Keeyask reservoir (Terrestrial Environment Supporting
25 Volume Section 2.3.6.3.1, p. 2-101).

26 Groundwater predictions will be verified by monitoring the direct and indirect Project
27 effects on the terrestrial environment. Post-Project monitoring is planned on the
28 terrestrial environment around the reservoir shoreline (Terrestrial Environment
29 Supporting Volume, Section 2.12, Table 2-52) and will be designed to document actual
30 direct and indirect effects on terrestrial habitat (i.e., habitat loss and change), including
31 indirect groundwater effects. Monitoring activities will include periodic in-situ
32 observations at terrestrial monitoring sites, including measuring depth to groundwater
33 within the root zone to determine if a change in groundwater is causing an effect on the
34 terrestrial environment. Terrestrial monitoring to measure loss and change to habitat
35 will be conducted and will provide an overall indication of groundwater effects on a
36 broader scale around the +/-250 km of reservoir shoreline. The monitoring will thus be

37 focused on the verification of the predicted effects on the terrestrial environment,
38 which would indirectly verify the groundwater assessment results used in the prediction
39 of terrestrial effects.

40 Except for development of the Keeyask Generation Project, there are no present or
41 reasonably foreseeable future groundwater users in the groundwater study areas (also
42 see response to TAC Rd 1 NRCan-0009), therefore, monitoring of groundwater for
43 effects on groundwater users is not required.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Project Effects, Mitigation and**
3 **Monitoring, Cross-Sections B-B' and C-C'; p. N/A**

4 **CEC Rd 1 CEC-0081**

5 **QUESTION:**

6 These cross-sections show the dykes on each side of the reservoir, but little or no
7 change to the groundwater conditions beyond the dykes. Clarification is requested as to
8 how such a significant new surface water body could have such a limited influence
9 immediately beyond the new dykes. Have influences of permafrost melting been
10 considered? Have bedrock structural geology conditions been considered in predicting
11 the connection between the reservoir and groundwater in the adjacent area?

12 **RESPONSE:**

13 The purpose of the dykes are to contain the reservoir and to limit the extent of flooding.
14 As described in the Project Description Supporting Volume Section 2.3.7 the dykes will
15 be founded on glacial till material and in some areas will be founded on permafrost
16 affected overburden. The dykes will not be founded on bedrock. The dykes will be
17 designed to minimize or prevent seepage. The design of the dykes has accounted for the
18 thawing of permafrost affected foundation soils and the resultant potential for
19 differential settlements (Project Description Supporting Volume, Sec. 3.5.4), as
20 discussed more fully in the response to CEC Rd 1 CEC-0070.

21 The physical properties of the Project structures (i.e., proposed Project dykes and dam
22 structures and the associated drainage) were assigned low hydraulic conductivity values
23 in the model that were consistent with their proposed construction, resulting in limited
24 influence on the groundwater conditions beyond the dykes. Physical properties in the
25 areas surrounding the dykes were reflective of the existing environment (since these
26 areas will remain unchanged). Drains along the toe of the dykes will capture water from
27 permafrost melting, groundwater coming to the surface just behind the dyke, or
28 seepage through the dyke. The drains will also divert groundwater that would flow to
29 the Nelson River in the existing environment to a point downstream of the dam. The
30 Project will cause limited change to groundwater water levels on the dry side of the
31 dykes.

32 The bedrock conditions were considered in the geological/stratigraphic model that
33 formed the basis for the groundwater modeling done for the assessment. More
34 specifically, precambrian igneous and metamorphic rocks form the bedrock basement of
35 the study area. This basal hydrostratigraphic unit is generally impermeable to

36 groundwater, except where the bedrock has been fractured by tectonic movement
37 (Betcher et al.1995). The permeability of the bedrock units within the study area is
38 reported to be varied based on the location of local bedrock positions (Manitoba Hydro
39 1993). For example, within the bedrock, the first ~10 m is reported to have a relatively
40 low hydraulic conductivity of 10^{-7} m/s , while deeper portions (>10 m deep) exhibits
41 minimal hydraulic conductivity.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Environmental Setting; p. N/A**

3 **CEC Rd 1 CEC-0082**

4 **QUESTION:**

5 This section indicates that permafrost may be present beneath lakes within the study
6 area which could be acting as a barrier to flow of water from the lakes to the
7 groundwater. Has this issue been further examined taking into consideration the
8 influence of the development of the new large reservoir?

9 **RESPONSE:**

10 The assessment of Project effects on groundwater identified one lake immediately
11 south of the south dyke that may be affected due to changes in groundwater levels (see
12 Physical Environment Supporting Volume, Map 8.4-2a). Groundwater levels along a
13 portion of the north side of the lake will increase due to the presence of the dyke (see
14 response to CEC Rd 1 CEC-0081 for additional discussion), which could affect permafrost
15 if it is present. The groundwater level on the north side of this lake is currently close to
16 the surface and will remain close to the surface in the future.

17 The melting of permafrost may increase the hydraulic conductivity, thus changing the
18 flow of groundwater and the size of the affected area. A sensitivity analysis was
19 performed to determine potential effects of changes in permafrost due to climate
20 change by increasing hydraulic conductivity across the model area (PE SV, Sec. 11.6),
21 which is discussed in the response to CEC Rd 1 CEC-0083. The sensitivity analysis
22 indicated that the overall conclusions regarding Project effects on groundwater would
23 not change. Therefore a localized change in permafrost, if it is present at the small lake
24 affected by groundwater changes, would likewise not be expected to change the
25 conclusions of the groundwater assessment.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Environmental Setting; p. N/A**

3 **CEC Rd 1 CEC-0083**

4 **QUESTION:**

5 The note at the base of Table 8.3-1 states "Hydraulic conductivity in the vertical
6 direction is assumed to be 0.1x the coefficient of hydraulic conductivity in the horizontal
7 direction." Hydraulic conductivity values are provided for 8 different stratigraphic
8 materials ranging from clays to alluvium to diabase bedrock. This assumption regarding
9 vertical permeability seems too general given the range of strata present and the lack of
10 horizontal bedding associated with most of the strata. A rationale is requested as to the
11 selection of the 0.1x value. What sensitivity analyses were carried out using alternative
12 values and assessing the changes to the model outputs?

13 **RESPONSE:**

14 The 0.1 value is widely accepted and is supported by Todd (1980) who reports values of
15 K_z/K_x ranging between 0.1 and 0.5 for alluvium and by Domenico and Schwartz (1990)
16 who summarized the ratio as about 0.1 for most materials.

17 A sensitivity analysis of parameters used in groundwater modeling was done to
18 determine whether conclusions on residual effects would change due to uncertainty in
19 these parameters. Sensitivity analysis was completed to review several important
20 parameters, including: hydraulic conductivity, storativity, recharge, perimeter head
21 boundary, and colmation coefficient. Each of these was varied (within a reasonable
22 range) during systematic analysis to assess the response of the model. The findings of
23 this analysis indicated that the Keeyask groundwater model is more sensitive to the
24 assigned storativity and hydraulic conductivity in the first layer and the recharge rates
25 specified in the top layer. By contrast, the model was found to be insensitive to
26 perimeter head boundary and colmation coefficient.

27 Increasing the hydraulic conductivity values (both vertical and horizontal from those
28 presented in Table 8.3-1) by a factor of 10 over the calibrated model values for all layers
29 resulted in a about a 2.3 km² increase in the predicted Project effect on the area outside
30 the flooded zone. The effect of increasing the recharge rate on the affected area for the
31 typical year (50th percentile) resulted in a 0.2 km² Project effect on the area outside the
32 flooded zone. The results of sensitivity analysis due to change in other parameters
33 (storativity, perimeter boundary, and colmation coefficient) were even more negligible.

Sensitivity of the Total Affected Terrestrial Area as a Result of Change in Hydraulic Conductivity (K) & Recharge for Typical Year

Simulation	Total Affected Area (km ²)	Change in Area* (%)
Typical Year (50 th percentile)	17.9	3.2
Increased K by a factor 10	20.2	3.6
Increased R by 10 %	18.2	3.2

* The change in area in terms of % is relative to the total groundwater study area, which is approximately 565 km².

34 Overall, the conclusions on residual effects of the Project on groundwater are not
35 changed by this sensitivity analysis.

36 **REFERENCES:**

37 Todd, D.K., 1980, Ground-water hydrology (Second Edition): John Wiley and Sons, New
38 York, 535 p.

39 Domenico, P.A., and Schwartz, 1998, Physical and chemical hydrogeology (Second
40 edition): John Wiley and Sons, New York, 506 p.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Project Effects, Mitigation and**
3 **Monitoring; p. N/A**

4 **CEC Rd 1 CEC-0084**

5 **QUESTION:**

6 Groundwater levels in the area surrounding the reservoir are predicted to rise from 0 m
7 to approximately 7.5 m with an average increase of 2 m. What environmental concerns
8 or issues will arise from this change in groundwater levels?

9 **RESPONSE:**

10 Please see the response to CEC Rd 1 CEC-0078, which also asks about environmental
11 concerns related to changes in groundwater levels.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater; p. N/A**

3 **CEC Rd 1 CEC-0085**

4 **QUESTION:**

5 The groundwater/surface water modeling approach did not permit assessment of
6 effects from prolonged extreme events. Given that the dam and reservoirs are long term
7 installations and that significant climate change influences are anticipated, modeling of
8 more extreme conditions may be warranted. Please explain.

9 **RESPONSE:**

10 The sensitivity of the assessment conclusions to potential climate change is provided in
11 Section 11.0 of the PE SV. The main driver of the groundwater level is the reservoir level
12 and it will not change due to climate change; with or without climate change the
13 reservoir will continue to be operated within a 1 m operating range from 158-159 m.
14 Increased temperature and precipitation may result in some melting of permafrost in
15 the area and this would increase recharge rates and increase hydraulic conductivity. This
16 change could widen the affected area but probably by no more that about 2%, and this
17 may be offset by increased evapotranspiration. Overall, the conclusions on residual
18 effects of the Project on groundwater are not changed by climate change.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater, Environmental Setting; p. N/A**

3 **CEC Rd 1 CEC-0086**

4 **QUESTION:**

5 Groundwater recharged is noted to be influenced by the presence of permafrost. The
6 presence of new reservoir could be expected to significantly influence the extent of
7 permafrost. Clarification is requested as to how these changes to permafrost have been
8 utilized in the model and have influenced the groundwater regime.

9 **RESPONSE:**

10 To understand the potential implications of the presence of permafrost within the study
11 area in relation to the predicted potential Project effects (presented in Sections 8.4.1
12 and 8.4.2), sensitivity analysis on hydraulic conductivity was conducted by increasing
13 vertical and horizontal hydraulic conductivity (see response to CEC Rd 1 CEC-0083 for
14 additional discussion). Based on the results of this sensitivity analysis, permafrost,
15 where present and melted by increased groundwater levels, was shown not to
16 substantively affect the size of the predicted area of Project groundwater effects.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater; p. N/A**

3 **CEC Rd 1 CEC-0087**

4 **QUESTION:**

5 The scope of work for this groundwater study is provided. Is the scope of work
6 sufficiently detailed? What other factors should have been considered? How have rapid
7 drawdown events and resulting groundwater influences on reservoir shoreline slopes
8 been considered? Groundwater conditions at greater distances from the reservoir
9 should potentially be examined. What influences can be expected on groundwater flow
10 or quality at distances beyond the identified groundwater study?

11 **RESPONSE:**

12 Regarding effects beyond the area in which groundwater results are displayed, please
13 refer to the response for CEC Rd 1 CEC-0088, which addresses a similar question.

14 The groundwater model for the Keeyask Project is a regional model that was primarily
15 developed to support the overall assessment of the potential Project effects on the
16 terrestrial environment. The primary effect of concern is that raising groundwater level
17 into the root zone could result in vegetation and habitat changes in terrestrial areas
18 around the reservoir shoreline, which may then affect valued environmental
19 components assessed in the terrestrial environment section of the EIS. The potential for
20 effects on groundwater quality was also considered, as discussed in the response to CEC
21 Rd 1 MB Wildlands-0012. The scope of the groundwater assessment was sufficient to
22 fulfill the purpose for which it was developed.

23 The Physical Environment Supporting Volume (PE SV) describes the modeling of
24 shoreline erosion and peatland disintegration (Sec. 6). The models were developed to
25 assess future shoreline composition and bank recession during operation, with
26 predictions being made for time frames of 1, 5, 15 and 30 years after reservoir
27 impoundment. While processes affecting shoreline erosion including changes in water
28 level are noted in the discussion of erosion processes (PE SV, Sec. 6.1.2, 6.1.3), the
29 models do not simulate specific short duration events. These types of events are
30 integrated into model characterizations of shoreline erosion over longer-term time
31 frames (i.e., modeling of operation periods for year 1, years 2-5, years 6-15 and years
32 16-30).

33 The reservoir will normally be operated in one of two modes of operation: a peaking
34 mode of operation with levels fluctuating through the 1m operating range (158-159 m)
35 on a weekly basis; or a base loaded mode where the reservoir is kept at full supply level

36 (Project Description Supporting Volume (PD SV), Sec. 4.2.1 and 4.2.2; PE SV, Sec.
37 4.4.2.2.1 and 4.4.2.2.2). Typical weekly patterns of reservoir level variation for each
38 mode of operation at 50th percentile flow are shown in PE SV Figure 4.4-17 and Figure
39 4.4-18. Having only a 1 m operating range, the maximum possible drawdown is small
40 under typical operating conditions and, to the extent it will occur, has been
41 incorporated into shoreline erosion models. Emergency operating conditions may
42 require a rapid drawdown, but this atypical operating condition is unlikely to occur (PD
43 SV, Sec. 4.2.4).

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater; Page No.: N/A**

3 **CEC Rd 1 CEC-0088**

4 **QUESTION:**

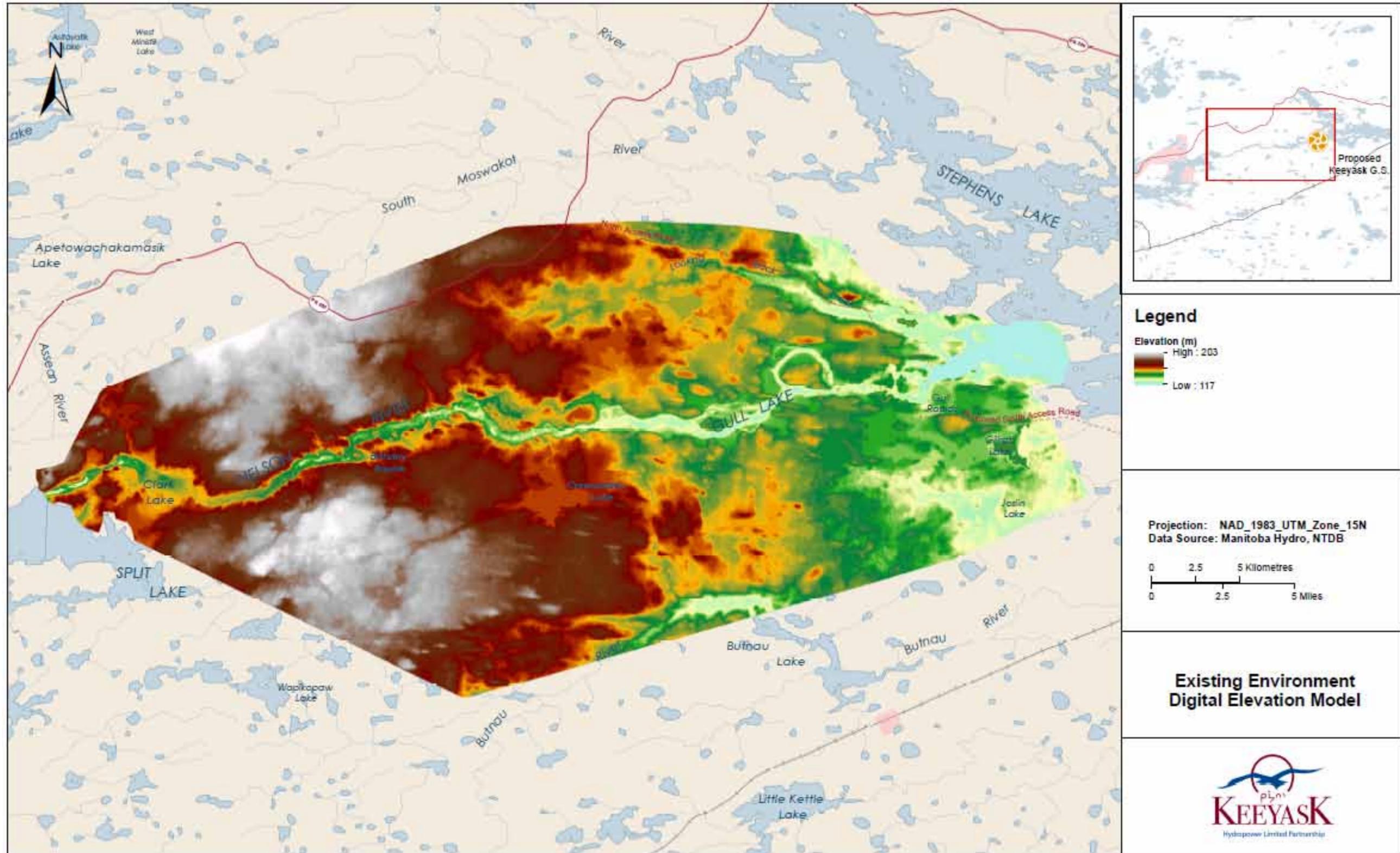
5 The groundwater study area appears to be limited to quite close to the edge of the
6 reservoir and dykes within the first 10km upstream of the powerhouse. An explanation
7 is requested as to why groundwater evaluation to a greater extent has not been done in
8 this area. What further study is to be done on groundwater impacts as part of the
9 detailed design and assessment work?

10 **RESPONSE:**

11 To ensure that effects of the Project would be captured, the groundwater model was
12 applied over an area that was sufficiently large to encompass the area likely to be
13 affected by the Project. The area in which the model results were displayed in the
14 Physical Environment Supporting Volume (PE SV, Sec. 8) is only part of the area that was
15 actually modeled. The boundaries of the groundwater model were set to match the
16 boundaries of the digital elevation model (DEM) developed for the Keeyask studies,
17 which was a large enough area to encompass the Project effects. The DEM area is
18 shown in Figure 1, which is copied from the DEM map in the Physical Environment
19 Supporting Volume (PE SV, Map 4.2-3). Information required to understand the geology
20 and stratigraphy was collected within this area (see response to CEC Rd 1 CEC-0079). A
21 geological model was developed for this larger region and the associated groundwater
22 model was used to analyze the project effects over this entire area. The results showed
23 that the effects are limited to a region within approximately 500m from the shoreline
24 and that groundwater divide coincided with the surface water divide.

25 For clarity, the results presented in the EIS were shown over a reduced area that only
26 included the watersheds directly draining to Gull Lake. The areas that were modeled but
27 not displayed in the groundwater section of the PE SV (Sec. 8) showed no Project effects
28 on groundwater. The original model area assessed was 1,024 km² versus the reduced
29 area of 565 km² over which the results are shown. This reduced area was used to
30 calculate the percentage of the study area affected by the Project so as not to
31 understate the percent of area affected.

32 As noted in the response for CEC Rd 1 CEC-0087, the scope of the groundwater
33 assessment was sufficient to fulfill the purpose for which it was developed, therefore
34 further modeling is not proposed.



35
36

Figure 1: Extent of Digital Elevation Model (Physical Environment Supporting Volume, Map 4.2-3), which was used to define the boundaries for the groundwater model.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater; p. Map 8.2.1**

3 **CEC Rd 1 CEC-0089**

4 **QUESTION:**

5 On this map, the groundwater study area appears to match the surface water drainage
6 basin and is quite close to the reservoir near the generating station. What groundwater
7 influences would occur beyond these limits?

8 **RESPONSE:**

9 Please refer to the response to CEC Rd 1 CEC-0088, which addresses a similar question.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.0 Groundwater; p. Maps 8.3.1 and 8.4.1**

3 **CEC Rd 1 CEC-0090**

4 **QUESTION:**

5 Groundwater levels beyond dykes were frequently not simulated. Are significant
6 influences potentially present in these areas?

7 **RESPONSE:**

8 Please refer to the responses to CEC Rd 1 CEC-0081 and CEC-0088, which respectively
9 address modeling beyond the dykes and effects near the dykes.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.4**
 2 **Summary of Residual Effects and Significance; p. Table 6-69**

3 **CEC Rd 1 CFLGC-0001**

4 **QUESTION:**

5 In Table 6-69, it is stated that the geographic extent of the residual effects on heritage
 6 resources is small. Please explain how this was determined and if these characteristic
 7 assessment was calculated in collaboration with the First Nations.

8 Ekosi.

9 **RESPONSE:**

10 Table 6-69, The Summary of Residual Effects and Significance is based on Response to
 11 EIS Guidelines, Chapter 5, Section 5.5 p5-11 whereby four criteria were used to evaluate
 12 each Valued Environmental Component (VEC). The term "Geographic Extent" found on
 13 page 5-11 "describes the spatial boundary within which the residual environmental
 14 effect is expected to occur". Geographic extent is described as:

- 15 • Small geographic extent – Effects that are confined to a small portion of one or
 16 more small areas where direct and indirect effects can occur (e.g. rights-of-way or
 17 component sites and adjacent buffer areas);
- 18 • Medium geographic extent – Effects that extend into local surrounding areas where
 19 direct and indirect effects can occur, or
- 20 • Large geographic extent – Effects that extend into the wider regional area where
 21 indirect or cumulative effects may occur.

22 The geographic extent on heritage resources is considered small because the area of
 23 impact is geographically small in relation to the entire study area.

24 With regard to how this characteristic assessment was calculated in collaboration with
 25 the First Nations, CEC Rd 1 CAC-0106 provides an overview of the context in which the
 26 KCNs were involved in the Project planning and environmental assessment process.

27 Section 6.4.3 in the Response to EIS Guidelines (Heritage Resources section) outlines the
 28 role that KCNs played in guiding archaeological field investigations associated with the
 29 Project. In addition to considering the information presented in each of the KCNs'
 30 *Environmental Evaluation Reports*, KCNs community Members, Elders and youth were
 31 actively involved in the heritage resources field studies and assessment process.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 1.4**
2 **Aboriginal Traditional Knowledge, Local Knowledge and**
3 **Technical Sources; p. 1-10 and 2-39**

4 **CEC Rd 1 CFLGC-0002**

5 **QUESTION:**

6 On page 1-10 of the EIS, it is stated that "KCNs have led their evaluations of the effects
7 of the Project on their communities and Members, they have also collaborated in the
8 preparation of this EIS". However, on p. 2-39, it is stated that the "Fox Lake Traditional
9 Knowledge program emerged at a later stage of the environmental assessment
10 process".

11 Please provide an explanation to:

- 12 1. The contradiction on how the data was compiled to make up the EIS - especially
13 since the TK data was documented at later stages.
- 14 2. Provide examples how Fox Lake was collaborating on the writing of the EIS, the
15 chapter components found within and the components of the "Cree world view"
16 that are embedded in the EIS but not credited to any First Nation members
17 specifically.

18 Ekosi.

19 **RESPONSE:**

20 Responses to each question are provided below.

- 21 1. *The contradiction on how the data was compiled to make up the EIS - especially*
22 *since the TK data was documented at later stages.*

23 Since the 1990s, Manitoba Hydro has worked with TCN (and later also with WLFN, YFFN
24 and FLCN) in joint planning committees to improve the Project itself (*e.g.*, choice of a
25 lower-head option, development of a Forebay Clearing Plan, Waterways Management
26 Program and other measures) by drawing on the ATK of these First Nations
27 Members. Respectful relationships were developed between those planning the Project
28 for Manitoba Hydro and First Nation representatives, who contributed distinct
29 perspectives, grounded in their worldview, about how to make the Project more
30 consistent with their experience and Aboriginal Traditional Knowledge.

31 For almost 10 years, environmental assessment studies have been underway. The EA
32 Study Team has been guided by the Partners' Regulatory and Licensing Committee and
33 EIS Coordination Team, which each include representation from Manitoba Hydro and all

34 of the four KCNs. Bilateral working groups with each First Nation reviewed field study
35 work plans and study results on a regular basis; multilateral working groups focused on
36 three key areas of study – the aquatic environment, mammals and mercury and human
37 health. Guidance, again based in the ATK of the KCNs, shaped the environmental studies
38 that were done. Many studies were undertaken with the involvement of the First
39 Nations. Through all of these means, community issues and concerns were identified,
40 knowledge was provided about the environment today, how past hydroelectric
41 development changed the environment, what changes can be expected from the
42 Keeyask Project, how to reduce or mitigate those effects and how the Project should be
43 monitored into the future.

44 In 2008 and 2009, the KCNs were actively involved in developing ATK principles that
45 helped shape the inclusion of ATK in the EIS. In 2011, the KCNs came together to
46 develop their Cree worldview statement that is included in Chapter 2 in the Response to
47 EIS Guidelines. The Cree worldview was developed through a series of KCN-led
48 workshops in 2011 and 2012, with Elders and others from each of the KCNs
49 participating. In addition, each of the KCNs provided text pertinent to their respective
50 First Nation in Chapter 2 (for more detail on all of the above, see Chapter 2 of the
51 Response to EIS Guidelines). CNP, FLCN and YFFN each prepared reports that were
52 included as part of the EIS filing.

53 In addition, with funding from Manitoba Hydro, each of the KCNs undertook extensive
54 studies of their own and these informed their decisions about whether and how to
55 participate in the Project. These studies were used, along with technical science, to
56 develop the overall EIS that was filed with regulators in July 2012 to seek an
57 environmental license for the Project. FLCN-led ATK studies were undertaken and the
58 confidential draft reports were made available to the EA Study Team on sturgeon (draft
59 in 2008) and an overall TK Study (draft in October 2010). Their confidential draft history
60 report (Ninan), which provided traditional knowledge related to historical experience
61 with past hydroelectric development, was made available to the EA Study team in 2009.
62 (See also responses to CEC Rd 1 CFLGC-0003 and CFLGC-0009).

63 In addition to the above processes, all the KCNs were involved in the review of initial
64 results of the EIS, in effects and mitigation workshops prior to finalizing the effects
65 assessment; and participated in the review of all EIS and supporting volume
66 documentation prior to submission in July 2012.

67 See also TAC Public Rd 1 CAC-0001 response filed November 19, 2012 for information
68 related to ATK contributions to the EIS; as well as CEC Rd 1 CAC-0100.

69 2. *Provide examples how Fox Lake was collaborating on the writing of the EIS, the*
70 *chapter components found within and the components of the "Cree world view" that*
71 *are embedded in the EIS but not credited to any First Nation members specifically.*

72 FLCN was an active participant in all of the regulatory and assessment processes noted
73 above. For Chapter 2 of the EIS, FLCN drafted and finalized their section focused on
74 concerns of importance to FLCN. The Cree worldview workshops, initially organized by a
75 member of the FLCN Future Development Team, included Elders and others from each
76 of the KCNs. The purpose was to draft a Cree worldview that each of the KCNs could
77 support; as such, it was not credited to any one individual First Nation, but reflects the
78 coming together of all the KCNs to include a statement that all could support.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 2.6.3**
2 **Community History Document: Ninan and Community History**
3 **Video; p. 2-39**

4 **CEC Rd 1 CFLGC-0003**

5 **QUESTION:**

6 Page 2-39 of the EIS discusses a draft version of the community history document called
7 Ninan and community history video. Please provide us with a copy of Ninan, the written
8 compilation of the community's history and of the visual component referred to as
9 "community history video".

10 Ekosi.

11 **RESPONSE:**

12 The FLCN Environment Evaluation Report included with the Partnership's EIS filing is the
13 only report the community wishes to file through the formal regulatory review process.
14 *Ninan* and the Community History video were prepared to assist the community in
15 writing its evaluation report, participating in the environmental assessment process and
16 the decision to become Project partners. *Ninan* and the Community History video are
17 available to any Fox Lake Cree Nation member, upon request, at the Fox Lake Cree
18 Nation Negotiation Office in Winnipeg and Gillam.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 1.2**
 2 **Scope of the Project; p. 1-7**

3 **CEC Rd 1 CFLGC-0004**

4 **QUESTION:**

5 On page 1-7, please provide a detailed map of the area including the components that
 6 are part of the principal structures, including permanent and temporary infrastructures:
 7 North and south access roads, Cofferdams, Tower spur Rock groins Communication
 8 tower Boat launches and a portage Borrow areas, including roads to these areas
 9 Temporary and permanent (if any) work camps Work areas Landfill water, sewage
 10 treatment facilities Explosive magazines, Ice booms Placement for excavated materials
 11 Security gatehouses Dykes, causeways, culverts associated with the dam Which sites will
 12 be decommissioned Clearing/burning/timber areas Any streams where sewage will be
 13 released Any roads and transmission lines We would like a map of the phases and all
 14 infrastructure at the

- 15 1. start of the project,
- 16 2. middle of the project, and
- 17 3. after completion of the project.

18 Ekosi.

19 **RESPONSE:**

20 The Project Description Supporting Volume includes the following maps that show the
 21 components of the project that are requested:

- 22 • Map 2-1: Project Footprint Construction Phase - Site Level
- 23 • Map 2-2: Project Footprint Operation Phase - Site Level
- 24 • Map 2-5: Principal Structures
- 25 • Map 2-10: Supporting Infrastructure
- 26 • Map 2-11: Ice Boom Location, Access and Public Safety Measures
- 27 • Map 2-13: Borrow Sources and Quarries - Potential
- 28 • Map 2-14: Access Roads
- 29 • Map 2-15: South Access Road Stream Crossings
- 30 • Map 2-16: Boat Launches and Access Routes
- 31 • Map 2-17: Excavated Material Placement Areas
- 32 • Map 2-20: Keyask Transmission Project - Preliminary Transmission Corridors During
 33 Keyask Generation Project Construction
- 34 • Map 2-21: Keyask Transmission Project - Preliminary Transmission Corridors During
 35 Keyask Generation Project Operation

- 36 • Map 3-1: Construction Sequence Years 2014 to 2016
- 37 • Map 3-2: Construction Sequence Years 2017 to 2019
- 38 • Map 3-3: Construction Sequence Years 2019 to 2022
- 39 • Map 3-4: River Management (1 of 3)
- 40 • Map 3-5: River Management (2 of 3)
- 41 • Map 3-6: River Management (3 of 3)
- 42 • Map 3-7 Proposed Reservoir Clearing Methods

43 A permanent self-supported communications tower will be constructed on the roof of
 44 powerhouse for use during the operation phase for VHF, paging, wireless data, and
 45 cellular communications. The tower will be 30 m to 40 m tall. Additional information can
 46 be found in the Keeyask Generation Project – Project Description Supporting Volume
 47 Section 2.4.11 Communication Infrastructure.

48 There will be no on-site manufacture of explosives. However, a temporary explosives
 49 magazine will be required by the contractors. Specifics regarding the storage and use of
 50 explosives will become available after these contractors are selected. Additional
 51 information can be found in the Keeyask Generation Project – Project Description
 52 Supporting Volume Section 2.4.12 Temporary Explosive Magazine.

53 A security gatehouse will be located at least 30 m south of PR 280 to allow large trucks
 54 to pull off the highway and be clear of the intersection. Similarly, once the south access
 55 road is complete, security will be maintained near the Butnau Dam. The final location of
 56 the south access road security gate has not been determined. Additional information
 57 can be found in the Keeyask Generation Project – Project Description Supporting
 58 Volume Section 2.4.8 Public Access and Site Security During Construction.

59 Decommissioning will involve removal of supporting infrastructure, including specific
 60 roads and buildings; collection and disposal of wastes, recyclables and hazardous
 61 materials; and removal of water intake, wastewater treatment and landfill facilities.
 62 Additional information can be found in the Keeyask Generation Project – Project
 63 Description Supporting Volume Section 3.8 Construction Cleanup, Decommissioning and
 64 rehabilitation.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
 2 **Monitoring and Follow-up; p. 4-50; 6-490 to 6-493**

3 **CEC Rd 1 CFLGC-0005**

4 **QUESTION:**

- 5 a. What processes are in place to ensure 'active participation' in "the development and
 6 implementation of monitoring and follow-up programs" (page 6-490)?
 7 b. Are First Nations like Fox Lake participating in the monitoring programs developed
 8 by Manitoba Hydro, or are they provided with funds and expert support to develop
 9 and implement own monitoring plans and programs?
 10 c. What steps are taken to ensure monitoring programs are according to the needs of
 11 each First Nation?
 12 d. With the new East Side Traditional Lands Planning and Special Protected Areas Act,
 13 will the participatory First Nation be provided with assistance to encourage the
 14 development for a similar Bill in Northern Manitoba to monitor their own traditional
 15 territories?

16 Ekosi.

17 **RESPONSE:**

18 *What processes are in place to ensure 'active participation' in "the development and*
 19 *implementation of monitoring and follow-up programs" (page 6-490)?*

20 The Keeyask Cree Nations (KCNs) are currently contributing to and reviewing monitoring
 21 plans that are being developed for submission as part of the regulatory process. During
 22 the construction and operation phases of the Project, the KCNs will participate in
 23 monitoring and follow-up programs in a few different ways:

- 24 • The technical science monitoring plans will be Manitoba Hydro's responsibility to
 25 fulfill with KCN members working with the scientists as part of biophysical and
 26 socio-economic monitoring teams.
 27 • Each of the KCNs will be responsible for collecting and interpreting Aboriginal
 28 Traditional Knowledge (ATK), based on community-specific ATK Monitoring plans.
 29 ATK and community knowledge will be used by each KCN to assess the project for
 30 the purposes of reporting on the actual effects to regulators and also to evaluate
 31 the impact of the Project on its Members from a Keeyask Cree Nations Worldview
 32 perspective.
 33 • Monitoring activity outcomes will be discussed at Monitoring Advisory Committee
 34 (MAC) meetings. The MAC is an advisory committee to the Keeyask Hydropower
 35 Limited Partnership Board of Directors comprised of Manitoba Hydro

36 representatives and representatives from each of the KCNs. The MAC will meet
 37 bimonthly. It will review information and results generated as the Environmental
 38 Protection Program is implemented and, if appropriate, may provide advice and
 39 recommendations to the Partnership about the need for additional or alternative
 40 mitigation measures. It is anticipated that the outcomes of both the technical
 41 science and ATK monitoring programs, as well as other aspects of the Environmental
 42 Protection Program, will be reviewed and discussed at the MAC.

43 *Are First Nations like Fox Lake participating in the monitoring programs developed by*
 44 *Manitoba Hydro, or are they provided with funds and expert support to develop and*
 45 *implement own monitoring plans and programs?*

46 As noted above, all of the Keeyask Cree Nations, which includes Fox Lake Cree Nation,
 47 will participate on the technical scientific monitoring developed by the KHLP. Each of
 48 the KCNs will be funded to develop and implement ATK based monitoring to assess the
 49 project from a Keeyask Cree Nations Worldview perspective. If the KCNs choose, they
 50 can allocate a portion of their funding to engage technical advisors.

51 *What steps are taken to ensure monitoring programs are according to the needs of each*
 52 *First Nation?*

53 As each of the KCNs are responsible for developing their own ATK-based monitoring,
 54 community-specific concerns about potential effects are expected to be incorporated
 55 into ATK monitoring.

56 The KCNs have also reviewed and provided input into all of the technical science
 57 monitoring programs, most of which were filed with regulators on June 28, 2013. Some
 58 of the proposed monitoring deals directly with addressing KCNs concerns, especially
 59 where ATK and technical science conclusions differed (see response to CEC Rd 1 CAC-
 60 0057).

61 *With the new East Side Traditional Lands Planning and Special Protected Areas Act, will*
 62 *the participatory First Nation be provided with assistance to encourage the development*
 63 *for a similar Bill in Northern Manitoba to monitor their own traditional territories?*

64 As per the JKDA, funding is provided to each of the KCNs for activities specifically linked
 65 to the Keeyask Generation Project. No additional assistance is currently being
 66 contemplated by the Partnership to provide the KCNs with assistance to encourage the
 67 development of a Bill similar to the East Side Traditional Lands Planning and Special
 68 Protected Areas Act in Northern Manitoba.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.6**
 2 **Culture and Spirituality; p. 6-490**

3 **CEC Rd 1 CFLGC-0006**

4 **QUESTION:**

5 Please explain what is meant by the statement on page 6-490: "Traditional knowledge is
 6 dynamic and interactive. While this interaction is notably in decline because of other
 7 factors, the process of loss may be accelerated".

- 8 a. What is meant by "notably in decline because of other factors"?
 9 b. What data exists to support this statement? Please provide us with the data to
 10 support this claim in Fox Lake.

11 Ekosi.

12 **RESPONSE:**

13 Responses to each of the above questions are provided below.

14 *Please explain what is meant by the statement on page 6-490: "Traditional knowledge is*
 15 *dynamic and interactive.*

16 The statement "dynamic and interactive" as written in the Keeyask Generation Project:
 17 Response to EIS Guidelines, Ch. 6: Environmental Effects Assessment, Section 6.6.5.6.1,
 18 p. 6-490 means that traditional knowledge is not frozen in time but is part of a **dynamic**
 19 or alive and vibrant process. It is **interactive** because the Elders pass on not only the
 20 core cultural values of countless generations, but also their personal observations and
 21 experiences to the next generation. Younger generations receive and interpret these
 22 observations and teachings in the context of their current reality. As such, this
 23 statement is based on the fact that culture is not static but is always being influenced by
 24 internal and external interactions with other human populations and by changes in the
 25 physical environment. Traditional Knowledge is in a constant state of change.

- 26 a. *What is meant by "notably in decline because of other factors"?*

27 The statement "Traditional knowledge is dynamic and interactive. While this interaction
 28 is notably in decline because of other factors, the process of loss may be accelerated"(6-
 29 490) means that because of outside cultural influences such as TV, internet, personal
 30 decisions made by individuals, such as moving away from home and the decline in Cree
 31 language use (i.e., other factors), the loss of traditional knowledge may be accelerated.

32 *b. What data exists to support this statement? Please provide us with the data to*
33 *support this claim in Fox Lake.*

34 KCN Elders at meetings and in informal discussions with the socio-economic study team
35 commented on the decline in the use of Cree language because of TV and the internet.
36 Concerns were raised over the possible lack of understanding of certain cultural
37 practices because the words were only meaningful in Cree. It should be acknowledged
38 that despite the pressures of change and/or loss, each generation has the opportunity,
39 through the aforementioned dynamic and interactive process of knowledge transfer, to
40 sustain and reinvent what it means to be Cree.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8**
2 **Effects and Mitigation Heritage Resources; p. 6-561**

3 **CEC Rd 1 CFLGC-0007**

4 **QUESTION:**

5 On Page 6-561, it is stated that: "the approach taken to interpreting the effects and
6 extending the appropriate mitigation to heritage resources known and unknown was
7 based on the results of archeological field investigations, ATK...on archeological sites".
8 Please explain how intangible cultural heritage, as defined by UNESCO's Convention for
9 the Safeguarding of Intangible Cultural Heritage, will be affected and mitigation
10 measures taken to ensure their protection.

11 Ekosi.

12 **RESPONSE:**

13 Please refer to the response to CEC Rd 1 CFLGC-0012.

14 During the construction and operation phases of the Keeyask Project a Heritage
15 Resources Protection Plan (HRPP) drafted, in part, under the direction of the KCNs
16 reflects the "safeguarding" measures of the UNESCO Convention for the Safeguarding of
17 Intangible Cultural Heritage. While the HRPP is designed for the protection of tangible
18 cultural heritage, the ongoing input from the KCNs has provided valuable knowledge of
19 intangible cultural heritage that has been incorporated into the document. In addition,
20 the Adverse Effects Agreements which have been signed with each of the KCNs include
21 a range of offsetting programs for the perpetuation of cultural practices – part of
22 'intangible cultural heritage'. Other measures to address concerns related to intangible
23 heritage include ceremonies associated with Project Milestones as well as KCNs
24 involvement in identifying and contributing to impact management measures at
25 important cultural and spiritual sites. Please see CEC Rd 1 CAC-0108b for a full list of
26 mitigation measures.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4.2**
 2 **Aboriginal Traditional Knowledge; p. 6-239**

3 **CEC Rd 1 CFLGC-0008**

4 **QUESTION:**

5 On Page 6-239, it is stated that: "the Keeyask dam is expected to negatively affect fish
 6 populations by blocking fish movements...and causing spillway and turbine mortality".

7 Please provide us with the appropriate fish passage report on Keeyask and for BiPole 3
 8 that helps portray this data.

9 Ekosi.

10 **RESPONSE:**

11 The quotation refers to the summary of Aboriginal traditional knowledge presented in
 12 the Response to EIS Guidelines. The complete quotation from the Response to EIS
 13 Guidelines, Section 6.4.2 (pages 6-239 to 6-240) is as follows:

14 "As part of their historical connection to Askiy (Mother Earth), the KCNs have
 15 acquired ATK from life experiences and their relationship with the land, water and
 16 all living things. They have explained their holistic worldview in Chapter 2 and in
 17 more detail in the CNP Keeyask Environmental Evaluation Report, YFFN Evaluation
 18 Report (Kipekiskwaywinan) and FLCN Environment Evaluation Report (Draft). ATK in
 19 this section of the EIS should be understood from the perspective of the Cree
 20 worldview. This worldview and knowledge guided the KCNs in their participation in
 21 planning the Project with Manitoba Hydro and in providing guidance to the
 22 environmental assessment. Many community Members expressed doubt that the
 23 effects of past projects were fully understood or accurately predicted and hold
 24 similar reservations regarding the current Project.

25 Some of the ATK observations with respect to the aquatic environment include the
 26 following:

- 27
- 28 • When Keeyask is built, water will be much higher on Split Lake (CNP, YFFN and
 29 FLCN 2011; SE SV), which will affect water quality, fish quality and fish
 abundance near York Landing (YFFN Evaluation Report (Kipekiskwaywinan)).
 - 30 • Water velocity changes, shoreline erosion, the release of peat and sediment,
 31 and decaying organic matter that results from flooding will affect water quality
 32 (FLCN Environment Evaluation Report (Draft)).
 - 33 • Shorelines are expected to be subject to more erosion, which will contribute to
 34 increases in sediment in Gull and Stephens lakes (FLCN 2010 Draft; FLCN

35 Environment Evaluation Report (Draft)). Sediment in the water is believed to
 36 negatively affect fish eggs (FLCN 2010 Draft) and fishing success (CNP Keeyask
 37 Environmental Evaluation Report). Erosion monitoring in Stephens Lake is
 38 recommended on an ongoing basis (FLCN 2010 Draft).

- 39 • The Keeyask dam is expected to negatively affect fish populations by blocking
 40 fish movements (CNP Keeyask Environmental Evaluation Report) and causing
 41 spillway and turbine mortality (FLCN 2008 Draft; FLCN 2010 Draft; FLCN
 42 Environment Evaluation Report (Draft)). Potential mitigation strategies
 43 identified during community review meetings in 2009 include incorporating a
 44 fish ladder onto future project designs similar in concept and function to those
 45 implemented in Washington State (FLCN 2010 Draft).
- 46 • Drying of the south channel downstream of the Keeyask GS when the spillway is
 47 not in operation is expected to contribute to fish mortality (FLCN 2008 Draft).
- 48 • Lake sturgeon populations have decreased downstream of hydroelectric
 49 generating stations post-impoundment, and FLCN community Members are
 50 concerned that the viability of lake sturgeon populations will be threatened by
 51 construction of the Keeyask GS (FLCN 2010 Draft). If the Keeyask GS is built,
 52 FLCN Members expect that there will be no viable lake sturgeon populations left
 53 without significant re-stocking efforts. While restocking programs are necessary,
 54 FLCN Members are apprehensive of their long-term success (FLCN 2010 Draft).
 55 FLCN Elders have communicated that they do not prefer the currently proposed
 56 methods for harvesting lake sturgeon eggs, and they believe that if larger lake
 57 sturgeon are released, the fish will be more likely to survive (FLCN 2010 Draft).
- 58 • Increases in mercury in fish, particularly walleye and northern pike, will affect
 59 fish quality and consumption (FLCN 2010 Draft; CNP Keeyask Environmental
 60 Evaluation Report; FLCN Environment Evaluation Report (Draft)) and the
 61 palatability of fish will continue to decline (FLCN 2010 Draft; YFFN Evaluation
 62 Report [Kipekiskwaywinan])."

63 References to specific reports are provided in the above-stated quotation. For further
 64 information on the Fox Lake Cree Nation Traditional Knowledge studies, please see CEC
 65 Rd 1 CFLGC-0009.

66 There was no fish passage report created for the Bipole III Transmission Project as the
 67 construction and operation of the project does not affect fish passage.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 2.6 Fox**
2 **Lake Cree Nation Involvement in the Project; p. N/A**

3 **CEC Rd 1 CFLGC-0009**

4 **QUESTION:**

5 In this section, the history and the diplomatic relationship of Fox Lake is presented.
6 Please provide us with ALL the TK reports that have been done - completed, drafts, or
7 pending, with Fox Lake Cree Nation. The reports we are requesting include all
8 infrastructure in Makeso Sakahican including any converter, generating stations,
9 transmission lines, dams, roads, lagoons, work camps, etc as they all are interconnected
10 to each other in the eyes of members of FL. The presence of Manitoba Hydro in Makeso
11 Sakahican has been long-standing and we would like to see all the TK reports done with
12 Fox Lake First Nation.

13 Ekosi.

14 **RESPONSE:**

15 The FLCN Environment Evaluation Report included with the Partnership's EIS filing is the
16 only report the community wishes to file through the formal regulatory review process.
17 Other community-based ATK reports have been prepared to assist the community in
18 writing its evaluation report, participating in the environmental assessment process and
19 the decision to become Project partners. These documents are available to Fox Lake
20 Cree Nation members, upon request, at the Fox Lake Cree Nation Negotiation Office in
21 Winnipeg and Gillam.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 2.6.2**
2 **Laying the Foundation for Diplomatic Relationships: Forgotten**
3 **Nation in the Shadows of the Dams; p. N/A**

4 **CEC Rd 1 CFLGC-0010**

5 **QUESTION:**

6 In this section, there is mention of the report entitled: "The Forgotten Nation in the
7 Shadows of the Dams" (1997). We would like a copy of this report.

8 Ekosi.

9 **RESPONSE:**

10 *Fox Lake First Nation: Forgotten Nation in the Shadow of the Dams* is available to Fox
11 Lake Cree Nation Members, upon request, through the Fox Lake Cree Nation
12 Negotiation Office in Winnipeg and in Gillam.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4.3**
2 **Aquatic Ecosystems and Habitat; Page No.: 6-240**

3 **CEC Rd 1 CFLGC-0011**

4 **QUESTION:**

5 In this section on "Aquatic Ecosystems and Habitat", there is discussion of numerous
6 issues. We would like to have copies of all the reports done on the lower Nelson River
7 through to the estuary.

8 This list of reports includes (but is not limited to):

- 9 • all biophysical reports
10 • all hydraulic reports
11 • all physical reports

12 Ekosi.

13 **RESPONSE:**

14 Table 6A of the Errata Supplemental Filing (April 2013) is a revised list of the
15 environmental study reports developed to support the environmental assessment.

16 Table 6A is attached as an appendix to this response.

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
PHYSICAL ENVIRONMENT			
GN-9.1.1	Manitoba Hydro, 2009. Existing and Project Environment Flow Files. Keeyask Project Environmental Studies Program Report. 32 pp.	Completed	9/1/2012
GN-9.1.2	Manitoba Hydro, 2009. Sensitivity of Water Regime Products to Inflows. Keeyask Project Environmental Studies Program Report. 42 pp.	Completed	9/1/2012
GN-9.1.3	Manitoba Hydro, 2009. Existing and Project Environment Shoreline & Depth Effects Assessment. Keeyask Project Environmental Studies Program Report. 17 pp.	Completed	9/1/2012
GN-9.1.4	Manitoba Hydro, 2009. Existing and Project Environment Velocity Regime Effects Assessment. Keeyask Project Environmental Studies Program Report. 17 pp.	Completed	9/1/2012
GN-9.1.5	Manitoba Hydro, 2009. Existing and Project Environment Digital Terrain Models. Keeyask Project Environmental Studies Program Report. 20 pp.	Completed	9/1/2012
GN-9.1.6	KGS Acres Ltd., 2011. Existing Environment Ice Processes. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	3/24/2011
GN-9.1.7	KGS Acres Ltd., 2011. Project Environment Ice Processes and Effects Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	3/24/2011
GN-9.1.8	Manitoba Hydro, 2009. Existing Environment Water Regime - Key Sites. Keeyask Project Environmental Studies Program Report. 305 pp.	Completed	9/1/2012
GN-9.1.12	Manitoba Hydro, 2009. Project Environment - Water Level and Flow Regime at Key Sites and Effects Assessment. Keeyask Project Environmental Studies Program. 66 pp.	Completed	9/1/2012
GN-9.1.13	Manitoba Hydro, 2009. Existing and Project Environment Water Surface Profiles Effects Assessment. Keeyask Project Environmental Studies Program Report. 19 pp.	Completed	9/1/2012
GN-9.1.14	Manitoba Hydro, 2009. Existing and Project Environment Creek Hydraulics Effects Assessment. Keeyask Project Environmental Studies Program Report. 33 pp.	Completed	9/1/2012

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
GN-9.1.15	Manitoba Hydro, 2009. Existing and Project Environment Creek Hydrology. Keeyask Project Environmental Studies Program Report. 33 pp.	Completed	9/1/2012
GN-9.1.16	KGS Acres Ltd., 2011. Ice Processes and Their Potential Link to Erosion – Existing Environment, Nelson River Outlet of Split Lake to Stephens Lake. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	3/24/2011
GN-9.1.17	KGS Acres Ltd., 2011. Post-Impoundment Velocity and Shear Stress Distributions. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	3/21/2011
GN-9.2.1	Ecostem Ltd., 2009. Composition and Distribution of Shoreline and Inland Peatlands in the Keeyask Forebay Area and Historical Trends in Peatland Disintegration. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 99 pp.	Completed	9/18/2011
GN-9.2.2	J.D. Mollard and Associates Ltd. and KGS Acres Ltd., 2008. Existing Environment Mineral Erosion. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 72 pp.	Completed	2/16/2012
GN-9.2.3	KGS Acres Ltd., 2011. Existing Environment Sedimentation. Draft report prepared for Manitoba Hydro by KGS Acres Ltd. and the University of Ottawa. 89 pp.	Completed	6/10/2011
GN-9.2.4	Ecostem Ltd., 2009. Projected Future Peatland Disintegration in the Proposed Keeyask Reservoir Area Without the Keeyask Project. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp. <i>Draft</i> .	Completed	3/7/2012
GN-9.2.5	J.D. Mollard and Associates Ltd., 2008. Projected Future Mineral Erosion Without the Keeyask GS. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 19 pp.	Completed	2/16/2012
GN-9.2.6	KGS Acres Ltd., 2011. Projected Future Sedimentation Without the Keeyask Project. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 15 pp.	Completed	3/11/2011
GN-9.2.7	Ecostem Ltd., 2009. Peatland Disintegration in the Proposed Keeyask Reservoir Area: Model Development and Post-Project Predictions. Keeyask Project Environmental Studies Program	Completed	12/29/2012

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	Report prepared for Manitoba Hydro. 195 pp.		
GN-9.2.8	J.D. Mollard and Associates Ltd., 2011. Project Environment Mineral Erosion and Effects Assessment. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	12/21/2011
GN-9.2.9	KGS Acres Ltd., 2009. Project Environment Sedimentation and Effects Assessment. Project Environmental Studies Program Report prepared for Manitoba Hydro. 99 pp.	Completed	8/17/2012
GN-9.2.10	Manitoba Hydro, 2009. Estimate of Shoreline Erosion During Construction. Keyask Project Environmental Studies Program Report. pp. <i>Draft</i> .	Completed	3/15/2013
GN-9.2.11	KGS Acres Ltd., 2011. Estimate of Sedimentation in Stephens Lake During Construction. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 82 pp.	Completed	12/7/2012
GN-9.2.13	Ecostem Ltd., 2007. Study of Physical Properties of Peat: Lab Results – Particle Size Distribution and Specific Gravity. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	07/11/2011
GN-9.2.14	KGS Acres Ltd., 2011. Study of Erosion Potential of Disposal Material. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	10/7/2011
GN-9.2.16	KGS Acres Ltd., 2012. Relationship of Total Suspended Solids and Turbidity in the Lower Nelson River near the Proposed Keyask Generating Station. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	10/24/2012
GN-9.2.17	KGS Acres Ltd., 2012. Cofferdam Erosion During Construction. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	4/9/2012
GN-9.2.18	KGS Acres Ltd., 2011. Peat Transport and Deposition Modelling. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	4/12/2011
GN-9.2.21	J.D. Mollard and Associates Ltd., 2010. Classification of Sediment Gradations Within Areas That Will Be Inundated During Staged Construction of the Keyask GS. Keyask Project Environmental	Completed	2/24/2012

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	Studies Program Report prepared for Manitoba Hydro. pp.		
GN-9.2.22	Ecostem Ltd., 2011. Laboratory Estimation of Organic Sediment Settling Rates. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	3/2/2011
GN-9.2.23	TetrES Consultants Inc., 2012. Estimation of Potential Organic Total Suspended Solids – Future With Project. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	11/19/2012
GN-9.3.1	TetrES Consultants Inc., 2008. Keeyask Existing Environment Groundwater Regime. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. pp.	Completed	8/9/2012
GN-9.3.2	TetrES Consultants Inc., 2008. Keeyask Predicted Future Groundwater Regime Without the Keeyask GS. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 37 pp.	Completed	8/9/2012
GN-9.3.3	TetrES Consultants Inc., 2008. Keeyask Predicted Future Groundwater Regime With the Keeyask GS. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 90 pp.	Completed	8/9/2012
GN-9.4.1	TetrES Consultants Inc., 2009. Water Temperature & Dissolved Oxygen Study – Existing Conditions. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 119 pp.	Completed	10/9/2012
GN-9.4.2	TetrES Consultants Inc., North/South Consultants Inc. and Manitoba Hydro, 2009. Water Temperature & Dissolved Oxygen Study – Future Without Project. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 10 pp.	Completed	8/21/2012
GN-9.4.3	TetrES Consultants Inc., North/South Consultants Inc. and Manitoba Hydro, 2011. Water Temperature & Dissolved Oxygen Study – Project Effects. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 100 pp.	Completed	11/19/2012
GN-9.5.1	Manitoba Hydro, 2009. Historical Climate Analysis. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 29 pp.	Completed	2/29/2012

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
GN-9.5.2	Manitoba Hydro, 2011. Future Climate Scenarios. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 66 pp.	Completed	2/29/2012
GN-9.5.5	The Pembina Institute, 2012. A Life Cycle Assessment of Greenhouse Gases and Select Criteria Air Contaminants. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 89 pp.	Completed	02/16/2012
GN-9.5.6	Environnement Illimité Inc., 2012. Keeyask Environmental Impact Statement – Reservoir Greenhouse Gases Technical Memo. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro.	Completed	03/08/2012
GN-9.5.7	Manitoba Hydro, 2008. Historical Flow Trend Analysis. Keeyask Project Environmental Studies Program.	In preparation	
AQUATIC ENVIRONMENT			
99-01	Remnant, R.A. and C.C. Barth. 2003. Results of Experimental Gillnetting on the Nelson River between Birthday and Gull Rapids, Manitoba, Fall 1999. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 75 pp. <i>Draft</i> .	Completed	12/2003
99-02	Zrum, L. and C.L. Bezte. 2003. Water Chemistry, Phytoplankton, Benthic Invertebrate, and Sediment Data for Gull Lake and the Nelson River between Birthday Rapids and Gull Rapids, Manitoba, Fall, 1999. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 66 pp. <i>Draft</i> .	Completed	12/2003
01-01	Zrum, L. and T.J. Kroeker. 2003. Benthic Invertebrate and Sediment Data from Split Lake and Assean Lake, Manitoba, Winter, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 78 pp. <i>Draft</i> .	Completed	12/2003
01-02	Barth, C.C., R.L. Bretecher, and J. Holm. 2004. Floy-tag Application and Recapture Information from the (Gull) Keeyask Study Area, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 88 pp. <i>Draft</i> .	Completed	11/2004
01-03	Barth, C.C., D.L. Neufeld, and R.L. Bretcher. 2003. Results of Fisheries Investigations Conducted in Tributaries of the Nelson River Between Birthday Rapids and Gull Rapids, Manitoba, Spring, 2001. Draft report prepared for Manitoba Hydro by	Completed	12/2003

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	North/South Consultants Inc. 53 pp. <i>Draft</i> .		
01-04	Juliano, K.M. and L. Zrum. 2003. Zooplankton Data from Split, Clark, Gull, Stephens, and Assean Lakes, Manitoba, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 59 pp. <i>Draft</i> .	Completed	12/2003
01-05	Dunmall, K.M., J. Holm, and R.L. Bretcher. 2003. Results of Index Gillnetting Studies Conducted in Assean Lake, Manitoba, Summer 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 70 pp. <i>Draft</i> .	Completed	12/2003
01-06	Dolce, L.T. and M.A. Sotiropoulos. 2004. Aquatic Macrophyte and Associated Epiphytic Invertebrate Data Collected in Gull Lake and Portions of the Nelson River Between Birthday Rapids and Gull Rapids, Manitoba, Fall 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 56 pp. <i>Draft</i> .	Completed	1/2004
01-07	Dunmall, K.M., J.E. MacDonald, and R.L. Bretecher. 2004. Results of Summer Index Gillnetting Studies Conducted in Split Lake and Clark Lake, and Spring Investigations of Adult and Larval Fish Populations in Portions of the Burntwood River, Grass River, and Nelson River flowing into Split Lake, Manitoba, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 116 pp. <i>Draft</i> .	Completed	2/2004
01-08	Remnant, R.A., N.J. Mochnacz, and J.E. MacDonald. 2004. Results of Fisheries Investigations Conducted in the Assean River Watershed, Manitoba, Spring and Fall, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 106 pp. <i>Draft</i> .	Completed	10/2004
01-10	Pisiak, D.J., T. Kroeker, and R.A. Remnant. 2004. Results of Summer Index Gillnetting Studies in Stephens Lake, Manitoba, and Seasonal Investigations of Adult and Larval Fish Communities in the Reach of the Nelson River between Gull Rapids and Stephens Lake, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 110 pp. <i>Draft</i> .	Completed	10/2004
01-11	Sotiropoulos, M.A. and L.J. Neufeld. 2004. Benthic Invertebrate, Sediment, and Drifting Invertebrate Data Collected from the Gull (Keeyask) Study Area, Manitoba, Spring - Fall 2001. Draft report	Completed	10/2004

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	prepared for Manitoba Hydro by North/South Consultants Inc. 138 pp. <i>Draft</i> .		
01-13	Remnant, R.A., C.R. Parks, and J.E. MacDonald. 2004. Results of Fisheries Investigations Conducted in the Reach of the Nelson River between Clark Lake and Gull Rapids (Including Gull Lake), 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 154 pp. <i>Draft</i> .	Completed	10/2004
01-14	Barth, C.C. and N.J. Mochnacz. 2004. Lake Sturgeon Investigations in the Gull (Keeyask) Study Area, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 146 pp. <i>Draft</i> .	Completed	10/2004
01-15	Badiou, P.H., and H.M. Cooley. 2004. Water Chemistry, Phytoplankton, and Sediment Chemistry Data for the Nelson and Assean River Systems, Manitoba, 2001. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 210 pp. <i>Draft</i> .	Completed	10/2004
02-03	Barth, C.C., L.J. Neufeld, and J.R. Olynik. 2003. Movements of Northern Pike, Walleye, and Lake Whitefish Tagged with Radio and Acoustic Transmitters in the Gull (Keeyask) Study Area, 2001/2003. Draft report prepared for Manitoba Hydro by North/South Consultants. 137 pp. <i>Draft</i> .	Completed	12/2003
02-04	Juliano, K.M. and L. Zrum. 2004. Zooplankton Data from Split, Clark, Gull, Stephens, and Assean Lakes, and the Nelson River, Manitoba, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 65 pp. <i>Draft</i> .	Completed	1/2004
02-05	Holm, J., V.L. Richardson, and R.L. Bretecher. 2003. Results of Index Gillnetting Studies Conducted in Assean Lake, Manitoba, Summer 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 80 pp. <i>Draft</i> .	Completed	12/2003
02-06	Hartman, E.J. and R.L. Bretecher. 2004. Results of Fisheries Investigations Conducted in the North Moswakot and South Moswakot Rivers, Manitoba, Fall 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 69 pp. <i>Draft</i> .	Completed	1/2004
02-08	Mochnacz, N.J., C.C. Barth, and J. Holm. 2004. Results of Fisheries Investigations Conducted in the Aiken River and at the Mouth of the Ripple River, Manitoba, Spring 2002. Draft report	Completed	3/2004

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	prepared for Manitoba Hydro by North/South Consultants Inc. 106 pp. <i>Draft</i> .		
02-09	Holm, J. and R.A. Remnant. 2004. Results of Summer Index Gillnetting Studies Conducted in Split Lake and Clark Lake, and Spring Investigations of Adult and Larval Fish Communities in Portions of the Burntwood, Grass, and Nelson Rivers Flowing into Split Lake, Manitoba, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 131 pp. <i>Draft</i> .	Completed	4/2004
02-10	Dolce, L.T. and M.A. Sotiropoulos. 2004. Aquatic Macrophyte and Associated Epiphytic Invertebrate Data Collected in Gull Lake and Portions of the Nelson River between Birthday Rapids and Gull Rapids, Manitoba, Fall 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 57 pp. <i>Draft</i> .	Completed	3/2004
02-12	Juliano, K.M. and L.J. Neufeld. 2004. Benthic Invertebrate and Sediment Data from Split Lake and Assean Lake, Manitoba, Winter 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 67 pp. <i>Draft</i> .	Completed	12/2004
02-13	Juliano, K.M. and L.J. Neufeld. 2005. Benthic Invertebrate, Sediment, and Drifting Invertebrate Data Collected from the Gull (Keeyask) Study Area, Manitoba, Spring - Fall 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 161 pp. <i>Draft</i> .	Completed	1/2005
02-14	Badiou, P.H. and H.M. Cooley. 2005. Water Chemistry, Phytoplankton, and Sediment Chemistry Data for the Nelson and Assean River Systems, Manitoba, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 255 pp. <i>Draft</i> .	Completed	2/2005
02-15	Johnson, M.W. 2005. Results of Fish Community Investigations Conducted in the Assean River Watershed, Manitoba, Spring and Fall 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 133 pp. <i>Draft</i> .	Completed	2/2005
02-16	Pisiak, D.J. 2005. Results of Summer Index Gillnetting Studies in Stephens Lake, Manitoba and Seasonal Investigations of Adult and Larval Fish Communities in the Reach of the Nelson River between Gull Rapids and Stephens Lake, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc.	Completed	1/2005

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Report Number	Report Title	Status	Date Completed
	179 pp. <i>Draft.</i>		
02-17	Richardson, V.L. and J. Holm. 2005. Results of Fish Community Investigations Conducted in Tributary Systems of the Nelson River between Birthday Rapids and Gull Rapids, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 98 pp. <i>Draft.</i>	Completed	1/2005
02-18	Holm, J., V.L. Richardson, and C.C. Barth. 2005. Floy-tag Application and Recapture Information from the Gull (Keeyask) Study Area, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 175 pp. <i>Draft.</i>	Completed	2/2005
02-19	Barth, C.C. 2005. Lake Sturgeon Investigations in the Keeyask Study Area, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 131 pp. <i>Draft.</i>	Completed	2/2005
02-20	Johnson, M.W. and C.R. Parks. 2005. Results of Fish Community Investigations Conducted in the Reach of the Nelson River between Clark Lake and Gull Rapids, 2002. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 222 pp. <i>Draft.</i>	Completed	8/2005
03-01	Ryland, D. and B. Watts. Fish Taste Studies for Tataskweyak Cree Nation. Draft report prepared for Manitoba Hydro by the University of Manitoba. 44 pp. <i>Draft.</i>	Completed	1/2004
03-02	Ryland, D. and B. Watts. Fish Taste Studies for Fox Lake Cree Nation. Draft report prepared for Manitoba Hydro by the University of Manitoba. 43 pp. <i>Draft.</i>	Completed	1/2004
03-03	Maclean, B.D. and D.J. Pisiak. 2005. Results of Fish Community Investigations Conducted at the Mouth of the Ripple River, Manitoba, Spring 2003. Year II. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 43 pp. <i>Draft.</i>	Completed	2/2005
03-05	Badiou, P.H., H.M. Cooley, and T. Savard. 2005. Water Chemistry Data for the Lower Nelson River System, Manitoba, 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 219 pp. <i>Draft.</i>	Completed	12/2005
03-06	Murray, L., C.C. Barth, and J.R. Olynik. 2005. Movements of Radio- and Acoustic- Tagged Northern Pike, Walleye, and Lake Whitefish in the Keeyask Study Area: May 2002 to April 2003.	Completed	8/2005

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Report Number	Report Title	Status	Date Completed
	Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 125 pp. <i>Draft.</i>		
03-08	Barth, C.C. and L. Murray. 2005. Lake sturgeon Investigations in the Keeyask Study Area, 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 127 pp. <i>Draft.</i>	Completed	10/2005
03-09	Pisiak, D.J. and E.J. Hartman. 2005. Results of Fish Community Investigations Conducted in the North Moswakot and South Moswakot Rivers, Manitoba, Spring and Fall 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 157 pp. <i>Draft.</i>	Completed	9/2005
03-11	Kroeker, D.S. and W. Jansen. 2005. Results of Fish Community Investigations Conducted in Tributaries of the Nelson River between Clark Lake and Gull Rapids, Manitoba, 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 72 pp. <i>Draft.</i>	Completed	1/2006
03-12	Maclean, B.D. and J.Holm. 2005. Results of Fish Community Investigations Conducted in the Mistuska River, Manitoba, Spring 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 90 pp. <i>Draft.</i>	Completed	9/2005
03-13	Maclean, B.D. and D.J. Pisiak. 2005. Results of Fish Community Investigations Conducted in the Aiken River, Manitoba, Spring 2003, Year II. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 108 pp. <i>Draft.</i>	Completed	12/2005
03-14	Pisiak, D. 2005. Results of Summer Index Gillnetting Studies in Stephens Lake, Manitoba, and Seasonal Investigations of Fish Communities in the Reach of the Nelson River between Gull Rapids and Stephens Lake, 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 313 pp. <i>Draft.</i>	Completed	10/2005
03-15	Holm, J. 2006. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 244 pp. <i>Draft.</i>	Completed	9/2006
03-16	Dolce, L. T. and M.J. Burt. 2008. Aquatic Macrophyte and Associated Epiphytic Invertebrate Data Collected from the Keeyask Study Area, Manitoba, Late Summer 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc.	Completed	2/2008

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Report Number	Report Title	Status	Date Completed
	111 pp. <i>Draft</i> .		
03-17	Gill, G. 2007. Invertebrate Drift and Plant Biomass Data from the Nelson River at Birthday Rapids, Gull Lake, Gull Rapids, and Kettle Generating Station, Manitoba, Summer and Fall 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 72 pp. <i>Draft</i> .	Completed	11/2007
03-35	Maclean, B.D. and P. Nelson. 2005. Population and Spawning Studies of Lake Sturgeon (<i>Acipenser fulvescens</i>) at the Confluence of the Churchill and Little Churchill Rivers, Manitoba, Spring 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 70 pp. <i>Draft</i> .	Completed	1/2006
03-36	Bretecher, R.L., G.C. Dyck, and R.A. Remnant. 2007. Results of Fish Community Investigations Conducted in the Reach of the Nelson River Between Clark Lake and Gull Rapids (Including Gull Lake), 2003. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 275 pp. <i>Draft</i> .	Completed	2/2007
03-37	Cooley, H.M. and M.W. Johnson. 2008. An Evaluation of Walleye Condition from Stephens Lake. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 59 pp. <i>Draft</i> .	Completed	3/2008
04-03	Holm, J. 2005. Results of Fish Community Investigations Conducted in Clark Lake, 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 116 pp. <i>Draft</i> .	Completed	10/28/2005
04-04	Badiou, P.H., T. Savard, and H.M. Cooley. 2007. Water Chemistry and Phytoplankton data for the Lower Nelson River System, Manitoba, 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 247 pp. <i>Draft</i> .	Completed	1/2007
04-05	BARTH, C.C. and K. AMBROSE. 2006. Lake Sturgeon Investigations in the Keeyask Study Area, 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 105 pp. <i>Draft</i> .	Completed	1/2006
04-06	Cooley, H.M. and T.G. Savard. 2008. Results of Greenhouse Gas Sampling in the Keeyask and Conawapa Study Areas: 2001-2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 76 pp. <i>Draft</i> .	Completed	2/2008
04-07	T. Savard and H.M. Cooley. 2007. Turbidity Monitoring Data for	Completed	1/2007

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Report Number	Report Title	Status	Date Completed
	Clark and Gull Lakes, Fall 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 51 pp. <i>Draft.</i>		
04-08	Holm, J. 2007. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 148 pp. <i>Draft.</i>	Completed	1/2007
04-09	Johnson, M.W. 2007. Results of Fish Community Investigations Conducted in the Reach of the Nelson River Between Clark Lake and Gull Rapids (Including Gull Lake), 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 159 pp. <i>Draft.</i>	Completed	1/2007
04-10	Johnson, M.W. and C.C. Barth. 2007. Results of Fish Community Investigations in the Kettle and Butnau Rivers, Manitoba, Spring 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 59 pp. <i>Draft.</i>	Completed	1/2007
04-11	Holm, J., H.M. Cooley, and E. Shipley. 2007. Trace Elements in Fish from the Keeyask Study Area: Fall 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 62 pp. <i>Draft.</i>	Completed	2/2007
04-12	Johnson, M.W. and B.D. Maclean. 2007. Results of Fish Community Investigations Conducted in the Mistuska River, Manitoba, Spring 2004. Year II. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 87 pp. <i>Draft.</i>	Completed	6/2007
04-13	Johnson, M.W. and B.D. Maclean. 2007. Results of Fish Community Investigations Conducted in the York Landing Arm of Split Lake and Its Major Tributaries, Manitoba, Fall 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 74 pp. <i>Draft.</i>	Completed	5/2007
04-14	Pisiak, D.J. and B.D. Maclean. 2007. Population Studies of Lake Sturgeon (<i>Acipenser fulvescens</i>) in the Fox River, Manitoba, Summer 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 42 pp. <i>Draft.</i>	Completed	4/2007
04-15	Neufeld, L. 2007. Benthic Invertebrate and Sediment, Data Collected from Littoral Zones in the Keeyask Study Area, Manitoba, Fall 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 92 pp. <i>Draft.</i>	Completed	4/2007

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Report Number	Report Title	Status	Date Completed
04-16	MacDonald, J.E. 2007. Results of Fish Community Investigations in Gull Rapids and Stephens Lake, 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 113 pp. <i>Draft.</i>	Completed	5/2007
04-17	Burt, M.J. and L.T. Dolce. 2008. Aquatic Macrophyte and Associated Epiphytic Invertebrate Data Collected from the Keeyask Study Area, Manitoba, Summer 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 130 pp. <i>Draft.</i>	Completed	2/2008
04-18	Gill, G. 2007. Invertebrate Drift and Plant Biomass Data from the Nelson River at Birthday Rapids, Gull Rapids, and Kettle Generating Station, Manitoba, Summer and Fall 2004. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 91 pp. <i>Draft.</i>	Completed	11/2007
05-02	Holm, J. 2007. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2005. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 56 pp. <i>Draft.</i>	Completed	4/2007
05-03	Murray, L. and C.C. Barth. 2007. Movements of Radio- and Acoustic- Tagged Northern Pike, Walleye, and Lake Whitefish in the Keeyask Study Area: May 2003 to August 2004 and a Summary of Findings from 2001-2005. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 111 pp. <i>Draft.</i>	Completed	4/2007
05-04	Jansen, W. and N. Strange. 2007. Mercury Concentrations in Fish From the Keeyask Project Study Area for 1999-2005. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 168 pp. <i>Draft.</i>	Completed	8/2007
05-05	Barth, C.C. and J.E. MacDonald. 2008. Lake Sturgeon Investigations in the Keeyask Study Area, 2005. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 63 pp. <i>Draft.</i>	Completed	3/2008
05-06	Mazur, K.M. and T.G. Savard. 2008. Proposed Keeyask Access Road Stream Crossing Assessment, 2004 and 2005. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 68 pp. 83 pp. <i>Draft.</i>	Completed	2/2008
06-02	Holm, J. 2007. Floy-tag Application and Recapture Information	Completed	4/2007

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Report Number	Report Title	Status	Date Completed
	from the Keeyask Study Area, 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 61 pp. <i>Draft.</i>		
06-03	Savard, T. and H.M. Cooley. 2007. Dissolved Oxygen Surveys in the Keeyask Study Area: Winter 2005 and 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 54 pp. <i>Draft.</i>	Completed	4/2007
06-04	MacDonald, J.E. 2008. Lake Sturgeon Investigations in the Keeyask Study Area, 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 110 pp. <i>Draft.</i>	Completed	3/2008
06-05	Cassin, J. and R.A. Remnant. 2008. Results of Fish Spawning Investigations Conducted in Gull Rapids Creek, Pond 13, and Selected Tributaries to Stephens Lake, Spring 2005 and 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 45 pp. <i>Draft.</i>	Completed	3/2008
06-06	MacDonald, J.E. 2007. Fish community assessments of selected lakes within the Split Lake Resource Management Area, 2004-2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 145 pp. <i>Draft.</i>	Completed	11/2007
06-07	Jansen, W. 2008. Infection Rate of the Parasite <i>Triaenophorus crassus</i> in Lake Whitefish from the Keeyask Study Area for 2003-2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 35 pp. <i>Draft.</i>	Completed	3/2008
06-08	Cooley, P.M. and L. Dolce. 2008. Aquatic Habitat Utilization Studies in Stephens Lake: Macrophyte Distribution and Biomass, Epiphytic Invertebrates, and Fish Catch-Per- Unit-Effort in Flooded Habitat. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 75 pp. <i>Draft.</i>	Completed	3/2008
06-09	Cooley, P.M. 2008. Carbon dioxide and methane flux from peatland watersheds and divergent water masses in a sub-arctic reservoir. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 45 pp. <i>Draft.</i>	Completed	3/2008
06-10	Capar, L.N. 2008. Benthic Invertebrate Data Collected from O'Neil Bay and Ross Wright Bay in Stephens Lake, Manitoba, Fall 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 34 pp. <i>Draft.</i>	Completed	3/2008

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Report Number	Report Title	Status	Date Completed
06-11	Jansen, W. and N. Strange. 2009. Fish mercury concentrations from the Keeyask Project Study Area for 2006. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 68 pp. <i>Draft.</i>	Completed	7/2009
06-12	Larter, J.L. and P.M. Cooley. 2010. Substratum and Depth Distribution in Flooded Habitat of Stephens Lake, Manitoba, Thirty-Five Years after Impoundment. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 57 pp. <i>Draft.</i>	Completed	12/2010
06-13	Cooley, P.M., L. Dolce Blanchard, and J. Larter. 2009. The effect of local and regional watersheds on the spectral composition and attenuation of light and water quality parameters in the surface waters of Stephens Lake, Manitoba. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 51 pp. <i>Draft.</i>	Completed	5/2009
08-01	MacDonald, J.E. 2009. Lake Sturgeon Investigations in the Keeyask Study Area, 2007-2008. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 116 pp. <i>Draft.</i>	Completed	4/2009
08-02	Holm, J. 2009. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2007 and 2008. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 63 pp. <i>Draft.</i>	Completed	4/2009
09-01	Holm, J. 2010. Results of Index Gillnetting Studies Conducted in the Keeyask Study Area, Summer 2009. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 110 pp. <i>Draft.</i>	Completed	10/2010
09-02	Holm, J. 2010. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2009. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 48 pp. <i>Draft.</i>	Completed	10/2010
09-03	Michaluk, Y. and J.E. MacDonald. 2010. Lake Sturgeon Investigations in the Keeyask Study Area, 2009. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 83 pp. <i>Draft.</i>	Completed	12/2010
09-04	Savard, T. S. Hnatiuk-Stewart, and H.M. Cooley. 2010. Water Quality Data for the Lower Nelson River System, Manitoba, 2009. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 240 pp. <i>Draft.</i>	Completed	7/2010
09-05	Jansen, W. 2010. Fish Mercury Concentrations in the Keeyask	Completed	12/2010

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Report Number	Report Title	Status	Date Completed
	Study Area, 2009. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 42 pp. <i>Draft</i> .		
10-01	<u>MacDonald, J. and C.C. Barth. 2011. Adult Lake Sturgeon Investigations in the Keeyask Study Area, Spring 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 78 pp. <i>Draft</i></u>	Completed	12/2011
10-02	<u>Michaluk, Y., J. MacDonald and C.C. Barth. 2011. Results of Lake Whitefish Spawning Surveys in Ferris Bay and the North and South Moswakot Rivers, Fall 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 51 pp. <i>Draft</i></u>	Completed	11/2011
10-03	<u>Henderson, L., C.C. Barth, J.E. MacDonald and S.J. Garner. 2011. Results of a Coarse Scale Habitat Inventory in the Upper Split Lake Area, Fall 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 75 pp. <i>Draft</i></u>	Completed	12/2011
10-04	<u>Holm, J. 2011. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 53 pp. <i>Draft</i></u>	Completed	12/2011
10-05	<u>Ambrose, K.M. and R. Remnant. 2011. Fish Community Assessment of Armstrong Lake, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 90 pp. <i>Draft</i></u>	Completed	12/2011
10-06	<u>MacDonald, J. and C.C. Barth. 2011. Benthic Invertebrate Surveys in Gull Lake and Stephens Lakes, Fall 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 78 pp. <i>Draft</i></u>	Completed	12/2011
10-07	<u>Henderson, L.M., C.C. Barth, J.E. MacDonald and M. Blanchard. 2011. Young-of-the-Year and Sub-Adult Lake Sturgeon Investigations in the Keeyask Study Area, Spring and Fall 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. 60 pp. <i>Draft</i></u>	Completed	12/2011
11-01	<u>Hrenchuk, C.L. C.A. McDougall, 2012. Adult Lake Sturgeon Investigations in the Keeyask Study Area, 2011. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i></u>	Completed	12/2012
11-04	<u>Henderson, L.M. and D.J. Pisiak, 2012. Results of Young-of-the-Year and Sub-Adult Lake Sturgeon Investigations in the Keeyask</u>	Completed	12/2012

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Report Number	Report Title	Status	Date Completed
	<u>Study Area, Spring and Fall 2011. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. Draft</u>		
11-05	<u>Holm, J., 2012. Floy-tag Application and Recapture Information from the Keeyask Study Area, 2011. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. Draft</u>	<u>Completed</u>	<u>12/2012</u>
TBA	Ambrose, K.M. and R.A. Remnant. 2011. Results of fish community investigations in Armstrong Lake, Manitoba, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	Capar, L.N., and F. Schneider-Vieira. 2011. Results of benthic invertebrate sampling conducted in Gull and Stephens Lakes, Fall, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	Henderson, L. M., C. C. Bart, J.E. MacDonald, and S.J. Garner. 2011. Results of a coarse scale habitat inventory in the upper Split Lake area, fall 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	Henderson, L.M. and C.C. Barth. 2011. Young-of-the-year and subadult lake sturgeon investigations in the Keeyask Study Area, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	Holm, J. 2011. Floy-tag application and recapture information from the Keeyask Study Area, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	MacDonald, J.E. and C.C. Barth. 2011. Lake sturgeon investigations in the Keeyask Study Area, Spring 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	Michaluk, Y. J.E. MacDonald, and C. C. Barth. 2011. Results of lake whitefish spawning surveys in Ferris Bay and the North and South Moswakot rivers, fall, 2010. Draft report prepared for Manitoba Hydro by North/South Consultants Inc. <i>Draft</i>	In preparation	
TBA	North/South Consultants Inc., 2011. Lake Sturgeon Telemetry Juvenile, 2011. Keeyask Project Environmental Studies Program	In preparation	

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Report Number	Report Title	Status	Date Completed
	Report prepared for Manitoba Hydro. <i>Draft</i>		
Terrestrial Habitat and Ecosystems			
	Terrestrial habitats and ecosystems in the Lower Nelson River Region	In preparation	
	Responses of terrestrial habitats to reservoir flooding and water regulation in northern Manitoba	In preparation	
	Habitat relationships and wildlife habitat quality models for the Keyask region		
FORESTRY			
01-16	Forestry Activities 2001. Draft report prepared for North/South Consultants Inc. by Plus4 Consulting Inc. and Resource Ecosystem Services. 49 pp.	Completed	12/1/2004
03-07	Forestry activities 2003. Draft report prepared for Manitoba Hydro by Plus4 Consulting Inc.	Completed	3/31/2006
TBA	Keyask GS Forebay Clearing Plan Comparative Analysis; Hand Clearing Versus Machine Clearing (Draft). 2006 Draft report prepared for Manitoba Hydro by Plus4 Consulting Inc.	Completed	3/27/2006
	Plus4 Consulting Inc. and Ecostem Ltd., 2006. Keyask Forebay Clearing Plan (Draft). Draft report prepared for Manitoba Hydro by Plus4 Consulting Inc.	Completed	2/22/2006
BIRDS, AMPHIBIANS AND REPTILES			
01-09	TetrES Consultants Inc., 2004. Avian field studies report, 2001. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i>	Completed	12/1/2004
02-11	TetrES Consultants Inc., 2005. Avian field studies report, 2002. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 190 pp. <i>Draft</i>	Completed	3/9/2005
03-04	TetrES Consultants Inc., 2005. Avian field studies report, 2003. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i>	Completed	10/28/2005
04-01	TetrES Consultants Inc., 2005. Access road – Avian Field Studies report, 2004. Keyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 33 pp. <i>Draft</i>	Completed	10/28/2005

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Report Number	Report Title	Status	Date Completed
04-02	TetrES Consultants Inc., 2005. Amphibian and reptile field studies report 2001-2004. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 27 pp. <i>Draft</i>	Completed	10/28/2005
05-01	TetrES Consultants Inc., 2006. Access road – Avian field studies report, 2005. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 52 pp. <i>Draft</i>	Completed	3/31/2006
06-01	TetrES Consultants Inc., 2007. Access road – Avian field studies report, 2006. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	3/28/2007
07-01	TetrES Consultants Inc., 2007. Avian field studies report, 2007. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	12/2007
07-02	TetrES Consultants Inc., 2007. Amphibian and Reptile field studies report, 2007. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	12/21/2007
11-01	Stantec Consultants Ltd. Avian 2011 Field Studies Report, 2011. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	In preparation	
MAMMALS			
01-12	Patenaude, A. and R. Berger. 2004. Results of Mammal, Reptile & Amphibian Investigations in the Gull (Keeyask) Study Area, 2001. Draft report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB, Inc. 142 pp. <i>Draft</i> .	Completed	12/1/2004
02-07	Patenaude, A. and R. Berger. 2004. Results of Mammal Investigations in the Keeyask Study Area, 2002. Draft report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB, Inc. 162 pp. <i>Draft</i> .	Completed	3/15/2004
03-34	Patenaude, A., A. Kibbins, A. Walley and R. Berger. 2006. Results of mammal investigations in the Keeyask study area, 2003. Draft report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB, Inc. 246 pp. <i>Draft</i> .	Completed	1/23/2006
04-19	Kibbins, A. and R. Berger. 2007. Results of mammal investigations in the Keeyask study area, 2004. Draft report prepared for Manitoba Hydro by Wildlife Resource Consulting	Completed	1/8/2007

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Report Number	Report Title	Status	Date Completed
	Services MB, Inc. 64 pp. <i>Draft</i> .		
08-XX	Wildlife Resource Consulting Services MB, Inc. Keeyask Project Generating Station Caribou of the Lower Nelson River, Workshop Discussion Report. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. 21 pp. <i>Draft</i> .	Completed	12/31/2008
09-01	Knudsen, B., R. Berger, B. Kiss, S. Johnstone, J. Hopkins and J. Kelly. 2009. Split Lake Resource Management Area Moose Survey Stage 1 - March 2009. Draft report prepared for Manitoba Hydro by Knudsen Wildlife Management Systems and Wildlife Resource Consulting Services MB, Inc. 52 pp. <i>Draft</i> .	Completed	4/30/2009
10-01	Knudsen, B., R. Berger, S. Johnstone, B. Kiss, J. Paille and J. Kelly. 2010. Split Lake Resource Management Area Moose Survey 2009 and 2010. Draft report prepared for Manitoba Hydro by Knudsen Wildlife Management Systems and Wildlife Resource Consulting Services MB, Inc. 144 pp. <i>Draft</i> .	Completed	12/15/2010
HERITAGE			
N/A	Northern Lights Heritage Services Inc. Keeyask Powistick (Gull Rapids) Generating Station Cultural and Physical Heritage Area Characterization Study. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	3/2001
A36-01	Northern Lights Heritage Services Inc. Keeyask Powistick (Gull Rapids) Heritage Resource Impact Assessment: 2001. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	12/2001
A27-02	Northern Lights Heritage Services Inc. Gull Rapids (Keeyask) Generating Station: Heritage Resource Impact Assessment (Year I): Fox Lake Cree Nation (Interim Report). Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	9/2002
02-04	Northern Lights Heritage Services Inc. Gull (Keeyask) Project Generating Station: Heritage Resource Impact Assessment Fox Lake Cree Nation. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft</i> .	Completed	2002
A10-03	Northern Lights Heritage Services Inc. Keeyask Project: Generating Station: Heritage Resource Impact Assessment: Gull	Completed	6/2003

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	(Keeyask) Rapids Camp. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>		
A10-03	Northern Lights Heritage Services Inc. Keeyask Project: Generating Station: Heritage Resource Impact Assessment of Gull (Keeyask) Rapids. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	11/2003
A10-03	Northern Lights Heritage Services Inc. Keeyask Project Heritage Resource Impact Assessment: Archaeological Survey of Stephen's and Fox (Atkinson) Lakes. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	12/2003
A07-04	Northern Lights Heritage Services Inc. Keeyask Project Generating Station: 2004 Heritage Resource Impact Assessment Gull (Keeyask) Rapids. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	11/2004
A07-04	Northern Lights Heritage Services Inc. Participatory Action Research, Tataskweyak Cree Nation Student Archaeological Program. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2005
A08-04	Northern Lights Heritage Services Inc. Keeyask Projects: Heritage Resource Impact Assessment: Archaeological Investigation at the Paradise Beach Site on Fox (Atkinson) Lake. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2005
A30-05	Northern Lights Heritage Services Inc. Gull (Keeyask) Project: Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	12/2005
A31-05	Northern Lights Heritage Services Inc. Gull (Keeyask) Generating Station: Kettle Lake Comparison Study. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	1/2006
A33-05	Northern Lights Heritage Services Inc. War Lake Archaeological Research Project (WARP) Archaeological Field Survey Report. Keeyask Project Environmental Studies Program Report prepared	Completed	4/2006

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	for Manitoba Hydro. <i>Draft.</i>		
A31-06	Northern Lights Heritage Services Inc. Keeyask (Gull) Generating Station: Bryant's Point: Archaeological Field Investigation Component Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	9/2006
A28-06	Northern Lights Heritage Services Inc. Archaeological Survey of the Northwest Arm of Stephens Lake, Manitoba. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	12/2006
A31-06	Northern Lights Heritage Services Inc. Keeyask Projects: Archaeological Survey of Kettle Lake, Manitoba: Comparative Study for the Heritage Resource Impact Assessment (HRIA). Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	1/2007
A30-06	Northern Lights Heritage Services Inc. Keeyask (Gull) Project: 2006 Fox Lake Comparative Study Component. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2007
A32-06	Northern Lights Heritage Services Inc. Keeyask Generating Station: Archaeological Field Investigation Component Clark Lake Archaeological Survey Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2007
A25-07	Northern Lights Heritage Services Inc. Keeyask Generating Station 2007 Archaeological Field Investigation Component Clark Lake Archaeological Survey Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	2/2008
A25-07	Northern Lights Heritage Services Inc. Keeyask Generating Station 2007 Archaeological Field Investigation Component Carscadden Lake and Portage (Pisitif) Creek Archaeological Survey Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	2/2008

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
A38-08	Northern Lights Heritage Services Inc. Archaeological Investigation of the Lower Odei & Burntwood Rivers Related to the Aboriginal Sturgeon Fishery. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	10/2008
A34-08	Northern Lights Heritage Services Inc. Keeyask Generating Station 2008 Archaeological Field Investigation Component: Carscadden Lake Archaeological Survey Heritage Resource Impact Assessment (HRIA). Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	1/2009
A30-08	Northern Lights Heritage Services Inc. 2008 Split Lake Archaeological Shoreline Survey. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2009
A35-08	Northern Lights Heritage Services Inc. Keeyask Generating Station 2008 Archaeological Field Investigation Component Clark Lake Archaeological Survey Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2009
A29-08	Northern Lights Heritage Services Inc. Keeyask Generating Station 2008 Archaeological Field Investigation Component Pointe West Site (HfKe-2) Formal Excavation. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	4/2009
N/A	Northern Lights Heritage Services Inc. Keeyask Construction Power Transmission Line Cultural and Physical Heritage Area Characterization Study & Route Selection. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	5/2009
A40-09	Northern Lights Heritage Services Inc. Keeyask Generation Project 2009: HRIA of Impervious and Granular Deposit Borrow Areas. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	6/2009
A37-09	Northern Lights Heritage Services Inc. Keeyask Infrastructure Project 2009 HRIA Startup and Main Camp (Phase 1). Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	8/2009

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
A18-09 & A5109	Northern Lights Heritage Services Inc. Keeyask Transmission Project 2009 Heritage Resource Impact Assessment. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	10/2009
A41-09	Northern Lights Heritage Services Inc. Keeyask Generation Project 2009 Heritage Resource Impact Assessment: Monitoring of Drill Testing on Caribou Island. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	11/2009
A42-09	Northern Lights Heritage Services Inc. Keeyask Generation Project 2009 HRIA of North and South Retaining Dykes. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	11/2009
A32-09	Northern Lights Heritage Services Inc. Keeyask Generation Project 2009 Archaeological Field Investigations: Excavation of the Pointe West Site (HbKx-02), a Proxy Site Investigated for the Keeyask Generation Project HRIA. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	3/2010
A21-10	Northern Lights Heritage Services Inc. Keeyask Generation Project 2010 Archaeological Survey of Cache Lake as part of the HRIA Process. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	6/2011
A40-10	Northern Lights Heritage Services Inc. Keeyask Generation Project 2010: HRIA of William Smith Island & Selected Borrow Areas. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	6/2011
A25-10	Northern Lights Heritage Services Inc. Keeyask Generation Project 2010 Archaeological Field Investigations: Excavation of the Pointe West Site (HbKx-02), a Proxy Site Investigated for the Keeyask Generation Project HRIA. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	Completed	6/2011
A56-11	Northern Lights Heritage Services Inc. Keeyask Generation Project 2011 South Access Road Butnau River Crossing HRIA. Keeyask Project Environmental Studies Program Report prepared	Completed	11/2011

Environmental Study Report List

Report Number	Report Title	Status	Date Completed
	for Manitoba Hydro. <i>Draft.</i>		
A17-11	Northern Lights Heritage Services Inc. Keeyask Generation Project 2011 HRIA North Shore Gull Lake and Selected Borrow Area Investigations. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	MB Hydro Review	
A16-11	Northern Lights Heritage Services Inc. Keeyask Generation Project 2011 HRIA of Potential Burial Locations on Gull Lake and Caribou Island. Keeyask Project Environmental Studies Program Report prepared for Manitoba Hydro. <i>Draft.</i>	MB HYDRO Review	

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.2**
2 **Aboriginal Traditional Knowledge; p. 6-563**

3 **CEC Rd 1 CFLGC-0012**

4 **PREAMBLE:**

5 On page 6-563, it is stated that "intensive archeological investigations" had taken place.

6 **QUESTION:**

7 We would like to see all the archeological reports completed and pending done in
8 Makeso Sakahican for Keeyask and BiPole 3 and all other projects including the SAR, the
9 generating and converting stations. Ekosi.

10 **RESPONSE:**

11 The full statement on pg. 6-563 of the Response to EIS Guidelines is: "Despite
12 discussions with KCN Elders and intensive archaeological investigations, no definitive
13 evidence of burials was found at these four sites." The four sites are identified in the
14 preceding bullet on pg. 6-563 as: Bechonea, Effie Bay, Old Boat and Caribou Island, all
15 within the Core Study Area, and all sites in reference to investigating burials.

16 The question on archaeological reports is not clear. We have interpreted the question to
17 mean the following:

- 18 • A request for archaeological reports completed and pending under the Keeyask
19 Project (which includes the south access road (SAR)), and Bipole III (which includes
20 the Keewatinoow converter station).

21 The SE SV, Part 3, Heritage, Section 1.9 pp 1-46 – 1-49 identifies the HRIAs and other
22 reports completed for the Keeyask Project. These reports have previously been provided
23 to FLCN Future Development; however, a list of the reports conducted by Northern
24 Lights Heritage Services for both Keeyask and Bipole III is attached for convenience.
25 These reports are available through the Historic Resources Branch to qualified
26 archaeologists who are conducting archaeological investigations in the Keeyask Project
27 area. They are not publicly available due to the nature of the sensitive site-specific
28 information contained in the reports.

29 In addition to this list of HRIAs and other reports, a List of Field Reports is included in
30 Appendix A of Section 1.9 in the SE SV, Part 3, Heritage, that identifies all archaeological
31 reports completed for the Keeyask Heritage Regional Study Area.

32 **LIST OF HERITAGE REPORTS BY NLHS IN THE KEEYASK PROJECT AREA**

- 33 Northern Lights Heritage Services Inc. 2001a. Keeyask Powistick (Gull Rapids) Generating
34 Station Cultural and Physical Heritage Area Characterization Study. Ms on file
35 Northern Lights Heritage Services Inc. Winnipeg, MB.
- 36 Northern Lights Heritage Services Inc. 2001b. Keeyask Powistick (Gull Rapids) Heritage
37 Resource Impact Assessment: 2001. Ms. on file Northern Lights Heritage
38 Services Inc., Winnipeg, MB.
- 39 Northern Lights Heritage Services Inc. 2002a. Gull Rapids (Keeyask) Generating Station:
40 Heritage Resource Impact Assessment (Year I): Fox Lake Cree Nation (Interim
41 Report). Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 42 Northern Lights Heritage Services Inc. 2002b. Gull (Keeyask) Project Generating Station:
43 Report # 02-04 Heritage Resource Impact Assessment Fox Lake Cree Nation
44 (Final Report). Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 45 Northern Lights Heritage Services Inc. 2003a. Keeyask Project: Generating Station:
46 Heritage Resource Impact Assessment: Gull Rapids Camp. Ms on file Northern
47 Lights Heritage Services Inc. Winnipeg, Mb
- 48 Northern Lights Heritage Services Inc. 2003b. Keeyask Project: Generating Station:
49 Heritage Resource Impact Assessment of Gull (Keeyask) Rapids. Ms on file
50 Northern Lights Heritage Services Inc., Winnipeg, MB.
- 51 Northern Lights Heritage Services Inc. 2003c. Keeyask Project Heritage Resource Impact
52 Assessment: Archaeological Survey of Stephen's and Fox (Atikinson) Lakes. Ms
53 on file Northern Lights Heritage Services Inc., Winnipeg, MB.
- 54 Northern Lights Heritage Services Inc. 2004a. Keeyask Project Generating Station:
55 Heritage Resource Impact Assessment Gull (Keeyask) Rapids. Ms on file
56 Northern Lights Heritage Services Inc., Winnipeg, MB.
- 57 Northern Lights Heritage Services Inc. 2005a. Gull (Keeyask) Project: Generating Station:
58 Heritage Resource Impact Assessment. Ms on file Northern Lights Heritage
59 Services Inc., Winnipeg, MB.
- 60 Northern Lights Heritage Services Inc. 2005b. Participatory Action Research,
61 Tataskweyak Cree Nation Student Archaeological Program. Ms on file Northern
62 Lights Heritage Services Inc., Winnipeg, MB.
- 63 Northern Lights Heritage Services Inc. 2005c. Keeyask Projects: Heritage Resource
64 Impact Assessment: Archaeological Investigation at the Paradise Beach Site on

- 65 Fox (Atkinson) Lake. Ms on file Northern Lights Heritage Services Inc., Winnipeg,
66 MB.
- 67 Northern Lights Heritage Services Inc. 2006a. Gull (Keeyask) Project: 2005 Kettle Lake
68 Comparison Study. Ms on file Northern Lights Heritage Services Inc., Winnipeg,
69 MB.
- 70 Northern Lights Heritage Services Inc. 2006c. Keeyask (Gull) Project: Bryant's Point
71 Component Archaeological Field Investigation Component Heritage Resource
72 Impact Assessment. Ms on file Northern Lights Heritage Services Inc., Winnipeg,
73 MB.
- 74 Northern Lights Heritage Services Inc. 2006d. Archaeological Survey of the Northwest
75 Arm of Stephens Lake, Manitoba. Ms on file Northern Lights Heritage Services
76 Inc. Winnipeg, MB.
- 77 Northern Lights Heritage Services Inc. 2006e. War Lake Archaeological Research Project
78 (WARP) Archaeological Field Survey Report. Ms on file Northern Lights Heritage
79 Services Inc. Winnipeg, MB.
- 80 Northern Lights Heritage Services Inc. 2007a. Keeyask Projects: 2006 Archaeological
81 Survey of Kettle Lake, Manitoba, Comparative Study for the Heritage Resource
82 Impact Assessment. Ms on file Northern Lights Heritage Services Inc. Winnipeg,
83 MB.
- 84 Northern Lights Heritage Services Inc. 2007b. Keeyask (Gull) Project: 2006 Fox Lake
85 Comparative Study Component. Ms on file Northern Lights Heritage Services
86 Inc. Winnipeg, MB.
- 87 Northern Lights Heritage Services Inc. 2007c. Keeyask Generating Station:
88 Archaeological Field Investigation Component Clark Lake Archaeological Survey.
89 Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 90 Northern Lights Heritage Services Inc. 2008a. Keeyask Generating Station 2007
91 Archaeological Field Investigation Component Clark Lake Archaeological Survey,
92 Heritage Resource Impact Assessment. MS on file Northern Lights Heritage
93 Services Inc. Winnipeg, MB.
- 94 Northern Lights Heritage Services Inc. 2008b. Keeyask Generating Station 2007
95 Archaeological Field Investigation Component Carscadden Lake and Portage
96 (Pisitif) Creek; Archaeological Survey Heritage Resource Impact Assessment. Ms
97 on file Northern Lights Heritage Services Inc. Winnipeg, MB.

- 98 Northern Lights Heritage Services Inc. 2008c. Archaeological Investigation of the Lower
99 Odei & Burntwood Rivers Related to the Aboriginal Sturgeon Fishery. Ms on file
100 Northern Lights Heritage Services Inc. Winnipeg, MB.
- 101 Northern Lights Heritage Services Inc. 2009a. Keeyask Generating Station 2008
102 Archaeological Field Investigation Component: Carscadden Lake Archaeological
103 Survey Heritage Resource Impact Assessment (HRIA). Ms on file Northern Lights
104 Heritage Services Inc. Winnipeg, MB.
- 105 Northern Lights Heritage Services Inc. 2009b. Keeyask Generating Station 2008
106 Archaeological Field Investigation Component Clark Lake Archaeological Survey
107 Heritage Resource Impact Assessment. Ms on file Northern Lights Heritage
108 Services Inc. Winnipeg, MB.
- 109 Northern Lights Heritage Services Inc. 2009c. Keeyask Generating Station 2008
110 Archaeological Field Investigation Component Pointe West Site (HfKe-2) Formal
111 Excavation. Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 112 Northern Lights Heritage Services Inc. 2009d Keeyask Infrastructure Project 2009 HRIA
113 Startup and Main Camp (Phase 1). Ms on file Northern Lights Heritage Services
114 Inc. Winnipeg, MB.
- 115 Northern Lights Heritage Services Inc. 2009e. Keeyask Generation Project 2009 HRIA of
116 Impervious and Granular Borrow Areas. Ms on file Northern Lights Heritage
117 Services Inc. Winnipeg, MB.
- 118 Northern Lights Heritage Services Inc. 2009f. Keeyask Generation Project 2009
119 Monitoring of Drill Testing on Caribou Island. Ms on file Northern Lights
120 Heritage Services Inc. Winnipeg, MB.
- 121 Northern Lights Heritage Services Inc. 2009g. Keeyask Generation Project 2009 HRIA of
122 North and South Retaining Dikes. Ms on file Northern Lights Heritage Services
123 Inc. Winnipeg, MB.
- 124 Northern Lights Heritage Services Inc. 2009h. Split Lake Shoreline Archaeological Survey.
125 Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 126 Northern Lights Heritage Services Inc. 2009i. Keeyask Heritage Handbook. Ms on file
127 NLHS, Winnipeg, MB.
- 128 Northern Lights Heritage Services Inc. 2010a. Keeyask Generation Project 2009
129 Archaeological Field Investigations: Excavation of the Pointe West Site (HbKx-
130 02), a Proxy Site Investigated for the Keeyask Generation Project HRIA. Ms on
131 file Northern Lights Heritage Services Inc. Winnipeg, MB.

- 132 Northern Lights Heritage Services Inc. 2010b. Keeyask Generation Project 2010
 133 Archaeological Field Investigations: Cache Lake Heritage Resource Impact
 134 Assessment. Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 135 Northern Lights Heritage Services Inc. 2011. Keeyask Generation Project 2010:
 136 Archaeological Field Investigations: Borrow Areas and William Smith Island. Ms
 137 on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 138 Northern Lights Heritage Services Inc. 2011. Keeyask Generation Project 2011 South
 139 Access Road Butnau River Crossing HRIA. Ms on file Northern Lights Heritage
 140 Services Inc. Winnipeg, MB.
- 141 Northern Lights Heritage Services Inc. 2012. Keeyask Generation Project 2011 North
 142 Shore Gull Lake and Selected Borrow Areas. Ms on file Northern Lights Heritage
 143 Services Inc. Winnipeg, MB.
- 144 Northern Lights Heritage Services Inc. 2012. Keeyask Generation Project 2011 Potential
 145 Burial Locations on Gull Lake and Caribou Island . Ms on file Northern Lights
 146 Heritage Services Inc. Winnipeg, MB.
- 147 Northern Lights Heritage Services Inc. 2013. Keeyask Generation Project 2012 HRIA
 148 Archaeological Salvage of the Old Boat Site, HbKu-21 . Ms on file Northern Lights
 149 Heritage Services Inc. Winnipeg, MB.
- 150 Northern Lights Heritage Services Inc. 2013. Keeyask Ice Boom Project 2012
 151 Archaeological Salvage Investigation of the Keeyask Ice Boom Project Salvage
 152 Area. Ms on file Northern Lights Heritage Services Inc. Winnipeg, MB.
- 153 Petch, V. 1992. Archaeological Excavation at HaLd-7, Pukatawakan Bay, Split Lake,
 154 Manitoba. Northern Lights Heritage Services Inc. Submitted to Manitoba
 155 Historic Resources Branch in fulfillment of Heritage Resource Impact
 156 Assessment Mitigation, Split Lake Complex.

- 157 **List of Bipole III Heritage Resource Impact Assessments within Fox lake RMA**
- 158 2010 Bipole III: Keewatinoow Converter Station, Geophysical Survey of Rock Features at
159 HdK1-01
- 160 2010 Bipole III Transmission Project: Archaeological Field Investigations for the
161 Proposed Bipole III Transmission Line, HRIA Heritage Permit Report A42-10/
162 A34-10
- 163 2011 Proposed Bipole III Transmission Project: Archaeological Field Investigations for
164 the Proposed Keewatinoow Converter Station, HRIA Heritage Permit Report
165 A49-10
- 166 2011 Proposed Bipole III Transmission Project: Archaeological Field Investigations for
167 the Proposed Keewatinoow Converter Station, HRIA Heritage Permit Report
168 A11-28
- 169 2011 Proposed Bipole III Transmission Project: Archaeological Field Investigations of the
170 230 kV Transmission Collector Lines, HRIA Heritage Permit Report A43-11
- 171 2011 Proposed Bipole III Transmission Project: Archaeological Field Investigations of the
172 Northern Ground Electrode and Feeder Line, HRIA Heritage Permit Report A44-
173 11
- 174 2011 Proposed Bipole III Transmission Project: Archaeological Field Investigations of the
175 Keewatinoow Camp Facilities, Construction Power Site and Lagoon Areas, HRIA
176 Heritage Permit Report A45-11

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.6.14**
 2 **Water and Wastewater Treatment; p. 4-39 and 4-54**

3 **CEC Rd 1 CFLGC-0013**

4 **QUESTION:**

5 On page 4-39, it is stated that "Filtered backwash from the water treatment plant
 6 operations will be discharged to the Nelson River" This "effluent quality will meet or
 7 exceed Manitoba's standards..." Please explain how:

- 8 1. The community was informed of this process and their responses to the effluence,
 9 especially the Fishermen and Elders from FL
- 10 2. The data may exceed Manitoba's standards
- 11 3. The research was completed for alternative means of treating wastewater and fecal
 12 matter for current and future projects.

13 Ekosi.

14 **RESPONSE:**

15 A response to each question is provided below.

- 16 1. *The community was informed of this process and their responses to the effluence,*
 17 *especially the Fishermen and Elders from FL*

18 The Keeyask Cree Nations (KCNs) and their Members have been involved in discussions
 19 with Manitoba Hydro in regards to the planning and environmental assessment of the
 20 Keeyask Generation Project for more than a decade and, as Partners, this involvement
 21 continues today. This multi-year process has included an extensive community
 22 engagement process in each of the KCNs communities. As per Schedule 3-1 Section 7(b)
 23 of the JKDA, each of the KCNs was responsible for facilitating processes with its
 24 respective Members. The engagement processes undertaken separately by each of the
 25 KCNs is described in Chapter 2 of the Response to EIS Guidelines and in each of the KCNs
 26 Environmental Evaluation Reports.

27 A number of multi-lateral and bi-lateral forums were established to exchange
 28 information and discuss issues related to the Keeyask environmental assessment. In
 29 addition to processes undertaken by each of the KCNs to consult with its respective
 30 members, the KCNs also chose community representatives to participate in each of
 31 these forums. Over time, representatives in these forums have included elected First
 32 Nations representatives, Elders, resource users, youth, other community members, First
 33 Nations staff, and specialist advisors from each of the KCNs. With respect to the topic of
 34 water and wastewater treatment, information regarding the environmental effects of

35 effluents was shared at meetings between the Keeyask Hydropower Limited Partnership
 36 and government agencies which included participation from each of the KCNs. The KCNs
 37 were also made aware of this information during their review of the Response to EIS
 38 Guidelines.

39 2. *The data may exceed Manitoba's standards*

40 The quote from p. 4-39 is in reference to backwash from the drinking water-treatment
 41 plant to be used during the construction period. Backwash refers to the water that has
 42 been used to rinse the filter material. The water used to rinse the filter material is
 43 treated water and not the source groundwater. The filters are designed to remove
 44 particulate matter and colour from the source water. The same quote is also on p. 4-54
 45 but in this case it is in reference to the drinking water plant for the operations phase.
 46 The reservoir will be the source of water for this treatment plant. Neither the
 47 groundwater nor the reservoir source waters are expected to have any substantial fecal
 48 coliform concentrations.

49 With reference to the quote "effluent quality will meet or exceed Manitoba's
 50 standards," this quote was intended to communicate that the treated effluent from the
 51 wastewater-treatment plants will be at or below the concentrations stipulated in
 52 Manitoba's Tier 1 Water Quality Standards, i.e., at or "exceed" the requirements for
 53 fecal coliform. The standard is that the water must be at or below 200 fecal coliform
 54 organisms/100 mL.

55 It is noted that the plans for the water treatment plant backwash have changed from
 56 what is described in the quote on page 4-39. Based on the most current final design,
 57 backwash from the main camp water treatment plant will be sent to the main camp
 58 sewage treatment plant. Wastewater effluent criteria to be achieved prior to its disposal
 59 to the environment are provided in Schedule B to (Manitoba) *Environment Act* Licence
 60 No. 2952 R, which states that wastewater effluent will not be discharged from the
 61 sewage treatment plant to the receiving environment unless:

- 62 • The five day carbonaceous biochemical oxygen demand (CBOD₅) is less than 25
 63 mg/L;
- 64 • The fecal coliform content, as indicated by the Most Probable Number (MPN) index,
 65 is less than 200 per 100mL of effluent;
- 66 • The total coliform content, as indicated by the MPN index, is less than 1500 per
 67 100mL of effluent;
- 68 • The total suspended solids (TSS) concentration in the effluent is less than 25 mg/L;
- 69 • The concentration of unionized ammonia is less than 1.25 mg/L, expressed as
 70 nitrogen (N), at 15°C ± 1°C; and

- 71 • The total residual chlorine concentration of the effluent is less than 0.02 mg/L, as
72 determined by the monthly average.

73 It should be noted that the sewage treatment plant effluent will be disinfected using
74 ultraviolet light and not chlorine, so there will be no residual chlorine in the effluent.

75 These criteria meet those listed in the new *Wastewater Systems Effluent Regulations*
76 under the federal *Fisheries Act*. The wastewater-treatment plants for both the
77 construction phase and operations phase are designed (and will be monitored) to
78 achieve these standards or better.

79 3. *The research was completed for alternative means of treating wastewater and fecal*
80 *matter for current and future projects.*

81 Lagoons were initially selected during the preliminary design phase to treat wastewater.
82 During the final design phase, Manitoba Hydro on behalf of the Partnership engaged
83 consultants practicing in the wastewater-treatment field who reviewed the alternative
84 proven technologies and selected the technology best suited for the wastewater-
85 treatment to be used for the temporary construction and permanent operation phase
86 for the Keeyask Project. Mechanical wastewater treatment plants were favored over
87 lagoons and holding tanks with truck hauling to reliably achieve the federal standards
88 for discharge to surface water.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Executive Summary; p. 21, 36, 38**

3 **CEC Rd 1 CFLGC-0014**

4 **QUESTION:**

5 Throughout the EIS executive summary, the term "regulatory test of/for significance" is
 6 used. Please provide more information as to the source of this test as well as the basic
 7 standards and data for determining the value of this test.

8 Ekosi.

9 **RESPONSE:**

10 The *Canadian Environmental Assessment Act* requires that the response to EIS
 11 Guidelines determine the "significance" of likely adverse residual (after mitigation)
 12 environmental effects of the Keeyask Generation Project on each Valued Environmental
 13 Component (VEC). The term "regulatory significance" was adopted by the Partnership to
 14 distinguish this specific regulatory test use of the word "significance" from everyday or
 15 common uses of this term (see also response to CEC Rd 1 CAC-0060).

16 Section 9.4 of the EIS Guidelines sets out criteria to be used in determining the
 17 significance of predicted potential residual adverse environmental effects. As described
 18 in the Response to EIS Guidelines Section 5.2 (Overview of Approach):

19 "Work by Manitoba Hydro and the KCNs on the government regulatory assessment
 20 process . . . is in accordance with the regulatory framework outlined in Section 1.3,
 21 guidance provided by federal and provincial regulatory agencies, and standard
 22 environmental assessment practice. The existing environment and the manner in which
 23 it functions was studied and analyzed using the scientific method (referred to as
 24 "technical information" in the environmental impact statement (EIS), ATK and local
 25 knowledge. The assessment then predicted the effects on this environment if the
 26 Project is developed, and mitigation was identified to reduce the severity of adverse
 27 effects as much as possible."

28 Section 5.3.1 of the Response to EIS Guidelines describes the various assessment
 29 framework steps. Step 7 is the regulatory significance of residual effects. The regulatory
 30 significance of residual effects on each VEC was evaluated according to criteria set out in
 31 the EIS Guidelines. Section 5.5 of the Response to EIS Guidelines (Approach to
 32 Determination of Regulatory Significance) describes the various steps to determine
 33 regulatory significance, as required by the *Canadian Environmental Assessment Act*.

- 34 Chapter 6 of the Response to EIS Guidelines provides details on how the regulatory
- 35 significance of the Project's effects on each VEC was determined.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Executive Summary; p. 21, 36, 38**

3 **CEC Rd 1 CFLGC-0015**

4 **QUESTION:**

5 The EIS and the executive summary defines the Valued Environmental Components
6 (VECs) as on the basis of cultural ideals or scientific concern. Please provide for us how
7 the proponents of the Keeyask place intangible cultural heritage as defined by UNESCO's
8 Convention for the Safeguarding of Intangible Cultural Heritage, in this understanding of
9 cultural ideals and scientific concern.

10 Ekosi.

11 **RESPONSE:**

12 According to the UNESCO Convention for the Safeguarding of Intangible Cultural
13 Heritage the purposes of the Convention are:

14 **Article 1- Purposes of the Convention:**

- 15 a. to safeguard the intangible cultural heritage;
16 b. to ensure respect for the intangible cultural heritage of the communities, groups
17 and individuals concerned;
18 c. to raise awareness at the local, national and international levels of the
19 importance of the intangible cultural heritage, and of ensuring mutual
20 appreciation thereof;
21 d. to provide for international cooperation and assistance.

22 **Article 2 – Definitions**

23 "1. "Intangible cultural heritage in terms of the Convention " means the practices,
24 representations, expressions, knowledge, skills – as well as the instruments, objects,
25 artefacts and cultural spaces associated therewith – that communities, groups and,
26 in some cases, individuals recognize as part of their cultural heritage. This intangible
27 cultural heritage, transmitted from generation to generation, is constantly recreated
28 by communities and groups in response to their environment, their interaction with
29 nature and their history, and provides them with a sense of identity and continuity,
30 thus promoting respect for cultural diversity and human creativity. For the purposes
31 of this Convention, consideration will be given solely to such intangible cultural
32 heritage as is compatible with existing international human rights instruments, as
33 well as with the requirements of mutual respect among communities, groups and
34 individuals, and of sustainable development."

35 "2. The "intangible cultural heritage", as defined in paragraph 1 above, is
36 manifested inter alia in the following domains:
37 (a) oral traditions and expressions, including language as a vehicle of the intangible
38 cultural heritage;
39 (b) performing arts;
40 (c) social practices, rituals and festive events;
41 (d) knowledge and practices concerning nature and the universe;
42 (e) traditional craftsmanship."

43 "Whereas "Safeguarding" means measures aimed at ensuring the viability of the
44 intangible cultural heritage, including the identification, documentation, research,
45 preservation, protection, promotion, enhancement, transmission, particularly
46 through formal and non-formal education, as well as the revitalization of the various
47 aspects of such heritage (UNESCO October 17, 2003)."

48 In Chapter 2 of the Response to EIS Guidelines the Keeyask Cree Nations clearly outlined
49 the foundation of their intangible cultural heritage through the collective expression of
50 the KCNs worldview (see Section 2.2.1 in the EIS), and their individual statements of
51 involvement in the planning and assessment of the Project - see Sections 2.4, 2.5 and
52 2.6 of the EIS as well as their respective Environmental Evaluation Reports. Please refer
53 to the responses to CEC Rd 1 CFLGC-0007 and CEC Rd 1 CAC-0108b for examples on
54 measures to address, including safeguard, intangible cultural heritage.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0016**

4 **QUESTION:**

5 Please provide us with a copy of the access management plan for Fox Lake Cree Nation.
6 Ekosi.

7 **RESPONSE:**

8 The Keyask Hydropower Limited Partnership filed the Preliminary Draft Construction
9 Access Management Plan for the Keyask Generation Project on April 26, 2013. The
10 draft Plan can be found on the Keyask Project's website at the following link:

11 [http://keyask.com/wp/the-project/environmental-assessment-process/preliminary-
environmental-protection-program](http://keyask.com/wp/the-project/environmental-assessment-process/preliminary-
12 environmental-protection-program)

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.2**
2 **Aboriginal Traditional Knowledge; p. 6-426**

3 **CEC Rd 1 CFLGC-0017**

4 **QUESTION:**

5 On page 6-426, it is stated that adverse social economic effects have been identified.
6 We would like more information on the discussions about these effects, so please
7 provide us with all the reports and studies completed or not-yet-completed by Rachel
8 Eni.
9 Ekosi.

10 **RESPONSE:**

11 The predicted socio-economic effects of the Keeyask Generation Project are
12 documented in Section 6.2.3.5 of the Response to EIS Guidelines, in the Socio-Economic
13 Environment, Resource Use and Heritage Resources Supporting Volume, and in each of
14 the KCNs evaluation reports. No references to work undertaken by Rachel Eni are cited
15 in any of these documents, and no work undertaken by Rachel Eni has been used in the
16 development of these predictions.

17 Rachel Eni was previously on contract with the Fox Lake Cree Nation Negotiation Office.
18 The work undertaken by Rachel Eni as part of this contract is considered confidential by
19 Fox Lake Cree nation.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
 2 **N/A**

3 **CEC Rd 1 CFLGC-0019**

4 **PREAMBLE:**

5 In the updated Keeyask Traffic Assessment, it is stated: "the updated traffic analysis
 6 examines the effects of construction traffic on public roads (PR 280 and PR 391). It does
 7 not include traffic effects on private roads or traffic experienced during the operation
 8 phase. As a result, the north and south access roads, which will be private during
 9 construction, have not been considered in this analysis" (page i)

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. if the North and South Access Roads will be private during construction only, will
 13 they become public/provincial highways after construction is complete?
- 14 2. if so, when will that be?
- 15 3. if so, please provide us with a) a traffic report that discusses public involvement;
 16 terrestrial & aquatic & social/heritage effects b) monitoring during and post
 17 construction c) access to the road by MH workers as well as Fox Lake community
 18 members d) any and all compensation/access agreements of the trappers/resource
 19 users of all the areas that the North and South Access Roads will go through
- 20 4. Will the pr280 be decommissioned?
- 21 5. if so, please provide what "decommissioning" means and what it entails.
- 22 6. if so, will all concrete, pipes and man-made material be removed and will soil &
 23 trees be re-planted (ie. Will the area be rehabilitated?)
- 24 7. Please provide us with any benefits that exists for the Fox Lake community
 25 members to have the SAR.
- 26 8. Please explain how the First Nations and especially Fox Lake participated in the
 27 initiation, design and monitoring of the SAR and NAR.

28 **RESPONSE:**

29 A response to each of the above questions is provided below.

- 30 1. *If the North and South Access Roads will be private during construction only, will*
 31 *they become public/provincial highways after construction is complete?*

32 Section 6.6.4.5.3 of the Response to EIS Guidelines states: "Once the Project is
 33 commissioned, MIT will re-route PR 280 to include the north access road, the generating

34 station facility over the Nelson River and the south access road to Gillam. The road
35 will be transferred from a private road to the provincial road system."

36 2. *If so, when will that be?*

37 The Partnership will not be making the decision on the exact timing of transference of
38 responsibility to MIT; that will be the responsibility of MIT. It will be some time after
39 construction has been completed, the generating station has been commissioned and
40 the North Access Road (NAR) and South Access Road (SAR) are completed to the
41 satisfaction of MIT.

42 3. *If so, please provide us with a) a traffic report that discusses public involvement;*
43 *terrestrial & aquatic & social/heritage effects b) monitoring during and post*
44 *construction c) access to the road by MH workers as well as Fox Lake community*
45 *members d) any and all compensation/access agreements of the trappers/resource*
46 *users of all the areas that the North and South Access Roads will go through*

47 It is unclear what the question is asking. Once the Keeyask Project has been completed
48 and the re-route of PR 280 has been transferred to MIT, then MIT will have
49 responsibility for preparing traffic-related reports. However, the following is noted:

- 50 • During construction, the north and south access roads will remain private roads and
51 the Partnership will have responsibility for monitoring traffic along the roads. The
52 preliminary draft Construction Access Management Plan, filed in April 2013 contains
53 provisions for managing access and patrolling the roads.
- 54 • The preliminary draft Construction Access Management Plan (Cons. AMP) also
55 contains provisions for who has access to travel along the north and south access
56 roads, including construction workers and FLCN resource users (see Section 2.3 of
57 the Cons. AMP).
- 58 • Section 6.7.4.1.1 of the Resource Use section of the Response to EIS Guidelines
59 includes details on compensation for commercial trappers, including Trapline 09
60 along the south access road.

61

62 4. *Will the PR280 be decommissioned?*

63 Section 6.6.4.5.2 of the Response to EIS Guidelines indicates that "MIT plans to abandon
64 the northeastern section of PR 280." In discussions with MIT they indicate once the new
65 road alignment from PR 280 to Gillam, via the new Keeyask generating station, has been
66 completed to the satisfaction of MIT, it is intended that the MIT will take ownership of
67 the new road alignment and legally declare it as Provincial Road (PR 280). At that time,
68 MIT will also legally abandon the north eastern section of existing PR 280 (Km 174 to PR
69 290), which means the declared provincial road status will be legally removed and all

70 associated provincial road route number signing will be taken down. The formal
 71 provincial road declaration and abandonment process is a process that may take several
 72 months. Once the declared status has been removed, the north eastern section of
 73 existing PR 280 (Km 174 to PR 290) will remain open (both legally and physically) as it
 74 automatically becomes a departmental road under the jurisdiction of MIT, given that
 75 the road is located in an unorganized territory. Any future decision as to whether the
 76 old road should remain open, or be otherwise permanently and legally closed, cannot
 77 be made until the new road alignment is opened and legally declared as PR 280. As well,
 78 MIT has indicated that part of the decision-making process will involve a thorough
 79 analysis and assessment, by MIT to determine if on-going public usage and/or access is
 80 still required on the proposed abandoned section of PR 280 (Km 174 to PR 290).

81 *5. if so, please provide what "decommissioning" means and what it entails.*

82 See response to (4) above.

83 *6. if so, will all concrete, pipes and man-made material be removed and will soil & trees*
 84 *be re-planted (ie. Will the area be rehabilitated?)*

85 See response to (4) above.

86 *7. Please provide us with any benefits that exists for the Fox Lake community members*
 87 *to have the SAR.*

88 As stated in Section 6.6.5.5.3 of the Response to EIS Guidelines, pg. 6-486, "Once the
 89 Project is complete, MIT will re-route PR 280 along the north access road, across the
 90 Keeyask Generating Station and along the south access road to Gillam. This will reduce
 91 the overall travel time between Thompson and Gillam by approximately an hour (based
 92 on legal speeds limits). The presence of this route is expected to change travel patterns
 93 in the Gillam area, resulting in an ongoing benefit to Gillam area residents, including
 94 FLCN Members who reside in Gillam."

95 In addition to reduced travel time, the re-routed sections of PR 280 will be new roads
 96 and in better condition than the existing PR 280 around the north side of Stephens Lake.
 97 This could benefit all road travelers, including FLCN Members.

98 *8. Please explain how the First Nations and especially Fox Lake participated in the*
 99 *initiation, design and monitoring of the SAR and NAR.*

100 Access Roads

101 North Access Road

102 In June 2005 a North Access Road Selection Committee was established to recommend
 103 a preferred route alternative within the selected corridor. The Sub-Committee was co-
 104 chaired by TCN and Manitoba Hydro and was to include one or two representatives of
 105 each of the Keeyask Cree Nations (CNP, YFFN and FLCN); representatives from the
 106 engineering disciplines (Manitoba Hydro, Acres Manitoba Limited, and Ininew); and
 107 representatives from the various environmental/socio-economic discipline consultants
 108 (plants, mammals, birds, fisheries, heritage, etc.). It was also recognized that liaison and
 109 input would be required from Manitoba Highways.

110 The North Access Road Selection Committee reviewed route alternatives and potential
 111 issues and concerns related to the access road. Specifically, the Committee combined
 112 engineering, environmental and local knowledge to evaluate issues affecting route
 113 selection, including stream crossings, terrestrial habitat, sensitive areas, heritage
 114 resources, and land use. Input on aspects such as important use by fish, birds, moose,
 115 caribou, important plants and heritage resources (on route alternatives) were provided
 116 from field studies conducted separately by the environmental consulting team. Covering
 117 the range of perspectives expressed, the comparison and evaluation of alternatives
 118 centered on the effects on the Project, the communities and the environment.

119 Committee meetings were held over the summer of 2005 to understand the
 120 perspectives of local residents on the potential road alternatives. Additional engineering
 121 design fieldwork was undertaken to evaluate alternative alignments and complete
 122 detailed design. This included a constraint mapping process to identify areas such as
 123 heritage resources potential, fisheries and wildlife sensitive areas, rare or uncommon
 124 habitat, enduring physical features and local First Nations' sensitivities such as resource
 125 harvesting trails and traplines. The resultant mapping products were analyzed for
 126 alignment adjustments to avoid sensitive areas and enabled the identification of a
 127 preferred route.

128 South Access Road

129 A decision was made to establish a South Access Road Selection Subcommittee to assist
 130 in selecting an alternative for this alignment. Where the North Access Road Selection
 131 Committee was co-chaired by Manitoba Hydro and TCN, the South Access Road
 132 Committee was co-chaired by Manitoba Hydro and FLCN. While committee members
 133 remained the same and the same terms of reference as the North Access Road were
 134 used, it was felt important to have FLCN co-chair the process for the South Access Road.

135 A field trip similar to one for the North Access Road took place on November 3 and 4,
136 2005. One of the key participants in the field visit was a Member from FLCN who had a
137 trap line in the vicinity. As with the North Access Road process, participants were given
138 the opportunity to fly the proposed routes, make observations, and suggest changes
139 and preferences.

140 A community presentation on route alternatives was prepared by FLCN with assistance
141 from Manitoba Hydro. These presentations were made in June 13 and 14, 2006 at
142 Gillam and Bird.

143 Based on engineering, environmental, socio-economic and heritage resource inputs,
144 using the same approach described previously for the North Access Road, three
145 alternative routes were identified within a corridor that extended from the western
146 terminus of the Butnau Dyke to the south shore of the Nelson River at the south dam
147 axis. The committee recommended the most southerly option of the three alternative
148 routes, primarily because it minimized the number of stream crossings, it was the
149 shortest route, and had the least impact on sensitive terrestrial habitats. An additional
150 adjustment was made to the extreme westerly portion of the route to take advantage of
151 more favorable terrain and minimize costs. A further adjustment to the route was made
152 during the final stages of engineering design; any further design changes will be
153 communicated with FLCN and the Town of Gillam. The road was moved off the Butnau
154 Dam due to driver safety, dam safety and costs (construction and maintenance).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020a**

4 **QUESTION:**

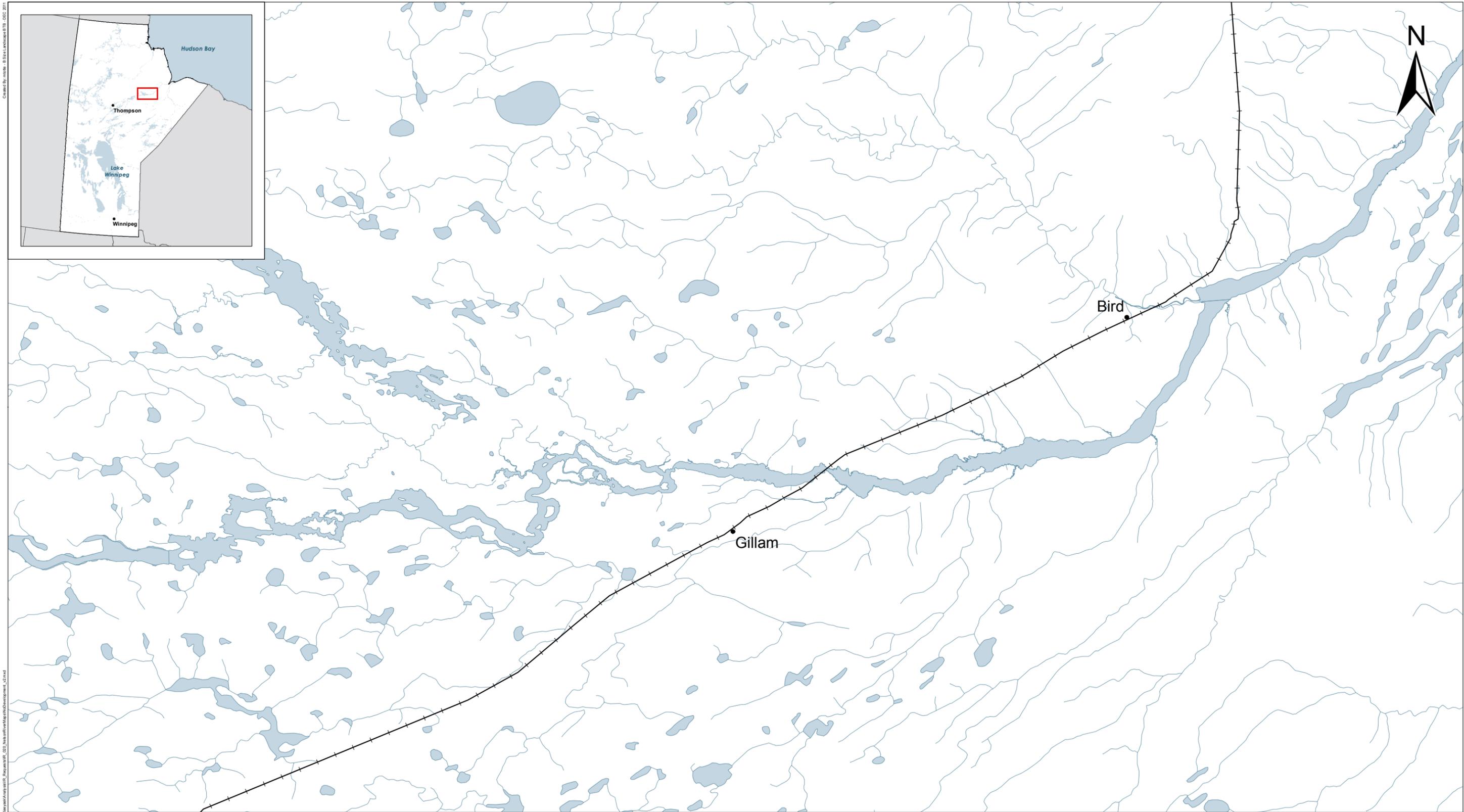
5 Please provide us with a copy of poster-sized maps of:

- 6 • Gillam area prior to any Manitoba Hydro development and any flooding

7 **RESPONSE:**

8 Please see the attached map.

Created by: [unreadable]



File Location: [unreadable]



DATA SOURCE: Company, Source, Etc.	
CREATED BY: Department - Section	
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: DD-MMM-YY
VERSION NO: 1.0	REVISION DATE: 09-JUL-13
QA/QC: XXX/YYY/ZZZ	

Legend

Railroad

No Development

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020b**

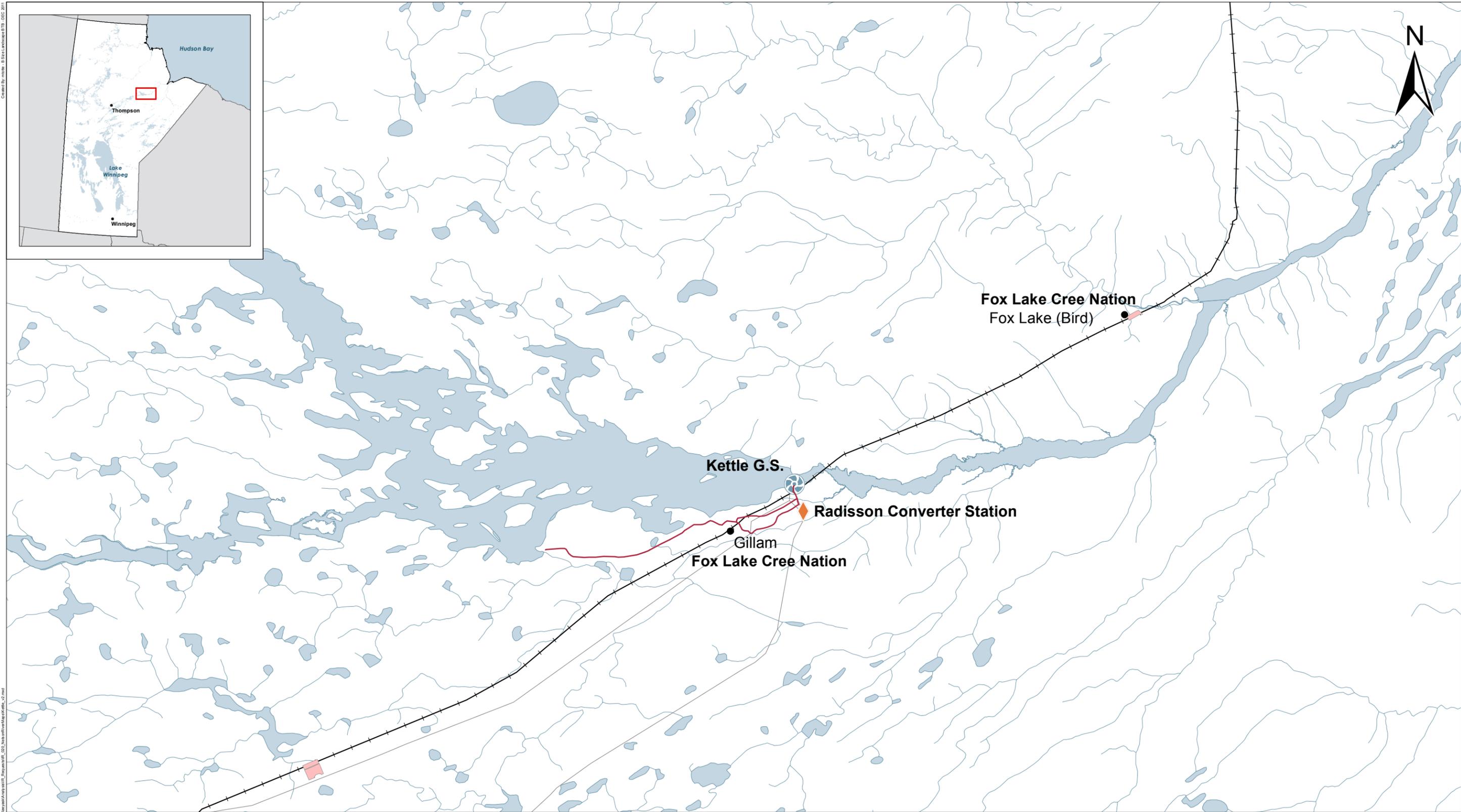
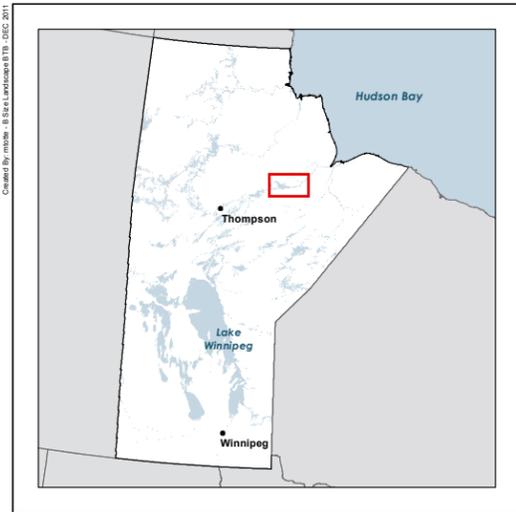
4 **QUESTION:**

5 Please provide us with a copy of poster-sized maps of:

- 6 • Gillam area after Kettle dam and Stephen's Lake

7 **RESPONSE:**

8 Please see the attached map.



File Location: \\pds\share\env\manitoba\Comp\Power_Supply\Report\manitoba\kettle\Report\Map_002_ManitobaMap.mxd, 07.mxd



DATA SOURCE: Company, Source, Etc.	
CREATED BY: Department - Section	
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: DD-MMM-YY 05-JUL-13
VERSION NO: 1.0	QA/QC: XXX/YYY/ZZZ

Legend	
Roads	Railroad
Transmission Lines	Aboriginal Lands
Converter Station	
Generating Station - Hydro-Electric	

Kettle Generating Station

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020c**

4 **QUESTION:**

5 Please provide us with a copy of poster-sized maps of:

- 6 • Nelson River after Long Spruce

7 **RESPONSE:**

8 Please see the attached map.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020d**

4 **QUESTION:**

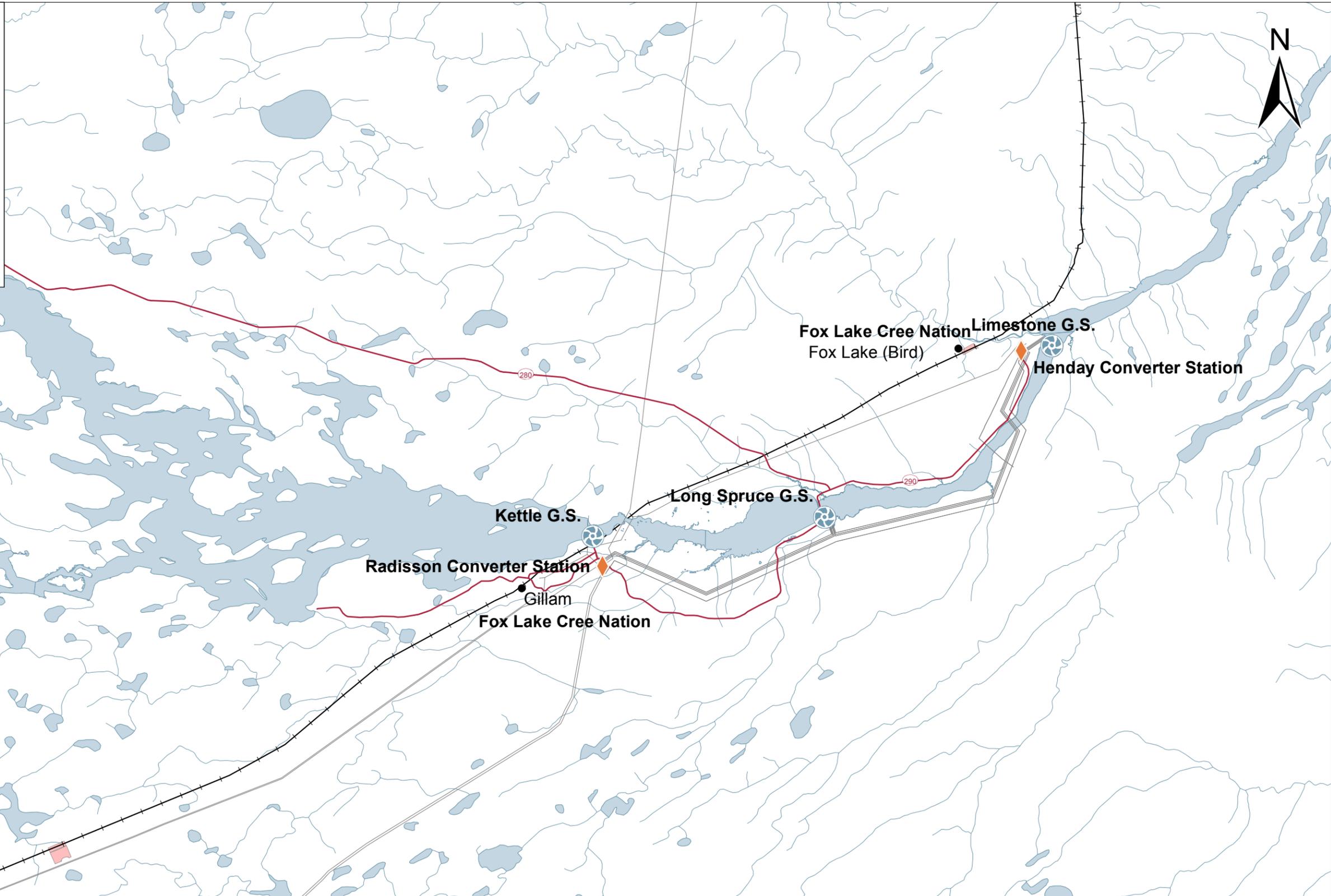
5 Please provide us with a copy of poster-sized maps of:

- 6 • Nelson River after Limestone

7 **RESPONSE:**

8 Please see the attached map.

Created By: [unreadable] 8/24/2013
 File Location: [unreadable]



DATA SOURCE: Company, Source, Etc.	
CREATED BY: Department - Section	
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: DD-MMM-YY 09-JUL-13
VERSION NO: 1.0	QA/QC: XXX/YYY/ZZZ

Legend

- Roads
- Transmission Lines
- Converter Station
- Generating Station - Existing Hydro-Electric
- Railroad
- Aboriginal Lands

**Kettle, Long Spruce
and Limestone
Generating Stations**

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020e**

4 **QUESTION:**

5 Please provide us with a copy of poster-sized maps of:

- 6 • predictions of the submersions and flooding that was to occur after the construction
7 of Kettle Dam in Gillam

8 **RESPONSE:**

9 Please refer to the response to question CFLGC-0020b, which addresses the request for
10 mapping related to the Kettle Dam development.

11 For Kettle:

- 12 • Flooded area predicted in 1966 was 263.0 km² (Manitoba Hydro, 1966).
13 • Flooded area actual is 220.66 km² (Government of Manitoba, 1990).
14 • Maximum forebay level in 1968 and today is 141.12 m (Government of Manitoba,
15 1968).
16 • Water level increase of approximately 30m over predevelopment levels on Stephens
17 Lake upstream of the dam (Keeyask Hydropower Limited Partnership 2012).

18 **REFERENCES:**

19 Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project
20 Environmental Impact Statement: Response to EIS Guidelines, Winnipeg,
21 Manitoba. June 2012. 1,200 pp.

22 Government of Manitoba, Water Resources Branch. 1990. Final License for the
23 Development of Water Power, Kettle Rapids Site, Nelson River [online].
24 Available from
25 http://www.gov.mb.ca/waterstewardship/licensing/pdf/kettle/kettle_1990.pdf
26 [accessed June, 18 2013].

27 Government of Manitoba, Water Control and Conservation Branch. 1968. Interim
28 License for the Development of Water Power, Kettle Rapids Site, Nelson River.
29 Government of Manitoba, Water Control and Conservation Branch, Winnipeg,
30 MB.

31 Manitoba Hydro. 1966. Manitoba Water Power Application Kettle Generating Station.
32 Manitoba Hydro, Winnipeg, MB.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020f**

4 **QUESTION:**

5 Please provide us with a copy of poster-sized maps of:

- 6 • predictions of the submersions and flooding that was to occur after the construction
7 of Limestone

8 **RESPONSE:**

9 Please refer to the response to question CFLGC-0020d, which addresses the request for
10 mapping related to the Limestone development.

11 For Limestone:

- 12 • Flooded area predicted in 1986 was 3.0 km² (Manitoba Hydro, 1986).
13 • Flooded area actual is 2.1 km² (Manitoba Hydro Hydraulics Operations Department).
14 • Maximum forebay level in 1986 and today is 85.34 m (Manitoba Hydro, 1986).
15 • Water level increase of approximately 30m over predevelopment levels just
16 upstream of the dam (Manitoba Hydro, 1986).

17 **REFERENCES:**

18 Manitoba Hydro. 1986. Limestone Generating Station: Environmental Impact Study –
19 Final Report. Prepared by MacLaren Plan Research Inc. and InterGroup
20 Consultants Ltd.

21 Manitoba Hydro, Hydraulic Operations Department

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0020g**

4 **QUESTION:**

5 Please provide us with a copy of poster-sized maps of:

- 6 • predictions of the submersions and flooding that was to occur after the construction
7 of Long Spruce

8 **RESPONSE:**

9 Please refer to the response to question CFLGC-0020c, which addresses the request for
10 mapping related to the Long Spruce development.

11 For Long Spruce:

- 12 • Flooded area predicted in 1972 was 20.6 km² (Manitoba Hydro, 1972).
13 • Flooded area estimated in 1990 was 14.5 km² (Government of Manitoba, 1990).
14 • Flooded area actual is 13.76 km² (Government of Manitoba, 1990).
15 • Maximum forebay level in 1973 and today is 110.33 m (Government of Manitoba,
16 1973).
17 • Water level increase of approximately 26 m over predevelopment levels just
18 upstream of the dam (Keeyask Hydropower Limited Partnership, 2012).

19 **REFERENCES:**

20 Government of Manitoba, Water Resources Branch. 1990. Final License for the
21 Development of Water Power, Long Spruce Site, Nelson River [online]. Available
22 from
23 http://www.gov.mb.ca/waterstewardship/licensing/pdf/long_spruce/long_spruce_final_90.pdf
24 [accessed June, 18 2013].

25 Government of Manitoba, Water Resource Branch. 1973. Interim License for the
26 Development of Water Power, Long Spruce Site, Nelson River. Government of
27 Manitoba, Water Resource Branch, Winnipeg, MB.

28 Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project
29 Environmental Impact Statement: Response to EIS Guidelines, Winnipeg,
30 Manitoba. June 2012. 1,200 pp.

31 Manitoba Hydro. 1972. Manitoba Water Power Application Long Spruce Generating
32 Station. Manitoba Hydro, Winnipeg, MB.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6; p.**
 2 **N/A**

3 **CEC Rd 1 CFLGC-0021**

4 **QUESTION:**

5 Section 6.6 describes the numerous benefits and employment opportunities that are
 6 available to First Nations.

- 7 1. Please provide us with a list of investments and business opportunities that will be
 8 created for the First Nations and those which will be assisting First Nations develop
 9 their own business opportunities.
- 10 2. How will challenges discussed on page 6-434 be resolved?
- 11 3. How will the percentage of the Aboriginal workforce be increased from the low
 12 numbers that are predicted to be in Keeyask on page 6-432?
- 13 4. Please explain why community enhancement through investments and training in
 14 leadership, governance, law and engineering are not part of Manitoba Hydro's
 15 mandates towards community members.

16 **RESPONSE:**

- 17 1. *Please provide us with a list of investments and business opportunities that will be*
 18 *created for the First Nations and those which will be assisting First Nations develop*
 19 *their own business opportunities.*

20 The Keeyask Cree Nations (KCNs) have the opportunity to invest in the Keeyask Project
 21 itself; no other organization or investor has this opportunity. KCNs' involvement in the
 22 project has afforded the communities an opportunity to build local skills and capacity in
 23 terms of planning, assessing and overseeing major development projects. As Project
 24 Partners, the KCNs are beneficiaries to a share of the profits generated from the Project.
 25 The profits will be a new source of income to the KCNs which can be used for
 26 community purposes including infrastructure and programming deficits and economic
 27 development initiatives (refer to CEC Rd 1 CAC- 87).

28 As stated in Section 3.4.2.3.1 of the SE SV, "under the JKDA, KCNs communities have the
 29 option of acquiring up to 25% equity in the Project. Of this total, the CNP has the
 30 opportunity to acquire up to 15% equity in the Project, while FLCN and YFFN each have
 31 the opportunity to acquire up to 5%." The KCNs have two options for investment:

- 32 • A common equity option, which requires a higher level of investment and generates
 33 a proportionate share of distributions from the Project based on Partnership
 34 financial performance, or

- 35 • A preferred equity option. The latter option involves a lower investment and a
36 guaranteed return on investment.

37 For further details, see the JKDA, Sections 4 and 5.

38 Section 6.6.3.2 of the EIS includes the list of Direct Negotiated Contracts (DNCs) in Table
39 6-44 (pg. 6-437). These DNCs, as outlined in Schedule 13-1 of the JKDA, represent
40 business opportunities for each of the KCNs. To be eligible, the business must be
41 majority owned by a KCN community or a Member of the KCNs. In total, 16 DNCs
42 require a wide range of construction services from catering to camp installation to rock
43 excavation. Some will last several months while others are for the entire duration of the
44 construction phase. The list of contracts is detailed in Section 3.4.1.3.1 of the SE SV and
45 are also outlined below:

Table 1: Schedule 13-1

DNC	KCN Allocation
SC-1 Catering	FLCN and YFFN
SC-2 Camp Maintenance Services	CNP
SC-3 Security Services	FLCN and YFFN
SC-4 Employee Retention and Support Services	FLCN and YFFN
SC-5 First Aid Services	CNP
IC-1 Start-Up Camp (part of KIP) - completed	CNP
IC-2 Main Camp (Phase 1 and 2)	CNP
IC-3 Main Camp –sewer and water	CNP
IC-4 Construction Power (ROW) clearing – part of KIP - completed	CNP
IC-5 Main Camp decommissioning	CNP
IC-7 North Access Road construction (part of KIP)	CNP
IC-8 South Access Road construction	CNP
PS-1 Forebay clearing	CNP
PS-2 Painting and Architectural Finish	CNP
PS-5 Rock and Unclassified Excavation	CNP
Bridge install (part of KIP)	CNP

46 In addition to these DNCs, several individual KCNs businesses, especially those with
47 capacity in construction-related activities, could also potentially benefit. These KCNs
48 businesses were identified in Section 3.3.2.1 of the SE SV.

49 2. *How will challenges discussed on page 6-434 be resolved?*

50 The challenges identified in Section 6.6.3.1.1 on p. 6-434 are also noted in the SE SV
 51 Section 3.2.1.1.4 on p. 3-10 and are factored into the employment model. While the
 52 decision to accept a job offer is a candidate's personal choice, the remaining three
 53 identified challenges are addressed through enhancement measures identified in the EIS
 54 and in the Project's collective agreement, Burntwood Nelson Agreement (BNA). Several
 55 mechanisms attempt to address the issues of maintaining a candidate's status in the job
 56 referral system and informing a selected candidate about a specific job opportunity: as
 57 noted in CEC Rd 1 CAC-0089f, KCNs Members have the option to utilize a job seeker
 58 manager as their referral agent. For these individuals, the job seeker manager receives
 59 a notification for registrations that are about to expire.

60 In terms of getting to the job site, section 5.4.1.4.4 of the SE SV notes that there will be
 61 a shuttle service to and from airports in Gillam and Thompson to transport workers to
 62 the Project site. Provision of transportation services for project employees is governed
 63 by the BNA. Under the conditions of the BNA, contractors are responsible to provide
 64 transportation to and from the nearest point of public transportation or the
 65 'Transportation Departure Point' (e.g. Thompson, Gillam, Split Lake, Ilford, York Landing)
 66 to the Project Transportation Point (see CEC Rd 1 CEC- 0012).

67 3. *How will the percentage of the Aboriginal workforce be increased from the low*
 68 *numbers that are predicted to be in Keeyask on page 6-432?*

69 While the percentage of KCNs employment is low, the absolute amount of employment
 70 for the KCNs is substantial for these small to medium sized First Nation communities. In
 71 concert with the initiatives and opportunities outlined in response to 4) below,
 72 numerous measures have or are being implemented for maximizing the participation of
 73 KCNs Members in Keeyask Generation employment opportunities. The most important
 74 of these are:

- 75 • Direct hiring of KCNs Members on Direct Negotiated Contracts, which are being
 76 awarded to businesses that are majority owned by KCNs enterprises.
- 77 • Preferential hiring of Aboriginal residents from the Churchill/Burntwood/Nelson
 78 River areas, which include KCNs residents, as defined by provisions of the BNA for
 79 non-DNC contracts.
- 80 • Community based pre-project training for KCNs residents who were interested in
 81 improving their qualifications for Project jobs.

82 The labour force supply/demand model used to determine levels of KCNs employment
 83 during construction incorporate these employment maximizing measures. The low
 84 percentage outcomes for the KCNs is largely due to the relatively small number of

85 qualified KCNs Members who could work on the Project relative to the large number of
 86 technically skilled Project construction jobs. Again, while the percentage of KCNs
 87 employment is low, the absolute amount of employment for the KCNs is substantial for
 88 these small to medium sized First Nation communities.

89 4. *Please explain why community enhancement through investments and training in*
 90 *leadership, governance, law and engineering are not part of Manitoba Hydro's*
 91 *mandates towards community members.*

92 Manitoba Hydro's Corporate Strategic Plan is available online:
 93 http://ceo.hydro.mb.ca/strategicplan/Documents/csp2012_final.pdf). This plan
 94 articulates Manitoba Hydro's Vision, Mission and Operating Principles. It also describes
 95 goals aimed at achieving its stated Vision including:

- 96 • Attract, develop and retain a highly skilled and motivated workforce that reflects
 97 the demographics of Manitoba; and
- 98 • Strengthen working relationships with Aboriginal peoples.

99 To attain these goals, Manitoba Hydro has a number of initiatives that support and
 100 enhance Aboriginal training and employment for community members. Such initiatives
 101 also support interest in, and pursuit of a variety of career paths, including engineering,
 102 and provide opportunities for work experience and related skill development. Below
 103 are many examples of Manitoba Hydro initiatives and investments in training (also see
 104 CEC Rd 1 CAC 0088d):

105 **Bursaries and Scholarships**

106 Manitoba Hydro's Educational Funding Program provides for bursaries and scholarships
 107 for students pursuing studies in hydro related streams such as Engineering, Technology,
 108 Information Technology and Business. The Program offers a total of \$211,000 annually
 109 in awards, \$171,000 of which is designated for Aboriginal students.

110 **Aboriginal Pre-Placement Training Initiatives**

111 Manitoba Hydro has Aboriginal Pre-Placement Training programs which provide on-the
 112 job training, academic upgrading, mentorship and guidance to help Aboriginal
 113 candidates acquire the skills and competencies required to prepare them for entry into
 114 apprenticeship programs at Manitoba Hydro.

115 **Joint Keeyask Development Agreement (JKDA) Operational Jobs**

116 An Employment Working Group on Operational Jobs implements an employment
 117 framework referenced in the JKDA. The Working Group is comprised of Manitoba Hydro
 118 staff and representatives from Tataskweyak Cree Nation, War Lake First Nation, York

119 Factory First Nation and Fox Lake Cree Nation. The purpose of the Employment
 120 Framework is to increase the number of members employed in Manitoba Hydro's
 121 ongoing operations. The employment framework identifies seven components:
 122 Systemic Foundations, Manitoba Hydro and Career Awareness, Career Exploration,
 123 Career Preparation, Employment Preparation, Pre-Project Training Employment
 124 Bridging, Recruitment and Employment (see CEC Rd 1 CEC-0011).

125 **The Hydro Northern Training and Employment Initiative (HNTEI)**

126 HNTEI was a comprehensive training and employment initiative designed to prepare
 127 northern Aboriginal residents for skilled labour positions related to Manitoba Hydro
 128 projects and other northern Manitoba employment opportunities. Manitoba Hydro
 129 contributed \$20 million to this \$60.3 million initiative. Training was designed and
 130 implemented by the Aboriginal partners for their own community members (see SE SV
 131 Section 3.3.1.1 for further details).

132 **Promoting Aboriginal Skills Development and Employment**

133 Manitoba Hydro is actively involved in promoting Aboriginal skills development and
 134 employment by:

- 135 • Engaging students at high schools and post secondary institutions such as the
 136 Aboriginal Business Education Partners (ABEP) and Engineering Access Program
 137 (ENGAP) at the University of Manitoba;
- 138 • Career fairs and community recruitment visits with hands-on demonstrations of
 139 equipment, and information on career opportunities; and
- 140 • Summer employment opportunities.

141 At the Project level, direct engagement and collaboration in the planning and
 142 assessment phases of the Project and local hiring and contracting have required the
 143 oversight and leadership of each of the KCNs communities. Fostering a workable
 144 management framework, developing and maintaining business relationships and
 145 continuing to build local capacity has the potential to multiply positive effects on local
 146 communities, including in the areas of governance and leadership.

147 **Summer Student Program**

148 Manitoba Hydro hires on average 350 summer students each year and generally 21 -
 149 25% are Aboriginal. In 2012 8 students were hired from KCN communities. In 2013, 12
 150 KCN students have been hired to date.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0022**

4 **QUESTION:**

5 Please provide us with a description of research made into fish passages and fish ladders
6 in Keeyask and in future developments.

7 Ekosi.

8 **RESPONSE:**

9 Fish passage is discussed in the response to EIS Guidelines in Section 6.4.6.1.2, 6.4.6.2.2,
10 Aquatic Environment Supporting Volume Appendix 1A and Project Description
11 Supporting Volume Section 6.10. The Manitoba Hydro document titled “Keeyask Fish
12 Passage Identification of Design Concepts” (November 29, 2012) contains an overview
13 of research made into fish passage relevant to the Project. This document was
14 submitted as part of the Responses to Request for Additional Information from TAC
15 Public Rd 2 and is included on the CD of technical reports provided with this filing.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 3.0; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0023**

4 **QUESTION:**

5 Please provide us with an explanation why Elders and other community members are
6 not presenting /provided with the time to present their views and any support for the
7 Keeyask project in any of the information sessions/public workshops along with the
8 proponents.

9 **RESPONSE:**

10 The question above refers the Public Involvement chapter of the Keeyask Generation
11 Project: Response to EIS Guidelines.

12 As per Schedule 3-1 7(b) of the Joint Keeyask Development Agreement (JKDA),
13 Manitoba Hydro, on behalf of the Partnership, is responsible for undertaking the
14 Keeyask Generation Project Public Involvement Program (PIP) focused on targeted
15 audiences beyond the KCNs. Each of the KCNs also undertook comprehensive and
16 thorough engagement activities with their Members.

17 The KCNs were provided opportunities to participate, as part of the Partnership team, in
18 the Public Involvement Program and, where they chose to participate in this way
19 identified which community representatives to attend PIP events. KCNs participation is
20 noted in the relevant event notes included as part of the Public Involvement Program
21 Supporting Volume and PIP Round Three Supplemental Filing.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CFLGC-0024**

4 **QUESTION:**

5 Please provide us with a report and data for the CUMULATIVE accumulation of mercury
6 and the predictions of mercury increases from all the dams along the Nelson River,
7 including Keeyask and Conawapa.

8 **RESPONSE:**

9 Although not explicitly stated in the question, based on the terminology (e.g.,
10 “accumulation”) it is assumed that the reviewer is interested in mercury concentrations
11 in fish.

12 The concentrations of mercury in fish are considered to represent the estimates from
13 the cumulative effects of all past projects and the proposed Keeyask Project. The
14 concentration estimates provided for the baseline condition are based on measured
15 concentrations that inherently account for the contribution of past projects. Mercury
16 concentrations in fish from waterbodies affected by past projects (including all on-
17 system waterbodies of the lower Nelson River) have declined and are currently similar
18 to concentrations of natural waterbodies in the general region (i.e., boreal forest of
19 northern Manitoba). As a result, predicted mercury concentrations in fish address
20 cumulative effects from the past projects and the proposed Keeyask Project. Further
21 details are provided below.

22 The history of fish mercury concentrations of waterbodies within the Keeyask Study
23 Area is reported in detail in the Keeyask EIS Aquatic Environment Support Volume
24 (AESV; Keeyask Hydropower Limited Partnership 2012). This includes the entire record
25 for concentrations in Lake Whitefish, Northern Pike, and Walleye in Stephens Lake up to
26 year 2005 (AESV Figure 7-2), the only waterbody associated with a dam in the Keeyask
27 Study Area. Although not located directly upstream of a dam, fish mercury
28 concentrations for Split Lake are also presented in similar detail (AESV Figure 7-1).
29 Updated (to year 2007) versions of the figures for Stephens and Split lakes have been
30 published in Jansen (2010, p.18-19). Mercury concentrations in fish from the Nelson
31 River near dams located upstream of the Keeyask Study Area have been presented (and
32 included in meeting notes) for Sipiwesk Lake at the Keeyask “Mercury and Human
33 Health Working Group” * and have been summarized for Cross Lake in Jansen (2010,
34 p.20). Mercury concentrations in Northern Pike and Walleye from the Longspruce and
35 Limestone forebays, the only waterbodies associated with dams on the Nelson River

36 downstream of the Keeyask Study Area, have been presented (and included in meeting
 37 notes) for years up to 2005 at the Keeyask “Mercury and Human Health Working
 38 Group”. A detailed discussion of mercury in fish (including Lake Whitefish) from the
 39 Limestone Forebay for years up to 2003 is available in the “Limestone Synthesis Report”
 40 (NSC 2012) included on the CD of technical reports with this filing.

41 Predictions for increases in fish mercury concentrations in waterbodies along the Nelson
 42 River only exist for the Keeyask Project and are detailed in the Keeyask EIS AESV starting
 43 on p. 7-16. The development of estimates of fish mercury concentrations for the
 44 Conawapa Project are ongoing. It should be noted that flooding as a result of the
 45 Keeyask Project is not expected to affect mercury concentrations in fish in the
 46 Conawapa area. As discussed in the response to CEC Rd 1 CEC-0048, the methylmercury
 47 export via suspended particulate matter or invertebrates further downstream of
 48 Stephens Lake will likely be much reduced, limiting the potential for post-Project
 49 increases in fish mercury concentrations further downstream. These conclusions are
 50 supported by empirical results for reservoirs in Québec and Labrador (summarized by
 51 Schetagne et al. 2003). Similarly, the transfer of mercury for fish moving downstream
 52 from Stephens Lake is expected to be minor.

53 *The “Keeyask Mercury and Human Health Technical Working Group” was formed in June 2007 to address
 54 concerns expressed by the Keeyask Cree Nation (KCN) partners regarding mercury in the environment. The
 55 Group included representatives from each KCN community, Manitoba Hydro, and the Environmental
 56 Assessment Study Team.

57 **REFERENCES:**

58 Jansen, W. 2010. Mercury in fish from six northern Manitoba lakes and reservoirs:
 59 results from 2007-2008 sampling and an update of time trends of monitoring
 60 data. Report by North/South Consultants Inc., Winnipeg, MB for Manitoba
 61 Hydro, 44 pp.

62 Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project
 63 Environmental Impact Statement: Aquatic Environment Supporting Volume,
 64 Winnipeg, Manitoba. June 2012.

65 NSC (North/South Consultants Inc.) 2012. Limestone Generating Station: Aquatic
 66 Environment Monitoring Programs – A synthesis of results from 1985-2003.
 67 Report prepared for Manitoba Hydro, 192 pp.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 4.3.1.3.1 Spring Break-up on the Nelson River; p. 4-42**

3 **CEC Rd 1 CAC-0001**

4 **PREAMBLE:**

5 Some researchers have hypothesized that the northern range limits of sedentary
6 (boreal) caribou coincide with the availability of open water on large lakes at calving in
7 springtime. It is reported (Physical Environment, Section 4.3.1.3.1, p. 4-42) that the
8 study reach along the Nelson River attains “open water levels” by mid-May, but no
9 precise information is provided.

10 **QUESTION:**

11 Please provide summary observations (e.g., approximate mean or range) of the date of
12 spring break-up on one or more large lakes (with islands) in the Project area – for
13 example, Stephens Lake or Split Lake.

14 **RESPONSE:**

15 Approximate dates for spring break-up (2001-2013 inclusive) are based on monitoring
16 studies performed by Manitoba Hydro and analysis of imagery from NASA’s MODIS
17 instruments, which are mounted on their Aqua and Terra satellites. Terra MODIS and
18 Aqua MODIS have viewed the entire Earth’s surface every 1 to 2 days since they were
19 launched in December 1999 and May 2002 respectively. MODIS images are publicly
20 available free of charge on the NASA website¹.

21 The tables below present dates since 2001 where it is known whether there is ice cover
22 or open water for the Keeyask study area and for Stephens Lake. Gaps between dates of
23 known ice cover and known open water are a result of the area of interest being
24 obscured by cloud cover in the satellite imagery or the time interval between
25 reconnaissance trips for the field monitoring studies.

¹ <http://rapidfire.sci.gsfc.nasa.gov/cgi-bin/imagery/realtime.cgi?date=2013171>

Keyask Area Existing Environment Approximate Ice-Off Dates

Year	Known Ice On	Known Open Water
2001	5/10/2001	5/25/2001
2002	6/3/2002	6/13/2002
2003	5/16/2003	5/29/2003
2004	5/31/2004	6/11/2004
2005	5/15/2005	5/29/2005
2006	4/29/2006	5/12/2006
2007	5/13/2007	5/26/2007
2008	5/31/2008	6/9/2008
2009	5/26/2009	6/2/2009
2010	4/29/2010	5/7/2010
2011	5/21/2011	5/26/2011
2012	5/12/2012	5/14/2012
2013	5/24/2013	5/25/2013

26

Stephens Lake Approximate Ice-Off Dates

Year	Known Ice on	Known Open Water
2001	5/10/2001	5/25/2001
2002	6/11/2002	6/23/2002
2003	5/25/2003	5/26/2003
2004	6/4/2004	6/6/2004
2005	5/17/2005	5/18/2005
2006	5/6/2006	5/7/2006
2007	5/18/2007	5/19/2007
2008	5/30/2008	5/31/2008
2009	6/3/2009	6/8/2009
2010	5/9/2010	5/15/2010
2011	5/21/2011	5/26/2011
2012	5/17/2012	5/22/2012
2013	5/25/2013	5/29/2013

27 In the Keeyask study area, the earliest dates of known open water have been observed
 28 from May 7th to June 13th but the range may be as early as April 30th to June 4th
 29 depending on how long after the last known ice-on image that break-up actually
 30 occurred.

31 On Stephens Lake, the earliest date of known open water observed through monitoring
 32 and satellite imagery was May 7th, in 2006. The latest that open water was known to
 33 first occur on Stephens Lake (between 2001 and 2013) was between June 12th and June
 34 23rd.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Photo 7-3; p. N/A**

3 **CEC Rd 1 CAC-0002**

4 **PREAMBLE:**

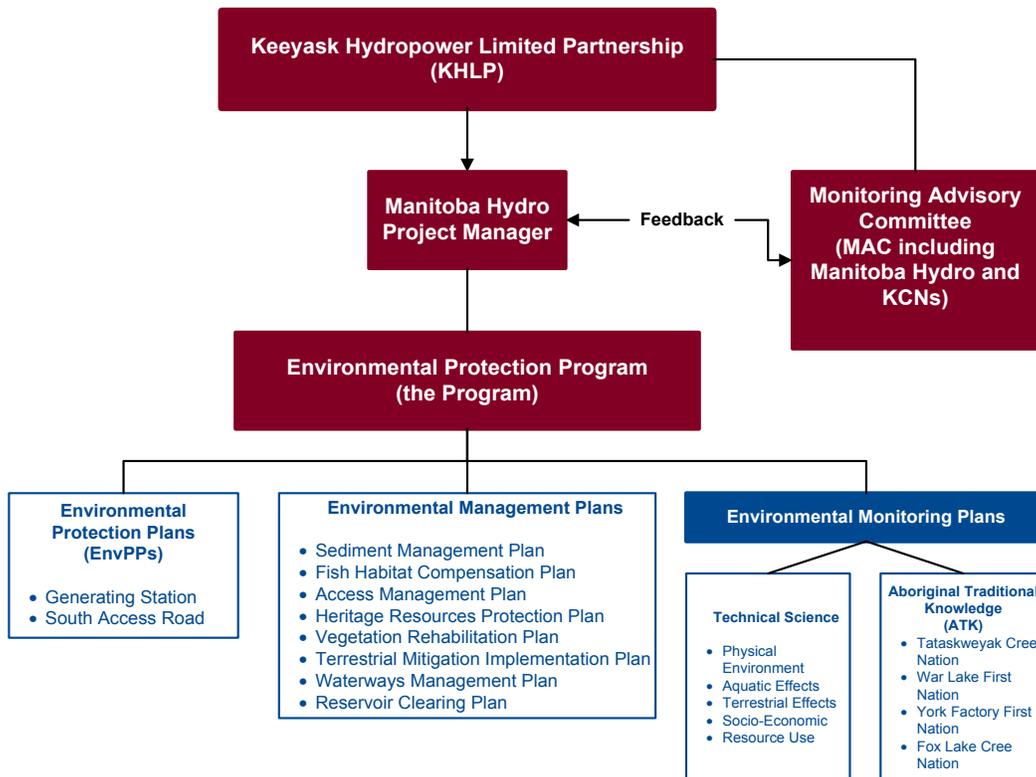
5 The sedentary caribou ecotype can sometimes be distinguished from the migratory
 6 ecotype on the basis of pelage characteristics and antler morphology.

7 **QUESTION:**

8 In addition to Photo 7-3 (Terrestrial Environment), please provide copies or access to
 9 good-quality photographs of adult summer resident caribou taken with remote trail
 10 cameras in Caribou Local Study Area.

11 **RESPONSE:**

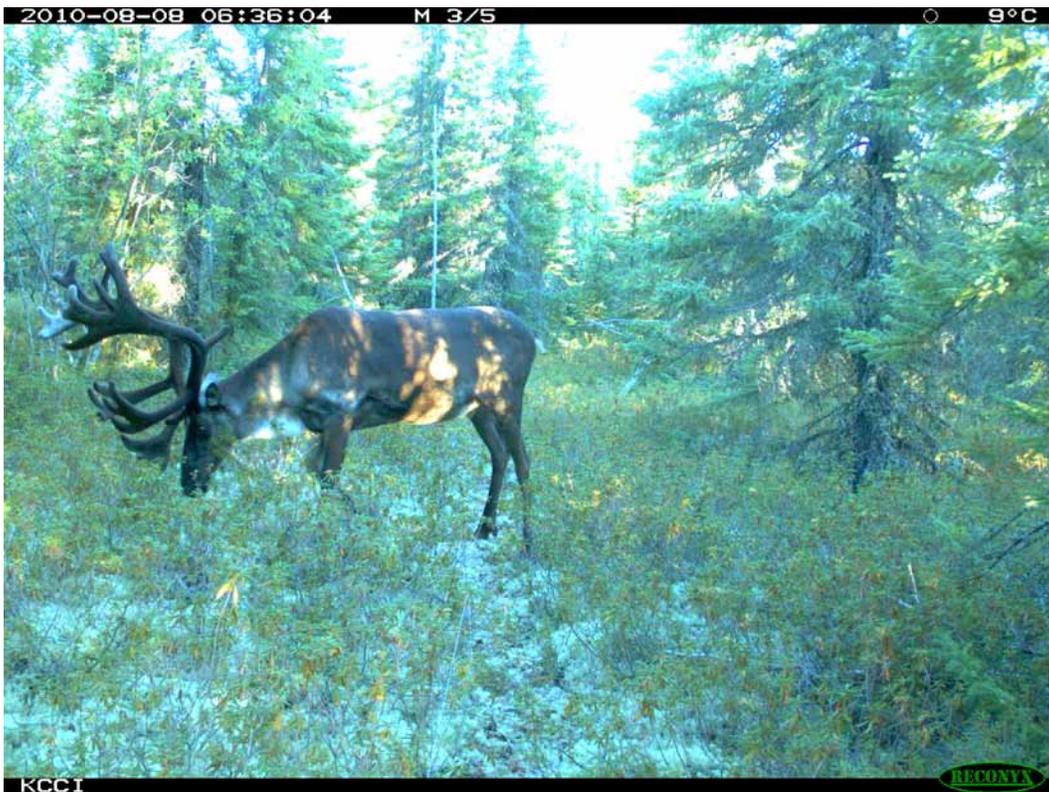
12 As requested, please see below six photographs of adult summer resident caribou taken
 13 in the Caribou Local Study Area with remote trail cameras.



14



15



16



17



18



19

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.6.2 Intactness; p. 7-10**

3 **CEC Rd 1 CAC-0003**

4 **PREAMBLE:**

5 On page 7-10 of Section 7.2.6.2 (Terrestrial Environment), some elements in the
 6 following passage are unclear:

7 “Benchmark values for intactness indicated a low magnitude adverse effect where core
 8 area, as a percentage of land area, is greater than 65%, a moderate magnitude adverse
 9 effect where core area percentage is between 45% and 65%, and a high magnitude
 10 adverse effect where core area percentage is lower than % ... Benchmark values for
 11 intactness indicated a low magnitude adverse effect where less than 35% of the range is
 12 undisturbed, a moderate magnitude adverse effect when 35% to 45% of the range is
 13 undisturbed, and a high magnitude adverse effect when more than 45% of the range is
 14 disturbed ...”

15 **QUESTION:**

- 16 • In the first sentence, please confirm that the final percentage value, which is
 17 missing, is 45%
 18 • In the second sentence, please confirm that “undisturbed” should be replaced with
 19 “disturbed”.

20 **RESPONSE:**

21 The final percentage value is 45% and “undisturbed” should be replaced with
 22 “disturbed.” The sentences should read:

23 Benchmark values for intactness indicated a low magnitude adverse effect
 24 where core area, as a percentage of land area, is greater than 65%, a moderate
 25 magnitude adverse effect where core area percentage is between 45% and 65%,
 26 and a high magnitude adverse effect where core area percentage is lower than
 27 45% (Salmo Consulting Inc. *et al.* 2003; Athabasca Landscape Team 2009; Dzus
 28 *et al.* 2010). Benchmark values for intactness indicated a low magnitude adverse
 29 effect where less than 35% of the range is disturbed, a moderate magnitude
 30 adverse effect when 35% to 45% of the range is disturbed, and a high
 31 magnitude adverse effect when more than 45% of the range is disturbed (Salmo
 32 Consulting Inc. *et al.* 2003).

33 **REFERENCES:**

34 Athabasca Landscape Team. 2009. Athabasca Caribou Landscape Management Options
35 Report. Alberta Caribou Committee. Edmonton, AB. 107 pp.

36 Dzus, E., Ray, J., Thompson, I., and Wedeles, C. 2010. Caribou and the National Boreal
37 Standard:

38 Salmo Consulting Inc. Diversified Environmental Services, GAIA Consultants Inc., Forem
39 Technologies Ltd. and AXYS Environmental Consulting Ltd. 2003. CEAMF Study:
40 Volume 2 Cumulative Effects Indicators, Thresholds, and Case Studies. The BC
41 Oil and Gas Commission and The Muskwa Kechika Advisory Board. 83 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5.3.3**
2 **Intactness; p. 6-322**

3 **CEC Rd 1 CAC-0004**

4 **PREAMBLE:**

5 To depict core areas, it is stated (Response to EIS Guidelines, p. 6-94) that low-use linear
6 features were buffered by 200 m, rather than 500 m for high-use features. Later in this
7 volume (Section 6.5.3.3, p. 6-322), however, it is stated that a core area "... is reduced
8 by Project features that ... occur within 500 m."

9 **QUESTION:**

10 Please clarify what buffer width(s) were used.

11 **RESPONSE:**

12 Existing low use linear features (transmission lines, trails, dykes and cutlines) were
13 buffered 200 m while existing settlements and high use linear features (railways and all
14 types of roads) were buffered 500 m (Terrestrial Environment Supporting Volume
15 Section 2.4.2.4, p. 2-113).

16 Taking a precautionary approach, all of the proposed physical Project footprints were
17 buffered by 500 m so they were treated in the same manner as settlements and high
18 use linear features.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.4.2 Terrestrial Ecosystems and Habitat; p. 6-93**

3 **CEC Rd 1 CAC-0005**

4 **PREAMBLE:**

5 Zone 6 is deemed the Regional Study Area (RSA) for caribou, but Zone 5 is the RSA to
6 estimate intactness, even though caribou are identified as particularly sensitive to
7 fragmentation (Response to EIS Guidelines, p. 6-93). Given that the extent of these two
8 zones differ substantially, the results for intactness at a regional scale are not wholly
9 applicable to caribou.

10 **QUESTION:**

11 Please provide an estimate of proportion of the area undisturbed in Zone 6 (the Caribou
12 RSA) following the Environment Canada protocol for boreal caribou – i.e., after
13 subtracting burns (40 or 50 years old), linear features and other anthropogenic
14 disturbances, buffered by 500 m, while not removing waterbodies.

15 **RESPONSE:**

16 Please refer to the responses to CEC Rd 1 CEC-0021, Table 6 on Caribou, and CEC-Rd 1-
17 CEC-0037a for detailed information concerning Study Zones 5 and 6, based on the
18 Environment Canada protocol for boreal caribou.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 CAC-0006**

4 **PREAMBLE:**

5 EIS Chapter 5, pg 5-6, states: "The cumulative effects assessment focuses on VECs (as
6 described in Step 2) that may be adversely affected by the Project (after mitigation) and
7 considers likely adverse effects caused by the other projects or human activities that
8 overlap in space and time with those of the Project".

9 Based on Fig 5-1 "Regulatory significance Step 1 Assessment", only "VECs that have an
10 adverse effect and meet the criteria for Step 2...are examined further. The effects of the
11 Project on VECs that do not proceed beyond the above Step 1 assessment are
12 determined to be not significant for the purposes of this regulatory assessment."

13 If a Project has no effect on a VEC, it may be reasonable that it not be considered
14 further in a cumulative effects assessment. However, a cumulative effect on a VEC is not
15 defined solely by the size of a project's contribution – a cumulative effect is the total
16 effect on a VEC. Good practice indicates that if the effects of a project on a VEC are
17 minor, but there are effects from other projects on the same VEC, those effects should
18 be included in the cumulative effects assessment.

19 Based on sec 5.3.1, a VEC subject to a "medium" (defined by geographic extent) and
20 "moderate" impact (defined by magnitude) is not carried forward for further
21 consideration in the cumulative effects assessment. Albeit small, such effects may be
22 cumulatively significant when considered in combination with the effects of other
23 present and future activities. A Project's effect could be "minimum", "below a
24 threshold" or have "minimum impairment of an ecosystem component's function." In
25 such cases, the conclusion is NOT that there is no effect, but that it is a small or minor
26 one. However, such 'small effects' effects could be significant from a cumulative effects
27 perspective when considering the effects of other present and future actions.

28 When considering the decision rules for determining regulatory significance as
29 described in sec 5.3.1 and Fig 5-1, project effects that are "minimum", "below a
30 threshold" or have "minimum impairment of an ecosystem component's function" are
31 not carried forward to the cumulative effects assessment.

32 **QUESTION:**

33 How is the cumulative significance of these 'small' (i.e. medium and moderate) project
 34 effects captured or accounted for if they are not carried forward to the cumulative
 35 effects analysis for future activities?

36 **RESPONSE:**

37 The preamble and question do not reflect what is actually done in the Response to the
 38 EIS Guidelines (the EIS).

39 In summary, in the EIS the following is done:

- 40 1. **All VECs** are assessed in Chapter 6 taking into account the cumulative residual
 41 effects of the Project in combination with the effects of past and current projects
 42 and activities; and
- 43 2. **All VECs** with any detectable adverse effect from the Project are "carried forward"
 44 to the Chapter 7 cumulative effects summary review, and considered as well for
 45 potential overlap of Project effects with the effects of reasonably foreseeable future
 46 projects (in combination with the effects of past and current projects as considered
 47 in the Chapter 6 assessment).

48 The preamble confuses the outline provided for the overall effects assessment,
 49 including the cumulative effects assessment, and the methodology used to determine
 50 regulatory significance. Although called 'steps' in each of the quotes provided in the
 51 question, the steps outlined in Section 5.3.1 and those shown in Figure 5-1 come from
 52 two different sections of Chapter 5, addressing two different topics. To assist reviewers
 53 on this matter, these two separate sections are reviewed below.

54 *Nine-Step Approach Outlined in Section 5.3.1 and Cumulative Effects Assessment*
 55 *Approach*

56 The nine-step approach outlined in Section 5.3.1 of the Response to EIS Guidelines
 57 provides the overall "assessment framework" (the cumulative effects quote came from
 58 Step 8), and the steps taken as part of completing the full environmental assessment for
 59 each of the identified VECs. In this section, for example, Step 2 addresses "scope of the
 60 assessment" and Step 7 addresses "regulatory significance of residual effects" (with
 61 reference to criteria set out in Section 5.5).

62 The summary outline of overall approach in Section 5.3.1 by its nature provides only a
 63 cursory outline of the approach to cumulative effects assessment - this specific topic is
 64 addressed in more detail in Section 5.4. As outlined in Section 5.4, and elaborated on in
 65 Chapter 7, the cumulative effects assessment is carried out for all VECs with adverse
 66 effects of the Project, and considers the potential for spatial and temporal overlap with
 67 the effects of other projects and activities.

- 68 • The results of this analysis with regard to adverse effects of the Project in
 69 combination with past and current projects and activities are documented in
 70 Chapter 6 of the Responses to EIS Guidelines and summarized in Chapter 7; the
 71 methods used for this portion of the assessment are summarized as Steps 3 to 7 in
 72 Section 5.3.1: Assessment Framework Steps. As part of this assessment, the
 73 significance of residual effects (i.e., those project effects remaining after mitigation
 74 is applied) is determined for each VEC (as noted above, this is Step 7 and references
 75 criteria in Section 5.5).
- 76 • All VECs that have the potential to experience *any detectable residual adverse*
 77 *effect* from the Project, acting in combination with past and current activities, and
 78 regardless of magnitude or duration, are also addressed in Chapter 7. Here, the
 79 potential for these effects to overlap spatially or temporally with those of
 80 reasonably foreseeable future projects and activities is assessed. The significance of
 81 the Project's residual adverse effects on each VEC is then re-evaluated using the
 82 same criteria as in Step 7. Together, this is Step 8 in section 5.3.1.

83 In Chapter 7, which specifically addresses cumulative effects assessment, Section 7.2
 84 (pages 7-2 and 7-3) reviews the overall approach adopted for the cumulative effects
 85 assessment (CEA) and makes clear the scope of this assessment in Chapters 6 and 7.

86 To be more specific on the matters addressed in this question, Section 7.4 of Chapter 7,
 87 at page 7-11, summarizes the criteria for selection of the CEA VECs as follows:

- 88 • There is an adverse effect on the VEC from the Project after mitigation, when
 89 considered in Chapter 6 in the context of past and present projects and activities
 90 (including those projects and activities identified in table 7-1); and
- 91 • The adverse effect of the Project overlaps in space and time with the effects of one
 92 or more of the past and current projects and activities in Table 7-1 or the future
 93 projects or activities in Table 7-2.

94 Finally, Tables 7-3 and 7-4 present the application of the criteria for selection of CEA
 95 VECs to biophysical and socio-economic VECs, respectively.

96 **Section 5.5 Approach to Determination of Regulatory Significance**

97 Chapter 5 separately sets out in Section 5.5 the steps used to evaluate the regulatory
 98 significance of residual effects of the Project on each VEC; these steps outline the
 99 process used for undertaking Step 7 in Section 5.3.1 for the overall assessment
 100 framework.

101 Determination of the significance of Project effects was undertaken using a two-step
 102 approach, based on the criteria outlined in the EIS guidelines. This two-step approach is
 103 shown in Figure 5-1. It was applied for each VEC considered in Chapter 6, and again for

104 those VECs with the potential to experience residual adverse project effects that were
105 further assessed in Chapter 7.

106 In particular, Section 5.5 (where Figure 5-1 is located) notes the following on pp 5-10 to
107 5-13:

108 **“STEP 1**

109 Each VEC is initially evaluated using the following criteria as provided in the EIS
110 Guidelines:

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

115 ... VECs that have an adverse effect and meet the criteria for Step 2 (see below)
116 are examined further. The effects of the Project on VECs that do not proceed
117 beyond the above Step 1 assessment are determined to be not significant for
118 the purposes of this regulatory assessment.

119 **STEP 2**

120 VECs that have an adverse effect and meet the following criteria are examined
121 further:

- 122 • A species at risk listed as threatened or of special concern under SARA (or is
123 being considered for such listing today based on a COSEWIC
124 recommendation); or
- 125 • Small in geographic extent, large in magnitude and long-term in duration; or
- 126 • Medium in geographic extent and either large in magnitude (regardless of
127 duration) or moderate in magnitude and long-term in duration; or
- 128 • Large in geographic extent and either moderate or large in magnitude
129 (regardless of duration).”

130 In Step 2, additional criteria that may be considered are as follows:

- 131 • Frequency describes how often the predicted residual environmental effect
132 would occur. ...
- 133 • Reversibility describes the potential for recovery from an adverse effect. ...
- 134 • Ecological and Social Context describes whether the VEC is particularly
135 sensitive to disturbance and has the capacity to adapt to change. This
136 includes where relevant the rarity, uniqueness and fragility of the VEC

137 within the ecosystem (e.g., rare species/habitats, critical habitats, breeding
138 areas). ...

139 Following Step 2 analysis for a VEC, a determination is provided on whether the
140 adverse effects of the Project on the VEC are significant for the purposes of this
141 regulatory assessment."

142 The preamble and question set out various assumed conclusions as to how the EIS
143 assessed effects of the Project, including when cumulative effects were assessed, which
144 are not correct and are not supported by any statement in the Response to EIS
145 Guidelines. The following examples are noted as statements that are not correct in this
146 regard:

- 147 • The preamble states that a VEC subject to a "medium" geographic extent impact
148 and a "moderate" magnitude impact "...is not carried forward for further
149 consideration in the cumulative effects assessment".
- 150 • The preamble states that "...project effects that are 'minimum', 'below a threshold'
151 or have 'minimum impairment of an ecosystem component's function' are not
152 carried forward to the cumulative effects assessment."
- 153 • The question assumes, as fundamental to what is asked, that ..."'small' (i.e., medium
154 and moderate) project effects...are not carried forward to the cumulative effects
155 analysis for future activities."

156 In summary, the preamble and overall question note a quote from Section 5.5 regarding
157 Figure 5-1 (which is included in the above response) to the effect that only "VECs that
158 have an adverse effect and meet the criteria for Step 2 (see below) are examined
159 further" and appear to assume that any VEC that does not meet the Section 5.5 criteria
160 for Step 2 in Figure 5-1 (and as outlined above) will not be subject to any cumulative
161 effects assessment. This assumption is not correct. The two steps set out in Section 5.5
162 to determine regulatory significance are applied in both Chapters 6 and 7. The "Step 2 "
163 criteria have no bearing as to which VECs are "carried forward to the cumulative effects
164 analysis for future projects".

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.5.3.1.4 Terrestrial Habitat - Residual Effects of Operation;**
 3 **6.5.3.1.5 Terrestrial Habitat - Conclusion about Residual Effects on**
 4 **Ecosystem Diversity; Chapter 7; p. N/A**

5 **CEC Rd 1 CAC-0007**

6 **PREAMBLE:**

7 EIS Chapter 6, sec 6.5.3.1.4 states: "Project operation is expected to affect less than 1%
 8 of total terrestrial habitat area and areas of the common broad habitat types. After
 9 considering these remaining Project effects in combination with the effects of other past
 10 and existing projects and activities, it is predicted that the Project operation could
 11 increase the affected amounts of total terrestrial habitat and the common habitat types
 12 of almost 6% of historical area, which is a moderate magnitude residual effect."

13 Section 6.5.3.1.5 states that the "residual Project effects on terrestrial habitat are
 14 expected to be adverse but regionally acceptable..." But, on pg 6-318 it reads as follows:
 15 "As terrestrial habitat is not a VEC, it is not carried forward to the CEA with future
 16 projects in Chapter 7."

17 **QUESTION:**

18 Given that the EIS claims to adopt an ecosystem approach (see, for example, Terrestrial
 19 Ecosystem Supporting Volume):

- 20 • How are potential cumulative effects to terrestrial habitat accounted for in the
 21 cumulative effects analysis with regard to VECs of concern: i) water quality
 22 (specifically sedimentation), ii) ecosystem diversity iii) intactness and iv) caribou, if
 23 the Project's impacts on terrestrial habitat are not carried forward and modeled
 24 with respect to the cumulative effects in combination with future projects?

25 **RESPONSE:**

26 Terrestrial habitat change resulting from the future projects was predicted and used as
 27 needed for the ecosystem diversity, water quality (specifically sedimentation),
 28 intactness and caribou assessments. It was not necessary in this regard to carry
 29 "terrestrial habitat" separately forward to the EIS sections dealing with cumulative
 30 effects with future projects in order to consider how changes to terrestrial habitat from
 31 those future projects would affect ecosystem diversity, water quality (specifically
 32 sedimentation), intactness and caribou.

33 It should also be noted that even if the terrestrial habitat supporting topic was carried
 34 forward to the future project EIS sections as a VEC, none of the conclusions for the

35 regulatory significance criteria would change because the terrestrial footprints of the
36 future actions are relatively small and cumulative effects with past and current projects
37 were less than 6% for total terrestrial habitat and the common habitat types. Please see
38 Table 1 in the response to CEC-0021 for the amounts and percentages of total terrestrial
39 habitat affected by the Project in combination with past, current and potential future
40 projects.

41 The following describes how cumulative effects on terrestrial habitat were incorporated
42 into the assessments for ecosystem diversity, intactness, caribou and water quality
43 (specifically sedimentation).

44 Ecosystem Diversity

45 The ecosystem diversity analysis directly includes the cumulative effects of past, current
46 and potential future projects on terrestrial habitat through several of the ecosystem
47 diversity indicator measures. The relevant measures for habitat composition are the
48 number of native broad habitat types and the distribution of area amongst the native
49 broad habitat types while those for priority habitat types are the areas of each priority
50 habitat type. In combination, these indicator measures provide representation for all of
51 the native habitat types. These findings are extended to include cumulative effects with
52 future projects in the Response to EIS Guidelines Section 7.5.2.3 and the TE SV Section
53 2.10.3. Potential cumulative effects of future projects on total terrestrial habitat and the
54 common terrestrial habitats are described above in the second paragraph of this
55 response.

56 Intactness

57 The intactness analysis incorporates cumulative effects on terrestrial habitat through
58 the core area indicator measures, specifically total core area as a percentage of land
59 area, the total number of core areas by size class and the sizes of the largest core areas.
60 Among other things, core area indicates how much habitat is effectively available for
61 wildlife species that are sensitive to human disturbance. Results for the core area
62 indicator measures, extended to include the cumulative effects of potential future
63 projects, are provided in the Response to EIS Guidelines Section 7.5.2.3 and the TE SV
64 Section 2.10.2.

65 Caribou

66 The caribou assessment incorporates cumulative effects of past and current projects on
67 terrestrial habitat through analysis of effects on caribou habitat (winter and calving and
68 rearing) and intactness (Response to EIS Guidelines Section 7.5.2.2.3 and TE SV Section
69 7.4.8.2.2). The loss of caribou habitat and changes in intactness due to past projects was
70 described, and the additional effects of the Project were assessed in the Response to EIS

71 Guidelines Section 6.2.3.4.7 and the TE SV Section 7.4.6.2. Additional detail about
72 cumulative effects of past, current projects and potential future projects on caribou
73 habitat and intactness is provided in the response to CEC Rd 1 CEC-0021.

74 Water Quality (specifically sedimentation)

75 The water quality assessment described historic and existing water quality conditions,
76 and provided an examination of existing and future trends. Water quality is affected by
77 conditions in the watershed, which extends well beyond the study area considered for
78 the Keeyask Project. The cumulative effects assessment for water quality considered
79 whether projects that affect the terrestrial environment, such as Keewatinoow
80 Converter Station and associated facilities (*e.g.*, construction camp), Bipole III, and the
81 Keeyask Transmission Project had the potential to affect water quality, including
82 through increased terrestrial runoff, and concluded that, given planned mitigation
83 measures, effects to water quality in the Keeyask area were not expected. Please see
84 response to CEC Rd 1 CAC-0008 for additional discussion related to the water quality
85 and sedimentation.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
 2 **Cumulative Effects Assessment; p. N/A**

3 **CEC Rd 1 CAC-0008**

4 **PREAMBLE:**

5 EIS Chapter 7, Table 7-3, identifies the potential Conawapa GS as a project that overlaps
 6 with the proposed Keeyask project, having a potential to cumulatively affect water
 7 quality. No other activities or disturbances in the area are identified as acting
 8 cumulatively with the Project's impacts to water quality.

9 Sedimentation (an impact to water quality) is identified in the EIS (Chapter 6, sec. 6.4)
 10 and in the Aquatic Environment Supporting Volume (sec 2) as "large for all aspects of
 11 shoreline erosion." The cumulative effects analysis is focused on in-stream and shoreline
 12 disturbance. Sedimentation caused by terrestrial disturbances receives limited (if any)
 13 attention in the cumulative effects analysis.

14 The cumulative effects of land uses/clearing (e.g. forestry, access roads, transmission
 15 lines) can significantly increase the cumulative amount of sediment loading to that
 16 expected from natural processes. Sediment loading can have adverse effects on
 17 spawning areas and food production for fish. Active stream crossings are often a key
 18 source of sediments and in-stream and riparian habitat changes. This can be either
 19 directly from the crossing construction, or indirectly from delivery of sediments along
 20 the right-of-way.

21 **QUESTION:**

- 22 • What are the predicted or modeled cumulative impacts to water quality
 23 (sedimentation) in the regional study area caused by the Project in combination
 24 with other terrestrial disturbances caused by: i) forestry; ii) stream crossings (e.g.
 25 Bipole III); access roads and trails?

26 Some of these disturbances are outside the study area but affect the same aquatic
 27 processes.

28 **RESPONSE:**

29 To clarify, Table 7-3 identifies overlap of Keeyask Project effects on water quality with
 30 other past/current projects or activities, including CRD, LWR, and hydroelectric stations
 31 on the Nelson and Burntwood rivers (Response to EIS Guidelines, Table 7-3 and Section
 32 7.5.1.1.1). The cumulative effects of the Project in combination with these other
 33 projects are assessed in Chapter 6. The reference to the potential Conawapa GS is in the
 34 context of potential overlap of Keeyask effects with future projects - and, in this context,

35 no other future activities or disturbances in the area are identified as acting
36 cumulatively with the Project's impacts to water quality.

37 Potential cumulative effects of the Project in combination with the future Conawapa GS
38 were identified with respect to suspended sediment (a component of the water quality
39 VEC) due to potential concurrent in-stream construction activity in the Nelson River at
40 both sites at certain times (Response to EIS Guidelines, Table 7-3 and Section 7.5.1.3.1).
41 Aside from this potential cumulative effect, no other detectable likely cumulative
42 adverse effects are predicted to water quality in the regional study area discussed. This
43 response is elaborated on below.

44 The Keeyask Project will include comprehensive erosion and sediment control measures
45 to minimize the erosion of terrestrial areas where Project activities occur (e.g., roads,
46 borrow areas) and to minimize and prevent sediment laden runoff from entering
47 watercourses. The draft Environmental Protection Plans for the construction of the
48 generating station and south access road specifically address erosion and sediment
49 control (Sec. 5.11 in each). This includes regular inspection and maintenance of control
50 measures. Depending on site-specific conditions, erosion and sediment control may
51 include measures such as silt fences, erosion control blankets, seeding exposed areas,
52 rip-rap at stream crossings, buffer strips adjacent to streams, etc. With the
53 implementation of erosion and sediment control measures, the impacts of land-based
54 Project activities are not anticipated to affect sedimentation in the Nelson River in
55 addition to the predicted construction and operation effects discussed in the Response
56 to EIS Guidelines regarding in-stream work and reservoir creation (Sec. 6.3.8).

57 The Keeyask Infrastructure², Keeyask Transmission³, Bipole III⁴ and Conawapa GS
58 projects identified in the Response to EIS Guidelines are current or future activities that
59 would be most likely, in the absence of mitigation, to have a cumulative effect on
60 sedimentation with Keeyask due to land-based activities. Past and current water quality
61 conditions are discussed in the Response to EIS Guidelines (Sec. 7.5.1.1.1) and the
62 Aquatic Environment Supporting Volume (AE SV, Sec. 2.4), while discussion related to
63 past sedimentation is discussed in the Physical Environment Supporting Volume (PE SV,
64 Sec. 7.3). The Response to EIS Guidelines discusses the overlap of the Project with past
65 and current projects on water quality in Section 7.5.1.1.1, and with future projects in
66 Section 7.5.1.3.1.

67 Environmental impact statements for the Keeyask Infrastructure, Keeyask Transmission,
68 and Bipole III projects are publicly available. While specifics of those environmental
69 assessments are beyond the scope of consideration for the Keeyask EIS, it is noted that

² <http://keeyask.com/wp/the-project/keeyask-infrastructure-project-kip>

³ <http://www.ceaa.gc.ca/050/document-eng.cfm?document=83658>

⁴ http://www.hydro.mb.ca/projects/bipoleIII/index.shtml?WT.mc_id=2605

70 these other EISs indicate that comprehensive erosion and sediment control measures
71 will be implemented, similar to that which is noted above for Keeyask. In addition, the
72 *Environment Act* Licence for the Keeyask Infrastructure Project includes a requirement
73 for erosion and sediment control (EA Licence No. 2952⁵). Although an EIS is not available
74 for the Conawapa Project, as a Manitoba Hydro project it is expected to include
75 comprehensive erosion and sediment control measures in the same manner as Keeyask
76 and the other projects noted above. It is reasonable to assume that environmental
77 licences for the three projects not yet licensed would include requirements for erosion
78 and sediment control. It is also noted that these projects primarily affect areas
79 downstream of the area in which Keeyask effects on sediment occur during operation:
80 i.e., in the upstream open-water hydraulic zone of influence, and the area about 10-12
81 km downstream into Stephens Lake where sediment concentrations are reduced with
82 the Project. Cumulative effects with Keeyask are not anticipated as erosion and
83 sediment control measures are expected to prevent effects to water quality (Response
84 to EIS Guidelines, Sec. 7.5.1.3.1).

85 Forestry is not indicated as a likely future activity overlapping with effects of the
86 Keeyask Project (Response to EIS Guidelines, Chap.7). However, to the extent that it
87 does occur elsewhere, the Province's Forestry Branch promotes forest practice
88 guidelines that provide direction for forestry activity in Manitoba⁶. These include
89 guidelines on measures to minimize and prevent erosion and sediment resulting from
90 forestry activities that are the same as or similar to measures noted above for the
91 Keeyask Project.

⁵ <http://keeyask.com/wp/wp-content/uploads/EAct-Licence-2011.pdf>

⁶ <http://www.gov.mb.ca/conservation/forestry/practices/guidelines.html>

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
 2 **Assessment Framework Steps, 6.5.8 Mammals, 7.0 Cumulative**
 3 **Effects Assessment; p. N/A**

4 **CEC Rd 1 CAC-0009**

5 **PREAMBLE:**

6 With regard to flooding in the Local Study Area, for example, two islands will be lost on
 7 Gull Lake, one of which was occupied by caribou during field data collection. The EIS
 8 makes the following claim: "...islands comprise less than 1% of the primary calving and
 9 rearing habitat in the Regional Study Area" and the initial loss of this habitat will likely
 10 be "negligible."

11 The EIS, sec. 7.5.2.2.3, further indicates: "Past and current project effects have resulted
 12 in moderate regional habitat losses and alterations but most of these changes are
 13 limited to habitat near the Nelson River. In comparison, habitat effects over large
 14 migratory caribou ranges are negligible to small." The EIS goes on to state that: "Small
 15 changes in habitat are expected compared to its widespread regional availability and
 16 use by caribou."

17 Interestingly, with regard to spatial bounding and significance determination, Chapter 5
 18 of the EIS, sec 5.3.1, states: "The study areas selected are large enough to capture the
 19 effects of the Project, but not so large as to mask the effects of the Project (by making
 20 the effect of the Project as a percent of the area appear unreasonably small."

21 **QUESTION:**

22 What is the local significance of this habitat loss considering:

- 23 • Observations of the local Cree that caribou are moving back into the area?
 24 • The increasing cumulative effects on habitat (fragmentation) outside the Local Study
 25 Area due to current and future transmission lines, mineral leases, forestry and
 26 access roads?

27 **RESPONSE:**

28 To clarify the second sentence in the preamble to this question, the quoted statement in
 29 its entirety reads "Two islands in Gull Lake will be lost at the GS site, only one of which
 30 was occupied by caribou with calves during field studies. As these islands comprise less
 31 than 1% of the primary calving and rearing habitat in the Regional Study Area, the initial
 32 loss of the islands at the GS site will likely be negligible" (p. 6-369). It is not islands in
 33 general that comprise less than 1% of the primary calving and rearing habitat in the
 34 Regional Study Area, it is the two islands at the GS site that comprise less than 1%. One

35 per cent of the primary calving and rearing islands in the Local Study Area will be lost,
36 and less than 1% of all primary calving and rearing habitat in the Regional Study Area
37 will be lost.

38 Potential Project effects on caribou were assessed in Section 7.4.6.2 of the Terrestrial
39 Environment Supporting Volume (TE SV) and Section 6.2.3.4.7 of the Response to EIS
40 Guidelines. The meaning of the question's reference to "local significance" of this
41 habitat loss is unclear, in the event that it is intended to reference anything beyond the
42 regulatory significance assessment carried out in accordance with Section 5.5 of the
43 Response to EIS Guidelines. As potential Project effects are measured on populations
44 (i.e., in the Regional Study Area) and not individuals (i.e., in the Local Study Area), the
45 significance of Project effects is measured at the regional, not local, scale.

46 As described in the TE SV (Section 7.3.6.3.3), caribou can be found in the area (i.e., have
47 returned). Two of the three groups of caribou that occur in the Regional Study Area
48 (Study Zone 6) are barren-ground caribou and coastal caribou, a forest-tundra migratory
49 woodland caribou ecotype. These caribou utilize very large ranges and the significance
50 of the referenced habitat loss due to the Project is not considered likely to be
51 detectable.

52 A third variety of caribou common to the Keeyask region is present year-round, and has
53 been identified by some KCNs as woodland caribou. The calving behaviour of summer
54 residents is similar to that of boreal woodland caribou. This group has recently been
55 identified by some KCNs as migratory woodland caribou. The exact core range, long-
56 term calving frequency, and herd association of these caribou cannot be clearly
57 determined. Based on recent radio-collaring data, some of the summer residents have
58 been identified as Pen Islands coastal caribou. This group could be coastal caribou,
59 woodland caribou, or a mixture of both, and are referred to as summer resident
60 caribou. For the purposes of the assessment of potential Project effects, the group of
61 summer resident caribou was treated as an independent population that uses a smaller
62 range than the migratory groups, and is more likely to use calving and rearing habitat
63 that occurs in the Keeyask region.

64 The residual effects of the Project and the significance of the loss of calving and rearing
65 habitat have been assessed for the regulatory environmental assessment process and
66 can be found in Section 6.4.6.2 of the TE SV and Section 6.5.8.1 of the Response to EIS
67 Guidelines. Two islands will be lost at the GS site, which comprise less than 1% of the
68 primary calving and rearing habitat in the Regional Study Area. One of these islands was
69 occupied by caribou and calves during field studies. No suitable primary and secondary
70 calving and rearing complexes will be directly affected by the Project during
71 construction. The loss of the islands at the GS site will likely be negligible. This
72 assessment considers the cumulative effects of past and current projects on the

73 landscape. The understanding of current conditions of caribou in the Keeyask region and
74 potential Project effects has been informed by Aboriginal traditional knowledge
75 provided by the KCNs. The cumulative effects of Project effects with future projects has
76 been assessed in Section 7.4.8.2.3 of the TE SV, Section 7.5.2.3.3 of the Response to EIS
77 Guidelines, and in the responses to CEC-0021, CEC-0037a, and CEC-0037b. All of the
78 past, present, and future projects considered in the cumulative effects assessment can
79 be found in Tables 7-1 and 7-2 in Chapter 7 of the Response to EIS Guidelines.

80 As indicated in CEC Rd 1 KK-0007a, included in the assessment was ATK that the EA
81 Study Team was aware of and was relevant to the topic at hand. ATK contributed to the
82 identification of concerns and issues about the Project, helped shape technical science
83 field work studies and contributed to mitigation ideas. Where this ATK disagreed with
84 the conclusions of technical science, this was noted. For example, the Cree Nation
85 Partners' Keeyask Environmental Evaluation Report expressed concerns regarding
86 Project effects on caribou. These differences underscored the importance of monitoring
87 (including ATK monitoring) and management of Project effects.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **7.5.2.2.3 Summary of Cumulative Effects of the Project with Past**
 3 **and Current Projects/Activities; p. N/A**

4 **CEC Rd 1 CAC-0010**

5 **PREAMBLE:**

6 EIS Chapter 7, sec 7.5.2.2.3 7 states: "Potentially, and with moderate scientific certainty,
 7 habitat effects, additive mortality from resource harvest and increased predator access,
 8 accidental mortality, and localized movement effects, which cumulatively affect the
 9 regional caribou population, have occurred only to a small degree in the Regional Study
 10 area."

11 **QUESTION:**

12 Clarification and quantification are requested on the following:

- 13 • What is considered "moderate scientific uncertainty" in this regard?
 14 • What is considered a "small degree" in the Regional Study Area (i.e. what is the
 15 benchmark or comparison)?

16 **RESPONSE:**

17 A response to each of the above questions is provided below.

- 18 • *What is considered "moderate scientific uncertainty" in this regard?*

19 In this regard, a moderate degree of uncertainty is associated with some effects of past
 20 and current projects, such as domestic resource harvest mortality, and the greater
 21 degree of certainty relates to estimates of other effects, such as habitat loss and
 22 alteration and licensed harvest. See Section 5.5 of the Response to EIS Guidelines for a
 23 description of certainty/uncertainty.

- 24 • *What is considered a "small degree" in the Regional Study Area (i.e. what is the*
 25 *benchmark or comparison)?*

26 Benchmark values for physical habitat loss, intactness, linear feature density, and gray
 27 wolf density are described in TE SV Section 7.2.6. These benchmark values were
 28 considered where possible using quantitative analysis and applied to the assessment of
 29 cumulative effects of the project with past and current projects and activities. Please
 30 see CEC Rd 1 CEC-0021 for more detail concerning quantitative habitat values and the
 31 approach to assessing significance. Coming to a final conclusion for a VEC has, in many
 32 cases, required a balancing of the criteria used to assess significance based on

33 professional judgement, past experience, current and potential future trends for these
34 VECs and other non-quantifiable factors. The reference to 'small degree' incorporated
35 all of the above considerations, in assessing the conclusion of cumulative effects
36 significance with the project including future projects and activities (Response to EIS
37 Guidelines Section 7.5.2.2.3).

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: EIS Executive Summary; 7.0 Mammals (TE SV); p.**
 3 **N/A**

4 **CEC Rd 1 CAC-0011**

5 **PREAMBLE:**

6 Terrestrial Environment Supporting Volume Section 7, sec 1.1 states: the Keeyask
 7 impact assessment adopts an ecosystem approach and that an ecosystem "is a
 8 functional unit comprised of the living and non-living things in a geographic are, as well
 9 as the relationships between all of these things." It further recognizes that an ecosystem
 10 has patterns, structures, dynamics, and performs functions (p.1-3). There are four
 11 common categories of ecosystem services: (i) supporting services; (ii) provisioning
 12 services; (iii) regulating services; and (iv) cultural services, each of which is dependent
 13 on specific aspects and relationships of the physical environment to exist and are
 14 phenomena of importance in themselves. Supporting services (e.g. nutrient dispersal
 15 and cycling, seed dispersal, primary production) are regarded as the basis for the
 16 services of the other three categories.

17 However, according to the Executive Summary (p.21), "no valued ecosystem
 18 components were identified for the physical environment".

19 **QUESTION:**

- 20 1. Why are no valued ecosystem components identified for the physical environment,
 21 given the above definition of an ecosystem and ecosystem services?
- 22 2. What specific ecosystem services (at minimum, regulating services) are represented
 23 in the biophysical VEC selection for the Project?
- 24 3. How are cumulative effects to specific ecosystem services quantified and/or
 25 qualified?

26 **RESPONSE**

27 Questions 2 and 3 are combined in the response below.

- 28 1. *Why are no valued ecosystem components identified for the physical environment,*
 29 *given the above definition of an ecosystem and ecosystem services?*

30 The correct and full sentence quote from page 21 of Executive Summary is as follows:
 31 "Although no valued **environmental** components [emphasis added] were identified for
 32 the physical environment, the analysis and characterization of the effects to the physical
 33 environment formed the pathways and foundation for the analysis of the effects to
 34 aquatic, terrestrial and socio-economic valued environmental components." This quote

35 does not address "ecosystems", as such - it simply says that there were no physical
 36 environment component VECs identified. (Please see pages 25/26 of the Executive
 37 Summary for comments regarding terrestrial VECs examined under the broad heading
 38 "ecosystems and habitat".)

39 Project-specific guidelines for the environmental assessment of the Keeyask Generation
 40 Project were followed in the assessment of Project effects on the Physical Environment.

41 While there were no VECs selected for the physical environment assessment, the
 42 pathways of effect from changes to the physical environment to other aspects of the
 43 environment were fully recognized and evaluated in the aquatic, terrestrial, and socio-
 44 economic supporting volumes and in the Response to EIS Guidelines. It is common
 45 environmental assessment practice (and consistent with the project-specific guidelines)
 46 for the EIS to provide a focused assessment using VECs. Since changes to the physical
 47 environment are ultimately manifested as effects to one or more VECs, the selected
 48 VECs provide adequate representation of the effects of the changes on the various
 49 components of the bio-physical and socio-economic environment.

50 The response to CEC Rd 1 CAC-0051a explains the approach towards identifying linkages
 51 and pathways among physical environment components and to other components of
 52 the environment, e.g., aquatic, terrestrial, and socio-economic environments and their
 53 VECs. This reflects the ecosystem approach used in the assessment.

- 54 2. *What specific ecosystem services (at minimum, regulating services) are represented*
 55 *in the biophysical VEC selection for the Project?*
 56 3. *How are cumulative effects to specific ecosystem services quantified and/or*
 57 *qualified?*

58 Ecosystem services are commonly defined as the benefits that people derive from
 59 ecosystems. Ecosystem patterns and processes are the means that produce the human
 60 benefits. The bio-physical and socio-economic VECs that were selected (along with
 61 supporting topics) capture the services provided by nature that are of benefit to people.
 62 Human benefits (i.e., ecosystem services) are either directly or indirectly represented by
 63 the KCNs evaluations or the socio-economic and resource use VECs and supporting
 64 topics.

65 For the purposes of the regulatory assessment, cumulative effects to ecosystem services
 66 are captured through the overall effects assessment for each VEC. This approach is
 67 described in the Response to EIS Guidelines Section 7.2 and 7.6.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.0 (TE SV); EIS Executive Summary; 2.0 (AE SV);**
3 **p. N/A**

4 **CEC Rd 1 CAC-0012**

5 **PREAMBLE:**

6 The Project is located on the Nelson River, which “has been substantially altered over
7 the past 55 years by the development of the Lake Winnipeg Regulation, the Churchill
8 River Diversion and construction of five generating stations” (Exec Summary p. 36).
9 Manitoba Hydro acknowledges that these changes have altered the aquatic and
10 terrestrial environments (Exec Summary).

11 Good practice cumulative effects assessment suggests that the significance of
12 cumulative effects be measured against a past reference condition, i.e. pre-disturbance
13 conditions for in the project area region. With respect to the Project, this is
14 approximately 55 years ago (the late 1950s).

15 However, the Terrestrial Environment Supporting Volume Section 7, sub-sec 1.3.6, for
16 example, states that in the impact assessment, the temporal scope for historical
17 conditions was “as far into the past as needed to describe historical conditions and
18 trends” (p. 1-21) **but not necessarily as far back as needed to clearly describe residual**
19 **impact significance**. The Aquatic Environment Supporting Volume Section 2, sub-sec
20 2.3.4.3 similarly states that an evaluation of potential temporal changes in water quality
21 within the study area was undertaken to determine if conditions have been undergoing
22 **recent** change (p. 2-9) that could affect impact predictions. To this end, a statistical
23 analysis was undertaken for “a **recent** 20 year period”, literature was consulted to
24 assess **recent** temporal changes in water quality, and an assessment of water quality
25 data from Stephens Lake **since the 1970s** was undertaken. In other words, impact
26 analyses seem focused on characterizing recent conditions and changes rather than also
27 pre-disturbance conditions which would be necessary to fully understand the
28 significance of the incremental addition of the Project’s impacts.

29 The Terrestrial Environment Supporting Volume Section 7 outlines the approach taken
30 to evaluating residual effects of the Project on terrestrial VECs. Sub-sec 1.4.4 (p. 1-24)
31 states “current and future trends in key topic indicators and contextual factors were
32 considered in the residual effects assessment.” There is no statement made about “past
33 or historic trends” as a key factor in determining residual effects significance. Lack of
34 focus on pre-disturbance conditions as a key factor in determining significance of
35 residual effects of Project may mean some of the incremental effects of the Project are

36 minimized and can this can later obscure determination of **cumulative impact**
 37 **significance**.

38 **QUESTION:**

39 How were pre-disturbance conditions factored into both the residual impact significance
 40 determination of the Project's effects, and later the significance determination of the
 41 Project's cumulative effects?

42 **RESPONSE:**

43 Contrary to the suggestions in the preamble to this question, the assessments of
 44 regulatory significance of the Project's effects for terrestrial and aquatic VECs
 45 considered available information on the extent to which each VEC had already been
 46 affected by past and current projects (i.e., the extent to which the VEC had already been
 47 changed from "pre-disturbance" or "natural" conditions). Further, where relevant, the
 48 assessments also considered available information on whether a VEC is, therefore,
 49 particularly vulnerable to the additional incremental effects of the Project.

50 Overall, the significance determination of the Project's residual effects carried out for all
 51 VECs in Chapter 6 considered "pre-disturbance" conditions, i.e., the cumulative effects
 52 of the Project in combination with the effects of past and current projects and human
 53 activities. Chapter 7 summarized the Chapter 6 assessments for all VECs with detectable
 54 adverse effects of the Project where the adverse effect of the Project overlaps in space
 55 and time with the effects of one or more of the projects and activities identified for the
 56 cumulative effects assessment (see Tables 7-1 and 7-2 in the Response to EIS
 57 Guidelines).

58 As reviewed in Section 5.5 of the Response to EIS Guidelines (and in Section 1.4.4 of the
 59 Terrestrial Environment Supporting Volume referenced in the question), a standard
 60 overall approach was adopted for the significance determination of the Project's
 61 residual effects (including significance of the Project's cumulative effects) - and this
 62 approach conforms to requirements in the EIS Guidelines for the Project. With regard to
 63 considering the extent to which other projects and activities to date have affected a VEC
 64 and made it particularly vulnerable to additional incremental effects of the Project, the
 65 following elements of this overall approach are noted:

- 66 • Any VEC species at risk listed as threatened or of special concern under SARA (or is
 67 being considered for such listing today based on a COSEWIC recommendation) was
 68 identified and subjected to the Step 2⁷ additional examination with regard to
 69 regulatory significance. In this way, evidence developed to date by others to identify

⁷ See section 5.5 of the Response to EIS Guidelines for a description of the approach to determining significance.

70 vulnerable VECs as a result of disturbances to date from other projects and actions,
71 or any other factor, was fully considered.

- 72 • "Ecological and Social Context Criteria" were considered for all VECs subject to the
73 Step 2 additional examination with regard to regulatory significance in order to
74 assess whether a VEC is particularly sensitive to disturbance (i.e., where relevant, its
75 rarity, uniqueness and fragility within the ecosystem [e.g., rare species/habitats,
76 critical habitats, breeding areas]) and has the capacity to adapt to change. These
77 criteria address directly the extent to which a VEC is particularly vulnerable, for
78 whatever reason, including impacts from other past and current projects.
- 79 • "Magnitude" criteria, which were considered for all VECs in the Step 1 assessment
80 with regard to regulatory significance, also considered where relevant the extent to
81 which a VEC is vulnerable (including a species at risk) to detectable adverse effects,
82 e.g., these criteria considered, where the information is available, established
83 thresholds of acceptable change, range of natural variability, and extent of
84 impairment of an ecosystem's functions.

85 The specific examination of pre-disturbance conditions varied for each VEC depending
86 on 1) the availability of relevant historical information; 2) information on the extent to
87 which there is a basis for concern as to VEC vulnerability due to impacts and changes
88 that have occurred prior to the Project, and/or; 3) current trends or changes that are
89 expected to occur in the future without the Project. Ultimately, the focus of the
90 assessment was on the future rather than on the past, i.e., on examining the
91 vulnerability of each VEC today and in the future without the Project (due to whatever
92 factors might affect this vulnerability), in order to help in identifying the extent to which
93 incremental effects on a VEC from additional changes caused by the Project could
94 potentially result in a cumulative significant adverse effect on the VEC.

95 For example, the full sentence from Section 1.3.6 (p. 1-21) of the Terrestrial
96 Environment Supporting Volume that is quoted only in part in the question is as follows:
97 "For historical conditions, [the temporal scope was determined separately for each key
98 topic] as far into the past as needed to describe historical conditions and trends, **subject**
99 **to the availability of relevant historical information**" (emphasis added).

100 A summary of historical as well as other information examined in this regard by VEC is
101 provided in the attachment to the response to CEC Rd 1 CEC-0020. Two examples of key
102 topic areas and VECs where historical information was available and utilized are noted
103 below:

104 Terrestrial studies examined total historical habitat loss and alteration due to
105 human infrastructure (e.g., settlements, roads and transmission lines) and
106 hydroelectric development to date at approximately 611 km² or 4.8% of Regional
107 Study Area inland habitat area (Response to EIS Guidelines, section 6.2.3.4, p. 6-91

108 and 6-92). These studies also noted that none of the habitat types considered in
109 the ecosystem diversity assessment are experiencing substantial ongoing adverse
110 changes in response to past human development and climate change (as
111 summarized at p. 6-320); similarly, these studies also reviewed impacts of human
112 development to date on intactness (linear feature density and core areas - p. 6-94
113 and 6-95; summarized in combination with Project effects at p. 6-323 and 6-324)
114 and wetland function (p. 6-95 to 6-100; summarized in combination with Project
115 effects at p. 6-327, 6-328).

116 Aquatic studies related to lake sturgeon reviewed historical information regarding
117 impacts of commercial fishing dating back to the early 1900s, as well as impacts of
118 past hydroelectric development. The assessment of Project effects fully recognized
119 that this is a species of particular concern due to the current low population
120 numbers and its vulnerability to the effects of hydroelectric development (Response
121 to EIS Guidelines, p. 6-274 and p. 6-71 and following).

122 In summary, in accordance with good practice for a project-focused EIS carried out to
123 meet regulatory environmental assessment requirements, available and relevant
124 information on pre-disturbance conditions was considered in the significance
125 assessments of the Project's residual effects for all VECs identified for the Project's
126 environmental assessment.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.10.1 Cumulative Effects with Future Projects; p.**
 3 **2-199**

4 **CEC Rd 1 CAC-0013**

5 **PREAMBLE:**

6 Terrestrial Environment Supporting Volume Section 7, sec 1.1 states: the Keeyask
 7 impact assessment adopts an ecosystem approach and that an ecosystem “is a
 8 functional unit comprised of the living and non-living things in a geographic area, as well
 9 as the relationships between all of these things.” The Terrestrial Environment
 10 Supporting Volume Section 7, Section 2: Habitat and Ecosystems, sub-sec 2.10.1
 11 contradictorily states: “By focusing on individual environmental components, the VEC
 12 approach does not capture the broader concept of the Cree worldview, which
 13 emphasizes that all things are interconnected and should be viewed as a whole” (p. 2-
 14 199). This same statement is repeated numerous times throughout the Supporting
 15 Volumes for the EIS.

16 **QUESTION:**

17 If the impact assessment adopts an ecosystem approach, which is by definition focused
 18 on relationship dynamics, then why is the holistic Cree worldview presented as at odds
 19 with it via the valued ecosystem component approach? (Particularly when the latter
 20 may be used to designate ecosystem services as key topics of investigation?)

21 **RESPONSE:**

22 As a clarification, the ecosystem-based approach used in the aquatic and terrestrial
 23 assessments includes other components in addition to relationship dynamics (Aquatic
 24 Environment Supporting Volume Section 1.2; Terrestrial Environment Supporting
 25 Volume Section 1.1).

26 The question does not reflect the context of each referenced quote, or the two track
 27 approach adopted by the Partnership.

28 As explained in the EIS and in response to many other IRs (e.g., see response to CEC Rd 1
 29 CAC-0060 and CAC-0075a), to reflect differences between the VEC-based approach and
 30 the approach of the KCNs based on their Cree worldview, the Partnership chose to
 31 undertake two tracks of analysis and to present both in the filing. This two-track
 32 approach is noted at many places in the EIS, along with acknowledgements as to the
 33 differences that arise from these two different tracks.

34 The Partnership's response to the government regulatory environmental process
35 includes some VECs that reflect ecosystems, and the analysis in each instance strives to
36 understand pathways and interconnections between the Project and each VEC. The VEC
37 approach adopted in the EIS, in accordance with the EIS Guidelines, focuses on
38 individual environmental components even though the components that support the
39 VEC are also discussed (e.g., benthos is not a VEC but since it is a major food source for
40 fish it is examined in detail). The VECs for biophysical topics are selected, where
41 possible, to be representative of ecosystem processes, drivers, emergent properties and
42 functions, and taken together, to provide a picture of the ecosystem, not only of the
43 VEC itself. While the EIS does take an ecosystem-based approach, the approach does
44 not necessarily capture the entire "broader concept of the Cree worldview".

45 The quote at p.2-199 focuses on "the VEC approach" and not on "an ecosystem
46 approach", as such. It says: "By focusing on individual environmental components, the
47 VEC approach does not capture the broader concept of the Cree worldview, which
48 emphasizes that all things are interconnected and should be viewed as a whole." The
49 references in this instance are clearly comparing VECs adopted in the government
50 regulatory environmental process track, and the Cree worldview adopted in the KCNs
51 environmental evaluation track. Subsequent sentences following this quote reference
52 Chapter 2 of the Response to EIS Guidelines, as well as the KCNs' separate
53 Environmental Evaluation Reports to place in context what is being referenced by the
54 "broader concept of the Cree worldview".

55 Please also see response to CEC Rd 1 CAC-0055a.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.8 Cumulative Effects; p. N/A**

3 **CEC Rd 1 CAC-0014**

4 **PREAMBLE:**

5 Terrestrial Environment Supporting Volume Section 7, sec 7.4.8.1 presents a number of
 6 conclusion statements about cumulative impacts on beaver seemingly in absence of
 7 supporting evidence. Examples of such statements include:

8 "Regional beaver populations **are highly likely** to maintain viable levels." (p. 7-144)

9 "Beaver populations **are most likely** to remain sustainable because beaver are widely
 10 distributed and abundant in creeks..." etc. (p. 7-144)

11 "The system will **most likely** remain as it is today." (p. 7-144)

12 **QUESTION:**

13 Are these claims based on population modeling or some other form of modeling or
 14 scenario analysis? If not, what methods or methodology was used to predict impacts on
 15 beaver populations? What specific quantitative and/or qualitative evidence supports
 16 such claims about cumulative effects on beaver?

17 **RESPONSE:**

18 The cumulative effects assessment was based on what is known of beaver, a resilient
 19 species. Evidence that supports the anticipated cumulative effects on beaver is detailed
 20 in the description of beaver in the Regional and Local Study Areas (TE SV Section 7.3.6.2)
 21 and in the effects assessment that precedes the cumulative effects assessment (TE SV
 22 Section 7.4.6.1 and Response to EIS Guidelines Section 6.5.8.3.1). Also, see CEC Rd 1
 23 CEC-0020 and CEC Rd 1 CEC-0021 for a summary of the measures. Beaver reproduce
 24 relatively slowly but can easily compensate for local losses through rapid dispersal
 25 (Boyle and Owens 2007). Beaver can replace annual mortality of 30%, can compensate
 26 for greater losses with increased reproduction (Payne 1989), can create their own
 27 habitat in most areas where water occurs, and are currently under harvest management
 28 regulations.

29 Regional beaver populations are likely to maintain viable levels and to remain
 30 sustainable in the context of the addition of the Bipole III and Keeyask transmission
 31 projects and Gillam redevelopment. A small loss of habitat is expected along the
 32 transmission lines, and Gillam redevelopment could affect a few individuals but is not
 33 expected to affect the regional population. The system will most likely remain as it is

34 today because the Nelson River is already unsuitable for beaver, as only a single beaver
35 lodge was found on the central Nelson River, including Gull Lake, in the 2011 aerial
36 survey for beaver (TE SV Tables 7B-67 and 7B-68). As described in the TE SV (Section
37 7.3.6.2.3), certain conditions must exist on large lakes to be suitable for beaver, and
38 larger rivers with swift waters and unpredictable depths (such as the Nelson River) are
39 not suitable habitat (Allen 1982); new shoreline wetland habitat will not likely be
40 colonized during operation. However, beaver are abundant and widely distributed
41 beyond the Nelson River in the Regional Study Area. For these reasons and the reasons
42 described in the preceding paragraph, no large change in beaver habitat or population is
43 anticipated, and the cumulative effects of the transmission projects and Gillam
44 redevelopment with the Project on beaver will likely be small.

45 **REFERENCES:**

- 46 Allen, A.W. 1982. Habitat suitability index models: beaver. U.S. Department of the
47 Interior, Fish and Wildlife Service. FWS/OBS-82/10.30. 20 pp.
- 48 Boyle, S. and Owens, S. 2007. North American beaver (*Castor canadensis*): a technical
49 conservation assessment. USDA Forest Service, Rocky Mountain Region.
50 Available from
51 <http://www.fs.fed.us/r2/projects/scp/assessments/northamericanbeaver.pdf>
52 [accessed June 12, 2013].
- 53 Payne, N.F. 1989. Population dynamics and harvest response of beaver. Fourth Eastern
54 Wildlife Damage Conference. 134 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.8.3 Moose; p. N/A**

3 **CEC Rd 1 CAC-0015**

4 **PREAMBLE:**

5 In the Terrestrial Environment Supporting Volume Section 7, sub-sec 7.4.8.3.2 states
 6 with respect to moose that “moose abundance, distribution, and movements are likely
 7 to be changed by the Project during construction and operation”, but that “small
 8 changes in habitat are expected compared to the regional availability” (p. 7-147). Good
 9 practice cumulative effects assessment is that a Project’s effects are not minimized by
 10 comparing them against the effects of other Projects or diluted through manipulations
 11 of scale.

12 Sub-sec 7.4.8.3.3 further notes recent decline in the abundance of moose in western
 13 and southeastern Manitoba, where it is thought that access and harvesting are the main
 14 activities affecting the moose. Sub-sec 7.4.8.3.3 goes on to acknowledge that “residual
 15 Project effects on moose are expected to overlap with reasonably foreseeable future
 16 projects”, and presumably also activities such as access and harvesting.

17 **QUESTION:**

18 What are the total effects of past, current, and reasonably foreseeable projects and
 19 activities on the sustainability of the moose VEC, and what is the significance of the
 20 Project’s incremental contribution to this total effect?

21 **RESPONSE:**

22 The total effects of past, current and reasonably foreseeable projects and activities on
 23 the sustainability of the moose VEC, and the overall assessment of the regulatory
 24 significance of the Project's incremental contribution to this total effect, are outlined in
 25 Section 7.5.2.3.3 of the Response to EIS Guidelines. A summary of the analysis for
 26 moose is also provided in the Cumulative Effects Summary included with the response
 27 to CEC Rd 1 CEC-0020.

28 In addressing the sustainability of moose in the area that could be affected by the
 29 Keyask Project, the Split Lake Resource Management Area (SLRMA) was considered as
 30 the regional study area in order to incorporate broader regional issues concerning the
 31 Offsetting Programs, including access and harvest effects. In addition, consideration was
 32 given to future moose harvest sustainability plans in this regional study area. The
 33 sustainability of moose in the SLRMA is described in the Moose Harvest Sustainability
 34 Plan. This plan is currently undergoing an internal review and approval process involving
 35 TCN and WLFN members and Chiefs and Councils and is expected to be available in final

36 form by August 1, 2013 and, once ready, will be presented to the Split Lake Resource
37 Management Board for review and discussion. The scientific model used to predict the
38 effects of harvest on the regional sustainability of moose is included on the CD of
39 Technical Reports provided with this filing.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0016**

4 **PREAMBLE:**

5 It is stated in the introduction of the HHRA that the risk assessment addresses mercury
6 concentrations in the environment that may result if the proposed Keeyask Generation
7 Project is approved. In section 4.2.1 it is stated that the HHRA focus on mercury as the
8 main chemical of potential concern.

9 The risk assessment should identify and address all chemicals of potential concern
10 (COPC) that humans may be directly, indirectly, or accidentally be exposed to during
11 both construction and operation of the proposed Keeyask Generation Project.

12 **QUESTION:**

13 Please identify and assess COPC other than mercury, and update the HHRA with this
14 information.

15 **RESPONSE:**

16 In the early stages of the Project's environmental assessment, the potential for project-
17 related increased concentrations of mercury was identified as a key concern by both
18 Manitoba Hydro and the KCNs (see Section 5.5.3.2 of the SE SV for further details). The
19 identification of mercury as a key concern stems from past experience and current
20 understandings of potential reservoir effects (with regard to COPCs). Furthermore,
21 mercury was the only metal identified in the EIS Guidelines for investigation related to
22 fish and wildlife. An independent toxicologist was selected by the multi-lateral Mercury
23 and Human Health Technical Working Group and requested to undertake a HHRA
24 focused on the evaluation of mercury under these conditions.

25 With regard to an analysis of anticipated increases of COPCs in fish and wildlife and their
26 pathway to human health, Section 7.3.4.2 of the AE SV concluded that "Except for
27 mercury, no substantial changes in total trace element concentrations in fish are
28 anticipated as a result of the operation of the Keeyask GS." The primary sites in which
29 most heavy metals accumulate in fish are tissues other than muscle (e.g., gills, liver,
30 kidney, intestine); mercury is the exception in that its methylated form accumulates in
31 skeletal muscle in the long-term and is therefore the primary metal of concern with
32 respect to human consumption of fish flesh (see response to CEC Rd 1 CAC-0022b).

33 As noted in CEC Rd 1 CAC-0022a, "All mean and individual fish concentrations of arsenic,
34 lead, and mercury, the elements with existing Manitoba guidelines for the protection of

35 human health (Williamson 2002), were below (mercury) or well below (arsenic and lead)
 36 the guideline limits" (see Section 7.3.3.2 of the AE SV, pg. 7-26) (see response to CEC Rd
 37 1 CAC-0022a and CAC-0022b for additional discussion on metals other than mercury in
 38 fish). With regard to birds and mammals, there is no evidence of a connection to heavy
 39 metals other than mercury following hydroelectric development. This was based on a
 40 brief review of Federal Energy Regulatory Commission (2008), Hydro-Quebec (2004),
 41 Ontario Power Generation (2009), and SOMER (1993). Despite no anticipated increase
 42 in COPCs in wildlife associated with the Project, at the request of the KCNs and as
 43 indicated in the draft Terrestrial Effects Monitoring Plan, other heavy metal content
 44 (e.g., cadmium) will be monitored in caribou and moose in response to concerns about
 45 current conditions (not as a result of the Project).

46 Furthermore, based on a brief review of four major hydroelectric projects that have
 47 recently been filed and undergone (or are currently undergoing) the environmental
 48 assessment process in Canada, mercury and/or methylmercury have been the only
 49 COPCs consistently identified for evaluation in terms of human health⁸.

50 In only a few instances have other issues been identified for assessment with regard to
 51 human health for these projects, such as water quality, air quality and noise. However,
 52 while these issues were identified for assessment in terms of impacts to human health,
 53 no specific COPCs associated with these issues were identified in project terms of
 54 reference, EISs or, where available, in HHRAs.

55 In terms of drinking water, which is the other key pathway of effect to human health
 56 mentioned in the EIS Guidelines, the AE SV states "The Project is expected to increase
 57 the magnitude of exceedences of the aesthetic drinking water quality guideline for iron
 58 but is not expected to result in exceedences of other MWQSOGs or CCME guidelines for
 59 drinking water." (pg. 2-83). Consequently, there was no requirement to further
 60 evaluate other COPCs since drinking water guidelines are considered to be protective of
 61 human health.

62 In the case of accidental spills humans may accidentally be exposed to during both
 63 construction and operation of the proposed Keeyask Generation Project, Section 5.7 of
 64 both the *Keeyask Generation Project Generating Station Construction Environmental*
 65 *Protection Plan* and *Keeyask Generation Project South Access Road Environmental*
 66 *Protection Plan* (EnvPPs) provides a list of specific measures to be followed with respect
 67 to transportation and inventory control, storage, handling, refueling and disposal of

⁸ The projects reviewed included: Hydro-Québec – Romaine Complex Project (2007); Hydro-Québec – Eastmain-1-A and Rupert Diversion Project (2004); Nalcor Energy and – Lower Churchill Hydroelectric Generation Project (2009); and BC Hydro – Site C Clean Energy Project (2013).

68 hazardous materials. Following these measures will protect personnel and the
69 environment from exposure.

70 Spills cannot be guaranteed to be entirely prevented by following measures listed in
71 Section 5.7. In the case of accidental spills, Section 4.1 of both EnvPPs states:

72 “Prior to construction, the contractor will prepare a Project-specific Emergency
73 Response Plan including prevention planning and response for both hazardous material
74 spills and fires. The plan will be reviewed and accepted by the Resident Manager or
75 delegate”. See the response to CEC Rd 1 PFN-0041 for additional information related to
76 the spill response plan.

77 **REFERENCES:**

78 **Eastmain**

79 Hydro-Québec. (2004). *Eastmain-1-A Powerhouse and Rupert Diversion: Environmental*
80 *Impact Statement*. 6 volumes.

81 Ministère de l’Environnement. (2003). *Directives for the Preparation of the Impact*
82 *Statement for the Eastmain-1-A and Rupert Diversion Project*. July 2003.

83 Hydro-Quebec. (2004). *Eastmain-1-A powerhouse and Rupert Division - Environmental*
84 *impact statement*. Volume 1: Chapters 1-19. December 2004. 2335 pp.

85 Federal Energy Regulatory Commission. 2008. Final environmental impact statement for
86 hydropower licenses - Yadkin hydroelectric project. Office of Energy Projects
87 April 2008. 408 pp.

88 **Lower Churchill**

89 Government of Canada and Government of Newfoundland and Labrador. (2008).
90 *Environmental Impact Statement Guidelines for the Lower Churchill*
91 *Hydroelectric Generation Project*. July 2008.

92 Nalcor Energy. (2009). *Lower Churchill Hydroelectric Generation Project – Environmental*
93 *Impact Statement*. 3 volumes.

94 Minaskuat Inc. (2008). *Lower Churchill Hydroelectric Generation Project: Calculations of*
95 *Anticipated Consumption Advisory Levels of Fish in the Lower Churchill Area*.

96 **Romaine**

97 Environnement Québec. (2004). *Direction des évaluations environnementales : Directive*
98 *pour le projet du complexe de La Romaine*, 3211-12-86. Avril 2004.

- 99 Hydro-Québec. (2007a). *Complexe de la Romaine: Etude d'impact sur l'environnement*. 9
100 volumes.
- 101 Hydro-Québec. (2007b) *Complexe de la Romaine: Le mercure et la santé publique.*
102 *Exposition au mercure et perception du risqué de contamination par le mercure*
103 *de la population d'Ekuanitshit, Rapport Sectoriel.*
- 104 Hydro-Québec. (2007c). *Complexe de la Romaine. Le mercure et la santé public:*
105 *Exposition au mercure et perception du risqué de contamination part le mercure*
106 *des populations de Havre-Saint-Piere et de Longue-Pointe-de-Mingan, Rapport*
107 *Sectoriel.*
- 108 Hydro-Québec. (2008a). *Complexe de la Romaine – Complément de l'étude d'impact sur*
109 *l'environnement, Réponses aux questions et commentaires de l'Agence*
110 *canadienne d'évaluation environnementale (L'ACEE) – Volume 2 – juin 2008*
- 111 Hydro-Québec. (2008b). *Complexe de la Romaine – Complément de l'étude d'impact sur*
112 *l'environnement, Réponses aux questions et commentaires de l'Agence*
113 *canadienne d'évaluation environnementale (L'ACEE), Deuxième série : Volume 3*
114 *– juillet 2008*
- 115 Hydro-Québec. (2008c). *Complexe de la Romaine – Complément de l'étude d'impact sur*
116 *l'environnement, Réponses aux questions et commentaires de l'Agence*
117 *canadienne d'évaluation environnementale (L'ACEE), Deuxième série : Questions*
118 *CA-131 à CA-173 – septembre 2008.* NALCOR. 2009. Lower Churchill
119 Hydroelectric Generation Project Environmental Impact Statement Volume II
120 Part A Biophysical Assessment. Accessed at:
121 www.NALCORenergy.com/assets/eisvol2a.pdf
- 122 Ontario Power Generation Inc. 2009. Comprehensive study report - Lower Mattagami
123 River hydroelectric complex
- 124 **Site C**
- 125 CEAA & BCEAO (2012) *Site C Clean Energy Project Environmental Impact Statement*
126 *Guidelines: Pursuant to the British Columbia Environmental Assessment Act and*
127 *the Canadian Environmental Assessment Act, September 5, 2012.*
- 128 BC Hydro. (2013a). *Site C Clean Energy Project Environmental Impact Statement. Volume*
129 *2 Appendix J: Mercury Technical Reports Part 2.*
- 130 BC Hydro. (2013b). *Site C Clean Energy Project Environmental Impact Statement. Volume*
131 *4: Social, Heritage, and Health Effects Assessment.*

- 132 Societe Multidisciplinaire d'études et de Recherches de Montréal (SOMER). (1993).
133 Complexe Grande-Baleine, La contamination du milieu et des ressources
134 fauniques de la zone d'étude du complexe Grande-Baleine. Prepared for Hydro-
135 Québec. Montréal: SOMER.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0017**

4 **PREAMBLE:**

5 Typical sources of mercury exposures to humans are listed in Section 2.2 of the HHRA.
6 This listing contains several potential exposure pathways and sources other than eating
7 of fish from the lakes that will be impacted by the Keeyask Generation project. In
8 Section 4.3 it is stated that human receptors were assumed to consume country (wild)
9 foods including wild game, fish and plants. In addition, receptors were assumed to be
10 exposed to surface water.

11 **QUESTION:**

12 The HHRA should consider the combination of mercury exposures from both the
13 proposed project as well as from other "background" sources to arrive at total mercury
14 exposure. Total mercury exposure would then be compared to exposure limits
15 (tolerable daily intake) to determine potential health risks. Please update the HHRA
16 accordingly.

17 **RESPONSE:**

18 Consumption of fish is recognized by most health agencies as the key source of
19 exposure to methylmercury and evaluation of background non-fish sources is not
20 typically considered or required. This approach is illustrated in Manitoba Water
21 Stewardship (2007) "Mercury in Fish & Guidelines for the Consumption of Recreationally
22 Angled Fish in Manitoba" (available at:
23 [http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007](http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007.pdf)
24 [.pdf](http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007.pdf)) where fish consumption guidelines are developed using 100% of the tolerable daily
25 intake without the need to consider other background sources. Similarly, Health Canada
26 (2007) "Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish
27 Consumption" (available at: [http://www.hc-sc.gc.ca/fn-](http://www.hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson-eng.php)
28 [an/pubs/mercur/merc_fish_poisson-eng.php](http://www.hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson-eng.php)) provide a nearly identical approach
29 whereby 100% of the tolerable daily intake is allowed to result from fish. Consequently,
30 the evaluation of total mercury exposure has not been practiced by the key regulatory
31 agencies for the Keeyask Project. Instead, these agencies routinely compare fish
32 consumption exposures to the tolerable daily intake without the need for consideration
33 of other sources.

34 With the above in mind, however, the HHRA did evaluate the potential health risks from
35 combined sources of exposure that include fish, birds, wild game and surface water.

36 Risk estimates were provided for both existing conditions and Project conditions. These
37 risk estimates are provided in Sections 5.6.1 and 5.6.2 of the Human Health Risk
38 Assessment. In the HHRA, Tables 5-10 and 5-11, risk estimates are provided as the
39 percentage of the tolerable daily intake which are interchangeable with the term Hazard
40 Quotient (*e.g.*, 80% of the tolerable daily intake is the same as a Hazard Quotient of
41 0.80; 100% of the tolerable daily intake is the same as a Hazard Quotient of 1.0). The
42 reader is referred to Sections 5.6.1 and 5.6.2 of the HHRA report for further information
43 and a description of the approach used to evaluate risks from combined sources.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0018**

4 **PREAMBLE:**

5 On page 5C-38, the toxicological reference values (TRVs) that were used in the
 6 assessment are described:

- 7 • Methylmercury: Tolerable Daily Intake (TDI) of 0.2 µg/kg bw-day (children and
 8 women of child bearing age), and a TDI of 0.47 µg /kg-day (general population),
 9 based on Health Canada 2010.
- 10 • Total mercury: TDI of 0.57 µg /kg bw-day (general population), based on WHO 2010.

11 On page 5C-38 it states that it was assumed the mercury concentrations in fish and
 12 waterfowl were all methylmercury, while in wild game, plants and surface water it was
 13 assumed that it was total mercury. Also it was assumed that surface water
 14 concentrations were total mercury.

15 In Appendix 5C-14, it is noted that “the WHO (2010) Committee established a PTWI for
 16 inorganic mercury of 4 µg /kg bw-day. WHO (2010) indicated that this PTWI for
 17 inorganic mercury was considered applicable to dietary exposure to total mercury from
 18 foods other than fish and shellfish. WHO (2010) also indicated that this was applicable
 19 to the whole population and did not indicate that risks would be additive with
 20 methylmercury exposures”.

21 Further, Appendix 5C-14 notes that the toxicological basis of the TDIs for total/inorganic
 22 mercury and methylmercury are based on different endpoints. The basis of the
 23 total/inorganic mercury TDI is kidney effects (WHO 2010), based on chronic exposures in
 24 rats, while the methylmercury TDI is based on the incidence of neurological impairment
 25 in children of mothers with elevated methylmercury intake from fish.

26 In Tables 5-10 and 5-11, risk estimates for various foods (fish and non-fish foods) are
 27 combined into a single table. The text within pages 5C-61 to 5C-64 relate to the addition
 28 of the predicted hazard quotients (HQs) for mercury in relation to different food
 29 exposures (fish and non-fish), and also surface water ingestion.

30 **QUESTION:**

31 Given that the toxicological endpoints upon which the TDIs for total/inorganic mercury
 32 and methylmercury are different (kidney effects vs. developmental neurotoxicity), the
 33 target organs and mechanisms of effect appear to be different, is the addition of the HQ

34 values in Section 5.6 justifiable? Please provide additional rationale, or a revised Section
35 5.6, where the potential risks associated with total/inorganic mercury are summed
36 (water, game) and interpreted separately from methylmercury risks (fish, waterfowl).

37 **RESPONSE:**

38 Firstly, it is noted that there are some slight errors in the preamble provided above.
39 The HHRA indicates that the WHO (2010) PTWI for inorganic mercury is 4 µg/kg/week
40 (not 4 µg/kg bw/day that is stated in line 32 of the preamble). Also, this information can
41 be found on pages 6 to 7 of Appendix 5C-1-1 (not on page Appendix 5C-14 as noted in
42 line 31 of the preamble).

43 With the above in mind, there is no clear consensus on the requirement to add the HQ
44 values for methylmercury and inorganic mercury. In development of their PTWI for
45 inorganic mercury, WHO (2010) "Joint FAO/WHO Expert Committee on Food Additives:
46 Seventy-Second Meeting" (available at:
47 http://www.who.int/foodsafety/chem/summary72_rev.pdf) stressed that the
48 predominant form of mercury would be as inorganic mercury in non-fish foods;
49 however, WHO (2010) indicated that some undefined quantity of mercury will occur as
50 methylmercury in these foods. Consequently, there would be some undefined potential
51 contribution to neurological effects from non-fish foods since some undefined amount
52 may be present as methylmercury. It is also noted that inorganic mercury exposure may
53 have neurological consequences; however, a TDI for that endpoint has not been
54 provided. Consequently, as a conservative assumption, the addition of the HQ values
55 from methylmercury and inorganic mercury was completed.

56 The decision to sum risk estimates from methylmercury with total mercury was a
57 relatively insensitive parameter in the HHRA. Although it is unlikely that the actual HQ
58 values would be the direct sum of the fish HQ and the non-fish HQ values (instead it
59 would best be estimated using the undefined proportion of methylmercury in non-fish
60 media), the use of this assumption has very little effect on the risk estimates.
61 Specifically, as noted in Tables 5-10 and 5-11 of the Final HHRA filed in April 2013, the
62 non-fish food items are very minor compared to fish (*i.e.*, in Table 5-10 [present
63 conditions], the corresponding HQ values from non-fish foods for the most sensitive
64 receptors are approximately 10-15% of the HQ value from fish when 1 meal per week of
65 each of the various food types are considered; in Table 5-11 [post-impoundment
66 conditions], the corresponding HQ values from non-fish foods are approximately 5-10%
67 of the HQ value from fish when 1 meal per week of each of the various food types are
68 considered).

69 In the case of surface water, the greatest HQ value was estimated to be 0.0032.
70 Consequently, the addition of risks from this pathway has essentially no effect on the

71 overall results or conclusions when these values are summed to HQ values from fish
72 sources.

73 As a result, although this summation may be considered to be overly conservative, it
74 does not have an appreciable effect on the overall results or conclusions of the HHRA.
75 In addition, it provides an estimate of the upper bound risks of the methylmercury
76 contribution from non-fish foods.

77 With the above noted, if agencies do not want to consider that the mercury in fish may
78 be additive with the mercury in non-fish sources, the tables provided below provide this
79 distinction from the previously provided Tables 5-10 and 5-11 (the only tables where
80 this concept was presented in the HHRA).

Risk Estimates from Mercury for Combined Sources: Present Conditions Assuming Methylmercury and Inorganic Mercury Risks are Non-Additive

Food	% of TDI Used Based on 1 Meal per Week		
	Toddlers	Women of Childbearing Age	Other Members of the General Population
Gull Lake			
Lake whitefish	30	33	12
Northern Pike	94	104	37
Walleye	99	108	39
Lake sturgeon	86	94	34
HQ from All Fish Sources*	3.09	3.39	1.22
Duck	17	17	6
Beaver	3	<1	<1
Muskrat	<1	<1	<1
Moose	10	12	10
Snowshoe hare	4	4	3
HQ from All Non-Fish Sources*	0.35	0.35	0.21
Stephens Lake			
Lake whitefish	40	42	15
Northern Pike	110	123	44
Walleye	120	137	49
Lake sturgeon	No estimate available	No estimate available	No estimate available
HQ from All Fish Sources*	2.70	3.02	1.08
Duck	17	17	6
Beaver	<1	<1	<1
Muskrat	2	2	1
Moose	10	12	10
Snowshoe hare	4	4	3
HQ from All Non-Fish Sources*	0.34	0.36	0.21

*HQ values estimated as the sum of % TDI used divided by 100.

**Risk Estimates from Mercury for Combined Sources: Post-Impoundment Conditions
Assuming Methylmercury and Inorganic Mercury Risks are Non-Additive**

Food	% of TDI Used Based on 1 Meal per Week		
	Toddlers	Women of Childbearing Age	Other Members of the General Population
Gull Lake			
Lake whitefish	80	90	32
Northern Pike	430	470	170
Walleye	430	470	170
Lake sturgeon	130	140	50
HQ from All Fish Sources*	10.7	11.7	4.22
Duck	47	45	16
Beaver	<1	<1	<1
Muskrat	3	3	3
Moose	10	12	10
Snowshoe hare	4	4	3
HQ from All Non-Fish Sources*	0.65	0.65	0.33
Stephens Lake			
Lake whitefish	60	71	25
Northern Pike	210	240	85
Walleye	210	240	85
Lake sturgeon	110	118	42
HQ from All Fish Sources*	5.90	6.69	2.37
Duck	37	35	13
Beaver	<1	<1	<1
Muskrat	3	3	3
Moose	10	12	10
Snowshoe hare	4	4	3
HQ from All Non-Fish Sources*	0.55	0.55	0.30

*HQ values estimated as the sum of % TDI used divided by 100.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C-1-4, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0019**

4 **PREAMBLE:**

5 Appendix 5C-1-4 provides information regarding the TRVs selected for use in the HHRA.
 6 This section does not appear to provide a discussion of other available TRVs from
 7 relevant jurisdictions. The US EPA (2013, 2001) has derived an oral reference
 8 concentration for methylmercury of 0.1 µg/kg-day, which is more conservative than the
 9 Health Canada value of 0.2 µg/kg-day selected for use in the HHRA.

10 **QUESTION:**

11 Please provide information as to why the lower US EPA TRV was not selected for use in
 12 the assessment?

13 **RESPONSE:**

14 Firstly, it is noted that the preamble does not provide a reference to the citation
 15 provided as "US EPA (2013, 2001)"; however, it is assumed that this reference is the US
 16 Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS)
 17 database where a reference dose (RfD) for methylmercury was provided as 0.1 µg/kg
 18 bw/day in the last revision in 2001. Citation of the US EPA IRIS database as "US EPA
 19 (2013)" should not be construed as a recent evaluation by the US EPA; instead 2013
 20 implies the date the database was accessed by the user.

21 Most Canadian health agencies use Health Canada as the key source of toxicity
 22 reference values (TRVs) for evaluation of exposure to methylmercury. In Manitoba
 23 Water Stewardship (2007) "Mercury in Fish & Guidelines for the Consumption of
 24 Recreationally Angled Fish in Manitoba" (available at:
 25 [http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007](http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007.pdf)
 26 [.pdf](http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007.pdf)), fish consumption guidelines are developed for sensitive members of the
 27 population (*i.e.*, children and women of childbearing age) using the Health Canada
 28 tolerable daily intake of 0.2 µg/kg bw/day. Similarly, in providing guidance on the
 29 health of Canadians, Health Canada (2007) "Human Health Risk Assessment of Mercury
 30 in Fish and Health Benefits of Fish Consumption" (available at: [http://www.hc-](http://www.hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson-eng.php)
 31 [sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson-eng.php](http://www.hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poisson-eng.php)) uses this tolerable daily intake
 32 of 0.2 µg/kg bw/day for sensitive receptors. Consequently, the key agencies involved in
 33 providing guidance for fish consumption in Manitoba routinely use the same TRVs that
 34 were used in the HHRA.

35 It is noted that the Health Canada TRV for sensitive populations is very similar to the
36 World Health Organization (WHO) recommendation. Specifically, the WHO (2006)
37 "Joint FAO/WHO Expert Committee on Food Additives Sixty-seventh Meeting (see
38 ftp://ftp.fao.org/ag/agn/jecfa/jecfa67_final.pdf) reaffirmed its recommendation of a
39 tolerable weekly intake for sensitive populations of 1.6 µg/kg bw/week (equivalent to a
40 tolerable daily intake of 0.23 µg/kg bw/day). Consequently, the Health Canada values
41 are supported by the most recent WHO (2006) analysis.

42 US EPA last revised their TRV in 2001 (see: <http://www.epa.gov/iris/subst/0073.htm>);
43 and, thus, Health Canada (2007) and the WHO (2006) TRVs are more recent
44 recommendations. It is clear that the US EPA position was available, but considered to
45 be unnecessarily conservative by both Health Canada (2007) and the WHO (2006).

46 Overall, the selected TRVs were similar to those typically used by the Province of
47 Manitoba and Health Canada. Use of these values ensures a consistent approach was
48 applied for the Keeyask Project as compared to other locations in Manitoba and
49 elsewhere in Canada. In addition, the selected TRVs are supported by reputable
50 agencies (*i.e.*, Health Canada and the WHO) and are based on documentation that is
51 more recent than the US EPA analysis.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C-1-4, Human Health Risk Assessment, Table 5-2; p.**
3 **N/A**

4 **CEC Rd 1 CAC-0020a**

5 **PREAMBLE:**

6 Table 5-2 presents the risk estimates for present conditions from consumption of fish
7 for various fish size classes. The risks are based on a fixed consumption rate for each
8 receptor group (i.e., toddler, child bearing woman and adult male) assessed in the
9 HHRA.

10 **QUESTION:**

11 Is it reasonable to assume that the risk estimates presented in Table 5-2 are
12 representative of all individuals in the KCN community or are there portions of the
13 community where risk estimates are predicted to be lower or higher?

14 **RESPONSE:**

15 The variability in risk estimates provided in Table 5-2 is primarily associated with: (1) fish
16 intake rates; and (2) estimated concentrations of methylmercury in fish. As discussed in
17 the response to CEC Rd 1 CAC-0021, the information used to estimate consumption
18 rates was based on KCNs' input as reasonable estimates of upper intake levels. These
19 consumption rates are based on a person who enjoys the food group of concern and,
20 consequently, it is acknowledged that these consumption rates could overestimate the
21 patterns for persons who do not enjoy or partake in the consumption of a particular
22 food group. Nevertheless, human health risk assessment guidance is focussed upon
23 individuals and, thus, it is considered appropriate to evaluate risks for the portion of the
24 population that enjoys and actively consumes that food group.

25 On the other hand, it also remains possible that certain individuals could intake greater
26 amounts of mercury than assumed in the HHRA. This could result from persons
27 consistently consuming greater amounts of fish and/or choosing to preferentially
28 consume fish of the large sizes. Fish consumption advice provided by Manitoba Health
29 and Health Canada should address issues related to these circumstances.

30 With respect to the concentration of methylmercury in fish, the values assumed in Table
31 5-2 were based on an analysis by North/South Consultants (NSC). For this, the size-
32 specific mercury concentrations were calculated by stratifying all available fish of each
33 species into three size-classes that showed natural breaks in the distribution of mercury
34 concentrations.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C-1-4, Human Health Risk Assessment, Table 5-2; p.**
3 **N/A**

4 **CEC Rd 1 CAC-0020b**

5 **PREAMBLE:**

6 Table 5-2 presents the risk estimates for present conditions from consumption of fish
7 for various fish size classes. The risks are based on a fixed consumption rate for each
8 receptor group (i.e., toddler, child bearing woman and adult male) assessed in the
9 HHRA.

10 **QUESTION:**

11 What are the risk estimates for post-impoundment conditions from consumption of fish
12 for various fish size classes?

13 **RESPONSE:**

14 It was not possible to accurately model the mercury concentrations for the various fish
15 size classes under post-impoundment conditions.

16 North/South Consultants (NSC) calculated mean, length standardized and size class-
17 specific mercury concentrations for the existing environment based on actual data for
18 fish captured in Gull and Stephens lakes (see section 3 of Appendix 7B to the AE SV for
19 the calculation of length standardized means; note that size-class specific mean
20 concentrations were calculated specifically in support of the HHRA and are not included
21 in the AE SV).

22 Predictions of post-impoundment mercury concentrations in fish were made for the
23 standard mean, according to models that were developed for predictions of average
24 concentrations. As stated in the footnotes to Table 5-3 in the HHRA [Appendix 5C to the
25 SE SV], there was not sufficient information to do a length-class analysis of mercury
26 concentrations under post-impoundment conditions. The models do not provide for a
27 means to make predictions for different size-classes of fish. The relationship between
28 fish length and mercury concentration can change over time and may also be affected
29 by the average mercury concentration in the population. These phenomena introduce
30 additional uncertainty (in addition to the uncertainties associated with predictions of
31 the mean concentration) into estimates of future mercury concentrations that are
32 specific to certain size-classes of fish. Therefore, no attempt was made to extrapolate
33 from the current size-specific distribution of mercury concentrations in Lake Whitefish,
34 Northern Pike, and Walleye to potential future distributions of concentrations.

35 Since it was not possible to accurately model for the various fish size classes under post-
36 impoundment conditions, there are no post-impoundment risk estimates for the fish
37 size classes. Nevertheless, the monitoring of mercury concentrations in fish following
38 impoundment as described in Chapter 8 of the Response to EIS Guidelines and to be
39 included in the Aquatic Effects Monitoring Plan (AEMP) should provide an alternative
40 approach to addressing mercury concentrations in relation to fish size. Based on fish
41 monitoring results, it will be possible to provide risk estimates for the various sizes of
42 fish. As stated in Section 6.6.5.3.3 of the Response to EIS Guidelines, and in relation to
43 providing updated consumption recommendations, the "HHRA will be updated every
44 five years after peak mercury levels have been reached to determine if adjustments can
45 be made to the consumption recommendations; updates will continue until mercury
46 levels return to pre-Project conditions."

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C-1-4, Human Health Risk Assessment, Table 5-2; p.**
 3 **N/A**

4 **CEC Rd 1 CAC-0021**

5 **PREAMBLE:**

6 The results of the HHRA are based on two critical assumptions:

- 7 1. mercury concentrations in fish; and
- 8 2. consumption rates for receptors.

9 Detailed information is available regarding observed distribution of mercury in various
 10 species of fish and fish sizes. However, consumption rates are fixed in the HHRA.

11 **QUESTION:**

12 What is the variability or distribution of consumption rates (i.e., portion size and
 13 frequency) observed in the KCN community?

14 **RESPONSE:**

15 Section 5.3.3.2 of the Socio-Economic Supporting Volume (SE SV) indicates the process
 16 that led to the development of consumption rates in the KCN communities. The
 17 Mercury and Human Health Technical Working Group (the TWG) organized a country
 18 foods workshop in 2009 with Members and representatives of each of the KCNs to
 19 provide information on the types of country foods used by people in their communities
 20 as well as how often and in which season(s) they ate these foods. Based on consumption
 21 rate estimates for persons who enjoy and actively seek out various food groups, KCNs
 22 agreed on an average portion size and frequency for the different population categories
 23 (see HHRA and Table 5-12 inserted below).

24 The SE SV (p. 5-112) states, "these rates of consumption were used at the request of the
 25 KCN communities as provided at the Country Foods Workshop in October 2009. The
 26 HHRA considered these values in order to ensure a conservative assessment and
 27 address all concerns of the KCN communities." Although it was not possible to
 28 quantitatively evaluate variability with the dataset provided, these were considered to
 29 be upper end estimates.

30 KCN workshop participants noted that this workshop approach (attended by
 31 approximately 20 Members of the KCNs and/or their representatives) was considered to
 32 be the preferred approach of the KCNs for obtaining this information (i.e., other
 33 approaches were offered whereby the KCNs would provide consumption information

34 from their own communities but the KCNs considered this group workshop approach to
 35 be preferred). The KCNs and their representatives reviewed and agreed with the
 36 memorandum summarizing the outcome of the workshop and the estimated
 37 consumption rates.

Table 5-12: Assumed Consumption Rates of Various Country Foods Consumed by First Nation Communities

Food Type	Serving Size for Young Child	Serving Size for Adult	Frequency of Consumption
Fish			
Whitefish	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Jackfish	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Pickeral	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Sturgeon	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Three times per week
Wild Game			
Beaver	57 g (or 2 ounces)	200 g (or 7 ounces)	Three times per week
Muskrat	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week
Moose	100 g (or 3.5 ounces)	400 g (or 14 ounces)	Five times per week
Snowshoe hare	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week
Waterfowl			
Duck	57 g (or 2 ounces)	200 g (or 7 ounces)	One time per week

Source: Wilson Scientific 2012.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 7.3.1 Trace Elements; p. N/A**

3 **CEC Rd 1 CAC-0022a**

4 **PREAMBLE:**

5 The fish quality assessment indicates that trace metal concentrations in existing fish
6 tissue concentrations are lower than tissue residue guidelines for the protection of
7 human health.

8 **QUESTION:**

9 Apart from mercury, trace metal tissue guidelines are only available for arsenic and lead.
10 What assurance does the assessment provide that metals without tissue residue
11 guidelines are safe?

12 **RESPONSE:**

13 As discussed in the response to CEC Rd 1 CAC-0016, the human health risk assessment
14 only evaluated the risks from mercury in fish tissue. Briefly, mercury was the only metal
15 identified in the EIS Guidelines for investigation related to fish; and based on past
16 experience and available information, no other chemicals of potential concern for
17 human health were identified as needing similar investigations (also see response to
18 CEC Rd 1 CAC-022b).

19 As stated in Section 7.3.3.2 of the AE SV, pg. 7-26: "All mean and individual fish
20 concentrations of arsenic, lead, and mercury, the elements with existing Manitoba
21 guidelines for the protection of human health (Williamson 2002), were below (mercury)
22 or well below (arsenic and lead) the guideline limits. Section 7.3.4.2 of the AE SV also
23 concluded that "Except for mercury, no substantial changes in total trace element
24 concentrations in fish are anticipated as a result of the operation of the Keeyask GS."
25 Therefore, there was no need to undertake further investigation.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 7.3.1 Trace Elements; p. N/A**

3 **CEC Rd 1 CAC-0022b**

4 **PREAMBLE:**

5 The fish quality assessment indicates that trace metal concentrations in existing fish
6 tissue concentrations are lower than tissue residue guidelines for the protection of
7 human health.

8 **QUESTION:**

9 Will the post-impoundment fish tissue concentrations change for metals other than
10 mercury?

11 **RESPONSE:**

12 The primary sites in which most heavy metals accumulate in fish are tissues other than
13 muscle (*e.g.*, gills, liver, kidney, intestine); mercury is the exception in that its
14 methylated form accumulates in skeletal muscle in the long-term and is therefore the
15 primary metal of concern with respect to human consumption of fish flesh.

16 The following text is from the Aquatic Environment Supporting Volume Section 7.3.4.2,
17 p. 7-27.

18 "Most trace element concentrations (i.e., total metals) are not expected to increase
19 measurably in the Keeyask reservoir water column during Project operation.
20 Furthermore, the bioavailability of dissolved metals is predicted to be reduced because
21 of complex formation with organic acids. The few elements that are expected to
22 increase in water concentrations are currently well above (iron and aluminum) or
23 occasionally exceed (silver and selenium) Manitoba Water Quality Standards,
24 Objectives, and Guidelines (MWQSOGs; Williamson 2002). No tissue residue guidelines
25 for the protection of human consumers exist for these four elements. Despite their
26 regular exceedance of guideline values for water, concentrations of iron, aluminum,
27 silver, and selenium in fish muscle from all study area lakes sampled in 2004 were quite
28 low and, with the exception of aluminum, were at or slightly above the detection limit of
29 the analytical method used. Except for mercury, no substantial changes in total trace
30 element concentrations in fish are anticipated as a result of the operation of the
31 Keeyask GS. The predicted increases in methylmercury concentrations are considered in
32 detail in Section 7.2.4."

33 Also see the response to CEC Rd 1 CAC-0016.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C-1-4, Human Health Risk Assessment, Table 3-1; p.**
3 **N/A**

4 **CEC Rd 1 CAC-0023**

5 **PREAMBLE:**

6 The results of the HHRA are based on a standardized fish concentration for lake
7 whitefish, northern pike, walleye and lake sturgeon. Further, the standard lengths used
8 in the HHRA are based on the approximate size of fish that would typically be caught
9 and eaten. It is unclear what exposure point concentration was selected from Table 7H-
10 1 in the Fish Quality assessment for each species and lake assessed in the HHRA.

11 **QUESTION:**

12 Please provide additional information that describes how the mercury concentrations in
13 fish tissue were calculated or selected from the Fish Quality assessment. For example,
14 were the exposure point concentrations based on the average of the annual standard or
15 based on the 95% confidence intervals?

16 **RESPONSE:**

17 The HHRA used concentrations that were based on mean annual standard concentration
18 provided in the Aquatic Effects Supporting Volume (AE SV). To calculate current fish
19 mercury concentrations for Table 7-2 (p.7-54) of the AE SV, North/South Consultants
20 used the weighted (by sample size) mean annual standard concentrations for years
21 starting in 2001 (see Table 7H-1 of the AESV). As an example, the value of 0.07 µg/g for
22 Lake Whitefish from Gull Lake was arrived as follows: $21 \times 0.062 \mu\text{g/g} + 26 \times 0.082 \mu\text{g/g}$
23 $= 1.302 \mu\text{g/g} + 2.132 \mu\text{g/g} = 3.434 \mu\text{g/g}$ divided by 47 (*i.e.*, total sample size) = 0.073
24 µg/g. This value was rounded to the nearest 0.01 µg/g (*i.e.*, 0.07 µg/g) for use in the
25 HHRA.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C-1-4, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0024a**

4 **PREAMBLE:**

5 The results of the HHRA present risk quotient values above 1 and indicated that
6 Manitoba Health and Health Canada have committed to working with the KCN and
7 Manitoba Hydro on consumption advisories in a separate process. In addition, Section
8 7.2.1 in the Fish Quality assessment indicated that mercury concentrations can remain
9 above preimpoundment levels for 20-30 years.

10 **QUESTION:**

11 Are Manitoba Health and/or Health Canada committed to issuing consumption
12 advisories for up to 30 years?

13 **RESPONSE:**

14 The Partnership cannot commit on behalf of either Manitoba Health or Health Canada
15 regarding what consumption advisories will be undertaken. However, in a technical
16 meeting with representatives from both regulatory bodies in March 2013, each
17 acknowledged that mercury consumption advisories were within the purview of
18 provincial and federal agencies. As noted in the response to TAC Rd 2 HC-002, there was
19 agreement to a process in which the Partnership would continue to work with Manitoba
20 Health and Health Canada in the addressing mercury related risk communication
21 strategies. Further, the response to TAC Rd 2 HC-003 indicates that Manitoba Health is
22 currently developing provincial messaging for subsistence fishing that can be adapted to
23 the Keeyask area and expressed a willingness to work with First Nations and Inuit Health
24 Branch, the Keeyask Partnership and the Northern Health Region to develop
25 communication materials regarding mercury and health for the Keeyask area under
26 present conditions, including continued consultation with the Partnership. In addition,
27 Manitoba Health and Manitoba Conservation and Water Stewardship will be looking at
28 the need to provide additional messaging, such as an advisory for the impacted
29 waterways in this area.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C-1-4, Human Health Risk Assessment; p. N/A**

3 **CEC Rd 1 CAC-0024b**

4 **PREAMBLE:**

5 The results of the HHRA present risk quotient values above 1 and indicated that
 6 Manitoba Health and Health Canada have committed to working with the KCN and
 7 Manitoba Hydro on consumption advisories in a separate process. In addition, Section
 8 7.2.1 in the Fish Quality assessment indicated that mercury concentrations can remain
 9 above preimpoundment levels for 20-30 years.

10 **QUESTION:**

11 The project reservoir impoundment is predicted to reduce the quality of a food source
 12 to the extent where it could impact health. The creation of the reservoir could affect
 13 both food security and food quality for the First Nations communities in the region. How
 14 does the Partnership plan to address this issue?

15 **RESPONSE:**

16 The Final HHRA submitted in April 2013 noted that the greatest post-impoundment risks
 17 are estimated from eating jackfish and pickerel from Gull Lake and to a lesser extent
 18 Stephens Lake. Other types of fish such as lake whitefish can be consumed; however,
 19 consumption recommendations as determined by Manitoba Health and Health Canada
 20 will guide how much lake whitefish is possible to eat.

21 Healthy Food Fish programs, along with other offsetting programs to support access to
 22 country foods, are provided for in the adverse effects agreements with each of the
 23 KCNs. Prompted by Members concerns about increased mercury levels due to the
 24 Project, these programs are designed to provide Members with fish and other country
 25 foods from off-system areas not affected by Keeyask development. For example, TCN's
 26 Healthy Food Fish Program and WLFN's Community Fish Program is intended "to
 27 provide opportunities for Members to continue to fish and to provide a supply of
 28 wholesome food fish to Members to replace fish which may no longer be available to
 29 Members as a result of increased methyl-mercury levels." The program runs annually,
 30 with Members fishing lakes within the Split Lake Resource Management Area as
 31 determined by TCN in consultation with the Resource Management Board.

32 Offsetting programs are being delivered in conjunction with a mercury and human
 33 health risk assessment and communication strategy, which was designed in partnership
 34 by the KCNs, Manitoba Hydro, specialists and regulators through the Mercury and
 35 Human Health Working Group. Monitoring of mercury will occur under the Aquatic and

36 Terrestrial Monitoring Programs. Results will be incorporated into the human health risk
37 assessment (HHRA) which will be updated every five years after peak mercury levels
38 have been reached. This information will be provided to health regulators and inform
39 consumption recommendations (including need for adjustments) and associated
40 communication products (see Section 6.6.5.3.3 of the Response to EIS Guidelines). The
41 updated HHRAs will continue until mercury levels return to pre-Project conditions.

42 The Monitoring Advisory Committee, as outlined in the JKDA, (see Chapter 8, Section
43 8.3.1 in the Response to EIS Guidelines) will also review and discuss outcomes and
44 provide guidance to the Partnership on additional or alternative mitigation measures
45 that may be required.

46 A risk communication strategy, developed in conjunction with advice from health
47 authorities, will also communicate the risks of eating fish from Gull and Stephens lakes
48 to KCNs, as well as Gillam residents.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 3.2; p. N/A**

3 **CEC Rd 1 CAC-0025a**

4 **PREAMBLE:**

5 Section 3.2 of the HHRA refers the reader to the Terrestrial Environment Supporting
6 Volume (TE SV) (Section 8) for full details of the measured and predicted concentrations
7 of mercury in wild game. The HHRA does not give a reference to the specific subsection
8 of Section 8 where this information is provided. Upon review, it appears that the
9 relevant information is presented, in part, in subsections 8.4.3.2.2, 8.4.3.3, and 8.4.4.2.
10 Subsection 8.4.4.2 states that “based on scientific literature, a surrogate model, and
11 scientific judgment, estimated post-Project mercury levels in mammals are predicted to
12 increase over baseline conditions (Table 8-16) and peak about three to seven years after
13 the reservoir is impounded. The predicted mercury concentrations are presented in
14 Table 8-16.

15 **QUESTION:**

16 Please confirm that the wildlife mercury concentrations used in the HHRA are those
17 presented in the referenced sections above.

18 **RESPONSE:**

19 Wildlife mercury concentration values indicated in Section 3.2 of the Human Health Risk
20 Assessment (HHRA) were presented in Table 8-16 of the Terrestrial Environment
21 Supporting Volume (TE SV), in considering beaver and muskrat values. Comparison of
22 the values in Table 8-16 to the concentrations identified in the HHRA indicates that the
23 correct values were used.

24 Mercury concentration values used to produce the moose model are presented in Table
25 8-15; for model values please see Table 3-3 and Table 3-4 of the Human Health Risk
26 Assessment. The values provided for moose and snowshoe hare are consistent with
27 those identified in the HHRA.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 3.2; p. N/A**

3 **CEC Rd 1 CAC-0025b**

4 **PREAMBLE:**

5 Section 3.2 of the HHRA refers the reader to the Terrestrial Environment Supporting
6 Volume (TE SV) (Section 8) for full details of the measured and predicted concentrations
7 of mercury in wild game. The HHRA does not give a reference to the specific subsection
8 of Section 8 where this information is provided. Upon review, it appears that the
9 relevant information is presented, in part, in subsections 8.4.3.2.2, 8.4.3.3, and 8.4.4.2.
10 Subsection 8.4.4.2 states that “based on scientific literature, a surrogate model, and
11 scientific judgment, estimated post-Project mercury levels in mammals are predicted to
12 increase over baseline conditions (Table 8-16) and peak about three to seven years after
13 the reservoir is impounded. The predicted mercury concentrations are presented in
14 Table 8-16.

15 **QUESTION:**

16 Limited information is provided on how mercury concentrations in wild game were
17 calculated. Please provide additional detail on how the mercury concentrations were
18 predicted, including a worked example.

19 **RESPONSE:**

20 Present concentration mercury levels found in Table 8-16 of the Terrestrial Environment
21 Supporting Volume (TE SV) were based on mercury concentrations determined through
22 mercury sampling in the Keeyask Region. For beaver and muskrat these results are
23 presented and discussed in Section 8.4.3.2.2, Section 8 of the TE SV. To calculate these
24 values the median, minimum and maximum values were identified after removing low
25 confidence outlier values. Please refer to CEC Rd 1 CEC-0047 on how Table 8-16 in the
26 TE SV was derived and CEC Rd 1 CEC-0046 for further information. A worked example
27 was not provide because it would only contain sampled mercury levels with identified
28 median, minimum and maximum values.

29 For moose, the mercury concentration values indicated in Table 3-3 and Table 3-4 of the
30 Human Health Risk Assessment (HHRA) were based on a review of published mercury
31 concentrations. Mercury concentrations specific to moose that occur near hydroelectric
32 reservoirs were not found or reported in other environmental assessments reviewed.

33 Mercury transfer and bio-magnification through mammalian food chains is well
34 documented in the scientific literature, but considerable variation exists. Moose are an
35 example of a trophic level 2 species as they are primary consumers (herbivores) in

36 relation to trophic level 1 species which are primary producers (and include algae, plant
37 life, etc). Those species at risk of mercury bioaccumulation, through the consumption of
38 fish species, include trophic level 3 (secondary consumers) and trophic level 4 (tertiary
39 consumer) species (US EPA 1997).

40 Moose consume primarily terrestrial plants, although a proportion of its diet may
41 consist of aquatic plants. This includes the consumption of plants associated with beaver
42 floods, which can produce a considerable source of mercury in the environment (Ray et
43 al. 2009). Mercury concentrations in moose stay low even with the consumption of
44 plants from beaver floods, and other sources of mercury in their diet such as mineral
45 licks. For the Keeyask Generation Project, the largely terrestrial herbivorous diet and
46 the large home-ranges of moose apart from the reservoir are expected to limit exposure
47 to mercury from consuming submergent, emergent or riparian plants associated with
48 the reservoir. Based on these facts and assumptions, mercury values were not identified
49 as becoming substantively different from the range of natural variation for the local
50 population of moose in Study Zone 4, including from the present concentration to the
51 post-impoundment environment. The sources used in identifying moose mercury
52 concentration values can be found in Table 8-15 of the TE SV.

53 It was assumed further that mercury concentrations in moose would not exceed the
54 maximum range reported in the scientific literature. Using a conservative approach, the
55 highest mean value and range of mercury concentrations found in moose muscle in
56 Canada, based on reviewed publications, were selected as a proxy for the Keeyask
57 region. It is important to note that the mean muscle value selected for HHRA purposes
58 was two to three times higher than the average kidney samples for moose in the Yukon,
59 and seven times higher than the single value reported for a moose (albeit a young bull)
60 collected in the Keeyask region. In addition, baseline moose mercury concentration
61 values are expected to be low based on the sampling of this species which has occurred
62 through other studies, including Gamberg et al. (2005) which estimated mean moose
63 mercury concentration at 0.02 µg/g (wet weight) based on the sampling of 481 moose
64 kidneys; an organ often identified as having mercury levels in excess of that identified in
65 muscle. As such, and based on the assumptions outlined, a mathematical model
66 indicating increased mercury levels was not warranted.

67 Further, that median moose mercury concentrations would not increase as a result of
68 the Keeyask Project was supported through a number of assumptions. It is known that
69 mercury concentrations in plants increase based on their proximity to waterbodies with
70 high mercury concentration (Moore et al. 1995). While these levels may serve to
71 increase mercury levels in a few individual moose using these areas, the larger moose
72 population in the Local and Regional Study Areas would have lower levels of exposure.
73 Based on this, median mercury levels are expected to stay low due to a majority of

74 animals having little exposure to areas where there is some likelihood of increased
75 mercury exposure. This assumption is based on the moderate to large home range of
76 moose and the results of aerial surveys which indicated the presence of approximately
77 125 animals in the Local Study Area and 960 animals in the Regional Study Area (Section
78 6.2.3.4.7 of the Response to EIS Guidelines). Here, the distribution of moose on the
79 landscape is well distributed, and where not many animals' home range would be
80 centered on a specific landscape feature such as the future Keeyask reservoir (Map 7-36
81 and Map 7-37 of the TE SV).

82 For snowshoe hare, mercury concentration levels were based on a review of literature
83 sources indicating sampled mercury concentration levels for this species and cottontail
84 rabbit (Table 1 below). Mercury concentrations specific to snowshoe hare that occur
85 near hydro-electric reservoirs were not found or reported in other environmental
86 assessments reviewed. The range of snowshoe hare values present in Table 3-3 and
87 Table 3-4 of the HHRA were based solely on sampled mercury levels from muscle
88 samples; and not based on those quantities provided for whole body, liver or kidney.
89 Similarly as considered for moose, based on their herbivorous diet, snowshoe hare
90 mercury concentrations were not identified as increasing based on the bioaccumulation
91 of mercury such as in higher trophic level species (Wren 1987) and to not exceed the
92 maximum range reported in the scientific literature. As a result, present concentration
93 values from proxy values elsewhere are also used to indicate post-impoundment
94 mercury values.

95 Based on an extensive review of the potential for mercury uptake by herbivorous
96 species, the indication that for moose and snowshoe hare there is no expected increase
97 in mercury levels based on the Keeyask Project has been done with a high degree of
98 certainty. A similar assumption was also made for beaver, which are also an herbivorous
99 species although may be exposed to higher mercury levels based on their dependence
100 on an aquatic environment where increased mercury levels are expected.

Table 1. Mercury Residue Levels ($\mu\text{g/g}$) for Snowshoe Hare and Cottontail Rabbit

Species	Tissue	Concentration ($\mu\text{g/g}$)	Reference
snowshoe hare	whole body	< 0.01	Smith, G.J., and Rongstad, O.J. 1981. Heavy metals in mammals from two unmined copper-zinc deposits in Wisconsin. <i>Bulletin of Environmental Contamination and Toxicology</i> 27:28-33
snowshoe hare	muscle	< 0.05	Langlois, C. and Langis, R. 1995. Presence of airborne contaminants in the wildlife of northern Quebec. <i>Science of the Total Environment</i> 160/161:391-402
snowshoe hare	Liver	0.13	Langlois, C. and Langis, R. 1995. Presence of airborne contaminants in the wildlife of northern Quebec. <i>Science of the Total Environment</i> 160/161:391-402
snowshoe hare	muscle	0.05	Schetagne, R., N. Therien, C. Langlois and A. Tremblay. 1999. Mercury in natural ecosystems of northern Quebec. Lucotte, M., R. Schetagne, N. Therien, C. Langois, A. Tremblay (Eds); In <i>Mercury in the Biogeochemical Cycle. Natural Environments and Hydroelectric Reservoirs of Northern Quebec</i> . Springer, New York.
cottontail rabbit	kidney	0.16	Lynch, D.W. (1973). Selected toxic metals in Ohio's upland wildlife. M.Sc. thesis, Ohio State University, Ohio.
cottontail rabbit	muscle	0.02	Lynch, D.W. (1973). Selected toxic metals in Ohio's upland wildlife. M.Sc. thesis, Ohio State University, Ohio.
cottontail rabbit	liver	0.05, (0.12 upper range)	Lynch, D.W. (1973). Selected toxic metals in Ohio's upland wildlife. M.Sc. thesis, Ohio State University, Ohio.
snowshoe hare	liver	0.04, 0.08	Poole, K.G., Elkin, B.T., and Bethke, R.W. 1998. Organochlorine and heavy metal contaminants in wild mink in western Northwest Territories, Canada. <i>Archives of Environmental Contamination and Toxicology</i> 34:406-413

101

102 **REFERENCES:**

- 103 Gamberg, M., Braune, B., Davey, E., Elkin, B., Hoekstra, P.F., Kennedy, D., Macdonald, C.,
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 105 trends of contaminants in terrestrial biota from the Canadian Arctic. *Science of*
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- 107 Langlois, C. and Langis, R. 1995. Presence of airborne contaminants in the wildlife of
 108 northern Quebec. *Science of the Total Environment* 160/161:391-402.
- 109 Lynch, D.W. 1973. Selected toxic metals in Ohio's upland wildlife. M.Sc. thesis, Ohio
 110 State University, Ohio.
- 111 Moore, T.R. Bubier, J.L., Heyes, A. and R.J. Flett. 1995. Methyl and total mercury in
 112 boreal wetlands plants, Experimental Lakes Area, Northwestern Ontario. *Journal*
 113 *of Environmental Quality* 24: 845-850.
- 114 Poole, K.G., Elkin, B.T., and Bethke, R.W. 1998. Organochlorine and heavy metal
 115 contaminants in wild mink in western Northwest Territories, Canada. *Archives of*
 116 *Environmental Contamination and Toxicology* 34:406-413
- 117 Ray, V., M. Amyot and R. Carignan. 2009. Beaver ponds increase methylmercury
 118 concentrations in Canadian Shield streams along vegetation and pond-age
 119 gradients. *Environ. Sci. Technol.* 43 (15): 5605–5611.
- 120 Schetagne, R., N. Therien, C. Langlois and A. Tremblay. 1999. Mercury in natural
 121 ecosystems of northern Quebec. Lucotte, M., R. Schetagne, N. Therien, C.
 122 Langlois, A. Tremblay (Eds); In *Mercury in the Biogeochemical Cycle. Natural*
 123 *Environments and Hydroelectric Reservoirs of Northern Quebec.* Springer, New
 124 York.
- 125 Smith, G.J., and Rongstad, O.J. 1981. Heavy metals in mammals from two unmined
 126 copper-zinc deposits in Wisconsin. *Bulletin of Environmental Contamination and*
 127 *Toxicology* 27:28-33US EPA (United States Environmental Protection Agency).
 128 1997. Mercury Study Report to Congress. Volume VII: Characterization of
 129 Human Health and Wildlife Risks from Mercury Exposure in the United States.
 130 EPA-452/R-97-009.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 3.2; p. N/A**

3 **CEC Rd 1 CAC-0025c**

4 **PREAMBLE:**

5 Section 3.2 of the HHRA refers the reader to the Terrestrial Environment Supporting
6 Volume (TE SV) (Section 8) for full details of the measured and predicted concentrations
7 of mercury in wild game. The HHRA does not give a reference to the specific subsection
8 of Section 8 where this information is provided. Upon review, it appears that the
9 relevant information is presented, in part, in subsections 8.4.3.2.2, 8.4.3.3, and 8.4.4.2.
10 Subsection 8.4.4.2 states that “based on scientific literature, a surrogate model, and
11 scientific judgment, estimated post-Project mercury levels in mammals are predicted to
12 increase over baseline conditions (Table 8-16) and peak about three to seven years after
13 the reservoir is impounded. The predicted mercury concentrations are presented in
14 Table 8-16.

15 **QUESTION:**

16 The footnote to Table 3-3 of the HHRA indicates that mercury concentrations in moose
17 and snowshoe hare were literature values. Section 8 presents information on mercury
18 concentrations in moose. However, no information is presented for snowshoe hare.
19 Please provide a reference for the snowshoe hare mercury concentrations.

20 **RESPONSE:**

21 Please see response to CEC Rd 1 CAC-0025b.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment, Section 3.2; p. N/A**

3 **CEC Rd 1 CAC-0026**

4 **PREAMBLE:**

5 Page 5C-20 of the HHRA states that "as described in the TE SV (Section 8), Stantec has
 6 estimated that concentrations of mercury in ducks would be similar to or less than
 7 concentrations measured in whitefish".

8 **QUESTION:**

9 Please provide rationale along with references for why mercury concentrations in
 10 mallards are expected to be similar or less than concentrations measured in whitefish.

11 **RESPONSE:**

12 Existing levels of methyl-mercury in birds (e.g., mallard) were estimated based on the
 13 levels measured in the muscle tissue of fish species that inhabit the Gull Lake, Nelson
 14 River and Stephens Lake areas (See Section 8, Appendix 8A for details regarding the
 15 assessment of mercury in birds). Studies have found that for some birds, mercury levels
 16 in bird tissue (i.e., muscle) are comparable to total mercury levels in fish that consume a
 17 similar diet or have similar feeding habits (DesGranges et al. 1998; Schetagne et al.
 18 1999; Gerrard and St. Louis 2001; Hydro-Quebec 2007). Schetagne et al. (1999) made
 19 this conclusion based on analysis of muscle tissue from fish and waterbirds using natural
 20 lakes in northern Quebec (Langis et al. 1999; Schetagne and Verdon 1999). Their
 21 findings support the use of fish mercury levels as predictors of mercury levels in some
 22 waterbirds.

23 Based on the feeding habits and diet of mainly benthic invertebrates, adult Lake
 24 Whitefish can be used to estimate mercury levels in waterbirds that consume similar
 25 diets or share similar feeding habits (e.g., scoter; Appendix 8A Table 8A-2). For strictly
 26 herbivorous or herbivorous/benthivorous birds (e.g., mallard), muscle levels of mercury
 27 will likely be less than levels observed in Lake Whitefish muscle due to differences in
 28 diet. Compared to Lake Whitefish, mallard diets consists of a greater proportion of plant
 29 matter. Plants do not present a significant source of mercury to birds that consume
 30 them as plants are at the bottom of the food chain (i.e., lower trophic level organisms)
 31 and consequently take-up and retain only minute levels of mercury (Scheuhammer
 32 1995).

33 **REFERENCES:**

34 Des Granges, J., Rodrigue, J., Tardif, B. and M. Laperle. 1998. Mercury Accumulation and
 35 Biomagnification in Ospreys (*Pandio haliaetus*) in the James Bay and Hudson Bay

- 36 Regions of Quebec. Archives of Environmental Contamination and Toxicology
37 35(2): 330-341.
- 38 Gerrard, P.M., and V.L. St. Louis. 2001. The effects of experimental reservoir creation on
39 the bioaccumulation of methylmercury and reproductive success of tree
40 swallows (*Tachycineta bicolor*). Environ. Sci. & Technol. 35:1329-1338.
- 41 Hydro-Quebec. 2007. Construction of 4 Hydro-electric Dams, Romaine River
42 Environmental Impact Statement. Accessed at: [www.ceaa.gc.ca/050/document-](http://www.ceaa.gc.ca/050/document-eng.cfm?document=25316)
43 [eng.cfm?document=25316](http://www.ceaa.gc.ca/050/document-eng.cfm?document=25316).
- 44 Langis, R., C. Langlois and F. Morneau. 1999. Mercury in Birds and Mammals In: Lucotte,
45 M., R. Schetagne, N. Therien, C. Langlois and A. Tremblay (Eds.). Mercury in the
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- 47 Schetagne, R and R. Verdon. 1999. Mercury in Fish of Natural Lakes of Northern Quebec.
48 In Lucotte, M., Schetagne, R., Therien, N., Langlois, C., and A. Tremblay (Eds.)
49 Mercury in the Biogeochemical Cycle. Natural Environments and Hydroelectric
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- 51 Schetagne, R., M. Lucotte, N. Therien, C. Langlois and A. Tremblay. 1999. Mercury in
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59 [rese.ca/eman/reports/publicatoins/mercury95/part1.html](http://www.eman-rese.ca/eman/reports/publicatoins/mercury95/part1.html)

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment, Section 3.1; p. N/A**

3 **CEC Rd 1 CAC-0027**

4 **PREAMBLE:**

5 Tables 3-1 and 3-2 of the HHRA present existing and post-impoundment (i.e., predicted)
 6 concentrations of mercury in fish.

7 **QUESTION:**

8 Please explain why mercury concentrations in lake sturgeon are not expected to
 9 increase to the same extent as for the other fish species in Gull Lake under post-
 10 impoundment conditions.

11 **RESPONSE:**

12 There are two main reasons why mercury concentrations in Lake Sturgeon are expected
 13 to increase considerably less (relative to their pre-Project concentrations) than in
 14 Northern Pike and Walleye and slightly less than in Lake Whitefish.

- 15 a) Lake Sturgeon mainly feed on benthic invertebrates. Thus, sturgeon occupy a lower
 16 trophic level than the two mainly piscivorous species, Pike and Walleye, and is at a
 17 similar trophic level to (adult) Whitefish. As indicated by the differences in mercury
 18 concentrations between Pike and Walleye, compared to Lake Whitefish and Lake
 19 Sturgeon in Gull Lake (Table 3-1 of the HHRA), mercury concentrations in the two
 20 piscivore are substantially higher than in the two benthivores. These results are in
 21 full agreement with many other studies showing substantial increases in fish
 22 mercury levels with increasing trophic position (e.g., Phillips et al. 1980; Kamman et
 23 al. 2005; Surette et al. 2006; Peterson et al. 2007). As indicated in Table 3-2 of the
 24 HHRA, the differences in maximum post-Project concentrations between the
 25 piscivorous and benthivorous species are expected to become even more
 26 accentuated in the Keeyask reservoir.
- 27 b) The 13 Lake Sturgeon from Gull Lake available to calculate mercury concentrations
 28 under existing conditions were relatively large (mean total length of 1280 mm) and
 29 old (mean age >25 years) and predictions for post-Project concentrations apply to
 30 similar sized Sturgeon. The half-life of methylmercury in muscle, the primary storage
 31 tissue in fish (Van Wallegghem et al. 2007), is approximately two years under natural
 32 conditions (Lockhart et al. 1972; Laarman et al. 1976; Van Wallegghem et al. 2007). In
 33 addition, elimination rates of methylmercury are negatively correlated to fish body
 34 size (Trudel and Rasmussen 1997). Large Lake Sturgeon have a considerable muscle
 35 mass with mercury concentrations that will respond to increases in methylmercury

36 uptake less quickly than the much smaller Whitefish, Pike, and Walleye. Thus,
 37 maximum post-Project concentrations are expected to be reached later in Lake
 38 Sturgeon than in the other three species and the relative increase compared to pre-
 39 Project concentrations is expected to be lower.

40 **REFERENCES:**

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- 62 Surette, C., M. Lucotte, and A. Tremblay. 2006. Influence of intensive fishing on the
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- 66 Trudel, M., and J. B. Rasmussen. 1997. Modeling the elimination of mercury by fish.
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1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 3.4; p. N/A**

3 **CEC Rd 1 CAC-0028**

4 **PREAMBLE:**

5 Section 3.4 of the HHRA states that “there was no information available on present
6 mercury concentrations in these plants. Nor future concentration estimates provided
7 for post-impoundment conditions. Consequently, these would need to be directly
8 measured in the field if further information was required”.

9 **QUESTION:**

10 Please indicate whether or not the Partnership plans to collect wild plants and to test
11 these for mercury concentrations?

12 **RESPONSE:**

13 As identified in Chapter 8 of the Response to EIS Guidelines – Monitoring and Follow-up
14 Plans - collection of wild plants on a voluntary basis by local KCNs community Members
15 will be undertaken to confirm that mercury concentrations remain acceptable for
16 domestic consumption. This initiative is contained in Section 5.2 of the preliminary draft
17 Socio-Economic Monitoring Plan (SEMP), filed with regulators on June 28, 2013. It is
18 available on the Keeyask Hydropower Limited Partnership website at
19 <http://www.Keeyask.com>.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 4.2.3; p. N/A**

3 **CEC Rd 1 CAC-0029**

4 **PREAMBLE:**

5 The country food consumption rates used in the HHRA are based on a 2009 memo
6 provided by the InterGroup Consultants.

7 **QUESTION:**

8 Please provide this memo.

9 **RESPONSE:**

10 The 2009 memo noted in the request is confidential at the request of the KCNs
11 community Members who participated in the Mercury and Human Health Technical
12 Working Group. However, the key summary results are provided in Table 4-1 of the
13 HHRA that was recently filed. The Final HHRA can be found on the Partnership website
14 at: [http://keeyask.com/wp/the-project/environmental-assessment-process/eis/03-
15 human-health-risk-cd-version](http://keeyask.com/wp/the-project/environmental-assessment-process/eis/03-human-health-risk-cd-version).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 4.3.1; p. N/A**

3 **CEC Rd 1 CAC-0030**

4 **PREAMBLE:**

5 Page 5C-34 describes the mercury concentrations in wild game.

6 **QUESTION:**

7 Please provide the rationale why consumption of moose and caribou organs was not
8 assessed in the HHRA.

9 **RESPONSE:**

10 There was not enough site information available to estimate reliably the mercury
11 concentrations in moose or caribou organs. Although a key conclusion provided in
12 Section 8.4.3.3 of the Terrestrial Environment Supporting Volume (TE SV) is that the
13 mercury concentration in moose and caribou is not expected to be affected by the
14 Keeyask Generation Project, there was not considered to be sufficient information
15 available to predict present concentrations of mercury in the organs. It is possible that
16 organs such as kidney and liver of these animals may contain greater mercury
17 concentrations than muscle tissue (Table 8-15 of the TE SV); however, it is also stressed
18 that these organs represent only a small fraction of the total amount of the animal that
19 is consumed.

20 To address this issue, the KCNs have been provided the opportunity to voluntarily
21 submit samples of moose, caribou or other wild game for mercury analysis. Members of
22 the KCNs have been sent sampling kits and instructions for sampling. Thus far, samples
23 from one moose and two caribou (including muscle, liver and kidney) have been
24 analyzed and where measured mercury levels ranged from <0.010 – 0.019 µg/g (p 8-36
25 of TE SV), comparable with the low range of mercury values indicated in reviewed
26 publications.

Species	Statistic	Tissue Sample		
		Muscle	Liver	Kidney
Caribou	N	2	1	0
	Mean	0.017	0.014	N/A
	Minimum	0.014	N/A	N/A
	Maximum	0.019	N/A	N/A
Moose	N	1	1	1
	Mean	<0.01	<0.01	0.019
	Minimum	N/A	N/A	N/A
	Maximum	N/A	N/A	N/A

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment, Section 5.1; p. N/A**

3 **CEC Rd 1 CAC-0031**

4 **PREAMBLE:**

5 The HHRA assumed that people would eat whitefish, walleye and northern pike three
 6 times per week.

7 **QUESTION:**

8 Please explain how the health risks would change if a person would eat walleye three
 9 times in a week, but the other types of fish for the remainder of the week?

10 **RESPONSE:**

11 There is not considered to be enough information in the question to provide a clear
 12 response. The risk estimates are dependent upon various factors that are not included
 13 in the question. The missing information includes: (1) the age of the person (*i.e.*, child
 14 or woman of childbearing age or adult men); (2) the size of the fish; (3) the lake from
 15 which the fish are caught; (4) present conditions or post-impoundment conditions; and
 16 (5) duration (does the fish consumption occur during only one week of the year or does
 17 the questioner want to know the risk estimates from consumption of fish at this rate on
 18 a consistent basis).

19 With the above in mind, the risk estimates (*i.e.*, Hazard Quotient values) from fish
 20 intakes are considered to be directly additive. As an example, if it is assumed that the
 21 questioner wants to know the risk estimate for a woman of childbearing age eating
 22 standard-sized fish from Gull Lake under present conditions, the risks would be
 23 estimated as follows:

- 24 • Hazard Quotient from 3 meals per week of walleye = 3.3 (see Table 5-1 of the HHRA)
- 25 • Hazard Quotient from 1 meal per week of lake whitefish = 0.33 (value from Table 5-
 26 1 divided by 3 to account for only 1 meal per week)
- 27 • Hazard Quotient from 1 meal per week of northern pike = 1.0 (value from Table 5-1
 28 divided by 3 to account for only 1 meal per week)
- 29 • Hazard Quotient from 1 meal per week of lake sturgeon = 0.93 (value from Table 5-1
 30 divided by 3 to account for only 1 meal per week)

31 Consequently, under this scenario, the Hazard Quotient value would be 5.6 (the sum of
 32 all of the Hazard Quotient values provided above) if this rate of consumption occurred
 33 for an extended period of time. If persons consumed smaller fish or if this rate of
 34 exposure only occurred one week per year, the risk estimates would be substantially

35 reduced. On the other hand, if people consumed larger fish than standard size, even
36 greater Hazard Quotient values would be estimated.

37 There are too many combinations to evaluate all possible consumption scenarios and,
38 thus, the above additive scenario is provided as an example. In Manitoba Water
39 Stewardship (2007) "Mercury in Fish & Guidelines for the Consumption of Recreationally
40 Angled Fish in Manitoba" (available at:
41 http://www.gov.mb.ca/waterstewardship/fisheries/education/mercury_final_nov_2007
42 [.pdf](#)), a similar approach is offered to evaluate the various possible scenarios for
43 individual concerns from consumption of multiple species of fish.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 5.1; p. N/A**

3 **CEC Rd 1 CAC-0032**

4 **PREAMBLE:**

5 Table 5-1 presents the risk estimates for fish consumption. The hazard quotient for
6 walleye for women of childbearing age is presented as 4.7 for the present conditions in
7 Stephens Lake (Table 5-1). However, based on the measured mercury concentration in
8 walleye of 0.29 ppm (Table w3-1), body weight of 60 kg, serving size of 400 g,
9 consumption frequency of three times per week (Table 4-1), and tolerable daily intake
10 of 0.2 ug/kg/day (Section 4.4.), the hazard quotient should be 4.1.

11 **QUESTION:**

12 Please explain this discrepancy. Also, please confirm that the other hazard quotients are
13 correct.

14 **RESPONSE:**

15 In Table 5-1 of the HHRA, the Hazard Quotient value for women of childbearing age
16 consuming walleye from Stephens Lake should have been presented as 4.1 (not 4.7).
17 This was a typo and the proper value of 4.1 was used to develop the conclusions (the
18 correct value was actually provided in Table 5C-1-2 of the HHRA report). Upon review of
19 this issue, other Hazard Quotient values in Table 5-1 are also not considered to be
20 consistent with Table 5C-1-2. All the differences are associated with Stephens Lake fish
21 under present conditions and do not affect any of the overall conclusions (see below).

22 The discrepancy resulted from an early draft of the HHRA which used slightly higher
23 estimates of methylmercury concentrations in fish from Stephens Lake. These
24 concentrations were subsequently revised in later estimates and used in the final HHRA
25 (and correctly reported in Table 5C-1-2 of the HHRA); however, the revised Hazard
26 Quotient were erroneously not updated in Table 5-1 (for Stephens Lake fish only). The
27 revised values are provided below; however, all values are identical to the values
28 provided in Table 5C-1-2 of the HHRA.

29 None of these differences affect the overall conclusions of the HHRA since the correct
30 values from Table 5C-1-2 of the HHRA were used to formulate the overall conclusions.

Revised Risk Estimates from Consumption of Fish from Stephens Lake: Present Conditions

Fish Species	Standardized Concentration* (µg/g, wet weight)	Hazard Quotient from Consumption of Three Large Meals per Week (Acceptable Value = 1)***		
		Toddlers	Women of Childbearing Age	Adult Males and All Seniors
Stephens Lake				
Lake Whitefish	0.09	1.2 (previous = 1.3)	1.3 (previous = 1.4)	0.5 (no change)
Northern Pike	0.26	3.3 (previous = 3.5)	3.7 (previous = 3.8)	1.3 (previous = 1.4)
Walleye	0.29	3.7 (previous = 4.2)	4.1 (previous = 4.7)	1.5 (previous = 1.7)

* Standard lengths: lake whitefish 350 mm; northern pike 550 mm; walleye 400 mm. Individual mercury concentrations would be dependent upon the size of the fish with the smaller fish having generally lower concentrations than bigger fish.

** Based on information provided by local First Nation communities, all fish were assumed to be consumed at a frequency of three meals per week with a serving size of 100 g for toddlers and 400 g for adults.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment, Section 6.0; p. N/A**

3 **CEC Rd 1 CAC-0033**

4 **PREAMBLE:**

5 Section 6.0 describes uncertainty related to mercury concentrations in the environment,
 6 toxicity reference values, and food consumption rates. Page 5C-66 states that “the
 7 prediction of the magnitude and extent of the changes in environmental concentrations
 8 was considered to be beyond the scope of the HHRA”.

9 **QUESTION:**

- 10 • Please provide the relevant sections where the uncertainty related to the prediction
 11 of the post-impoundment mercury concentrations was described in detail.
 12 • Please comment on the uncertainty associated with using predictive models to
 13 estimate methylmercury concentrations in fish for the post-impoundment
 14 conditions.
 15 • Please explain how the Partnership plans to address the long-term uncertainty
 16 associated with the predicted mercury concentrations in fish.

17 **RESPONSE:**

18 The following response addresses each question individually.

19 *1. Please provide the relevant sections where the uncertainty related to the prediction*
 20 *of the post-impoundment mercury concentrations was described in detail.*

21 Uncertainties related to predictions of post-impoundment mercury concentrations for
 22 the Keeyask Project are discussed in detail in the Aquatic Environment Supporting
 23 Volume in Section 7.2.4.2.2, p. 7-18 to 7-20. For the benefit of the reviewer, these
 24 sections are repeated at the end of this response.

25 *2. Please comment on the uncertainty associated with using predictive models to*
 26 *estimate methylmercury concentrations in fish for the post-impoundment conditions.*

27 Generally, sources of uncertainty in using empirical models for predictions of fish
 28 mercury concentrations can include:

- 29 a. The specific model may have been developed for waterbodies in a different
 30 geographical area or for different types (i.e., in terms of water chemistry,
 31 morphometry, associated wetland area) than the waterbody for which predictions
 32 are made;

- 33 b. The fish community of the study waterbody may differ in species composition
 34 and/or number of trophic levels, or in the predominating trophic pathway (littoral or
 35 pelagic) from the waterbodies used for model building;
- 36 c. Each waterbody is in some way unique, having some qualities or combination of
 37 qualities not found in other waterbodies. These qualities, if relevant for mercury
 38 bioavailability and/or biomagnification, will result in responses to flooding and
 39 patterns of fish mercury uptake that may slightly deviate from those underlying the
 40 empirical model, even if the model was generated from a large set of waterbodies
 41 of similar types as the study waterbody.

42 To predict maximum post-Project fish mercury levels for Keeyask, the Partnership chose
 43 a predictive published model that was developed using waterbodies of largely similar
 44 type and from the same general geographical area (boreal forest of northern Manitoba)
 45 and watershed as Gull Lake. In this way the Partnership tried to minimize the sources of
 46 uncertainty associated with a) and b). The Partnership further tried to constrain
 47 uncertainty in predictions of fish mercury concentrations by not relying just on one
 48 model, but by applying a second model that could be considered to represent a worst
 49 case scenario. This model was based on recorded effects in Stephens Lake, which is
 50 immediately downstream of Gull Lake and situated in similar terrain with extensive
 51 areas of peat. The results of both models were used to predict concentrations based on
 52 a “weight of evidence” approach that considered the known strengths and
 53 shortcomings of both models.

- 54 3. *Please explain how the Partnership plans to address the long-term uncertainty*
 55 *associated with the predicted mercury concentrations in fish.*

56 The Partnership plans to address the long-term uncertainty associated with the
 57 predicted mercury concentrations in fish by monitoring of mercury concentrations in
 58 fish relevant to human and wildlife consumers following impoundment of the reservoir
 59 until mercury concentrations in fish muscle return to stable levels. After impoundment,
 60 monitoring within the Keeyask reservoir and Stephens Lake is planned to proceed yearly
 61 until maximum fish mercury concentrations are reached (i.e., do not significantly
 62 increase over a 3-year period; see response to TAC Public Rd 1 HC-0007). Thereafter,
 63 monitoring will continue every three years until fish mercury concentrations are not
 64 statistically different for three consecutive sampling periods (see response to TAC Public
 65 Rd 1 HC-0007). Provisions will also be made to monitor fish mercury concentrations
 66 upstream and downstream of the Keeyask reservoir and Stephens Lake should
 67 maximum concentrations in fish of either of the two waterbodies increase to higher
 68 than predicted levels. Monitoring results will be incorporated into updated fish
 69 consumption recommendations on a timely basis, if required.

70 Section 7.2.4.2.2 Excerpt:

71 The following text is from the Aquatic Environment Supporting Volume Section 7.4.2.2
72 p. 7-18 to 7-19:

73 “There are several limitations to the Johnston *et al.* (1991) model(s) that must be
74 considered when interpreting its predictions for fish mercury levels in the
75 Keeyask reservoir and Stephens Lake:

- 76 • Few of the reservoirs used to build the model(s) had extensive in-lake
77 flooding with no upstream effects, as is predicted to occur in the Keeyask
78 reservoir;
- 79 • The Percentage Flooding model explained between 38% (for northern pike)
80 and 57% (for walleye) of the variation in fish mercury burden (Johnston et al.
81 2001), resulting in considerable uncertainties when the model is applied to
82 predict mercury concentrations;
- 83 • The measurement of fish mercury concentrations used in the Johnston et al.
84 (1991) model(s) generally began after peak concentrations occurred, such
85 that maximum mercury burdens used for modeling were likely lower than
86 actual burdens. This may have resulted in an underestimation of predicted
87 concentrations in the Keeyask reservoir; and
- 88 • The model(s) does not include the effect of flow rate”

89 The following text is from the Aquatic Environment Supporting Volume Section
90 7.2.4.2.2, p.7-20:

91 “It must be emphasized that although an attempt was made to provide
92 quantitative estimates of future mercury concentrations in the Keeyask
93 reservoir and downstream areas, all predicted values should be treated more as
94 indicators and not as precise quantitative predictions”.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 5C, Human Health Risk Assessment, Section 7.0; p. N/A**

3 **CEC Rd 1 CAC-0034**

4 **PREAMBLE:**

5 Page 5C-70 states that “muskrat is the only mammal that was predicted to have
6 increased tissue concentrations of mercury following impoundment”.

7 **QUESTION:**

8 Please explain why mercury concentrations are expected to increase in no mammals
9 other than muskrat.

10 **RESPONSE:**

11 As indicated in Section 8.4.4.2 of the Terrestrial Environment Supporting Volume (TE
12 SV), increases in total mercury concentration are expected for fish-eating wildlife such
13 as mink and river otter that forage in the Keeyask reservoir and/or Stephens Lake. These
14 two mammal species were not considered in the Human Health Risk Assessment (HHRA)
15 because they are not normally consumed by humans. The HHRA was referring to
16 mammals identified as key species of concern based on their frequency of human
17 consumption and likelihood to accumulate mercury (Section 3.2 of the HHRA). Of the
18 four species identified (beaver, muskrat, moose, and snowshoe hare), only muskrat,
19 which is predominantly herbivorous but occasionally consumes some animal matter, is
20 expected to have a small increase in tissue concentrations of mercury following
21 impoundment (see TE SV Section 7.3.3.1.1). The assumptions and rationale describing a
22 condition that could increase mercury concentrations in muskrat are described in CEC
23 Rd 1 CEC-0046. Initially, it was assumed mercury concentrations in muskrat for both the
24 Local and Regional study areas would not increase for this trophic level 2 herbivore
25 because of limited numbers predicted to occupy the reservoir post-impoundment over
26 the long term. For example, the mean mercury concentration in muscle for animals
27 collected near the Nelson River was 0.01 µg/g ww (n=3), and was below detectable
28 limits in the region. A highly conservative approach in the end, however, was selected to
29 account for a scenario where a moderate-sized local muskrat population recolonized the
30 reservoir in bays containing shoreline peatlands for a short period of time.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Appendix 5C, Human Health Risk Assessment, Section 4.4; p. N/A**

3 **CEC Rd 1 CAC-0035**

4 **PREAMBLE:**

5 Page 5C-38 indicates that mercury in wild game was estimated as total mercury and that
 6 mercury in wild game and wild plants was assumed to be present as total mercury since
 7 information is not readily available on the mercury form in muscle tissue.

8 The apportionment of inorganic and organic mercury in meats and vegetables are
 9 available from US EPA (1997). Table 3-23 presents 11 to 57% of total mercury measured
 10 in wild deer is in the form of methylmercury. In addition, Table 3-24 presents 11 to 36%
 11 of total mercury in tuberous plants is in the form of methylmercury.

12 **QUESTION:**

13 How would risk estimates change in the HHRA by increasing methylmercury exposures
 14 from wild game and wild plants?

15 **REFERENCES:**

16 US EPA (1997). United States Environmental Protection Agency. 1997. Mercury Study
 17 Report to Congress. Volume III. United States Environmental Protection Agency.
 18 Office of Air Quality Planning & Standards and Office of Research and
 19 Development. EPA-452/R-97-003 to EPA-452/R-97-010. December 1997.

20 **RESPONSE:**

21 It is not anticipated that the overall conclusions would appreciably change if the values
 22 suggested above for mercury composition of non-fish foods were adopted in the HHRA.
 23 The following toxicity reference values (TRVs) were used in the HHRA:

- 24 • 0.2 µg/kg bw/day for methylmercury (sensitive receptors)
- 25 • 0.47 µg/kg bw/day for methylmercury (general population)
- 26 • 0.57 µg/kg bw/day for inorganic mercury (all receptors)

27 Consequently, the TRV for methylmercury is approximately 35% of the TRV for inorganic
 28 mercury for sensitive receptors (*i.e.*, 0.2 µg/kg bw/day divided by 0.57 µg/kg bw/day =
 29 0.35) and 82% of the TRV for inorganic mercury for the general population (*i.e.*, 0.47
 30 µg/kg bw/day divided by 0.57 µg/kg bw/day = 0.82). As a result, for food groups with
 31 total mercury as 35% and 82% methylmercury, the results of the HHRA would not
 32 change for sensitive receptors and the general population, respectively. As provided in

33 the preamble, 35% is approximately the midpoint of the range cited for deer and the
34 high end of the range cited for tuberous plants.

35 In development of their provisional tolerable weekly intake (PTWI) for inorganic
36 mercury, WHO (2010) "Joint FAO/WHO Expert Committee on Food Additives: Seventy-
37 Second Meeting" (available at:
38 http://www.who.int/foodsafety/chem/summary72_rev.pdf) stressed that the
39 predominant form of mercury would be as inorganic mercury in non-fish foods;
40 however, WHO (2010) did not provide specific values.

41 It is also noted that consumption of the non-fish food groups is quite a minor
42 contributor to mercury intakes (see response to CEC Rd 1 CAC-0021) and risks under
43 both present conditions and post-impoundment conditions. In addition, the
44 methylmercury concentrations are not expected to increase under post-impoundment
45 conditions for most non-fish foods.

46 Overall, it is stressed that the TRV used for non-fish food was based on the
47 recommendations of the WHO (2010). It would seem very unlikely that the fraction of
48 methylmercury in non-fish food groups would have an appreciable effect on the overall
49 conclusions of the HHRA.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Parameters Considered for Turbines to Increase Fish; Page No.:**
 3 **N/A**

4 **CEC Rd 1 CAC-0036**

5 **PREAMBLE:**

6 Entrainment of fish through turbines has been proposed as a reasonable method of
 7 providing downstream passage for fish. Measures have been taken by the proponent to
 8 reduce mortality associated with injury and mortality. Trash racks will exclude the
 9 largest of fish. The turbine design is expected to result in 90% survival in fish greater
 10 than 500 mm in length.

11 **QUESTION:**

- 12 • Given that most adult lake sturgeon can be expected to pass through the trash
 13 racks, and that most of these will be in the 800 to 1200 mm range (considerably
 14 larger than 500 mm), and given that in general the risk of injury is greater for larger
 15 fish, can it really be expected that a considerable portion of these (very important)
 16 individuals will not be injured or killed?
 17 • Given that this proportion is unknown, please give detailed information on the
 18 planned monitoring program for establishing injury and mortality rates for large fish
 19 that are expected to pass through the trash racks.

20 **RESPONSE:**

21 The response is provided separately for the two bullets in the question.

22 *Given that most adult Lake Sturgeon can be expected to pass through the trash racks,*
 23 *and that most of these will be in the 800 to 1200 mm range (considerably larger than*
 24 *500 mm), and given that in general the risk of injury is greater for larger fish, can it really*
 25 *be expected that a considerable portion of these (very important) individuals will not be*
 26 *injured or killed?*

27 As stated by the reviewer, passage past the turbines and the spillway (when it is in
 28 operation) has been selected as the method of downstream passage. By way of
 29 clarification, turbine design is expected to result in the survival of over 90% of the fish
 30 up to 500 mm in length that pass through the station. Effects of turbine mortality on the
 31 Lake Sturgeon population will depend on both rates of injury and mortality, and the

32 number of Lake Sturgeon moving downstream through the generating station. Available
33 information on these two topics is summarized below.

34 To our knowledge, no experimental studies have been conducted examining the
35 incidence of injury and mortality for Lake Sturgeon passing by turbines. The incidence of
36 Lake Sturgeon known to have passed generating stations on the lower Nelson River
37 (based on tracking or recapture of tagged fish) is summarized in TAC/ Public Round 1
38 DFO-0050. Of the ten acoustically tagged Lake Sturgeon known to have passed via either
39 the spillway or turbines at the lower Nelson River generating stations, nine were
40 confirmed to have survived, and these ranged in length from 595 to 895 mm (the tenth
41 fish was not detected again and its survival is unknown).

42 There are few turbine effects studies that have included larger fish; the results of these
43 studies were presented in the Aquatic Environment Supporting Volume (AE SV)
44 Appendix 1A Attachment 1 and in TAC Public Round 1 DFO-0051. Survival estimates
45 range from 65-93% and tend to be greater for turbines with a larger diameter and
46 slower rotational speed. As described in TAC Public Round 1 DFO-0102, the turbines at
47 the Keeyask Generating Station will have a larger diameter (8.35 m) and slower
48 rotational rate (30 rpm) than any of the generating stations listed in TAC/ Public Round
49 1 DFO-0051; these properties are expected to reduce the incidence of fish injury and
50 mortality. For the convenience of the reviewer, TAC Public Rd 1 DFO-0050, 0051, and
51 0102 are attached at the end of this response.

52 The other factor determining the effect of turbine mortality on Lake Sturgeon
53 populations is the number of fish moving downstream and the contribution of these fish
54 to the population. As noted by the reviewer, the majority of adult sturgeon would
55 physically be able to pass by the trashracks; however, fish may also choose to not pass
56 through the trashracks. The number of larger sturgeon that will attempt to pass the
57 trashracks of the Keeyask Generating Station is not known; however, based on existing
58 movements from Gull Lake to Stephens Lake, the number may be small. Of 511 Lake
59 Sturgeon that were marked with floy tags in Gull Lake during the period 1999-2008, only
60 two were recaptured downstream in Gull Rapids or the adjacent river reach (AE SV
61 Table 6-15). Similarly, of 21 adult sturgeon that were initially tagged with radio or
62 acoustic tags in Gull Lake in 2001, only one moved downstream over Gull Rapids during
63 the three years of the study. In 2011, 31 Lake Sturgeon in Gull Lake were implanted
64 with acoustic tags with a 10 year lifespan to provide a record of the movements of
65 individual Lake Sturgeon immediately before and during construction. By fall of 2012,
66 none of the 31 Lake Sturgeon tagged in Gull Lake had moved downstream. It is
67 recognized that the movement of Lake Sturgeon downstream may increase when the

68 generating station is in operation; as noted in TAC Public Rd 1 DFO-0051, mean
69 entrainment rates of Lake Sturgeon at the Slave Falls Generating Station were 3.1%/year
70 for adults tagged throughout the Slave Falls Reservoir and 17.9%/year for subadults
71 tagged in the lowermost section of the Slave Falls Reservoir (McDougall 2011).

72 *Given that this proportion is unknown, please give detailed information of the planned*
73 *monitoring program for establishing injury and mortality rates of large fish that are*
74 *expected to pass through the trash racks.*

75 Monitoring of Lake Sturgeon movements during construction will be conducted based
76 on acoustic tags (Vemco V16 transmitters with a 10 year battery life) that were
77 implanted in 2011. It is anticipated that the number of tags (31 initially applied
78 upstream of the generating station) will be maintained through the initial years of
79 operation. A 50+ receiver VR2W array, currently being used to monitor movements of
80 Lake Sturgeon (Figure 1), will be supplemented in 2013 with receiver "gates" deployed
81 in several key areas (upstream and downstream of Gull Rapids, upstream and
82 downstream of Birthday Rapids, upstream of Kettle GS). For reference, "gates" refer to
83 simultaneous use of two or more acoustic receivers oriented perpendicular to the
84 primary flow axis to provide complete coverage for a cross section of river.
85 Theoretically, this should result in 100% detection of passing fish and allow for
86 directionality of movements to be ascertained. The number and location of receivers
87 may be modified post-impoundment to continue to provide maximum possible
88 coverage of the mainstem of the Nelson River. Movements of tagged fish will be
89 monitored throughout the open-water season and, to a lesser extent, during the ice
90 covered season (depending on ice conditions). The methodologies employed will
91 achieve a high level temporal resolution associated with large scale movements
92 between or through key locations (i.e. Gull Rapids and, post-Project, the generating
93 station). In addition to addressing movements past the generating station, the data
94 collected post-impoundment will increase understanding of Lake Sturgeon movement
95 patterns (i.e., typical distances and spatial patterns associated with spawning and
96 foraging) and relative utilization of the different reaches of the Nelson River.

97 Movements of other species such as Walleye, and potentially Northern Pike and Lake
98 Whitefish, will also be monitored with acoustic telemetry; however, the largest fish in
99 the population will likely not be targeted due to increased susceptibility to mortality due
100 to tagging.

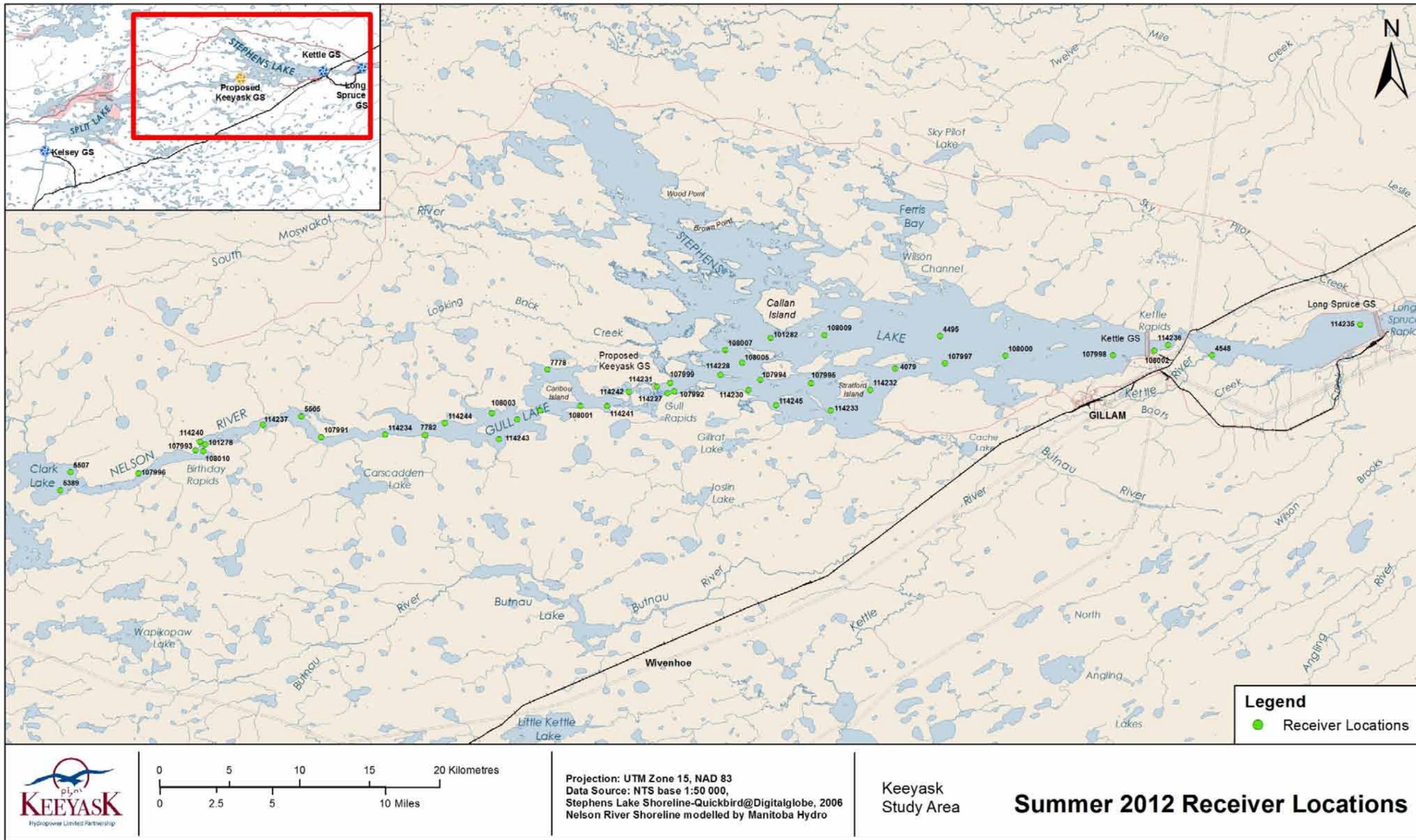
101 Turbine effects may also be assessed based on the experimental introduction of fish into
102 the turbines (i.e., not passing by the trashracks). Based on currently available

103 information, this aspect of monitoring will be modelled after studies conducted at the
 104 Kelsey Generating Station in 2006 and 2008 (North/South Consultants Inc. [NSC] and
 105 Normandeau Associates Inc. 2007, 2009). While the approach outlined in the sections
 106 below is based on the Kelsey studies, alternate approaches to estimating turbine and
 107 spillway mortality at the Keeyask Generating Station will be evaluated in consultation
 108 with MCWS and DFO before such a study is conducted, and the most effective approach
 109 will be selected.

110 To estimate the rates of injury and mortality of fish during passage through the Keeyask
 111 Generating Station, Walleye, Northern Pike, and Lake Whitefish (if adequate numbers
 112 can be captured) would be experimentally passed through one turbine and the spillway
 113 in sufficient numbers to make statistically valid predictions of 48-hour survival. Control
 114 fish would be released immediately downstream of the GS and the spillway. All study
 115 fish will be captured in the area, marked with HI-Z (balloon) and radio tags, and released
 116 into the turbine intake or spillway. Fish would be recaptured downstream of the
 117 generating station, injuries assessed, and survival calculated after a 48-hour holding
 118 period.

119 **REFERENCES:**

- 120 McDougall, C.A. 2011. Investigating downstream passage of Lake Sturgeon, *Acipenser*
 121 *fulvescens*, through a Winnipeg River generating station. M.Sc. Thesis.
 122 University of Manitoba, Winnipeg, Manitoba. X + 175 pp.
- 123 North/South Consultants Inc. and Normandeau Associates Inc. 2007. Fish movements
 124 and turbine passage at selected Manitoba Hydro generating stations 2005-2006
 125 interim report. North/South Consultants Inc., Winnipeg, MB.
- 126 North/South Consultants Inc. and Normandeau Associates Inc. 2009. Survival and
 127 movement of fish experimentally passed through a re-runnered turbine at the
 128 Kelsey Generating Station, 2008. North/South Consultants Inc, Winnipeg, MB.



131 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 132 **Section: 6.4.2.3.2 Movements; p. 6-43**

133 **TAC Public Rd 1 DFO-0050**

134 **PREAMBLE:**

135 "Sturgeon moving downstream from the Keeyask reservoir would need to pass either
 136 the spillway (when its in operation) or past the trash racks and turbines...Although
 137 experimental studies of turbine effects have not been conducted with lake sturgeon,
 138 studies of fish movements in the Limestone reservoir have recorded downstream
 139 passage by lake sturgeon both over the spillway and past the turbines."

140 **QUESTION:**

141 What is the survival of sturgeon that pass: 1) through the turbines and 2) over the
 142 spillway? How does this survival change with size? What provisions for safe downstream
 143 passage have been considered?

144 **RESPONSE:**

145 With respect to DFO's questions on the survival of sturgeon that pass through the
 146 turbines or over the spillway, data on lake sturgeon movement through generating
 147 stations is limited. Further, because experimental studies of turbine effects on lake
 148 sturgeon have not, to the Partnership's knowledge, been conducted, as stated in the
 149 Aquatic Environment Supporting Volume "There is no information available on turbine
 150 mortality rates for sturgeon."

151 There are several studies, however, that have been conducted in Manitoba that provide
 152 information relevant to:

- 153 1. the frequency with which lake sturgeon move downstream through generating
- 154 stations;
- 155 2. the mode (spillway vs. turbines) of downstream passage; and
- 156 3. whether or not passage was survived.

157 Downstream movement of lake sturgeon through the Slave Falls Generating Station (GS)
 158 in the Winnipeg River was investigated by McDougall (2011). Mean entrainment rates of
 159 lake sturgeon at the Slave Falls GS were 3.1%/year for adults tagged throughout the
 160 Slave Falls Reservoir and 17.9%/year for subadults tagged in the lowermost section of
 161 the Slave Falls Reservoir. In total, 11 lake sturgeon (adults and subadult combined)

162 tagged during the study passed through the station. Of these 11, seven either
 163 conclusively passed, or were likely to have passed, via the bottom-draw regulating gates
 164 (a structure unique to the Slave Falls station). Routes of four could not conclusively be
 165 determined. Eight of the 11 passage events were known to have survived, while the
 166 remaining three were deemed likely to have survived passage.

167 In 2007, 16 lake sturgeon ranging in length from 595 to 895 mm fork length were
 168 captured downstream of the Limestone GS, tagged with acoustic transmitters, and
 169 released into the Limestone Forebay. Of these 16 fish, after three years of study, eight
 170 were confirmed to have moved downstream through the Limestone GS. Five of these
 171 fish are known to have moved through the GS as no spill was occurring at this time of
 172 passage. For the remaining three, the spillway was in operation, thus movement could
 173 have occurred via spillway or turbines. Seven of these fish survived passage. Survival of
 174 the one remaining fish was not confirmed.

175 In 2011 and 2012, a total of 60 acoustic tags were applied to lake sturgeon in the Nelson
 176 River between Clark Lake and the Kettle GS; 31 upstream of Gull Rapids and 29
 177 downstream of Gull Rapids. As of October 2012, none of the fish tagged upstream of
 178 Gull Rapids had moved downstream through Gull Rapids into Stephens Lake; however,
 179 two of the sturgeon tagged in Stephens Lake moved downstream through the Kettle GS.
 180 The route that both fish took through the GS is unknown as the spillway was operating
 181 when they moved through. These fish measured 796 mm and 880 mm in fork length.
 182 There has not been an instance of an adult lake sturgeon that has moved downstream
 183 to the Kettle GS and subsequently disappeared.

184 With respect to DFO's question regarding the provisions for safe downstream passage
 185 that have been considered, the Partnership has identified that optimizing the design of
 186 turbines to increase fish survival and reduce injury rates is the best option for
 187 downstream passage. A discussion of changes to turbine design to reduce effects to fish
 188 is provided in Aquatic Environment Supporting Volume Appendix 1A Attachment 1.

189 **REFERENCES:**

190 McDougall, C.A. 2011. Investigating downstream passage of Lake Sturgeon, *Acipenser*
 191 *fulvescens*, through a Winnipeg River generating station. M.Sc. Thesis. University
 192 of Manitoba, Winnipeg, Manitoba. X + 175 pp.

193

194 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 195 **Section: 6.4.2.3.2 Movements; p. 6-43**

196 **TAC Public Rd 1 DFO-0051**

197 **PREAMBLE:**

198 "There is no information available on turbine mortality rates for sturgeon."

199 **QUESTION:**

200 Mortality rate for sturgeon should be based on: 1) known mortality for species of a
 201 similar size (e.g. pike) for both spillway and turbine and 2) the number of individuals
 202 passing the turbines can be calculated based on fish passage studies (e.g. Missi Falls)
 203 and a commensurate relative abundance estimates. Please provide detailed reports
 204 which describe this.

205 **RESPONSE:**

206 As discussed in DFO-0050, there is no experimental information on turbine mortality
 207 rates for lake sturgeon that the Partnership are aware of. In the absence of data based
 208 on lake sturgeon, DFO suggested that the mortality rate of a species of similar size to
 209 lake sturgeon (i.e., large northern pike) could be used as a proxy for estimating the
 210 mortality rate. While using a species of similar size is one approach in the absence of
 211 other data, the turbines at Kelsey are not similar to the turbines that will be used at
 212 Keeyask; the Keeyask turbines incorporate several features that are expected to
 213 improve survival over the kind tested at Kelsey (see DFO-0102). Therefore, using results
 214 from turbine mortality studies at the Kelsey GS to directly predict lake sturgeon
 215 mortality through turbines at Keeyask, is not advisable. Table 2 in the Aquatic
 216 Environment Supporting Volume Appendix 1A, Attachment 1 contains a list of measured
 217 mortality rates from many species, sizes and types of turbines and provides an
 218 indication of the range in mortality rates that have been observed. Information from
 219 Table 2 for larger fish and a few key turbine parameters is attached¹. Survival estimates
 220 range from 65-93% and tend to be greater for turbines with a larger diameter and
 221 slower rotational speed. As described in DFO-0102, the turbines at the Keeyask GS will
 222 have a larger diameter (8.35 m) and slower rotational rate (75 rpm) than any of the GS
 223 listed in the attached table; these properties are expected to reduce the incidence of
 224 fish injury and mortality.

¹ Note that the turbine diameter of the Kelsey GS has been corrected to 5.84 m here and was erroneously presented as 7.92 m in Table 2 in the Aquatic Environment Supporting Volume.

225 With respect to mortality for sturgeon passing the spillway, there are no experimental
226 studies to directly measure mortality. The spillway design does not incorporate features
227 such as baffle blocks, which are associated with elevated mortality at other GSs (see
228 Aquatic Environment Supporting Volume Section 5.4.2.3.7).

229 DFO requested that the number of individual sturgeon be estimated from studies that
230 have been conducted using hydroacoustic technology to determine the total number of
231 fish passing a facility (e.g., Missis Falls Control Structure, Great Falls GS) and a
232 commensurate relative abundance estimate for lake sturgeon. In our opinion, the
233 number of sturgeon passing downstream cannot be extrapolated from these studies
234 given that sturgeon are primarily a benthic species and would behave differently at a GS
235 intake than species in the water column. Direct records of tagged sturgeon passing GSs
236 (summarized in DFO-0050) provides a better estimate of the magnitude of downstream
237 movements.

238 Summary of information extracted from Aquatic Environment Supporting Volume Appendix 1A, Part 1, Attachment 1 Table 2

Station	Species	Size (mm)	Turbine	Blades	Runner Speed (rpm)	Diam. (m)	48 d Survival
Safe Harbor	shad	425	Mixed Flow	7	76.6	6.10	0.843
Kelsey	walleye	431	Propeller	5	102.9	5.84	0.877
Kelsey	walleye	447	Propeller	6	102.9	5.84	0.804
Kelsey	pike	595	Propeller	5	102.9	5.84	0.756
Kelsey	pike	661	Propeller	6	102.9	5.84	0.659
Beaucaire	eel	690	Bulb	4	94	6.24	0.93
Fessenheim	eel	704	Kaplan	4	88	6.67	0.924
Ottmarsheim	eel	750	Kaplan	5	94	6.25	0.799
Robert Moses	eel	1020	Propeller	6	99	6.10	73.5 (88h)

239

240 **REFERENCE: Volume: Project Description Supporting Volume;**
 241 **Section: 6.7 Powerhouse; p. 6-13**

242 **TAC Public Rd 1 DFO-0102**

243 **QUESTION:**

244 The EIS indicates that the turbine has been designed to maximize fish survival compared
 245 to other Manitoba Hydro generating stations. Please provide a table to compare
 246 turbines of similar design and on similar systems.

247 **RESPONSE:**

248 Vertical fixed blade propellers, in general, have higher fish survival rates than other
 249 turbine designs, such as Kaplan or Francis. The rate of mortality and injury to fish is less
 250 for fixed blade vertical shaft turbines that have fewer blades, a larger diameter, and
 251 slower rotational speed. Based on these features, the rate of mortality and injury to fish
 252 is expected to be lower for the turbines at Keeyask relative to the turbines at the Kelsey
 253 and Wuskwatim generating stations (see summary table below). As discussed in Aquatic
 254 Environment Supporting Volume Appendix 1A Part 1 Attachment 2, the design
 255 specifications for the Keeyask turbines included additional features associated with
 256 reduced harm to fish (e.g., thicker leading edges on the turbine blade).

Station	Turbine Type	# Blades	Diameter	Rotational Rate
Kelsey GS	Vertical fixed blade propeller	5	5.84	102.9 RPM
Keeyask GS	Vertical fixed blade propeller	5	8.35 m	75 RPM
Wuskwatim GS	Vertical fixed blade propeller	5	6.7 m	94.8 RPM

257

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Parameters Considered for Turbines to Increase Fish; p. N/A**

3 **CEC Rd 1 CAC-0037**

4 **PREAMBLE:**

5 Entrainment of fish through turbines has been proposed as a reasonable method of
6 providing downstream passage for fish. Measures have been taken by the proponent to
7 reduce mortality associated with injury and mortality. Trash racks will exclude the
8 largest of fish. The turbine design is expected to result in 90% survival in fish greater
9 than 500 mm in length.

10 **QUESTION:**

11 Given that the very largest (and therefore perhaps the most “valuable”) lake sturgeon
12 that might encounter a trash rack may become impinged (the fact that burst swim
13 capacity may exceed approach velocity does not necessarily mean impinged fish will be
14 able to escape – once impinged, the animal needs to be able to “jump” off the screen
15 and clear it so as to be able to initiate normal swimming for escape – once fish are
16 impinged on screens, water velocity almost always needs to be lowered to allow them
17 to escape, especially if they are exhausted from multiple attempts to clear the screen –
18 the biomechanics of burst swimming and escape from impingement are fundamentally
19 different), please provide details of a monitoring plan (if present) to directly determine
20 the frequency of large fish impingements, so that mitigation can be planned if needed.

21 **RESPONSE:**

22 The frequency that adult lake sturgeon may encounter the upstream side of the Keeyask
23 GS will be monitored through the 31 Lake Sturgeon tagged with acoustic transmitters
24 upstream of the proposed Keeyask GS (also see response to CEC Rd 1 CAC-0036). In
25 short, 31 adult Lake Sturgeon (fork length range of 816 – 1610 mm) have been tagged
26 with 10-year acoustic transmitters upstream of the GS. This number of active tags will
27 be maintained during construction and the initial years of operation. Acoustic receivers
28 will be in place to determine the frequency with which these tagged fish move to the
29 upstream side of the Keeyask GS. Should acoustic telemetry monitoring results suggest
30 that tagged Lake Sturgeon are moving to the immediate upstream side of the GS and
31 becoming impinged on the trash racks (i.e., are no longer recorded at any receivers),
32 further mitigation/monitoring will be developed by the Partnership in consultation with
33 DFO and MCWS.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Keeyask Lake Sturgeon Stocking Strategy; p. 27**

3 **CEC Rd 1 CAC-0038**

4 **PREAMBLE:**

5 "It is important to note that lake sturgeon year class strength and the proportion of
6 hatchery reared versus wild fish that comprise each year class will be monitored
7 annually."

8 **QUESTION:**

9 Given that (a) the proponents suggest that stocking of larval lake sturgeon may be a
10 common practice, and (b) that the only way (that I can think of) to identify a captured
11 sturgeon as coming initially coming from the hatchery as a larvae is through genetic
12 means, and (c) that the only way to assess the success of stocking larval fish is to carry
13 out "blind" (and expensive) DNA testing on large numbers of captured juvenile, sub-
14 adult, and adult fish once stocking has been carried out for a number of years, is DNA
15 analysis of larval fish really a feasible means of evaluating the efficacy of stocking larval
16 fish?

17 **RESPONSE:**

18 The stocking strategy presented in the Aquatic Environment Supporting Volume (AE SV)
19 Appendix 1A Part 2 states that stocking of larval fish is only planned during years that
20 excess larvae (i.e., more larvae than the hatchery is capable of rearing to the fingerling
21 stage) hatch from the eggs that are collected during spawn taking. It is possible that
22 larvae could be stocked annually if excess larvae are available each year, but it should be
23 noted that these would be "extra" fish beyond the requirements set out in the stocking
24 strategy.

25 As indicated by the reviewer, genetic identification is a proven, reliable means of
26 determining whether or not sturgeon captured during monitoring are of wild or
27 hatchery origin. This DNA testing can be expensive and estimated costs, provided that
28 the microsatellite approach was used for analyzing 200 samples, would be
29 approximately \$24,000 – \$30,000 annually. However, DNA testing may not be the only
30 reliable method for distinguishing between wild and hatchery reared Lake Sturgeon. Dr.
31 Gary Anderson (University of Manitoba) has received funding from Manitoba Hydro to
32 research reliable methods (mainly isotopic signatures) of marking larval and fingerling
33 Lake Sturgeon and subsequently identifying these marks when the fish are captured
34 during monitoring. Recently the use of isotopic signatures in a variety of fish species for
35 the monitoring of stocked animals has come to the fore. This technique has been

36 successful in marine and freshwater species including Lake Sturgeon (Thorrold et al.
37 2007; Smith and Whitley 2011) and, although Dr. Anderson's results are preliminary,
38 the technique appears promising.

39 In the event that these methods are either not successful or not applied, DNA analysis
40 will provide an alternate method to distinguish between wild and hatchery reared fish.

41 Further, it is unlikely that DNA analysis could be used to directly evaluate "the efficacy
42 of stocking larval fish". This is because the DNA of fish released at the larval stage would
43 be similar to the DNA of fish released at the fingerling stage, meaning that although
44 DNA analysis could be used to distinguish between wild or hatchery reared fish, the DNA
45 test could not determine if the fish was released at the larval or fingerling stage. The
46 question of the efficacy of stocking sturgeon at the larval vs the fingerling stage would
47 be better addressed by using a different means of marking the larvae.

48 **REFERENCES:**

49 Smith, K. T., and G. W. Whitley. 2011. Evaluation of a stable isotope labelling
50 technique for mass marking fin rays of age-0 lake sturgeon. Fisheries
51 Management and Ecology. 18: 168-175

52 Thorrold, S. R., D. C. Zacherl, and L. A. Levin. 2007. Population Connectivity and larval
53 dispersal using geochemical signatures in calcified structures. Oceanography.
54 20: 80-89.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Keeyask Lake Sturgeon Stocking Strategy; p. 27**

3 **CEC Rd 1 CAC-0039**

4 **PREAMBLE:**

5 "It is important to note that lake sturgeon year class strength and the proportion of
6 hatchery reared versus wild fish that comprise each year class will be monitored
7 annually."

8 **QUESTION:**

9 If DNA analysis is the only way to reliably determine if a sturgeon caught during
10 monitoring was originally stocked as a larvae, and given that broodstock will ideally be
11 taken from the local populations and that sturgeon are multiple spawners, are there
12 concerns regarding the potential inability to determine if a fish is actually wild or
13 hatchery reared?

14 **RESPONSE:**

15 Lake Sturgeon are periodic spawners and in the Nelson River, the estimated spawning
16 periodicity is 1-3 years for males and 3-7 years for females. Therefore, if two fish
17 previously used as broodstock for hatchery reared fish were to spawn together in the
18 wild in a different year, it would be a minimum of three years between these spawning
19 events. In this hypothetical example, the offspring would have a similar genetic
20 structure (i.e., the same parents) but the hatchery reared and wild-spawned fish would
21 be at least three years apart in age and could be readily distinguishable on that basis.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Keeyask Lake Sturgeon Stocking Strategy; p. 27**

3 **CEC Rd 1 CAC-0040**

4 **PREAMBLE:**

5 "It is important to note that lake sturgeon year class strength and the proportion of
6 hatchery reared versus wild fish that comprise each year class will be monitored
7 annually."

8 **QUESTION:**

9 If it is decided that an evaluation of the success of larval stocking cannot be realistically
10 monitored, should they ever be used in stocking, given that it will not be possible to
11 distinguish a wild fish from one that was stocked as a larvae?

12 **RESPONSE:**

13 As noted in CEC Rd 1 CAC-0038, Dr. Gary Anderson (University of Manitoba) is
14 evaluating reliable methods that can be used to mark larval and fingerling Lake
15 Sturgeon; some of these methods have been successful in other locations. Given that
16 the purpose of the stocking program is to increase Lake Sturgeon numbers, it would not
17 make sense to euthanize excess larval sturgeon solely because it would be unknown if
18 the fish was released as a larvae or fingerlings. Should the experimental means of
19 marking larvae prove unsuccessful, it will still be possible to determine whether these
20 fish are of hatchery vs. wild origin from DNA testing.

1 **REFERENCE: Volume: N/A; Section: Keeyask Lake Sturgeon**
2 **Stocking Strategy; p. N/A**

3 **CEC Rd 1 CAC-0041**

4 **PREAMBLE:**

5 Stocking is the key mitigative strategy proposed by the proponent to offset lake
6 sturgeon losses due to the Project and bolster the populations. The proponents should
7 be commended for the scope of the research that has been invested in, and in terms of
8 their willingness to incur costs associated with rearing lake sturgeon. However, the
9 proponents have understated the difficulties associated with rearing this species in
10 Manitoba, even once the obstacles of getting viable gametes has been surmounted.
11 Although lake sturgeon appear easy to rear in facilities like the White Rose Hatchery in
12 Wisconsin, the hatchery workers at Grand Rapids (and others who have tried), even
13 with years of experience, will readily admit to massive and inexplicable die offs of fish
14 without warning. Survival rates have been wildly erratic over the past decade and
15 complete losses of cohorts have not been uncommon.

16 **QUESTION:**

17 Please comment on the uncertainty associated with rearing success of lake sturgeon,
18 and how that relates to stocking as a mitigative strategy.

19 **RESPONSE:**

20 The reviewer is correct that inexplicable die-offs have occurred at various times in
21 hatcheries located in Manitoba. Facilities in Manitoba, including the Grand Rapids
22 Hatchery, the Whiteshell Hatchery, the University of Manitoba, and a small scale
23 experimental hatchery in Pinawa, Manitoba, have encountered highly variable success
24 rates with respect to gamete collection and rearing on an annual basis. This has resulted
25 in considerable variation in the annual number of fish returned to the wild. However,
26 information and experience gained over the past twenty years has led to improved
27 gamete collection techniques and improved survival rates during the rearing process.

28 The issue of die-offs is being addressed through a two-pronged approach:

- 29 • Firstly, there is a continuous effort to improve rearing success, through
30 collaboration among hatchery operators in Manitoba and consultation with other
31 hatchery operators, experimental assessment of various gamete collection and
32 rearing techniques, and adaptation of techniques as deemed necessary. For
33 example, after experiencing limited success with gamete collection, the Nelson River
34 Sturgeon Board and Manitoba Conservation and Water Stewardship modified their
35 gamete collection technique, in consultation with the operator of the Rainy River

- 36 hatchery, to use a hormone to stimulate gamete production to achieve a better
37 result; and
- 38 • Secondly, there is a commitment to a long term (25 years or longer) stocking
39 program until a self-sustaining population is achieved. Given the length of the
40 program and the longevity of Lake Sturgeon, a few missing year classes of stocked
41 fish will not preclude the long term success of the program for the recovery of Lake
42 Sturgeon. It should be noted that natural recruitment in Lake Sturgeon populations
43 is also quite variable.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4.6.1**
2 **Walleye, Northern Pike, Lake Whitefish and other Scale Fish; p. 6-**
3 **270**

4 **CEC Rd 1 CAC-0042**

5 **PREAMBLE:**

6 Upstream fish passage will be provided by a trap and transport program that will target
7 key fish species during the initial period of station operation.

8 **QUESTION:**

9 Please provide details and rationale for the details related to the initial program, before
10 it is evaluated and modified post-implementation. How many fish of each species and
11 sex per year? How will fish be sexed in the field? What time of year for each species?
12 Methods used to minimize injury and mortality (e.g. lake whitefish are susceptible to
13 post capture mortality).

14 **RESPONSE:**

15 The Partnership will work with MCWS and DFO to determine the rationale and details
16 related to the initial program, as well as how to evaluate this program. Details such as
17 how many fish that will be moved, what species, sex, and size, and what time of year to
18 move fish, have yet to be determined. As suggested by the question, Lake Whitefish are
19 very sensitive and susceptible to post capture mortality. As such, a decision not to
20 include this species in the initial program may be made.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.4.2.4 Net Effects of Operation with Mitigation; p. 6-46**

3 **CEC Rd 1 CAC-0043**

4 **PREAMBLE:**

5 "The Project will be designed and constructed in a manner that would allow it to be
6 retrofitted to accommodate other upstream and/or downstream fish passage options if
7 required in the future..."

8 **QUESTION:**

9 Has the design of the Project allowed for all options of alternative fish passage
10 structures to be retrofitted (i.e. fish ladder, fish lock, fish elevator, nature-like bypass
11 channel etc.) and if not, which of the possibilities actually could be feasibly installed
12 after the fact.

13 **RESPONSE:**

14 A report titled "Keeyask Fish Passage Identification of Design Concepts Report,
15 November 29th, 2012" was prepared and provided to Fisheries and Oceans Canada and
16 Manitoba Conservation and Water Stewardship to assist in on-going discussions
17 between these agencies and the Partnership related to this topic. This report describes
18 design concepts for fish passage that with some modification and further detailed
19 design would be feasible for retrofit at the Keeyask Generating Station. This report was
20 included on a CD in the TAC Public Round 2 submission (as referenced in TAC Public Rd 2
21 DFO-0048) and is included on the CD of technical reports included with this filing.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 6.4.2.2.6 Net Effects with Mitigation; p. 6-39**

3 **CEC Rd 1 CAC-0044**

4 **PREAMBLE:**

5 "...it may be necessary to create compensatory YOY habitat via strategic placement of
6 sand in the reservoir...."

7 Much data has shown that YOY lake sturgeon prefer a sandy substrate; however, this
8 preference must certainly be indirect, as sand cannot in itself directly contribute to YOY
9 survival. It is most likely that the sand provides suitable habitat for benthic
10 macroinvertebrates that YOY prefer (e.g. Dipterans). As such, the proponents should
11 adjust their mitigative plans to create sandy habitats that are suitable habitat for YOY
12 prey items and the subsequent monitoring and evaluation program should include
13 benthic and drift sampling to ensure that the new habitat contains sufficient food, and
14 does not merely attract YOY to an "empty table".

15 **QUESTION:**

16 Please respond to the proposed adjustment to the mitigative plan.

17 **RESPONSE:**

18 If it is deemed necessary to create compensatory young-of-the-year habitat in the
19 reservoir post-Project, as the reviewer suggests, monitoring would include benthic
20 invertebrate and drifting invertebrate sampling, in addition to fish community sampling.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4.6.1**
2 **Walleye, Northern Pike, Lake Whitefish and Other Scale Fish; p. 6-**
3 **270**

4 **CEC Rd 1 CAC-0045**

5 **PREAMBLE:**

6 "This would include both an assessment of the success in capturing the fish for transport
7 and whether transported fish are better able to fulfil their life history requirements than
8 fish that remain below the generating station."

9 **QUESTION:**

10 Please describe exactly how a monitoring program could quantitatively determine
11 whether transported fish might be better able to fulfil their life history requirements
12 than those that remain below the generating station.

13 **RESPONSE:**

14 The Partnership recognizes the challenges of determining whether transport to
15 upstream of the generating station improves the opportunity of individual fish of
16 species such as lake sturgeon, northern pike, and walleye to fulfill their life history
17 requirements, in particular where habitat to fulfill all life history functions is available
18 both upstream and downstream of the generating station. The Partnership notes that
19 in addition to assessing effects to individual fish, the overall test is the long-term success
20 of the fish populations upstream and downstream of the generating station.

21 In discussions with the regulators, Fisheries and Oceans Canada (DFO) has indicated
22 that the requirement for fish passage facilities will be determined by DFO, in
23 consultation with Manitoba Conservation and Water Stewardship (MCWS) Fisheries
24 Branch, based on the results of monitoring, established fisheries management
25 objectives and support for ongoing fisheries productivity. MCWS has prescribed, in the
26 Fisheries Management Objectives for the Keeyask area, that "Determination for the
27 need for fish passage (types, timing, mechanisms and species) to support future stocks
28 associated with the new ecosystem should be based on scientifically experimental and
29 defensible assessment in conjunction with provincial management goals and in
30 consultation with provincial fisheries managers." The Partnership will work closely with
31 DFO and MCWS to interpret monitoring of transported fish to determine whether
32 transport represents a net benefit to fish populations.

33 It should be noted that fish passage at the Keeyask Generating Station is the subject of
34 on-going discussions with DFO and MCWS and the approach has evolved subsequent to

35 submission of the EIS in July 2012. Please see CEC Rd 1 CEC-0026 for the current
36 approach.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.4.7 Mammals, 6.2.3.2 Physical Environment (R to EIS); CNP**
 3 **Environmental Evaluation Report; FLCN Environmental**
 4 **Evaluation Report; p. N/A**

5 **CEC Rd 1 CAC-0046**

6 **PREAMBLE:**

7 Within the Keeyask Study Area, FLFN members actively hunt moose along the shoreline
 8 of Stephens Lake, and near the (proposed) south access road close to Kettle and Cache
 9 Lakes, while TCN members have moose hunting areas on the south shore of the Nelson
 10 River between Split Lake and Birthday Rapids, and on the north and south shores of the
 11 Nelson River downstream of Birthday Rapids to Stephens Lake. These hunters observe
 12 that moose are more abundant now than they were previously and believe this is due,
 13 in part, to existing hydro developments – with moose displaced from Split Lake into the
 14 Keeyask Study Area as a result of shoreline habitat loss and fluctuating water levels
 15 caused by hydroelectric development at the Kettle GS.

16 **QUESTION:**

17 Do the other Partners, and Manitoba Hydro in particular, believe this to be the case? If
 18 not, why not?

19 **RESPONSE:**

20 The first two statements presented in the preamble are correct and are found in the
 21 FLCN Evaluation Report (2012 p.57) and the TE SV Section 6.2.3.4.7 respectively. The
 22 third statement does not accurately describe the comments made by “these hunters”.

23 Information provided by the KCNs is as follows:

- 24 • Historic hydroelectric (i.e., Kelsey and CRD) development reduced moose
 25 populations at Split Lake in the post-Kelsey and CRD era (1960s to 1976) as observed
 26 by TCN (then the Split Lake Cree) and YFFN (due to shoreline habitat loss and
 27 fluctuating water levels respectively). TCN indicated that moose were forced upland
 28 as the shorelands could no longer support them (TE SV 7.3.6.4.2, Split Lake Cree –
 29 Manitoba Hydro Joint Study Group 1996a p.53);
- 30 • Abundant moose populations have been observed in the SLRMA as observed circa
 31 1996 by TCN (TE SV 7.3.6.4.2); and in 2012 by FLCN on Stephens Lake islands, the
 32 Butnau Road and at the South Moswakot River that drains into Stephens Lake (FLCN
 33 Evaluation Report 2012 p.57); and

34 • FLCN observed moose in the post-Kettle (1974) period moving to “inland locations”
35 away from what is now Stephens Lake (FLCN Evaluation Report 2012 p.57). Inland
36 movement was also attributed to wolf avoidance and food-abundant Stephens Lake
37 islands were noted as a current refuge for moose (FLCN Evaluation Report 2012
38 p.57).

39 The interpretation provided by the CAC refers to three different areas: Split Lake, the
40 Split Lake RMA, and the Stephens Lake area at two different time periods (mid to late-
41 1970s and circa 1996 and later) by Members of three different First Nations. The cause-
42 effect relationship drawn by the CAC is not correct. For example, one of the
43 displacement areas (the Stephens Lake area) is the same area of noted abundance.
44 Aerial surveys confirm the moose population in the Split Lake RMA is higher (that is, has
45 not just been displaced from one area to another) since the mid-1990s- it was estimated
46 at 1,639 in 1994 and was estimated at 2,600 in 2010, but no statistical comparison can
47 be made (TE SV Section 7.3.6.4.3).

48 It should be noted that other landscape factors affect the distribution of moose
49 including natural succession of the forest community (i.e., plant composition), forest
50 fires, and climate (i.e., seeking thermal cover) (TE SV Sections 7.3.6.4.1 and 7.3.8.1). For
51 example, moose density peaks in burned areas between 11 and 30 years after a fire (TE
52 SV Section 7.3.6.4). The results of the 2010 aerial survey of the Split Lake RMA found
53 that the distribution of moose is very patchy, and there are many areas ranging from
54 low to high moose density throughout the RMA.

55 To address any redistribution of moose that may occur as a result of the Project, KCN
56 AEA offsetting programs were designed to provide substitute opportunities to hunt
57 moose in unaffected areas.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2.3.2**
 2 **Physical Environment, 6.5.8.2.1 Moose - Construction Effects and**
 3 **Mitigation (R to EIS); CNP Environmental Evaluation Report; FLCN**
 4 **Environmental Evaluation Report; 7.3.6.4 Moose, 7.4.6.3 Moose**
 5 **(TE SV); Results of Mammal, Reptile & Amphibian Investi; p. N/A**

6 **CEC Rd 1 CAC-0047**

7 **PREAMBLE:**

8 FLCN members point to the importance of willow, alder and hazel along current
 9 shorelines on Stephens Lake and Gull Lake as good moose feeding areas, all of which will
 10 be lost to flooding. TCN/WL members indicate that local veneer bogs, also set to be
 11 flooded, are used as important calving areas. CNP Members have indicated that veneer
 12 bogs (peatlands less than 1.5 m deep that generally occur on slopes) are occupied in wet
 13 seasons and are used as calving areas. FLCN members make mention of other key
 14 calving areas and in particular islands in both Stephens Lake and Gull Lake (of which 42%
 15 had moose present when surveyed in summer).

16 **QUESTION:**

- 17 • Given the important role that specific shorelines, veneer bogs and islands play as
 18 prime moose habitat within the Local Study Area, please comment on the
 19 significance of their loss through Project construction and operation, and reconcile
 20 those comments with the finding in the EIS that because “peatlands are low quality
 21 habitat for moose, the predicted habitat composition trend for moose is likely to be
 22 neutral”.
- 23 • Similarly, please reconcile the environmental assessment of the KCNs, that point to
 24 declines in moose numbers sufficiently high to force their hunters to travel further
 25 afield, with the regulatory finding that the “effect on moose will likely be negligible
 26 to small”.

27 **RESPONSE:**

28 Each of the questions above is answered in turn.

- 29 • *Given the important role that specific shorelines, veneer bogs and islands play as*
 30 *prime moose habitat within the Local Study Area, please comment on the*
 31 *significance of their loss through Project construction and operation, and reconcile*
 32 *those comments with the finding in the EIS that because “peatlands are low quality*
 33 *habitat for moose, the predicted habitat composition trend for moose is likely to be*
 34 *neutral”.*

35 The preamble statement “TCN/WL members indicate that local veneer bogs, also set to
 36 be flooded, are used as important calving areas” could not be verified in the CNP
 37 Evaluation Report (2012). The preamble statement suggesting the Project will flood
 38 “veneer bogs (peatlands less than 1.5 m deep that generally occur on slopes) [that] are
 39 occupied in wet seasons and are used as calving areas” also cannot be verified from the
 40 CNP Evaluation Report (2012). On p.81 of the CNP Evaluation Report (2012), veneer
 41 bogs are noted to be used as calving areas when wet, but are noted to be typical of the
 42 northern part of the Split Lake RMA (see photo caption on p.81). [R1]

43 The “finding in the EIS” stated in the question, quotes from TE SV Section 7.3.8.1
 44 indicating that because “peatlands are low quality habitat for moose, the predicted
 45 habitat composition trend for moose is likely to be neutral” is misleading. This section
 46 describes expected changes to the mammal community without the Project. Because
 47 statements within the preamble and question cannot be verified, the first bullet of this
 48 question is difficult to be addressed.

49 The moose expert information model indicates various coarse habitat types of potential
 50 importance as primary and secondary habitat types used by moose (Table-27 of the TE
 51 SV). Coarse habitat types were used to identify the availability of moose habitat in the
 52 moose Local and Regional Study Areas as well as to predict project related effects
 53 including habitat loss related to the Keeyask Project. Coarse habitat types vary based on
 54 their vegetation compositions and some included quantities of tall shrub species
 55 including willow and alder. Of note, the coarse habitat type ‘tall shrub on mineral and
 56 thin peatland’ (Figure 2-22 to the TE SV) was identified as containing quantities of
 57 “dense willow, often mixed with bog birch and speckled alder of varying densities” and
 58 was considered a moose primary habitat type. The loss of such habitat areas in the
 59 construction and operation of the Keeyask Project was considered in detailing project
 60 related effects and identifying the availability of these habitat types elsewhere in the
 61 Local and Regional Study Areas.

62 As described in the EIS, important moose calving areas also include islands in lakes such
 63 as Stephens Lake and peatland complexes and shorelines of lakes and rivers (TE SV
 64 Section 7.4.6.3.1), both of which are consistent with the ATK provided by the CNP and
 65 Fox Lake Cree Nation. The predictions of the EIS and CNP members concerning
 66 peatlands as important moose calving habitat require clarification because there are
 67 differences in scale and definitions applied to peatland type. Veneer bog captures just
 68 one of several ecosite types considered in the importance of peatland complexes used
 69 by moose for calving. , As described for caribou, and in the case similarly for moose,
 70 calving and rearing complexes, which are clusters of island in lakes or islands of black
 71 spruce surrounded by expansive wetlands or treeless areas (peatland complexes), to
 72 avoid predators (TE SV Section 7.3.6.3.3). The ecosite types that form the matrix either

73 individually, or as a mixture of types used for predator protection, include horizontal
 74 fen, flat bog, collapse scar peatland, deep wet peatland and riparian peatland. The
 75 ecosite types that form islands which are the raised areas above the wet matrix, are
 76 veneer bog, peat plateau bog, and mineral. Blanket bogs can fall into either category
 77 depending on local conditions. As such, both the predictions of the elders and the EIS
 78 are correct. With this exception as described, peatlands are usually low habitat quality
 79 for moose. It should be noted further that by using caribou calving and rearing peatland
 80 complexes as a proxy for this type of important moose calving habitat, the total habitat
 81 affected by the Project is less than 1% as compared to total other peatland habitat in
 82 the Moose Regional Study Area.

83 • *Similarly, please reconcile the environmental assessment of the KCNs, that point to*
 84 *declines in moose numbers sufficiently high to force their hunters to travel further*
 85 *afield, with the regulatory finding that the "effect on moose will likely be negligible*
 86 *to small".*

87 FLCN state that "the Kitayatisuk" [Fox Lake Cree Nation Elders] witnessed the moose
 88 population move inland following the initial flooding caused by the Kettle Generating
 89 Station. Moose returned to Stephens Reservoir [Lake] only after a number of years"
 90 (FLCN Evaluation Report 2012 p.80) and "as a result our people will have to travel
 91 greater distances to hunt moose" (FLCN Evaluation Report 2012 p.80). FLCN do not state
 92 that declines in moose numbers will force their hunters to travel further. Instead, they
 93 state that their hunters will need to go further if moose move inland. This is particularly
 94 relevant because of the hunting methods used. Resource Use Section 1.2.3.2.3 of the SE
 95 SV indicates that "moose hunters prefer hunting from boats because moose are
 96 attracted to shorelines and transporting the harvest is easier than by overland routes".
 97 Moose located at inland locations are not accessible by boat and therefore, to reach
 98 them, hunters would have to travel further and over terrestrial terrain which can be
 99 swampy and difficult to traverse (Resource Use Section 1.2.3.2.3). This would be an
 100 effect on moose hunters not moose.

101 To address any redistribution of moose that may occur as a result of the Project, AEA
 102 offsetting programs were designed to provide substitute opportunities to hunt moose in
 103 unaffected areas.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5.8.3**
 2 **Beaver (R to EIS); YFFN Our Voices Evaluation Report; FLCN**
 3 **Environmental Evaluation Report; 7.3.6.2 Beaver and 7.4.6.1**
 4 **Valued Environmental Components – Beaver (TE SV); p. N/A**

5 **CEC Rd 1 CAC-0048a**

6 **PREAMBLE:**

7 Moose rely on beaver for the creation of high quality habitat. According to technical
 8 science reports and KCN environmental assessments, a combination of shoreline
 9 changes, the seasonal reversal of water flow from system operations, flooding, changes
 10 in winter water levels and unpredictable ice conditions will all contribute to the direct
 11 mortality of beaver and/or impede individual home range reestablishment in the Local
 12 Study Area.

13 **QUESTION:**

14 Given these predictions, please provide information on the expected impact that such
 15 declines in the local beaver population, as a keystone species, will have on local moose
 16 populations.

17 **RESPONSE:**

18 To clarify the Preamble, the seasonal reversal of water flow from system operations is
 19 not a Project effect because the seasonal flow has already been altered by previous
 20 hydroelectric developments.

21 While moose benefit from the habitat created by beaver, moose are generalists and
 22 occupy a variety of habitat types, such as burned areas and willow communities that are
 23 important for maintaining moose populations by providing high-quality browse. As
 24 described in TE SV Section 7.3.6.4 p 7-72, food availability, thermal cover and predator
 25 avoidance influence habitat selection. A wide range of seral stage riparian and forested
 26 areas, including upland and lowland habitats are used. Less than 1% of all moose habitat
 27 in the Moose Regional Study Area (Study Zone 5) is expected to be affected by the
 28 Project (TE SV Section 7.4.6.3.1). In 15 to 30 years, shoreline vegetation in the Keeyask
 29 reservoir is expected to re-establish and become suitable for moose, as was the case
 30 with the Stephens Lake shoreline, which is now an important moose hunting area (FLCN
 31 2010).

32 Effects on the beaver population are measured in the Beaver Regional Study Area (Study
 33 Zone 4). Project-related beaver mortality will mainly be due to the removal of 20 to 30
 34 colonies in the Project Footprint (Study Zone 1) prior to clearing and flooding;

35 approximately 10% of the beaver population is expected to be affected along with
36 approximately 5% of beaver habitat in the Local Study Area (TE SV Section 7.4.6.1.2).
37 Fluctuations in water levels in the reservoir will make any potential habitat unsuitable
38 for beaver during operation, as in Stephens Lake where the density of beaver lodges
39 was 0.02 lodges/km (TE SV Section 7.3.6.2.3, Table 7B-61). Water level fluctuations can
40 cause beaver to abandon habitat in the reservoir and could contribute to mortality in
41 winter. Approximately 5% of beaver habitat in the Regional Study Area will be affected
42 by fluctuating water levels, leaving the majority of unaffected habitat available in ponds,
43 creeks, and lakes (TE SV Section 7.4.6.1.2). Beaver are resilient and are able to relocate
44 to new habitats, have the ability to create habitat, can replace annual mortality of 30%,
45 and can compensate for even greater losses through increased reproduction (Payne
46 1989; TE SV Section 7.4.6.1.1). For more information on beaver population loss also see
47 CEC Rd 1 CAC-0048b.

48 **REFERENCES:**

- 49 FLCN (Fox Lake Cree Nation). 2010. Keeyask Traditional Knowledge Report. Fox Lake
50 Cree Nation, Manitoba. 123 pp.
- 51 Payne, N.F. 1989. Population dynamics and harvest response of beaver. Fourth Eastern
52 Wildlife Damage Conference. 134 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5.8.3**
 2 **Beaver (R to EIS); YFFN Our Voices Evaluation Report; FLCN**
 3 **Environmental Evaluation Report; 7.3.6.2 Beaver and 7.4.6.1**
 4 **Valued Environmental Components – Beaver (TE SV); p. N/A**

5 **CEC Rd 1 CAC-0048b**

6 **PREAMBLE:**

7 Moose rely on beaver for the creation of high quality habitat. According to technical
 8 science reports and KCN environmental assessments, a combination of shoreline
 9 changes, the seasonal reversal of water flow from system operations, flooding, changes
 10 in winter water levels and unpredictable ice conditions will all contribute to the direct
 11 mortality of beaver and/or impede individual home range reestablishment in the Local
 12 Study Area.

13 **QUESTION:**

14 It is expected that between 20 to 30 active beaver colonies will be removed during
 15 clearing in Zone 1. While this is less than 10% of the estimated population in the
 16 Regional Study Area, what percentage does it constitute of the estimated population in
 17 the Local Study Area (Terrestrial Zones 1-4)? In terms of impact on the Local Study Area,
 18 would the effect of removing this many beaver colonies still be considered "small". If
 19 not, what would the predicted magnitude be?

20 **RESPONSE:**

21 Aerial surveys for beaver were conducted in the Local and Regional Study Areas in 2001
 22 and 2003, and a comprehensive survey of Study Zone 1 (the Project Footprint) was
 23 conducted in 2011. Because the Local Study Area (Study Zone 3) was not surveyed in its
 24 entirety in 2011, the percentage of beaver colonies to be removed in the Local Study
 25 Area cannot be calculated. Based on the number of active lodges observed in the Local
 26 Study Area in 2001 (n = 39; TE SV Table 7B-66) and in Study Zone 1 in 2011 (n = 23; Table
 27 7B-67) approximately 59% of the active lodges in the Local Study Area will be removed.
 28 If inactive lodges are used as an indicator of potential beaver habitat, 18 to 36% of
 29 colonies could be removed in the Local Study Area (Tables 7B-64 and 7B-68).

30 Effects on beaver are measured at the regional scale to consider the population and not
 31 by individuals at the local scale (TE SV Section 1.3.5); as such, the conclusion reached
 32 that effects on the beaver population will be small is unchanged. Please refer to CEC Rd
 33 1 CAC-0048a for additional detail concerning the effects conclusions.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: EIS Exec**
 2 **Sum; YFFN Environmental Evaluation Report; FLCN**
 3 **Environmental Evaluation Report; CNP Keeyask Environmental**
 4 **Evaluation Report; Appendix 9A (PE SV); 6.3.8.2 Sedimentation (R**
 5 **to EIS); p. 24 (Exec Sum); 22, 43, 63-94 (YFFN); 4-7, 46-47, 76, 82-**
 6 **84 (FLCN); 9A-7 (PE SV); 6-215 (R to EIS)**

7 **CEC Rd 1 CAC-0049**

8 **PREAMBLE:**

9 While the cycling of sediments and nutrients is essential to a healthy aquatic ecosystem,
 10 too much sediment and nutrient entering a waterway can have negative impacts on
 11 water quality and aquatic life. For the KCNs, the importance of water and water quality
 12 to local people is readily apparent.

13 When the Executive Summary states that “water quality will always be suitable for
 14 aquatic life in the main part of the reservoir”, this appears to contradict the KCN
 15 environmental evaluation reports that stress: (i) the impact that previous dam
 16 construction and reservoir impoundment have had on the declining quality and health
 17 of aquatic life in affected water bodies, with declines in water quality seen as a key
 18 cumulative impact/effect of hydro development in the region; and, (ii) how the release
 19 of peat and other sediment, along with increased mercury levels, is expected to
 20 negatively impact water quality in the study area, especially in places such as Gull Lake
 21 and Stephens Lake where fish habitat is predicted to be negatively impacted to the
 22 point of no longer being viable.

23 **QUESTION:**

24 In light of the observations and views of the KCNs, and an acknowledgement of
 25 uncertainty as to the magnitude of subsequent changes in sediments, nutrients, and
 26 metals, and decreases in dissolved oxygen, please provide information to support the
 27 validity of this statement on water quality and in doing so respond to the discrepancies
 28 apparent upon comparing the EIS technical science findings with the KCN environmental
 29 evaluation reports. What, for example, constitutes the “main part” of the reservoir and
 30 is water quality indeed expected to decline in Gull Lake and Stephens Lake to the point
 31 whereby aquatic life is negatively impacted? Not all organic sediment will be suspended
 32 in water bodies. Much will be deposited on the bottom of the river channel. For areas
 33 that will become depositional environments, please explain fully any negative effects
 34 associated with such deposits, and particularly for the area between Gull Lake and the
 35 Keeyask GS.

36 Lastly, if monitoring shows that water quality in the main part of the reservoir is not
 37 suitable for some or all aquatic life, what adaptive measures are being considered in
 38 response to such an eventuality?

39 **RESPONSE:**

40 As stated by the reviewer, water quality during the operation phase will be suitable for
 41 aquatic life in the main part of the reservoir; however, the summary also states that
 42 water quality will be affected at other times and locations, as follows:

43 “The Project’s main effect to water quality during construction will be the input
 44 of suspended solids due to construction in the river. Increases in suspended
 45 solids will generally be small and only be detectable in Stephens Lake. For a few
 46 months during two years of construction, work in the river will release enough
 47 sediment to cause increases to extend downstream past the Kettle Generating
 48 Station. However, the increase in the concentration of total suspended solids is
 49 not expected to be large enough to harm plants and animals living in the river.

50 During initial years of Project operation, effects to water quality will occur in the
 51 newly flooded areas but will diminish over 10 to 15 years. In the main part of
 52 the reservoir and part of Stephens Lake, total suspended solids concentrations
 53 will decline due to setting of sediments in the reservoir. Overall, water quality
 54 will always be suitable for aquatic life in the main part of the reservoir, and will
 55 be suitable at most locations and most times of the year in the flooded areas.”

56 The Aquatic Environment Supporting Volume (AE SV) provides predictions regarding
 57 effects of the Project during construction and operation on water quality parameters,
 58 including nutrients, dissolved oxygen, suspended solids, metals, and numerous other
 59 parameters. The AE SV describes these effects in terms of magnitude, duration, and
 60 spatial extent and includes consideration of effects in Gull Lake (i.e., future reservoir)
 61 and Stephens Lake in conjunction with existing water quality conditions and provincial
 62 and national water quality objectives and guidelines for the protection of aquatic life.
 63 The AE SV utilized modeling, scientific literature, and proxy information as the
 64 foundation of the predictions.

65 It is acknowledged that the KCNs environmental evaluation reports present a different
 66 view than described in the scientific assessment. See response to CEC Rd 1 CAC-0057.

67 With respect to the question regarding the “main part” of the reservoir, the main part of
 68 the reservoir refers to areas of high mixing/flow and short residence times. This area is
 69 identified as Zones 1 to 3 in the Physical Environment Supporting Volume, Map 7.2-3.

70 With respect to the deposition of organic material, the majority of organic material will
 71 be deposited in flooded areas near where the disintegrated peat originates (PE SV, Sec.

72 7) and not in existing aquatic habitat. This was addressed in TAC Public Rd 2 DFO-0072
73 which is reproduced below.

74 Mitigative measures that have been incorporated into the Project design and proposed
75 measures to address effects of the Project on water quality are identified in the EIS and
76 the Environmental Protection Program. Water quality will be monitored during
77 construction and operation, and results will be compared to EIS predictions and to
78 Manitoba Water Quality Standards, Objectives, and Guidelines and to the Canadian
79 Council for Ministers of the Environment guidelines for the protection of aquatic life.
80 The aquatic effects monitoring program will also include monitoring of the biological
81 communities in the reservoir directly; this monitoring would identify the net effects of
82 all Project-related impacts on aquatic biota, including effects related to water quality
83 changes.

84 The adaptive measures that could be applied in the event of unanticipated effects to
85 water quality will depend on the nature, magnitude and location of the effect, and the
86 consequence for other components of the aquatic environment.

87 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 88 **Section: 7.4.2.3 Peat Sedimentation - Upstream of Projects; p. 7-35**
 89 **Volume: Aquatic Environment Supporting Volume; Section: 3.4.2.2**
 90 **Outlet of Clark Lake to the Keeyask Generating Station; p. N/A**
 91 **TAC Public Rd 2 DFO-0072**

92 **ORIGINAL PREAMBLE AND QUESTION:**

93 Peatland Erosion.

94 Visual distribution (maps) of peatland deposition not presented in the EIS. How will peat
 95 deposition impact on known/suspected areas of fish habitat in the future forebay?

96 **FOLLOW-UP QUESTION:**

97 Would the proponent please provide a GIS or similar analysis of peatland deposition in
 98 fish habitat in the future forebay? Would the proponent please provide an analysis,
 99 including a table of areas, of impact, given a biologically significant risk threshold, of
 100 impact area?

101 **RESPONSE:**

102 Deposition of fine organic material is not expected to impact existing aquatic habitat
 103 because, as discussed in TAC Round 1 DFO-0072, the majority of peat released from
 104 flooded terrestrial areas will settle in the bay of origin (i.e., over flooded terrestrial
 105 habitat). The substrate in the flooded terrestrial area will initially consist largely of
 106 organic matter; however, in the long term silt is expected to deposit over the peat (see
 107 TAC Round 1 DFO-0072). Organic material is expected to be present in the long term in
 108 certain areas of flooded terrestrial habitat, as discussed below.

109 Sites for the deposition of fine organic material are shown in AE SV Map 3 – 34. The
 110 model used to predict deposition of this fine organic material is provided in AE SV Map
 111 3B - 4. Deposits of fine organic material are only expected to occur in the long term
 112 (more than 30 years) in flooded areas at the terminal ends of small and flooded
 113 peatland bays. This is consistent with observed conditions in Stephens Lake, where 30
 114 years or more after impoundment, there is no evidence of fine organic deposition in
 115 areas of the reservoir other than at the terminal ends of small tributaries.

116 The formation of organic deposits has been described in the AESV for Year 30 (i.e., 30
 117 years post-impoundment) on page 3-35, Year 1 on page 3 – 37, Year 5 on page 3-38, and
 118 Year 15 on page 3-39. (The relevant sections of the AE SV are provided below for
 119 convenience.) TAC Public Rd 2 DFO-0014 provides maps and areas of pre- and post-
 120 Project substrate type.

121 AE SV (Pages 3-34 to 3-39)

122 Section 3.4.2.2.3 Aquatic Habitat at Year 30

123 At Year 30, reservoir expansion will have increased the reservoir area to about 99.8 km²,
 124 an increase of 7–8 km² due to mineral bank erosion and shore peat breakdown (PE SV,
 125 Section 6.4.2.1, see Map 6.4-6 and Map 6.4-7). Shoreline erosion, peatland resurfacing
 126 and transport, and sedimentation processes will remain active in some areas, but are at
 127 rates that are much slower than in the first 15 years of the reservoirs history (PE SV,
 128 Section 6.4.2.1). The physical environment modelling studies and the aquatic
 129 environment observations on Stephens Lake collectively suggest that the exposed
 130 nearshore areas of a reservoir in the study area at Year 30 will be mostly mineral,
 131 whereas sheltered bays retain more of their pre-flood peatland characteristics. Less
 132 wave energy is available in flooded bays, and when compared to the main basin of the
 133 reservoir, the slope of bays is minimal and the peat deposits tend to be larger and
 134 deeper. The inherent character of peatland bays infers that they are less able to shift to
 135 a mineral nearshore area over time. For the Keeyask reservoir, the physical environment
 136 studies estimate that mineral-based shorelines are expected to increase from 28% to
 137 69% of the total shoreline length over 30 years. This transition from mainly peat-based
 138 substrates, which do not support rooted plants, to nearshore slopes that develop from
 139 mineral soils due to erosion and resurfacing of peat is important as it helps develop
 140 potential macrophyte habitat over time. Water velocities and water depths at Year 30
 141 will essentially be the same as following the initial FSL, with the exception of changes in
 142 very shallow water due to shoreline recession, peatland resurfacing, and development
 143 of nearshore slopes that will slightly increase the amount of lentic habitat around the
 144 perimeter of the reservoir.

145 The results of substrate modelling for the Keeyask reservoir at Year 30 are provided in
 146 Appendix 3B. The pattern of substrate deposition in the reservoir is similar when 95th
 147 and 5th percentile inflow scenarios are compared, although some differences are
 148 apparent. The 95th percentile inflow model results suggest that the silt sediment
 149 boundary would occur up to about 1 km farther downstream in Reach 6, at the entrance
 150 to present day Gull Lake, when compared to the 5th percentile inflows. A few small areas
 151 that are depositional under 95th percentile inflows will not be under 5th percentile flows.
 152 These non-depositional sites under low flows tend to be shallow where flows would be
 153 constrained, such as near the boundary of reaches 6 and 7 at narrows found between
 154 islands, and in shallow areas within present day Gull Rapids.

155 Soil erosion studies indicate the river banks will erode (PE SV, Section 6.3.1.2.2),
 156 including the riverine reaches 4 and 5 below Birthday Rapids. The altered state of the
 157 banks is expected to be sandy/clay given the deposits are mainly glacial till, with local
 158 occurrences of **glaciofluvial** or glaciolacustrine sediments. Nearshore sedimentation

159 studies suggest however that the mineral sediments eroded from these banks will not
 160 be transported downriver, so deposition of gravel and sand at the entrance to Gull Lake
 161 is not expected (PE SV, Section 7). The PE studies of the existing environment
 162 demonstrated limited bed load movement from upstream (PE SV 7.3.1.2); this is
 163 expected to continue in the future with the Project;

164 The combined results of the terrestrial soil studies (TE SV, Section 2.3.4.2), peatland and
 165 mineral erosion studies (PE SV, Section 5 and Section 6), sedimentation studies (PE SV,
 166 Section 7) and the reservoir habitat models (Map 3-34 and Appendices 3B and 3C)
 167 suggest:

- 168 • The bottom of the thalweg in the riverine section (reaches 2B–5) of the reservoir is
 169 expected to remain free of silt. The thalweg of reaches 2B–5 expected to maintain a
 170 bed composition similar to that of the existing environment;
- 171 • Most of the lower reservoir (reaches 6–9A) will become depositional with silt
 172 sediments, except for some of the main thalweg areas where velocity, depth,
 173 exposure, and slope are sufficient to keep the substrate silt-free with a substrate
 174 composition similar to today;
- 175 • Shallow water substrate type depends strongly on the pre-flood soils (Appendix 3C).
 176 In open areas of the reservoir, clay substrata forms from pre-flood mineral soils or
 177 from thin peat veneers overlying mineral deposits, often in glaciolacustrine
 178 deposits. The substrate in other shallow habitat is inundated fibrous or humic peat
 179 where pre-flood peatlands are large and relatively deep;
- 180 • Deposits of fine organic material will accumulate in lentic habitat at the ends of bays
 181 fed by local peatland streams in reaches 5–7(Appendix 3C); and
- 182 • Potential macrophyte habitat may develop in many nearshore areas of the
 183 reservoir. Areas of thin peat, which is a common soil type within the bounds of the
 184 future reservoir (PE SV 5.3.3.2), will resurface or erode and expose mineral-based
 185 soils (Appendix 3C). Once relatively stable, nearshore processes (*i.e.*, waves and
 186 water level variation) will wash the clay and aggregate lag and keep some or the
 187 entire photic zone on the nearshore slope silt free. Potential macrophyte habitat
 188 may even develop at the ends of sheltered bays where peat accumulation was
 189 relatively thick, after peat has floated away and local water masses prevent silt from
 190 the main reservoir to deposit (Appendix 3C).

191 The availability of potential and suitable macrophyte habitat in the proposed reservoir
 192 (reaches 2B–9A) varies by mode of operation. Under a base loaded mode of operation
 193 scenario, when the Keeyask GS operates at 159 m ASL continuously, the amount of
 194 habitat that is suitable is equal to the potential (*i.e.*, all potential habitat is permanently
 195 wetted). Conversely, under a peaking mode of operation, the area of suitable habitat is

196 expected to be less than the potential due to dewatering from daily and weekly draw
197 down.

198 For the Base loaded mode of operation at the 95th percentile and 159 m ASL reservoir
199 stage, the area of potential macrophyte habitat in the reservoir is estimated to be
200 1,878.1 ha (Map 3-35), or 1.6 times more than the 1,197 ha of potential macrophyte
201 habitat present in reaches 2A–9A in the existing environment. For the peaking mode of
202 operation, the area of suitable macrophyte habitat (i.e., assuming half of the post-
203 Project IEZ is suitable), is 1,396 ha or about 26% less than the Base loaded mode of
204 operation. The suitable macrophyte habitat of the peaking mode of operation is about
205 1.2 times more than exists in the same area under present day conditions.

206 The actual area occupied by plants in the reservoir may range widely in space and time,
207 given that Keeyask environmental studies have shown the area of potential habitat
208 actually occupied varied from a low of 11.5% at Stephens Lake (regulated reservoir) to a
209 maximum of 31% in the unregulated river/lake environment of the Keeyask area (Table
210 3-4). At present, it remains uncertain if the range of habitat occupied by macrophytes
211 arises from intrinsic differences between habitats in a reservoir and large river, or if the
212 area occupied by macrophytes is attributable to incomplete colonization of the potential
213 habitat available in Stephens Lake. In addition, the Stephens Lake reservoir experienced
214 high water conditions during the Keeyask environmental studies, which may suggest
215 plants could have been depth (*i.e.*, light) limited and so had lower areas of occupation.
216 Consequently, as a highly conservative approach, it was assumed that 10% of the
217 potential habitat at Year 30 would be occupied by rooted macrophytes. Estimates
218 suggest that the area occupied by rooted macrophytes at Year 30 is 187.8 ha under Base
219 loaded mode of operation or 139.6 ha for peaking. When compared to the average area
220 occupied in reaches 2B–9A (*i.e.*, 208 ha) in the existing environment, this equates to a
221 loss of 10.7% under a Base loaded scenario or 48.9% under peaking.

222 **Evolution of the Reservoir - Year 1 to Year 15**

223 The physical processes responsible for the development and maintenance of aquatic
224 habitat in the Keeyask area after the Project are expected to slow to levels at or near
225 those expected without the Project before or by Year 15 (PE SV, Section 6.4.2, Section
226 6.4.4, and Section 7.4.2). These studies suggest: 1) that rates of shoreline erosion are
227 expected to stabilize at rates similar to those of the existing environment by about Year
228 15; 2) like the rate of shoreline erosion, the rates of mineral deposition will be greatest
229 at Year 1 and generally decrease thereafter; and 3) the peatland disintegration models
230 suggest that most of the flooded peatland dynamics, which are unique to the post-
231 Project, have occurred by Year 15.

232 When compared to the Peaking Mode of operation, the Base loaded scenario generates
 233 a slightly higher rate of mineral erosion, and rate of mineral deposition (PE SV, Section
 234 6.4.2.1 and Section 7.4.2.1). The mode of operation is not expected to change the
 235 amount of peat resurfacing or rate of disintegration, or movement of floating peat (PE
 236 SV, Section 6.4.2.1).

237 The results of total suspended solids, dissolved oxygen, and organic sediment models by
 238 the physical environment studies are described in Section 2 of this volume and in the PE
 239 SV, Section 7 and Section 9. A detailed examination of the differences between Base
 240 loaded and Peaking operations is provided in the PE SV, Section 4.4.2.2.

241 **Development of Reservoir Habitat**

242 The Keeyask environmental studies suggest that the reservoir habitat may begin to
 243 approach a more stable state by Year 15 given that the physical processes that force the
 244 composition and distribution of habitat (including water depth and velocity regimes
 245 established at initial FSL) have slowed appreciably. Accordingly, the main habitat
 246 patterns that are well established at Year 30 are expected to be evident by Year 15.
 247 Although erosion, transport, and deposition are expected to continue in the reservoir
 248 after Year 15, the rates of change within the habitats established are expected to be
 249 relatively low and/or episodic over smaller areas. In all but the highly exposed areas
 250 such small increments of change are not expected to alter the type of reservoir habitat
 251 developed by Year 15 but more heterogeneity would be evident (*i.e.*, arising from
 252 remnants of flooded terrestrial and shore erosion) than in Year 30. Further, the ability of
 253 the reservoir to form habitat boundaries (*i.e.*, those that define the edges of habitat
 254 types like rock, sand, or silt) is in part dependent on the available hydraulic energy. As
 255 such, substrate habitat boundaries that form in Deep Water due to the pattern of
 256 lentic/lotic habitat are more likely to be evident earlier in the reservoir than shallow
 257 habitat, which, due to erosion, is relatively unstable for longer periods of time. Deep
 258 Water habitat boundaries, such as the superimposition of silt on the existing riverbed,
 259 could probably be observed by Year 5. In Shallow and Lentic habitat, the habitat
 260 boundaries that form in back bays would be at a slower rate than those that form in the
 261 main body of the reservoir where wave energy is higher, but could stabilize earlier than
 262 highly exposed sites.

263 *Year 1*

264 As described in detail in the PE SV, the physical changes from the state at initial FSL are
 265 mainly: 1) the ongoing peat resurfacing and transport, 2) mineral and peat erosion, 3)
 266 mineral sediment deposition in shallow water and silt sediment begins to deposit in
 267 many areas of the lower reservoir.

268 One year after flooding the reservoir substrate is expected to be heterogeneous and
 269 composed of flooded terrestrial habitat, flooded aquatic habitat, and early signs of
 270 newly formed substrate that will eventually be predominant at Year 30. The area of
 271 flooded terrestrial habitat (*i.e.*, where substrate is still the same as at initial FSL) is
 272 expected to decrease relative to initial FSL; many areas of the lower reservoir will be
 273 heterogeneous and composed of pre-flood and post-flood materials. The distribution of
 274 post-flood materials is expected to be discontinuous and under-developed due to the
 275 limited time the reservoir has had to segregate water masses, move materials that have
 276 been mobilized since flooding, and the available bottom types. Floating peat islands will
 277 be readily apparent and mobile on the surface of the reservoir (PE SV, Appendix 6D).
 278 Differences in the rate of peatland and mineral shore erosion around the perimeter of
 279 the reservoir (PE SV, Section 6.4.2.1) suggest differences in the rate of reservoir habitat
 280 evolution may be apparent. The shallow flooded terrestrial areas in the south Shallow
 281 Water area of Reach 6 are expected to have the highest rates of shore erosion and
 282 deposition at Year 1 (PE SV, Section 7.4.2.1).

283 The post-Project distribution of aquatic habitat types within each water elevation zone
 284 (MOL=158 m ASL, FSL=159 m ASL, and the IEZ) that are expected to develop by Year 1
 285 are shown in Appendix 3D (Table 3D-1). These predicted habitat distributions were used
 286 in the lower trophic level and fish community assessments (Section 4 to Section 6).

287 Local tributaries that enter at the ends of bays will have pooled tea-colour peatland
 288 water at the end of the bays; the visible contrast to that of the turbid water of the main
 289 reservoir will remain a long-term characteristic of the reservoir (Appendix 3B). The
 290 location where the peatland water mass meets the more turbid water of the reservoir
 291 will influence the long-term position of organic and silt habitat boundaries evident at
 292 Year 30 (Appendix 3B). The flooded terrestrial bays will have markedly different water
 293 quality characteristics and are expected to show large seasonal changes in oxygen
 294 (Section 2).

295 *Year 5*

296 At Year 5, the area of substrate comprised of post-flood materials is expected to
 297 increase while the area of flooded terrestrial habitat will decrease. Sedimentation
 298 analyses indicate erosion and sedimentation processes in the reservoir remain active at
 299 five years post-flooding (PE SV, Section 6.4.2.1 and Section 7.4.2.1). Sedimentation
 300 analysis indicates rates of sediment deposition of 0–1 cm/year in offshore areas (PE SV,
 301 Section 7.4.4). Mineral sediment, primarily in the form of silt, is expected to cover much
 302 of the flooded aquatic habitat and flooded terrestrial habitat, except where water
 303 velocity, surface wave energy, or slope of the substrate is sufficient to prevent
 304 deposition (Appendix 3B).

305 Erosion of thin peatlands in exposed areas of shallow water of the lower reservoir is
 306 expected to expose the underlying mineral soils (PE SV, Section 6.4.2.1). Aquatic studies
 307 of Stephens Lake also show that, over time, a clay-based substrate will form from pre-
 308 flood topography that is mineral or thin peat from which potential macrophyte habitat
 309 will begin to develop (Appendix 3B). Occupation of the potential plant habitat by rooted
 310 macrophytes could occur but would probably be infrequent and, in general, not a widely
 311 visible aspect of the reservoir. According to the results of erosion and sedimentation
 312 studies (PE SV, Section 6.4.2.1), the habitat adjacent to the southern shoreline area of
 313 Reach 7 and in Reach 9 would likely be the most unstable Shallow habitat in the
 314 reservoir.

315 Ends of back bays fed by peatland streams will lack silt sediment originating from the
 316 turbid waters of the main reservoir (Appendix 3B) and will resemble flooded terrestrial
 317 habitat. Peat resurfacing and transport away from the bays appears to be slower when
 318 compared to the main body of the reservoir (Larter 2010). At Year 5 peat is likely to be a
 319 readily visible characteristic of back bays in the reservoir; floating and mobile peat is
 320 estimated to be greatest at Year 5 (PE SV, Appendix 6D). The greatest accumulation of
 321 floating peat is expected in the southern bays of the lower reservoir (PE SV, Section
 322 7.4.4). Some of this mobile peat could anchor on shores and superimpose existing
 323 reservoir habitat. This would constitute a small and short-term loss of habitat that is not
 324 expected to influence biota.

325 The boundaries of post-flood substrate materials in deep water, (*i.e.*, substrates of silt
 326 and other harder bottom types) could be evident by Year 5 in lentic habitat given that silt
 327 sedimentation is the dominant open-water process but, as described in later time steps,
 328 is discontinuous in the Lotic areas of the lower reservoir.

329 The post-Project distribution of aquatic habitat types within each water elevation zone
 330 (MOL=158 m ASL, FSL=159 m ASL, and the IEZ) that are expected to develop by Year 5
 331 are shown in Appendix 3D (Table 3D-1). These predicted habitat distributions were used
 332 in the lower trophic level and fish community assessments (Section 4 to Section 6).

333 *Year 15*

334 The main habitat patterns that are evident and well established at Year 30 (described in
 335 previous section) are expected to be present at Year 15. When compared to the
 336 reservoir habitat at Years 1 and 5, relatively stable shallow water habitats will have
 337 developed given that peatland disintegration, mineral erosion and mineral
 338 sedimentation processes are expected to have slowed markedly (PE SV, Section 6.4.2.1
 339 and Section 7.4.2.1). It is anticipated that the areas of post-flood substrate materials at
 340 Year 15 would be somewhat less than at Year 30 as some heterogeneity would persist
 341 given that some remnant flooded terrestrial habitat would remain but the segregation
 342 of distinct reservoir habitats (Appendix 3B) would be recognizable.

343 Some of the potential macrophyte habitat available at Year 30 would be present at Year
344 15 but heterogeneity would be expected due to remnants of flooded terrestrial habitat
345 and occasional changes in quality of some of that habitat due to ongoing erosion. A
346 predominantly clay-based substrate with some aggregate lag will begin to be widely
347 available in the lower reservoir in Shallow Water within the zone of wave action
348 (Appendix 3B); this is expected to form the primary habitat for the rooted macrophyte
349 *Potamogeton richardsonii*. Some of the potential macrophyte habitat found at the ends
350 of back bays also will have developed. By Year 15, much of the fibrous surface layers of
351 the resurfaced peat will have resurfaced and transported away (PE SV, Section 7) which
352 creates and enables fine organic deposition to form (Appendix 3B). The ends of
353 sheltered bays with fine organic deposition are expected to form some of the habitat for
354 the rooted macrophyte *Myriophyllum sibiricum*.

355 The Deep Water habitat patterns of silt deposition are expected to be quite similar to
356 modelled estimates of Year 30 (described in previous section). Unlike the development
357 of Shallow Habitat, which in most areas of the reservoir responds mainly to the
358 intermittent effects wave action and water level cycling, the Deep Water habitat will
359 arise from water depth and velocity regimes that will have acted continuously since
360 initial FSL. Silt deposits, which will sediment at rates from 0–1 cm/year (PE SV 7.4.2.1)
361 will form a continuous surface where deposition is expected at Year 30 (described in
362 previous section), but at Year 15 the deposits will be thinner (PE SV 7.4.2.1). In reaches
363 2A–5 the velocity of the thalweg will be sufficient to maintain the bottom type observed
364 in the studies of the existing environment. A substrate material size gradient is not
365 expected where riverine flows leave Reach 5 and enter Reach 6 upstream of the zone of
366 deep water silt deposition based on sediment transport analysis that suggest negligible
367 amounts of sand and gravel material will be transported from the flooded banks
368 upstream in the flooded riverine reaches (PE SV, Section 7). This is unlike the material
369 size gradient that appears to have formed 4–5 km below Gull Rapids after Kettle GS was
370 built (see Map 3-14). The area of the confluence of reaches 5 and 6 will be monitored
371 after the Project to determine if sand and gravel transport and deposit in this area.

372 The post-Project distribution of aquatic habitat types within each water elevation zone
373 (MOL=158 m ASL, FSL=159 m ASL, and the IEZ) that are expected to develop by Year 15
374 are shown in Appendix 3D (Table 3D-1). These predicted habitat distributions were used
375 in the lower trophic level and fish community assessments (Section 4 to Section 6).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.7.2**
2 **Shoreline Erosion Processes, 6.3.8 Sedimentation (R to EIS);**
3 **Executive Summary; p. 23 (Exec Sum)**

4 **CEC Rd 1 CAC-0050**

5 **PREAMBLE:**

6 While the EIS predicts that the magnitude of residual operation effects “associated with
7 shoreline erosion processes” are expected to be large, subsequent discussions shift the
8 emphasis to the observation that sediment loads will decrease rapidly over time,
9 including the observation that “the overall amount of organic suspended sediment in
10 the reservoir will be very low after the first few years of operation and will continue to
11 be very low”. However, given that sediment loads will fall only after a year one increase
12 in annual organic sediment that is 1300 times greater than the current annual figure,
13 while 30 years after inundation (Year 30 being “considered a reasonable model for the
14 long-term condition of the reservoir”) they will still be 18 times that of current annual
15 levels, the above-quoted statement about decreasing sediment loads and future levels
16 appears inaccurate.

17 **QUESTION:**

18 Please provide more compelling evidence to validate the statement and prove its
19 accuracy.

20 **RESPONSE:**

21 The intervener correctly notes that, relative to the existing loading of organic (peat)
22 material of about 1,000 t/y (tonnes/year), the total amount of peat entering the
23 waterway is about 1,300 times greater in year 1 (1,300,000 t) and 18 times greater in
24 the years 16-30 time period (average approximately 18,000 t/y). Relative to Year 1, the
25 average annual loadings are lower by approximately 75%, 95% and almost 99% in years
26 2-5, 6-15, and 16-30 respectively (Table 1). It is these decreases that are noted as being
27 a quick decline in organic loading relative to year 1.

Table 1: Loading of organic sediment into the aquatic system (from Physical Environment Supporting Volume (PE SV), Table 6.4-3)

Model Period	Duration (y)	Total Organic Load in Period (t)	Average Annual Load (t/y)	Ratio to Year 1 (%)
Year 1	1	1,304,300	1,304,300	100 %
Year 2-5	4	818,970	204,700	16 %
Year 6-15	10	581,100	58,100	4.5 %
Year 16-30	15	282,500	18,800	1.4%

28 Organic suspended sediment is discussed in the PE SV (Sections 7.2.1.3, 7.2.5.2, and
 29 7.4.2.3.2). Of the total peat loading indicated in the above table, not all of it is present in
 30 the water as suspended organic sediment in the water at any time. For example, a large
 31 floating peat mat is part of the total loading, but is not suspended organic sediment.
 32 Also, the loadings in the above table are totals for a year, but the organic sediment
 33 actually enters over a period of time, and some of it settles out before additional
 34 suspended organic material enters the water. This is considered in the estimated peak
 35 organic suspended sediment concentrations shown in the PE SV (Table 7.4-5). In the
 36 most affected bay of the reservoir, the peak concentration is about 21 mg/L in year 1,
 37 but that declines to about 1 mg/L by years 5, while most other areas are estimated to
 38 have less than 1 mg/L by year 5. The concentrations decrease even more in subsequent
 39 years, with all areas having peak concentrations of organic suspended sediment of
 40 about 1 mg/L or less. These are peak estimated concentrations, the average is lower. The
 41 peak concentrations decrease substantially over the first few years of operation relative
 42 to year 1, as total loading declines.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: PE SV;**
 2 **AQ SV; YFFN Environmental Evaluation Report; FLCN**
 3 **Environmental Evaluation Report; R to EIS 6.2.3.2.1 Physical**
 4 **Environment; p. N/A**

5 **CEC Rd 1 CAC-0051a**

6 **QUESTION:**

7 Given the complex interactions that link shoreline erosion processes, organic and
 8 mineral sedimentation, debris, surface water temperature and dissolved oxygen, water
 9 quality and their individual and cumulative impact on human health and aquatic life,
 10 please provide the rationale for an environmental assessment that tackles each of these
 11 as separate components.

12 **RESPONSE**

13 The question refers to the complex interactions with respect to physical environment
 14 changes, such as shoreline erosion process, etc., and the effects (pathways) to other
 15 environmental components and asks for a rationale for addressing each of the physical
 16 environment components separately, e.g., erosion, debris, surface water temperature
 17 and DO.

18 The simple answer is that these physical environment components were not addressed
 19 separately. In fact, the assessment of changes to the physical environment resulting
 20 from the Project were addressed in a highly integrated manner, as stated in Section 1.4
 21 of the Physical Environment Supporting Volume (PE SV):

22 “The physical environment studies were integrated during the assessment using a
 23 variety of methods. Meetings were held between various study team specialists to share
 24 information that was used by other team members (e.g., water regime with
 25 sedimentation or shoreline erosion). There were also large-scale workshops including all
 26 members of the physical environment team as well as members from the aquatic
 27 environment, socio-economic and terrestrial environment teams to present methods,
 28 results and obtain feedback on the information needs. There were many meetings
 29 interacting with the KCNs representatives and their consultants presenting data
 30 collection methods, methods of analysis and initial results to ensure that the local
 31 environment was fully understood and that important effects were considered.”

32 The need for integration was recognized at the outset of the physical environment
 33 studies. It was also recognized at the outset that changes to the physical environment
 34 constitute pathways to other environmental components such as aquatic, terrestrial,
 35 and socio-economic environments, and associated VECs.

36 The technical analysis determined effects of the Project on the physical environment by
37 considering the linkages among the physical environment components and changes
38 caused by the Project, both directly (e.g., presence of the dam) and indirectly through
39 changes to the physical environment (e.g., alterations in water levels and flows, inputs
40 of sediment following flooding). The changes in the physical environment comprise
41 pathways to effects on other aspects of the environment such as aquatic, terrestrial and
42 socio-economic components. The pathways are discussed and illustrated in Section
43 6.2.3.2 (see also response to CEC Rd 1 CAC-0011).

44 The assessment of the physical environment provides the foundation for assessment of
45 the resulting effects on the aquatic, terrestrial, and, subsequently, the socio-economic
46 environments. The PE SV provides more detailed descriptions of the changes in the
47 various components of the physical environment and the other environmental studies
48 identify corresponding pathways of effect to selected VECs.

49 In summary, the changes to the physical environment resulting from the Project were
50 assessed in a highly integrated manner with extensive communication between physical
51 environment discipline leads and the other environmental specialists involved in the
52 assessment of the aquatic, terrestrial and socio-economic components. The response to
53 CEC Rd 1 CAC-0051c describes the extent of communication and collaboration between
54 specialists.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: PE SV;**
2 **AQ SV; YFFN Environmental Evaluation Report; FLCN**
3 **Environmental Evaluation Report; R to EIS 6.2.3.2.1 Physical**
4 **Environment; p. N/A**

5 **CEC Rd 1 CAC-0051**

6 **QUESTION:**

7 Explain how the ecosystem approach to environmental assessment adopted for this
8 project accounts for and reflects (in practice) said interactions and interrelationships?

9 **RESPONSE:**

10 The ecosystem-based approach considers interactions and interrelationships among
11 ecosystem components as well as pathways of effect (linkages) between the Project and
12 the environment.

13 The ecosystem-based approach is described in the Aquatic Environment Supporting
14 Volume (AE SV) Section 1.2 and the Terrestrial Environment Supporting Volume (TE SV)
15 Section 1.1. Interrelationships within the aquatic ecosystem are summarized in AE SV
16 Section 1.2.1 and illustrated in Figure 1-1A (p. 1-26). A summary of linkages between the
17 Project and the aquatic ecosystem is provided in AE SV Section 1.4 and illustrated in
18 Figure 1-1B (p. 27). Pathways of effect considered in the impact assessment are
19 summarized in AE SV Figure 1-2 (p. 1-28). Similarly for the terrestrial environment,
20 interrelationships within the terrestrial ecosystem are discussed in TE SV Section 1.2 and
21 an example of habitat relationships is provided in TE SV Figure 1-2 (p. 1-4). The
22 identification of linkages to the Project is discussed in TE SV Section 1.3.3 and an
23 example of a linkage diagram for terrestrial vegetation changes caused by clearing is
24 provided in TE SV Figure 1-4 (p. 1-11).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: PE SV;**
2 **AQ SV; YFFN Environmental Evaluation Report; FLCN**
3 **Environmental Evaluation Report; R to EIS 6.2.3.2.1 Physical**
4 **Environment; p. N/A**

5 **CEC Rd 1 CAC-0051c**

6 **QUESTION:**

7 Please include information about the extent of communication and collaboration
8 between the different teams of specialists who prepared the reports for each of these
9 areas.

10 **RESPONSE:**

11 A Keeyask Physical Environment Coordination Team, comprising of staff from Manitoba
12 Hydro (on behalf of the KHLF) and Stantec Consulting Ltd., was established for the
13 purpose of coordinating the work of the physical environment specialists and to assure
14 that the range of information needs were being addressed. The team met regularly
15 during the development of the EIS. The Keeyask Physical Environment Coordination
16 Team and the various specialists were provided with all the technical memoranda
17 developed by the specialists for the physical environment studies, as listed in the
18 Response to EIS Guidelines (Appendix 6A).

19 The physical environment studies were not only integrated with each other but also the
20 other study areas during the assessment using a variety of methods. For example, the
21 the mineral shoreline erosion study, peatland disintegration study, sedimentation study
22 and aquatic habitat study were so highly integrated that the leads for all of these studies
23 met together on a regular basis with the Keeyask Physical Environment Coordination
24 Team. The leads for each study regularly outlined their methods and shared results with
25 each other to ensure that full integration of the studies was achieved.

26 As another example, there was a collaborative process involving the physical, aquatic,
27 and terrestrial teams to select the modeling zones for water regime and shoreline
28 erosion processes. As the studies progressed, meetings were held between various
29 study team specialists to share information that would be used by other team members
30 (e.g., water regime specialists with sedimentation and shoreline erosion specialists).
31 There were also large-scale workshops including all members of the physical
32 environment team as well as members from the aquatic environment, socio-economic
33 and terrestrial environment teams to present methods, initial results and obtain
34 feedback on remaining information needs. There were numerous meetings interacting
35 with the KCNs representatives and their consultants regarding data collection methods,

36 methods of analysis and initial results to ensure that the local environment was fully
37 understood and that important effects were considered.

38 All these activities resulted in a highly collaborative, interdisciplinary approach to the
39 assessment of effects to the physical environment.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.4.2.1.5 Peat Resurfacing and Floating Peat Mat Mobility,**
 3 **7.1.1.2 Peat Sedimentation, 10.4.2.1 Debris due to Reservoir**
 4 **Expansion (PE SV); 6.2.3.2.1 1 Debris, 6.3.8.2 Sedimentation, 6.3.11**
 5 **Debris (R to EIS); 3.2 Keeyask Forebay Clearing Plan Draft 2006; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0052a**

8 **PREAMBLE:**

9 Peat-lands make up a significant portion of the 45km² area that will be cleared and then
 10 flooded by the Project. Reservoir impoundment is predicted to expand by a further 7-8
 11 km² over the first three decades due to shoreline erosion, leading to more peat-land
 12 disintegration and break-up.

13 **QUESTION:**

14 Projected peat debris has been assessed to be “small in magnitude and short term”. Yet
 15 a discrepancy exists in regards to estimates of how much flooded peat will become
 16 mobile. While one section of the EIS points to 10-20% of flooded peat-land being
 17 expected to break-up and resurface, elsewhere the figure is considerably higher at
 18 around 35% (or approximately 15km² to 16km²). Please respond to and explain this
 19 discrepancy.

20 **RESPONSE:**

21 The apparent discrepancy arises because the two percentages mentioned are based on
 22 two different comparisons.

23 The question states that “the EIS points to 10-20% of flooded peatland being expected
 24 to break-up and resurface”, which is not correct. The EIS says: “Overall, the mass of
 25 potentially mobile peat ranges from about 10-20% of the total peat loading into the
 26 reservoir” (Physical Environment Supporting Volume (PE SV), Sec. 10.4.2.1). Of the total
 27 peat mass entering the water in year 1, years 2-5 and years 6-15 (1,300,000 t; 819,000 t;
 28 and 581,000 t respectively) approximately 7%, 21% and 14% of the total mass in the
 29 respective periods is potentially mobile. The range of 7%-21% was rounded to 10%-20%
 30 in the statement from the EIS.

31 The reference to 35% in the question refers to the total area of resurfacing during
 32 operation and comes from Section 6.4.2.1.5 of the PE SV where it says: “It is predicted
 33 that approximately 15 km² to 16 km², or 35% to 36%, of flooded peatland area will
 34 resurface”. Note that while 15-16 km² of resurfacing is only about 33% of the initial

35 flooded area of 45 km², the 35% value is relative to the smaller flooded terrestrial
36 habitat area (Terrestrial Environment Supporting Volume, Table 2-15), which does not
37 include small lakes that would be flooded and would not contribute resurfaced peat.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.4.2.1.5 Peat Resurfacing and Floating Peat Mat Mobility,**
 3 **7.1.1.2 Peat Sedimentation, 10.4.2.1 Debris due to Reservoir**
 4 **Expansion (PE SV); 6.2.3.2.1 1 Debris, 6.3.8.2 Sedimentation, 6.3.11**
 5 **Debris (R to EIS); 3.2 Keeyask Forebay Clearing Plan Draft 2006; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0052b**

8 **PREAMBLE:**

9 Peat-lands make up a significant portion of the 45km² area that will be cleared and then
 10 flooded by the Project. Reservoir impoundment is predicted to expand by a further 7-8
 11 km² over the first three decades due to shoreline erosion, leading to more peat-land
 12 disintegration and break-up.

13 **QUESTION:**

14 Even at the lower estimate, this still suggests the equivalent of 5-10km² of peat
 15 resurfacing as debris. If this is considered small in magnitude, what amounts of peat
 16 debris would have to be seen in order to be considered medium or large in magnitude?
 17 Do these figures account for areas beyond the initial impoundment (159 masl) at risk to
 18 erosion and peatland disintegration after flooding?

19 **RESPONSE:**

20 The statement in the question that “the equivalent of 5-10km² of peat resurfacing as
 21 debris” implies that all resurfaced peat is considered debris, which is not correct. The
 22 total estimated amount of peat that resurfaces is 15-16 km² (Physical Environment
 23 Supporting Volume (PE SV), Sec. 6.4.2.1.5), as noted in CEC Rd 1 CAC-0052a. Not all
 24 resurfaced peat is considered debris for the purposes of the discussion of Project effects
 25 with respect to debris in Section 10 of the PE SV. Resurfaced peat that is mobile (i.e. it is
 26 able to be transported due to wind and currents) is considered debris because, if it is
 27 large enough, it may pose a hazard to navigation.

28 The predicted amounts of peat resurfacing in the year 1, years 2-5, and years 6-15
 29 operation periods are 10.6 km², 3.4 km² and 1.6 km² (PE SV, Table 6.4-2), although it is
 30 noted that resurfacing is not expected to occur beyond year 10 in the third prediction
 31 period (PE SV, Sec. 6.4.2.1.5). Of the total peat resurfaced in year 1, approximately 25%
 32 of that peat mass was identified as potentially mobile while the remainder is considered
 33 immobile. In the years 2-5 and 6-15 approximately 76% and 62% of resurfaced peat
 34 mass is considered potentially mobile respectively. These percentages are higher than
 35 year 1 due to differences in where the resurfaced peat originates. Using these mass

36 percentages, the average annual areas of potentially mobile peat would be a about 2.7
37 km², 0.7 km² and 0.2 km² for year 1, years 2-5 and years 6-15 respectively, where the
38 last value assumes resurfacing only in years 6 to 10 (the rate would be lower over the
39 longer period from year 6-15). As noted in the PE SV, there is some uncertainty about
40 the specific amount and timing of resurfacing, however the rates do decline over time.

41 Of the amount of resurfaced peat that is potentially mobile, not all of it will need to be
42 managed as debris in the waterway. Some mobile peat will be transported to areas
43 where it is not impeding safe navigation and does not need to be managed as debris, for
44 example, if it subsequently sinks, if it becomes immobilized on a shoreline or shallow
45 area, or if it ends up in an off current area away from navigation routes where it is not
46 being actively transported and is not an impediment. While the amount of peat that
47 may need to be handled as debris will be less than the amount that is potentially
48 mobile, it is not possible to reasonably determine how much will need to be dealt with.

49 Consideration of peat debris includes peat originating from shoreline breakdown. As
50 noted in the PE SV (Sec. 10.4.2.1): "Mobile peat is attributed to resurfaced peat mats
51 rather than material from shoreline breakdown (Section 7), which typically produces
52 small peat chunks. Because the breakdown material is generally small in size, it would
53 not be expected to have an appreciable impact in the waterway as a source of debris
54 even if it were mobile in the larger reservoir area". Additional discussion of mobile peat,
55 including peat from ongoing reservoir expansion is provided in the response to CEC Rd 1
56 CEC-0052c.

57 Overall, the amount of mobile peat that may need to be managed as debris was
58 considered to be small.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.4.2.1.5 Peat Resurfacing and Floating Peat Mat Mobility,**
 3 **7.1.1.2 Peat Sedimentation, 10.4.2.1 Debris due to Reservoir**
 4 **Expansion (PE SV); 6.2.3.2.11 Debris, 6.3.8.2 Sedimentation, 6.3.11**
 5 **Debris (R to EIS); 3.2 Keeyask Forebay Clearing Plan Draft 2006; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0052c**

8 **PREAMBLE:**

9 Peat-lands make up a significant portion of the 45km² area that will be cleared and then
 10 flooded by the Project. Reservoir impoundment is predicted to expand by a further 7-8
 11 km² over the first three decades due to shoreline erosion, leading to more peat-land
 12 disintegration and break-up.

13 **QUESTION:**

14 In light of the above, and given how variability in debris amounts can be increased due
 15 to fluctuations in water flow and levels, as well as variable ice conditions, please provide
 16 information about the capacity of the Waterways Management Program to cope with
 17 the removal of peat mats/blocks/islands etc. (in addition to woody debris) if levels are
 18 higher than expected, and given the current context where “minor amounts of organic
 19 sediment and floating peat are generated”. In particular, how is the Program expected
 20 to deal with the fact that two-thirds of peat break-up and resurface is expected to
 21 happen in the first year? Similarly, how does the Program plan to manage debris
 22 removal adaptively given the uncertainty about how much debris may be mobile at any
 23 one time since it can go through “many cycles of being mobilized and immobilized as
 24 conditions on the waterway change over time”? On this issue, please provide evidence
 25 that supports the claim that “there is not expected to be any additional mobile peat
 26 after 15 years of operation”. One scientific report (Keeyask Forebay Clearing Plan) states
 27 that there is “uncertainty regarding the full extent and rate of peatland disintegration
 28 and erosion. It is also impossible at this time to predict annual clearing requirements as
 29 numerous variables will affect the extent and rate of peatland disintegration and
 30 erosion from year to year”. What guarantees are there that those requirements can be
 31 met?

32 **RESPONSE:**

33 The Partnership has committed to the implementation of a Waterways Management
 34 Program (the Program) as part of the Joint Keeyask Development Agreement (JKDA,
 35 Schedule 11-2). As a service to the Partnership, Manitoba Hydro will implement the

36 Program. Manitoba Hydro currently has a Waterways Management Program in place
37 throughout the Churchill River Diversion and Lake Winnipeg Regulation waterways, as
38 well as the Saskatchewan River watershed areas¹⁰. In part, the objectives state that the
39 Program will be implemented “to contribute to the safe use and enjoyment of the
40 waterway from Split Lake to Stephens Lake throughout the pre-flooding and operational
41 stages of the Keeyask Project”. The JKDA commits the Partnership to review program
42 capacity to ensure that it is able to meet the objective of contributing to the safe use of
43 the waterway, which includes removal of debris that poses a hazard to navigation.

44 The Program commits to having a large crew of up to 25 people on the reservoir during
45 the first three to five years when debris effects are expected to be greatest due to
46 peatland disintegration and shoreline erosion caused by initial flooding and reservoir
47 expansion. In year’s six to ten, when shoreline erosion and peatland disintegration are
48 predicted to be lower, there will be a two-person boat patrol, which is expected to be
49 supported by one or more maintenance crews of up to 12 workers in total. A two-
50 person boat patrol will operate on Keeyask following year 10 as the rate of reservoir
51 expansion is expected to decline to more stable long-term rates.

52 This Information Request incorrectly assumes that all resurfaced peat would need to be
53 dealt with as debris. Resurfaced peat that is immobile, approximately 75% in year 1,
54 would not need to be handled as debris; only a fraction of the peat that is potentially
55 mobile will become debris that may need to be dealt with. Potentially mobile peat that
56 is already isolated away from main navigation routes or becomes immobilized (e.g.,
57 hung up in shallow areas, sinks to bottom) would not require removal or relocation by
58 the waterways management crews. Only mobile peat that is present in the main
59 navigation areas along safe travel routes and poses a hazard to navigation will need to
60 be relocated. This will likely involve moving it (e.g., pushing or towing with boats if large
61 enough) to off-current areas where it will not affect the safe travel routes and is less
62 likely to be transported back into main navigation areas. Considering the amount of
63 people and equipment available in the Program over the different time periods, in
64 conjunction with the expected decline over time in mobile peat that may need to be
65 handled as debris, it is anticipated that the Program will be able to address the
66 requirement to displace peat debris that poses a hazard to the main navigation areas
67 along the safe travel routes.

68 Additional mobile peat is not anticipated after year 15 for several reasons as noted in
69 the Physical Environment Supporting Volume (PE SV, Sec 10.4.2.1). Peat resurfacing is
70 no longer expected to occur because by that time any peat with a propensity to
71 resurface is likely to have done so. Information from Stephens Lake compiled for the
72 peatland disintegration model, as well as studies conducted in northern Quebec

¹⁰ <http://www.hydro.mb.ca/environment/projects/water/index.shtml>

73 reservoirs, indicated resurfacing ceases at some point between the 5th and 10th year
74 after impoundment. Over time, mobile peat will decline as some of it sinks, becomes
75 immobilized on shorelines or in shallow areas, and is broken down. Additionally, by year
76 15, most of the peatland breakdown occurs in shallow, off-current areas from which
77 broken-down peat is less likely to be transported.

78 The Information Request correctly notes that the actual quantity of debris to be handled
79 in any year is uncertain. Manitoba Hydro already deals with this issue in its existing
80 Waterways Management Program. For this reason, the requirements in any
81 management area are considered on an ongoing basis. If an area requires assistance,
82 resources can be temporarily allocated to provide support when it is needed, which may
83 include hiring locally sourced workers on a temporary basis. Based on Manitoba Hydro's
84 experience implementing debris management on other waterways, including the much
85 larger Split and Stephens lakes, there is confidence that debris at Keeyask can be
86 managed to meet the objectives of the Waterways Management Program.

87 Additional clarification on several items in the question is provided below.

88 Reference to the influence of fluctuations in water flow and levels, as well as variable ice
89 conditions is referring to the discussion of debris in the existing environment (PE SV,
90 Sec. 10.3.1.1.2 and 10.3.1.1.2). Without the Project, water levels in Gull Lake vary over a
91 wider range (151.9-154.1, 5th to 95th percentile, PE SV Table 4A.15a) as compared with
92 the 1 m reservoir operating range (158-159 m). Without the Project, it may be years
93 between events where water levels are at the upper end of the range for Gull Lake (e.g.,
94 see inflow hydrograph (PE SV, Figure 4.3-1) where high flow would correspond to high
95 water level on Gull Lake). Therefore, when levels do get higher during a flood event, it
96 may mobilize a large amount of debris that has accumulated above the normal water
97 level over a number of years.

98 The reservoir environment is much different because, depending on operating mode,
99 levels will either be held steady at full supply level (159 m) or will fluctuate over the 1m
100 operating range on a weekly basis (see PE SV, Sec. 4.4.2.2 for description of operating
101 modes). As the reservoir is routinely at full supply level and would not be expected to
102 exceed this level even in an extreme flood (see Project Description Supporting Volume,
103 Sec. 2.2.3.2), the occurrence of high flows causing a large influx of debris from reservoir
104 shorelines would not occur the way it does in the existing environment. Thus the
105 reference to debris going through cycles of being mobilized and immobilized is also
106 more applicable to the existing environment where debris may be temporarily
107 immobilized above the normal water level and then remobilized during high water
108 periods.

109 In the existing Gull Lake environment many shorelines exhibit ice scouring that can
110 result in debris (PE SV, Sec 10.3.1.1.2). Due to changes in ice conditions with the Project,
111 ice scouring would not be expected along most of the reservoir shorelines (PE SV, Sec
112 10.3.1.1.2).

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.4.2.1.5 Peat Resurfacing and Floating Peat Mat Mobility,**
 3 **7.1.1.2 Peat Sedimentation, 10.4.2.1 Debris due to Reservoir**
 4 **Expansion (PE SV); 6.2.3.2.1 1 Debris, 6.3.8.2 Sedimentation, 6.3.11**
 5 **Debris (R to EIS); 3.2 Keeyask Forebay Clearing Plan Draft 2006; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0052d**

8 **PREAMBLE:**

9 Peat-lands make up a significant portion of the 45km² area that will be cleared and then
 10 flooded by the Project. Reservoir impoundment is predicted to expand by a further 7-8
 11 km² over the first three decades due to shoreline erosion, leading to more peat-land
 12 disintegration and break-up.

13 **QUESTION:**

14 Lastly, please provide an estimate of the number of pieces of woody debris expected on
 15 an annual basis for years 1 through 30 post-inundation (following the report that
 16 between 2002 and 2008, the Program removed between 13 to 177 pieces per year). If
 17 the range is expected to be significantly higher than this, what measures will be taken to
 18 ensure the capacity of the Program to cope with such an increase?

19 **RESPONSE:**

20 There is no reasonable means to estimate the number of pieces of debris that will need
 21 to be removed each year during Keeyask operation, nor the degree to which it may or
 22 may not exceed the amounts of debris removed in the past. Regardless of the number
 23 of pieces that may need to be removed, the Partnership has committed to the
 24 implementation of a Waterways Management Program (the Program) as part of the
 25 Joint Keeyask Development Agreement (JKDA, Schedule 11-2), as discussed in the
 26 response to CEC Rd 1 CAC-0052c.

27 Regarding the quantities of debris mentioned in the question, these quantities were
 28 collected on approximately once per-week trips by a two-person boat patrol crew. This
 29 crew implemented Manitoba Hydro's Waterways Management Program on Split Lake,
 30 which is much larger than the future Keeyask reservoir.

31 It is noted that, similar to potentially mobile peat discussed in the response to
 32 interrogatory CEC-0052c, it is not necessary to remove all potentially mobile woody
 33 debris from the waterway. Some of this debris may be essentially immobilized in off
 34 current areas or other locations where it does not pose a hazard along the main

35 navigation routes. Part of the Program will involve identifying areas of debris generation
36 and accumulation so that management efforts can be prioritized to address areas that
37 are more likely to create a hazard to navigation. This is partly facilitated through regular
38 informal communication between the boat patrol crews and resource users on the
39 waterway who help identify areas they see as being of concern relative to their use of
40 the waterway.

41 Keeyask will have a major head start on debris management due to pre-impoundment
42 clearing. Because of this, the large work crews proposed over the first five and ten years
43 of the Program (see response to CAC-0052c), will be able to manage woody debris that
44 poses a hazard to navigation. The crews will be able to focus on prevention of mobile
45 woody debris through proactive management in areas of active erosion (e.g., clearing
46 trees before they enter the water).

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.3.3.1 and 6.3.3.2 Climate (R to EIS); 2.4.1 Effect of the**
 3 **Project on Climate Change; EIS Executive Summary 2012:42;**
 4 **Technical Memorandum GN-9.5.5 (A Life Cycle Assessment of**
 5 **Greenhouse Gases and Select Criteria Air Contaminants) 2012; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0053a**

8 **PREAMBLE:**

9 Consistent with federal and provincial government efforts to reduce GHG emissions, the
 10 EIS states that the Project will “significantly displace coal-or-gas generated electricity
 11 that could produce over 200-times more greenhouse gas” and “while the construction
 12 and operation of the Project will result in short, small increases in regional GHG
 13 emissions, the operation of the Project will result in large reductions regionally over the
 14 long-term”.

15 **QUESTION:**

16 The net implication of the Project on GHG emissions must consider both the life-cycle
 17 GHG emissions resulting from the construction and operation of the Project, as well as
 18 the avoided GHG emissions that result from delivery of the energy (less transmission
 19 losses) to markets outside of Manitoba that currently depend on alternative fossil-fuel
 20 sources of generation. As such, please clarify whether the calculation of life-cycle GHG
 21 emissions takes into account the breakdown and disintegration of peat – both an
 22 important GHG source and sink – through flooding and increased shoreline erosion? If
 23 so, please provide these calculations because they appear to be missing from the EIS. If
 24 they are not available, please explain the rationale for their omission given that
 25 significantly more carbon is stored in the world's soils—including peat-lands—than is
 26 present in the atmosphere, with undisturbed peat-lands known to accumulate carbon
 27 from the air at a rate of up to 0.7 tons per hectare per year (Pearce, F. 1994, ‘Peat Bogs
 28 hold the bulk of the Britain’s carbon’ New Scientist).

- 29 • In answering the above, please explain the data shown in Table 2 and Table 14 in
 30 Technical Memorandum GN-9.5.5 (A Life Cycle Assessment of Greenhouse Gases
 31 and Select Criteria Air Contaminants). In Table 2, over half of all GHG emissions for
 32 the Keeyask generating stations are tied to land use change. What of this calculation
 33 correspond to peat disintegration and break-up through flooding? In Table 14, what
 34 does the peatland figure of 146 tonnes DM/ha correspond to? Is that the carbon
 35 content of these lands or the amount of carbon that will be emitted through
 36 peatland disintegration?

37 **RESPONSE:**

38 Section 2.2.4.3.6 within the Climate chapter of the Physical Environment Supporting
39 Volume addresses greenhouse gas (GHG) emissions associated with land use changes.
40 As stated within this section, the GHG emissions for flooding are a result of the
41 conversion of a portion of the flooded carbon in vegetation and soils to carbon dioxide
42 (CO₂) and methane (CH₄). In addition to the aquatic emissions associated with flooding,
43 the GHG life cycle assessment also accounts for the clearing and assumed burning of the
44 above ground biomass.

45 The life cycle GHG analysis detailed in Technical Memorandum GN 9.5.5 (A Life Cycle
46 Assessment of Greenhouse Gases and Select Criteria Air Contaminants (listed in
47 Appendix 6A, Response to EIS Guidelines)) takes into account not only the initial
48 flooding of soils including peat, but also the area associated with the breakdown and
49 disintegration of peat through shoreline erosion. The initial flooded area is 45.1 km²
50 increasing to 52.4 km² after 30 years of reservoir expansion. The GHG life cycle
51 assessment uses the larger 30-year flooded area from the point of initial flooding and
52 hence is a conservative assumption.

53 The peatland value of 146 tonnes DM/ha shown in Table 14 of the Technical
54 Memorandum GN 9.5.5 corresponds to the IPCC published carbon content of boreal
55 wetland soils. This value is not used in the life cycle analysis. While the decomposition of
56 vegetation and soil is a driver for reservoir emissions, the soil carbon content is not used
57 in the IPCC flux methodologies for reservoirs. Section 5 in Technical Memorandum GN
58 9.5.6 (Reservoir Greenhouse Gases) explains that GHG emissions resulting from flooding
59 were estimated by applying IPCC emission factors for flooded lands in the “polar/boreal
60 wet” climate region to the 30-year flooded area of 52.4 km². As per IPCC guidance, CO₂
61 and CH₄ emissions were estimated for 10 years and 100 years, respectively, following
62 initial flooding.

63 Section 5 in Technical Memorandum GN 9.5.6 (Reservoir Greenhouse Gases) provides
64 additional details on the Intergovernmental Panel on Climate Change (IPCC)
65 methodology that was used to determine reservoir GHG emissions.

66 Table 2 in Section 5.2 of Technical Memorandum GN 9.5.5 presents the overall results of
67 the GHG life cycle assessment (a copy of this table is provided below). Land-use change
68 GHG emissions account for about 50% of all life cycle GHG emissions. As stated in
69 Section 5.2, 95% of the land-use change GHG emissions are due to reservoir formation.
70 The 7.3 km² incremental area associated with the post-flooding shoreline erosion
71 accounts for about 14% of the total flooded area after 30 years and hence about 14% of
72 the associated reservoir flux GHG emissions.

Table 2 from Technical Memorandum GN 9.5.5: Summary of emission sources for the Keeyask Generating Station.

Air Emission	Units	Construction			Land Use Change	Operation	Decommissioning	Total
		Building Material Manufacture	Transportation	On-Site Construction Activities	Clearing for Roads, Transmission and Reservoir	Maintenance and Refurbishment	Decommissioning Activities	
Greenhouse Gas	tCO ₂ eq/GWh	0.68	0.12	0.34	1.24	0.03	0.05	2.46 (tCO ₂ eq/GWh)
Nitrogen Oxides	kgNO _x /GWh	1.51	1.31	7.04	0.00	0.09	0.57	10.52 (kgNO _x /GWh)
Sulphur Dioxide	kgSO ₂ /GWh	0.86	0.26	0.45	0.00	0.02	0.06	1.66 (kgSO ₂ /GWh)

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.3.3.1 and 6.3.3.2 Climate (R to EIS); 2.4.1 Effect of the**
 3 **Project on Climate Change; EIS Executive Summary 2012:42;**
 4 **Technical Memorandum GN-9.5.5 (A Life Cycle Assessment of**
 5 **Greenhouse Gases and Select Criteria Air Contaminants) 2012; p.**
 6 **N/A**

7 **CEC Rd 1 CAC-0053b**

8 **PREAMBLE:**

9 Consistent with federal and provincial government efforts to reduce GHG emissions, the
 10 EIS states that the Project will “significantly displace coal-or-gas generated electricity
 11 that could produce over 200-times more greenhouse gas” and “while the construction
 12 and operation of the Project will result in short, small increases in regional GHG
 13 emissions, the operation of the Project will result in large reductions regionally over the
 14 long-term”.

15 **QUESTION:**

16 Do the Project Partners expect peat breakup in some areas to be offset by peat
 17 formation in others? If so, please provide details. Does the Project classify peat as a
 18 renewable biomass? How long does Hydro estimate it takes for peat to reaccumulate
 19 (convert to new peatland types) in the Local and Regional Stud Areas post-
 20 impoundment?

21 **RESPONSE:**

22 The EIS indicates that reservoir expansion may be offset in some shoreline locations
 23 because peat is forming rather than disintegrating, causing the shoreline peatland to
 24 expand (Physical Environment Supporting Volume Section 6.1.1, p. 6-2). The use of low-
 25 lying peatlands adjacent to the year 30 reservoir shoreline to define the limits of
 26 reservoir expansion beyond Year 30 (Terrestrial Environment Supporting Volume
 27 Section 2.3.6.3.1 p. 2-102) is implicit recognition that a balance between peatland
 28 breakdown and formation is expected to eventually occur on back bay shore segments
 29 subject to peatland disintegration processes (which is where most of these segments
 30 occur after Year 30).

31 Peat can be classified as a renewable biomass because it is produced over periods
 32 ranging from months to years, depending on the type of peat and local conditions.
 33 While the physical assessment of the Project’s potential effects on peatlands considered
 34 the regenerative properties of peat, the GHG assessment did not. The GHG estimation

35 included emissions from the increase in flooded area associated with shoreline erosion
36 but did not include any potential offsetting peatland expansion.

37 The rates of peat production and accumulation (*i.e.*, the balance between production
38 and decomposition), as well as the rates of transformation from one peatland type to
39 another, vary greatly depending on many factors such as depth to groundwater, water
40 regime, soil temperature and nutrient availability. An overview of these processes, their
41 key driving factors and rates of change is provided in Section 2 of physical environment
42 technical memorandum GN 9.2.1. Along the newly formed reservoir shoreline,
43 conversion of horizontal and collapse scar peatlands to riparian peatlands is expected to
44 occur within a few years because the vegetation and stratigraphy of horizontal
45 peatlands is already similar to that of riparian peatlands (see descriptions in Terrestrial
46 Environment Supporting Volume Sections 2.3.4.1.1 and 2.3.4.1.2). Depending on local
47 conditions, this conversion could require years to decades for veneer bog, but less time
48 for the wetter peatland types such as blanket bog, basin bog or slope peatland.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Executive Summary; 6.0 Environment Effects Assessment; p. 6, 33**
 3 **(Exec Sum)**

4 **CEC Rd 1 CAC-0054**

5 **QUESTION:**

- 6 • Please provide evidence to show how the regulatory test for significance (of residual
 7 adverse effects) for the 38 VECs, a test that lies at the heart of the Keeyask
 8 environmental assessment process, provides “equal consideration to both technical
 9 scientific studies and ATK [...] creating a thorough and comprehensive planning and
 10 environmental assessment process”.
- 11 • Specifically, explain how the assessment process, as well as the negotiations and
 12 discussions that took place between the Partners, supports the claim of an
 13 “integrated and collaborative approach”. Please stipulate the nature and extent of
 14 this “integration” (i.e. provide concrete examples across all aspects of the
 15 assessment process, as well as mitigation and adaptive management strategies).
 16 Please also describe the nature and extent of the efforts made to bridge the gap
 17 between what the regulations required and their synergy (or lack thereof) with the
 18 beliefs and views of the KCN partners?

19 **RESPONSE:**

20 As outlined in the EIS, the starting point for understanding how ATK played an important
 21 role in planning the Project, as well as in the conduct of the KCNs' evaluations and in the
 22 regulatory environmental assessment, is recognition that two separate evaluations were
 23 conducted of the Project (see Response to EIS Guidelines, Chapter 5, pp. 5-1 and 5-2 as
 24 well as Chapter 1, Section 1.4):

- 25 • the first was conducted by the Keeyask Cree Nations (KCNs) for their own internal
 26 purposes (the KCNs' Environmental Evaluation Reports have been provided to assist
 27 other people to understand their independent decisions to be Project proponents);
 28 and
- 29 • the second was for the regulatory review currently being conducted by federal and
 30 provincial regulators for which the Partnership prepared an environmental impact
 31 statement (the EIS) in accordance with the regulatory framework outlined in Section
 32 1.3 of the Response to EIS Guidelines (including the EIS Guidelines, guidance
 33 provided by federal and provincial authorities and standard environmental
 34 practice). The existing environment and the manner by which it functions was
 35 studied and analyzed using the scientific method (referred to as “technical
 36 information” in the environmental impact statement), ATK and local knowledge.

37 The Executive Summary (p. 6) refers to these two separate evaluations as “an integrated
38 and collaborative approach”, and notes (p. 42), in addressing environmental
39 sustainability, that “equal consideration to both technical-scientific studies and
40 Aboriginal traditional knowledge has created a thorough and comprehensive planning
41 and environmental assessment process”.

42 As noted in Section 1.4 of the Response to EIS Guidelines, the Partnership recognized
43 that the regulatory assessment processes led by governments are different from the
44 KCNs’ process in terms of scope, methods, values and concepts.

45 Section 1.4 notes that ATK and technical science are used throughout the EIS, from
46 identifying issues to assessing effects and identifying mitigation. Section 1.4 also notes
47 that both ATK and technical science were, and will continue to be, used by the
48 Partnership to improve the Project (*e.g.*, choice of low head design, reservoir clearing,
49 waterway management program, ATK and technical monitoring programs). Finally,
50 Section 1.4 also notes that, as a result of the ongoing participation of the KCNs in the
51 Project planning, assessment and regulatory review, ATK, local knowledge and technical
52 science underpin the planning and development of the Project.

53 Nowhere does the EIS suggest that the regulatory test for significance of residual
54 adverse effects for the 38 VECs could somehow provide a test to ensure “equal
55 consideration” to ATK and technical-scientific studies - if anything, the EIS continues to
56 highlight that government environmental evaluation processes (such as the regulatory
57 test for significance of residual adverse effects for the 38 VECs) are different from the
58 KCNs’ process in terms of scope, methods, values and concepts.

59 Section 5.3.2 of the Response to EIS Guidelines reviews how ATK, local knowledge and
60 technical information were utilized in the regulatory assessment provided in the EIS.
61 Each section of the assessment set out in Chapter 6 of the Response to EIS Guidelines
62 includes reference to applicable ATK. Mitigation, monitoring and adaptive management
63 measures are identified, where relevant, in the EIS to address uncertainty around
64 predictions for how the Project is expected to impact the physical, biophysical and
65 socio-economic environments (this includes measures to address concerns in this regard
66 identified by ATK).

67 Please also see response to CEC Rd 1 CAC-0057.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: YFFN**
 2 **Environmental Evaluation Report; FLCN Environmental**
 3 **Evaluation Report; p. 18 (FLCN)**

4 **CEC Rd 1 CAC-0055a**

5 **QUESTION:**

6 For some among the KCN Partners, the VEC process was very difficult to accept, given
 7 that its very nature "ignores the interrelatedness of people, animals, water, landscape
 8 and plants". Please describe and provide details about the extent and nature of
 9 discussions held between Manitoba Hydro and the KCNs with regards to the selection of
 10 the VECs and/or the modification of selected VECs in order to reflect the Cree
 11 Worldview, and specifically the interrelatedness of people, animals, water landscape
 12 and plants. What was the outcome of these discussions?

13 **RESPONSE:**

14 As explained in the EIS and in response to many other IRs (e.g., see response to CEC Rd 1
 15 CAC-0060 and CAC-0075a), the Partnership chose to undertake two tracks of analysis for
 16 the Project (i.e., a Keeyask Cree Nations evaluation process as well as the government
 17 regulatory environmental assessment process) and to present both in the filing. The two
 18 tracks resulted in two separate types of evaluations carried out by different authors for
 19 different purposes.

20 As described in Chapter 5, p. 5-5 of the Response to EIS Guidelines, the VEC analysis was
 21 undertaken as part of the government regulatory environmental assessment process in
 22 response to EIS Guidelines. During the scoping step of the government regulatory
 23 environmental assessment, key issues of importance to regulatory authorities and
 24 people who may be affected by or have an interest in the Project were identified. From
 25 these issues, Valued Environmental Components (VECs) were selected to focus the
 26 assessment of the significance of adverse effects. A series of six criteria were used to
 27 select VECs, as noted in Chapter 5 of the Response to EIS Guidelines (p. 5-5).

28 All of the Partners were extensively involved in the VEC selection process.

29 As provided for in the Joint Keeyask Development Agreement, the government
 30 regulatory environmental assessment was guided by Manitoba Hydro and the Keeyask
 31 Cree Nations who worked together via working committees, thematic workshops and
 32 working groups. In 2008, the Partnership held two major workshops with representation
 33 from the KCNs and Manitoba Hydro to review and discuss the concept of VECs and the
 34 proposed scope of VECs used in the environmental assessment. The VEC concept was

35 discussed by the EIS Coordination Committee at meetings leading up to these
36 workshops and then following up from these workshops.

37 The 38 VECs selected for detailed study in the government regulatory environmental
38 assessment reflected the methodology set out in Chapter 5 of the Response to EIS
39 Guidelines. Assessment of the VECs included consideration of their context (e.g., past,
40 present and future environment without the Project, including supporting topics in
41 some cases), as well as how the Project is expected to affect each VEC through
42 connections (or pathways) of effect including, in some cases, among VECs.

43 Please also see response to CEC Rd 1 CAC-0013.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: YFFN**
 2 **Environmental Evaluation Report; FLCN Environmental**
 3 **Evaluation Report; p. 18 (FLCN)**

4 **CEC Rd 1 CAC-0055b**

5 **QUESTION:**

6 Similarly, did any discussions take place between Manitoba Hydro and the four KCNs
 7 about making 'value' a designation of significance (in addition to those of 'nature',
 8 'magnitude', 'geographical extent' and 'duration'), in order to better reflect Cree
 9 perspectives of the Keeyask homeland ecosystem (as stated in the respective
 10 environmental evaluation reports)? If these did take place, what was the nature and
 11 outcome of the discussions and what efforts made to modify the assessment process
 12 and test criteria in order to integrate Cree perspectives?

13 **RESPONSE:**

14 As explained in the response to CEC Rd 1 CAC-0055a, the Partnership chose to
 15 undertake two tracks of analysis for the Project (i.e., a Keeyask Cree Nations evaluation
 16 process as well as the government regulatory environmental assessment process) and
 17 to present both in the filing. The two tracks resulted in two separate types of
 18 evaluations carried out by different authors for different purposes.

19 As described in Section 5.5 of the Response to EIS Guidelines, the significance
 20 determination analysis was undertaken as part of the government regulatory
 21 environmental assessment process in response to the EIS Guidelines. Each VEC was
 22 evaluated using criteria as provided in the EIS Guidelines, and in accordance with related
 23 regulatory guidance.

24 In accordance with related regulatory guidance, the Partnership did not consider making
 25 'value' a criterion for designation of significance (in addition to those of 'nature',
 26 'magnitude', 'geographical extent' and 'duration'). Although the selection of VECs allows
 27 for consideration of what is of value to different people, regulatory guidance is clear
 28 that the determination of regulatory significance regarding effects of a project on a VEC
 29 must be limited to questions related to scientific analysis and interpretation¹¹.

¹¹ See CEAA Reference Guide: *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (November 1994). Section 3 on requirements of the *Canadian Environmental Assessment Act* states as follows: "...public input into the determination of significant adverse environmental effects must limit itself to questions related to scientific analysis and interpretation. The public, for example, could provide new evidence, offer a different interpretation of the facts, or question the credibility of the conclusions. Issues that are

not directly linked to the scientific (including traditional ecological knowledge) analysis of environmental effects, such as long-term unemployment in a community or fundamental personal values, cannot be introduced into the determination at this step. Such public concerns and values are given prominence elsewhere in the EA process."

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: YFFN Our**
 2 **Voices Report 2012; FLCN Environmental Evaluation Report 2012;**
 3 **Response to EIS Guidelines, Chapter 6.; p. N/A**

4 **CEC Rd 1 CAC-0056**

5 **QUESTION:**

6 Please provide information about the nature and extent of discussions between the
 7 Project Partners about the use of biodiversity offsetting as a principle mitigation tool.
 8 Specifically, did any of the Partners question whether biodiversity offsetting was
 9 consistent with a Cree Worldview, given that it circumvents the role that 'place' plays in
 10 the homeland ecosystem? If concerns were raised, how were these resolved?

11 **RESPONSE:**

12 Biodiversity offsetting was not applied by the Partnership as a principal mitigation tool
 13 for the Keeyask Generation Project, and none of the Partners discussed whether
 14 biodiversity offsetting was consistent with a Cree Worldview. The approach adopted by
 15 the Partnership is reviewed below. In brief, the approach to mitigation was sequential,
 16 and steps were as follows: minimize the size of the Project Footprint; avoid sensitive
 17 sites; mitigate in the Local Study Area for effects where additional mitigation is needed;
 18 and, mitigate outside the Local Study Area for situations where other mitigation is
 19 needed.

20 As noted in several responses to Information Requests, the Keeyask Generation Project
 21 was subject to two environmental evaluations. The first was conducted by each of the
 22 Keeyask Cree Nations (KCNs) for their internal purposes; the second was prepared to
 23 comply with the federal and provincial environmental regulatory process:

- 24 • *KCNs Evaluation Process:* The KCNs evaluation process took place over the course of
 25 a decade with the support of Manitoba Hydro. The process assisted the KCNs to
 26 understand the Project and its impacts on their communities and Members, and to
 27 determine the conditions under which they would approve the Joint Keeyask
 28 Development Agreement and support the Project. The Project was evaluated by
 29 each of the KCNs in terms of their own worldview, values and experience with past
 30 hydroelectric development, as well as their relationships with Mother Earth (see
 31 Chapter 2 and the KCNs' Environmental Evaluation Reports which were provided to
 32 assist other people to understand their independent decisions to be Project
 33 proponents).
- 34 • *Government Regulatory Assessment Process:* Work by Manitoba Hydro and the
 35 KCNs on the government regulatory assessment process also took place over many

36 years. The Keeyask environmental impact assessment is in accordance with the
37 regulatory framework outlined in guidance provided by federal and provincial
38 regulatory agencies, and standard environmental assessment practice. The effects
39 assessment, as well as identified mitigation and long-term monitoring were
40 developed based on scientific methods (referred to as “technical information” in the
41 EIS), Aboriginal traditional knowledge (ATK) and local knowledge (see Chapter 5 of
42 the Response to EIS Guidelines for a full description of the methodology employed
43 in the government regulatory assessment process).

44 Through the government regulatory assessment process, the Partnership considered
45 potential effects to biodiversity in the Keeyask region, including a consideration of
46 ecosystems and habitat, ecosystem diversity, intactness, wetland function, plants, and a
47 variety of animal species. The Partnership also evaluated and assessed current resource
48 use and cultural connections to the landscape by the Keeyask Cree Nations and others.

49 Through this assessment, the Partnership predicted potential environmental effects of
50 the Project, identified ways to avoid or mitigate adverse effects, and determined the
51 nature and magnitude of any residual adverse effects remaining after mitigation and
52 based on a consideration of the effects of the Project in combination with other past,
53 current and potential future projects. The Partnership concluded that, with the
54 identified avoidance and mitigation measures in place, Project effects (including those
55 to the studied components of biodiversity) will be reduced to regionally acceptable
56 levels and that the residual adverse effects of the Project are not significant.

57 The Partnership will continue to review and assess this conclusion following Keeyask
58 development through the implementation of a comprehensive Environmental
59 Protection Program, which includes Project effects monitoring and adaptive
60 management.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: YFFN Our**
 2 **Voices Report 2012:71; FLCN Environmental Evaluation Report**
 3 **2012:35; YFFN Our Voices Report 2012:69-94; Response to EIS**
 4 **Guidelines, Chapter 8.; p. N/A**

5 **CEC Rd 1 CAC-0057**

6 **PREAMBLE:**

7 The Project is located in a region that has been greatly altered over the past five to six
 8 decades by development of the Lake Winnipeg Regulation Project (LWR), the Churchill
 9 River Diversion Project (CRD) and five generating stations. When KCN members spoke
 10 about Keeyask, many took the view that Keeyask is simply a continuation of one large
 11 development project, with their evaluation reports all detailing the impacts that
 12 previous Hydro developments have had on their homeland ecosystems and way of life.
 13 The EIS makes clear that the monitoring of changes and impacts will be measured
 14 against current conditions (i.e. prior to construction and operation of the Keeyask Dam
 15 and Generating Station). This is not consistent with the views of members of at least
 16 two of the KCNs, who believe that baseline conditions should be those that existed prior
 17 to the construction of the first dam in the region in the late 1950s.

18 **QUESTION:**

19 Please respond to the difference in viewpoint between Manitoba Hydro and the KCN
 20 Partners around the issue of baseline data. If discussions took place between the
 21 Partners about this apparent discrepancy, please provide information about the nature
 22 and outcome of those discussions, and explain how collaborative monitoring is expected
 23 to function successfully in light of these differences - for "situations where ATK and
 24 technical assessments differ" how will monitoring be carried out and decisions made if
 25 the KCNs and Manitoba Hydro are working off of different sets of baseline data?

26 **RESPONSE:**

27 The Keeyask Generation Project recognized and addressed differences in viewpoints
 28 between the KCNs and government regulators as to environmental assessment
 29 approaches. However, on the matter of monitoring, there is no difference in viewpoint
 30 between Manitoba Hydro and the KCN Partners around the issue of baseline data, i.e.,
 31 the data against which changes will be measured after the Project is developed.

32 The Keeyask Project was subject to two environmental evaluations. While each process
 33 was used for a different purpose, both focused on the potential future environment
 34 with the Project based on an understanding of historical conditions and responses of the
 35 environment to previous developments. The first environmental evaluation was

36 conducted by each of the Keeyask Cree Nations (KCNs) for their internal purposes; the
 37 second was prepared to comply with the federal and provincial environmental
 38 regulatory process:

- 39 • *KCNs' Evaluation Process*: The KCNs evaluation process took place over the course of
 40 a decade with the support of Manitoba Hydro. The process assisted the KCNs to
 41 understand the Project and its impacts on their communities and Members, and to
 42 determine the conditions under which they would approve the Joint Keeyask
 43 Development Agreement and support the Project. The Project was evaluated by
 44 each of the KCNs in terms of their own worldview, values and experience with past
 45 hydroelectric development, as well as their relationships with Mother Earth (see
 46 Chapter 2 and the KCNs' Environmental Evaluation Reports which were provided to
 47 assist other people to understand their independent decisions to be Project
 48 proponents).
- 49 • *Government Regulatory Assessment Process*: Work by Manitoba Hydro and the
 50 KCNs on the government regulatory assessment process also took place over many
 51 years. The Keeyask environmental impact assessment is in accordance with the
 52 regulatory framework outlined in guidance provided by federal and provincial
 53 regulatory agencies, and standard environmental assessment practice. The effects
 54 assessment, as well as identified mitigation and long-term monitoring were
 55 developed based on scientific methods (referred to as "technical information" in the
 56 EIS), Aboriginal traditional knowledge (ATK) and local knowledge (see Chapter 5 of
 57 the Response to EIS Guidelines for a full description of the methodology employed
 58 in the government regulatory assessment process).

59 The differences in these two worldviews are noted in the EIS.

60 Given the differing worldviews, there are naturally some cases where the conclusions
 61 reached to date by these two evaluation processes are different. For example,
 62 Tataskweyak Cree Nation and York Factory First Nation believe that open water levels
 63 on Split Lake will be affected as a result of the Project; in contrast, engineering studies
 64 and analysis indicate that open water levels on Split Lake will not be affected – in fact,
 65 the requirement that these open water levels will not be affected by the Project is a
 66 fundamental feature of the Project in the Joint Keeyask Development Agreement.

67 In such cases, the Partnership has developed monitoring programs that respond to the
 68 concerns raised through both worldviews (e.g., water levels will be monitored on Split
 69 Lake). This monitoring will be conducted to determine what, if any, changes occur to a
 70 VEC or other indicator due to Project development and/or other factors, and to assess
 71 the accuracy of predictions in the Project EIS and the efficacy of mitigation measures. As
 72 such, monitoring will measure changes against current conditions and the expected
 73 trends in such conditions without the Project. This monitoring will be undertaken

74 through both technical monitoring programs, as well as ATK monitoring programs
75 undertaken by each of the KCNs.

76 Chapter 8 of the Response to EIS Guidelines outlines monitoring and follow-up activities
77 planned for the Project, including how the KCNs Partners will collaborate in this regard
78 through the Monitoring Advisory Committee (MAC), the Partnership Board of Directors,
79 participation in technical monitoring programs and implementation of their own ATK
80 monitoring programs.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.0**
2 **Environmental Effects Assessment; 7.0 Cumulative Effects**
3 **Assessment; p. N/A**

4 **CEC Rd 1 CAC-0058**

5 **QUESTION:**

6 Please comment on the decision to separate the cumulative effects and residual
7 environmental effects assessments, explaining how the significance of any given
8 residual adverse effect can be accurately determined without incorporating the
9 associated cumulative adverse effects that stem from prior Hydro development in the
10 region. In choosing not to incorporate cumulative adverse effects in this way, please
11 explain how this reflects the stated commitment to combining technical science and ATK
12 as part of an integrated and collaborative assessment approach.

13 If cumulative effects were to be included in the determination of residual adverse
14 effects, please estimate for which of the 38 VECs Step 2 analyses would have been
15 required/triggered?

16 **RESPONSE:**

17 The question incorrectly states what was done in the EIS. The significance assessment
18 for residual adverse effects of the Project included a consideration for each VEC of the
19 cumulative effects of the Keeyask Project in combination with the effects of past,
20 current and reasonably foreseeable future projects. The responses to CEC Rd 1 CAC-
21 0006 and CAC-0012 indicate how these significance assessments were undertaken.

22 The significance assessment undertaken for the Project resulted in 8 of the 18
23 biophysical VECs requiring a Step 2 analysis as defined in Chapter 5, Figure 5-1 (none of
24 the 20 socio-economic VECs required a Step 2 analysis). It is important to note that
25 whether or not a VEC meets the criteria for Step 2 in the significance assessment has no
26 bearing as to which VECs are "carried forward to the cumulative effects analysis for
27 future projects" (see response to CEC Rd 1 CAC-0006).

1 **REFERENCE: Volume: N/A; Section: PE SV: AQ SV; TE SV: KCN**
 2 **Evaluation Reports; p. N/A**

3 **CEC Rd 1 CAC-0059**

4 **QUESTION:**

5 How were local Cree observations and experiences regarding the impact of previous
 6 Hydro development projects on the region's biophysical environment integrated into
 7 the modeling of projected impacts for Keeyask? In other words, to what degree did
 8 modeling integrate ATK in order to reduce uncertainty around predictions for how
 9 Keeyask would impact the physical and biophysical environments in the study area?

10 **RESPONSE:**

11 In addressing ATK and the experience and observations of the KCNs, the EIS outlines
 12 how ATK played an important role in planning the Project as well as the conduct of the
 13 KCNs' evaluations and in the regulatory environmental assessment. As outlined in the
 14 EIS, the Project was subject to two separate evaluations (see Response to EIS Guidelines,
 15 Chapter 5, pp. 5-1 and 5-2). The first was conducted by the Keeyask Cree Nations (KCNs)
 16 for their internal purposes; the second was prepared to comply with the federal and
 17 provincial environmental regulatory process:

- 18 • *KCNs' Evaluation Process:* The KCNs evaluation process took place over the course of
 19 a decade with the support of Manitoba Hydro. The process assisted the KCNs to
 20 understand the Project and its impacts on their communities and Members, and to
 21 determine the conditions under which they would approve the Joint Keeyask
 22 Development Agreement and support the Project. The Project was evaluated by
 23 each of the KCNs in terms of their own worldview, values and experience with past
 24 hydroelectric development, as well as their relationships with Mother Earth (see
 25 Chapter 2 and the KCNs' Environmental Evaluation Reports which were provided to
 26 assist other people to understand their independent decisions to be Project
 27 proponents).
- 28 • *Government Regulatory Assessment Process:* Work by Manitoba Hydro and the
 29 KCNs on the government regulatory assessment process also took place over many
 30 years. The Keeyask environmental impact assessment is in accordance with the
 31 regulatory framework outlined in guidance provided by regulatory agencies, and
 32 standard environmental assessment practice. The effects assessment, as well as
 33 identified mitigation and long-term monitoring were developed based on scientific
 34 methods (referred to as "technical information" in the EIS), Aboriginal traditional
 35 knowledge (ATK) and local knowledge (see Chapter 5 of the Response to EIS

36 Guidelines for a full description of the methodology employed in the government
37 regulatory assessment process).

38 The Cree worldview and related ATK is recognized in the Response to EIS Guidelines to
39 differ from technical knowledge. In this context, ATK is not reliant on technical models -
40 and models relied upon for technical knowledge typically do not incorporate ATK (unless
41 the ATK is in a form, and meets the tests, required for such models).

42 Information provided by ATK helped the Partnership identify concerns to be addressed
43 about possible effects of the Project, to reduce uncertainty when ATK and technical
44 models were in agreement, and to develop monitoring programs to determine actual
45 effects of the Project when ATK and technical models were not in agreement.

46 Each section of the assessment set out in Chapter 6 of the Response to EIS Guidelines
47 includes reference to applicable ATK, and mitigation, monitoring and adaptive
48 management measures are identified, where relevant, in the EIS to address uncertainty
49 around predictions for how the Project would impact the physical, biophysical and
50 socio-economic environments (including measures to address concerns in this regard
51 identified by ATK).

52 Models used in the Response to EIS Guidelines as part of the government regulatory
53 assessment process to assess degrees of disturbance to date and/or effects of the
54 Project on physical and biophysical environments utilized available observations and
55 data suited to each model, and are described in the relevant technical supporting
56 volumes. Excluding the moose population model used in development of the moose
57 harvest sustainability plan (see below), no specific instances have been identified where
58 the physical or biophysical study "models", as described in the relevant technical
59 supporting volumes, integrated specific ATK "in order to reduce uncertainty around
60 predictions for how Keeyask would impact the physical and biophysical environments in
61 the study area".

62 The development of the CNP Moose Harvest Sustainability Plan integrated ATK 'data'
63 directly into this product in several ways:

- 64 1. A meeting was held to develop the plan for sustainable moose harvest in the
65 SLRMA. One of the exercises conducted was to establish management unit
66 boundaries based on where CNP Members traditionally harvest moose, and to
67 establish meaningful names for these units, for future implementation purposes.
68 ATK was used directly in its development.
- 69 2. A workshop was held to identify and collect data on where CNP Members 'knew'
70 were high/low moose areas, and secondly, to identify where gray wolf packs were
71 located in the SLRMA

- 72 3. The ATK moose data collected in the workshop was used to improve the overall
73 design of the stratified aerial survey in the SLRMA, and as a result, this improved
74 certainty (i.e., increased confidence) in the overall population estimate.
75 4. CNP participated as observers in the data collected during the aerial survey.
76 5. The wolf pack data was used to visually fit and corroborate the location information.
77 6. A workshop was held to review the findings of the aerial survey, describe the
78 preliminary model, and to move forward in the development of the Moose Harvest
79 Sustainability Plan.

80 The scientific model used to predict the effects of harvest on the regional sustainability
81 of moose is provided on the CD of technical reports included with this filing. CNP has
82 also noted that its Environmental Evaluation Reports did utilize western science models
83 to better explain the evaluation process and the Cree worldview to the general public.

1 **REFERENCE: Volume: N/A; Section: 6.0 (R to EIS); Executive**
 2 **Summary; YFFN Environmental Evaluation Report; FLCN**
 3 **Environmental Evaluation Report; p. 33 (Exec Sum); 24, 66, 125**
 4 **(YFFN); 21, 98 (FLCN)**

5 **CEC Rd 1 CAC-0060**

6 **QUESTION:**

- 7 • The EIS states that the Project will have “major unavoidable effects”, that the
 8 landscape will be “permanently changed”, and the homeland ecosystem
 9 “transformed by the project”. Please reconcile these statements and predictions
 10 with the environmental assessment results that found that for all 38 VECs the
 11 residual adverse effects were not deemed significant after Step 1 of the regulatory
 12 test.
- 13 • The KCNs make use of the word ‘substantial’ rather than ‘significant’ on multiple
 14 occasions in their Evaluation Reports. Similarly, Section 6 of the ‘Response to EIS
 15 Guidelines’ makes use of the word ‘substantial’ 126 times in reference to predicted
 16 adverse effects on a range of VECs. Given that the Merriam-Webster dictionary
 17 defines ‘substantial’ as meaning considerable in quantity: significantly great, please
 18 explain how ‘substantial’ is different from ‘significant’ in terms of determining the
 19 severity and importance of residual adverse effects?

20 **RESPONSE:**

21 The referenced statements reflect two separate types of evaluations carried out by
 22 different authors for different purposes, and were not intended to be statements that
 23 are to be “reconciled”.

24 As explained in the EIS, two separate types of evaluations were conducted of the Project
 25 (see Response to EIS Guidelines, Chapter 5, p. 5-1 to 5-2). The first was conducted by the
 26 Keeyask Cree Nations (KCNs) for their internal purposes; the second was prepared to
 27 comply with the federal and provincial environmental regulatory process:

- 28 • *KCNs Evaluation Process:* The KCNs evaluation process took place over the course of
 29 a decade with the support of Manitoba Hydro. The process assisted the KCNs to
 30 understand the Project and its impacts on their communities and Members, and to
 31 determine the conditions under which they would approve the Joint Keeyask
 32 Development Agreement and support the Project. The Project was evaluated by
 33 each of the KCNs in terms of their own worldview, values and experience with past
 34 hydroelectric development, as well as their relationships with Mother Earth (see
 35 Chapter 2 and the KCNs' Environmental Evaluation Reports which were provided to

36 assist other people to understand their independent decisions to be Project
 37 proponents).

- 38 • *Government Regulatory Assessment Process: Work by Manitoba Hydro and the*
 39 *KCNs on the government regulatory assessment process also took place over many*
 40 *years. The Keeyask environmental impact assessment is in accordance with the*
 41 *regulatory framework outlined in guidance provided by regulatory agencies, and*
 42 *standard environmental assessment practice. The effects assessment, as well as*
 43 *identified mitigation and long-term monitoring were developed based on scientific*
 44 *methods (referred to as “technical information” in the EIS), Aboriginal traditional*
 45 *knowledge (ATK) and local knowledge (see Chapter 5 of the Response to EIS*
 46 *Guidelines for a full description of the methodology employed in the government*
 47 *regulatory assessment process).*

48 The question does not suggest any inconsistency with regard to the regulatory
 49 assessment carried out in Chapter 6 of the EIS regarding the regulatory significance of
 50 the Project’s effects on the 38 VECs. To clarify, and contrary to what is suggested in the
 51 question, this regulatory assessment resulted in 8 of 18 biophysical VECs requiring a
 52 “Step 2” analysis as defined in Chapter 5, Section 5.5 and Figure 5-1 (none of the 20
 53 socio-economic VECs required a Step 2 analysis).

54 Although the term “substantial” was used on multiple occasions in Chapter 6 of the
 55 Response to EIS Guidelines to denote ‘considerable in quantity’ (and thus in this respect
 56 similar to ‘significantly great’), its use was not employed to avoid or compromise the
 57 regulatory significance assessment required for each of the 38 VECs.

58 To avoid confusion, the EIS sought to avoid use of the term “significant” except when
 59 determining the regulatory significance of effects of the Project on a specific VEC. The
 60 Partnership adopted the term “Regulatory significance” in the EIS specifically to alert
 61 readers to the specific, restricted and defined use of “significance” in the EIS, i.e., its use
 62 in the context of defined criteria as set out in Section 5.5 to determine for regulatory
 63 purposes whether expected and likely adverse residual effects of the Project on a VEC
 64 were “significant” in the context of the federal EIS Guidelines requirements.

65 In contrast, “substantial” was used in Chapter 6 in a wide variety of contexts that did not
 66 compromise such determinations of regulatory significance and were not intended to
 67 denote the application of any specific regulatory test required by the EIS Guidelines. By
 68 way of example, most of the uses of the term “substantial” referenced description of
 69 various characteristics of the existing environment and/or effects on environmental
 70 elements that were not VEC’s (e.g., physical environment elements). This term was also
 71 used in various ways, including to confirm that something was “not substantial” or was
 72 “not substantially affected”. At no time was the word “substantial” used to reference

- 73 the specific criteria set out in Section 5.5 to determine the regulatory significance of
- 74 effects of the Project on a specific VEC.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: Section 7.0 Glossary; p. page 7-1**

3 **CEC Rd 1 CAC-0061a**

4 **PREAMBLE:**

5 As stated in the glossaries listed above, AM includes mitigation measures to address
6 *unanticipated environmental effects*. However, at other points in the impact statement,
7 AM is identified as a means of dealing with *unforeseen effects* (e.g., Response to EIS
8 Guidelines, page 5-6), which we interpret as potentially includes a range of
9 uncertainties, an explanation congruent with AM literature.

10 AM is referenced throughout the document as an element of monitoring. For example
11 AM is one of four key principles of the Monitoring Plans submitted for the Project
12 (Response to EIS Guidelines, 8-7).

13 Executive Summary (Volume I p. 39) commits that the Environmental Protection
14 Program will set out the process for addressing unanticipated effects. "If unexpected
15 effects are detected, the program will also define processes for determining appropriate
16 adaptive management programs and practices."

17 In addressing this commitment, the Sediment Management Plan, for example, explains
18 the steps involved should the TSS reach certain thresholds (Section 4).

19 **QUESTION:**

20 Please confirm that Adaptive Management is designed to address unanticipated and
21 unforeseen effects, thus including the broadest definition of uncertainty.

22 **RESPONSE:**

23 Adaptive Management was designed to address unanticipated and unforeseen effects,
24 through monitoring and a commitment to follow up, as a means of dealing with
25 uncertainty in its broadest definition. This includes "real time" scenarios as described in
26 the Sediment Management Plan, as well as long term AM linked with the long-term
27 commitment to monitoring described in the various monitoring plans.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Sediment Management Plan (Section 4); p. N/A**

3 **CEC Rd 1 CAC-0061b**

4 **PREAMBLE:**

5 As stated in the glossaries listed above, AM includes mitigation measures to address
 6 unanticipated environmental effects. However, at other points in the impact statement,
 7 AM is identified as a means of dealing with unforeseen effects (e.g., Response to EIS
 8 Guidelines, page 5-6), which we interpret as potentially includes a range of
 9 uncertainties, an explanation congruent with AM literature.

10 AM is referenced throughout the document as an element of monitoring. For example
 11 AM is one of four key principles of the Monitoring Plans submitted for the Project
 12 (Response to EIS Guidelines, 8-7).

13 Executive Summary (Volume I p. 39) commits that the Environmental Protection
 14 Program will set out the process for addressing unanticipated effects. "If unexpected
 15 effects are detected, the program will also define processes for determining appropriate
 16 adaptive management programs and practices."

17 In addressing this commitment, the Sediment Management Plan, for example, explains
 18 the steps involved should the TSS reach certain thresholds (Section 4).

19 **QUESTION:**

20 Similar to the procedure identified in Section 4 of the Sediment Management Plan,
 21 please describe the general process in place for determining appropriate adaptive
 22 management programs and practices for unforeseen effects. This should include the
 23 timing between observation and action, the role of the MAC, and the communication
 24 plan for the Cree communities, government and public.

25 **RESPONSE:**

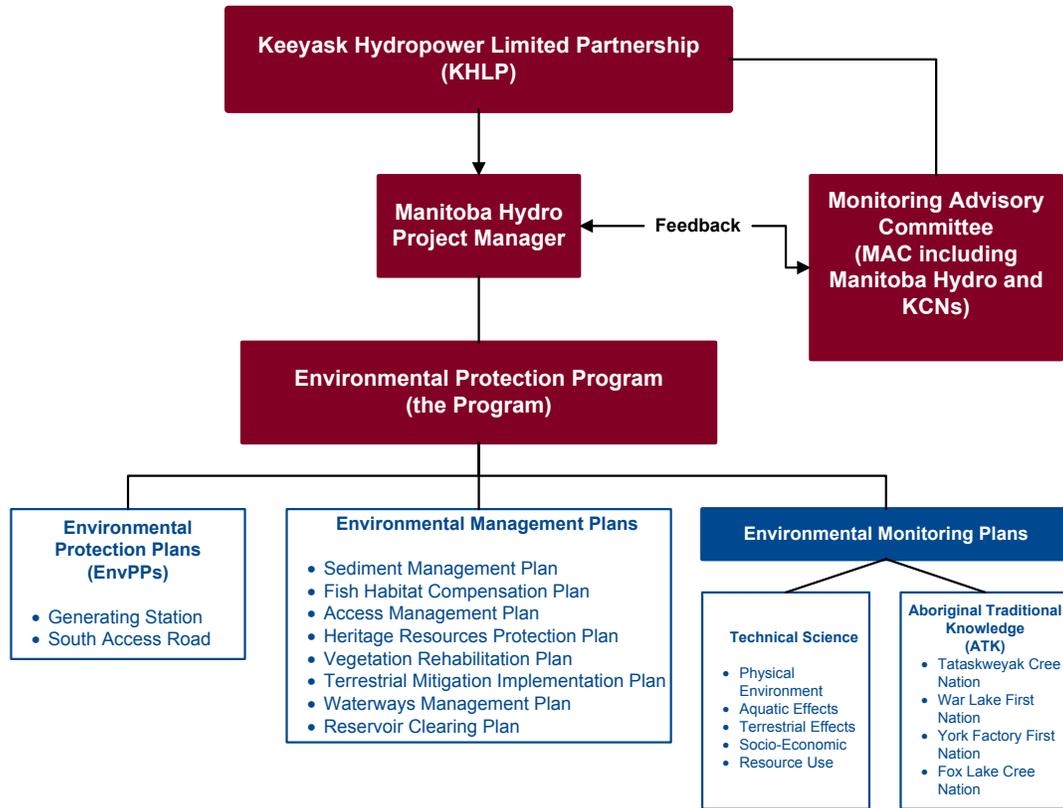
26 The Preliminary Construction In stream Sediment Management Plan is unique among
 27 the monitoring programs because it monitors, in real-time, in stream sediment
 28 concentrations during construction activities and is used to determine if changes in
 29 construction are needed to mitigate sediment inputs into the waterway within a very
 30 short time span.

31 Adaptive management is a fundamental component of the Project's Environmental
 32 Protection Program, most of which has been filed with regulators and is available on the
 33 Partnership's Website.

34 The preface to the Environmental Protection Program builds on text in Chapter 8 of the
35 Response to EIS Guidelines and indicates how the Partnership will work together on
36 implementing the Plan:

37 “Moving forward, long-term success of the project will continue to depend on
38 equal consideration of both ATK and technical science as a means to measure
39 the actual effects on the environment, and whether mitigation is working as
40 anticipated. With the above principles in mind, an Environmental Protection
41 Program has been developed to mitigate, manage and monitor potential
42 environmental effects described in the EIS during the construction and
43 operation phases of the Project... The Program includes a collection of plans
44 grouped in the following categories: Environmental Protection Plans,
45 Environmental Management Plans, and Environmental Monitoring Plans.

46 Figure 1 lists all of the plans included in the Program. It also demonstrates
47 graphically how the Program will be managed. The Keeyask Hydropower
48 Limited Partnership (the Partnership) has delegated authority to Manitoba
49 Hydro to manage construction and operation of the Project including
50 implementation of the Environmental Protection Program. The organizational
51 structure of the Partnership for this aspect of the Project includes a Monitoring
52 Advisory Committee (MAC), which includes participants from each of the
53 Keeyask Cree Nations and Manitoba Hydro. Manitoba Hydro will be guided on
54 the implementation of the Program by the MAC, the Partnership’s Board of
55 Directors and ongoing discussion with Regulators.



56
57 **Figure 1: Environmental Protection Program”**

58 The concept of adaptive management is integrated into the Environmental Protection
59 Program. The Partnership will undertake mitigation of the Project, will monitor the
60 success of mitigation of actual Project effects, will seek the guidance and advice of
61 Monitoring Advisory Committee (MAC) members based on Plan outcomes and will
62 determine whether modifications to current mitigation or new mitigation measures are
63 required to address actual Project outcomes.

64 As noted above, the primary venue for discussing and reviewing Program outcomes is
65 the MAC. The MAC is an advisory committee to the Partnership Board of Directors
66 comprised of Manitoba Hydro representatives involved in the Program and participants
67 from each of the KCNs. The MAC will review information and results generated as the
68 Program is implemented and, if appropriate, may provide advice and recommendations
69 to the Partnership about the need for additional or alternative mitigation measures. It is
70 anticipated that the outcomes of both the technical science and ATK monitoring
71 programs, as well as other aspects of the Program, will be reviewed and discussed at the
72 MAC. In this way, the MAC will provide an opportunity to review and discuss outcomes
73 from both a western science and ATK perspective and create a forum that will improve
74 understanding and respect among the partners, foster an environment of sharing and

75 collaboration among all partners in undertaking environmental stewardship activities
76 and lead to the implementation of a more robust environmental protection program.

77 On behalf of the Partnership, the MAC will also be responsible for communicating the
78 outcomes of the Program more broadly on an annual basis to Members of the KCNs
79 communities, regulators and the general public. Of particular note, the MAC will annual
80 submit annual monitoring reports, including discussion of related adaptive management
81 measures, to regulators and will also be post these on the Partnership's website. As
82 applicable, adaptive management information will also be included in the annual
83 Monitoring Overview reports (annual summary of Program results in non-technical
84 language) to be published by the Partnership.

85 Section 8.1.3 of the Response to EIS Guidelines provides examples of three types of
86 adaptive management circumstances: those for which predetermined adaptive
87 management measures are feasible, those for which adaptive management measures
88 will be designed based on monitoring and those for which no probably adaptive
89 management measures are available (see also response to CEC Rd 1 MMF-0013).

90 If action (alternative/additional mitigation or additional/amended monitoring) is
91 required it will be implemented as soon as it is feasible to do so. Timing of action may
92 be controlled by the season - for example, some actions may only be possible to
93 implement in the open water period meaning the time from discovery of unforeseen
94 effect until action may be several months. In other cases, action may be taken very
95 shortly after observation. Where appropriate, government agencies will be engaged in
96 the review and discussion of adaptive management options, selection of the
97 appropriate response and implementation.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: Section**
 2 **8 Monitoring & Follow-up; p. N/A**

3 **CEC Rd 1 CAC-0062**

4 **PREAMBLE:**

5 Experimentation is considered to be at the core of Adaptive Management (AM). That is,
 6 actions should be designed to test ideas about the behaviour of an ecosystem impacts
 7 by human use. The literature identifies two types of purposeful experimentation:
 8 passive AM, and active AM. Passive AM is should desired objectives not be met, one
 9 remediation is proposed, implemented and evaluated at a time. Active AM focuses on
 10 deliberately probing the system to test competing hypothesis, by implementing more
 11 than one strategy concurrently.

12 Section 8.6 outlines examples of predetermined AM measures.

13 **QUESTION:**

- 14 • To what degree will active AM be employed?
 15 • Can you provide examples of potential active AM strategies

16 A. For example, are there several competing prescriptions for vegetation rehabilitation
 17 that would be employed should the terrestrial habitat not respond to the EIS mitigation
 18 measures?

19 B. For example, are there competing designed for lake sturgeon spawning structures
 20 that might be employed should the structure not be as effective as anticipated?

21 **RESPONSE:**

22 It is agreed that experimentation is a valuable tool in the process of adaptive
 23 management in order to gain confidence in dealing with uncertainty and the
 24 effectiveness of alternate measures. In developing methods for managing adverse
 25 effects Manitoba Hydro investigates current and emerging technology and research
 26 conducted by others on alternate techniques. In addition, Manitoba Hydro invests
 27 considerable resources in funding research and development programs, many of which
 28 are focused on developing effective ways to measure and address adverse effects (e.g.,
 29 fish movements, fish habitat compensation and fish passage). Ideally, conducting this
 30 research prior to project construction, and applying mitigation/compensation measures
 31 already tested is preferred, in order to manage risks. However, it is recognized that in
 32 some instances, it is prudent to develop two or more methods of addressing adverse
 33 effects and implement them concurrently to test alternate hypotheses for solving the
 34 issue. It is possible that the Keeyask Vegetation Rehabilitation Plan may include more

35 than one generic prescription for challenging sites. Likewise, the design for the 12 ha of
36 off-system marsh development may include more than one approach for certain types
37 of marsh. The details of this Plan have not been developed yet, and this will be done
38 through consultation with federal and provincial regulators.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: Section**
2 **8 Monitoring & Follow-up; p. N/A**

3 **CEC Rd 1 CAC-0063a**

4 **PREAMBLE:**

5 The Joint Keeyask Development Agreement (JKDA) provides for a Monitoring Advisory
6 Committee (MAC). The Terms of Reference for this Committee are described in
7 Schedule 4-7 of the JKDA. In addition to providing a means of communication with KCNs
8 (2a), the MAC will “provide input into monitoring activities and planning” (2(b) (ii)).

9 Section 8 of the Response to EIS Guidelines notes that through the MAC, the Keeyask
10 Cree Nations “will be actively involved in the development of scientific monitoring
11 programs in the Partnership.”

12 The response to information request CAC-001 notes that “KCNs will play a role in
13 monitoring and follow-up plans (including ATK) through mechanism established through
14 governance structures of the JKDA”

15 **QUESTION:**

16 Please clarify the role of the MAC in the development and implementation of the
17 monitoring programs.

18 **RESPONSE:**

19 Preliminary technical monitoring plans have been developed and are available on the
20 Partnership’s website; ATK monitoring plans are still under development. These plans
21 were not developed by MAC, as MAC is not currently established. They were developed
22 in Partnership with the KCNs and are part of the Keeyask Generation Project
23 Environmental Protection Program.

24 The activities that occur and the results generated from the Environmental Protection
25 Program will be discussed at MAC meetings. The MAC is an advisory committee to the
26 Partnership Board of Directors and will review outcomes of the programs and, if
27 appropriate, provide advice and recommendations to the Partnership on additional
28 monitoring or alternative mitigation measures that may be required. The MAC will
29 provide a forum for collaboration among all partners.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: Section**
2 **8 Monitoring & Follow-up; p. N/A**

3 **CEC Rd 1 CAC-0063b**

4 **PREAMBLE:**

5 The Joint Keeyask Development Agreement (JKDA) provides for a Monitoring Advisory
6 Committee (MAC). The Terms of Reference for this Committee are described in
7 Schedule 4-7 of the JKDA. In addition to providing a means of communication with KCNs
8 (2a), the MAC will “provide input into monitoring activities and planning” (2(b) (ii)).

9 Section 8 of the Response to EIS Guidelines notes that through the MAC, the Keeyask
10 Cree Nations “will be actively involved in the development of scientific monitoring
11 programs in the Partnership.”

12 The response to information request CAC-0001 notes that “KCNs will play a role in
13 monitoring and follow-up plans (including ATK) through mechanism established through
14 governance structures of the JKDA”

15 **QUESTION:**

16 Should KCN request a report be issued to the General Partner (and thus appended to
17 the board of the General Partner) as per section 9, what, if any, is the process for
18 resolving outstanding concerns?

19 **RESPONSE:**

20 As per the Monitoring Advisory Committee (MAC) Terms of Reference, a report
21 outlining concerns raised by the KCNs at MAC will be provided to the board (Board) of
22 the General Partner upon request. In accordance with the JKDA, each of the KCNs is
23 entitled to representation on the Board for as long as a KCN owns units in the Keeyask
24 Hydropower Limited Partnership. As a result of this representation, concerns forwarded
25 by MAC to the Board will be discussed and addressed by both the KCNs and Hydro.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: Section**
2 **8 Monitoring & Follow-up; p. N/A**

3 **CEC Rd 1 CAC-0063c**

4 **PREAMBLE:**

5 The Joint Keeyask Development Agreement (JKDA) provides for a Monitoring Advisory
6 Committee (MAC). The Terms of Reference for this Committee are described in
7 Schedule 4-7 of the JKDA. In addition to providing a means of communication with KCNs
8 (2a), the MAC will “provide input into monitoring activities and planning” (2(b) (ii)).

9 Section 8 of the Response to EIS Guidelines notes that through the MAC, the Keeyask
10 Cree Nations “will be actively involved in the development of scientific monitoring
11 programs in the Partnership.”

12 The response to information request CAC-001 notes that “KCNs will play a role in
13 monitoring and follow-up plans (including ATK) through mechanism established through
14 governance structures of the JKDA”

15 **QUESTION:**

16 Is there potential for the MAC to have a greater role in monitoring, for example having
17 on-site visits to evaluate project impacts, or implement select independent monitoring
18 studies?

19 **RESPONSE:**

20 MAC meetings will be conducted at the Keeyask project site and many meetings will
21 include a tour of the construction site so committee members can see the construction
22 progress and the mitigation being employed.

23 MAC will not implement independent monitoring studies. MAC is an advisory
24 committee to the Partnership Board of Directors and will review outcomes of the
25 programs and, if appropriate provide advice and recommendations to the Partnership
26 on additional monitoring or alternative mitigation measures that may be required.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
 2 **Section: 4; p. N/A**

3 **CEC Rd 1 CAC-0064**

4 **PREAMBLE:**

5 The impact statement notes, in several locations, that Manitoba Hydro's EMS system is
 6 ISO 14001 registered, and it anticipates that this project will be included in that
 7 registration (eg., Project Description 4-11; Response to EIS Guidelines 4-49; 8-1). For
 8 example, certification is cited as evidence of Hydro's "continual improvement of
 9 environmental performance." (Response to EIS Guidelines 8-1)

10 **QUESTION:**

- 11 • Please explain how certification demonstrates continual improvement of
 12 environmental performance, with specific examples.
 13 • Please include a copy of the most recent ISO-14001 audit. If this is not possible,
 14 please summarize the outcomes of this audit, including areas where improvement
 15 was suggested.

16 **RESPONSE:**

- 17 • *Please explain how certification demonstrates continual improvement of*
 18 *environmental performance, with specific examples.*

19 An ISO 14001-registered Environmental Management System (EMS) follows the 'Plan-
 20 Do-Check-Act' cycle, which perpetuates a process of continual improvement.
 21 Improvements are recognized and acted upon through two processes: self assessment
 22 and audit.

23 The standard requires organizations to identify what are known as "significant aspects",
 24 which are those aspects of the organization's activities with the potential for significant
 25 environmental impact. Once these aspects are identified, controls must be put in place
 26 to minimize the risk of environmental impact. The organization must then check the
 27 effectiveness of the controls, which can be done through self-assessment and then act
 28 on any improvements that are required.

29 In order to maintain the ISO 14001 registration, accredited auditors regularly review
 30 how well the organization meets the requirements of the ISO 14001 standard. This
 31 process includes reviewing these controls and assessing their effectiveness, as well as
 32 looking at all other required elements of the standard (such as staff training,
 33 documentation of procedures, emergency response plans, etc.).

34 In the event that an ISO 14001 auditor determines one of these items does not meet the
35 requirements, they can issue an opportunity for improvement or a finding. A finding
36 must be formally addressed through a correction within a specific period of time. The
37 correction must then be tested for effectiveness to ensure its sustainability.

38 This process of identifying significant activities, implementing controls and measuring
39 them for effectiveness is reviewed by the organization on a regular basis, as required by
40 the ISO 14001 standard. Organizations may find that as their environmental
41 performance improves with the implementation of an EMS, activities once considered
42 high risk are controlled to the point that the risk is lessened. Other activities are then
43 identified as priorities, and the process continues until those activities are fully
44 controlled.

45 An example of a significant aspect could be an activity which poses a risk of releasing oil
46 into the ground or water. The organization may determine that an appropriate control
47 to reduce the risk would be to install an oil/water separator, to ensure that any oil
48 spilled would be diverted and captured before it could reach the ground or water.
49 Identifying this activity and the associated control would be the 'Plan' portion of the
50 cycle as identified above.

51 This separator would have to be installed and calibrated, staff would be trained in its
52 use and it would be monitored to ensure that it is working. This is the 'Do' part of the
53 cycle. The amount of oil captured in the separator could be measured against the
54 amount of oil unaccounted for in the system to determine how effective it was
55 ('Check'). If this method of self-assessment finds that the control is not effective, this
56 provides the organization with an opportunity for improvement (the 'Act' portion of the
57 cycle).

58 • *Please include a copy of the most recent ISO-14001 audit. If this is not possible,*
59 *please summarize the outcomes of this audit, including areas where improvement*
60 *was suggested.*

61 The ISO 14001 audit reports are considered to be the intellectual property of the
62 auditors and, as such, cannot be released in whole or in part without their written
63 consent. In the past, the auditor has agreed to the production of its audit subject to the
64 party, or parties, receiving it executing a "confidentiality agreement". Such a condition
65 makes it impossible for the receiving party to make any real use of the information it
66 contains in a public hearing process. Accordingly, we are unable to provide a copy of
67 the most recent audit. We asked the auditor for permission to provide a summary of the
68 audit and the auditor advised it is not prepared to give such permission.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8; p.**
2 **N/A**

3 **CEC Rd 1 CAC-0065a**

4 **PREAMBLE:**

5 The Environmental Protection Plan for the Bi-Pole III Project included:

- 6 1. An Environmental Protection Information Management System (EPIMS): an
7 electronic system for compiling and managing results of environmental monitoring;
8 and
9 2. A community liaison (in addition to an environmental monitor) who would be on-
10 site 1-2 days per week during construction.

11 However, I could not find reference to either in the Environmental Protection Program
12 for Keeyask.

13 **QUESTION:**

14 Does the Environmental Protection Plan for Keeyask include the use of an EPIMS?

15 **RESPONSE:**

16 Although the acronym Environmental Protection Information Management System
17 (EPIMS) is not used in the Keeyask Environmental Protection Program, a system will be
18 in place for the management of environmental project information. An electronic
19 central storage system will be used for project information including but not limited to
20 environmental protection program documents, licenses, permits and authorizations.
21 Data from monitoring fieldwork will be maintained in a database which also includes the
22 data gathered during the over 10 years of environmental assessment studies completed
23 to prepare the Environmental Impact Statement.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8; p.**
2 **N/A**

3 **CEC Rd 1 CAC-0065b**

4 **PREAMBLE:**

5 The Environmental Protection Plan for the Bi-Pole III Project included:

- 6 1. An Environmental Protection Information Management System (EPIMS): an
7 electronic system for compiling and managing results of environmental monitoring;
8 and
- 9 2. A community liaison (in addition to an environmental monitor) who would be on-
10 site 1-2 days per week during construction.

11 However, I could not find reference to either in the Environmental Protection Program
12 for Keeyask.

13 **QUESTION:**

14 Will there be a Manitoba Hydro Position termed "environmental monitor"? (as this is
15 not specified in section 1.4 of the Generating Station Construction Environmental
16 Protection Plan)

17 **RESPONSE:**

18 There is no Manitoba Hydro position for the Keeyask Generation Project termed
19 "environmental monitor", as described in the Draft Environmental Protection Plan for
20 the Bipole III project. There will be a Site Environmental Officer(s) for the project that
21 will be responsible for conducting environmental compliance monitoring to confirm that
22 the terms of the EnvPP and other project related permits, authorizations, licences,
23 approvals, regulations and guidelines are followed.

24 The Bipole III environmental monitors are to be community members. Community
25 members of the Keeyask Cree Nations (KCNs) will participate in monitoring the Keeyask
26 Generation Project in several ways. Each of the KCNs will undertake their own ATK
27 monitoring, based on their Cree worldview. KCN members will work with environmental
28 consultants during technical science monitoring activities, as they have during the many
29 years of assessment studies. The KCNs will also be members of the Monitoring Advisory
30 Committee (MAC) where information and results of the entire Environmental Protection
31 Program (described in Chapter 8 of the Response to the EIS Guidelines), including ATK
32 monitoring, will be discussed. If results indicate that unforeseen effects are occurring,
33 possible alternative or additional mitigation will be discussed and determined.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8; p.**
2 **N/A**

3 **CEC Rd 1 CAC-0065c**

4 **PREAMBLE:**

5 The Environmental Protection Plan for the Bi-Pole III Project included:

- 6 1. An Environmental Protection Information Management System (EPIMS): an
7 electronic system for compiling and managing results of environmental monitoring;
8 and
- 9 2. A community liaison (in addition to an environmental monitor) who would be on-
10 site 1-2 days per week during construction.

11 However, I could not find reference to either in the Environmental Protection Program
12 for Keeyask.

13 **QUESTION:**

14 Will there be a community liaison positions? (as this is not specified in section 1.4 of the
15 Generating Station Construction Environmental Protection Plan)

16 **RESPONSE:**

17 There will be community liaison positions for the Keeyask Generation Project. These
18 positions will be filled by community members of the Keeyask Cree Nations.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.9-4,5**
 2 **and 11; p. N/A**

3 **CEC Rd 1 CAC-0066**

4 **PREAMBLE:**

5 **Rationale**

6 In several instances the project proponent outlines principles, policies, guidelines and
 7 goals for sustainable development that require enhancement of the natural
 8 environment, for which the proposed project is claimed to meet. Two examples are
 9 Goal 6 of Federal Sustainable Development Goals - Ecosystem / Habitat Conservation
 10 and Protection

11 *Goal* – Maintain productive and resilient ecosystems with the capacity to
 12 recover and adapt; and protect areas in ways that leave them unimpaired for
 13 present and future generations.

14 *EIS Response* – “Special efforts have been undertaken to avoid or minimize
 15 Project effects to habitat and ecosystem intactness and to replace the loss of
 16 important habitat types; for example, sensitive terrestrial habitat sites were
 17 avoided to the extent feasible when routing roads and locating borrow and
 18 excavated material placement areas. Overall, the likely Project related effects
 19 on ecosystem diversity are expected to be adverse but regionally acceptable
 20 because no stand level habitat types are lost, the distribution of area amongst
 21 the stand level habitat types is not expected to change substantially and the
 22 cumulative area losses for all of the priority habitat types remains below 10%
 23 (Keeyask HLP 2012, 9.5)”

24 Principle 1 of Manitoba Hydro’s Sustainable Development Principles – Stewardship of
 25 the Economy and the Environment

26 *Principle* – Recognize its responsibility as a caretaker of the economy and the
 27 environment for the benefit of present and future generations of Manitobans.
 28 Meet the electricity needs of present and future Manitobans in a manner that
 29 ensures the long-term integrity and productivity of our economy, our
 30 environment and our natural resources, and safeguards our human health.

31 *EIS Response* – Consistent with the KCNs’ commitment to caring for Askiy and
 32 Manitoba Hydro’s commitment to sustainable development, the Project has
 33 been designed to minimize adverse effects and maximize benefits to local and
 34 regional residents. Manitoba Hydro and the KCNs have planned the Project

35 together and completed more than a decade of both ATK and technical studies
 36 to predict and mitigate adverse effects and enhance Project benefits. (Keeyask
 37 HLP 2012, 9.11).

38 In general, there are few to no mentions of enhancing the natural environment and
 39 improving ecological resilience. Where there are attempts described as improvements
 40 (such as a habitat and fish-stocking program (Keeyask HLP 2012, 9.4) there are concerns
 41 regarding whether such actions will in fact lead to long-term improvement.

42 Given the historically negative impact of hydro development on the natural
 43 environment (as well as First Nations ways of living, etc.) it is imperative that future
 44 actions by Manitoba Hydro lead to improved environmental outcomes rather than
 45 simply avoiding adverse effects. Furthermore, given the proponents' claims to have met
 46 various sustainability goals, principles, policies and guidelines, many of which require
 47 environmental enhancement, it is necessary for the proponent to better describe and
 48 justify how its actions will lead to such enhancement.

49 **QUESTION:**

50 Please describe how the proposed EIS will have positive impacts on the environment as
 51 opposed to minimizing adverse harm. Please provide attention to:

- 52 • climate change mitigation
- 53 • enhancement of long-term ecological resilience
- 54 • appropriate land-use planning
- 55 • the avoidance of adverse effects

56 **RESPONSE:**

57 The federal EIS Guidelines require a description of "the effects of the Project on the
 58 capacity of renewable resources to meet the needs of the present and those of the
 59 future." Where possible, the Project has been planned and designed not only to meet
 60 these needs but to enhance the existing natural environment and improve ecological
 61 resilience. The references to fish stocking programs and climate change are excellent
 62 examples of this and commitments have been made for monitoring and adaptive
 63 management to facilitate achievement of these goals. The Response to TAC Public Rd 2
 64 CEAA-0015 provides discussion of capacity indicators and assessment methods.

65 Additional information on the four listed topics is provided below.

66 Climate Change Mitigation

67 With respect to climate change, the Project will contribute to substantial reductions in
 68 greenhouse gases (GHG) by displacing fossil fuel electricity generation. A detailed Life
 69 Cycle Assessment was conducted by the Pembina Institute (see Section 2.4.1.1 of PE SV)

70 to estimate the GHG emissions resulting from the construction, land use change,
71 operation, and decommissioning of the Project. The resulting emissions are extremely
72 low relative to other forms of generation. An equivalent amount of electricity, produced
73 by a combined cycle natural gas generating station during one year of operation would
74 result in more than double the entire life cycle emissions estimated associated with the
75 Keeyask Project over a 100 year period. Since the Project will displace gas and coal
76 generation, primarily in the U.S. Midwest, it will contribute to substantial GHG
77 reductions. The Project is estimated to displace 30 million tonnes of carbon dioxide
78 equivalent during the first 10 years of operation.

79 Enhancement of Long-Term Ecological Resilience

80 With respect to long-term ecological resilience, the assessments considered the effects
81 of the Project in the ecological and social context, as described in Chapter 5, p. 5-13.
82 These assessments included consideration of whether a VEC is particularly sensitive to
83 disturbance and has the capacity to adapt to change. This includes, where relevant, the
84 rarity, uniqueness and fragility of the VEC within the ecosystem (e.g., rare
85 species/habitats, critical habitats, breeding areas). As described in p. 9-18, special
86 attention has been given to sensitive species and habitats. One example is Lake
87 Sturgeon, a species designated as endangered by COSEWIC and being considered for
88 designation under the *Species at Risk Act*. Lake Sturgeon were assessed as being at risk
89 in terms of ecological resilience and so particular attention was given to this species.
90 Through a combination of mitigation measures that include habitat enhancement, and a
91 fish stocking program, the objective is not only to maintain existing stocks but to
92 improve the species' population over existing conditions.

93 Fish and moose harvest sustainability plans have been developed by the CNP to guide
94 the sustainable harvest of fish and moose in the Split Lake Resource Management Area
95 (SLRMA). Moose and caribou monitoring will also be conducted by the Partnership to
96 promote future sustainability of the regional populations.

97 Manitoba Hydro also works collaboratively on stewardship activities with regulators,
98 academic institutions, First Nations and stakeholder organizations such as the various
99 resource management boards in northern Manitoba, the Nelson River Sturgeon Board
100 and the Saskatchewan River Sturgeon Management Board. Due to the priority and risks
101 to Lake Sturgeon, as indicated above, Manitoba Hydro and the other KHLPP partners are
102 among the founding members of the newly established Lower Nelson River Sturgeon
103 Stewardship Committee, which is made up of interested stakeholders, including local
104 First Nations, committed to implementing measures to protect and enhance sturgeon
105 populations in the Lower Nelson River from Kelsey Generating Station to Hudson Bay.

106 Manitoba Hydro has been conducting stewardship activities related to Lake Sturgeon
 107 and the impacts of hydroelectric development since the 1980s, and activities have
 108 expanded dramatically since that time. Manitoba Hydro has organized its internal
 109 stewardship initiatives into a formal Lake Sturgeon Stewardship & Enhancement
 110 Program (LSSEP), which focuses on filling information gaps on population status, habitat
 111 availability, biology and ecology in the Nelson, Churchill, Saskatchewan and Winnipeg
 112 rivers. LSSEP activities also include rearing and stocking Lake Sturgeon from Manitoba
 113 Hydro's Grand Rapids Fish Hatchery in areas where the population status and needs are
 114 well understood, educational programs about the needs and vulnerability of Lake
 115 Sturgeon, and the development of measures to mitigate the impacts of hydroelectric
 116 development, e.g., constructed spawning shoals.

117 Appropriate Land-Use Planning

118 With respect to land-use planning, the Project is located on Crown lands. Project effects
 119 on socio-economic VECs such as population growth, housing, infrastructure and services
 120 and transportation infrastructure have considered existing land use plans or processes
 121 (where they exist) when undertaking the assessment. In the case of Gillam, specifically,
 122 the Gillam Land Use Planning process is currently underway by Manitoba Hydro, the
 123 Town and FLCN to examine and address future community growth, including housing,
 124 infrastructure and services and the need for new serviceable land (see Section 4.4.1 of
 125 the SE SV for further details).

126 The Avoidance of Adverse Effects

127 The EIS contains many references to measures taken to avoid or minimize adverse
 128 effects. These include planning and design features; the study of alternative means of
 129 developing the Project (see Section 6 of Project Description S V); mitigation measures
 130 such as the Reservoir Clearing Plan (Section 3.6 of PD SV and 10.4.3.1 of PE SV),
 131 Waterways Management Program (Section 3.9 of PD SV and Section 10.4.3.2 of PE SV),
 132 establishment of a Worker Interaction Committee (Section 5.4.1 of the SE SV), and many
 133 other mitigation measures discussed in each of the SVs.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.9-6**
 2 **and 12; p. N/A**

3 **CEC Rd 1 CAC-0067**

4 **PREAMBLE:**

5 Rationale In several instances the project proponent outlines principles, policies,
 6 guidelines and goals for sustainable development that require integrated decision-
 7 making, for which the proposed project is claimed to meet. Two examples are

8 Government of Manitoba Sustainable Development Principle – Integration of
 9 Environmental and Economic Decisions

10 *Principle* – Economic decisions should adequately reflect environmental, human
 11 health and social effects. Environmental and health initiatives should
 12 adequately take into account economic, human health and social consequences.

13 *EIS Response* – The proponent argues the project will provide clean affordable
 14 energy in comparison to coal and gas (Keeyask HLP 2012, 9.6).

15 Manitoba Hydro Policy/Principle 3 – Integration of Environmental and Economic
 16 Decisions:

17 *Policy/Principle* – Treat technical, economic and environmental factors on the
 18 same basis in all corporate decisions, from initial planning to construction to
 19 operations to decommissioning and disposal. To the extent practical, include
 20 environmental costs in economic and financial analysis.

21 *EIS Response* – A major example of this integration is the Project design. The
 22 Project incorporates mitigation, compensation and enhancement measures to
 23 reduce adverse environmental and social impacts and maximize benefits. By
 24 incorporating these measures into the Project’s capital and operating budgets,
 25 the Project costs closely reflect the full societal cost of the Project (Keeyask HLP
 26 2012, 9.12).

27 Both responses by the proponent are noteworthy insofar as they illustrate attempts to
 28 increase positive outcomes from the project. However, it is unclear to what extent the
 29 EIS represents a serious attempt at integration.

30 The intent of integration is not simply to look at mitigation or enhancement of effects in
 31 economic, social and biophysical areas, but rather to consider the entire full suite of
 32 requirements for progress towards sustainability, including their interrelations, covering

33 interactive effects as well as effects in particular areas. Likewise, the impacts of the
 34 project - both good and bad, on the natural environment, First Nation communities, the
 35 people of Manitoba, etc. both and now and in the future – cannot be separated into
 36 social, ecological, and economic components without losing much, if not all, that many
 37 consider valuable in this world. Given the scale of this proposed project, and the
 38 possibility of the project providing long-term lasting benefits, if properly undertaken, it
 39 is important to ensure that the decision-making framework is appropriated integrated.

40 **QUESTION:**

41 Please describe how the proposed EIS represents an integrated approach to decision-
 42 making and planning, particularly with regards to sustainable development. Please
 43 provide attention to:

- 44 • applying integrated assessment to seek the best alternative
- 45 • the achievement of mutually reinforcing positive gains through all of Manitoba
 46 Hydro's activities
- 47 • the avoidance of tradeoffs

48 **RESPONSE:**

49 The Partnership considers this Information Request to be out of scope of the Clean
 50 Environment Commission review of the Keeyask Generation Project. The details being
 51 requested will be reviewed and discussed as part of the Needs For and Alternatives To
 52 (NFAT) review of Manitoba Hydro's preferred development plan currently being
 53 undertaken by the Public Utilities Board (PUB) at the request of the Manitoba
 54 government.

55 Under *The Manitoba Hydro Act*, the provincial government must approve the
 56 development of any new generating stations, transmission interconnections, or power
 57 exports and imports that are proposed by Manitoba Hydro, either independently or in
 58 partnership with others.

59 Approval for the Keeyask Generation Project will only be provided after completion of
 60 the NFAT review process being conducted by the PUB. The review will examine the
 61 "need-for-and-alternatives-to" Manitoba Hydro's preferred development plan, which
 62 includes the Keeyask and Conawapa Generating Stations, their associated domestic AC
 63 transmission facilities and a new Canada-USA transmission interconnection.

64 Based on the Terms of Reference issued for the review by the Manitoba government on
 65 April 25, 2013, the following scope has been established for the NFAT review:

66 "The Panel will review and assess the needs for and alternatives to Hydro's Plan. Its
 67 assessment will be based upon the evidence submitted by Hydro, intervenors and

68 independent expert consultants used by PUB to assist in the NFAT. The Panel's
69 report to the Minister will address the following items:

- 70 1. An assessment as to whether the needs for Hydro's Plan are thoroughly
71 justified, and sound, its timing is warranted, and the factors that Hydro
72 is relying upon to prove its needs are complete, reasonable and
73 accurate. The assessment will take the following factors into
74 consideration:
- 75 a. The alignment of the Plan to Hydro's mandate, as set out in Section
76 2 of *The Manitoba Hydro Act*.
 - 77 b. The alignment of the Plan to Manitoba's Clean Energy Strategy and
78 the Principles of Sustainable Development as outlined in *The*
79 *Sustainable Development Act*.
 - 80 c. The extent to which the Plan is needed to address reliability and
81 security requirements of Manitoba's electricity supply.
 - 82 d. The reasonableness, thoroughness and soundness of all critical
83 inputs and assumptions Hydro relied upon for its justification of its
84 needs. This should include Hydro's planning load forecast and future
85 load scenarios, its demand and supply analysis, export expectations
86 and commitments, and demand side management and conservation
87 forecasts.
- 88 2. An assessment as to whether the Plan is justified as superior to
89 potential alternatives that could fulfill the need. The assessment will
90 take the following factors into consideration:
- 91 a. If preferred and alternative resource and conservation evaluations
92 are complete, accurate, thorough, reasonable and sound;
 - 93 b. The alignment of the Plan and alternatives to Manitoba's Clean
94 Energy Strategy, *The Climate Change and Emissions Reduction Act*
95 and the Principles of Sustainable Development as outlined in *The*
96 *Sustainable Development Act*;
 - 97 c. The accuracy and reasonableness of the modeling of export
98 contract sale prices, terms, conditions, scheduling provisions, export
99 transmission costs, and the reasonableness of projected revenues;
 - 100 d. The reasonableness of forecasted critical inputs including
101 construction costs, opportunity export revenues, future fuel prices,
102 electricity market price forecasts, the determinants of those values,
103 and export volumes;
 - 104 e. The reasonableness of the scope and evaluation of risks and the
105 benefits proposed to arise from the development and the
106 reasonableness and the reliability of Hydro's interpretation of the
107 most likely future outcomes as a result of climate changes, interest

- 108 rate fluctuations, export market prices, domestic load fluctuations,
 109 droughts, competing technologies, fuel prices, carbon pricing,
 110 technology developments, economic conditions, Hydro's
 111 transmission positions and other relevant factors;
- 112 f. The impact on domestic electricity rates over time with and without
 113 the Plan and with alternatives;
 - 114 g. The financial and economic risks of the Plan and export contracts
 115 and export opportunity revenues in relation to alternative
 116 development strategies;
 - 117 h. The socio-economic impacts and benefits of the Plan and
 118 alternatives to northern and aboriginal communities;
 - 119 i. The macro environmental impact of the Plan compared to
 120 alternatives;
 - 121 j. If the Plan has been justified to provide the highest level of overall
 122 socio-economic benefit to Manitobans, and is justified to be the
 123 preferable long-term electricity development option for Manitoba
 124 when compared to alternatives.

125 At the NFAT review, Manitoba Hydro intends to demonstrate that continued
 126 development of Manitoba's renewable hydroelectric resources is the best approach
 127 from an environmental perspective and from an economic point of view, delivering the
 128 lowest electricity rates for Manitobans compared to the alternatives.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 9-10**
 2 **and 13; p. N/A**

3 **CEC Rd 1 CAC-0068**

4 **PREAMBLE:**

5 Rationale In several instances the project proponent outlines principles, policies,
 6 guidelines and goals for sustainable development that relate to the development of a
 7 sustainable society. Two examples are

8 Manitoba Guidelines for Sustainable Development – Waste Minimization and
 9 Substitution:

10 *Guideline* - (a) Encouraging and promoting the development and use of
 11 substitutes for scarce resources where such substitutes are both
 12 environmentally sound and economically viable; and (b) Reducing, reusing,
 13 recycling and recovering the products of society.

14 *EIS Response* – While opportunities to recycle wastes in remoter northern areas
 15 are limited, waste generated by the Project will be minimized and waste
 16 materials will be recycled to the extent practical, and the remaining waste will
 17 be disposed of in accordance with license and regulatory requirements (Keeyask
 18 HLP 2012, 9.10).

19 Manitoba Hydro Sustainable Development Policy/Principles – Conservation

20 *Policy/Principle* – To the extent practical, plan, design, build, operate, maintain
 21 and decommission Corporate facilities in a manner that protects essential
 22 ecological processes and biological diversity. Give preference, where practical,
 23 to projects and operating decisions that use renewable resources or that extend
 24 the life of supplies of non-renewable resources.

25 *Response* – Hydropower utilizes a renewable resource, thus assisting in the
 26 conservation of non-renewable resources such as gas or coal that otherwise
 27 would be used to generate the electricity being produced at the Project
 28 (Keeyask HLP 2012, 9.13).

29 The responses by the proponent indicate positive steps, but much more is evidently
 30 needed. Both the guideline and the policy/principle provided above need to be
 31 understood more broadly in society. Neither of them relates solely, nor even primarily,
 32 to the environmental impacts of supplying electricity, but rather to the broader
 33 consumption of resources and production of wastes in society. Furthermore, this

34 broader understanding of sustainability is illustrated in Manitoba Hydro's full set of
35 sustainable development policy/principles (Manitoba Hydro n.d.).

36 The proposed project represents an important opportunity for Manitoba to take steps in
37 a transition towards a more sustainable society. For such a transition to take place,
38 however, planning for future energy undertakings must take proactive measures to
39 address both the supply of electricity as well as the end-uses of the electricity. At this
40 point, however, it is unclear how the proposed project plays a role in the transition to a
41 sustainable society beyond reducing GHG emissions.

42 **QUESTION:**

43 Please provide as background an explanation of how the comparative assessment of
44 alternatives leading to the project proposal included attention to sustainability
45 principles including the one noted above in determining that the proposed project
46 would be preferable to demand management alternatives.

47 Please also describe how the proposed project will help Manitoba transition to a
48 sustainable society that uses energy and resources in an efficient, benign and renewable
49 manner. Please provide attention to:

- 50 • the reduction of overall energy and resource consumption
- 51 • the promotion of appropriate uses of energy and matching of energy supply quality
52 to final needs
- 53 • the development of a resilient energy system in Manitoba
- 54 • the avoidance of resource conflicts

55 **RESPONSE:**

56 The Partnership considers this Information Request to be out of scope of the Clean
57 Environment Commission review of the Keeyask Generation Project. The details being
58 requested will be reviewed and discussed as part of the Needs For and Alternatives To
59 (NFAT) review of Manitoba Hydro's preferred development plan currently being
60 undertaken by the Public Utilities Board (PUB) at the request of the Manitoba
61 government.

62 For further details on the NFAT review, please see the response to CEC Rd 1 CAC-0067.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.9 – 6**
 2 **and 14; p. N/A**

3 **CEC Rd 1 CAC-0069**

4 **PREAMBLE:**

5 **Rationale**

6 In several instances the project proponent outlines principles, policies, guidelines and
 7 goals for sustainable development that relate to the need for fostering and maintaining
 8 livelihood opportunities. Two examples are:

9 Government of Manitoba Principles of Sustainable Development – Shared Responsibility
 10 and Understanding

11 *Principle* – Manitobans should acknowledge responsibility for sustaining the
 12 economy, the environment, human health and social well-being, with each
 13 being accountable for decisions and actions in a spirit of partnership and open
 14 cooperation. Manitobans share a common economic, physical and social
 15 environment. Manitobans should understand and respect differing economic
 16 and social views, values, traditions and aspirations. Manitobans should consider
 17 the aspirations, needs and views of the people of the various geographical
 18 regions and ethnic groups in Manitoba, including Aboriginal peoples, to
 19 facilitate equitable management of Manitoba's common resources (Manitoba
 20 1998).

21 *EIS Response* – The processes for developing the Project have included the
 22 development of a partnership that is intended, in part, to meet the societal,
 23 cultural, economic and employment aspirations of the local KCNs communities,
 24 which include the continuation of traditional and cultural practices, as well as a
 25 deeper integration into the regional and provincial economy. Discussions
 26 leading to the formation of the Partnership and the planning and environmental
 27 assessment activities have led to a growing understanding and respect for the
 28 different values, and worldviews of Manitoba Hydro and the KCNs. (Keeyask HLP
 29 2012, 9.6).

30 Manitoba Hydro Sustainable Development Policy/Principles – Understanding and
 31 Respect

32 *Policy/Principle* – Strive to understand and respect differing social and economic
 33 views, values, traditions and aspirations when deciding upon or taking action.
 34 Give preference to those alternatives that best fulfil Corporate objectives while

35 minimizing infringement on the ability, rights, and interests of others to pursue
36 their aspirations.

37 *EIS Response* – The Project proponent is a partnership comprising Manitoba
38 Hydro and the KCNs. Considerable effort has been made in forging constructive
39 relationships between Manitoba Hydro and the KCNs, including facilitating
40 community studies aimed at understanding history, community history, and
41 more importantly the Cree worldview and ATK. This growing understanding has
42 had a major impact on Project design, construction and operation. It has also led
43 to specific arrangements through community-specific [adverse effects
44 agreements]” (Keeyask HLP 2012, 9.14).

45 Both responses are notable insofar as they recognize the shared responsibility of the
46 project proponents to ensure lasting and desirable livelihood opportunities and
47 foundations, particularly among the First Nation communities. While the EIS contains
48 significant discussion relating to livelihood opportunities, no overall picture emerges
49 from the discussions with regards to the overall and integrated effects on livelihood
50 opportunities, especially lasting ones. A project of this scope may provide Manitoba
51 Hydro an important opportunity to meet the goals of sustainable livelihood foundations
52 over the entire lifecycle of the project (e.g. construction, operation, end-use of the
53 electricity). To obtain these benefits requires a proactive and integrated approach to
54 decision making.

55 **QUESTION:**

56 Please describe how the proposed project will ensure sufficient and desirable livelihood
57 opportunities both now and in the future. Please provide attention to:

- 58 • basic livelihood foundations (e.g. skills and education, social capital)
- 59 • protection of the most vulnerable
- 60 • lasting local economic development
- 61 • maintenance of First Nations ways of living; and
- 62 • prevention of boom and bust cycles Please describe how the proposed project
63 compares with alternatives to and alternative means of the project with regards to
64 fostering livelihood opportunities.

65 **RESPONSE:**

66 In Section 9.2.1 of the Response to EIS Guidelines, the Partnership specifically notes the
67 following:

68 “The World Commission on Environment and Development put forward the
69 proposition that the empowerment of vulnerable indigenous people is a
70 touchstone of a sustainable development policy (United Nations World

71 Commission on Environment and Development 1987). The Commission was
72 concerned that the gradual advance of development into remote regions would
73 increase the vulnerability of indigenous people as they were often left out of the
74 processes of economic development. The Keeyask Cree Nations (KCNs), in each
75 of their respective Environmental Evaluation Reports, have shared their
76 perspectives about how past hydroelectric projects have affected their
77 communities.

78 In contrast to the past, the Project puts into practice the proposition of greater
79 empowerment of local indigenous people. The KCNs Partners have been directly
80 involved in planning the Project and the environmental impact assessment,
81 emphasizing the importance of respecting Mother Earth in a manner consistent
82 with their Cree worldview. As expressed in their philosophy of *mino pimatisiwin*
83 (or “living the good and honourable life”), everything is interrelated and must
84 be respected. Each KCN received funding to undertake its own evaluation of the
85 Project and to involve its community in the decision as to whether or not to
86 become a partner in the initiative. The KCNs’ Environmental Evaluation Reports
87 speak to a desire to restore harmony and balance with Mother Earth, to protect
88 the environment, which is broadly defined to include people’s wellbeing, to
89 maintain and enhance their culture and traditions, and to provide greater hope
90 and opportunities for future generations. The decision to support the Project
91 was difficult, requiring much study, discussion and soul searching. Ultimately,
92 the decision to proceed was based on evaluations of social, economic and
93 environmental considerations, and a focus on both present and future
94 generations to whom the benefits of the Project would accrue. In deciding to
95 proceed with the Project, the KCNs saw an opportunity for current and future
96 generations to benefit economically and to build their communities’ capacity
97 and self-sufficiency, while respecting and maintaining their Cree values,
98 teachings, identity, culture and traditional knowledge.”

99 As part of preparing for the Project, the \$60 Million Hydro Northern Training and
100 Employment Initiative (HNTEI) was implemented with funding from Manitoba Hydro,
101 Canada and Manitoba. HNTEI partners included each of the KCNs, Nisichawayasihk Cree
102 Nation (partner in the Wuskwatim Generation Project), Manitoba Keewatinowi
103 Okimakanak (MKO) and the Manitoba Métis Federation (MMF). HNTEI sought to provide
104 educational upgrading, enhance general job readiness, and provide skills development
105 and work experience to prepare northern Aboriginals for construction employment and
106 business opportunities available on the Wuskwatim and Keeyask Projects. It focused on
107 training for occupations that could serve both Project and long-term community needs.
108 Partner First Nations and Aboriginal organizations were responsible for designing and
109 delivering most of the training, largely through community-based programs.

110 Over the life of HNTEI, approximately 2,600 training opportunities were provided in
 111 communities throughout the Regional Study Area. Of that total, more than 1,070
 112 Aboriginal people were registered in occupational training courses or programs¹². HNTEI
 113 also helped place hundreds of trainees into jobs and facilitated several hundred work
 114 placements for their trainees (see Section 6.2.3.5.2. of the Response to EIS Guidelines
 115 and Section 3.3.1 of the SE SV for further detail). The skills and education gained
 116 through this program are applicable to proposed hydro-electric development projects in
 117 the region (including Keeyask), but also other industrial developments and community-
 118 based activities.

119 Through the JKDA (Section 12.7), Manitoba Hydro has also committed to an
 120 employment target of 182 operational jobs over 20 years among the KCNs communities.
 121 In order to achieve this target, working groups on operational jobs have been
 122 established with each community and community-based initiatives are being
 123 implemented to attract and recruit KCNs members into Manitoba Hydro's operational
 124 workforce. This includes training initiatives to address skill gaps. (Please see response to
 125 CEC Rd 1 CEC-0011 for more information).

126 Project planning has also involved the employment of many community-based members
 127 in the negotiation of the Joint Keeyask Development Agreement and the Adverse Effects
 128 Agreements, undertaking field work to support the technical environmental assessment
 129 of the Project, participating in the analysis of Project effects and the development of
 130 appropriate mitigation measures, reviewing and commenting on the Partnership's
 131 Environmental Impact Statement and the completion of community-based studies,
 132 including the KCNs Evaluation Reports. Throughout the course of construction, the KCNs
 133 will also collectively manage and implement over \$200 Million worth of direct
 134 negotiation contracts. They will continue to be involved in the Project over the long-
 135 term through participation in the Partnership Board and related Committees,
 136 undertaking Aboriginal Traditional Knowledge Monitoring Programs and participating in
 137 technical monitoring programs. These activities are also contributing to the knowledge
 138 and capacity of community members within each of the KCNs.

139 The Adverse Effects Agreements negotiated with each of the KCNs provide measures to
 140 avoid, offset or compensate for anticipated project effects. Most notably, these
 141 agreements provide offsetting programs to be implemented in each of the Keeyask Cree
 142 Nations (KCNs) communities to offset unavoidable Keeyask Adverse Effects on practices,
 143 customs and traditions integral to its distinctive cultural identity. Unlike past
 144 developments, these agreements have been negotiated prior to the start of project
 145 construction and are based equally on community and corporate views of potential
 146 project effects. Mitigation measures developed for the Project also include

¹² Many of the participants in the HNTEI program took more than one course.

147 opportunities for the KCNs to undertake appropriate activities, including rituals and
148 ceremonies, to show respect and give thanks to *Askiy* at major Project milestones, and
149 the development of measures to retain cultural memory of the Keeyask region.

150 Over the long-term, each of the KCNs has the potential to benefit from equity revenue
151 stemming from their investment in the Project. Each community will decide how to
152 invest this revenue, but it may potentially be used to invest in community and economic
153 development activities.

154 There is no doubt that a project of this nature has the potential to create a boom-bust
155 cycle within the KCNs and in other local communities. The extent to which this boom-
156 bust is experienced will, in part, depend on the level of participation in the Project by
157 individual KCNs members, the timing of other future developments in the region (e.g.,
158 development of the proposed Conawapa Generation Project) and measures
159 implemented by leadership at the community level. Counseling services, including
160 financial counseling, are provided for site employees and may help to assist individual
161 employees and their families with this transition at the end of the Project construction
162 period.

163 Further analysis of the alternatives to and alternatives means of carrying out the project
164 will be examined more thoroughly through the Needs For and Alternatives To (NFAT)
165 review of Manitoba Hydro's preferred development plan currently being undertaken by
166 the Public Utilities Board (PUB) at the request of the Manitoba government. For further
167 detail on the NFAT review please see the response to CEC Rd 1 CAC-0067.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.9-8**
 2 **and 15; p. N/A**

3 **CEC Rd 1 CAC-0070**

4 **PREAMBLE:**

5 **Rationale**

6 In several instances the project proponent outlines principles, policies, guidelines and
 7 goals for sustainable development that relate to the need to leave a positive legacy for
 8 future generations. Two examples are

9 Government of Manitoba Principles of Sustainable Development – Stewardship

10 *Principle* – The economy, the environment, human health and social well-being
 11 should be managed for the equal benefit of present and future generations.
 12 Manitobans are caretakers of the economy, the environment, human health
 13 and social well-being for the benefit of present and future generations. Today's
 14 decisions are to be balanced with tomorrow's effects.

15 *EIS Response* – Partnership income will be beneficial to generations of KCNs
 16 community Members, and will provide sustained revenues to the broader
 17 Manitoba economy. (Keeyask HLP 2012, 9.6).

18 Government of Manitoba Guidelines for Sustainable Development –Integrated Decision
 19 Making and Planning

20 *Guideline* – Encouraging and facilitating decision making and planning processes
 21 that are efficient, timely, accountable and cross-sectoral and which incorporate
 22 an inter- generational perspective of future needs and consequences.

23 *EIS Response* – “The Partnership has established a governance structure that
 24 includes KCNs representation. As part of this structure, the communities have
 25 had direct involvement in the environmental assessment and will continue to
 26 have a strong role with their Aboriginal traditional knowledge (ATK) in the
 27 monitoring and follow-up programs. Each partner concerns itself with the short
 28 and long-term benefits and costs of the Project. Multi-generational benefits are
 29 key to the commitment of the KCNs’ participation in the Project (Keeyask HLP
 30 2012, 9.9).

31 The responses by the proponent are commendable insofar as they outline various
 32 attempts to ensure a positive legacy, particularly with regards to First Nations

33 communities. However, there is a need to broaden the scope of analysis when
34 considering what a positive legacy entails.

35 With reference to the guideline and principle provided above, as a crown corporation
36 Manitoba Hydro has a duty to ensure a positive legacy more broadly in society. Some
37 relevant – although non-exhaustive – issues include the extent to which future concerns
38 will be met by present savings (e.g. setting aside money and resources for successful
39 adaptive environmental management), as well as ensuring that future generations have
40 sufficient resources and capital (social, financial, natural, etc.) to meet their needs. A
41 project of this scope provides Manitoba Hydro an important opportunity to ensure that
42 future generations are left with such a positive legacy, and this is something the EIS
43 should explicitly and fully address.

44 **QUESTION:**

45 Please describe how the proposed project will leave a positive legacy for future
46 generations. Please provide attention to:

- 47 • the long-term availability of energy and other resources
48 • the potential for future generations to live sustainability (including maintenance of
49 First Nations ways of living)
50 • how future needs will be met by present savings

51 **RESPONSE:**

52 As cited in the Information Request, the Partnership has assessed the Project based on
53 the principles and goals of Sustainable Development in Chapter 9 of the Response to EIS
54 Guidelines. This has included a review of the principles and goals outlined in the *Federal*
55 *Sustainable Development Act*, the *Manitoba Sustainable Development Act* and Manitoba
56 Hydro's Sustainable Development Principles.

57 In 1987, the World Commission on Environment and Development defined sustainable
58 development as "... development that meets the needs of the present without
59 compromising the ability of future generations to meet their own needs" (United
60 Nations World Commission on Environment and Development 1987). The Partnership
61 believes that this important principle has been considered and is met with the proposed
62 Keyask Generation Project.

63 The development of the Keyask Generation Project will provide current and future
64 generations with a long-term (at least 100 year) supply of renewable energy that emits
65 extremely low levels of greenhouse gas emissions when compared to other forms of
66 generation like gas or coal. This sustainable energy source will be developed in such a
67 way that significant adverse effects to the capacity of renewable resources are avoided,

68 and in some cases are enhanced (e.g., lake sturgeon) when compared to current
69 conditions (see response to TAC/Public Rd 2 – CEAA-0015).

70 The Project EIS submitted by the Partnership contains a number of measures to mitigate
71 the potential for adverse effects on the physical, biophysical and socio-economic
72 environments. These include opportunities for the Keeyask Cree Nations (KCNs) to
73 undertake appropriate activities, including rituals and ceremonies, to show respect and
74 give thanks to *Askiy* at major Project milestones, and the development of mitigation
75 measures to retain cultural memory of the Keeyask region. Long-term monitoring, based
76 on both technical science and Aboriginal Traditional Knowledge, will also be undertaken
77 and has been designed to measure actual effects of the Project, identify unanticipated
78 effects and determine the effectiveness of mitigation measures.

79 The Keeyask Cree Nations (KCNs), as potential partners in the Project and those most
80 affected by its development, have been involved in Project planning and assessment
81 and will continue to be involved in Project implementation throughout its operational
82 lifespan. As partners, these communities have the potential to benefit from long-term
83 equity revenue stemming from their investment in the Project – resources that can be
84 invested in community development activities and projects that enhance the overall
85 well-being of residents over time.

86 As well, the Adverse Effects Agreements negotiated with each of the KCNs provide
87 funding for community-specific offsetting programs that provide appropriate
88 replacements, substitutions or opportunities to offset unavoidable Keeyask Adverse
89 Effects on practices, customs and traditions integral to its distinctive cultural identity.
90 Programs include access to alternative areas to pursue traditional activities, the sharing
91 of traditional foods, provision of healthy food fish, Cree language instruction, traditional
92 lifestyle experiences, community-based cultural and heritage interpretation and
93 documentation, environmental stewardship, annual gatherings and gravesite
94 restoration. To assist in program implementation, the Cree Nation Partners of
95 Tataskweyak Cree Nation and War Lake First Nation, have developed Moose
96 Sustainability and Fish Harvest Sustainability Plans to ensure the long-term sustainability
97 of these resources continues to be maintained within the Resource Management Areas.
98 Each of the KCNs has also committed to working with the respective Resource
99 Management Boards to share and discuss information linked to the implementation of
100 resource-based offsetting programs. Over the long-term, there are opportunities within
101 the Adverse Effects Agreements to modify programming based on experience with
102 program implementation, actual Project effects and changing community
103 circumstances.

104 Manitoba Hydro has supported each of the KCNs throughout the environmental
105 assessment process in documenting the traditional knowledge and history of their

106 communities. Project studies have also documented and researched heritage resources
 107 throughout much of the Keeyask region, including in areas not expected to be affected
 108 by the Project and those off the Nelson River system. Collectively, these studies have
 109 helped to document the richness and longevity of Cree history in the region – a history
 110 that is now documented and available for reference by future generations.

111 As noted on Page 9-2 of the Response to EIS Guidelines:

112 *“In deciding to proceed with the Project, the KCNs saw an opportunity for*
 113 *current and future generations to benefit economically and to build their*
 114 *communities’ capacity and self-sufficiency, while respecting and maintaining*
 115 *their Cree values, teachings, identity, culture and traditional knowledge.”*

116 Overall, the Project proposal put forward by the Partnership provides substantial
 117 commitments with respect to long-term mitigation and monitoring activities through
 118 negotiated terms outlined in the Joint Keeyask Development Agreement and in the
 119 KCNs Adverse Effects Agreements, as well as through measures identified in the EIS.
 120 Implementation of these measures as part of overall Project development means
 121 Keeyask will be constructed and operated in a manner that is environmentally and
 122 socially responsible, and that reduces the potential for future generations to bear the
 123 costs of unsound development practices.

124 It is anticipated that some of these topics will be more fully explored as part of the
 125 Needs For and Alternatives To (NFAT) review of Manitoba Hydro’s preferred
 126 development plan that is currently being undertaken by the Public Utilities Board (PUB)
 127 (see response to CEC Rd 1 CAC-0067).

128 **REFERENCES:**

129 United Nations World Commission on Environment and Development, 1987. *Our*
 130 *Common Future*. Oxford University Press. 1987.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.9-8**
 2 **and 15; p. N/A**

3 **CEC Rd 1 CAC-0071**

4 **PREAMBLE:**

5 Rationale In several instances the project proponent outlines principles, policies,
 6 guidelines and goals for sustainable development that relate to the need to leave
 7 improved equity outcomes. Two examples are

8 Government of Manitoba Guidelines for Sustainable Development –Global
 9 Responsibility

10 *Guideline* – Manitobans should think globally when acting locally, recognizing
 11 that there is economic, ecological and social interdependence among provinces
 12 and nations, and working cooperatively, within Canada and internationally, to
 13 integrate economic, environmental, human health and social factors in decision-
 14 making while developing comprehensive and equitable solutions to problems.

15 *Response* – “A detailed Life Cycle Assessment was conducted by the Pembina
 16 Institute in order to estimate the GHG emissions resulting from the
 17 construction, land use change, operation, and decommissioning of the Project.
 18 The resulting emissions are extremely low relative to other forms of generation.
 19 An equivalent amount of electricity, produced by a combined cycle natural gas
 20 generating station during one year of operation would result in more than
 21 double the entire life cycle emissions estimated associated with the Keeyask
 22 Project over a 100 year period. Since the Project will displace gas and coal
 23 generation, primarily in the U.S. Midwest, it will contribute to substantial GHG
 24 reductions. The Project is estimated to displace 30 million tonnes carbon dioxide
 25 equivalent during the first 10 years of operation” (Keeyask HLP 2012, 9.8).

26 Manitoba Hydro’s Sustainable Development Principle – Global Responsibility:

27 *Principle* – Recognize there are no political and jurisdictional boundaries to our
 28 environment, and that there is ecological interdependence among provinces
 29 and nations. Consider environmental effects that occur outside of Manitoba
 30 when planning and deciding on new developments and major modifications to
 31 facilities and to methods of operation

32 *Response* – “The Project will contribute to substantial reductions in greenhouse
 33 gases (GHG) by displacing fossil fuel electricity generation” (Keeyask HLP 2012,
 34 9.15).

35 As has been previously noted, the reduction in GHG emissions is important and
36 commendable. However, the Government of Manitoba's Guideline notes the economic,
37 ecological and social interdependence among provinces and nations, and this
38 interdependence requires extending considerations of equity well beyond GHG
39 emissions.

40 The proposed Keeyask project – along with Manitoba Hydro's other projects – may
41 present an opportunity to continue building a foundation for a more just and equitable
42 Manitoba, from the construction phase through final use of the electricity over the long
43 anticipated lifetime of the project. The process of striving for greater equity must begin
44 at the planning stage. At this point, however, it is unclear what steps are being taken to
45 promote both inter- and intra-generational equity in their various manifestations.

46 **QUESTION:**

47 Please describe how the proposed project will promote greater equity. Please provide
48 attention to

- 49 • the fair distribution of benefits and risks
- 50 • the fair access to resources and opportunities
- 51 • the accounting of impacts from previous developments
- 52 • the shared responsibility amongst all partners to seek equitable outcomes and
53 processes
- 54 • the promotion of equity both between and within generations

55 **RESPONSE:**

56 The Partnership considers this Information Request to be out of scope of the
57 Clean Environment Commission review of the Keeyask Generation Project. The
58 details being requested will be reviewed and discussed as part of the Needs For
59 and Alternatives To (NFAT) review of Manitoba Hydro's preferred development
60 plan currently being undertaken by the Public Utilities Board (PUB) at the request
61 of the Manitoba government.

62 For further details on the NFAT review, please see the response to CEC Rd 1 CAC-0067.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 9 – 6**
2 **and 13; p. N/A**

3 **CEC Rd 1 CAC-0072**

4 **PREAMBLE:**

5 In several instances the project proponent outlines principles, policies, guidelines and
6 goals for sustainable development that relate to the long-term capacity to respond. Two
7 examples are

8 Government of Manitoba Guidelines for Sustainable Development –Stewardship

9 *Guideline* – The economy, the environment, human health and social well-being
10 should be managed for the equal benefit of present and future generations.
11 Manitobans are caretakers of the economy, the environment, human health
12 and social well-being for the benefit of present and future generations. Today's
13 decisions are to be balanced with tomorrow's effects.

14 *Response* – Stewardship of the environment will continue through ongoing
15 monitoring and follow-up programs involving KCNs communities and Manitoba
16 Hydro, and AEA programs will enhance the cultural identity and connection to
17 the land of present and future generations which in turn will contribute to social
18 well being. (Keeyask HLP 2012, 9-6).

19 Manitoba Hydro's Sustainable Development Principle – Prevention and Remedy

20 *Principle* – To the extent practical, anticipate and prevent adverse
21 environmental and economic effects that may be caused by Corporate policies,
22 programs, projects and decisions rather than reacting to and remedying such
23 effects after they have occurred. Purchase, where practical, environmentally
24 sound products taking into account the life cycle of the products. Address
25 adverse environmental effects of Corporate activities that cannot be prevented
26 by: (1) endeavouring, wherever feasible, to restore the environment to
27 predevelopment conditions or developing other beneficial uses through
28 rehabilitation and reclamation; (2) striving to replace the loss with substitutes
29 that would enhance the environment and/or associated resource uses while
30 offsetting the type of damage experienced; (3) making monetary payments for
31 compensable damages on a fair, equitable and timely basis. Give preference,
32 where practical, to projects and operating decisions that use renewable
33 resources or that extend the life of supplies of nonrenewable resources.

34 *Response* – “A number of measures have been taken to prevent and minimize
 35 adverse effects, the most substantial being to reduce the size of the Project. At
 36 one time, a high head project with 180 km² of initial flooding was under
 37 consideration; in contrast, the current Project that will result in 45 km² of initial
 38 flooding. As another example, a combination of habitat enhancement measures
 39 and a fish stocking program that includes a fish hatchery will enhance the
 40 population of lake sturgeon in the Project area. As another example of
 41 anticipating and remedying effects before they occur, AEAs with the KCNs were
 42 negotiated as proactive measures in advance of the development, and programs
 43 under those agreements will address effects on resource users” (Keeyask HLP
 44 2012, 9.13).

45 The responses by the project proponents are commendable. However, the responses do
 46 not sufficiently indicate the capacity of the project proponents to respond to both
 47 foreseen and unforeseen events. For example, an analysis of climate change scenarios
 48 by Manitoba Hydro forecasted an increase in average temperature by 4.1°C and an
 49 increase in precipitation of 14% by the 2080s (Manitoba Hydro 2012, iv). Such increases
 50 in temperature and precipitation will have major interacting implications for Manitoba’s
 51 social, economic and ecological conditions, and for the proposed project. If only for this
 52 reason, it is imperative that a project with such a long lifespan be designed from early
 53 stages to be adaptable to change. Furthermore, it is imperative for reasons of equity
 54 and long-term ecological integrity, among other things, that sufficient resources are
 55 secured to provide future generations the ability to respond appropriately to future
 56 circumstances.

57 At this point it is unclear the extent to which the proposed project will be designed in a
 58 manner to ensure the full capacity to respond.

59 **QUESTION:**

60 Please describe how the proposed project will ensure the long-term capacity to respond
 61 to both foreseen and unforeseen challenges and opportunities. Please provide attention
 62 to:

- 63 • the adaptability of the design
- 64 • the development of responsive monitoring and adaptive management plan
- 65 • the resources (financial and otherwise) and ability to act upon foreseen and
 66 unforeseen challenges and opportunities (esp. climate change)
- 67 • the development of appropriate baseline data
- 68 • the attention to uncertainty, including irreducible uncertainty
- 69 • the ability to avoid lock-in

70 RESPONSE:

71 Chapter 9 of the Response to EIS Guidelines describes the Project relative to federal,
72 provincial and Manitoba Hydro's goals, principles and guidelines for sustainable
73 development and demonstrates how the Project addresses this issue. The Response to
74 EIS Guidelines also describes the recognition that for a Project with such a long life span
75 it is important to address long term effects and trends such as climate change. This was
76 discussed in the Response to EIS Guidelines in Section 6.9 (Effects of the Environment on
77 the Project), and a sensitivity analysis of the effects to climate change was described in
78 terms of the capacity of each broad environmental component (i.e., physical
79 environment – 6.3.12; aquatic environment – 6.4.9; terrestrial environment – 6.5.11;
80 socioeconomic environment – 6.6.7; resource use – 6.7.7; and heritage resources –
81 6.8.5).

82 Examples of the various measures established to deal with the long term capacity of the
83 Project to respond to changes are presented below under each of the six requested
84 categories.

85 Adaptability of the Design

86 As described in Chapter 6.0 of the Project Description Supporting Volume (Alternative
87 Means, Design Enhancements and Mitigation Alternatives), a "joint process has been
88 undertaken between the KCNs and Manitoba Hydro over many years to optimize the
89 Project design, including consideration of alternative means to develop the Project that
90 could avoid and mitigate potential environmental effects." In addition, where
91 appropriate, adaptability has been incorporated into the design in order to deal with
92 uncertainties. Examples include installation of Lake Sturgeon spawning habitat and
93 young-of-year habitat, the approach to dealing with fish passage, how the reservoir
94 level and station design can accommodate changes to inflows due to climate change,
95 design of dykes to account for thawing permafrost foundation soils and the ability of the
96 station to accommodate large floods.

97 The design of sturgeon spawning habitat downstream of the generating station is an
98 important component in sustaining the downstream populations of lake sturgeon, as
99 well as a number of other fish species. The design is based on a prediction of the
100 amount of area required to support spawning. However, if results of post-construction
101 monitoring indicate that this is not sufficient or is not located in an optimal location a
102 contingency design has been developed to allow for expansion of the area. Lake
103 sturgeon also currently spawn at Birthday Rapids, located at the upper end of the
104 Project reservoir. Based on studies conducted to date, it is predicted that this spawning
105 habitat will still be available after reservoir impoundment; however, an option is being
106 considered to create white water at Birthday Rapids to attract spawning fish if
107 monitoring indicates that sturgeon no longer spawn in the vicinity of Birthday Rapids.

108 Predictions of changes in substrates and associated young-of-the-year sturgeon habitat
 109 suggest that this habitat will be located in a new area in the reservoir. In order to
 110 confirm that sufficient post-impoundment habitat will be available, alternative designs
 111 have been developed to establish the required substrate in appropriate areas after
 112 results of post-impoundment monitoring are conducted.

113 As described in Section 4.5.1.5 of the Response to EIS Guidelines, “a phased approach to
 114 evaluating and developing fish passage alternatives is being undertaken to allow for the
 115 collection of more site specific fish behavior and hydraulic data during the initial stages
 116 of the operating phase. This information will help guide the development of fish
 117 passage, enable optimization of the performance, and provide a means to select the
 118 most ecologically responsible and cost effective alternative.” Various designs and
 119 locations of a potential long term collection facility are being examined and final
 120 decisions will integrate knowledge based on examining fish movements/behavior once
 121 the Project is operating. The Project will be designed and constructed in a manner that
 122 would allow it to be retrofitted to accommodate upstream and/or downstream fish
 123 passage options if required in the future.

124 The Physical Environment Supporting Volume Section 11.3 summarizes a sensitivity
 125 analysis carried out to determine how changes to inflows due to climate change would
 126 impact reservoir levels. The reservoir operating range of 158 m to 159 m would not
 127 change with either an increase or decrease in Nelson River flows because of the design
 128 of the generating station. Higher flows would result in a higher frequency of water levels
 129 in the upper part of this operating range and reduced daily water level fluctuations
 130 within the operating range. Lower river flows would result in more frequent fluctuations
 131 within the 1 m operation range.

132 Where permafrost is deep and it is not cost effective to remove completely, the design
 133 of the dykes takes into consideration the potential for thawing of permafrost beneath
 134 the dykes. The granular dyke sections are designed to be self healing as they settle,
 135 include sand drains to dissipate pore pressures in the thawing foundation soils and are
 136 constructed higher than initially required to allow for the structure to settle downwards.
 137 The response to CEC Rd 1 CEC-0070 provides further details.

138 Development of Responsive Monitoring and Adaptive Management Plan

139 Chapter 8 of the Response to EIS Guidelines (Monitoring and Follow Up) describes the
 140 commitment to “constructing and operating the Keeyask Generation Project (the
 141 Project) in a manner that facilitates the long-term integrity and productivity of the
 142 economy, environment, and natural resources, and that safeguards human health.”

143 In this chapter it is stated that the monitoring and follow-up process addresses areas
 144 where uncertainty exists in the predictions, and that variations in predicted and actual
 145 results identified through monitoring will be assessed by the Partnership and regulatory
 146 authorities for follow-up actions such as mitigation adjustments and adaptive
 147 management. Most of the plans include a commitment to several decades of monitoring
 148 and ongoing reporting and communication with regulators and the public. Section 8.1.3
 149 describes the adaptive management approach. Most of the Partnership's management
 150 and monitoring plans were filed with regulators on April 26, 2013 and June 28, 2013
 151 respectively.

152 Resources and Ability to Act Upon Foreseen and Unforeseen Challenges and
 153 Opportunities

154 The Project proposal put forward by the Partnership provides substantial commitments
 155 with respect to long-term mitigation and monitoring activities through negotiated terms
 156 outlined in the Joint Keeyask Development Agreement and in the KCNs Adverse Effects
 157 Agreements, as well as through measures identified in the EIS. Implementation of these
 158 measures as part of overall Project development means Keeyask will be constructed and
 159 operated in a manner that is environmentally and socially responsible and demonstrates
 160 a commitment by the Partnership to provide the resources and ability to act upon
 161 foreseen and unforeseen challenges and opportunities. This, combined with the
 162 extensive efforts undertaken by the Partnership to design the Project in a manner that
 163 minimizes environmental effects, reduces the potential for future generations to bear
 164 the costs of unsound development practices.

165 Development of Appropriate Baseline Data

166 Baseline data consists of a comprehensive multidiscipline Project-specific program
 167 initiated in 2000 and in many cases continuing until Project Construction, which has
 168 been adapted over time based on review of relevant literature and feedback from the
 169 general public, affected in-vicinity Aboriginal communities, regulators and peer
 170 reviewers.

171 Attention to Uncertainty, Including Irreducible Uncertainty

172 As discussed in Section 8.1.3 of the Response to the EIS Guidelines it is recognized that
 173 there is uncertainty in the predictions of effects and the strategy to deal with this is
 174 discussed. It is also recognized that "there exist in nature stochastic effects that no
 175 amount of sampling (scientific or otherwise) will remove" (Mangel 2000). In some
 176 instances thresholds (e.g., water quality guidelines) exist with which to manage against;
 177 however, in many cases these do not exist and management decisions will be based on
 178 regular communications/reporting with appropriate regulatory authorities so that

179 unacceptable effects can be confirmed and appropriate adaptive management
180 measures can be approved. As indicated, monitoring and follow up programs have been
181 developed and will be finalized through discussions with regulators to facilitate
182 implementation of adaptive management measures as a formal commitment from the
183 Proponent.

184 Ability to avoid lock-in

185 The design of the generating station permits it to operate efficiently using different
186 modes of operation. This will allow the station operation to adapt to potential changes
187 to inflow conditions because of climate change. The design will also allow the station to
188 adapt to varying demands of Manitoba Hydro's Integrated Power System which may
189 also change due to climate change or other factors. When using the different modes of
190 operation, the station will operate efficiently without the reservoir level deviating
191 outside of the 1 m operating range. By turning units on and off in response to changing
192 inflow and power demand requirements, the vertical-shaft fixed-blade units could be
193 operated at or near peak efficiency under nearly all flow conditions.

194 **REFERENCES:**

195 Mangel, M. 2000. Irreducible uncertainties, sustainable fisheries and marine reserves.
196 *Evolutionary Ecology Research*, 2000, 2: 547–557

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 9-4**
 2 **and 8; p. N/A**

3 **CEC Rd 1 CAC-0073**

4 **PREAMBLE:**

5 Rationale In several instances of the EIS, the proponent argues the proposed project is
 6 promoting sustainable development by avoiding the GHG emissions from the coal-fired
 7 and natural gas-fired electricity that would otherwise be providing the electricity (e.g.,
 8 Keeyask HLP 2012, 9.4 and 9.8). The amount of GHG offsetting is both significant and
 9 commendable. However, there are certain issues that add complexity to the matter.

10 First, it is not clear that the electricity produced by the proposed Keeyask project will
 11 replace existing electricity demand or facilitate additions to it (i.e. it is latent demand). If
 12 the goal is to promote sustainable development by reducing GHG emissions, it is
 13 important to ensure the project effects will reduce overall GHG emissions from current
 14 levels, as opposed to reducing the rate of increase of GHG emissions. Meeting the
 15 higher test of reducing current GHG emissions requires a proactive approach, but one
 16 that is within the potential of an electricity provider as important and large as Manitoba
 17 Hydro.

18 Second, it is not clear how the anticipated GHG displacement attributable to the
 19 proposed project compares with alternatives to the project, such as enhanced
 20 conservation options and energy efficiency. It may be that increased generating capacity
 21 is not the preferred means of reducing GHG emissions in both the near term (e.g. the
 22 upfront GHG emissions related to the flooding and construction of the dam) and the
 23 long-term.

24 **QUESTION:**

25 Please elaborate further on how the proposed project will reduce GHG emissions in
 26 both the near-term and long-term. Please provide attention to:

- 27 • the extent to which the proposed project would be replacing existing coal-fired and
 28 natural gas-fired supply, or adding to that supply
 29 • the extent to which the project would help to support rather than compete with
 30 demand management efforts and options
 31 • how the GHG emissions reduction of the proposed project compare with
 32 alternatives to the project (e.g. conservation and efficiency)

33 **RESPONSE:**

34 Manitoba Hydro operates an electrical system that facilitates the export of surplus
35 electricity. Particularly in the earliest years, the majority of the Project's production will
36 result in increased electricity exports, primarily to neighbouring U.S. States. This region
37 relies heavily on fossil fuel generation. As presented in PE SV 2.4.1.2 an assumption of
38 750 tonnes CO₂ / GWh (representing a mixture of coal and natural gas) was used to
39 estimate the GHG reductions associated the Project. This assumption is conservative
40 relative to the current marginal resources within the broader region to which Manitoba
41 Hydro is interconnected. The total 100-year life cycle emissions of the Project (Technical
42 Memorandum GN9.5.5) will have been displaced within the first six months of
43 operation.

44 In the longer term, significant net GHG benefits due to exports will continue to accrue,
45 (although the portion of Keeyask that is contributing to exports will tend to decrease as
46 domestic load increases). The Project also has lower emissions than the several other
47 potential alternatives that are available within Manitoba, as is demonstrated by Figure
48 2.4-2 (PE SV 2.4.1.2).

49 The questions relating to alternatives to the Project, as well as the implications of supply
50 and demand, will be key components of the "Needs For And Alternatives To" process.
51 These issues are beyond the scope of this CEC process (please see the response to CEC
52 Rd 1 CAC-0067 for further detail).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 9-8; p.**
 2 **N/A**

3 **CEC Rd 1 CAC-0074**

4 **PREAMBLE:**

5 Rationale Manitoba Hydro has stated:

6 "A detailed Life Cycle Assessment was conducted by the Pembina Institute in order to
 7 estimate the GHG emissions resulting from the construction, land use change,
 8 operation, and decommissioning of the Project. The resulting emissions are extremely
 9 low relative to other forms of generation. An equivalent amount of electricity, produced
 10 by a combined cycle natural gas generating station during one year of operation would
 11 result in more than double the entire life cycle emissions estimated associated with the
 12 Keeyask Project over a 100 year period. Insofar as the Project will displace gas and coal
 13 generation, primarily in the U.S. Midwest, it will contribute to substantial GHG
 14 reductions. The Project is estimated to displace 30 million tonnes carbon dioxide
 15 equivalent during the first 10 years of operation" (Keeyask HLP 2012, 9.8)

16 The Fuel Switching report filed by Manitoba Hydro in the 2013/14 PUB General Rate
 17 Application provides additional information regarding displaced CO2.

18 **QUESTION:**

- 19 • If it is not otherwise on the record of this proceeding, please provide the detailed
 20 Life Cycle Assessment conducted by the Pembina Institute;
- 21 • Please provide any information within the possession of Manitoba Hydro relating to
 22 the growth of wind power and other renewables in MISO. If no such information is
 23 in the possession of Manitoba Hydro, please indicate whether that information is
 24 readily available and please explain why Manitoba Hydro has not sought this
 25 information from other sources such as the Midwest Independent System Operator;
- 26 • Please provide any information in the possession of Manitoba Hydro that discusses
 27 the possibility of Manitoba Hydro displacing wind generated power or other
 28 renewables in MISO during certain periods of time. If no such information is in the
 29 possession of Manitoba Hydro, please indicate whether that information is readily
 30 available and please explain why Manitoba Hydro has not such sought this
 31 information from other sources such as the Midwest Independent System Operator
- 32 • Please provide the Fuel Switching report filed by Manitoba Hydro in the recent
 33 Manitoba Hydro General Rate Application.

34 **RESPONSE:**

35 The detailed Life Cycle Assessment is included with the CD of Technical Reports
36 provided with this submission.

37 Other requested information will be reviewed through the Need For and Alternatives To
38 (NFAT) Review currently being carried out by the Public Utilities Board. Please see
39 response to CEC Rd 1 CAC-0067 for further details on the NFAT Review.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6, C.**
 2 **7-3 and 7-45; p. p. 425 and 6, p. 488**

3 **CEC Rd 1 CAC-0075a**

4 **PREAMBLE:**

5 The project identified valued environmental components (VECs) and then analyzed the
 6 adverse residual affects [sic] of the project on the VECs, taking into consideration
 7 mitigation efforts. Then they determined the significance of the adverse effects based
 8 on guidance from regulatory authorities which the project admitted differs from Cree
 9 World Views. (C. 7-3)

10 **QUESTION:**

11 How would the results vary if a Cree World View was used as the benchmark?

12 **RESPONSE:**

13 As explained in the EIS and in response to many other IRs, the Keeyask Generation
 14 Project was subject to two environmental evaluations. The first was conducted by each
 15 of the Keeyask Cree Nations (KCNs) for their internal purposes; the second was prepared
 16 to comply with the federal and provincial environmental regulatory process:

- 17 • *KCNs Evaluation Process:* The KCNs evaluation process took place over the course of
 18 a decade with the support of Manitoba Hydro. The process assisted the KCNs to
 19 understand the Project and its impacts on their communities and Members, and to
 20 determine the conditions under which they would approve the Joint Keeyask
 21 Development Agreement and support the Project. The Project was evaluated by
 22 each of the KCNs in terms of their own worldview, values and experience with past
 23 hydroelectric development, as well as their relationships with Mother Earth (see
 24 Chapter 2 and the KCNs' Environmental Evaluation Reports which were provided to
 25 assist other people to understand their independent decisions to be Project
 26 proponents).
- 27 • *Government Regulatory Assessment Process:* Work by Manitoba Hydro and the
 28 KCNs on the government regulatory assessment process also took place over many
 29 years. The Keeyask environmental impact assessment is in accordance with the
 30 regulatory framework outlined in guidance provided by regulators, and standard
 31 environmental assessment practice. The effects assessment, as well as identified
 32 mitigation and long-term monitoring were developed based on scientific methods
 33 (referred to as "technical information" in the EIS), Aboriginal traditional knowledge
 34 (ATK) and local knowledge (see Chapter 5 of the Response to EIS Guidelines for a full

35 description of the methodology employed in the government regulatory assessment
36 process).

37 The KCNs Evaluation Reports provide an evaluation of the Project based on the Cree
38 Worldview, including each community's own benchmarks for determining Project
39 effects on their communities. The Response to EIS Guidelines has been developed
40 specifically to respond to guidelines issued by regulators based on federal and provincial
41 environmental legislation; in this context, determinations of significance are provided
42 based on relevant guidance from regulators and legislative definitions of significance
43 under the *Canadian Environmental Assessment Act*.

44 The results, which are presented in the filing, confirm that these two separate
45 approaches, undertaken for different purposes, both resulted in support to move
46 forward with the Project as proposed. (See also response to CEC Rd 1 CAC-0060 which
47 notes that specific statements from the two separate evaluations were not intended to
48 be "reconciled".)

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 7-3**
 2 **and 7-45; p. N/A**

3 **CEC Rd 1 CAC-0075b**

4 **PREAMBLE:**

5 The project has identified socio-economic cumulative affects and concluded that this
 6 project will not worsen them. (C.7-45)

7 **QUESTION:**

8 Given that these cumulative affects have been very troublesome, is it sufficient to not
 9 create more damage to justify the project? What ethical principle is being used to make
 10 this decision, e.g. Pareto optimality?

11 **RESPONSE:**

12 To clarify the Preamble's reference at p. 7-45, the summary conclusion on this page as
 13 presented in the EIS is as follows: "Assuming that such further mitigation and
 14 monitoring occurs [as identified to be required for the Project in combination with other
 15 future projects], the conclusions are not changed with respect to the regulatory
 16 significance of adverse effects of the Project on socio-economic VECs presented in
 17 Chapter 6."

18 The Partnership made the decision early in the assessment process to adopt a two-track
 19 process in which there would be a KCNs evaluation process as well as a government
 20 regulatory assessment process. As such, the response to the above question is two-fold
 21 and includes: 1) a reflection of the KCNs' own evaluation process of the effects of the
 22 Project and their journey in making the decision to ultimately support the Project and
 23 become a Partner; and 2) a review of the Project's environmental assessment
 24 (significance determination analysis) in response to the guidelines issued by regulatory
 25 authorities – with the direct involvement of all of the Project Partners – to determine
 26 Project effects.

27 As noted in the Preface of the Response to EIS Guidelines, the Partnership's
 28 Environmental Impact Statement (EIS) consists of a variety of products, including a
 29 video, *Keeyask: Our Story*; an Executive Summary, a Response to EIS Guidelines; and the
 30 KCNs' Evaluation Reports. Both *Keeyask: Our Story* and the KCNs' Evaluation Reports
 31 present the KCNs' unique history, perspectives, and experiences related to hydro-
 32 electric development. In considering the past, present, and hopes for the future, both
 33 products convey an emotional story, including the difficult decision-making process that
 34 KCNs leaders and community members went through to ultimately support the Keeyask
 35 project. KCNs Members interviewed in the video are explicit that, while the decision in

36 weighing potential adverse effects against the potential benefits was a difficult one, the
37 decision to support the Project was based on a belief that the future will be better with
38 the Project than without – that there will be a benefit to future generations.

39 The Partnership acknowledges that rigorous measures were necessary to avoid
40 repeating the mistakes of the past. Chapter 2 in the Response to EIS Guidelines
41 presents the KCNs Worldview and Evaluation Process and describes the context within
42 which the Partnership approached and developed the principles and processes that
43 guided the preparation of the EIS. The negotiated Joint Keeyask Development
44 Agreement (JKDA) and community-specific Adverse Affects Agreements (AEAs) provide a
45 framework for the relationship between KCNs and Manitoba Hydro in the planning,
46 construction, future operations and monitoring of the Project. These legally binding
47 agreements outline measures, to name a few, that aim to: build local capacity by
48 affording business and employment opportunities (e.g. through direct negotiation
49 contracts and employment targets) and foster local sustainability; provide appropriate
50 replacements, substitutions or opportunities to offset unavoidable adverse effects on
51 practices, customs, and traditions integral to KCNs cultural identities (e.g. resource
52 access and healthy fish food programs and language and wellness initiatives); and
53 alongside direct involvement in the environmental assessment process, encourage
54 documentation of ATK in project studies as well as in monitoring of Project effects. The
55 processes and measures outlined above prompted a determination by the KCNs that
56 overall, they would benefit from the Project.

57 On the matter of the significance determination criteria, this is described in Section 5.5
58 of Chapter 5 of the Response to EIS Guidelines. The overall regulatory environmental
59 assessment requirements focus on identifying adverse effects of the Project, and
60 seeking to determine if the adverse effects of the Project on any one VEC are significant
61 and likely to occur (in which case it would be necessary to determine if such adverse
62 effects are justified in the circumstances).

63 In summary, the significance determination analysis in the Response to EIS Guidelines
64 was undertaken as part of the government regulatory environmental assessment
65 process in response to the EIS Guidelines. Each VEC was evaluated in this regard using
66 criteria as provided in the EIS Guidelines, and in accordance with related regulatory
67 guidance. When assessing the significance of an effect on a VEC in accordance with the
68 EIS Guidelines, a fundamental initial step is to determine the "direction" or "nature" of
69 the effect, *i.e.*, is it positive, adverse, or neutral/negligible. In accordance with the EIS
70 Guidelines (section 9.8), the cumulative effects assessment in Chapter 7 of the Response
71 to EIS Guidelines examined VECs identified in Chapter 6 to be affected by residual
72 adverse environmental effects of the Project.

73 The Partnership focused on providing separately for the decisions required by each
74 Partner (including each of the KCNs) and the decisions required by government
75 regulatory environmental processes. The values of the KCNs were fully considered in
76 the KCNs' separate Environmental Evaluation Reports which were conducted for their
77 own internal purposes, and which have been provided, in part, to assist other people to
78 understand the independent decisions of each of the KCNs to be Project proponents
79 (see response to CAC-0055b for additional information).

80 See also the response to CEC Rd 1 CAC-0085.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.1**
 2 **employment, 6.6.3.1.1 construction, 6.6.3.2, business**
 3 **opportunities, 6.6.3.3, income; p. N/A**

4 **CEC Rd 1 CAC-0076a**

5 **PREAMBLE:**

6 Section 6.6 addresses a variety of subjects including economy, employment, business
 7 opportunities and income. While some details are provided further information is
 8 desirable. Please provide additional details on the following subject matters:

9 **QUESTION:**

- 10 • How will higher waged/higher skilled jobs be created for Keeyask members?
 11 • How will Keeyask Cree Nations (KCN) residents gain skills to take on these jobs?

12 **RESPONSE:**

13 Based on the reference document sections identified above, it is assumed that these
 14 two questions pertain to construction employment on the Project.

15 Qualified Members of the KCNs will have preferential access to construction jobs
 16 through opportunities for direct hiring on direct negotiation contracts. Section 6.6.3.2
 17 of the EIS includes the list of Direct Negotiation Contracts (DNCs) in Table 6-44 (pg. 6-
 18 437). These DNCs, as identified in Schedule 13-1 of the JKDA, represent business
 19 opportunities for each of the KCNs.

20 Manitoba Hydro's Northern Purchasing Policy encourages participation for Aboriginal
 21 and other Northern Communities in business and employment opportunities.

22 The Burntwood Nelson Agreement stipulates that qualified KCNs members residing
 23 within the Churchill/Burntwood/Nelson River Area (CBNR) fall within the first hiring
 24 preference outlined in BNA Article 12.1.1.3 (a). As well, KCNs members living within the
 25 province of Manitoba and who have registered with the JRS will be treated as residing
 26 within the CBNR for the purpose of Article 12.1.1.3 (a). This provision has been granted
 27 through the JKDA and LOA #23 of the BNA.

28 Pre-project training, designed to train and prepare northern Aboriginal people for
 29 employment in a wide range of occupations during construction of both the Wuskwatim
 30 and Keeyask projects, was offered through the Wuskwatim and Keeyask Training
 31 Consortium (WKTC). Funded by Manitoba Hydro, and provincial and federal
 32 governments, WKTC administered the Hydro Northern Training and Employment
 33 Initiative (HNTEI). Under HNTEI, project based funding was provided to the four KCNs',

34 Nisichawayasihk Cree Nation (NCN), the Manitoba Métis Federation and Manitoba
35 Keewatinowi Okimakanak (MKO), who in turn offered training to their members.

36 In addition, it is anticipated that on-the-job training opportunities will be available to
37 KCNs Members and other northern Aboriginals.

38 See response to CEC Rd 1 CAC 0076b, c and d for responses regarding operation
39 employment.

40 Responses to CEC Rd 1 CEC-0088d and CEC Rd 1 CFLGC-0021 outline Manitoba Hydro
41 training initiatives and investments that support and enhance Aboriginal training and
42 employment for community members to achieve higher waged/higher skilled jobs.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.1**
 2 **employment, 6.6.3.1.1 construction, 6.6.3.2, business**
 3 **opportunities, 6.6.3.3, income; p. N/A**

4 **CEC Rd 1 CAC-0076b**

5 **PREAMBLE:**

6 Sections 6.6 addresses a variety of subjects including economy, employment, business
 7 opportunities and income. While some details are provided further information

8 **QUESTION:**

9 How will KCN residents get training and education needed to get other permanent jobs?

10 **RESPONSE:**

11 As noted in Section 3.4.2.1.1.1 of the Socio-Economic Environment, Resource Use and
 12 Heritage Resources Supporting Volume, a JKDA job target of 182 permanent positions,
 13 achieved over a 20 year timeframe, was negotiated and agreed upon by the KCNs and
 14 Manitoba Hydro (see Section 12.7.1 of the JKDA). A Working Group on Operational Jobs
 15 (Section 12.7.3 of the JKDA), comprised of Manitoba Hydro staff and KCNs
 16 representatives has been established with the purpose to increase the number of KCNs
 17 members employed in Manitoba Hydro's ongoing operations. Schedule 12-8 of the JKDA
 18 outlines an employment framework for Manitoba Hydro and the KCNs that identifies
 19 key stages and activities in order to facilitate KCNs Members employment in Manitoba
 20 Hydro operation jobs. Activities include the development of strategies and opportunities
 21 for education, training and employment preparation that will enable KCNs Members to
 22 qualify for these jobs (for more detail, see response to CEC Rd 1 CEC-0011).

23 In addition and more broadly, Manitoba Hydro operates an on-the-job training program
 24 that can be applied to some of the permanent positions. The Northern Aboriginal Pre-
 25 Placement Training Program was the first program of its kind, designed to provide
 26 opportunities for Aboriginal candidates to gain on-the-job training to acquire the
 27 technical skills and competencies required in the technical trades used for operation of
 28 its generating facilities as follows:

- 29 • Operating Technician – Electrical
- 30 • Operating Technician – Mechanical

31 Trainees gain experience at Manitoba Hydro. Upon successful completion of this 10-
 32 month program, the trainees can choose one of the two full-time in-house trades
 33 apprenticeship programs. Trainees who complete the six-year apprenticeship program
 34 will be skilled and trained in the two trades, Mechanical Technician/Station Operator or

35 Electrical Technician/Station Operator journeyperson. The Aboriginal Line Trades Pre-
36 Placement Program also exists for the line trades. These programs also provide for paid
37 upgrading for participants.

38 Manitoba Hydro has a number of initiatives that support and enhance Aboriginal
39 training and employment for community members. Refer to the responses to CEC Rd 1
40 CFLGC-0021 and CEC Rd 1 CAC-0088d for additional information.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.1**
2 **employment, 6.6.3.1.1 construction, 6.6.3.2, business**
3 **opportunities, 6.6.3.3, income; p. N/A**

4 **CEC Rd 1 CAC-0076c**

5 **PREAMBLE:**

6 Section 6.6 addresses a variety of subjects including economy, employment, business
7 opportunities and income. While some details are provided further information is
8 desirable. Please provide additional details on the following subject matters:

9 **QUESTION:**

10 How many permanent positions in Keeyask operations will be taken on by KCN
11 residents?

12 **RESPONSE:**

13 Given the range of investments in training and initiatives afforded to KCNs communities
14 (see CFLGC IR 0021), it is reasonable to anticipate that some Keeyask Generation
15 operation and maintenance jobs will be filled by KCNs Members. No estimate of this
16 number was provided in the EIS as the 182 permanent positions in the JKDA for KCNs
17 Members on Manitoba Hydro operation and maintenance jobs extend across Manitoba
18 Hydro's system and are not confined to the Keeyask Project. Furthermore, it is not
19 feasible to ascertain the exact number of Keeyask positions to be filled by KCNs
20 Members as this number is dependent upon a variety of factors such as career
21 aspirations, readiness and job opportunities.

22 As noted in CEC Rd 1 CAC-0076b and CEC Rd 1 CAC-0088d, Schedule 12-8 of the JKDA
23 includes an operation employment framework to assist KCNs Members in advancing
24 towards operation jobs across Manitoba Hydro's system.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.1**
 2 **employment, 6.6.3.1.1 construction, 6.6.3.2, business**
 3 **opportunities, 6.6.3.3, income; p. N/A**

4 **CEC Rd 1 CAC-0076d**

5 **PREAMBLE:**

6 Sections 6.6 addresses a variety of subjects including economy, employment, business
 7 opportunities and income. While some details are provided further information is
 8 desirable. Please provide additional details on the following subject matters:

9 **QUESTION:**

10 In the longer term, 182 jobs for KCN residents will be created for Manitoba Hydro
 11 employment. Why 182 jobs as compared to some other figure? What if any implications
 12 does the employment of these members have on internal community capacity? Please
 13 discuss the suggestion that this might create a 'brain drain' on the KCN communities by
 14 encouraging these better trained employees to leave their community and move on to
 15 more lucrative opportunities elsewhere?

16 **RESPONSE:**

17 As noted in Section 3.4.2.1.1.1 of the Socio-Economic Environment, Resource Use and
 18 Heritage Resources Supporting Volume, a JKDA job target of 182 permanent positions,
 19 to be achieved over a 20 year timeframe, was negotiated and agreed upon by the KCNs
 20 and Manitoba Hydro (see Section 12.7.1 of the JKDA). Within this timeframe, Manitoba
 21 Hydro and the KCNs intend to work together, through a working group, to develop
 22 strategies to achieve this goal. The KCNs advocated strongly to secure these job target
 23 commitments in the JKDA, recognizing that they are well-paying, long-term jobs. The
 24 target for these permanent positions was determined by an evaluation of the
 25 anticipated Manitoba Hydro vacancy rate (over a 20 year period) and KCNs communities
 26 input on their availability to fill these positions. The targeted number exceeds the labour
 27 force requirement for operating jobs at the Keeyask Generation Project (see Table 3-32
 28 in SE SV Section 3.4.2.1.2 for operation jobs related to the Project).

29 In response to the suggestion that training and operational employment opportunities
 30 could prompt a 'brain drain' within the KCNs, while individuals may choose to leave a
 31 community for opportunities elsewhere, building capacity through local hiring and
 32 contracting is an effective way to build self-sufficiency and generate sustainable
 33 economic growth at the community / local level. The Project will create new
 34 opportunities that are local and are a means of reducing unemployment. Opportunities
 35 to build local capacity (including business management) may be achieved through Direct

36 Negotiation Contracts negotiated in the JKDA (see CEC Rd 1 CAC-0076a) in conjunction
37 with Project employment targets and a range of investments in training and education
38 (outlined in CEC Rd 1 CAC-0088d and CEC Rd 1 CFLGC-0021).

39 For additional information, also see CEC Rd 1 CAC-0077a, b and c.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.6.6,**
2 **Chapter 9-9; p. N/A**

3 **CEC Rd 1 CAC-0077a**

4 **PREAMBLE:**

5 Section 6.6 addresses a variety of subjects including economy, employment and training
6 opportunities and business development opportunities. In Chapter 9, Manitoba Hydro
7 indicates that “the project is designed to... maximize economic and social benefits for
8 the community.” Additional information is requested on the following matters:

9 **QUESTION:**

10 How is it ensured that the KCN will get the lucrative contracts that are to be publicly
11 tendered? Regarding the KCN businesses that are established during the construction
12 phase, what will be done to ensure that they are sustainable into the future?

13 **RESPONSE:**

14 The project will be developed using various contracting strategies. One of these are
15 open-tendered (publicly tendered) contracts. The JKDA Section 13.4.2 precludes KCN
16 businesses from participating on these contracts except as a sub-contractor through a
17 bid depository process. Instead, the JKDA provides for opportunities for the KCN
18 through Direct Negotiation Contracts, which have the ability to expand the number,
19 capacity, diversity and viability of KCN businesses. These are outlined in SE SV Section
20 3.4.1.3.1, Table 3-24 which is provided below.

Table 3-24: Direct Negotiated Contracts for the Keeyask Generation Project

Code	Service Contracts	KCNs Allocation
SC-1	Catering	FLCN and YFFN
SC-2	Camp Maintenance Services	CNP
SC-3	Security Services	FLCN and YFFN
SC-4	Employee Retention and Support Services	FLCN and YFFN
SC-5	First-Aid Services	CNP
Construction Contracts		
IC-2	Main Camp (Phase II only) - Site Preparation and Development	CNP
IC-5	Main Camp - Decommissioning	CNP
IC-8	South Access Road Construction	CNP
PS-1	Reservoir Clearing	CNP
PS-2	Painting and Architectural Finish	CNP
PS-5	Rock and Unclassified Excavation	CNP

Source: JKDA, Schedule 13-1 (CNP *et al.* 2009).

21 These contracts, worth approximately \$200 million (or more), represent a substantial
 22 amount of Project construction work. These DNCs can be expected to use up much of
 23 the construction-related business capacity that is available in the KCNs communities.
 24 Several of these contracts have already been implemented through the Keeyask
 25 Infrastructure Project to build the north access road.

26 The sustainability of a business hinges on its performance, experience and equity
 27 capital. The scope of work involved in the DNCs will further build on the capacity of
 28 KCNs community businesses. The experience and capacity gained from carrying out the
 29 DNCs should enable the KCNs businesses involved to compete for other similar
 30 contracts on other projects while Keeyask is underway and after it is complete.
 31 Furthermore, most of the DNCs are being carried out as joint ventures between a
 32 KCNs-owned business and a non-KCNs business with extensive experience and a solid
 33 track record in performing similar types of work. It is expected that these relationships
 34 will result in additional transfers of knowledge and building of skills, and could lead to
 35 future joint undertakings.

36 All of the above factors can contribute to business sustainability. As noted in the
 37 response to CEC Rd 1 CAC-0076d, building capacity through local hiring and contracting
 38 is an effective means to generate self-sufficiency and economic growth at the local level.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.6.6,**
 2 **Chapter 9-9; p. N/A**

3 **CEC Rd 1 CAC-0077b**

4 **PREAMBLE:**

5 Section 6.6 addresses a variety of subjects including economy, employment and training
 6 opportunities and business development opportunities. In Chapter 9, Manitoba Hydro
 7 indicates that “the project is designed to... maximize economic and social benefits for
 8 the community.” Additional information is requested on the following matters:

9 **QUESTION:**

10 As KCN businesses are established please describe the mechanisms to ensure that they
 11 build management capacity, and accumulate capital?

12 **RESPONSE:**

13 See response to CEC Rd 1 CAC-0077a in addition to below.

14 The DNCs range from catering and security services to camp maintenance services to
 15 road construction to excavation. The type of work involved in these contracts will be
 16 needed on other construction projects. As noted in the response to CEC Rd 1 CAC-
 17 0077a, most of the DNCs are being carried out as joint ventures between KCN-owned
 18 businesses and non-KCNs businesses with extensive experience and a solid track record
 19 in performing similar types of work. These joint venture arrangements provide a setting
 20 in which KCNs managers and forepersons can develop experience under the guidance of
 21 experienced managers and forepersons from the joint venture partners’ companies.
 22 Under this arrangement, KCNs business partners have to opportunity to develop their
 23 management and supervisor capacity.

24 As stated in the SE SV Section 3.4.1.3.1, “in all cases, the company owned by the KCN
 25 party will own the largest share of the joint venture. This approach will enable the KCN
 26 partner to maintain control of the contract and receive the largest share of the profits to
 27 be generated.”

28 In terms of building management and capital accumulation Section 3.4.1.3.1 of the SE
 29 SV, states:

30 “These business opportunities are also expected to generate the following
 31 important business benefits:

- 32 • The process of negotiating, managing and completing these contracts in
33 a joint venture setting will provide valuable business experience to the
34 KCNs owners and managers selected for the Project.
- 35 • The revenues associated with the Project could be used to finance
36 payments for up to nine years on buildings, equipment and capital items
37 that could be used to secure future contracts within the region.
- 38 • The relationships developed as part of the joint ventures could be used
39 to pursue additional joint venture contracts on other construction
40 projects”

41 To the extent that the joint ventures can perform well and generate profits, businesses
42 could expand their equity base, invest in capital, or choose to grow. Ultimately, how the
43 communities choose to manage their businesses and related financial decisions about
44 revenues is their decision.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C.6.6,**
2 **Chapter 9-9; p. N/A**

3 **CEC Rd 1 CAC-0077c**

4 **PREAMBLE:**

5 Section 6.6 addresses a variety of subjects including economy, employment and training
6 opportunities and business development opportunities. In Chapter 9, Manitoba Hydro
7 indicates that “the project is designed to... maximize economic and social benefits for
8 the community.” Additional information is requested on the following matters:

9 **QUESTION:**

10 How will business development enforce a virtuous community economic development
11 cycle whereby surpluses are reinvested locally?

12 **RESPONSE:**

13 Community economic development is reliant upon a variety of factors. Promoting
14 opportunities for local employment, ownership and decision-making, re-investment of
15 profits in communities, and enhancement of local knowledge, skill development and
16 health and well-being, to name a few, are mechanisms to build self-sufficiency and local
17 economic development. The Project has established fundamental arrangements that
18 reflect these features by providing the KCNs with the opportunity to benefit through
19 Project-related training, business and employment opportunities, equity arrangements
20 and the various offsetting programs included in the Adverse Effects Agreements. The
21 extent to which these opportunities will ultimately translate into long-term community
22 economic development will vary based on the established governance and community
23 development processes in each of the KCNs communities.

24 Refer to the responses to CEC Rd 1 CAC-0077a, CAC-0077b and CAC-0078 for additional
25 information.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6, S**
 2 **6.6.5.2; p. N/A**

3 **CEC Rd 1 CAC-0078**

4 **PREAMBLE:**

5 Chapter 6.6 discusses a variety of activities expected to develop local businesses and
 6 improve employment opportunities. As businesses grow and employment opportunities
 7 improve, local tax revenue will increase.

8 **QUESTION:**

9 Please elaborate on how associated plans for local governments (e.g., band councils) to
 10 increase their capacity to manage and effectively utilize these funds?

11 **RESPONSE:**

12 It is important to firstly recognize the nature of the local governments within the Project
 13 vicinity.

14 The City of Thompson is a well established jurisdiction with a sophisticated planning,
 15 management and accountability structure. Incremental revenues arising from increases
 16 in property or other taxes are assumed to be dealt with in the normal course. It should
 17 also be noted that the City has long experience dealing with expansion and contraction
 18 of its economic and revenue base over its history.

19 Gllam administration and Manitoba Hydro, along with FLCN, work to jointly plan and
 20 manage the land use, development, service requirements and financial implications of
 21 increasing development and operational activities associated with hydro development
 22 in the region.

23 The remaining jurisdictions within the vicinity of the project are First Nations exercising
 24 their own governmental authority. None of the Keeyask Cree Nations (KCNs) have a
 25 property tax or business tax regime under the *Indian Act* or the *First Nations Fiscal and*
 26 *Statistical Management Act* nor do they have any authority to levy income tax.
 27 Revenues are derived from transfers from Canada and to a small degree from Manitoba.
 28 Incidental revenue may be generated by First Nation controlled businesses or joint
 29 venture arrangements. Planning and expenditure of monies provided by other
 30 governments is generally under the oversight of Canada through annual contribution
 31 agreements which provides training or funding for training of First Nation administrative
 32 staff and in extreme circumstances has the ability to take control of First Nation
 33 financial administration.

34 As a result of previous settlement agreements for hydro-electric development, the KCNs
35 have experience managing reimbursement funding based on work plans and budgets
36 prepared by the First Nations, as well as negotiated compensation payments, many of
37 which required the communities to establish Trusts with community-based planning,
38 approval and reporting procedures.

39 Given the nature of the Project and its implementation, as well as the experience of
40 KCNs leadership, it is anticipated that these communities will be able to respond to the
41 additional capacity required to manage and effectively utilize new funds available to the
42 community over the course of Project implementation. These funds would include those
43 earned through Direct Negotiation Contracts and each community's equity interest in
44 the Project, as well as funding provided for programming through the Adverse Effects
45 Agreements and for implementation activities to be undertaken during construction
46 through the JKDA. Some of these management activities have already begun with the
47 management of income earned through Direct Negotiation Contracts on the Keeyask
48 Infrastructure Project, the early implementation of some of the offsetting programs
49 provided for in the AEAs, and through reimbursement-based, process funding provided
50 by Manitoba Hydro for Project negotiation and planning activities, and specific funding
51 provided for Traditional Knowledge studies.

52 As the Project is implemented, each of the KCNs, as autonomous, self-governing
53 entities, will continue to exercise its right and responsibility to develop and implement
54 plans which will serve the membership, recognize their specific and individual priorities
55 and create long term benefit and stability.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6**
2 **socio economic environment, C. 8 Monitoring and Follow-up,**
3 **S.8.2.4; p. p. 8-27, table 5, p. 8-28 to 8-33.**

4 **CEC Rd 1 CAC-0079a**

5 **PREAMBLE:**

6 Funds will be made available for the offsetting programs.

7 **QUESTION:**

8 Please elaborate on the mechanisms in place to ensure that these funds will be used for
9 these programs and done so efficiently and effectively?

10 **RESPONSE:**

11 Manitoba Hydro has entered into Keeyask Adverse Effects Agreements (AEA) with each
12 of Tataskweyak Cree Nation, War Lake First Nation Fox Lake Cree Nation, and York
13 Factory First Nation. The AEAs, signed in 2009, stipulate the obligations of Manitoba
14 Hydro and each First Nation with respect to funding, implementation and monitoring of
15 the Offsetting Programs.

16 The AEAs provide for a Guaranteed Annual Amount that the First Nation undertakes to
17 use to manage, administer and implement the Offsetting Programs for the benefit of its
18 members. The First Nations have significant autonomy in managing and implementing
19 their Offsetting Programs.

20 Under the York Factory First Nation AEA, the Guaranteed Annual Amount will be settled
21 to the York Factory First Nation Trust, a trust which will be established to hold all
22 payments on behalf of York Factory First Nation and its members. The York Factory First
23 Nation AEA does not set out the specific reporting requirements described below but
24 York Factory First Nation must provide to Manitoba Hydro any reports and portions of
25 the annual audits produced by the Trust relating to the Offsetting Programs (see Section
26 4.1.10 "Disclosure of Reports"). The Guaranteed Annual Amounts for Fox Lake Cree
27 Nation, Tataskweyak Cree Nation and War Lake First Nation are held directly by each
28 First Nation.

29 Pursuant to the AEAs, each First Nation is to prepare an Annual Program Budget to
30 outline its plans for the coming year's Offsetting Programs. Each First Nation is to hold a
31 Members' meeting to provide an opportunity for community members to review and
32 provide input to their elected officials with respect to the Annual Program Budget for
33 the Offsetting Programs. Following review by members and approval by Chief and
34 Council, this Annual Program Budget is to be provided to Manitoba Hydro by December

35 31 for the upcoming fiscal year. In addition to the Annual Program Budget, the First
36 Nations are to provide an Annual Program Report, with an accounting of the use of the
37 funds and a report on the implementation of offsetting programs for the previous year.
38 This report is to be provided to Members, as well as to Manitoba Hydro. A senior
39 official, duly appointed by Chief and Council, must certify that the activities undertaken
40 and expenses incurred are accurately described in the budget or report and relate to the
41 relevant Offsetting Program. Should Manitoba Hydro have any concerns that cannot be
42 addressed cooperatively, it may refer the matter to an arbitrator. For further
43 information please consult: Tataskweyak Cree Nation AEA Section 6.3 "Annual Program
44 Budgets and Annual Program Reports"; and Section 6.2 "Annual Program Budgets and
45 Annual Program Reports" in both War Lake First Nation and Fox Lake Cree Nation AEA's.

46 The AEA's also outline the process should the First Nation wish to discontinue an existing
47 Offsetting Program or use a portion of the Guaranteed Annual Amount to implement a
48 New Program. The AEA requires that a written proposal be submitted to its members at
49 a duly called public meeting of its members, obtain a Council Resolution approving the
50 proposal and deliver it to Manitoba Hydro for consent (see Section 5.2 "Program
51 Changes" in the Tataskweyak Cree Nation, War Lake First Nation and Fox Lake Cree
52 Nation AEA's).

53 The AEA's also include provisions for the establishment of Program Planning
54 Committees, with representation from the First Nation and Manitoba Hydro, to act as a
55 forum for co-operative review, discussions, and recommendations regarding ways and
56 means for strengthening the implementation success of Offsetting Programs. Please see
57 Tataskweyak Cree Nation AEA Section 6.4 ("Program Planning Committee"); and Section
58 6.3 ("Program Planning Committee") in the War Lake First Nation and Fox Lake Cree
59 Nation AEA's.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6**
2 **socio economic environment, C. 8 Monitoring and Follow-up,**
3 **S.8.2.4.; p. p. 8-27, table 5, p. 8-28-8-33.**

4 **CEC Rd 1 CAC-0079b**

5 **PREAMBLE:**

6 Funds will be made available for the offsetting programs.

7 **QUESTION:**

8 In terms of the offsetting programs themselves, please elaborate on the organization
9 that will be put in place and whether it will be one organization or whether each
10 community will create their own.

11 **RESPONSE:**

12 Manitoba Hydro has entered into separate Adverse Effects Agreements (AEAs) with
13 each of Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York
14 Factory First Nation. Each of the First Nations will have considerable autonomy in
15 establishing their own internal processes related to program implementation, consistent
16 with the various requirements summarized in CEC Rd 1 CAC-0079a. As per the
17 provisions of these agreements, each of the First Nations will take responsibility for the
18 management, implementation and operation of their own community's Offsetting
19 Programs, except as otherwise specifically provided.

20 In some instances, the AEAs specify that Manitoba Hydro has certain ongoing
21 obligations with respect to the implementation of certain Offsetting Programs. These
22 obligations are related to purchasing and providing certain specified pieces of
23 equipment to certain First Nations, or constructing certain specified facilities. These
24 obligations are set out in Tataskweyak Cree Nation AEA Section 3.5 ("Healthy Food Fish
25 Program"), and in War Lake First Nation AEA Section 3.2 ("Distribution Centre") and
26 Section 3.3 ("Community Fish Program").

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6**
 2 **Socio-Economic Environment, C. 8 Monitoring and Follow-up,**
 3 **S.8.2.4; p. p. 8-27, Table 5, p. 8-28 to 8-33.**

4 **CEC Rd 1 CAC-0079c**

5 **PREAMBLE:**

6 Funds will be made available for the offsetting programs.

7 **QUESTION:**

8 Please elaborate on the role to be played by KCN residents in the offsetting programs
 9 and upon their training to participate in this program.

10 **RESPONSE:**

11 Manitoba Hydro has entered into separate Adverse Effects Agreements (AEAs) with
 12 each of Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York
 13 Factory First Nation. These agreements describe a range of Offsetting Programs. As per
 14 the provisions of these agreements, each of the First Nations will take responsibility for
 15 the management, implementation and operation of their own community's Offsetting
 16 Programs, although in some instances, the AEAs specify that Manitoba Hydro has
 17 certain ongoing obligations with respect to the implementation of certain Offsetting
 18 Programs. These obligations are related to purchasing and providing certain specified
 19 pieces of equipment to certain First Nations, or constructing certain specified facilities.

20 These obligations are set out in Tataskweyak Cree Nation AEA Section 3.5 ("Healthy
 21 Food Fish Program"), and in War Lake First Nation AEA Section 3.2 ("Distribution
 22 Centre") and Section 3.3 ("Community Fish Program").

23 KCN participation in the implementation of the offsetting programs will take many
 24 forms. Members will have opportunities to participate in the Offsetting Programs
 25 directly and some Members will be involved in a staff or administrative capacity or
 26 through participation in the Program Planning Committees (see Tataskweyak Cree
 27 Nation AEA Section 6.4 "Program Planning Committee" and Section 6.3 "Program
 28 Planning Committee" in the War Lake First Nation and Fox Lake Cree Nation AEAs). The
 29 AEAs also include provisions for Members to provide input to Chief and Council with
 30 respect to the Annual Program Budgets and Annual Program Reports for the Offsetting
 31 Programs (see Tataskweyak Cree Nation AEA Section 6.3 "Annual Program Budgets and
 32 Annual Program Reports"; and Section 6.2 "Annual Program Budgets and Annual
 33 Program Reports" in both War Lake First Nation and Fox Lake Cree Nation AEAs).

34 Members would not generally require formal training to participate in these Programs.
35 In some instances, Programs are tailored to individuals who would already have
36 specialized knowledge. For example, some programs are aimed specifically at resource
37 users.

38 Some of the Offsetting Programs do contain a strong training or educational
39 component, including the Tataskweyak Cree Nation AEA Traditional Lifestyle Experience
40 Program, Traditional Knowledge Learning Program, and Cree Language Program; the
41 War Lake First Nation AEA Cree Language Program; and the Fox Lake Cree Nation AEA
42 Youth Wilderness Traditions Program, Cree Language Program, and Lateral Violence and
43 "Where do we go from here" Program.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6**
 2 **Socio Economic Environment, C. 8 Monitoring and Follow-up,**
 3 **S.8.2.4; p. p. 8-27, Table 5, p. 8-28 to 8-33.**

4 **CEC Rd 1 CAC-0079d**

5 **PREAMBLE:**

6 Funds will be made available for the offsetting programs.

7 **QUESTION:**

8 Please elaborate on the ongoing monitoring and evaluation of all Keeyask programs –
 9 construction, operations, offsetting program– to ensure that programs are effective and
 10 meeting community interests? Please elaborate on the mechanism for adjustment if
 11 negative results are identified from the monitoring.

12 **RESPONSE:**

13 Chapter 8 of the *Keeyask Generation Project: Response to the EIS Guidelines* describes
 14 monitoring and follow-up programs to be undertaken during construction and operation
 15 of the project. Chapter 8 includes an overview of the Environmental Protection Program
 16 and how it will be implemented (Section 8.1 & 8.3), provides an overview of the
 17 monitoring to be undertaken (Section 8.2), and includes a discussion on how adaptive
 18 management (Section 8.1.3 – pages 8-7 and 8-9) will be incorporated into monitoring.
 19 On June 28, 2013, the Partnership filed the following monitoring plans with regulators:
 20 Preliminary Physical Environment Monitoring Plan; Preliminary Terrestrial Effects
 21 Monitoring Plan; Preliminary Socio-Economic Monitoring Plan; and Preliminary
 22 Resource Use Monitoring Plan.

23 Manitoba Hydro has entered into separate Adverse Effects Agreements (AEAs) with
 24 each of Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York
 25 Factory First Nation. These agreements, signed in 2009, describe a range of Offsetting
 26 Programs. As per the provisions of these agreements, each of the First Nations will take
 27 responsibility for the management, implementation and operation of their own
 28 community's Offsetting Programs.

29 There are a number of provisions within the AEA which will help to ensure that the
 30 programs are effective and meeting community interests. Members will have an
 31 opportunity to provide feedback to their Chief and Council regarding the effectiveness
 32 of the Offsetting Programs through the Annual Program Budgets and Annual Program
 33 Reports (see Tataskweyak Cree Nation AEA Section 6.3 "Annual Program Budgets and
 34 Annual Program Reports"; and Section 6.2 "Annual Program Budgets and Annual
 35 Program Reports" in both War Lake First Nation and Fox Lake Cree Nation AEAs). There

36 will be similar provisions in the York Factory First Nation Trust, which is to administer
37 the Offsetting Program Funds, when the Trust is created (this provision is contemplated
38 in Schedule 3 of the York Factory First Nation AEA).

39 The Program Planning Committee will act as a forum for co-operative review,
40 discussions and recommendations regarding ways and means for strengthening the
41 implementation of the Offsetting Programs, including consideration of issues related to
42 effective implementation and coordination with other initiatives implemented to
43 mitigate Keeyask Adverse Effects. See Tataskweyak Cree Nation AEA Section 6.4
44 "Program Planning Committee" and Section 6.3 "Program Planning Committee" in the
45 War Lake First Nation and Fox Lake Cree Nation AEAs.

46 Each First Nation has sole control over reallocating the funds among the various
47 Offsetting Programs outlined in Article 3 of each AEA, provided that the reallocation
48 continues to support the Offsetting Programs (see the specific section "Reallocation" in
49 each of the AEAs (section 4.1.4 in the case of Tataskweyak, 4.1.3 in the case of War Lake
50 and York Factory and 4.1.2 in the case of Fox Lake).

51 In this way, the First Nation has the ability to consider whether the programs are
52 effective and whether the programs are meeting community interests. If they are of the
53 view that there is room for improvement then the AEAs allow for modifications. The
54 First Nation also has the ability to discontinue one or more of the initial programs and
55 implement a new program (please see the process described in Section 5.2 "Program
56 Changes" in the Tataskweyak Cree Nation, War Lake First Nation, and Fox Lake Cree
57 Nation AEAs). Similar provisions will be included in the York Factory Trust when it is
58 finalized (this provision is contemplated in Schedule 3 of the York Factory First Nation
59 AEA).

60 Each of the AEAs contemplates a monitoring program that could build upon the
61 monitoring programs that may be included as conditions to the closing licenses (Article
62 8 "Monitoring Commitment" in the Tataskweyak, War Lake, and Fox Lake AEAs and
63 Article 6 in the York Factory AEA). These articles allow for the parties to consider adding
64 additional programs for the purposes of monitoring adverse effects. In the event that
65 the parties are unable to agree, there is an arbitration provision so that a neutral third
66 party can resolve the issue of the necessity for further monitoring programs.

67 Article 7 in the Tataskweyak, War Lake, and Fox Lake AEAs "Closing Licences and
68 Offsetting Programs" describes the process to be undertaken in the event of a change in
69 circumstance, that is, if new and material information about potential Keeyask Adverse
70 Effects becomes apparent, if the project is altered (without changing a fundamental
71 feature), or an offsetting program is required by, a regulatory authority, to be modified.

- 72 Similar provisions are in place in York Factory AEA Article 5 "Changes to Closing
- 73 Licences/Future Information Related to Adverse Effects".

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 6.6**
2 **Socio-Economic Environment, C. 8 Monitoring and Follow-up, C. 9,**
3 **Sustainable Development; p. 9-9**

4 **CEC Rd 1 CAC-0080**

5 **QUESTION:**

- 6 • As the project continues through construction and implementation, how will the
7 Keyyask Hydropower Limited Partnership (KHLP) ensure that changes in local
8 governance (e.g., band council) and popular opinion are reflected in program
9 implementation?
10 • For instance if there is a change local leadership how will KHLP ensure continuity
11 from one government to the next in order to ensure that transitions occur
12 seamlessly?

13 **RESPONSE:**

14 In accordance with the Joint Keyyask Development Agreement (JKDA), the Keyyask Cree
15 Nations (KCNs) are entitled to representation on the board of the General Partners
16 (Board) and membership on the Keyyask Project Advisory Committees. Each of the
17 KCNs is entitled to representation on the Board for as long as a KCN owns units in the
18 Keyyask Hydropower Limited Partnership. Each of the KCNs will also have members on
19 the monitoring, construction and employment advisory committees. Each of the KCN
20 Chief and Councils will appoint their members to The Board and the various
21 committees.

22 If there is a change in local governance of one or more of the KCNs, the incoming Chief
23 and Council(s) will be able to confirm or replace the existing Board representatives and
24 committee members. If there are changes, the KHLP will make every effort to orient the
25 new representatives and members to the business of the partnership and subject
26 matter pertinent to the three committees.

27 Additional to the KHLP governance structure, the KCN Chief and Councils and Manitoba
28 Hydro will work closely throughout the Project to maintain and where possible
29 strengthen the relationship, as well as identify and address issues.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.2**
2 **Community Health, 6.6.4.2, Housing; p. N/A**

3 **CEC Rd 1 CAC-0081a**

4 **QUESTION:**

5 KCN notes that there is a housing crisis in their communities. Please elaborate on how
6 the project will assist in addressing this crisis.

7 **RESPONSE:**

8 While Manitoba Hydro and the Keeyask Cree Nation (KCN) communities are of the view
9 that First Nations' on-reserve housing is a responsibility of the Federal Government, the
10 Keeyask Project could assist the KCNs communities in addressing housing concerns
11 within their communities.

12 The project will provide the KCNs with the opportunity to become equity partners, and
13 the income earned through this investment could be used by the KCNs to address a
14 range of community priorities, such as housing.

15 Manitoba Hydro has also entered into separate Adverse Effects Agreements (AEAs) with
16 each of Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York
17 Factory First Nation. The agreements provide guaranteed annual funding to enable the
18 KCNs to operate a range of offsetting programs for their Members.

19 The AEAs include provisions related to modifying the Offsetting Programs or creating
20 new programs (please see Tataskweyak Cree Nation AEA Section 5.2 "Program
21 Changes"; War Lake First Nation AEA Section 5.2 "Program Changes"; and Fox Lake Cree
22 Nation AEA Section 5.2 "Program Changes"). Similar provisions will be included in the
23 York Factory Trust, a trust to be created and settled by York Factory and funded
24 pursuant to the York Factory First Nation AEA, when it is finalized.

25 Provided that the appropriate community approvals were in place, pursuant to the
26 AEAs, if one of the KCN communities were to identify housing as a measure to offset
27 Keeyask adverse effects, Manitoba Hydro would potentially be supportive of the
28 community establishing a new Offsetting Program related to this issue.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.2**
 2 **Community Health, 6.6.4.2, Housing; p. N/A**

3 **CEC Rd 1 CAC-0081b**

4 **QUESTION:**

5 Community health care is limited in KCN communities. Please elaborate on how the
 6 project will assist in addressing this issue.

7 **RESPONSE:**

8 The provision of core health care services in Manitoba is solely within the legislated
 9 jurisdiction of government. Health care for most of Manitoba's northern Aboriginal
 10 population is primarily the responsibility of the Government of Canada and is provided,
 11 in part, through collaborative arrangements between Manitoba Health and Health
 12 Canada's First Nations and Inuit Health Branch (FNIHB).

13 The Partnership acknowledges that, as a proponent, it has responsibilities to address
 14 adverse impacts caused by the Project. In the context of health care, all of the Partners
 15 have worked very hard to develop a Project that strives to enhance well-being and
 16 addresses effects on health services in KCNs communities and Gillam.

17 To the extent that construction of the Project generates new demands for health care
 18 services, Section 6.6.5.2.1 in the Response to EIS Guidelines outlines the mitigation
 19 measures to attempt to enhance health services in both the KCNs communities and
 20 Gillam (also see Section 6.6.4.3. and Section 6.6.5.4).

21 The following provides an overview of what is planned or underway to support existing
 22 community health care services and address well-being (which informs the nature and
 23 extent of usage of health care services) in KCNs communities and Gillam. To date, and as
 24 noted in the bullets that follow, efforts have been made through mitigation measures
 25 specific to Keeyask, Manitoba Hydro support for health care provision in Gillam, and
 26 certain offsetting programs in the Keeyask Adverse Effects Agreements.

- 27 • To ease the burden on local hospitals and clinics due to a large Project workforce
 28 and to provide efficient medical response to Project workers, paramedic and
 29 ambulance services will be available at the main camp, 24 hours a day, 7 days a
 30 week.
- 31 • The Partnership is working with the Northern Regional Health Authority (NRHA) to
 32 secure an on-site public health care professional who would be responsible for the
 33 provision of and/or referral to health promotion and risk management
 34 programming (including communicable disease education and prevention measures,

35 if required) and make referrals to appropriate and more comprehensive services at
 36 the community or regional level. In addition, this health care professional would
 37 work with the above Medical Services provider, Project counseling services, NRHA
 38 and the Partnership to identify and develop adaptive management measures, if
 39 required (e.g. expansion of on-site addictions counseling). Services will be available
 40 to all site staff, including KCN members.

- 41 • Manitoba Hydro also continues to work closely with the NRHA to help it identify
 42 new health service requirements and priorities to be incorporated in its 5 year
 43 Strategic Plan. This is mutually beneficial for the NRHA and the Partnership in
 44 preparing for any additional service requirements that may be needed as the
 45 project unfolds.
- 46 • The adverse effects agreements (AEAs) with the KCNs include programming to
 47 promote healing and well-being, provide opportunities for traditional lifestyles and
 48 healthy food consumption, and strengthen cultural identity. For example, the Fox
 49 Lake Cree Nation AEA provides funding for a crisis centre and wellness counseling
 50 program, as well as a Lateral Violence and “Where Do We Go From Here” Program,
 51 which through counseling, education and other supports, is intended to assist
 52 individuals to identify and participate in the opportunities made available in
 53 connection with the Keeyask Project. Notably, many AEA programs will be available
 54 in the long term, well beyond the end of construction employment.
- 55 • Some of the AEA offsetting programs support access to fish and country foods from
 56 areas not influenced by hydro development, including the Tataskweyak Cree Nation
 57 Healthy Food Fish Program and Traditional Foods Program, and the War Lake First
 58 Nation Community Fish Program.
- 59 • Extensive mercury and human health communication is being developed and
 60 delivered in collaboration with Manitoba Health, Health Canada and KCNs
 61 community health care providers and Gillam.
- 62 • The Employee Retention and Services Contract negotiated with FLCN and YFFN
 63 (with input from all the KCNs) provides for cultural ceremonies marking Project
 64 milestones to respect and respond to issues of well-being and the emotional loss
 65 associated with a changing landscape. This contract also includes preventative
 66 measures, notably at the main camp and through camp services that address health
 67 conditions and well-being, such as cultural awareness programming and counseling,
 68 including addictions counseling. As needed, this service may be extended to a KCNs’
 69 workers’ family.
- 70 • Manitoba Hydro has worked with the Town of Gillam and FLCN to establish a Terms
 71 of Reference for a worker interaction committee. This committee will include
 72 representatives from these three parties, as well as community health care
 73 providers and other stakeholders and service providers in the Gillam area. This
 74 Committee is intended to provide a coordinated approach to addressing worker

75 interaction issues across all of Manitoba Hydro's projects in the vicinity of the Gillam
 76 area and will determine the best mechanism for tracking and addressing such issues
 77 and concerns in the vicinity of Gillam (SE SV Section 5.4.1.4.4).

78 The extent that operation of the Project generates new demands for health care
 79 services in Gillam (due to permanent Keeyask operation positions) has also been
 80 considered in the environmental assessment and the cumulative effects assessment
 81 (see Sections 6.6.5.2.3 and 7.6.3.1 of the Response to EIS Guidelines).

82 At a corporate level and in the context of its northern projects, Manitoba Hydro, as
 83 Project Manager of several northern projects, will continue to cooperate with health
 84 care providers as new northern projects, including Keeyask, are developed. Manitoba
 85 Hydro works directly with the NRHA to support its efforts to maintain and enhance the
 86 capacity of local health services, particularly in Gillam. Note that access to these services
 87 extends beyond Gillam residents. In this regard, efforts include the following:

- 88 • Manitoba Hydro meets formally on an annual basis with the NRHA to discuss issues
 89 and opportunities. In addition to this meeting, Manitoba Hydro has regular informal
 90 contact with this health region on a range of issues.
- 91 • Manitoba Hydro assists the NRHA in the recruitment and retention of health
 92 professionals, where feasible, by making homes or rental housing available, and
 93 helping to secure employment for a health professional's spouse (housing and
 94 spousal employment are both important factors in recruiting and retaining health
 95 professionals). Health professionals recruited by the health region include doctors,
 96 nurses, pharmacists, and lab technicians.
- 97 • In some cases, Manitoba Hydro assists by flying in other health workers like
 98 massage therapists, physiotherapists, chiropractors, and dentists, whose services
 99 are not covered under the *Canada Health Act*. Note that these are the "private"
 100 health care professionals; because of funding arrangements, the company is much
 101 more limited when it comes to an ability to bring in staff like doctors and nurses.
 102 Without this support, it is very unlikely a town the size of Gillam would have access
 103 to services like physiotherapy. In addition, Manitoba Hydro funds a Spring and Fall
 104 clinic through Assiniboine Dental Group and provides housing for the dentists during
 105 their visits. These services are available to the entire community.
- 106 • A Professional Center is being funded through the Gillam Redevelopment and
 107 Expansion Program (GREP). This Centre will break ground in 2014 and will
 108 consolidate a range of services (e.g. chiropractic, physiotherapy, massage therapy,
 109 dentistry) at one location. This will consequently free up space in the hospital for
 110 other purposes.

111 Lastly, it is expected that the Project will generate a stream of revenue to the KCNs
 112 communities as a result of each community's investment in the Project. This revenue

- 113 may be used by communities to invest in other initiatives that may support overall
- 114 health and wellness (see CEC Rd 1 CEC-0004).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.7.3.1,**
2 **Domestic Fishing, s. 6.7.3.2, Hunting and Gathering, s. 7.4.1,**
3 **Commercial Trapping, s. 6.7.4.2 Commercial fishing; p. p. 6-528, p.**
4 **6-536, p.6-544, p. 6-546**

5 **CEC Rd 1 CAC-0082**

6 **PREAMBLE:**

7 KHLP plans offsetting programs to hunt, fish and trap.

8 **QUESTION:**

- 9 • Please discuss the long term sustainability of this approach? What are the
10 implications of offsetting for domestic food security? Please describe the expected
11 take up for a program requiring people who used to use traditional territories to
12 fish, hunt, or trap now to fly to offset sites? Please elaborate on the organization of
13 these offset arrangements?
- 14 • Please provide any academic literature or research in the possession of the
15 partnership that demonstrates that these offsetting programs are likely to be
16 successful.
- 17 • Please discuss alternatives plans in effect for the eventuality that offset programs do
18 not work effectively and people face food insecurity and/or declining nutrition.
- 19 • What are the consequences of these offsetting programs for these new geographic
20 areas?

21 **RESPONSE:**

22 *Please discuss the long term sustainability of this approach? What are the implications*
23 *of offsetting for domestic food security? Please describe the expected take up for a*
24 *program requiring people who used to use traditional territories to fish, hunt, or trap*
25 *now to fly to offset sites? Please elaborate on the organization of these offset*
26 *arrangements?*

27 The Keeyask Adverse Effect Agreements (AEAs) with each of the Keeyask Cree Nations
28 (KCNs) are intended to provide appropriate replacements, substitutions or opportunities
29 to offset anticipated Keeyask adverse effects on cultural practices and traditions integral
30 to cultural identity, some of which is related to hunting, trapping and fishing, and
31 gathering. AEAs with Tataskweyak Cree Nation, War Lake First Nation (working together
32 as the Cree Nation Partners) and York Factory First Nation include provisions for a
33 program to provide opportunities for Members to continue to fish and provide a supply
34 of wholesome food fish to Members by replacing the domestic supply of fish that have
35 the potential to be affected as a result of the Project. The AEA with Fox Lake Cree

36 Nation includes provision for an Alternative Resource Use Program, which may be used
 37 to harvest fish species within the Fox Lake Resource Management Area. Albeit a
 38 possible indirect benefit, enhancing food security is beyond the scope and mandate of
 39 these offsetting programs.

40 As per their AEAs, each of the KCNs will take the sole responsibility for the management,
 41 implementation and operation of their respective offsetting programs. TCN and WLFN
 42 are currently finalizing community-controlled Fish and Moose Harvest Sustainability
 43 Plans to guide the sustainable implementation of offsetting programs that involve
 44 resource management, resource harvesting and resource use activities (e.g. TCN's
 45 Healthy Food Fish Program and WLFN's Community Fish Program) . Community uptake
 46 is difficult to fully predict, but early implementation of the TCN Access Program suggests
 47 participation levels by community members are high. . The TCN Pilot Access Program
 48 ran from autumn of 2004 to March 31, 2009 when it was converted to a regular annual
 49 program. It is from this experienced position that the CNP negotiated their offsetting
 50 programs to be "as vibrant 50 or 100 years from the commissioning of Keeyask as they
 51 will be the day they come into effect" (CNP Evaluation Report 2012 p. 47).

52 As part of their AEA agreements, CNP is to coordinate its activities with the Split Lake
 53 Resource Management Board. TCN is to seek input from the Board and submit annual
 54 program reports that describe the implementation of each offsetting program in the
 55 previous year including uptake at the community level and assessment of results. As
 56 noted above, the CNP Fish Harvest Sustainability Plans will serve to secure the long-term
 57 benefits of the TCN Healthy Food Fish Program and the WLFN Community Fish
 58 Programs. Similarly, the CNP Moose Harvest Sustainability Plan will also manage for the
 59 sustainability of the TCN Access Program over the long-term. As noted in the response
 60 to TAC Rd 1 MCWS-LB-0009, "CNP proposes that implementation of the Fish Harvest
 61 Sustainability Plan will occur in close cooperation with the Split Lake Resource
 62 Management Board and that any adjustment to future fishing activities will be done in
 63 consultation with the Board." *Please provide any academic literature or research in the*
 64 *possession of the partnership that demonstrates that these offsetting programs are*
 65 *likely to be successful.*

66 Community distribution centres and increased opportunities / encouragement to eat
 67 wild or country foods are mechanisms that have been identified as ways to tackle food
 68 security issues in remote arctic communities¹³; however, this literature was not used as
 69 the basis for developing the offsetting programs. Offsetting programs were negotiated
 70 based on each community's perspectives about the types of programming required to
 71 address anticipated Project effects. As noted above, TCN has extensive experience

¹³ Nunavik and Nunatsiavut: From Science to Policy. An Integrated Regional Impact Study (IRIS)
 of Climate Change and Modernization. Allard, M. and Lemay, M., Eds (2012).

72 implementing the Access Program and, based on this success, the program was included
73 in its final Adverse Effects Agreement. See discussion below with regard to evaluation of
74 success of offsetting programs.

75 *Please discuss alternatives plans in effect for the eventuality that offset programs do not*
76 *work effectively and people face food insecurity and/or declining nutrition.*

77 The offsetting programs were negotiated separately with each of the KCNs based on the
78 KCNs community-specific priorities and concerns as a result of constructing and
79 operating the Project. As noted earlier, while enhanced food security could be a
80 beneficial by-product of these programs, it is not the explicit purpose of these programs.

81 Ongoing evaluation of the success of offsetting programs, based on their intended
82 purpose, will take place at the community-level throughout Project implementation.
83 Each community will develop their own approach to evaluate the effectiveness of their
84 offsetting programs and, based on their own values and priorities, will measure whether
85 the programs continue to address their concerns about Project-related effects. If
86 required, provisions in the AEAs allow communities the opportunity to modify offsetting
87 programs or to reallocate annual program funding to more appropriately address
88 Project effects as they are experienced (see response to CEC Rd 1 CAC 0079a for further
89 detail). Furthermore, Sustainability Plans will serve to protect the viability of
90 aforementioned AEA programming.

91 *What are the consequences of these offsetting programs for these new geographic*
92 *areas?*

93 The areas to be used are within the traditional territories of TCN and WLFN where
94 hunting, fishing, trapping and gathering have been practiced since time immemorial.
95 The offsetting programs are expected to disperse traditional land use over a larger land
96 base. Effects on other users (i.e., tourist operators) are discussed in the responses to
97 TAC Public Rd 1 MCWS-LB-0008 and MCWS-Fisheries-0002 and to CEC Rd 1 CEC-0015.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.7.1.2,**
2 **Residual Effects of Construction; p. 6-532**

3 **CEC Rd 1 CAC-0083**

4 **PREAMBLE:**

5 "It is recognized that some resource users may be negatively affected." (6-532)

6 **QUESTION:**

7 KHLP plans to compensate the person unable to continue to pursue traditional
8 livelihoods. Please elaborate on the form that compensation will take? To the degree
9 that compensation is monetary, please elaborate on how these funds will truly
10 compensate for livelihoods?

11 **RESPONSE:**

12 Firstly, the reference to the above quote is incorrect – that quote is found in Section
13 6.7.3.1.2 [there is no such section as 6.7.1.2]. Further, the quote was in reference to
14 domestic fishing and states in its entirety:

15 However, it is recognized that some resource users may be negatively affected by
16 a change in the spiritual and cultural nature of their domestic fishing activities
17 neutralizing the positive effects of the AEA offsetting programs (e.g., local
18 knowledge would need to be relearned at new fishing locations; fishing may not
19 be as spontaneous for some Members as it would become, in part, a planned
20 activity through AEA offsetting programs).

21 Issues related to collective rights, including domestic resource use, are being addressed
22 through the Adverse Effects Agreements, which were negotiated with each of the KCNs,
23 on behalf of their members. As such, the Partnership does not plan to provide
24 compensation at the individual level.

25 Pursuant to the AEAs, Manitoba Hydro will establish and operate a claims process for an
26 individual's loss or damage resulting from Keeyask Adverse Effects to personal property
27 belonging to such Member, which claims are not settled and resolved by the AEAs. This
28 could include, for example, the loss of cabins or other personal property.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 9,**
 2 **9.2.3.1.1; p. 9-2**

3 **CEC Rd 1 CAC-0084a**

4 **QUESTION:**

5 There are many asymmetries in this project. How will it be ensured that these
 6 asymmetries do not lead to dominance of one group's interests over another groups?
 7 For instance, the KCNs communities are tiny in comparison to Manitoba Hydro and even
 8 regarding ownership shares, this imbalance holds. How can it be ensured that KCN
 9 communities have a fair voice in ongoing management of the project?

10 **RESPONSE:**

11 The potential for imbalance in the planning, development, management and operation
 12 of the Keeyask Project was recognized during the negotiations of the Joint Keeyask
 13 Development Agreement (the "JKDA") and, accordingly, a number of provisions were
 14 incorporated to facilitate the interests of the Keeyask Cree Nations (KCNs).

15 For example, the concept of "fundamental features" originated with the KCNs and the
 16 terms setting them out in Article 7 of the JKDA reflect the imposition of restrictions on
 17 the design and operation of the project that bind Manitoba Hydro, notwithstanding the
 18 fact that it owns a majority of the shares in the Partnership.

19 In addition, each of the KCNs, through their respective investment entities, are partners
 20 and as partners are entitled to participate in the meetings of partners, to bring forward
 21 matters for discussion at partners' meetings and to dispute decisions made at partners'
 22 meetings in accordance with the dispute resolution provisions set out in Article 19 of
 23 the JKDA.

24 The project will be managed and operated by the General Partner, 5900345 Manitoba
 25 Ltd. Although the General Partner is wholly owned by Manitoba Hydro, Manitoba Hydro
 26 is committed through the JKDA to appointing to the board of directors of the General
 27 Partner persons nominated by each of the KCNs. Accordingly, this will also be a forum
 28 where concerns originating with each of the KCNs can be brought forward for
 29 discussion.

30 The construction, monitoring and employment aAdvisory committees, are to have
 31 members nominated from each of the KCNs. This membership will provide additional
 32 opportunities for the KCNs to participate in the identification, discussion and resolution
 33 of issues arising during construction and during monitoring activities.

34 Over \$ 200 million of work will be undertaken through contracts that either have now
35 been or will be negotiated directly with the KCNs and business partners selected by
36 them. One of the features of a direct negotiation contract is that it allows the KCN entity
37 that is awarded the contract to hire directly its own members to work on the contract.

38 It is expected that members from each of the KCNs will be employed in carrying out
39 monitoring and mitigation plans and, therefore, that through such employees matters of
40 concern to the KCNs will be heard and discussed.

41 Another avenue through which the KCNs voices will be heard on the Project are the
42 community implementation offices which will be established as outlined in the JKDA.

43 All of the foregoing were conceived with the intent that each of the KCNs would have a
44 "fair" voice in the planning, development, management and operation of the project.

45 The key principles of fairness are that a party/stakeholder:

- 46 • receive notice of occasions when issues are to be discussed and decisions to be
47 taken
- 48 • be provided an opportunity to state views on the issue
- 49 • be provided an explanation for decisions that are taken and why views were/were
50 not accepted, and
- 51 • finally, when a decision that is taken cannot be accepted, there be a reasonable
52 process for resolving disputes

53 The JKDA through the processes and forums described above provides ample
54 opportunities for the voices of the KCNs to be "fairly" heard and for the KCNs to
55 participate "fairly".

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 9,**
2 **9.2.3.1.1; p. 9-2**

3 **CEC Rd 1 CAC-0084b**

4 **QUESTION:**

5 Within KCN communities some people did not support the project. How will their
6 interests be protected as the project is implemented?

7 **RESPONSE:**

8 Each KCN community is governed by an elected Chief and Council. As is the case in every
9 community which elects its leaders, those elected carry a responsibility to listen to all of
10 the members they govern and to be sensitive to their concerns. Listening to the
11 concerns of members who have not in the past supported the Project may require that a
12 community's leadership explain the basis for decisions being taken with respect to the
13 Project and there may be opportunities, where feasible, to factor into new decisions
14 solutions to concerns that are raised. Similarly, the responsibility of elected leaders to
15 show respect to members who have contrary opinions through listening and explaining
16 is matched by the obligation of such members to show respect to Chiefs and Councils
17 after decisions are made and implemented with the purpose of benefitting the
18 community as a whole.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: C. 9,**
 2 **9.2.3.1.1; p. 9-2**

3 **CEC Rd 1 CAC-0084c**

4 **QUESTION:**

5 "In contrast to the past, the Project puts into practice the proposition of greater
 6 empowerment of local indigenous people." It is claimed that the project will empower
 7 KCN communities. How does KHLF define empowerment? How does it expect that the
 8 project will lead to empowerment?

9 **RESPONSE:**

10 "Empowerment", for the purposes of understanding the foregoing reference, means "to
 11 give authority" to one or more persons, or to "enable" one or more persons to do
 12 something or to take part in something.

13 Each Keeyask Cree Nation (KCN) community conducted its own reviews of the Project
 14 over a number of years with its members and each community conducted referendums
 15 on whether its members wanted the Project to proceed. In all four cases, a majority of
 16 those voting chose to support the Project. Manitoba Hydro had advised each KCN
 17 community that if a majority of the members of the collective KCN did not support the
 18 Project, it would not be built at this time. In effect, the KCN were 'empowered' to
 19 determine whether or not the Project would proceed at this time.

20 Further, in the case of the Keeyask Project, each of the KCNs has to date played an
 21 important role in fundamental aspects of the design of the project through the
 22 incorporation in the Joint Keeyask Development Agreement (the "JKDA") of
 23 "fundamental features". (See the response to CAC-0084a). In effect, through the
 24 negotiation of the JKDA the KCNs were able to secure commitments that the project
 25 would be built and operated so as to comply with key concerns they had regarding
 26 hydro-electric generating stations.

27 Further, through their participation as partners in the Project, as contractors through
 28 the award of direct negotiation contracts, through their power to nominate directors to
 29 the board of the General Partner and through their participation on advisory
 30 committees, the KCNs and their members will share profits, benefit from jobs and have
 31 the "authority" to participate in the myriad of decisions that will have to be made over
 32 the life of the project with respect to its construction and operation.

33 All of the foregoing is in stark contrast to the views advanced by each of the KCNs
 34 regarding past projects with respect to which they say they were no more than

35 bystanders who were not consulted, whose voices were ignored and who had no
36 effective power, authority or ability to influence any decision made with respect to such
37 projects.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.6;**
 2 **p. 6-488**

3 **CEC Rd 1 CAC-0085**

4 **PREAMBLE:**

5 There are a variety of frameworks used to address ethical aspects of major decisions.
 6 There range from simple rules such and Pareto Optimality through to more elaborate
 7 theories such as the capability theory.

8 **QUESTION:**

9 Given the project has stated that it will cause 'sorrow' to the communities regarding
 10 culture and spiritual issues, what ethical framework was used to weigh this against the
 11 benefits?

12 **RESPONSE:**

13 The Executive Summary includes a table on page 55 that is intended to summarize
 14 potential effects of the Project on the Culture and Spirituality VEC, and which states
 15 (under potential effects on this VEC before mitigation) that "The Project will result in the
 16 loss of the rapids, flooding of land, and changes to the cultural landscape causing great
 17 sorrow to local Aboriginal people¹⁴." This table also summarizes the relevant mitigation
 18 and the residual effect on this VEC after mitigation, and notes in conclusion that "The
 19 Keeyask Cree Nations' Adverse Effects Agreement Offsetting Programs and participation
 20 as Project partners address these residual effects."

21 As regards the "ethical framework" used to weigh cultural and spiritual adverse residual
 22 effects (as well as other adverse residual effects) against benefits of the Project, the KCN
 23 applied their own world view (and therefore their own ethical framework) in assessing
 24 the project. See response to CEC Rd 1 CAC-0075b.

25 The decision process adopted by the Partners for the Project to weigh all of the effects
 26 and issues relevant to each Partner is stated as follows in the Preface to the Response to
 27 EIS Guidelines:

28 "The Partners agreed early on that there would be a Keeyask Cree Nations
 29 evaluation process as well as the government regulatory environmental
 30 assessment process for the Project.

¹⁴ Note that pg. 6-488 does not include the word 'sorrow'; as noted in the text, the word is included in the Executive Summary.

31 In the KCNs' process, each of the KCNs, assisted by Manitoba Hydro, evaluated
32 the impact of the Project on their communities and Members in terms of their
33 own worldview, values and experience with past hydroelectric development.
34 This process supported conclusions of the Joint Keeyask Development
35 Agreement by the Partners.

36 The Partnership's EIS response to the government regulatory environmental
37 process was undertaken by Manitoba Hydro with the support of the KCNs."

38 This two track process is elaborated on in Section 1.4 of the Response to EIS Guidelines,
39 and the specific views, decision processes and evaluations carried out by each of the
40 KCNs, all which reflect their worldview, values and experiences, are summarized in
41 Chapter 2 of the Response to EIS Guidelines.

42 The results, which are presented in the filing, confirm that these two types of separate
43 approaches, undertaken by different authors for different purposes, both resulted in
44 support to move forward with the Project as proposed.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.12; p. N/A**

3 **CEC Rd 1 CAC-0086**

4 **QUESTION:**

5 Is there a literature indicating that the type of preferential treatment being used by the
6 project for First Nation-owned businesses is effective? If so, please provide any
7 literature in the possession of the partnership evaluating the success.

8 **RESPONSE:**

9 The decision to engage in business relationships with First Nations-owned businesses
10 was not based on literature, but rather on experience gained through past projects.
11 Implementing Manitoba Hydro's Northern Purchasing Policy and Direct Negotiation
12 Contracts (DNC) on Wuskwatim and on various transmission line and other projects
13 throughout Manitoba has yielded successful results for both the project and First
14 Nations-owned businesses. As stated in the Joint Keeyask Development Agreement
15 (JKDA), an objective of the Partnership is to expand the number, capacity, diversity and
16 viability of KCNs Businesses. DNCs and the Northern Purchasing Policy are proven
17 methods of achieving these Partnership objectives.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.2.3; p. 3-13**

3 **CEC Rd 1 CAC-0087**

4 **PREAMBLE:**

5 It is noted that “Estimates of equity investment income to the KCNs are not presented
 6 since this is commercially sensitive information, and will depend on the nature and level
 7 of investment chosen by each of the KCNs communities” (page 3-13). Predicted equity
 8 investment income for the KCNs is a crucial piece of information and this should be
 9 shared with interested stakeholders, for various levels of investment by the KCNs.

10 **QUESTION:**

11 Further, how will revenue be determined for all project partners? How will revenue be
 12 distributed within communities? Is there a contingency plan if U.S. demand or prices for
 13 Canadian hydroelectric power decreases significantly?

14 **RESPONSE:**

15 The JKDA contains two equity ownership options for the KCNs, common and preferred.
 16 Within 180 days after the final turbine is commissioned each of the KCN will have to
 17 decide which ownership option they prefer and how much they will invest. Revenue for
 18 all partners will be determined annually dependent upon performance of the KHLP and
 19 the ownership interest selected by each of the partners.

20 Revenue distributions from the KHLP will be provided to the investment entities
 21 established by the KCNs. As per JKDA Article 14.2.2, distributions received by a KCN
 22 investment entity may be used for the following:

- 23 a. resource rehabilitation and development measures to support increased viability for
- 24 traditional and commercial resource pursuits and other resource harvesting;
- 25 b. initiatives to support its Aboriginal or treaty rights;
- 26 c. cultural support and social development initiatives;
- 27 d. business and employment development undertakings;
- 28 e. local community infrastructure and housing development;
- 29 f. the construction of capital projects, including related infrastructure, as well as the
- 30 operation and maintenance of any capital projects, including related infrastructure;
- 31 and
- 32 g. technical and legal services related to its business and other affairs.

33 Chief and Council of each KCN will ensure that, there will be appropriate community
 34 consultation processes prior to using project distributions.

35 A contingency plan if U.S. demand or prices for Canadian hydroelectric power decreases
36 significantly is not required given the KCNs have the right to select the preferred
37 ownership option.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088a**

4 **QUESTION:**

5 Why did the Hydro Northern Training Employment Initiative (HNTEI) cease in 2010?

6 **RESPONSE:**

7 The duration of the Hydro Northern Training and Employment Initiative was tied to the
8 availability of the funding, which was allocated to each of the participating Aboriginal
9 Partners. The bulk of the funding was expended by 2010. Where Aboriginal Partners
10 had funding remaining, they were able to utilize these funds for further training of
11 existing HNTEI trainees. See SE SV Section 3. 3.1.1 for additional background on HNTEI.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088b**

4 **QUESTION:**

5 The HNTEI cost \$60.3 million and this cost was shared by Manitoba Hydro, Canada and
6 the Province of Manitoba - what proportion did each contribute?

7 **RESPONSE:**

8 Funding for HNTEI was as follows:

9	Manitoba Hydro	\$20.0 million
10	Province of Manitoba	\$10.0 million
11	Western Economic Diversification	\$5.0 million
12	Indian and Northern Affairs Canada	\$3.3 million
13	Human Resources and Skills Development Canada	\$22.0 million

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088c**

4 **QUESTION:**

5 How have community members' concerns regarding Wuskwatim training opportunities
6 been addressed? Community members raised concerns regarding accessing funding for
7 student training and proper notice of training opportunities.

8 **RESPONSE:**

9 The information in the question does not appear in Section 3.2.1 of the Socio-Economic
10 Supporting Volume. Without further detail, the question cannot be responded to as
11 asked.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088d**

4 **QUESTION:**

5 The Gillam KPI Program 2009-2010 found that 'community youth required additional
 6 motivation to pursue available opportunities' (pages 3-39) – have the Keeyask Partners
 7 considered additional incentives for youth to undertake training activities?

8 **RESPONSE:**

9 As a pre-project program, The Hydro Northern Training and Employment Initiative
 10 (HNTEI) was a comprehensive training and employment initiative designed to prepare
 11 northern Aboriginal residents for skilled labour positions related to Manitoba Hydro
 12 projects and other northern Manitoba employment opportunities. Manitoba Hydro
 13 contributed \$20 million to this \$60.3 million initiative. Training was designed and
 14 implemented by the Aboriginal partners for their own community members.

15 The Partnership also attempted to integrate local employment and capacity building
 16 opportunities for the Keeyask Cree nations (KCNs), including young people, during the
 17 environmental assessment process. For example, the Socio-Economic Supporting
 18 Volume notes multiple examples of community participation in the heritage resources
 19 fieldwork process, including a program in which high school students received school
 20 credit for their participation in a six-week archaeological program (see Section 1.4.3 of
 21 Part 3 – Heritage Resources of the SE SV). The purpose of the program was also to
 22 generate interest in pursuing archaeology as a career.

23 A Manitoba Hydro Keeyask Leadership Scholarship (\$500 each) is provided annually to
 24 four graduating high school students from each of the KCNs who have shown exemplary
 25 leadership qualities within the school and the community. This scholarship is provided
 26 for post-secondary studies and recipients are selected by their respective community.

27 With regard to construction employment, the Partnership included consideration of
 28 youth employment in the effects assessment. For example, KCNs community members
 29 that are currently in high school will be eligible for employment on the Project during its
 30 eight and a half year construction period. As part of the Joint Keeyask Development
 31 Agreement (JKDA), which was ratified by each of the KCNs communities, there is
 32 provision for direct negotiation contracts (DNCs) with each of the KCNs (see Section
 33 3.4.1.3.1 of the SE SV; and Section 6.6.3.1.1 and 6.6.3.2.1 of the Response to EIS
 34 Guidelines). The DNCs enable each of the KCN communities to direct-hire community

35 members under their respective contracts; not all of the jobs associated with these
36 contracts require extensive schooling in advance.

37 With regard to future opportunities that include youth, the Employment Working Group
38 on Operational Jobs implements the employment framework referenced in the JKDA.
39 The Working Group is comprised of Manitoba Hydro staff and representatives from Fox
40 Lake Cree Nation, Tataskweyak Cree Nation, York Factory First Nation and War Lake First
41 Nation. The purpose of the Employment Framework is to increase the number of
42 members employed in Manitoba Hydro's ongoing operations. The employment
43 framework identifies seven components: Systemic Foundations, Manitoba Hydro and
44 Career Awareness, Career Exploration, Career Preparation, Employment Preparation,
45 Pre-Project Training Employment Bridging, Recruitment and Employment. The activities
46 of the working group are aimed at different segments of each community from youth in
47 elementary school to teens in high school to post- secondary students to mature
48 students (for more detail, see CEC Rd 1 CEC-0011).

49 It is anticipated that each of the KCNs develop community specific ATK monitoring
50 plans. Section 8.2.7 in the Response to EIS Guidelines notes, "the involvement of youth
51 will also ensure that the ATK held by elders and resources users is passed on to the next
52 generation, and that there is long term continuity in the monitoring programs."

53 Furthermore, Manitoba Hydro has a number of initiatives that support and enhance
54 Aboriginal training and employment for community members. Below are some
55 examples of Manitoba Hydro initiatives and investments in training for young people
56 (also see CEC Rd 1 CFLGC 0021):

57 The High School Apprenticeship program, which was launched in 2008 is a joint project
58 of Manitoba Hydro (sponsor), the Apprenticeship Branch, Red River College, and the
59 Frontier School Division. The program introduces students in grades 11 and 12 to a
60 range of careers that Hydro offers. Those accepted into the program receive paid, part-
61 time, on-the-job training that counts as supplemental academic credits toward
62 graduation as well as apprenticeship hours towards a trade.

- 63 • The program offers a choice of 50 trades, including Industrial Electrician, Industrial
64 Instrument Mechanic, Industrial Mechanic, Industrial Welder, Power Electrician,
65 Carpenter, Construction Electrician, Painter, and Plumber. Radisson Training Centre
66 is the setting for teaching the core trades of Electrical and Mechanical, as well as
67 Construction Craft Worker and Carpentry.
- 68 • Manitoba Hydro is actively involved in promoting Aboriginal skills development and
69 employment by engaging students at high schools and post secondary institutions
70 such as the Aboriginal Business Education Partners (ABEP) and the Engineering
71 Access Program (ENGAP) at the University of Manitoba; career fairs and community

72 recruitment visits with hands-on demonstrations of equipment, and information on
73 career opportunities; and summer employment opportunities.

74 As noted in CEC Rd 1 CFLGC 0021, the following list provides additional examples of
75 Manitoba initiatives and investments in training:

76 **Bursaries and Scholarships**

77 Manitoba Hydro's Educational Funding Program provides for bursaries and scholarships
78 for students pursuing studies in Hydro related streams such as Engineering, Technology,
79 Information Technology and Business. The Program offers a total of \$211,000 in awards,
80 \$171,000 of which is available only to Aboriginal students.

81 **Aboriginal Pre-Placement Training Initiatives**

82 Manitoba Hydro has Aboriginal Pre-Placement Training programs which provide on-the
83 job training, academic upgrading, mentorship and guidance to help Aboriginal
84 candidates acquire the skills and competencies required to prepare them for entry into
85 apprenticeship programs at Manitoba Hydro.

86 **Summer Student Program**

87 Manitoba Hydro hires on average 350 summer students each year and generally 21 -
88 25% are Aboriginal. In 2012, 8 students were hired from KCN communities. In 2013, 12
89 KCN students have been hired to date.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088e**

4 **QUESTION:**

5 Please elaborate on the role to be played by KCN residents in the offsetting programs
6 and upon their training to participate in this program.

7 **RESPONSE:**

8 Please see the response to CEC Rd 1 CAC-0079c.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0088f**

4 **QUESTION:**

5 Please elaborate on the ongoing monitoring and evaluation of all Keeyask programs –
6 construction, operations, off-setting program– to ensure that programs are effective
7 and meeting community interests? Please elaborate on the mechanism for adjustment if
8 negative results are identified from the monitoring.

9 **RESPONSE:**

10 Please see the response to CEC Rd 1 CAC-0079d.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089a**

4 **QUESTION:**

5 How was the concern raised regarding transportation to the construction site
6 addressed?

7 **RESPONSE:**

8 There will be a shuttle service to and from airports in Gillam and Thompson to transport
9 workers to the Project site for isolation leaves. The availability of a Project shuttle
10 service is a mechanism to enhance worker safety as well as reduce traffic congestion
11 from use of personal vehicles.

12 Provision of transportation services for project employees is governed by the
13 Burntwood Nelson Agreement (BNA). Under the conditions of the BNA, contractors are
14 responsible to provide transportation to and from the nearest point of public
15 transportation or the 'Transportation Departure Point' (TDP). In the case of KCNs
16 communities, the contractor will provide transportation from Thompson, Gillam, Split
17 Lake, Ilford, and York Landing to the Project site. The shuttle from Gillam will also stop
18 at the junction of PR 280 and 290 (former Greyhound bus stop location) for residents of
19 Fox Lake Cree Nation (Bird); note that the Partnership will establish a mechanism to
20 safely transport such workers to and from Bird and the highway junction. This shuttle
21 service is available for workers before and after their isolation leave (i.e., work rotation).
22 For out of province workers, the contractor is bound to pay the travel costs of out of
23 province workers to/from the nearest airport closest to their homes.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089b**

4 **QUESTION:**

5 Will there be jobs for individuals with disabilities? If so, please describe these jobs.

6 **RESPONSE:**

7 As long as they are qualified to perform the job function to the required standard and
8 safely, individuals with disabilities will be eligible for employment. Candidates need to
9 meet the job requirements specified on the job orders submitted to the Job Referral
10 Service.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089c**

4 **QUESTION:**

5 Community members raised concerns regarding employment (layoff) practices (page
6 3C- 43)– some implying that layoffs of Aboriginal workers were being used to
7 circumvent preferential employment policies – how have such practices been altered to
8 address such concerns?

9 **RESPONSE:**

10 The Burntwood Nelson Agreement (BNA) contains language so that preferential
11 employment (layoff and recall) policies are not circumvented (refer to Article 12 of the
12 BNA available at: http://www.hydro.mb.ca/projects/bna_agreement.pdf).

13 As of July 2010, Manitoba Hydro has directed that, despite the provisions of Article
14 12.4.2.3, the order of recall shall, at all times, be the same as the order of employment
15 preference set out in Article 12.1. In other words, in no instances shall non-Manitobans
16 involved in a common or collective work assignment be recalled prior to that
17 assignment's Manitobans.

18 The result of these directions can be summarized as follows: Contractors shall only
19 utilize the lay-off subject to recall provisions (Article 12.4.2) where all employees will be
20 recalled within 60 days. If the lay-off is to be more than 60 days, regular lay-off
21 procedures apply. Sub-Article 12.4.2.3, which allows for 'out of order' recalls as long as
22 all employees in a common or collective work assignment are all recalled within 28 days
23 of the date of the first recall, is suspended. So, in all instances, employees laid-off
24 subject to recall must be recalled in order of preference.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089d**

4 **QUESTION:**

5 Are there anti-discrimination policies in place? Please describe them.

6 **RESPONSE:**

7 The Burntwood Nelson Agreement states that the parties agree that no person covered
8 by the BNA shall be subject to discrimination or harassment on the basis of any
9 characteristic referred to in subsection 9(2) of the Human Rights Code of the Province of
10 Manitoba. If there are claims of discrimination, the BNA outlines a procedure to follow
11 regarding the claim.

12 Every camp resident will be required to follow the Project site rules. The objective of the
13 site rules is to maintain safe working conditions, to protect the health, life and well
14 being of each and every individual and to ensure the best possible quality of life, as well
15 as to protect personal and company property.

16 Workplace Safety and Health regulations require contractors to have and make available
17 to all employees their harassment and violence policies.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089e**

4 **QUESTION:**

5 Will job ad wording be altered to ensure some will not find it overly complex?

6 **RESPONSE:**

7 The National Occupational Classification (NOC) provides a standardized language for
8 describing the work performed by Canadians in the labour market. Job orders sent to
9 the Job Referral Service (JRS) will follow the NOC codes for job descriptions.

10 Each of the KCNs communities will have a job seeker manager hired by Employment
11 Manitoba in order to assist with ensuring KCNs Members are registered correctly in the
12 JRS.

13 Employment Manitoba runs several offices throughout the province and any individual
14 can attend the office and request help in registering with the JRS.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089f**

4 **QUESTION:**

5 Are applicants informed that they must renew their application every 6 months to
6 prevent their file from going dormant?

7 **RESPONSE:**

8 Yes, applicants are informed that they must renew their application every 6 months to
9 prevent their file from going dormant.

10 KCNs Members have the option to utilize a job seeker manager as their referral agent.
11 For these individuals, the job seeker manager receives a notification for registrations
12 that are about to expire. As well, the job seeker managers will receive community lists
13 for all registrations that are dormant. Only KCNs Members that have selected using a job
14 seeker manager are included due to Freedom of Information and Protection of Privacy
15 Act (FIPPA).

16 Information on the Job Referral Service (JRS) can be found at the following link:
17 <http://www.gov.mb.ca/jrs/keeyask/index.html>

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089g**

4 **QUESTION:**

5 A number of factors are mentioned that are predicted to possibly affect employment of
 6 KCNs, CBNs and northern Aboriginal workers (Attraction, Availability and Qualifications)
 7 – have the Keeyask partners thought of ways to mitigate them? Please see examples
 8 immediately below:

- 9 • Attraction e.g. flexible work schedule to ensure workers aren't away from families
 10 for too long (mentioned at many community consultations)
- 11 • Availability e.g. sufficient notice of a job opportunity
- 12 • Qualifications e.g. could apprenticeships be used to substitute for lack of
 13 experience?

14 **RESPONSE:**

15 Work schedules are set by the contractors for all Project workers and largely driven by
 16 contractual commitments to meet Project schedule. Within the work schedule, hours of
 17 work, shift duration and isolation leave are governed by the Burntwood Nelson
 18 Agreement (BNA) (available at: http://www.hydro.mb.ca/projects/bna_agreement.pdf).
 19 Provisions for a day of rest (normally considered to be Sunday) are included in the BNA.
 20

21 Contractors will provide as much notice as possible regarding job opportunities.
 22 Construction needs change rapidly which may reduce the notice that is provided.
 23

24 To mitigate factors that may affect employment of the KCNs, CBNs and northern
 25 Aboriginal workers, the following measures will be implemented:

- 26 • A Direct Negotiation Contract (DNC) will be in place to provide employee retention
 27 and support services. Through a joint venture, two of the KCN (Fox Lake Cree and
 28 York Factory) will provide these services which include cultural ceremonies,
 29 aboriginal awareness training, counseling services and KCN site orientation where,
 30 prior to arrival at the work site Members have an opportunity to learn about the
 31 camp construction experience and enhance their prospects of staying on the job.
- 32 • KCNs community Job Seeker Managers are notified when contractors submit job
 33 orders within the Job Referral Service (JRS). They can assist job seekers with
 34 registering to have their names referred to the contractor. There are Employment

- 35 Manitoba Centres located throughout the province to offer registration assistance
36 to any potential employees.
- 37 • Within the acceptable limits of the BNA, on-the-job training programs for
38 apprentices and trainees are offered under a number of contracts to assist workers
39 in gaining experience while working on the Project.
 - 40 • Amenities located at the Main Camp (to help provide balance to a worker's stay at
41 camp) include accommodation with private bathrooms, personal televisions and
42 individual heating and cooling units. Recreation and entertainment facilities will
43 also be located at the Main Camp.
 - 44 • Transportation services will be provided for isolation leaves, please see response to
45 CEC Rd 1 CAC-0089a and CEC Rd 1 CEC-0012 for detail.
 - 46 • Hydro Projects Management Association (HPMA) and the Allied Hydro Council of
47 Manitoba (AHC) are presently reviewing changes to the Burntwood Nelson
48 Agreement (BNA) in regards to isolation leaves to better attract and retain a
49 qualified workforce.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089h**

4 **QUESTION:**

5 Table 3-1 lists employment estimates – these are likely calculated using the labour force
6 as the denominator. As many workers may be discouraged from looking for work and
7 therefore not show up in the labour force figures, it seems important to re-calculate
8 these employment rates with the adult population as the denominator. Please discuss
9 the merits of this suggestion.

10 **RESPONSE:**

11 Table 3-1 presents percentage values of attraction, availability and qualifications factors
12 used to assess challenges affecting employment levels in the labour supply/demand
13 matching model that was used for estimating northern Aboriginal participation in
14 Project construction opportunities. The supply component of the model is built up from
15 Statistics Canada labour force data from the 2001 Census, the most recent year for
16 which detailed occupational data were available from Statistics Canada, as well as from
17 data on participation in the Hydro Northern Training and Employment Initiative (HNTEI).
18 Statistics Canada labour force data were deemed to be the most relevant indicator for a
19 model that was estimating northern Aboriginal participation in Project jobs. To ensure
20 consistency with the rest of the supply/demand model, the percentages used to
21 incorporate the challenges affecting employment into the estimation procedure are
22 based on labour force. Applying total population as the basis for these factors would be
23 inconsistent with the rest of the model and produce invalid results.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.2.1; p. N/A**

3 **CEC Rd 1 CAC-0089i**

4 **QUESTION:**

5 On pages 3-24, it was noted that factors such as a lack of daycare facilities, addictions, a
 6 lack of confidence or job experience and housing insecurity prevent individuals in the
 7 KCN communities from taking up jobs. Will the Keeyask Partners consider broader
 8 interventions to assist individuals in the KCNs to take advantage of new job
 9 opportunities?

10 **RESPONSE:**

11 The Partnership has established a variety of mitigation measures to reduce barriers to
 12 employment and assist members of the KCNs communities to take advantage of new
 13 job opportunities. Examples of investments in training and education, promotion of
 14 local hiring and contracting and efforts to enhance social well-being include the
 15 following:

- 16 • A \$60 million Hydro Northern Training and Employment Initiative between 2002 and
 17 2010 was put in place to enhance the ability of northern Aboriginal residents to
 18 qualify for a range of employment opportunities [Section 3.4.1.2.3 of the SE SV];
- 19 • The Burntwood Nelson Agreement (BNA), the collective agreement governing
 20 employment on the Project includes preferential hiring provisions for qualified
 21 Aboriginal residents from the Churchill-Burntwood-Nelson area (the KCNs
 22 communities are located within this CBN area) [Section 3.4.1 of the SE SV];
- 23 • The extensive use of Direct Negotiation Contracts (DNCs) that, through the BNA
 24 include direct-hire provisions,
 - 25 ○ One of these DNCs with YFFN and FLCN – the Employee Retention and
 26 Support Services contract – includes cross-cultural training and on-site
 27 counseling services (including addictions and financial counseling) to assist
 28 KCNs Members and their families, if needed [Section 3.4.1.2.3 and 4.4.1.3.4
 29 of the SE SV];
- 30 • Keeyask Site Representatives to liaise with construction workers (including the
 31 KCNs) and assist with issues that may arise at the job site [Section 3.4.1.2.3 of the SE
 32 SV];
- 33 • Community-based job referral officers [Section 3.4.1.2.3 of the SE SV] (see also
 34 response to CEC Rd 1 CAC-0089e);
- 35 • An Advisory Group on Employment (AGE) is a forum for addressing employment-
 36 related issues, in particular Aboriginal employment related to the Project, with

- 37 voting representatives from the KCNs, the province of Manitoba, the Hydro Project
 38 Management Association and the Allied Hydro Council. Non-voting representatives
 39 include each Project contractor and the Aboriginal union site representative from
 40 the Allied Hydro Council [see Schedule 12-7 of the JKDA];
- 41 • Ongoing communication between Manitoba Hydro and local service providers (e.g.,
 42 NNADAP for addictions) to allow for effective and timely planning of service delivery
 43 [Section 4.4.1.3.4 of the SE SV];
 - 44 • KCNs Members are not required to live in their home communities to be eligible for
 45 preferential hiring on the Project. This has the potential to reduce in-migration and
 46 thus any added pressure on housing in the communities [Section 4.4.1.2.1 of the SE
 47 SV]. For those Members who gain employment on the Project, housing is provided
 48 at the camp;
 - 49 • In terms of daycare facilities, the Gillam Childcare facility has responded to
 50 increased demand and has increased their capacity [Section 4.4.1.3.2 of the SE SV].
 51 For the KCNs communities, there is an entrepreneurial opportunity to increase
 52 daycare options in their communities [Section 4.4.1.3.4 of the SE SV.]
 - 53 • Operational job provisions in the JKDA. A Working Group for Operational Jobs
 54 (WGOJ) has been established with a target of employing 182 Keeyask Cree Nations
 55 (KCNs) Members into Hydro's ongoing operational jobs over a 20 year period (also
 56 see responses to CEC Rd 1 CEC-0011, CAC-0088d and CAC-0091a).
 - 57 • Provision in many of the KCNs Adverse Effects Agreements provide for culturally
 58 important initiatives (re: language, traditional lifestyle, healthy wild food access)
 59 and counseling and wellness programming.
 - 60 • A variety of Manitoba Hydro initiatives that extend beyond the Project exist. Please
 61 refer to CEC Rd 1 CEC-0011, CAC-0088d, CEC-0091b and CFLGC-0021.

62 As noted in CEC Rd 1 CAC-0077c, promoting opportunities for local employment,
 63 ownership and decision-making, re-investment of profits in communities, and
 64 enhancement of local knowledge, skill development and health and well-being, to
 65 name a few, are mechanisms to build self-sufficiency and esteem and support
 66 individuals to take advantage of employment opportunities.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.2.4 and Appendix 3B; p. N/A**

3 **CEC Rd 1 CAC-0090**

4 **QUESTION:**

5 Please elaborate on the evidence supporting your conclusion of the predicted effect of
 6 the Keeyask project on the cost of living? Have the Keeyask partners thought of ways to
 7 minimize the negative impact of inflation?

8 **RESPONSE:**

9 Sections 3.4.1.5 and 3.4.2.4 of the Socio-Economic Environment, Resource Use and
 10 Heritage Resources Supporting Volume examined the potential effects of Project
 11 construction and operation on the cost of living in the Socio-Economic Local Study Area
 12 (LSA), focusing on the most likely areas of effect: food and household items,
 13 transportation and housing. The analysis examined separately the KCNs' communities,
 14 Thompson and Gillam. For each economic category and location, the analysis examined
 15 key factors affecting the current cost structure along with where and how Project
 16 expenditures and activities would occur.

17 The assessment of cost of living effects used a combination of quantitative data
 18 collection (*i.e.*, through the use of the Revised Northern Food Basket survey) and
 19 qualitative analysis to characterize current cost of living. However, it was not possible to
 20 isolate quantitatively the specific projected contribution of the Project to cost of living in
 21 these communities. The analysis relied upon a review of cost pressure circumstances in
 22 each community without the Project and the nature of cost inflation pressure effects
 23 that are expected to result from the Project.

24 Key findings from this analysis are as follows:

- 25 1. **KCNs communities:** There would be a modest increase in Project-related spending,
 26 largely from re-spending by locally based construction workers, in the KCNs'
 27 communities. Since commercial competition is currently lacking in these
 28 communities, the added spending could precipitate increased local competition in
 29 the retail and transportation sectors, possibly dampening pressure on local costs.
- 30 2. **Thompson:** For several years prior to today, the economy of Thompson experienced
 31 rapid growth, resulting in upward pressure on housing prices and on wages, which
 32 prompted price hikes in the hospitality, trades and transportation-related sectors.
 33 The growth also contributed to capacity expansion in many sectors. Looking
 34 forward, as noted in Section 3.4.1.5.3 of the SE SV: "It is expected that if Vale moves
 35 forward with its plan to shut down the smelter and refinery during the same

36 timeframe as Project construction, the Thompson economy may grow more slowly
37 or enter a state of decline during the construction phase of the Project. If this were
38 to occur, then any inflationary effect is unlikely to materialize and local labour
39 shortages could be expected to relax." Local businesses could shift from a position
40 of insufficient capacity to excess capacity. In this context, added expenditures in
41 Thompson from Project construction would be beneficial to the business enterprises
42 in Thompson, helping to dampen the effects of the economic slowdown. Given the
43 capacity build-up during the high growth years, Project-related expenditures are not
44 expected to precipitate increased cost of living in Thompson.

45 3. **Gillam:** With respect to Gillam, Project-related cost of living implications pertain
46 mainly to the operation phase of the Project when many of the operation phase
47 workers and their families will be moving into the community, requiring additional
48 housing and services. Effects on housing prices are expected to be moderated by
49 Manitoba Hydro's planned housing expansions to accommodate the added workers
50 and their families; in addition, a planned new retail and service mall is expected to
51 provide added capacity in these sectors. It is anticipated that this new capacity
52 would moderate pressure on prices associated with added demand from the new
53 population.

54 Overall, there were no predicted upward effects on cost of living due to Project-related
55 spending and re-spending in the KCNs' communities, Thompson and Gillam. In light of
56 this, no mitigation is needed nor was it proposed to "minimize the negative impact of
57 inflation".

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.3.1 Employment and Training Opportunities - Local Study Area;**
 3 **p. N/A**

4 **CEC Rd 1 CAC-0091a**

5 **PREAMBLE:**

6 Tables throughout this volume indicate the labour demand will fluctuate quite a bit, and
 7 be highest for the construction phase. This indicates that the KCN communities will
 8 experience volatile economic conditions (a 'boom bust' situation, figure 3-20). Given
 9 this, it is important that the project make an effort to support initiatives that could bring
 10 about long-term economic development opportunities that do not derive from
 11 hydroelectric power generation. For example, Fox Lake, YFFN and WLFN seem to lack a
 12 high school so that students have to leave their communities for high school. This may
 13 be a barrier to high school completion for some children.

14 **QUESTION:**

15 Please discuss the merits of the Keeyask Partners contributing funds for a high school in
 16 these communities?

17 **RESPONSE:**

18 Funding capital projects or upgrades in KCNs communities is beyond the scope and
 19 responsibility of the Keeyask Hydropower Limited Partnership. On-reserve education is
 20 the responsibility of the federal government.

21 As stated in SE SV Section 3.4.2.3, each of the Keeyask Partners has the opportunity to
 22 invest in the Project and, after the Project is operational, receive income based on
 23 Project revenues. As such, the distribution of annual Project dividends is expected to
 24 increase the amount of discretionary income the KCNs have to address economic,
 25 infrastructure and social needs. Section 14.2.2 of the JKDA indicates that distributions
 26 may be used by a KCNs community for the following purposes:

- 27 • business and employment development undertakings;
- 28 • local community infrastructure and housing development; and
- 29 • the construction of capital projects, including related infrastructure, as well as the
 30 operation and maintenance of any capital projects, including related infrastructure.

31 The KCNs leadership and community Members will ultimately determine how
 32 investment income will be used within each of the communities.

1 **REFERENCE: Volume: Socio-Economic Supporting Volume; Section:**
 2 **3.3.1 Employment and Training Opportunities - Local Study Area;**
 3 **p. N/A**

4 **CEC Rd 1 CAC-0091b**

5 **PREAMBLE:**

6 Tables throughout this volume indicate the labour demand will fluctuate quite a bit, and
 7 be highest for the construction phase. This indicates that the KCN communities will
 8 experience volatile economic conditions (a 'boom bust' situation, figure 3-20). Given
 9 this, it is important that the project make an effort to support initiatives that could bring
 10 about long-term economic development opportunities that do not derive from
 11 hydroelectric power generation.

12 **QUESTION:**

13 The University College of the North in Thompson is also in need of funds for campus
 14 upgrading to support the increase in demand for its courses. Please discuss the merits of
 15 the Keeyask Partners support this institution which supports diversified long-term
 16 economic opportunities in the Regional Study Area?

17 **RESPONSE:**

18 Funding capital projects or upgrades in the Regional Study Area is beyond the scope and
 19 responsibility of the Keeyask Hydropower Limited Partnership. As a corporation,
 20 Manitoba Hydro supports The University College of the North by offering a number of
 21 scholarships to support their students. The corporation has committed to providing
 22 scholarships from 2012 to 2015. Eight scholarships valued at \$2000 each will be
 23 awarded to Aboriginal students registered in one of the following:

- 24 • Computer Analyst/Programming
 25 • Computer Systems Technology
 26 • Electrical/Electronic Technology

27 Additionally, eight scholarships valued at \$500 will be awarded to Aboriginal students
 28 registered in one of the following areas:

- 29 • Bachelor of Arts
 30 • Bachelor of Nursing
 31 • Business Administration Diploma
 32 • Carpentry/Woodworking Certificate
 33 • Civil/CAD Technology Certificate
 34 • Early Childhood Education Diploma

- 35 • Facilities Technician Diploma
- 36 • General Studies: Adult Education Diploma
- 37 • Heavy Duty Mechanics Certificate
- 38 • Industrial Welding Certificate
- 39 • Kenanow Bachelor of Education – Integrated Stream (BEDIS)
- 40 • Kenanow Bachelor of Education – After Degree Stream (BEADS)
- 41 • Natural Resource management Technology Diploma
- 42 • Office Administration Diploma, or
- 43 • Preparation for Technology Certificate

1 **REFERENCE: Volume: Public Involvement Supporting Volume;**
2 **Section: 3.2.3; p. 3-13**

3 **CEC Rd 1 CAC-0092a**

4 **QUESTION:**

5 Were the public consultations in the North advertised on the radio in all communities?

6 **RESPONSE:**

7 Radio advertising was used, along with other media, to advertise and promote
8 participation during all three rounds of the Keeyask Generation Project Public
9 Involvement Program.

10 All communities except Granville Lake are included in areas where NCI Radio or CJOB PIP
11 advertisements were broadcast.

12 Keeyask Generation Project PIP Notification Packages were distributed to all
13 communities in the Churchill-Burntwood-Nelson area, as well as communities,
14 organizations and other Aboriginal groups that may be potentially affected by or
15 interested in the Project.

1 **REFERENCE: Volume: Public Involvement Supporting Volume;**
2 **Section: 3.2.3; p. 3-13**

3 **CEC Rd 1 CAC-0092b**

4 **QUESTION:**

5 Individuals in a number of communities complained that Hydro was starting a new
6 development before old disputes had been settled. Please discuss the importance of
7 Keyask being put ahead of past grievances?

8 **RESPONSE:**

9 For clarification, the Keyask Generation Project is not a Manitoba Hydro development.
10 The Proponent of the Keyask Generation Project is the Keyask Hydropower Limited
11 Partnership (KHLP) representing Manitoba Hydro and four Cree Nations known
12 collectively as the Keyask Cree Nations: Tataskweyak Cree Nation, War Lake First
13 Nation (working together as the Cree Nation Partners), Fox Lake Cree Nation and York
14 Factory First Nation.

15 The Keyask Generation Project Public Involvement Program recorded several
16 statements from both community members and representatives of organizations
17 offering comment on their experiences related to past hydro developments. These
18 statements should not be construed as individuals "...complain[ing] that Hydro was
19 starting a new development before old disputes had been settled." Nowhere was this
20 specifically stated.

21 Manitoba Hydro has entered into settlement agreements with First Nations, community
22 councils, local organizations and resource harvesters along each stretch of the
23 waterways affected by its past projects. Manitoba Hydro has also established several
24 programs which it continues to implement to address past and ongoing impacts from
25 these previous developments.

1 **REFERENCE: Volume: KTP - Environmental Assessment Report;**
2 **Section: 6.0 and 7.0; Page No.: N/A**

3 **CEC Rd 1 CAC-0093a**

4 **QUESTION:**

5 On page 32, it is noted that there was a Survey at Sam Cook school in TCN. Please
6 indicate where the results of this survey can be found.

7 **RESPONSE:**

8 It is understood that the Reference should be Cree Nation Partners – Keeyask
9 Environmental Evaluation [January 2012], since the cited page numbers in the Question
10 match those in the CNP Keeyask Environmental Evaluation Report.

11 A summary of survey results can be found in the November/December 2002 edition of
12 the Tataskweyak Journal, an excerpt of which follows:

13 *“Following the presentations, the students [about 60] provided responses to*
14 *some of the findings contained in the [2002] OWL Overview Summary Report*
15 *using an electronic balloting system. The students strongly supported the*
16 *Report’s conclusions about the importance of the historical connection to the*
17 *land; about the need to respect the wisdom of the Elders; about the desirability*
18 *of a familiar future and about the great respect that Tataskweyak Cree have for*
19 *Mother Earth. There was less support for the view that all of Mother Earth’s*
20 *beings should be treated as members of one’s family and that all things,*
21 *including inanimate things, have spirits.”*

22 A scan of the full article is attached.

23 Please note that results of the survey are considered to be confidential to the
24 community.

OWL YOUTH FORUM

Submitted by: **Bryant Keeper**



Tataskweyak Cree Nation (TCN) held a Youth Forum November 4, 2002 as part of the ongoing information sharing aspect of the potential Keeyask Generating Station project. Overview of Water and Land (OWL) was the primary focus of the forum.

Tataskweyak Cree Nation undertook our OWL process for two principal reasons: (1) to enable our Members to judge the tolerability of hydroelectric development of Keeyask Rapids based upon our own experience, understanding, knowledge, wisdom, values, beliefs, and priorities, and (2) to encourage the larger Canadian society to respect our judgement through a better understanding of our world view.

The OWL Technical Support team, headed by Brian Ransom, one of the OWL advisors, made a series of presentations to about 60 Senior 1 to Senior 4 high school students at the Chief Sam Cook School. Presentations included the Keeyask Project Description and the Overview of Water and

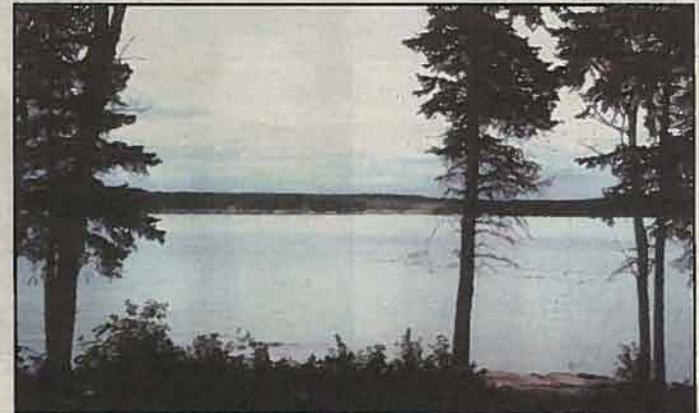
Land (OWL) process. A model of Keeyask Rapids showing the potential generating station was also displayed and drew a lot of attention.

Following the presentations, the students provided responses to some of the findings contained in the OWL Overview Summary Report using an electronic balloting system. The students strongly supported the Report's conclusions about the importance of the historical connection to the land; about the need to respect the wisdom of the Elders; about the desirability of a familiar future and about the great respect that Tataskweyak Cree have for Mother Earth. There was less support for the view that all of Mother Earth's beings should be treated as members of one's family and that all things, including inanimate things, have spirits.

The Youth Forum was seen by most as being worthwhile and that others should be held in the future as more presentations are available.



Scenes from
Tatskweyak
Cree
Nation



1 **REFERENCE: Volume: KTP - Environmental Assessment Report;**
2 **Section: 6.0 and 7.0 CNP; p. 37-39**

3 **CEC Rd 1 CAC-0093b**

4 **QUESTION:**

5 On pages 37-39, a list of issues identified by community members is provided on pages
6 36-39. There is reference to community members' ranking of these issues. Please
7 provide these aggregate rankings. Finally, 535 people responded to a community
8 questionnaire. Please summarize the results.

9 **RESPONSE:**

10 It is understood that the Reference should be *Cree Nation Partners (CNP) – Keeyask*
11 *Environmental Evaluation* [January 2012], since the cited page numbers in the Question
12 match those in the CNP Environmental Evaluation Report.

13 All 45 of the issues represent a refinement of the original 65 issues identified by
14 Members. As the *CNP Environmental Evaluation Report* notes on p.36, "*The wording of*
15 *the issues has been modified to avoid duplication.*"

16 The 65 issues consisted of 51 issues which were the subject of a 2003 Tataskweyak
17 Community survey, as well as 12 additional issues which were not ranked as part of the
18 survey but were identified as requiring to be addressed, including two issues of concern
19 for War Lake First Nation Members and 10 issues of common concern to Tataskweyak
20 and War Lake.

21 All of the 51 issues were ranked as "very important" or "extremely important". The
22 highest ranked issues were:

- 23 • Increase in mercury in fish;
24 • Loss of burial sites from flooding;
25 • Loss of sturgeon spawning areas;
26 • Less traditional food available;
27 • Suffering and deaths of muskrats and beaver;
28 • Increase in death and injury on PR 280;
29 • Increase in the risk of flooding like 1997;
30 • Less fish in diet;
31 • Fewer fish and animals available; and
32 • Fewer moose to harvest.

33 The May 1999 Community questionnaire completed by 535 Tataskweyak Members
 34 comprised 41 questions concerning the importance of environmental protection and
 35 cultural and resource development, economic and employment development and
 36 training, and the Tataskweyak Community and the Keeyask Project.

37 Results can be summarized as follows:

38 Environmental Protection and Cultural and Resource Development

39 The importance of a healthy environment and its continued protection, including
 40 burial and other traditional sites received high rankings. The importance of a strong
 41 culture, including the importance of young people learning traditional skills and
 42 living a traditional lifestyle also ranked highly. Securing funding for Tataskweyak to
 43 conduct its own environmental review ranked high. Lower rankings were given to
 44 the acceptance of flooding of burial and traditional sites and negative impacts on
 45 fish, wildlife, and plants in exchange for part ownership of Keeyask. The Tataskweyak
 46 Resource Area was viewed as being central to development of Tataskweyak Cree
 47 Nation.

48 Economic and Employment Development and Training

49 Delivering increased jobs on or near the Tataskweyak Reserve ranked higher than
 50 increased jobs in the Resource Area. Very high rankings were given to the need to
 51 improve training programs and having more young people attend university and
 52 college.

53 High rankings were given to having more businesses owned by Tataskweyak, jobs
 54 and economic development in the resource sector, having more Tataskweyak
 55 professionals, and having Tataskweyak work for businesses in a range of economic
 56 sectors. Lower rankings were given to having fewer construction and operating jobs
 57 in exchange for part ownership of Keeyask.

58 The Tataskweyak Community and the Keeyask Project

59 High rankings were given to negotiating jobs and ensuring environmental
 60 protection, including burial and other sites. High rankings were also given to
 61 ensuring compensation for any damages that may occur and on receiving long-term
 62 benefits, as well as to Tataskweyak participation in the decision making and
 63 planning of Keeyask and to part ownership.

1 **REFERENCE: Volume: KTP - Environmental Assessment Report;**
 2 **Section: 6.0 and 7.0 CNP; p. 75**

3 **CEC Rd 1 CAC-0093c**

4 **QUESTION:**

5 On page 75, the referenda were discussed. Please elaborate upon the information that
 6 community members were given before the referendum (especially concerning jobs,
 7 training, revenue sharing, adverse effects mitigation)?

8 **RESPONSE:**

9 The referenda are actually discussed on page 75 of the Cree Nation Partners Keyeyask
 10 Environmental Evaluation Report, rather than the KTP Environmental Assessment
 11 Report, as indicated in the above reference.

12 Appendix 3 of the Cree Nation Partners Keyeyask Environmental Evaluation Report, titled
 13 the CNP Proposed Keyeyask Generating Station Community Consultation Report,
 14 provides detailed information about the engagement of Tataskweyak and War Lake
 15 (CNP) Members prior to the Keyeyask Referendums.

16 Section 2.0 of Appendix 3 provides an overview of how this community engagement
 17 occurred. As the engagement process developed over time, various forums for CNP
 18 Member participation were established. These forums included five Reference Groups
 19 to develop detailed negotiating positions on specific subject matters, but also included
 20 more general information and planning meetings, negotiation meetings, membership
 21 meetings, youth meetings, and the development and provision of a variety of
 22 communication materials. Communication materials included community newspapers in
 23 Tataskweyak and War Lake, interactive DVDs, community questionnaires, interviews
 24 with Elders, the use of Tataskweyak's local radio station, and websites.

25 These forums allowed for the discussion of various subject areas related to the Keyeyask
 26 Project, both internally with CNP Members and their advisors, and with Manitoba Hydro
 27 and the other Keyeyask Cree Nations. These forums were utilized to provide information,
 28 receive feedback, and answer questions related to the following subject areas:

- 29 • Partnership Arrangements;
 30 • Employment Objectives/Opportunities;
 31 • Adverse Effects Agreements;
 32 • Business Opportunities;
 33 • Construction and Operation Arrangements;
 34 • Project Description;

- 35 • Environmental and Regulatory Matters;
- 36 • CNP Governance/Committees;
- 37 • External Relations and Communication Strategy; and
- 38 • Joint Keeyask Development Agreement (JKDA) and Adverse Effects Agreements
- 39 (AEA) Review.

40 Over the course of the formal engagement period from 1998 to 2009, 1,299 individual
41 Cree Nation Partner Members attended a total of 2,082 meetings related to the topics
42 described above. These meetings were held in Split Lake, Ilford, Thompson, and
43 Winnipeg, to ensure broad participation for on and off-reserve Members.

44 As noted on page 75 of the CNP Keeyask Environmental Evaluation Report, in late 2008,
45 prior to the Referendums held in each community, 15 general membership meetings
46 were held with the specific purpose of reviewing, discussing, and answering questions
47 from CNP Members about all aspects of the Joint Keeyask Development Agreement and
48 the Adverse Effects Agreements.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 CAC-0094**

3 **QUESTION:**

4 Please indicate whether gender was a consideration in project design? If so, how was it
5 taken into account?

6 **RESPONSE:**

7 The response to the question of whether gender was a consideration in Project design is
8 informed by the concept of 'gender democracy' where "values, standards and social
9 practices are able to tap into the potential of all members of society. Women and men
10 must enter into a meaningful dialogue to be able to participate actively in the processes
11 of change".¹ While many of the inputs to develop and promote gender democracy are
12 outside the scope and mandate of the Project, there are, nonetheless, gender-sensitive
13 considerations in the design, planning and assessment stages of the Project.

14 Section 5 of the Socio-Economic Supporting Volume assesses the effect of the Project on
15 personal, family, and community life and is contextualized by a Cree worldview "that
16 shapes the perceptions and experience of the KCNs whose personal, family, and
17 community life will be most affected by the Project "(p. 52). Within this assessment
18 approach and context, key issues raised relating to gender include concerns about the
19 safety of women, in particular, due to an influx of workers, reasonable access to daycare
20 (in order to take advantage of Project-related employment opportunities), as well as the
21 effect on the 'family' (as defined by the Cree) due to local Members leaving the
22 community to work on the Project.

23 The following considerations have been incorporated into the project design: separate
24 dorm(s) for female occupants; strict provisions in camp rules and the Burntwood Nelson
25 Agreement (BNA) concerning harassment; and contractors are required to provide
26 gender specific washrooms/washcar facilities. Furthermore, considerations related to
27 respect for women (amongst others) are anticipated to be incorporated into mandatory
28 Cultural Awareness training for the Project workforce.

29 In addition, the following discussion provides examples of the Partnership's attempt to
30 promote equal (which does not necessarily mean 'same') treatment and participation to
31 support women, develop measures to protect against violence, and recognize the self-
32 determining role of men and women.

33 While the Project construction workforce is anticipated to be predominantly male,
34 employment opportunities relating to all aspects of the Project will be available to

35 qualified men and women (ranging from construction to counseling to catering
36 contracts as well as other project-related opportunities – i.e., no discrimination based
37 on gender). Furthermore, the KCNs environmental assessment team and Partnership
38 fieldwork programs sought to employ and engage representatives of various segments
39 of the communities involved, from women to youth to Elders.

40 As noted in the response to CEC Rd 1 CEC-0017, a series of mitigation measures have
41 been confirmed by the Partnership at the construction site to prevent adverse non-local
42 worker interaction issues with local community members (see SE SV pg. 5-190 for full
43 list). In addition, The Partnership is working with the Northern Regional Health
44 Authority (NRHA) to secure an on-site public health care professional who would be
45 responsible for the provision of and/or referral to health promotion and risk
46 management programming (including communicable disease – e.g., sexually transmitted
47 infection education and prevention measures, if required).

48 A Harmonized Gillam Development (HGD) committee, made up of representatives from
49 Fox Lake, the Town of Gillam, Manitoba and Manitoba Hydro was established several
50 years ago as a forum to address grassroots community issues. From their work a HGD
51 Worker Interaction Subcommittee is being established to deal with increased workforce
52 in the Gillam area due to planned Manitoba Hydro projects. This Committee will include
53 representatives from Fox Lake, the Town of Gillam, Manitoba Hydro and other relevant
54 service providers including RCMP and others based on who holds, or needs, information
55 related to the increased workforce. It is intended to be a forum for information sharing
56 and communication related to the anticipated increased workforce in the Gillam area
57 with the intent of: early identification of potential issues, preventing issues to the extent
58 possible, and identifying ways and means to work cooperatively to address issues as
59 they arise (SE SV Section 5.4.1.4.4).

60 The adverse effects agreements (AEAs) with the KCNs include programming to promote
61 healing and well-being, provide opportunities for a traditional lifestyle, healthy food
62 consumption and to strengthen cultural identity. For example, the Fox Lake AEA
63 provides funding for a crisis centre and wellness counseling program, as well as a Lateral
64 Violence and “Where Do We Go From Here” Program, which through counseling,
65 education and other supports, is intended to assist individuals to identify and participate
66 in the opportunities made available in connection with the Keeyask Project.

67 The RCMP and Manitoba Hydro also meet regularly to discuss policing matters related
68 to the Town of Gillam. Manitoba Hydro, on behalf of the Partnership, has started
69 discussions with the RCMP to assess and respond to Project impacts on policing for the
70 region including beyond the town of Gillam and into the rural areas around Gillam (Bird
71 and Thompson and surrounding areas (Split Lake). (See also response to CEC Rd 1 CEC-
72 0013).

73 In anticipation of a growing demand for childcare due to this and other projects, the
74 Gillam Childcare facility has increased its capacity (see Section 4.4.1.3.2 of the SE SV).
75 Development and/or expansion of existing daycare services in KCNs communities can be
76 considered an entrepreneurial opportunity (see response to CEC Rd 1 CAC-0077c for
77 local community development discussion).

78 Lastly, socio-economic monitoring and, in particular, a planned worker family survey will
79 serve to identify issues relating to Project effects on workers and their families.

80 In summary, the goal is that the above mentioned considerations and measures will
81 enhance safety, encourage fair and meaningful participation and interaction of both
82 women and men and respond to the unique realities and cultural context in which the
83 Project is situated.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 2.2.2**
2 **Aboriginal Traditional Knowledge; p. N/A**

3 **CEC Rd 1 CAC-0095**

4 **QUESTION:**

5 Aboriginal Traditional Knowledge “ATK” is described as “a cumulative body of
6 knowledge, practice and belief about relationships among living beings that is handed
7 down by Elders in each generation and is a way of life continuously adapted and added
8 to by each generation.”

9 Questions:

- 10 • To what extent is Cree/Ineniwak Indigenous Legal Tradition considered and/or
11 included in the term ATK.
12 • To what extent is Cree/Ineniwak Traditional Governance considered and/or included
13 in the term ATK

14 **RESPONSE:**

15 Manitoba Hydro and the Keeyask Cree Nations (KCNs) undertook a two-track approach
16 to assess the effects of the Keeyask Generation Project (Keeyask). The KCNs assessed
17 the effects of the Project on themselves through their 50 years of experience with
18 hydro-electric development and their own distinctive worldview, while the Partnership
19 assessed the effects of the Project in terms of regulatory significance through a technical
20 science-based approach. The extent to which Cree/Ineniwak Indigenous Legal Tradition
21 and Cree/Ineniwak Traditional Governance is considered in this assessment is inherent
22 in each of the KCNs Environmental Evaluation Reports.

23 In the case of the KCNs, ATK and the Cree worldview are inseparable and
24 complementary components of their way of life and, ultimately, are the foundation of
25 their assessment of the Project.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CAC-0096**

4 **QUESTION:**

- 5 1. What if any resources were allocated to considering Indigenous Legal Traditions in
6 advance of the KCNs preparation of the Environmental Evaluation Reports?
7 2. What if any resources were allocated to considering Indigenous Legal Traditions in
8 the context of the KCNs preparation of the Environmental Evaluation Reports?

9 **RESPONSE:**

10 The Preface to Response to EIS Guidelines states:

11 "The Partners agreed early on that there would be a Keeyask Cree Nations
12 evaluation process as well as the government regulatory environmental
13 assessment process for the Project.

14 "In the KCNs' process, each of the KCNs, assisted by Manitoba Hydro, evaluated
15 the impact of the Project on their communities and Members in terms of their
16 own worldview, values and experience with past hydroelectric development.
17 This process supported conclusions of the Joint Keeyask Development
18 Agreement by the Partners."

19 The KCNs' Environmental Evaluation Reports were prepared separately by each of the
20 KCNs as part of the KCNs' review process supported by Manitoba Hydro. The extent to
21 which the KCNs allocated resources for the consideration of Indigenous Legal Traditions
22 as part of preparing these reports was determined and implemented individually by
23 each community.

1 **REFERENCE: Volume: KCN Evaluation Reports; Section: N/A; p.**
2 **N/A**

3 **CEC Rd 1 CAC-0097**

4 **PREAMBLE:**

5 FLCN Environmental Evaluation Report indicates that the “VEC approach tends to ignore
6 the interrelatedness of people, animals, water, landscape and plants, which are inherent
7 in the way FLCN and our people view and define Aski.” (p. iv)

8 **QUESTION:**

9 Please advise what has been done to reconcile this concern about FLFN's “difficulty to
10 accept” VECs as an acceptable means to approach environmental assessment from the
11 perspective of Fox Lake Cree worldview.

12 **RESPONSE:**

13 Please note it is Fox Lake Cree Nation not Fox Lake First Nation.

14 Please see the responses to CEC Rd 1 CAC-0013 and CEC Rd 1 CAC-0055a.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.0**
2 **Environmental Effects Assessment; 10.5 Keeyask Cree Nations'**
3 **Evaluations of the Project; p. N/A**

4 **CEC Rd 1 CAC-0098**

5 **PREAMBLE:**

6 In addition to the government regulatory environmental assessment process, each of
7 the KCNs conducted an environmental assessment process.

8 **QUESTION:**

9 Please confirm the methodology that was employed by each of the KCNs for the
10 environmental assessment process.

- 11 • Please advise if the environmental assessment process was modeled on
12 Cree/Ineniwak environmental decision making principles.
13 • To what extent is Cree/Ineniwak Indigenous Legal Tradition considered and/or
14 included in the environmental assessment process.
15 • To what extent is Cree/Ineniwak Traditional Governance considered and/or included
16 in the environmental assessment process.

17 **RESPONSE:**

18 This question is focused exclusively on the environmental assessment process
19 conducted separately by each of the KCNs.

20 As reviewed in response to CEC Rd 1 CAC-0096, the Preface to the Response to EIS
21 Guidelines states:

22 "The Partners agreed early on that there would be a Keeyask Cree Nations
23 evaluation process as well as the government regulatory environmental
24 assessment process for the Project.

25 In the KCNs' process, each of the KCNs, assisted by Manitoba Hydro, evaluated
26 the impact of the Project on their communities and Members in terms of their
27 own worldview, values and experience with past hydroelectric development.

28 This process supported conclusions of the Joint Keeyask Development
29 Agreement by the Partners."

30 The KCNs' Environmental Evaluation Reports were prepared separately by each of the
31 KCNs as part of the KCNs' process. The methodology employed by each of the KCNs for
32 each of their own environmental assessment processes is documented in these reports.

- 33 The extent to which these processes were modeled on Cree/Ineniwak environmental
34 decision making principles, or the extent to which these processes considered and/or
35 included Cree/Ineniwak Legal Tradition and/or Cree/Ineniwak Traditional Governance
36 was determined separately by each of the KCNs, and is inherent in the nature of the
37 Reports.
- 38 Please also see responses to CEC Rd 1 CAC-0095 and CEC Rd 1 CAC-0096.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **Appendix 2A; p. N/A**

3 **CEC Rd 1 CAC-0099**

4 **PREAMBLE:**

5 Appendix 2A sets out the “common” principles regarding the inclusion of Aboriginal
6 Traditional Knowledge in the Keeyask Environmental Assessment.

7 **QUESTION:**

- 8 a. Who was responsible for the drafting of the principles? And what was the process?
9 b. What was the process for adopting the final “common” principles?
10 c. What methodology is employed to measure the “inclusion” of ATK in the Keeyask
11 Environmental Assessment?

12 **RESPONSE:**

13 A response to each of the questions above is outlined below.

- 14 a. *Who was responsible for the drafting of the principles? And what was the process?*
15 b. *What was the process for adopting the final “common” principles?*

16 The EIS Coordination Team (as per Schedule 3-1 of the JKDA), with representation from
17 each of the Keeyask Cree Nations (KCNs) and Manitoba Hydro, was responsible for
18 leading the process of developing the ATK Principles as set out in Appendix 2A of the
19 Response to EIS Guidelines.

20 The process is summarized as follows:

- 21 • The EIS Coordination Team planned and implemented a two-day ATK workshop in
22 June 2008 with Elders and other Members of the KCNs, as well as Manitoba Hydro
23 and the EA Study Team.
24 • A series of draft ATK principles were identified at the workshop and the EIS
25 Coordination Team was asked to refine them. They did that over the course of
26 meetings in 2008 and early 2009.

27 The final ATK principles were adopted through consensus by the EIS Coordination Team.

- 28 c. *What methodology is employed to measure the “inclusion” of ATK in the Keeyask
29 Environmental Assessment?*

30 As stated in the Preface to the Response to EIS Guidelines (and reviewed in the response
31 to CEC Rd 1 CAC-0075a and several other Information Requests), the Partners agreed

32 early on that there would be a Keeyask Cree Nations evaluation process, as well as the
 33 government regulatory environmental assessment process for the Project. The ATK
 34 Principles as set out in Appendix 2A of the Response to EIS Guidelines provide common
 35 principles agreed on by the Partnership regarding inclusion of ATK in these Keeyask
 36 environmental assessments.

37 It is not entirely clear what the question means by "measuring" ATK inclusion.

38 Beyond what is provided in each of these reports, the Partnership cannot comment on
 39 methodology employed by each of the KCNs to "measure" the inclusion of ATK in each
 40 of the separate KCNs Environmental Evaluation Reports prepared under the KCNs'
 41 process.

42 With regard to the government regulatory environmental assessment process, Chapter
 43 5 outlines the methodology employed with regard to inclusion of ATK, technical
 44 information, and local knowledge (see Section 5.2, pp. 5-1 and 5-2; and Section 5.3.2.1,
 45 p. 5-7). In summary, based on ATK that the KCNs and/or other Aboriginal people
 46 provided, ATK information inclusion in the government regulatory environmental
 47 assessment process as summarized in Chapter 6 of the EIS was based on (a) what the EA
 48 Study Team was aware of and (b) what was relevant to the assessment topic at hand.
 49 Where this ATK disagreed with the conclusions of technical science, this was noted.
 50 These differences underscored the importance of monitoring and management of
 51 Project effects, including ATK monitoring (see response to CEC Rd 1 CAC-0057). The
 52 following quote from page 5-7 provides additional details on the inclusion of ATK of the
 53 KCNs in this environmental assessment process:

54 "ATK played a role in the scoping and conduct of the environmental assessment.
 55 A major ATK workshop was held by the partners in June 2008; from there, they
 56 established ATK principles to guide how ATK would be brought into the process
 57 (see Chapter 2, Appendix 2A). ATK helped to identify issues, effects, mitigation
 58 and monitoring. The KCNs brought their ATK to the processes, which guided the
 59 environmental assessment (*e.g.*, through the Partners Regulatory and Licensing
 60 Committee, EIS Coordination Team, bilateral environmental studies working
 61 groups, and multilateral working groups dealing with the aquatic environment,
 62 mammals and mercury and human health). In addition, extensive community-
 63 based consultation was undertaken by each of the KCNs with its Members.
 64 Finally, the KCNs will play a role in monitoring and follow-up plans (including
 65 ATK) through mechanisms established through the governance structures of the
 66 JKDA.

67 "The more specific ATK of the KCNs, also grounded in their worldview, is
 68 reflected in Chapter 6, Environmental Effects Assessment. ATK that contributes

69 to the understanding of the environmental setting is included in Section 6.2, and
70 ATK that contributes to the understanding of effects of the Project is described
71 in Sections 6.3 through 6.8. Where ATK identifies uncertainty regarding
72 conclusions reached through technical science, this is addressed through
73 monitoring and follow-up in Chapter 8."

1 **REFERENCE: Volume: N/A; Section: Kipekiskwaywinan: Our Voices**
2 **(June 2012); Fox Lake Cree Nation Environmental Evaluation**
3 **Report; p. N/A**

4 **CEC Rd 1 CAC-0100**

5 **PREAMBLE:**

6 The Environmental Evaluation Reports of York Factory First Nation and Fox Lake Cree
7 Nation were completed in June 2012 and September 2012 respectively.

8 **QUESTION:**

9 How was the evaluation contained in those reports incorporated into the EIS
10 subsequent to them being completed?

11 **RESPONSE:**

12 The final version of the YFFN Environmental Evaluation Report "*Kipekiskwaywinan: Our*
13 *Voices*" was filed in July 2012 and the final version of the FLCN Environment Evaluation
14 Report was filed in September 2012. The Partnership, however, had access to
15 confidential draft versions of both these reports well in advance of the July 2012
16 submission date of the EIS to regulators, and this information, where relevant to the EIS,
17 was included in the July 2012 EIS filing.

18 To provide additional context, the Partnership has been working together on the
19 planning and environmental assessment of the Project for many years as stated in
20 Section 2.3 of the Response to EIS Guidelines (pgs 2-11 and 2-12) – further details are
21 included in response to CEC Rd 1 CAC-0101 through 0106 and CEC Rd 1 CFLGC-0002.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3**
 2 **Effects and Mitigation Physical Environment; p. N/A**

3 **CEC Rd 1 CAC-0101**

4 **PREAMBLE:**

5 Section 6.3.2 lists “ATK observations with respect to the physical environment”. The
 6 observations are in the nature of particular concerns regarding the physical
 7 environment.

8 **QUESTION:**

- 9 a. How were the “observations” identified and by whom?
 10 b. Please describe the methodology employed to consider and address each of the ATK
 11 “observation” in the corresponding subsections (e.g. Climate (6.3.3), Surface Water
 12 and Ice Regime (6.3.6)).
 13 c. Was ATK data, direct observation or technical knowledge of the physical
 14 environment considered?

15 **RESPONSE:**

- 16 a. *How were the “observations” identified and by whom?*

17 The Partnership, comprised of Manitoba Hydro and the Keeyask Cree Nations (KCNs),
 18 agreed to utilize a two-track approach to assess the effects of the Keeyask Generation
 19 Project (Keeyask). One track of the assessment involved the KCNs assessing the effects
 20 of the Project on themselves based on their 50 years of experience with hydro-electric
 21 development and their own distinctive Cree worldview (see KCNs Environmental
 22 Evaluation Reports). The other assessment track, led by the Partnership, assessed the
 23 effects of the Project in terms of regulatory significance, within the context of, and
 24 consistent with Federal and Provincial requirements (see Preface to the Response to EIS
 25 Guidelines).

26 Both the KCNs Environmental Evaluation Reports and the Partnership’s Response to EIS
 27 Guidelines make reference to Aboriginal Traditional Knowledge (ATK). For the purposes
 28 of the regulatory assessment, the Partnership uses the term ATK in a more limited form,
 29 primarily in relation to the information gathered and applied from working with First
 30 Nations’ people.

31 In the case of the KCNs, ATK and the Cree worldview are inseparable and
 32 complementary components of their way of life and, ultimately, are the foundation of
 33 their assessment of the Project. Although ATK encompasses knowledge of local
 34 ecosystems and the surrounding physical environment it is a much more complex

35 concept. It is a holistic understanding of the world which is based on sustaining vital
 36 relationships with Mother Earth, or *Askíy*, such as spiritual, historical, educational, social
 37 and life-sustaining relationships. These relationships, in turn, are the basis of Cree
 38 language, history and spirituality – cumulatively, the Cree culture. The basis of the Cree
 39 worldview is described in the each KCNs Keeyask Environmental Evaluation Reports and
 40 Section 2.0 of the Keeyask EIS – Response to EIS Guidelines.

41 ATK that is discussed in Chapter 6 of the Response to EIS Guidelines and in the Technical
 42 Supporting Volumes is sourced either to the evaluation reports prepared by the CNP,
 43 YFFN and FLCN, or to Chapter 2 of the Response to EIS Guidelines document. Chapter 2
 44 includes sections individually authored by CNP, YFFN and FLCN. In addition, Chapter 2
 45 also includes a consensus Cree worldview statement. "...Elders and leadership of the
 46 KCNs came together to arrive at a consensus on a common understanding and
 47 statement of their Cree worldview and values" (Section 6.6.2, p 6-427). It should be
 48 noted that beyond the description of effects specific to each component set out in
 49 Section 6, the KCNs' ATK was brought into the Project planning and environmental
 50 assessment process, including the assessment of effects on the environment, through
 51 several joint processes that are described in b) below.

52 For a discussion on ATK with regard to the Physical Environment, see Section 6.3.2 in the
 53 Response to EIS Guidelines.

54 *b. Please describe the methodology employed to consider and address each of the ATK*
 55 *"observation" in the corresponding subsections (e.g. Climate (6.3.3), Surface Water*
 56 *and Ice Regime (6.3.6)).*

57 The assessment of effects on the environment took place within the context of a Project
 58 planning and assessment process undertaken in partnership, and in a manner that
 59 sought to involve the KCNs in joint planning and oversight. As set out in Schedule 3.1 of
 60 the Joint Keeyask Development Agreement, a series of joint management structures
 61 were established that included participation of KCNs and Manitoba Hydro. Through
 62 KCNs involvement, their ATK was brought into the Project planning and Environmental
 63 Assessment process, and contributed to the following aspects of the environmental
 64 assessment:

- 65 • Identification of concerns and issues about the proposed Project to be addressed in
 66 the environmental assessment;
- 67 • Inclusion of the KCNs' experiences with past hydroelectric development that helped
 68 guide field studies as well as assessment of effects;
- 69 • Development of the two-track assessment process (see Preface of Response to EIS
 70 Guidelines);

- 71 • Through bilateral environmental studies working groups with each of the KCNs,
 72 review and revision of annual field work plans for the studies which responded to
 73 EIS Guidelines, and extensive participation in these studies as field assistants;
 74 • Special topic multilateral working groups to address key issues: the Aquatics
 75 Working Group, the Terrestrial Working Group and the Mercury and Human Health
 76 Technical Working Group;
 77 • Overall guidance on the EIS filing through the Partners Regulatory and Licensing
 78 Committee and the EIS Coordination Team;
 79 • Shaping of the structure of the EIS filing and how ATK would be included in the filing
 80 – under the direction of the EIS Coordination Team, a working group focused on
 81 establishing ATK principles to guide how ATK would be incorporated into the
 82 process (see Chapter 2, Appendix 2A);
 83 • Review of annotated outlines for each of the chapters of the Response to the EIS
 84 Guidelines document;
 85 • Review of initial results of the environmental assessment, as well as discussion and
 86 consideration of mitigation and monitoring measures;
 87 • Review and comment on environmental protection and monitoring plans; and
 88 • Review, comment (and approval in the case of CNP) of the text of each chapter of
 89 the Response to the EIS Guidelines document as well as supporting volumes.

90 ATK data, direct observation or technical knowledge of the physical environment were
 91 considered. Where ATK observations and perspectives identified concerns or where
 92 there was uncertainty regarding Project effects on the physical environment, the
 93 concerns were addressed through detailed consideration of these effects as discussed in
 94 each section of the Physical Environment Supporting Volume in the Response to EIS
 95 Guidelines. The draft Physical Environment Monitoring Plan, which was reviewed by the
 96 KCNs and filed with regulators on June 28, 2013, identifies physical environment
 97 monitoring activities that will measure effects of concern to the KCNs.

98 *c. Was ATK data, direct observation or technical knowledge of the physical*
 99 *environment considered?*

100 Please see response to b) above.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4**
2 **Effects and Mitigation Aquatic Environment; p. N/A**

3 **CEC Rd 1 CAC-0102**

4 **PREAMBLE:**

5 Section 6.4.2 lists “ATK observations with respect to the aquatic environment”. The
6 observations are in the nature of particular concerns regarding the aquatic
7 environment.

8 **QUESTION:**

- 9 a. How were the “observations” identified and by whom?
10 b. Please describe the methodology employed to consider and address each of the ATK
11 “observation” in the corresponding subsections.
12 c. Was ATK data, direct observation or technical knowledge of the aquatic
13 environment considered?

14 **RESPONSE:**

15 Please see the response to CEC Rd 1 CAC-0101 for an understanding of how ATK
16 observations were identified and by whom as part of the environmental assessment and
17 planning process. For a discussion on ATK with regard to the Aquatics Environment, see
18 Section 6.4.2, Response to EIS Guidelines.

19 ATK data, results of field studies, and technical knowledge of the aquatic environment
20 were all considered in the assessment. For example, ATK assisted in the identification of
21 key areas of fish habitat (e.g., spawning habitat in Long, Birthday and Gull Rapids); ATK
22 informed conduct of studies, with emphasis on respectful handling of animals (e.g.,
23 concerns with internal tagging of fish limited numbers of fish tagged, concerns with
24 collecting brood stock led to the involvement of other First Nations who conduct spawn
25 collection program); and ATK contributed to the development of mitigation options
26 (e.g., options for rehabilitation of dewatered riverbed).

27 Where ATK observations and perspectives differed from technical science, or where
28 there was uncertainty, these were discussed in the Response to EIS Guidelines (where
29 appropriate).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5**
2 **Effects and Mitigation Terrestrial Environment; p. N/A**

3 **CEC Rd 1 CAC-0103**

4 **PREAMBLE:**

5 Section 6.5.2 lists "ATK observations with respect to the terrestrial environment". The
6 observations are in the nature of particular concerns regarding the terrestrial
7 environment.

8 **QUESTION:**

- 9 • How were the "observations" identified and by whom?
10 • Please describe the methodology employed to consider and address each of the ATK
11 "observation" in the corresponding subsections.
12 • Was ATK data, direct observation or technical knowledge of the terrestrial
13 environment considered?

14 **RESPONSE:**

15 Please see the response to CEC Rd 1 CAC-0101 for an understanding of how ATK
16 observations were identified and by whom as part of the environmental assessment and
17 planning process.

18 For a discussion on ATK with regard to the Terrestrial Environment, see Section 6.5.2,
19 Response to EIS Guidelines.

20 ATK data, direct observation or technical knowledge of the terrestrial environment were
21 all considered as part of the assessment. Where ATK observations and perspectives
22 differed from technical science, or where there was uncertainty, the concerns were
23 discussed in each of the sections of the Terrestrial Environment Supporting Volume
24 (Sections 2-8) and in Chapter 8 (Monitoring and Follow-Up) in the Response to EIS
25 Guidelines.

26 More specific responses are also provided in the preliminary draft of the Terrestrial
27 Environment Monitoring Plan which was filed on June 28, 2013, and is available at
28 Keyask.com.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6**
2 **Effect and Mitigation Socio-Economic Environment; p. N/A**

3 **CEC Rd 1 CAC-0104**

4 **PREAMBLE:**

5 Section 6.6.2 lists "ATK observations with respect to the socio-economic environment".
6 The observations are in the nature of particular concerns regarding the socio-economic
7 environment.

8 **QUESTION:**

- 9 a. How were the "observations" identified and by whom? ·
10 b. Please describe the methodology employed to consider and address each of the ATK
11 "observation" in the corresponding subsections. ·
12 c. Was ATK data, direct observation or technical knowledge of the socio-economic
13 environment considered?

14 **RESPONSE:**

15 Note that the Preamble indicates that "Section 6.6.2 lists "ATK observations with
16 respect to the socio-economic environment"." This quoted phrase does not appear in
17 Section 6.6.2.

18 The response to CEC Rd 1 CAC-0101 provides an understanding of how ATK observations
19 were identified and by whom as part of the environmental assessment and planning
20 process.

21 For a discussion on ATK with regard to the Socio-Economic Environment, see Section
22 6.6.2 of the Response to EIS Guidelines.

23 In addition to the processes noted in CEC Rd 1 CAC-0101, the socio-economic
24 assessment included the involvement of the KCNs in joint planning of studies in each of
25 the KCNs communities, participation in bi-lateral steering committees with each of the
26 KCNs communities, undertaking field work in association with EA Team staff, and
27 reviewing results of the field work and their meaning prior to drafting the assessment
28 findings.

29 ATK data, direct observation or technical knowledge of the socio-economic environment
30 were considered. For example, ATK informed the key questions addressed by the
31 Mercury and Human Health Technical Working Group and led to the development of
32 risk communication products to inform Members about the risks of elevated mercury in
33 some fish and the benefits of eating country food overall; ATK assisted in the

34 identification of areas of archaeological investigation; and direct experience and
35 observations from the community were pivotal in establishing measures relating to
36 worker interaction.

37 Where ATK observations and perspectives differed from technical science, or where
38 there was uncertainty, these were discussed in each of the socio-economic environment
39 sections of the Supporting Volume (sections 3 through 5) and in the Response to EIS
40 Guidelines document for the socio-economic VECs (where appropriate). These
41 differences, for example pertaining to travel safety, were considered in the design of
42 monitoring related to this topic.

43 More specific responses are also provided in the preliminary draft of the Socio-
44 Economic Environment Monitoring Plan which was filed on June 28, 2013, and is
45 available at Keyask.com.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.7**
 2 **Effect and Mitigation Resource Use; p. N/A**

3 **CEC Rd 1 CAC-0105**

4 **PREAMBLE:**

5 Section 6.7.2 lists "ATK observations with respect to resource use". The observations are
 6 in the nature of particular concerns regarding resource use.

7 **QUESTION:**

- 8 • How were the "observations" or concerns identified and by whom?
 9 • Please describe the methodology employed to consider and address each of the ATK
 10 "observation" in the corresponding subsections.
 11 • Was ATK data, direct observation or technical knowledge of resource use
 12 considered?

13 **RESPONSE:**

14 Please see the response to CEC Rd 1 CAC-0101 for an understanding of how ATK
 15 observations were identified and by whom as part of the environmental assessment and
 16 planning process.

17 For a discussion on ATK with regard to Resource Use, see Section 6.7.2, Response to EIS
 18 Guidelines.

19 ATK data, direct observation and technical knowledge of the resource use environment
 20 were considered. For example, as noted in CEC Rd 1 PFN-0001b, many years of
 21 negotiations, meetings and consultations with knowledge holders occurred to establish
 22 the Joint Keeyask Development Agreement, which included development the
 23 Waterways Management Program. The Waterways Management Program addresses
 24 issues around travel, access and human safety resulting from floating debris that, in
 25 turn, minimize effects on domestic fishing (for a description of the negotiation process,
 26 see Section 4.3.3.1 of the Response to EIS Guidelines; for the Waterways Management
 27 Program, see http://www.hydro.mb.ca/projects/keeyask/jkd_agreement.shtml).

28 Also after many years of negotiation, meetings and consultations, the Members of each
 29 of the KCNs partners approved community-specific Adverse Effects Agreements (AEAs)
 30 by independent referendums (Section 4.3.3.1 of the Response to EIS Guidelines). The
 31 AEAs include offsetting programs with the objectives to provide substitute opportunities
 32 to hunt, fish and trap for food and to carry out associated customs, practices and
 33 traditions in area not affected by the Project. These AEAs were developed to meet the
 34 specific needs of the communities and have been central to forming the Partnership.

35 Where ATK observations and perspectives differed from technical science, or where
36 there was uncertainty, these concerns were discussed in applicable resource use
37 sections of the Supporting Volume (e.g., Sections 1.2 to 1.4) and in the Response to EIS
38 Guidelines document for the resource use VECs (where appropriate). These differences,
39 for example, pertaining to the potential for construction workforce harvest, were
40 considered in the design of monitoring related to this topic.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8**
2 **Effect and Mitigation Heritage Resources; p. N/A**

3 **CEC Rd 1 CAC-0106**

4 **PREAMBLE:**

5 Section 6.8.2 lists ATK observations with respect to heritage resources. The observations
6 are in the nature of particular concerns heritage resources.

7 **QUESTION:**

- 8 a. How were the "observations" or concerns identified and by whom?
9 b. Please describe the methodology employed to consider and address each of the ATK
10 observations in the corresponding subsections. ·
11 c. Was ATK data, direct observation or technical knowledge of resource use
12 considered?

13 **RESPONSE:**

14 Please see the response to CEC Rd 1 CAC-0101 for an understanding of how ATK
15 observations were identified and by whom as part of the environmental assessment and
16 planning process.

17 In addition to the details provided in CEC Rd 1 CAC-0101, the heritage resources
18 assessment included participatory action work accomplished through development of
19 high school credit student programs which involved KCNs students; KCNs Elders and
20 resource-users interacted with the programs. Further, the development of a Heritage
21 Handbook of archaeological sites, community discussions and presentations all
22 contributed to the assessment.

23 ATK data, direct observation or technical knowledge of heritage resources were
24 considered. For example, ATK informed the field research program that sought to
25 identify heritage resources that could be affected by the Project. Where ATK
26 observations and perspectives differed from technical science, or where there was
27 uncertainty, the concerns were discussed in the heritage resources environment section
28 of the Supporting Volume (Section 5, Part 3) and the Monitoring and Mitigation sections
29 of the Response to EIS Guidelines for Heritage Resources (where appropriate).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.2**
2 **Aboriginal Traditional Knowledge; p. N/A**

3 **CEC Rd 1 CAC-0107a**

4 **PREAMBLE:**

5 Section 6.8.2 lists ATK observations with respect to heritage resources. The observations
6 are in the nature of particular concerns heritage resources. KCNs noted the importance
7 of certain areas that might experience effects on heritage resources. In particular, four
8 key areas were identified as burial locations (see p. 6-563). The document then
9 indicates: "Despite discussions with KCN Elders and intensive archaeological
10 investigations, no definitive evidence of burials was found at these four sites."

11 **QUESTION:**

12 Please advise as to the standard for "definitive evidence" as employed in relation to
13 burial sites.

14 **RESPONSE:**

15 The standard of "definitive evidence" as referenced in the Response to EIS Guidelines
16 Ch. 6, Section 6.8.2, p. 6-563 is based on observable attributes that are associated with
17 burial sites found in northern Manitoba. These include evidence such as standing or
18 fallen crosses; crib structures; circular/elliptical stone features mounded or at ground
19 surface; log bases with or without stacked logs and sunken, unmarked in-ground
20 features, exposed human remains, cleared landscapes, groves of birch or poplar.

21 Further to pedestrian surveys, a geophysical survey was conducted at one site, the Old
22 Boat Site (HbKu-21). A geophysical survey is a controlled, unobtrusive, sub-surface
23 investigation which uses a technique called Electro-Magnetic Ground Conductivity
24 (EMGC) to determine areas of soil disturbances below the ground surface. This process
25 did not identify anomalies that are usually associated with in-ground burials. The site of
26 Old Boat was excavated in 2012 under the direction of a TCN Elder and in consultation
27 with the Historic Resources Branch. The three other locations (Effie Bay, Caribou Island
28 and Bechonea) were too large and ill-defined to conduct geophysical surveys.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.2**
 2 **Aboriginal Traditional Knowledge; p. N/A**

3 **CEC Rd 1 CAC-0107b**

4 **PREAMBLE:**

5 Section 6.8.2 lists ATK observations with respect to heritage resources. The observations
 6 are in the nature of particular concerns heritage resources. KCNs noted the importance
 7 of certain areas that might experience effects on heritage resources. In particular, four
 8 key areas were identified as burial locations (see p. 6-563). The document then
 9 indicates: "Despite discussions with KCN Elders and intensive archaeological
 10 investigations, no definitive evidence of burials was found at these four sites."

11 **QUESTION:**

12 Please advise if the four identified burial locations, as identified by the ATK, may be
 13 impacted by the project.

14 **RESPONSE:**

15 The four burial locations identified in Chapter 6, Effects Assessment, Section 6.8.2, p. 6-
 16 563 (Bechonea, Effie Bay, Old Boat and Caribou Island) were identified through ATK as
 17 potentially containing burials. All four sites were thoroughly investigated by pedestrian
 18 survey and soil probing where feasible. Excavation of the Old Boat Site was completed
 19 under the direction of a TCN Elder and in consultation with the Historic Resources
 20 Branch. Geophysical survey was carried out at the Old Boat Site with negative results
 21 (see response to CEC Rd 1 CAC-0107a for further details on the geophysical survey). The
 22 three other locations (Effie Bay, Caribou Island and Bechonea) were too large and ill-
 23 defined to conduct geophysical survey. As noted in preamble, Section 6.8.2 identifies
 24 these four areas as potential burial grounds.

25 The potential burial locations may be impacted during the construction phase.. In order
 26 to reduce the risk of disturbance to heritage resources during construction, Section 5.5
 27 (page 5-4) of both the *Draft Keeyask Generation Project: Generating Station*
 28 *Construction Environmental Protection Plan* and *Draft Keeyask Generation Project: South*
 29 *Access Road Environmental Protection Plan* states:

- 30 • "A Heritage Resources Protection Plan has been written for the Project and will be
 31 implemented.
 32 • All Project employees will be aware of the potential for heritage resources to be
 33 discovered during clearing and construction. Orientation for Project staff working in
 34 the construction area will include heritage resource awareness training so they
 35 know who to contact if a heritage resource is discovered."

36 The potential burial locations will be impacted during the operation phase. Manitoba's
37 *Heritage Resources Act* (1986) and Policy Concerning the Reporting, Exhumation and
38 Reburial of Found Human Remains (1987) and the Heritage Resources Protection Plan
39 (HRPP) drafted by Manitoba Hydro and the KCNs provide measures for dealing with all
40 found human remains.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.2**
 2 **Aboriginal Traditional Knowledge; p. 6-563**

3 **CEC Rd 1 CAC-0108a**

4 **PREAMBLE:**

5 Section 6.8.2 lists ATK observations with respect to heritage resources. The observations
 6 are in the nature of particular concerns heritage resources. KCNs noted the importance
 7 of certain areas that might experience effects on heritage resources. In particular, "Gull
 8 Rapids has been noted by the KCNs as an important location for recalling memory,
 9 resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social
 10 cohesion." (see p. 6-563).

11 **QUESTION:**

12 Please advise of method and conclusions related to these effects on recalling memory,
 13 resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social
 14 cohesion.

15 **RESPONSE:**

16 The Project's environmental assessment was completed in accordance with the
 17 guidelines issued by regulatory authorities, and with the direct involvement of all of the
 18 Project Partners; this involvement witnessed the use of both technical science and
 19 Aboriginal Traditional Knowledge (ATK) in the determination of Project effects.

20 As noted in SE SV, Heritage Resources, Section 1.2, triangulation, incorporating
 21 archaeological, quantitative and ATK information (including key person interviews) was
 22 used to assess potential Project effects to heritage resources and culture and
 23 spirituality. For example, and as noted in the question, Elders identified Gull Rapids
 24 "...as an important location for recalling memory, resource activity, ceremonial and
 25 spiritual purposes, and as a place for reaffirming social cohesion". These accounts,
 26 provided by Elders during formal and informal discussions, informed areas selected for
 27 archaeological site investigation; when relevant, the historic record was also employed
 28 to corroborate information. Prior to field studies, the KCNs reviewed all work plans
 29 regarding heritage resources and culture and spirituality. Further field investigations of
 30 specific areas, where it was believed that more information could be recovered, took
 31 place at the request of the KCNs. An Elder and/or resource user accompanied the
 32 archaeological field study team to areas noted by the communities as culturally
 33 important, as well as to all other sites investigated. The results of follow-up were then
 34 shared with the KCNs communities. Additionally, as per the provincial Heritage Resource
 35 Act, 'Heritage Resources Impact Assessment' reports for each permit drawn were

36 submitted to Manitoba's Historic Resources Branch; a copy was provided to the KCNs
37 for their information. In addition to field studies, community-specific information was
38 available to the Partnership through the KCNs evaluation reports, undertaken by each of
39 the communities based on their own Cree worldview.

40 For additional discussion, refer to SE SV, Heritage Resources, Sections 1.2, p-1-6;
41 Response to EIS Guidelines, Chapter 5, Section 5.3.2.1, p 5-7 and Chapter 6, Sections
42 6.2.3.7 p.6-182. The Response to EIS Guidelines, Chapter 6, Section 6.6.5.6, p. 6-488
43 identifies anticipated effects to culture and spirituality.

44 Please see the response to CEC Rd 1 CAC-0108b for mitigation measures related to this
45 topic.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.2**
 2 **Aboriginal Traditional Knowledge; p. 6-563**

3 **CEC Rd 1 CAC-0108b**

4 **PREAMBLE:**

5 Section 6.8.2 lists ATK observations with respect to heritage resources. The observations
 6 are in the nature of particular concerns heritage resources. KCNs noted the importance
 7 of certain areas that might experience effects on heritage resources. In particular, "Gull
 8 Rapids has been noted by the KCNs as an important location for recalling memory,
 9 resource activity, ceremonial and spiritual purposes, and as a place for reaffirming social
 10 cohesion." (see p. 6-563).

11 **QUESTION:**

12 Please advise of mitigation measures relating to recalling memory, resource activity,
 13 ceremonial and spiritual purposes, and as a place for reaffirming social cohesion.

14 **RESPONSE:**

15 Reference to mitigation measures related to recalling memory, resource activity,
 16 ceremonial and spiritual purposes, and as a place for reaffirming social cohesion are
 17 identified in the Response to EIS Guidelines, Chapter 4, Section 4.3.3.2.6 p 4-19; Chapter
 18 6, Section 6.6.5.7.3 p 6-498 to 6-499; Chapter 6 Section 6.8.3 p 6-566 to 6-567 and p 6-
 19 573; in the SE SV, Part 3, Heritage Resources, Section 1.6.2 , p1-33 to 1-34 and 1.6.4 p 1-
 20 40; the KCN AEAs; and Schedules 7-1 and 11-2 of the JKDA.

21 The Partnership has worked for years to develop measures to avoid or mitigate
 22 potential effects related to heritage resources, and to culture and spirituality. These
 23 include salvage activities to enable long-term preservation and to enhance public and
 24 local awareness through forms of cultural media, development of a cemetery for any
 25 human remains found during the construction and operation of the Project,
 26 mechanisms through the Waterways Management Program (JKDA Schedule 11-2) for
 27 KCNs Members to be involved in identifying and contributing to impact management
 28 measures at important spiritual and heritage sites.

29 The Table below provides an overview of mitigation measures related to recalling
 30 memory, resource activity, ceremonial and spiritual purposes and social cohesion.

Mitigation Measure	Purpose	Recalling Memory	Resource Activity	Ceremonial & Spiritual Purposes	Social Cohesion
Archaeological Salvage / Monitoring	To record cultural information of potentially affected archaeological sites, enable long-term preservation of found heritage resources and promote memory recollection	ü		ü	ü
Cemetery Site Selection	To identify a site, guided by cultural criteria, for the reburial of human remains found during construction of the Project, including a memorial marker.			ü	
Waterways Management Program	Among other purposes, to involve KCNs Members in identifying and contributing to impact management measures at important spiritual and heritage sites		X	X	
Heritage Resources Protection Plan as part of the Environmental Protection Program.	To provide a set of guidelines for carrying out mitigative measures at the times of construction; to support the protection of found heritage resources during construction	ü		ü	
Ceremonies and rituals at key Project milestones (e.g., steam crossings, road clearing); Counselling services	To assist the KCNs in coping with the inevitable loss of the rapids through flooding.	ü		ü	ü
AEAs agreed to by the KCNs to		ü	ü	ü	ü

Mitigation Measure	Purpose	Recalling Memory	Resource Activity	Ceremonial & Spiritual Purposes	Social Cohesion
<p>address the known and foreseeable impacts. .</p> <p>Examples of Offsetting Programs:</p> <p>Cree language Program (TCN, WFLN and FLCN); Museum and Oral Histories Program (TCN, WFLN)</p> <p>Improved Access Program (TCN, WFLN)</p>	<p>To address and resolve Keeyask adverse effects through the provision of offsetting programs as described in the agreement.</p>				
<p>Park and/or rest area associated with boat launches</p>	<p>To facilitate safe access to the Gull Lake area (e.g. resource activity)</p>	ü	ü		ü
<p>Commemorative plaque or memorial</p>	<p>To recognize people who have used and continue to use the Gull Lake area.</p>	ü			
<p>A video taken of the stretch of the Nelson River between Birthday Rapids and Gull Rapids prior to construction</p>	<p>To promote memory recall and make available for viewing in a visitor space at the generating station once the station is in operation.</p>	ü			
<p>Reclamation of site construction</p>	<p>To follow the principles set out in Schedule 7-1 of the JKDA regarding</p>	ü	ü		

Mitigation Measure	Purpose	Recalling Memory	Resource Activity	Ceremonial & Spiritual Purposes	Social Cohesion
<p>areas such as borrow areas including using native plant types in disturbed areas.</p>	<p>respect for the land. Principles include:</p> <ul style="list-style-type: none"> • adopting measures that increase, to the extent ecologically reasonable, the abundance of species and/ or growing conditions for species that have special social or economic importance for the Keeyask Cree Nations; • employing strategies that “go with” rather than “go against” nature, as they have a much higher probability of success; • planting species and promoting site conditions that are widespread in the subregion in which the Keeyask Project is located, rather than planting species and promoting site conditions that may be popular in more southern areas; and • being respectful of the Keeyask Cree Nations’ traditional relationships with the land 				

31

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.9**
2 **Effects of the Environment on the Project; p. N/A**

3 **CEC Rd 1 CAC-0109**

4 **QUESTION:**

5 Please advise if ATK was considered with respect to effects of the environment on the
6 Project.

7 **RESPONSE:**

8 ATK was not explicitly considered in the effects of the environment on the Project;
9 however, ATK was considered in the planning and design of the Project, as discussed in
10 Section 6.0 of the Project Description Supporting Volume. Further, Section 6.9 (Effects
11 of the Environment on the Project) of the Response to EIS Guidelines was reviewed by
12 all the Keeyask Cree Nations (KCNs). The Cree Nation Partners (comprised of
13 Tataskeyak Cree Nation and War Lake First Nation), as per the JKDA, and it was
14 approved by CNP. The KCN reviews and CNP approval afforded each of the partner First
15 Nations the opportunity to provide their perspectives and ATK as it pertains to this
16 component of the EIS.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.10**
2 **Capacity of Renewable Resources; p. N/A**

3 **CEC Rd 1 CAC-0110**

4 **QUESTION:**

5 Please advise if ATK was considered with respect to the capacity of renewable
6 resources.

7 **RESPONSE:**

8 A variety of mechanisms was used to gather ATK on the Project and input often included
9 perspectives with respect to the capacity of renewable resources. In addition to formal
10 workshops with KCN community Members on ATK methods and how to represent both
11 “scientific” and ATK perspectives in the Response to EIS Guidelines, these mechanisms
12 included informal discussions among field crew members (scientists and FN Community
13 Members), workshops in Winnipeg and workshops within each community on various
14 topics/themes, where historic information on renewable resources and thoughts about
15 their capacity regarding Project effects was shared. Early on in the assessment process
16 these discussions formed valuable input in the development of mitigation and
17 monitoring plans.

18 As described in Section 9.2.1 of the Response to EIS Guidelines:

19 “Each KCN received funding to undertake its own evaluation of the Project and
20 to involve its community in the decision as to whether or not to become a
21 partner in the initiative. The KCNs’ Environmental Evaluation Reports speak to a
22 desire to restore harmony and balance with Mother Earth, to protect the
23 environment, which is broadly defined to include people’s wellbeing, to
24 maintain and enhance their culture and traditions, and to provide greater hope
25 and opportunities for future generations. The decision to support the Project
26 was difficult, requiring much study, discussion and soul searching. Ultimately,
27 the decision to proceed was based on evaluations of social, economic and
28 environmental considerations, and a focus on both present and future
29 generations to whom the benefits of the Project would accrue. In deciding to
30 proceed with the Project, the KCNs saw an opportunity for current and future
31 generations to benefit economically and to build their communities’ capacity
32 and self-sufficiency, while respecting and maintaining their Cree values,
33 teachings, identity, culture and traditional knowledge.

34 As partners, the KCNs have been influential in identifying and advocating for
35 measures to lessen the adverse environmental effects of the Project, and they

36 will undertake appropriate activities, including rituals and ceremonies to show
 37 respect and give thanks to Askiy at major Project milestones. The Adverse
 38 Effects Agreements (AEAs) will provide continued access to healthy country
 39 foods and programs to maintain and strengthen their traditions and culture. The
 40 KCNs will also have a hands-on role in monitoring and follow-up activities,
 41 opportunities for training and employment on the Project and in the operation
 42 of existing hydroelectric projects, and a continuing role as board members of
 43 the Partnership, and they will receive long-term income from their investment
 44 in the Project.

45 Consistent with their Cree worldview, the KCNs established the following
 46 Principles for Respect for the Land, to be followed in the construction and
 47 operation of the Project, and had these principles embedded into the Joint
 48 Keeyask Development Agreement (JKDA):

49 **Principles Regarding Respect for the Land**

- 50
- 51 • Adopting measures that increase, to the extent ecologically reasonable, the
 52 abundance of species and/or growing conditions for species that have
 53 special social or economic importance for the Keeyask Cree Nations.
 - 54 • Employing strategies that “go with” rather than “go against” nature, as they
 55 have a much higher probability of success.
 - 56 • Planting species and promoting site conditions that are widespread in the
 57 sub-region in which the Keeyask Project is located, rather than planting
 58 species and promoting site conditions that may be popular in more
 59 southern areas.
 - 60 • Being respectful of the Keeyask Cree Nations’ traditional relationships with
 the land.”

61 As indicated, the concept of sustaining the capacity of renewable resources was
 62 discussed in the KCNs' Environmental Evaluation Reports as part of the separate
 63 evaluation done by each of the KCNs to understand and accept the Project. They view
 64 their participation in Keeyask as giving them the added opportunity to improve upon
 65 previous development projects – not only in the design (low head), but also in
 66 mitigation, environmental management and monitoring during construction and
 67 operation. For example, Chapter 11 of the Cree Nation Partners Environmental Report
 68 (Assessing Harmony and Balance in Our Homeland Ecosystem) discusses the efforts to
 69 “restore and enhance the capacity of our homeland ecosystem to sustain our people
 70 both physically and culturally”; that “after Keeyask, we believe that the overall harmony
 71 and balance of our ecosystem will improve”; and that the “resilience of our homeland
 72 ecosystem in maintaining its original purpose of sustaining us physically and culturally
 73 will improve.” In the Fox Lake Cree Nation (FLCN) Environmental Evaluation Report they

74 state that the overall goal is to live "*mino pimatisiwin*" (overall health of the people, or
75 "the good life") and that "Keeyask represents the first stage in finding balance/harmony
76 between FLCN people and *Aski*", which includes healthy ecosystems. Their report also
77 discusses how they provided key input, including ATK, in identifying alternate fish
78 spawning habitat to ensure that lake whitefish can continue to spawn after the Project,
79 and identify a number of effects to renewable resources such as caribou and lake
80 sturgeon and list the mitigation measures to deal with effects and their involvement in
81 the Monitoring Advisory Committee.

82 For further information please see the response to TAC Public Rd 2 CEAA-0015.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0001**

3 **QUESTION:**

4 Please detail the understanding of the Proponent of the potential adverse effects of the
5 Keeyask Generation Project on the rights and interests of the Kaweechiwasihk Kay-tay-
6 a-ti-suk, including:

- 7 a. Livelihood rights;
- 8 b. Harvesting rights;
- 9 c. Rights to protect and exercise cultural and spiritual rights;
- 10 d. Existing Treaty Entitlement Parcels and areas for potential future selection
- 11 e. Planning and management of the York Factory Resource Management Area

12 **RESPONSE:**

13 Responses to the items identified above are outlined below.

14 *a), b) and c) Livelihood, Harvesting, Culture, Spirituality*

15 Potential effects of the Keeyask Generation Project on the York Factory First Nation
16 (YFFN), including Elders and other Members, are described in Chapter 6 and 7 of the
17 Response to EIS Guidelines document and in YFFN's evaluation report,
18 *Kipekiskwaywinan*.

19 Section 6.6 of the Response to EIS Guidelines describes the effects of the Project and
20 proposed mitigation in relation to the socio-economic environment, including potential
21 effects on livelihood, culture and spirituality. Effects of the Project on resource use and
22 proposed mitigation are described in Section 6.7 of the Response to EIS Guidelines.

23 In *Kipekiskwaywinan*, YFFN members speak about the effects of past hydroelectric
24 development and their concerns about potential effects of the Keeyask Project.

25 *d) Treaty Land Entitlement*

26 As stated in section 6.2.3.5.3 of the Response to EIS Guidelines, "No reserve land or
27 Treaty Land Entitlement land is required for the Project".

28 YFFN participated in the negotiations that led to the 1997 Framework Agreement on
29 Treaty Land Entitlement; however YFFN has not signed that Agreement. YFFN has not
30 received all the reserve land to which it is entitled. YFFN has identified a number of
31 potential TLE selections in the region. The Keeyask Project is not expected to affect the

32 rights and interests of YFFN with respect to the sites identified by YFFN as potential
33 Treaty Land Entitlement selections.

34 With respect to potential future selections, assuming the terms and conditions of the
35 1995 Agreement would apply to treaty land entitlement selections by YFFN, that
36 agreement sets out principles for selection of land. The Keeyask Project is not expected
37 to affect the rights and interest of YFFN as set out in that Agreement.

38 *e) Planning and Management of YF RMAs*

39 York Factory First Nation has two RMAs established under the 1995 Agreement between
40 YFFN, Manitoba, Manitoba Hydro and Canada. One RMA is located on Split Lake
41 surrounding York Landing, upstream of Keeyask and the other is located at the Hudson
42 Bay coast, including the Nelson River estuary.

43 Keeyask is not expected to have adverse effects on the planning and management of
44 the YFFN RMAs.

45 Consistent with the precautionary principle stated in Appendix 2A of the Response to
46 EIS Guidelines, monitoring will be undertaken to confirm there are no unforeseen
47 adverse effects. YFFN will be involved in monitoring programs through participation on
48 the Monitoring Advisory Committee and through its own monitoring program.

49 The YFFN Resource Management Board will provide a venue for communication
50 between Manitoba and the First Nation regarding potential effects of the Keeyask
51 Project on the Resource Management Areas.

52 YFFN'S Keeyask Adverse Effects Agreement provides for programs to offset some of the
53 potential adverse effects of Keeyask, including enhancing access for YFFN Members to
54 the Hudson Bay RMA. Section 3.5 of the Adverse Effects Agreement states: "York
55 Factory will seek input from the Resource Management Board, where practicable, and
56 provide to the Resource Management Board any reports produced in relation to the
57 Offsetting Programs that involve resource management, resource harvesting and
58 resource use activities within the York Factory Resource Management Area, such as the
59 Resource Access and Use Program". The Adverse Effects Agreement also provides for
60 establishment of an Environmental Stewardship Program "to monitor and assess
61 potential environmental changes resulting from Keeyask Adverse Effects, including
62 potential environmental changes resulting from implementation of Offsetting
63 Programs". The program provides for and supports participation by YFFN Elders to
64 provide guidance and advice to the Environmental Stewardship Program.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0002**

3 **QUESTION:**

4 Please detail the mechanisms and processes applied by the Proponent to ensure the
5 engagement of the Kaweechiwasihk Kay-tay-a-ti-suk in the planning, design,
6 construction, operation and monitoring of the Keeyask Generation Project.

7 **RESPONSE:**

8 Section 2.5.3 of the Response to EIS Guidelines summarizes YFFN involvement in the
9 Keeyask process. Section 2.5.6 summarizes YFFN involvement in the Keeyask
10 environmental impact assessment.

11 As explained in section 2.5.3, in October 2002, YFFN signed a Negotiations Principles and
12 Process Proposal with Manitoba Hydro, Fox Lake Cree Nation and the Cree Nation
13 Partners that set out a framework, including principles and processes for planning and
14 negotiations leading to the Joint Keeyask Development Agreement (JKDA). The “Process
15 Agreement” provided for reimbursement of YFFN costs and expenditures for project
16 negotiation and project planning and implementation activities.

17 Following the signing of the Process Agreement, YFFN established the York Factory
18 Future Development office with staff responsible for coordinating and leading YFFN’s
19 involvement in project negotiation, planning and implementation. The YFFD staff
20 include a Future Development Coordinator, Negotiators, and staff responsible for
21 community liaison, translation, GIS, business opportunities, environmental matters,
22 administration and negotiation support.

23 Between 2002 and 2008, YFFN participated with Manitoba Hydro, the Cree Nation
24 Partners (CNP – representing TCN and WLFN) and FLCN (collectively referred to as KCNs)
25 in the negotiation and drafting of the JKDA. The JKDA outlines, in detail, the mechanisms
26 and processes for KCNs’ participation in the Keeyask Project including training and
27 employment, business opportunities, KCNs investment, environmental and regulatory
28 licensing, monitoring and other matters.

29 As described in section 2.5.4 and 2.5.6 of the Response to EIS Guidelines, various
30 methods are used by YFFD to inform and engage YFFN members, including Elders, about
31 the Keeyask Project including meetings, workshops, interviews, site visits, newsletters,
32 and a web site. YFFD and YFFN Chief and Council held special meetings with YFFN Elders
33 to discuss the Keeyask Project.

34 YFFN and MH have together held meetings and open houses in York Landing to discuss
35 the Keeyask Project with members, including Elders.

36 As explained in the response to CEC Rd 1 KK-0006, YFFN members, including Elders,
37 were engaged in a series of community-based environmental and socio-economic
38 studies. The study reports were provided to Manitoba Hydro and its environmental
39 management team.

40 Also as explained in the response to CEC Rd 1 KK-0006, many YFFN members, including
41 Elders, were engaged in the process of crafting Kipekiskwaywinan, YFFN's evaluation
42 report.

43 YFFN members, including Elders, participated at meetings of various Keeyask working
44 groups including the Environmental Studies Working Group, Aquatics Working Group,
45 Mammals Working Group and Mercury and Human Health Technical Working Group.
46 YFFN members, including Elders, participated at various workshops held jointly by the
47 Keeyask Partnership to consider such topics as Cree worldview, cumulative effects, fish
48 passage, caribou, Aboriginal traditional knowledge, and EIS scoping.

49 YFFN has representation on the Board of Directors of the Keeyask General Partner, the
50 Monitoring Advisory Committee, Construction Advisory Committee and Advisory Group
51 on Employment. YFFN is preparing a monitoring plan and will be undertaking its own
52 monitoring program. YFFN will continue to consult with YFFN members, including
53 Elders, about its participation in the Keeyask Project.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0003**

3 **QUESTION:**

4 Please detail the mechanisms and processes applied by the Proponent to ensure the
5 engagement of the Kaweechiwasihk Kay-tay-a-ti-suk in the pre-project studies, design,
6 and business opportunities and training, employment and other benefits associated
7 with the Keeyask Generation Project.

8 **RESPONSE:**

9 See also the responses to CEC Rd 1 KK-0002 and KK-0006, which describe mechanisms
10 and processes for engagement of YFFN in the various aspects of the Keeyask Project
11 (planning, design, EIS preparation, construction, operations and monitoring).

12 The JKDA provides for participation by the KCNs, including YFFN, in, training,
13 employment, business opportunities and other benefits associated with Keeyask.

14 Through the Hydro Northern Training and Employment Initiative (HNTEI), YFFN was
15 responsible for the design, delivery and implementation of community-based training to
16 its members. During HNTEI, 250 YFFN members participated in 738 training activities.
17 York Factory Learning Institute delivered the training on behalf of the First Nation.

18 The Burntwood Nelson Agreement (BNA) sets out hiring preferences, including priority
19 for qualified northern Aboriginals living within the Churchill/Burntwood/Nelson River
20 region and surrounding areas as defined in the BNA and members of the KCNs who live
21 in Manitoba. The BNA also provides for the Keeyask Cree Nations (KCNs) to direct hire
22 northern Aboriginals who qualify as northern residents under Direct Negotiation
23 Contracts (DNCs) without having to follow the BNA preference provisions. Qualified
24 YFFN members are eligible for the BNA hiring preference, as well as direct hiring on the
25 contracts.

26 As per the Joint Keeyask Development Agreement, YFFN is eligible to negotiate direct
27 contracts with Manitoba Hydro. YFFN and FLCN have joined together and successfully
28 negotiated terms for two direct negotiations contracts to deliver catering and security
29 services and employee retention services for construction of the Keeyask Generation
30 Project and Keeyask Infrastructure Project. As indicated above, YFFN members can be
31 direct hired on these contracts.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0004**

3 **QUESTION:**

4 Please detail the understanding of the Proponent of:

- 5 a. the degree of engagement of Kaweechiwasihk Kay-tay-a-ti-suk by the province of
6 Manitoba in a Crown-First Nation justification, consultation and accommodation
7 process in respect of the Keeyask Generation Project; and
8 b. the effect of the degree of such engagement on the consideration of mitigation and
9 accommodation measures, including the consideration, identification and
10 recommendation of proposed licence conditions related to such potential
11 accommodation measures.

12 **RESPONSE:**

13 The Partnership has been advised by Manitoba and Canada that they will take
14 responsibility for conducting Crown-First Nation consultations with respect to the
15 Keeyask Project.

16 It is the understanding of the Partnership that there have been preliminary discussions
17 between Manitoba and York Factory First Nation with respect to the Crown-First Nation
18 consultation process. The nature of these discussions is between the Crown and York
19 Factory First Nation.

20 It is the understanding of the Partnership that the outcomes of the Crown-First Nation
21 consultation process will be considered by the responsible federal and provincial
22 ministers, prior to the issuing of approvals and licences for the Keeyask Project.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0005**

3 **QUESTION:**

4 Please describe the perspective and understanding of the Proponent of the importance
5 of applying the Inninewin – the Traditional Knowledge and wisdom - of
6 Kaweechiwasihk Kay-tay-a-ti-suk to all aspects of the Keeyask Generation Project and of
7 treating Inninewin with equal importance and value to that accorded Western
8 Scientific Knowledge.

9 **RESPONSE:**

10 The partners in the Keeyask Project agreed early in the planning process for Keeyask,
11 that "...information collection for the Environmental Impact Assessment will include
12 both Aboriginal traditional knowledge and western scientific analysis". (JKDA Schedule
13 3-1, s. 7(a)).

14 In the early stages of the drafting of the Keeyask EIS, YFFN, TCN, WLCN, FLCN (the KCNs)
15 and Manitoba Hydro discussed and developed principles to reflect how the KCNs'
16 Aboriginal traditional knowledge (*inninewin* or *ininiwi-kiskénihtamowin*) was being
17 and would be treated in the environmental assessment for the Keeyask Generation
18 Project. The principles are outlined in Appendix 2A of the Response to EIS Guidelines.
19 The first principle states, "The EA process honours and respects ATK and the Cree
20 worldview. The EA aims to give equal weight to ATK and western science. It is
21 recognized that ATK has value in and of itself."

22 YFFN is one of four partners and co-proponents in the Keeyask Generation Project. The
23 importance of *inninewin* is described in Kipekiskwaywinan, YFFN's environmental
24 evaluation report for the Keeyask Project:

25 "Ininiwi-kiskénihtamowin is absolutely fundamental and central to who we are as
26 a people and culture. Our traditional knowledge is held by our Elders and passes
27 from generation to generation. It is a dynamic, living process that is added to and
28 adapted in the lives of successive generations of Cree people." P. 18

29 "Today, our community Elders, members and resource users are maintaining our
30 traditional knowledge, and one way it is expressed is through Kipekiskwaywinan
31 (Our Voices). This document doesn't represent all of our traditional knowledge,
32 but it is based on our traditional knowledge, cultural values, and worldview. Our
33 traditional knowledge informs and adapts along with the Keeyask Project." p. 19

34 “However, our knowledge isn’t just information to be recorded and included in
35 the Environmental Impact Statement (EIS); rather it is an ongoing process of
36 sharing and participating in the Partnership. Because traditional knowledge lives
37 within our way of life, the process of engaging our community Elders, members
38 and resource users is the most important way our traditional knowledge, values,
39 and worldview enter the Keeyask Environmental Impact Assessment (EIA). For
40 this reason, it is important that our community representatives, Elders, youth,
41 resource users, and knowledge holders continue to participate in the Keeyask
42 Project’s next phases including construction, operation, environmental
43 monitoring and adaptive management.” P. 19

44 A brief summary of YFFN worldview, values and traditional knowledge is found in
45 Section 2.5.2 of the Response to EIS Guidelines. The following statements are found on
46 page 2-28:

47 “YFFN’s traditional knowledge (*ininiwi-kiskénihtamowin*) is held by its Elders and
48 passes from generation to generation. It is a dynamic, living process that is
49 added to and adapted in the lives of successive generations of Cree people. To
50 YFFN, traditional knowledge is more than just information. It lives within YFFN’s
51 way of life.

52 YFFN Elders, Members and resources users continue to maintain their
53 worldview, values and *ininiwi-kiskénihtamowin*. Some of YFFN’s traditional
54 knowledge has been documented in community reports. However, YFFN’s
55 traditional knowledge isn’t just information to be recorded and included in the
56 Environmental Impact Statement (EIS); rather YFFN considers it as an ongoing
57 process of sharing and participating in the partnership. Because traditional
58 knowledge lives within the community’s way of life, the process of engaging
59 community Elders, Members and resources users is the most important way
60 that its traditional knowledge, values, and worldview enter the Environmental
61 Impact Assessment (EIA). For this reason, it is crucial that our community
62 representatives, Elders, youth, resources users, and knowledge holders continue
63 to participate in the Keeyask Generation Project’s next phases including
64 construction, operation, environmental monitoring and **adaptive**
65 **management.**”

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0006**

3 **QUESTION:**

4 Please describe the manner and degree to which the Proponent treats and has treated
5 the Inninesewin of Kaweechiwasihk Kay-tay-a-ti-suk with equal importance and value,
6 with a particular discussion, as examples, of the consideration in the Environmental
7 Impact Statement of:

- 8 a. Lake Sturgeon;
- 9 b. Pickerel;
- 10 c. Whitefish;
- 11 d. Northern Pike;
- 12 e. Woodland caribou;
- 13 f. Moose;
- 14 g. Fur-bearing animals; and
- 15 h. Other fish and wildlife.

16 **RESPONSE:**

17 YFFN produced its own environmental evaluation report for the Keeyask Generation
18 Project: *Kipekiskwaywinan*, which was included in the filing. *Kipekiskwaywinan* speaks
19 about, and reflects, the worldview, values and Aboriginal traditional knowledge of York
20 Factory First Nation. A steering group composed of YFFD staff and other community
21 members led the process of creating *Kipekiskwaywinan*. Many other YFFN members,
22 including Elders, contributed to the content by participating in interviews, meetings and
23 workshops. See also the response to CEC Rd 1 KK-0005 for additional information from
24 *Kipekiskwaywinan* about the importance of *inninesewin*.

25 As explained in the EIS, the Partnership, comprised of Manitoba Hydro and the Keeyask
26 Cree Nations (KCNs), agreed to utilize a two-track approach to assess the effects of the
27 Keeyask Generation Project (Keeyask). One track of the assessment involved the KCNs
28 assessing the effects of the Project on themselves based on their 50 years of experience
29 with hydro-electric development and their own distinctive Cree worldview (see KCNs
30 Environmental Evaluation Reports). The other assessment track, led by the Partnership,
31 assessed the effects of the Project in terms of regulatory significance, within the context
32 of, and consistent with Federal and Provincial requirements (see Preface to the
33 Response to EIS Guidelines).

34 Both the KCNs Environmental Evaluation Reports (including *Kipekiskwaywinan*) and the
35 Partnership's Response to EIS Guidelines make reference to Aboriginal Traditional

36 Knowledge (ATK). For the purposes of the regulatory assessment, the Partnership uses
 37 the term ATK in a more limited form, primarily in relation to the information gathered
 38 and applied from working with First Nations' people.

39 In the case of the KCNs, ATK and the Cree worldview are inseparable and
 40 complementary components of their way of life and, ultimately, are the foundation of
 41 their assessment of the Project. Although ATK encompasses knowledge of local
 42 ecosystems and the surrounding physical environment it is a much more complex
 43 concept. It is a holistic understanding of the world which is based on sustaining vital
 44 relationships with Mother Earth, or *Askiy*, such as spiritual, historical, educational, social
 45 and life-sustaining relationships. These relationships, in turn, are the basis of Cree
 46 language, history and spirituality – cumulatively, the Cree culture. The basis of the Cree
 47 worldview is described in the each KCNs Keeyask Environmental Evaluation Reports and
 48 Section 2.0 of the Keeyask EIS – Response to EIS Guidelines.

49 ATK that is discussed in Chapter 6 of the Response to EIS Guidelines and in the Technical
 50 Supporting Volumes is sourced either to the evaluation reports prepared by the KCNs,
 51 including *Kipekiskwaywinan*, or to Chapter 2 of the Response to EIS Guidelines
 52 document. Chapter 2 includes sections individually authored by each of the KCNs,
 53 including YFFN. In addition, Chapter 2 also includes a consensus Cree worldview
 54 statement. "...Elders and leadership of the KCNs came together to arrive at a consensus
 55 on a common understanding and statement of their Cree worldview and values"
 56 (Section 6.6.2, p 6-427).

57 It is important to understand that the assessment of effects on the environment took
 58 place within the context of a Project planning and assessment process undertaken in
 59 partnership, and in a manner that sought to involve the KCNs (including YFFN) in joint
 60 planning and oversight. As set out in Schedule 3.1 of the Joint Keeyask Development
 61 Agreement, a series of joint management structures were established that included
 62 participation of KCNs and Manitoba Hydro. Through KCNs involvement, their ATK, was
 63 brought into the Project planning and Environmental Assessment process, and
 64 contributed to the following aspects of the environmental assessment:

- 65 • Identification of concerns and issues about the proposed Project to be addressed in
 66 the environmental assessment;
- 67 • Inclusion of the KCNs' experiences with past hydroelectric development that helped
 68 guide field studies as well as assessment of effects;
- 69 • Development of the two-track assessment process (see Preface of Response to EIS
 70 Guidelines);
- 71 • Through bilateral environmental studies working groups with each of the KCNs,
 72 review and revision of annual field work plans for the studies which responded to
 73 EIS Guidelines, and extensive participation in these studies as field assistants;

- 74 • Special topic multilateral working groups to address key issues: the Aquatics
75 Working Group, the Terrestrial Working Group and the Mercury and Human Health
76 Technical Working Group;
- 77 • Overall guidance on the EIS filing through the Partners Regulatory and Licensing
78 Committee and the EIS Coordination Team;
- 79 • Shaping of the structure of the EIS filing and how ATK would be included in the filing
80 – under the direction of the EIS Coordination Team, a working group focused on
81 establishing ATK principles to guide how ATK would be incorporated into the
82 process (see Chapter 2, Appendix 2A);
- 83 • Review of annotated outlines for each of the chapters of the Response to the EIS
84 Guidelines document;
- 85 • Review of initial results of the environmental assessment, as well as discussion and
86 consideration of mitigation and monitoring measures;
- 87 • Review and comment on environmental protection and monitoring plans; and
- 88 • Review, comment (and approval in the case of CNP) of the text of each chapter of
89 the Response to the EIS Guidelines document as well as supporting volumes.

90 As described in section 2.5.6 of the Response to EIS Guidelines, “Between 2002 and
91 2010, YFFN undertook a number of community-based studies to examine environmental
92 and socio-economic issues of specific importance to the community. Studies were
93 undertaken to examine: existing socio-economic and environmental conditions;
94 potential environmental and socio-economic impacts of the Project; socio-economic
95 baseline and sustainability indicators; community goals and future priorities; traditional
96 economic and land based activities; and community history. Community Members were
97 involved in the studies through meetings, workshops, interviews, surveys and field trips.
98 Study reports were provided to Manitoba Hydro and its environmental management
99 team.” (p. 2-31)

100 The Response to EIS Guidelines also describes the application of ATK in the
101 environmental assessment.

- 102 • The Concordance Table located in the front section of the Response to EIS
103 Guidelines indicates where EIS Guidelines specific to ATK are located in the
104 document: Section 6.1 (p. viii); Section 6.2.1 (p. ix); Section 8.3.6 (p. xxix).
- 105 • Chapter 2 of the response to EIS Guidelines summarizes the Partners’ context,
106 worldviews and evaluation processes. Section 2.5.2 of the Response to EIS
107 Guidelines provides a brief summary of YFFN’s worldview, values and Aboriginal
108 traditional knowledge as they apply to the Keeyask Generation Project.
- 109 • In describing effects on each component of the environment, a summary of ATK is
110 included. With respect to the topics noted in the question, these include effects on

111 the Aquatic Environment (Section 6.3.2) and the Terrestrial Environment (Section
112 6.4.2).

113 Where ATK observations and perspectives differed from technical science, or where
114 there was uncertainty, these were considered in monitoring plans (Chapter 8).

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0007a**

3 **QUESTION:**

4 Where the Proponent asserts in the EIS that the identification, consideration or
5 application of Aboriginal Traditional Knowledge (ATK) played a role in project design,
6 please explain:

- 7 a. how the referenced ATK was contributed or solicited;
8 b. what ATK was considered;
9 c. which elements of the project design took ATK into account; and
10 d. how the final project design is different as a result of the consideration of the
11 referenced ATK.

12 **RESPONSE:**

13 Please see the response to CEC Rd 1 KK-0006 for a full description of how ATK was
14 contributed and incorporated in the Keeyask Generation Project Environmental Impact
15 Statement.

16 Physical design of the Project considered ATK. Discussions with TCN as early as the
17 1990s led to the choice of a low-head design for the Project, a major difference which
18 meant substantially reduced flooding compared to higher-head options.

19 The process which led to the Joint Keeyask Development Agreement (JKDA) included
20 joint planning between Manitoba Hydro and the KCNs. The project description in the
21 JKDA resulted from this process, including the establishment of fundamental features.
22 One of these fundamental features, of importance to YFFN, is that the operation of the
23 Keeyask Generation Project will not affect water levels on Split Lake during open water
24 conditions (JKDA, p. 75). Other fundamental features were also identified. In addition, a
25 Forebay Clearing Plan, a Waterways Management Program and principles to address
26 disturbed site reclamation were developed and included as a result of this planning
27 process (JKDA Schedule 7-1).

28 The assessment included available ATK that was relevant to the topic at hand. ATK
29 contributed to the identification of concerns and issues about the Project, helped shape
30 technical science field work studies and contributed to mitigation ideas. It was noted
31 where conclusions derived from technical science and ATK differed. These conclusions
32 underscored the relevance of two ways of knowing and understanding, and informed
33 the management of Project effects and development of monitoring plans. They are also
34 likely to inform community based ATK monitoring priorities and plans.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0007b**

3 **QUESTION:**

4 Where the Proponent asserts in the EIS that Aboriginal Traditional Knowledge (ATK) will
5 play a role in future monitoring activities, to examine:

- 6 a. how ATK was identified, documented, contributed or solicited;
- 7 b. how ATK was considered;
- 8 c. which elements of the project monitoring will or are expected to take ATK into
9 account;
- 10 d. in the context of project monitoring, how ATK is expected to assist in addressing any
11 gaps in baseline information or the prediction of impacts; and
- 12 e. in the context of regulatory requirements, including licence terms and conditions,
13 how ATK is expected to assist in addressing gaps in baseline information or the
14 prediction of impacts.

15 **RESPONSE:**

16 Please see response to CEC Rd 1 KK-0006 and CEC Rd 1 KK-0007a for a description of
17 how ATK was brought into the planning and Environmental Assessment process. As
18 noted in these responses, the Partnership undertook a two-track environmental
19 assessment process that saw each of the KCNs, including YFFN, undertake their own
20 studies and prepare environmental evaluation reports, while the Partnership undertook
21 a regulatory assessment consistent with the EIS Guidelines. *Kipekiskwaywinan*, the
22 environmental evaluation report prepared by YFFN, places particular emphasis on the
23 importance of ongoing monitoring and management of Project effects. Monitoring was
24 also discussed extensively in the joint EA working group processes.

25 As noted in the response to CEC Rd 1 CAC-0057, given the differing worldviews, there
26 are naturally some cases where the conclusions reached to date by these two
27 evaluation processes are different. For example, Tataskweyak Cree Nation and York
28 Factory First Nation believe that open water levels on Split Lake will be affected as a
29 result of the Project; in contrast, engineering studies and analysis indicate that open
30 water levels on Split Lake will not be affected – in fact, the requirement that these open
31 water levels will not be affected by the Project is a fundamental feature of the Project in
32 the Joint Keeyask Development Agreement.

33 In such cases, the Partnership has developed monitoring programs that respond to the
34 concerns raised through both worldviews (e.g., water levels will be monitored on Split
35 Lake). This monitoring will be conducted to determine what, if any, changes occur to a

36 VEC or other indicator due to Project development and/or other factors, and to assess
37 the accuracy of predictions in the Project EIS and the efficacy of mitigation measures. As
38 such, monitoring will measure changes against current conditions and the expected
39 trends in such conditions without the Project. This monitoring will be undertaken
40 through both technical monitoring programs, as well as ATK monitoring programs
41 undertaken by each of the KCNs. To date, draft technical science monitoring plans have
42 been submitted to regulators; work is still underway with each of the KCNs to develop
43 community-specific ATK monitoring plans. All of the preliminary monitoring plans filed
44 to date have been reviewed by the KCNs, and they will continue to be involved as these
45 plans are finalized.

46 Chapter 8 of the Response to EIS Guidelines outlines monitoring and follow-up activities
47 planned for the Project, including how the KCNs Partners will collaborate in this regard
48 through the Monitoring Advisory Committee (MAC), the Partnership Board of Directors,
49 participation in technical monitoring programs and implementation of their own ATK
50 monitoring programs.

51 It should be noted that the licence, authorizations and permit terms and conditions for
52 the Keeyask Generation Project will not be known until issued, currently predicted to be
53 June of 2014. Monitoring plans will be finalized once the conditions of these approvals
54 are known.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0008**

3 **QUESTION:**

4 Where the EIS refers to effects on caribou, and in particular, to the effects related to the
5 disruption or fragmentation of areas used by caribou during calving and to any
6 suggestion in respect of the availability of alternative suitable caribou habitat, please
7 describe:

- 8 a. the analysis applied to arrive at any conclusion in respect of effects on caribou as a
9 result of the presumed availability of alternative habitat and the sources of the
10 information relied upon;
- 11 b. whether the analysis and description of the location and nature of any suggested
12 alternative caribou habitat makes a clear distinction between habitat used by
13 caribou during non-calving periods and habitat used by caribou during calving
14 periods;
- 15 c. whether any conclusions set out in the EIS in respect of caribou rely upon an
16 assumption as to the availability of alternative caribou calving habitat, and further
17 rely on an assumption that any such alternative caribou calving habitat will actually
18 be used, and if so, to describe the analysis applied and the sources of the
19 information relied upon; and
- 20 d. in the event that ATK is a source of the information relied regarding the conclusions
21 of the Proponent in respect of the anticipated effect of the loss of caribou calving
22 islands, to provide the explanations requested in KK-IR-007B (a) through (e),
23 inclusive.

24 **RESPONSE:**

25 Responses to each of the above questions are provided below.

- 26 a. *the analysis applied to arrive at any conclusion in respect of effects on caribou as a*
27 *result of the presumed availability of alternative habitat and the sources of the*
28 *information relied upon*

29 Winter caribou habitat was modeled through the use of an expert-information model
30 that was used to determine the amount of suitable coarse habitat types, identified in
31 Table 7-18 of the TE SV, occurring in various Study Zones. Physical habitat loss
32 associated with the Project was based on the amount of modeled caribou habitat up to
33 and including Study Zone 2 whereas effective habitat loss (e.g., due to noise
34 disturbance) occurring based on the construction phase of the Project only, was based
35 on the amount of modeled caribou habitat up to and including Study Zone 3. As

36 effective habitat loss is only expected during the construction phase of the Project, any
 37 modeled caribou habitat beyond Study Zone 3 is potential habitat for use during this
 38 time. During the operation phase, when there is less effective habitat loss, the amount
 39 of available alternate winter habitat is generally the extent of modeled habitat areas
 40 beyond Study Zone 2.

41 Caribou calving and rearing habitat (i.e., summer habitat) was modeled based on the
 42 monitored use of islands in lakes and peatland complexes in the Keeyask region for
 43 caribou calving and rearing in 2003, 2010 and 2011. Based on the use of islands and
 44 peatland complexes, these areas were identified as primary or secondary habitat areas.
 45 The designation of islands and peatland complexes as primary or secondary habitat
 46 areas was based on their size, using the criteria described on page 6-131 of the
 47 Response to EIS Guidelines. These criteria were then extrapolated to all islands and
 48 peatland complexes, many of which had been monitored previously, to determine the
 49 composition of primary and secondary calving and rearing areas in the Keeyask region.
 50 The anticipated loss or alteration of calving and rearing habitat was based on those
 51 habitat areas affected by physical habitat loss or by sensory disturbance, as described
 52 above, and, for islands in lakes, how the change in water level will alter the size of
 53 islands. By assessing the change in island size, the predicted change in the amount of
 54 primary and secondary habitat areas was determined.

55 *b. whether the analysis and description of the location and nature of any suggested*
 56 *alternative caribou habitat makes a clear distinction between habitat used by*
 57 *caribou during non-calving periods and habitat used by caribou during calving*
 58 *periods*

59 Yes, a clear distinction between habitat used by caribou during non-calving periods and
 60 habitat used by caribou during calving periods was retained throughout the analysis (see
 61 TE SV Section 7.3.6.3.4 and response to question a), above).

62 *c. whether any conclusions set out in the EIS in respect of caribou rely upon an*
 63 *assumption as to the availability of alternative caribou calving habitat, and further*
 64 *rely on an assumption that any such alternative caribou calving habitat will actually*
 65 *be used, and if so, to describe the analysis applied and the sources of the*
 66 *information relied upon*

67 For winter caribou habitat, there is an assumption that these areas could be used based
 68 on their suitability and despite other considerations that may affect caribou distribution.
 69 This assumption was also used in the initial calculation of the amount of winter caribou
 70 habitat that will be affected by the construction and operation phases of the Project.
 71 Methods for calculating winter caribou habitat are identified in the response to question
 72 a), above.

73 For summer resident caribou calving and rearing habitat there is the assumption that
74 modeled primary and secondary habitat areas will be used at the rates calculated, based
75 on monitoring activities used for assignment of thresholds for primary and secondary
76 habitat areas. It also understood, however, that there is seasonal variability in peatland
77 complex and island use by caribou with calculated usage rates serving as an average rate
78 of usage rather than a level of caribou use expected year over year.

79 *d. in the event that ATK is a source of the information relied regarding the conclusions*
80 *of the Proponent in respect of the anticipated effect of the loss of caribou calving*
81 *islands, to provide the explanations requested in KK-IR-007B (a) through (e), inclusive*

82 Please see the response to CEC Rd 1 KK-0007a and KK-0007b.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0009**

3 **QUESTION:**

4 Where the EIS refers to effects of the Project on Lake Sturgeon or other fish species,
5 including in the context of the monitoring of the effects of the Project on the
6 populations of Lake Sturgeon and other fish species, please describe and provide:

- 7 a. where ATK is a source of the information relied upon regarding the conclusions in
8 respect of the effect on Lake Sturgeon and other fish species, the explanations
9 requested in KK-IR-007A (a) through (d), inclusive; and
10 b. where the EIS suggests and appears to rely upon the role of ATK in the monitoring of
11 the effects on Lake Sturgeon and other fish populations, the explanations requested
12 in KK-IR-007B (a) through (e), inclusive.

13 **RESPONSE:**

- 14 a. *where ATK is a source of the information relied upon regarding the conclusions in*
15 *respect of the effect on Lake Sturgeon and other fish species, the explanations*
16 *requested in KK-IR-007A (a) through (d), inclusive;*

17 A summary of how ATK related to the environmental assessment is provided in Chapter
18 5, page 5-2:

19 "Through bilateral and multilateral planning processes involving the KCNs and
20 Manitoba Hydro, the Project was shaped to reduce adverse effects. Since the
21 1990s, Manitoba Hydro has worked with TCN (and later also with WLFN, YFFN
22 and FLCN) in joint planning committees to improve the Project itself (*e.g.*, choice
23 of a lower-head option, development of a Reservoir Clearing Plan [Appendix
24 4A], Waterways Management Program [Appendix 4B] and other measures) by
25 drawing on the ATK of Members of the KCNs. This meant that there were fewer
26 effects to be assessed."

27 "ATK played a role for each of the KCNs in coming to conclusions about their
28 participation in the Partnership. Each of the KCNs did its own studies to evaluate
29 the Project and the Partnership. An understanding of the worldview of the
30 KCNs, the evaluation process that they undertook, and their conclusions about
31 the Project and the Partnership are found in Chapter 2."

32 "The KCNs also agreed to contribute ATK to the government regulatory
33 assessment process."

34 As set out in Schedule 3.1 of the Joint Keeyask Development Agreement, a series of joint
 35 management structures were established that included participation of KCNs and
 36 Manitoba Hydro. ATK of the KCNs contributed to the following aspects of the
 37 environmental assessment:

- 38 • Identification of concerns and issues about the proposed Project to be addressed in
 39 the environmental assessment;
- 40 • Inclusion of the KCNs' experiences with past hydroelectric development that helped
 41 guide field studies as well as assessment of effects;
- 42 • Development of the two-track assessment process (see Preface of Response to EIS
 43 Guidelines);
- 44 • Through bilateral environmental studies working groups with each of the KCNs,
 45 review and revision of annual field work plans for the studies which responded to
 46 EIS Guidelines;
- 47 • Special topic multilateral working groups to address key issues: the Aquatics
 48 Working Group, the Terrestrial Working Group and the Mercury and Human Health
 49 Technical Working Group;
- 50 • Overall guidance on the EIS filing through the Partners Regulatory and Licensing
 51 Committee and the EIS Coordination Team;
- 52 • Shaping of the structure of the EIS filing and how ATK would be included in the filing
 53 – under the direction of the EIS Coordination Team, a working group focused on
 54 establishing ATK principles to guide how ATK would be incorporated into the
 55 process (see Chapter 2, Appendix 2A);
- 56 • Review of annotated outlines for each of the chapters of the Response to the EIS
 57 Guidelines document;
- 58 • Review of initial results of the environmental assessment, as well as discussion and
 59 consideration of mitigation and monitoring measures;
- 60 • Review and comment on environmental protection and monitoring plans; and
- 61 • Review, comment (and approval in the case of CNP) of the text of each chapter of
 62 the Response to the EIS Guidelines document as well as supporting volumes.

63 With respect to the effects of the Project on Lake Sturgeon and other fish species, input
 64 from the KCNs occurred from many sources, including participation in the planning of
 65 field studies (via the Environmental Working Groups and review of annual field work
 66 plans), working as part of the field sampling teams, participation in the Aquatic Working
 67 Group and related venues (e.g., Fish Passage Workshops), though community
 68 workshops with Environmental Assessment team members, and by preparation of their
 69 own environmental evaluation reports.

70 Given the collaborative approach to the development of mitigation, it is difficult to state
 71 which elements of the mitigation program would have been developed based on

72 technical information alone, and which reflected the input of ATK. However, ATK did
73 have a relatively greater role than technical information in describing historic effects.
74 For example, the statement that Lake Sturgeon were abundant in Stephens Lake prior to
75 the construction of the Kettle Generating Station and declined thereafter is based on
76 ATK from the Fox Lake Cree Nation, as no site-specific technical information exists.

77 *b. where the EIS suggests and appears to rely upon the role of ATK in the monitoring of*
78 *the effects on Lake Sturgeon and other fish populations, the explanations requested*
79 *in KK-IR-007B (a) through (e), inclusive.*

80 The KCNs will develop their own community-based ATK monitoring programs.

81 The technical monitoring program has considered ATK to the extent of incorporating
82 programs to address uncertainty in the assessment identified where ATK and technical
83 assessments reached different conclusions. For example, water quality will be
84 monitored in Split Lake to address concerns that Project effects will extend upstream of
85 the expected zone of influence.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0010**

3 **QUESTION:**

4 Where the EIS refers to effects of the Project on historic, heritage and cultural
5 resources, and in particular to the effects of the Project on historic, heritage and cultural
6 resources of significance to First Nations, please describe and provide:

- 7 a. in the event that ATK is a source of the information relied regarding the conclusions
8 in respect of the effect on historic, heritage or cultural resources, the explanations
9 requested in KK-IR-007A (a) through (d), inclusive;
- 10 b. in the event that the EIS may suggest or rely upon the role of ATK in the monitoring
11 of the effects on historic, heritage or cultural resources, the explanations requested
12 in KK-IR-007B (a) through (e), inclusive.

13 **RESPONSE:**

14 Please see the responses to CEC Round 1 KK-0006 and KK-0007a for an overview of how
15 ATK was brought into the planning and Environmental Assessment processes for the
16 Keeyask Generation Project. The response to CEC Rd 1 KK-0007b outlines how ATK has
17 and will continue to contribute to the Partnership's monitoring plans.

18 The SE SV, Chapter 5, Section 5.2 p 5-4-6 describes the approach and methodology used
19 to acquire ATK important to each of the KCNs with regard to historic, heritage and
20 cultural resources of significance to the KCNs. Further, Part 3, Heritage Resources
21 Section 1 p 1-1 to 1-11 provides information as to ATK as a source of information
22 regarding the conclusions related to the effects on heritage resources.

23 ATK contributed to the identification of concerns and issues about the Project, helped
24 shape technical science field work studies and contributed to mitigation ideas. Where
25 this ATK disagreed with the conclusions of technical science, this was noted. These
26 differences underscored the importance of monitoring and management of Project
27 effects (including ATK monitoring).

28 Part 3 of the SE SV Section 1.7 p 1-40 and Section 1.8 p 1-41 indicate measures that have
29 been developed in conjunction with the KCNs to mitigate and monitor heritage
30 resources sites. The Heritage Resources Protection Plan (HRPP) that was filed with
31 regulators on April 26, 2013 establishes a set of protocols and guidelines that have been
32 approved by the KCNs as an active means of protecting the safety of heritage resources
33 ([http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-
34 environmental-protection-program](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program)).

35 The HRPP, in conjunction with Manitoba's *Heritage Resources Act* (1986) and Policy
36 Concerning the Reporting, Exhumation and Reburial of Found Human Remains (1987)
37 will address cultural and legislative concerns. In addition, the Waterways Management
38 Program (Schedule 11-2 of the JKDA) "consists of measures to work with KCNs to
39 identify and contribute to impact management measures at high priority heritage sites
40 that will be flooded" (see Section 1.7.1, pg. 1-40 of the SE SV).

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0011**

3 **QUESTION:**

4 Where the EIS refers to effects of the Project on people, fish, wildlife, trees, plants,
5 peatlands, waters, lands or other resources, please:

- 6 a. identify the specific effect (such as the clearing or grubbing of forested lands,
7 berries, medicines or peatlands);
8 b. quantify the effect (such as by species, volume or area); and
9 c. assign an economic value to the effect.

10 **RESPONSE:**

11 The Partnership has completed its assessment of the potential environmental effects of
12 the Project in accordance with guidelines issued by regulatory authorities and standard
13 environmental assessment methodology. A summary of the effects of the project can be
14 found in tabular format at the end of the Keeyask Generation Project Environmental
15 Impact Statement Executive Summary. Further details on specific Project effects can be
16 found in the Chapter 6 (Environmental Effects Assessment) and Chapter 7 (Cumulative
17 Effects Assessment) of the Response to EIS Guidelines document and in the supporting
18 volumes.

19 The assessment guidelines do not require the Partnership to assign an economic value
20 to project effects, nor is this standard practice for a project-specific environmental
21 assessment.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0012**

3 **QUESTION:**

4 Where the Proponent refers to Woodland Caribou which calve in the general area of the
5 Project and in the general vicinity of Gillam, please describe and provide:

- 6 a. the analysis applied to arrive at any conclusion in respect of "Gillam area" woodland
7 caribou being "coastal caribou" and not a distinct herd of woodland caribou that is
8 apart from the Pen Island herd of woodland caribou; and
9 b. in the event that ATK is a source of the information relied regarding the conclusions
10 of the Proponent described at a), above, the explanations requested in KK-IR-007A
11 (a) through (d), inclusive.

12 **RESPONSE:**

13 Responses to each of the above questions are provided below.

- 14 a. *the analysis applied to arrive at any conclusion in respect of "Gillam area" woodland*
15 *caribou being "coastal caribou" and not a distinct herd of woodland caribou that is*
16 *apart from the Pen Island herd of woodland caribou*

17 No definitive conclusions were reached about summer resident caribou in the
18 Terrestrial Environment Supporting Volume (TE SV) and the Response to EIS Guidelines.
19 Information from Environment Canada, Manitoba Conservation and Water Stewardship,
20 results from studies conducted for the Bipole III Transmission Project, Keeyask field
21 studies and ATK from the Keeyask Cree Nations were presented in Section 7.3.6.3.3 of
22 the TE SV and in Section 6.2.3.4.7 of the Response to EIS Guidelines. It was stated that
23 the summer residents could be coastal woodland caribou, boreal woodland caribou, or a
24 mixture of both, and they were treated as an independent population that could use a
25 smaller range than the migratory groups and is more likely to use calving and rearing
26 habitat that occurs within the Keeyask region. Using a precautionary approach, the
27 possibility of the summer resident group being exclusively boreal woodland caribou was
28 explored in the EIS.

29 The following set of information was considered and led to the statement that the
30 summer resident caribou could be coastal woodland caribou, boreal woodland caribou,
31 or a mixture of both:

32 **Regulatory (Federal and Provincial)**

- 33 • Caribou in the region are specified as forest-tundra ecotype (Thomas and Gray
34 2002) or as coastal caribou (Manitoba Conservation 2005). By definition these are
35 not 'Threatened' boreal woodland caribou.
- 36 • By population range, the general region considers the range overlap of three
37 provincially defined groupings, including Qamanirjuaq barren-ground caribou, Cape
38 Churchill coastal caribou and Pen Islands coastal caribou.
- 39 • The nearest 'Threatened' boreal woodland caribou ranges in the geographic area of
40 interest where the majority of direct and indirect effects are captured (Study Zone
41 4) are Manitoba North and Wapisiu herds (Environment Canada 2012; Manitoba
42 Conservation 2005). The fringe of these ranges is captured by Study Zones 5 and 6
43 near Thompson (see TAC Public Rd 1 EC-0032b and CEC Rd 1 CEC-0037a).
- 44 • The picture is evolving for definitions of caribou classification systems, groupings
45 and management systems, including Designatable Units (DU) (COSEWIC 2011) for
46 *Rangifer tarandus* in Canada.

47 **Historic**

- 48 • Subspecific definitions in the range of *Rangifer tarandus caribou* (or woodland
49 caribou) and *Rangifer tarandus groenlandicus* (or barren-ground caribou) (Banfield
50 1961) were historically made using comparative morphometrics. However, the sub-
51 species method may not be the correct way to classify "true woodland caribou." If
52 the argument is valid where only the nuptial characteristics of mature bulls is the
53 appropriate distinguishing character for *Rangifer*, then the true woodland caribou
54 are only the very few, dark, small-maned caribou scattered across the southern
55 portion of caribou distribution (Geist 2011).
- 56 • There is some range overlap of barren-ground caribou in the geographic area of
57 interest (Beverly and Qamanirjuaq Caribou Management Board 2012). The range of
58 the earlier, provincially-designated Nelson-Hayes woodland caribou partially
59 overlapped the Keeyask region (Manitoba Conservation 2005). This herd has
60 appeared to have blended with Pen Islands coastal caribou and no longer exists as a
61 discrete population (Manitoba Conservation 2005). Animals from the Pen Islands
62 herd were first reported in the Keeyask region in the early 1990s (TE SV Section
63 7.3.6.3.2)

64 **ATK**

- 65 • The identification of caribou is based on a long history of harvesting caribou, namely
66 by behaviour and appearance (FLCN Environment Evaluation Report).
- 67 • Askî Keskontamowin identifies at least three subspecies of caribou in the local area:
68 *mistikoskaw utikuk* (caribou of a wooded area - resident in the area throughout the
69 year); also referred to as migratory woodland ecotype; *puskwaw utikosisak* (small
70 caribou of a barren land - early winter migration into the area and resident on the

71 north side of the Kischi Sipi), and *namowin atikok* (the caribou from the north east -
 72 early winter migration into the area and resident on the south side of the Kischi Sipi;
 73 occasional late autumn convergence into one herd along with barren land caribou
 74 has been reported (FLCN Environment Evaluation Report).

- 75 • Caribou in the region use forests and bogs of the area, and may be made up of a
 76 migratory woodland ecotype and what is defined as a southerly/westerly ranging
 77 boreal migratory woodland ecotype. An extension of this boreal caribou range into
 78 the FLCN's prime resource use area would be well beyond the accepted distribution
 79 reported by the federal and provincial governments. It is likely that some woodland
 80 caribou have interbred with Pen Islands caribou thus constituting a hybrid variety
 81 within the overall woodland population (FLCN Environment Evaluation Report).
- 82 • Caribou seek refuge from wolves in swampy areas and dense bogs, as well as island
 83 habitats during calving and calf rearing periods. Caribou currently utilize the
 84 Stephens Reservoir islands during calving (FLCN Environment Evaluation Report).
- 85 • Pen Island and migratory woodland ecotype occupy the same territory and are
 86 known to converge into one herd (FLCN Environment Evaluation Report).
- 87 • The migratory woodland caribou ecotype continues to live in the local area (FLCN
 88 Environment Evaluation Report).
- 89 • Caribou have recently returned to the area (Split Lake Cree 1996a).

90 **Local Knowledge**

- 91 • Calving on islands in Stephens Lake was first noted in the early 1990s, but tended to
 92 be occasional and sporadic (i.e., not every year) (Resource Use Member).
- 93 • Small groups of caribou with calves were observed in spring on islands (Resource
 94 Use Member).

95 **Behaviour and Range**

- 96 • Solitary calving behaviour on islands in lakes and peatlands in Study Zone 6 is
 97 observed (TE SV Section 7.3.6.3.3), which is similar to boreal woodland caribou
 98 behaviour.
- 99 • The nearest known location of caribou calving en masse (June 2011) is adjacent to
 100 the Hayes River, but inland. The specific calving ground of this group is unknown,
 101 but it is likely comprised of coastal caribou (WRCS unpubl. data).
- 102 • Summer habitat and occupancy of caribou with solitary calving behaviour is
 103 consistent with some variation in local, regional and lower Nelson River areas (2003,
 104 2009 - 2012).
- 105 • The summer range of radio-collared Pen Islands coastal caribou overlaps with Study
 106 Zones 4, 5 and broader. Some animals exhibited solitary calving behaviour in Study
 107 Zones 4 and 5, but with a larger summer range identified (Manitoba Hydro 2011,
 108 2012). This range is equivalent in size to Study Zone 6, but with a range overlap that
 109 extends much further east.

- 110 • Possible sedentary or short-distance migrant caribou were found in winter south of
 111 the Nelson River between Atkinson Lake and Clark Lake during late winter aerial
 112 surveys after Pen Islands caribou had left, or found in small groups when large
 113 numbers of coastal or barren-ground caribou were absent.
- 114 • The winter range of radio-collared Pen Islands coastal caribou is well defined
 115 (Manitoba Hydro 2011, 2012). The home range of radio-collared Pen Islands coastal
 116 caribou is extensive and equivalent to Map 7-21 of the TE SV.
- 117 • The winter and home range of radio-collared Cape Churchill coastal caribou is
 118 outside of Zone 6 and equivalent to Map 7-21 of the TE SV.

119 **Behaviour and Range Plasticity**

- 120 • Boreal woodland caribou exhibit a range of behaviours with respect to movements;
 121 some movements are local and others migratory (i.e., twice annual movements
 122 between two distinct seasonal ranges; Thomas and Gray 2002).
- 123 • Changes from sedentary to more migratory behaviour have been assumed for
 124 Nelson-Hayes woodland caribou (Manitoba Conservation 2005).
- 125 • Switching of calving ranges and moving from coastal to inland areas (Abraham et al.
 126 2012) has been reported for Pen Islands coastal caribou.
- 127 • There are no documented cases of calving site switching between migratory and
 128 boreal populations (COSEWIC 2011). Recent radio-collaring data have shown some
 129 caribou spent a summer in the Keeyask region and migrated to the coast the
 130 following year (Manitoba Conservation unpubl. data).

131 **Genetics**

- 132 • Two genetic groups of caribou have been identified: barren-ground and coastal
 133 caribou. Coastal caribou do appear to be genetically distinct from boreal woodland
 134 caribou in northern Manitoba.
- 135 • Summer resident caribou subset could not be genetically separated from coastal
 136 caribou (Ball and Wilson 2007).
- 137 • "In Ontario, preliminary genetic work reported little genetic differentiation between
 138 the aggregated calving Pen Islands population (DU4) and Boreal caribou (DU6)".
 139 However, "there has been no phylogeographic study including both the aggregated
 140 calving populations of Ontario/Manitoba and Québec/Labrador, and no samples
 141 from the western-most portion of this DU (Cape Churchill population) have been
 142 compared with those of neighbouring populations" (COSEWIC 2011).
- 143 • Manitoba Hydro is funding further genetics research aimed at identifying these
 144 summer resident caribou.

145

146 *b. in the event that ATK is a source of the information relied regarding the conclusions*
147 *of the Proponent described at a), above, the explanations requested in KK-IR-007A*
148 *(a) through (d), inclusive.*

149 As indicated in Section 7.3.6.3.3 of the TE SV, ATK from Fox Lake Cree Nation (FLCN
150 Environment Evaluation Report; Fox Lake Aski Kescentamowin Keeyask Powistik), York
151 Factory First Nation (YFFN Evaluation Report (Kipekiskwaywinan), and the Mammals
152 Working Group (January 24, 2012) was presented as a source of information about the
153 summer resident caribou. Please see the responses to CEC Rd 1 KK-0007a and KK-0007b
154 for related information.

155 **REFERENCES:**

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160 Board, Stonewall, MB. 46 pp.
- 161 COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011.
162 Designatable Units for Caribou (*Rangifer tarandus*) in Canada. Committee on the
163 Status of Endangered Wildlife in Canada. Ottawa. 88 pp.
- 164 Environment Canada. 2012. Recovery strategy for the woodland caribou (*Rangifer*
165 *tarandus caribou*), Boreal population, in Canada. *Species at Risk Act* Recovery
166 Strategy Series. Environment Canada, Ottawa, ON. 138 pp.
- 167 FLCN (Fox Lake Cree Nation) Environment Evaluation Report. 2012. Fox Lake Cree
168 Nation, MB. 89 pp.
- 169 Geist, V. 2011. Defining subspecies, invalid taxonomic tools, and the fate of the
170 woodland caribou. *Rangifer* Special Issue No. 17: 25-28.
- 171 Manitoba Conservation. 2005. Manitoba's conservation and recovery strategy for boreal
172 woodland caribou (*Rangifer tarandus caribou*). Manitoba Conservation, Wildlife
173 and Ecosystem Protection Branch, Winnipeg, MB. 19 pp.
- 174 Manitoba Hydro. 2011. Bipole III Transmission Project Caribou Technical Report.
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177 Report. Prepared for Manitoba Hydro by Joro Consultants Inc., Winnipeg, MB.
178 108 pp.
- 179 Split Lake Cree. 1996a. Analysis of change: Split Lake Cree post project environmental
180 review. Split Lake Cree – Manitoba Hydro Joint Study Group; vol. 3 of 5.
- 181 Thomas, D.C. and Gray, D.R. 2002. Update COSEWIC status report on the woodland
182 caribou *Rangifer tarandus caribou* in Canada. Committee on the Status of
183 Endangered Wildlife in Canada, Ottawa, ON. 98 pp.

1 **REFERENCE: Volume: N/A; Section: N/A; p. N/A**

2 **CEC Rd 1 KK-0013**

3 **QUESTION:**

4 Where the Proponent refers to consideration of options to provide fish passage at the
5 Keeyask Generating Station, including consideration of potential measures to mitigate
6 the direct and cumulative effects on sturgeon resulting from the Project, and to the
7 conclusions of the Proponent in respect of the consideration of such options, please
8 describe and provide:

- 9 a. whether consideration was given to the design and installation of fish passage
10 facilities at the location of the former rapids at the Kelsey Generating Station to
11 restore the passage of Sturgeon between the Upper Nelson River and Lower Nelson
12 River, and if so, the conclusions of such consideration, together with any studies or
13 reports; and
14 b. in the event that ATK is a source of the information relied regarding the conclusions
15 of the Proponent in respect of the design and installation of fish passage facilities at
16 the location of the former rapids at the Kelsey Generating station, to provide the
17 explanations requested in KK-IR-007A (a) through (d), inclusive.

18 **RESPONSE:**

19 The Kelsey Generating Station was built on the Nelson River between 1957 and 1961.
20 The initial purpose of the Kelsey Generating Station was to supply the International
21 Nickel Company's (INCO) mining and smelting operations in the Moak Lake and Mystery
22 Lake areas and supply electricity to the City of Thompson. Six years after completion,
23 the generating station was linked to the province's electrical system. No evidence could
24 be found of fish passage studies undertaken during the design phase of the generating
25 station. This suggests that no studies were undertaken regarding fish passage as a
26 component of the design of the Kelsey Generating Station. No evidence could be found
27 indicating that since the station was first constructed until present there has been any
28 consideration for implementing fish passage at the Kelsey Generating Station. Therefore
29 it is unlikely that ATK was considered.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.4.6 Sources of Information; 7.5.1 Mammal Sign**
 3 **Surveys; p. 1-27, 7A-7, 7-7, Map 7-2**

4 **CEC Rd 1 MMF-0001a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following
 7 attributes in the applicable study area(s):... Species composition, distribution and
 8 relative abundance of small mammals, furbearers, large carnivores and ungulates, in
 9 relation to habitat including seasonal changes."

10 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
 11 composition, distribution, and relative abundance of ungulates. Appendix 7A makes
 12 reference to "statistical comparisons" with collected data (TE-SV-7.0, Appendix 7A, p.
 13 7A-7); however, no analyses or statistical comparisons are presented in TE-SV-7.0 or
 14 Appendix 7A. It appears the study design for the Project included both "proxy" and
 15 "benchmark" areas (TE-SV-1.0, Section 1.4.6, p. 1-27) which can be useful for
 16 comparison to areas that have experienced similar project impacts and relatively
 17 pristine areas that will presumably remain pristine. However, the mammals report (TE-
 18 SV-7.0) does not appear to contain any results of comparisons utilizing data from the
 19 proxy and benchmark areas. With sufficient sample size, analyses should demonstrate
 20 the effectiveness (or ineffectiveness) of mitigation measures applied to previous
 21 hydroelectric projects. Analyses should also demonstrate that benchmarks function
 22 effectively as control sites (i.e., not impacted by hydroelectric activity and similar in
 23 nature to Project study area at baseline).

24 **QUESTION:**

25 Describe what statistical analyses or comparisons were completed for ungulates for the
 26 Project and provide the results.

27 **RESPONSE:**

28 The results for ungulates are included in the Response to EIS Guidelines Sections 6.5.8.1
 29 and 6.5.8.2, and in the Terrestrial Environment Supporting Volume (TE SV) Sections
 30 7.4.6.2 and 7.4.6.3. Descriptive statistics are found in Appendix 7B of the TE SV to
 31 support the effects assessment for ungulates, in addition to the literature and
 32 professional judgment used. Other supporting analyses for ungulates can be found in
 33 the CNP Moose Harvest Sustainability Plan and the Habitat Relationships and Wildlife
 34 Habitat Quality Models for the Keeyask Region report (pending). The scientific model
 35 used to predict the effects of harvest on the regional sustainability of moose is included

36 on the CD of Technical Reports provided with this filing. Please see CEC Rd 1 MMF-
37 0011a and CEC Rd 1 MMF-0002b in reference to these documents.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.4.6 Sources of Information; 7.5.1 Mammal Sign**
 3 **Surveys; p. 1-27**

4 **CEC Rd 1 MMF-0001b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following
 7 attributes in the applicable study area(s): ..Species composition, distribution and relative
 8 abundance of small mammals, furbearers, large carnivores and ungulates, in relation to
 9 habitat including seasonal changes."

10 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
 11 composition, distribution, and relative abundance of ungulates. Appendix 7A makes
 12 reference to "statistical comparisons" with collected data (TE-SV-7.0, Appendix 7A, p.
 13 7A-7); however, no analyses or statistical comparisons are presented in TE-SV-7.0 or
 14 Appendix 7A. It appears the study design for the Project included both "proxy" and
 15 "benchmark" areas (TE-SV-1.0, Section 1.4.6, p. 1-27) which can be useful for
 16 comparison to areas that have experienced similar project impacts and relatively
 17 pristine areas that will presumably remain pristine. However, the mammals report (TE-
 18 SV-7.0) does not appear to contain any results of comparisons utilizing data from the
 19 proxy and benchmark areas. With sufficient sample size, analyses should demonstrate
 20 the effectiveness (or ineffectiveness) of mitigation measures applied to previous
 21 hydroelectric projects. Analyses should also demonstrate that benchmarks function
 22 effectively as control sites (i.e., not impacted by hydroelectric activity and similar in
 23 nature to Project study area at baseline).

24 **QUESTION:**

25 Indicate if analyses performed provide support for proposed Project mitigation
 26 measures for ungulates.

27 **RESPONSE:**

28 Mitigation measures from the TE SV (Section 7.4.6.2.1) for which there were supporting
 29 analyses are:

30 **The excavated material placement areas were sited to avoid caribou calving**
 31 **complexes and reduce habitat loss**

32 Excavated material may act as a disturbance, effectively reducing the amount of
 33 available habitat. Using the information from mammal sign surveys and caribou habitat
 34 models, calving and rearing habitat was avoided during the siting of these areas.

35 **Future calving islands greater than 0.5 ha in the reservoir area will be flagged and left**
36 **undisturbed to protect the vegetation that will remain on these islands from clearing**
37 **disturbances**

38 The expert information models, which were verified by the habitat quality models,
39 identified these islands as important for caribou calving and rearing. Results of field
40 studies indicate the presence of caribou on a high proportion of larger islands.

41 **The access roads were routed to avoid caribou calving complexes and reduce loss of**
42 **effective habitat**

43 Mammal sign surveys and caribou habitat models identified primary and secondary
44 calving and rearing habitat for caribou in peatland complexes and areas used for calving
45 and rearing habitat. These areas were avoided during the routing of access roads.

46 **Warning signs will be placed along the access roads near caribou travel corridors and**
47 **high-quality habitats to reduce the potential of wildlife-vehicle collisions**

48 The high-quality habitat was identified via mammal sign surveys and in caribou habitat
49 quality models.

50 Other mitigation measures for moose and caribou were based on practices developed
51 through experience with similar projects. Examples include minimizing blasting during
52 the caribou calving and rearing period and prohibiting firearms in camps and at work
53 sites to reduce mortality due to hunting during construction (refer to the Response to
54 EIS Guidelines, Sections 6.5.8.1.1, 6.5.8.1.3, 6.5.8.2.1, and 6.5.8.2.3). Further mitigation
55 includes the implementation of the CNP Moose Harvest Sustainability Plan to help CNP
56 offsetting program managers manage implementation of the Tataskweyak Cree Nation
57 & War Lake First Nation Access Programs such that moose populations remain
58 sustainable in the Split Lake Resource Management Area. The scientific model used to
59 predict the effects of harvest on the regional sustainability of moose is included on the
60 CD of Technical Reports provided with this filing. See the response to CEC Rd 1 MMF-
61 0011b for more information.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.4.6; p. 1-27**

3 **CEC Rd 1 MMF-0001c**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following
6 attributes in the applicable study area(s): ..Species composition, distribution and relative
7 abundance of small mammals, furbearers, large carnivores and ungulates, in relation to
8 habitat including seasonal changes."

9 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
10 composition, distribution, and relative abundance of ungulates. Appendix 7A makes
11 reference to "statistical comparisons" with collected data (TE-SV-7.0, Appendix 7A, p.
12 7A-7); however, no analyses or statistical comparisons are presented in TE-SV-7.0 or
13 Appendix 7A. It appears the study design for the Project included both "proxy" and
14 "benchmark" areas (TE-SV-1.0, Section 1.4.6, p. 1-27) which can be useful for
15 comparison to areas that have experienced similar project impacts and relatively
16 pristine areas that will presumably remain pristine. However, the mammals report (TE-
17 SV-7.0) does not appear to contain any results of comparisons utilizing data from the
18 proxy and benchmark areas. With sufficient sample size, analyses should demonstrate
19 the effectiveness (or ineffectiveness) of mitigation measures applied to previous
20 hydroelectric projects. Analyses should also demonstrate that benchmarks function
21 effectively as control sites (i.e., not impacted by hydroelectric activity and similar in
22 nature to Project study area at baseline).

23 **QUESTION:**

24 Provide power analyses demonstrating that sufficient sample sizes for tracking data
25 were collected at baseline such that meaningful comparisons with future monitoring
26 data can be made.

27 **RESPONSE:**

28 Results will be available in the Habitat Relationships and Wildlife Habitat Quality Model
29 report, expected to be available late summer 2013.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.5.1, 7.3.6, 7.4.6.2.1, 7.4.6.2.2, 7.5.1; p. 7-7, 7-**
 3 **57, 7-75, 7-112, 7-120, 7-124**

4 **CEC Rd 1 MMF-0002a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.1.3.6 Mammals: “The EIS will describe the following
 7 attributes in the applicable study area(s): ..Species composition, distribution and relative
 8 abundance of small mammals, furbearers, large carnivores and ungulates, Page 8 in
 9 relation to habitat including seasonal changes.”

10 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
 11 composition, distribution, and relative abundance of ungulates. The EIS states that
 12 additional efforts were made to design studies and collect sufficient data to construct
 13 and validate “statistically derived multivariate habitat models” for mammal VECs (TE-SV-
 14 7.0, Section 7.2.5, p. 7-7). Section 7.3.6.1 discusses “expert information models” that
 15 were used to estimate the abundance of habitat available pre- and post-Project. The
 16 expert information models are described as being based on scientific literature and
 17 expert information (not statistically derived). Section 7.3.6.3.4 contains a Caribou
 18 Habitat Model discussion and Section 7.3.6.4.4 contains a Moose Model discussion;
 19 however, neither appear to be “statistically derived”, nor do they appear to be
 20 statistically validated. Appendix 6A of the Response to EIS Guidelines lists an
 21 Environmental Study Report titled “Habitat relationships and wildlife habitat quality
 22 models for the Keeyask region” but does not provide a status or date completed.

23 The habitat model discussions require some additional information. It is critical to
 24 explain how suitability of islands and peatland complexes for calving caribou was
 25 determined as this information feeds into the impact assessment. The EIS states
 26 “Evidence of calving was documented on approximately 10% of the island in Gull and
 27 Stephens lakes and only 5% of the peatland complexes surveyed in 2010 and 2011,
 28 indicating that there is likely more habitat available than caribou are currently using.”
 29 (TE-SV-7.0, Section 7.4.6.2, p. 7-112). Alternatively, this may indicate that the unused
 30 islands and peatland complexes may have characteristics that result in caribou
 31 avoidance of these sites. Since the EIS also identifies important moose calving and
 32 rearing habitat in the LSA to be similar to those used by summer resident caribou (TE-
 33 SV-7.0, Section 7.4.6.3.1, p. 7-124), the assumption that more calving habitat is available
 34 needs to be supported for moose as well. Project impact predictions require more
 35 consistent argumentation and clarity and support for assumptions made within the
 36 presented arguments.

37 **QUESTION:**

38 Provide the reference to sections where the details on how “statistically derived
39 multivariate habitat models” for caribou and moose were generated and validated.

40 **RESPONSE:**

41 Statistical analyses focused on associations between environmental attributes and their
42 use by caribou and moose in the Local and Regional Study Areas. Expert information
43 models were created based on the results of these analyses and a review of published
44 materials to determine habitat types important to caribou and moose. Coarse habitat
45 types identified from a spatial dataset were then used to validate expert information
46 models and develop a winter habitat model for caribou and a primary and secondary
47 habitat model for moose. The development of the expert model for summer resident
48 caribou calving habitat on islands in lakes and peatland complexes was informed by and
49 validated using trail cameras and tracking data. Aerial survey data were also used to
50 validate coarse habitat types for moose and caribou. The scientific model used to
51 predict the effects of harvest on the regional sustainability of moose is included on the
52 CD of Technical Reports provided with this filing. Results will be presented in the Habitat
53 Relationships and Wildlife Habitat Quality Model report (pending).

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.5.1, 7.3.6, 7.4.6.2.1, 7.4.6.2.2, 7.5.1; p. 7-7, 7-**
 3 **57, 7-75, 7-112, 7-120, 7-124**

4 **CEC Rd 1 MMF-0002b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.1.3.6 Mammals: “The EIS will describe the following
 7 attributes in the applicable study area(s): ..Species composition, distribution and relative
 8 abundance of small mammals, furbearers, large carnivores and ungulates, Page 8 in
 9 relation to habitat including seasonal changes.”

10 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
 11 composition, distribution, and relative abundance of ungulates. The EIS states that
 12 additional efforts were made to design studies and collect sufficient data to construct
 13 and validate “statistically derived multivariate habitat models” for mammal VECs (TE-SV-
 14 7.0, Section 7.2.5, p. 7-7). Section 7.3.6.1 discusses “expert information models” that
 15 were used to estimate the abundance of habitat available pre- and post-Project. The
 16 expert information models are described as being based on scientific literature and
 17 expert information (not statistically derived). Section 7.3.6.3.4 contains a Caribou
 18 Habitat Model discussion and Section 7.3.6.4.4 contains a Moose Model discussion;
 19 however, neither appear to be “statistically derived”, nor do they appear to be
 20 statistically validated. Appendix 6A of the Response to EIS Guidelines lists an
 21 Environmental Study Report titled “Habitat relationships and wildlife habitat quality
 22 models for the Keeyask region” but does not provide a status or date completed.

23 The habitat model discussions require some additional information. It is critical to
 24 explain how suitability of islands and peatland complexes for calving caribou was
 25 determined as this information feeds into the impact assessment. The EIS states
 26 “Evidence of calving was documented on approximately 10% of the island in Gull and
 27 Stephens lakes and only 5% of the peatland complexes surveyed in 2010 and 2011,
 28 indicating that there is likely more habitat available than caribou are currently using.”
 29 (TE-SV-7.0, Section 7.4.6.2, p. 7-112). Alternatively, this may indicate that the unused
 30 islands and peatland complexes may have characteristics that result in caribou
 31 avoidance of these sites. Since the EIS also identifies important moose calving and
 32 rearing habitat in the LSA to be similar to those used by summer resident caribou (TE-
 33 SV-7.0, Section 7.4.6.3.1, p. 7-124), the assumption that more calving habitat is available
 34 needs to be supported for moose as well. Project impact predictions require more
 35 consistent argumentation and clarity and support for assumptions made within the
 36 presented arguments.

37 **QUESTION:**

38 Provide the status or date completed for the Environmental Study Report titled "Habitat
39 relationships and wildlife habitat quality models for the Keeyask region". If available,
40 please provide the report to the Métis for review.

41 **RESPONSE:**

42 The environmental study report titled "Habitat relationships and wildlife habitat quality
43 models for the Keeyask region" is expected to be available in late summer 2013.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.5.1, 7.3.6, 7.4.6.2.1, 7.4.6.2.2, 7.5.1; p. 7-7, 7-**
 3 **57, 7-75, 7-112, 7-120, 7-124**

4 **CEC Rd 1 MMF-0002c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.1.3.6 Mammals: "The EIS will describe the following
 7 attributes in the applicable study area(s). Species composition, distribution and relative
 8 abundance of small mammals, furbearers, large carnivores and ungulates, Page 8 in
 9 relation to habitat including seasonal changes."

10 The Scoping Document (Section 4.1.3.6) sets out that the EIS will describe the
 11 composition, distribution, and relative abundance of ungulates. The EIS states that
 12 additional efforts were made to design studies and collect sufficient data to construct
 13 and validate "statistically derived multivariate habitat models" for mammal VECs (TE-SV-
 14 7.0, Section 7.2.5, p. 7-7). Section 7.3.6.1 discusses "expert information models" that
 15 were used to estimate the abundance of habitat available pre- and post-Project. The
 16 expert information models are described as being based on scientific literature and
 17 expert information (not statistically derived). Section 7.3.6.3.4 contains a Caribou
 18 Habitat Model discussion and Section 7.3.6.4.4 contains a Moose Model discussion;
 19 however, neither appear to be "statistically derived", nor do they appear to be
 20 statistically validated. Appendix 6A of the Response to EIS Guidelines lists an
 21 Environmental Study Report titled "Habitat relationships and wildlife habitat quality
 22 models for the Keeyask region" but does not provide a status or date completed.

23 The habitat model discussions require some additional information. It is critical to
 24 explain how suitability of islands and peatland complexes for calving caribou was
 25 determined as this information feeds into the impact assessment. The EIS states
 26 "Evidence of calving was documented on approximately 10% of the island in Gull and
 27 Stephens lakes and only 5% of the peatland complexes surveyed in 2010 and 2011,
 28 indicating that there is likely more habitat available than caribou are currently using."
 29 (TE-SV-7.0, Section 7.4.6.2, p. 7-112). Alternatively, this may indicate that the unused
 30 islands and peatland complexes may have characteristics that result in caribou
 31 avoidance of these sites. Since the EIS also identifies important moose calving and
 32 rearing habitat in the LSA to be similar to those used by summer resident caribou (TE-
 33 SV-7.0, Section 7.4.6.3.1, p. 7-124), the assumption that more calving habitat is available
 34 needs to be supported for moose as well. Project impact predictions require more
 35 consistent argumentation and clarity and support for assumptions made within the
 36 presented arguments.

37 **QUESTION:**

38 Provide support for the assumption that “there is likely more habitat available than
39 caribou are currently using”. How was suitability of islands and peatland complexes for
40 caribou and moose calving determined?

41 **RESPONSE:**

42 Support for the assumption “there is likely more habitat available than caribou are
43 currently using” can be found in the reply to question 7 in the response to CEC Rd 1 CEC-
44 0037a.

45 Calving and rearing habitat in peatland complexes and islands in lakes was identified as
46 primary or secondary based on observed use. Data from 2003, 2010, and 2011 mammal
47 sign and trail camera surveys were used to show use of islands in lakes, and data from
48 2010 and 2011 mammal sign and trail camera surveys were used to show use of
49 peatland complexes. Through the exploration of various features associated with islands
50 in lakes and peatland complexes, the geographic size of islands and peatland complexes
51 was identified as the factor most strongly contributing to the use of these areas for
52 caribou calving and rearing. Other factors tested to explain the use of peatland
53 complexes for calving and rearing included the number of islands within a complex and
54 the proportion of islands to total land area. No other factors were incorporated in the
55 final model development, such as habitat composition, to determine the occupancy of
56 islands in lakes because no differences in habitat composition were apparent.

57 Identification of secondary calving and rearing complexes was based on habitat areas
58 that support adult caribou approximately 65% of the time and calves less than 45% of
59 the time for peatland complexes, or less than 25% of the time for islands in lakes.
60 Identification of primary habitat was based on the presence of adults approximately
61 90% of the time and calves more than 45% of the time for peatland complexes or more
62 than 25% of the time for islands in lakes. These levels were determined through an
63 iterative process of inspecting caribou use of sampled areas over two years (for sampled
64 peatland complexes) or three years (for sampled islands in lakes), where criteria were
65 adjusted and graphed to inspect inflection points. By doing this it was apparent that
66 higher rates of use were evident for larger islands in lakes and peatland complexes.

67 It is understood that other factors are likely important to caribou calving and rearing
68 success beyond island or peatland complex size. For this reason, the influence of fire
69 events on islands in lakes and peatland complexes used for calving and rearing was
70 evaluated. A comparison was done to determine the relative presence of caribou calves
71 and adults in those areas affected by fire, versus those areas where no fire events have
72 occurred.

73 Monitoring of islands and peatland complexes was also done to examine life-history
74 characteristics of summer resident caribou in the Keeyask region. Based on these
75 studies, it was seen that moose do use islands for calving, but they also use alternate
76 areas beyond those used by caribou.

77 The sampled islands and peatland complexes where moose were identified during
78 monitoring of summer resident caribou calving and rearing activities were assessed as
79 to their habitat attributes. This was done to validate the moose expert information
80 model which demonstrates sampled coarse habitat types as being of either primary or
81 secondary importance. Through this analysis it was determined that many of the coarse
82 habitat types where moose were sampled had been considered primary or secondary
83 habitat and classified as potential moose habitat.

84 The research showed a strong association between the areas identified as primary and
85 secondary calving habitats and its use by caribou or moose for that purpose, therefore
86 empirically proving its suitability and the availability of additional areas unused at the
87 time of survey. In short, there was high quality moose and caribou habitat that was not
88 used every year.

89 **REFERENCES:**

90 Knudsen, B., Berger, R., Johnstone, S., Kiss, B., Paille, J., and Kelly, J. 2010. Split Lake
91 Resource Management Area moose survey 2009 and 2010. Keeyask Generation
92 Project Environmental Studies Program Report #10-01. Prepared for Manitoba
93 Hydro by Wildlife Resource Consulting Services MB Inc., Winnipeg. 144pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Section 1.4.4; 5.5 (Response to EIS Guidelines); p.**
 3 **Table 1-4, p. 1-24; Figure 5-1, p. 5-9 (Response to EIS Guidelines)**

4 **CEC Rd 1 MMF-0003a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1.1 Criteria for Determining Significance: “The
 7 following criteria will be used to determine the significance of residual adverse
 8 environmental effects on each VEC: Nature (i.e., positive or negative) of the effect;
 9 Magnitude (i.e., severity) of the effect; Temporal boundaries (i.e., duration); and Spatial
 10 boundaries (i.e., geographic extent)....In assessing the significance of environmental
 11 effects on a VEC, the EIS may also discuss the frequency of effects, ecological context
 12 and the reversibility, where relevant.” The EIS discusses the approach used to
 13 determining “Regulatory Significance” (R to EIS, Section 5.5, p. 5-9). As per the Keeyask
 14 Generation Project Scoping Document (hereafter Scoping Document) Section 5.1.1, the
 15 EIS uses the “Magnitude” criterion to assist in determination of impact significance. In
 16 the EIS, the definition of moderate magnitude is: “Moderate – Effects that could be
 17 measured and could be determined within a normal range of variation of a well
 18 designed monitoring program; or are generally below or only marginally beyond
 19 guidelines or established thresholds of acceptable change; or are marginally beyond the
 20 range of natural variability or marginally beyond minimal impairment of ecosystem
 21 component’s function”. The definition of large magnitude is: “Large – Effects that are
 22 easily observable, measured and described (i.e., readily detectable without a monitoring
 23 program), and well beyond guidelines or established thresholds of acceptable changes,
 24 are well beyond the range of natural variability, or are well beyond minimal impairment
 25 of an ecosystem component’s functions”. (R to EIS, Section 5.5, p. 5-11). This implies
 26 that the ranges of natural variability (RNV) of populations are known. The current
 27 presentation of data for moose and caribou does not clearly indicate the RNV. The
 28 “Reversibility” criterion is only considered in “Step 2” of the regulatory significance
 29 assessment for those VECs that have an adverse effect and meet particular criteria (R to
 30 EIS, Section 5.3.1; Scoping Document 5.1.1). Reversible is defined as an “Effect that is
 31 reversible during the life of the Project” (R to EIS, Section 5.3.1). All borrow areas
 32 (except portions of G-1 and G-3), all road footprints (except the north and south access
 33 roads and Butnau road upgrades), camp, work, and landfill areas would be
 34 decommissioned at the end of construction (TE-SV-1.0, Section 1.5.1, p. 1-30 to 1-31).
 35 Under operations, camp, work, borrow, other temporarily cleared areas (TE-SV-1.0,
 36 Section 1.5.2, p. 1-32), and material placement areas will undergo some degree of
 37 rehabilitation (R to EIS, Section 4.6.16, p. 4-40). Unfortunately, “a detailed

38 decommissioning and rehabilitation plan for infrastructure not required for the
39 operation of the Project will be developed during the construction phase and provided
40 to regulators for review and approval" (R to EIS, Section 4.6.16, p. 4-41). Without a
41 rehabilitation plan, it is difficult to evaluate whether those areas identified for
42 rehabilitation will meet the reversibility criterion or whether the duration ("Step 1") of
43 effects was accurately assessed.

44 **QUESTION:**

45 Explain the concept of "regulatory significance" and provide reasoning and references
46 for its use in environmental impact assessment.

47 **RESPONSE:**

48 The government regulatory environmental assessment process requires a determination
49 as to whether residual (i.e., after mitigation) adverse effects of the Project on each
50 Valued Environmental Component (VEC) are "significant", and, where this is the case,
51 whether such effects are "likely" (See Section 16 of the *Canadian Environmental*
52 *Assessment Act*; Section 9.4 of EIS Guidelines)

53 The approach adopted for determination of regulatory significance of predicted residual
54 adverse environmental effects of the Project on each VEC, in accordance with the EIS
55 Guidelines, is outlined in Section 5.5 of the Response to EIS Guidelines. The term
56 "regulatory significance" was adopted by the Partnership in the EIS to help distinguish
57 this very specific use of the term for regulatory assessment purposes from other more
58 common uses in very different contexts.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Section 1.4.4; 5.5 (Response to EIS Guidelines); p.**
 3 **Table 1-4, p. 1-24; Figure 5-1, p. 5-9 (Response to EIS Guidelines)**

4 **CEC Rd 1 MMF-0003b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1.1 Criteria for Determining Significance: “The
 7 following criteria will be used to determine the significance of residual adverse
 8 environmental effects on each VEC: Nature (i.e., positive or negative) of the effect;
 9 Magnitude (i.e., severity) of the effect; Temporal boundaries (i.e., duration); and Spatial
 10 boundaries (i.e., geographic extent)....In assessing the significance of environmental
 11 effects on a VEC, the EIS may also discuss the frequency of effects, ecological context
 12 and the reversibility, where relevant.” The EIS discusses the approach used to
 13 determining “Regulatory Significance” (R to EIS, Section 5.5, p. 5-9). As per the Keeyask
 14 Generation Project Scoping Document (hereafter Scoping Document) Section 5.1.1, the
 15 EIS uses the “Magnitude” criterion to assist in determination of impact significance. In
 16 the EIS, the definition of moderate magnitude is: “Moderate – Effects that could be
 17 measured and could be determined within a normal range of variation of a well
 18 designed monitoring program; or are generally below or only marginally beyond
 19 guidelines or established thresholds of acceptable change; or are marginally beyond the
 20 range of natural variability or marginally beyond minimal impairment of ecosystem
 21 component’s function”. The definition of large magnitude is: “Large – Effects that are
 22 easily observable, measured and described (i.e., readily detectable without a monitoring
 23 program), and well beyond guidelines or established thresholds of acceptable changes,
 24 are well beyond the range of natural variability, or are well beyond minimal impairment
 25 of an ecosystem component’s functions”. (R to EIS, Section 5.5, p. 5-11). This implies
 26 that the ranges of natural variability (RNV) of populations are known. The current
 27 presentation of data for moose and caribou does not clearly indicate the RNV.

28 The “Reversibility” criterion is only considered in “Step 2” of the regulatory significance
 29 assessment for those VECs that have an adverse effect and meet particular criteria (R to
 30 EIS, Section 5.3.1; Scoping Document 5.1.1). Reversible is defined as an “Effect that is
 31 reversible during the life of the Project” (R to EIS, Section 5.3.1). All borrow areas
 32 (except portions of G-1 and G-3), all road footprints (except the north and south access
 33 roads and Butnau road upgrades), camp, work, and landfill areas would be
 34 decommissioned at the end of construction (TE-SV-1.0, Section 1.5.1, p. 1-30 to 1-31).
 35 Under operations, camp, work, borrow, other temporarily cleared areas (TE-SV-1.0,
 36 Section 1.5.2, p. 1-32), and material placement areas will undergo some degree of
 37 rehabilitation (R to EIS, Section 4.6.16, p. 4-40). Unfortunately, “a detailed

38 decommissioning and rehabilitation plan for infrastructure not required for the
 39 operation of the Project will be developed during the construction phase and provided
 40 to regulators for review and approval" (R to EIS, Section 4.6.16, p. 4-41). Without a
 41 rehabilitation plan, it is difficult to evaluate whether those areas identified for
 42 rehabilitation will meet the reversibility criterion or whether the duration ("Step 1") of
 43 effects was accurately assessed.

44 **QUESTION:**

45 Present data outlining the range of natural variability (RNV) and thresholds in moose
 46 and caribou populations (i.e., provide upper and lower targets in moose and caribou
 47 populations, beyond which adaptive management action would need to be
 48 implemented) that are being used to determine magnitude. Explain how one
 49 determines whether effects are "marginally" vs. "well-beyond" guidelines or the range
 50 of natural variability.

51 **RESPONSE:**

52 It should be noted that the Keeyask Hydropower Limited Partnership does not manage
 53 wildlife populations; population management is the responsibility of provincial
 54 governments and resource management boards. Monitoring identified in the
 55 preliminary Terrestrial Effects Monitoring Plan and information shared through the
 56 Resource Management Boards will inform Manitoba Conservation and Water
 57 Stewardship of the potential need for altered management approaches. A Moose
 58 Harvest Sustainability Plan has been developed to predict effects of harvest associated
 59 with the Project and other sources of mortality (e.g., predation) on moose in the Split
 60 Lake Resource Management Area. A plan is being developed to coordinate caribou
 61 monitoring activities among northern hydroelectric developments for summer resident
 62 caribou and migratory populations, in conjunction with government authorities and
 63 existing caribou committees and management boards, where there is uncertainty
 64 regarding caribou mortality related to predators and harvest.

65 Range of natural variability (RNV) is one of three criteria considered to determine the
 66 magnitude of Project effects on VECs (Section 5.5 of the Response to EIS Guidelines).
 67 Because wildlife populations are influenced by a number of factors over time, a series of
 68 data points over a timeframe appropriate to the species are needed to establish with a
 69 reasonable level of confidence what the natural range of variability might be for a
 70 population. If data were available, modeling might be used to establish upper and lower
 71 benchmarks where, if exceeded, management actions would need to be implemented.

72 As such, other direct and indirect indicators are most often selected to measure existing
 73 management actions, or potentially, adaptive management actions that could be
 74 implemented if certain benchmarks are met or exceeded. For example, population
 75 trends (e.g., increasing, decreasing or stable), changes to population drivers or stressors

76 (e.g., fire, predators, hunting), or loss of habitat are most often used instead of RNV. The
77 magnitude of Project effects on moose and caribou was determined using benchmarks
78 (TE SV Section 7.2.6), including physical habitat loss, intactness, linear feature density,
79 gray wolf density, and harvest. If a benchmark is exceeded, additional mitigation or
80 action may be considered, whether effects are marginally or well beyond guidelines.

81 For example, past and current estimates of the moose population are not a reasonable
82 indicator of the range of natural variability for this species since only two data points
83 can be established. The moose population in the Split Lake Resource Management Area
84 (SLRMA) was estimated at 1,639 in the mid-1990s and at 2,600 individuals in 2010 (TE
85 SV Section 7.3.6.4.3). Instead, indicators were selected to assess significance for
86 mammals of magnitude (i.e., severity) of the effect, temporal boundaries (i.e., duration)
87 and spatial boundaries (i.e., geographic extent). Please refer to CEC-IR-Rd1-0021 for
88 further information. A higher level of uncertainty in effects predictions to the moose
89 population as a result of the offsetting programs was addressed in the development of
90 the Moose Harvest Sustainability Plan. The scientific model used to predict the effects of
91 harvest on the regional sustainability of moose is included on the CD of Technical
92 Reports provided with this filing. Drivers, stressors, benchmarks, and trends affecting
93 the SLRMA moose population are included in the analysis.

94 The numbers of individuals observed in the Regional Study Area over the last 12 years
95 are an indicator of the range of variability for the groups of caribou in the Keeyask
96 region, but the presence or absence of migratory caribou in the Regional Study Area is
97 highly variable from year to year (TE SV Section 7.3.6.3). Because of the high variability
98 of migratory herds over time, and considering that long-term migration patterns are
99 based on such factors as snow depth, habitat loss from fires, and the timing and location
100 of plant growth on calving grounds (TE SV Section 7.4.5.2.1), for example, other
101 benchmarks and thresholds for caribou populations were selected. These are also
102 described in TE SV Section 7.2.6.

103 The number of summer resident caribou in the Local Study Area was conservatively
104 estimated at 20 to 50 individuals, but is likely to be higher in the Caribou Regional Study
105 Area (see response to CEC Rd 1 CEC-0037a). There is little quantitative historical
106 information and considerable uncertainty remaining about the affiliation of these
107 animals; thus it is not possible to establish a reasonable range of natural variability. As
108 such, the benchmarks and thresholds established for this group included intactness,
109 linear feature density, habitat and gray wolf density. Please also refer to CEC Rd 1CEC-
110 0021 for a summary of benchmarks, and CEC Rd 1 CEC-0037a, CEC-0037b and CEC-
111 0037c for clarification concerning summer resident and other caribou populations, and
112 CEC Rd 1 MMF-0013a for more information about adaptive management triggers.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Section 1.4.4; 5.5 (Response to EIS Guidelines); p.**
 3 **Table 1-4, p. 1-24; Figure 5-1, p. 5-9 (Response to EIS Guidelines)**

4 **CEC Rd 1 MMF-0003c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1.1 Criteria for Determining Significance: “The
 7 following criteria will be used to determine the significance of residual adverse
 8 environmental effects on each VEC: Nature (i.e., positive or negative) of the effect;
 9 Magnitude (i.e., severity) of the effect; Temporal boundaries (i.e., duration); and Spatial
 10 boundaries (i.e., geographic extent)....In assessing the significance of environmental
 11 effects on a VEC, the EIS may also discuss the frequency of effects, ecological context
 12 and the reversibility, where relevant.”

13 The EIS discusses the approach used to determining “Regulatory Significance” (R to EIS,
 14 Section 5.5, p. 5-9). As per the Keeyask Generation Project Scoping Document (hereafter
 15 Scoping Document) Section 5.1.1, the EIS uses the “Magnitude” criterion to assist in
 16 determination of impact significance. In the EIS, the definition of moderate magnitude
 17 is: “Moderate – Effects that could be measured and could be determined within a
 18 normal range of variation of a well designed monitoring program; or are generally below
 19 or only marginally beyond guidelines or established thresholds of acceptable change; or
 20 are marginally beyond the range of natural variability or marginally beyond minimal
 21 impairment of ecosystem component’s function”. The definition of large magnitude is:
 22 “Large – Effects that are easily observable, measured and described (i.e., readily
 23 detectable without a monitoring program), and well beyond guidelines or established
 24 thresholds of acceptable changes, are well beyond the range of natural variability, or are
 25 well beyond minimal impairment of an ecosystem component’s functions”. (R to EIS,
 26 Section 5.5, p. 5-11). This implies that the ranges of natural variability (RNV) of
 27 populations are known. The current presentation of data for moose and caribou does
 28 not clearly indicate the RNV.

29 The “Reversibility” criterion is only considered in “Step 2” of the regulatory significance
 30 assessment for those VECs that have an adverse effect and meet particular criteria (R to
 31 EIS, Section 5.3.1; Scoping Document 5.1.1). Reversible is defined as an “Effect that is
 32 reversible during the life of the Project” (R to EIS, Section 5.3.1). All borrow areas
 33 (except portions of G-1 and G-3), all road footprints (except the north and south access
 34 roads and Butnau road upgrades), camp, work, and landfill areas would be
 35 decommissioned at the end of construction (TE-SV-1.0, Section 1.5.1, p. 1-30 to 1-31).
 36 Under operations, camp, work, borrow, other temporarily cleared areas (TE-SV-1.0,

37 Section 1.5.2, p. 1-32), and material placement areas will undergo some degree of
 38 rehabilitation (R to EIS, Section 4.6.16, p. 4-40). Unfortunately, “a detailed
 39 decommissioning and rehabilitation plan for infrastructure not required for the
 40 operation of the Project will be developed during the construction phase and provided
 41 to regulators for review and approval” (R to EIS, Section 4.6.16, p. 4-41). Without a
 42 rehabilitation plan, it is difficult to evaluate whether those areas identified for
 43 rehabilitation will meet the reversibility criterion or whether the duration (“Step 1”) of
 44 effects was accurately assessed.

45 **QUESTION:**

46 Identify and describe the rehabilitation target (time frame and vegetation target) and
 47 demonstrate that this target has been achieved elsewhere. Clarify if sites that are to be
 48 rehabilitated are considered “reversible” and if they are “medium-term” or “long-term”
 49 (i.e., how was rehabilitation considered in the determination of impact significance). If
 50 no examples of successful rehabilitation can be provided, re-assess impacts considering
 51 that sites cannot be rehabilitated.

52 **RESPONSE:**

53 Please see the response to TAC Public Rd 2 EC-0029 for the target vegetation types. The
 54 target time frame to achieve the rehabilitation targets will vary with the degree of site
 55 disturbance during construction and the target vegetation type. For example, it will take
 56 longer to develop a black spruce forest than to develop a willow shrubland, and it will
 57 take longer to restore vegetation where the topsoil has been removed than in places
 58 where only the vegetation was cleared. Because it is anticipated that a considerable
 59 portion of the borrow and potential disturbance areas will not be used, site-specific
 60 target vegetation types and time frames will be developed when it is known which sites
 61 are actually affected during construction and the nature of post-construction site
 62 conditions. The target vegetation types and target time frames to achieve these targets
 63 will be provided in the Keeyask Generation Project Vegetation Rehabilitation Plan.
 64 Progress in achieving these targets will be monitored as a component of the Terrestrial
 65 Effects Monitoring Plan, filed with regulators on June 28, 2013.

66 The terrestrial habitat assessment considered that if a site is successfully rehabilitated
 67 then this is a reversible, medium-term effect while those sites that achieve limited
 68 rehabilitation success are long-term effects that may or not be reversible. Because it will
 69 not be known how much of the proposed Project Footprint will actually be needed for
 70 construction, and the extent to which rehabilitation of temporarily cleared areas will be
 71 fully successful, the assessments used the total area of habitat affected prior to
 72 rehabilitation when determining the magnitude of effects on VECs. In all cases, it was
 73 concluded that effects are expected to be adverse but remain at either a low or
 74 moderate magnitude.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.4.1 Aboriginal Traditional Knowledge,**
 3 **7.4.6.2.2 Caribou - Operation; p. 7-5, 7-114**

4 **CEC Rd 1 MMF-0004a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 7 of potential environmental effects, the EIS will describe the approach and methods used
 8 to identify and assess the effects, and it will also provide a record of assumptions and
 9 analyses that support the conclusions."

10 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 11 support conclusions regarding Project effects will be described. With respect to
 12 conclusions about the impact of Project related disturbance on caribou, the EIS does not
 13 present or reconcile differing statements when making conclusions about Project
 14 impact. The EIS states that "They [caribou] will often return to disturbed areas once the
 15 disturbance ends" and "Caribou show a high level of site fidelity and do not readily
 16 abandon suitable areas due to disturbance unless they are actively pursued (Tucker and
 17 Mahoney 1990; Dyke 2008)" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-114). However, KCNs
 18 noted that caribou are only now just returning to the local region since Kettle GS was
 19 constructed and that the Kettle GS changed the landscape (TE-SV-7.0, Section 7.2.4.1, p.
 20 7-5). Construction of the Kettle GS was completed in 1974 and the date of this KCN
 21 comment is 2012 (TE-SV-7.0, Section 7.2.4.1, p. 7-5). The Partnership has committed to
 22 monitoring to verify the prediction that impacts to calving and rearing habitat (and
 23 thereby caribou populations) in the RSA will likely be negligible to small. However, the
 24 impact assessment would benefit from any support that can be provided by existing
 25 monitoring data from other GS's in the same watershed given the discrepancy between
 26 KCN observations and The Partnership's impact assessment. There are at least four
 27 other GS's on the Nelson River that should have data that could be used to inform this
 28 impact assessment.

29 **QUESTION:**

30 Demonstrate that previously disturbed sites would be in pre-disturbance condition as
 31 far as human and predator access is concerned such that caribou would exhibit site
 32 fidelity.

33 **RESPONSE:**

34 The mammals sections of the TE SV and Response to EIS Guidelines do not state that
 35 previously disturbed sites will be in pre-disturbance condition. The loss of physical and

36 effective habitat (winter and calving and rearing) was estimated in Section 6.5.8.1.1 of
37 the Response to EIS Guidelines, and it was stated that some additional habitat loss is
38 expected in the reservoir by year 30 of operation as a result of peatland disintegration
39 and bank erosion (Response to EIS Guidelines Section 6.5.8.1.3). Some caribou may
40 avoid the area during construction, and others may remain despite the disturbance.
41 Some of those that avoid the area are expected to return once the disturbance ends (TE
42 SV Section 7.4.6.2.1).

43 Site fidelity of caribou is most strongly related to calving and rearing areas, which are
44 selected in an attempt to avoid predators. Site fidelity was not referred to in the context
45 of linear features, but in reference to sensory disturbance during construction (TE SV
46 Section 7.4.6.2.1). It was predicted that calving and rearing habitat within 2 km of the
47 generating station will be less suitable for calving and rearing during operation, and that
48 caribou may re-occupy most habitats early in the operation phase. This prediction is
49 currently being monitored at the Wuskwatim generating station, where caribou still
50 used calving habitat during construction in the area 2-4 km from the access road and
51 borrow areas. Based on past experience by some KCNs, it may take decades before
52 caribou return to the Project area (Response to EIS Guidelines Section 6.5.8.1.3). Much
53 of the Project infrastructure was designed to avoid important caribou habitats and
54 minimize caribou disturbance. Project effects on caribou habitat were predicted to be
55 small because a small proportion of the suitable habitat available in the Regional Study
56 Area will be affected.

57 **REFERENCES:**

58 Mahoney, S.P and J.A. Schaefer. 2002. Hydroelectric development and the disruption of
59 migration in caribou. *Biological Conservation* 107: 147-153.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.2.4.1 Aboriginal Traditional Knowledge,**
 3 **7.4.6.2.2 Caribou - Operation; p. 7-5, 7-114**

4 **CEC Rd 1 MMF-0004b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 7 of potential environmental effects, the EIS will describe the approach and methods used
 8 to identify and assess the effects, and it will also provide a record of assumptions and
 9 analyses that support the conclusions."

10 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 11 support conclusions regarding Project effects will be described. With respect to
 12 conclusions about the impact of Project related disturbance on caribou, the EIS does not
 13 present or reconcile differing statements when making conclusions about Project
 14 impact. The EIS states that "They [caribou] will often return to disturbed areas once the
 15 disturbance ends" and "Caribou show a high level of site fidelity and do not readily
 16 abandon suitable areas due to disturbance unless they are actively pursued (Tucker and
 17 Mahoney 1990; Dyke 2008)" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-114). However, KCNs
 18 noted that caribou are only now just returning to the local region since Kettle GS was
 19 constructed and that the Kettle GS changed the landscape (TE-SV-7.0, Section 7.2.4.1, p.
 20 7-5). Construction of the Kettle GS was completed in 1974 and the date of this KCN
 21 comment is 2012 (TE-SV-7.0, Section 7.2.4.1, p. 7-5). The Partnership has committed to
 22 monitoring to verify the prediction that impacts to calving and rearing habitat (and
 23 thereby caribou populations) in the RSA will likely be negligible to small. However, the
 24 impact assessment would benefit from any support that can be provided by existing
 25 monitoring data from other GS's in the same watershed given the discrepancy between
 26 KCN observations and The Partnership's impact assessment. There are at least four
 27 other GS's on the Nelson River that should have data that could be used to inform this
 28 impact assessment.

29 **QUESTION:**

30 Can monitoring data from other projects be used to support this prediction, particularly
 31 given the discrepancy between KCN observations and The Partnership's impact
 32 assessment? Longer term results from monitoring programs for existing GS's should be
 33 used to inform the impact assessment.

34 **RESPONSE:**

35 The effects assessment was informed by changes from past hydroelectric development,
36 including habitat loss, alteration, and intactness. There are no technical monitoring data
37 available from Kelsey, Kettle, Long Spruce, or Limestone generating stations on caribou.
38 However, KCNs observations and experiences with these generating stations have
39 informed understanding about the likely effects of these previous projects on caribou in
40 the region. Monitoring data from the Wuskwatim Generation Project were also used to
41 estimate potential Project effects on caribou (e.g., Section 7.4.6.2.1 of the Terrestrial
42 Environment Supporting Volume).

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.4.6.2.1, 7.4.6.2.2 Valued Environmental**
3 **Components - Caribou; p. 7-113, 7-116, 7-121**

4 **CEC Rd 1 MMF-0005**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: Attachment C: "The Keeyask Generation Project (the
7 Project) involves the operation of the following permanent infrastructure constructed as
8 part of the Keeyask Infrastructure Project (KIP): North access road, including a clear-
9 span bridge over Looking Back Creek and an upgrade at the intersection of the road."
10 (Attachment C, Scoping Document); 5.1 Project Effects: In reporting on the assessment
11 of potential environmental effects, the EIS will describe the approach and methods used
12 to identify and assess the effects, and it will also provide a record of assumptions and
13 analyses that support the conclusions."

14 The Scoping Document (Attachment C) indicates that the Keeyask Project requires use
15 of the North access road and that the EIS will describe the approach and methods used
16 to identify and assess Project effects (Section 5.1). With respect to the assessment of
17 sensory disturbance and mortality on caribou, the EIS does not adequately describe the
18 linkages between caribou and the changes caused by the Project during construction
19 and operations. During construction, the EIS considers sensory disturbance and
20 mortality due to wildlife-vehicle collisions on the south access road (TE-SV-7.0, Section
21 7.4.6.2.1, p. 7-113). It does not appear that the north access road was considered as an
22 impact on sensory disturbance and mortality for caribou during construction, even
23 though it will be the main access route to the GS during construction and will likely
24 receive higher human use than pre-Project (TE-SV-7.0, Section 7.4.6.2.1, p. 7-116).
25 Under the operations scenario, both the north and south roads are considered and the
26 EIS predicts that the risk of wildlife-vehicle collisions is unlikely to change (TE-SV-7.0,
27 Section 7.4.6.2.2, p. 7-121).

28 **QUESTION:**

29 Re-assess the loss of effective habitat in the LSA considering the north access road
30 during construction.

31 **RESPONSE:**

32 For clarification of the Preamble to this question, the north access road was considered
33 as a potential source of impact on sensory disturbance and mortality for caribou during
34 construction of the Keeyask Generation Project. In TE SV Section 7.4.6.2.1 (p 7-113) the
35 north access road was inadvertently omitted from the following sentence: "Potential

36 Project-related disturbances include sensory disturbances and mortality due to wildlife-
37 vehicle collisions on the south access road." In TE SV Section 7.4.6.2.1 (p 7-116) the
38 north access road is recognized from the following sentence: "The potential increase in
39 caribou mortality due to workers hunting will be managed (see Mitigation) and the
40 overall effect will likely be neutral. In addition, as the north access road will be the main
41 access route to the GS during construction (PD SV), effects are expected to be neutral on
42 the south access road during construction."

43 Please see CEC Rd 1 CEC-0037c for a description regarding the loss of effective habitat in
44 Zone 3, which includes the north and south access roads during construction.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.1 Valued Environmental Components -**
 3 **Caribou; Chapter 6, Section 6.5.8.1.1 Construction Effects and**
 4 **Mitigation - Caribou (Response to EIS Guidelines); p. 7-117; 6-369**

5 **CEC Rd 1 MMF-0006a**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 8 of potential environmental effects, the EIS will describe the approach and methods used
 9 to identify and assess the effects, and it will also provide a record of assumptions and
 10 analyses that support the conclusions." "

11 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 12 support conclusions regarding Project effects will be described. However, the EIS does
 13 not present adequate support for assumptions or premises when making predictions
 14 about Project impact on summer resident caribou. Furthermore, there is an
 15 inconsistency in the scale at which analyses are conducted and the scale at which
 16 conclusions are made. The EIS states that "Because some of the summer resident
 17 caribou are likely coastal caribou, caribou are not using all of the calving and rearing
 18 habitat currently available in the Regional Study Area, and the proportion of
 19 undisturbed habitat is greater beyond the Regional Study Area, the effect of habitat
 20 disturbance on summer resident caribou is predicted to be small" (TE-SV-7.0, Section
 21 7.4.6.2.1, p. 7-117). The EIS discusses a 65% undisturbed habitat benchmark, as
 22 recommended in the draft caribou recovery strategy (Environment Canada 2011; final
 23 version now available: Environment Canada 2012), in reference to the above impact
 24 prediction on boreal woodland caribou. There are some assumptions in the above quote
 25 from the EIS that should be verified to support the prediction. Also, there is some
 26 confusion about the Zone being considered in this impact prediction. Zone 4 is the
 27 caribou LSA, Zone 6 is the caribou RSA, and Zone 5 was used to assess Intactness (the
 28 degree to which a geographic area has not been subdivided into smaller areas by human
 29 features (TE-SV-7.0, Section 7.2.6.2, p. 7-9)). According to the EIS, Zone 5 is currently
 30 48% intact or undisturbed and 36% of Zone 5 is less than 40 years old (R to EIS, Section
 31 6.5.8.1.1, p. 6-372), but no similar estimates are provided for the caribou LSA or RSA.
 32 Furthermore, reference is made to undisturbed area "beyond the RSA" in the above
 33 quote, but no estimate of undisturbed area is provided. With the information provided
 34 and using the 65% undisturbed habitat benchmark (Environment Canada 2012), it
 35 appears that an insufficient amount of undisturbed habitat is currently available to
 36 support a sustainable woodland caribou population in Zone 5 (48% undisturbed). The
 37 conclusion of "small" Project impact is based on a scale ("beyond the RSA") for which no

38 measures were provided. Given that the amount of undisturbed habitat available in
 39 Zone 5 is below the recommended 65% in the recovery strategy, any contribution,
 40 however small, could have negative repercussions on the long-term viability of the
 41 population (See MMF IR #19 and 22).

42 **QUESTION:**

43 Assumptions requiring verification:

- 44 a. Are all of the summer resident caribou actually coastal caribou?
 45 b. Is the unused calving and rearing habitat in the RSA suitable?
 46 c. Is the proportion of undisturbed habitat greater beyond the RSA such that the 65%
 47 benchmark of undisturbed habitat is met? (What is the estimate of undisturbed
 48 habitat beyond the RSA? What area beyond the RSA is measured and considered in
 49 this assessment on caribou?)

50 **RESPONSE:**

51 The following responses provide verification for questions above.

- 52 *a. Are all of the summer resident caribou actually coastal caribou?*

53 As described in Section 7.3.6.3.3 of the Terrestrial Environment Supporting Volume (TE
 54 SV) and Section 6.2.3.4.7 of the Response to EIS Guidelines, the exact core range, long-
 55 term calving frequency, and herd association of the caribou that remain in the Keeyask
 56 region year-round cannot be clearly determined. This group could be coastal caribou,
 57 boreal woodland caribou, or a mixture of both. It was never assumed that summer
 58 residents are all coastal caribou, and for the purposes of the assessment of potential
 59 Project effects, they were treated as an independent population that uses a smaller
 60 range than migratory groups, and is more likely to use calving and rearing habitat that
 61 occurs within the Keeyask region. Please refer to the responses to CEC Rd 1 KK-0012,
 62 and CEC Rd 1 CEC-0037a, b and c for additional clarification on the assumptions and
 63 analyses used for summer resident caribou.

- 64 *b. Is the unused calving and rearing habitat in the RSA suitable?*

65 Primary calving and rearing habitat is defined as islands in lakes greater than 10 ha in
 66 size or peatland complexes greater than 200 ha, and secondary calving and rearing
 67 habitat is defined as islands in lakes between 0.5 and 10 ha in size or peatland
 68 complexes between 30 and 200 ha. Based on these criteria, the unused habitat in the
 69 Regional Study Area is suitable. Please refer to CEC Rd 1 MMF-0002c regarding the
 70 suitability of calving and rearing habitat.

71 c. *Is the proportion of undisturbed habitat greater beyond the RSA such that the 65%*
72 *benchmark of undisturbed habitat is met? (What is the estimate of undisturbed*
73 *habitat beyond the RSA? What area beyond the RSA is measured and considered in*
74 *this assessment on caribou?)*

75 The revised intactness estimate based on Environment Canada (2012) calculations of
76 critical habitat for the Caribou Regional Study Area (RSA - Study Zone 6) indicates that
77 the 65% benchmark for undisturbed habitat is met. The undisturbed habitat value is
78 65.9% for Keeyask and Past & Current Projects, and 65.3% for Keeyask & past, current &
79 potential future projects in the Caribou RSA. In addition, calculations of the amount of
80 undisturbed habitat for Pen Islands caribou summer range beyond the RSA are also
81 above the 65% benchmark of undisturbed habitat. For this area, the undisturbed habitat
82 value is 72.6% when Keeyask and Past & Current Projects are considered and 70.9% for
83 Keeyask & past, current & potential future projects. Please refer to CEC Rd 1 CEC-0021
84 and CEC Rd 1 CEC-0037a for details concerning undisturbed habitat in the Caribou
85 Regional Study Area.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.1 Valued Environmental Components -**
 3 **Caribou; Chapter 6, Section 6.5.8.1.1 Construction Effects and**
 4 **Mitigation - Caribou (Response to EIS Guidelines); p. 7-117; 6-369**

5 **CEC Rd 1 MMF-0006b**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 8 of potential environmental effects, the EIS will describe the approach and methods used
 9 to identify and assess the effects, and it will also provide a record of assumptions and
 10 analyses that support the conclusions."

11 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 12 support conclusions regarding Project effects will be described. However, the EIS does
 13 not present adequate support for assumptions or premises when making predictions
 14 about Project impact on summer resident caribou. Furthermore, there is an
 15 inconsistency in the scale at which analyses are conducted and the scale at which
 16 conclusions are made. The EIS states that "Because some of the summer resident
 17 caribou are likely coastal caribou, caribou are not using all of the calving and rearing
 18 habitat currently available in the Regional Study Area, and the proportion of
 19 undisturbed habitat is greater beyond the Regional Study Area, the effect of habitat
 20 disturbance on summer resident caribou is predicted to be small" (TE-SV-7.0, Section
 21 7.4.6.2.1, p. 7-117). The EIS discusses a 65% undisturbed habitat benchmark, as
 22 recommended in the draft caribou recovery strategy (Environment Canada 2011; final
 23 version now available: Environment Canada 2012), in reference to the above impact
 24 prediction on boreal woodland caribou. There are some assumptions in the above quote
 25 from the EIS that should be verified to support the prediction. Also, there is some
 26 confusion about the Zone being considered in this impact prediction. Zone 4 is the
 27 caribou LSA, Zone 6 is the caribou RSA, and Zone 5 was used to assess Intactness (the
 28 degree to which a geographic area has not been subdivided into smaller areas by human
 29 features (TE-SV-7.0, Section 7.2.6.2, p. 7-9)). According to the EIS, Zone 5 is currently
 30 48% intact or undisturbed and 36% of Zone 5 is less than 40 years old (R to EIS, Section
 31 6.5.8.1.1, p. 6-372), but no similar estimates are provided for the caribou LSA or RSA.
 32 Furthermore, reference is made to undisturbed area "beyond the RSA" in the above
 33 quote, but no estimate of undisturbed area is provided. With the information provided
 34 and using the 65% undisturbed habitat benchmark (Environment Canada 2012), it
 35 appears that an insufficient amount of undisturbed habitat is currently available to
 36 support a sustainable woodland caribou population in Zone 5 (48% undisturbed). The
 37 conclusion of "small" Project impact is based on a scale ("beyond the RSA") for which no

38 measures were provided. Given that the amount of undisturbed habitat available in
 39 Zone 5 is below the recommended 65% in the recovery strategy, any contribution,
 40 however small, could have negative repercussions on the long-term viability of the
 41 population (See MMF IR #19 and 22).

42 **QUESTION:**

43 Assess the effect of habitat disturbance on summer resident caribou for the defined
 44 caribou study areas. Alternatively, justify the selection of a larger study area than the
 45 caribou RSA as the basis for the predicted impact on summer resident caribou and
 46 provide associated measure of intactness.

47 **RESPONSE:**

48 Study Zone 6 was chosen as the regional study area for all caribou types to account for
 49 the large ranges of migratory herds and to include Pen Islands and potentially Cape
 50 Churchill animals that calve in the general region. Given uncertainty in the identity of
 51 the summer resident caribou, Study Zone 5 (the Intactness Regional Study Area) was
 52 developed to include a possible boreal woodland caribou core range scenario that could
 53 support a population of animals (see CEC Rd 1 CEC-0037a). The overall level of
 54 disturbance was initially assessed in Study Zone 5, but was expanded to include the
 55 Regional Study Area.

56 The level of disturbance in Study Zone 5 was calculated in the Terrestrial Environment
 57 Supporting Volume (TE SV) model using land area only (waterbodies were excluded),
 58 and including several types of linear features. When recalculated using the methods in
 59 Environment Canada's (2012) critical habitat model for boreal woodland caribou, lakes
 60 and other waterbodies were included in the total area, and several types of linear
 61 features (e.g., trails) that were included in the TE SV model were excluded. Both models
 62 used a 500 m buffer of anthropogenic features (see responses to CEC Rd 1 CEC-0037a).

63 If the overall level of disturbance in Study Zone 6 is calculated using linear feature
 64 density and Environment Canada's (2012) model, both linear feature density and the
 65 amount of disturbed caribou habitat are reduced from the figures in the original
 66 analysis. Linear feature density, a benchmark measure of the level of disturbance,
 67 declines from 0.45 km/km² in Study Zone 5 to 0.23 km/km² in Study Zone 6. With the
 68 Project, linear feature density declines from approximately 0.44 km/km² in Study Zone 5
 69 to 0.23 km/km² in Study Zone 6. Linear feature density would be greater in the Local
 70 Study Area (Study Zone 4) than in the larger study areas. As effects are assessed at the
 71 regional level, there is no change in the predicted impact of small magnitude effects on
 72 caribou.

73 Using the Environment Canada (2012) method for calculating critical caribou habitat,
 74 the current level of disturbance declines from 35.6% disturbed (Study Zone 5) to 33.9%

75 disturbed habitat (Study Zone 6). With the Project, the level of disturbance declines
76 from 36.1% disturbed habitat in Study Zone 5 to 34.2% disturbed habitat (Study Zone 6).
77 An indication of the level of disturbance in the Local Study Area is shown in Map 7-47
78 (TE SV). As effects are assessed at the regional level, there is no change in the predicted
79 cumulative impact of small magnitude effects using these and other indicators. Please
80 refer to the responses to CEC Rd 1 CEC-0037a for additional detail.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.1 Valued Environmental Components -**
 3 **Caribou; Chapter 6, Section 6.5.8.1.1 Construction Effects and**
 4 **Mitigation - Caribou (Response to EIS Guidelines); p. 7-117; 6-369**

5 **CEC Rd 1 MMF-0006c**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 8 of potential environmental effects, the EIS will describe the approach and methods used
 9 to identify and assess the effects, and it will also provide a record of assumptions and
 10 analyses that support the conclusions." "

11 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 12 support conclusions regarding Project effects will be described. However, the EIS does
 13 not present adequate support for assumptions or premises when making predictions
 14 about Project impact on summer resident caribou. Furthermore, there is an
 15 inconsistency in the scale at which analyses are conducted and the scale at which
 16 conclusions are made. The EIS states that "Because some of the summer resident
 17 caribou are likely coastal caribou, caribou are not using all of the calving and rearing
 18 habitat currently available in the Regional Study Area, and the proportion of
 19 undisturbed habitat is greater beyond the Regional Study Area, the effect of habitat
 20 disturbance on summer resident caribou is predicted to be small" (TE-SV-7.0, Section
 21 7.4.6.2.1, p. 7-117). The EIS discusses a 65% undisturbed habitat benchmark, as
 22 recommended in the draft caribou recovery strategy (Environment Canada 2011; final
 23 version now available: Environment Canada 2012), in reference to the above impact
 24 prediction on boreal woodland caribou. There are some assumptions in the above quote
 25 from the EIS that should be verified to support the prediction. Also, there is some
 26 confusion about the Zone being considered in this impact prediction. Zone 4 is the
 27 caribou LSA, Zone 6 is the caribou RSA, and Zone 5 was used to assess Intactness (the
 28 degree to which a geographic area has not been subdivided into smaller areas by human
 29 features (TE-SV-7.0, Section 7.2.6.2, p. 7-9)). According to the EIS, Zone 5 is currently
 30 48% intact or undisturbed and 36% of Zone 5 is less than 40 years old (R to EIS, Section
 31 6.5.8.1.1, p. 6-372), but no similar estimates are provided for the caribou LSA or RSA.
 32 Furthermore, reference is made to undisturbed area "beyond the RSA" in the above
 33 quote, but no estimate of undisturbed area is provided. With the information provided
 34 and using the 65% undisturbed habitat benchmark (Environment Canada 2012), it
 35 appears that an insufficient amount of undisturbed habitat is currently available to
 36 support a sustainable woodland caribou population in Zone 5 (48% undisturbed). The
 37 conclusion of "small" Project impact is based on a scale ("beyond the RSA") for which no

38 measures were provided. Given that the amount of undisturbed habitat available in
39 Zone 5 is below the recommended 65% in the recovery strategy, any contribution,
40 however small, could have negative repercussions on the long-term viability of the
41 population (See MMF IR #19 and 22).

42 **QUESTION:**

43 Explain why no measures of undisturbed habitat are provided for the caribou LSA and
44 RSA? (What data are used as the foundation of the impact assessment for habitat
45 disturbance on summer resident caribou?)

46 **RESPONSE:**

47 Data used as the foundation of the assessment for caribou habitat disturbance included
48 intactness and linear feature density. Please refer to CEC-Rd 1-CEC-0037a, including the
49 updated Environment Canada (2012) model, for clarification of the amount of
50 undisturbed habitat in the Caribou Regional Study Area. For consideration of potential
51 effects to summer resident caribou, a precautionary approach was applied and this
52 population was treated as a (hypothetical) boreal woodland caribou population
53 requiring a small range. For this purpose, Study Zone 5 was developed to include a
54 boreal woodland caribou core range scenario that could support a population of animals
55 (CEC-Rd 1-CEC-0037a). Study Zone 4 was used as the Local Study Area because it defined
56 a potential zone of influence large enough to capture all of the direct, and many of the
57 indirect Project effects on individual caribou (e.g., habitat loss). As effects are measured
58 on populations (i.e., in the Regional Study Area) and not individuals, no measures of
59 undisturbed habitat were provided for the Local Study Area.

60 **REFERENCES:**

61 Environment Canada. 2012. Recovery strategy for the woodland caribou, boreal
62 population (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Recovery
63 Strategy Series. Environment Canada, Ottawa, Ontario. 55 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.2 Valued Environmental Components -**
 3 **Caribou; p. 7-121 to 7-122; 78-79 (FLCN 2012)**

4 **CEC Rd 1 MMF-0007a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
 7 of potential environmental effects, the EIS will describe the approach and methods used
 8 to identify and assess the effects, and it will also provide a record of assumptions and
 9 analyses that support the conclusions."

10 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
 11 support conclusions regarding Project effects will be described. With respect to
 12 conclusions about the impact of Project altered ice conditions on caribou, the EIS does
 13 not reconcile differing accounts using data or references when making conclusions
 14 about Project impact. Concerns about caribou falling through the ice and drowning due
 15 to altered ice conditions were raised by the FLCN (FLCN 2012, p. 78-79). The EIS
 16 concludes that caribou drowning is unlikely because "once the ice has formed...post-
 17 Project conditions include the formation of a stable ice cover on the reservoir...,
 18 including maintaining a steady reservoir level during freeze-up and monitoring ice
 19 thickness..., and less variation in water levels once the reservoir is established relative to
 20 current conditions" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The impact assessment
 21 would benefit from any support that can be provided by existing monitoring data from
 22 other GS's in the same watershed given the discrepancy between KCN observations and
 23 The Partnerships impact assessment. There are at least four other GS's on the Nelson
 24 River that should have data that could be used to inform this impact assessment. The
 25 EIS states that "There is no mitigation for dam failure" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-
 26 122), but does not indicate the likelihood of dam failure and does not describe the
 27 potential impact on caribou. This should be explained so that affected groups can have a
 28 complete understanding of potential Project effects.

29 **QUESTION:**

30 Describe any mitigation proposed to manage impacts of an altered ice regime (thin ice,
 31 air pockets under ice) on caribou mortality.

32 **RESPONSE:**

33 There is no mitigation proposed that addresses potential impacts of an altered ice
 34 regime on caribou mortality, since no population-level effects as a result of accidents

35 are expected from the reservoir, and since ice conditions in Stephens Lake downstream
36 of Keeyask are not expected to change.

37 Drowning is a common hazard during annual migrations (Banfield 1954; Miller and Gunn
38 1986; Ruttan 2012), as caribou regularly cross frozen rivers and lakes. As accidents do
39 occur in natural waterbodies, watercourses and hydroelectric reservoirs, it was
40 considered in the effects assessment as a likely major factor. The scientific literature has
41 not established a cause and effect relationship that distinguishes hydroelectric
42 reservoirs apart from natural water bodies and watercourses in terms of drowning
43 hazard frequency or additive mortality as measured on populations resulting from the
44 difference.

45 As stated in the TE SV (Section 7.4.6.2.2), an increase in caribou drowning due to an
46 altered ice regime is not anticipated as post-Project conditions are expected to improve
47 the stability of ice cover on the reservoir. Although no increase in caribou drowning as a
48 direct result of the Project is anticipated, there is uncertainty associated with the
49 conditions under which the risk of mortality can change. The earlier formation of thin
50 ice across the reservoir, if it coincided with the arrival of caribou in the Local Study Area,
51 could increase the drowning hazard risk, but once initiated, the ice cover will grow
52 rapidly in the reservoir environment so this potential risk is expected to have a very
53 short duration. Once the ice cover has formed, an increase in caribou drowning on the
54 reservoir is unlikely because post-Project conditions will include the formation of a
55 stable ice cover that would be similar to that found on other reservoirs and lakes such as
56 Stephens Lake (i.e., smoother, more consistent, and more competent than the existing
57 environment ice cover in the area).

58 Observations of barren-ground caribou sniffing the edge of thin ice and returning into
59 the forest after attempting to cross thin ice on lakes in the Northwest Territories, and
60 the tendency of caribou to detour around individuals that have broken through the ice
61 (Miller and Gunn 1986), indicate that caribou can react to dangerous ice conditions and
62 will seek out safer routes. Furthermore, one FLCN Member indicated that when
63 thousands of barren-ground caribou crossed PR 280 and moved towards Stephens Lake,
64 they could not and did not cross the lake as it was not safe (FLCN 2010).

65 Historical caribou drownings have been identified in the FLCN Evaluation Report (FLCN
66 2012). Under the currently variable water levels and ice conditions in the Local Study
67 Area, no events of caribou drowning have been reported (Mammals Working Group
68 June 28, 2011). However, as described in Chapter 4 of this report, "our people caution
69 that water level fluctuations during the winter cause water levels to fall below the ice
70 cover and increase the likelihood of caribou falling through the ice." One drowning
71 event was reported by a FLCN elder shortly after freeze-up that occurred in the
72 Limestone Forebay near the Generating Station, where five caribou attempted to cross

73 and went through ice. During project-related fieldwork, no evidence of caribou falling
 74 through the ice was observed between Clark Lake and the Kettle Generating Station,
 75 including recent caribou crossing events on the Nelson River and Stephens Lake in
 76 February 2013. In Conawapa-related fieldwork, a single caribou was observed
 77 downstream of Limestone GS attempting to emerge from open water onto shore-fast
 78 ice. It was unsuccessful at climbing onto the ice, and it was carried quickly downstream.
 79 The fate of this caribou is unknown.

80 Although the impact assessment could have benefited from monitoring data from the
 81 four existing generating stations regarding altered ice conditions on caribou, such data
 82 are not available in Manitoba or elsewhere. The best available information comes from
 83 Aboriginal Traditional Knowledge (FLCN 2010, FLCN 2012) recounting caribou drowning
 84 events on the Nelson River, and from scientific literature that indicates that river
 85 crossings are a common hazard during migration, but few caribou drownings are
 86 reported. Both ATK and Project monitoring will be used to confirm effects predictions.
 87 Caribou drowning reports will be investigated and reported as part of Partnership's
 88 Terrestrial Effects Monitoring Plan (please see the Preliminary Draft Terrestrial Effects
 89 Monitoring Plan filed on June 28, 2013 for more details).

90 **REFERENCES:**

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 95 Lake Cree Nation, Manitoba. 123 p.
- 96 FLCN. 2012. Fox Lake Cree Nation Environment Evaluation Report. Submitted March 26,
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 99 notes. 7p.
- 100 Miller, F. and A. Gunn. 1986. Observations of barren ground caribou travelling on thin
 101 ice during autumn migration. *Arctic*, 39(1):85-88.
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 103 102.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.4.6.2.2 Valued Environmental Components -**
3 **Caribou; p. 7-121 to 7-122; 78-79 (FLCN 2012)**

4 **CEC Rd 1 MMF-0007b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
7 of potential environmental effects, the EIS will describe the approach and methods used
8 to identify and assess the effects, and it will also provide a record of assumptions and
9 analyses that support the conclusions." The Scoping Document (Section 5.1) sets out
10 that assumptions and analyses that support conclusions regarding Project effects will be
11 described. With respect to conclusions about the impact of Project altered ice
12 conditions on caribou, the EIS does not reconcile differing accounts using data or
13 references when making conclusions about Project impact. Concerns about caribou
14 falling through the ice and drowning due to altered ice conditions were raised by the
15 FLCN (FLCN 2012, p. 78-79). The EIS concludes that caribou drowning is unlikely because
16 "once the ice has formed...post-Project conditions include the formation of a stable ice
17 cover on the reservoir..., including maintaining a steady reservoir level during freeze-up
18 and monitoring ice thickness..., and less variation in water levels once the reservoir is
19 established relative to current conditions" (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The
20 impact assessment would benefit from any support that can be provided by existing
21 monitoring data from other GS's in the same watershed given the discrepancy between
22 KCN observations and The Partnerships impact assessment. There are at least four other
23 GS's on the Nelson River that should have data that could be used to inform this impact
24 assessment. The EIS states that "There is no mitigation for dam failure" (TE-SV-7.0,
25 Section 7.4.6.2.2, p. 7-122), but does not indicate the likelihood of dam failure and does
26 not describe the potential impact on caribou. This should be explained so that affected
27 groups can have a complete understanding of potential Project effects.

28 **QUESTION:**

29 Can monitoring data from other projects be used to support this prediction, particularly
30 given the discrepancy between KCN observations and The Partnerships impact
31 assessment?

32 **RESPONSE:**

33 Please refer to the response to CEC Rd MMF-0007a for additional information
34 supporting this response.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.4.6.2.2 Valued Environmental Components -**
3 **Caribou; p. 7-121 to 7-122; 78-79 (FLCN 2012)**

4 **CEC Rd 1 MMF-0007c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: "In reporting on the assessment
7 of potential environmental effects, the EIS will describe the approach and methods used
8 to identify and assess the effects, and it will also provide a record of assumptions and
9 analyses that support the conclusions." The Scoping Document (Section 5.1) sets out
10 that assumptions and analyses that support conclusions regarding Project effects will be
11 described. With respect to conclusions about the impact of Project altered ice
12 conditions on caribou, the EIS does not reconcile differing accounts using data or
13 references when making conclusions about Project impact. Concerns about caribou
14 falling through the ice and drowning due to altered ice conditions were raised by the
15 FLCN (FLCN 2012, p. 78-79). The EIS concludes that caribou drowning is unlikely because
16 "once the ice has formed...post-Project conditions include the formation of a stable ice
17 cover on the reservoir..., including maintaining a steady reservoir level during freeze-up
18 and monitoring ice thickness..., and less variation in water levels once the reservoir is
19 established relative to current conditions" (TE SV Section 7.4.6.2.2, p. 7-121). The impact
20 assessment would benefit from any support that can be provided by existing monitoring
21 data from other GS's in the same watershed given the discrepancy between KCN
22 observations and The Partnerships impact assessment. There are at least four other GS's
23 on the Nelson River that should have data that could be used to inform this impact
24 assessment. The EIS states that "There is no mitigation for dam failure" (TE-SV-7.0,
25 Section 7.4.6.2.2, p. 7-122), but does not indicate the likelihood of dam failure and does
26 not describe the potential impact on caribou. This should be explained so that affected
27 groups can have a complete understanding of potential Project effects.

28 **QUESTION:**

29 Explain the likelihood of dam failure and the potential impact on caribou.

30 **RESPONSE:**

31 Please see response to TAC Public Rd 2 CEAA-0009.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.2 Valued Environmental Components -**
 3 **Caribou; p. 7-121**

4 **CEC Rd 1 MMF-0008a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 7 effects that are technically and economically feasible will be identified. Potential effects
 8 that remain after the application of mitigation measures will be considered to be
 9 potential residual effects;

10 The Scoping Document (Section 5.1) indicates that the EIS will describe the approach
 11 and methods used to identify and assess Project effects (Section 5.1). The EIS states that
 12 “This new section of PR 280 could increase local caribou hunting activity by domestic
 13 resource users” (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The EIS concludes that harvest
 14 of LSA caribou populations is not expected to affect the broader regional harvest, and
 15 thus, the effect is expected to be small. It is not clear if the predicted Project impact is
 16 similar for the different caribou herds in the Keeyask region.

17 The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects
 18 that are technically and economically feasible will be identified, but more specific details
 19 are required to understand how Project impacts might be managed. The EIS refers to
 20 Adverse Effects Agreements (AEA) offsetting programs that will result in alternate
 21 harvesting opportunities in the SLRMA to offset loss of TR due to the Project and to
 22 disperse harvest pressure in the LSA (TE-SV-7.0, Section 7.4.6.2.2, p.7-121). No details
 23 are provided of precisely how AEA offsetting programs will disperse existing harvest
 24 pressure. AEA offsetting programs mitigate impacts to First Nations Project partners by
 25 providing alternative harvesting opportunities. No reference was made to how other
 26 potential harvesters, such as Métis members, will be managed.

27 **QUESTION:**

28 Describe how the effect of harvest on caribou populations differs between barren-
 29 ground and summer resident caribou.

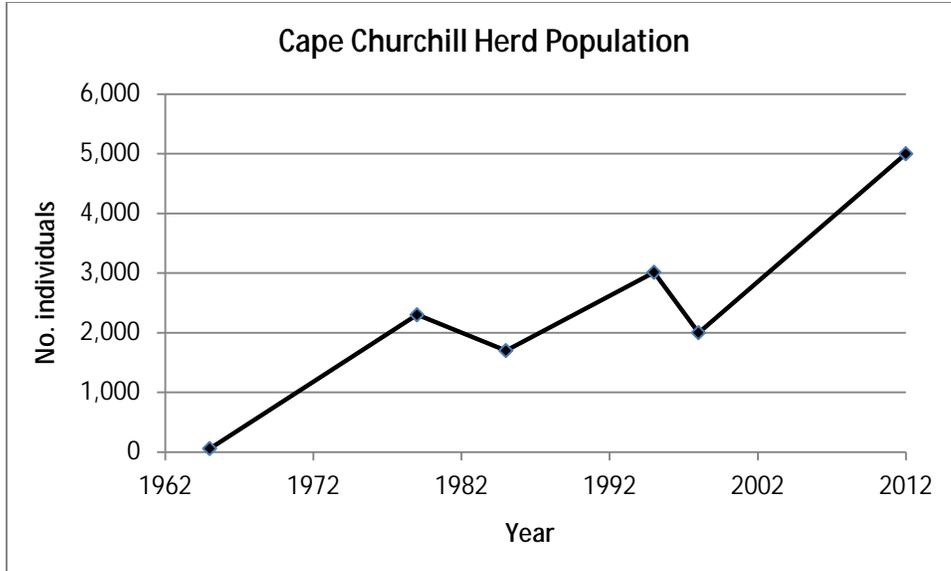
30 **RESPONSE:**

31 Migratory caribou may occasionally reach the Regional Study Area, but their abundance
 32 is highly variable from year to year. As the caribou harvest depends on the location of
 33 the herd (Resource Use Section 1.2.3.2.3 of the Socio-Economic Environment, Resource
 34 Use and Heritage Resources [SE SV] Supporting Volume), it is also variable. Barren-
 35 ground caribou from the Qamanirjuaq herd are absent from the Keeyask region in

36 spring and summer and migrate to the region in winter (Thompson and Abraham 1994;
37 Hummel and Ray 2008). The Keeyask region has recently seen a return of large numbers
38 of barren-ground caribou, following a substantial decline in the 1950s after the
39 construction of the Kettle Generating Station (FLCN 2012). In 2008, the population of
40 the Qamanirjuaq herd was an estimated 348,000 individuals (Campbell et al. 2010).

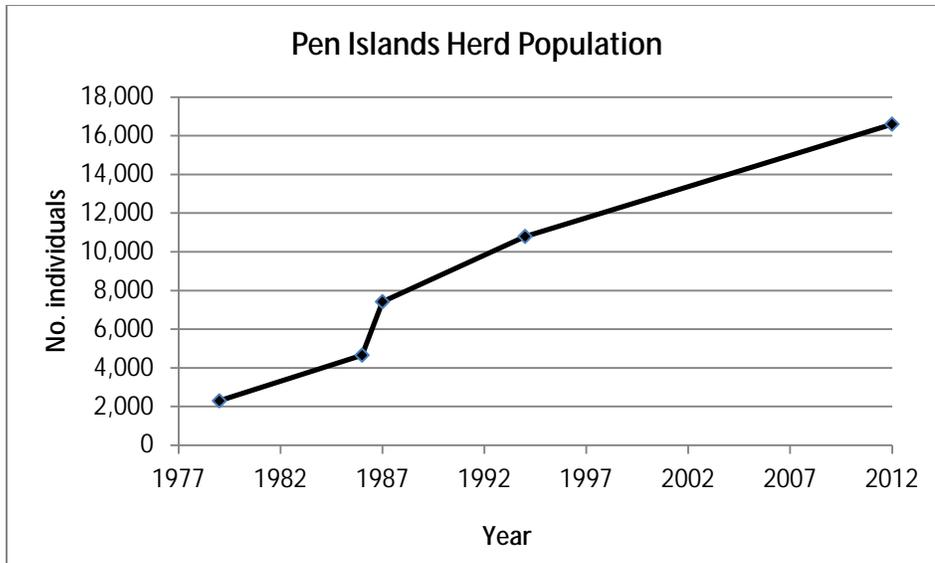
41 Because the herd is large, effects of occasional local harvest on barren-ground caribou
42 will likely be negligible to small. There is no licensed harvest of caribou in Game Hunting
43 Area (GHA) 9, which overlaps most of the Local Study Area (Study Zone 4). With the
44 exception of two larger domestic harvests of migratory caribou in the last 10 years, only
45 a small number of caribou have been harvested from the Local Study Area (Response to
46 EIS Guidelines p. 6-375). Regionally, licensed harvest occurs in GHAs 1, 2, and 3 with
47 GHA 1 harvest most likely to be from the Qamanirjuaq herd. In GHA 1, 350 fall resident
48 licenses and 450 winter resident licenses are issued. This harvest and harvest by
49 outfitters (only in GHA 1) occurs well outside of Project-affected areas and is not
50 expected to change as a result of the Project. Data on domestic harvest of this herd are
51 unavailable.

52 Coastal caribou from the Cape Churchill and Pen Islands herds also occur in the Regional
53 Study Area. These animals spend their time near the Hudson Bay coast during the spring
54 and summer and migrate inland during the winter (Abraham and Thompson 1998). As
55 shown in Figure 1 below, the Cape Churchill herd is thought to be increasing in size since
56 the 1960s and is estimated to be 5,000 individuals (Manitoba Conservation and Water
57 Stewardship no date).



58
 59 **Figure 1: Cape Churchill Herd Population Estimates over Time (Elliott 1986; Campbell 1994;**
 60 **Abraham and Thompson 1998; Gunn *et al.* 2011; Manitoba Hydro 2012).**

61 The Pen Islands herd is estimated to have 16,600 individuals as of 2012 (Figure 2; G.
 62 Racey pers. comm. 2012). Licensed hunting of these herds takes place in GHAs 2 and 3,
 63 which overlap with the Cape Churchill and Pen Islands herd ranges, respectively. In GHA
 64 3, 75 licenses are issued annually, of which 65 are typically sold to Gillam residents and
 65 10 sold to people outside of Gillam. It is estimated that harvest success rate is 50%,
 66 resulting in the harvest of approximately 30-35 coastal animals. A limited number of
 67 licenses are also sold for GHA 2, but much less than GHA 3 due to the better accessibility
 68 of this area (Resource Use Section 1.7.3.2 of the SE SV). Licensed harvest in GHAs 2 and
 69 3 is not expected to change as a result of the Project. Data on domestic harvest of this
 70 herd are unavailable.



71

72 **Figure 2: Pen Islands Population Estimates over Time (Abraham and Thompson 1998; G. Racey**
 73 **pers. comm. 2012).**

74 Summer-resident caribou can be found in the Regional Study Area in summer, and most
 75 likely interact with migrating caribou, making it difficult to differentiate among the
 76 mixed populations (TE SV Section 7.3.6.3.3). Summer-resident caribou may consist of a
 77 mixture of woodland caribou, Pen Islands caribou or both. Although summer-residents
 78 are in the area year-round, KCNs Members typically limit the hunt to late fall and early
 79 winter (FLCN 2012). Licensed harvesting of summer-resident caribou is assumed to be
 80 negligible as hunting seasons are limited to the fall and winter, licensed hunting is
 81 prohibited in GHA 9 and licensed hunting of boreal woodland caribou is prohibited.
 82 However, the amount of domestic harvest is unknown. As the population is small,
 83 estimated at 20 to 50 individuals (TE SV Section 7.3.6.3.3), or potentially larger (see CEC
 84 Rd 1 CEC-0037a), very small populations are very sensitive to overharvest and may not
 85 be self-sustaining (TE SE, Section 7.4.6.2.1).

86 The pattern of domestic caribou harvest is not expected to be affected by the Project
 87 due to its spatial distribution primarily in unaffected areas (Resource Use Section
 88 1.2.3.2.3 of the SE SV). AEA programming also is not directed towards caribou harvest
 89 (Resource Use Section 1.2.4.2.1 of the SE SV; see also responses to TAC Public Round 1
 90 MCWS-LB-0004, MCWS-LB-0012, and MCWS-LB-0013).

91 **REFERENCES:**

92 Abraham, K. F. and Thompson, J. E. 1998. Defining the Pen Islands caribou herd of
 93 southern Hudson Bay. *Rangifer* 10: 33-40.

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 123 August 2012. 108 pp.
- 124 Racey, G. 2012. Ontario Ministry of Natural Resources, October 17, 2012.
- 125 Thompson, J. E. and Abraham, K. F. 1994. Range, seasonal distribution and population
 126 dynamics of the Pen Islands caribou herd of southern Hudson Bay: final report.
 127 Ontario Ministry of Natural Resources, Moosonee, Ontario. 144 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.2.2 Valued Environmental Components -**
 3 **Caribou; p. 7-121**

4 **CEC Rd 1 MMF-0008b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 7 effects that are technically and economically feasible will be identified. Potential effects
 8 that remain after the application of mitigation measures will be considered to be
 9 potential residual effects;

10 The Scoping Document (Section 5.1) indicates that the EIS will describe the approach
 11 and methods used to identify and assess Project effects (Section 5.1). The EIS states that
 12 “This new section of PR 280 could increase local caribou hunting activity by domestic
 13 resource users” (TE-SV-7.0, Section 7.4.6.2.2, p. 7-121). The EIS concludes that harvest
 14 of LSA caribou populations is not expected to affect the broader regional harvest, and
 15 thus, the effect is expected to be small. It is not clear if the predicted Project impact is
 16 similar for the different caribou herds in the Keeyask region.

17 The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects
 18 that are technically and economically feasible will be identified, but more specific details
 19 are required to understand how Project impacts might be managed. The EIS refers to
 20 Adverse Effects Agreements (AEA) offsetting programs that will result in alternate
 21 harvesting opportunities in the SLRMA to offset loss of TR due to the Project and to
 22 disperse harvest pressure in the LSA (TE-SV-7.0, Section 7.4.6.2.2, p.7-121). No details
 23 are provided of precisely how AEA offsetting programs will disperse existing harvest
 24 pressure. AEA offsetting programs mitigate impacts to First Nations Project partners by
 25 providing alternative harvesting opportunities. No reference was made to how other
 26 potential harvesters, such as Métis members, will be managed.

27 **QUESTION:**

28 Provide the details of the components of the AEA offsetting program that function as
 29 mitigation for harvesting effects on caribou populations. Do these programs give
 30 consideration to Métis harvest in the region? How will residual adverse effects on Métis
 31 be offset?

32 **RESPONSE:**

33 Negligible effects on KCNs caribou harvest are expected (see Resource Use Section 1.2.4
 34 of the SE SV and MCWS-LB-04 [TAC round 1])., The KCNs AEA offsetting programs are

35 not intended to mitigate for loss of caribou harvest opportunities (see responses to TAC
36 Public Rd 2 MCWS-LB-0012, and section 4 of CEC-0037b).

37 As noted in the response to TAC Public Rd 2 CEAA-0014, to date caribou have not been
38 explicitly identified as a large game species harvested by Métis in any location in the
39 Resource Use Regional Study Area. Based on no known use of caribou by the Métis, no
40 effects can be determined, no residual impacts can be determined, and the need for
41 mitigation measures cannot be determined.

42 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
43 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
44 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
45 and historical narrative for the Keeyask region. Manitoba Hydro, on behalf of the
46 Partnership, remains committed to consider any additional information provided on the
47 use of lands and resources for traditional purposes by the Métis as a result of these
48 studies. Upon review of any information provided, Manitoba Hydro (on behalf of the
49 Partnership) will consider the need to develop appropriate mitigation strategies, if
50 necessary.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Sections 7.4.2.1.4, 7.4.6.2.1, 7.4.6.2.2, 7.4.6.2.3**
 3 **(TE SV); Section 6.5.8.1.1, 4.6.3, 6.5.8 (R to EIS); Section 3.3.2 (PD**
 4 **SV); p. 7-90, 7-117, 7-121 to 7-124, Map 7-27 (TE SV); 6-371, 4-34,**
 5 **6-367 (R to EIS); 3-14 (PD SV)**

6 **CEC Rd 1 MMF-0009a**

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 14 are required to understand how Project impacts might be managed. The EIS indicates a
 15 “high confidence” (TE-SV-7.0, Section 7.4.6.2.3, p. 7-124) in the ability to mitigate and
 16 manage potential Project effects on caribou, yet the EIS provides little detail on
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 18 some plans intended to outline mitigation measures. It is difficult, if not impossible, to
 19 understand residual Project effects (and conclusions regarding the magnitude, extent,
 20 duration, and direction of residual effects) without a complete understanding of the
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 22 mitigation success will be measured, including targets or definitions of success, are not
 23 provided.

24 The following proposed mitigation measures require more information in order to have
 25 a better understanding of how Project impacts might be managed:

- 26 • *“Use of the access roads by resources users will be addressed in the Construction*
 27 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). During
 28 operations, the EIS indicates that Project-related cutlines and trails will be blocked
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 30 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
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 33 assume responsibility for the north and south access roads (with permanent river
 34 crossing) once construction is completed. It is not clear if any further mitigation

- 35 measures are proposed to manage increased access created by the upgraded and
 36 permanent north and south roads once construction is complete.
- 37 • *“Roadside ditches will be rehabilitated with native plants with low quality food value*
 38 *for caribou where practicable, to minimize attraction and the risk of collisions and*
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 40 list of the native plant species to be used is provided.
 - 41 • First Nations indicated concerns about hindered access by wildlife due to debris
 42 accumulation on shorelines upon flooding. The EIS concluded a negligible to small
 43 effect on local caribou movement along shorelines due to implementation of the
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 45 7.4.6.2.2, p. 7-121). A Reservoir Clearing Plan for the Keeyask Project
 46 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_1_090529.pdf) and a
 47 Waterways Management Program for the Keeyask Project
 48 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_2_090529.pdf) were
 49 found on-line. No measures specific to caribou (or wildlife) movement were
 50 included within either report.
 - 51 • The majority of reservoir clearing will be occurring in winter when caribou herds
 52 converge on the site (TE-SV-7.0, Section 7.4.2.1.4, p. 7-90, Map 7-27). It is not clear
 53 what mitigation measures are proposed to specifically address this scenario for
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 - 58 • “A plan is being developed to coordinate caribou mitigation and monitoring
 59 activities among MH’s northern developments, as well as with government
 60 authorities and existing caribou committees and management boards” (TE-SV-7.0,
 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Indicate if there will be any ongoing mitigation of increased access by resource users,
 65 created by the upgraded and permanent north and south roads, upon completion of
 66 construction. If so, please describe.

67 **RESPONSE:**

68 No mitigation measures directed at effects on resources as a result of increased access
 69 by resource users created by the north and south access roads (which are then
 70 transferred to provincial jurisdiction as PR 280) are planned during operation. The
 71 Partnership does not have the authority to manage fish or wildlife populations in public
 72 areas. Manitoba Conservation and Water Stewardship has the mandate to sustainably
 73 manage use of fisheries and wildlife resources in these (and all) public areas which can

74 be accomplished through provincial harvest restrictions applicable to recreational
75 resource users. Caribou hunting, for example, by non-Aboriginal people is prohibited in
76 this area (Game Hunting Area 9). Aboriginal harvests are self-regulated and a priority for
77 provincial resource allocation (see also responses to CEC Rd 1 CEC-0009 and CEC Rd 1
78 CEC-0015).

79 Monitoring identified in the preliminary Resource Use Monitoring Plan entails working
80 with Manitoba Conservation and Water Stewardship to monitor changes in moose
81 licence demand and harvest locations to support the Terrestrial Environment
82 Monitoring Plan and the CNP Moose Harvest Sustainability Plan objectives. The Moose
83 Harvest Sustainability Plan is currently undergoing an internal review and approval
84 process involving TCN and WLFN members and Chiefs and Councils and is expected to
85 be available in final form by August 1, 2013. Once ready, it will be presented to the Split
86 Lake Resource Management Board (SLRMB) for review and discussion. The Split Lake
87 Resource Management Board is also expected to provide a venue for communication on
88 any resource harvesting conflicts and allow for appropriate responses to potential
89 increases in recreational and/or Aboriginal resource use during the operation phase (see
90 Resource Use Section 1.2.4.1.5 of the SE SV).

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
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6 **CEC Rd 1 MMF-0009b**

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 33 assume responsibility for the north and south access roads (with permanent river
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 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Describe or list the native plant species to be used in roadside rehabilitation. Are these
 65 plant species a potential attractant for other species, such as moose?

66 **RESPONSE:**

67 This is a similar question to CEC Rd 1 MMF-0012d.

68 The following table lists the species and their percentages for the current seed mix that
 69 has been recommended by the terrestrial and wildlife biologists for use in revegetating
 70 ditches in the Keeyask Infrastructure Project (KIP) area. It has been specifically selected
 71 because it contains species native to the area, suited to the site conditions, that will
 72 control erosion and invasive plant spread and will minimize mammal attraction. This

73 same seed mix could be used for roadside rehabilitation in the Keeyask Generation
 74 Project area, which is next to the KIP area. It is possible this mix will be adjusted
 75 depending on the conditions of the area and availability of seed, but the resulting mix
 76 prescribed will be comprised of native species that are specifically chosen to minimize
 77 attracting mammals.

78 **Keeyask Infrastructure Project Access Road Seed Mixture**

Species	Common Name	Percentage
<i>Poa alpina</i>	Alpine Bluegrass	10
<i>Calamagrostis canadensis</i>	Bluejoint Reedgrass	10
<i>Leymus innovatus</i>	Hairy Wild Rye	20
<i>Festuca rubra</i>	Creeping red fescue	10
<i>Koeleria macrantha</i>	Junegrass	20
<i>Elymus lanceolatus ssp. lanceolatus</i>	Northern Wheatgrass	10
<i>Poa glauca</i>	Glaucous Bluegrass	10
<i>Agrostis scabra</i>	Ticklegrass	10

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6 **CEC Rd 1 MMF-0009c**

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 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Describe proposed mitigation measures to address impacts on local caribou movement
 65 due to debris accumulation on shorelines.

66 **RESPONSE:**

67 As indicated in Section 4.6.3 (Reservoir Clearing) of the Response to EIS Guidelines,
 68 much of the reservoir will be cleared prior to impoundment in 2019, which will reduce
 69 debris accumulation on shorelines. Additionally, after impoundment and during
 70 operation, floating debris will be collected from the reservoir to further reduce possible
 71 debris accumulation on shorelines. For further details see Appendix 4A (Reservoir
 72 Clearing Plan) and Appendix 4B (Waterways Management Program) of the Response to
 73 EIS Guidelines.

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 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Describe the mitigation measures established to minimize impacts when the presence of
 65 caribou in the Keeyask region coincides with proposed reservoir clearing.

66 **RESPONSE:**

67 There are no specific mitigation measures established for caribou to minimize impacts
 68 of the sensory disturbance caused by the proposed reservoir clearing. However, there is
 69 usually little caribou activity in the Local Study Area in winter, and caribou that move
 70 away from affected winter habitat are expected to find suitable habitat elsewhere in the
 71 Local or Regional Study Areas. Caribou could avoid the Local Study Area due to clearing
 72 noise, but the disturbance will be local and temporary, and no interruption of long-
 73 distance seasonal migration is anticipated. Caribou have shown a high level of site

74 fidelity and do not readily abandon suitable areas due to disturbance unless they are
 75 actively pursued (Tucker and Mahoney 1990; Dyke 2008). Other studies have
 76 demonstrated decreased habitat effectiveness of migratory caribou from 1 to 5 km
 77 during construction (Mahoney and Schaefer 2002). An extreme loss of 13 km of
 78 effective habitat was reported for barren-ground caribou in areas where atmospheric
 79 dust/mineral deposition from diamond mining was an issue (Boulanger et al. 2012).
 80 Additional information on Caribou can be found in the Terrestrial Environment
 81 Supporting Volume Section 7.4.6.2.1 Construction - Project-related Disturbances.

82 In late January 2013, a large number of Pen Islands caribou migrated into the Local
 83 Study Area (refer to Updated Caribou Information for the Keeyask Generation Project
 84 Environmental Assessment included in Supplemental Filing # 2). After crossing the
 85 Nelson River between Birthday Rapids and Gull Lake from south to north, an estimated
 86 7,750 (WRCS, unpubl. data) animals occupied habitat for a few days between the Nelson
 87 River and the Keeyask Infrastructure Project North Access Road, which is under active
 88 construction. Small groups of caribou crossed the road construction area, and other
 89 groups continued migrating throughout Study Zones 4 and 5 that were used in the
 90 terrestrial effects assessment. To prevent and minimize inadvertent vehicle harassment
 91 disturbance and to reduce the potential for vehicle-caribou collisions, contractors were
 92 briefed on protocols to be used to avoid caribou conflicts. Recommendations were
 93 implemented for vehicle speeds, and to stop and wait for caribou groups to clear the
 94 roadway if encountered. Traffic movements and caribou road crossing conflicts were
 95 monitored. Relevant mitigation measures to protect caribou and wildlife in general,
 96 have been included in the draft Environmental Protection Plans submitted to regulators
 97 on April 26, 2013.

98 **REFERENCES:**

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 110 caribou on the southwest coast of Newfoundland, June 8, 1985 – March 30,

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112 Department of Environment and Lands. 48 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
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 13 that are technically and economically feasible will be identified, but more specific details
 14 are required to understand how Project impacts might be managed. The EIS indicates a
 15 “high confidence” (TE-SV-7.0, Section 7.4.6.2.3, p. 7-124) in the ability to mitigate and
 16 manage potential Project effects on caribou, yet the EIS provides little detail on
 17 proposed mitigation measures and does not appear to have provided the details of
 18 some plans intended to outline mitigation measures. It is difficult, if not impossible, to
 19 understand residual Project effects (and conclusions regarding the magnitude, extent,
 20 duration, and direction of residual effects) without a complete understanding of the
 21 proposed mitigation measures and the effectiveness of those measures. Details of how
 22 mitigation success will be measured, including targets or definitions of success, are not
 23 provided.

24 The following proposed mitigation measures require more information in order to have
 25 a better understanding of how Project impacts might be managed:

- 26 • *“Use of the access roads by resources users will be addressed in the Construction*
 27 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). During
 28 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 29 and portions re-vegetated (Section 7.4.6.2.2, p. 7-123). The Preliminary
 30 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 31 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 32 [CD-version.pdf](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)) indicates that Manitoba Infrastructure and Transportation (MIT) will
 33 assume responsibility for the north and south access roads (with permanent river
 34 crossing) once construction is completed. It is not clear if any further mitigation

- 35 measures are proposed to manage increased access created by the upgraded and
 36 permanent north and south roads once construction is complete.
- 37 • *“Roadside ditches will be rehabilitated with native plants with low quality food value*
 38 *for caribou where practicable, to minimize attraction and the risk of collisions and*
 39 *harvest opportunities”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-118), but no description or
 40 list of the native plant species to be used is provided.
 - 41 • First Nations indicated concerns about hindered access by wildlife due to debris
 42 accumulation on shorelines upon flooding. The EIS concluded a negligible to small
 43 effect on local caribou movement along shorelines due to implementation of the
 44 Forebay Clearing Plan and Waterways Management Plan (TE-SV-7.0, Section
 45 7.4.6.2.2, p. 7-121). A Reservoir Clearing Plan for the Keeyask Project
 46 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_1_090529.pdf) and a
 47 Waterways Management Program for the Keeyask Project
 48 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_2_090529.pdf) were
 49 found on-line. No measures specific to caribou (or wildlife) movement were
 50 included within either report.
 - 51 • The majority of reservoir clearing will be occurring in winter when caribou herds
 52 converge on the site (TE-SV-7.0, Section 7.4.2.1.4, p. 7-90, Map 7-27). It is not clear
 53 what mitigation measures are proposed to specifically address this scenario for
 54 caribou.
 - 55 • Blasting restrictions will be put in place with respect to caribou calving season
 56 (Project Description SV, Section 3.3.2, p. 3-14), but it is not clear what mitigation is
 57 in place for blasting during other times caribou are present in the Keeyask region.
 - 58 • “A plan is being developed to coordinate caribou mitigation and monitoring
 59 activities among MH’s northern developments, as well as with government
 60 authorities and existing caribou committees and management boards” (TE-SV-7.0,
 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Indicate if blasting will occur while caribou are present in the Keeyask region. If so,
 65 describe the mitigation measure established to minimize the impacts of blasting on
 66 caribou.

67 **RESPONSE:**

68 As indicated in Section 4.3.3.2.3 of the Response to EIS Guidelines, blasting will be
 69 minimized to the maximum extent feasible from May 15 to June 30, to reduce the
 70 effects on calving females and their young.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Sections 7.4.2.1.4, 7.4.6.2.1, 7.4.6.2.2, 7.4.6.2.3**
 3 **(TE SV); Section 6.5.8.1.1, 4.6.3, 6.5.8 (R to EIS); Section 3.3.2 (PD**
 4 **SV); p. 7-90, 7-117, 7-121 to 7-124, Map 7-27 (TE SV); 6-371, 4-34,**
 5 **6-367 (R to EIS); 3-14 (PD SV)**

6 **CEC Rd 1 MMF-0009f**

7 **PREAMBLE:**

8 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 9 effects that are technically and economically feasible will be identified. Potential effects
 10 that remain after the application of mitigation measures will be considered to be
 11 potential residual effects;”

12 The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects
 13 that are technically and economically feasible will be identified, but more specific details
 14 are required to understand how Project impacts might be managed. The EIS indicates a
 15 “high confidence” (TE-SV-7.0, Section 7.4.6.2.3, p. 7-124) in the ability to mitigate and
 16 manage potential Project effects on caribou, yet the EIS provides little detail on
 17 proposed mitigation measures and does not appear to have provided the details of
 18 some plans intended to outline mitigation measures. It is difficult, if not impossible, to
 19 understand residual Project effects (and conclusions regarding the magnitude, extent,
 20 duration, and direction of residual effects) without a complete understanding of the
 21 proposed mitigation measures and the effectiveness of those measures. Details of how
 22 mitigation success will be measured, including targets or definitions of success, are not
 23 provided.

24 The following proposed mitigation measures require more information in order to have
 25 a better understanding of how Project impacts might be managed:

- 26 • *“Use of the access roads by resources users will be addressed in the Construction*
 27 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). During
 28 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 29 and portions re-vegetated (Section 7.4.6.2.2, p. 7-123). The Preliminary
 30 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 31 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 32 [CD-version.pdf](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)) indicates that Manitoba Infrastructure and Transportation (MIT) will
 33 assume responsibility for the north and south access roads (with permanent river
 34 crossing) once construction is completed. It is not clear if any further mitigation

- 35 measures are proposed to manage increased access created by the upgraded and
 36 permanent north and south roads once construction is complete.
- 37 • *“Roadside ditches will be rehabilitated with native plants with low quality food value*
 38 *for caribou where practicable, to minimize attraction and the risk of collisions and*
 39 *harvest opportunities”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-118), but no description or
 40 list of the native plant species to be used is provided.
 - 41 • First Nations indicated concerns about hindered access by wildlife due to debris
 42 accumulation on shorelines upon flooding. The EIS concluded a negligible to small
 43 effect on local caribou movement along shorelines due to implementation of the
 44 Forebay Clearing Plan and Waterways Management Plan (TE-SV-7.0, Section
 45 7.4.6.2.2, p. 7-121). A Reservoir Clearing Plan for the Keeyask Project
 46 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_1_090529.pdf) and a
 47 Waterways Management Program for the Keeyask Project
 48 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_2_090529.pdf) were
 49 found on-line. No measures specific to caribou (or wildlife) movement were
 50 included within either report.
 - 51 • The majority of reservoir clearing will be occurring in winter when caribou herds
 52 converge on the site (TE-SV-7.0, Section 7.4.2.1.4, p. 7-90, Map 7-27). It is not clear
 53 what mitigation measures are proposed to specifically address this scenario for
 54 caribou.
 - 55 • Blasting restrictions will be put in place with respect to caribou calving season
 56 (Project Description SV, Section 3.3.2, p. 3-14), but it is not clear what mitigation is
 57 in place for blasting during other times caribou are present in the Keeyask region.
 - 58 • “A plan is being developed to coordinate caribou mitigation and monitoring
 59 activities among MH’s northern developments, as well as with government
 60 authorities and existing caribou committees and management boards” (TE-SV-7.0,
 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Indicate when the details of the plan for coordination of caribou mitigation and
 65 monitoring activities will be available to the Métis for review.

66 **RESPONSE:**

67 A preliminary draft of the Terrestrial Effects Monitoring Plan was filed with regulators
 68 on June 28, 2013. It is available to be reviewed on the Partnership’s website
 69 (Keeyask.com). A Terrestrial Mitigation Implementation Plan is in the process of being
 70 developed and will be made public once available. The Partnership continues to
 71 determine the best process for coordinating its monitoring activities with other
 72 stakeholders.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: Sections 7.4.2.1.4, 7.4.6.2.1, 7.4.6.2.2, 7.4.6.2.3**
 3 **(TE SV); Section 6.5.8.1.1, 4.6.3, 6.5.8 (R to EIS); Section 3.3.2 (PD**
 4 **SV); p. 7-90, 7-117, 7-121 to 7-124, Map 7-27 (TE SV); 6-371, 4-34,**
 5 **6-367 (R to EIS); 3-14 (PD SV)**

6 **CEC Rd 1 MMF-0009g**

7 **PREAMBLE:**

8 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 9 effects that are technically and economically feasible will be identified. Potential effects
 10 that remain after the application of mitigation measures will be considered to be
 11 potential residual effects;”

12 The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects
 13 that are technically and economically feasible will be identified, but more specific details
 14 are required to understand how Project impacts might be managed. The EIS indicates a
 15 “high confidence” (TE-SV-7.0, Section 7.4.6.2.3, p. 7-124) in the ability to mitigate and
 16 manage potential Project effects on caribou, yet the EIS provides little detail on
 17 proposed mitigation measures and does not appear to have provided the details of
 18 some plans intended to outline mitigation measures. It is difficult, if not impossible, to
 19 understand residual Project effects (and conclusions regarding the magnitude, extent,
 20 duration, and direction of residual effects) without a complete understanding of the
 21 proposed mitigation measures and the effectiveness of those measures. Details of how
 22 mitigation success will be measured, including targets or definitions of success, are not
 23 provided.

24 The following proposed mitigation measures require more information in order to have
 25 a better understanding of how Project impacts might be managed:

- 26 • *“Use of the access roads by resources users will be addressed in the Construction*
 27 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-117). During
 28 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 29 and portions re-vegetated (Section 7.4.6.2.2, p. 7-123). The Preliminary
 30 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 31 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 32 [CD-version.pdf](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)) indicates that Manitoba Infrastructure and Transportation (MIT) will
 33 assume responsibility for the north and south access roads (with permanent river
 34 crossing) once construction is completed. It is not clear if any further mitigation

- 35 measures are proposed to manage increased access created by the upgraded and
 36 permanent north and south roads once construction is complete.
- 37 • *“Roadside ditches will be rehabilitated with native plants with low quality food value*
 38 *for caribou where practicable, to minimize attraction and the risk of collisions and*
 39 *harvest opportunities”* (TE-SV-7.0, Section 7.4.6.2.1, p. 7-118), but no description or
 40 list of the native plant species to be used is provided.
 - 41 • First Nations indicated concerns about hindered access by wildlife due to debris
 42 accumulation on shorelines upon flooding. The EIS concluded a negligible to small
 43 effect on local caribou movement along shorelines due to implementation of the
 44 Forebay Clearing Plan and Waterways Management Plan (TE-SV-7.0, Section
 45 7.4.6.2.2, p. 7-121). A Reservoir Clearing Plan for the Keeyask Project
 46 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_1_090529.pdf) and a
 47 Waterways Management Program for the Keeyask Project
 48 (http://www.hydro.mb.ca/projects/keeyask/pdf/Schedule_11_2_090529.pdf) were
 49 found on-line. No measures specific to caribou (or wildlife) movement were
 50 included within either report.
 - 51 • The majority of reservoir clearing will be occurring in winter when caribou herds
 52 converge on the site (TE-SV-7.0, Section 7.4.2.1.4, p. 7-90, Map 7-27). It is not clear
 53 what mitigation measures are proposed to specifically address this scenario for
 54 caribou.
 - 55 • Blasting restrictions will be put in place with respect to caribou calving season
 56 (Project Description SV, Section 3.3.2, p. 3-14), but it is not clear what mitigation is
 57 in place for blasting during other times caribou are present in the Keeyask region.
 - 58 • “A plan is being developed to coordinate caribou mitigation and monitoring
 59 activities among MH’s northern developments, as well as with government
 60 authorities and existing caribou committees and management boards” (TE-SV-7.0,
 61 Section 7.4.6.2.2, p. 7-123). No timeframe was provided for when this plan could be
 62 available for review by affected parties.

63 **QUESTION:**

64 Indicate how the success of mitigation will be gauged.

65 **RESPONSE:**

66 To monitor the success of terrestrial mitigation for the Keeyask Generation Project a
 67 Terrestrial Effects Monitoring Plan (TEMP) is being developed. A preliminary draft was
 68 filed with regulators on June 28, 2013. Section 6.3.1 Caribou of the TEMP describes the
 69 monitoring of caribou during operation to evaluate performance of mitigation
 70 measures.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.4.6.3.1 Valued Environmental Components -**
3 **Moose; Section 6.5.8.2.1 Mammals - Moose; p. 7-116 (TE SV); 6-**
4 **378, Map 6-68 (R to EIS)**

5 **CEC Rd 1 MMF-0010a**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.1 Project Effects: In reporting on the assessment of
8 potential environmental effects, the EIS will describe the approach and methods used to
9 identify and assess the effects, and it will also provide a record of assumptions and
10 analyses that support the conclusions.”

11 The Scoping Document (Section 5.1) sets out that assumptions and analyses that
12 support conclusions regarding Project effects will be described. More detail is required
13 to understand how conclusions about the Project impact on moose were reached. The
14 EIS concludes that sensory disturbance on moose in the LSA are expected to be
15 negligible to small. This conclusion is partially based on results on the Mammal
16 Monitoring Investigations for the Wuskwatim Generation Project Pre-construction and
17 Construction Report (2004-2009), but no data was provided. The EIS also indicates that
18 moose may avoid heavy traffic roads. The northern access road appears to be within the
19 largest concentration of primary moose habitat in the LSA (R to EIS, Map 6-68) and will
20 be the primary access during construction of the GS (TE-SV-7.0, Section 7.4.6.2.1, p. 7-
21 116). It is not clear if this was factored into the assessment for the impact of sensory
22 disturbance on moose.

23 **QUESTION:**

24 Are the Mammal Monitoring Investigations for the Wuskwatim General Project available
25 for review by the Métis? If so, please provide.

26 **RESPONSE:**

27 The mammal monitoring report Mammal Monitoring Investigations for the Wuskwatim
28 Generation Project Pre-construction and Construction Report (2004-2009) is available
29 on the MCWS public registry. A copy of this report is provided on the CD of Technical
30 Reports included with this filing.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.6.3.1 Valued Environmental Components -**
 3 **Moose; Section 6.5.8.2.1 Mammals - Moose; p. 7-116 (TE SV); 6-**
 4 **378, Map 6-68 (R to EIS)**

5 **CEC Rd 1 MMF-0010b**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.1 Project Effects: In reporting on the assessment of
 8 potential environmental effects, the EIS will describe the approach and methods used to
 9 identify and assess the effects, and it will also provide a record of assumptions and
 10 analyses that support the conclusions.” The Scoping Document (Section 5.1) sets out
 11 that assumptions and analyses that support conclusions regarding Project effects will be
 12 described. More detail is required to understand how conclusions about the Project
 13 impact on moose were reached. The EIS concludes that sensory disturbance on moose
 14 in the LSA are expected to be negligible to small. This conclusion is partially based on
 15 results on the Mammal Monitoring Investigations for the Wuskwatim Generation
 16 Project Pre-construction and Construction Report (2004-2009), but no data was
 17 provided. The EIS also indicates that moose may avoid heavy traffic roads. The northern
 18 access road appears to be within the largest concentration of primary moose habitat in
 19 the LSA (R to EIS, Map 6-68) and will be the primary access during construction of the GS
 20 (TE-SV-7.0, Section 7.4.6.2.1, p. 7-116). It is not clear if this was factored into the
 21 assessment for the impact of sensory disturbance on moose.

22 **QUESTION:**

23 Was the association between the high levels of use of north access road and primary
 24 moose habitat in the LSA factored into the assessment for the impact of sensory
 25 disturbance on moose during construction? If not, re-assess the loss of effective habitat
 26 in the LSA considering the north access road during construction or add further
 27 justification for the negligible to small impact of sensory disturbance on moose during
 28 construction considering this information.

29 **RESPONSE:**

30 Yes, the EIS considered the association between construction traffic and the use of
 31 habitat by moose near roads, including the north access road. The EIS does not indicate
 32 that moose may avoid heavy traffic roads. The EIS states that sensory disturbances such
 33 as traffic, machinery, and blasting could result in a loss of effective habitat for moose,
 34 and then explains why the effect will likely be negligible to small (Response to EIS
 35 Guidelines Section 6.5.8.2.1). Loss of effective habitat was not modeled for moose as it
 36 was for caribou because moose were reported by workers during construction of the

37 Wuskwatim Generation Project, and overall moose activity levels remained high
38 throughout the access road construction period (Manitoba Hydro 2011; TE SV Section
39 7.4.6.3.1). While a few individuals may exhibit a flight response, no effect on the
40 distribution of moose is anticipated (Yost and Wright 2001) in the Local Study Area,
41 particularly since moose are currently broadly distributed and suitable habitat is
42 available elsewhere. Studies indicate that the spatial distribution of forage may have
43 more of an effect on moose than traffic on the road, with less activity near roads if there
44 is no suitable forage and more activity in primary habitat near roads (Yost and Wright
45 2001; Laurian et al. 2008).

46 **REFERENCES:**

- 47 Burson, S.L. III, J.T. Belant, K.A. Fortier, and W.C. Tomkiewicz III. 2000. The effect of
48 vehicle traffic on wildlife in Denali National Park. *Arctic* 53(2): 146-151.
- 49 Laurian, C., C. Dussault, J.-P. Ouellet, R. Courtois, M. Poulin, and L. Breton. 2008.
50 Behavior of moose relative to a road network. *Journal of Wildlife Management*
51 72(7): 1550-1557.
- 52 Manitoba Hydro. 2011. Mammal Investigations for the Wuskwatim Generation Project
53 Pre-construction and Construction Report (2004-2009). Prepared for Manitoba
54 Hydro, Winnipeg by Wildlife Resource Consulting Services MB Inc. 186 pp.
- 55 Yost, A.C. and R.G. Wright. 2001. Moose, caribou, and grizzly bear distribution in relation
56 to road traffic in Denali National Park, Alaska. *Arctic* 54(1): 41-48.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.3.6.4.3 Moose - Split Lake Resource**
 3 **Management Area Abundance and Habitat, 7.4.6.3.2 Valued**
 4 **Environmental Components - Moose; Sections 6.5.8.2.1, 6.5.8.2.3**
 5 **Mammals - Moose (R to EIS); p. 7-75, Table 7-26, 7-130 (TE SV); 6-**
 6 **379, 6-381**

7 **CEC Rd 1 MMF-0011a**

8 **PREAMBLE:**

9 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 10 effects that are technically and economically feasible will be identified. Potential effects
 11 that remain after the application of mitigation measures will be considered to be
 12 potential residual effects;” The Scoping Document (Section 5.1) sets out that measures
 13 to mitigate potential effects that are technically and economically feasible will be
 14 identified, but more specific details are required to understand how Project impacts
 15 might be managed. The EIS refers to AEA offsetting programs that will result in alternate
 16 harvesting opportunities in the SLRMA to offset loss of TR due to the Project and to
 17 disperse harvest pressure in the LSA (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). No details
 18 are provided of precisely how AEA offsetting programs will disperse existing harvest
 19 pressure on moose. AEA offsetting programs mitigate impacts to First Nations Project
 20 partners by providing alternative harvesting opportunities. No reference was made to
 21 how other potential harvesters, such as Métis members, will be managed.

22 The mean regional moose population is “extra low” according to aerial surveys
 23 conducted from 2002 to 2006 (mean 0.04 moose/km²; Table 7-26) and criteria provided
 24 in the EIS (Section 7.3.6.4.3, p. 7-75). The EIS concluded that moose harvest in the
 25 SLRMA will not likely exceed sustainable limits based on an estimate of current moose
 26 harvest (<10% of regional population) sourced from the Moose Harvest Sustainability
 27 Plan (MHSP). This information is used to support a prediction of negligible or small
 28 effect of moose harvest on the regional moose population. However, it does not appear
 29 that the Moose Harvest Sustainability Plan has been finalized or released for review.
 30 Understanding the details of the approach to moose management is critical for
 31 understanding if and how Project impacts are appropriately and successfully mitigated,
 32 particularly given the extra low regional moose population.

33 **QUESTION:**

34 Provide the details of the components of the AEA offsetting program that function as
 35 mitigation for harvesting effects on moose. Do these programs give consideration to
 36 Métis harvest in the region? How will residual adverse effects on Métis be offset?

37 • Provide the Moose Harvest Sustainability Plan or indicate when it will be available for
38 review by the Métis.

39 **RESPONSE:**

40 To clarify the statement in the Preamble to this question (“No details are provided of
41 precisely how AEA offsetting programs will disperse existing harvest pressure on
42 moose.”), information on this topic can be found in the Resource Use Section 1.2.4.2 of
43 the SE SV.

44 At this time the Partnership is not aware of any Métis-specific concerns regarding
45 moose harvest in the Resource Use Regional Study Area or the Moose Regional Study
46 Area (see Response to EIS Guidelines and also response to TAC Public Rd 1 CEEA-0014).
47 All sources of moose mortality, habitat changes and disturbances associated with
48 construction and operation of the Project indicate that, with mitigation, no noticeable
49 reduction in moose abundance will occur during the construction and operation of the
50 Project.

51 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
52 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
53 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
54 and historical narrative for the Keeyask region. It is anticipated that these studies will
55 assist in understanding the nature of the Métis community in the Keeyask region, and
56 any potential effects that may be experienced as a result of developing the Project. It is
57 anticipated that these studies will assist in understanding the nature of the Métis
58 community in the Keeyask region, and any potential effects that may be experienced as
59 a result of developing the Project. Manitoba Hydro, on behalf of the Partnership, will
60 consider any additional information provided through these studies on the use of lands
61 and resources for traditional purposes by the Métis. Upon review of any information
62 provided, the Partnership will consider the need to develop appropriate mitigation
63 strategies, if necessary.

64 The CNP Moose Harvest Sustainability Plan is currently undergoing an internal review
65 and approval process involving TCN and WLFN members and Chiefs and Councils and is
66 expected to be available in final form by August 1, 2013. Once ready, the Plan will be
67 presented to the Split Lake Resource Management Board (SLRMB) for review and
68 discussion. This Plan has been developed specifically for use by CNP program managers
69 responsible for implementation of the TCN and WLFN Access Programs negotiated in
70 each community’s Adverse Effects Agreement.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
 3 **6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-**
 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012a**

7 **PREAMBLE:**

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 15 “high confidence” (TE-SV-7.0, Section 7.4.6.3.3, p. 7-131) in the ability to mitigate and
 16 manage potential Project effects on moose, yet the EIS provides little detail on proposed
 17 mitigation measures and does not appear to have provided the details of some plans
 18 intended to outline mitigation measures. It is difficult, if not impossible, to understand
 19 residual Project effects (and conclusions regarding the magnitude, extent, duration, and
 20 direction of residual effects) without a complete understanding of the proposed
 21 mitigation measures and the effectiveness of those measures. Details of how mitigation
 22 success will be measured, including targets or definitions of success, are not provided.

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 24 a better understanding of how Project impacts might be managed:

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 26 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127). During
 27 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 28 and portions re-vegetated (Section 7.4.6.3.2, p. 7-130). The Preliminary
 29 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 30 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 31 [CD-version.pdf](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)) indicates that Manitoba Infrastructure and Transportation (MIT) will
 32 assume responsibility for the north and south access roads (with permanent river
 33 crossing) once construction is completed. It is not clear if any further mitigation
 34 measures are proposed to manage increased access created by the upgraded and
 35 permanent north and south roads once construction is complete.

- 36 • The EIS indicated that access to the north and south roads will be restricted to
 37 “designated resource harvesters only” (TE-SV-1.0, Section 1.5.1, p.1-31). There is no
 38 definition of or explanation of how one becomes a “designated resource harvester”.
 39 It is not clear if this includes Métis members.
- 40 • The EIS makes reference to a Moose Harvest Sustainability Plan developed by TCN
 41 to guide the management of their Adverse Effects Agreement Access Program. This
 42 Plan apparently contains mitigation to ensure the sustainability of the moose
 43 population in the SLRMA. The MHSP appears to be a primary piece of mitigation for
 44 moose, yet we are not able to review the detailed information in this report and do
 45 not know when we will be able to review the report.
- 46 • *“Roadside ditches will be rehabilitated with native plants with low quality food value
 47 for moose where practicable, to minimize attraction of moose to the road and the
 48 risk of wildlife-vehicle collisions and harvest opportunities”* (TE-SV-7.0, Section
 49 7.4.6.3.1, p. 7-127), but no description or list of the native plant species to be used is
 50 provided.
- 51 • *“Continue to communicate and coordinate with TCN Members to verify that
 52 recommendations in the moose harvest sustainability plan are being implemented”*
 53 (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). There is no indication that any plans are in
 54 place to communicate with Métis members regarding Project impacts on moose.
- 55 • The EIS indicates that mitigation for wetland function will benefit moose (TE-SV-7.0,
 56 Section 7.4.6.3.2, p. 7-130). Map 2-22 (Project Description SV) and Map 4-10 (R to
 57 EIS, Section 4.0) show Mitigation Areas and, more specifically, the location of
 58 Potential High Quality Wetlands. The route for the Proposed South Access Road
 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Indicate if there will be any ongoing mitigation of increased access by resource users,
 65 created by the upgraded and permanent north and south roads, upon completion of
 66 construction. If so, please describe.

67 **RESPONSE:**

68 With respect to additional mitigation measures for changes in access on the north and
 69 south access roads in the operation phase, please see response to CEC Rd 1 MMF-
 70 0009a.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
 3 **6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-**
 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012b**

7 **PREAMBLE:**

8 EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential
 9 effects that are technically and economically feasible will be identified. Potential effects
 10 that remain after the application of mitigation measures will be considered to be
 11 potential residual effects;”

12 The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects
 13 that are technically and economically feasible will be identified, but more specific details
 14 are required to understand how Project impacts might be managed. The EIS indicates a
 15 “high confidence” (TE-SV-7.0, Section 7.4.6.3.3, p. 7-131) in the ability to mitigate and
 16 manage potential Project effects on moose, yet the EIS provides little detail on proposed
 17 mitigation measures and does not appear to have provided the details of some plans
 18 intended to outline mitigation measures. It is difficult, if not impossible, to understand
 19 residual Project effects (and conclusions regarding the magnitude, extent, duration, and
 20 direction of residual effects) without a complete understanding of the proposed
 21 mitigation measures and the effectiveness of those measures. Details of how mitigation
 22 success will be measured, including targets or definitions of success, are not provided.

23 The following proposed mitigation measures require more information in order to have
 24 a better understanding of how Project impacts might be managed:

- 25 • *“Use of the access roads by resources users will be addressed in the Construction*
 26 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127). During
 27 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 28 and portions re-vegetated (Section 7.4.6.3.2, p. 7-130). The Preliminary
 29 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 30 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
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 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Define and explain how one becomes a “designated resource harvester”. Does this
 65 designation include Métis members?

66 **RESPONSE:**

67 In Section 2.3 of the Preliminary Construction Access Management Plan, filed April 29,
 68 2013 and available on the Keeyask website (Keeyask.com), users of the access roads are
 69 identified (see Table 2 on pg.2-4). The opportunity to request access is also available to
 70 the Métis as indicated on pg. 2-4 which states:

71 “The Partnership is willing to meet to discuss access to the Project with any
 72 persons who at the time of this AMP have not come forward, who identify

73 themselves as First Nation Members or Métis, and who indicate they are
74 established resource users in the geographic area of the Project.”

75 As outlined in section 3.0 of the AMP, there will be implementation of an education and
76 communication strategy to share and discuss pertinent information about access with
77 stakeholders, which includes, but is not limited to, other First Nations and Aboriginal
78 peoples, including Métis.

79 The Partnership recognizes that those who access Crown lands on either side of the
80 access road rights-of-way via means other than the access roads (e.g., existing trails in
81 the area) may be legally entitled to do so. The Partnership can only implement
82 restrictions within the area of the road and road right-of-way. As such, changes in access
83 to the area for any Métis individuals who might use it are not expected to change.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
 3 **6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-**
 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012c**

7 **PREAMBLE:**

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 24 a better understanding of how Project impacts might be managed:

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 29 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
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 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Describe the mitigation measures or plans that are in place to address Métis-specific
 65 concerns regarding moose harvest (the Moose Harvest Sustainability Plan seems to be
 66 First Nation specific, although this would need to be confirmed once it is available for
 67 review).

68 **RESPONSE:**

69 Please see response to CEC Rd 1 MMF-0011a.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
 3 **6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-**
 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012d**

7 **PREAMBLE:**

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 32 assume responsibility for the north and south access roads (with permanent river
 33 crossing) once construction is completed. It is not clear if any further mitigation
 34 measures are proposed to manage increased access created by the upgraded and
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 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Describe or list the native plant species to be used in roadside rehabilitation. Are these
 65 plant species a potential attractant for other species, such as caribou?

66 **RESPONSE:**

67 Please see response to CEC Rd 1 MMF-0009b.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
 3 **6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-**
 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012e**

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 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Are any plans proposed to communicate with the Métis community regarding moose
 65 harvest in the Project area?

66 **RESPONSE:**

67 Annual monitoring results from the Terrestrial Effects Monitoring Plan (TEMP) will be
 68 summarized every five years to track long-term changes in moose populations and will
 69 be made available to the public.

70 Harvest along the access roads will also be monitored using Manitoba Conservation and
 71 Water Stewardship harvest records, and harvest data collected from socio-economic
 72 resource use studies where possible (TEMP p. 6-7). The results of ATK monitoring by the
 73 KCNs will be reviewed and used to corroborate long-term technical scientific monitoring

74 initiatives. The wildlife biologist will analyze all data collected and report to KHLP every
75 five years on long-term moose population trends (TEMP p. 6-19).

76 To supplement this information and support the moose and caribou monitoring
77 objectives identified in TEMP, licensed moose and caribou harvest monitoring is
78 proposed for the construction and operation phases as part of the Preliminary Resource
79 Use Monitoring Plan (RUMP) in cooperation with Manitoba Conservation and Water
80 Stewardship. Monitoring of licensed moose and caribou harvest will continue into the
81 operation phase of the Project.

82 The activities that occur and the results generated from the Environmental Protection
83 Program (which include TEMP and RUMP) will be discussed at Monitoring Advisory
84 Committee (MAC) meetings. MAC provides a forum for collaboration among all
85 partners. On behalf of the Partnership, the MAC will also ensure that the outcomes of
86 the Environmental Protection Program are communicated more broadly on an annual
87 basis to Members of the KCNs, regulators and the general public.

88 For more details see the Preliminary Terrestrial Effects Monitoring Plan and Preliminary
89 Resource Use Monitoring Plan filed with regulators on June 28, 2013 and available on
90 the Partnership's website.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8,**
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 4 **131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22**
 5 **(PD SV)**

6 **CEC Rd 1 MMF-0012f**

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- 25 • *“Use of the access roads by resources users will be addressed in the Construction*
 26 *Access Management Plan”* (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127). During
 27 operations, the EIS indicates that Project-related cutlines and trails will be blocked
 28 and portions re-vegetated (Section 7.4.6.3.2, p. 7-130). The Preliminary
 29 Construction Access Management Plan ([http://keeyask.com/wp/wp-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 30 [content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)
 31 [CD-version.pdf](http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf)) indicates that Manitoba Infrastructure and Transportation (MIT) will
 32 assume responsibility for the north and south access roads (with permanent river
 33 crossing) once construction is completed. It is not clear if any further mitigation
 34 measures are proposed to manage increased access created by the upgraded and
 35 permanent north and south roads once construction is complete.

- 36 • The EIS indicated that access to the north and south roads will be restricted to
 37 “designated resource harvesters only” (TE-SV-1.0, Section 1.5.1, p.1-31). There is no
 38 definition of or explanation of how one becomes a “designated resource harvester”.
 39 It is not clear if this includes Métis members.
- 40 • The EIS makes reference to a Moose Harvest Sustainability Plan developed by TCN
 41 to guide the management of their Adverse Effects Agreement Access Program. This
 42 Plan apparently contains mitigation to ensure the sustainability of the moose
 43 population in the SLRMA. The MHSP appears to be a primary piece of mitigation for
 44 moose, yet we are not able to review the detailed information in this report and do
 45 not know when we will be able to review the report.
- 46 • “Roadside ditches will be rehabilitated with native plants with low quality food value
 47 for moose where practicable, to minimize attraction of moose to the road and the
 48 risk of wildlife-vehicle collisions and harvest opportunities” (TE-SV-7.0, Section
 49 7.4.6.3.1, p. 7-127), but no description or list of the native plant species to be used is
 50 provided.
- 51 • “Continue to communicate and coordinate with TCN Members to verify that
 52 recommendations in the moose harvest sustainability plan are being implemented”
 53 (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). There is no indication that any plans are in
 54 place to communicate with Métis members regarding Project impacts on moose.
- 55 • The EIS indicates that mitigation for wetland function will benefit moose (TE-SV-7.0,
 56 Section 7.4.6.3.2, p. 7-130). Map 2-22 (Project Description SV) and Map 4-10 (R to
 57 EIS, Section 4.0) show Mitigation Areas and, more specifically, the location of
 58 Potential High Quality Wetlands. The route for the Proposed South Access Road
 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Indicate if and explain how the interaction between proposed potential high quality
 65 wetlands and the south access road was factored into the impact assessment.

66 **RESPONSE:**

67 While the south access road passes through the general location for the off-system
 68 marsh mitigation, the proposed mitigation areas will not be located next to the road.
 69 The conceptual figure in TAC Public Rd 2 CEAA-0005 shows that there will be a minimum
 70 100-m buffer between the road and the wetland mitigation areas. The existing
 71 peatlands, where the mitigation areas are likely to be constructed, continue for
 72 approximately 1 km from either side of the road. Please see TAC Public Rd 1 CEAA-0005
 73 for an explanation of how the south access road was factored into selecting the general
 74 location for the off-system marsh mitigation areas. Additional information regarding

75 measures to minimize potential effects from the south access road on the wetland
76 mitigation areas is provided in TAC Public Rd 2 CEAA-0005.

77 To clarify, the EIS indicates that mitigation for wetland function will benefit moose (TE-
78 SV-7.0, Section 7.4.6.3.2, p. 7-130). The benefit being referred to will consist primarily of
79 high quality summer aquatic forage, but considering the size of the wetland design, the
80 benefit is likely limited to a few local individuals. Studies indicate that the spatial
81 distribution of forage may have a greater effect on moose than traffic on the access
82 roads, with less activity near roads if there is no suitable forage and more activity in
83 primary habitat near roads (Yost and Wright 2001; Laurian et al. 2008). As the proposed
84 mitigation areas will not be located next to the road (i.e., a minimum buffer of 100 m),
85 the risk of moose-vehicle collisions is not expected to increase substantially.

86 The effects of increased access were considered for all linear features, including the
87 access roads, regardless of the suitability of the habitat they will transect (TE SV Sections
88 7.4.6.3.1 and 7.4.6.3.1). It was assumed that access effects could increase mortality due
89 to harvest and predation, but effects would be small for the reasons described in
90 Sections 7.4.6.3.1 and 7.4.6.3.1 of the TE SV.

91 **REFERENCES:**

- 92 Laurian, C., C. Dussault, J.-P. Ouellet, R. Courtois, M. Poulin, and L. Breton. 2008.
93 Behavior of moose relative to a road network. *Journal of Wildlife Management*
94 72(7): 1550-1557.
- 95 Yost, A.C. and R.G. Wright. 2001. Moose, caribou, and grizzly bear distribution in relation
96 to road traffic in Denali National Park, Alaska. *Arctic* 54(1): 41-48.

REFERENCE: Volume: Terrestrial Environment Supporting Volume; Section: 1.5.1, 7.4.6.3.1, 7.4.6.3.2, 7.4.6.3.3 (TE SV); 6.5.8, 6.5.8.2.1, 6.5.8.2.3 (R to EIS); 4.0 (PD SV); p. 1-31, 7-127, 7-130, 7-131 (TE SV); 6-367, 6-379, 6-381, Map 4-10 (R to EIS); Map 2-22 (PD SV)

CEC Rd 1 MMF-0012g

PREAMBLE:

EIS Scoping Document Reference: 5.1 Project Effects: “Measures to mitigate potential effects that are technically and economically feasible will be identified. Potential effects that remain after the application of mitigation measures will be considered to be potential residual effects;”

The Scoping Document (Section 5.1) sets out that measures to mitigate potential effects that are technically and economically feasible will be identified, but more specific details are required to understand how Project impacts might be managed. The EIS indicates a “high confidence” (TE-SV-7.0, Section 7.4.6.3.3, p. 7-131) in the ability to mitigate and manage potential Project effects on moose, yet the EIS provides little detail on proposed mitigation measures and does not appear to have provided the details of some plans intended to outline mitigation measures. It is difficult, if not impossible, to understand residual Project effects (and conclusions regarding the magnitude, extent, duration, and direction of residual effects) without a complete understanding of the proposed mitigation measures and the effectiveness of those measures. Details of how mitigation success will be measured, including targets or definitions of success, are not provided.

The following proposed mitigation measures require more information in order to have a better understanding of how Project impacts might be managed:

- *“Use of the access roads by resources users will be addressed in the Construction Access Management Plan”* (TE-SV-7.0, Section 7.4.6.3.1, p. 7-127). During operations, the EIS indicates that Project-related cutlines and trails will be blocked and portions re-vegetated (Section 7.4.6.3.2, p. 7-130). The Preliminary Construction Access Management Plan (<http://keeyask.com/wp/wp-content/uploads/2013/04/05-Preliminary-Construction-Access-Management-Plan-CD-version.pdf>) indicates that Manitoba Infrastructure and Transportation (MIT) will assume responsibility for the north and south access roads (with permanent river crossing) once construction is completed. It is not clear if any further mitigation measures are proposed to manage increased access created by the upgraded and permanent north and south roads once construction is complete.

- 36 • The EIS indicated that access to the north and south roads will be restricted to
 37 “designated resource harvesters only” (TE-SV-1.0, Section 1.5.1, p.1-31). There is no
 38 definition of or explanation of how one becomes a “designated resource harvester”.
 39 It is not clear if this includes Métis members.
- 40 • The EIS makes reference to a Moose Harvest Sustainability Plan developed by TCN
 41 to guide the management of their Adverse Effects Agreement Access Program. This
 42 Plan apparently contains mitigation to ensure the sustainability of the moose
 43 population in the SLRMA. The MHSP appears to be a primary piece of mitigation for
 44 moose, yet we are not able to review the detailed information in this report and do
 45 not know when we will be able to review the report.
- 46 • *“Roadside ditches will be rehabilitated with native plants with low quality food value
 47 for moose where practicable, to minimize attraction of moose to the road and the
 48 risk of wildlife-vehicle collisions and harvest opportunities”* (TE-SV-7.0, Section
 49 7.4.6.3.1, p. 7-127), but no description or list of the native plant species to be used is
 50 provided.
- 51 • *“Continue to communicate and coordinate with TCN Members to verify that
 52 recommendations in the moose harvest sustainability plan are being implemented”*
 53 (TE-SV-7.0, Section 7.4.6.3.2, p. 7-130). There is no indication that any plans are in
 54 place to communicate with Métis members regarding Project impacts on moose.
- 55 • The EIS indicates that mitigation for wetland function will benefit moose (TE-SV-7.0,
 56 Section 7.4.6.3.2, p. 7-130). Map 2-22 (Project Description SV) and Map 4-10 (R to
 57 EIS, Section 4.0) show Mitigation Areas and, more specifically, the location of
 58 Potential High Quality Wetlands. The route for the Proposed South Access Road
 59 runs directly through the Potential High Quality Wetland. It seems likely that this
 60 interaction would result in moose adjacent to the road which would increase
 61 mortality risk from collisions and/or hunting. It is not clear if this interaction was
 62 taken into consideration.

63 **QUESTION:**

64 Indicate how the success of mitigation will be gauged.

65 **RESPONSE:**

66 The success of mitigation specific to moose will be gauged via the results of moose
 67 monitoring outlined in the Preliminary Draft Terrestrial Effects Monitoring Plan (filed
 68 June 28, 2013) and compared with the benchmarks established for moose in Section
 69 7.2.6 of the Terrestrial Environment Supporting Volume.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.1.3**
 2 **Adaptive Management; p. 8-7**

3 **CEC Rd 1 MMF-0013**

4 **PREAMBLE:**

5 EIS Scoping Document Reference:

6 7.0 Environmental Monitoring, Management and Follow-up:: "The monitoring programs
 7 will determine effects of the Project....To address relevant issues and concerns identified
 8 by KCN, other Aboriginal groups and other stakeholders; and To identify the role of KCN
 9 in implementing the plans."

10 The EIS outlines numerous potential adaptive management measures for a range of
 11 VECs. However, there is no discussion of "action thresholds" or adaptive management
 12 triggers. Such triggers are necessary for understanding when to invoke the outlined
 13 adaptive management measures, or for modifying planned mitigation measures that are
 14 unsuccessful (CEAA 2009).

15 **QUESTION:**

- 16 • Provide adaptive management triggers for all VECs considered in CEA, especially for
 17 those where the assessment is most uncertain.
 18 • Provide a table of adaptive management thresholds and triggers for VECs as a
 19 reference tool for use in follow-up and monitoring programs.
 20 • Provide potential management actions that would be triggered if thresholds are
 21 surpassed.

22 **RESPONSE:**

23 As outlined in the Response to EIS Guidelines, "adaptive management" is defined in the
 24 EIS more broadly than is assumed in this question. Although triggers or thresholds and
 25 potential actions may be defined regarding adaptive management for some VECs in the
 26 Response to EIS Guidelines (or noted as being developed prior to start of the Project
 27 construction or operation), in many cases this is not feasible or appropriate and
 28 alternative approaches have been accordingly outlined. In this regard, Section 8.1.3 of
 29 the Response to EIS Guidelines (p. 8-7 to 8-9) defines and describes adaptive
 30 management in the context of the Keeyask Generation Project (the Project). This section
 31 includes the following overview:

- 32 • "...adaptive management is a planned process for responding to uncertainty or to an
 33 unanticipated or underestimated Project effect. It is the application of information
 34 learned from monitoring actual Project effects and comparing them with predicted
 35 effects. If there is a variance between the actual and the predicted effects, a

- 36 determination will be made as to whether modifications are required in existing
 37 mitigation measures, other actions are necessary to address the variance or, in
 38 cases where there may be no mitigating options available, the appropriate
 39 information is disseminated in a timely manner."
- 40 • "Where appropriate, potential adaptive management activities are included in the
 41 monitoring and management plans that are being developed as a part of the
 42 Environmental Protection Program or through an on-going process during
 43 monitoring in consultation with regulators."
 - 44 • "Where there is a reasonable understanding of an area of uncertainty such that a
 45 choice was made between two or more potential outcomes, it is reasonable to have
 46 prepared, in advance, a conceptually appropriate response should one of the
 47 optional outcomes occur. However, in other cases, the effects will be unforeseen
 48 and the response will be designed upon receipt and analysis of the data/information
 49 resulting from the monitoring. In a few cases, especially in areas of greater
 50 certainty, the monitoring is for information and communication purposes and there
 51 may be no potential adaptive management opportunities available."

52 Section 8.1.3 of the Response to EIS Guidelines proceeds to provide examples of each of
 53 the three situations outlined above regarding adaptive management:

- 54 1. Examples of predetermined adaptive management (as assumed in the question) -
 55 these include measures for terrestrial habitat, suspended sediment, lake sturgeon
 56 spawning structure, lake sturgeon stocking program, and colonial waterbirds.
- 57 2. Examples of adaptive management to be designed based on monitoring - these
 58 include fish passage, employment, and worker interaction.
- 59 3. Examples of monitoring with no probable adaptive management available - these
 60 include methylmercury in fish in reservoir and Stephens Lake, water quality effects
 61 in the flooded areas during operation, and dissolved oxygen and temperature.

62 As described in the response to CEC Rd 1 CEC-0072, Chapter 8 of the Response to EIS
 63 Guidelines (Monitoring and Follow Up) states that the monitoring and follow-up process
 64 addresses areas where uncertainty exists in the predictions, and that variations in
 65 predicted and actual results identified through monitoring will be assessed by the
 66 Partnership and regulatory authorities for follow-up actions such as mitigation
 67 adjustments and adaptive management. Most of the plans include a commitment to
 68 several decades of monitoring and ongoing reporting and communication with
 69 regulators and the public.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.2.3**
 2 **Terrestrial Environment Monitoring; p. 8-23, 8-24**

3 **CEC Rd 1 MMF-0014**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 6 follow-up: "The EIS will describe a preliminary outline of an environmental protection
 7 program for monitoring and managing the effects of the Project on the biophysical and
 8 socio-economic environments arising from the construction, operation, and
 9 decommissioning of the Project".

10 The EIS states that monitoring of caribou and moose VECs will occur "Regularly during
 11 construction and continuing for up to 30 years of operation, depending on results." (R to
 12 EIS, Section 8.2.3, Table 8-4, p. 8-23). Given the open ended lifespan of the Project,
 13 where hydroelectric generating stations can operate for a century or more, limiting the
 14 temporal scope of the monitoring program may cause important cumulative effects to
 15 be overlooked.

16 **QUESTION:**

17 Provide an explanation for limiting the temporal scope of caribou and moose monitoring
 18 programs to 30 years post-construction given an expected lifespan of the Project of 100
 19 years or more and the potential for cumulative effects resulting from the high level of
 20 development and disturbance already occurring and expected to increase in the region
 21 over the life of this Project.

22 **RESPONSE:**

23 Please note that the content of the question is misleading and requires clarification. As
 24 described in the Response to EIS Guidelines Sections 6.5.8.1 and 6.5.8.2 for caribou and
 25 moose, and in the Terrestrial Environment Supporting Volume in Sections 7.4.6.2 and
 26 7.4.6.3, and as described further in CEC Rd 1 CEC-0037b, indicator levels for past and
 27 current project habitat, intactness, linear features, predators and mortality are low
 28 relative to the benchmarks for caribou and moose in the Regional Study Areas, and
 29 these are not expected to change substantially with the addition of Keeyask. With
 30 respect to other future development in the region, each project is assessed according to
 31 existing provincial and federal legislation.

32 The main consideration in identifying the duration of monitoring was whether
 33 population trend analysis was a suitable way to monitor effects on moose and caribou.
 34 In the case of moose, it works. Demographic data, and other studies measuring

35 population drivers and stressors (e.g., predators including gray wolf, harvest, habitat)
36 which are updated regularly in the short-term, will be used to associate potential causal
37 factors with long-term population trends, and will result in greater certainty regarding
38 potential Project effects.

39 In the case of caribou, population trend analysis does not work because of the high
40 range of natural variability associated with the migratory caribou groups in the Regional
41 Study Area. Therefore, the approach for monitoring caribou that are at most risk of
42 potential Project effects is to focus primarily on summer resident caribou calving habitat
43 effects, and to confirm that habitat changes for summer residents will remain small
44 when compared to regional availability. Potential habitat effects such as these should be
45 detectable within 10 to 15 years after operation, and a 30-year monitoring timeframe is
46 considered more than sufficient.

47 In the event that monitoring shows that there are substantial deviations from
48 benchmarks (e.g., population stability, habitat alteration) or uncertainties related to
49 these effects, then monitoring will be extended. For caribou, where there is a concern of
50 cumulative effects with future projects for the wider-ranging and more numerous
51 migratory coastal and barren-ground caribou, monitoring will be coordinated with other
52 Manitoba Hydro projects and Manitoba Conservation and Water Stewardship
53 monitoring initiatives to increase efficiency and allow for monitoring regional
54 cumulative effects within and beyond the Keeyask Project Study Area.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
2 **Monitoring and Follow-up; p. 8-26**

3 **CEC Rd 1 MMF-0015**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
6 follow-up: "The EIS will describe a preliminary outline of an environmental protection
7 program for monitoring and managing the effects of the Project on the biophysical and
8 socio-economic environments arising from the construction, operation, and
9 decommissioning of the Project".

10 The EIS states that monitoring of predators will occur annually during construction, and
11 then every 5 years, for only 30 years, during operations. Given the natural variability in
12 population dynamics of potential prey species (e.g. caribou and moose), and the
13 cumulative effects already impacting prey species, it would seem finer temporal scale
14 data, over a longer period would be necessary to separate potential causal factors (e.g.
15 density independent or dependent factors from anthropogenic factors) for prey species
16 declines.

17 **QUESTION:**

18 Provide an ecologically based explanation for limiting the temporal scope of gray wolf
19 monitoring programs to every 5 years for only 30 years post-construction given the
20 indeterminate lifespan of the Project.

21 **RESPONSE:**

22 Please refer to CEC Rd 1 MMF-0014 for further information on mammal monitoring
23 programs.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.10 (TE SV); 5.3.2.1, 8.2.7 (R to EIS); p. 7-152**
 3 **(TE SV); 5-7, 8-39 (R to EIS)**

4 **CEC Rd 1 MMF-0016a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 7 Follow-up: "The monitoring programs will determine effects of the Project....To address
 8 relevant issues and concerns identified by KCN, other Aboriginal groups and other
 9 stakeholders; and To identify the role of KCN in implementing the plans."

10 The Scoping Document (Section 7.0) sets out that monitoring programs will address
 11 relevant issues and concerns identified by KCN, other aboriginal groups and other
 12 stakeholders. Unfortunately, neither the Scoping Document nor the EIS describe how
 13 relevant issues and concerns will be identified nor how Métis members will be involved.

14 The EIS states that "Monitoring is outlined for situations where the ATK and technical
 15 assessments differ, where a prediction has substantial uncertainty or a difference
 16 between predicted and actual residual effects could substantially alter the effects
 17 assessment." (TE-SV-7.0, Section 7.4.10, p. 7-152; R to EIS, Section 5.3.2.1, p. 5-7). It is
 18 not clear how it would be determined that there is a potential for "substantial"
 19 alteration to the effects assessment.

20 The EIS contains extensive discussion of the role the Keeyask Cree Nations (KCNs) will
 21 play in the monitoring and follow-up programs for the Project, including participation in
 22 their development and implementation which "will facilitate capacity building by
 23 providing employment and training opportunities" (R to EIS, Section 8.2.7, p. 8-39) for
 24 their members. The EIS also discusses plans to facilitate communications with KCN
 25 communities through forums such as open houses to keep "community Members
 26 updated on Project activities, adverse effects, and proposed mitigation strategies." (R to
 27 EIS, Section 8.2.7, p. 8-39). No mention is made in the EIS if these same opportunities for
 28 participation and capacity building will be extended to Manitoba Métis Federation
 29 members."

30 **QUESTION:**

31 Explain how it is determined that there could be a substantial alteration to the effects
 32 assessment such that monitoring would be implemented.

33 **RESPONSE:**

34 Please see the response to CEC Rd 1 MMF-0013.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.10 (TE SV); 5.3.2.1, 8.2.7 (R to EIS); p. 7-152**
 3 **(TE SV); 5-7, 8-39 (R to EIS)**

4 **CEC Rd 1 MMF-0016b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 7 Follow-up: "The monitoring programs will determine effects of the Project....To address
 8 relevant issues and concerns identified by KCN, other Aboriginal groups and other
 9 stakeholders; and To identify the role of KCN in implementing the plans."

10 The Scoping Document (Section 7.0) sets out that monitoring programs will address
 11 relevant issues and concerns identified by KCN, other aboriginal groups and other
 12 stakeholders. Unfortunately, neither the Scoping Document nor the EIS describe how
 13 relevant issues and concerns will be identified nor how Métis members will be involved.
 14 The EIS states that "Monitoring is outlined for situations where the ATK and technical
 15 assessments differ, where a prediction has substantial uncertainty or a difference
 16 between predicted and actual residual effects could substantially alter the effects
 17 assessment." (TE-SV-7.0, Section 7.4.10, p. 7-152; R to EIS, Section 5.3.2.1, p. 5-7). It is
 18 not clear how it would be determined that there is a potential for "substantial"
 19 alteration to the effects assessment.

20 The EIS contains extensive discussion of the role the Keeyask Cree Nations (KCNs) will
 21 play in the monitoring and follow-up programs for the Project, including participation in
 22 their development and implementation which "will facilitate capacity building by
 23 providing employment and training opportunities" (R to EIS, Section 8.2.7, p. 8-39) for
 24 their members. The EIS also discusses plans to facilitate communications with KCN
 25 communities through forums such as open houses to keep "community Members
 26 updated on Project activities, adverse effects, and proposed mitigation strategies." (R to
 27 EIS, Section 8.2.7, p. 8-39). No mention is made in the EIS if these same opportunities for
 28 participation and capacity building will be extended to Manitoba Métis Federation
 29 members.

30 **QUESTION:**

31 Will Manitoba Métis Federation members be invited to participate in the development
 32 and implementation of monitoring and follow-up programs related to the Project? If
 33 yes, explain to what extent the Métis will be involved. If no, explain why the Métis will
 34 not be involved.

35 **RESPONSE:**

36 As the Project proponent, the Partnership is responsible for developing and
37 implementing monitoring and follow-up programs consistent with commitments made
38 in the Response to EIS Guidelines and final license conditions. Preliminary drafts of most
39 of the Partnership's monitoring and follow-up programs have been filed with regulators
40 and are available on the Partnership's Web site at: [http://keeyask.com/wp/the-](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program)
41 [project/environmental-assessment-process/preliminary-environmental-protection-](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program)
42 [program](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program). These plans will be finalized upon receipt of all Regulatory approvals and
43 license conditions for the Keeyask Generation Project.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 7.4.10 (TE SV); 5.3.2.1, 8.2.7 (R to EIS); p. 7-152**
 3 **(TE SV); 5-7, 8-39 (R to EIS)**

4 **CEC Rd 1 MMF-0016c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 7 Follow-up: “The monitoring programs will determine effects of the Project....To address
 8 relevant issues and concerns identified by KCN, other Aboriginal groups and other
 9 stakeholders; and To identify the role of KCN in implementing the plans.”

10 The Scoping Document (Section 7.0) sets out that monitoring programs will address
 11 relevant issues and concerns identified by KCN, other aboriginal groups and other
 12 stakeholders. Unfortunately, neither the Scoping Document nor the EIS describe how
 13 relevant issues and concerns will be identified nor how Métis members will be
 14 involved. The EIS states that “Monitoring is outlined for situations where the ATK and
 15 technical assessments differ, where a prediction has substantial uncertainty or a
 16 difference between predicted and actual residual effects could substantially alter the
 17 effects assessment.” (TE-SV-7.0, Section 7.4.10, p. 7-152; R to EIS, Section 5.3.2.1, p. 5-
 18 7). It is not clear how it would be determined that there is a potential for “substantial”
 19 alteration to the effects assessment.

20 The EIS contains extensive discussion of the role the Keeyask Cree Nations (KCNs) will
 21 play in the monitoring and follow-up programs for the Project, including participation in
 22 their development and implementation which “will facilitate capacity building by
 23 providing employment and training opportunities” (R to EIS, Section 8.2.7, p. 8-39) for
 24 their members. The EIS also discusses plans to facilitate communications with KCN
 25 communities through forums such as open houses to keep “community Members
 26 updated on Project activities, adverse effects, and proposed mitigation strategies.” (R to
 27 EIS, Section 8.2.7, p. 8-39). No mention is made in the EIS if these same opportunities for
 28 participation and capacity building will be extended to Manitoba Métis Federation
 29 members.

30 **QUESTION:**

31 Will monitoring results be communicated on a regular basis to Manitoba Métis
 32 Federation members? If so, what approach to communication (frequency, venue, in
 33 person or in person meetings) would be taken?

34 **RESPONSE:**

35 As described in Chapter 8, section 8.3.1.3 of the *Keeyask Generation Project: Response*
36 *to the EIS Guidelines*, the Partnership will share reports on monitoring results with the
37 regulators. The same reports submitted to the regulator will also be made available
38 annually to the public by the Monitoring Advisory Committee on the Partnership's
39 website (Keeyask.com).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
2 **Monitoring and Follow-up; p. N/A**

3 **CEC Rd 1 MMF-0017**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
6 follow-up: "The EIS will describe a preliminary outline of an environmental protection
7 program for monitoring and managing the effects of the Project on the biophysical and
8 socio-economic environments arising from the construction, operation, and
9 decommissioning of the Project".

10 The EIS provides a general outline of the terrestrial monitoring program, but contains no
11 details on the sampling design for the monitoring and follow-up programs for terrestrial
12 VECs including caribou and moose. The Preliminary Environmental Protection Program
13 (EPP) document, released on April 26, 2013, states "The Partnership currently plans to
14 file a preliminary draft of the Terrestrial Effects Monitoring Plan in the second quarter of
15 2013".

16 **QUESTION:**

17 Is the draft terrestrial monitoring plan still scheduled to be released in the second
18 quarter of 2013? If so, please provide a copy to the Métis for review.

19 **RESPONSE:**

20 A preliminary draft of the Terrestrial Effects Monitoring Plan was filed with regulators
21 on June 28, 2013. It is available for review on the Partnership's website (Keeyask.com).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Chapters 6 and 7; p. N/A**

3 **CEC Rd 1 MMF-0018**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects
 6 assessment will focus on VECs (as described in section 3.3.1) the may be adversely
 7 affected by the Project and will consider likely adverse effects caused by the other
 8 projects or human activities that overlap in time and space with those of the Project".

9 The EIS lacks a description of pre-disturbance baseline conditions for VECs such as
 10 caribou and moose that can be used to assess the cumulative effects of development. A
 11 general description is provided of caribou and moose conditions in the past and, based
 12 on the qualitative descriptions from KCN members, it sounds like past development has
 13 already had a significant cumulative impact on caribou and moose. Better technical data
 14 on historical conditions is required to understand change in VEC condition from pre-
 15 hydro development to the current day and into the future. A similar issue was noted as
 16 part of the review process for the Bipole III project:

17 "The development of a baseline for evaluation of cumulative effects is more than a
 18 description of current conditions, which alone can discount the effects of past changes
 19 as simply the 'new normal'. Baseline development requires a retrospective analysis of
 20 how VEC conditions have changed over time and whether that change is significant in
 21 terms of the sustainability of the VEC." (Gunn and Noble, 2012)

22 **QUESTION:**

23 Include a retrospective analysis of the historical or reference state of caribou and moose
 24 VECs in order to establish baseline conditions from which to assess change in VECs over
 25 time due to cumulative impacts of development in the region.

26 **RESPONSE:**

27 Moose

28 Historical moose numbers from provincial surveys conducted in 1999-2000 in Game
 29 Hunting Area 3 (GHA 3) and GHA 9 in 2001-2002 were similar to those found in the
 30 Regional Study Area (TE SV, Section 7.3.6.4.2) during the 2002-2006 studies done for the
 31 Project, suggesting that there have not been drastic declines in the population as a
 32 result of hydroelectric development. Additionally, in 1994 the moose population in the
 33 Split Lake Management Area was estimated to be 1,639 individuals (Split Lake Resource
 34 Management Board 1994), compared to 2,600 individuals in 2010 (TE SV, Section

35 7.3.6.4.3), suggesting an increase in moose numbers. This potential increase is also
 36 supported by local observations: "Historically, moose were much less abundant in the
 37 local study area. Today moose are found in much greater numbers..." (FLCN 2012, p. 57).

38 Caribou

39 Historical information on caribou numbers in the RSA is lacking. It has been suggested
 40 that migratory caribou were plentiful in the area prior to the 1950s, but had declined
 41 following the construction of the Kettle Generating Station (FLCN 2010 Draft). Due to
 42 the nomadic nature of caribou and absence of quantitative data, it is difficult to know
 43 the extent of this potential decline.

44 In the absence of quantitative information on caribou numbers a retrospective analysis
 45 was done of habitat intactness in the region (TE-SV-2.0, Section 2.4.3, p. 2-114). Habitat
 46 intactness is important to caribou as linear features may reduce the core habitat
 47 available and cause shifts in range and movements. The region was predicted to be
 48 completely intact prior to 1929, at which time the rail line to Churchill was constructed.
 49 Intactness was further reduced with the construction of the Kettle Generating Station
 50 and the development of the communities of Gillam and Split Lake. Currently, the linear
 51 feature density in the RSA (0.45 km/km²) is estimated to have low-moderate effects and
 52 the percent of core area that is intact is estimated to be 83%, well above the range
 53 considered to have a low adverse effect (>65%) (TE SV, Section 2.4.3.2; Section 7.2.6.2;
 54 Table 7-32.

55 **REFERENCES:**

- 56 FLCN (Fox Lake Cree Nation). 2010. Keeyask Traditional Knowledge Report. Draft. Fox
 57 Lake Cree Nation, Manitoba.
- 58 FLCN Environment Evaluation Report (Draft). 2012. Fox Lake Cree Nation Environment
 59 Evaluation Report (Draft) Draft submitted by: Fox Lake Cree Nation –
 60 Negotiations June 7, 2012.
- 61 Split Lake Resource Management Board. 1994. Moose Conservation Plan 1993/94. Split
 62 Lake, Manitoba. 22 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.5.8.1.1 Mammals - Caribou; Chapter 7; p. 6-137**

3 **CEC Rd 1 MMF-0019**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects
 6 assessment will focus on VECs (as described in section 3.3.1) the may be adversely
 7 affected by the Project and will consider likely adverse effects caused by the other
 8 projects or human activities that overlap in time and space with those of the Project".

9 The qualitative nature of the CEA makes comparing VEC conditions from the past,
 10 present and into the future very difficult and highly subjective. The CEA does not
 11 present clear thresholds for understanding the significance of cumulative effects
 12 currently, or into the future. The only threshold we observed was the 65% undisturbed
 13 habitat threshold to sustain a caribou population from Environment Canada (2012), and
 14 currently only 48% of the caribou range in Zone 5 is undisturbed (R to EIS, Section
 15 6.5.8.1.1, p. 6-371), suggesting caribou are already experiencing significant cumulative
 16 impacts in the region. Quantitative thresholds are necessary for understanding the
 17 significance of past cumulative effects and the significance of future impacts on the
 18 VECs (Gunn and Noble 2012).

19 **QUESTION:**

- 20 • Provide relevant, quantitative, threshold values for assessing the significance of
 21 cumulative effects on caribou and moose VECs.
 22 • Cumulative effects for caribou and moose are variously determined in Chapter 7 to
 23 be 'small', 'relatively small', or 'negligible'. Define the scales used to determine the
 24 magnitude and significance of cumulative effects acting on VECs.

25 **RESPONSE:**

26 *Provide relevant, quantitative, threshold values for assessing the significance of*
 27 *cumulative effects on caribou and moose VECs.*

28 Benchmark values for cumulative effects on VECs are the same as those for the effects
 29 assessment (see Section 7.2.6 of the TE SV). Please also see CEC Rd 1 CEC-0021.

30 *Cumulative effects for caribou and moose are variously determined in Chapter 7 to be*
 31 *'small', 'relatively small', or 'negligible'. Define the scales used to determine the*
 32 *magnitude and significance of cumulative effects acting on VECs.*

33 To clarify, there are no references to “relatively small” effects on any mammal in the
34 Response to EIS Guidelines or in the mammals section (Section 7) of the Terrestrial
35 Environment Supporting Volume.

36 Scales used to determine the magnitude and regulatory significance of cumulative
37 effects acting on VECs were defined in Section 5.5 of the Response to EIS Guidelines. By
38 way of example, focusing on the specific terms noted in the question:

- 39 • A "small" magnitude effect is defined in Section 5.5 as “no definable, detectable, or
40 measurable effect; or below established thresholds of acceptable change; or within
41 the range of natural variability; or minimum impairment of an ecosystem
42 component’s function.” For mammals, "small" magnitude effects were expected
43 effects of the Project generally below established thresholds of acceptable change
44 or were considered to be within the range of natural variability (i.e., not
45 distinguishable from other processes, for example accidental mortality or changes in
46 migration routes due to snow depth or food availability). The assessment of
47 magnitude of effects of the Project on each mammal VEC was "small".
- 48 • As reviewed in Section 5.5., "negligible" was used in the context of direction or
49 nature of the effect, and (in contrast to adverse or positive effects) means no
50 definable, detectable, or measurable effect. The assessment of direction of effects
51 of the Project on each mammal VEC was "adverse".

52 The regulatory significance determinations of effects of the Project on each mammal
53 VEC also considered, as provided for in Section 5.5, the geographic extent and duration
54 of the effects. Based on Figure 5-1, Step 2 assessment was not required for any mammal
55 VEC.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **7.5.2.2.3 Summary of Cumulative Effects on the Project with Past**
3 **and Current Projects/Activities - Mammals; p. 7-29, 7-30**

4 **CEC Rd 1 MMF-0020**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects
7 assessment will focus on VECs (as described in section 3.3.1) the [sic] may be adversely
8 affected by the Project and will consider likely adverse effects caused by the other
9 projects or human activities that overlap in time and space with those of the Project".

10 The EIS states that the "main Project effects on intactness are predicted to include a
11 slight reduction in total linear feature density (positive effect) due to existing cutlines
12 being replaced by Project features" (Section 7.5.2.2.1, p.7-28). It is unclear how
13 overlaying Project features on pre-existing cutlines equals a decrease in linear
14 disturbance. At best should it not mean that no more linear disturbance will be created?

15 **QUESTION:**

16 Clarify how overlaying Project features on pre-existing cutlines will reduce the amount
17 of linear disturbance leading to a positive effect on cumulative impacts.

18 **RESPONSE:**

19 Total linear feature density would be reduced during Project construction and operation
20 because portions of existing linear features would be covered by Project features (e.g.,
21 reservoir flooding; TE SV Section 2.4.4.1.1, pp. 2-119 and 2.4.4.2.1, p. 2-122). In
22 recognition that these same Project features have adverse effects on intactness, core
23 area abundance is also used as an intactness indicator (TE SV Section 2.4.1, pp. 2-111 to
24 2-112). So, while there will be a net reduction in linear feature density, which would be
25 a positive effect for that numerical measure, there would be an offsetting negative
26 effect in terms of reductions in core area size and number, resulting in a net adverse
27 effect in intactness (Response to EIS Guidelines Section 7.5.2.2.1, p. 7-28 and TE SV
28 Section 2.4.4.3, p. 2-124).

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 7.5.2.2.3 Summary of Cumulative Effects of the**
3 **Project with Past and Current Projects/Activities - Mammals; p. 7-**
4 **29, 7-30**

5 **CEC Rd 1 MMF-0021**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects
8 assessment will focus on VECs (as described in section 3.3.1) the may be adversely
9 affected by the Project and will consider likely adverse effects caused by the other
10 projects or human activities that overlap in time and space with those of the Project".

11 The manner in which Project related effects are discussed in the CEA downplays the
12 significance of the total cumulative effects caused by past and current developments
13 and the addition of any Project specific impacts to that total. For example, the Project is
14 expected to have small or negligible impacts on cumulative effects for caribou, yet
15 based on habitat disturbance thresholds provided in the EIS (See MMF IR# 19) it would
16 appear that there already are significant cumulative effects of development on caribou
17 in the region. When discussing the cumulative effects of the Project with past and
18 current projects/activities as this section does, it would seem like the effect of the
19 Project should be added to the pre-existing cumulative effects to determine total
20 cumulative effects and then assess their significance. Instead this section primarily
21 discusses Project specific effects relative to cumulative effects from past and current
22 projects/activities, downplaying the importance of the total cumulative effect on the
23 VEC in question.

24 **QUESTION:**

25 Discuss the significance of total cumulative effects on caribou and moose in the
26 presence and absence of the Project. Does significance of the cumulative effect change
27 by adding or removing the Project?

28 **RESPONSE:**

29 The regulatory significance assessment of cumulative effects of the Project on caribou
30 and on moose assessed the incremental residual effects of the Project on each VEC in
31 combination with the effects of past, current and identified future projects (i.e., it
32 assessed the incremental effect on the VEC in a world with the Project as compared to a
33 world without the Project).

34 The incremental effects of the Project (i.e., the impact of adding the Project) on moose
35 and caribou were determined to not be significant for the purposes of the regulatory
36 assessment required in response to the EIS Guidelines.

37 Benchmark values for cumulative effects on VECs are the same as those for the effects
38 assessment (see Section 7.2.6 of the TE SV). Please also see CEC Rd 1 CEC-0021 and CEC-
39 Rd 1 MMF-0018 and 0019 for related additional information.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **7.5.2.3.3 Cumulative Effects of the Project including Future**
 3 **Projects/Activities - Mammals; p. 7-35**

4 **CEC Rd 1 MMF-0022**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.2 Cumulative Effects: "The cumulative effects
 7 assessment will focus on VECs (as described in section 3.3.1) the may be adversely
 8 affected by the Project and will consider likely adverse effects caused by the other
 9 projects or human activities that overlap in time and space with those of the Project".

10 Linear disturbances are well known to have complex and significant impacts on caribou
 11 distribution and movement (Dyer et al. 2001; Scurrah and Schindler 2012). The EIS
 12 states that while "the Keeyask Transmission Project could result in one or more
 13 transmission line rights-of-way south of Stephens Lake, it is not likely to limit caribou
 14 from passing through the area and calving on islands in the lake" (R to EIS, Section
 15 7.5.2.3.3, p. 7-35), but provides no evidence to support this statement. The EIS assumes
 16 there will be no significant cumulative effect of future projects.

17 **QUESTION:**

18 Provide supporting literature or data for the assumption that future increases in linear
 19 disturbance will not hinder movement or restrict the distribution of caribou in the
 20 region.

21 **RESPONSE:**

22 Increases in linear feature density in the Regional Study Area are not anticipated as a
 23 result of the Project. A small (<1%) decrease in linear feature density in Study Zone 5 is
 24 expected (see TE SV Section 2.4.4.1.1). This decrease in linear feature density is
 25 attributable to the removal of some existing linear features during clearing of borrow
 26 areas and camps. For caribou, the overall effect of a reduction in linear feature density
 27 in Study Zone 5 will be negligible to small and positive. Cumulatively, the transmission
 28 projects would increase linear feature density in Study Zone 5 from 0.44 km/km² to 0.48
 29 km/km², and from 0.31 km/km² to 0.36 km/km² if the Thompson area is excluded (TE SV
 30 Section 2.10.2). As these values are below the 0.60 km/km² benchmark established for
 31 low magnitude effects of linear feature density on caribou (Section 7.2.6 of the TE SV),
 32 the cumulative effect of increased linear feature density on caribou is expected to be
 33 small.

34 Although avoidance of infrastructure development by caribou has been investigated by
 35 several research teams (i.e. Bradshaw et al. 1997; Wolfe et al. 2000; Dyer et al. 2001),

36 the extent of avoidance of linear disturbances by boreal caribou remains poorly
 37 understood (Dyer et al. 2001; Scurrah and Schindler 2012). There is evidence to suggest
 38 that not all linear features are equal contributors to fragmentation effects and the loss
 39 of effective habitat. For example, it is likely that portions of cutlines and transmission
 40 line rights-of-way were not being used as human or wildlife corridors because they are
 41 partially overgrown, distant from any current human uses and/or are accessible only in
 42 winter due to natural barriers (TE SV Section 2.4.3.2.1).

43 Analysis of boreal woodland caribou radio-collaring data in the Bipole III Transmission
 44 Project Study Area demonstrated a weak trend of increasing distance from linear
 45 features (Manitoba Hydro 2012). Although minor aversion to linear disturbances was
 46 suggested, boreal woodland caribou movements across roads and transmission lines
 47 were not deterred (Manitoba Hydro 2012). Additional studies of pre- and post-
 48 construction caribou movements conducted for the Wuskwatim Transmission Project
 49 suggested little effect of transmission lines on boreal woodland caribou habitat use and
 50 range occupation (Manitoba Hydro 2012).

51 Outside of Manitoba, traditional caribou migrations across roads and rail lines in the
 52 Yukon (Surrendi and DeBock 1976), Newfoundland (Bergerud 1971), and British
 53 Columbia (Johnson and Todd 1977) were not deterred. Furthermore, although individual
 54 caribou differ in response to linear corridors (Weir et al. 2007), radio-collared Pen
 55 Islands and Cape Churchill woodland caribou demonstrated that movements are not
 56 limited by the Hudson Bay Railway (HBR) and Bipoles I and II between Ilford and Gillam
 57 (Manitoba Hydro 2012). Additional observations in February 2013 of large numbers of
 58 Pen Islands coastal woodland caribou entering the eastern half of Study Zone 4 from the
 59 southeast suggest that the existing linear disturbances (HBR and Bipoles I and II) were
 60 not a limiting factor to these movements.

61 In conclusion, although some loss of effective habitat is expected near linear features
 62 during construction and to a lesser degree during operation (Section 6.5.8.1 of the
 63 Response to EIS Guidelines), and where functional habitat loss can occur near roads
 64 (Schindler et al. 2007) where caribou exhibit high site fidelity (Schaefer et al. 2000), such
 65 as is the case for islands in Stephens Lake, caribou are still expected to cross these linear
 66 features to access the high quality, predator free, island lake habitat that remains
 67 unaffected by fragmentation, physical habitat loss or sensory disturbance effects.

68 **REFERENCES:**

69 Bradshaw, C.J.A., S. Boutin, and D.M. Hebert. Effects of Petroleum Exploration on
 70 Woodland Caribou in Northeastern Alberta. *The Journal of Wildlife*
 71 *Management*, 61(4): 1127-1133.

- 72 Bergerud, A.T. 1971. The population dynamics of Newfoundland caribou. *Wildlife*
73 *Monographs*, 25: 1-25.
- 74 Dyer, S.J., J.P. O'Neill, S.M. Wasel, and S. Boutin. 2001. Avoidance of industrial
75 development by woodland caribou. *The Journal of Wildlife Management*, 65(3):
76 531-542.
- 77 Johnson, D.R. and M.C. Todd. 1977: Summer use of a highway crossing by mountain
78 caribou. *Canadian Field Naturalist* 91(3): 12-314.
- 79 Manitoba Hydro. 2012. Bipole III Transmission Project Supplemental Caribou Technical
80 Report. Prepared for Manitoba Hydro by Joro Consultants Inc. 108 pp.
- 81 Schaefer, J.A., C.M. Bergman and S.N. Luttich. 2000. Site fidelity of female caribou at
82 multiple spatial scales. *Landscape Ecology* 15: 731-739.
- 83 Schindler, D.W., D. Walker, T. Davis and R. Westwood. 2007. Determining effects of an
84 all weather logging road on winter woodland caribou habitat use in south-
85 eastern Manitoba. *Rangifer* 17: 209-217.
- 86 Scurrah, F.E. and D.W. Schindler. 2012. Towards a Manitoba Hydro boreal woodland
87 caribou strategy: Outcomes from Manitoba Hydro boreal woodland caribou
88 workshop. *Rangifer* 32(2): 115-124.
- 89 Surrendi, D.C. and E.A. DeBock. 1976: Seasonal distribution, population, status and
90 behaviour of the Porcupine Caribou Herd. Edmonton: Canadian Wildlife Service,
91 Western and Northern Region. 144 p.
- 92 Weir, J.N., S.P. Mahoney, B. McLaren, and S.H. Ferguson. 2007. Effects of mine
93 development on woodland caribou *Rangifer tarandus* distribution. *Wildlife*
94 *Biology* 13(1): 66-74.
- 95 Wolfe S.A., B. Griffith, and C.A.G. Wolfe. 2000. Response of Reindeer and caribou to
96 human activities. *Polar Research* 19(1): 63-73.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.2, 6.6**
 2 **(R to EIS); 1.0 (SE SV); p. 5-1, 5-6, 6-426 (R to EIS); 1-18 (SE SV)**

3 **CEC Rd 1 MMF-0023**

4 **PREAMBLE:**

5 EIS Scoping Document Reference:

- 6 • 3.5 Spatial and Temporal Boundaries. Spatial boundaries (i.e. the study areas) will be
 7 established for the Project effects assessment. Study areas may vary between
 8 various environmental components, as appropriate. The EIS will explain the
 9 rationale used to determine the study area for various environmental components.
 10 • 5.1 Project Effects. The EIS will identify the potential positive and adverse
 11 environmental effects of the Project. Measures to mitigate potential effects that are
 12 technically and economically feasible will be identified. Potential effects that remain
 13 after the application of mitigation will be considered to be potential residual effects.

14 The EIS states that the extent to which the Project would have an effect on people
 15 "...depends largely on their proximity to and level of involvement in the Project" (R to
 16 EIS, Section 6.6, p. 6-426). The Socio-economic Local Study Area is defined as consisting
 17 of "...the four partner First Nation communities of TCN, WLFN, FLCN and YFFN, the Town
 18 of Gillam and the City of Thompson..." (R to EIS, Section 6.6, p. 6-426). The EIS goes on
 19 to state that the four KCNs are affected by the Project through the following pathways
 20 of effect:

- 21 • Physical/biophysical effects on resource use/traditional use areas and heritage
 22 resources;
 23 • Employment and business effects;
 24 • Construction worker interaction within the partners' home communities; and
 25 • Investment income (Socio-economic SV, Section 1, p. 1-18).

26 The Project was subject to two evaluations, "...the first of which was conducted by the
 27 Keeyask Cree Nations (KCNs) for their internal purposes and the second of which is a
 28 public review currently being conducted by federal and provincial environmental
 29 regulators" (R to EIS, Section 5.2, p. 5-1). As "in-vicinity" First Nations, the KCNs are
 30 described as having "...played an integral role, along with Manitoba Hydro, in directing
 31 and shaping the assessment" (R to EIS, Section 5.2, p. 5-6).

32 There are Métis residing in the Local Study Area, including, the Town of Gillam and some
 33 of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of
 34 Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and

35 Regional Study Areas. Despite this, the Métis have not been considered or assessed as a
36 distinct group in the Local Study Area.

37 **QUESTION:**

- 38 • What criteria were used to define the KCNs in the Local Study Area as “in-vicinity”?
- 39 • What criteria were used to exclude the Métis from being defined as “in-vicinity”,
40 particularly those who reside in the Local Study Area?
- 41 • Why were the Métis not identified as a distinct group in the Local Study Area?
- 42 • Explain how the Métis in the Local Study Area will not be affected by the same
43 pathways of effect as are identified for the KCNs.
- 44 • Why were impacts of the Project on Métis in the Local Study Area not considered
45 and assessed, as a distinct group, and to the same level of assessment, as First
46 Nations in the Local Study Area?
- 47 • Why was there no equivalent evaluation process provided to the Manitoba Métis
48 Federation to evaluate the impacts of the project on the Métis residing in and using
49 the Local Study Area, similar to the evaluation process that was provided to the First
50 Nations in the Local Study Area
- 51 • Explain how impacts on the Métis, as a distinct group in the Local Study Area, have
52 been adequately assessed, without consideration of the Métis as a distinct group in
53 the Local Study Area, and without the provision of this same evaluation process to
54 the Métis.

55 **RESPONSE:**

56 For purposes of the socio-economic assessment in the Response to EIS Guidelines, a
57 Local Study Area was defined which includes the people and communities in the
58 immediate vicinity of the Project that have the greatest potential to experience socio-
59 economic effects as result of the development and operation of the Keeyask Generation
60 Project. These communities include the Town of Gillam, the City of Thompson, and the
61 communities of Split Lake, Ilford/War Lake, Fox Lake/Bird and York Landing, with the
62 last four representing the home communities of the four Keeyask Cree Nations (KCNs).
63 Each of the KCNs is identified in the assessment by the name of its First Nation.

64 The Local Study Area is defined based on pathways of effect of the Project that will
65 impact people in this area. To the extent that there are Métis or other Aboriginal
66 citizens resident in the Local Study Area, these individuals are included in the
67 assessments of effects of the Project on people in the Local Study Area, and are also
68 captured in the total and Aboriginal populations (where available) identified for each
69 Local Study Area community (please also refer to the responses to CEC Rd 1 MMF -
70 0024g and MMF-0024h).

71 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
72 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
73 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
74 and historical narrative for the Keeyask region. It is anticipated that these studies will
75 assist in understanding the nature of the Métis community in the Keeyask region, and
76 any potential effects that may be experienced as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 At what point during the Project environmental assessment were the AEAs negotiated
 24 with the KCNs?

25 **RESPONSE:**

26 The Keeyask Adverse Effects Agreements were negotiated concurrently with the
 27 Keeyask environmental impact assessment. The Keeyask environmental assessment
 28 studies were initiated in 1999 and the information gained through these studies
 29 contributed to both the Keeyask Adverse Effects Agreements and the Environmental
 30 Impact Statement. The Tataskweyak Cree Nation and War Lake First Nation began
 31 working together on their Keeyask environmental evaluation in 1999 in a process called
 32 Overview of Water and Land (OWL) which laid the groundwork for their respective
 33 adverse effects agreements, completed on March 13, 2009. The Fox Lake Cree Nation
 34 and York Factory First Nation adverse effects agreements were each completed on May
 35 28, 2009. The Environmental Impact Statement was completed in 2012.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 How were "known and foreseeable adverse effects" accepted or validated by Manitoba
 24 Hydro or the KHLP?

25 **RESPONSE:**

26 The ancestors of the KCN have been stewards of the Nelson River basin since time
 27 immemorial and possess intimate knowledge of the land and waters. Their experience
 28 with Hydro development goes back to 1957 with the construction of the Kelsey GS.
 29 Their knowledge and wisdom has shaped their involvement in Keeyask from the early
 30 planning stages. Manitoba Hydro's approach to project development has been to avoid
 31 impacts where feasible, and where impacts cannot be avoided to take remedial and
 32 other measures to mitigate the impact, and finally to provide compensation in-kind or
 33 monetary compensation to address such impacts. Through a process of dialogue,
 34 drawing on a range of information and experiences, the parties assessed the
 35 foreseeable adverse effects of the project and reached a negotiated agreement as

36 reflected in the Adverse Effects Agreements. This information and experience included:
37 an understood and agreed upon Project Description, the past experience of the First
38 Nations and Manitoba Hydro with respect to hydro-electric development, and the best
39 professional advice available on the impacts of the project.

40 In the case of Tataskweyak Cree Nation and War Lake First Nation, the negotiations also
41 drew upon the Overview of Water and Land Process, a community-based process used
42 by each of Tataskweyak and War Lake to assess Keeyask adverse effects based on the
43 experience, understanding, knowledge, wisdom, values, beliefs and priorities of each
44 community and its members.

45 The Adverse Effects Agreements were validated by the Keeyask Cree Nations
46 communities through the community ratification processes. For further information
47 consult Section 7.1.1 "Existing Understandings" in the Tataskweyak, War Lake, and Fox
48 Lake Adverse Effects Agreements. Preamble Paragraph U in the York Factory First Nation
49 AEA also speaks to the existing understandings of York Factory at the time of the signing
50 of the AEA.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 How were "known and foreseeable adverse effects" quantified by Manitoba Hydro or
 24 the KHLP for the AEAs?

25 **RESPONSE:**

26 Manitoba Hydro's approach to project development has been to avoid impacts where
 27 feasible, and where impacts cannot be avoided to take remedial and other measures to
 28 mitigate the impact, and finally to provide compensation in-kind or monetary
 29 compensation to address such impacts. Through a process of dialogue, drawing on a
 30 range of information and experiences, Manitoba Hydro and each of Tataskweyak Cree
 31 Nation, War Lake First Nation, Fox Lake Cree Nation and York Factory First Nation
 32 assessed the foreseeable adverse effects of the project and reached a negotiated
 33 agreement as reflected in the Adverse Effects Agreements. Each of the KCN
 34 communities were funded to undertake processes within their respective communities
 35 to consider the project and its potential adverse effects. The monetary value of the four

36 Adverse Effects Agreements was negotiated, giving consideration to a range of factors
37 such as the cost of implementing the Offsetting Programs identified by each community,
38 the population of each community, and their use of the Project area.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024d**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, the Town of Gillam and some
 18 of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of
 19 Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and
 20 Regional Study Areas. Despite this, the Métis have not been considered or assessed as a
 21 distinct group in the Local Study Area.

22 **QUESTION:**

23 In addition to traditional knowledge and past experience, what information from the
 24 environmental and socioeconomic assessment (e.g. regarding potential impacts of the
 25 Project on the KCNs) informed the content of the AEAs?

26 **RESPONSE:**

27 The content of the four AEAs was informed by a range of factors in the environmental
 28 assessment. These factors included: information regarding the physical effects of the
 29 project on land and waters; information regarding furbearers and other mammals;
 30 information regarding domestic resource use related to trapping, hunting, fishing, and
 31 other culturally significant pursuits in the area; a range of demographic information
 32 regarding each community; estimated project-workforce; and a review of the potential
 33 for aquatic effects up and downstream from the project (e.g. change in water levels or
 34 water quality).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024e**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
7 positive and adverse environmental effects of the Project. Measures to mitigate
8 potential effects that are technically and economically feasible will be identified.
9 Potential effects that remain after the application of mitigation will be considered to be
10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
13 traditional knowledge and past experience with hydro development was telling them
14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
15 offsetting programs that are intended to provide replacements and opportunities to
16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 What efforts were undertaken to gather and document Métis past experiences with
24 hydro development and Métis traditional knowledge, with the same purpose of
25 addressing "known and foreseeable adverse effects" on the Métis?

26 **RESPONSE:**

27 The preparation of the Keeyask Environmental Impact Statement involved years of
28 effort to study and document the existing environment in the project area. Efforts were
29 made, throughout the planning process, to provide opportunities for potentially
30 affected or interested parties to learn about the project and to express any concerns.
31 This has primarily been accomplished through the Keeyask Public Involvement Program,
32 which targeted First Nations and other northern Manitoba communities and groups,
33 other interested organizations and the general public. Any Métis individuals in the
34 Project Study Area would have had the opportunity to participate in these sessions and
35 to express any concerns regarding the Keeyask Project.

36 In addition Manitoba Hydro, on behalf of the KHLF, undertook a review of existing
37 literature to determine Métis use of the Resource use Local and Regional study areas
38 identified in the Response to the EIS Guidelines (please see response to TAC Public Rd 2
39 CEAA-0014) .

40 The Manitoba Métis Federation (MMF) has expressed an interest in the Keeyask Project
41 and Manitoba Hydro, on behalf of the Keeyask Hydropower Limited Partnership, has
42 sought to engage with the MMF in a constructive, meaningful and respectful way.

43 Since an introductory meeting in November 2008, Manitoba Hydro, on behalf of the
44 Keeyask Hydropower Limited Partnership, has met regularly with the MMF to explore
45 the interests of the MMF's members in the Keeyask Project area. These discussions have
46 focused largely on the development of a Métis Traditional Land Use and Knowledge
47 Study (TLUKS) and Métis Socio-Economic Impact Assessment for the Keeyask Study
48 Area.

49 Manitoba Hydro (acting on behalf of the Partnership) and the MMF have reached an
50 agreement on a workplan and budget to undertake a Métis-specific Traditional Land Use
51 and Knowledge Study, Socio-economic Impact Assessment and historical narrative for
52 the Keeyask region. It is anticipated that these studies will assist in furthering our
53 understanding of the Métis community in the Keeyask region, and any potential effects
54 that may be experienced as a result developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024f**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 Describe any mitigation or offset programs that include or apply specifically to the
 24 Métis.

25 **RESPONSE:**

26 There are no mitigation or offsetting programs that apply only to the Métis, but all
 27 people (including Métis) are included in mitigation programs that are not restricted to
 28 specific groups.

29 To the extent reasonably practical, Manitoba Hydro seeks to first prevent or avoid works
 30 or measures that might cause adverse effects, and then to lessen or reduce unavoidable
 31 adverse effects. The general mitigation measures which were taken to prevent or avoid,
 32 or lessen and reduce adverse effects, such as the selection of the low-head option,
 33 would apply to any resident or resource user in the area, including any Métis individuals.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024g**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
7 positive and adverse environmental effects of the Project. Measures to mitigate
8 potential effects that are technically and economically feasible will be identified.
9 Potential effects that remain after the application of mitigation will be considered to be
10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
13 traditional knowledge and past experience with hydro development was telling them
14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
15 offsetting programs that are intended to provide replacements and opportunities to
16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 Why was an AEA not negotiated with the Manitoba Métis Federation?

24 **RESPONSE:**

25 Tataskweyak Cree Nation, War Lake First Nation, Fox Lake Cree Nation and York Factory
26 First Nation have significant knowledge about their communities and the broader Study
27 Area. Based on this knowledge, and years of study to document the existing socio-
28 economic environment for the Keeyask Environmental Impact Statement, the Keeyask
29 Hydropower Limited Partnership is not aware of any Métis community in the vicinity of
30 the project or of any potential project impact that is specific to the Métis. As a result,
31 adverse effects agreements were not negotiated with any Métis communities or Métis
32 organizations.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.3**
 2 **Environmental Mitigation/Compensation; 6.6.2 Aboriginal**
 3 **Traditional Knowledge; p. 4-15, 6-430**

4 **CEC Rd 1 MMF-0024h**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 5.1 Project Effects. The EIS will identify the potential
 7 positive and adverse environmental effects of the Project. Measures to mitigate
 8 potential effects that are technically and economically feasible will be identified.
 9 Potential effects that remain after the application of mitigation will be considered to be
 10 potential residual effects.

11 Each of the KCNs negotiated an Adverse Effects Agreement (AEA) with Manitoba Hydro
 12 "...as a proactive approach... ..to address known and foreseeable adverse effects their
 13 traditional knowledge and past experience with hydro development was telling them
 14 would occur" (R to EIS, Section 6.6.2, p. 6-430). The AEAs include mitigation and
 15 offsetting programs that are intended to provide replacements and opportunities to
 16 offset unavoidable adverse effects of the Project (R to EIS, Section 4.3.3, p. 4-15).

17 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 18 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 19 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 20 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 21 assessed as a distinct group in the Local Study Area.

22 **QUESTION:**

23 Explain how impacts on the Métis, as a distinct group in the Local Study Area, have been
 24 adequately mitigated, without consideration of the Métis as a distinct group in the Local
 25 Study Area, and without negotiation of an AEA with the Métis.

26 **RESPONSE:**

27 Based on existing studies of the project area and the experience and expertise of the
 28 Keeyask Cree Nations, the Keeyask Hydropower Limited Partnership does not currently
 29 have any knowledge of how the Métis, as a distinct group of people within the study
 30 area, would be affected any differently by the Keeyask Project than the general
 31 population.

32 Manitoba Hydro (acting on behalf of the Partnership) and the MMF have reached an
 33 agreement on a workplan and budget to undertake a Métis-specific Traditional Land Use
 34 and Knowledge Study, Socio-economic Impact Assessment and historical narrative for

35 the Keeyask region. It is anticipated that these studies will assist in furthering our
36 understanding of the Métis community in the Keeyask region, and any potential effects
37 that may be experienced as a result developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
 2 **Monitoring and Follow-up; p. 8-1, 8-3, 8-6, 8-27 - 8-33**

3 **CEC Rd 1 MMF-0025a**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 6 Follow-up. The EIS will describe a preliminary outline of an environmental protection
 7 program for monitoring and managing the effects of the Project on the biophysical and
 8 socio-economic environments arising from the construction, operation, and
 9 decommissioning of the Project. ...The monitoring programs will determine effects of
 10 the Project, including: whether they are consistent with the analysis in the
 11 environmental impact assessment; whether they assess the effectiveness of remedial
 12 measures; and whether they allow for adaptive management and mitigation measures
 13 to be implemented if unforeseen impacts occur.

14 The EIS states that an Environmental Protection Program will be developed to mitigate,
 15 manage and monitor potential environmental effects during the construction and
 16 operation phases of the Project. It will be comprised of three types of plans: protection
 17 plans, management plans, and monitoring plans (R to EIS, Chapter 8.0, p. 8-1).

18 Environmental monitoring plans are designed "...to measure the actual effects of the
 19 Project, test predictions or identify unanticipated effects" (p. 8-6). A Socio-economic
 20 Monitoring Plan (SEMP) will be developed to monitor effects on components "...such as
 21 employment, business opportunities, traffic, and safety" (R to EIS, Chapter 8.0, p. 8-6).

22 The EIS states that the SEMP will be developed by the Partnership, and it is expected
 23 that the KCNs will play a central role in its development and implementation (R to EIS,
 24 Chapter 8.0, p. 8-27).

25 There are Métis residing in the Local Study Area, including, the Town of Gillam and some
 26 of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of
 27 Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and
 28 Regional Study Areas. Despite this, the Métis have not been considered or assessed as a
 29 distinct group in the Local Study Area.

30 **QUESTION:**

31 Will the Métis, particularly those residing in and using the Local Study Area, be involved
 32 in the development and implementation of the SEMP? If yes, explain to what extent the
 33 Métis will be involved. If no, explain why the Métis will not be involved.

34 **RESPONSE:**

35 As the Project proponent, the Partnership is responsible for developing and
36 implementing the SEMP consistent with commitments made in the Response to EIS
37 Guidelines and final license conditions. A preliminary draft of the SEMP was filed with
38 regulators on June 28, 2013 and is available on the Partnership's Web site at:
39 [http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-
40 environmental-protection-program](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-
40 environmental-protection-program). The SEMP will be finalized upon receipt of all
41 Regulatory approvals and licence conditions for the Keeyask Generation Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
 2 **Monitoring and Follow-up; p. 8-1, 8-3, 8-6, 8-27 to 8-33**

3 **CEC Rd 1 MMF-0025b**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 6 Follow-up. The EIS will describe a preliminary outline of an environmental protection
 7 program for monitoring and managing the effects of the Project on the biophysical and
 8 socio-economic environments arising from the construction, operation, and
 9 decommissioning of the Project. ...The monitoring programs will determine effects of
 10 the Project, including: whether they are consistent with the analysis in the
 11 environmental impact assessment; whether they assess the effectiveness of remedial
 12 measures; and whether they allow for adaptive management and mitigation measures
 13 to be implemented if unforeseen impacts occur.

14 The EIS states that an Environmental Protection Program will be developed to mitigate,
 15 manage and monitor potential environmental effects during the construction and
 16 operation phases of the Project. It will be comprised of three types of plans: protection
 17 plans, management plans, and monitoring plans (R to EIS, Chapter 8.0, p. 8-1).

18 Environmental monitoring plans are designed "...to measure the actual effects of the
 19 Project, test predictions or identify unanticipated effects" (p. 8-6). A Socio-economic
 20 Monitoring Plan (SEMP) will be developed to monitor effects on components "...such as
 21 employment, business opportunities, traffic, and safety" (R to EIS, Chapter 8.0, p. 8-6).

22 The EIS states that the SEMP will be developed by the Partnership, and it is expected
 23 that the KCNs will play a central role in its development and implementation (R to EIS,
 24 Chapter 8.0, p. 8-27).

25 There are Métis residing in the Local Study Area, including, the Town of Gillam and some
 26 of the KCNS. As well, there are Métis living in Regional Study Area, including, the City of
 27 Thompson. These Métis, as well as other Métis, use and rely on the land in the Local and
 28 Regional Study Areas. Despite this, the Métis have not been considered or assessed as a
 29 distinct group in the Local Study Area.

30 **QUESTION:**

31 Where specific impacts on the Métis have not been identified, explain how the SEMP
 32 will "identify unanticipated effects" that are experienced by the Métis as a result of the
 33 Project.

34 **RESPONSE:**

35 As noted in the responses to CEC Rd 1 MMF-0023 and CEC Rd 1 MMF-0027b, to the
36 extent that there are Métis or other Aboriginal citizens resident in the Local or Regional
37 Study Areas, these individuals are included in the assessments of effects of the Project
38 on people in these Study Areas and are captured in the total and Aboriginal populations
39 (where information available) for these Study Areas. As such, socio-economic
40 monitoring of actual Project effects for these Study Areas would also capture the effects
41 to Métis and other Aboriginal citizens resident in these areas.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
 2 **Monitoring and Follow-up; p. 8-1, 8-3, 8-6, 8-27 - 8-33**

3 **CEC Rd 1 MMF-0025c**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 7.0 Environmental Monitoring, Management and
 6 Follow-up. The EIS will describe a preliminary outline of an environmental protection
 7 program for monitoring and managing the effects of the Project on the biophysical and
 8 socio-economic environments arising from the construction, operation, and
 9 decommissioning of the Project. ...The monitoring programs will determine effects of
 10 the Project, including: whether they are consistent with the analysis in the
 11 environmental impact assessment; whether they assess the effectiveness of remedial
 12 measures; and whether they allow for adaptive management and mitigation measures
 13 to be implemented if unforeseen impacts occur.

14 The EIS states that an Environmental Protection Program will be developed to mitigate,
 15 manage and monitor potential environmental effects during the construction and
 16 operation phases of the Project. It will be comprised of three types of plans: protection
 17 plans, management plans, and monitoring plans (R to EIS, Chapter 8.0, p. 8-1).

18 Environmental monitoring plans are designed "...to measure the actual effects of the
 19 Project, test predictions or identify unanticipated effects" (p. 8-6). A Socio-economic
 20 Monitoring Plan (SEMP) will be developed to monitor effects on components "...such as
 21 employment, business opportunities, traffic, and safety" (R to EIS, Chapter 8.0, p. 8-6).

22 The EIS states that the SEMP will be developed by the Partnership, and it is expected
 23 that the KCNs will play a central role in its development and implementation (R to EIS,
 24 Chapter 8.0, p. 8-27).

25 There are Métis residing in the Local Study Area, including, , the Town of Gillam and
 26 some of the KCNS. As well, there are Métis living in Regional Study Area, including, the
 27 City of Thompson. These Métis, as well as other Métis, use and rely on the land in the
 28 Local and Regional Study Areas. Despite this, the Métis have not been considered or
 29 assessed as a distinct group in the Local Study Area.

30 **QUESTION:**

31 Which of the "Supporting Topics or VECs" listed in Table 8-5 (p. 8-28) will have Métis-
 32 specific data gathered and documented as part of the monitoring activities?

33 **RESPONSE:**

34 Métis-specific data gathered as part of monitoring activities will be collected for
35 Employment and Training Opportunities during construction, to the extent individuals
36 self-identify as Métis.

37 For further details, please see the response to CEC Rd MMF-0025b.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 3.4.1.3**
 2 **Manitoba Métis Federation (R to EIS); Appendix 1A - Public**
 3 **Involvement Plan (PIP SV); p. 3-2, 3-3 (R to EIS); 1A-7 (PIP SV)**

4 **CEC Rd 1 MMF-0026**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 3.3.1 – Public Involvement – Aboriginal People. The
 7 EIS will describe the consultation and involvement processes with the Keeyask Cree
 8 Nations (KCN), other First Nations, and Métis related to the environmental assessment.

9 The Public Involvement Plan is described as applying to “Potentially affected Aboriginal
 10 people”, but not to the four “in-vicinity” First Nations (the KCNs). It defines “Potentially
 11 affected Aboriginal people” as “Beyond the in-vicinity First Nations, other Aboriginal
 12 people (First Nation, Métis, and Inuit people) who may be affected by the Project...”
 13 (Public Involvement SV, Appendix 1A, p. 1A-7).

14 There is therefore a distinction between Métis and First Nations who reside in the same
 15 communities in the Local Study Area, with the KCNs defined as “in-vicinity” to the
 16 project while the Métis are not.

17 **QUESTION:**

18 How would the Métis have been engaged differently by Manitoba Hydro if they were
 19 defined and considered as “in-vicinity”, particularly those Métis residing in communities
 20 and using land in the Local Study Area?

21 **RESPONSE:**

22 Métis in the Local Study Area, and elsewhere, have been provided with the same
 23 opportunities to participate in the Partnership’s Public Involvement Program (PIP) as all
 24 other residents of this Study Area, including in-vicinity communities. Opportunities have
 25 been made available through community meetings and public open houses in all Local
 26 Study Area communities, open houses in Winnipeg and meeting in other communities
 27 visited through the PIP program. Efforts have also been made to engage with Métis
 28 citizens through the Manitoba Métis Federation. The Partnership has provided
 29 information in the PIP SV documenting interactions with the Manitoba Métis Federation
 30 up to the time of the EIS submission. This information is found in Appendix 5 of the PIP
 31 SV and will be updated in July 2013 based on the outcomes of PIP Round Three
 32 activities.

33 Please also see the response to CEC Rd 1 MMF-0024e.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-144**

3 **CEC Rd 1 MMF-0027a**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 10 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 11 environment...”

12 The EIS presents information on the levels of educational attainment for the KCNs
 13 Members, the Town of Gillam, and the City of Thompson in the Local Study Area. It also
 14 presents this information for northern Aboriginal residents, comparing it to educational
 15 levels in the Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-144).

16 It does not present information on the levels of educational attainment of the Métis
 17 population in the Local Study Area and Regional Study Area. This information would be
 18 useful for determining the potential Métis labour force, and would be necessary to
 19 measure changes in the levels of education for Métis in the Local and Regional Study
 20 Areas, particularly if these changes are to be attributed to the Project.

21 **QUESTION:**

22 Provide information on the current levels of educational attainment of the Métis
 23 population in the Local Study Area communities.

24 **RESPONSE:**

25 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or
 26 other Aboriginal citizens resident in the Local Study Area, these individuals are included
 27 in the assessment of effects of the Project on people in the Local Study Area, and are
 28 also captured in the total and Aboriginal populations (where available) identified for
 29 each Local Study Area community.

30 Information on the educational attainment of residents in the Local Study Area is
 31 provided in Section 3.3.1 of the SE SV and in Appendix 3-A. The highest level of
 32 education attained for individuals aged 20 years and over was determined using the
 33 2001 Census of Canada. Information provided for Gillam and Thompson includes

34 comparison populations of Northern Aboriginal Residents, the Regional Study Area and
35 Manitoba, all of these would include Métis residents.

36 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
37 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
38 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
39 for Keeyask and historical narratives on Métis use and occupancy in northern Manitoba
40 and in the Keeyask region specifically. It is anticipated these studies will assist in
41 understanding the nature of the Métis community in the Keeyask region, including
42 relevant socio-economic information, and any potential effects that may be experienced
43 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-144**

3 **CEC Rd 1 MMF-0027b**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 10 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 11 environment...”

12 The EIS presents information on the levels of educational attainment for the KCNs
 13 Members, the Town of Gillam, and the City of Thompson in the Local Study Area. It also
 14 presents this information for northern Aboriginal residents, comparing it to educational
 15 levels in the Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-144).

16 It does not present information on the levels of educational attainment of the Métis
 17 population in the Local Study Area and Regional Study Area. This information would be
 18 useful for determining the potential Métis labour force, and would be necessary to
 19 measure changes in the levels of education for Métis in the Local and Regional Study
 20 Areas, particularly if these changes are to be attributed to the Project.

21 **QUESTION:**

22 Provide information on the levels of educational attainment of the Métis population in
 23 the Regional Study Area communities.

24 **RESPONSE:**

25 For purposes of the socio-economic assessment, a Regional Study Area was defined
 26 which includes the population in northern Manitoba defined by the boundary identified
 27 under Schedule D of the current Burntwood Nelson Agreement, and which includes
 28 Census Divisions 19, 21, 22 and 23. To the extent that there are Métis or other
 29 Aboriginal citizens resident in the Regional Study Area, these individuals are included in
 30 the assessments of effects of the Project on people in this Study Area, and are also
 31 captured in the total and Aboriginal populations (where available) identified for the
 32 Regional Study Area..

33 Section 3.3.5.1.2 of the Socio-Economic Supporting Volume (SE SV) includes Table 3-18
 34 which depicts levels of educational attainment for Northern Aboriginal residents, as well

35 as the Regional Study Area and Manitoba based on Statistics Canada data. Statistics
36 Canada defines Aboriginal people as First Nations, Métis and Inuit. (For additional
37 details, please refer to the Socio-Economic Supporting Volume, Appendix 3A, Table 3A-
38 18.)

39 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
40 Partnership) have reached agreement on a Métis-specific study that includes a
41 Traditional Land Use and Knowledge Study, a socio-economic impact assessment for
42 Keeyask and historical narratives on Métis use and occupancy in northern Manitoba and
43 in the Keeyask region specifically. It is anticipated that these studies will assist in
44 understanding the nature of the Métis community in the Keeyask region, including
45 relevant socio-economic information, and any potential effects that may be experienced
46 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-145, 6-146**

3 **CEC Rd 1 MMF-0028a**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 10 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 11 environment...”

12 The Proponent produced an inventory of skills pertinent to Project construction
 13 employment to complement the Statistics Canada information that was gathered. For
 14 the KCNs, “...this provides a more direct estimate of individuals who may be qualified for
 15 Project construction jobs” (R to EIS, Section 6.2.3.5.2, p. 6-145). The EIS (Table 6-12)
 16 presents estimates of the number of KCNs Members with relevant skills according to
 17 broad job categories required for Project construction, for the years 2014 (construction
 18 start) and 2021 (construction end) (R to EIS, Section 6.2.3.5.2, p. 6-146).

19 The EIS does not provide the equivalent information for the Métis population in the
 20 Local Study Area and the Regional Study Area. This information would be useful for
 21 determining the potential Métis labour force, and would be necessary to measure
 22 changes in the skill levels and employability of Métis in the Local and Regional Study
 23 Areas, particularly if these changes are to be attributed to the Project.

24 **QUESTION:**

25 Provide information on the current (i.e. 2014, construction start) levels of skills by
 26 occupational category for the Métis population in the Local Study Area communities and
 27 Regional Study Area.

28 **RESPONSE:**

29 As noted in the responses to CEC Rd 1 MMF-0023 and CEC Rd 1 MMF-0027b, to the
 30 extent that there are Métis or other Aboriginal citizens resident in the Local or Regional
 31 Study Areas, these individuals are included in the assessments of effects of the Project
 32 on people in these Study Areas and captured in the total and Aboriginal populations
 33 (where information available) for these Study Areas.

34 Section 3.3.1.3.3 of the Socio-Economic Supporting Volume (SE SV) contains information
35 on the levels of skills by occupational category in Gillam – this would include any Métis
36 residents. Further details are included in Appendix 3A, Table 3A9. For Thompson, data
37 on levels of skills by occupational category are contained in Table 3-9 in Section 3.3.1.4.3
38 (with further details in Appendix 3A, Table 3A-13). These tables include comparison
39 populations of Northern Aboriginal Residents, the Regional Study Area and Manitoba –
40 all of which include Métis citizens.

41 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
42 Partnership) have reached agreement on a Métis-specific study that includes a
43 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment for
44 Keeyask and historical narratives on Métis use and occupancy in northern Manitoba and
45 in the Keeyask region specifically. It is anticipated that these studies will assist in
46 understanding the nature of the Métis community in the Keeyask region, including
47 relevant socio-economic information, and any potential effects that may be experienced
48 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-145, 6-146**

3 **CEC Rd 1 MMF-0028b**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 10 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 11 environment...”

12 The Proponent produced an inventory of skills pertinent to Project construction
 13 employment to complement the Statistics Canada information that was gathered. For
 14 the KCNs, “...this provides a more direct estimate of individuals who may be qualified for
 15 Project construction jobs” (R to EIS, Section 6.2.3.5.2, p. 6-145). The EIS (Table 6-12)
 16 presents estimates of the number of KCNs Members with relevant skills according to
 17 broad job categories required for Project construction, for the years 2014 (construction
 18 start) and 2021 (construction end) (R to EIS, Section 6.2.3.5.2, p. 6-146).

19 The EIS does not provide the equivalent information for the Métis population in the
 20 Local Study Area and the Regional Study Area. This information would be useful for
 21 determining the potential Métis labour force, and would be necessary to measure
 22 changes in the skill levels and employability of Métis in the Local and Regional Study
 23 Areas, particularly if these changes are to be attributed to the Project.

24 **QUESTION:**

25 Provide information on the estimated levels of skills by occupational category for the
 26 Métis population in the Local Study Area communities and Regional Study Area in 2021
 27 (construction end).

28 **RESPONSE:**

29 Please see response to CEC Rd 1 MMF-0028a.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy (R to EIS); 3.3.1.1 Pre-Project Training - Hydro**
 3 **Northern Training and Employment Initiative (SE SV); p. 6-140 (R**
 4 **to EIS); Table 3-2, p. 3-20 (SE SV)**

5 **CEC Rd 1 MMF-0029a**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 8 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 9 the regional centre, with an emphasis on the labour force, employment, unemployment,
 10 income, and education and training, and with a profile of local business capacity (e.g.,
 11 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 12 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 13 environment...”

14 The EIS describes the Hydro Northern Training and Employment Initiative (HNTEI) as a
 15 pre-project training initiative, implemented to prepare Aboriginal northerners to
 16 participate in the construction employment and business opportunities available from
 17 northern hydroelectric development, including the Keeyask Projects (R to EIS, Section
 18 6.2.3.5.2, p. 6-140). Ninety-one members of the MMF are reported to have completed
 19 courses or programs (2009, 2010) (Socio-economic SV, Table 3-2, p. 3-20).

20 **QUESTION:**

21 Provide information regarding the level of Métis enrollment in this initiative to compare
 22 to the numbers of course and program completions.

23 **RESPONSE:**

24 149 MMF members participated in 266 training activities. Overall there was a 69%
 25 success rate in completing 183 of the 266 training activities (also see CEC Rd 1 MMF-
 26 0029b).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy (R to EIS); 3.3.1.1 Pre-Project Training - Hydro**
 3 **Northern Training and Employment Initiative (SE SV); p. 6-140 (R**
 4 **to EIS); Table 3-2, p. 3-20 (SE SV)**

5 **CEC Rd 1 MMF-0029b**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 8 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 9 the regional centre, with an emphasis on the labour force, employment, unemployment,
 10 income, and education and training, and with a profile of local business capacity (e.g.,
 11 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 12 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 13 environment...”

14 The EIS describes the Hydro Northern Training and Employment Initiative (HNTEI) as a
 15 pre-project training initiative, implemented to prepare Aboriginal northerners to
 16 participate in the construction employment and business opportunities available from
 17 northern hydroelectric development, including the Keeyask Projects (R to EIS, Section
 18 6.2.3.5.2, p. 6-140). Ninety-one members of the MMF are reported to have completed
 19 courses or programs (2009, 2010) (Socio-economic SV, Table 3-2, p. 3-20).

20 **QUESTION:**

21 Provide information regarding the employment of Métis participants following
 22 completion of the courses and programs, as well as the number of Métis estimated to
 23 be employed on the Keeyask Project as a result of participation in this initiative.

24 **RESPONSE:**

25 As stated in the SE SV, Section 3.3.1.1, pg. 3-18, “a pre-project training initiative called
 26 the Hydro Northern Training and Employment Initiative (HNTEI) was implemented to
 27 prepare Aboriginal northerners to participate in the construction employment and
 28 business opportunities available from northern hydroelectric development, including
 29 Wuskwatim and Keeyask Projects.” HNTEI was designed and delivered largely through
 30 community-based programs, including through the Manitoba Métis Federation (MMF).
 31 The \$60 million initiative was funded by Manitoba Hydro, Canada and the Province of
 32 Manitoba.

33 As noted in CEC Rd 1 MMF-0029a, 149 MMF members participated in 266 training
 34 activities during HNTEI. Table 3-2 in Section 3.3.1.1 of the SE SV presents a further

35 breakdown of the HNTEI participants with completed courses or programs by job
 36 category in occupational classifications that align with Keeyask workforce estimates,
 37 including MMF participants. Within these classifications, there were 91 MMF
 38 participants who completed courses or programs:

- 39 • 9 in designated trades;
- 40 • 12 in construction support; and
- 41 • 70 in non-designated trades.

42 In addition to the above, during the last 3 months of HNTEI (January to March 31, 2010),
 43 statistics gathered reported 91 MMF trainees employed during that time with the
 44 following employers:

- 45 • Wuskwatim Project (4)
- 46 • Manitoba Hydro Operations (5)
- 47 • Province of Manitoba (4)
- 48 • Employed In-Community – multiple employers (11)
- 49 • Northern Manitoba—multiple employers (51)
- 50 • Out of Province (6)
- 51 • Southern Manitoba (7)
- 52 • Self-Employed (3)

53 As noted in the response to CEC Rd 1 MMF-0031a, estimates of Métis employment in
 54 Keeyask project construction are included within the estimates provided in the
 55 Response to EIS Guidelines for Aboriginal residents in the Regional Study Area.

56 In terms of operation phase employment, Section 3.4.2.1 of the SE SV provides an
 57 estimate of operation and maintenance staff requirements for the Keeyask Project.
 58 These jobs would be open to any qualified individual, including Métis workers. As noted
 59 in the response to CEC Rd 1 MMF-0031a, Manitoba Hydro and the Manitoba Métis
 60 Federation signed an agreement in 2004 to jointly develop a Career Development
 61 Partnership Program. This program aims to achieve an employment objective of 100
 62 permanent positions for Métis citizens in the Trades, Technical, Semi-professional and
 63 Professional occupations over a 7 to 10 year time frame. As of June 2013, there have
 64 been 64 Métis hires achieved through this partnership. It is possible that some of these
 65 individuals may be hired into operational jobs at the Keeyask Generation Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-141, 6-142**

3 **CEC Rd 1 MMF-0030a**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).”

10 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 11 environment... ..the EIS will identify the effects of the Project on the environment...”

12 The EIS presents information on the potential labour force in the KCNs communities, the
 13 Town of Gillam, the City of Thompson, and general labour force information for the
 14 Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-142). It does not present
 15 information on the Métis potential labour force in the Local Study Area and Regional
 16 Study Area.

17 To estimate the extent to which KCNs Members and the Regional Study Area Aboriginal
 18 workforce would participate in construction employment opportunities, a labour
 19 supply/demand model was developed (R to EIS, Section 6.6.3.1.1, p. 6-433). It does not
 20 include data on the potential labour force of the Métis, and nor does it provide
 21 information specific to the estimated levels of Métis participation in construction
 22 employment.

23 **QUESTION:**

24 Provide information on the potential labour force of the Métis in the Local Study Area
 25 communities, equivalent to the potential labour force information provided for the
 26 KCNs, Gillam, and Thompson.

27 **RESPONSE:**

28 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or
 29 other Aboriginal citizens resident in the Local Study Area, these individuals are included
 30 in the assessments of effects of the Project on people in the Local Study Area, and are
 31 also captured in the total and Aboriginal populations (where available) identified for
 32 each Local Study Area community

33 Section 3.3.1.3.1 of the Socio-Economic Supporting Volume (SE SV) contains information
34 on the labour force of residents of Gillam – data are presented in Figures 3-5 and 3-6
35 (for a more detailed analysis, see Appendix 3A, Tables 3A-6 and 3A-7). Figure 3-6 shows
36 employment, participation and unemployment rates in Gillam as compared to Northern
37 Aboriginal Residents, the Regional Study Area and Manitoba. Thompson data on labour
38 force are presented in Figures 3-8 and 3-9 in Section 3.3.1.4.1, with comparisons to
39 Northern Aboriginal Residents, the Regional Study Area and Manitoba, respectively
40 (more detailed analysis is in Appendix 3A, Tables 3A-10 and 3A-11). All groups in these
41 figures and tables include a Métis population.

42 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
43 Partnership) have reached agreement on a Métis-specific study that includes a
44 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment for
45 Keeyask and historical narratives on Métis use and occupancy in northern Manitoba and
46 in the Keeyask region specifically. It is anticipated that these studies will assist in
47 understanding the nature of the Métis community in the Keeyask region, including
48 relevant socio-economic information, and any potential effects that may be experienced
49 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy; p. 6-141, 6-142**

3 **CEC Rd 1 MMF-0030b**

4 **PREAMBLE:**

5 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 6 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 7 the regional centre, with an emphasis on the labour force, employment, unemployment,
 8 income, and education and training, and with a profile of local business capacity (e.g.,
 9 goods and services).” 5.1 – Project Effects: “Based on the description of the Project...
 10 ...and the existing environment... ..the EIS will identify the effects of the Project on the
 11 environment...”

12 The EIS presents information on the potential labour force in the KCNs communities, the
 13 Town of Gillam, the City of Thompson, and general labour force information for the
 14 Regional Study Area (R to EIS, Section 6.2.3.5.2, p. 6-142). It does not present
 15 information on the Métis potential labour force in the Local Study Area and Regional
 16 Study Area.

17 To estimate the extent to which KCNs Members and the Regional Study Area Aboriginal
 18 workforce would participate in construction employment opportunities, a labour
 19 supply/demand model was developed (R to EIS, Section 6.6.3.1.1, p. 6-433). It does not
 20 include data on the potential labour force of the Métis, and nor does it provide
 21 information specific to the estimated levels of Métis participation in construction
 22 employment.

23 **QUESTION:**

24 Provide information on the potential labour force of the Métis in the Regional Study
 25 Area.

26 **RESPONSE:**

27 As noted in the response to CEC Rd 1 MMF-0027b, to the extent that there are Métis or
 28 other Aboriginal citizens resident in the Regional Study Area, these individuals are
 29 included in the assessments of effects of the Project on people in the Regional Study
 30 Area and are captured in the total and Aboriginal populations (where information
 31 available) for this Study Area.

32 As noted in the preamble to the question, the potential labour force for the Regional
 33 Study Area, including the total Aboriginal labour force, is presented in the Section
 34 6.6.3.1.1 of the Response to EIS Guidelines.

35 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
36 Partnership) have reached agreement on a Métis-specific study that includes a
37 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment for
38 Keeyask and historical narratives on Métis use and occupancy in northern Manitoba and
39 in the Keeyask region specifically. It is anticipated that these studies will assist in
40 understanding the nature of the Métis community in the Keeyask region, including
41 relevant socio-economic information, and any potential effects that may be experienced
42 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3**
 2 **Economy (R to EIS); 3.0 Economy (SE SV); p. 6-434, 6-435 (R to**
 3 **EIS); 3-98, 3-125 (SE SV)**

4 **CEC Rd 1 MMF-0031a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 7 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 8 the regional centre, with an emphasis on the labour force, employment, unemployment,
 9 income, and education and training, and with a profile of local business capacity (e.g.,
 10 goods and services).”

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 The EIS states that the Project is expected to generate “...an estimated 235 to 600
 14 person years of construction employment for KCNs Members, which equates to 6-14%
 15 of the total construction workforce” (R to EIS, Section 6.6.3, p. 6-434). During
 16 construction, the JKDA includes an employment target of 630 person-years of
 17 employment for the KCNs. The target includes their participation in construction of the
 18 Keeyask Generation Project as well as their participation in employment opportunities
 19 associated with the Keeyask Infrastructure Project (R to EIS, Section 6.2.3.5.2, p. 6-435;
 20 Socio-economic SV, Section 3, p. 3-98). With regard to “Aboriginal workers from the
 21 Regional Study Area” the EIS states that the Project “is expected to provide substantial
 22 construction employment... ..ranging from an estimated 550 to 1,700 person years. At
 23 these levels, between 13% and 40% of total construction employment would be filled by
 24 Aboriginal workers from the Regional Study Area” (R to EIS, Section 6.6.3, p. 6-435).

25 Commitments in the JKDA also include 20-year targets for employment of KCNs
 26 Members during operations with Manitoba Hydro, across Manitoba Hydro’s entire
 27 system, not just for the Keeyask Generation Project. The target level of employment for
 28 all four KCNs is 182 jobs, with 100 jobs for TCN Members, 10 for WLFN Members, 36 for
 29 YFFN Members, and 36 for FLCN Members by 2029 (Socio-economic SV, Section 3, p. 3-
 30 125).

31 The EIS distinguishes between the KCNs, Gillam, and Thompson in the Local Study Area,
 32 and Aboriginal workers from the Regional Study Area (which includes the KCNs). In
 33 doing so, it does not include specific information on estimated levels of employment of
 34 Métis in the Local Study Area and the Regional Study Area during construction and
 35 operations.

36 **QUESTION:**

- 37 • Provide information on the estimated (or anticipated) levels of employment for the
38 Métis as follows:
- 39 ○ What is the estimated level of construction employment for Métis in the
40 Local Study Area?
 - 41 ○ What is the estimated level of construction employment for Métis in the
42 Regional Study Area?
 - 43 ○ What is the estimated level of operations employment for Métis in the Local
44 Study Area?
 - 45 ○ What is the estimated level of operations employment for Métis in the
46 Regional Study Area?

47 **RESPONSE:**

48 As noted in the responses to CEC Rd 1 MMF-0023 and CEC Rd 1 MMF-0027b, to the
49 extent that there are Métis or other Aboriginal citizens resident in the Local or Regional
50 Study Areas, these individuals are included in the assessments of effects of the Project
51 on people in these Study Areas and are captured in the total and Aboriginal populations
52 (where information available) for these Study Areas. This includes the analysis of
53 potential Project employment for the Local and Regional Study areas – i.e., estimates of
54 overall Aboriginal employment for these regions includes Métis employment.

55 Estimates of level of construction employment for Aboriginal residents in the Regional
56 Study Area are included in the SE SV Section 3.4.1.7.1 Tables 3-26 (high employment
57 estimate) and 3-27 (low employment estimate) for the Churchill-Burntwood-Nelson
58 (CBN) area. These tables present person-years of construction employment estimated
59 to be taken up by qualified Aboriginal residents of the CBN area by job category – this
60 includes any Métis residents of this area.

61 “Aboriginal workers from the CBN area [including Métis residents] are predicted
62 to obtain between 390 and 1,195 person –years of employment, representing
63 9% (low estimate) and 28 % (high estimate) of Project construction employment
64 opportunities. ”

65 As noted in the preamble, in addition to the CBN area, the estimated range of
66 participation by Aboriginal workers from the Regional Study Area (including Métis
67 workers) was between 13% (low estimate) and 40% (high estimate) of total Project
68 construction employment, representing between 550 and 1,700 person-years of
69 employment (see Tables 3-28 and 3-29 in Section 3.4.1.7.2 of the SE SV for details).

70 In terms of operation phase employment, Section 3.4.2.1 of the SE SV provides an
71 estimate of operation and maintenance staff requirements for the Keeyask Project.
72 These jobs would be open to any qualified individuals, including Métis workers.

73 It should be noted that the Manitoba Métis Federation and Manitoba Hydro (acting on
74 behalf of the Partnership) have reached agreement on a workplan and budget to
75 undertake a Métis-specific Traditional Land Use and Knowledge Study, Socio-economic
76 Impact Assessment and historical narrative for the Keeyask region. It is anticipated that
77 these studies will assist in understanding the nature of the Métis in the Keeyask area,
78 and any potential effects that may be experienced as a result of developing the Project.

79 Outside of the Keeyask Generation Project, in 2002, Manitoba Hydro and the Manitoba
80 Métis Federation signed a Memorandum of Understanding, which established the MMF-
81 Hydro Employment Working Group. The intent of this Working Group is to support,
82 develop and increase Métis employment opportunities within Manitoba Hydro's
83 workforce. Manitoba Hydro and the Manitoba Métis Federation also signed an
84 agreement in 2004 to jointly develop a Career Development Partnership Program.
85 Manitoba Hydro and the Manitoba Métis Federation continue to work cooperatively on
86 this Career Development Partnership, which is aimed at achieving an employment
87 objective of 100 permanent positions to be held by Métis citizens in the Trades,
88 Technical, Semi-professional and Professional occupations over a 7 to 10 year time
89 frame. As of June 2013, there have been 64 Métis hires achieved through this
90 partnership. It is possible that future hires may be for operational positions at the
91 Keeyask Generation Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3**
 2 **Economy (R to EIS); 3.0 Economy (SE SV); p. 6-434, 6-435 (R to**
 3 **EIS); 3-98, 3-125 (SE SV)**

4 **CEC Rd 1 MMF-0031b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 7 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 8 the regional centre, with an emphasis on the labour force, employment, unemployment,
 9 income, and education and training, and with a profile of local business capacity (e.g.,
 10 goods and services).”

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 The EIS states that the Project is expected to generate “...an estimated 235 to 600
 14 person years of construction employment for KCNs Members, which equates to 6-14%
 15 of the total construction workforce” (R to EIS, Section 6.6.3, p. 6-434). During
 16 construction, the JKDA includes an employment target of 630 person-years of
 17 employment for the KCNs. The target includes their participation in construction of the
 18 Keeyask Generation Project as well as their participation in employment opportunities
 19 associated with the Keeyask Infrastructure Project (R to EIS, Section 6.2.3.5.2, p. 6-435;
 20 Socio-economic SV, Section 3, p. 3-98). With regard to “Aboriginal workers from the
 21 Regional Study Area” the EIS states that the Project “is expected to provide substantial
 22 construction employment... ..ranging from an estimated 550 to 1,700 person years. At
 23 these levels, between 13% and 40% of total construction employment would be filled by
 24 Aboriginal workers from the Regional Study Area” (R to EIS, Section 6.6.3, p. 6-435).

25 Commitments in the JKDA also include 20-year targets for employment of KCNs
 26 Members during operations with Manitoba Hydro, across Manitoba Hydro’s entire
 27 system, not just for the Keeyask Generation Project. The target level of employment for
 28 all four KCNs is 182 jobs, with 100 jobs for TCN Members, 10 for WLFN Members, 36 for
 29 YFFN Members, and 36 for FLCN Members by 2029 (Socio-economic SV, Section 3, p. 3-
 30 125).

31 The EIS distinguishes between the KCNs, Gillam, and Thompson in the Local Study Area,
 32 and Aboriginal workers from the Regional Study Area (which includes the KCNs). In
 33 doing so, it does not include specific information on estimated levels of employment of
 34 Métis in the Local Study Area and the Regional Study Area during construction and
 35 operations.

36 **QUESTION:**

37 Why are no targets established for Métis participation in construction and operations
38 employment?

39 **RESPONSE:**

40 The JKDA and the Environmental Impact statement (EIS) are two different documents
41 with unique purposes. The JKDA sets out negotiated arrangements between the Project
42 Partners, including employment *targets* for construction and operation phases. In terms
43 of predicting project effects, the EIS portrays the Partnership's best understanding of
44 potential employment impacts, or *estimates* based on pathways of effect that connect
45 relevant features of the Project (e.g., employment opportunities) to the socio-economic
46 environment (e.g. labour force) in which the Project would occur. The EIS, in its function
47 of an assessment tool, does not assume to establish targets for any group, Aboriginal or
48 otherwise.

49 As noted in the response to CEC Rd 1 MMF-0031a, Manitoba Hydro and the Manitoba
50 Métis Federation signed an agreement in 2004 to jointly develop a Career Development
51 Partnership Program. This program aims to achieve an employment objective of 100
52 permanent positions for Métis citizens in the Trades, Technical, Semi-professional and
53 Professional occupations over a 7 to 10 year time frame.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.6.4.1.1 Population; p. 6-450**

3 **CEC Rd 1 MMF-0032a**

4 **PREAMBLE:**

5 EIS Scoping Document Reference:

- 6 • 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local
 7 Aboriginal and non-Aboriginal communities and the regional centre, with an
 8 emphasis on the labour force, employment, unemployment, income, and education
 9 and training, and with a profile of local business capacity (e.g., goods and services).”
 10 • 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 11 environment... ..the EIS will identify the effects of the Project on the
 12 environment...”

13 The EIS states that KCNs Members would qualify for Project hiring preferences
 14 “...regardless of their home address within the province of Manitoba...” (R to EIS,
 15 Section 6.6.4.1.1, p. 6-450) and as such, would not need to move to communities in the
 16 Local Study Area. This measure is intended to address potential in-migration to, and
 17 crowding in, the Local Study Area communities; however, it has implications for the
 18 Métis in terms of hiring preferences.

19 **QUESTION:**

20 Confirm whether KCN Members residing outside of the Local Study Area will be given
 21 employment preference to equally qualified Métis residing within the Local Study Area.

22 **RESPONSE:**

23 The short answer is no. For contractor hiring on open-tendered contracts KCN Members
 24 residing outside the Local Study Area will not be given priority over equally qualified
 25 Métis residing within the Local Study Area (or residing within the Regional Study Area
 26 for the socio-economic assessment). Northern Aboriginals residing in the
 27 Churchill/Burntwood/Nelson River Area (i.e., the Regional Study Area for socio-
 28 economic assessment) fall within the first hiring preference outlined in the BNA Article
 29 12.1.1.3 (a). This first preference was extended to KCN Members residing anywhere in
 30 Manitoba through provisions of the JKDA and subsequently negotiated as a Letter of
 31 Agreement to the BNA. As both KCN members residing in Manitoba and Métis residing
 32 within the Regional Study Area fall within the same first hiring preference, they will be
 33 selected on the basis of their qualifications.

- 34 While the above applies to open-tendered contracts, for Direct Negotiation Contracts
- 35 (DNC) with the KCN, each KCN is entitled to give a first preference to its own members.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.6.4.1.1 Population; p. 6-450**

3 **CEC Rd 1 MMF-0032b**

4 **PREAMBLE:**

5 EIS Scoping Document Reference:

- 6 • 4.2.1 – Economy: “The EIS will describe... ..The regional economy, in particular local
7 Aboriginal and non-Aboriginal communities and the regional centre, with an
8 emphasis on the labour force, employment, unemployment, income, and education
9 and training, and with a profile of local business capacity (e.g., goods and services).”
10 • 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
11 environment... ..the EIS will identify the effects of the Project on the
12 environment...”

13 The EIS states that KCNs Members would qualify for Project hiring preferences
14 “...regardless of their home address within the province of Manitoba...” (R to EIS,
15 Section 6.6.4.1.1, p. 6-450) and as such, would not need to move to communities in the
16 Local Study Area. This measure is intended to address potential in-migration to, and
17 crowding in, the Local Study Area communities; however, it has implications for the
18 Métis in terms of hiring preferences.

19 **QUESTION:**

20 If employment preference is given to KCN Members, provide a rationale for this
21 provision.

22 **RESPONSE:**

23 See the response to CEC Rd 1 MMF-0032a.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy, 6.6.3.2 Business Opportunities; p. 6-146, 6-438**
 3 **- 6-442**

4 **CEC Rd 1 MMF-0033a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 7 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 8 the regional centre, with an emphasis on the labour force, employment, unemployment,
 9 income, and education and training, and with a profile of local business capacity (e.g.,
 10 goods and services).”

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 The EIS presents information about the capacity of existing businesses to participate in
 14 opportunities that may arise from the Project, and states that “KCNs businesses are of
 15 particular interest given the direct negotiated contracts (DNCs) that will be made
 16 available to them as a result of the JKDA” (R to EIS, Section 6.2.3.5.2, p. 6-146). It
 17 provides a description of the range of KCNs Members’ businesses with the potential for
 18 participating in Keeyask-related contracts, and then describes the capacity of Gillam and
 19 Thompson to supply needed services to the Project (R to EIS, Section 6.2.3.5.2, p.6-146).
 20 The EIS concludes that “...the majority of business opportunities in the Local Study Area
 21 are expected to flow to the KCNs through DNCs” (R to EIS, Section 6.6.3.2, p. 6-439) and
 22 further, that “Business effects in the Regional Study Area are expected to be minimal in
 23 comparison to communities in the Local Study Area.” (R to EIS, Section 6.6.3.2, p. 6-
 24 438).

25 It is not apparent whether any efforts were undertaken to determine the presence and
 26 capacity of Métis-owned businesses in the Local Study Area communities (i.e. including
 27 in Gillam and in Thompson) and the Regional Study Area. The extent to which Métis-
 28 owned businesses can be anticipated to participate in opportunities that may arise from
 29 the Project is also not known.

30 **QUESTION:**

31 Describe the efforts that were undertaken to determine the presence and capacity of
 32 Métis-owned businesses in the Local Study Area communities and the Regional Study
 33 Area that could participate in opportunities to supply services to the Project.

34 **RESPONSE:**

35 The baseline analysis of businesses in the Local Study Area considered all businesses in
 36 the region, including Aboriginal and non-Aboriginal, which could potentially participate
 37 in Keeyask related contracts (see SE SV Section 3.3.2). Similar to the qualification noted
 38 in the response to CEC Rd 1 MMF-0031b, the JKDA outlines employment targets and the
 39 business opportunities that would be available as Direct Negotiation Contracts (DNC).
 40 Other work will be contracted via an open tender process. Métis vendors would be
 41 open to tendering on this work.

42 Manitoba Hydro's Northern Purchasing Policy encourages and promotes the maximum
 43 business participation of northern Manitoba's local communities and businesses,
 44 particularly local Aboriginal communities and businesses. Regarding the procurement
 45 process, Manitoba Hydro maintains a Vendor Database which is populated based on
 46 vendor input via Vendor Registration (see website
 47 http://www.hydro.mb.ca/selling_to_mh/vendor_information.shtml). Vendors are
 48 asked to self declare status of being a Northern Aboriginal Contractor. Definitions are:

- 49 1. **Northern Aboriginal:** A First Nations, Non-status Indian, Métis or Inuit person who
 50 has resided in Manitoba, north of the Northern Affairs Boundary (open new
 51 window), for a cumulative period of 5 years or more.
 52 2. **Northern Aboriginal contractor:** a Northern business (including Aboriginal Joint
 53 Venture, partnership or corporation) that is:
 54 • at least 51 per cent owned and controlled by a Northern Aboriginal; AND
 55 • if the business has 6 or more full-time staff, at least one-third of them are
 56 Aboriginal people.

57 MH Purchasing would not be able to provide specific information regarding vendors that
 58 are Métis based. The preference under the Northern Purchasing Policy (NPP) would be
 59 for Northern Aboriginal of which Métis is a subset.

60 It should be noted that the Manitoba Métis Federation and Manitoba Hydro (acting on
 61 behalf of the Partnership) have reached agreement on a workplan and budget to
 62 undertake a Métis-specific Traditional Land Use and Knowledge Study, Socio-economic
 63 Impact Assessment and historical narrative for the Keeyask region. It is anticipated that
 64 these studies will assist in understanding the nature of Métis business in the Keeyask
 65 region, and any potential effects that may be experienced as a result of developing the
 66 Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy, 6.6.3.2 Business Opportunities; p. 6-146, 6-438**
 3 **- 6-442**

4 **CEC Rd 1 MMF-0033b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 7 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 8 the regional centre, with an emphasis on the labour force, employment, unemployment,
 9 income, and education and training, and with a profile of local business capacity (e.g.,
 10 goods and services).”

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 The EIS presents information about the capacity of existing businesses to participate in
 14 opportunities that may arise from the Project, and states that “KCNs businesses are of
 15 particular interest given the direct negotiated contracts (DNCs) that will be made
 16 available to them as a result of the JKDA” (R to EIS, Section 6.2.3.5.2, p. 6-146). It
 17 provides a description of the range of KCNs Members’ businesses with the potential for
 18 participating in Keeyask-related contracts, and then describes the capacity of Gillam and
 19 Thompson to supply needed services to the Project (R to EIS, Section 6.2.3.5.2, p.6-146).
 20 The EIS concludes that “...the majority of business opportunities in the Local Study Area
 21 are expected to flow to the KCNs through DNCs” (R to EIS, Section 6.6.3.2, p. 6-439) and
 22 further, that “Business effects in the Regional Study Area are expected to be minimal in
 23 comparison to communities in the Local Study Area.” (R to EIS, Section 6.6.3.2, p. 6-
 24 438).

25 It is not apparent whether any efforts were undertaken to determine the presence and
 26 capacity of Métis-owned businesses in the Local Study Area communities (i.e. including
 27 in Gillam and in Thompson) and the Regional Study Area. The extent to which Métis-
 28 owned businesses can be anticipated to participate in opportunities that may arise from
 29 the Project is also not known.

30 **QUESTION:**

31 Provide information on the number of Métis-owned businesses in the Local Study Area
 32 communities and the Regional Study Area that provide services needed by the project,
 33 regardless of whether these can be met by existing KCNs Members’ businesses.

34 **RESPONSE:**

35 Please refer to the response to CEC Rd 1MMF-0033a.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.2 Economy, 6.6.3.2 Business Opportunities; p. 6-146, 6-438**
 3 **- 6-442**

4 **CEC Rd 1 MMF-0033c**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.1 – Economy: “The EIS will describe... ..The
 7 regional economy, in particular local Aboriginal and non-Aboriginal communities and
 8 the regional centre, with an emphasis on the labour force, employment, unemployment,
 9 income, and education and training, and with a profile of local business capacity (e.g.,
 10 goods and services).”

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 The EIS presents information about the capacity of existing businesses to participate in
 14 opportunities that may arise from the Project, and states that “KCNs businesses are of
 15 particular interest given the direct negotiated contracts (DNCs) that will be made
 16 available to them as a result of the JKDA” (R to EIS, Section 6.2.3.5.2, p. 6-146). It
 17 provides a description of the range of KCNs Members’ businesses with the potential for
 18 participating in Keeyask-related contracts, and then describes the capacity of Gillam and
 19 Thompson to supply needed services to the Project (R to EIS, Section 6.2.3.5.2, p.6-146).
 20 The EIS concludes that “...the majority of business opportunities in the Local Study Area
 21 are expected to flow to the KCNs through DNCs” (R to EIS, Section 6.6.3.2, p. 6-439) and
 22 further, that “Business effects in the Regional Study Area are expected to be minimal in
 23 comparison to communities in the Local Study Area.” (R to EIS, Section 6.6.3.2, p. 6-
 24 438).

25 It is not apparent whether any efforts were undertaken to determine the presence and
 26 capacity of Métis-owned businesses in the Local Study Area communities (i.e. including
 27 in Gillam and in Thompson) and the Regional Study Area. The extent to which Métis-
 28 owned businesses can be anticipated to participate in opportunities that may arise from
 29 the Project is also not known.

30 **QUESTION:**

31 Provide an estimate of the extent to which the above-identified Métis-owned
 32 businesses can expect to participate in opportunities that may arise from the Project.

33 **RESPONSE:**

34 Please refer to the response to CEC Rd 1 MMF-0033a.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.1**
 3 **Population (R to EIS); 4.0 Population, Infrastructure and Services**
 4 **(SE SV); p. 6-148 - 6-151, 6-449 - 6-451 (R to EIS); 4-34, 4-97 (SE**
 5 **SV)**

6 **CEC Rd 1 MMF-0034a**

7 **PREAMBLE:**

8 EIS Scoping Document Reference: 4.2.2 – Population, Infrastructure, and Services: “The
 9 EIS will describe the following attributes in the relevant study area(s): Existing
 10 population distribution and demographics, ...”.

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 As stated in the EIS, “Population is a supporting topic that leads to an understanding of
 14 changes to housing, infrastructure and services” (R to EIS, Section 6.6.4.1, p. 6-449).
 15 Using Statistics Canada 2006 Census data, the EIS provides the populations of (1) the
 16 KCNs combined, including both on- and off-reserve Members, (2) Gillam, and (3)
 17 Thompson. The EIS then provides population projections to understand population
 18 growth both with and without the project. The analysis focuses on the Local Study Area;
 19 the Project is not expected to result in population changes in the Regional Study Area (R
 20 to EIS, Section 6.2.3.5.3, p.6-149, p. 6-150; R to EIS, Section 6.6.4.1, p. 6-449, p. 6-450).

21 Forty-five percent of the population of Gillam self-identified as Aboriginal in the 2006
 22 Census (Socio-economic SV, Section 4, p. 4-34), while 72% of the population of the
 23 Regional Study Area is identified as Aboriginal (Socio-economic SV, Section 4, p. 4-97).
 24 The EIS, however, does not present information regarding the Métis population in the
 25 Local Study Area communities, or the distribution of the Métis population in the Local
 26 and Regional Study Areas. This information would enable a better understanding of how
 27 the Métis residing in communities in the Local Study Area might experience impacts as a
 28 result of changes in population. This understanding is particularly critical, as the Métis
 29 are not specifically included in the mitigation and offsetting programs conducted as part
 30 of the Adverse Effect Agreements (AEAs) negotiated between the KCNs and Manitoba
 31 Hydro.

32 **QUESTION:**

33 Provide estimates of the Métis population in the Local Study Area, including, specific
 34 communities.

35 **RESPONSE:**

36 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or
37 other Aboriginal citizens resident in the Local Study Area, these individuals are included
38 in the assessment of effects of the Project on people in the Local Study Area, and are
39 also captured in the total and Aboriginal populations (where available) identified for
40 each Local Study Area community (see SE SV Section 4.3.1).

41 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
42 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
43 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
44 and historical narrative for the Keeyask region. It is anticipated that these studies will
45 assist in understanding the nature of the Métis community in the Keeyask region,
46 including overall population, and any potential effects that may be experienced as a
47 result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.1**
 3 **Population (R to EIS); 4.0 Population, Infrastructure and Services**
 4 **(SE SV); p. 6-148 - 6-151, 6-449 - 6-451 (R to EIS); 4-34, 4-97 (SE**
 5 **SV)**

6 **CEC Rd 1 MMF-0034b**

7 **PREAMBLE:**

8 EIS Scoping Document Reference: 4.2.2 – Population, Infrastructure, and Services: “The
 9 EIS will describe the following attributes in the relevant study area(s): Existing
 10 population distribution and demographics, ...”.

11 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 12 environment... ..the EIS will identify the effects of the Project on the environment...”

13 As stated in the EIS, “Population is a supporting topic that leads to an understanding of
 14 changes to housing, infrastructure and services” (R to EIS, Section 6.6.4.1, p. 6-449).
 15 Using Statistics Canada 2006 Census data, the EIS provides the populations of (1) the
 16 KCNs combined, including both on- and off-reserve Members, (2) Gillam, and (3)
 17 Thompson. The EIS then provides population projections to understand population
 18 growth both with and without the project. The analysis focuses on the Local Study Area;
 19 the Project is not expected to result in population changes in the Regional Study Area (R
 20 to EIS, Section 6.2.3.5.3, p.6-149, p. 6-150; R to EIS, Section 6.6.4.1, p. 6-449, p. 6-450).

21 Forty-five percent of the population of Gillam self-identified as Aboriginal in the 2006
 22 Census (Socio-economic SV, Section 4, p. 4-34), while 72% of the population of the
 23 Regional Study Area is identified as Aboriginal (Socio-economic SV, Section 4, p. 4-97).
 24 The EIS, however, does not present information regarding the Métis population in the
 25 Local Study Area communities, or the distribution of the Métis population in the Local
 26 and Regional Study Areas. This information would enable a better understanding of how
 27 the Métis residing in communities in the Local Study Area might experience impacts as a
 28 result of changes in population. This understanding is particularly critical, as the Métis
 29 are not specifically included in the mitigation and offsetting programs conducted as part
 30 of the Adverse Effect Agreements (AEAs) negotiated between the KCNs and Manitoba
 31 Hydro.

32 **QUESTION:**

33 Provide estimates of the Métis population in the Regional Study Area, including, specific
 34 communities.

35 **RESPONSE:**

36 As noted in the response to CEC Rd 1 MMF-0027b, to the extent that there are Métis or
37 other Aboriginal citizens resident in the Regional Study Area, these individuals are
38 included in the assessment of effects of the Project on people in this Study Area, and are
39 also captured in the Study Area's total and Aboriginal populations (where available).

40 Regional Study Area population is included in SE SV Section 4.3.6, pgs. 4-97 through 4-
41 99.

42 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
43 Partnership) have reached agreement on a Métis-specific study that includes a
44 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment and
45 historical narratives on Métis use and occupancy in northern Manitoba and in the
46 Keeyask region specifically. It is anticipated that these studies will assist in
47 understanding the nature of the Métis community in the Keeyask region, including
48 overall population, and any potential effects that may be experienced as a result of
49 developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.2 Housing;**
 3 **p. 6-152, 6-153, 6-453 - 6-455**

4 **CEC Rd 1 MMF-0035a**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.2 – Population, Infrastructure, and Services: “The
 7 EIS will describe the following attributes in the relevant study area(s): Existing
 8 infrastructure and services of Aboriginal and other in-vicinity communities, including...
 9 ...housing/accommodation supply...”

10 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 11 environment... ..the EIS will identify the effects of the Project on the environment...”

12 The EIS describes the current availability of housing in the KCNs communities, Gillam,
 13 and Thompson (R to EIS, Section 6.2.3.5.3, p. 6-152), and predicts the residual effects of
 14 Project construction on housing in the KCNs communities, Gillam and Thompson to be
 15 adverse, in terms of the demand that will be created for housing, particularly temporary
 16 housing, during construction, and in the context of current levels of housing availability
 17 (R to EIS, Section 6.6.4.2, p. 6-453).

18 It is necessary to understand how adverse impacts on housing during construction might
 19 be experienced by the Métis populations residing in Local Study Area communities. (To
 20 understand the magnitude of this impact, it is necessary to understand the size of the
 21 Métis populations in the Local Study Area communities. A previous IR requested that
 22 the Proponent provide an estimate of the Métis populations in the Local Study Area
 23 communities).

24 **QUESTION:**

25 Predict how the Métis population in the Local Study Area communities, particularly
 26 Gillam, might be anticipated to experience adverse effects on the availability of housing
 27 during construction.

28 **RESPONSE:**

29 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or other
 30 Aboriginal citizens resident in the Local Study Area, these individuals are included in the
 31 assessment of effects of the Project on people in the Local Study Area. .As stated in Section
 32 4.4.1.1.2 of the Socio-Economic Supporting Volume (SE SV), housing for workers will be
 33 provided at the construction camp(s); this applies to any Métis members being
 34 employed on the Project.

35 The effects on housing in Gillam and Thompson are reported in Sections 4.4.1.2.2 and
36 4.4.1.2.3 of the SE SV, respectively. For both communities increased demand for housing
37 would be limited to short-term accommodation by Project labour force temporarily
38 visiting the area and opting to stay in Gillam and Thompson, rather than at the Main
39 Camp (about 1% of total Project labour force) (see response to CEC Rd 1 CEC-0016); as
40 well as construction workers who travel to these communities during time off.

41 No additional demand for housing is expected in other Local Study Area communities
42 during the construction period, as outlined in Section 6.6.4.2 of the Response to EIS
43 Guidelines.

44 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
45 Partnership) have reached agreement on a Métis-specific study that includes a
46 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment and
47 historical narratives on Métis use and occupancy in northern Manitoba and in the
48 Keeyask region specifically. It is anticipated that these studies will assist in
49 understanding the nature of the Métis community in the Keeyask region, including
50 relevant socio-economic information, and any potential effects that may be experienced
51 as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.2 Housing;**
3 **p. 6-152, 6-153, 6-453 - 6-455**

4 **CEC Rd 1 MMF-0035b**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.2 – Population, Infrastructure, and Services: “The
7 EIS will describe the following attributes in the relevant study area(s): Existing
8 infrastructure and services of Aboriginal and other in-vicinity communities, including...
9 ...housing/accommodation supply...”

10 5.1 – Project Effects: “Based on the description of the Project... ...and the existing
11 environment... ...the EIS will identify the effects of the Project on the environment...”

12 The EIS describes the current availability of housing in the KCNs communities, Gillam,
13 and Thompson (R to EIS, Section 6.2.3.5.3, p. 6-152), and predicts the residual effects of
14 Project construction on housing in the KCNs communities, Gillam and Thompson to be
15 adverse, in terms of the demand that will be created for housing, particularly temporary
16 housing, during construction, and in the context of current levels of housing availability
17 (R to EIS, Section 6.6.4.2, p. 6-453).

18 It is necessary to understand how adverse impacts on housing during construction might
19 be experienced by the Métis populations residing in Local Study Area communities. (To
20 understand the magnitude of this impact, it is necessary to understand the size of the
21 Métis populations in the Local Study Area communities. A previous IR requested that
22 the Proponent provide an estimate of the Métis populations in the Local Study Area
23 communities).

24 **QUESTION:**

25 Identify measures that could be implemented, and identify the party or parties
26 responsible for their implementation, to lessen the predicted adverse effects to housing
27 as specifically experienced by the Métis.

28 **RESPONSE:**

29 As noted in the response to CEC Rd 1 MMF-0035a, there are no anticipated effects to
30 housing as a result of project construction, other than an increased demand for short-
31 term accommodation in Gillam and Thompson. Given this, no mitigation is required or
32 planned.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.5.3 Population, Infrastructure and Services, 6.6.4.3**
 3 **Infrastructure and Services; p. 6-153 to 6-156, 6-455 to 6-459**

4 **CEC Rd 1 MMF-0036**

5 **PREAMBLE:**

6 EIS Scoping Document Reference: 4.2.2 – Population, Infrastructure, and Services: “The
 7 EIS will describe the following attributes in the relevant study area(s): Existing
 8 infrastructure and services of Aboriginal and other in-vicinity communities...”

9 5.1 – Project Effects: “Based on the description of the Project... ..and the existing
 10 environment... ..the EIS will identify the effects of the Project on the environment...”

11 The EIS describes existing infrastructure and service delivery in the KCNs, Gillam and
 12 Thompson (R to EIS, Section 6.2.3.5.3, p. 6-153 to 6-156), and predicts residual effects of
 13 Project construction on the infrastructure and services of the Local Study Area
 14 communities to be adverse (R to EIS, Section 6.6.4.3, p. 6-458). To address adverse
 15 effects, mitigation measures are provided for Local Study Area communities (R to EIS,
 16 Section 6.6.4.3, p. 6-458). As well, new infrastructure and services are included in the
 17 AEAs negotiated between each of the KCNs and Manitoba Hydro (R to EIS, Section
 18 6.6.4.3, Table 6-45, p.6-457).

19 It is necessary to understand how adverse impacts on infrastructure and services during
 20 construction might be experienced by the Métis populations residing in Local Study Area
 21 communities. (To understand the magnitude of this impact, it is necessary to
 22 understand the size of the Métis populations in the Local Study Area communities. A
 23 previous IR requested that the Proponent provide an estimate of the Métis populations
 24 in the Local Study Area communities). This understanding is particularly critical, as
 25 Manitoba Hydro has not negotiated an AEA with the Métis in the Local Study Area, and
 26 as such, several of the new infrastructure and services that will be available to the KCNs
 27 will not be available to the Métis in the Local Study Area communities.

28 **QUESTION:**

- 29 a. Predict how the Métis population in the Local Study Area communities, particularly
 30 Gillam, might be anticipated to experience adverse effects on infrastructure and
 31 services during construction.
- 32 b. Identify measures that could be implemented, and identify the party or parties
 33 responsible for their implementation, to lessen the predicted adverse effects to
 34 infrastructure and services as specifically experienced by the Métis.

35 **RESPONSE:**

36 Responses to each of the above questions are provided below.

37 *a. Predict how the Métis population in the Local Study Area communities, particularly*
 38 *Gillam, might be anticipated to experience adverse effects on infrastructure and*
 39 *services during construction.*

40 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or
 41 other Aboriginal citizens resident in the Local Study Area, these individuals are included
 42 in the assessment of effects of the Project on people in the Local Study Area.

43 Section 4.4.1.3.2 of the SE SV provides the effects assessment of the Project on
 44 infrastructure and services in Gillam during the construction phase; and Section
 45 4.4.1.3.3 provides effects on infrastructure and services in Thompson. As Métis people
 46 live in both these communities, the effects assessment completed for residents of
 47 Gillam and Thompson also apply to Métis residents of these communities.

48 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
 49 Partnership) have reached agreement on a Métis-specific study that includes a
 50 Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment for
 51 Keeyask and historical narratives on Métis use and occupancy in northern Manitoba and
 52 in the Keeyask region specifically. It is anticipated that these studies will assist in
 53 understanding the nature of the Métis community in the Keeyask region, including any
 54 Métis-specific infrastructure and services, as well as any potential effects that may be
 55 experienced as a result of developing the Project.

56 *b. Identify measures that could be implemented, and identify the party or parties*
 57 *responsible for their implementation, to lessen the predicted adverse effects to*
 58 *infrastructure and services as specifically experienced by the Métis.*

59 The Partnership, in its EIS filing, has identified the mitigation and monitoring measures it
 60 believes are appropriate to address the Project's potential adverse effects to
 61 infrastructure and services in the Local Study Area. These are documented in Section
 62 6.6.4 of the Response to EIS Guidelines.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.5.1**
 2 **– Governance, Goals and Plans, 6.6.5.2 – Community Health, 6.6.5.3**
 3 **– Mercury and Human Health, 6.6.5.6 – Culture and Spirituality; p.**
 4 **6-465 to 6-468, 6-468 to 6-473, 6-473 to 6-478, 6-490 to 6-497**

5 **CEC Rd 1 MMF-0037**

6 **PREAMBLE:**

7 EIS Scoping Document Reference: 4.2.3 – Personal, Family and Community Life: The EIS
 8 will describe the following attributes in the relevant study area(s): public safety; travel,
 9 access and safety; aesthetics; health status and health issues; culture and spirituality;
 10 governance, goals and plans.

11 Some of the VECs used to assess the effects of the Project on personal, family and
 12 community life in the Local Study Area include (1) Governance, Goals and Plans, (2)
 13 Community Health, and (3) Mercury and Human Health. The assessment results for each
 14 of these VECs are described below.

15 **Governance, Goals and Plans**

16 *“Overall, the expected and likely Project residual effects on the KCNs governance, goals*
 17 *and plans are expected to be positive due to existing provisions of the JKDA and AEA*
 18 *and ongoing involvement in Project committees and the Board. Residual effects on*
 19 *Gillam and Thompson governance, goals and plans are expected to be neutral (due to*
 20 *the planning processes already in hand)” (R to EIS, Section 6.6.5.1, p. 6-468).*

21 In the discussion for this VEC, a description of Métis governance, goals and plans, and
 22 how the Project could be expected to impact these, is not included. Furthermore, and as
 23 evident in the above text, the Proponent is relying on the JKDA and the AEA to mitigate
 24 impacts to the KCNs. This has implications for the Métis, with whom Manitoba Hydro
 25 has not negotiated an AEA.

26 **Community Health**

27 *“Overall, residual Project effects on community health are expected to be adverse for the*
 28 *construction phase due to the potential for increased alcohol and drug use, adverse*
 29 *worker interactions and worry about impending changes to the environment; and*
 30 *positive for the operation phase due to the implementation of AEA programs and the*
 31 *commitment to ongoing communication and planning” (R to EIS, Section 6.6.5.2, p. 6-*
 32 *473).*

33 In the discussion for this VEC, there is no description of Project effects on the
 34 community health of the Métis population in the Local Study Area communities.
 35 Furthermore, and as evident in the above text, the Proponent is relying on the JKDA and
 36 the AEAs to mitigate impacts to the KCNs. This has implications for the Métis, with
 37 whom Manitoba Hydro has not negotiated an AEA.

38 **Mercury and Human Health**

39 As part of the assessment, a human health risk assessment was conducted.

40 *“The human health risk assessment evaluated the potential exposure to methylmercury*
 41 *for the KCNs, as these are the communities at greatest risk due to their use of country*
 42 *foods. Although the human health risk assessment focused on the KCNs, the baseline*
 43 *conditions and results of the risk assessment are also generally applicable to non-First*
 44 *Nation individuals who use Stephens Lake and/or Gull Lake for resource harvesting in a*
 45 *similar capacity” (R to EIS, Section 6.6.5.3, p.6-474).*

46 The EIS predicted residual Project effects on mercury and human health to be adverse
 47 during the operation phase, *“due to the elevated levels of methylmercury in country*
 48 *foods” (R to EIS, Section 6.6.5.3, p. 6-478).* To mitigate adverse effects, the Proponent
 49 has referred to the AEAs. *“Reduced use of country foods may have its own health effects.*
 50 *To address this concern, fish replacement programs have been included in each of the*
 51 *KCNs AEAs as a key measure to encourage continued use of country food from areas*
 52 *unaffected by the Project” (R to EIS, Section 6.6.5.3, p. 6-477).*

53 In the discussion for this VEC, and apparent in the above text, the Proponent is relying
 54 on the JKDA and the AEAs to mitigate impacts to the KCNs. This has implications for the
 55 Métis, with whom Manitoba Hydro has not negotiated an AEA.

56 **Culture and Spirituality**

57 The discussion of this VEC is restricted to the KCNs; there is no apparent consideration
 58 of the impacts of the Project on Métis culture and spirituality. Overall, the residual
 59 Project effects on culture and spirituality are expected to be adverse (R to EIS, Section
 60 6.6.5.6, p.6-496). To address these adverse effects, the Proponent refers to the AEAs
 61 negotiated between Manitoba Hydro and the KCNs. *“Within each agreement, a set of*
 62 *cultural and AEA offsetting programs were developed which deal directly with the*
 63 *potential adverse effects of the Project on culture and spirituality” (R to EIS, Section*
 64 *6.6.5.6, p. 6-491).*

65 **QUESTION:**

66 For each of the VECs described above, explain how adverse impacts on the Métis
 67 population residing in the Local Study Area communities will be identified and managed,

68 particularly in the absence of an AEA between Manitoba Hydro and the Métis, and given
69 the lack of mitigation and offset programs included in the AEAs between Manitoba
70 Hydro and the KCNs.

71 **RESPONSE:**

72 Please see responses to MMF-0024e, f, g and h regarding review of discussions with the
73 MMF, the extent to which the EIS identifies and manages adverse effects on people
74 residing in the Local Study Area, why an AEA has not been negotiated with the Métis,
75 and how the Partnership, to date, does not have any knowledge of how the Métis, as a
76 distinct group of people within the Local Study Area, would be affected any differently
77 by the Keeyask Project than the general population in this Local Study Area.

78 As noted in the response to CEC Rd 1 MMF-0023, to the extent that there are Métis or
79 other Aboriginal citizens resident in the Local Study Area, these individuals are included
80 in the assessment of effects of the Project on people in the Local Study Area, including
81 those identified for the above topics.

82 As noted in the response to CEC Rd 1 MMF-0024f, there are no mitigation or offsetting
83 programs that apply only to the Métis, but all people (including Métis) resident in the
84 Local Study Area are included in mitigation programs that are not restricted to specific
85 groups.

86 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
87 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
88 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
89 and historical narrative for the Keeyask region. It is anticipated that these studies will
90 assist in understanding the nature of the Métis community in the Keeyask region, and
91 any potential effects that may be experienced as a result of developing the Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.5**
 2 **Resource Economy; p. 6-444**

3 **CEC Rd 1 MMF-0038a**

4 **PREAMBLE:**

5 According to the summary contained in Section 1.2, Socio-Economic Environment,
 6 Resource Use and Heritage Resources, Supporting Volume 1, pages 1-3 to 1-6, the
 7 process to arrive at the conclusions presented in the EIS with respect to effects
 8 assessment, mitigation, and characterization of residual effects concerning Aboriginal
 9 use of land and resources for traditional purposes was carried out over an approximate
 10 20-year period. This process culminated in an EIS that only assesses effects on Aboriginal
 11 groups collectively referred to as the KCN's.

12 Chapter 6, Section 6.6.3.5, Page 6-444 states; "There is no evidence to date on effects
 13 on members of the Manitoba Métis Federationat the time this report was submitted.
 14 Manitoba Hydro has been working with the Manitoba Métis Federation ...to undertake
 15 studies identifying any effects of the Project related to resource use of the area by their
 16 members, these studies will be funded by Manitoba Hydro (see PIP Section 3.4.1.)"

17 Also, Supporting Volume, Socio-Economic Environment, Resource Use and Heritage
 18 Resources, Section 1.2.2.1, Page 1-7 states; "Use of the Local Study Area by other
 19 Aboriginal groups has not been identified through the Public Involvement Program or
 20 through direct consultations with Aboriginal groups and communities (see PIP SV).
 21 Therefore no effects to other Aboriginal groups have been identified. Ongoing
 22 discussions are occurring with the Manitoba Métis Federation..."

23 To date, no arrangement has been concluded to enable the Manitoba Métis Federation
 24 to document the use of lands and resources for traditional purposes by Manitoba Métis
 25 in the Regional or Local Study Areas, which would provide the necessary foundational
 26 baseline in which to consider Project effects on this Aboriginal group.

27 The assessment of Project impacts on KCN's traditional use prior to application of
 28 mitigation measures contained in the Adverse Effects Agreements is highly qualitative.
 29 The EIS findings are that the mitigation and compensation measures in these Adverse
 30 Effects Agreements, in combination with other identified mitigation will result in neutral
 31 residual effects on traditional use.

32 **QUESTION:**

33 Given the lack of quantitative assessment of project effects on traditional use in the
 34 absence of Adverse Effects Agreement mitigation and compensation measures, how

35 does the Proponent intend to assess project effects on Manitoba Métis use of lands and
36 resources for traditional purposes, when and if, the Manitoba Métis Federation is
37 enabled to document current and future traditional use?

38 **RESPONSE:**

39 Please see responses to CEC Rd 1 MMF-0024 e, f, g and h.

40 The Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
41 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
42 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
43 and historical narrative for the Keeyask region. It is anticipated that these studies will
44 assist in understanding the nature of the Métis community in the Keeyask region, and
45 any potential effects that may be experienced as a result of developing the Project.

46 In the interim, the response to TAC Public Rd 1 CEAA-0014 provides the Partnership's
47 current understanding (from available information) of Métis use of lands and resources
48 for traditional purposes in the Keeyask area and potential Project effects on the Métis.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.5**
 2 **Resource Economy; p. 6-444**

3 **CEC Rd 1 MMF-0038b**

4 **PREAMBLE:**

5 According to the summary contained in Section 1.2, Socio-Economic Environment,
 6 Resource Use and Heritage Resources, Supporting Volume 1, pages 1-3 to 1-6, the
 7 process to arrive at the conclusions presented in the EIS with respect to effects
 8 assessment, mitigation, and characterization of residual effects concerning Aboriginal
 9 use of land and resources for traditional purposes was carried out over an approximate
 10 20-year period. This process culminated in an EIS that only assesses effects on Aboriginal
 11 groups collectively referred to as the KCN's.

12 Chapter 6, Section 6.6.3.5, Page 6-444 states; "There is no evidence to date on effects
 13 on members of the Manitoba Métis Federationat the time this report was submitted.
 14 Manitoba Hydro has been working with the Manitoba Métis Federation ...to undertake
 15 studies identifying any effects of the Project related to resource use of the area by their
 16 members, these studies will be funded by Manitoba Hydro (see PIP Section 3.4.1.)"

17 Also, Supporting Volume, Socio-Economic Environment, Resource Use and Heritage
 18 Resources, Section 1.2.2.1, Page 1-7 states; "Use of the Local Study Area by other
 19 Aboriginal groups has not been identified through the Public Involvement Program or
 20 through direct consultations with Aboriginal groups and communities (see PIP SV).
 21 Therefore no effects to other Aboriginal groups have been identified. Ongoing
 22 discussions are occurring with the Manitoba Métis Federation..."

23 To date, no arrangement has been concluded to enable the Manitoba Métis Federation
 24 to document the use of lands and resources for traditional purposes by Manitoba Métis
 25 in the Regional or Local Study Areas, which would provide the necessary foundational
 26 baseline in which to consider Project effects on this Aboriginal group.

27 The assessment of Project impacts on KCN's traditional use prior to application of
 28 mitigation measures contained in the Adverse Effects Agreements is highly qualitative.
 29 The EIS findings are that the mitigation and compensation measures in these Adverse
 30 Effects Agreements, in combination with other identified mitigation will result in neutral
 31 residual effects on traditional use.

32 **QUESTION:**

33 In the event that the Manitoba Métis Federation is enabled to document Manitoba
 34 Métis traditional use in the Regional and Local Study Areas, how will the Proponent

35 work with the Manitoba Métis Federation to assess project effects, develop appropriate
36 mitigation measures, and assess and characterize residual effects, if any?

37 **RESPONSE:**

38 As noted in the response to CEC Rd 1 MMF-0038a and in other Information requests,
39 the Manitoba Métis Federation and Manitoba Hydro (acting on behalf of the
40 Partnership) have reached agreement on a workplan and budget to undertake a Métis-
41 specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment
42 and historical narrative for the Keeyask region.

43 The details of the agreed to approach to assess effects are contained within the
44 Contribution Agreement for this workplan and budget signed by the MMF and Manitoba
45 Hydro.

46 Manitoba Hydro, on behalf of the Partnership, remains committed to consider any
47 additional information provided on the use of lands and resources for traditional
48 purposes by the Métis. Upon review of any information provided, Manitoba Hydro, on
49 behalf of the Partnership, will consider the need to develop appropriate mitigation
50 strategies, if necessary.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.5**
 2 **Resource Economy; p. 6-444**

3 **CEC Rd 1 MMF-0038c**

4 **PREAMBLE:**

5 According to the summary contained in Section 1.2, Socio-Economic Environment,
 6 Resource Use and Heritage Resources, Supporting Volume 1, pages 1-3 to 1-6, the
 7 process to arrive at the conclusions presented in the EIS with respect to effects
 8 assessment, mitigation, and characterization of residual effects concerning Aboriginal
 9 use of land and resources for traditional purposes was carried out over an approximate
 10 20-year period. This process culminated in an EIS that only assesses effects on Aboriginal
 11 groups collectively referred to as the KCN's.

12 Chapter 6, Section 6.6.3.5, Page 6-444 states; "There is no evidence to date on effects
 13 on members of the Manitoba Métis Federationat the time this report was submitted.
 14 Manitoba Hydro has been working with the Manitoba Métis Federation ...to undertake
 15 studies identifying any effects of the Project related to resource use of the area by their
 16 members, these studies will be funded by Manitoba Hydro (see PIP Section 3.4.1.)"

17 Also, Supporting Volume, Socio-Economic Environment, Resource Use and Heritage
 18 Resources, Section 1.2.2.1, Page 1-7 states; "Use of the Local Study Area by other
 19 Aboriginal groups has not been identified through the Public Involvement Program or
 20 through direct consultations with Aboriginal groups and communities (see PIP SV).
 21 Therefore no effects to other Aboriginal groups have been identified. Ongoing
 22 discussions are occurring with the Manitoba Métis Federation..."

23 To date, no arrangement has been concluded to enable the Manitoba Métis Federation
 24 to document the use of lands and resources for traditional purposes by Manitoba Métis
 25 in the Regional or Local Study Areas, which would provide the necessary foundational
 26 baseline in which to consider Project effects on this Aboriginal group.

27 The assessment of Project impacts on KCN's traditional use prior to application of
 28 mitigation measures contained in the Adverse Effects Agreements is highly qualitative.
 29 The EIS findings are that the mitigation and compensation measures in these Adverse
 30 Effects Agreements, in combination with other identified mitigation will result in neutral
 31 residual effects on traditional use.

32 **QUESTION:**

33 In the event that the Manitoba Métis Federation is not enabled to document Manitoba
 34 Métis traditional use in the Regional and Local Study Areas, how will the Proponent

35 address this gap in the EIS and address paragraph 9.1.3 of the CEAA Guidelines (March
 36 2012), and paragraph 4.2.4 of the Scoping Document for the Environmental Assessment
 37 of the Keeyask Generation Project (December 2011)?

38 **RESPONSE:**

39 Manitoba Hydro, on behalf of the Partnership has reached an agreement (June 21,
 40 2013) with the MMF on MMF-led studies including a Keeyask Traditional Land Use and
 41 Knowledge Study, a socio-economic impact assessment and two historical narratives to
 42 better understand the potential effects of the Keeyask Project on the Métis.

43 Accordingly, the Manitoba Métis Federation has been enabled to document Manitoba
 44 Métis traditional use in the Regional and Local Study Areas (see also response to CEC Rd
 45 1 MMF-0024e and MMF-0038b regarding the commitments of the Partnership to
 46 consider any additional information provided in this regard).

47 The EIS combined with other information filed by the Partnership complies with the
 48 requirements of the referenced sections of the EIS Guidelines and the Scoping
 49 Document.

50 Section 4.2.4 of the Scoping Document prepared by the Partnership stated, in part, that
 51 in describing the socio-economic resource use environment, the EIS will focus on the
 52 following land and resource use attributes in the relevant study area:

- 53 • “Based on the information provided by Aboriginal groups or, if Aboriginal groups do
 54 not provide this information, on available information from other sources, a
 55 description of the following:
- 56 ○ “Current and proposed uses of land and resources by each Aboriginal group
 57 for traditional purposes, i.e., hunting, fishing, trapping, cultural and other
 58 traditional uses of the land (e.g., collection of medicinal plants and uses of
 59 sacred sites);
 - 60 ○ Land and water access into the area by Aboriginal people;
 - 61 ○ Water and ice routes, modes of transportation, and timing of water/ice
 62 route usage; and
 - 63 ○ Navigation and navigation safety” (CEAA 2012 p.23).

64 The EIS Guidelines prepared in March 2012 by CEAA also required a description of the
 65 potential effects of the Project on Aboriginal groups pertaining to resource use (Section
 66 9.1.3) including the following requirements:

- 67 • “Effects the Project may have on the current use of lands and resources for
 68 traditional purposes by Aboriginal peoples, including but not limited to hunting,
 69 fishing, navigation, trapping, gathering, cultural or other traditional uses of the land
 70 (e.g., collection of medicinal plants, use of sacred sites) as well as related effects on

71 lifestyle, culture, quality of life of Aboriginal groups and measures to avoid, mitigate,
72 compensate or accommodate effects on traditional uses; and
73 • Effects of alterations to access into the area on Aboriginal groups, including
74 deactivation or reclamation of access roads..." (CEAA 2012 p.27).

75 The Partnership addressed these guidelines in the Response to EIS Guidelines and in
76 response to a request for additional information (see TAC Public Rd 2 CEAA-0014). In
77 response to TAC Public Rd 2 CEAA-0014, the Partnership has provided a document
78 entitled "Manitoba Métis: a review of available information on the current use of lands
79 and resources for traditional purposes in the Keeyask resource use regional study area
80 and potential effects of the Keeyask Generation Project on those uses". The MMF has
81 had the opportunity to review this document and notes that it disagrees with its
82 conclusions.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.5**
 2 **Resource Economy; p. 6-446 to 6-449**

3 **CEC Rd 1 MMF-0039a**

4 **PREAMBLE:**

5 The EIS evaluates the effects of the Project on the “cash and in-kind income and
 6 livelihood” of resource users in the KCNs communities, and concludes that these are
 7 expected to be neutral during construction and operations as a result of mitigation.
 8 “Losses of in-kind income from reduced domestic resource use in the vicinity of the
 9 Project are expected to be mitigated by the AEA offsetting programs that provide access
 10 to resource harvesting at alternative and unaffected locations as well as to healthy fish
 11 for consumption in communities” (R to EIS, Section 6.6.3.5.1, p.6-447).

12 There are Métis residing in the Local and Regional Study Areas. These Métis, as well as
 13 other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this,
 14 the EIS does not include an assessment of the impacts of the Project on the resource
 15 economy (i.e. the cash and in-kind income and livelihood) of the Métis. It states that the
 16 Proponent has been working with the MMF to undertake studies “...identifying any
 17 effects of the Project related to resource use of the area by their members...” but that
 18 “...there is no evidence to date of effects on members of the Manitoba Métis
 19 Federation... ..at the time this report was submitted” (R to EIS, Section 6.6.3.5, p.6-446).

20 The Métis anticipate adverse effects as a result of the Project on their cash and in-kind
 21 income and livelihood. Furthermore, and as evident in the preceding text, the
 22 Proponent is relying on the AEAs to mitigate impacts to the KCNs. This has implications
 23 for the Métis, with whom Manitoba Hydro has not negotiated an AEA. As such, no
 24 mitigation is in place to address the adverse economic effects anticipated by the Métis
 25 as a result of changes in their resource use.

26 **QUESTION:**

27 In the absence of studies identifying the effects of the Project on resource use by the
 28 Métis, on what information did the Proponent base their conclusion that “...there is no
 29 evidence to date of effects on members of the Manitoba Métis Federation...”?

30 **RESPONSE:**

31 The statement simply states that there is no evidence *to date* from work done, including
 32 engagement activities and efforts to secure information relevant to the assessment of
 33 effects (see response to CEC Rd 1 MMF-0024e regarding such efforts directly with the
 34 MMF).

35 As noted in the response to MMF-0038c, the Partnership has provided a document
36 containing additional information on Métis land and resource use (in response to TAC
37 Public Rd 2 CEAA-0014). Within that document, a description of the efforts to engage
38 Métis people through the PIP process is documented, as well as a description of the
39 numerous direct consultations with the MMF since 2008 (a full description of the
40 meetings held are located in the PIP SV Appendix 5).

41 Manitoba Hydro, on behalf of the Partnership, has reached an agreement (June 21,
42 2013) with the MMF to undertake Métis-specific studies including a Keeyask Traditional
43 Land Use and Knowledge Study, a socio-economic impact assessment and two historical
44 narratives to better understand the potential effects of the Keeyask Project on the
45 Métis. The Partnership has committed to consider any information that is provided by
46 these studies (see response to CEC Rd 1 MMF-0038b).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.6.3.5**
 2 **Resource Economy; p. 6-446 to 6-449**

3 **CEC Rd 1 MMF-0039b**

4 **PREAMBLE:**

5 The EIS evaluates the effects of the Project on the “cash and in-kind income and
 6 livelihood” of resource users in the KCNs communities, and concludes that these are
 7 expected to be neutral during construction and operations as a result of mitigation.
 8 “Losses of in-kind income from reduced domestic resource use in the vicinity of the
 9 Project are expected to be mitigated by the AEA offsetting programs that provide access
 10 to resource harvesting at alternative and unaffected locations as well as to healthy fish
 11 for consumption in communities” (R to EIS, Section 6.6.3.5.1, p.6-447).

12 There are Métis residing in the Local and Regional Study Areas. These Métis, as well as
 13 other Métis, use and rely on the land in the Local and Regional Study Areas. Despite this,
 14 the EIS does not include an assessment of the impacts of the Project on the resource
 15 economy (i.e. the cash and in-kind income and livelihood) of the Métis. It states that the
 16 Proponent has been working with the MMF to undertake studies “...identifying any
 17 effects of the Project related to resource use of the area by their members...” but that
 18 “...there is no evidence to date of effects on members of the Manitoba Métis
 19 Federation... ..at the time this report was submitted” (R to EIS, Section 6.6.3.5, p.6-446).

20 The Métis anticipate adverse effects as a result of the Project on their cash and in-kind
 21 income and livelihood. Furthermore, and as evident in the preceding text, the
 22 Proponent is relying on the AEAs to mitigate impacts to the KCNs. This has implications
 23 for the Métis, with whom Manitoba Hydro has not negotiated an AEA. As such, no
 24 mitigation is in place to address the adverse economic effects anticipated by the Métis
 25 as a result of changes in their resource use.

26 **QUESTION:**

27 How will impacts on the resource economy of the Métis be identified and managed,
 28 particularly in the absence of an AEA between Manitoba Hydro and the Métis, and given
 29 the lack of mitigation and offset programs included in the AEAs between Manitoba
 30 Hydro and the KCNs?

31 **RESPONSE:**

32 It is assumed that the latter portion of this question was intended to read “...given the
 33 mitigation and offset programs included in the AEAs between Manitoba Hydro and the
 34 KCNs”.

35 In-kind income relates to losses of opportunity to harvest fish and wildlife for food
36 (which substitutes for income that would otherwise be used to purchase food). As noted
37 in the response to TAC Public Rd 2 CEAA-0014, based on available information, no effect
38 on the Métis can be determined at this time.

39 Manitoba Hydro, on behalf of the Partnership, has reached an agreement (June 21,
40 2013) with the MMF to undertake Métis-specific studies including a Keeyask Traditional
41 Land Use and Knowledge Study, a socio-economic impact assessment and two historical
42 narratives to better understand the potential effects of the Keeyask Project on the
43 Métis. Upon review of any information provided, Manitoba Hydro (on behalf of the
44 Partnership) will consider the need to develop appropriate mitigation strategies, if
45 necessary.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **4.3.3.2.3 Terrestrial Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0001a**

4 **PREAMBLE:**

5 On page 4-17, in Chapter 4, during mitigation discussions, the method employed for
6 wetland mitigation will include the “Development of wetlands to offset potentially
7 important wetlands”. Wetlands serve many ecological functions which provide water
8 quality ecological services such as the regulation of water flows, which purifies water;
9 the filtering, retention and storage of fresh water; the maintenance of arable land and
10 prevents water silting by lowering soil losses; and the removal, breakdown or
11 abatements of pollution. In order to “offset” the important wetlands during mitigation,
12 these specific services need to be assessed (preferably spatially and temporally
13 quantified in GIS- mapped) in order to know what is being provided by the existing
14 wetland function.

15 **QUESTION:**

16 Which studies, methodologies, data sets, and assessment approaches did Manitoba
17 Hydro use to assess the ecosystem services and functions provided by wetlands to be
18 mitigated? Please provide verification of the basis for the planned mitigation activities
19 via studies, methodologies, etc employed.

20 **RESPONSE:**

21 The Partnership describes the information, methods and approach used to assess
22 potential Project effects on wetland functions in Section 2.8 of the Terrestrial
23 Environment Supporting Volume. Please see the response to CEC Rd 1 CAC-0011b for
24 explanation of the Partnership’s approach to assessing ecosystem services.

25 The mitigation being referred to on page 4-17 of the Response to EIS Guidelines is the
26 12 ha of off-system marsh identified in Map 4-10 and described in the responses to TAC
27 Public Rd 1 CEAA-0005 and TAC Public Rd 2 CEAA-0005. The basis of this mitigation is to
28 pursue no net area loss for these wetland types since they were identified as being
29 particularly important in the region because they are rare, they perform a relatively high
30 number of wetland functions to at least a moderate degree and they perform some
31 wetland functions to a relatively high degree (e.g., shoreline erosion protection, high
32 quality habitat for some wildlife species).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **4.3.3.2.3 Terrestrial Environment; p. 4-17**

3 **CEC Rd 1 MB Wildlands-0001b**

4 **PREAMBLE:**

5 On page 4-17, in Chapter 4, during mitigation discussions, the method employed for
 6 wetland mitigation will include the “Development of wetlands to offset potentially
 7 important wetlands”. Wetlands serve many ecological functions which provide water
 8 quality ecological services such as the regulation of water flows, which purifies water;
 9 the filtering, retention and storage of fresh water; the maintenance of arable land and
 10 prevents water silting by lowering soil losses; and the removal, breakdown or
 11 abatements of pollution. In order to “offset” the important wetlands during mitigation,
 12 these specific services need to be assessed (preferably spatially and temporally
 13 quantified in GIS- mapped) in order to know what is being provided by the existing
 14 wetland function.

15 **QUESTION:**

16 Are these studies available to participants? Where water quality related ecosystem
 17 services and functions of these wetlands have been identified, quantified and
 18 mapped. Explain how mitigation will be accomplished.

19 **RESPONSE:**

20 Published literature and study results identified in Terrestrial Environment Supporting
 21 Volume Section 2.8.2.4 were used to determine which specific wetland functions were
 22 ascribed to each wetland type and the relative degree to which the wetland type
 23 performs these functions. The published literature is publicly available. The study results
 24 provided in the Terrestrial Environment Supporting Volume include the composition and
 25 distribution of wetlands in the region (Sections 2.8.2.4.1, 2.8.3.2.1 and 2.8.3.2.2), and
 26 the specific wetland functions ascribed to each mapped wetland type are provided in
 27 Terrestrial Environment Supporting Volume Appendix 2F. More detailed study results
 28 are available in ECOSTEM Ltd. (2012a), including wetland composition and distribution
 29 (Section 6.3.2.3), and the ecological associations for various wetland types (Section
 30 7.3.3).

31 Please see the response to CEC Rd 1 MB Wildlands-0002a for a description of the
 32 general approach to mitigation, including that employed for wetlands and water quality.
 33 For a description of how the 12 ha of off-system marsh mitigation will be accomplished,
 34 please see the responses to TAC Public Rd 1 CEAA-0005 and TAC Public Rd 2 CEAA-0005.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 4.3.3.2.3 Terrestrial Environment; p. 4-17**

3 **CEC Rd 1 MB Wildlands-0001c**

4 **PREAMBLE:**

5 On page 4-17, in Chapter 4, during mitigation discussions, the method employed for
6 wetland mitigation will include the “Development of wetlands to offset potentially
7 important wetlands”. Wetlands serve many ecological functions which provide water
8 quality ecological services such as the regulation of water flows, which purifies water;
9 the filtering, retention and storage of fresh water; the maintenance of arable land and
10 prevents water silting by lowering soil losses; and the removal, breakdown or
11 abatements of pollution. In order to “offset” the important wetlands during mitigation,
12 these specific services need to be assessed (preferably spatially and temporally
13 quantified in GIS- mapped) in order to know what is being provided by the existing
14 wetland function.

15 **QUESTION:**

16 Are there technical reports to support these wetlands assessments in the EIS contents?

17 **RESPONSE:**

18 The technical information related to mapping and assessing potential Project effects on
19 wetland functions is provided in Section 2.8 of the Terrestrial Environment Supporting
20 Volume and in ECOSTEM (2012).

21 **REFERENCES:**

22 ECOSTEM Ltd. 2012. Terrestrial Habitats and Ecosystems in the Lower Nelson River
23 Region: Keeyask Regional Study Area. A report prepared for Manitoba Hydro.
24 506 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0002a**

4 **PREAMBLE:**

5 In Chapter 4, the overall mitigation strategy for Keeyask is discussed. Rationale for
6 developing areas to compensate for losses of habitats and ecosystems is often a
7 strategy employed in development.

8 **QUESTION:**

9 Are no-net loss of biodiversity or water quality part of this discussion? This
10 compensation terminology is often used as a means of replacing sensitive habitat such
11 as wetlands and species (i.e., sturgeon) but should be used to demonstrate the
12 maintenance of not just the habitat, species and wetlands, but it should demonstrate
13 that ecosystem services and biodiversity are not lost. Was this approach used in the
14 Keeyask EIS? If not, why not?

15 **RESPONSE:**

16 Through the government regulatory assessment process, the Partnership considered
17 potential effects to biodiversity and water quality. Through this assessment, the
18 Partnership predicted potential environmental effects of the Project, identified ways to
19 avoid or mitigate adverse effects, and determined the nature and magnitude of residual
20 adverse effects remaining after mitigation. This was based on a consideration of the
21 effects of the Project in combination with other past, current and potential future
22 projects. The Partnership concluded that with the identified avoidance and mitigation
23 measures in place, Project effects (including those to the studied components of
24 biodiversity) will be reduced to regionally acceptable levels and that the residual
25 adverse effects of the Project are not significant.

26 The Partnership used a multi-stage mitigation approach. First, potential adverse Project
27 effects were reduced by minimizing the size of the Project Footprint, avoiding sensitive
28 sites or time periods, wherever feasible, and included environmental protection
29 measures in the Environmental Protection Plans. For example, effects to water quality
30 during construction were reduced by implementing measures such as those in the
31 Keeyask Generation Project Sediment Management Plan For In-Stream Construction.
32 For situations where the potential residual effects were higher than acceptable levels,
33 additional mitigation was implemented as needed to reduce these effects below the
34 benchmarks adopted for regulatory significance.

35 Mitigation for biodiversity generally includes implementing measures that reduce
36 effects to regionally acceptable levels. A no net loss approach was used for wetland
37 habitat types that make particularly high contributions to ecosystem function (i.e., off-
38 system marsh). For fish species such as Lake Sturgeon that will experience unavoidable
39 alterations in habitat as a result of the Project, the emphasis was on maintaining or,
40 where required, creating through construction of compensatory habitat, sufficient
41 habitat to support a population that would be sustainable in the long-term. Mitigation
42 for Lake Sturgeon also includes a stocking program to increase the number of sturgeon,
43 since an important factor limiting the population at present is the very small number of
44 sturgeon present. Therefore, rather than a no net loss approach for Lake Sturgeon,
45 emphasis was placed on a net gain over existing conditions.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0002b**

4 **PREAMBLE:**

5 In Chapter 4, the overall mitigation strategy for Keeyask is discussed. Rationale for
6 developing areas to compensate for losses of habitats and ecosystems is often a
7 strategy employed in development.

8 **QUESTION:**

9 Please indicate how Keeyask restoration/mitigation plans look at restoring
10 biodiversity/water quality ecosystem services and the natural capital that these
11 ecosystems provide to the project and surrounding area.

12 **RESPONSE:**

13 Please see the responses to CEC Rd 1 CAC-0011a, MB Wildlands-0025, MB Wildlands-
14 0002a, CAC-0007 and CAC-0008 for an explanation of the Partnership's approaches to
15 ecosystem services, natural capital and mitigation.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0003a**

4 **PREAMBLE:**

5 In Chapter 4, on page 4-16, it is stated that spawning habitat/ over wintering habitat
6 channels will be created for fish movement, spawning feeding and overwintering. Every
7 flow regime alters the biotic as well as abiotic aspect of the environment. It has been
8 shown in studies testing flow regimes that habitat classification and recreation are often
9 difficult to achieve under altered flow regimes when the optimum habitat has not been
10 characterized for each flow.

11 **QUESTION:**

12 If the recreation of habitat is a major mitigation strategy to replace lost habitat for
13 several species of fish, have the characteristics of optimum habitats been quantified and
14 mapped spatially at the different possible flow regimes of the project?

15 **RESPONSE:**

16 Habitat suitability, including water level/ flow variation, was a central aspect of study
17 during the field study and assessment parts of the project. Generally, the habitat
18 suitability was understood by empirical observation, or was modeled, and/or was
19 derived from the scientific literature for variables that included discharge, depth,
20 substrate, and water velocity.

21 The field studies of the existing environment observed nearly the full range of inflow
22 and stage characteristics (AE SV Figure 3-2). Modelling and literature approaches to
23 habitat assessment included the use of models over a wide range in flow (i.e., 5th to
24 95th percentile flows); for example, predictive substrate models compared the effect of
25 velocity, depth, and wave energy on substrate distributions using low and high flow data
26 (AE SV Map 3b-6). Predicted post-Project aquatic habitat then formed the basis of the
27 assessments of the lower trophic levels and fish community.

28 Habitat suitability indices were developed for Lake Sturgeon. These indices are based on
29 habitat suitability curves developed for water velocity, depth and substrate. On these
30 curves, a value of one is considered "optimum". Maps showing habitat suitability for
31 four life history stages of Lake Sturgeon are provided in the AE SV for 5th, 50th and 95th
32 percentile flows (see AE SV maps 6-44 to 6-55).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0003b**

4 **PREAMBLE:**

5 In Chapter 4, on page 4-16, it is stated that spawning habitat/ over wintering habitat
6 channels will be created for fish movement, spawning feeding and overwintering. Every
7 flow regime alters the biotic as well as abiotic aspect of the environment. It has been
8 shown in studies testing flow regimes that habitat classification and recreation are often
9 difficult to achieve under altered flow regimes when the optimum habitat has not been
10 characterized for each flow.

11 **QUESTION:**

12 Which studies, methodologies, data sets, and assessment approaches did Manitoba
13 Hydro use to assess the ecosystem services and functions biodiversity provided by
14 habitat planned to be mitigated?

15 **RESPONSE:**

16 The Partnership describes the information, methods and approach used to assess
17 potential Project effects on aquatic habitat in Section 3.2 of the Aquatic Environment
18 Supporting Volume. Please see the response to CEC Rd 1 CAC-0011 for an explanation of
19 the Partnership's approach to assessing ecosystem services.

20 Effects of habitat mitigation on the fish community are discussed in AE SV sections
21 5.4.2.2, 5.4.2.3, 6.4.2.2.2 and 6.4.2.3.1. The basis of the mitigation is to provide Valued
22 Environmental Component (VEC) fish species with habitat to fulfill all life history
23 functions in the reservoir upstream of the generating station and in Stephens Lake
24 downstream of the generating station.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0003c**

4 **PREAMBLE:**

5 In Chapter 4, on page 4-16, it is stated that spawning habitat/ over wintering habitat
6 channels will be created for fish movement, spawning feeding and overwintering. Every
7 flow regime alters the biotic as well as abiotic aspect of the environment. It has been
8 shown in studies testing flow regimes that habitat classification and recreation are often
9 difficult to achieve under altered flow regimes when the optimum habitat has not been
10 characterized for each flow.

11 **QUESTION:**

12 Which on the development of habitat? Are these studies available to participants? Are
13 there technical reports to support these assessments in the EIS contents? If so, which
14 reports?

15 **RESPONSE:**

16 Please see the response to CEC Rd 1 MB Wildlands-0003a for a description of habitat
17 assessments at varying flows and assessment of effects to fish. Table 6A of the Errata
18 Supplemental Filing (April 2013) is a revised list of the environmental study reports
19 developed to support the environmental assessment.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0004a**

4 **PREAMBLE:**

5 Maintaining biodiversity includes the control of populations, pests and diseases through
6 trophic dynamic processes. This is a regulating ecosystem service.

7 **QUESTION:**

8 Have the dynamics of local and regional ecosystems within the Keeyask areas, and their
9 natural biological control, been mapped or examined spatially or temporally?

10 Which studies, methodologies, data sets, and assessment approaches did Manitoba
11 Hydro use to assess biodiversity and specifically services to maintain biodiversity?

12 Where in the EIS is this addressed? Are there technical reports that support this
13 assessment? If it was not done, what methodology was used instead?

14 If Manitoba Hydro did not take any of these aspects into account, why not?

15 **RESPONSE:**

16 Developing an understanding of the dynamics of Keeyask terrestrial ecosystems was a
17 key component of the terrestrial habitat and ecosystems assessments (Terrestrial
18 Environment Supporting Volume Section 2.1, p. 2-2). The key dynamics and spatial
19 patterns for Keeyask terrestrial ecosystems are described in the EIS. Spatial and
20 temporal patterns are examined in the Terrestrial Environment Supporting Volume
21 Sections 2.3.3, 2.3.4, 2.3.5, 2.4.3, 2.5.3, 2.6.3, 2.7.3 and 2.8.3. Terrestrial Environment
22 Supporting Volume Section 2.3.2 reviews the ecosystem drivers and dynamics for the
23 Keeyask region. Further details can be found in ECOSTEM (2012). As discussed in the
24 Terrestrial Environment Supporting Volume Section 2.2.2 (p. 2-5) and Section 2.3.2.1,
25 some of these drivers became supporting topics for the terrestrial effects assessment
26 (e.g. fire regime, invasive plants; Terrestrial Environment Supporting Volume Sections
27 2.5 and, 3.4.2). Pests and diseases were not identified as a key driver based on field
28 observations and literature relevant for the study region (Terrestrial Environment
29 Supporting Volume Section 2.3.2.1, p. 2-25).

30 The methodological approach to assessing biodiversity is described in the Terrestrial
31 Environment Supporting Volume Appendix 1A. Please see the response to CEC Rd 1 CAC-
32 0011b for explanation of the Partnership's approach to assessing ecosystem services.

33 **REFERENCES:**

- 34 ECOSTEM Ltd. 2012. Terrestrial Habitats and Ecosystems in the Lower Nelson River
35 Region: Keeyask Regional Study Area. Report Prepared For Manitoba Hydro. 506
36 pp.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: Appendix 1A Aquatic Mitigation and Compensation**
3 **Measures; p. 1A-48, Table 1A-7**

4 **CEC Rd 1 MB Wildlands-0005**

5 **PREAMBLE:**

6 The Keeyask Generation Station will prevent fish and other aquatic species from moving
7 between Gull and Stephens Lakes. The Supporting Volume indicates that in order to
8 assist fish movement from Stephens Lake to Gull Lake, fish will be manually transported.

9 **QUESTION:**

10 The questions below pertain to the transport methodology:

- 11 1. How often will fish be captured from Stephens Lake and transported to Gull Lake?
- 12 2. How will fish be transported to Gull Lake to ensure minimal mortality?
- 13 3. What types of fish species will be captured/selected in Stephens Lake?
- 14 4. How many fish will be captured and transported on a weekly/monthly basis and are
15 there minimum and maximum numbers required as targets?
- 16 5. Will the capture and transport program vary depending on the season, or will the
17 program operate continuously without variation?
- 18 6. How will fish be captured in Stephens Lake?
- 19 7. Provide a complete fish capture and transport methodology, which outlines the
20 process on a monthly basis, highlighting the above mentioned points, including
21 species.

22 **RESPONSE:**

23 The Partnership will work with Manitoba Conservation and Water Stewardship and
24 Fisheries and Oceans Canada to determine the rationale and details (such as how many
25 fish will be moved, what species, sex, and size, and what time of year to move fish)
26 related to the initial trap and transport program, as well as how to evaluate this
27 program.

28 The current approach to the assessment of the need for fish passage is provided in CEC
29 Rd 1 CEC-0026.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. Map 3-1**

3 **CEC Rd 1 MB Wildlands-0006**

4 **PREAMBLE:**

5 According to Map 3-1, the local study area for terrestrial plants encompassed an area
 6 that was 150 m outside of the predicted flooding zone during construction phase. The
 7 150 m study area did not encompass the expected additional zone of influence on
 8 terrestrial plants during operation phase.

9 **QUESTION:**

10 Answer the following questions:

- 11 1. What was the rationale behind selection of the Terrestrial Plant study area, given
 12 that the majority of the terrestrial plant study area overlaps with the predicted
 13 initial flooding area?
- 14 2. Why was 150 m selected as the buffer zone? Why did the buffer zone not include
 15 the expected additional zone of flooding? Provide scientific basis for 150m buffer.
- 16 3. How specific were the plant studies conducted in zone 4 and within the terrestrial
 17 plants regional study area? Provide list of plants for each.
- 18 4. The additional zone of influence within the terrestrial plant study area is vague in its
 19 description of time line and duration of impact and area. A better description of this
 20 impacted area is needed to provide periods of impact and the amount of area being
 21 influenced.

22 **RESPONSE:**

23 The Terrestrial Plants Local Study Area was determined using the same general rationale
 24 that was used for all of the terrestrial VECs and supporting topics (Response to EIS
 25 Guidelines Section 5.3.1; Terrestrial Environment Supporting Volume Sections 1.3.5 and
 26 2.14.2). The Local Study Area reflected the potential worst case scenario for the direct
 27 and indirect effects of Project clearing and flooding on terrestrial plants and their
 28 habitat based on information available when Project studies commenced (Terrestrial
 29 Environment Supporting Volume Section 3.2.2), some of which came from studies
 30 conducted in other geographic areas. The effects assessment subsequently predicted
 31 the extent to which the Project was expected to affect habitat and plants.

32 On this basis, the Terrestrial Plants Local Study Area was delimited as a 150-m buffer of
 33 the Project Footprint and initial flooding. Since plants are primarily affected in the same
 34 manner as terrestrial habitat (i.e., Project-related habitat loss, habitat alteration and

35 physical disturbance; Terrestrial Environment Supporting Volume Section 3.2.4),
36 terrestrial habitat effects are the main proxy for terrestrial plant effects.

37 The 150-m buffer was several times larger than a cautious estimate of the typical extent
38 of terrestrial habitat and plant effects, which was generally less than 50 m from the
39 cleared areas and the reservoir shorelines. This was to account for locations where
40 effects could extend further than 50 m due to local conditions (e.g., reservoir water
41 regime effects transmitted further inland through riparian peatlands on the reservoir
42 shoreline) or Project features whose locations cannot be determined prior to
43 construction. The scientific basis for the 150 m being considerably larger than the
44 anticipated extent of indirect effects is provided in Terrestrial Environment Supporting
45 Volume Section 2.3.6.2.1. The 150-m buffer zone was also selected to capture the
46 majority of reservoir expansion.

47 As noted above, the effects assessment subsequently predicted the expected extent of
48 direct and indirect effects on terrestrial habitat and plants. This prediction, which is the
49 one used for the terrestrial habitat and plants effects assessment, includes the entire
50 Project Footprint, reservoir expansion area and the expected spatial extent of indirect
51 changes to terrestrial plants and their habitat from edge effects and reservoir-related
52 groundwater changes. As Map 2-11 (Terrestrial Environment Supporting Volume Section
53 3.2.2) shows, the 150-m buffer zone (i.e., the Terrestrial Plants Local Study Area) does
54 include the vast majority of reservoir expansion to Year 30. Exceptions occur where the
55 analysis determined that groundwater effects in shore zone peatlands up to and after
56 Year 30 are expected to extend more than 150 m from the initial flooding shoreline.

57 Regarding the specificity of plant studies, plant data were collected along approximately
58 1,130 km of priority and invasive plant sample transects and in over 800 habitat plots
59 and transects in the Terrestrial Plants Regional Study Area. The density of sample
60 locations was highest in the Local Study Area and then generally decreased outwards
61 into the Regional Study Area with increasing distance (Maps 2-3, 2-4 and 3-3 in the
62 Terrestrial Environment Supporting Volume show the locations of these samples). Data
63 from studies conducted east of the Terrestrial Plants Regional Study Area were also
64 considered in the assessment analyses. See Terrestrial Environment Supporting Volume
65 Appendix 3B for lists of plant species and number of recorded locations in the Local and
66 Regional Study Areas.

67 As described above, the terrestrial plants zone of influence coincides with the terrestrial
68 habitat zone of influence. The time frame used to determine residual effects on priority
69 plants was the same as that used for terrestrial habitat and the other key topics in the
70 EIS because they share key project linkages (Terrestrial Environment Supporting Volume
71 Section 3.2.4.2). As indicated in the Terrestrial Environment Supporting Volume Section
72 2.2.5.2, the time frame for assessing effects on terrestrial habitat (and therefore plant

- 73 habitat) includes the construction phase while the operation phase was subdivided into
74 the Year 1, Years 2 to 5, Years 6 to 15, Years 16 to 30 and Years 31 to 100 periods.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: N/A; p. Table 4.4-7**

3 **CEC Rd 1 MB Wildlands-0007**

4 **QUESTION:**

5 Freshwater outflow from the Nelson River runs into Hudson Bay, creating an estuary.
6 Salt water is comprised roughly of 35 parts per thousand (ppt) of dissolved salts.
7 Compared to fresh water, salt water is denser, a better conductor of electricity and
8 refracts light better.

9 Increased outflow into Hudson Bay will inevitably change the water salinity, thereby
10 altering the characteristics of the water in the bay, particularly when it comes to
11 freezing, creating and impacts to marine life and their migratory patterns.

12 Answer the following questions:

- 13 1. What is the predicted volume of fresh water to flow into the Hudson Bay during
14 low, medium and peak energy demand periods from the combined Manitoba
15 Hydro generating stations along the Nelson River?
16 2. How are the dams along the Nelson River be coordinated to minimize outflow to
17 Hudson Bay?
18 3. How will increased outflow into Hudson Bay from Keeyask alter ice flows and
19 freezing regime?
20 4. Provide Manitoba Hydro monitoring information regarding fresh water flow into
21 Hudson Bay (1980-2013)

22 **RESPONSE:**

23 Each question is answered in turn.

- 24 1. *What is the predicted volume of fresh water to flow into the Hudson Bay during low,*
25 *medium and peak energy demand periods from the combined Manitoba Hydro*
26 *generating stations along the Nelson River?*

27 Physical Environment Supporting Volume Section 4.2.5.2 describes the long-term flow
28 file that was developed to be representative of future inflows into the study area with
29 and without the Project which could be used to approximate the inflows to the Hudson
30 Bay. These flows are provided in the table below. The inflows to the Hudson Bay would
31 be slightly higher than what is shown in the table because of the additional inflow from
32 tributary streams and rivers downstream of the Keeyask GS. Typically peak energy
33 demand occurs during the winter months and the lowest energy demand occurs during

34 the spring and fall months. The flows vary from year to year over a large range during
35 these periods of the year.

Post-project inflow data (m³/s) for the Keeyask Generating Station:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1912				3055	2955	3193	3306	3212	2987	3294	3308	3401	3190
1913	3440	3312	3150	3090	2966	3160	3429	3404	3187	3415	3427	3497	3290
1914	3509	3282	3133	2280	2350	2619	3050	3176	2276	2477	2757	3000	2826
1915	3083	2903	2683	2386	2769	2955	2968	3020	2875	2624	3055	3262	2882
1916	3251	3097	2982	3478	3798	4160	4196	4202	3835	4099	3809	3714	3719
1917	3618	3186	3237	3094	3000	3121	3416	3436	3332	3348	3484	3544	3318
1918	3581	3416	3211	2474	2794	3000	3112	3205	2424	2653	2890	3191	2996
1919	3233	3051	2860	2294	2317	2562	3097	3150	2381	2469	2744	3002	2763
1920	3074	2853	2697	2381	2605	2940	3035	3140	2295	2639	2839	3169	2806
1921	3216	2988	2907	2975	2828	3003	3278	3384	2917	3131	3309	3305	3103
1922	3268	3226	3131	2981	2957	3113	3292	3127	2233	2567	2847	3104	2987
1923	3100	2957	2865	2976	2801	2983	3132	3106	2902	3125	3308	3288	3045
1924	3225	3155	3093	2332	2325	2559	3174	3242	2247	2637	2575	2918	2790
1925	3114	2878	2713	3124	2906	3294	3424	3399	3125	3335	3392	3540	3187
1926	3578	3399	3203	2873	2803	3007	3092	3147	2918	3067	3258	3253	3133
1927	3302	3234	3045	4047	5060	5167	5088	4318	4265	4423	4016	3817	4148
1928	3606	3327	3325	3172	3010	3452	3485	3296	2992	3289	3296	3400	3304
1929	3406	3284	3149	1964	2045	2373	2622	2715	1992	2112	2417	2760	2570
1930	2830	2692	2401	2130	1998	2475	2711	2751	2078	2129	2407	2845	2454
1931	2965	2588	2500	2069	2030	2288	2702	2672	2141	2041	2361	2634	2416
1932	2810	2665	2478	2284	2344	2610	3138	3126	2109	2371	2421	2935	2608
1933	3082	2849	2478	2290	2330	2780	3134	3179	2352	2637	2927	3102	2762
1934	3162	3006	2701	3196	2980	3114	3411	3385	3072	3310	3364	3516	3185
1935	3594	3343	3214	2998	3063	3225	3435	3386	3073	3299	3392	3491	3293
1936	3467	3286	3187	2509	2640	2994	2984	2755	2089	2202	2426	2980	2793
1937	3087	2832	2517	2358	2169	2813	2970	3004	2306	2446	2761	3004	2689
1938	3077	2930	2699	2024	1961	2459	2838	2516	1992	2116	2374	2921	2492



Post-project inflow data (m³/s) for the Keeyask Generating Station:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1939	3036	2793	2393	1853	1892	2007	2065	1913	1929	2059	2359	2618	2243
1940	2739	2512	2320	1818	1690	1857	1895	1898	1949	1930	2264	2452	2110
1941	2584	2453	2249	1852	1538	1758	1802	1787	1707	1790	2162	2374	2005
1942	2582	2342	2107	2424	2305	2610	3054	2887	2361	2586	2759	3088	2592
1943	3212	2931	2831	2949	2867	2965	3205	3016	2750	2855	2973	3155	2976
1944	3284	3126	2834	2535	2566	2959	2984	3024	2799	3062	3193	3259	2969
1945	3217	3091	2956	3066	2973	3361	3412	3392	3111	3400	3552	3521	3254
1946	3484	3190	3056	2902	2815	2965	3193	3345	2906	3329	3299	3299	3149
1947	3290	3247	3093	3295	3371	3937	3971	3589	3292	3311	3480	3498	3448
1948	3498	3303	3200	3472	3661	4020	4028	3089	2273	2693	2911	3167	3276
1949	3198	2988	2872	2982	2806	3055	3374	3480	3037	3177	3322	3425	3143
1950	3400	3374	3306	3921	4758	4981	5120	4313	3989	4203	3971	3828	4097
1951	3569	3236	3183	3429	3844	4017	4221	4031	3977	3961	3737	3626	3736
1952	3509	3351	3194	2813	2513	2528	3000	3073	2851	3084	3011	3225	3012
1953	3208	3104	2866	3114	3248	3450	3624	3579	3502	3696	3580	3692	3389
1954	3541	3344	3169	3677	3958	4182	4219	4228	3952	4264	3758	3832	3844
1955	3657	3510	3459	4307	4989	5024	4600	3457	3372	3555	3470	3547	3912
1956	3470	3323	3214	3295	3461	3875	3904	3262	3077	3132	3273	3361	3387
1957	3306	3120	3022	2990	2841	2974	3476	3334	3166	3112	3114	3257	3143
1958	3281	3143	2971	2117	2288	2623	3109	3049	2126	2604	2523	2940	2731
1959	3071	2761	2463	3551	3872	4242	4303	3937	3928	3950	3942	3817	3653
1960	3573	3347	3209	2915	2834	3086	3336	3141	2135	2575	2586	2951	2974
1961	3023	2808	2703	1766	1744	2020	1981	1938	1848	1866	2238	2413	2196
1962	2538	2331	2179	3106	3067	3238	3502	3355	3287	3251	3289	3481	3052
1963	3433	3260	3171	3151	3049	3271	3548	3054	2825	2806	3149	3151	3156
1964	3237	3080	2819	2966	3050	3123	3238	3316	3082	3361	3386	3417	3173
1965	3411	3352	3226	4069	5479	6110	5937	4338	4075	4379	3776	3789	4328

Post-project inflow data (m³/s) for the Keeyask Generating Station:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1966	3671	3509	3394	4245	5344	6249	6170	4531	4005	4069	3711	3649	4379
1967	3536	3381	3266	3473	3478	4187	3556	3112	2745	2707	3027	3191	3305
1968	3269	3121	2835	3603	4090	4072	4182	4155	3998	4405	3874	3757	3780
1969	3554	3320	3199	4163	4292	4379	4472	4530	4081	4503	4438	4224	4096
1970	3867	3516	3379	4129	5088	5340	5619	4083	3989	4044	3998	3887	4245
1971	3627	3349	3181	3647	3882	4258	4263	4123	3998	4205	3718	3723	3831
1972	3552	3315	3251	4174	4585	4510	3830	3211	2944	3173	3196	3327	3589
1973	3279	3068	2940	3071	3091	3233	3466	3488	3156	3334	3316	3345	3232
1974	3336	3199	3147	4203	5743	6223	6131	5801	4568	4093	3873	3733	4504
1975	3546	3350	3276	4078	4370	4929	4776	3843	3614	3848	3714	3735	3923
1976	3527	3337	3170	2933	2971	3194	2866	2145	2091	2067	2412	2767	2790
1977	2896	2481	2310	2538	2579	2734	3241	3285	2516	2462	2616	2968	2719
1978	3057	2830	2638	3131	3069	3220	3498	3489	3127	3499	3513	3499	3214
1979	3568	3410	3247	4021	5274	6415	5244	3227	2946	2926	3155	3196	3886
1980	3242	3069	2855	1959	2105	2716	3211	3015	2256	2443	2398	2896	2680
1981	3010	2760	2446	2123	2087	2156	2485	2570	1913	2036	2365	2678	2386
1982	2799	2570	2359	3160	3287	3202	3482	3307	3094	3224	3272	3353	3092
1983	3253	3120	3025	3164	3369	3498	3643	3252	2486	2591	2829	3089	3110
1984	3064	2920	2700	2180	2358	2881	3041	3212	2481	2627	2868	3006	2778
1985	3069	2921	2645	3498	4018	4317	4354	4264	3998	4224	3694	3707	3726
1986	3517	3253	3148	4119	5380	5069	3318	3378	3196	3324	3370	3405	3706
1987	3414	3245	3129	2005	2105	2591	2744	2119	2009	1998	2316	2469	2512
1988	2703	2395	2322	1918	2042	2043	1989	2050	1984	1850	2127	2310	2144
1989	2448	2293	2132	1957	1938	2473	2541	2569	1883	2091	2376	2894	2300
1990	2961	2636	2410	2530	2797	2790	2887	2353	1783	1870	2315	2542	2490
1991	2805	2412	2252	2041	2369	2631	3064	2720	2120	2306	2264	2784	2481
1992	2978	2724	2268	2999	3041	3204	3252	3302	3065	3366	3316	3487	3084

Post-project inflow data (m³/s) for the Keeyask Generating Station:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1993	3518	3302	3080	2829	2579	3026	3031	3035	2852	2876	2820	2992	2995
1994	3061	3143	3095	2436	2637	2893	3098	3065	2377	2633	2814	2986	2853
1995	3151	2907	2793	2591	2584	2703	3133	3076	2952	2978	2998	3148	2918
1996	3217	3079	2874	3629	4928	5622	5131	3998	3758	3849	3498	3540	3927
1997	3405	3188	3057	3888	5175	5604	5609	4282	3998	4260	4005	3984	4205
1998	3737	3435	3272	3518	3664	4039	4199	2794	2124	2203	2462	2945	3200
1999	2836	2511	2357	2798	2859	3020	3248	3067	3019	3091	3318	3294	2952
2000	3340	3260	3144	3116	3426	3802	3864	3890	3557	3773	3548	3665	3532
2001	3569	3399	3201	3691	4902	5042	5087	3562	2706	2654	3058	3242	3676
2002	3215	3069	2811	3106	3110	3220	3303	3311	3094	2532	2613	2956	3028
2003	3097	2875	2757	1833	1769	1887	1921	1907	1999	1949	2273	2377	2220
2004	2493	2245	2159	3354	3938	4237	4177	4169	3998	4422	3876	3812	3573
2005	3669	3383	3189	4342	5425	5740	5703	5856	5796	4445	4177	4011	4645
2006	3830	3616	3515										3654
Mean	3252	3054	2892	2972	3181	3458	3558	3302	2915	3045	3104	3248	3165
Min	2448	2245	2107	1766	1538	1758	1802	1787	1707	1790	2127	2310	2005
Max	3867	3616	3515	4342	5743	6415	6170	5856	5796	4503	4438	4224	4645

36 2. How are the dams along the Nelson River be coordinated to minimize outflow to
37 Hudson Bay?

38 The dams along the Nelson River are managed to meet the requirements of Manitoba
39 Hydro's Integrated Power System. The dams are not managed to minimize outflow to
40 the Hudson Bay. While the dams can regulate the timing and magnitude of flows to the
41 Hudson Bay, the water that flows from the Nelson and Churchill River drainage basins
42 eventually flows into the Hudson Bay.

43 3. *How will increased outflow into Hudson Bay from Keeyask alter ice flows and*
44 *freezing regime?*

45 The flow of water into the Hudson Bay, ice flows on the Hudson Bay and the freezing
46 regime will not change as a result of the Keeyask Project.

47 4. *Provide Manitoba Hydro monitoring information regarding fresh water flow into*
48 *Hudson Bay (1980-2013)*

49 Environment Canada provides daily discharge data to the public for the Kettle and Long
50 Spruce Generating Stations. These inflows are a good approximation of inflows to the
51 Hudson Bay since actual flow would be slightly higher because of the additional inflow
52 from tributary streams and rivers located downstream of the generating stations. The
53 data can be downloaded from the following Environment Canada website:
54 <http://www.wsc.ec.gc.ca/applications/H2O/index-eng.cfm>

55 The station IDs are 05UF006 (Kettle Generating Station) and 05UF007 (Long Spruce
56 Generating Station). Note that the Environment Canada website only provides this data
57 back to 1987 so the 1980 to 1986 data is provided on the CD included with this filing.

1 **REFERENCE: Volume: N/A; Section: Preliminary Environment**
2 **Protection Program; p. N/A**

3 **CEC Rd 1 MB Wildlands-0008**

4 **PREAMBLE:**

5 The Environmental Protection Program (EnvPP) is referenced throughout the Keeyask
6 EIS materials. Inspection of the EnvPP shows that many areas are incomplete, and
7 program sections are separated, preventing assessment of the complete program and
8 its overall efficacy.

9 **QUESTION:**

10 Answer the following questions:

- 11 1. When will a completed version of the EnvPP be available?
- 12 2. Will there be a component of the EnvPP that reviews all individual programs
13 together to provide a thorough examination of program efficacy?
- 14 3. Will the EnvPP reports be available to public?
- 15 4. Will Manitoba Hydro bring detailed EnvPP information to the Keeyask CEC hearings?

16 **RESPONSE:**

- 17 1. *When will a completed version of the EnvPP be available?*

18 The Environmental Protection Program can only be finalized once the various licences
19 and authorizations for the Keeyask Project are awarded. The reason for this is that
20 specific requirements may be laid out for inclusion in the various Environmental
21 Protection Program documents by the regulators in the licence/permits/authorizations
22 that must be incorporated before they can be finished. Preliminary versions of the two
23 draft Environmental Protection Plans (EnvPPs), *Draft Instream Construction Sediment*
24 *Management Plan, Draft Construction Access Management Plan, Draft Heritage*
25 *Resources Protection Plan, Waterways Management Program, Reservoir Clearing Plan,*
26 *Draft Physical Environment Monitoring Plan, Draft Terrestrial Effects Monitoring Plan,*
27 *Draft Socio-Economic Monitoring Plan and Draft Resource Use Monitoring Plan* are
28 available on the Public Registry and are posted on the Partnership's website at:
29 [http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program)
30 [environmental-protection-program.](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program)

31 The *Draft Fish Habitat Compensation Plan* and *Draft Aquatic Effects Monitoring Plan* will
32 be available to the public in the second quarter of 2013. The *Terrestrial Mitigation*
33 *Implementation Plan* and *Vegetation Rehabilitation Plan* will be developed at a later

34 date, following the start of construction. All will be made available to the public at
35 www.Keeyask.com.

36 2. *Will there be a component of the EnvPP that reviews all individual programs*
37 *together to provide a thorough examination of program efficacy?*

38 The Environmental Protection Program will be overseen by the Monitoring Advisory
39 Committee (MAC). The MAC is an advisory committee to the Partnership Board of
40 Directors comprised of Manitoba Hydro representatives involved in the Program and
41 participants from each of the KCNs. The MAC will meet bimonthly. It will review
42 information and results generated as the Program is implemented and, if appropriate,
43 may provide advice and recommendations to the Partnership about the need for
44 additional or alternative mitigation measures. The outcomes of both the technical
45 science and ATK monitoring programs, as well as other aspects of the Program, will be
46 reviewed and discussed at the MAC.

47 3. *Will the EnvPP reports be available to public?*

48 The final versions of the Environmental Protection Program documents and the reports
49 generated as the Program is implemented will available to the public on
50 www.keeyask.com

51 4. *Will Manitoba Hydro bring detailed EnvPP information to the Keeyask CEC hearings?*

52 Yes, the Partnership will share details pertaining to the EnvPP at the Keeyask CEC
53 hearings.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 2.5.1.1.1 Excavated Materials Disposal; p. N/A**

3 **CEC Rd 1 MB Wildlands-0009**

4 **PREAMBLE:**

5 Excavated materials will be deposited in various areas within Gull and Stephens Lake. As
6 indicated by KHLP/Manitoba Hydro, excavated materials will be capped to prevent
7 introduction of solids into surface waters leaching of minerals and heavy metals into the
8 aquatic environment.

9 **QUESTION:**

10 Answer the following questions:

- 11 1. How much excavated materials will be deposited in each of Gull and Stephens Lake?
- 12 2. What kind of material will be used to cap the excavated materials?
- 13 3. Will the capping material degrade in water, thereby contributing to contamination
14 from construction activities?
- 15 4. What type of monitoring activities will be conducted to ensure that capped
16 materials are not leaching any heavy metals, minerals or chemicals?
- 17 5. What is the source of the capping methods? Have other Hyrdo utilities successfully
18 capped excavated materials?

19 **RESPONSE:**

- 20 1. *How much excavated materials will be deposited in each of Gull and Stephens Lake?*

21 The total capacity of the excavated material placement areas (EMPAs) is approximately
22 18,233,000 m³ which is 4.3 times larger than the estimated 4,200,000 m³ of unclassified
23 material that would need to be disposed of. This provides the contractor several
24 alternatives to dispose of the material allowing the contractor to optimize construction
25 activities, minimize haul distances and minimize costs. The current preliminary estimate
26 is that approximately half of the material would be placed in EMPAs located in the
27 Keeyask reservoir and half would be placed in EMPAs located outside of the reservoir.
28 There are no EMPAs identified within Stephens Lake, therefore no material would be
29 placed in Stephens Lake. The final disposal plan will be developed by the General Civil
30 Contractor in the future and may be different than the current preliminary estimate.

31 2. *What kind of material will be used to cap the excavated materials?*

32 Hard surface armoring of the EMPAs located in the reservoir is not expected to be
33 required. See response to CEC-0072 for explanation. Rock or granular material would be
34 used for armoring EMPAs if it is found to be required in the future.

35 3. *Will the capping material degrade in water, thereby contributing to contamination
36 from construction activities?*

37 The rock and granular material are not expected to degrade in water or contaminate the
38 water. The material is not expected to generate acidic leachate because most of the
39 rock does not contain sulphides which is required for form acidic leachate and also
40 because the majority of the material will not be exposed to atmospheric oxygen which is
41 required to oxidize sulphides. It is worth noting that under water disposal is a common
42 method used in mining to prevent acid rock drainage from waste materials (tailings) that
43 have a far greater leaching potential than the rock and granular material in the Keeyask
44 area. Metals that may leach from granular material would be highly diluted and would
45 not pose a concern to the environment. See Section 5.4.1.1.6 of the Physical
46 Environment Supporting Volume for further details.

47 4. *What type of monitoring activities will be conducted to ensure that capped materials
48 are not leaching any heavy metals, minerals or chemicals?*

49 At this time hard-surface armoring of the EMPAs located in the reservoir is not
50 expected. In the event that armoring is implemented, laboratory testing of rock and
51 granular materials has already been undertaken to assess the suitability of placing this
52 material in the aquatic environment. The results of this lab testing indicated that placing
53 the material in the aquatic environment will not pose a concern to this environment.
54 See Section 5.4.1.1.6 of the Physical Environment Supporting Volume for further details.

55 5. *What is the source of the capping methods? Have other Hyrdo utilities successfully
56 capped excavated materials?*

57 The question "What is source of capping method?" is unclear. Regarding the question if
58 other hydro utilities have successfully capped excavated material, there are other hydro
59 utilities that have placed excavated material in reservoirs. One example is the
60 placement of excavated soil material from the construction of a cutoff wall at the
61 Shikwamkwa Dam in Wawa Ontario and owned by Brookfield Power Corporation. The
62 excavated soil material was placed in the new reservoir and was capped with granular
63 material. The purpose of the cap was to separate the bentonite containing excavated
64 materials from the reservoir. It was determined that granular materials were suitable as
65 a capping material.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.11 Sensitivity of Predictions to Future Climate**
3 **Change; p. 2-202**

4 **CEC Rd 1 MB Wildlands-0010**

5 **PREAMBLE:**

6 Predicted future drivers of terrestrial climate change referenced within the Terrestrial
7 Environment Supporting Volume include; longer growing seasons, higher
8 evapotranspiration, droughts, extreme weather events, heat waves, large fires and
9 accelerated permafrost melting. The impact of climate change on the terrestrial
10 environment is regarded as small to moderate, as measured through changes to
11 terrestrial VECs; intactness, fire regime, ecosystem diversity, wetland function and soil
12 quantity and quality.

13 **QUESTION:**

14 Provide information on the following questions;

- 15 1. How was each terrestrial VEC assessed for sensitivity to each type of climate change
16 driver presented above? Provide results in a table.
17 2. What length of time does the terrestrial climate change analysis assess? 10, 30,100-
18 years? Explain choice of time lines.
19 3. Conduct a terrestrial climate change analysis examining changes over 100 years of
20 operation, assessing change at 10-year intervals, for the local project area.
21 4. Did the terrestrial climate change analysis include changes to the aquatic
22 environment? If not, why not? Explain.

23 **RESPONSE:**

24 Each of the above questions answered in turn.

- 25 1. *How was each terrestrial VEC assessed for sensitivity to each type of climate change*
26 *driver presented above? Provide results in a table.*

27 For the terrestrial Valued Environmental Components (VECs), the sensitivity of residual
28 Project effects conclusions to climate change is discussed in the Response to EIS
29 Guidelines Section 6.5.11. Section 6.5.11 discusses how projected future climate change
30 drivers for the Keeyask area may or may not affect the residual effects conclusions for
31 terrestrial VECs. Additional information on the sensitivity of predictions to future
32 climate change is also found in the Terrestrial Environment Supporting Volume (TE SV)
33 (Table 1).

Table 1: TE SV Reference locations for Information on Terrestrial VECs and Sensitivity of Effects to Climate Change

VEC	Location of Information
Intactness	TE SV 2.11.3
Ecosystem diversity	TE SV 2.11.5
Wetland function	TE SV 2.11.6
Priority plants	TE SV 3.5.3.2
Canada goose	EIS 6.5.11
Mallard	EIS 6.5.11
Bald eagle	EIS 6.5.11
Olive-sided flycatcher	EIS 6.5.11
Common nighthawk	EIS 6.5.11
Rusty blackbird	EIS 6.5.11
Caribou	TE SV 7.4.9.1.2
Moose	TE SV 7.4.9.1.3
Beaver	TE SV 7.4.9.1.1

34 2. *What length of time does the terrestrial climate change analysis assess? 10, 30, 100-*
 35 *years? Explain choice of time lines.*

36 As discussed in the Response to EIS Guidelines Section 6.3.12.1, the ensemble of climate
 37 scenarios were developed for three future time periods; the 2020s (average of 2010-
 38 2039), the 2050s (2040-2069), and the 2080s (2070-2099). These climate scenarios
 39 provided projected average annual temperature, precipitation and evapotranspiration
 40 increases with time in the region. These data, as well as the resultant potential physical
 41 and aquatic environment consequences, were used, if they were applicable, to assess
 42 the effects of future climate change on the Project effects predictions for the Terrestrial
 43 Environment VECs.

44 Timelines are selected to represent three, non-overlapping, fixed, future 30 year
 45 averaged climates that make best use of available Global Climate Model data (up to the
 46 year 2100). The World Meteorological Organization considers thirty years as a sufficient
 47 amount of time to eliminate year-to-year variations. Selection of timelines for the 2020s
 48 (2010-2039), 2050s (2040-2069) and 2080s (2070-2099) are quite common in the
 49 climate science studies to cover the range of data available.

50 3. *Conduct a terrestrial climate change analysis examining changes over 100 years of*
 51 *operation, assessing change at 10-year intervals, for the local project area.*

52 Please see response to Question 2 above.

53 4. *Did the terrestrial climate change analysis include changes to the aquatic*
 54 *environment? If not, why not? Explain.*

55 Yes, the terrestrial climate change analysis considered changes to the aquatic
 56 environment. As mentioned in the answer to Question 2, the resultant potential aquatic
 57 environment consequences, if they were applicable, were used to assess the effects of
 58 future climate change on the Project effects predictions for the Terrestrial Environment
 59 VECs. Please see CEC Rd 1 CAC-0051c for more information about the extent of
 60 communication and collaboration between the different teams of specialists who
 61 prepared the reports for each of these environmental components.

62 **REFERENCES:**

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1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 8.4.6 Environmental Monitoring and Follow-up; p. N/A**

3 **CEC Rd 1 MB Wildlands-0011**

4 **PREAMBLE:**

5 Moderate, long-term and continuous residual effects to ground water are predicted in
 6 the EIS, particularly relating to ground water levels, affected shoreline, direction of
 7 ground water flow, water levels and contamination. Manitoba Hydro indicates that
 8 there is no need for a ground water monitoring and follow-up program, despite
 9 acknowledging the long-term and continuous residual effects to ground water.

10 **QUESTION:**

11 Answer the following questions:

- 12 1. Explain why no ground water monitoring and follow-up program is intended? And
 13 when will one be developed?
 14 2. Without a ground water monitoring and follow-up program, how will Manitoba
 15 Hydro know whether or not ground water has been compromised and how to
 16 properly resolve the situation?

17 **RESPONSE:**

18 As noted in the response to the TAC Public Rd 1 NRCan-0007, groundwater predictions
 19 will be verified by monitoring the direct and indirect Project effects on the terrestrial
 20 environment. Post-project monitoring is planned on the terrestrial environment around
 21 the reservoir shoreline (Terrestrial Environment Supporting Volume, Section 2.12, Table
 22 2-52) and will be designed to document actual direct and indirect effects on terrestrial
 23 habitat (i.e., habitat loss and change), including indirect groundwater effects.

24 Monitoring activities will include periodic in-situ observations at terrestrial monitoring
 25 sites, including measuring depth to groundwater within the root zone to determine if a
 26 change in groundwater is causing an effect on the terrestrial environment. Terrestrial
 27 monitoring to measure habitat loss and change will provide an overall indication of
 28 groundwater effects on a broader scale around the +/-250 km reservoir shoreline than
 29 would be reasonably practicable using a limited number of groundwater wells at
 30 discrete locations. The monitoring will thus be focused on the verification of the
 31 predicted effects on the terrestrial environment, which would indirectly verify the
 32 groundwater assessment results used in the prediction of terrestrial effects.

33 Except for the development of the Keeyask Generation Project, which will use
 34 groundwater drawn from an area far from the Project effects on groundwater, there are
 35 no present or reasonably foreseeable future groundwater users in the groundwater

36 study area. Therefore, direct monitoring of groundwater for effects on groundwater
37 users is not required.

38 Protection of groundwater is an important part of the Project's Environmental
39 Protection Plan, as discussed further in the response to CEC Rd 1 MB Wildlands-0012.

36 study area. Therefore, direct monitoring of groundwater for effects on groundwater
37 users is not required.

38 Protection of groundwater is an important part of the Project's Environmental
39 Protection Plan, as discussed further in the response to CEC Rd 1 MB Wildlands-0012.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.4.2.4 Depth to Groundwater; p. N/A**

3 **CEC Rd 1 MB Wildlands-0012**

4 **PREAMBLE:**

5 Areas outside the reservoir are where the ground water levels are predicted to coincide
6 with water surface levels. It is further indicated in the EIS that groundwater may
7 become contaminated due to construction and operation related activities. Project
8 features of the operation phase predicted to impact groundwater include; development
9 of north and south dykes, reservoir creation, development of powerhouse, spillway and
10 related structures. Project features of the construction phase that may impact
11 groundwater are not discussed in the EIS.

12 **QUESTION:**

13 Answer the following questions:

- 14 1. Provide a list of all the Keeyask construction related activities that may impact
15 groundwater quality.
16 2. An analysis of all possible sources of groundwater contaminants is required,
17 identifying both direct and indirect sources of contamination from the construction
18 and operation phases of the Keeyask Generation Project.
19 3. Provide the analysis in order to complete the EIS.

20 **RESPONSE:**

21 The Physical Environment Supporting Volume (Sec. 8.4.1) states that due to the shallow
22 nature of the groundwater conditions in the study area, there is a potential risk of
23 groundwater contamination from construction activities, particularly as a result of an
24 accident such as a fuel or sewage spill. However, with mitigation measures in place to
25 minimize and prevent accidental spills as much as possible, and considering the likely
26 localized area affected by any spills, the Project is not expected to impact groundwater
27 quality.

28 Each question above is responded to in turn.

- 29 1. *Provide a list of all the Keeyask construction related activities that may impact*
30 *groundwater quality.*
31 2. *An analysis of all possible sources of groundwater contaminants is required,*
32 *identifying both direct and indirect sources of contamination from the construction*
33 *and operation phases of the Keeyask Generation Project.*

34 There are many different construction activities, which may be broadly characterized as:
 35 site preparation (clearing and grubbing) including clearing the reservoir; development
 36 and use of work areas (e.g., set up and use of contractor offices and work areas);
 37 material excavation and placement including transport of materials (e.g., borrow
 38 sources, quarries, roads); construction of supporting and principal infrastructure
 39 (cofferdams, dykes, powerhouse, spillway, etc.). These activities take place over a large
 40 area within the Project footprint and all typically involve the use of heavy construction
 41 equipment and other vehicles.

42 The primary risk to groundwater would be due to an accidental spill of petroleum
 43 hydrocarbons such as diesel fuel, hydraulic fluids, oils and lubricants, which will be used
 44 extensively within the construction area as many pieces of heavy equipment will be
 45 required to construct the Project. Accidental spills could result from a number of causes
 46 such as leaks from equipment or storage containers, during fuel transfer, or when
 47 transporting these materials. In addition to potential spills of hydrocarbons, accidental
 48 sewage spills or leaks from holding tanks, during transport or at the wastewater
 49 treatment plant, could pose a risk of groundwater contamination.

50 Draft Environmental Protection Plans (EnvPPs) have been developed for the
 51 construction phase of both the generating station and the south access road (available
 52 from the Partnership website). The EnvPPs include countermeasures and prevention
 53 and response actions to reduce or prevent the impacts from a release of petroleum
 54 hydrocarbons or other hazardous substances. These countermeasures are detailed in
 55 Section 5.7 of the EnvPPs and include safeguards and procedures for handling hazardous
 56 materials and petroleum products pertaining to:

- 57 • Transportation and Inventory Control
- 58 • Storage
- 59 • Petroleum Products (spill/leak containment)
- 60 • Refuelling
- 61 • Petroleum Product Tanks 5000L (or greater)
- 62 • Hazardous Waste Disposal

63 Examples of safeguards detailed within the EnvPPs include measures such as:

- 64 • Secondary containment measures for fuel storage.
- 65 • Conducting maintenance activities in contained areas on impermeable surfaces,
 66 with impermeable surfaces surrounded by berms to contain spills.
- 67 • Drip pans placed under machinery, vehicles and equipment during maintenance.
- 68 • Prohibition of maintenance, washing and refuelling activities for vehicles and
 69 equipment in borrow areas and quarries

- 70 • Hazardous material and petroleum product containers will be inspected daily for
- 71 leaks.
- 72 • Storage and handling of all products to occur only within dedicated staging areas.
- 73 • Requirements to clean up spills should they occur.
- 74 • Weekly checks of levels in sewage tanks to prevent overfilling.
- 75 • Emptying sewage tanks when they are no more than 90% full.
- 76 • Liquid level monitor and alarm for sewage holding tanks.

77 The EnvPP plan includes additional measures that reduce the potential risks to
 78 groundwater such as requirements for an emergency response plan and spill response
 79 kits. The EnvPP (Sec. 1.4) describes roles and responsibilities of different parties with
 80 respect to spill management including the Site Environmental Officer who will act as the
 81 Manitoba Hydro Spill Response Coordinator.

82 During the operation phase of the project, the risk posed to groundwater quality due to
 83 accidental spills or malfunctions will be small. This is because the overall quantities of
 84 hazardous materials and petroleum products will be present in much lower volumes
 85 during the operations phase, and these materials will be stored within the powerhouse.
 86 Section 4.6 of the Project Description Supporting Volume provides additional details for
 87 the framework for the operations phase, including an Environmental Management
 88 System (EMS) and Safety Management System (SMS), which will minimize or prevent
 89 the potential for accidental spills.

90 *3. Provide the analysis in order to complete the EIS.*

91 With the implementation of the EnvPPs, Emergency Response Plans, and other
 92 mitigation measures, the risk of groundwater contamination from construction
 93 activities, particularly as a result of accidental spills is small. In the event that a spill does
 94 occur, the quantities of material involved are likely to be limited in volume and would
 95 not be expected to affect a large area. As noted above, where a spill does occur, the
 96 EnvPP includes requirements for spill kits on-site to contain and clean up a spill, plus it
 97 has requirements to clean up the affected site.

98 For the above reasons, the Project is not expected to affect groundwater quality.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 6.4.2.1.1 –Shoreline Conditions, Shoreline Recession and**
 3 **Reservoir Expansion; p. N/A**

4 **CEC Rd 1 MB Wildlands-0013**

5 **PREAMBLE:**

6 Inland lake habitats are critical for maintaining healthy lake ecosystems. Having an
 7 understanding of the five distinct inland lake zones and the habitats associated with
 8 those zones, is key to maintaining lake ecosystem health and restoring the ecosystem.
 9 Within the Aquatics or Terrestrial Environment EIS Supporting Volumes there is no
 10 discussion of current inland lake zones, nor how flooding will impact those zones and
 11 the habitats associated with them. Peatland areas are described, however their
 12 relationship with the aquatic environment is not discussed.

13 **QUESTION:**

14 Answer the following questions:

- 15 1. Provide a complete description of the inland lake zones for the predicted flooding
 16 area, and describe how alteration of those habitats will influence aquatic ecosystem
 17 health and which species will be affected.
- 18 2. How will alteration of inland lake zones impact aquatic VECs?
- 19 3. Provide a complete description of the inland lake zones for the Keeyask/ Gull
 20 reservoir at 5,10,20,40 year intervals post flooding.

21 **RESPONSE:**

- 22 1. *Provide a complete description of the inland lake zones for the predicted flooding*
 23 *area, and describe how alteration of those habitats will influence aquatic ecosystem*
 24 *health and which species will be affected.*

25 Inland lake zones (e.g. euphotic, littoral, limnetic, profundal, and benthic zones) were
 26 not selected to describe the habitat in the Nelson River given that much of the study
 27 area is lotic habitat, which is not included in this limnological classification of lake
 28 habitat. In addition, the approach adopted reflected factors important to the
 29 distribution of the biota (e.g., velocity classes reflect the swimming ability of fish, depth
 30 classes reflect the distribution of rooted vegetation, intermittently exposed vs.
 31 permanently wetted is important for benthic invertebrates). The approach adopted met
 32 the need for relative comparisons in this EIS.

33 2. *How will alteration of inland lake zones impact aquatic VECs?*

34 The impact of changes on VEC fish species is provided for the period of operation in the
35 AE SV, Section 5.4.2.

36 3. *Provide a complete description of the inland lake zones for the Keeyask/ Gull*
37 *reservoir at 5, 10, 20, 40 year intervals post flooding.*

38 As described above, the application of Inland Lake Zone classes would provide an
39 incomplete assessment using only subset of the relevant variables. The time steps
40 adopted were based on the empirical data of the physical environment studies that
41 showed most physical changes would occur in the first 15 years. A year 30 time step was
42 chosen as this was the approximate age of the Stephens Lake, the proxy for the Keeyask
43 reservoir. Consequently, the time steps selected were: initial flooding, Years 1, 5, 15,
44 and 30.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 3.4.2.2.4 Evolution of the Reservoir –Year 1 to 15; p. N/A**

3 **CEC Rd 1 MB Wildlands-0014**

4 **PREAMBLE:**

5 The degree of light penetration alters the zone characteristics within a water column,
6 and impacts plant growth, phytoplankton and food web characteristics. Increased total
7 suspended solids (TSS) into Stephens Lake combined with changing water levels as per
8 the EIS, will alter the degree of light penetration, particularly in shallow regions of the
9 lake.

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. Identify how changes in light penetration arising from increased TSS within Stephens
13 Lake will impact lake ecosystem health
14 2. How will changes in light penetration/TSS levels alter the euphotic zone of the lake?
15 3. How will increased sedimentation and TSS impact the benthic zone of Stephens
16 Lake?

17 **RESPONSE:**

18 Responses to each question are answered below.

- 19 1. *Identify how changes in light penetration arising from increased TSS within Stephens*
20 *Lake will impact lake ecosystem health*
21 2. *How will changes in light penetration/TSS levels alter the euphotic zone of the lake?*

22 Water quality may be affected by the Project during the operation period through a
23 number of pathways, including erosion and sediment transport/deposition. The
24 assessment of this pathway in the Stephens Lake Area is provided in Section 2.5.2.3.4
25 (Total Suspended Solids/Turbidity: page 2-85) and Section 2.5.2.3.7 (Water Clarity: page
26 2-86) and is presented below for the convenience of the reviewer.

27 **"2.5.2.3.4 Total Suspended Solids/Turbidity**

28 As described in the PE SV, Section 7, and summarized above, TSS is expected to
29 be lower at the GS during the operation period, relative to conditions that
30 would be expected without the Project (i.e., "background" condition). The
31 largest decrease relative to background (11 mg/L) would occur during high flow
32 conditions (i.e., 95th percentile flows), although TSS is also expected to be lower
33 under median and low flows with the Project.

34 Currently, TSS concentrations decrease from the inflow to Stephens Lake to the
 35 Kettle GS (Figure 2-7; PE SV, Section 7). The Project will result in lower TSS
 36 concentrations at the inflow to Stephens Lake (downstream of the Keeyask GS)
 37 and decreased concentrations, relative to conditions without the Project, are
 38 expected to persist along the mainstem in Stephens Lake for approximately 10–
 39 12 km from the GS (PE SV, Section 7). At this point, TSS concentrations are
 40 expected to be similar to those that would occur without the Project. Predicted
 41 reductions in shoreline erosion in winter in Stephens Lake (PE SV, Section 6),
 42 may lead to decreases in TSS during the ice-cover season. No effects are
 43 expected for the north arm of Stephens Lake or in the vicinity of the Gillam
 44 drinking water intake.

45 Direct effects of reduced TSS on aquatic biota relate to the subsequent increase
 46 in water clarity. Higher water clarity may serve as an advantage to visual
 47 predators and a disadvantage to prey items within this 10–12 km stretch of the
 48 lake. Increased water clarity may also affect primary producers through
 49 increases in light availability and depth of the euphotic zone; this pathway is
 50 characterized in Section 4.2.4.2.”

51 “2.5.2.3.7 Water Clarity

52 Water clarity is expected to be increased in the 10–12 km stretch downstream
 53 of the GS, along the main flow of the Nelson River, due to predicted decreases
 54 in TSS due to Project operation. Neither TOC, DOC, nor true colour are expected
 55 to be measurably changed in Stephens Lake and therefore would not result in
 56 changes in water clarity. As for other water quality variables, no effects are
 57 expected for the north arm of Stephens Lake or in the vicinity of the Gillam
 58 drinking water intake.”

59 Section 4.2.4.2 referenced above in Section 2.5.2.3.4 pertains to the assessment of the
 60 phytoplankton community (and therefore chlorophyll *a* concentrations as an estimate of
 61 biomass) during the operation of the Project. The assessment of light availability in the
 62 Stephens Lake Area is provided in Section 4.2.4.2.3 (Downstream of the Keeyask
 63 Generating Station; pages 4-16 and 4-17) and is presented below for the convenience of
 64 the reviewer.

65 “4.2.4.2.3 Downstream of the Keeyask Generating Station

66 Downstream effects on water quality are not expected to be substantive as the
 67 conditions of the reservoir outflow will not be considerably different from
 68 current conditions (Section 2.5.2.3). The major exception is a predicted decrease
 69 in TSS at the outflow of the GS. Furthermore, TSS is expected to decrease

70 further as water moves through Stephens Lake and this area of reduced TSS
 71 would likely extend approximately 10–12 km downstream of the GS. This
 72 improvement in water clarity is expected to result in a long-term, small increase
 73 in phytoplankton biomass in the affected portion of Stephens Lake (Figure 4-6).
 74 The absence of a marked increase in phytoplankton biomass is likely due to the
 75 relatively short water residence time within the portion of Stephens Lake along
 76 the main flow of the Nelson River, which, although longer than the
 77 unimpounded river, is still too short to allow substantial growth of
 78 phytoplankton.”

79 3. *How will increased sedimentation and TSS impact the benthic zone of Stephens*
 80 *Lake?*

81 As provided above in the response to Questions 1 & 2, operation of the Project will
 82 result in lower TSS concentrations at the inlet to Stephens Lake (downstream of the
 83 Keeyask GS) and reduced concentrations, relative to conditions without the Project, are
 84 expected to persist along the mainstem in Stephens Lake for approximately 10–12 km
 85 from the GS; consequently, it is expected that sediment deposition will also be reduced
 86 relative to conditions without the Project.

87 During the construction period the benthic zone of Stephens Lake may be affected
 88 through a number of pathways, including sediment transport/deposition. However, it is
 89 expected that construction effects (e.g., inputs affecting water quality) will be managed
 90 through appropriate mitigation measures (Section 2.5.1: pages 2-41 to 2-51; Section
 91 3.4.1: pages 3-24 to 3-30), thereby reducing the duration and magnitude of
 92 construction-related effects on the benthic invertebrate community. The assessment of
 93 this pathway in the Stephens Lake Area during construction is provided in Section
 94 4.5.4.1.2 (Downstream Sedimentation: pages 4-76 and 4-77) and is presented below for
 95 the convenience of the reviewer. Based on the low rate of deposition and resultant
 96 minimal depth of deposited sediments, downstream sedimentation is not expected to
 97 have a measurable effect on the benthic invertebrate community during the
 98 construction period. Deposited material will likely be a combination of silt, sand, and
 99 coarser material, and is unlikely to be remobilized during the GS operating period.

100 **“Downstream Sedimentation**

101 It is predicted that approximately 30 % of the additional sediment resulting from
 102 shore erosion during Stage I and II Diversions will be deposited in Stephens Lake
 103 before it reaches the Kettle GS (Section 2.5.1.1.3); most of the deposition is
 104 expected to occur near the entrance of Stephens Lake, downstream of Gull
 105 Rapids (Section 3.4.1.5). This additional sedimentation could negatively
 106 influence the aquatic macroinvertebrate community in the affected area

107 depending on the size of sediment particles, the type of substrate (e.g., greater
108 negative potential if coarser substrate affected), the spatial extent (e.g., greater
109 negative potential as percent surface cover increases), and depth of deposited
110 sediments (e.g., greater negative potential if depth of sediments exceeds 5 cm),
111 the rate of deposition, and if deposited sediments are stable or transient (e.g.,
112 washed away with the next higher flow event). Cumulative sediment input from
113 all construction sources, over a four-year period for instream work, is expected
114 to result in a depth of deposited sediments less than 0.6 cm (very low rate of
115 deposition) through the south arm of Stephens Lake. Deposited material will
116 likely be a combination of silt, sand, and coarser material, and is unlikely to be
117 remobilized during the GS operating period. A small increase in sediment may
118 reduce population densities because of a reduction in habitat space (e.g., an
119 increase in substrate embeddedness); however, community structure (i.e.,
120 community composition) may not change (Lenat et al. 1979). An increase in the
121 volume of fine sediments may favour certain taxa over others; for example,
122 some chironomids use fine sediments in the construction of cases and tubes,
123 aquatic earthworms and fingernail clams are often associated with fine
124 sediment, and specific mayflies (*Hexagenia limbata*) are more common in silt
125 deposits, into which they burrow. Some types of mayflies, stoneflies, and
126 caddisflies are often particularly affected by sedimentation due the inhibitory
127 effects of fine sediments on attached algae as a food source, density of prey
128 items, available oxygen for respiration, and interstitial space (i.e., spaces
129 between coarser particles) for refuge. When the substrate is degraded by fine
130 sediment, there will be a point where the macroinvertebrate community will
131 become less diverse and numerically dominated by fine sediment tolerant taxa,
132 such as chironomids. However, based on the low rate of deposition and
133 resultant minimal depth of deposited sediments over the four years of instream
134 work, downstream sedimentation is not expected to have a measurable effect
135 on the aquatic macroinvertebrate community during the construction period.”

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.5.1 – Water Quality; p. N/A**

3 **CEC Rd 1 MB Wildlands-0015**

4 **PREAMBLE:**

5 There are a variety of effluent sources arising from the construction and operation
 6 phases of the project such as treated sewage effluent, concrete batch plant effluent,
 7 construction site run-off, road run-off, leaching from flooded peatlands, leaching from
 8 excavated materials, etc. (EIS contents) Increased effluent release impacts water quality
 9 characteristics by altering nutrient availability, pH levels, heavy metal content, mineral
 10 content, total dissolved solids, oxygen content and turbidity.

11 **QUESTION:**

12 There is reference made to “Good Management Practices” in reducing effluent
 13 discharge, however those practices are not disclosed.

- 14 1. Disclose all good management practices employed or to be employed to reduce
 15 effluent release into the surrounding environment from the Keeyask Generation
 16 Project for both construction and operation phases of the project.
 17 2. Advise if these management practices have been changed or improved due to the
 18 Waskwatim effluent management practices.

19 **RESPONSE:**

- 20 1. Best management practices to be used to mitigate various effluent releases during
 21 the project’s construction and operation are provided below.
 22 a. With respect to best management practices that will be used to reduce
 23 municipal wastewater effluent releases and associated impacts, the following
 24 will take place:
 25 • Municipal wastewater (sewage) effluent produced during construction will be
 26 treated prior to release in accordance with Manitoba *Environment Act* Licence
 27 No. 2952R (Schedule B).
 28 • Municipal wastewater effluent produced in the Keeyask Generating station
 29 during operation is described in Section 4.6.7 (page 4-14) of the *Project*
 30 *Description Supporting Volume*:
 31 “A wastewater treatment plant will be installed inside the powerhouse to
 32 serve during operation. Treated wastewater effluent will discharge into the
 33 Nelson River and will meet Manitoba Conservation’s Tier 1 Water Quality
 34 Standards for municipal wastewater effluent discharged to a water body.
 35 Effluent quality will meet or exceed Manitoba’s standards of 200 fecal coliform

36 organisms/100 mL for fecal coliform, 25 mg/L for biochemical oxygen demand
 37 (BOD) and 25 mg/L for total suspended sediments (TSS) and any other
 38 effluent requirements stipulated in the authorizing *Environment Act* licence.”

39 b. With respect to best management practices that will be used to reduce the
 40 effects of concrete batch plant effluent on the environment, it will be treated
 41 prior to release as described in Section 3.3.1.3 (page 3-14) of the *Project*
 42 *Description Supporting Volume*:

43 “Washwater for the concrete aggregate and batch plant will go into a multi-
 44 cell settling pond to reduce suspended solids. The pond will be located in an
 45 area of relatively impermeable soil or the pond will be lined with a clay or
 46 synthetic liner to avoid seepage into the groundwater. The larger particles
 47 will settle out in the primary cell and the finer ones in the secondary. If
 48 required, baffles will also be used to facilitate the settling of sediment in the
 49 ponds. The clarified effluent will be discharged into the river when the total
 50 suspended solids are below the Manitoba Surface Water Quality Standards,
 51 Objectives and Guidelines criteria of 25 mg/L. The discharge will not be
 52 continuous.”

53 c. With respect to best management practices that will be used to reduce the
 54 effects of water that needs to be pumped out of excavations into the
 55 environment, Section 3.3.3 (page 3-14 to 3-15) of the *Project Description*
 56 *Supporting Volume* states:

57 “Surface water, snowmelt and seepage entering excavations and
 58 cofferdams will need to be pumped as required. The water will be
 59 discharged into the river when the total suspended solids (TSS) are below
 60 Manitoba Water Quality standards, Objectives and Guidelines of 25 mg/L
 61 total suspended solids. If the water has a TSS concentration that exceeds 25
 62 mg/L, the water will be pumped into settling ponds to further reduce the
 63 TSS, and the clarified effluent will be discharged into the river when the TSS
 64 is below 25 mg/L.”

65 d. With respect to best management practices that will be used to reduce the
 66 effects of general site drainage/runoff, Section 5.25 of the *Keeyask Generation*
 67 *Project – Generating Station Construction Environment Protection Plan-Draft*
 68 states:

- 69 • All water originating from concrete activities and any other sediment
 70 laden water*, where the TSS > 25 mg/L, will be directed to adequately
 71 sized multi-cell settling pond(s) and not directly to the environment.

- 72 • The multi-cell settling pond will be constructed with a barrier to prevent
73 contained wastewater from percolating into the ground.
- 74 • The settling pond cells will be properly designed, which could include (but
75 not be limited to) installing baffles and/or filters, such that the final
76 effluent is < 25 mg/L TSS.
- 77 • The final effluent will be monitored on a weekly basis to verify the settling
78 ponds are in good working order.

79 * "Sediment laden water" is not intended to include stormwater runoff/drainage from around the site,
80 which will be mitigated through implementation of erosion and sediment control works.

- 81 e. Respecting general best management practices to reduce erosion and sediment
82 loss to water resulting from construction, Section 5.11 of the *Keeyask*
83 *Generation Project – Generating Station Construction Environment Protection*
84 *Plan-Draft* states:
- 85 • Prior to construction activities, as soon as it is feasible, erosion and
86 sediment control (ESC) measures will be put into place.
- 87 • All ESC measures will remain in place and be maintained throughout
88 construction.
- 89 • All ESC measures will be maintained in proper working condition during all
90 phases of the Project. In addition, the following will be adhered to by the
91 contractor:
- 92 ○ Wherever practicable, clearing will be minimized to reduce the
93 exposure of bare ground;
- 94 ○ Construction will be designed and executed to prevent the release or
95 settling of any sediment outside of construction boundaries;
- 96 ○ In steeply sloped areas susceptible to erosion, runoff will be directed
97 away from disturbed areas to prevent further site degradation;
- 98 ○ Disturbed areas will be stabilized, vegetated and/or seeded as soon as
99 practicable following construction;
- 100 ○ Accumulated sediment will be removed from silt fences, check dams,
101 straw bales, etc. as required, to confirm proper function;
- 102 ○ ESC measures will be maintained until either natural vegetation or
103 permanent measures are established to prevent further erosion or
104 sediment loss; and
- 105 ○ Additional measures will be implemented, if required, to protect
106 permafrost areas from extreme runoff events during periods of heavy
107 precipitation or melt.
- 108 • All temporary and permanent ESC measures will be inspected regularly by
109 the Site Environmental Officer for effectiveness. Shortcomings will be
110 rectified to restore their proper function.

- 111 • Routine maintenance (at least once per week) of sediment (silt) fencing,
112 check dams and erosion control blankets, etc. will be completed to
113 confirm proper function.
- 114 • All ESC measures (structures and procedures), either temporary and/or
115 permanent, will be maintained in proper working condition for the
116 duration of the Project.
- 117 • Changes to the construction schedule may be required to maintain ESC
118 measures.
- 119 • Completed work areas will be graded and permanently stabilized.
- 120 • ESC measures will be left in place until at least 50% vegetative cover is
121 established in the seeded area.
- 122 • Stockpiled material will be located at least 100 metres from any
123 watercourse/body or wetland, where practicable and will be surrounded
124 by a berm if it contains a high fines content.

125 f. Best management practices related to reducing erosion caused by clearing the
126 reservoir are provided in Section 3.6 (page 3-29) of the *Project Description*
127 *Supporting Volume*:

128 "There are some shallow sites that will not be cleared, thereby reducing
129 erosion rates and providing a more stable shoreline for new growth of
130 riparian shrubs and trees."

131 g. Best management practices related to road runoff (it is assumed the question is
132 related to control of erosion and sediment during road construction) are
133 described in Section 3.3.5 (page 3-17) of the *Project Description Supporting*
134 *Volume*:

135 "Temporary erosion and sediment control measures will be implemented as
136 dictated by local conditions, consistent with Manitoba Transportation and
137 Government Services "Manual of Erosion and Sediment Control" and
138 "Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish
139 Habitat". These may include seeding of exposed areas, rip rap at culvert
140 inverts, and on steep ditch slopes, straw or coconut fibre erosion control
141 blankets on grade and back slopes constructed with soils of high erodibility,
142 and silt fences to prevent sediment from entering watercourses."

143 Also:

144 "Construction of the stream crossings will be scheduled to take place in the
145 winter and early spring, before runoff. Construction procedures at stream
146 crossings will minimize in stream time and disturbance of the watercourse
147 bed and banks. Temporary soil- erosion and sediment control measures will

148 be implemented to the extent practical based on local site conditions and in
 149 accordance with Manitoba Transportation and Government Services
 150 "Manual of Erosion and Sediment Control" and "Manitoba Stream Crossing
 151 Guidelines for the Protection of Fish and Fish Habitat".

152 h. Regarding best management practices to be undertaken during operation of the
 153 project, as described in Section 4.6.7 (page 4-14) of the *Project Description*
 154 *Supporting Volume*:

155 "Once the Project goes into operation, the north and south access roads will
 156 be connected by a permanent river crossing over the Project's north dam,
 157 powerhouse, central dam, spillway and south dam. Manitoba Infrastructure
 158 and Transportation Department (MIT) has indicated it will assume the
 159 responsibility as part of the provincial transportation system."

160 Therefore, it is the KHLP's understanding that ongoing erosion and sediment
 161 control during operation will be undertaken by MIT.

162

163 i. Specific best management practices pertaining to erosion and leaching from
 164 excavated material placement areas (EMPA) are described in Section 2.4.9
 165 (pages 2-27 to 2-28) of the *Project Description Supporting Volume*:

166 "Where required, EMPAs within the reservoir will be armored to prevent
 167 erosion and sedimentation. The locations and maximum elevations of the
 168 excavated material placement areas were chosen based on minimizing the
 169 potential for erosion or transportation of materials into the flowing waters."

170 Also:

171 "The EMPAs outside of the dyke lines will be gently sloped and covered with
 172 salvaged organics and soils, providing an erosion resistant surface layer and
 173 promoting the regrowth of natural vegetation."

174 With respect to EMPAs located on land, outside of the reservoir, Section
 175 5.21 of the *Keeyask Generation Project – Generating Station Construction*
 176 *Environment Protection Plan-Draft* states that:

- 177 • Excavated material comprised of many fines will be placed in a
 178 contained area (i.e. with a surrounding berm) to prevent it from
 179 entering watercourses/bodies during precipitation events. Collected
 180 runoff from bermed areas will be sent to settling ponds.
- 181 • The side slopes of piles will be set to minimize washout and erosion.

- 182 j. There is no mitigation proposed related to flooding peatlands. The effects
 183 assessment and associated monitoring and follow-up are provided in the AESV.
 184 k. Reference to the term “Good Management Practices”, written in the IR, is
 185 located throughout the *Response to the EIS Guidelines* and Aquatic Environment
 186 Supporting Volume (SV) and refers specifically to mitigating potential releases of
 187 hazardous substances to the aquatic environment. Section 2.5.1.6.5 of the
 188 Aquatic Environment SV provides a list of the “Good Management Practices”
 189 that will be followed to mitigate the release of hazardous substances to the
 190 aquatic environment (including groundwater).

191 2.5.1.6.5 Accidental Spills/Releases

192 The presence and levels of hydrocarbons in the local surface water
 193 environment could potentially be affected by accidental spills or releases of
 194 substances containing hydrocarbons (*e.g.*, fossil fuels) or other
 195 contaminants.

196 The release of significant quantities of hazardous substances to the aquatic
 197 environment as a result of accidental spills and releases is considered
 198 unlikely due to the development and implementation of good management
 199 practices, including:

- 200 • Handling and storage of materials in accordance with established
- 201 policies and regulations;
- 202 • Transportation of dangerous goods as required by
- 203 legislation/regulation; and
- 204 • Having spill response programs and equipment in place to address
- 205 spillage or oils or other contaminants.

206 As discussed in the Physical Environment SV Section 8.4.1, due to the
 207 shallow nature of the groundwater in most areas, there is a risk of
 208 groundwater contamination from an accidental event such as a fuel spill.
 209 Contaminated groundwater could eventually flow into surface waters.
 210 However, this effect will be mitigated through measures such as (sighting)
 211 of (refueling) areas. A Project-Specific Emergency Response Plan including
 212 prevention and planning and response for hazardous material spills by the
 213 contractor (is) described in the Keeyask GS EnvPP. Various environmental
 214 protection measures for the management of hazardous materials and
 215 petroleum products will be applied, as described in the Keeyask GS EnvPP.

216 Additional “Good Management Practices” related to spills are provided in
 217 Section 2.3.1 (page 2-11) of the *Project Description SV*:

218 "To prevent any accidental discharge of oil to the river, the main
219 transformers on the tailrace deck will be supported on concrete pedestal
220 foundations surrounded by tall concrete curbs to contain any oil leaks
221 should a transformer fail. The foundations will drain to the oil-water
222 separation reservoir below the electrical galley floor. The tailrace deck will
223 also have downstream curbs and drainage slopes to contain any oil spills.
224 Run-off from the deck will be drained to the oil-water separation reservoir.

225 2. It is possible that applicable good management practices pertaining to effluent
226 releases used during the Wuskwatim project will be applied to the Keeyask project,
227 where appropriate. However, as Keeyask is a completely different project built in a
228 different area than Wuskwatim, alternative practices that are suitable for the
229 Keeyask project will also be implemented.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.10 – Cumulative Effects with other projects; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0016a**

5 **PREAMBLE:**

6 The cumulative impact of the Keeyask Generation project was assessed in conjunction
7 with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III
8 transmission line, Keeyask Transmission Project and the Conawapa Generation Project.

9 For the assessments examining combined future projects cumulative effects to
10 intactness, ecosystem diversity and wetland function, no cumulative effect was
11 reported. It was not discussed how the conclusions were arrived at, what baseline
12 values or which parameters were evaluated to calculate the cumulative impacts.

13 **QUESTION:**

14 Why did this analysis not investigate the cumulative effects of future projects on the
15 aquatic environment? If this study was conducted, provide.

16 **RESPONSE:**

17 The cumulative effects analysis for the aquatic environment is provided in the Response
18 to EIS Guidelines Section 7.3.1 pages 7-16 to 7-23 with in analysis of future projects on
19 pages 7-21 to 7-23.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.10 – Cumulative Effects with other projects; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0016b**

5 **PREAMBLE:**

6 The cumulative impact of the Keeyask Generation project was assessed in conjunction
7 with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III
8 transmission line, Keeyask Transmission Project and the Conawapa Generation Project.
9 For the assessments examining combined future projects cumulative effects to
10 intactness, ecosystem diversity and wetland function, no cumulative effect was
11 reported. It was not discussed how the conclusions were arrived at, what baseline
12 values or which parameters were evaluated to calculate the cumulative impacts.

13 **QUESTION:**

14 Provide a table indicating the land quantum associated with each future Manitoba
15 Hydro project.

16 **RESPONSE:**

17 Tables with detailed information on the total land area to be affected by each future
18 Manitoba Hydro project can be found in the response to CEC Rd 1 CEC-0035.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.10 – Cumulative Effects with other projects; p.**
 3 **N/A**

4 **CEC Rd 1 MB Wildlands-0016c**

5 **PREAMBLE:**

6 The cumulative impact of the Keeyask Generation project was assessed in conjunction
 7 with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III
 8 transmission line, Keeyask Transmission Project and the Conawapa Generation Project.
 9 For the assessments examining combined future projects cumulative effects to
 10 intactness, ecosystem diversity and wetland function, no cumulative effect was
 11 reported. It was not discussed how the conclusions were arrived at, what baseline
 12 values or which parameters were evaluated to calculate the cumulative impacts.

13 **QUESTION:**

14 Explain methodology used to identify no cumulative effect for any future hydro project.

15 **RESPONSE:**

16 The question is not correct when it asserts that the EIS states that there is no cumulative
 17 effect for any future hydro project.

18 Chapter 7 of the Response to EIS Guidelines explained the methodology used to identify
 19 adverse effects of the Keeyask Project that are expected to overlap with the other
 20 future projects or activities listed in Table 7-2 (which included one future hydro project;
 21 (Conawapa) as being reasonably foreseeable).

- 22 • Table 7-3 identifies potential overlap of Keeyask biophysical adverse effects with
 23 effects of the potential future Conawapa hydro project as regards the following
 24 VECs: water quality; priority plants; Canada Goose; Mallard; caribou; and moose.
 25 These potential cumulative effects are discussed and assessed in Section 7.5.1.3
 26 (aquatic VECs) and Section 7.5.2.3 (the terrestrial VECs).
- 27 ○ Potential cumulative effects of Keeyask in combination with Conawapa are
 28 identified for water quality; however, no measurable cumulative effects are
 29 expected at Conawapa or further downstream because inputs from both
 30 projects will be managed to maintain the overall TSS increase during
 31 construction within levels that would not have harmful effects .
 - 32 • Potential cumulative effects of Keeyask in combination with Conawapa are not
 33 identified for intactness, ecosystem diversity and wetland function because the
 34 physical footprint of Conawapa does not overlap the VEC Regional Study Areas and

35 the effects of construction traffic passing through the Regional Study Areas are
36 expected to be negligible. However, contrary to what is stated in the Preamble
37 above, potential cumulative effects of Keeyask in combination with other future
38 projects are indentified in Table 7-3 for each of these three VECs.

- 39 • Table 7-4 identifies potential overlap of Keeyask socio-economic adverse effects
40 with effects of the potential future Conawapa hydro project as regards the following
41 VECs: housing; infrastructure & services; transportation infrastructure; community
42 health; public safety & worker interaction; travel, access and safety; the way the
43 landscape looks; and culture & spirituality. These potential cumulative effects are
44 discussed and assessed in Section 7.6.3, including any additional mitigation that will
45 be relevant (e.g., see public safety and worker interaction VEC), and the basis for
46 not expecting a change from Chapter 6 significance assessments is reviewed.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.10 – Cumulative Effects with other projects; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0016d**

5 **PREAMBLE:**

6 The cumulative impact of the Keeyask Generation project was assessed in conjunction
7 with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III
8 transmission line, Keeyask Transmission Project and the Conawapa Generation Project.

9 For the assessments examining combined future projects cumulative effects to
10 intactness, ecosystem diversity and wetland function, no cumulative effect was
11 reported. It was not discussed how the conclusions were arrived at, what baseline
12 values or which parameters were evaluated to calculate the cumulative impacts.

13 **QUESTION:**

14 Provide components in Gillam redevelopment and explain reasoning as to no cumulative
15 effects.

16 **RESPONSE:**

17 The Gillam Redevelopment & Expansion Program (GREP), described in Appendix 7A of
18 the Response to EIS Guidelines, consists of three phases staged to align with major new
19 generation project schedules. This program has two goals: 1) the redevelopment and
20 expansion of existing infrastructure including the replacement and upgrade of
21 water/sewer, roads and commercial space, 2) additional new or refurbished housing
22 with approximately 250 new dwellings in the proposed plan to accommodate Manitoba
23 Hydro requirements, and associated town needs to service the expansion over the next
24 20 years.

25 As described in the Response to EIS Guidelines Section 7.5.2.3.1, the effects of GREP are
26 expected to overlap spatially and temporally with residual Project effects on intactness,
27 ecosystem diversity and wetland function. As also indicated in this section, the
28 magnitude of effects from GREP and the other future projects are relatively small so
29 that all effects are expected to remain in the small or moderate magnitude ranges.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 8.3.1.7 Groundwater quality; p. N/A**

3 **CEC Rd 1 MB Wildlands-0017**

4 **PREAMBLE:**

5 It is indicated in the EIS that there are no known users of the groundwater in the
6 groundwater study area.

7 **QUESTION:**

8 Answer the following questions:

- 9 1. Has Manitoba Hydro/KHLP evaluated whether there will be future users of the
10 groundwater sources?
11 2. Given that Manitoba Hydro has no ground water monitoring and follow-up program
12 in place or planned, what is the potential of the groundwater source becoming un-
13 usable for potential future users?
14 3. Provide verification that no ground water users are likely, including the basis for the
15 assumption.
16 4. Provide Manitoba hydro ground water contaminants list results for the local study
17 area, and project area.

18 **RESPONSE:**

19 The cumulative effects assessment indicates that future developments that might use
20 groundwater within the area are unlikely to be affected by changes in groundwater. It is
21 unlikely that cabins constructed on the reservoir shoreline in the future would use
22 groundwater as a water source as there is a lack of road access to get equipment in to
23 install a well, and a lack of electrical service to power a pump. Discussions with local
24 community members indicated that drinking water at cabins in the area is typically
25 obtained from surface water sources and in some cases bottled water may be used, and
26 it is expected that this would continue to be the source of water at isolated cabins. The
27 Project will use groundwater drawn from two wells located about 2.5 km north of the
28 main camp, well removed from the main Project work areas and the area of
29 groundwater changes due to the reservoir. It is considered very unlikely that the quality
30 of groundwater in the vicinity of the Project's water supply would be affected by the
31 Project.

32 Protection of groundwater quality is important even without future groundwater users.
33 Please refer to the response to interrogatory CEC Rd 1 MB Wildlands-0012, which also
34 asks about groundwater quality, for a discussion of the potential for groundwater
35 contamination.

36 The Project's Principal and Supporting infrastructure will be constructed in areas lacking
37 any previous substantive development or sites where groundwater contaminants might
38 be likely to occur, except for the portion of the south access road that utilizes an existing
39 Butnau road. Pre-project contamination of groundwater in these areas is deemed to be
40 very unlikely.

41 Groundwater quality monitoring was completed on two occasions in the project area:

- 42 • During a camp well investigation; and
- 43 • As part of the groundwater assessment supporting the Keeyask EIS.

44 The results of the groundwater testing did not indicate any contaminants of concern.
45 The response to a request for additional information from Natural Resources Canada in
46 the Responses to Request for Additional Information from TAC Public Rounds 1 and 2
47 (see TAC Rd 1 NRCan-0005 and TAC Rd 2 NRCan-0005) provides additional discussion
48 and tables of results from the groundwater quality testing.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 6.4.2.1.1 –Shoreline Conditions, Shoreline Recession and**
3 **Reservoir Expansion; p. N/A**

4 **CEC Rd 1 MB Wildlands-0018**

5 **PREAMBLE:**

6 Inland lake habitats are critical for maintaining healthy lake ecosystems. Having an
7 understanding of the five distinct inland lake zones and the habitats associated with
8 those zones, is key to maintaining lake ecosystem health and restoring the ecosystem.
9 Within the Aquatics or Terrestrial Environment EIS Supporting Volumes there is no
10 discussion of current inland lake zones, nor how flooding will impact those zones and
11 the habitats associated with them. Peatland areas are described, however their
12 relationship with the aquatic environment is not discussed

13 **QUESTION:**

14 Answer the following questions:

- 15 1. Provide a complete description of the inland lake zones for the predicted flooding
16 area, and describe how alteration of those habitats will influence aquatic ecosystem
17 health and which species will be affected.
18 2. How will alteration of inland lake zones impact aquatic VECs?
19 3. Provide a complete description of the inland lake zones for the Keeyask/Gull
20 reservoir at 5, 10, 20, 40 year intervals post flooding.

21 **RESPONSE:**

22 The question is identical to CEC Rd 1 MB Wildlands-0013.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1A.3.1.5.2 Channel construction at the Little Gull Lake for**
3 **Fish Egress; p. N/A**

4 **CEC Rd 1 MB Wildlands-0019**

5 **PREAMBLE:**

6 According the EIS materials: A channel between Little Gull Lake to Stevens Lake
7 reservoir is proposed to allow for fish to migrate to areas where there is increased
8 dissolved oxygen content during overwintering. The channels will be constructed to
9 allow fish egress and minimize fish mortality in Little Gull Lake during overwintering.
10 The channel will be 5 m wide, with a bottom elevation of 156 m ASL, allowing 1-2 m
11 below the ice surface (depending on reservoir levels and ice thickness) for fish
12 movement. The EIS materials do not address how the channel will be constructed, nor
13 whether the channel will be sufficient of effective during peak operating periods in the
14 winter when water levels fluctuate dramatically.

15 **QUESTION:**

16 Answer the following questions:

- 17 1. Will a depth of 1-2 m be sufficient to allow for fish passage under variable water
18 levels during winter months when temperatures are exceedingly cold and energy
19 demands are high?
20 2. Are there other regions where channels are being planned to assist with fish
21 passage?
22 3. Provide names and locations of successful fish channels in Manitoba Hydro system.

23 **RESPONSE:**

24 Each question above is answered in turn.

- 25 1. *Will a depth of 1-2 m be sufficient to allow for fish passage under variable water*
26 *levels during winter months when temperatures are exceedingly cold and energy*
27 *demands are high?*

28 A depth of 1-2 m will be sufficient to allow fish pass through the channel during the
29 winter when an ice cover is present. The forebay's maximum and minimum operating
30 levels are at elevations 159.0 m and 158.0 m respectively and the water level could
31 fluctuate within this 1 m range in the winter. The elevation of the bottom of the channel
32 has been set at 156.0 m which will provide a depth of 1 m of water below the ice when
33 the water level is 158 m. Lake ice is typically 1 m thick during the winter in the vicinity of
34 Gull Rapids and would be representative of ice conditions on the Keeyask reservoir. The

35 bottom elevation of the channel will be examined during the final design phase to
36 ensure it is adequate.

37 2. *Are there other regions where channels are being planned to assist with fish*
38 *passage?*

39 A channel will be excavated to allow fish to move between the spillway discharge
40 channel and Stephens Lake. (See response to CEC Rd 1 MB Wildlands-0020).

41 3. *Provide names and locations of successful fish channels in Manitoba Hydro system.*

42 Manitoba Hydro does not have similar channels elsewhere in its system.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1A.3.2.6.1 Measures to allow for Escape from Pools; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0020**

5 **PREAMBLE:**

6 The EIS materials indicate that channels to allow for fish passage/escape from pools will
7 be constructed during the operation period of the Keeyask Project during low flow
8 periods. Rock will be excavated using drilling and dynamite and will be side cast into
9 low lying areas within the river, outside the zone of influence of the spillway discharge.
10 There are currently 1000 m channels (2 m by 2 m) planned to permit fish access to
11 Stephens Lake. There is no further discussion regarding the specifics of how channel
12 construction will be carried out.

13 **QUESTION:**

14 Respond to the following questions

- 15 1. Will the use of dynamite and drilling fragment the rock bed, and lead to increased
16 mineral leaching within the aquatic environment?
17 2. Where are the 1000 m of fish passage channels to be located?
18 3. Where will the excavated material, provide map.
19 4. Is 2 m sufficient to allow for fish passage given the variable water levels and ice
20 thickness? Provide details by water levels, and seasonal fish passages.
21 5. Will plans for fish channel construction be available for the CEC hearings?

22 **RESPONSE:**

- 23 1. *Will the use of dynamite and drilling fragment the rock bed, and lead to increased*
24 *mineral leaching within the aquatic environment?*

25 The final design and construction methodology for the planned egress channels from
26 the spillway discharge channel to Stephens Lake will be detailed during the final design
27 phase of the Keeyask project. The newly blasted rock walls of the channel will increase
28 mineral leaching in the short term right after channel construction. In the longer term,
29 however, the mineral leaching will be equivalent to that of existing steep riverbanks and
30 bedrock outcrops (weathered aluminosilicates). The localized products of mineral
31 leaching will include higher Total Dissolved Solids (TDS) and a higher pH which will be
32 removed by the flow of water through the channel.

33 2. *Where are the 1000 m of fish passage channels to be located?*

34 The approximate location of the egress channel is shown conceptually on Map 2-22 of
35 the Project Description Supporting Volume. Bathymetric data in this area is not known
36 because it could not be collected due to the large rapids and high velocities in this area.
37 The precise location of the channels will be determined in the field once the
38 powerhouse is operational, the spillway is closed and the area is dewatered. This will
39 allow bathymetric data to be collected and the location of isolated pools to be
40 determined in order to finalize the alignment of the channels. It is likely there will be a
41 series of channels that connect pools or depressions in the rock which would allow fish
42 to move between the spillway discharge channel and Stephens Lake.

43 3. *Where will the excavated material, provide map.*

44 The final material utilization plan for excavated rock has not been determined for the
45 project. The excavated rock could be side cast into low lying areas within the river,
46 outside the zone of influence of the spillway discharge to reduce the potential for fish
47 standing in these areas. These areas will need to be identified once bathymetric data in
48 this area can be collected. The excavated rock could also be utilized for shoreline
49 protection as rip rap or be used for other aquatic mitigation measures, or be disposed of
50 in one of the excavated material placement areas.

51 4. *Is 2 m sufficient to allow for fish passage given the variable water levels and ice
52 thickness? Provide details by water levels, and seasonal fish passages.*

53 The bottom elevation of the channel (invert) is believed to be adequate at this time. The
54 proposed fish egress channel depth was selected to develop a conceptual design and
55 will be reviewed for adequacy during final design phase and will be changed if
56 necessary.

57 5. *Will plans for fish channel construction be available for the CEC hearings?*

58 Plans that show the final location for the proposed fish egress channel will not be
59 available for the CEC hearings since the bathymetric data required to finalize the design
60 and location will not be available until the area is dewatered late in the construction
61 phase of the generating station.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.3.3 Project linkage identification; p. N/A**

3 **CEC Rd 1 MB Wildlands-0021**

4 **PREAMBLE:**

5 The EIS materials seek to understand ecosystem relationships and identify potential
 6 ecosystem health issues by evaluating linkages through modeling. The figures
 7 presented to describe modeling methods and linkages appear overly simplified.
 8 Ecosystem modeling is important in order to understand the true impacts of Project
 9 activities on ecosystem function. Despite the idea of ascribing importance and priority
 10 to various VECs, habitats and indicators, all components of an ecosystem impact other
 11 components directly and indirectly through horizontal and vertical mechanisms.

12 **QUESTION:**

13 Answer the following questions

- 14 1. Was it even considered that in order to assess linkages between habitat destruction
 15 and species, numerous species must be consider simultaneous (food chain) and
 16 various habitat types included? If not, why not? Explain.
 17 2. Complete a new set of linkage modeling for VECs of the aquatic and terrestrial
 18 environments, and include additional species and habits.
 19 3. Also present data to show the direct and indirect linkages between species and
 20 environments, in the ecosystems affected by Keeyask.

21 **RESPONSE:**

22 The components and linkages that could materially alter the assessment conclusions
 23 regarding habitat, species, effects of habitat changes on species and ecosystem
 24 functions were considered. Table 1A-1 in the Terrestrial Environment Supporting
 25 Volume and Figure 6-16 in the Response to EIS Guidelines demonstrate that numerous
 26 species, pathways and ecosystem linkages were considered when selecting the VECs and
 27 supporting topics used to focus the terrestrial effects assessment. Conceptual diagrams
 28 of the aquatic ecosystem pre and post Project and a summary of pathways of effect are
 29 provided in the Aquatic Environment Supporting Volume Figures 1-1A, 1-1B and 1-2.

30 The linkage information and results provided in the Response to EIS Guidelines are
 31 provided as needed to support the effects assessment conclusions. The figures are
 32 limited to the key components and linkages for three reasons. First, displaying every
 33 possible component and linkage would create so many boxes and lines that the most
 34 useful information would be obscured. Second, it is standard practice in environmental
 35 assessment and wide area ecosystem monitoring to focus on the key ecosystem drivers,

36 components and linkages, which can be viewed as the most influential factors and the
37 most informative response indicators. Third, the purpose of the EIS is to provide a
38 focused analysis, which is consistent with the Project-specific EIS guidelines.

39 For each VEC and supporting topic, the focused analysis typically includes (i) a
40 description of the major pathways of effect that were considered in the assessment; (ii)
41 an analysis of each of the pathways of effect using models, empirical results from other
42 systems and/or other appropriate methods; (iii) a description of mitigation to address
43 effects (if required); and, (iv) a description of the overall residual effect to the
44 environmental component of interest, considering the net result of all pathways of
45 effect and measures. For example, the assessment of water quality during the
46 construction period provides a description of pathways of effect (Aquatic Environment
47 Supporting Volume Section 2.51, Table 2-11), an analysis of effects to each water quality
48 parameter of concern with a description of mitigation (for example for total suspended
49 solids, Aquatic Environment Supporting Volume Section 2.5.1.1), and a description of
50 the net effect of all changes (e.g., for total suspended solids Aquatic Environment
51 Supporting Volume Section 2.5.1.1.1.2)

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.3.5 Spatial Scope; p. Map 1-1 and Table 1-3**

3 **CEC Rd 1 MB Wildlands-0022**

4 **PREAMBLE:**

5 Each terrestrial VEC was evaluated in a local and regional study area, which corresponds
6 to a particular study zone. However, assessment of individual VECs was carried out in
7 different local and regional study areas. Therefore, VECs were not assessed within the
8 same local and regional study areas, thus preventing comparative assessment of VECs
9 within a given local or regional study area.

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. What criteria were used to assign VECs to local and regional study areas?
- 13 2. What was the rationale behind assigning different local and regional study areas to
14 VECs?
- 15 3. In what locations is the monitoring carried out during the construction and
16 operation phase of the project for terrestrial VECs?
 - 17 a. Do the locations differ from where baseline measurements were taken?
 - 18 b. Are VECs compared to one another during monitoring? If so, explain.

19 **RESPONSE:**

20 Each of the questions above is answered in turn:

- 21 *1. What criteria were used to assign VECs to local and regional study areas?*

22 As indicated in Section 6.2.3.4.1 of the Response to EIS Guidelines, for terrestrial wildlife
23 VECs, the Local Study Area was determined by the spatial extent of potential direct and
24 indirect Project effects on individual animals while the Regional Study Area was
25 determined by the potential effects on populations. For the other VECs, the spatial
26 extent of potential direct and indirect Project effects on individual ecosystem elements
27 (e.g., jack pine stands) defined the Local Study Area while potential effects on the
28 relevant regional entity (e.g., regional ecosystem) defined the Regional Study Area.
29 Species with large home ranges (e.g., caribou) and VECs closely linked with ecosystem
30 processes that occur over large areas had the largest Local and Regional Study Areas.

31 More detailed information on Study Area selection can be found in the Terrestrial
32 Environmental Supporting Volume (TE SV), Section 1.3.5 Spatial Scope.

33 2. *What was the rationale behind assigning different local and regional study areas to*
34 *VECs?*

35 Local and regional study areas appropriate to the home ranges of the particular species
36 were selected in order to capture the effects of the Project on individuals and
37 populations. Too small a scale would not sufficiently capture direct and indirect effects;
38 too large a scale would tend to mask them. Additionally, using a limited number of
39 common study areas facilitated linking results from different VECs.

40 Detailed methodology of the selection process is described in the response to CEC Rd 1
41 CEC-0022.

42 3. *In what locations is the monitoring carried out during the construction and operation*
43 *phase of the project for terrestrial VECs?*

44 Detailed information for each VEC can be found in the TEMP under the "Study Area" and
45 "Sample Locations" headings for that VEC.

46 a. *Do the locations differ from where baseline measurements were taken?*

47 In some cases, these may differ from baseline measurement location. This would
48 depend on the purpose of the monitoring as well as on location relative to the Project
49 Footprint and flooding. Detailed information for sampling locations for each VEC can be
50 found in the TEMP under the "Study Area" and "Sample Locations" headings for that
51 VEC.

52 b. *Are VECs compared to one another during monitoring? If so, explain.*

53 Valued Environmental Components will not be compared to one another during
54 monitoring. However, the fundamental basis for the overall design of the TEMP
55 recognizes that there are interrelationships between ecosystem components. Results
56 from the terrestrial habitat and ecosystems monitoring will be used for many other
57 terrestrial components. Additionally, the results of the terrestrial study teams can
58 provide input to the SE team (through the linkages and pathways among the Terrestrial
59 and Resource Use VECs).

60 Please see the response to CEC Rd 1 MB Wildlands-0008 for information about the role
61 of the Partnership's Monitoring Advisory Committee (MAC) in overseeing and reviewing
62 the results of all monitoring programs.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.8.4.2.2 Mitigation; 2.8.4.5 Environmental**
3 **Monitoring and Follow-Up; p. N/A**

4 **CEC Rd 1 MB Wildlands-0023**

5 **PREAMBLE:**

6 Wetland mitigation measures will include “additional wetland development to the
7 extent practicable if monitoring determines that further measures are needed to
8 achieve successful development of 12 ha of the off-system marsh wetland type.” No
9 further discussion on wetland mitigation is provided. Environmental monitoring and
10 follow-up for wetlands is outlined within the Terrestrial Environment Monitoring Plan as
11 indicated within the EIS materials, however no such plan is available. Instead the
12 Environment Protection Program has a section entitled “Terrestrial Effects Monitoring
13 Plan”, which is also not available/incomplete.

14 **QUESTION:**

15 Please answer the following questions:

- 16 1. How will mitigation activities for wetland protection be carried out, and how
17 frequently will they be conducted?
18 2. The mitigation measures proposed for wetland protection are not clear: please
19 provide a detailed description of the wetland mitigation program.
20 3. Provide a complete copy of the Terrestrial Effects Monitoring Plan.
21 4. What direct and indirect effects on wetland habitat will be measured within the
22 monitoring program?
23 5. How can the mitigation program be proposed if the monitoring program is not
24 developed? Explain.

25 **RESPONSE:**

26 Please refer to the response for TAC Public Rd 2 EC-0030 for a description of wetland
27 mitigation and protection measures, and to TAC Public Rd 2 CEAA-0005 for measures
28 specifically developed for the off-system marsh wetland compensation area.

29 Effects on wetland habitat will be measured according to the *Keeyask Generation Draft*
30 *Project Terrestrial Effects Monitoring Plan (TEMP)*, which was filed on June 28, 2013 and
31 is available on the Partnership’s website at www.Keeyask.com. As per the TEMP,
32 wetland monitoring will include the following:

33 During Construction

- 34 • amount of off-system marsh being successfully created;
- 35 • amounts and types of Project-related erosion, siltation, and surface hydrological
- 36 alteration in off-system marshes near the Project Footprint; and
- 37 • areas and locations of wetlands affected by the Project by wetland type.

38 During Operation

- 39 • areas, locations and composition of off-system marsh that is successfully created;
- 40 • utilization of the created off-system marsh habitat by various wildlife;;
- 41 • areas and locations of Nelson River shoreline wetlands by wetland type; and
- 42 • areas and locations of wetlands affected by the Project by wetland type.

43 The mitigation included in the EIS is based on the predicted potential Project effects.
44 The monitoring program will monitor attributes that indicate how close actual effects
45 are to predictions, and the success of off-system wetland creation (see above).

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: Cooley, P.M. 2008. Carbon dioxide and methane flux from**
3 **peatland watersheds and divergent water masses in a sub-arctic**
4 **reservoir. Draft report prepared for Manitoba Hydro by**
5 **North/South Consultants Inc. 45pp. Draft.; p. Table 1B-1**

6 **CEC Rd 1 MB Wildlands-0024**

7 **PREAMBLE:**

8 Reservoirs can absorb or emit CO₂ and methane (greenhouse gases: GHGs)). Water
9 originating from peatlands contains a high amount of dissolved organic carbon (DOC),
10 which is broken down to form methane in the presence of oxygen: DOC depletes water
11 oxygen content. Positive flux describes a state where there is a movement of gas from
12 across the air-water interface, emitting gas into the environment. Independent
13 scientific study reports that peatlands can emit GHGs for a minimum of 10 years after
14 flooding. In 1974 Kettle Generation Station was complete, flooding approximately
15 22,055 ha of land to create Stephens Lake. In August 2006, a study was conducted by
16 Manitoba Hydro to evaluate the flux of GHGs from Stephens Lake reservoir, 35 years
17 post flooding. The results of the study reported the following: - Stephens Lake reservoir
18 emits 466 tonnes of GHGs/day (equivalent to emissions from 77 cars over a one year
19 period) - GHGs emissions were reported as being the highest in small tributaries and at
20 the ends of flooded peatland bays.

21 **QUESTION:**

22 Please respond to the following questions:

- 23 1. What will the total GHG emissions/day from the Keeyask reservoir arising from
24 flooded peat land, over 40 years?
25 2. Calculate the cumulative GHGs released from flooded peatlands in the Keeyask
26 reservoir from 30, 50 and 100 years of operation.

27 **RESPONSE:**

28 The referenced study (Cooley, P.M. 2008) estimated gross carbon dioxide and methane
29 emissions from Stephens Lake for a particular day in August 2006. The sampling
30 occurred during a very limited period of time and over a limited portion of Stephens
31 Lake. Many factors can influence aquatic greenhouse gas (GHG) emissions, which can
32 vary daily, seasonally and annually. The gross GHG emissions estimated by the
33 referenced study for Stephens Lake are typical of gross GHG emissions from boreal
34 rivers and lakes.

35 Section 5 in Technical Memorandum GN9.5.6 (Reservoir Greenhouse Gases; provided in
 36 the CD included with the Responses to EIS Guidelines provides details on the
 37 Intergovernmental Panel on Climate Change (IPCC) methodology that was used to
 38 determine reservoir GHG emissions. The reservoir GHG emissions for flooding are a
 39 result of the conversion of a portion of the flooded carbon in vegetation and soils
 40 (including that of peat) to carbon dioxide (CO₂) and methane (CH₄). This GHG flux based
 41 approach takes into account not only the initial flooding but also the area associated
 42 with the breakdown and disintegration of peat and mineral shoreline erosion (the initial
 43 flooded area is 45.1 km² increasing to 52.4 km² after 30 years of shoreline erosion). The
 44 reservoir GHG emission calculations use the larger 30-year flooded area from the point
 45 of initial flooding as a conservative assumption. Table 2 in Technical Memorandum
 46 GN9.5.6 provides the estimated annual net aquatic reservoir GHG emissions as well as
 47 the cumulative 100-year reservoir GHG emission values, where 100 years is the assumed
 48 life of the Project.

49 Although the IPCC methodology for reservoir GHG emissions is inclusive of peat land it
 50 does not utilize the carbon content of flooded soils nor does it calculate the proportion
 51 of the emissions from peatland versus other types of flooded land. Section 5 in
 52 Technical Memorandum GN 9.5.6 (Reservoir Greenhouse Gases) explains that GHG
 53 emissions resulting from flooding were estimated by applying IPCC emission factors for
 54 flooded lands in the “polar/boreal wet” climate region to the 30-year flooded area of
 55 52.4 km². As per the IPCC guidance, CO₂ and CH₄ emissions were estimated for 10 years
 56 and 100 years, respectively, following initial flooding.

57 Table 1 below illustrates the estimated increase in average daily reservoir flux over the
 58 first 40 years of flooding, and cumulative total increase in reservoir flux associated with
 59 the total 52.4 km² of flooded lands after 30, 50 and 100 years.

Table 1: Estimate of Greenhouse Gas Emissions from Flooded Lands Based on Flux Equations

Greenhouse Gas Emissions	Median
	(tonnes CO ₂ eq)
Average GHG Emissions / Day during first 40 years after initial flooding	12
Cumulative GHGs	
30 years after flooding	162,571
50 years after flooding	200,875
100 years after flooding	296,636

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
2 **Monitoring and Follow-Up; p. N/A**

3 **CEC Rd 1 MB Wildlands-0025**

4 **QUESTION:**

5 In the relevant Ecosystem Services literature, it is demonstrated that a historic and
6 current lack of data exists to support informed decision making regarding ecosystem
7 goods, services and natural capital assets. These data should also be used to inform the
8 monitoring and management of the project:

- 9 1. Does this long-term proposed monitoring program strive to adapt and correct this
10 acknowledged scientific gap regarding natural capital within the project area?
11 2. Does it strive to change as the information needs change for local and regional
12 decision makers with regard to intensively managed flow regimes? a. If yes, please
13 verify this by providing plans, methodologies, etc. that demonstrate this. If not, why
14 not?

15 **RESPONSE:**

16 The Partnership has completed its assessment of the potential environmental effects of
17 the Project, and the development of long-term mitigation and monitoring plans, in
18 accordance with guidelines issued by regulatory authorities and standard environmental
19 assessment methodology. The assessment guidelines do not require the Partnership to
20 specifically address the concept of natural capital and, in particular, the economic
21 valuation of ecosystem services within the project area that is implied by this term. The
22 economic valuation of ecosystem services is also not considered to be standard practice
23 in project-specific environmental assessment.

24 Chapter 8: Monitoring and Follow-up of the Response to EIS Guidelines provides a
25 description of the Partnership's Environmental Protection Program, including long-term
26 monitoring plans. As noted on pg. 8-2, the Partnership's long-term monitoring and
27 follow-up process:

28 "...addresses areas where uncertainty exists in the predictions, including those
29 areas where there are differences between the predictions based on technical
30 analysis and [Aboriginal Traditional Knowledge (ATK)]. Variations in predicted
31 and actual results identified through monitoring will be assessed by the
32 Partnership and regulatory authorities for follow-up actions such as mitigation
33 adjustments and adaptive management."

- 34 While not a requirement of the EIS Guidelines, preliminary drafts of the Partnership's
- 35 monitoring plans were filed with regulators on June 28, 2013.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 2.3 Water Quality: Approach and Methods; p. 2-2**

3 **CEC Rd 1 MB Wildlands-0026a**

4 **PREAMBLE:**

5 On page 2-2, it is stated “existing water quality conditions” are used as a baseline and
6 foundation for assessing the potential effects of the Project on water quality. Given that
7 the aquatic environment has already been substantially altered by hydroelectric
8 developments, as described on page 6-54 in the Response to EIS Guidelines, please
9 demonstrate ‘existing’ water conditions represent baseline conditions that are “suitable
10 for aquatic life?”

11 **QUESTION:**

12 How is it demonstrated in the EIS that the existing conditions reflect properly
13 functioning aquatic systems that facilitate the necessary water quality services such as
14 water regulation, water supply, erosion control and sediment retention, and waste
15 treatment?

16 **RESPONSE:**

17 As discussed in the AE SV Section 2.3.1, existing water quality conditions were compared
18 to Manitoba Water Quality Standards Objectives and Guidelines and the Canadian
19 Council of Ministers of the Environment guidelines for the protection of aquatic life
20 (PAL) to describe the suitability for aquatic life.

21 For the purposes of the EIS, the effect of water quality on functions such as water
22 regulation, water supply, erosion control and sediment retention and waste treatment
23 was not relevant.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 2.3 Water Quality: Approach and Methods; p. 2-2**

3 **CEC Rd 1 MB Wildlands-0026b**

4 **PREAMBLE:**

5 On page 2-2, it is stated “existing water quality conditions” are used as a baseline and
6 foundation for assessing the potential effects of the Project on water quality. Given that
7 the aquatic environment has already been substantially altered by hydroelectric
8 developments, as described on page 6-54 in the Response to EIS Guidelines, please
9 demonstrate ‘existing’ water conditions represent baseline conditions that are “suitable
10 for aquatic life?”

11 **QUESTION:**

12 Have pre-alteration/ impoundment/ settlement conditions been considered for an
13 alternative baseline as has been done in the IISD Environment Canada report: An
14 Ecosystem Services Assessment of the Lake Winnipeg Watershed? If not, can you justify
15 why you chose not to examine these conditions?

16 **RESPONSE:**

17 The AE SV Section 2.4.1 provides an overview of available information on historic water
18 quality conditions and the effects of past hydroelectric development on water quality.
19 Current conditions are summarized in AE SV Section 2.4.2, including a comparison to
20 Manitoba Water Quality Standards Objectives and Guidelines and the Canadian Council
21 of Ministers of the Environment for the protection of aquatic life (PAL) to describe the
22 suitability for aquatic life. The AE SV Section 2.4.3 provides an analysis of current trends,
23 which addresses recent and on-going changes to water quality. As summarized in AE SV
24 Section 2.4.3.4, water quality along the mainstem of the Nelson River has generally
25 remained consistent for several decades.

26 Given that there is limited pre-development information, that current conditions can
27 support aquatic life, and that water quality has generally remained stable for decades,
28 existing water quality conditions (as defined by multiple years of sampling) are
29 considered to provide the most appropriate baseline for the assessment. It should be
30 noted that the aquatic biota in the current environment would reflect the water quality
31 conditions over the past decades.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **Executive Summary; p. Part 1 - Effects on the Biophysical**
 3 **Environment**

4 **CEC Rd 1 MB Wildlands-0027**

5 **PREAMBLE:**

6 Water quality was selected as a VEC. In the Executive Summary, Part 1, page 24 it is
 7 stated that “water quality will always be suitable for aquatic life in the main part of the
 8 reservoir- and will be suitable at most locations and most time of the year in the flooded
 9 area.” However, in section 2.4.3.4 Water Quality Trends: Synthesis, it is stated that
 10 “Overall then trend analysis information indicates that water quality may vary in the
 11 study area in the future in relation to discharges... however the reason for these
 12 observed increases are not known, making predictions of future conditions difficult.”

13 **QUESTION:**

- 14 1. Given the varying degree of water quality indicators in relation to discharge, why
 15 does the EIS state that “water quality will always be suitable for aquatic life in the
 16 main part of the reservoir - and will be suitable at most locations and most time of
 17 the year in the flooded area?”
 18 2. What scientific basis, methodologies, comparative studies, etc. were used to come
 19 to this conclusion?

20 **RESPONSE:**

21 The Aquatic Environment Supporting Volume (AE SV) Section 2.4.3.4 (Water quality
 22 trends: synthesis) provides a brief summary of the results of three sources of
 23 information compiled for considering current trends in the aquatic environment. One of
 24 these analyses involved examination of the long-term water quality data set at Split Lake
 25 and compared water quality conditions over two recent decades to evaluate potential
 26 changes in water quality over time. This exercise, which is described in detail in AE SV
 27 Appendix A2-4, concluded that some water quality parameters (i.e., specific
 28 conductance and alkalinity) differed statistically between the two intervals examined. It
 29 further concluded that the relative flows of the Burntwood and Nelson rivers affects
 30 water quality in Split Lake due to inherent differences in some water quality parameters
 31 between the two rivers.

32 Section 2.4.3.4 stated the following:

33 “Overall, the trend analysis information indicates that water quality may vary in
 34 the study area in the future in relation to discharges, in particular the relative
 35 contribution of the Nelson River versus the Burntwood River to discharge, and

36 that TSS and turbidity may be increasing over time - at least in Split Lake.
 37 However, the reasons for these observed increases are not known, making
 38 predictions of future conditions difficult. Water quality has been generally
 39 stable along the mainstem of the Nelson River in the Keeyask and Stephens Lake
 40 areas over the last several decades and conditions appear to have been stable in
 41 the north arm of Stephens Lake since the 1980s. Most notably, the occurrence
 42 of Manitoba water quality PAL guideline exceedances has been consistent over
 43 the last 20 years, indicating that water quality has not notably changed in terms
 44 of its suitability to support aquatic life. Based on this information, water quality
 45 conditions have been generally stable over the last several decades in the study
 46 area, although year-to-year changes may occur in relation to changes in river
 47 discharges."

48 With respect to question 1), "Given the varying degree of water quality indicators in
 49 relation to discharge, why does the EIS state that "water quality will always be suitable
 50 for aquatic life in the main part of the reservoir - and will be suitable at most locations
 51 and most time of the year in the flooded area?", Section 2.4.3.1 states that:

52 "The observed increase in specific conductance and alkalinity over the last
 53 decade may reflect higher river discharges, most notably, the greater
 54 proportional contribution of the Nelson River – which is characterized by a
 55 higher specific conductance and alkalinity than the Burntwood River. Linear
 56 regression analysis indicates a significant influence of the Nelson River discharge
 57 on the concentrations of these two parameters in Split Lake."

58 The parameters that vary with river discharge are not predicted to be substantially
 59 affected by the Project; therefore, variation in these parameters as a result of variation
 60 in river discharge would not affect the conclusions of the water quality assessment.

61 The effects of the Project on pH (which is related to alkalinity and for which there are
 62 water quality guidelines for the protection of aquatic life), are expected to be as follows:

- 63 • In lotic areas of the reservoir: "Effects...are expected to be small and not detectable
 64 due to the large volume of flow and short residence times and pH is expected to
 65 remain within Manitoba and CCME PAL, recreational, and aesthetic drinking water
 66 quality guidelines." (AE SV, Section 2.5.2.2.4, p. 2-64); and
- 67 • In nearshore, lentic habitat: "It is expected that pH will decrease in the nearshore,
 68 lentic areas of the Keeyask reservoir...it is expected that pH would still remain within
 69 Manitoba and CCME water quality guidelines for the PAL (6.5–9) and recreation (5-
 70 9) and the Manitoba and CCME aesthetic objective for drinking water (6.5–8.5)." (AE
 71 SV, Section 2.5.2.2.4, p. 2-63)

72 The effects of the Project on conductivity are expected to be: “conductivity and TDS are
73 expected to increase in the nearshore areas over flooded habitat in the Keeyask
74 reservoir, but would remain similar to existing conditions along the mainstem of the
75 reservoir.” (AE SV, Section 2.5.2.2.10, p. 2-77)

76 Regarding question 2), “What scientific basis, methodologies, comparative studies, etc.
77 were used to come to this conclusion?”, the water quality assessment was founded
78 upon a detailed characterization of current water quality conditions, modeling,
79 comparisons to provincial and national water quality objectives and guidelines for the
80 protection of aquatic life, scientific literature, notably information pertaining to
81 reservoirs, and use of a proxy area (i.e., Stephens Lake). The water quality assessment
82 used information presented in the PE SV, including results of modeling of effects of the
83 Project on total suspended solids and dissolved oxygen and temperature. The approach
84 applied, and information sources used, for the water quality assessment are described
85 in Section 2.3 of the AE SV.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0028**

4 **QUESTION:**

5 Indicators for ecosystem diversity were: habitat composition and priority habitat types.

- 6 1. Where it is shown that these indicators encompass the goods and services that are
7 essential to the sustained health and survival of the VECs?
- 8 2. Were the indicators above categorized and analyzed by ecosystem services within
9 the habitat composition and habitat types?
- 10 3. Did Manitoba Hydro take into account and complete an assessment on the
11 ecosystem goods and services provided by the habitat composition for each habitat
12 type defined?
- 13 4. If Manitoba Hydro did not take any of these aspects into account, why not?

14 **RESPONSE:**

15 The Partnership has completed its assessment of the potential environmental effects of
16 the Project, and the development of long-term mitigation and monitoring plans, in
17 accordance with guidelines issued by regulatory authorities and standard environmental
18 assessment methodology. Please see the response to CEC Rd 1 CAC-0011b for an
19 explanation of the Partnership's approach to assessing ecosystem services. Table 1A-1 in
20 the Terrestrial Environment Supporting Volume demonstrates how habitat composition,
21 priority habitat types and other topics were selected as indicators to represent the
22 status of and trends in terrestrial ecosystem patterns and processes.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0029**

4 **QUESTION:**

5 Biodiversity is mentioned 2.7.1 Page 1. It refers to ecosystem, species and genetic
6 diversity.

- 7 1. Have the genetic resources - such as medicine, products for materials, science,
8 genes for plant resistance and crop pests been assessed and included in the EIS?
- 9 2. Have any data (point, spatial, etc.) been collected regarding these biodiversity goods
10 and services?
- 11 3. Which studies, methodologies, data sets, and assessment approaches did Manitoba
12 Hydro use for the genetic diversity affected by the project?
- 13 4. What was scientific literature and methodology was used in the assessment? Have
14 these sources been made available to participants for review?

15 **RESPONSE:**

16 The terrestrial assessment employed a focused approach to evaluating Project effects
17 on the components of biodiversity using VECs and supporting topics. Table 1A-1 in the
18 Terrestrial Environment Supporting Volume Appendix 1A demonstrates how intactness,
19 priority species (i.e., species at a range limit, rare species) and habitat composition were
20 selected as proxies for effects on genetic diversity. In other words, effects on genetic
21 diversity are not expected if effects on the proxies for genetic diversity remain within
22 regionally acceptable ranges. The same rationale applies to genetic resources.

23 The relevant data, studies, methodologies, assessment approaches and literature used
24 for the intactness, priority species, habitat composition and ecosystem diversity
25 assessments are provided in Sections 2.4, 3.0, 5.0, 6.0, 7.0, 2.6 and 2.7 of the Terrestrial
26 Environment Supporting Volume.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0030**

4 **QUESTION:**

5 In 2.2.4, Habitat mapping, the attributes used to classify and map terrestrial habitats
6 were vegetation type, vegetation age class, ecosite, topographic position , disturbance
7 type, water depth duration zone. Mapping all of these attributes goes the first step in
8 classifying ecosystems and ecosystem function, however, the next step is taking this
9 information and mapping ecological services and biodiversity.

- 10 1. Has the next required step in the assessment has been conducted?
11 2. If it hasn't, how does Manitoba Hydro justify the gap in methodology?

12 **RESPONSE:**

13 The Partnership has completed its assessment of the potential environmental effects of
14 the Project, and the development of long-term mitigation and monitoring plans, in
15 accordance with guidelines issued by regulatory authorities and standard environmental
16 assessment methodology. Please see the response to CEC Rd 1 CAC-0011a for an
17 explanation of the Partnership's approach to assessing ecosystem services. Table 1A-1 in
18 the Terrestrial Environment Supporting Volume demonstrates how ecosystem diversity
19 and other VECs and supporting topics were selected to represent the status of and
20 trends in terrestrial biodiversity.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 8.0**
2 **Monitoring and Follow-Up; p. N/A**

3 **CEC Rd 1 MB Wildlands-0031**

4 **QUESTION:**

- 5 1. Do indicators exist within the monitoring programs that could inform a valuation of
6 natural capital for the project area, including the non-market (or un-priced)
7 benefits?
- 8 2. If so, please provide a comprehensive list, and provide evidence of how they could
9 be used to inform a natural capital assessment/ valuation of the study area?
- 10 3. Does the Cost-Benefit Analysis/ or Cost-Benefit Loss Analysis of the project consider
11 both the priced and unpriced benefits to society to understand how these costs/
12 benefits would impact the Project?
- 13 4. Has Manitoba Hydro included references to the methodologies or data used to
14 complete this assessment (spatial, temporal, point, descriptive, etc.)?
- 15 5. If this was not done, please explain the gap in documentation.

16 **RESPONSE:**

17 As noted in the response to CEC Rd 1 MB Wildlands-0025, the Partnership has
18 completed its assessment of the potential environmental effects of the Project, and the
19 development of long-term mitigation and monitoring plans, in accordance with
20 guidelines issued by regulatory authorities and standard environmental assessment
21 methodology. The assessment guidelines do not require the Partnership to undertake
22 an economic valuation of natural capital within the project area, nor is this standard
23 environmental assessment practice. Similarly, the Partnership has not completed a Cost-
24 Benefit Analysis or a Cost-Benefits Loss Analysis for the Project.

25 It is possible that information collected through the monitoring programs could inform a
26 valuation of natural capital for the project area; however, the programs have not been
27 designed for this purpose. The utility of the information collected through these
28 programs for economic valuation purposes would need to be assessed by those
29 interested in undertaking such an analysis.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.4.1**
2 **Aboriginal and Reserve Lands; p. N/A**

3 **CEC Rd 1 MB Wildlands-0032**

4 **QUESTION:**

5 The EIS indicates that as of summer 2012 there are “no Treaty Land Entitlement
6 selections extant or pending on these lands.”

- 7 1. Has this changed in the last year?
8 2. How many First Nations in Manitoba have the option to select lands in the RSA, in
9 the LSA?

10 **RESPONSE:**

11 The following provides a response to each of the above questions.

12 1. *Has this changed in the last year?*

13 Section 4.4.1 of the Response to EIS Guidelines states that “Federally designated First
14 Nations reserve lands will not be encroached upon by the Project’s principal structures,
15 reservoir and infrastructure. There are no Treaty Land Entitlement selections extant or
16 pending on these lands”. This has not changed since the submission of the Keeyask
17 Generation Project Response to EIS Guidelines [AMB2][NL3].

18 2. *How many First Nations in Manitoba have the option to select lands in the RSA, in*
19 *the LSA?*

20 According to the Government of Manitoba Aboriginal and Northern Affairs website
21 (http://www.gov.mb.ca/ana/pdf/treaty_land_entitlement.pdf), the TLE Committee of
22 Manitoba represents 19 Entitlement First Nations with validated TLE claims in the
23 Province of Manitoba. The document states that “An Entitlement First Nation (EFN) may
24 select Crown land or acquire other land from its treaty area of traditional territory
25 within the province”. The document also states that an EFN may select or acquire land
26 from outside its treaty area or traditional territory but within the province.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.5.2**
2 **Operation Effects and Mitigation; p. 6-203**

3 **CEC Rd 1 MB Wildlands-0033**

4 **QUESTION:**

- 5 1. What is the area size of Gull Rapids that will be submerged?
6 2. Is the 100 ha downstream rapids that will be dewatered the only area that will be
7 dewatered?

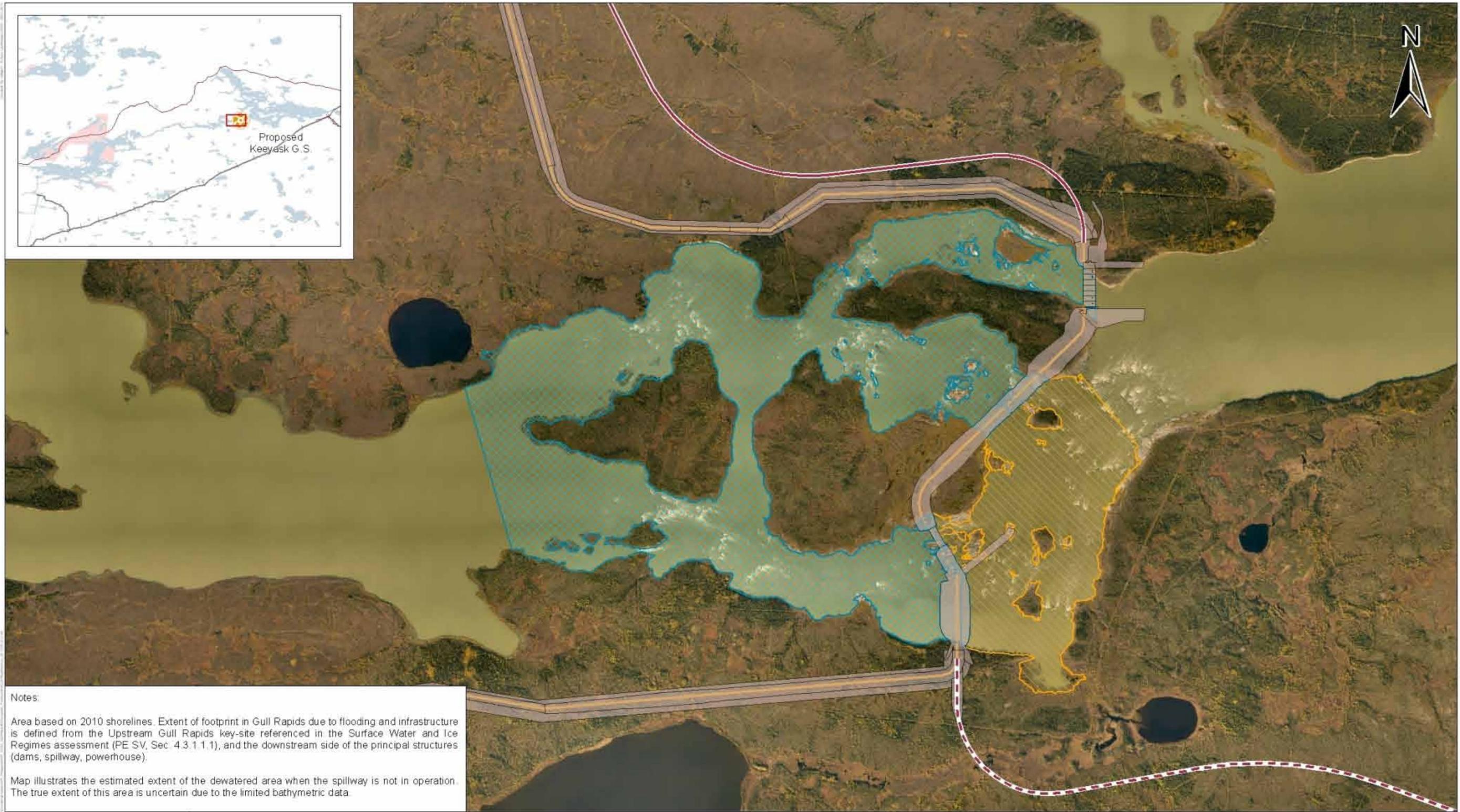
8 **RESPONSE:**

9 Included in this response is a map illustrating the areas within Gull Rapids that would be
10 inundated, dewatered or covered by infrastructure (i.e. dams, powerhouse, spillway).

11 The area of the Gull Rapids river channels that will be submerged or covered by
12 infrastructure is estimated to be 320 ha.

13 Approximately 100 ha of the rapids downstream of the spillway and south dam will be
14 dewatered when the spillway is not being used; however, this figure assumes that no
15 pools will form in the dewatered area. The final extent of the dewatered area that takes
16 into account the pools of water that will form in depressions is uncertain because it has
17 not been possible to collect this bathymetry data due to the hazardous conditions
18 associated with large rapids and high water velocities within Gull Rapids. It is anticipated
19 that there will be depressions in this area that will form ponds resulting in less area
20 having no water. The number and size of these pools is unknown at this time because
21 there is limited bathymetric data in this area. Some of the dewatered areas downstream
22 of the spillway and south dam will be submerged periodically whenever the spillway is
23 being used. A commitment has been made to complete topographic surveys for the
24 dewatered area during Project construction. CEC Rd 1 CEC-0073 describes two options
25 for developing aquatic habitat or wetland habitat in the dewatered area downstream of
26 the spillway and south dam.

27 No other waterway in the Gull Rapids area will be dewatered as a result of the Keeyask
28 Project.



Notes:

Area based on 2010 shorelines. Extent of footprint in Gull Rapids due to flooding and infrastructure is defined from the Upstream Gull Rapids key-site referenced in the Surface Water and Ice Regimes assessment (PE SV, Sec. 4.3.1.1.1), and the downstream side of the principal structures (dams, spillway, powerhouse).

Map illustrates the estimated extent of the dewatered area when the spillway is not in operation. The true extent of this area is uncertain due to the limited bathymetric data.



DATA SOURCE: Manitoba Hydro, Government of Manitoba, Government of Canada		
CREATED BY: Manitoba Hydro - Hydro Power Planning - GIS & Special Studies		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 11-JUN-13	REVISION DATE: 12-JUN-13
0 0.2 0.4 Kilometres	VERSION NO.: 1.0	GRSIC:
0 0.15 0.3 Miles		

Legend

Gull Rapids Altered Due to Project

- Dewatered Area (~ 100 ha)
- Flooded and Infrastructure Area (320 ha)
- Proposed Access Road
- Access Road
- Infrastructure

Keeyask Generation Project Footprint In Gull Rapids Area

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.5.2**
 2 **Construction Effects and Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0034**

4 **QUESTION:**

5 The EIS indicates “residual effects associates with Project construction and its resulting
 6 post construction footprint on the physical landscape will be large in magnitude, small in
 7 geographic extent, long term and continuous on the physical environment.”

8 On this basis, what is Manitoba Hydro’s plan to reduce the effects of Keeyask on the
 9 physical landscape?

10 **RESPONSE:**

11 The Response to EIS Guidelines (Sec. 4.5.1.1) describes the planning process and
 12 considerations that have lead to the proposed Keeyask Generation Project assessed in
 13 the EIS. Greater detail is provided in the Project Description Supporting Volume (PD SV,
 14 Section 6.3). The potential for hydroelectric development on the Nelson River between
 15 Split Lake and Stephens Lake has been studied since at least the 1960s. Several different
 16 development options for a generating station at Gull Rapids were considered over time.
 17 These included high-head and an intermediate-head options having reservoir levels of
 18 168.5 m and 162.5 m respectively, which would be 9.5 m and 3.5 m higher than the
 19 currently proposed low-head Keeyask development having a reservoir level of 159 m.
 20 The high-head and intermediate-head options would flood land areas of about 183 km²
 21 and 78 km² respectively. In 1993, Manitoba Hydro and Tataskweyak Cree Nation (TCN)
 22 entered into joint studies on the development options. In response to TCN concerns
 23 related to flooding and using flooded area as a proxy for adverse environmental effects,
 24 the development options were jointly reviewed. A decision was made to pursue a single
 25 development at Gull Rapids with less flooding, and less power production. With an
 26 initial flooded area of about 45 km², the proposed Keeyask GS incorporates decisions to
 27 reduce environmental effects, including those on the physical landscape, since it
 28 reduces flooding by about 138 km² and 33 km² as compared with the high- and
 29 intermediate-head development options considered in the past.

30 The Project’s construction and operation phase footprints used in the environmental
 31 assessment studies overestimate the actual area that the Project is expected to affect.
 32 Within the areas identified as being affected by the Project and assessed as disturbed in
 33 the EIS, there are areas that in fact will not be disturbed. Footprints that incorporate
 34 areas that will not be disturbed include:

- 35 • Granular and impervious borrow areas were identified where materials required for
 36 the Project may be obtained (Response to EIS Guidelines, Map 4-5). It will be up to
 37 the construction contractor to determine which borrow sources to utilize. For this
 38 reason it is uncertain if, how much and what part(s) of any specific borrow area will
 39 be developed. Because of this uncertainty, it has been assumed that every borrow
 40 area may be used to some extent and that they will be completely cleared. This is a
 41 conservative assumption because it is unlikely that the contractor will clear the
 42 entirety of all borrow areas. Borrow area E-1 however is excluded from the footprint
 43 because it has a very low likelihood of being used (Response to EIS Guidelines, Sec.
 44 4.3.2.9). The borrow areas that will be developed will likely be much smaller than
 45 what has been assumed because they contain much more material than is actually
 46 required for the Project. For example, a preliminary estimate of potential material
 47 utilization indicated that only about 5% of borrow G1 and 3.5% of borrow G3 might
 48 be required (Physical Environment Supporting Volume (PE SV), Table 5.4-3).
 49 Additionally, the preliminary material utilization plan did not indicate a need for
 50 material from some of the identified borrow sources that are part of the footprint,
 51 though again it is noted that actual requirements will be identified by the
 52 contractor.
- 53 • A large portion of borrow N-6 will not be utilized because it is a sensitive terrestrial
 54 habitat (Response to EIS Guidelines, Sec. 4.3.2.9). The area that cannot be utilized
 55 will be marked and avoided as an environmentally sensitive site (Keeyask
 56 Generation Project, Environmental Protection Plan, Section 5.2).
- 57 • Thirty-five excavated material placement areas (EMPA) will be made available to the
 58 contractor for the permanent disposal of excess unclassified materials no longer
 59 required for the Project (Response to EIS Guidelines, Section 4.5.1.9). While 35
 60 EMPAs are included in the footprint, contractors will develop their own plans to
 61 dispose of excavated materials within these EMPAs. Not all EMPAs will be utilized or
 62 only portions of the EMPAs will be used (Response to EIS Guidelines, Sec. 4.5.1.9).
- 63 • The footprint includes a number of corridors in which infrastructure such as borrow
 64 haul roads, trails and utilities will be located. In most cases the corridors are wider
 65 than required for the infrastructure in order to provide flexibility in making
 66 adjustments to the actual alignment within the corridor to account for specific site
 67 conditions. Actual footprint areas utilized within the corridors are thus expected to
 68 be less than what was included in the Project footprint. Note also that if any borrow
 69 or EMPA areas included in the footprint are not used during construction, then any
 70 associated corridors identified to access these locations would likewise not be
 71 developed.
- 72 • The footprint also includes areas that are classified as 'unlikely to be used'
 73 (Response to EIS Guidelines, Map 4-12 and 4-13). These areas have a low probability
 74 of being used but may be required during final design where adjustments to the

75 location of structures may be implemented, or it may be required by contractors to
 76 carry out construction activities (Response to EIS Guidelines, Sec. 4.4.2). For
 77 example, during construction of the north and south dykes, the contractor may
 78 require space for equipment maneuvering adjacent to the footprint of the actual
 79 structure.

80 In addition to the above factors that will reduce the actual footprint of the Project
 81 relative to the footprint that was assessed, the Preliminary Draft Environmental
 82 Protection Plans (EnvPP) for both the Generating Station (GS EnvPP) and South Access
 83 Road (SAR EnvPP) list measures that will help minimize the Project footprint.

- 84 • "In all cases, clearing will be kept to the minimum area required to carry out
 85 construction. Areas that are not required for construction activities will not be
 86 cleared." (Draft GS EnvPP; Section 5.12; page 5-10 & Draft SAR EnvPP; Section 5.12;
 87 page 5-11)
- 88 • "Right of way (ROW) clearing will be limited to a maximum width of 100 metres, and
 89 will be narrower where it is environmentally desirable and technically feasible."
 90 (Draft SAR EnvPP; Section 5.12; page 5-11)
- 91 • "A 100 metre vegetated buffer will be maintained adjacent to lakes, streams, marsh
 92 and riparian areas, wherever practicable." (Draft GS EnvPP; Section 5.12; page 5-11
 93 & Draft GS EnvPP; Section 5.12; page 5-11)
- 94 • With respect to constructing access trails – "The planned ROW will be used as much
 95 as practicable during Project construction and the need for additional access trails
 96 will be minimized." (Draft SAR EnvPP; Section 5.15; page 5-13)
- 97 • "The number of borrow areas and/or quarries developed will be minimized as much
 98 as practicable." (Draft GS EnvPP; Section 5.20; page 5-17)
- 99 • "Borrow areas and/or quarries will be located as close to existing access as
 100 practicable." (Draft GS EnvPP; Section 5.20; page 5-17 & Draft SAR EnvPP; Section
 101 5.20; page 5-16)
- 102 • With respect to accessing waterbodies – "Existing trails, roads or cut lines will be
 103 used wherever practicable to avoid disturbance to riparian vegetation." (Draft GS
 104 EnvPP; Section 5.12; page 5-11 & Draft SAR EnvPP; Section 5.21; page 5-17)
- 105 • "The width of the cleared right of way will be minimized at each stream crossing.
 106 Only that vegetation required to construct the actual stream crossing and maintain
 107 proper sight lines will be cleared." (Draft SAR EnvPP; Section 5.21.2; page 5-19)
- 108 • "Existing and planned ROWs will be used as much as practicable during construction
 109 and the need for additional access trails will be carefully reviewed before
 110 proceeding." (Draft GS EnvPP; Section 5.15; page 5-13)
- 111 • Construction areas that are not required for GS operations will be decommissioned
 112 and rehabilitated, where practicable. This includes borrow areas and quarries not

113 required for operation of the station or access roads constructed for the Project.”
114 Draft GS EnvPP; Section 5.27; page 5-21)

115 • “Construction areas that are not required for road operation will be
116 decommissioned and rehabilitated where practicable. This includes borrow areas
117 and quarries not required for operation of the station or access roads constructed
118 for the Project.” (Draft SAR EnvPP; Section 5.23; page 5-19)

119 CEC Rd 1 CEC-0073 describes two options for mitigating the dewatered area
120 downstream of the spillway and south dam. One of the two options will be
121 implemented which will mitigate impacts to the landscape by substantially reducing the
122 area that that would be permanently dewatered.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.7.1 Archeological Classification; p. N/A**

3 **CEC Rd 1 MB Wildlands-0035a**

4 **QUESTION:**

5 Where current archeological predictive modeling methods, as applies to aboriginal sites
6 and regions, used in the assessment of archeological sites in the RSA and LSA ?

7 **RESPONSE:**

8 The SE SV, Heritage Resources, Section 1.4.4, p. 12 and further described in the SE SV,
9 Heritage Resources Appendix B: Methodology and Methods, Predictive Modeling, Site
10 Ranking & Reporting, p. B5- 11 describes the archeological predictive modeling method
11 used in the Keeeyask heritage resource impact assessment process. As summary, current
12 archaeological predictive modeling methods, drew from a larger catchment area which
13 included the Regional Study Area. A larger regional area was examined because no
14 registered archaeological sites were present for the Local and Core Study areas²⁰; as
15 such, it became important to establish a proxy in order to identify certain physical &
16 cultural attributes within the larger area that could apply to the Local and Core Study
17 areas.

18 Based on the physical attributes of sites within the larger Regional Study area,
19 discussions with Elders regarding location preferences, terrain analysis studies, and
20 professional judgment, eight physical variables were selected and used to determine the
21 potential for archaeological sites within the Local and Core Study areas. While this
22 model may be refined, the variables used, as listed in The SE SV, Heritage Resources
23 Appendix B, p. B-7 are: 1) proximity to potable water; 2) soil types; 3) slope; 4) aspect; 5)
24 vista; 6) geographic features; 7) watersheds, and 8) water body convergence.

²⁰ Heritage sites are protected by the Manitoba Heritage Resources Act (See Article 23(1)).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.7.1 Archeological Classification; p. N/A**

3 **CEC Rd 1 MB Wildlands-0035b**

4 **QUESTION:**

5 How many known, acknowledged by government of Manitoba archeological sites are
6 there in the RSA and LSA?

7 **RESPONSE:**

8 As noted in the SE SV, Heritage Resources, Section 1.5.2, Table 1-1, p. 1-14 and 1.5.3.1.3
9 Figure 1-11, p. 1-22, as of the time of the EIS filing in June 2012, **162** archaeological sites
10 are registered for the Regional Study Area with the Province of Manitoba, Culture,
11 Heritage and Tourism, Historic Resources Branch. Forty-two of these sites were
12 previously recorded during other unrelated archaeological investigations.

13 Of the total site inventory of the Regional Study Area noted in the SE SV, Heritage
14 Resources, Section 1.5.2.1.2, p. 1-18, **100** sites are located within the Local Study Area;
15 **50** of these archaeological sites lay within the Heritage Resources Core Study Area (SE
16 SV, Heritage Resources, Section 1.5.2.1.1, p-14). This does not account for sites that
17 have not yet been discovered or have been registered since the submission of the EIS.

18 A requirement of receiving a Heritage Permit is that each discovered site be officially
19 registered with the Province. Each site that is registered with the province becomes
20 protected by the *Heritage Resources Act* (1986).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.2.6**
2 **Placement Areas for Excess Excavated Materials; p. N/A**

3 **CEC Rd 1 MB Wildlands-0036**

4 **QUESTION:**

5 This section mentioned submerging excess and excess unclassified material.

- 6 1. Does Manitoba Hydro know how much material will be submerged, where it will be
7 submerged, and what the effects on the reservoirs and lakes will be?
8 2. Are the intended practices to submerge material for the Keeyask project different
9 than Manitoba Hydro's practices to submerge material for other generation
10 projects?

11 **RESPONSE:**

- 12 1. *Does Manitoba Hydro know how much material will be submerged, where it will be*
13 *submerged, and what the effects on the reservoirs and lakes will be?*

14 The responses to CEC Rd 1 CEC-0072 and MB Wildlands-0009 answer this question.

- 15 2. *Are the intended practices to submerge material for the Keeyask project different*
16 *than Manitoba Hydro's practices to submerge material for other generation*
17 *projects?*

18 During the construction of existing hydroelectric generating stations, unclassified
19 excavated material may have been placed within reservoirs prior to reservoir
20 impoundment. Although the practice at Keeyask may be different than other projects,
21 the design of the excavated material placement areas in the Keeyask reservoir paid
22 careful consideration to potential environmental effects resulting in a design that
23 minimizes or avoids impacts to the aquatic environment. See responses to CEC Rd 1
24 CEC-0072 and MB Wildlands-0009 for further details regarding design.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.2.6**
2 **Roads; p. N/A**

3 **CEC Rd 1 MB Wildlands-0037**

4 **QUESTION:**

5 "Temporary, or permanent access roads or haul trails are also required..."

- 6 1. What is the estimate km length of these temporary and permanent access roads or
7 haul trails?
- 8 2. Does Manitoba Hydro know what proportion of these access roads or haul trails will
9 be permanent?
- 10 3. Please indicate the length of these causeways, and the length of time they will be in
11 place.
- 12 4. Where will the material from any temporary causeway be placed upon
13 decommissioning?
- 14 5. Are the materials for the causeways also from the LSA and RSA?
- 15 6. Are the causeways on the maps included in the EIS?

16 **RESPONSE:**

17 Each of the above questions is answered below.

- 18 1. *What is the estimate km length of these temporary and permanent access roads or*
19 *haul trails?*
- 20 2. *Does Manitoba Hydro know what proportion of these access roads or haul trails will*
21 *be permanent?*

22 Permanent haul roads and access trails:

- 23 • North access road: 25 km
- 24 • South access road: 35 km
- 25 • Haul road to borrow G-1: 0.3 km
- 26 • Access Road to upstream and downstream boat launch/portage: 1.6 km
- 27 • Deck road (crossing the north, central and south dam, powerhouse and spillway): 3
28 km
- 29 • North Dyke Maintenance and Inspection Road: 11.2 km
- 30 • South Dyke Maintenance and Inspection Road: 11.6 km

31 Temporary haul roads and access trails

- 32 • Roads to wells (camp water supply) off of north access road: 1 km

- 33 • Haul roads and access trails to the earth structures, borrow areas and excavated
- 34 material placement areas (EMPA), including access to borrows G-3 and N-5: 25.6 km
- 35 • Haul roads to work areas: 1 km
- 36 • Haul roads to cofferdams: 5.3 km
- 37 • Access road to ice boom: 5.6 km

38 The estimated permanent and temporary haul roads and access trails are based on the
 39 Project footprint. The estimated length of haul roads includes all the borrow areas and
 40 EMPAs that could be utilized by the contractor. Since the contractor will determine
 41 which borrow areas and EMPAs to utilize, the total length of temporary and permanent
 42 roads may be lower than the estimated values that are provided. The access road to
 43 borrow G-1 may also remain in place for future use. Borrow areas are shown on Map 2-
 44 13 and the EMPAs in Map 2-17 of the Project Description Supporting Volume.

45 Reservoir clearing will require access trails throughout the area to be flooded to support
 46 clearing activities. These access trails are considered temporary since they will be
 47 flooded once the Keeyask reservoir is impounded. It is not possible to provide an
 48 estimate of the length of these access trails.

49 3. *Please indicate the length of these causeways, and the length of time they will be in*
 50 *place.*

51 The length of the causeway to Deposit N-5 is approximately 70 m and the length of the
 52 causeway to Deposit G-3 is approximately 200 m. The two causeways will be
 53 constructed during the summer or fall of 2014 and removed towards the end of the
 54 construction phase, likely in 2021 or 2022.

55 4. *Where will the material from any temporary causeway be placed upon*
 56 *decommissioning?*

57 The material removed from the rockfill causeways will likely be stockpiled in the vicinity
 58 of the generating station to be used for future maintenance material. It is planned to
 59 remove approximately 80% of the rockfill and all culverts from the waterway. The
 60 remaining 20% of the rockfill material will be spread out in the waterway in the vicinity
 61 of where the causeways were located to create shallow rocky shoal habitat and rocky
 62 shelter for fish and other aquatic species (Aquatic Environment Supporting Volume
 63 Section 1A.3.1.1.1).

64 5. *Are the materials for the causeways also from the LSA and RSA?*

65 Based on the Keeyask Terrestrial Environment Supporting Volume Map 2-1
 66 Geographical Zones Used for Terrestrial Study Areas, the earth material for the
 67 causeways will be sourced within the LSA and RSA.

68 6. *Are the causeways on the maps included in the EIS?*

69 The assessment of the environmental effects of the causeways is included in the
70 Response to EIS Guidelines (Appendix 6C) and they are included in the footprint (Table
71 4-2).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.2.2**
2 **Additional Temporary Work Camp; p. N/A**

3 **CEC Rd 1 MB Wildlands-0038a**

4 **QUESTION:**

5 Have any plant studies, species studies, etc been undertaken now that this site will have
6 a work camp on it?

7 **RESPONSE:**

8 Manitoba Hydro is currently developing and evaluating different location alternatives
9 for accommodation for the south access road construction workforce. The alternatives
10 will be shared and reviewed by the Keeyask Cree Nations and reviewed for their
11 potential environmental effects to identify a preferred option. The final location will be
12 selected to achieve a balance between a variety of potential adverse effects. Regardless
13 of the location, it is unlikely that any of the effects assessment conclusions will change
14 given the selection process and the very small footprint area.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.3.2.2**
2 **Additional Temporary Work Camp; p. N/A**

3 **CEC Rd 1 MB Wildlands-0038b**

4 **QUESTION:**

5 The EIS is almost a year old now. What is the likelihood now that this temporary work
6 camp will become part of the switching station operation for the Keeyask Transmission
7 Project?

8 **RESPONSE:**

9 Manitoba Hydro and the Keeyask Cree Nations are currently evaluating different
10 alternatives for accommodating the south access road construction workforce. The
11 accommodations would also be used for the workforce carrying out the initial
12 construction of the south dyke prior to there being access across Gull Rapids during
13 Stage 2 river diversion. If a temporary camp is constructed along the south access road it
14 would not be required to support the operation of the Keeyask switching station.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.2**
2 **Needs for and Alternatives; p. 4-5**

3 **CEC Rd 1 MB Wildlands-0039a**

4 **PREAMBLE:**

5 Pages 4-5 describes the attributes required for the energy sale contracts Manitoba
6 Hydro has entered into.

7 **QUESTION:**

8 Are there any conditions, mandates or policies for Manitoba Hydro to fulfill in any of the
9 States whose utilities are entering into energy sale contracts with Manitoba Hydro
10 regarding the Aboriginal People of northern Manitoba?

11 **RESPONSE:**

12 No.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.2**
2 **Needs for and Alternatives; p. 4-5**

3 **CEC Rd 1 MB Wildlands-0039b**

4 **PREAMBLE:**

5 Pages 4-5 describes the attributes required for the energy sale contracts Manitoba
6 Hydro has entered into.

7 **QUESTION:**

8 The Manitoba government refers to “new green power” when describing the new
9 generation stations on the Nelson River, including Keeyask. Are there any assumptions
10 that new green power includes First Nation business partners, and the approval of any
11 new green power projects by First Nations in Manitoba?

12 **RESPONSE:**

13 Manitoba Hydro cannot comment on any assumptions made by the Manitoba
14 government when it referenced “new green power”.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2 –**
2 **Protected Areas and Scientific Sites; p. 6-179**

3 **CEC Rd 1 MB Wildlands-0040**

4 **QUESTION:**

- 5 1. What protected areas are located in the RSA?
6 2. What is the definition of a protected area in public and regulatory policy in
7 Manitoba, as applied to designations, and regulations since 1993?
8 3. What did Manitoba Hydro leave that definition out of this section of the EIS?
9 4. Why did Manitoba Hydro use a generic international definition for protected area in
10 its EIS glossary?

11 **RESPONSE:**

12 For clarification, it is understood the “What “in the third bullet is meant to be “Why”.

13 Resource use is comprised of subsistence and economic activities that make use of the
14 resources derived from the natural environment. One type of resource use includes
15 protected sites. The final EIS guidelines requirements required the Keeyask Generation
16 Project EIS to include an assessment of the Project on lands with special designation
17 including protected areas.

18 1. *What protected areas are located in the RSA?*

19 Protected areas and areas proposed for protection in the Resource Use Regional Study
20 Area are shown on Map 1-13 of the Resource Use Section of the SE SV and described in
21 Resource Use Section 1.9 of the SE SV. Protected areas and areas proposed for
22 protection in the Regional Study Area are:

- 23 • Portions of the Numaykoos Lake Provincial Park and the Amisk Park Reserve;
24 • Portions of the Amisk North Addition Area of Special Interest (ASI), the Amisk South
25 Addition ASI; the Bradshaw Lake ASI, the Cape Tatnum Addition ASI, and the Nikik
26 ASI;
27 • All of the Stephens Lake ASI, the Marsh Point ASI and the Marsh Point North
28 Proposed Ecological Reserve;
29 • Portions of the Churchill and Cape Tatnum Wildlife Management Areas; and
30 • The Regional Study Area’s border is adjacent to Wapusk National Park of Canada.

31 There are no protected areas or areas proposed for protection in the Local Study Area.

32 2. *What is the definition of a protected area in public and regulatory policy in*
33 *Manitoba, as applied to designations, and regulations since 1993?*

34 The EIS sought to determine if there was potential for Project effects on protected areas
35 and/or areas proposed for protection. Definitions of provincial protected areas, areas
36 proposed for protection and other designations are published in Resource Use Section
37 1.12 of the SE SV and were sourced from current provincial legislation (excepting ASIs)
38 as follows:

- 39 a. *The Provincial Parks Act* (Manitoba) for provincial parks (and land use
40 categories within), provincial forests, and park reserves;
- 41 b. *The Ecological Reserves Act* (Manitoba) for ecological reserves; and
- 42 c. *The Wildlife Act* (Manitoba) for wildlife management areas;

43 ASIs were defined based on a 2010 Manitoba Conservation document entitled
44 "Protecting Manitoba's Outstanding Landscapes by Manitoba's Protected Areas
45 Initiative" (see Resource Use Section 1.12 of the SE SV).

46 3. *What did Manitoba Hydro leave that definition out of this section of the EIS?*

47 This request makes reference to Section 6.2 of the Response to EIS Guidelines which
48 contains information summarized from the Resource Use Section 1.9 of the Socio-
49 Economic, Resource Use and Heritage Supporting Volume (SE SV). The evolution of
50 public and regulatory policy including changes in definitions (i.e., pre- and post-1993)
51 was not discussed in either section because this was not relevant to understanding
52 potential Project effects on these designated areas. As noted above, definitions were
53 derived primarily from current legislation and policy in the case of ASIs.

54 4. *Why did Manitoba Hydro use a generic international definition for protected area in
55 its EIS glossary?*

56 For brevity and simplicity, a more general definition of protected areas was selected for
57 the Response to EIS Guidelines (see Glossary of technical terms p12-21). The more
58 detailed definitions of each protected area can be found in Resource Use Section 1.12 of
59 the SE SV.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0041a**

4 **QUESTION:**

- 5 1. What further decrease in population of the common nighthawk does Manitoba
6 Hydro expect from the Keeyask project effects?
7 2. Does Manitoba Hydro have a recovery plan for the common nighthawk in the RSA
8 and LSA?
9 3. Does Manitoba Hydro acknowledge that data sets and information available for bird
10 species for this region of Manitoba are not complete, and may represent minimal
11 information about the bird populations in the region?

12 **RESPONSE:**

13 A response is provided below for each of the questions above.

- 14 1. *What further decrease in population of the common nighthawk does Manitoba*
15 *Hydro expect from the Keeyask project effects?*

16 During Project construction, common nighthawk habitat is anticipated to increase due
17 to reservoir clearing (about 15% increase in habitat relative to the RSA; TE SV Section
18 6.4.1.4.1). Overall, about 10% of the region's common nighthawk habitat will be lost or
19 modified as a result of Project operation; however, it is anticipated that this loss will be
20 minimized through the retention of decommissioned borrow sites, which provide
21 nesting habitat for common nighthawk. Common nighthawk may experience a small
22 localized decrease in population until such areas become available.

- 23 2. *Does Manitoba Hydro have a recovery plan for the common nighthawk in the RSA*
24 *and LSA?*

25 Recovery plans for species at risk are the responsibility of the federal government. Until
26 such plan is developed by federal agencies, the Partnership will mitigate loss of habitat
27 by retaining portions of decommissioned borrow sites for common nighthawk and will
28 follow-up on commitments to monitor common nighthawk during the construction and
29 operation phase (see the Preliminary Draft Terrestrial Effects Monitoring Plan [TEMP]).

- 30 3. *Does Manitoba Hydro acknowledge that data sets and information available for bird*
31 *species for this region of Manitoba are not complete, and may represent minimal*
32 *information about the bird populations in the region?*

33 The abundance and distribution of birds breeding in the boreal forest is well known and
34 well-studied on a coarse ecosystem level (i.e., boreal forest) (Bird Studies Canada 2005).
35 Species-specific population estimates and more localized densities or distribution are
36 less widely available. Local distribution mapping and density calculations for birds
37 inhabiting the Keeyask RSA have been developed using data gathered during extensive
38 field studies in the area between 2001-2012.

39 **REFERENCES:**

40 Blancher, P. and J. Wells. 2005. The Boreal Forest Region: North America's Bird Nursery.
41 Commissioned by the Boreal Songbird Initiative and the Canadian Boreal
42 Initiative. April 2005. 12pp

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0041b**

4 **QUESTION:**

5 Olive Sided Flycatcher:

6 Has Manitoba Hydro updated its birds studies in the LSA for this bird species? (as these
7 studies are 10 years old)

8 **RESPONSE:**

9 Within the LSA, the Partnership conducted studies for olive-sided flycatcher between
10 2001 and 2012. Additional information on this species was also gathered in the LSA
11 during the 2013 breeding period.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. 6-97**

3 **CEC Rd 1 MB Wildlands-0042**

4 **QUESTION:**

5 Where does the Canadian Wetland Classification System “reflect conditions including
6 water regulation on the Nelson River?” Please provide citation, page number etc.

7 **RESPONSE:**

8 As a clarification, the quotation in the preamble is out of context. The full sentence
9 reads: “Wetlands were classified into a wetland type using the Canadian Wetland
10 Classification System (National Wetlands Working Group 1997) with enhancements to
11 reflect local conditions, including water regulation on the Nelson River.” Enhancements
12 were developed because the Canadian Wetland Classification System does not include
13 wetland types that would capture Nelson River water regulation, or even water
14 regulation in general (please see quote below); enhancements to include several
15 additional classes for the environmental assessment.

16 “In some situations, wetlands are created by agricultural activities, hydroelectric
17 structures and through other human activities. Over time, these sites evolve into
18 naturally functioning wetland systems and are classified accordingly. Constructed
19 wetlands, such as those for habitat enhancement and wastewater treatment, are often
20 included in the mapping of Canadian wetlands. However, they essentially lie outside the
21 focus of The Canadian Wetland Classification System and are not included in this
22 publication.” (National Wetlands Working Group 1997, p. 2)

23 **REFERENCES:**

24 National Wetlands Working Group. 1997. The Canadian Wetland Classification System.
25 2nd Ed. Edited by B.G. Warner and C.D.A. Rubec. Wetlands Research Centre,
26 University of Waterloo, Waterloo, Ontario. 68 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0043**

4 **QUESTION:**

5 What is Manitoba Hydro's source for their apparent definition of: intactness,
6 fragmentation, edge, and ecosystem diversity, core areas?

7 **RESPONSE:**

8 Intactness, fragmentation, edge, core area and ecosystem diversity are widely used
9 terms in the scientific literature, and it is the case that the same term is used with
10 different meaning by different authors. In some cases, differences in definitions reflect
11 the various purposes for which the same term is being used. To avoid ambiguity, the
12 intactness and ecosystem diversity assessments define how they use key terms based
13 on the meaning that is relevant for the effects assessments. Definitions for these terms
14 are provided in the Terrestrial Environment Supporting Volume (Sections 2.4.1, 2.7.1)

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 MB Wildlands-0044a**

4 **QUESTION:**

5 Does Manitoba Hydro know the mercury levels in plant, fish and other biota in Stevens
6 Lake before and after it became a reservoir, including through the last 30 years?

7 **RESPONSE:**

8 The Response to EIS Guidelines reference in the question relates to the surface water
9 and ice regime while the question pertains to historic and recent mercury data.

10 To the best knowledge of the Partnership, the only information for Stephens Lake on
11 mercury concentrations is for fish. Because piscivorous fish are at the top of the aquatic
12 food chain of Stephens Lake, other fish, invertebrates, and plants will have lower,
13 mostly substantially lower, mercury concentrations in their bodies, A discussion of
14 historic and recent mercury concentrations (including the last 30 years) in fish from
15 Stephens Lake is provided in the Response to EIS Guidelines Section 6.2.3.3.6 page 6-77
16 to 6-79.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 MB Wildlands-0044b**

4 **QUESTION:**

5 What effect on the fishery does Manitoba Hydro expect from Gull Lake becoming a
 6 reservoir? Is Gull Lake fishery already affected by mercury?

7 **RESPONSE:**

8 There is no active commercial fishing on Gull Lake though a provincial quota of 4,600 kg
 9 is available for walleye (pickerel), lake whitefish and northern pike (jackfish) (Resource
 10 Use Section 1.3.3.2.2 of the SE SV). Gull Lake has been reported as an important
 11 domestic fishing location for TCN Members (Resource Use Section 1.2.3.2.3 of the SE
 12 SV).

13 For context, two different thresholds are applied to evaluate mercury levels in fish in the
 14 context of human consumption. The Bureau of Chemical Safety within Health Canada
 15 applies a standard of 0.5 ppm total mercury to all commercially-sold freshwater fish (AE
 16 SV 7.2.2.4.1). At this and higher concentrations, retail fish are deemed unfit for human
 17 consumption. In addition to the 0.5 ppm standard, the Medical Service Branch of Health
 18 Canada recommended in 1976 that the maximum acceptable concentration of mercury
 19 in fish should be 0.2 ppm for those persons that eat large quantities of fish domestically;
 20 this (i.e., at home) (AE SV 7.2.2.4.1) guideline no longer has official status.

21 Current (1999-2006) mean length standardized mercury concentrations in lake whitefish
 22 from Gull Lake are consistently less than 0.10 ppm and concentrations in northern pike
 23 and walleye are consistently less than 0.32 ppm (AE SV 7.2.3.2.3). Generally, mercury
 24 concentrations in lake whitefish, northern pike and walleye from Gull Lake have been
 25 relatively stable since 1999 (AE SV 7.2.3.2.3). When existing levels are compared to the
 26 two different guidelines above, lake whitefish, northern pike, and walleye from Gull
 27 Lake could be sold on the commercial market, whereas domestic consumption would be
 28 somewhat (lake whitefish) to moderately (pike and walleye) restricted for people who
 29 domestically consume large quantities of these fish (see HHRA Tables 5-1 and 5-2;
 30 further details on the risk associated with fish consumption are discussed in the
 31 response to CEC Rd 1 CAC-0020a).

32 Maximum mercury concentrations in walleye and northern pike from Gull Lake are
 33 predicted to increase substantially over current concentrations reaching or slightly
 34 exceeding 1.0 ppm (AE SV 7.2.4.2.2). These maximum mercury concentrations are
 35 expected to occur within 3-7 years after the start of Keeyask operations (AE SV

36 7.2.4.2.1) and will persist for a few years (AE SV 7.2.4.2.3). Thereafter fish mercury
37 concentrations will decrease, but it may take up to 30 years before concentrations
38 similar to off-system waterbodies are reached. Mercury concentrations in lake whitefish
39 are expected to more than double but will remain just below 0.2 ppm (AE SV 7.2.4.2.2).
40 At these levels, commercial marketing of lake whitefish could continue, while
41 commercial sales of pickerel and jackfish could not. Domestic consumption of all three
42 above mentioned species from the Keeyask reservoir would be severely restricted,
43 particularly in pike and walleye (see HHRA Table 5-3) during those years where mercury
44 concentrations are at or near their maxima. Outcomes of the ongoing monitoring of
45 mercury in fish flesh will contribute into the Human Health Risk Assessment and
46 communication of safe consumption guidelines. Consumption guidelines will be
47 available to advise resource users of safe consumption levels. As noted in Resource Use
48 Section 1.2.4.1.2 of the SE SV, offsetting fishing programs such as the TCN Healthy Food
49 Fish Program and the WLFN Community Fish Program will provide healthy food fish
50 from off-system (unaffected) lakes for domestic consumptions.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 MB Wildlands-0044c**

4 **QUESTION:**

5 Most of the data on this page is 20 or 30 years old. Does Manitoba Hydro have more
6 recent data regarding mercury in the Nelson River, in the RSA and LSA? In the two Lakes
7 one that is a reservoir and one that will become a reservoir?

8 **RESPONSE:**

9 The Response to EIS Guidelines reference in the question relates to the surface water
10 and ice regime while the question pertains to historic and recent mercury data.

11 A discussion of historic and recent mercury concentrations in fish muscle is provided in
12 the Response to EIS Guidelines Section 6.2.3.3.6 page 6-77 to 6-79 for several areas,
13 including Stephens Lake, Split Lake and Gull Lake. Gull Lake is the location of the future
14 reservoir and Stephens Lake provides data from an existing reservoir.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 MB Wildlands-0044d**

4 **QUESTION:**

5 Figure 6 – 7 shows mean mercury concentration in fish in Stephens Lake 1970 – 2005.
 6 Does Manitoba Hydro have data for fish harvest, fish population for the same three
 7 species over the same period of time in Stephens Lake? Will Manitoba Hydro make
 8 that information available?

9 **RESPONSE:**

10 The Aquatic Environment Supporting Volume (Section 5.3.1) described the pre-1997 fish
 11 community of Stephens Lake. The text is reproduced for the convenience of the
 12 reviewer:

13 “Stephens Lake was formed by the construction and operation of the Kettle GS,
 14 which flooded the existing river and lakes to form one large lake. With the
 15 exception of a small sturgeon fishery, there was no commercial fishery on these
 16 waterbodies prior to construction of the Kettle GS” (Split Lake Cree - Manitoba
 17 Hydro Joint Study Group 1996c).

18 A commercial fishery operated intermittently on Stephens Lake between 1979 and
 19 1994, producing an annual average yield of 1,339 kg (dressed weight; Manitoba
 20 Conservation *unpubl. data*). No information was located describing the fish community
 21 of the pre-Stephens Lake waterbodies. Some Members of the Split Lake Cree that
 22 participated in the Post-Project Environmental Review (PPER) reported that Kettle-
 23 related flooding had disturbed fish habitat and migration patterns in Stephens Lake and
 24 that there were more suckers in Stephens Lake after the Kettle GS was constructed
 25 (Split Lake Cree - Manitoba Hydro Joint Study Group 1996c). In 1973, the Kettle
 26 Reservoir had among the poorest production of commercially important species of the
 27 Nelson River lakes, which was attributed to the recent development of the reservoir
 28 (Ayles *et al.* 1974). The dominant species at this time was lake whitefish, followed by
 29 walleye and cisco. In contrast, Moose Lake, a relatively isolated part of the Kettle
 30 complex, was found to have extremely abundant lake whitefish and cisco populations,
 31 which were thought to represent unexploited populations prior to flooding.

32 After CRD/LWR came into operation in 1976, studies conducted between 1983 and 1989
 33 found that the Stephens Lake fish community, while showing considerable variation,
 34 was dominated by lake whitefish, mooneye, and longnose sucker (Patalas 1984; Kirton
 35 1986; Hagenson 1987b, 1988, 1989, 1990). Although comparisons of fish abundance

36 data between these studies and the 1973 survey were limited due to methodological
37 differences, Ramsey and Patalas (1992, cited in Split Lake Cree - Manitoba Hydro Joint
38 Study Group 1996c) reported that there had been a 50% reduction in lake whitefish and
39 a 70% decline in longnose sucker in the lake since 1973, while mooneye and possibly
40 sauger had increased. The authors attributed these changes to differences in sampling
41 strategy, natural evolution of limnological conditions in the reservoir, or Kettle-related
42 changes to the water regime, rather than to CRD/LWR. A survey of the Kettle reservoir
43 area of Stephens Lake in mid-July 1993 found a community dominated by longnose
44 sucker, followed by lake whitefish and cisco (MacDonell and Horne 1994), while a survey
45 of the same area in mid-August of 1996 found the community dominated by sauger,
46 walleye, and northern pike (Bretecher and Horne 1997).

47 The Split Lake Cree reported in the PPER that they felt that different currents and lake
48 bottom debris from CRD had resulted in a disturbance to fish habitat and migration
49 patterns in Stephens Lake (Split Lake Cree - Manitoba Hydro Joint Study Group 1996c).
50 Consultants participating in the PPER process noted that hydroelectric development, in
51 general, had changed the fish community structure in Stephens Lake and that the
52 overall abundance of fish had likely increased (Split Lake Cree - Manitoba Hydro Joint
53 Study Group 1996c).

54 Rainbow smelt were first reported in Split Lake and Stephens Lake in 1996 (Remnant *et*
55 *al.* 1997). The colonization of waterbodies by rainbow smelt is generally considered to
56 be an unfavourable occurrence. Rainbow smelt are an aggressive invading species that
57 can alter the composition and abundance of native species, such as lake whitefish, cisco,
58 and emerald shiner, residing in the waterbodies they invade. It is believed that rainbow
59 smelt compete with these species for space and food and prey on their larvae (Franzin
60 *et al.* 1994). Additionally, the consumption of rainbow smelt by predatory species such
61 as walleye and northern pike may lead to an increase in mercury concentrations in these
62 predators (Evans and Loftus 1987). Consumption of rainbow smelt has also been linked
63 to a condition called "belly burn" in commercial catches of walleye. Belly burn is
64 generally thought to occur by the release of enzymes found in rainbow smelt that break
65 down the flesh of walleye stomachs. This condition can negatively affect a commercial
66 fishery by decreasing the amount of time available to process fish and by depreciating
67 the value of fish stock that has not been processed fast enough (Freshwater Fish
68 Marketing Corporation [FFMC] 2003)." This was not reported as an issue for the current
69 Stephens Lake fishery.

70 The current Stephens Lake walleye commercial fishery is described in Resource Use
71 Section 1.3.3.2.3 of the SE SV and the domestic Stephens Lake fishery is described in
72 Resource Use Section 1.2.3.2.3 of the SE SV. The current fish community of Stephens
73 Lake is described in the AE SV Section 5.3.2.4, with individual sections for Walleye

74 (Section 5.3.2.4.1), Northern Pike (Section 5.3.2.4.2), and Lake Whitefish (Section
75 5.3.2.4.3).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 MB Wildlands-0045a**

4 **QUESTION:**

5 What is Manitoba Hydro's definition of cumulative effects?

6 **RESPONSE:**

7 Cumulative effects are defined in the Glossary (Chapter 12 of the Response to EIS
8 Guidelines) as "the effect on the environment, which results when the effects of a
9 project combine with those of the past, existing, and future projects and activities; the
10 incremental effects of an action on the environment when the effects are combined
11 with those from other past, existing and future actions."

12 Cumulative Effects Assessment as adopted in the EIS for the Project is described in
13 Section 5.4 of Chapter 5 (p.5-9) and in Chapter 7 of the Response to EIS Guidelines. As
14 set out in Section 7.1 of Chapter 7, the cumulative effects of the Project "describes the
15 incremental effects likely to result from the Project on the environment when the
16 effects are combined with the effects of other past, present or future projects or human
17 activities listed in Chapter 7". The adverse effects of the Project in combination with
18 other past and current projects are addressed in Chapter 6 and summarized in Chapter
19 7. These adverse effects of the Project are assessed in Chapter 7 in combination with
20 other future projects and activities.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 MB Wildlands-0045b**

4 **QUESTION:**

5 Does Manitoba Hydro have a draft monitoring program, or planning in place for the
6 project components, VECs, aquatic elements etc that are sure to be affected? When will
7 the monitoring plan be available? Will Manitoba Hydro make the monitoring plan
8 public? Will Manitoba Hydro share the results of its monitoring plan(s)?

9 **RESPONSE:**

10 The Partnership's monitoring and follow-up program is described in detail in Chapter 8
11 of the Response to EIS Guidelines. As part of the Environmental Protection Program, the
12 Partnership will conduct monitoring according to a Terrestrial Effects Monitoring Plan,
13 Aquatic Effects Monitoring Plan, Physical Environment Monitoring Plan, Resource Use
14 Monitoring Plan, Socio-Economic Monitoring Plan, Heritage Resources Protection Plan
15 and through Aboriginal Traditional Knowledge (ATK) monitoring plans with each of the
16 KCNs.

17 Draft versions of the Terrestrial Effects, Physical Environment, Resource Use and Socio-
18 Economic Monitoring Plans were filed with regulators on June 28, 2013. The Partnership
19 expects to file the Aquatic Effects Monitoring Plan by the end of August 2013. Manitoba
20 Hydro and the KCNs continue to work towards the development of ATK monitoring
21 programs that meet individual community needs.

22 The draft plans are available on the Public Registry and are posted on the Partnership's
23 website at: [http://keeyask.com/wp/the-project/environmental-assessment-
24 process/preliminary-environmental-protection-program](http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program).

25 The Partnership will share the results of monitoring through annual reports to be
26 submitted to the regulator, and an annual Monitoring Overview document produced by
27 the Partnership. Chapter 8, Section 8.3.1.3 of the Response to EIS Guidelines provides
28 details on this annual reporting. Annual monitoring reports will also be made available
29 on the Partnership's website.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 MB Wildlands-0045c**

4 **QUESTION:**

5 Page 5 – 12 Step 2

- 6 1. Does Manitoba Hydro mean that VECs have an adverse effect on the project?
7 2. What is Manitoba Hydro's definition of reversibility, and what methodology does
8 Manitoba Hydro use to measure reversibility?
9 3. What are Manitoba Hydro definitions of rare, fragility, and uniqueness as applies to
10 VECs?
11 4. Do these definitions agree with current conservation biology and ecological
12 assessment standards?

13 **RESPONSE:**

14 The above questions all reference Section 5.3.1 of the Response to EIS Guidelines and
15 ask what "Manitoba Hydro means" or "defines". The Response to EIS Guidelines was
16 prepared by the Partnership, and all responses below are provided by the Partnership
17 with reference to the EIS. Further, page 5-12 comes from Section 5.5 of the Response to
18 EIS Guidelines.

19 1. *Does the EIS mean that VECs have an adverse effect on the project?*

20 No.

21 Section 5-5 of the Response to EIS Guidelines outlines the two-step process for
22 determining the regulatory significance of predicted residual adverse environmental
23 effects on each VEC. Step 2, as described (p. 5-12), notes that "VECs that have an
24 adverse effect" and meet certain criteria listed on page 5-12 are examined further. This
25 statement "VECs that have an adverse effect" means VECs with a predicted residual
26 adverse effect from the Project and does not mean that VECs have an adverse effect on
27 the Project.

28 2. *What is Manitoba Hydro's definition of reversibility, and what methodology does*
29 *Manitoba Hydro use to measure reversibility?*

30 3. *What are Manitoba Hydro definitions of rare, fragility, and uniqueness as applies to*
31 *VECs?*

32 4. *Do these definitions agree with current conservation biology and ecological*
33 *assessment standards?*

34 The definition for reversibility is provided at page 5-13 of the Response to EIS
35 Guidelines. Rare, fragility and uniqueness are referenced in the definition of "ecological
36 and social context" at page 5-13 of the Response to EIS Guidelines, which describes
37 whether the VEC is particularly sensitive to disturbance and has the capacity to adapt to
38 change and includes, where relevant, the rarity, uniqueness and fragility of the VEC
39 within the ecosystem (e.g., rare species/ habitats, critical habitats, breeding areas). The
40 criteria adopted in Section 5.5 reflect the EIS Guidelines requirements.

41 Specific methodologies for assessing reversibility and ecological and social context are
42 outlined or referenced, where relevant, in the assessment of the eight VECs where a
43 Step 2 analysis is provided in Chapter 6 of the Response to EIS Guidelines. Beyond
44 noting that the EIS has been carried out in accordance with the EIS Guidelines and
45 current assessment standards, no comment can be provided on the matter of
46 agreement with "current conservation biology and ecological assessment standards"
47 without specification as to which "standards" are being referenced.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0046a**

4 **QUESTION:**

5 What is the relationship in definition and aquatic characteristics between peatlands,
6 inland peatlands, bogs, fen, veneer bogs, blanket peatlands, plateau bogs and muskeg?

7 **RESPONSE:**

8 All of the terms listed in the question are types of wetlands and, with the exception of
9 “muskeg”, are defined in the Response to EIS Guidelines glossary (Section 12) as follows:

- 10 • **Peatland:** Wetlands where organic material has accumulated because dead plant
11 material production exceeds decomposition.
- 12 • **Inland Peatland:** A peatland that is beyond the direct influence of a water body's
13 water regime and ice regime.
- 14 • **Bog:** A type of peatland that receives nutrient inputs from precipitation and dryfall
15 (particles deposited from the atmosphere) only. Sphagnum mosses are the
16 dominant peat forming plants. Commonly acidic and nutrient poor.
- 17 • **Fen:** Peatland in which the plants receive nutrients from mineral enriched ground
18 and/or surface water. Water chemistry is neutral to alkaline. Sedges, brown mosses
19 and/or Sphagnum mosses are usually the dominant peat forming vegetation.
- 20 • **Veneer bog:** Bog with thin surface peat (*i.e.*, less than 1.5 m thick) that generally
21 occurs on gentle slopes and contain discontinuous permafrost.
- 22 • **Blanket peatland:** Bog, fen or mixtures of these types with peat of intermediate
23 thickness (*i.e.*, up to approximately 2 m thick) and a featureless surface that cover
24 gentle slopes.
- 25 • **Plateau bog** (referred to as peat plateau bog in the EIS): Ice-cored bog with a
26 relatively flat surface that is elevated from the surroundings and has distinct banks.

27 **Muskeg** is a wetland term that was not used in the EIS. Generally, the term refers to
28 sparsely treed and untreed sphagnum peatlands (typically bogs).

29 The relationships and aquatic characteristics of the above wetland types are further
30 described in the TE SV Appendix 2B, Table 2B-3, p. 2B-6. Examples of these wetland
31 types are also described and illustrated with photographs in the TE SV Section 2.3.4.1.2.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0046b**

4 **QUESTION:**

5 How deep do peatlands or muskeg in the RSA and LSA become? Are they 10, 50, 100, or
6 200 feet deep, at different locations? Has Manitoba Hydro assessed the depths of
7 peatlands and muskeg in the RSA and LSA?

8 **RESPONSE:**

9 Median peatland depths (i.e., combined thickness of peat, water and ice core) in the
10 Physiography Local Study Area were found to range from 0.5 m to 3.2 m, depending on
11 peatland type (PE SV Section 5.3.2.2). Based on results from over 850 soil stratigraphy
12 samples and approximately 860 boreholes drilled for geotechnical investigations, the
13 largest peatland depth as defined above was 6.8 m. Only eight of the over 1,700
14 measured depths were greater than 5.0 m.

15 The Partnership did not measure peatland depths outside of the Physiography Local
16 Study Area since that was not relevant for the assessment.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0046c**

4 **PREAMBLE:**

5 Page 6 – 28 The EIS states that, “surface permafrost is widely distributed throughout
6 the area, occurring in 78% of the LSA.”

7 **QUESTION:**

8 Given that permafrost thickness within the RSA ranges from 10 m to 50 m, does
9 Manitoba Hydro have a monitoring program for permafrost during the construction and
10 operation periods for Keeyask?

11 **RESPONSE:**

12 Permafrost-specific monitoring has not been identified for the construction and
13 operation phases of the Project. However, the effects of permafrost changes may be
14 identified through several monitoring activities:

- 15 • Terrestrial habitat monitoring is planned to verify the predicted amounts and
16 composition of direct and indirect habitat loss, alteration and disturbance during
17 construction and operation (Response to EIS Guidelines, Table 8-4). Changes in
18 surface permafrost will be identified where it results in a change in habitat type
19 because it is a factor used to classify terrestrial habitat types, and as such will be
20 captured in the mapping of terrestrial habitat effects. Ground sampling to monitor
21 terrestrial habitat effects will typically also measure surface permafrost attributes
22 such as depth to permafrost table. More details on habitat monitoring can be found
23 in the Terrestrial Effects Monitoring Plan available at Keeyask.com.
- 24 • During construction, routine inspection activities will be performed that may
25 identify permafrost issues affecting construction activity and infrastructure. For
26 example, daily construction-site inspections by the Site Environmental Officer(s)
27 (Keeyask Generation Project, Generating Station Construction, Environmental
28 Protection Plan, Draft April 2013).
- 29 • Following completion of construction, the impacts of permafrost degradation will be
30 reviewed through condition assessments of the principal structures as part of the
31 Dam Safety program.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.2**
2 **Existing Environment; p. N/A**

3 **CEC Rd 1 MB Wildlands-0046d**

4 **PREAMBLE:**

5 Page 6 – 28 The EIS states that, “surface permafrost is widely distributed throughout
6 the area, occurring in 78% of the LSA.”

7 **QUESTION:**

8 Has Manitoba Hydro taken into account in its planning, designing and engineering
9 assumptions for Keeyask the potential for significant change in permafrost depth,
10 Thickness and presence?

11 **RESPONSE:**

12 Planning, design and engineering for Keeyask Project has taken into account the fact
13 that it is located in an area of permafrost of varying presence and thickness.

14 Permafrost conditions in the Project area were a consideration in the Planning process
15 for a development at Gull Rapids, as noted in Section 6 of the Project Description
16 Supporting Volume (PD SV). Section 6.4 notes a design alternative for a larger (high-
17 head) development that was not favourable because it required dykes that were
18 potentially too large to construct on permafrost soils. Section 6.9.2 notes permafrost
19 considerations that factored into the selection of the planned dyke design.

20 The design of the North and South Dykes will take into account the thawing of
21 permafrost affected foundations and the resultant potential for differential settlements
22 (PD SV, Sec. 2.3.7). Additional considerations related to permafrost for the North and
23 South Dykes are discussed in section 2.3.7 of the PD SV. The following text from Section
24 2.3.7 of the PD SV describes the design of granular dyke sections:

25 Granular Dyke - Used in areas of limited length, where permafrost affected overburden
26 is relatively thick and uneconomical to excavate. The dyke is founded on postglacial
27 clays and consists of semipervious granular zones, a downstream toe drain, and slope
28 protection zones. The dyke design will limit seepage to a controllable volume and
29 accommodate differential foundation settlements, which will occur due to thaw
30 consolidation of the permafrost affected postglacial clays.

31 Additionally, dyke construction in areas of permafrost is discussed further in the
32 response to CEC Rd 1 CEC-0070.

33 Permafrost considerations in the design of the North and South Access Roads are
34 discussed in section 2.4.6 of the PD SV. Sections 3.3.5 and 3.5.4 of the PD SV discuss
35 construction methods to be used where the South Access Road, and North and South
36 Dykes respectively are constructed on permafrost.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 MB Wildlands-0047**

4 **QUESTION:**

5 The EIS indicates that “the study area for each environmental component is defined by
6 the geographic extent of the direct and indirect effects of the project.”

- 7 1. How does Manitoba Hydro determine the study area before knowing the results of
8 studies to determine direct and indirect effects of the project, given the study areas
9 already define the extent of the direct and indirect effects of the project?
10 2. Which VECs are umbrella indicators?
11 3. Which VECs are key for ecosystem function?
12 4. Which VECs are regulatory requirements?

13 **RESPONSE:**

14 These questions are answered in turn below.

- 15 1. *How does Manitoba Hydro determine the study area before knowing the results of*
16 *studies to determine direct and indirect effects of the project, given the study areas*
17 *already define the extent of the direct and indirect effects of the project?*

18 The Partnership used an iterative process to determine study areas. At the outset of
19 environmental assessment studies, preliminary study areas were delineated based on
20 existing information. These preliminary study area boundaries were subsequently
21 refined as new information was developed by the environmental assessment studies.
22 For example, results from the water regime and shoreline erosion studies led to
23 adjustments to the aquatic and terrestrial study area boundaries. Study area boundaries
24 were also revised as the Project design was refined or became more precise (e.g., the
25 spatial extent of the Project hydraulic zone of influence was confirmed by water regime
26 modeling). The study areas presented in the EIS are the final versions used for the
27 effects assessments.

- 28 2. *Which VECs are umbrella indicators?*
29 3. *Which VECs are key for ecosystem function?*
30 4. *Which VECs are regulatory requirements?*

31 Questions 2, 3 and 4 are answered together in Table 1 below.

32 Table 1 identifies the VECs that were selected because they are an umbrella indicator,
33 key for ecosystem function and/or satisfy a regulatory requirement. It should be noted

34 that some VECs (e.g., commercial trapping) were also selected on the basis of other
35 criteria than the three identified in the question.

36 Table 1. Valued Environmental Components (VECs) that satisfied one or more of the
37 following criteria: an umbrella indicator, key for ecosystem function and/or satisfy a
38 regulatory requirement

VEC	Umbrella Indicator	Key For Ecosystem Function	Regulatory Requirement	EIS Reference
AQUATIC				
Water Quality	X	X	X	AE SV Table 1-1
Walleye	X		X	AE SV Table 1-1
Northern Pike	X		X	AE SV Table 1-1
Lake Whitefish	X		X	AE SV Table 1-1
Lake Sturgeon	X		X	AE SV Table 1-1
TERRESTRIAL				
Ecosystem Diversity	X	X	X	TE SV Table 1A-3
Wetland Function	X	X	X	TE SV Table 1A-3
Intactness	X	X	X	TE SV Table 1A-3
Priority Plant Species			X	TE SV Table 1A-3
Caribou			X	TE SV Table 1A-3
Moose		X	X ¹	TE SV Table 1A-3
Beaver		X	X ²	TE SV Table 1A-3
Olive-sided flycatcher			X	TE SV Table 1A-3
Common nighthawk			X	TE SV Table 1A-3
Rusty blackbird			X	TE SV Table 1A-3
SOCIO-ECONOMIC				
Employment and training opportunities			X	SE SV Sec. 1.2.5
Business opportunities			X	SE SV Sec. 1.2.5
Income			X	SE SV Sec. 1.2.5
Cost of living			X	SE SV Sec. 1.2.5
Resource Economy			X	SE SV Sec. 1.2.5
Housing			X	SE SV Sec. 1.2.5
Community infrastructure and services			X	SE SV Sec. 1.2.5
Land			X	SE SV Sec. 1.2.5
Transportation infrastructure			X	SE SV Sec. 1.2.5
Governance, goals and plans			X	SE SV Sec. 1.2.5
Community health			X	SE SV Sec. 1.2.5
Mercury and human health			X	SE SV Sec. 1.2.5
Public safety and worker interaction			X	SE SV Sec. 1.2.5

VEC	Umbrella Indicator	Key For Ecosystem Function	Regulatory Requirement	EIS Reference
Travel, access and safety			X	SE SV Sec. 1.2.5
Culture and spirituality			X	SE SV Sec. 1.2.5
The way the landscape looks (aesthetics)			X	SE SV Sec. 1.2.5
RESOURCE USE				
Domestic hunting and gathering			X	Resource Use section 1.1.2.3 of the SE SV
Domestic fishing			X	Resource Use section 1.1.2.3 of the SE SV
Commercial Trapping			X	Resource Use section 1.1.2.3 of the SE SV
HERITAGE				
Heritage resources			X	SE SV – Heritage Sec. 1.2.4
<p>Notes: ¹ In the Response to EIS Guidelines TE SV Table 1A-3, moose and beaver were not identified with regulatory requirements. Because ungulates and furbearers (<i>i.e.</i>, including moose and beaver), were identified in the Keeyask Generation Project Scoping Document, these two species should have been checked as having regulatory requirements. These omissions for moose and beaver have been corrected here.</p> <p>² See note 1.</p>				

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.9.3.2**
2 **Construction Phase; p. N/A**

3 **CEC Rd 1 MB Wildlands-0048**

4 **QUESTION:**

- 5 1. What is the basis for the "Project structures to be designed to withstands flows and
6 levels associated with a flood having an annual frequency of occurrence 1:20 years
7 "?
8 2. Given 2005 flows were a 1:30 year event, with significant flooding in the Split Lake
9 and Gillam region, is the 1:20 year design based on costs?

10 **RESPONSE:**

11 The approach adopted during the preliminary design studies (Stage IV engineering) was
12 to use the 1:20 year flood for the Construction Design Flood (CDF) for all temporary river
13 management structures during the construction of the Keeyask Project. The 1:20 year
14 flood has a probability of exceedance of 5% for any given year which provided an
15 acceptable balance of risk and cost for the preliminary design studies. Using the 1:20
16 year flood is a typical design criterion for temporary structures that was often used in
17 other Manitoba Hydro projects and elsewhere in Canada.

18 During the final design studies for Keeyask, a risk management approach was used to
19 assist in identifying the optimum design flood for each individual river management
20 structure. This risk analysis considered: the service life of the structure; the importance
21 of the infrastructure within each cofferdam that requires protection; the ability to "top-
22 up" the structure if a higher flood event is forecast, as well as the capital cost (or
23 savings) of building the structure to a higher (or lower) level. The risk management
24 approach was used to determine the optimal design elevation for each temporary
25 structure. This resulted in the selection of design floods with return periods ranging
26 from 1:10 to 1:100 years for each of the Stage 1 cofferdams. The risk review for the
27 Stage 2 river management structures is in progress and has not been completed. This
28 type of risk based design is becoming more commonly used for the design of temporary
29 river management structures.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.8.5**
2 **Sensitivity to Effects of Climate Change; p. N/A**

3 **CEC Rd 1 MB Wildlands-0049**

4 **QUESTION:**

- 5 1. On what basis does the EIS state that climate change will not have any effect during
6 the construction phase?
7 2. What proof of this statement does Manitoba Hydro hold?

8 **RESPONSE:**

9 Please refer to the response provided to CEC Rd 1 PFN-0019, which addresses the
10 questions posed in MB Wildlands-0049.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.12.1**
2 **Future Climate Change Scenarios; p. N/A**

3 **CEC Rd 1 MB Wildlands-0050**

4 **QUESTION:**

- 5 1. Which Global Climate Models were 'used to project future climate change'?
- 6 2. What is the date of the Canadian Regional Climate Model version 4.2.3 (CRCM)?
- 7 3. Which model and scenario are the temperature increases used in the EIS from?
- 8 4. Are these the conservative, moderate, or worse case scenarios
- 9 5. Did Manitoba Hydro leave out the change in temperature that has already occurred
- 10 in the region, in northern Manitoba since 1970 from its models and scenarios?
- 11 6. Are the increases in projected temperature in the region listed in this section of the
- 12 EIS each an additional increase OR cumulative?
- 13 7. What is the total temperature increase in the region the models and scenarios
- 14 indicate, starting in 1970 – to include increases in temperature that have already
- 15 occurred?
- 16 8. Has Manitoba Hydro taken these temperature increase projections into account in
- 17 its planning, engineering, and costing of Keeyask?
- 18 9. What increase in precipitation has occurred for the region since 1970?
- 19 10. Has the increase in extreme weather events since 2007 been taken into account in
- 20 Manitoba Hydro planning, engineering, and costing of Keeyask?

21 **RESPONSE:**

22 Each of the above questions is answered in turn. Note that CEC Rd 1 MB Wildlands-0060
23 asks the exact same set of questions.

24 1. *Which Global Climate Models were 'used to project future climate change'?*

25 In total, the ensemble of Global Climate Models (GCMs) consisted of 139 climate
26 scenarios as projected by 24 GCMs (all their members) and up to three different
27 emission scenarios ranging from low to high carbon dioxide emissions (B1, A1B, A2) as
28 listed in PE SV Section 2.2.3.2, Table 2.2-1.

29 2. *What is the date of the Canadian Regional Climate Model version 4.2.3 (CRCM)?*

30 The most current version of the Canadian Regional Climate Model (CRCM4.2.3), which
31 was generated and supplied by the Ouranos Consortium, was used for the Keeyask EIS.
32 CRCM4.2.3 simulations were numerically computed between 2007 and 2010.

33 3. *Which model and scenario are the temperature increases used in the EIS from?*

34 The reported increase in temperature is from the ensemble average of GCM projections.
 35 In total, the ensemble of Global Climate Models consisted of 139 climate scenarios as
 36 projected by 24 GCMs and up to three different emission scenarios ranging from low to
 37 high carbon dioxide emissions as listed in PE SV Section 2.2.3.2, Table 2.2-1. In addition,
 38 up to 9 climate scenarios using the most current Canadian Regional Climate Model
 39 4.2.3, nested within the Canadian Global Climate Model 3.1, European Centre Hamburg
 40 Model 5, and Centre National de Recherches Meteorologiques Climate Model 3, for all
 41 available emissions scenarios (A1B and A2) was used as described in PE SV Section 2.2.3.2

42 *4. Are these the conservative, moderate, or worse case scenarios*

43 As stated in PE SV Section 2.2.5.1, the Partnership used all available emission scenarios
 44 (B1, A1B, and A2) that were used to drive the GCMs and RCM. The B1, A1B, A2 emission
 45 scenarios range from low to high carbon dioxide emissions, with the A2 scenario having
 46 the highest projected carbon dioxide emissions. All emission scenarios are equally valid
 47 and have no assigned probability. All GCM simulations from AR4, including all three
 48 emission scenarios were used to develop an ensemble average.

49 *5. Did Manitoba Hydro leave out the change in temperature that has already occurred*
 50 *in the region, in northern Manitoba since 1970 from its models and scenarios?*

51 As described in PE SV Section 2.2.1.2, climate model outputs are used to determine the
 52 future change in climate with respect to the climate model's present-day climate (1971-
 53 2000). Then, these changes are applied to observed historical climate normals (1971-
 54 2000) to construct the future climate scenarios. This captures changes after 1970 and
 55 provides realistic temporal sequencing associated with the historic record and allows
 56 future climate change impacts to be evaluated in the context of historical events.

57 *6. Are the increases in projected temperature in the region listed in this section of the*
 58 *EIS each an additional increase OR cumulative?*

59 The average annual temperature projections for the future time periods (2020s, 2050s,
 60 2080s) described in the Response to EIS Guidelines, Section 6.3.12.1, are with respect to
 61 the 1971-2000 baseline period. The values presented represent the cumulative change
 62 in climate from the baseline period to the future time horizon of interest. For example,
 63 with an annual average baseline normal temperature of -4.2°C and a projected increases
 64 of 1.5°C, 2.8°C, 4.1°C, in the 2020s, 2050s and 2080s time horizons, the future average
 65 temperatures are estimated be -2.7°C, -1.4°C and -0.1°C respectively.

66 *7. What is the total temperature increase in the region the models and scenarios*
 67 *indicate, starting in 1970 – to include increases in temperature that have already*
 68 *occurred?*

69 The Response to EIS Guidelines, Section 6.3.12.1, provides future climate scenario
70 projections for the 2020s, 2050s and 2080s. Historical trends are reported in
71 Environmental Study Report No. GN-9.5.2. The trend analysis conducted on the Gillam
72 Airport weather station over the 1943-2008 period, showed a statistically significant
73 increase in annual mean temperature of 0.16°C/decade.

74 *8. Has Manitoba Hydro taken these temperature increase projections into account in*
75 *its planning, engineering, and costing of Keeyask?*

76 Increases in local temperatures will have limited effects on the design of the
77 infrastructure at Keeyask. CEC Rd 1 CAC-0072 describes how some dyke sections are
78 designed to accommodate the melting of frozen foundation soils.

79 *9. What increase in precipitation has occurred for the region since 1970?*

80 The Response to EIS Guidelines, Section 6.3.12.1, provides future climate scenario
81 projections for the 2020s, 2050s and 2080s. Historical trends are reported in
82 Environmental Study Report No. GN-9.5.2. The trend analysis conducted on the Gillam
83 Airport weather station over the 1967-2009 period, showed no statistically significant
84 trends in precipitation on a monthly, seasonal or annual basis.

85 *10. Has the increase in extreme weather events since 2007 been taken into account in*
86 *Manitoba Hydro planning, engineering, and costing of Keeyask?*

87 Manitoba Hydro is not aware of any published evidence that suggests that extreme
88 weather events have been increasing since 2007 in the Keeyask study area.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0051**

4 **QUESTION:**

5 Estimates for the Keeyask Generation Project required to conduct LCA:

- 6 1. The service life of the Project, defined as beginning at the date of operation phase
7 initiation (November 2019, as noted in Section 1.1 of the reference document), and
8 ending at the start of infrastructure decommissioning.
- 9 2. The Project 's total electricity generation over its service life.
- 10 3. Average line losses, by season, to consumer for electricity generated by the Project
11 over its service life.

12 This request for estimates is in IR format based on direction from the Keeyask project
13 managers.

14 **RESPONSE:**

15 There are a series of Information Requests from Manitoba Wildlands and Peguis First
16 Nation that request data for the purposes of undertaking a Life Cycle Assessment (LCA).
17 From the CEC Rd 1 Information Requests, these include: MB Wildlands-0054, MB
18 Wildlands-0055, MB Wildlands-0056, MB Wildlands-0057, MB Wildlands-0058, MB
19 Wildlands-0059, PFN- 0044, PFN-0045 and PFN-0047.

20 The data the Partnership is prepared to make available are included in its EIS filing, in
21 the Technical Reports outlined in Appendix 6A of the Response to EIS Guidelines and on
22 the Partnership Web site at <http://www.keeyask.com>.

23 Of particular note is the comprehensive peer-reviewed LCA for the Keeyask Generation
24 Project that has already been undertaken. The report is available for review as Technical
25 Memorandum GN 9.5.5 (A Life Cycle Assessment of Greenhouse Gases and Select
26 Criteria Air Contaminants) cited in Appendix 6A.

27 This detailed LCA was contracted by Manitoba Hydro, on behalf of the Partnership, with
28 the Pembina Institute for the purposes of the Keeyask Generation Project
29 Environmental Impact Statement.. The Pembina Institute followed the ISO 14040 Life
30 Cycle Standard and had the report and analysis peer reviewed by an expert from Hydro
31 Quebec for quality assurance. The LCA provides details on the quantification of life cycle
32 GHGs that result from the construction, land use change, operation and eventual
33 decommissioning of the Keeyask Generation Project. Technical Memorandum GN 9.5.6

34 (Reservoir Greenhouse Gases) provides the methodology and estimates associated with
35 the reservoir GHG emissions that were incorporated into the LCA.

36 The results of the LCA are summarized in Section 2.4.1 of the Physical Environment
37 Supporting Volume. The LCA technical memorandum and the technical memorandum
38 on Reservoir Greenhouse Gases document the principles of the LCA process, the
39 methodology employed, and conclusions. Section 4.2 describes the principles used to
40 determine which key activities to include in the assessment and the basis for excluding
41 insignificant activities. Appendix 3 (Section 8.3) provides key material, fuel and
42 transportation distances used in the LCA. The results of the related peer review process
43 are included in Appendix 6 Section 8.6.

44 Both the LCA technical memorandum and the reservoir GHG technical memorandum
45 have been made available and are provided on the CD of technical reports included with
46 the Responses to Information Requests – CEC Round 1. The CD also includes the
47 technical report that was requested for the LCA completed in 2003 for the Wuskwatim
48 Project (Title “Life Cycle Evaluation of GHG Emissions and Land Change Related to
49 Selected Power Generation Options in Manitoba”).

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: R to EIS;**
2 **AE SV; TE SV 7.0; Exec Sum; p. N/A**

3 **CEC Rd 1 MB Wildlands-0052a**

4 **PREAMBLE:**

5 In several sections, habitat is mentioned either as a restoration and/or mitigation
6 function. It is described that as long as the habitat is recreated, the important species or
7 ecosystem, whether it be fish (spawning habitat) or geese (i.e., staging habitat) will be
8 replaceable and thus in the operation stage of the project populations will not be
9 adversely effected.

10 **QUESTION:**

11 The spawning habitat for several species will be lost in Gull Rapids.

12 On the basis of what scientific literature does Manitoba Hydro assume that the
13 recreated habitat, which needs to provide everything needed for survival (i.e., food,
14 water, shelter) for each given life stage of an animal, plant or fish, will support the
15 maintenance of the genetic diversity needed to maintain healthy and resilient
16 populations over space and time?

17 **RESPONSE:**

18 With specific regards to Lake Sturgeon, to mitigate the loss of spawning habitat in Gull
19 Rapids a Lake Sturgeon spawning structure will be constructed downstream of the
20 Keeyask Generating Station that will mimic a natural Lake Sturgeon spawning ground by
21 providing suitable depth, water velocity and substrates typical of a natural spawning
22 location. The intent of this recreated spawning habitat is to provide suitable areas for
23 Lake Sturgeon to deposit their eggs, for the eggs to develop and hatch, and for the
24 larvae to grow to the stage where larval Lake Sturgeon emerge from the substrate and
25 begin to passively drift downstream with the current to rearing areas. Should the Project
26 be built, the only location for Lake Sturgeon in Stephens Lake to spawn will be in the
27 recreated spawning habitat, or below the generating station spillway if it is in operation
28 during the spawning period.

29 The proposed Lake Sturgeon spawning structure at Keeyask is designed based on
30 characteristics of other successful structures. Constructed spawning shoals that have
31 been reported in the primary literature include two locations in Quebec, one below the
32 Des Prairie GS (Dumont et al. 2011) and the other in the St. Lawrence River (Johnson et
33 al. 2006) and one in the Detroit River (Roseman et al. 2011). All three are reported to
34 have been successful at improving Lake Sturgeon spawning success. Spawning shoals
35 have also been developed downstream of the Pointe Du Bois Generating Station. A

36 description of monitoring results from these constructed shoals is provided in TAC
37 Public Rd 2 DFO-0045.

38 To further clarify, in addition to spawning habitat, several other habitat types are
39 necessary for Lake Sturgeon to fulfill their life history such as juvenile rearing areas,
40 juvenile foraging areas and adult foraging areas. These habitats possess markedly
41 different characteristics relative to the characteristics of Lake Sturgeon spawning
42 habitat. For example, deep areas of rivers and lakes, with detectable current and various
43 substrate types have been identified as preferred rearing areas for juvenile Lake
44 Sturgeon. In Stephens Lake, it is thought that with the addition of recreated Lake
45 Sturgeon spawning habitat, that habitat to fulfill the requirements of each stage of the
46 Lake Sturgeon's life history will exist following development of the Project.

47 With respect to other fish species such as Walleye, Northern Pike and Lake Whitefish, as
48 discussed in the AE SV Section 5.4.2.3.1, spawning habitat for these species has been
49 documented at other locations in Stephens Lake. In addition, the spawning structure
50 created for Lake Sturgeon is expected to provide spawning habitat for Walleye, and a
51 reef targeted for Lake Whitefish will be constructed at Stephens Lake.

52 REFERENCES:

53 Johnson, J.H., S.R. LaPan, R.M. Klindt, and A. Schiavone. 2006. Lake sturgeon spawning
54 on artificial habitat in the St Lawrence River. *Journal of Applied Ichthyology*
55 22:140 465-470 pp.

56 Dumont, P., J. D'Amours, S. Thibodeau, N. Dubuc, R. Verdon, S. Garceau, P. Bilodeau, Y.
57 Mailhot, and R. Fortin. 2011. Effects of the development of a newly created
58 spawning ground in the Des Prairies River (Quebec, Canada) on the reproductive
59 success of lake sturgeon (*Acipenser fulvescens*). *Journal of Applied Ichthyology*,
60 27: 394-404 pp.

61 Roseman, E.F., B. Manny, J. Boase, M. Child, G. Kennedy, J. Craig, K. Soper, and R.
62 Drouin. 2011. Lake sturgeon response to a spawning reef constructed in the
63 Detroit River. *Journal of Applied Ichthyology*, 27: 66-76 pp.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: R to EIS;**
2 **AE SV; TE SV 7.0; Exec Sum; p. N/A**

3 **CEC Rd 1 MB Wildlands-0052b**

4 **PREAMBLE:**

5 In several sections, habitat is mentioned either as a restoration and/or mitigation
6 function. It is described that as long as the habitat is recreated, the important species or
7 ecosystem, whether it be fish (spawning habitat) or geese (i.e., staging habitat) will be
8 replaceable and thus in the operation stage of the project populations will not be
9 adversely effected.

10 **QUESTION:**

11 Some habitats have more species, and thus more genetic diversity than others. One
12 area of particular concern is genetic diversity of the lake sturgeon.

13 Does the planned stocking program will take into account the need to preserve genetic
14 diversity, and consequently biodiversity, of this endangered fish as per SARA and
15 COSEWIC guidelines? Please and the methodology and supporting documentation used
16 to come to these conclusions.

17 Which studies, methodologies, data sets, and assessment approaches did Manitoba
18 Hydro use to determine that the construction of suitable habitat will provide for the
19 maintenance of genetic diversity and the subsequent maintenance of biodiversity?

20 Please provide verification of the basis for the assessing future created sturgeon
21 habitats via studies, methodologies. Are these studies available to participants?

22 Where is it demonstrated that these constructed habitats will also produce the
23 regulating service of biological control in the context of biodiversity? Has it been
24 demonstrated that these important services are not needed by this endangered
25 species? Please demonstrate where in the EIS this is addressed. And Please provide
26 verification of the basis for omitting these above habitat assessments via studies, data,
27 methodologies, etc. Are these studies available to participants?

28 **RESPONSE:**

29 As discussed in the Aquatic Environment Supporting Volume Appendix 1A, Part 2, Lake
30 Sturgeon will be stocked with brood stock taken from the same subpopulation so that
31 any subtle genetic differences between subpopulations will be preserved. In the event
32 that insufficient sturgeon are present to provide brood stock, an alternate location will
33 be selected in consultation with Fisheries and Oceans Canada and Manitoba

- 34 Conservation and Water Stewardship Fisheries Branch, taking into consideration the
35 known genetic similarities and differences among subpopulations.
- 36 The need to preserve genetic diversity of stocked fish is recognized and was previously
37 addressed in TAC Public Rd 1 DFO-0097, which is reproduced below.

38 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 39 **Section: Appendix 1A, Part 2 Keeyask Lake Sturgeon Stocking**
 40 **Strategy; p. N/A**

41 **DFO-0097**

42 **PREAMBLE:**

43 Appendix 1A - Part2

44 **QUESTION:**

45 Concern over the acquisition of sufficient broodstock to avoid genetic variability. There
 46 is acknowledgement that collecting spawning individuals will be unlikely. Concern over
 47 reliance on the use of gametes from just a few individuals (EIS suggests 2 females per
 48 year) and the subsequent release of closely related offspring. Decrease in
 49 heterozygosity/genetic drift/allele loss and thereby lower genetic diversity. Please provide
 50 detailed report(s) that examined these challenges.

51 **RESPONSE:**

52 DFO's concern over the number of brood stock to use to avoid loss of genetic diversity
 53 are acknowledged; however, it is probable that lake sturgeon stocks are so low in the
 54 Keeyask Study Area that a loss in genetic diversity may already be occurring in this
 55 remnant population. The Michigan guidelines for stocking lake sturgeon in the Great
 56 Lakes suggest that over a 25 year period, gametes should be collected from a minimum
 57 of 250 different females and 250-1250 different males (Elliot et al. 2005). At Keeyask,
 58 these targets would be impossible to reach. The population is sufficiently low that even
 59 the capture of two females per year (as suggested by the DFO review) may be difficult to
 60 attain. The objective of the stocking plan is to release four families per year, two
 61 females crossed with two males. Over a 25 year period that would equate to stocking
 62 out gametes from 50 females and 100 males.

63 Results from Schueller and Hayes (2011) demonstrate that both minimum viable
 64 population (MVP) size and extinction risk can be influenced by demographic
 65 stochasticity and inbreeding depression. This study was designed to determine MVP and
 66 how inbreeding may affect MVP. More specifically, the study was focused on how MVP
 67 and inbreeding is expected to accrue in remnant populations. Remnant populations of
 68 lake sturgeon would be those populations where there is limited to no natural
 69 recruitment. The lake sturgeon populations in the Keeyask area are naturally recruiting;
 70 however, recruitment is highly variable among years. Population viability analysis (PVA)
 71 is a standard tool for examining the relationship between extinction risk and population
 72 size, but often does not take into account genetic consequences. This study used a

73 standard modeling approach using individual-based model (IBM) to evaluate inbreeding
74 depression (genetic consequences) in two ways:

- 75 1. individuals with inbreeding coefficients above a threshold experienced inbreeding
76 depression; and
- 77 2. individuals experienced inbreeding depression at a rate related to their inbreeding
78 coefficient (gradual).

79 Three mechanisms relating inbreeding to fitness were explored:

- 80 1. young-of-the-year (YOY) viability;
- 81 2. post-YOY viability; and
- 82 3. number of progeny.

83 This study used a 5% chance of extinction over 250 years as the criterion to determine
84 MVP. The estimated MVP without inbreeding effects was 80 individuals. For some
85 scenarios incorporating inbreeding, MVP did not change, while others had MVP values
86 up to 1800. Table 2 in Schueller and Hayes (2011) demonstrates that for YOY viability
87 and Number of Progeny that gradually manifest do not affect MVP, but that a gradual
88 manifestation of post-YOY viability is the critical influence on MVP.

89 The stocking strategy presented in the EIS follows guidelines for a stocking program
90 from the Great Lakes, which was designed with the involvement and input of many
91 experts on lake sturgeon genetics in North America and, therefore, not only represents
92 the state of knowledge, but the approach that should be followed. While Schueller and
93 Hayes (2011) examine the derived parameters that are of direct interest to concerns
94 raised by DFO, there are no reports that directly examine the challenges described by
95 DFO. To address the concerns that DFO raises requires new genetic tools and a better
96 understanding of lake sturgeon genetics. The industry standard genetic tools that are
97 available for lake sturgeon do not allow for the assessment of effective dispersal within
98 a single watershed let alone a management unit, such as the Keeyask area. Effective
99 dispersal is a tool to allow the understanding of natural gene flow among populations or
100 geographically distinct areas.

101 To address these concerns and knowledge gaps, Manitoba Hydro is funding a study
102 conducted by Louis Bernatchez at Université Laval that will increase the understanding
103 of the current lake sturgeon population genetics for DU3. This “cutting edge” research
104 aims to develop tools that may be able to provide an understanding of the current level
105 of effective dispersal and allow the assessment of age cohorts to determine whether the
106 current level reproduction is the result of population wide successful spawning, or a few
107 large females contributing during ‘perfect storm’ years when conditions are ideal.

108 Results of the study will be used to support the genetic analysis that is one component
109 of the monitoring planned to assess the effectiveness of the stocking program.

110 The level of genetic diversity that currently exists within the adult lake sturgeon
111 population of the Nelson River is healthy and there is no indication of any inbreeding at
112 present. The Manitoba Hydro study will also be looking at the population genetics of the
113 juvenile populations to assess the genetic diversity as well to increase the state of
114 knowledge of lake sturgeon population genetics and demographics.

115 **REFERENCES:**

116 Elliott, R.F., E. Baker, B. Eggold, and M Holtgren. 2005. Lake Michigan Lake sturgeon
117 rehabilitation plan-conservation genetics, and rehabilitation stocking. Oral
118 presentation. Proceedings of the second Great Lakes Lake Sturgeon
119 Coordination Meeting. November 9-10, 2004. Sault Ste Marie, Michigan.

120 Schueller, A.M. and D.B. Hayes. 2011. Minimum viable population size for lake sturgeon
121 (*Acipenser fulvescens*) using an individual-based model of demographics and
122 genetics. Canadian Journal of Fisheries and Aquatic Sciences 68: 62-73.

1 **REFERENCE: Volume: N/A; Section: All Volumes; p. N/A**

2 **CEC Rd 1 MB Wildlands-0053**

3 **QUESTION:**

4 The loss of natural areas and the services provided by them may require substitution.

5 These substitutes may be very expensive to build and operate.

6 1. Has a baseline natural capital assessment been completed for the project area?

7 2. Have these cost-benefit analyses been conducted for the project area that assess
8 the costs of replacing the natural capital in the project area? Where is this topic
9 covered in the EIS?

10 **RESPONSE:**

11 Please see the responses to CEC Rd 1 MB Wildlands-0031 and CEC Rd 1 MB Wildlands-
12 0025.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0054**

4 **QUESTION:**

5 Operational stage of Keeyask facilities estimates required for LCA.

- 6 1. Operational energy use estimates:
 - 7 ○ for facilities
 - 8 ○ for reserve power, including system testing
- 9 2. Operational material use estimates:
 - 10 ○ Need of oil, hydraulic fluids, and or fat, as well as potential emissions
 - 11 thereof to the waterways
- 12 3. Operational waste estimates:
 - 13 ○ Amount, by type
 - 14 ○ Transportation distance and modes to handling/treatment/disposition
- 15 4. Maintenance estimates:
 - 16 ○ Energy and materials use, eg. lubrication, inspection trips

17 These requested estimates are in the IR form at the request of Keeyask project
18 managers.

19 **RESPONSE:**

20 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0055**

4 **QUESTION:**

5 Worker Related Estimates (exclusive of aspects related to construction) to provide:

- 6 1. Total # of flights to and from site and average per flight distance.
- 7 2. Total work related waste water flow.

8 This request for estimates is in IR format based on direction from the Keeyask project
9 managers.

10 **RESPONSE:**

11 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: 2.3 Principal Structures, 2.4 Supporting Infrastructure; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0056**

5 **QUESTION:**

6 Estimates requested for principal structures, and supporting infrastructures as noted in
7 reference volume:

- 8 1. Mix designed for ready mix concrete and grout.
- 9 2. Materials manufacturing locations, and transportation distance and mode to site.
- 10 3. Construction waste factors (% concrete, % structural steel,, etc) for initial
11 construction and maintenance, repair, replacement.
- 12 4. End of life outcomes for materials (disposal, incineration, recycling, reuse) for initial
13 construction (construction waste), maintenance/repair/replacement, and
14 decommissioning.
- 15 5. Material transportation distance and mode to end of life facility (landfill, scrap yard,
16 etc).

17 These requested estimates are in IR form at the request of the Keeyask project
18 managers.

19 **RESPONSE:**

20 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0057**

4 **QUESTION:**

5 Food production by the local and regional area will be altered by changes in water
6 quality.

- 7 1. Has data been made available to quantify the change in freshwater fishery value
8 associated with the change in water quality – nutrient concentrations in the project
9 local or regional area?
- 10 2. Has the financial Ecosystem Services/ biodiversity loss been quantified for
11 subsistence fisheries? Have replacement costs been calculated?
- 12 3. What is the cost of the price of the replacement food that it will take to bring in to
13 the communities when the subsistence fishery declines, as predicted in the aquatic
14 volume? Have these costs been quantified? This includes not only the price of food
15 but the price of shipping the food and emissions of doing so, as well as the
16 environmental costs of growing the food and bringing food into the territory in
17 general (LCA of replacement food products?)
- 18 4. Has this economic assessment been completed and appear in the EIS or supporting
19 documents? Are they available to public? If this has not been done, explain.

20 **RESPONSE:**

21 A response to each of the questions outlined above is provided below.

- 22 1. *Has data been made available to quantify the change in freshwater fishery value*
23 *associated with the change in water quality – nutrient concentrations in the project*
24 *local or regional area?*

25 Freshwater fishery value cannot be linked directly to changes in water quality (i.e.,
26 nutrient concentrations). The fish community was assessed in Section 6.4.6.1 of the
27 Response to EIS Guidelines and considers direct effects of the Project on the fish
28 community as well as indirect effects via ecosystem components such as water quality,
29 aquatic habitat, aquatic plants, and aquatic invertebrates. The effect of the Project on
30 fisheries was assessed in Sections 6.7.3.1 (domestic fisheries) and 6.7.4.2 (commercial
31 fisheries) of the Response to EIS Guidelines. The assessment considered effects to fish
32 harvest, including changes in the abundance and quality of fish to be harvested, as well
33 as other factors such as access. Given proposed mitigation, the residual effect of the
34 Project on domestic fishing and commercial fishing in both the construction and

35 operation phases is neutral (see Sections 6.7.3.1.5 and 6.7.4.2.5 of the Response to EIS
 36 Guidelines respectively).

37 2. *Has the financial Ecosystem Services/ biodiversity loss been quantified for*
 38 *subsistence fisheries? Have replacement costs been calculated?*

39 Quantification of financial ecosystem services/ biodiversity loss for the subsistence
 40 fishery has not been conducted. As noted in the response to CEC Rd 1 MB Wildlands-
 41 0025:

42 "The Partnership has completed its assessment of the potential environmental
 43 effects of the Project, and the development of long-term mitigation and
 44 monitoring plans, in accordance with guidelines issued by regulatory authorities
 45 and standard environmental assessment methodology. The assessment
 46 guidelines do not require the Partnership to specifically address the concept of
 47 natural capital and, in particular, the economic valuation of ecosystem services
 48 within the project area that is implied by this term. The economic valuation of
 49 ecosystem services is also not considered to be standard practice in project-
 50 specific environmental assessment."

51 3. *What is the cost of the price of the replacement food that it will take to bring in to*
 52 *the communities when the subsistence fishery declines, as predicted in the aquatic*
 53 *volume? Have these costs been quantified? This includes not only the price of food*
 54 *but the price of shipping the food and emissions of doing so, as well as the*
 55 *environmental costs of growing the food and bringing food into the territory in*
 56 *general (LCA of replacement food products?)*

57 Please see the responses to 1 and 2 above.

58 It should be noted that the Aquatic Environment Supporting Volume did not predict long
 59 term declines in the subsistence fishery.

60 The Response to EIS Guidelines (p. 6-273) concluded:

61 "Walleye and lake whitefish in Stephens Lake are predicted to experience
 62 negative effects during construction due to the loss of spawning habitat, but
 63 effects will be neutral in the long-term as replacement spawning habitat
 64 becomes available. In the Keeyask reservoir, both species are expected to
 65 experience a small, positive (population increase) effect. No construction-
 66 related effects are predicted for northern pike, but this species will experience
 67 some short-term negative effects until appropriate habitat becomes established
 68 in the reservoir."

69

- 70 4. *Has this economic assessments been completed and appear in the EIS or supporting*
71 *documents? Are they available to public? If this has not been done, explain.*
- 72 See response to question 1 and 2 above.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: 2.3 Principal Structures; 2.4 Supporting Infrastructure; p.**
3 **N/A**

4 **CEC Rd 1 MB Wildlands-0058**

5 **QUESTION:**

6 To enable Life Cycle Assessment of each principal structure and supporting
7 infrastructure of the Keeyask Generation project, provide estimate for:

- 8 1. Material use quantities for initial construction, and then
9 maintenance/repair/replacement over the project's service life;
- 10 2. Construction, excavation and quarrying energy use for initial construction and the
11 maintenance, repair, replacement construction;
- 12 3. Demolition, excavation, and deconstruction energy use for maintenance, repair,
13 replacement and decommissioning,
- 14 4. Quantity of explosive, particulate matter emissions, and emissions to water for
15 initial construction, maintenance/repair/replacement, and decommissioning;

16 For each component of the Keeyask Generation project.

17 These materials and energy use quantities to be provided for construction, and life of
18 the project. As per section 2.4.17 this request includes KIP infrastructure in the LSA for
19 Keeyask Generation

20 These requests are in an IR at the request of Manitoba Hydro Keeyask project managers.

21 **RESPONSE:**

22 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; p. Table 2-1**

3 **CEC Rd 1 MB Wildlands-0059**

4 **QUESTION:**

- 5 1. Provide annual carbon stock estimates for all lands listed in Table 2.1 – for the
6 current year, and each year in the project life cycle.
- 7 2. Provide volume of wood entering manufacturing streams, for all logs and fibre
8 removed from the project area.
- 9 3. Provide volume of wood material to be cleared from the project area, and then
10 burned. Provide for project construction period and the first 30 years of operation.
- 11 4. Provide annual carbon stock estimates for no build scenarios.
- 12 5. Provide annual land cover descriptions (plant species) for all lands affected by the
13 project listed in Table 2.1 (both build and no build scenarios) to support estimates
14 for albedo changes. Provide these annual land cover descriptions by zone, for all
15 construction years, 30 years into project operation, and project life cycle.
- 16 6. Add to this information any lands/land uses not listed in Table 2.1 (Quarries.
17 Blasting eg)
- 18 7. What data was used for landscape, peatland and forest cover? Manitoba Hydro
19 Keeyask project managers indicated these requests should be forwarded in IR
20 format.

21 **RESPONSE:**

22 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.12.1**
2 **Future Climate Change Scenarios; p. N/A**

3 **CEC Rd 1 MB Wildlands-0060**

4 **QUESTION:**

- 5 1. Which Global Climate Models were 'used to project future climate change'?
- 6 2. What is the date of the Canadian Regional Climate Model version 4.2.3 (CRCM)?
- 7 3. Which model and scenario are the temperature increases used in the EIS from?
- 8 4. Are these the conservative, moderate, or worse case scenarios
- 9 5. Did Manitoba Hydro leave out the change in temperature that has already occurred
- 10 in the region, in northern Manitoba since 1970 from its models and scenarios?
- 11 6. Are the increases in projected temperature in the region listed in this section of the
- 12 EIS each an additional increase OR cumulative?
- 13 7. What is the total temperature increase in the region the models and scenarios
- 14 indicate, starting in 1970 – to include increases in temperature that have already
- 15 occurred?
- 16 8. Has Manitoba Hydro taken these temperature increase projections into account in
- 17 its planning, engineering, and costing of Keeyask?
- 18 9. What increase in precipitation has occurred for the region since 1970?
- 19 10. Has the increase in extreme weather events since 2007 been taken into account in
- 20 Manitoba Hydro planning, engineering, and costing of Keeyask?

21 **RESPONSE:**

22 Please see response to CEC Rd 1 MB Wildlands-0050.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0;**
2 **Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0061**

4 **PREAMBLE:**

5 In Chapter 7, page 7-20, members of the KCNs have acknowledged that they expect a
6 decline in the numbers and health of most fish species as a result of the Keeyask Project
7 and adverse effects will extend to Split Lake.

8 **QUESTION:**

- 9 1. Has this cumulative loss of biodiversity been assessed? If so, how? a. If not, why
10 not?
11 2. What will these combined declines represent in terms of quantitative financial loss
12 of natural fisheries capital in the local and regional project area?
13 3. Has this information been mapped and quantified?
14 4. Has this cost information been evaluated in a financial way that considers non-
15 market benefits of biodiversity and the fish species in the project area?
16 a. If so, how?
17 b. If not, why not?
18 5. Have these financial replacement costs- which will ultimately fall on the local
19 communities been considered?

20 **RESPONSE:**

- 21 1. *Has this cumulative loss of biodiversity been assessed? If so, how? a. If not, why*
22 *not?*

23 Page 7-20 noted in the preamble to this Information Request is part of Section 7.5.1.2 of
24 the Response to EIS Guidelines. This section summarizes findings of the cumulative
25 effects of Keeyask to the aquatic environment acting in combination with other past and
26 current projects and activities, as discussed in Chapter 6 of the Response to EIS
27 Guidelines and in the Aquatic Environment Supporting Volume sections 5.4 and 6.4.
28 Section 7.5.1.3 then goes on to describe the potential cumulative effects of Keeyask on
29 the Aquatic Environment acting in combination with other potential future projects and
30 activities. This part of the assessment did “not indicate any with the potential to result
31 in cumulative adverse effects that require further mitigation for the Keeyask Project or
32 would alter the conclusion with respect to the regulatory significance of adverse effects
33 of the Project to Aquatic VECs...” p. 7-21.

34 The findings presented in these sections do not predict combined declines of these fish
35 species. Rather, it is predicted that after the reservoir is formed, pickerel and whitefish
36 populations in the reservoir will increase over time and remain the same in Stephens
37 Lake; jackfish populations in the reservoir and Stephens Lake are expected to remain
38 stable over the long term, though a short-term decline in the reservoir may occur. Lake
39 Sturgeon populations are also expected to increase throughout the area as a result of
40 the stocking program to be implemented by the Partnership.

41 There are certainly differences in the findings of the technical scientific assessment and
42 those of the Cree based on their worldview. These are noted in the assessment,
43 including on the cited page 7-20. As described in Chapter 8 of the Response to EIS
44 Guidelines, the Partnership will work together throughout the course of Keeyask
45 implementation to monitor actual Project outcomes based on both technical science
46 and Aboriginal Traditional Knowledge.

- 47 2. *What will these combined declines represent in terms of quantitative financial loss of*
48 *natural fisheries capital in the local and regional project area?*
49 3. *Has this information been mapped and quantified?*
50 4. *Has this cost information been evaluated in a financial way that considers non-*
51 *market benefits of biodiversity and the fish species in the project area?*
52 a. *If so, how?*
53 b. *If not, why not?*
54 5. *Have these financial replacement costs- which will ultimately fall on the local*
55 *communities been considered?*

56 As noted above, combined declines of VEC fish species have not been predicted in the
57 Response to EIS Guidelines. With respect to quantification of financial losses of natural
58 capital, please see the responses to CEC Rd 1 MB Wildlands-0025 and CEC Rd 1 MB
59 Wildlands-0057.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 6.2.3.9; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0062**

4 **PREAMBLE:**

5 On page 6-48, it is noted that the relationship between water levels in the adjacent
 6 lakes and groundwater is “inconsistent”. The “inconsistent” connections of
 7 groundwater to lake levels in the subject area suggest that a major knowledge gap exists
 8 and is described in the executive summary pertaining to water quality. Given that two
 9 major water quality ecosystem services are water supply (i.e., filtering, retention, and
 10 storage of fresh water) and water regulation (i.e., the regulation of water flows that
 11 entrains pollutants and purifies water) the current summation suggests that it is
 12 unknown how the altered flow regime will affect the services provided as described
 13 above.

14 **QUESTION:**

- 15 1. Where are these affects discussed in regards to water quality services
 16 2. If Manitoba Hydro did not take any of these aspects into account, why not?

17 **RESPONSE:**

18 For clarification, the text referenced in the preamble regarding an inconsistent
 19 groundwater connection is found in Section 6.2.3.2.9 (page 6-48) of the Response to EIS
 20 Guidelines rather than the Aquatic Environment Supporting Volume.

21 The inconsistent relationship referenced in the preamble is referring to the potential
 22 local presence of lower conductivity material (e.g., clay, permafrost) between some
 23 small lakes and the groundwater system, which may impede hydrologic flow between
 24 the two. A question related to this issue was posed and addressed in the response to
 25 CEC Rd 1 CEC-0082, which notes that one small lake may be affected by groundwater
 26 changes outside the flooded area. Model and sensitivity analysis results (see also
 27 response to CEC Rd 1 CEC-0083) indicate that Project effects are laterally localized in
 28 areas adjacent to the reservoir shoreline, consistent with observations from proxy study
 29 areas on the Kettle reservoir (Terrestrial Environment Supporting Volume Section
 30 2.3.6.3.1, p. 2-101). Further refinement of local hydraulic conductivities around other
 31 small lakes, which are not predicted to be affected by the Project and which represent a
 32 small proportion of the model area, would not be expected to change the overall
 33 conclusions of the groundwater assessment. The Physical Environment Supporting
 34 Volume (Section 8.4.2.6) concluded that groundwater quality is not predicted to change
 35 relative to existing conditions because, aside from some localized alterations,

36 groundwater flow will generally continue to be towards the Nelson River and area lakes.
37 The inconsistent relationship referred to is considered to be a minor localized gap in
38 understanding.

39 Section 6.4.3.1 of the Response to EIS Guidelines discusses potential Project effects on
40 water quality as a result of developing the Project. Further detail is provided in the
41 Section 2.5 of the Aquatic Environment Supporting Volume.

42 Please see the response to CEC Rd 1 CAC-0011 for an explanation of the Partnership's
43 approach to assessing ecosystem services.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 4.0 Water Quality; p. N/A**

3 **CEC Rd 1 MB Wildlands-0063**

4 **PREAMBLE:**

5 On page 4-17, in Chapter 4, during mitigation discussions, the method employed for
6 wetland mitigation will include the “Development of wetlands to offset potentially
7 important wetlands.” Wetlands serve many ecological functions which provide water
8 quality ecological services such as the regulation of water flows, which purifies water;
9 the filtering, retention and storage of fresh water; the maintenance of arable land and
10 prevents water silting by lowering soil losses; and the removal, breakdown or
11 abatements of pollution. In order to “offset” the development of important wetlands
12 during mitigation, these specific services need to be assessed (preferably spatially and
13 temporally quantified in GIS-mapped) in order to know what is being provided by the
14 existing wetland function.

15 **QUESTION:**

- 16 1. What studies, methodologies, data sets, and assessment approaches did Manitoba
17 Hydro use to assess the ecosystem services provided by wetlands planned to be
18 mitigated?
19 2. Are these studies available to participants?
20 3. Where, in the EIS, have these water quality related ecosystem services of the
21 wetland been quantified and mapped?
22 4. Are there technical reports to support these assessments in the EIS contents?

23 **RESPONSE:**

24 Please see the responses to CEC Rd 1 MB Wildlands-0001a, b and c for answers to the
25 same questions. The responses to CEC Rd 1 CAC-0011, CEC Rd 1 MB Wildlands-0028,
26 CEC Rd 1 MB Wildlands-0030 and CEC Rd 1 MB Wildlands-0062 also provide related
27 information.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Regulatory Environmental Assessment Approach; p. N/A**

3 **CEC Rd 1 MB Wildlands-0064**

4 **PREAMBLE:**

5 Selection of 18 biophysical VECs was based on the following criteria: Overall importance,
6 value to people; key for ecosystem function; umbrella indicator; amendable to scientific
7 study in terms of analysis of conditions; potential for substantial project affects; and
8 regulatory requirements. The main benefits that humans obtain from healthy
9 ecosystem functioning are actually provided by ecosystem services, not VECs. In the
10 Executive summary, it is stated "that following mitigation none of the residual adverse
11 effects exceeded the regulatory test for significance."

12 **QUESTION:**

13 How is it being proposed that the development of VECs and exceedance of adverse
14 effects included assessments pertaining to the ecosystem services actually provided by
15 the VEC?

16 **RESPONSE:**

17 Please see the response to CEC Rd 1 CAC-0011 for the Partnership's approach to
18 assessing effects on ecosystem services, including the role of VECs in this assessment.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; Page No.: Table 2.1**

3 **CEC Rd 1 MB Wildlands-0065**

4 **QUESTION:**

5 Manitoba Hydro has described the models and scenarios used to arrive at its climate
6 change effects content in the EIS.

- 7 1. Does Manitoba Hydro use flows of all green house gasses from each of the land
8 areas in Table 2.1 for their conclusions?
9 2. Did Manitoba Hydro use green house gas flows (carbon dioxide, methane etc) from
10 reservoirs, and build- no build scenarios?
11 3. Which equations from IPCC documents, and others sources to calculate the
12 emissions and scenarios in the EIS? In particular, which equations were used to
13 generate Figure 2A-1 in the Climate SV?

14 Provide data corresponding to the questions above. This request is in IR format at the
15 request of the Keeyask project managers.

16 **RESPONSE:**

17 Please see response to CEC Rd 1 PFN-0047, which addresses these same questions.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0066**

4 **PREAMBLE:**

5 Maintaining biodiversity includes the control of populations, pests and diseases through
6 trophic dynamic processes. This is a regulating ecosystem service.

7 **QUESTION:**

- 8 1. Have the dynamics of local and regional ecosystems within the Project areas and
9 their natural biological control been mapped or examined spatially or temporally?
- 10 2. Which studies, methodologies, data sets, and assessment approaches did Manitoba
11 Hydro use to assess biodiversity and specifically this service of biocontrol?
- 12 3. Where in the EIS is this addressed?
- 13 4. Are there technical reports that support this assessment?
- 14 5. If it was not done, what methodology was used instead? Are these studies available
15 to participants?
- 16 6. If Manitoba Hydro did not take any of these aspects into account, why not?

17 **RESPONSE:**

18 Please see the responses to CEC Rd 1 MB Wildlands-0004 for answers to the same
19 questions.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.0 Habitat and Ecosystems; p. N/A**

3 **CEC Rd 1 MB Wildlands-0067**

4 **PREAMBLE:**

5 In table 2-1 (page 2-11) fine quality habitat types are discussed. Fine habitat types were
6 used to address specialized needs of VECs. The study documents that extensive habitat
7 classification and mapping was conducted, and occasionally to a fine scale.

8 **QUESTION:**

9 Did the assessment goes the next level and provides how these classifications were used
10 for environmental assessment? The VECs may not actually encompass the necessary
11 services needed to maintain ecosystem function and biodiversity and the services
12 provided.

- 13 1. Specifically, were biodiversity and ecosystem services identified for the habitats
14 classified? Was this is done, or it was not done, and why? Answer for both above.
15 2. Which assessment approaches did Manitoba Hydro use to classify these services
16 and functions in order to address the specialized needs of the VECs? Are these
17 studies available to participants?

18 **RESPONSE:**

19 As a clarification to the preamble, fine habitat types were mapped in all areas where
20 broad habitat, coarse habitat and land cover were mapped. The latter three levels in the
21 hierarchical ecological land classification are groupings of the fine habitat types into
22 progressively broader classifications (Terrestrial Environment Supporting Volume
23 Section 2.2.4.4).

24 *Did the assessment goes the next level and provides how these classifications were used*
25 *for environmental assessment?*

26 The general ways that these habitat classifications were used for the environmental
27 assessment are described in the Terrestrial Environment Supporting Volume, Section
28 2.2.4.4. Each VEC and supporting topic section of the Terrestrial Environment
29 Supporting Volume typically provides the specific details regarding how the habitat
30 classifications were used in the topic specific assessment. As examples for terrestrial
31 habitat and ecosystems, the Terrestrial Environment Supporting Volume, Section 2.7.2.4
32 explains how the broad habitat types were classified into priority habitat types, while

33 Terrestrial Environment Supporting Volume, Section 2.7.2.4 explains how the fine
34 ecosite types were used as an indicator for soil quantity and quality.

35 For wildlife VECs, the habitat classification system described above was used to identify
36 the quality and quantity of habitat available within the Local and Regional Study Areas.
37 Specifically, coarse habitat types were selected for beaver, moose and caribou in the
38 construction of Expert Information Models (Section 7.3.6.1 of the TE SV). Important
39 habitat for caribou also included the identification of calving and rearing habitat on
40 islands in lakes and islands in peatland complexes (Section 7.3.6.3.3 of the TE SV)
41 developed from an understanding of fine and broad habitat classification and
42 orthophoto interpretation. For mammals VECs, a combination of habitat types were
43 used to calculate the direct and indirect habitat effects for past, current and future
44 projects. For common nighthawk and olive-sided flycatcher, habitat was mapped using
45 broad and fine habitat types while coarse and broad habitat types were used to model
46 rusty blackbird habitat (TE SV Section 6.3.2.4 and Appendix 6B, Table 6B-8).

47 The VECs may not actually encompass the necessary services needed to maintain
48 ecosystem function and biodiversity and the services provided.

- 49 1. *Specifically, were biodiversity and ecosystem services identified for the habitats*
50 *classified? Was this is done, or it was not done, and why? Answer for both above.*
51 2. *Which assessment approaches did Manitoba Hydro use to classify these services and*
52 *functions in order to address the specialized needs of the VECs? Are these studies*
53 *available to participants?*

54 Since the remaining questions are very similar to those in CEC Rd 1 MB Wildlands-0028
55 and CEC Rd 1 MB Wildlands-0030, please see the responses to those Information
56 Requests for further information.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1**
2 **Regulatory Environmental Assessment Approach; p. N/A**

3 **CEC Rd 1 MB Wildlands-0068**

4 **PREAMBLE:**

5 Selection of 18 biophysical VECs was based on the following criteria: - Overall
6 importance, value to people; - Key for ecosystem function; umbrella indicator;
7 amendable to scientific study in terms of analysis of conditions; potential for
8 substantial project affects; and regulatory requirements. The main benefits that
9 humans obtain from healthy ecosystem functioning are actually provided by ecosystem
10 services, not VECs. In the Executive summary, it is stated "that following mitigation
11 none of the residual adverse effects exceeded the regulatory test for significance".

12 **QUESTION:**

13 Did the development of VECs and exceedance of adverse effects included assessments
14 pertaining to the ecosystem services and functions actually provided by the VEC.

15 **RESPONSE:**

16 This Information Request is identical to CEC Rd 1 MB Wildlands-0064; please see the
17 response to CEC Rd 1 MB Wildlands-0064 for the response to this question.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 4.0**
2 **Mitigation; p. N/A**

3 **CEC Rd 1 MB Wildlands-0069**

4 **PREAMBLE:**

5 In Chapter 4, the overall mitigation strategy is discussed for the project. Rationale for
6 developing areas to compensate for losses of habitats and ecosystems is often a
7 strategy employed in development.

8 **QUESTION:**

- 9 1. Is there any mention of no-net loss of biodiversity or water quality Ecosystem
10 Services or anything pertaining to this discussion? This terminology is often used as
11 a means of replacing sensitive habitat such as wetlands and species (i.e., sturgeon)
12 but should be used to demonstrate the maintenance of not just the habitat, species
13 and wetlands, but actually it should demonstrate that ecosystem services and
14 biodiversity are not lost and mitigated for as well.
- 15 2. Was this approach used in the Keeyask EIS? If not, why not?
- 16 3. Explain what mitigation plans exist to restore Biodiversity/ Water Quality Ecosystem
17 Services and the Natural Capital that these services provide to the project and
18 surrounding area.

19 **RESPONSE:**

20 The preamble to this Information Request and the first two questions are identical to
21 those in CEC Rd 1 MB Wildlands-0002a; the last question is identical to that asked in CEC
22 Rd 1 MB Wildlands-0002b. Please see the responses to these earlier Information
23 Requests for the related response.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; Page No.: Table 2-5 Lake Trophic Status**

3 **CEC Rd 1 MB Wildlands-0070**

4 **PREAMBLE:**

5 The trophic status of the majority of areas sampled from Split Lake through to Stephens
6 Lake (in close proximity to area of Keeyask GS) are listed as eutrophic. Measurements
7 for water quality were taken between 2001-2004 (10-9 years prior).

8 **QUESTION:**

9 Please respond to the following questions:

- 10 1. Is the water quality data used to determine current day trophic levels still relevant?
11 Explain.
- 12 2. What are all the sources contributing to eutrophication of the Keeyask reservoir,
13 Split Lake and Stephens Lake?
- 14 3. What is the predicted time-frame for causing hyper-eutrophication of Split and Gull
15 Lakes?
- 16 4. What mitigation and monitoring activities will be employed to minimize
17 eutrophication?
- 18 5. How will the flooding of peatlands and peatland erosion contribute to
19 eutrophication of Split, Gull and Stephens Lakes? Explain for both the construction
20 and operation phases of the project.

21 **RESPONSE:**

22 Each of the above questions is answered in turn below.

- 23 1. *Is the water quality data used to determine current day trophic levels still relevant?*
24 *Explain.*

25 Please see response to CEC Rd 1 MB Wildlands-0082. As noted in this response and in
26 the AE SV (Section 2.3.3.2.1, p. 2-5), water quality sampling has been conducted post-
27 2004 in the study area under the Keeyask environmental studies program to augment
28 the baseline database for post-Project monitoring and to address information gaps that
29 were identified over the course of the studies. In addition, as noted in response to CEC
30 Rd 1 MB Wildlands-0082 and MB Wildlands-0083, water quality and other components
31 of the aquatic environment have been and continue to be monitored by the Province of
32 Manitoba and Manitoba Hydro in the study area. Data collected in 2009 indicated that

33 total phosphorus concentrations were within the range measured during the 2001-2004
34 period so the information collected in 2001-2004 is still relevant.

35 2. *What are all the sources contributing to eutrophication of the Keeyask reservoir,*
36 *Split Lake and Stephens Lake?*

37 The comment is interpreted to refer to discussion of nutrient sources. Sources of
38 nutrients to aquatic ecosystems include inflows to a waterbody (e.g., tributary streams),
39 point sources (e.g., municipal wastewaters), and non-point sources (e.g., atmospheric
40 deposition). The AE SV indicates that water quality conditions (including concentrations
41 of nutrients) are relatively consistent along the Lower Nelson River and reflect water
42 quality of the Upper Nelson and Burntwood rivers. The AE SV indicates that waterbodies
43 along the Nelson River are currently meso-eutrophic to eutrophic, based on
44 concentrations of total phosphorus (Section 2.4.2.1.5). The AE SV also indicates that
45 concentrations of phosphorus and nitrogen measured during the Keeyask baseline
46 studies were similar to or lower than concentrations measured over the period of 1997-
47 2006 upstream of the study area at Sipiwesk Lake and the Burntwood River at
48 Thompson (Section 2.4.2.2.1).

49 The AE SV provides an assessment of effects of construction of the Keeyask Project on
50 nutrients in Section 2.5.1.3. An assessment of effects of operation of the Keeyask
51 Project on nutrients and in Split Lake, the reservoir, and Stephens Lake are presented in
52 Sections 2.5.2.1, 2.5.2.2.9, and 2.5.2.3.8 of the AE SV. Please also see response to
53 Question 3 below.

54 3. *What is the predicted time-frame for causing hyper-eutrophication of Split and Gull*
55 *Lakes?*

56 The Project is not predicted to cause hyper-eutrophication of Split Lake. The AE SV
57 indicates that “no effects to water quality in Split Lake as a result of the operation of the
58 Project are predicted” (Section 2.5.2.1, p. 2-53).

59 The AE SV indicates that the Project is predicted to result in increased concentrations of
60 nutrients, including phosphorus and nitrogen, notably in relation to flooding (i.e.,
61 decomposition of organic materials) and erosion and disintegration of peat during
62 Project operation (Section 2.5.2.2.9). The AE SV describes that these increases are
63 predicted to be greatest in nearshore flooded areas (i.e., backbays) with long residence
64 times and that the increases are predicted to occur for approximately 10-15 years post-
65 impoundment. The AE SV also indicates that effects of flooding and peatland
66 disintegration on nutrients in the mainstem of the reservoir and downstream are
67 expected to be negligible.

68 4. *What mitigation and monitoring activities will be employed to minimize*
69 *eutrophication?*

70 Mitigation to reduce introduction of nutrients into the aquatic environment includes
71 forebay clearing, erosion control measures, water management (e.g., site drainage
72 management), and treatment/management of point sources (e.g., sewage effluent).
73 The aquatic effects monitoring plan (AEMP) will monitor effects of construction and
74 operation of the Project on water quality, including nutrients.

75 5. *How will the flooding of peatlands and peatland erosion contribute to eutrophication*
76 *of Split, Gull and Stephens Lakes? Explain for both the construction and operation*
77 *phases of the project*

78 The predicted effects of the Project on nutrients in the study area in relation to flooding,
79 shoreline erosion and peatland disintegration on Gull and Stephens lakes are described
80 in Sections 2.5.2.2.9 and 2.5.2.3.8 of the AE SV, respectively. The predicted effects of the
81 Project on water quality, including nutrients, in Split Lake are presented in Section
82 2.5.2.1 of the AE SV. The assessment considered the effects of flooding, including
83 peatlands and disintegration of peatlands, as well as other pathways of potential effects
84 on water quality. Please also see the response to question 3 above.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.3.4 VECs and Supporting Topics; Table 1-1**

3 **CEC Rd 1 MB Wildlands-0071**

4 **PREAMBLE:**

5 VECs are selected in order to act as a measurable indicator of ecosystem health. When
 6 selecting VECs, it is necessary to include information discussing why those VECs were
 7 chosen, how they act as a representative marker of ecosystem health, their relationship
 8 to the environment and how alterations to the environment/ecosystem will impact the
 9 selected VEC. A group of VECs should include a variety of components within a selected
 10 ecosystem; aquatics, terrestrial, etc, in order to provide as complete a picture as
 11 possible of the ecosystem being evaluated and impacted. The rationale for selection of
 12 the terrestrial Supporting Topics in the Keyask EIS materials is unclear.

13 **QUESTION:**

14 Answer the following questions:

- 15 1. What are Supporting Topics and how are they selected?
- 16 2. What are the criteria used to select the Supporting Topics? If there is no criteria,
 17 why not?
- 18 3. How are Supporting Topics being used to supplement the VECs?
- 19 4. Are there any guiding documents outlining the number, quality, species type,
 20 category of VECs required in order to adequately evaluate ecosystem health? If not,
 21 why not? And if so, please provide that information.
- 22 5. How are Supporting Topics measured in order to provide information about the
 23 environment, and how is the data interpreted to provide qualitative and
 24 quantitative conclusions and recommendations?

25 **RESPONSE:**

26 The terrestrial assessment employed a focused approach to evaluating Project effects
 27 on terrestrial ecosystems using VECs and supporting topics. Section 1.3.4 of the
 28 Terrestrial Environment Supporting Volume describes what the VECs and supporting
 29 topics represent, how they were selected, how they complement each other and some
 30 of the guidance documents that shaped the selection approach. Further details are
 31 provided in the Terrestrial Environment Supporting Volume Appendix 1A (particularly
 32 Table 1A-1), and in Section 2 of ECOSTEM (2012) (this technical report has been
 33 provided with this filing).

34 Measurement and evaluation methods are specific to each supporting topic, especially
35 given the diversity of supporting topics (e.g., soil quantity and quality, fire regime,
36 invasive plants). Referring to the Terrestrial Environment Supporting Volume, please see
37 Section 2.5.2 for fire regime, Section 2.6.2 for terrestrial habitat, Section 2.9.2 for soil
38 quantity and quality, and Section 3.2 for invasive plants.

39 Measurement and evaluation methods specific to birds are found in Section 6.2.4, with
40 Project effects discussed in Section 6.4.1 for bird VECs and Section 6.4.2 for priority
41 birds. Additional information on birds is also provided in the TE SV Section 6.4.3 and
42 Response to EIS Guidelines, Sections 6.2.3.4.6 and 6.5.7.

43 Measurement and evaluation methods specific to mammals can be found in the
44 Terrestrial Environment Supporting Volume, Sections 7.2 and 7.5. For specific project
45 effects on each supporting topic see Section 7.4.1 for small mammals, Section 7.4.2 for
46 aquatic furbearers, Section 7.4.3 for terrestrial furbearers, and Section 7.4.4 for large
47 carnivores in the Terrestrial Environment Supporting Volume. Additional information on
48 mammals is also provided in the Response to EIS Guidelines, Sections 6.2.3.4.7 and
49 6.5.8.

50 **REFERENCES:**

51 ECOSTEM Ltd. 2012. Terrestrial Habitats and Ecosystems in the Lower Nelson River
52 Region: Keeyask Regional Study Area. A report prepared for Manitoba Hydro.
53 506 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.3.5 Spatial Scope; Map 1-1 and Table 1-3**

3 **CEC Rd 1 MB Wildlands-0072**

4 **PREAMBLE:**

5 Study zones 1-6 were applied to the terrestrial environment to define areas for field
6 work, research and comparison. Around each study zone, an additional buffer was
7 applied that has a variable width depending on the zone. Each terrestrial VEC was
8 evaluated in a local and regional study zone, however the local and regional study zones
9 varied between VECs.

10 **QUESTION:**

11 Answer the following questions:

- 12 1. What criteria were used to establish each terrestrial study zone? If no criteria were
13 used, why not?
- 14 2. What criteria were used to establish each terrestrial study zone buffer area? If no
15 criteria were used, why not?
- 16 3. How was the area and amount of land determined for each study zone and
17 corresponding buffer area?
- 18 4. Was there a model used to establish study zones and buffer areas?
- 19 a. Is each zone/buffer area representative of a certain percent of the entire
20 project study area?
- 21 b. Are there certain terrestrial characteristics that were required within each
22 zone and buffer area? c. How were the study zones and buffer areas
23 determined and utilized to maximize/enhance VEC assessment?

24 **RESPONSE:**

25 As a clarification to the preamble, Study Zones 2 and 3 were the only study zones that
26 were buffers of another area. Study Zone 2 represented the maximum potential Project
27 zone of influence on terrestrial habitat and Study Zone 3 represented the potential
28 Project zone of influence on landscape elements. The remaining larger study zones
29 represented nested ecosystem levels. Study Zone 5 was identified as the Keeyask
30 regional ecosystem. For descriptions regarding how the study zones were delineated,
31 please see the Terrestrial Environment Supporting Volume, Sections 1.3.5 and 2.14.2,
32 Section 2.6.3 in ECOSTEM (2012; this technical report has been provided with this filing)
33 and the responses to CEC Rd 1 CEC-0022 and CEC Rd 1 MB Wildlands-0006.

34 **REFERENCES:**

- 35 ECOSTEM Ltd. 2012. Terrestrial Habitats and Ecosystems in the Lower Nelson River
36 Region: Keeyask Regional Study Area. A report prepared for Manitoba Hydro.
37 506 pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 1.3.6 Temporal Scope; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0073**

4 **PREAMBLE:**

5 The flooding of Gull Lake to create the Gull Lake reservoir for the Keeyask project, is
 6 compared to the Kettle Generation Station reservoir; Stephens Lake. It is stated that the
 7 Kettle reservoir stabilized after 30 years. The Kettle Generation Station was completed
 8 in 1974, now 39 years prior. Studies comparing the Keeyask and Kettle reservoirs were
 9 conducted between 2001 and 2011. The Kettle Generation Station is only 39 years old
 10 (up to 2013). How can Manitoba Hydro claim that the reservoir has stabilized after 30
 11 years, when the studies evaluating the stability of reservoir were conducted at the 30-
 12 year operational mark? An additional 10 years or more would be required in order to
 13 conclude that no additional changes occurred within the reservoir.

14 **QUESTION:**

15 Answer the following questions:

- 16 1. How are the Keeyask and Kettle reservoirs comparable, and give examples?
- 17 2. Please describe how a reservoir becomes stable, how is this measured, and are
 18 those measurements comparable to other reservoirs? Explain with regards to the
 19 Kettle reservoir.
- 20 3. What other Manitoba Hydro reservoirs can be compared with the Keeyask
 21 reservoir?
- 22 4. How long did it take other Manitoba Hydro reservoirs to stabilize, and what factors
 23 influence this?
- 24 5. What model was used to predict Keeyask reservoir stabilization?
- 25 6. Recalculate and provide the time required for the Keeyask reservoir to stabilize
 26 taking into account climate change, all other Manitoba Hydro current projects and
 27 future projects on the Nelson River, etc.

28 **RESPONSE:**

29 The preamble incorrectly indicates that the TE SV stated that the Kettle reservoir
 30 (Stephens Lake) stabilized after 30 years. In reference to shoreline wetland conditions
 31 observed during field studies, the TE SV Section 2.8.3.2.1 states that "Stephens Lake
 32 shorelines are still undergoing peatland disintegration from Kettle reservoir flooding".

33 Each of the above questions is answered in turn below.

34 1. *How are the Keeyask and Kettle reservoirs comparable, and give examples?*

35 Responses have been provided for similar information requests regarding comparisons
 36 between the Keeyask and Kettle reservoirs, as well as other proxy areas that have been
 37 considered. Please refer to the response to TAC Public Rd 2 PCN-0001 for further
 38 discussion on this topic. Additional discussion of comparisons between the future
 39 Keeyask reservoir and proxy areas may be found in: TAC Public Rd 1 MCWS-WQ-0001b,
 40 CEC Rd 1 PCN-0002, and the response to question one in CEC Rd 1 CEC-0038.

41 2. *Please describe how a reservoir becomes stable, how is this measured, and are those*
 42 *measurements comparable to other reservoirs? Explain with regards to the Kettle*
 43 *reservoir?*

44 As noted in the response to question 4 below, Keeyask studies did not focus on
 45 assessing overall stabilization of other Manitoba Hydro reservoirs; rather, the
 46 assessment undertook to study and make predictions for the Keeyask reservoir. As such,
 47 this response focuses on the predictions for the Keeyask reservoir.

48 As discussed in the Shoreline Erosion section of the Physical Environment Supporting
 49 Volume, the new Keeyask shorelines that will form after impoundment will be subject to
 50 erosion and peatland disintegration resulting in the expansion of the reservoir (PE SV,
 51 Section 6). The rate of reservoir expansion is higher in the first several years after
 52 impoundment and is anticipated to decline over time to a more stable, long-term rate as
 53 shoreline recession rates decrease to levels similar to pre-project shoreline recession
 54 rates. Reservoir expansion is expected to continue at the lower, relatively stable long-
 55 term rate beyond Year 30 of Project operation (i.e., expansion rate stabilizes, not
 56 reservoir size).

57 In general, the rate of expansion declines because more erosion resistant mineral soils
 58 become exposed as peatland disintegration occurs, resulting in the development of a
 59 more stable shoreline over time. Some shorelines will continue to recede at a higher
 60 than average rate (e.g., exposed points), while other areas that are less exposed to
 61 erosive forces (e.g., sheltered bays) may have a very low rate of recession. Shoreline
 62 peatlands will persist in some areas where erosive forces are low and massive ground
 63 ice is absent. Stabilization of shorelines is not uniform over time but will depend on site
 64 specific conditions. Some shorelines may be relatively stable soon after impoundment
 65 while others will experience a greater level of ongoing recession (e.g., see 30-year
 66 reservoir expansion maps provided in response to CEC Rd 1 MB Wildlands-0086).

67 The models used to predict shoreline erosion and peatland disintegration in the Keeyask
 68 reservoir were based substantially on the study of these processes in proxy areas on
 69 Stephens Lake. This included air photo interpretation of historic changes on Stephens

70 Lake after the Kettle reservoir was impounded, as well as field studies at proxy sites on
 71 the lake. The peatland disintegration study also used chronosequence¹ transects and
 72 labwork, as well as a consideration of proxy areas on the Notigi reservoir and
 73 Wuskwatim Lake. Additional details on the shoreline erosion and peatland
 74 disintegration studies of proxy areas is provided in Section 6.2.1.5 and Appendix 6A of
 75 the PE SV.

76 Please also see the response to CEC Rd 1 MB Wildlands-0086 (question 3) regarding
 77 reservoir expansion beyond Year 30 of Project operation.

78 *3. What other Manitoba Hydro reservoirs can be compared with the Keeyask reservoir?*

79 Please refer to information referenced in response to question 1 above, particularly TAC
 80 Public Rd 2 PCN-0001, for the information requested.

81 *4. How long did it take other Manitoba Hydro reservoirs to stabilize, and what factors*
 82 *influence this?*

83 The Keeyask studies did not assess the overall stabilization of other Manitoba Hydro
 84 reservoirs. Studies were limited to specific proxy areas that were used to develop the
 85 shoreline erosion and peatland disintegration models, and to develop an understanding
 86 of the effects of reservoir creation on components of the terrestrial environment. Proxy
 87 area studies were substantially focussed on Stephens Lake to develop the shoreline
 88 erosion and peatland disintegration models while components of the terrestrial
 89 environment studies (e.g., shoreline wetlands) also considered proxy areas on
 90 Wuskwatim Lake and the Kelsey and Long Spruce reservoirs. Model results indicating
 91 that the reservoir expansion rates stabilize near a lower long-term rate by year 15 are
 92 based on the results of these proxy area studies. These studies also identified the
 93 conditions that are typically associated with shore segments that stop receding.

94 There are a number of factors affecting the rates of shoreline erosion and peatland
 95 disintegration, which then influences the time it may take to achieve a more stable rate
 96 of reservoir expansion. A number of important factors are incorporated into the
 97 integrated models for shoreline erosion and peatland disintegration. For peatland
 98 disintegration these include “water depth, peat resurfacing potential, depth to
 99 subsurface mineral material or bedrock, wave energy, distance to water,
 100 island/mainland state and peatland type” (PE SV, Section 6.2.1.5.2). For shoreline
 101 erosion, important factors include “wave energy, erodibility of mineral shore materials,
 102 shoreline geometry and water level fluctuations in the reservoir” (PE SV, Section

¹ Chronosequence: The arrangement of information from different aged locations by increasing time since disturbance to represent change through time. Also referred to as space-for-time substitution.

103 6.2.1.5.3). The time span needed to achieve lower, more stable rates of reservoir
 104 expansion is also affected by how long it takes for shoreline peatlands to disintegrate
 105 and recede before exposing mineral shorelines, which recede at a slower rate.

106 5. *What model was used to predict Keeyask reservoir stabilization?*

107 As noted in the response to question 2 above, stabilization is referring to the condition
 108 where reservoir expansion is reduced to a lower, more stable long-term rate.
 109 Stabilization is not a modeled parameter. Rather, the processes of shoreline erosion and
 110 peatland disintegration were modeled for the future Keeyask reservoir. The shoreline
 111 erosion and peatland disintegration models are discussed in Section 6 of the PE SV (see
 112 Section 6.2.5 and Appendix 6A).

113 6. *Recalculate and provide the time required for the Keeyask reservoir to stabilize*
 114 *taking into account climate change, all other Manitoba Hydro current projects and*
 115 *future projects on the Nelson River, etc.?*

116 The sensitivity of residual Project effects to climate change with respect to shoreline
 117 erosion and peatland disintegration is discussed in Section 6.3.12.5 of the Response to
 118 EIS Guidelines. Among other potential effects, this section notes that climate change
 119 could potentially increase the rate of shoreline peat breakdown in later years, which
 120 would result in more stable mineral shorelines being exposed sooner.

121 Current Manitoba Hydro projects are factored into the assessment to the extent that
 122 the existing hydro power system is considered in the post-Project water regime (PE SV,
 123 Sec. 4.2.5.2).

124 As noted in Section 6.3.7.2 of the Response to EIS Guidelines with respect to shoreline
 125 erosion and peatland disintegration, these effects are not expected to overlap spatially
 126 with the Keeyask Transmission, Bipole III or Conawapa projects. Therefore, these other
 127 projects would not affect the predictions with respect to reservoir expansion.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.4.3 Effect Benchmarks; p. N/A**

3 **CEC Rd 1 MB Wildlands-0074**

4 **PREAMBLE:**

5 The EIS materials indicate that there is no general or scientifically accepted benchmarks
6 for assessing terrestrial VECs or Supporting Topics.

7 **QUESTION:**

8 Answer the following questions:

- 9 1. If there are no general or scientifically accepted regulatory benchmarks for
10 assessing terrestrial VECs or Supporting Topics, how are they assessed?
11 a. Does Manitoba Hydro apply its own internal benchmarks?
12 i. If so, what are those benchmarks and, how are they determined?
13 b. Are the benchmarks used by Manitoba Hydro comparable between
14 terrestrial VECs and Supporting Topics for Keeyask? Between other
15 Manitoba Hydro projects?
16 2. What is a benchmark as it pertains to VECs and Supporting Topics?

17 **RESPONSE:**

- 18 1. *If there are no general or scientifically accepted regulatory benchmarks for assessing*
19 *terrestrial VECs or Supporting Topics, how are they assessed?*
20 a. *Does Manitoba Hydro apply its own internal benchmarks?*
21 i. *If so, what are those benchmarks and, how are they determined?*
22 b. *Are the benchmarks used by Manitoba Hydro comparable between*
23 *terrestrial VECs and Supporting Topics for Keeyask? Between other*
24 *Manitoba Hydro projects?*

25 As a clarification to the preamble, which incorrectly paraphrases the Terrestrial
26 Environment Supporting Volume, Section 1.4.3 states: "Currently there are no
27 regulatory or generally accepted scientific thresholds or benchmarks for any of the
28 terrestrial environment VECs or supporting topics (a possible exception the hazard
29 quotient (see Wildlife and Mercury Section 8.2) used for mercury in wildlife)." Another
30 exception is the caribou intactness benchmark (see Section 7.2.6 of the Terrestrial
31 Environment Supporting Volume) that was modified to conform directly to the
32 Environment Canada (2012) benchmark standards of undisturbed critical habitat. Please
33 see CEC Rd 1 CEC-0037a and see CEC Rd 1 CEC-0037b for clarification of the caribou
34 intactness benchmark.

35 Since regulatory or generally accepted scientific thresholds or benchmarks were not
 36 available, the terrestrial assessment generally established effects benchmarks for each
 37 VEC (see response to question 2 for the distinction between thresholds and
 38 benchmarks) and most supporting topics based on values, ranges or rules of thumb
 39 reported in the scientific literature, environmental assessment guidance literature,
 40 environmental assessments of other projects and/or professional judgement.
 41 Exceptions were the fire regime and invasive plant supporting topics because potential
 42 Project effects are risks to be managed (e.g., an accidental fire) rather than an expected
 43 measurable effect. Mammal priority species were a partial exception - professional
 44 judgement was used to evaluate the magnitude of the various types of effects for each
 45 priority mammal group, but intactness VEC benchmarks were used for intactness effects
 46 (e.g., furbearers).

47 The specific benchmarks used for each VEC and supporting topic are provided in the
 48 Response to EIS Guidelines in the following sections: 6.5.3.1 for terrestrial habitat;
 49 6.5.3.2 for ecosystem diversity; 6.5.3.3 for intactness; 6.5.3.4 for wetland function;
 50 6.5.4.2 for priority plants, and 6.5.9 for wildlife and mercury. In the TE SV, this
 51 information can be found in Sections: 6.2.4.1 for birds; 7.2.6 for mammals; and Section
 52 8, Appendix 8-B for wildlife and mercury. Additional information regarding the rationale
 53 for each benchmark is provided in the corresponding sections of the Terrestrial
 54 Environment Supporting Volume.

55 Effects benchmarks may vary between VECs and supporting topics because they
 56 represent different ecosystem components and/or because they use different indicators
 57 (e.g., the intactness benchmark for caribou is different than the one used for the
 58 intactness VEC because caribou is more sensitive to human disturbance than most other
 59 species). Effects benchmarks may vary between projects for the same reasons, and
 60 because the ecological context is different. For example, the benchmark for further loss
 61 of wetlands in a region where most of the original wetlands have already been lost (e.g.,
 62 the agricultural zone) will be different than the benchmark used in a region where
 63 wetlands are widespread, abundant and naturally functioning.

64 *2. What is a benchmark as it pertains to VECs and Supporting Topics?*

65 In the terrestrial assessment, a "threshold" is a point where the VEC or supporting topic
 66 undergoes sudden, dramatic change. An effects benchmark is a precautionary value, or
 67 range of values, for an indicator measure used for a VEC or supporting topic that is
 68 below the level where a threshold is reached for the specific a VEC or supporting topic.
 69 An effects benchmark is used to evaluate the acceptability of an effect on the VEC or
 70 supporting topic (Terrestrial Environment Supporting Volume Section 1.4.4). For
 71 example, the benchmark value used to separate the moderate from the high magnitude
 72 ranges is not a point where a sudden, dramatic change in the VEC or supporting topic is

73 expected to occur; rather it is the point at which the total effect on the VEC is
 74 considered more seriously in conjunction with other factors (effect duration, ecological
 75 context) and other indicator measures, and when mitigation or adaptive management is
 76 often implemented to reduce the risk of an important adverse effect. That is, the ranges
 77 used for low, moderate and high magnitude terrestrial effects, respectively, identify
 78 values for an indicator measure where there is no concern, increasing potential concern
 79 but the effect is usually still regionally acceptable and then a range where there is
 80 increasing likelihood of a regionally important effect.

81 Using terrestrial habitat as an example, the benchmark value for a high magnitude
 82 effect on the total amount of terrestrial habitat is that more than 10% of pre-
 83 development native habitat will be cumulatively affected by human development. This
 84 benchmark does not imply that there will be a sudden, dramatic change in ecosystem
 85 function once the 10% value is reached but rather that it is expected that ecosystem
 86 stress may be starting to occur once this value is reached and this stress will increase as
 87 habitat effects continue to increase. As a component of Project design, one of the
 88 considerations was to avoid increasing cumulative area losses to more than 10% of the
 89 pre-development area for every priority habitat type through avoidance to the extent
 90 practicable and through area loss minimization where this was not practicable.
 91 Terrestrial habitat rehabilitation will give preference to rehabilitating the most affected
 92 priority habitat types (Response to EIS Guidelines Section 6.5.3.2.1). Once the Project is
 93 built, adaptive management will be triggered (likely in the form of additional
 94 rehabilitation) if ongoing monitoring indicates that cumulative area losses for a priority
 95 habitat type could reach 10%. Please see the response to CEC Rd 1 MMF-0013 for a
 96 summary of the Partnership's approach to adaptive management.

97 **REFERENCES:**

98 Environment Canada. 2012. Recovery Strategy for the woodland caribou, boreal
 99 population (*Rangifer tarandus caribou*) in Canada. *Species at Risk Act* Recovery
 100 Strategy Series, Environment Canada, Ottawa. xi + 138pp.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.4.3 Effect Benchmarks; p. N/A**

3 **CEC Rd 1 MB Wildlands-0075**

4 **PREAMBLE:**

5 The EIS materials indicate that the term benchmark is used to describe areas within the
6 study zones that are “relatively” unaffected by human activity. Benchmark areas are
7 used to characterize patterns and dynamics in natural ecosystems being used as control
8 areas. It is stated that there are no general or scientifically accepted regulatory
9 benchmarks for assessing terrestrial VECs or supporting topics.

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. Define what is meant by “relatively” unaffected by human activity?
13 2. Are the benchmarks used to assess VECs and ecosystem zones the same? Explain.
14 3. Are the benchmarks used to evaluate control areas also applied to the study
15 areas/zones?

16 **RESPONSE:**

17 As a clarification to the preamble, the Terrestrial Environment Supporting Volume uses
18 the word “benchmark” in two different applications: benchmark areas and effects
19 benchmarks. Benchmark areas are areas relatively unaffected by human activity that are
20 used to provide reference conditions for naturally functioning ecosystems (for more
21 information, please see Terrestrial Environment Supporting Volume, Sections 1.4.6 and
22 2.3.3). Effects benchmarks are used to evaluate the potential importance of a Project
23 effect on a VEC or supporting topic (for more information, please see Terrestrial
24 Environment Supporting Volume Section 1.4.3). Please see the response to CEC Rd 1 MB
25 Wildlands-0074 for further information on effects benchmarks and a correction to the
26 preamble of that Information Request.

- 27 1. *Define what is meant by “relatively” unaffected by human activity?*

28 Benchmark areas are referred to as being relatively unaffected by human activity
29 because no place on earth is free from global human effects (e.g., atmospheric
30 deposition of chemical elements). Benchmark areas have not been directly or indirectly
31 altered by regional development activities (e.g., clearing, water regulation) or by
32 intensive resource harvesting.

33 2. *Are the benchmarks used to assess VECs and ecosystem zones the same? Explain.*

34 Benchmark areas are not equivalent to the VEC Local and Regional Study Areas. What
35 constitutes a benchmark area, and consequently its location and size, depends on the
36 question of interest. For example, the benchmark areas for characterizing natural
37 shoreline wetlands are off-system lakes and large rivers within a comparable geographic
38 area as that potential affected by the Keeyask Generation Project. A VEC's Local and
39 Regional Study Areas represent ecologically meaningful areas for that VEC.

40 3. *Are the benchmarks used to evaluate control areas also applied to the study*
41 *areas/zones?*

42 Benchmark areas were not used to evaluate control areas, but rather to provide an
43 indication of what may have existed in the Local and Regional Study Areas for each VEC,
44 where feasible, prior to industrialized development. Effects benchmarks are used to
45 evaluate the importance of an effect on a particular VEC within its Regional Study Area.
46 For example, the caribou intactness benchmark of >35% disturbed habitat is based on
47 the Environment Canada (2012) method of calculating critical habitat for a boreal
48 woodland caribou ecotype, which indicates the probability of sustained stable or
49 positive population growth being affected by cumulative natural (i.e., fire) and
50 anthropogenic disturbances in a predefined caribou range.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.7.4 Project effects mitigation and monitoring;**
 3 **p. N/A**

4 **CEC Rd 1 MB Wildlands-0076**

5 **PREAMBLE:**

6 The EIS materials indicate there will be no net project effects to overall ecosystem
 7 diversity, stating that Keeyask activity will not change the total number of habitat types.
 8 The assessment for impacts to regional inland broad habitat composition of existing
 9 environment following construction is assessed for a 30 year period. Ecosystems are
 10 systems that do not draw lines between aquatic and terrestrial habitat types, meaning
 11 that a change to terrestrial ecosystems inevitably impacts aquatic ecosystems and vice
 12 versa.

13 **QUESTION:**

14 Please answer the following questions:

- 15 1. Were the effects to ecosystem habitat diversity measured solely based on the
 16 number of habitats remaining after project construction?
 17 a. What are the baseline values used for ecosystem habitat diversity
 18 assessment?
 19 b. Did Manitoba Hydro review other measures of ecosystem diversity, aside
 20 from number of habitat types that are used for assessing effects to
 21 ecosystem diversity?
 22 c. Why was the study conducted to examine a 30-year period?
 23 2. Did the terrestrial ecosystem effects mitigation and monitoring analysis incorporate
 24 changes and effects predicted for the aquatic environment? If not, why not?
 25 3. Did Manitoba Hydro perform a project effects mitigation and monitoring
 26 analysis/report that includes both the terrestrial and aquatics information to assess
 27 future impacts, mitigation measures and monitoring practices for each terrestrial
 28 and aquatic ecosystem
 29 a. Include information for 30, 50 and 100 years of the project lifespan.

30 **RESPONSE:**

31 As a correction to the preamble, EIS materials indicate that there will be net adverse
 32 effects on ecosystem diversity from the Project. These effects are expected to be
 33 regionally acceptable based on their magnitude, duration, geographic extent, frequency
 34 and ecological context (Response to EIS Guidelines, p. 6-322; Terrestrial Environment
 35 Supporting Volume Section 2.7.4.3).

- 36 1. *Were the effects to ecosystem habitat diversity measured solely based on the*
 37 *number of habitats remaining after project construction?*
 38 a. *What are the baseline values used for ecosystem habitat diversity*
 39 *assessment?*
 40 b. *Did Manitoba Hydro review other measures of ecosystem diversity, aside*
 41 *from number of habitat types that are used for assessing effects to*
 42 *ecosystem diversity?*

43 As indicated in the Response to EIS Guidelines (Section 6.5.3.2) and the Terrestrial
 44 Environment Supporting Volume (Section 2.7.2.1), the 46 indicator measures used to
 45 evaluate Project effects on ecosystem diversity include the number of native broad
 46 habitat types, the distribution of area amongst the native broad habitat types, the
 47 number of stands representing each native habitat type and the areas of each priority
 48 habitat type. These same EIS sections also identify the baseline values used. Sections
 49 2.7.1 and 2.7.2.1 of the Terrestrial Environment Supporting Volume provide an overview
 50 of the literature used to select the indicator measures used for the ecosystem diversity
 51 assessment.

- 52 c. *Why was the study conducted to examine a 30-year period?*

53 The ecosystem diversity Project effects predictions are for a period of approximately
 54 108 years, extending from the start of Project construction to the end of the first 100
 55 years of Project operation. One hundred years represents the longer of the expected
 56 time for effects to stabilize and the assumed life of the Project. Quantitative predictions
 57 are provided for the first 30 years of Project operation, and qualitative predictions
 58 thereafter to year 100. The quantitative prediction period was 30 years because Project
 59 effects predictions were largely based on the examples provided by areas in northern
 60 Manitoba that have already been affected hydroelectric development (i.e., proxy areas),
 61 and the proxy areas were approximately 30 years old when the data used for the EIS
 62 analyses were collected.

- 63 2. *Did the terrestrial ecosystem effects mitigation and monitoring analysis incorporate*
 64 *changes and effects predicted for the aquatic environment? If not, why not?*

65 Predicted effects and proposed mitigation for terrestrial ecosystem components
 66 considered the predicted changes and effects to the aquatic environment, as illustrated
 67 by the following examples. The expanding aquatic environment resulting from shoreline
 68 erosion is a key aquatic environment effect considered for Project effects on terrestrial
 69 ecosystems during operation (Response to EIS Guidelines Section 6.5.3.1.3). Changes to
 70 water and ice regimes are also important drivers for the predicted changes to shore
 71 zone habitat. An important driver for muskrat is the altered flow of the Nelson River
 72 upstream of the dam, and water level fluctuations in the reservoir, which will affect the

73 suitability of habitat for muskrat (TE SV Section 7.4.2.2.1). The assessment of Project
 74 effects on waterfowl considered how predicted changes in the distribution and
 75 abundance of aquatic plants in Gull Lake following impoundment (AQ SV Section 3.4.2)
 76 would affect use of the reservoir by waterfowl (e.g., mallard and Canada goose (TE SV
 77 Section 2.8.4)).

78 Predicted terrestrial ecosystem effects also considered the proposed aquatic mitigation.
 79 As examples, the potential borrow area identified to provide material for creation of fish
 80 spawning habitat (labelled B-1 in Response to EIS Guidelines Map 4-5) was assumed to
 81 be completely lost for the terrestrial assessment; and some of the excavated material
 82 placement areas were located in the reservoir so as to provide potential fish and marsh
 83 habitat.

84 3. *Did Manitoba Hydro perform a project effects mitigation and monitoring*
 85 *analysis/report that includes both the terrestrial and aquatics information to assess*
 86 *future impacts, mitigation measures and monitoring practices for each terrestrial*
 87 *and aquatic ecosystem*

88 a. *Include information for 30, 50 and 100 years of the project lifespan.*

89 As noted above, the Partnership completed Project effects and mitigation analyses for
 90 terrestrial and aquatics ecosystems. The results of these analyses are reported for each
 91 VEC and supporting topic in the corresponding Project effects sections of the Response
 92 to EIS Guidelines and the Terrestrial and Aquatic Environment Supporting Volumes.
 93 Those EIS sections generally provide quantitative predictions for the first 30 years of
 94 Project operation, and qualitative predictions thereafter to year 100 (please see the
 95 response to CEC Rd 1 MB Wildlands-0077 for the Partnership's approach to
 96 quantification beyond year 30).

97 Draft terrestrial and aquatic environment monitoring plans for the construction and
 98 operation phases of the Project were filed with regulators on June 28, 2013 and are
 99 available on the Keeyask Hydropower Limited Partnership website at
 100 <http://www.Keeyask.com>.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.0; Table 2-34**

3 **CEC Rd 1 MB Wildlands-0077**

4 **PREAMBLE:**

5 After 30 years of Keeyask project operation it is predicted the composition of inland
6 habitat will not dramatically change according to the EIS materials. The table shows
7 that after 30 years of operation total percent of land area will change from 98.5%
8 (existing regional study area habitat types) to 97.8% (year 30 of operation in regional
9 study area).

10 **QUESTION:**

11 Answer the following questions:

- 12 1. What is the percent change of inland habitat over 30, 50 and 100 years within the
13 local study area, regional study area and project footprint?
14 2. Did the model used to predict change of the inland habitat factor in climate change,
15 increased human activity (having 2000 workers on site and using the surround
16 environment), waste deposit, altered flow of Nelson River, infrastructure
17 development, linear fragmentation by development of transmission lines, access
18 roads, dykes, shoreline erosion and changes to wildlife population?
19 3. Will Manitoba Hydro provide an updated table on the changes to inland habitat
20 from the Keeyask project factoring in the above-mentioned parameters?
21 4. Does inland habitat include all, any habitat types?

22 **RESPONSE:**

- 23 1. *What is the percent change of inland habitat over 30, 50 and 100 years within the*
24 *local study area, regional study area and project footprint?*

25 Overall, the Project is expected to affect less than 1% of inland habitat in the Regional
26 Study Area to year 30 (Response to EIS Guidelines Section 6.5.3.1.4); 72% of this change
27 is in the potential Project Footprint.

28 The EIS provides quantitative predictions for the first 30 years of Project operation, and
29 qualitative predictions thereafter to year 100. The quantitative prediction period was
30 30 years because Project effects predictions were largely based on the examples
31 provided by other areas in northern Manitoba that have undergone hydroelectric
32 development (i.e., proxy areas), and these proxy areas were approximately 30 years old
33 when the data used for the EIS analyses were collected. The EIS also provides an

34 estimate for the total amount of terrestrial habitat change by year 100 (Response to EIS
 35 Guidelines Section 6.5.3.1.3, p. 6-316; Terrestrial Environment Supporting Volume
 36 Section 2.3.6.3.1). The estimate to year 100 indicates that any increased terrestrial
 37 habitat effects beyond year 30 are expected to be more than offset by native habitat
 38 recovery in lightly disturbed areas and in some of the temporary Project Footprint areas,
 39 and by accounting for potential borrow, EMPA and disturbance areas that were not
 40 actually used during construction.

41 The purpose of providing an estimate for terrestrial habitat to 100 years is to
 42 demonstrate why terrestrial habitat effects are expected to decline substantially
 43 between years 30 and 100; it is not intended to be a value that can be used for precise
 44 calculations such as percentage changes in affected area. Quantification beyond 30
 45 years was deemed unnecessary because the magnitude of effects at year 30 is within
 46 the regionally acceptable range, Project effects decline substantially after year 30 and
 47 there is substantial uncertainty as to what proportion of the potential Project Footprint
 48 areas will actually be used. On this basis, percent changes in the amounts of inland
 49 habitat from years 31 to 50 and years 51 to 100 have not been calculated and are not
 50 provided.

- 51 2. *Did the model used to predict change of the inland habitat factor in climate change,*
 52 *increased human activity (having 2000 workers on site and using the surround*
 53 *environment), waste deposit, altered flow of Nelson River, infrastructure*
 54 *development, linear fragmentation by development of transmission lines, access*
 55 *roads, dykes, shoreline erosion and changes to wildlife population?*
 56 3. *Will Manitoba Hydro provide an updated table on the changes to inland habitat*
 57 *from the Keeyask project factoring in the above-mentioned parameters?*

58 An updated table for Project-related changes to inland habitat is not required. Inland
 59 habitat Project effects predictions already incorporate ongoing responses to past
 60 climate change, increased human activity, waste deposit, altered flow of the Nelson
 61 River, infrastructure development, linear fragmentation by development of transmission
 62 lines, access roads, dykes and shoreline erosion (Terrestrial Environment Supporting
 63 Volume Sections 1.5 and 2.3.6). Several types of breakdowns for the habitat change
 64 resulting from these influences are provided in Tables 1-5, 2-12 and 2-18 of the
 65 Terrestrial Environment Supporting Volume. The sensitivity of the conclusions regarding
 66 Project effects on inland habitat to future climate change are addressed in the Response
 67 to EIS Guidelines, Section 6.5.11 and the Terrestrial Environment Supporting Volume,
 68 Section 2.11.2. The inland habitat assessment did not explicitly predict how changes to
 69 wildlife populations would alter inland habitat as beaver is the only species that could
 70 substantially alter inland habitat and Project-related changes to the beaver population
 71 are expected to have negligible subsequent effects on inland habitat.

- 72 4. *Does inland habitat include all, any habitat types?*
- 73 Total land area includes existing human footprints in 2011 and terrestrial habitat.
- 74 Terrestrial habitat includes inland habitat and shore zone habitat.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1.4.1 Introduction – Construction Period; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0078**

4 **PREAMBLE:**

5 Assessment of construction effects references the inputs of materials to the aquatic
6 environment through controlled discharges, instream construction, surface runoff, etc.
7 It further indicates that the principle effluents from the construction phase are those
8 from treated sewage and discharge from the concrete wastewater treatment ponds.
9 Heavy metals are known to migrate from construction sites by attaching to soil
10 sediments that erode aggressively due to disturbance of soils and vegetation.
11 Furthermore, heavy metal runoff from access roads, buildings, excavation sites, landfill
12 areas, bulk waste sites, etc, has the potential to pose a serious risk to heavy metal
13 leachate in nearby waters.

14 **QUESTION:**

15 Please respond to the following questions:

- 16 1. Has an increase in heavy metal contaminated sediments been considered when
17 determining the amount of heavy metals released into the aquatic environment? If
18 not, why not?
19 2. How will heavy metals within run-off effect ground water quality in the Keeyask
20 region (regional and local study areas)?
21 3. What mitigation measures are being employed to reduce the amount of heavy
22 metals released into the environment from Keeyask construction sites?

23 **RESPONSE:**

24 Note that the Keeyask EIS discusses and considers metals in the water quality section of
25 the Aquatic Environment Supporting Volume (AE SV, Section 2). "Heavy metals" are a
26 subset of the overall metals group and are generally considered to be those metals with
27 a specific gravity of 5.0 or greater. The AE SV considers a suite of metals that may be
28 present, including heavy metals.

29 Each of the above questions is answered in turn below.

- 30 1. *Has an increase in heavy metal contaminated sediments been considered when*
31 *determining the amount of heavy metals released into the aquatic environment? If*
32 *not, why not?*

33 Metals and contaminants that may enter the aquatic environment during construction
34 are considered in the AE SV (Sec. 2.5.1.6). As noted in the AE SV and in the response to
35 CEC Rd 1 MB Wildlands-0015, the Project will include erosion and sediment control
36 measures that will be implemented to minimize sediment movement off of construction
37 areas. These erosion and sediment control measures will minimize the introduction of
38 sediment and associated metals to surface waters (AE SV, Sec. 2.5.1.6.2). Additionally,
39 test results on granular materials that will be used during construction (e.g., for roads,
40 work areas, etc.) indicate that the use of these granular materials is unlikely to pose an
41 environmental concern with respect to metals in runoff, as discussed further in the
42 response to CEC Rd 1 CEC-0069a.

43 2. *How will heavy metals within run-off effect ground water quality in the Keeyask*
44 *region (regional and local study areas)?*

45 It is assumed that groundwater concerns would primarily relate to its potential as a
46 source of drinking water. Guideline concentrations for metals in drinking water are
47 generally greater than corresponding objectives for aquatic life (Manitoba Water Quality
48 Standards, Objectives and Guidelines, 2011). Therefore, given that the use of granular
49 material is unlikely to pose a concern to the aquatic environment, it is considered even
50 more unlikely that the use of granular materials would pose an environmental concern
51 with respect to groundwater and its use as a source of drinking water.

52 3. *What mitigation measures are being employed to reduce the amount of heavy*
53 *metals released into the environment from Keeyask construction sites?*

54 Erosion and sediment control measures to be employed during the Project, as discussed
55 in the response to CEC Rd 1 MB Wildlands-0015, will mitigate potential releases of
56 metals to the environment from the construction site.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1A.3 Keeyask Operation; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0079**

4 **PREAMBLE:**

5 Over the operation period of the Keeyask Project, water levels will fluctuate to
6 accommodate the peak mode operation mandate of the station. The Lake Winnipeg
7 Water Regulation License is past due. Manitoba Hydro facilities are linked along the
8 Nelson River and through the Churchill River Diversion (CRD) originating from Lake
9 Winnipeg. The linked generation facilities impact one another, and therefore changes
10 to Lake Winnipeg outflow is relevant to the operations of the Keeyask Generation
11 Project.

12 **QUESTION:**

13 Please respond to the following questions:

- 14 1. What are the intended min/max water levels within the Keeyask reservoir, spillway,
15 Stephens Lake and forebay?
16 2. What are the anticipated 10, 20, 30, 40 and 50-year impacts of altered water levels
17 on local topography and flooding?
18 3. How do the changing water levels within the Keeyask reservoir correlate with Lake
19 Winnipeg Water Regulation requirements for water level regulation?
20 4. How will Keeyask affect other components of the CRD?

21 **RESPONSE:**

- 22 1. *What are the intended min/max water levels within the Keeyask reservoir, spillway,*
23 *Stephens Lake and forebay*

24 The Keeyask EIS Project Description Supporting Volume (PDSV) Section 4.2 states that
25 the Keeyask GS will normally operate in a peaking mode of operation or a base loaded
26 mode of operation. Section 4.2.1 states that the reservoir will fluctuate up to 1.0 m
27 within any given day between the Full Supply Level (159 m) and the Minimum Operating
28 Level (158 m) during a peaking mode of operation. During the base loaded mode of
29 operation, the reservoir will remain relatively stable at or near the Full Supply Level.

30 The generating station will be operated to maintain a reservoir level within this range
31 the majority of the time. Sections 4.2.3 and 4.2.4 describe special and emergency
32 operating conditions that may cause the reservoir level to exceed the Full Supply Level

33 or be drawn down below the Minimum Operating Level. There is no distinction between
34 reservoir and forebay for Keeyask.

35 The PDSV Section 2.3.2 states that the spillway is designed to accommodate a flow of up
36 to 9,960 m³/s at the Project's normal full supply level of 159.0 m. The water level
37 reduces quickly through the spillway such that at a of 9,960 m³/s the water level
38 immediately downstream of the spillway would be at elevation 146.0 m (PDSV Figure 2-
39 3).

40 The PDSV Section 4.3.1.2 states that since the Kettle GS began operation, the water
41 level on Stephens Lake (measured at the Kettle GS) has varied between 137.5 m and
42 141.2 m. For 90% of the time, the Stephens Lake water level has varied between 139.2m
43 and 141.1 m (note that the PDSV states this range is between 139.3 m and 141.1 m
44 which is incorrect). During extremely high inflow conditions, the maximum water level
45 on Stephens Lake could reach 141.7 m. The range of elevations on Stephens Lake will
46 remain unchanged after the Project is operational.

47 2. *What are the anticipated 10, 20, 30, 40 and 50-year impacts of altered water levels*
48 *on local topography and flooding?*

49 The Project's reservoir surface area will initially be approximately 93 km², of which
50 45 km² is newly flooded area and 48 km² will consist of existing Nelson River area in
51 which water levels will rise. The reservoir is predicted to expand by 7-8 km² over the
52 first 30 years of Project operations due to ongoing shoreline erosion and peatland
53 disintegration. Changes to peat and mineral shorelines beyond 30 years of Project
54 operations are described qualitatively in Physical Environment Supporting Volume
55 (PESV) Section 6.4.2.1.7. It is predicted that the rate of shoreline erosion will reach a
56 relatively long-term stable rate after 15 years of operation and this rate of erosion will
57 likely continue into the future. Most of the shoreline erosion is predicted to occur during
58 the first 30 years of Project Operations. The PESV Section 6.4 provides a detailed
59 description of shoreline erosion, peatland disintegration and reservoir expansion during
60 the first 30 years of Project operations and beyond.

61 3. *How do the changing water levels within the Keeyask reservoir correlate with Lake*
62 *Winnipeg Water Regulation requirements for water level regulation?*

63 As explained in the Project Description Supporting Volume Section 4.2.1 (Peaking Mode
64 of Operation) and Section 4.2.2 (Base Loaded Mode of Operation), the Keeyask reservoir
65 will fluctuate within a 1.0 m operating range during peaking or base load modes of
66 operation. A peaking mode of operation could occur any time Split Lake outflow is less
67 than the powerhouse discharge capacity (4000 m³/s, with all units in service) and a
68 baseloaded mode of operation could occur at any time. Within the 1.0 m operating

69 range, the level is dependent on inflow conditions and the requirements of Manitoba
70 Hydro's Integrated Power System. The reservoir would not deviate outside of the 1.0 m
71 operating range because of Lake Winnipeg Regulation (LWR) and Churchill River
72 Diversion (CRD) operations. These system components establish the monthly inflow
73 pattern to Keeyask and make up the majority of the inflows to the Project, as compared
74 to the relatively smaller local tributary inflows from downstream of LWR and CRD.

75 Generally, a baseloaded mode of operation at Keeyask will be highly correlated to
76 periods when Lake Winnipeg elevation is above 715 feet. The LWR project is required to
77 be at maximum outflow when Lake Winnipeg levels are near or above elevation 715 feet
78 above sea level as required by the LWR Water Power Act licence. During other times,
79 when Lake Winnipeg levels are below elevation 715 feet, peaking or baseloaded modes
80 of operation at Keeyask would normally occur.

81 *4. How will Keeyask affect other components of the CRD?*

82 No changes to the operating licences/conditions of CRD are anticipated as a result of
83 Keeyask. Water levels associated with the CRD project are mainly influenced by
84 upstream water inflows, overall water and energy supply, energy demand and by the
85 existing CRD Water Power Act and other licences and agreements. The Keeyask
86 generation project will be operated as part of Manitoba Hydro's integrated system
87 within the constraints of licences granted for its facilities, including the Churchill River
88 Diversion Interim licence.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 1.2 Keeyask Reservoir Sturgeon stocking; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0080**

4 **PREAMBLE:**

5 The EIS is proposing the use of Ovaprim to facilitate collection of sturgeon eggs and milt,
 6 to promote fish spawning. Ovaprim (Salmon gonadotrophin releasing hormone analog)
 7 is a chemical hormone injected intraperitoneally or intramuscularly in fish to aid
 8 spawning. The chemical is not recommended for use in fish that are to be consumed as
 9 food products by humans or other animals and milt produced following exposure. The
 10 potential side effects of Ovaprim on fish health, egg quality, offspring viability and
 11 aquatic environment were not discussed. Manitoba Hydro has engaged a physiologist
 12 from University of Manitoba to investigate the impacts of Ovaprim on sturgeon sex
 13 hormone levels, influence of Ovaprim on endocrine stress levels and impacts on egg
 14 quality and fertilization success.

15 **QUESTION:**

16 Respond to the following questions:

- 17 1. When will the sturgeon stocking program be implemented?
- 18 2. When will the study of Ovaprim on sturgeon be completed by the University of
 19 Manitoba and will those results be available to the public?
- 20 3. Will other fish species be subject to Ovaprim injection?
- 21 4. How will Manitoba Hydro monitor for impacts to sturgeon and other fish species
 22 following exposure to Ovaprim?
- 23 5. Will the public be notified to avoid eating sturgeon due to potential exposure to
 24 Ovaprim?
- 25 6. Provide information on the pharmacodynamics and pharmacokinetics of Ovaprim in
 26 lake sturgeon.

27 **RESPONSE:**

- 28 1. *When will the sturgeon stocking program be implemented?*

29 The Lake Sturgeon stocking program will be implemented when construction begins to
 30 impact spawning habitat at Gull Rapids. The exact date will depend on the final Keeyask
 31 construction schedule. However, preparations for the stocking program began in 2012
 32 with identification of suitable egg collection sites and trial egg collection and rearing in
 33 2013.

34 2. *When will the study of Ovaprim on sturgeon be completed by the University of*
35 *Manitoba and will those results be available to the public?*

36 The Ovaprim study has been completed and a draft report is included with this filing. A
37 report is also being prepared for publication in a peer reviewed scientific journal.

38 3. *Will other fish species be subject to Ovaprim injection?*

39 No. Egg collection will not occur from any other species, so no other species will be
40 injected with Ovaprim, or any other hormone used for egg collection.

41 4. *How will Manitoba Hydro monitor for impacts to sturgeon and other fish species*
42 *following exposure to Ovaprim?*

43 Monitoring of sturgeon following exposure to Ovaprim or other similar products is not
44 necessary, as determined by the study conducted at the University of Manitoba. Effects
45 on fertilization success and hatching rates were found to be positive. Four female and
46 two male fish that had been injected in 2011 were monitored by means of acoustic
47 transmitters for 18 months following release. Results demonstrated that movements of
48 these fish were not affected by injection of Ovaprim and subsequent handling and
49 collection of eggs.

50 5. *Will the public be notified to avoid eating sturgeon due to potential exposure to*
51 *Ovaprim?*

52 Based on the study conducted by the University of Manitoba and measures being
53 undertaken as part of the spawn collection program, there is not anticipated to be
54 exposure to Ovaprim as a result of eating sturgeon; as such, the public notifications to
55 avoid eating sturgeon for this reason are not considered to be necessary. As
56 determined by the study conducted at the University of Manitoba, the effects of
57 Ovaprim, or other similar gonadotrophin releasing hormone analog products that may
58 be used, are very short in duration. The fish that are injected will be held at spawn
59 collection sites before release for a period of time that is sufficient to ensure that there
60 are no residual effects on flesh or blood.

61 6. *Provide information on the pharmacodynamics and pharmacokinetics of Ovaprim in*
62 *lake sturgeon.*

63 Please refer to the report on the study conducted by the University of Manitoba.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 2.0 Water and Sediment Quality; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0081**

4 **PREAMBLE:**

5 The EIS materials state that a description of the residual affects on drinking water and
6 recreational water quality are provided within the socio-economic supporting volume of
7 the EIS. The socio-economic supporting volume discusses residual effects to drinking
8 water that are scattered throughout the document and are primarily concerned with
9 heavy metal concentrations; mercury. There is no single location that addresses all
10 residual effects to drinking and recreational water quality.

11 **QUESTION:**

12 Answer the following questions:

- 13 1. Will Manitoba Hydro provide a table of all possible residual effects to drinking water
14 and recreational water quality?
15 2. Indicate how the provincial drinking water standards will be ensured.
16 3. What is the source of drinking water for the Keeyask work camp?

17 **RESPONSE:**

- 18 1. *Will Manitoba Hydro provide a table of all possible residual effects to drinking water
19 and recreational water quality?*

20 Residual effects on human health resulting in changes to drinking water in Gull Lake are
21 not anticipated for the following reasons:

- 22 • Local communities and their associated water treatment facilities are located at a
23 substantial distance from the Project site. As stated in the SE SV, Section 5.4.1.2.1,
24 p. 5-175:

25 "Changes in water quality are expected to be limited primarily to changes in
26 turbidity and associated sediment in the water and are isolated to the area in
27 the vicinity of the construction site (including immediately up and down stream
28 (PE SV). Changes to the water regime and shoreline erosion may lead to changes
29 in sedimentation processes, including the transport and deposition of mineral
30 sediment and peat material. Construction activities during river management
31 (e.g., cofferdam construction) will introduce additional sediment into the
32 Nelson River near Gull Rapids. There is a potential that some of the additional
33 sediment will flow downstream, which may affect the sedimentation

34 environment in Stephens Lake (PE SV). However, it is important to note that the
 35 majority, if not all, changes regarding turbidity are expected to be limited to the
 36 construction site area. **All of the communities in the Local Study Area are**
 37 **located beyond the anticipated open water hydraulic zone of influence, and as**
 38 **such, there should be no changes to community drinking water supplies**
 39 [emphasis added]. In addition to this, the areas in closest proximity to the
 40 construction site will be restricted from public access due to safety reasons.
 41 Therefore, most KCNs community Members as well as others, even if engaging
 42 in activities on the land, should not encounter increased turbidity in the water
 43 during the construction phase of the Project.”

- 44 • At the main construction camp, potable water will be provided by well (see
 45 response to part 3 below).
- 46 • While limited changes in water quality are anticipated (see water quality sections of
 47 the AE SV), Section 5.4.2.2.1, p. 5-212 of the SE SV indicates that consumption of
 48 untreated surface water is not recommended either before or after the Project is in
 49 place:

50 “It is also important to note that, regardless of location, direct drinking of
 51 surface water is not a recommended practice; Health Canada indicates that all
 52 untreated water should be boiled for one minute before consumption (Health
 53 Canada 2008). Manitoba Water Quality Standards, Objectives and [Guidelines
 54 sic] note the following: “It is therefore assumed that all raw surface water
 55 supplies will be disinfected as the minimum level of treatment prior to
 56 consumption” (Manitoba Water Stewardship 2011). This applies to potential
 57 area identified for the purpose of offset programs, in addition to downstream
 58 resource users and cabins on Stephens Lake.”

59 With respect to recreational water quality, the AE SV indicates that, during construction,
 60 there is expected to be no to negligible effects on pH in the fully mixed river, and small,
 61 localized effects in the immediate area of the sewage effluent discharge from the
 62 construction camp (AE SV Section 2.5.1.4). Recreational water quality guidelines relating
 63 to water clarity may be exceeded during Project construction, in association with
 64 Project-related increases in TSS” (AE SV, Section 2.5.1.1, p. 2-41). Bacteria in effluent will
 65 not exceed recreational guidelines (AE SV Section 2.5.1.5).

66 The AE SV indicates that during the operation period, for the Keeyask Area, the Project
 67 “is expected to adversely affect the suitability of surface waters for recreational uses, in
 68 terms of changes to water quality, in the nearshore areas through increases in turbidity.
 69 However, currently, the suggested guideline for water clarity (minimum Secchi disk
 70 depth of 1.2 m) is typically not met and the Project operation is expected to result in

71 increased water clarity on the main stem of the reservoir and over the long-term in
72 nearshore areas" (AE SV, Section 2.5.1.5).

73 See also the response to CEC Rd 1 MB Wildlands-0014.

74 2. *Indicate how the provincial drinking water standards will be ensured.*

75 Please refer to the Keeyask Generating Station Construction Environmental Protection
76 Plan, filed April 2013 – Section 5.17.1 Potable Water (pgs. 5-14 to 5-15).

77 3. *What is the source of drinking water for the Keeyask work camp?*

78 Section 4.6.14 of the Response to EIS Guidelines (p. 4-39) provides the following
79 information on water sources for the camp:

80 "Water for the camp will be obtained from a well and will be treated in a
81 packaged treatment system to meet the Drinking Water Safety Regulation
82 (2007) and Drinking Water Quality Standards Regulation (2007).

83 "The water treatment system will be designed to meet peak potable water
84 consumption. Water from the water treatment plant will be pumped via
85 pipelines to supply water for domestic consumption and fire protection to the
86 camp and office areas."

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 2.3.3.2.1 Keeyask Environmental Studies; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0082**

4 **PREAMBLE:**

5 The EIS materials state that additional baseline water quality data for the Keeyask study
6 area was collected in 2009, but it was not incorporated into the description of the
7 existing environment.

8 **QUESTION:**

9 Please respond to the following questions:

- 10 1. Why was the additional baseline water quality data not incorporated into the
11 description of the existing aquatic environment? Explain.
12 2. Provide the baseline aquatic data collected from 2009.

13 **RESPONSE:**

14 As described in the Aquatic Environment Supporting Volume (AESV Section 2.3.3.2.1),
15 baseline water quality studies for the Keeyask study area were initiated in 1999.
16 Sampling was conducted at sites along the Nelson River system four times in the open-
17 water season in 2001, 2002, 2003, 2004 and in the winters of 2003, 2004, and 2006.
18 Targeted programs (e.g., Access Road stream crossing sampling) were also conducted
19 over the period of 2003-2007. The majority of studies occurred from 2001 to 2004,
20 when a good understanding of the year-to-year variability was developed. After this
21 period, sampling was more targeted to address data gaps and/or verify that the original
22 data set continued to represent the span of variability in the pre-Project environment.
23 Studies of this nature conducted in 2006 and 2007 were integrated into the EIS dataset
24 for statistical analysis conducted in 2008, and included in the Response to EIS
25 Guidelines. The results of the 2009 water quality sampling program were compared to
26 data collected in previous years and, because water quality was similar (i.e., within the
27 range of conditions observed in past sampling years), a re-analysis of the full dataset
28 was not undertaken. Descriptions of the existing aquatic environment for the various
29 components presented in the AE SV were therefore prepared using data from the 1999-
30 2007 dataset. Additional water quality data collected after 2007 were incorporated into
31 the AE SV to specifically address information gaps respecting descriptions of the existing
32 environment. For example, results of a mercury sampling program conducted in 2011
33 were included in the AE SV to address the issue associated with a revision to the water
34 quality guideline for the protection of aquatic life in 2011. Although not all data that are
35 currently available were presented in the AE SV, all available data will be considered for

36 the purposes of aquatic effects monitoring. A data report describing the results of the
37 2009 water quality sampling program is provided as part of this filing.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; Page No.: Table 2-2**

3 **CEC Rd 1 MB Wildlands-0083**

4 **PREAMBLE:**

5 Studies conducted to evaluate baseline water quality in the Keeyask study areas were
6 conducted 10-9 years prior; 2001-2004. No indication provided within the materials of
7 whether the baseline data is still relevant.

8 **QUESTION:**

9 Please respond to the following questions:

- 10 1. Is the water quality data used to arrive at the conclusions in the Aquatics supporting
11 volume still relevant according to Manitoba Conservation and water quality
12 guidelines?
13 2. Provide current water quality data for the Keeyask study areas.
14 3. Does Manitoba Hydro hold current water quality data? If so, will it be filed as
15 supplementary information?

16 **RESPONSE:**

17 A response to each of the above questions is provided below.

- 18 1. *Is the water quality data used to arrive at the conclusions in the Aquatics supporting*
19 *volume still relevant according to Manitoba Conservation and water quality*
20 *guidelines?*

21 We are not able to provide the perspectives of Manitoba Conservation. As indicated in
22 the AE SV (Section 2.3.3), water quality data for the study area were compared to
23 Manitoba water quality guidelines (*Manitoba Water Stewardship [MWS]. 2011.*
24 *Manitoba Water Quality Standards, Objectives, and Guidelines. Water Science and*
25 *Management Branch, MWS. MWS Report 2011-01, November 28, 2011. 67 pp.*) and
26 Canadian Council of Ministers of the Environment (CCME) water quality guidelines
27 (*CCME. 1999. Canadian environmental quality guidelines. CCME, Winnipeg, MB.*
28 *Updated to 2012*). The most current water quality guidelines available at the time of
29 preparation (2012) were applied. There have been no modifications to these water
30 quality guidelines since the filing of the Keeyask Generation Project EIS.

- 31 2. *Provide current water quality data for the Keeyask study areas*

32 Please see response to CEC Rd 1 MB Wildlands-0082.

33 3. *Does Manitoba Hydro hold current water quality data? If so, will it be filed as*
34 *supplementary information?*

35 As noted in the AE SV (and referred to in the response to CEC Rd 1 MB Wildlands-0082),
36 additional baseline water quality data were collected as part of the 2009 Keeyask
37 baseline studies. Additional water quality data have been, and continue to be, collected
38 in the study area by the province of Manitoba and Manitoba Hydro. These data will be
39 used to augment the baseline water quality database to assist with post-Project
40 monitoring should the Project proceed.

41 Please also see the response to CEC Rd 1 MB Wildlands-0082.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 MB Wildlands-0084**

4 **PREAMBLE:**

5 Water bodies act as large natural sinks for sequestering anthropogenic carbon
6 emissions. Carbon enters the aquatic environment in the form of dissolved carbon
7 dioxide (CO₂), which then binds to calcium carbonates for sequestering. Dissolved CO₂
8 increases the acidity of the aquatic environment, which in turn slows calcium carbonate
9 precipitation, thereby decreasing the ability of the water to absorb CO₂. Vertical deep
10 mixing is a mechanism that then transports the sequestered carbon to the deeper layers
11 of the water column. Aquatic plants play a significant role absorbing dissolved carbon by
12 converting it to organic material, and mitigating aquatic acidification by converting CO₂
13 to oxygen during photosynthesis. In general, water bodies play a significant role in the
14 carbon cycles of the earth and in local ecosystems, and must be considered when
15 evaluating the impacts of carbon emissions on the environment (terrestrial and aquatic).

16 **QUESTION:**

17 Answer the following questions:

- 18 1. How will carbon emissions produced by the Keeyask Project during both the
19 construction and operation phases impact water carbon cycles?
20 2. What type of carbon inventory does Manitoba Hydro conduct regarding lakes,
21 rivers, peatlands and reservoirs; its projects areas?

22 **RESPONSE:**

23 Please refer to the response to CEC Rd 1 PFN-0024, which addresses Manitoba Hydro's
24 assessment related to the carbon cycle.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: 4.2.1 - Peak Mode of Operation; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0085**

4 **QUESTION:**

5 The EIS indicates it will take at least 30 years for the reservoir to reach maximum size.

6 Questions to answer:

- 7 1. Explain what the effect on Peak Mode of Operation this 30 year expansion of the
8 reservoir.
- 9 2. Given the intention to avoid any under water landscapes or forest, explain how the
10 clearing of areas that are going to convert to waterways over 30 years will be
11 anticipated and accomplished.
- 12 3. How will the reservoir monitoring program interact with the 30 year expansion of
13 the reservoir, including waterway management program? Will the monitoring
14 program for the reservoir continue for 30 years?
- 15 4. Peatland disintegration is referenced in several places regarding the 30 year
16 expansion period for the Keeyask reservoir. What happens in peat lands
17 disintegration? Describe.
- 18 5. What is the expected interaction between the dyke system for Keeyask and
19 peatlands disintegration?

20 **RESPONSE:**

21 As clarification to the preamble, the EIS does not state that the reservoir reaches
22 maximum size at year 30 of operation since that statement would imply no further
23 expansion of the reservoir beyond that time. As discussed in the Physical Environment
24 Supporting Volume (PE SV, Section 6.2.1.3), detailed modeling was performed to
25 estimate reservoir expansion over the first 30 years of operation, while qualitative
26 predictions are presented regarding expansion beyond year 30. The PE SV notes that
27 reservoir expansion rates are highest in the initial years after impoundment and that
28 model-predicted bank recession rates for the Year 15 to Year 30 period appear to
29 represent relatively stable long-term rates that will likely continue into the future
30 (Section 6.4.2.1.7).

31 Each of the above questions is answered in turn below.

- 32 1. *Explain what the effect on Peak Mode of Operation this 30 year expansion of the*
33 *reservoir.*

34 The small change of approximately 4% to 5% in reservoir volume due to expansion
 35 would have a negligible effect on the operation of the Keeyask Generating Station and
 36 would not affect any of the conclusions drawn from the effects assessment. The Project
 37 will continue to operate within the proposed limits as a modified peaking plant,
 38 meaning that it will operate either in a peaking mode of operation or a base loaded
 39 mode of operation. Both modes of operation have been assessed and the extent of
 40 peaking or base loaded mode of operation will be determined by the flows in the Nelson
 41 River at the time and the requirements of the Integrated Power System to meet the
 42 power demands.

43 2. *Given the intention to avoid any under water landscapes or forest, explain how the*
 44 *clearing of areas that are going to convert to waterways over 30 years will be*
 45 *anticipated and accomplished.*

46 The response to CEC Rd 1 CAC-0052d provides discussion related to the management of
 47 woody debris, including proactive management in areas of active erosion (e.g., clearing
 48 trees before they enter the water).

49 3. *How will the reservoir monitoring program interact with the 30 year expansion of*
 50 *the reservoir, including waterway management program? Will the monitoring*
 51 *program for the reservoir continue for 30 years?*

52 The question makes reference to “the reservoir monitoring program”, however the
 53 Partnership notes there is no monitoring program by that name listed in the monitoring
 54 section of the Response to EIS Guidelines (Chapter 8, Sec. 8.1.2.3).

55 Draft monitoring plans have been filed with regulators and are available on the
 56 Partnership’s website (www.Keeyask.com). The physical environment monitoring plan
 57 includes activities such as periodic collection of aerial/satellite imagery to map changes
 58 in shoreline position. The plan will also facilitate communication of debris management
 59 activities under the Waterway Management Program to the Keeyask Cree Nation
 60 partners through the Monitoring Advisory Committee (MAC, described in Response to
 61 EIS Guidelines, Sec. 8.3.1.1). The terrestrial environment monitoring plan includes
 62 monitoring for things such as terrestrial habitat loss, alteration and changes, which
 63 would include losses due to reservoir expansion.

64 The draft monitoring plans each discuss the planned durations of the proposed
 65 monitoring activities. It is anticipated that some monitoring activities will take place
 66 over a long-term time frame. However, the details of what will or will not be monitored
 67 long-term may not be specifically defined because the requirements for ongoing
 68 monitoring will depend upon observations from monitoring activities earlier in the
 69 Project. For example, the draft physical environment monitoring plan describes

70 monitoring for the first 10 years of operation, at which time the plan will be re-
71 evaluated to determine ongoing requirements.

72 The Joint Keeyask Development Agreement (JKDA), which is available on the
73 Partnership's website, includes commitments to implement the Reservoir Clearing Plan
74 (JKDA Schedule 11-1) and the Waterways Management Program (JKDA Schedule 11-2).
75 Both plans are also provided in the Response to EIS Guidelines (Appendix 4A and 4B).
76 The Reservoir Clearing Plan (Section 2.2) states: "Areas that will convert from land to
77 water over time as a result of peat land disintegration and shoreline erosion will be
78 cleared on an ongoing basis through the implementation of the Waterways
79 Management Program." The Waterways Management Program (Sections 4.2 to 4.5)
80 describes activities that will be undertaken in the Keeyask operation phase after
81 reservoir impoundment. Regarding the long-term implementation of this program after
82 year 10 of operation, Section 4.5 states: "In each year after year ten (10), it is expected
83 two (2) persons, making up a boat patrol crew, will be employed as Hydro seasonal
84 employees during the open water season and two persons making up a two (2) person
85 ice trail crew will be hired on a short term basis through a local contractor during the ice
86 covered season."

87 4. *Peatland disintegration is referenced in several places regarding the 30 year*
88 *expansion period for the Keeyask reservoir. What happens in peat lands*
89 *disintegration?*

90 The process of peatland disintegration is described in the Physical Environment
91 Supporting Volume (Section 6.1.1 Overview of Peatland Disintegration Processes, pages
92 6.2 to 6.6)

93 5. *What is the expected interaction between the dyke system for Keeyask and*
94 *peatlands disintegration?*

95 The mapping of reservoir expansion over the first 30 years of operation (Response to EIS
96 Guidelines, Map 6.51) shows there are few areas where predicted expansion interacts
97 with the north or south dykes. As noted in the Project Description Supporting Volume
98 (Section 6.5.4), the north and south dykes will generally be founded on glacial till
99 overburden, which would be exposed by removing the overlying surface organic (peat)
100 material. Since peat would not underlie the dyke structures, peatland disintegration
101 would not be expected to meaningfully interact with the dykes.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: 2.0 – Project Component; Page No.: N/A**

3 **CEC Rd 1 MB Wildlands-0086**

4 **PREAMBLE:**

5 The Project Description indicates that the size of the Keeyask reservoir will continue to
6 increase for at least 30 years after impoundment. The reasons provided for this are
7 shoreline erosion and peat land disintegration.

8 **QUESTION:**

- 9 1. Where is the shoreline erosion likely to be greatest? Provide mapping to show the
10 expected pattern of shoreline erosion, over 30 years, increments.
11 2. Given peat lands are expected to disintegrate over a 30 year period, provide
12 estimates as to GHG emissions from peat land disintegration over the 30 year
13 period, in 5 year periods.
14 3. Will the reservoir stop expanding by 30 years? Provide basis for this assumption.
15 4. Have other impacts to; water quality, species habitat, access for traditional use,
16 caribou winter and calving areas, medicinal plants, etc. been calculated in relation
17 to this 30 year expansion period for the reservoir? Provide basis for answer.
18 5. With reservoir storage varying and increasing over a 30 year period, how does this
19 variation show in calculations for operation of Keeyask Generation Station? Provide
20 examples.

21 **RESPONSE:**

22 Each of the above questions is answered in turn below.

- 23 1. *Where is the shoreline erosion likely to be greatest? Provide mapping to show the*
24 *expected pattern of shoreline erosion, over 30 years, increments.*

25 The attached maps (Figures 1a and 1b) from the Physical Environment technical
26 memorandum GN 9.2.8 (listed in Appendix 6A of the Response to EIS Guidelines) show
27 the predicted reservoir expansion due to shoreline erosion and peatland disintegration
28 for the year 1, years 2-5, years 6-15, and years 16-30 time frames.

- 29 2. *Given peat lands are expected to disintegrate over a 30 year period, provide*
30 *estimates as to GHG emissions from peat land disintegration over the 30 year*
31 *period, in 5 year periods.*

32 As noted in the response to CEC Rd 1 CEC-0053a:

33 “The life cycle GHG analysis detailed in Technical Memorandum GN 9.5.5 (A Life Cycle
 34 Assessment of Greenhouse Gases and Select Criteria Air Contaminants (listed in
 35 Appendix 6A, Response to EIS Guidelines)) takes into account not only the initial
 36 flooding of soils including peat, but also the area associated with the breakdown and
 37 disintegration of peat through shoreline erosion. The initial flooded area is 45.1 km²
 38 increasing to 52.4 km² after 30 years of reservoir expansion. The GHG life cycle
 39 assessment uses the larger 30-year flooded area from the point of initial flooding and
 40 hence is a conservative assumption.”

41 Therefore, the GHG assessment does not consider the incremental changes in GHG
 42 emissions due to incremental increases in reservoir area over time since the larger 30-
 43 year reservoir area is included in the GHG emission estimates as if this were the
 44 reservoir immediately after impoundment.

45 *3. Will the reservoir stop expanding by 30 years? Provide basis for this assumption.*

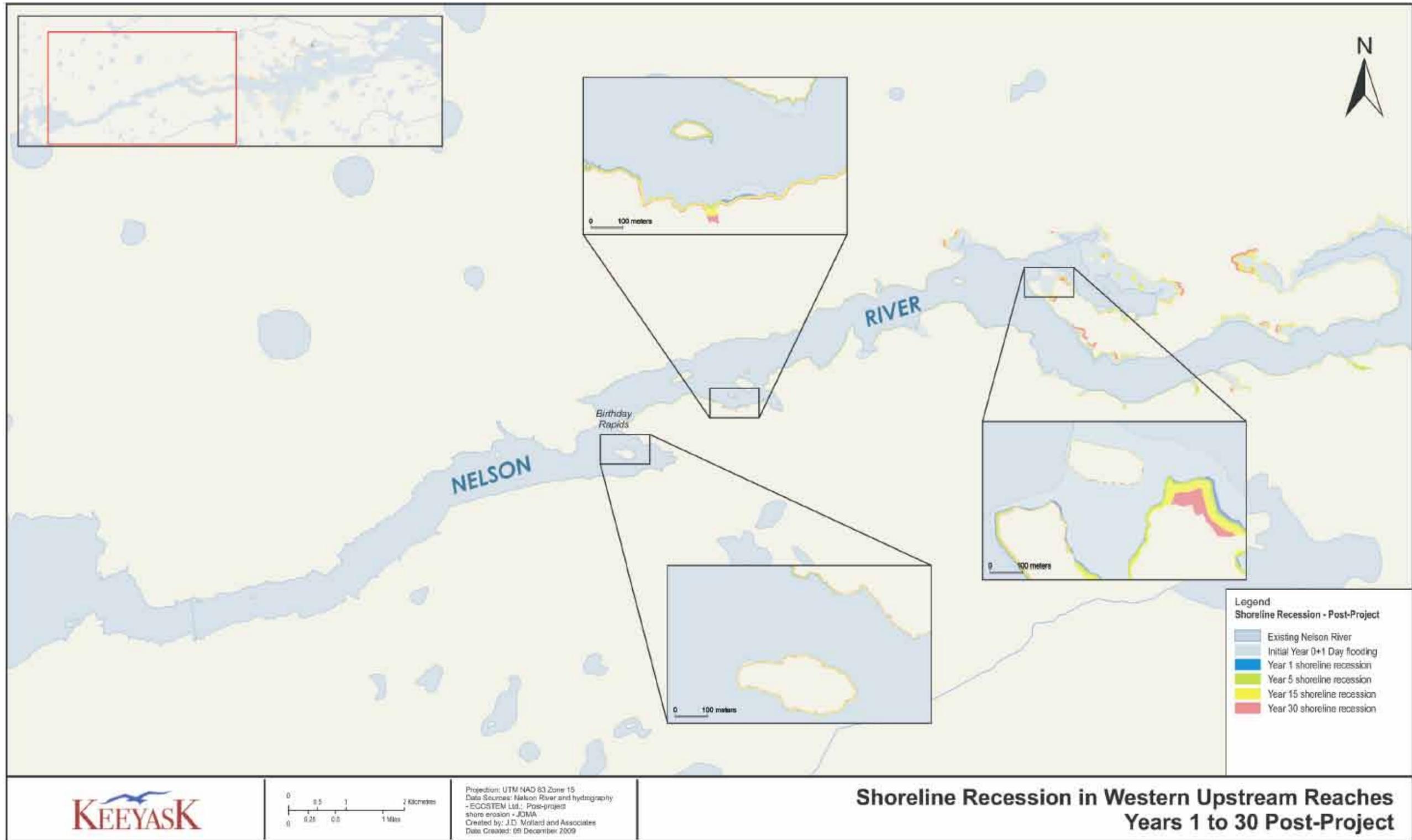
46 The rate of reservoir expansion is higher in the first several years after impoundment
 47 and the rate is anticipated to decline over time to a more stable, long-term rate that is
 48 similar to pre-project shoreline recession rates. Reservoir expansion would continue at
 49 the long-term stable rate beyond Year 30 of Project operation. This is discussed in the
 50 Shoreline Erosion section of the Physical Environment Supporting Volume (Section
 51 6.4.2.1.7 Project Effects Beyond Year 30). As noted in the response to CEC Rd 1 MB CEC-
 52 0068,c the use of low-lying peatlands adjacent to the Year 30 reservoir shoreline to
 53 define the limits of reservoir expansion beyond Year 30 (TE SV Section 2.3.6.3.1 p. 2-
 54 102) is implicit recognition that a balance between peatland breakdown and formation
 55 is expected to eventually occur on back bay shore segments (which is where most of
 56 these segments occur after Year 30) subject to peatland disintegration processes. Thus,
 57 the net contribution of peatland disintegration to reservoir expansion is expected to be
 58 small after Year 30.

59 *4. Have other impacts to; water quality, species habitat, access for traditional use,*
 60 *caribou winter and calving areas, medicinal plants, etc.been calculated in relation to*
 61 *this 30 year expansion period for the reservoir? Provide basis for answer.*

62 Short term and long term reservoir expansion converts terrestrial habitat to aquatic
 63 habitat and releases mineral and organic sediments to the waterway. These effects
 64 were considered in the assessments of the aquatic, terrestrial and socioeconomic
 65 environments, resource use and heritage resources. Project effects are summarized in
 66 Section 6.3 of the Response to EIS Guidelines.

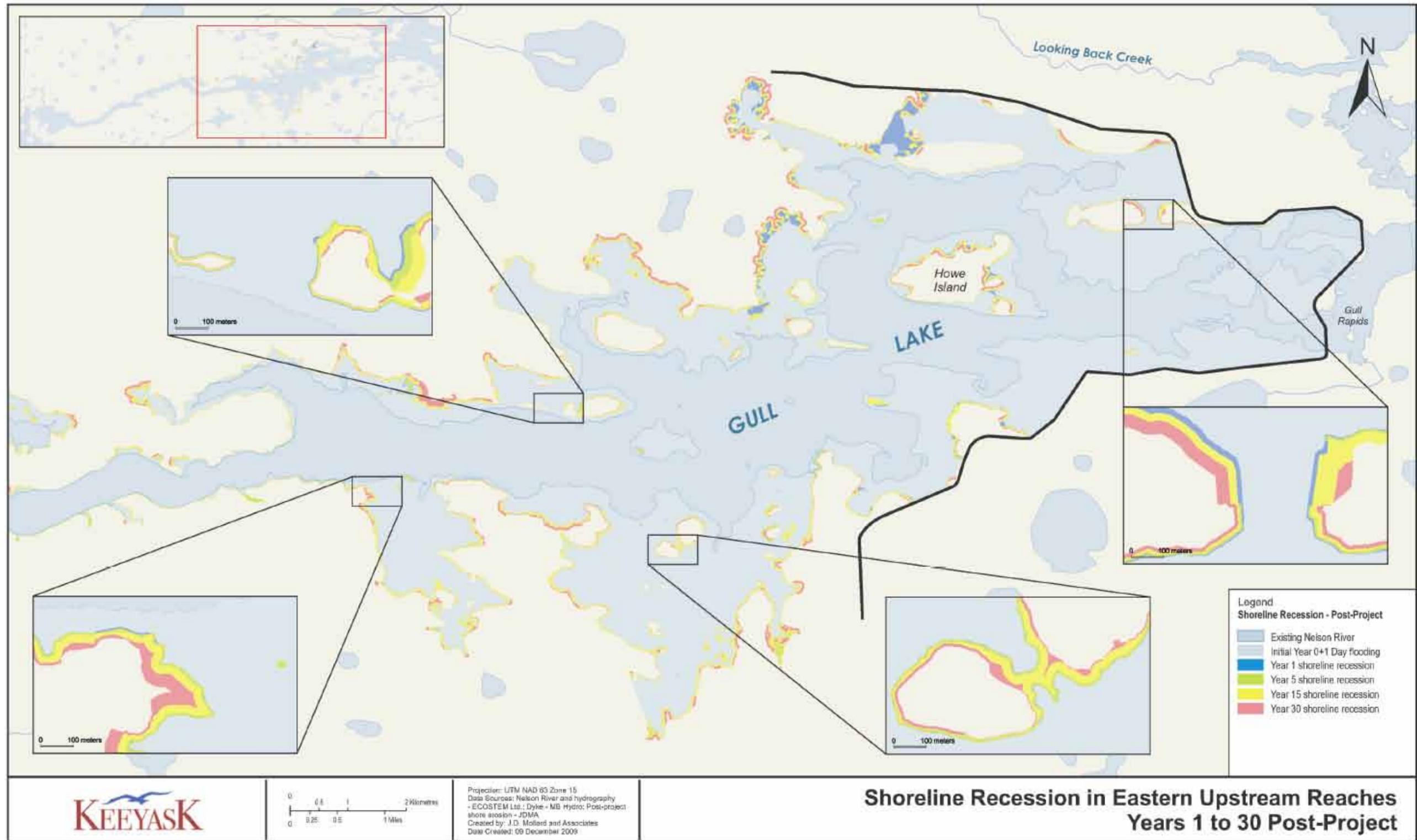
67 5. *With reservoir storage varying and increasing over a 30 year period, how does this*
68 *variation show in calculations for operation of Keeyask Generation Station? Provide*
69 *examples.*

70 For the answer to this question please refer to the response to question 1 in CEC Rd 1
71 MB Wildlands-0085.



72

73 Figure 1a: Shoreline Recession in Western Upstream Reaches, Years 1 to 30 Post-Project (Figure 12a, technical memorandum GN 9.2.8)



74

75 Figure 1b: Shoreline Recession in Eastern Upstream Reaches, Years 1 to 30 Post-Project (Figure 12b, technical memorandum GN 9.2.8)

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
2 **2012 Keeyask Traditional Plants Workshop Summary; p. 3**

3 **CEC Rd 1 PFN-0001a**

4 **PREAMBLE:**

5 In deference to Aboriginal and Treaty rights for people of all ages to have access to the
6 land, changes in water level make it difficult to land a boat and access land along altered
7 shorelines. Shoreline erosion being predicted to carry on for many years confirms the
8 need for access.

9 **QUESTION:**

10 How will members of TCN, WLFN, FLCN and YFFN be supported to carry out monitoring
11 of their lands and medicinal plants in areas above proposed new water levels during
12 each phase of the project?

13 **RESPONSE:**

14 Each of the KCNs communities will be responsible for collecting and interpreting
15 Aboriginal Traditional Knowledge (ATK), based on community-specific ATK Monitoring
16 plans. ATK and community knowledge will be used by each KCN to assess the project for
17 the purposes of reporting on the actual effects to regulators and also to evaluate the
18 impact of the Project on its Members from a Cree worldview perspective.

19 It is expected that ATK monitoring will involve the development and implementation of
20 annual monitoring programs based on construction and/or operational activities and
21 related community concerns about potential effects. Each KCN will determine which
22 parameters will be included in their plans. This may or may not include medicinal plants
23 in areas above proposed new water levels.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
 2 **2012 Keeyask Traditional Plants Workshop Summary; p. 3**

3 **CEC Rd 1 PFN-0001b**

4 **PREAMBLE:**

5 In deference to Aboriginal and Treaty rights for people of all ages to have access to the
 6 land, changes in water level make it difficult to land a boat and access land along altered
 7 shorelines. Shoreline erosion being predicted to carry on for many years confirms the
 8 need for access.

9 **QUESTION:**

10 What is the plan to coordinate with knowledge holders in each community to identify
 11 critical places where water access needs to be maintained? Does this plan include
 12 shoreline remediation, riparian buffer and bank stabilization, dock building, or other
 13 appropriate measures (detailed within a specific timeframe) to assure Aboriginal and
 14 Treaty rights are supported not infringed?

15 **RESPONSE:**

16 The last sentence of the preamble was interpreted to read "confirms the need for
 17 access". Many years of negotiations, meetings and consultations with knowledge
 18 holders has occurred as part of the Joint Keeyask Development Agreement (JKDA)
 19 process (Response to EIS Guidelines Section 4.3.3.1) including the development of the
 20 Waterways Management Program (Schedule 11-2). The JKDA was ratified by each of
 21 the KCNs (Tataskweyak Cree Nation and War Lake First Nation acting together as the
 22 Cree Nation Partners, York Factory First Nation and Fox Lake Cree Nation)).

23 The objective of the Waterways Management Program is to "contribute to the safe use
 24 and enjoyment of the waterway from Split Lake to Stephens Lake throughout the pre-
 25 flooding and operational stages of the Keeyask Project" (Section 2). Measures in the
 26 pre-flooding period include, but are not limited to: operating a multi-purpose boat
 27 patrol to monitor waterway activities and liaise with individuals and groups using the
 28 Nelson River; stabilizing the shoreline at sensitive streams; constructing and maintaining
 29 a safety cabin; cutting and maintaining trails and portages; and installing and monitoring
 30 regularly the condition of safe ice trails and the nature and extent of their use.

31 Measures in the post-flooding period include, but are not limited to: collecting floating
 32 debris; monitoring waterway activities and liaising with individuals and groups;
 33 preparing forebay depth charts and establishing safe travel routes by installing and
 34 maintaining navigation and hazard markers; constructing and maintaining safe landing
 35 sites on the reservoir and required docks and shelters; installing and monitoring

36 regularly the condition of safe ice trails and the nature and extent of their use;
37 monitoring and maintaining shoreline stabilization measures previously installed at
38 sensitive streams; and maintaining trails and portages. The Waterways Management
39 Program can be found at
40 http://www.hydro.mb.ca/projects/keeyask/jkd_agreement.shtml.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
2 **2012 Keeyask Traditional Plants Workshop Summary; p. 3**

3 **CEC Rd 1 PFN-0002**

4 **PREAMBLE:**

5 Trees and plants have already been destroyed by hydro developments. The EIS states
6 people will have to go further to access intact (uncontaminated) medicinal plant areas.

7 **QUESTION:**

8 Answer the following questions:

- 9 1. Have suitable alternative plant gathering areas been located by traditional
10 knowledge keepers? Provide documents and/or plans to define "further" in distance
11 and time.
- 12 2. Has Hydro made a formal commitment to provide travel services, available on
13 demand, as the need to access medicinal plants is triggered by illness and accidental
14 injury? What limitations will interfere or prohibit travel arrangements?
- 15 3. Are provision in place for access coordinated around plant life cycles and harvest
16 times?

17 **RESPONSE:**

18 The KCNs have negotiated AEA offsetting programs that they feel best provide
19 replacements, substitutions or opportunities to offset unavoidable adverse effects of
20 the Project. These include substitute opportunities to carry out associated customs,
21 practices and traditions integral to their cultural identity. The KCNs have the ability to
22 adapt these programs to meet their needs as they arise.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
2 **2012 Keeyask Traditional Plants Workshop Summary; p. 5**

3 **CEC Rd 1 PFN-0003**

4 **PREAMBLE:**

5 Medicinal plants are gathered for personal use from areas identified by families who
6 share that information within the bounds of personal relationships (plant location is not
7 generally shared or mapped, YFFN was determined not to share mapping information at
8 the 2012 workshop), and numerous areas of traditional harvest will be destroyed and/or
9 degraded.

10 **QUESTION:**

11 Answer the following questions:

- 12 1. Are people from TCN, WLCN, FLCN and YFFN who harvest medicinal plants afforded
13 access to all newly identified medicinal plant locations?
14 2. Will communities share harvesting sites and coordinate within and between each
15 other to protect and manage these sites?
16 3. How has Hydro documented and communicated their commitment to finding a
17 solution regarding medicinal plants that is amenable to all parties?

18 **RESPONSE:**

19 Please see the response to CEC Rd 1 PFN-0002.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
 2 **2012 Keeyask Traditional Plants Workshop Summary; p. 4**

3 **CEC Rd 1 PFN-0004**

4 **PREAMBLE:**

5 Borrow pits from Hydro development (past and present) have been raised as a concern
 6 in all three medicinal plant workshops, as they have been left in a degraded state and
 7 lay bare for opportunistic grass and weeds—workshop participants have proposed these
 8 areas be restored in a balanced way with useful plants, including berries. Doing this
 9 would alleviate scars that remain visible on the landscape and could serve as part of an
 10 field-based educational science program, an expressed goal for communities.

11 **QUESTION:**

12 Answer the following questions:

- 13 1. In number and surface area, what amount of land has been degraded by borrow pits
 14 within the project area to date? And, amount planned over the next 10 years?
 15 2. What percentage of that surface area has been restored to date in keeping with ATK
 16 and practices, repeatedly shared in workshops since the first in 2009?
 17 3. Is there a commitment in place to restore borrow pits in culturally appropriate
 18 ways, going forward? What are the specific targets in scale and time.
 19 4. Has Hydro dedicated funding specifically for classroom and field-based science
 20 curriculum with regard to medicinal plant knowledge and plant conservation?

21 **RESPONSE:**

22 Responses to each of the above are provided below.

- 23 1. *In number and surface area, what amount of land has been degraded by borrow pits*
 24 *within the project area to date? And, amount planned over the next 10 years?*

25 As the project has not been licensed or started as of yet no borrow pits have been
 26 opened for the Keeyask Generation Project. However, six borrow areas with an area of
 27 53.81 ha have been developed for the Keeyask Infrastructure Project.

28 As documented in the Updates to the Project Description included in Supplemental
 29 Filing # 2, there are a maximum of 19 borrow areas with a total area 2,030.65 ha that
 30 will potentially be used for the Keeyask Generation Project. Of that total, 546.31 ha will
 31 be under water at Project completion, 1,483.20 ha on land and 1.13 ha in permanent
 32 infrastructure. The extent of the actual area that will be utilized by the contractor will
 33 likely be much less than the full extent of the material sources included in the Project

34 Footprint because the potential material sources contain much more material than will
 35 actually be required for the Project (see Section 2.4.5 of the Project Description
 36 Supporting Volume).

37 As mentioned in Section 1.2 of the Response to EIS Guidelines, some borrow areas will
 38 be required for construction and operation; others will be decommissioned and
 39 rehabilitated after the Project is constructed. Currently this project is scheduled to be
 40 completed by 2022.

41 2. *What percentage of that surface area has been restored to date in keeping with ATK*
 42 *and practices, repeatedly shared in workshops since the first in 2009?*

43 As the project has not been licensed or started as of yet no restoration has occurred in
 44 the project area.

45 3. *Is there a commitment in place to restore borrow pits in culturally appropriate ways,*
 46 *going forward? What are the specific targets in scale and time.*

47 A Vegetation Rehabilitation Plan will be developed once construction is underway, and
 48 the actual extent of disturbance caused by construction of the Keeyask Generation
 49 Project is known. Detailed design and methodology for all rehabilitation areas will be
 50 carried out at that time. The Partnership will solicit input on the plan from the KCNs,
 51 through the plant workshop and review process. Additionally Manitoba Hydro and the
 52 KCNs continue to discuss community participation in the Keeyask Generation Project
 53 monitoring activities, specifically ATK monitoring. Under the JKDA Schedule 13-1
 54 Identified Work Packages and Allocation, Cree Nation Partners will be awarded the Main
 55 Camp - Decommissioning which includes restoration of project areas including grading
 56 and vegetation planting. As well as two Infrastructure Contracts - Roads that include
 57 rehabilitation of borrow-pits. All these could include restoration in culturally appropriate
 58 ways.

59 4. *Has Hydro dedicated funding specifically for classroom and field-based science*
 60 *curriculum with regard to medicinal plant knowledge and plant conservation?*

61 Each of the KCNs has and will continue to determine the most appropriate way to share
 62 cultural knowledge among their generations. For example, TCN has negotiated a
 63 program in their AEA called the Traditional Knowledge Learning Program with the
 64 objective to create "opportunities for traditional learning provided for students
 65 primarily at, or through, the Keeyask Centre". As part of this program, TCN will hire
 66 instructional staff. Hydro will provide to TCN annual funding for this program.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
 2 **2012 Keeyask Traditional Plants Workshop Summary; p. 5-10**

3 **CEC Rd 1 PFN-0005**

4 **PREAMBLE:**

5 Vast areas where Weekis and Trappers Tea is currently picked will be lost to flooding,
 6 Weekis has been identified as the most important medicinal plant, an Elder from TCN
 7 states that medicines in areas subject to water fluctuation (not complete flooding) have
 8 already been lost, and all in the EIS presenting plants by species are is qualified as being
 9 a partial, incomprehensive body of information.

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. Will a concerted/ongoing effort be made through community engagement with
 13 knowledge keepers in each community to monitor the loss of specific species of
 14 medicinal plants, given the gaps and generalizations in baseline data?
 15 2. If known primary knowledge holders are not able to attend workshops outside their
 16 community (as was the case in October 2012), will future engagements take extra
 17 steps to follow up with individuals, giving them the opportunity to contribute and
 18 comment?
 19 3. How will data gathering methods respect the inherent rights of individuals and
 20 communities to withhold cultural information yet ensure a full accounting of the
 21 affects of Hydro development in the project area?

22 **RESPONSE:**

- 23 1. *Will a concerted/ongoing effort be made through community engagement with*
 24 *knowledge keepers in each community to monitor the loss of specific species of*
 25 *medicinal plants, given the gaps and generalizations in baseline data?*

26 No evidence could be found to support the preamble statement indicating that “vast
 27 areas where Weekis (*Acorus americanus*) and Trappers Tea (*Thododendron*
 28 *tomentosum*) is currently picked will be lost to flooding”. Participants in the Keeyask
 29 Traditional Plants Workshop Summary (2012) did not identify *weekis* as a plant
 30 harvested in areas expected to be affected by the Project and *weekis* have not been
 31 located in the Local or Regional study areas by the Terrestrial Environment study team
 32 (TE SV Section 3.3.2.3.2). Some areas where Trappers Tea was picked were identified to
 33 be in areas to be flooded (Keeyask Traditional Plants Workshop Summary 2012) and one
 34 location was identified by the Terrestrial study team in the Local Study Area (TE SV
 35 3.3.2.3.2).

36 In addition to monitoring identified in the Terrestrial Environment Monitoring Plan, each
 37 of the Keeyask Cree Nations communities will develop ATK monitoring plans to reflect
 38 community priorities and concerns.

39 2. *If known primary knowledge holders are not able to attend workshops outside their*
 40 *community (as was the case in October 2012), will future engagements take extra*
 41 *steps to follow up with individuals, giving them the opportunity to contribute and*
 42 *comment?*

43 A subsequent plant workshop is being planned for the summer of 2013 with knowledge
 44 holders from each of the KCNs. KCNs participants will be selected by each of the KCNs.

45 It is anticipated that annual ATK monitoring activities will provide an opportunity for
 46 knowledge holders to contribute information and provide feedback to overall Project
 47 monitoring. This feedback would be received by the Partnership at Monitoring Advisory
 48 Committee (MAC) meetings. The MAC will provide a forum for discussion and
 49 determination of actions required, if any, based on both ATK and technical science
 50 monitoring results. As described in PFN-0004 the degree to which plants and plant
 51 gathering areas are monitored specifically by the KCNs will be decided by each of the
 52 KCNs in accordance with their own priorities.

53 3. *How will data gathering methods respect the inherent rights of individuals and*
 54 *communities to withhold cultural information yet ensure a full accounting of the*
 55 *affects of Hydro development in the project area?*

56 An Environmental Protection program has been developed, in collaboration with the
 57 KCNs, to mitigate, manage and monitor potential environmental effects described in the
 58 Response to EIS Guidelines. The Partnership has delegated authority to Manitoba Hydro
 59 to manage construction and operation of the Project including implementation of the
 60 Program. The organized structure of the Partnership for this aspect of the Project
 61 includes a Monitoring Advisory Committee (MAC), which includes participants from
 62 each of the KCNs and Manitoba Hydro. Manitoba Hydro will be guided on the
 63 implementation of the program, in part, by MAC. Monitoring plans, in conjunction with
 64 the Protection Plans and Management Plans, are designed to measure the actual effects
 65 of the Project, test predictions or identify unanticipated effects. There will be both
 66 technical science monitoring and ATK monitoring undertaken. The activities that occur
 67 and the results generated will be discussed at MAC meetings. The MAC will provide a
 68 forum for collaboration among all parties.

69 The draft Terrestrial Effects Monitoring Plan (TEMP) describes monitoring for the effects
 70 on terrestrial environmental components including plants. The approach to monitoring
 71 in the TEMP is adaptive with provisions to review results and modify monitoring

72 programs and mitigation measures, if and as required. Where possible the Partnership,
73 through its MAC, will also promote that monitoring undertaken for regulatory purposes
74 and ATK monitoring undertaken by the KCNs complement each other and are coherent.

1 **REFERENCE: Volume: N/A; Section: EIS Supplemental Filing 1 -**
2 **2012 Keeyask Traditional Plants Workshop Summary; p. 2-10**

3 **CEC Rd 1 PFN-0006**

4 **PREAMBLE:**

5 A one-time field trip is set out as a goal shared by Hydro and the communities, to
6 prompt interest in plants among the youth, a planning meeting was to have taken place
7 in February 2013, August 2013 was identified as the ideal time for the event to take
8 place. There is also consensus that this exchange of traditional knowledge should occur
9 in the context of elder-youth relationships.

10 **QUESTION:**

11 Please answer the following questions:

- 12 1. Are their quantifiable goals in terms of the number of students that will be involved,
13 targeted levels of participation from each community?
14 2. Is there a plan to support elders in the delivery of knowledge to be prepared for the
15 field-trip?
16 3. Is there a plan to foster elder involvement with teachers so that what “prompted”
17 this experience connects young people to ongoing learning opportunities?
18 4. Did the planning meeting occur in February 2013?

19 **RESPONSE:**

20 Each of the above questions is answered in turn.

- 21 1. *Are their quantifiable goals in terms of the number of students that will be involved,*
22 *targeted levels of participation from each community?*

23 Each of the KCNs will determine the level of student involvement from their community.

- 24 2. *Is there a plan to support elders in the delivery of knowledge to be prepared for the*
25 *field-trip?*

26 Elder involvement will be supported and Elders will be provided an honorarium for
27 participating in the field trip and sharing their knowledge.

- 28 3. *Is there a plan to foster elder involvement with teachers so that what “prompted”*
29 *this experience connects young people to ongoing learning opportunities?*

30 There is no specific plan to foster Elder involvement with teachers; as each of the KCNs
31 determines the most appropriate way to share cultural knowledge among their
32 generations.

33 4. *Did the planning meeting occur in February 2013?*

34 A planning meeting took place in June 2013 and the workshop is tentatively scheduled
35 for late August.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 2.1 Climate Change reference to IPCC 2001; 2.2.1.2 Future**
3 **Climate Change Scenarios; p. N/A**

4 **CEC Rd 1 PFN-0007**

5 **QUESTION:**

6 The references for both the Climate Change and Climate Change future scenarios are
7 out of date. Climate science and modeling has advance significantly since 2007 (the date
8 of the IPCC's 4th assessment report). The earth's GHG emissions have already suppressed
9 the "worst case" emissions scenario outlined in the 4th assessment report. This out-
10 dated science is a major shortcoming of the assessment of the sensitivity to climate
11 impacts.

- 12 • Provide updated climate modeling, include IPCC worst-case data.

13 **RESPONSE:**

14 The KHLP used the most current Intergovernmental Panel on Climate Change's (IPCC)
15 Fourth Assessment Report (AR4) - Coupled Model Intercomparison Project Phase 3
16 (CMIP3) data in preparation of the climate scenarios for the Keeyask EIS. The new
17 Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5), which will
18 use the Coupled Model Intercomparison Project Phase 5 (CMIP5) data, is scheduled to
19 be released in 2014. The Keeyask environmental assessment is therefore based on the
20 most current internationally accepted data-set of climate change scenarios published by
21 the IPCC.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 2B-6 Greenhouse Gas Reporting and Commitments; p.**
3 **N/A**

4 **CEC Rd 1 PFN-0008**

5 **PREAMBLE:**

6 The EIS states it is feasible to propose site-specific adaptation strategies that deal with
7 potential impacts of climate change on the local environment of Keeyask.

8 **QUESTION:**

- 9 1. What are the site-specific adaptation strategies to deal with;
10 a. Medicinal plant locations?
11 b. Calving and wintering locations for caribou?
12 c. Migration of habitat types due to climate change?
13 d. Change in habitat locations for endangered species?
14 e. Additional listed and endangered species?

15 **RESPONSE:**

16 The EIS states "At this time it is not feasible to propose site-specific strategies that deal
17 with potential impacts of climate change on the local environment of the Keeyask
18 Generation Project. This is due to the complexity and uncertainty about the key factors
19 that could potentially be affected such as water temperature, inflow variability, and the
20 frequency and intensity of system-wide drought. Through ongoing research and
21 sensitivity analyses, Manitoba Hydro will continue to advance the state of knowledge of
22 climate change impacts at the system-wide scale and improve our understanding of how
23 these impacts could affect the Keeyask Project environment." (Physical Environment
24 Supporting Volume Appendix 2B.5)

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.3.1-**
 2 **Assessment Framework Steps; p. N/A**

3 **CEC Rd 1 PFN-0009**

4 **PREAMBLE:**

5 Study areas for each VEC's are variable and the reason given is to ensure that effects
 6 described as a percentage of the area appear small.

7 **QUESTION:**

- 8 1. Which methods and metrics did Manitoba Hydro consider before using the study
 9 area per VEC approach in the EIS?
 10 2. Why are affected areas (VECs) not calculated as part of the LSA and RSA?

11 **RESPONSE:**

12 The statement provided in the Preamble is not made anywhere in section 5.3.1 or in the
 13 balance of Chapter 5 of the Response to EIS Guidelines. Study areas for each VEC do
 14 vary, but no statement is provided to suggest that the reason for such variation "is to
 15 ensure that effects described as a percentage of the area appear small."

16 To be clear, the exact opposite rationale is provided by the Partnership as follows in
 17 section 5.3.1, at page 5-4:

18 "Study areas vary between environmental components to appropriately reflect
 19 the extent of Project effects on that component (*e.g.*, the study area for socio-
 20 economic effects is larger than the study area for physical effects). Similarly, the
 21 study areas for individual VECs and supporting topics within each environmental
 22 component also vary as the study area for a species with a large home range
 23 need to be larger than the study area for a more sedentary species. The study
 24 areas are large enough to capture the effects of the Project, but not so large as
 25 to mask the effects of the Project (by making the effects of the Project as a
 26 percent of the area appear unreasonably small)."

27 The VEC approach is required for the government regulatory environmental assessment
 28 (EIS Guidelines, Section 6.2.1), and the EIS is required to identify proposed spatial study
 29 boundaries for the evaluation of each VEC (EIS Guidelines, Section 6.2.2). Given the
 30 required VEC approach, with its requirement to identify proposed study areas for the
 31 evaluation of each VEC, different study areas result for different VECs to reflect the
 32 factors referenced in the above quote from section 5.3.1 of the Response to EIS
 33 Guidelines, *e.g.*, to reflect different habitats and home ranges for different VECs that
 34 may be affected by the Project. Where feasible, common study area boundaries have

35 been utilized for a number of different VECs, e.g., see Table 6-6 in Response to EIS
36 Guidelines regarding study area similarities and differences for all terrestrial VECs and
37 supporting topics.

38 The Partnership is not aware of, and did not consider, any other approach in this regard
39 for the purposes of the government regulatory environmental assessment.

40 The scope of the assessment is reviewed at pages 5-4 and 5-5 of Section 5.3.1. Detailed
41 descriptions of the study areas and related temporal scope for each environmental
42 component and VEC are provided in Chapter 6 in Section 6.2.3.2 (Physical Environment);
43 Section 6.2.3.3 (Aquatic Environment); Section 6.2.3.4 (Terrestrial Environment); Section
44 6.2.3.5 (Socio-economic Environment); Section 6.2.3.6 (Resource Use) and Section
45 6.2.3.7 (Heritage Resources). Where relevant, and feasible, VEC habitat areas affected
46 by the Project are estimated within the identified VEC local and/or regional study area
47 (LSA or RSA).

48 Please see responses to CEC Rd 1 CEC-0021 and CEC-0022 for further detail.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.0**
2 **Environmental Effects Assessment; p. Table 6-6**

3 **CEC Rd 1 PFN-0010**

4 **PREAMBLE:**

5 Summarized in relevant sections (of chapter 6) and in detail in the TE SV all of the
6 hydrological systems as far as zone 6 and beyond are physically connected.

7 **QUESTION:**

- 8 1. Did Manitoba Hydro test different methods to determine LSAs and RSAs?
9 2. Were these LSA and RSA identified specifically so thresholds for change in habitat
10 would not be exceeded?
11 3. Will Manitoba Hydro provide a table for all VEC's showing total area lost, altered
12 and disturbed by construction, operation including residual effects and cumulative
13 effects across all 6 study zones (or at the very least for both LSA and RSA?)

14 **RESPONSE:**

15 A response to each question is provided below.

- 16 1. *Did Manitoba Hydro test different methods to determine LSAs and RSAs?*

17 Of all the alternative approaches available for determining LSA and RSAs; the
18 Partnership chose the one best suited to Keeyask. See "Approach Adopted for
19 Terrestrial Study Areas" of CEC Rd 1 CEC-0022

- 20 2. *Were these LSA and RSA identified specifically so thresholds for change in habitat*
21 *would not be exceeded?*

22 A detailed explanation of the ecosystem basis of the choice of RSAs can be found in CEC
23 Rd 1 CEC-0022

- 24 3. *Will Manitoba Hydro provide a table for all VEC's showing total area lost, altered*
25 *and disturbed by construction, operation including residual effects and cumulative*
26 *effects across all 6 study zones (or at the very least for both LSA and RSA?)*

27 Tables for each of the terrestrial VECs with detailed information on the total land area
28 to be lost, altered and disturbed can be found in CEC Rd 1 CEC-0021.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.12**
 2 **Sensitivity of Project Effects to Climate Change; p. 6-227**

3 **CEC Rd 1 PFN-0011**

4 **PREAMBLE:**

5 The examination of the sensitivity to climate change focused on the operation phase as
 6 the construction period will take place in the near term and climate change is a longer-
 7 term phenomenon. The EIS references given are dated 2003 and 2007.

8 **QUESTION:**

- 9 1. Why did Manitoba hydro ignore climate change scenarios and models available
 10 since 2007?
 11 2. Did Manitoba Hydro compare recent climate science to 2003, 2007 references and
 12 choose older climate science?

13 **RESPONSE:**

14 Each of the above questions is answered in turn.

- 15 1. *Why did Manitoba hydro ignore climate change scenarios and models available*
 16 *since 2007?*

17 This answer is provided in PFN IR 0007.

- 18 2. *Did Manitoba Hydro compare recent climate science to 2003, 2007 references and*
 19 *choose older climate science?*

20 KHLP used the most current climate science available at the time of Keeyask EIS
 21 submission. In the Response to EIS Guidelines, Section 6.3.12, the Canadian
 22 Environmental Assessment Agency (CEAA) (2003) reference, outlines the guidance to
 23 practitioners on incorporating climate change into project environmental assessments.
 24 This guidance document is the most current one available from CEAA. The Carter (2007)
 25 reference, developed by the Task Group on Data and Scenario Support for Impact and
 26 Climate Assessment (TGICA) is used to support methodology for future climate scenario
 27 development. The TGICA undertakes regular reviews of their guideline documents when
 28 required, provides revisions and/or updates. This guideline document is the most
 29 current one available from the IPCC's TGICA. The Meehl (2007) reference provides the
 30 latest scientific consensus statement on future extreme events from the
 31 Intergovernmental Panel on Climate Change's (IPCC's) Fourth Assessment Report (AR4).
 32 The Keeyask environmental assessment is therefore based on the most current
 33 internationally accepted data-set of climate change scenarios published by the IPCC.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.12**
 2 **Sensitivity of Project Effects to Climate Change; p. 6-227**

3 **CEC Rd 1 PFN-0012**

4 **PREAMBLE:**

5 The examination of the sensitivity to climate change focused on the operation phase as
 6 the construction period will take place in the near term and climate change is a longer-
 7 term phenomenon. The EIS references given are dated 2003 and 2007.

8 **QUESTION:**

- 9 1. Which IPCC 2007 model or scenario did Manitoba hydro use for the EIS?
 10 2. What System does Manitoba Hydro use to update its engineers managers and
 11 scientists regarding climate change?

12 **RESPONSE:**

13 Responses to each of the questions are answered below.

- 14 1. *Which IPCC 2007 model or scenario did Manitoba hydro use for the EIS?*

15 In total, the ensemble of Global Climate Models consisted of 139 climate scenarios as
 16 projected by 24 GCMs and up to three different emission scenarios ranging from low to
 17 high carbon dioxide emissions as listed in PE SV Section 2.2.3.2, Table 2.2-1. In addition,
 18 up to 9 climate scenarios using the most current Canadian Regional Climate Model
 19 4.2.3, nested within the Canadian Global Climate Model 3.1, European Centre Hamburg
 20 Model 5, and Centre National de Recherches Meteorologiques Climate Model 3, for all
 21 available emissions scenarios (A1B and A2) was used as described in PE SV Section 2.2.3.2

- 22 2. *What System does Manitoba Hydro use to update its engineers managers and*
 23 *scientists regarding climate change?*

24 Manitoba Hydro has established climate change strategies that shape the organization's
 25 response to climate change. These strategies inform all areas within the corporation
 26 about Manitoba Hydro's current and historical efforts, actions and initiatives related to
 27 climate change. The departments studying climate change at Manitoba Hydro regularly
 28 update decision makers and others throughout the corporation to ensure they are
 29 informed about the most current developments and to receive feedback to reassess the
 30 risks and opportunities presented by climate change.

31 While undertaking Manitoba Hydro's climate change impact studies, the corporation
 32 collaborates with universities, other hydropower agencies, scientific climate change
 33 working groups and some of the world's leading scientists in climatology and hydrology

34 to stay informed about the latest developments in the climate sciences field. Manitoba
35 Hydro has been an affiliated member of the Ouranos Consortium since 2008. Ouranos is
36 a consortium dedicated to climate sciences and adaptation to climate change. Ouranos
37 has considerable experience in designing and undertaking projects on climate change
38 impacts and adaptation, as well as in providing users with climate change data and
39 information. The consortium has developed an internationally recognized expertise,
40 participates in international research projects and regularly publishes scientific journals.

41 For additional information see PE SV (Appendix 2B): "Manitoba Hydro's Climate Change
42 Strategies".

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.7.7**
2 **Sensitivity of Effects to Climate Change; p. 6-560**

3 **CEC Rd 1 PFN-0013**

4 **PREAMBLE:**

5 An "adjustment period" of only a few years needed by resource users in the Local Study
6 Area.

7 **QUESTION:**

- 8 1. What is the adjustment period comprised of? Construction period and initial
9 operation period?
10 2. How is this only a few years? Explain?

11 **RESPONSE:**

12 As noted in Resource Use Section 1.2.4.2.2 of the SE SV, "resource users will require a
13 period of adjustment to navigate in the changed environment because of differences in
14 terms of navigation routes, water depths and velocities" in the forebay and downstream
15 of the Keeyask Generating Station. The duration of this effect is expected to be short to
16 medium –term (Resource Use Section 1.2.4.2.3 of the SE SV) and expedited by the
17 Waterways Management Program in both winter and summer by the development of
18 ice trails, navigation routes, safe landing sites, the construction and maintenance of one
19 or more safety cabins and ongoing communication with resource users through boat-
20 patrols (see also Schedule 11 of the JKDA).

21 The period and degree of adjustment will be unique to individual resource users but is
22 expected to be minimized by the Waterways Management Program. KCNs resource
23 users also have the option to participate in offsetting programs in unaffected areas.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: Section**
 2 **6.9 – Effects of the Environment on the Project; p. N/A**

3 **CEC Rd 1 PFN-0014**

4 **PREAMBLE:**

5 The Project has been designed to safely pass the probable maximum flood (PMF).

6 **QUESTION:**

- 7 1. How many times have Manitoba Hydro reservoir water levels exceeded PMF levels?
 8 2. How would climate change affect water levels for a 1:10,00 flood event for Keeyask?
 9 3. Has Manitoba Hydro run climate change models specific to worst-case scenarios for
 10 both floods and droughts?
 11 4. Do the conclusions in the EIS re: probable maximum flood correlate with recent
 12 climate change models—worst-case scenarios?

13 **RESPONSE:**

14 Each of the above questions is answered in turn below.

- 15 1. *How many times have Manitoba Hydro reservoir water levels exceeded PMF levels?*

16 Manitoba Hydro has never experienced PMF conditions on any of the rivers in the
 17 system. The PMF is flood that would result from the most severe hydrologic and
 18 meteorological conditions that could reasonably occur at a location. It is based on an
 19 analysis of local historic precipitation, snowmelt, and other factors producing maximum
 20 flows. Statistically, this flood represents an extremely remote event, estimated to be
 21 less frequent than a 1:10,000 year event. The estimated PMF for the Keeyask Project is
 22 nearly double the highest recorded daily average flow on record. As a result, reservoir
 23 water levels would not be expected to exceed estimated PMF levels. There may be rare
 24 instances when a reservoir level exceeds the level that would be observed during the
 25 PMF which could occur due to abnormal or emergency operations of the station.

- 26 2. *How would climate change affect water levels for a 1:10,00 flood event for Keeyask?*

27 While it is accepted that climate change will impact the frequency and variability of
 28 extreme events, it is difficult to quantify impacts on events as remote as the 1:10,000
 29 year flood. As is discussed in current guidance documents provided by the Canadian
 30 Dam Association, there is currently no accepted methodology to definitively quantify
 31 climate change impacts on extreme flood events:

32 *"... it is expected that the variability of extreme events (floods and droughts) will*
 33 *increase, but it is not possible to quantify this change. All these changes are*

34 *quite recent and intense research is active in that domain, but thus far, no*
 35 *generally accepted methodology exists to evaluate the effect of climate change*
 36 *on flood frequencies. Until the scientific community defines safe practices, high*
 37 *and extreme floods should be evaluated with a (realistic) degree of conservatism*
 38 *and flood frequency estimates should be updated as frequently as possible..."*
 39 *(Canadian Dam Association Hydrotechnical Considerations for Dam Safety*
 40 *(2007) Section 1.0).*

41 Manitoba Hydro's adoption of the Probable Maximum Flood (PMF) as the Inflow Design
 42 Flood (IDF) provides a level of conservatism in the design of Keeyask to accommodate
 43 extreme flood events. The magnitude of the PMF for Keeyask will be reviewed
 44 periodically and updated if necessary.

45 3. *Has Manitoba Hydro run climate change models specific to worst-case scenarios for*
 46 *both floods and droughts?*

47 As described in the Response to EIS Guidelines Section 6.3.12.1, the occurrence of
 48 extreme events (e.g., 1:10,000 year flood event) is difficult to analyze due to the
 49 absence of globally distributed, long-term records with sufficient detail and due to the
 50 uncertainty in the climate models' simulation of extreme events at the regional level.
 51 Therefore, CEAA guidance recommends practitioners focus on information sources such
 52 as the IPCC to formulate climate change information. In Response to EIS Guidelines
 53 Section 6.3.12.1, Physical Environment Supporting Volume Section 2.3.2.4 and Technical
 54 Memorandum GN-9.5.2-Future Climate Scenarios (listed in Response to EIS Guidelines,
 55 Appendix 6A), Manitoba Hydro has provided a summary of the IPCC's assessment on
 56 regional impacts to variability and extreme events generally as follows: "...the type,
 57 frequency and intensity of extreme events are expected to change as Earth's climate
 58 changes, and these changes could occur even with relatively small mean climatic
 59 changes...a number of modeling studies have also projected a general tendency for
 60 more intense but fewer storms outside the tropics, with a tendency towards more
 61 extreme wind events...". Additional details can be found in Technical Memorandum GN-
 62 9.5.2 and the sensitivity of the EIS effects assessment to climate change is discussed in
 63 Physical Environment Supporting Volume Section 11.

64 4. *Do the conclusions in the EIS re: probable maximum flood correlate with recent*
 65 *climate change models—worst-case scenarios?*

66 Please clarify the question and the conclusions associated with the probable maximum
 67 flood that are referenced in the question.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 1.3.4 Valued Environmental Components and**
3 **Supporting Topics; p. 1-13**

4 **CEC Rd 1 PFN-0015**

5 **PREAMBLE:**

6 The proponent states that those VEC's and STs selected were those that could
7 potentially experience substantial project effects yet the EIS Chapter 6 says all
8 significant effects to VECs and Supporting Topics were ultimately described as being
9 non-significant.

10 **QUESTION:**

- 11 1. How did Manitoba Hydro decide whether a terrestrial concern was a ST or a VEC?
12 2. What is the technical and scientific basis for these determinations of non-significant
13 effects?

14 **RESPONSE:**

15 Each of the above questions is answered in turn below.

- 16 1. *How did Manitoba Hydro decide whether a terrestrial concern was a ST or a VEC?*

17 The Keeyask Hydropower Limited Partnership used a sequence of steps to determine if a
18 terrestrial issue of concern was a valued environmental component or a supporting
19 topic. Appendix 1A *Methodology Used to Select Valued Environmental Components and*
20 *Supporting Topics* of the Terrestrial Environment Supporting Volume provides details
21 regarding the methods used to select the VECs and the supporting topics.

- 22 2. *What is the technical and scientific basis for these determinations of non-significant*
23 *effects?*

24 The technical and scientific basis for the determinations of non-significant effects can be
25 found in the Response to EIS Guidelines, Section 5.5 Approach to Determination of
26 Regulatory Significance.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5**
 2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 PFN-0016**

4 **QUESTION:**

5 The EIS indicates that effects of fragmentation and habitat losses are insignificant due to
 6 their being other habitat in the region. Significant, long term amphibious habitat losses
 7 (27%), within RSA is identified, yet it is stated that there are a lot of amphibians in the
 8 RSA since the project effects area represents small portion of regional study area.

- 9 1. What will Manitoba Hydro do to mitigate loss of 27% amphibian habitat?
 10 2. The reference to amphibians in the RSA: did Manitoba Hydro use recent scientific
 11 data regarding the rapid decline of amphibians in North America?

12 **RESPONSE:**

13 Each of the above questions is answered below.

- 14 1. *What will Manitoba Hydro do to mitigate loss of 27% amphibian habitat?*

15 Measures to off-set amphibian habitat loss include the creation of off-system marsh
 16 habitat (SV TE Section 5.6.2.3). It is anticipated that amphibian habitat will form
 17 naturally in some of the pits remaining in decommissioned borrow areas, along
 18 roadsides, and along dykes.

19 It should be noted that the assessment of Project effects on amphibians defined study
 20 Zone 4 as the amphibian Regional Study Area (Response to Guidelines Section 6.2.3.4,
 21 Table 6-6; TE SV Section 1.3.5, Table 1-3). The loss or alteration of amphibian habitat
 22 was inadvertently reported as 27%, which describes losses relative to the amphibian LSA
 23 (Zone 3, an area where the majority of direct and indirect Project effects are likely to be
 24 experienced). Using Zone 4, the total amount of amphibian breeding habitat affected by
 25 the Project is actually 3%.

- 26 2. *The reference to amphibians in the RSA: did Manitoba Hydro use recent scientific*
 27 *data regarding the rapid decline of amphibians in North America?*

28 As described in the TE SV, Section 5.3.3, rapid declines in North American amphibian
 29 populations occurred during the 1970s. All current amphibian literature refers to those
 30 declines and ramifications that are still being observed within amphibian populations.
 31 The Partnership has used the Canadian Amphibian and Reptile Conservancy Network
 32 (CARCNET 2012) as a source of information relating to this decline and other current
 33 issues regarding amphibians and reptiles in North America.

34 **REFERENCES:**

- 35 Canadian Amphibian and Reptile Conservation Network. 2012. Accessed at:
36 <http://www.carcnet.ca/english/index.php>

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5**
 2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 PFN-0017**

4 **QUESTION:**

5 Terrestrial habitat is not a VEC and isn't considered in Cumulative Effects Assessment.
 6 This helps maintain a degree of change <10% and therefore within natural range
 7 variability. This avoids having to account for the fact that there would indeed be
 8 cumulative effects to habitat at the regional scale potentially greater than 10%

- 9 1. Why did Manitoba Hydro leave terrestrial habitat out of VECs?
 10 2. Did Manitoba Hydro consider peatlands as a VEC?
 11 3. Did Manitoba Hydro identify that including habitat (terrestrial) as a VEC would
 12 indicate a cumulative effect of greater than 10%?

13 **RESPONSE:**

14 The Partnership assessed terrestrial habitat as a supporting topic rather than a VEC
 15 because the ecosystem diversity and wetland function VECs represent terrestrial habitat
 16 through their measured indicators (e.g., terrestrial habitat composition, priority habitat
 17 types, wetland types), and these VECs are carried forward to the cumulative effects
 18 assessment of Project residual effects in combination with future projects.

19 The Partnership did not include peatlands as a VEC because peatlands are adequately
 20 represented through the ecosystem diversity and wetland function VECs. Peatlands are
 21 represented by the ecosystem diversity VEC because they are the ecosite component of
 22 the terrestrial habitat types, so any priority habitat type that is a peatland type is
 23 assessed. Peatlands are also represented by the wetland function VEC because 19 of the
 24 25 wetland types used as indicators for this VEC are peatland types.

25 The Partnership identified terrestrial habitat as a supporting topic for the reason
 26 described in the first paragraph. It is noted that including terrestrial habitat as a VEC
 27 would not indicate a cumulative effect that is greater than 10%. The terrestrial habitat
 28 supporting topic assessment predicts that cumulative Project effects with past and
 29 current actions will remain below 6% for total terrestrial habitat and the common
 30 habitat types (Terrestrial Environment Supporting Volume Section 2.6.4.2.3). Even if
 31 total terrestrial habitat and the common habitat were carried forward to the future
 32 actions cumulative effects assessment, the effects for these terrestrial habitat classes
 33 would remain below 10% because the terrestrial footprints of the future actions are
 34 relatively small.

35 Of the 53 remaining native habitat types, 43 are represented by the ecosystem diversity
36 VEC through the priority habitat types, and these predictions are that cumulative effects
37 with past, current and future actions will remain below 10% for all of the priority habitat
38 types based on the anticipated locations of these future projects.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.5**
 2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 PFN-0018**

4 **QUESTION:**

5 The range of natural variability appears to be used as a reassurance that significant
 6 effects whenever and wherever found, are natural.

- 7 1. How did Manitoba Hydro determined the natural range of variability, and why are
 8 they sure that changes to VEC's and supporting topics don't vary significantly?
 9 2. Why did Manitoba hydro use different indicators for different VEC's without a
 10 technical explanation?
 11 3. Provide a table for all VECs
 12 4. Would Manitoba Hydro provide clear rationale for determinance of percent range
 13 or other predicted changes being insignificant or within natural range of variability?

14 **RESPONSE:**

15 Each of the above questions are answered below.

- 16 1. *How did Manitoba Hydro determined the natural range of variability, and why are*
 17 *they sure that changes to VEC's and supporting topics don't vary significantly?*

18 The Keeyask Hydropower Limited Partnership wants to clarify that the range of natural
 19 variability is only used for the magnitude criterion when assessing residual effects, and
 20 that this was only one of the available benchmarks used to determine whether a
 21 residual effect was small, moderate or large in magnitude. In some cases, benchmarks
 22 other than natural range of variability were used for the terrestrial VECs. Please see CEC
 23 Rd 1 PFN-0020, Question 1 for additional information on natural variability.

- 24 2. *Why did Manitoba hydro use different indicators for different VEC's without a*
 25 *technical explanation?*

26 The Partnership used different indicators for different VECs, as there is not one indicator
 27 or benchmark that is suitable for all VECs. In the TE SV, for each VEC, the Assessment
 28 Approach and Methods section provides the technical explanation for the different
 29 indicators and benchmarks used for the magnitude determination. The table below
 30 provides the relevant locations in the TE SV.

VEC	Section
Intactness	2.4.2.1
Ecosystem Diversity	2.7.2.1
Wetland Function	2.8.2.1
Priority Plants	3.2.1
Bald Eagle	6.2.4
Canada Goose	6.2.4
Mallard	6.2.4
Common Nighthawk	6.2.4
Olive-sided flycatcher	6.2.4
Rusty blackbird	6.2.4
Moose	7.2.6
Caribou	7.2.6
Beaver	7.2.6

31 3. Provide a table for all VECs

32 Please see the table above. Additionally, a table for all the Terrestrial VECs and
 33 Supporting Topics can be found in the Terrestrial Environment Supporting Volume
 34 (Table 1-1: Valued Environmental Components (VECs) and Supporting Topics Used for
 35 the Keeyask Terrestrial Environment Assessment).

36 4. Would Manitoba Hydro provide clear rationale for determinance of percent range or
 37 other predicted changes being insignificant or within natural range of variability?

38 For each VEC, please see the sections referred to in Question 2.

39 **REFERENCES:**

40 CCFM (Canadian Council of Forest Ministers). 1995. Defining sustainable forest
 41 management: a Canadian approach to criteria and indicators. Natural Resources
 42 Canada, Canadian Forest Service, Ottawa.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.3.12**
 2 **Sensitivity of Project Effects to Climate Change; p. N/A**

3 **CEC Rd 1 PFN-0019**

4 **QUESTION:**

5 The examination of the sensitivity to climate change focused on the operation phase as
 6 the construction period will take place in the near term and climate change is a longer-
 7 term phenomenon.

- 8 1. Why did Manitoba Hydro conclude the construction period is not relevant to climate
 9 change effects, or GHGs?
 10 2. Does Manitoba Hydro assume climate change effects are irrelevant for this 5-10
 11 year period;
 12 a. From the project?
 13 b. On the project?

14 **RESPONSE:**

15 The Proponent did not conclude that the construction period had no relevance to
 16 climate-change effects or GHGs.

17 The Life Cycle Assessment (LCA) completed specifically for the Keeyask Generation
 18 Project was used to estimate the GHG emissions from construction, land-use changes,
 19 operation and decommissioning of the Project. The LCA was conducted by the Pembina
 20 Institute, as described in the PE SV Section 2.0. The GHGs related to the construction
 21 period included the emissions of GHGs from vehicular/construction equipment,
 22 manufacture of construction material (e.g., steel and cement), transportation of
 23 materials to the site as well as other activities. With respect to climate-change effects
 24 on the Project during construction, activities during the construction period will be
 25 influenced by weather (i.e., daily variations in temperature, rainfall, wind, etc.) and
 26 there are construction practices to deal with these factors (e.g., enclosing work areas,
 27 establishing drainage systems, etc.). Climate refers to average weather experienced
 28 over an extended period of time. With construction expected to start in 2014, climate
 29 change is not expected to affect construction activities as climate change is a longer-
 30 term phenomenon. Climate change effects in the near-term construction period would
 31 be expected to be within the range of current weather variability expected during
 32 construction.

33 The assessment of the physical environment effects during construction are not
 34 expected to change as a result of climate change, again, because climate change is a
 35 longer-term consideration. As a result, the sensitivity of the Project and the effects

36 assessment conclusions to climate change focused on the longer-term operations
37 period.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 5.5**
 2 **Approach to Determination of Regulatory Significance; p. N/A**

3 **CEC Rd 1 PFN-0020**

4 **QUESTION:**

5 Please answer the following questions:

- 6 1. What is Manitoba Hydro's definition of natural variability?
 7 2. How is sensitivity to disturbance assessed? Methodology?
 8 3. How is VEC capacity to change assessed?
 9 4. Why were geese and ducks (pg. 630, 633) not evaluated further despite text
 10 describing adverse, long term impacts to their habitat?

11 **RESPONSE:**

12 The project Proponent for the Keeyask Generation Project is the Keeyask Hydropower
 13 Limited Partnership. The responses below reflect the work of the Partnership in
 14 undertaking the environmental assessment.

15 1. *What is Manitoba Hydro's definition of natural variability?*

16 For terrestrial VECs, the range of natural variability was used as one of the available
 17 benchmarks for determining whether a residual adverse effect is small, moderate or
 18 large in magnitude. Other available magnitude criteria used for the selected terrestrial
 19 VECs were established thresholds of acceptable change (of which none exist for the
 20 terrestrial VECs) and degree of impairment of an ecosystem component's function. For
 21 this reason, the types of benchmarks used were (Terrestrial Environment Supporting
 22 Volume Section 1.4.3):

- 23 • Principles or recommendations from federal or Provincial policies and guidelines;
 24 • Quantitative values or qualitative conditions proposed in the scientific literature;
 25 • Hazard quotient;
 26 • Conditions in areas relatively unaffected by human development;
 27 • The range of natural variability;
 28 • Comparison to known trends;
 29 • Comparison to conditions that existed in the past (*i.e.*, has the key topic already
 30 experienced major stress or declines from events that occurred in the past?);
 31 • Relative degree of change from current conditions; and/or
 32 • Relative degree of change from relatively natural conditions.

33 For some VECs, range of natural variability was the conceptual basis for understanding
34 the relative degree of change from current or relatively natural conditions.

35 Environmental conditions, habitat, and populations display natural variability that result
36 from long-term climatic trends, short-term weather fluctuations, natural succession, and
37 random events (Frissell and Bayles 1996). The definition of 'natural variability' depends
38 upon the topic being considered (i.e., habitat, wildlife populations). For example, in the
39 bird assessment, the range of natural variability was defined using data gathered during
40 field studies that spanned over 12 years and other existing data (e.g., frequency of
41 habitat loss/alteration due to natural events). And, the wetland studies observed how
42 the distribution and abundance of emergent and beach vegetation changed in response
43 to annual changes in Nelson River water levels.

44 *2. How is sensitivity to disturbance assessed? Methodology?*

45 Sensitivity to disturbance was assessed using scientific literature, where available, and
46 professional judgment. As described in a number of TE SV Sections (see CEC Rd 1 PFN-
47 0018 for a list of reference locations), sensitivity to disturbance was also assessed using
48 benchmarks.

49 *3. How is VEC capacity to change assessed?*

50 VEC capacity to change is assessed using scientific literature and professional judgment,
51 considers a number of variables, including population trends, specificity of habitat
52 requirements, and the availability of alternate habitat within the region. Additionally,
53 VEC capacity to change was determined using:

- 54 • benchmarks;
- 55 • abundance and distribution data;
- 56 • residual Project effects; and
- 57 • Project effects in combination with reasonably foreseeable future projects.

58 For further detail, please see response to TAC Public Rd 2 CEAA-0015.

59 *4. Why were geese and ducks (pg. 630, 633) not evaluated further despite text*
60 *describing adverse, long term impacts to their habitat?*

61 The Project effects on mallard were assessed using methods described in the Response
62 to EIS Guidelines Chapter 5. Although Step 2 was not required, frequency, reversibility
63 and ecological context were considered as part of the overall residual effects
64 conclusions (Response to EIS Guidelines Section 6.5.7.2). See also responses to CEC Rd 1
65 CEC-0041.

66 **REFERENCES:**

- 67 Frissell, C.A. and D. Bayles. 1996. Ecosystem management and the conservation of
68 aquatic biodiversity and ecological integrity. Water Resources Bulletin.
69 32(2):229-240.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.5.2**
 2 **Terrestrial Environment; p. N/A**

3 **CEC Rd 1 PFN-0021**

4 **QUESTION:**

5 The EIS says "Terrestrial environment ...substantially altered...continued to experience
 6 those effects today." In contrast, the Summary of Cumulative Effects of Project with
 7 Past and Current Activities (7.5.2.2), the proponent suggests that all of these previous
 8 (and significant) effects are no longer significant.

- 9 1. If all of these impacts of past projects are so significant, with long-term effects, how
 10 could the proponent be so sure that impacts of the Keeyask project will not be
 11 significant? How do you explain this?
 12 2. What is the basis for this assumption?
 13 3. Did the CN Partners agree that environmental effects from Keeyask are
 14 insignificant?
 15 4. Was a list of effects of past and current projects and activities that have had
 16 significant, long-term effect on the terrestrial environment used for cumulative
 17 effects assessment?

18 **RESPONSE:**

19 Please see the response to CEC Rd 1 CAC-0012 for a discussion of the Partnership's
 20 approach to determining regulatory significance. This is also described in Section 5.5 of
 21 the Response to EIS Guidelines.

22 To clarify the context for this question, the full statement referenced in the Preamble as
 23 provided at page 7-23 of the EIS is as follows (addressing in summary the effects on the
 24 terrestrial environment of past and current projects and activities):

25 "The terrestrial environment in the area to be affected by the Project has been
 26 substantially altered by past hydroelectric developments, linear developments
 27 (including transmission lines, highways and rail lines), forestry and mining
 28 exploration, and other agents of change, and continues to experience those
 29 effects today".

30 More detailed summaries of effects of past and current projects and activities on each
 31 terrestrial VEC are provided thereafter. No regulatory assessment of significance is
 32 provided with regard to the effects of past and current projects on any one overall
 33 "terrestrial VEC". Section 7.5.2.2 as referenced in the Preamble provides a summary of
 34 cumulative effects of the Project on terrestrial VECs in combination with past and

35 current projects/activities, as assessed in Chapter 6 based on the approach for
36 determination of regulatory significance provided in Section 5.5 of the Response to EIS
37 Guidelines.

38 Table 7-1 of the Response to EIS Guidelines provides a list of the past and current
39 projects and activities, as well as related effects, that are considered in the cumulative
40 effects assessment for the Project (this includes the assessment of effects on the
41 terrestrial environment). Additional information on the past and current projects and
42 activities is provided in Section 6.2 and Appendix 7A, as well as in responses to CEC Rd 1
43 CEC-0020, TAC Public Rd 2 MCWS-EAB-0001.

44 All of the KCNs had the opportunity to review and comment on the Partnership's EIS
45 Filing and to contribute to its overall findings. In addition, as per the JKDA, the CNP
46 reviewed and approved the Response to EIS Guidelines, including the overall
47 conclusions presented in Chapters 6 and 7 regarding residual environmental effects of
48 the Project on each VEC, including the determinations on regulatory significance.

49 More importantly, the CNP and each of York Factory First Nation and Fox Lake Cree
50 Nation also undertook separate environmental evaluations for the Keeyask Generation
51 Project based on their own Cree Worldview. These evaluation reports, and Chapter 2 of
52 the Response to EIS Guidelines, individually and collectively describe the KCNs
53 experiences with past and current projects and their concerns with respect to
54 development of the Keeyask Generation Project. The evaluation reports also outline the
55 factors each of the KCNs assessed, from their own Cree Worldview, when determining
56 whether or not to become Partners in the Project. Inherent in the Cree Worldview is a
57 consideration of cumulative effects, and this is the only way the KCNs were able to
58 evaluate the effects of Keeyask on their respective communities.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.3.2**
 2 **Summary of Project Physical Effects; p. N/A**

3 **CEC Rd 1 PFN-0022**

4 **QUESTION:**

5 Sections in chapter 7 outline changes from a current condition (eg. % habitat change)
 6 due to the project, rather than from a historical baseline or pre-development condition
 7 across all developments in the hydrological region. Whereas Hegman et al (1999) refers
 8 to the need to assess whether an individual project is incrementally responsible for
 9 adversely affecting a VEC beyond an acceptable point.

- 10 1. How is the long term flooding expected taken into account?
 11 2. Did Manitoba Hydro take into account any historic baseline for % habitat change
 12 data?
 13 3. Did Manitoba Hydro include habitat change measurements from other generation
 14 station projects to establish methods to predict habitat change % for Keeyask?

15 **RESPONSE:**

16 Each of the above questions is answered in turn below.

17 *1. How is the long term flooding expected taken into account?*

18 As was described in Section 6.3.5.2 of the Response to EIS Guidelines, completion of the
 19 proposed Project will result in an initial flooding of 45 km². Additionally, during the first
 20 thirty years of the operating phase the Project reservoir is predicted to expand by about
 21 7 km² (2.7 sq. mi.) to 8 km² (3.1 sq. mi.) due to ongoing peatland disintegration and
 22 mineral erosion along the shorelines. The Partnership evaluated the direct and indirect
 23 effects of flooding and water regulation on terrestrial habitat (Response to EIS
 24 Guidelines Section 6.5.3.1). Terrestrial habitat effects predictions became key inputs for
 25 terrestrial VECs and supporting topics.

26 *2. Did Manitoba Hydro take into account any historic baseline for % habitat change*
 27 *data?*

28 The Partnership fully considered available and relevant information on pre-disturbance
 29 conditions on habitat change and other factors (see response to CEC Rd 1 CAC-0012 and
 30 CEC Rd 1 CEC-0021).

31 As described in Section 1.3.6 of the Terrestrial Environment Supporting Volume (TE SV),
 32 the temporal scope for the historical conditions for a key topic included as far into the

33 past as needed to describe historical conditions and trends, subject to the availability of
34 relevant historical information.

35 Additionally, because Nelson River shoreline ecosystems have already been disrupted by
36 human activities, field studies were also conducted in relatively pristine areas (i.e.,
37 benchmark areas) that served to improve the understanding of natural ecosystems. For
38 example, off-system lakes and portions of the Fox River were used to characterize
39 natural shoreline wetlands, including habitat associations of shoreline wetland plant
40 species (Section 1.4.6 of the TE SV).

41 3. *Did Manitoba Hydro include habitat change measurements from other generation*
42 *station projects to establish methods to predict habitat change % for Keeyask?*

43 As was described in Section 1.4.6 of the TE SV, the Partnership considered existing
44 published information from ecologically comparable areas or areas that had
45 experienced similar project impacts (i.e., proxy areas) and this information contributed
46 to developing Project effects predictions. Studies conducted at existing hydroelectric
47 developments in northern Manitoba and northern Quebec, supplemented by field trips
48 to some of these locations, were particularly helpful.

49 The Partnership's predictions regarding terrestrial habitat change are based on six
50 northern Manitoba proxy areas for flooding and/or water regulation, some northern
51 Quebec reservoirs and the relevant scientific literature. Please see response to TAC
52 Public Rd 2 PCN-0001 for details.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
 2 **Section: 2.1 Climate Change reference to IPCC 2001; 2.2.1.2**
 3 **Climate Change future scenarios date to 2001; p. N/A**

4 **CEC Rd 1 PFN-0023**

5 **QUESTION:**

6 The EIS makes an assumption of no change in variability or frequency of weather events
 7 compared to present day (pg. 100). "It is contradictory to use climate modeling that
 8 assumes no change in variability, yet changes in variability are predicted. This
 9 contradicts the IPCC that states, "type, frequency and intensity of extreme storm events
 10 are expected to change as earth's climates changes" (pg 111)

- 11 • What does Manitoba Hydro see as the variability of weather and climate in the
 12 region, based on IPCC statement above?

13 **RESPONSE:**

14 As described in the Physical Environment Supporting Volume (PE SV), Section 2.2.1.2,
 15 Manitoba Hydro on behalf of the KHLP used the Delta method to generate future
 16 climate scenarios that were used to examine the sensitivity of the project to climate
 17 change for the Keeyask EIS. This method is recognized as standard practice among
 18 national climate change researchers studying climate change impacts and was selected
 19 for this sensitivity analysis as it provides realistic temporal sequencing associated with
 20 the historic record and allows future climate change impacts to be evaluated in the
 21 context of historical events. This approach is consistent with the current guidance
 22 available from the IPCC on incorporating scenario data for climate impact and
 23 adaptation assessments and has been used in the latest reports published by the
 24 Canadian government on regional climate change impacts and adaptation strategies.

25 As described in the Response to EIS Guidelines, Section 6.3.12.1, the occurrence of
 26 extreme events is difficult to analyze due to the absence of globally distributed long-
 27 term records with sufficient detail and due to the uncertainty in the climate models'
 28 simulation of extreme events at the regional level. Therefore, guidance from the
 29 Canadian Environmental Assessment Agency recommends practitioners focus on
 30 information sources such as the Intergovernmental Panel on Climate Change (IPCC) to
 31 formulate climate change information. In the Response to EIS Guidelines (Sec. 6.3.12.1),
 32 the PE SV (Sec. 2.3.2.4) and Technical Memorandum GN-9.5.2 (listed in Response to EIS
 33 Guidelines, Appendix 6A), Manitoba Hydro has provided a summary of the IPCCs
 34 assessment on regional impacts to variability and extreme events generally as follows:
 35 "...the type, frequency and intensity of extreme events are expected to change as

36 Earth's climate changes, and these changes could occur even with relatively small mean
37 climatic changes...a number of modeling studies have also projected a general tendency
38 for more intense but fewer storms outside the tropics, with a tendency towards more
39 extreme wind events...". Additional details can be found in Table 3 of Technical
40 Memorandum GN-9.5.2²¹, which is provided below. The conclusions made in Table 3 are
41 at the global or continental scale, and not specific to smaller regions such as the Keeyask
42 study area.

²¹ It was observed that Table 3 was omitted from Technical Memorandum GN-9.5.2 (Rev 0). This memorandum will be updated to include the missing table and will be resubmitted to the Clean Environment Commission as Technical Memorandum GN-9.5.2 (Rev 1).

Table 4 from Technical Memorandum GN-9.5.2 (Rev 1): Trends and projections of extremes for which there is an observed late-20th century trend (adapted from IPCC, 2007)

Phenomenon and direction of trend	Likelihood that trend occurred in late 20 th century (typically post 1960)	Likelihood of future trends based on projections for 21 st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	Very likely ^a	Virtually certain ^b
Warmer and more frequent hot days and nights over most land areas	Very likely ^c	Virtually certain
Warm spells/heat waves. Frequency increases over most land areas	Likely	Very likely
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	Likely	Very likely
Area affected by droughts increases	Likely in many regions since 1970s	Likely
Intense tropical cyclone activity increases	Likely in some regions since 1970	Likely
Increased incidence of extreme high sea level (excludes tsunamis) ^d	Likely	Likely ^e

Table notes:

a Decreased frequency of cold days and nights (coldest 10%).

b Warming of the most extreme days and nights each year.

c Increased frequency of hot days and nights (hottest 10%).

d Extreme high sea level depends on average sea level and on regional weather systems. It is defined here as the highest 1% of hourly values of observed sea level at a station for a given reference period.

e In all scenarios, the projected global average sea level at 2100 is higher than in the reference period. The effect of changes in regional weather systems on sea level extremes has not been assessed.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.5 Water Quality; p. N/A**

3 **CEC Rd 1 PFN-0024**

4 **PREAMBLE:**

5 Water bodies act as large natural sinks for sequestering anthropogenic carbon
 6 emissions. Carbon enters the aquatic environment in the form of dissolved carbon
 7 dioxide (CO₂), which then binds to calcium carbonates. Dissolved CO₂ increases the
 8 acidity of the aquatic environment, which in turn slows calcium carbonate precipitation,
 9 thereby decreasing the ability of the water to absorb CO₂. Vertical deep mixing is a
 10 mechanism that then transports the sequestered carbon to the deeper layers of the
 11 water column. Aquatic plants play a significant role absorbing dissolved carbon by
 12 converting it to organic material, and mitigating aquatic acidification by converting CO₂
 13 to oxygen during photosynthesis.

14 Water bodies play a significant role in the carbon cycles of the earth and in local
 15 ecosystems, and must be considered when evaluating the impacts of carbon emissions
 16 on the environment (terrestrial and aquatic). Within the EIS materials there is limited
 17 discussion on the role water plays in the carbon cycle, and how modification to the
 18 aquatic environment, terrestrial activities, effluent discharge and flooding of peatland as
 19 a result of the Keeyask Project, will influence carbon emissions.

20 **QUESTION:**

21 Please respond to the following questions:

- 22 1. How will the Keeyask Project influence the process of vertical mixing and
 23 sedimentation within the Keeyask reservoir and Stephens Lake
 24 2. How will the flooding of peatlands increase the amount of dissolved carbon within
 25 the aquatic environment?
 26 3. How will change in flow regime of the Nelson River impact carbon cycles?
 27 4. Did Manitoba Hydro conduct a cumulative carbon cycle analysis for the construction
 28 and operation phases of the Keeyask Project, which incorporates both terrestrial
 29 and aquatic carbon cycle data and mechanisms?

30 **RESPONSE:**

- 31 1. *How will the Keeyask Project influence the process of vertical mixing and*
 32 *sedimentation within the Keeyask reservoir and Stephens Lake*

33 Three dimensional modeling performed for the physical environment studies showed
 34 that the reservoir mainstem²² is well mixed vertically due to flow through the reservoir
 35 (Response to EIS Guidelines, Sec. 6.3.10.2.1). In backbay²³ areas that are not as well
 36 mixed due to flow, vertical mixing may be reduced during infrequent periods of
 37 sustained low-wind. However, these events are generally of short duration (i.e., a day to
 38 several days) because the water column is well mixed vertically when wind speeds are at
 39 or above average.

40 The effects of the Project on sedimentation processes were studied for construction and
 41 operation phases under a range of conditions for mineral and organic sediments, both
 42 upstream and downstream of the Project. Extensive work was performed with respect
 43 to Project effects on sedimentation and the topic is larger than can be reasonably
 44 addressed in an IR response. The Response to EIS Guidelines (Section 6.3.8, pages 6-211
 45 to 6-217) provides a good summary of Project effects on sedimentation while a much
 46 more detailed discussion of this large topic is provided in the Physical Environment
 47 Supporting Volume (PE SV, Sec. 7.4, pages 7-22 to 7-38).

48 *2. How will the flooding of peatlands increase the amount of dissolved carbon within*
 49 *the aquatic environment?*

50 The Aquatic Environment Supporting Volume (AE SV, Sec. 2.5.2.2.6) notes that dissolved
 51 organic carbon will increase in backbays as a result of flooding, particularly where there
 52 are long residence times and low mixing with the mainstem flow. The largest effects are
 53 expected in the first few years of operation and decrease over time as organic sediment
 54 loads decrease and as labile carbon is consumed. Along the mainstem, dissolved organic
 55 carbon is not expected to increase notably since conditions will be similar to the existing
 56 environment where the concentration of dissolved organic carbon in Gull Lake is
 57 determined by concentrations in the inflow.

58 *3. How will change in flow regime of the Nelson River impact carbon cycles?*

59 *4. Did Manitoba Hydro conduct a cumulative carbon cycle analysis for the construction*
 60 *and operation phases of the Keeyask Project, which incorporates both terrestrial and*
 61 *aquatic carbon cycle data and mechanisms?*

62 The flow regime for inflows to the reservoir is expected to be similar to existing
 63 conditions (PE SV Sec. 4.4.2.1); however, creation of the reservoir and flooding of
 64 peatlands will affect the carbon cycle. Changes to the carbon cycle will be most notable
 65 in backbay areas where the majority of the flooded peat is located while conditions
 66 along the mainstem will be similar to existing conditions since high flow rates along the

²² Mainstem: The unimpeded, main channel of a river.

²³ Backbay: Area in a river or stream isolated from the main flow where water velocities are typically low or nonexistent.

67 mainstem will be sustained. As noted above, dissolved organic carbon will increase in
 68 backbay areas. Additional water quality conditions that may be influenced by the
 69 carbon cycle are considered in the AE SV, including pH (Sec. 2.5.2.2.4), true colour (Sec.
 70 2.5.2.2.7), water clarity (Sec. 2.5.2.2.8), nutrients (Sec. 2.5.2.2.9) and metals (Sec.
 71 2.5.2.2.11). Changes in water quality, incorporating effects on the carbon cycle, are
 72 considered in other aquatic processes affected by the Project: for example, predicted
 73 small to moderate increases in the biomass of phytoplankton (Resp. to EIS Guidelines,
 74 Sec.6.4.4.1.2) and zooplankton (Resp. to EIS Guidelines, Sec.6.4.5.1.3). Conversely, other
 75 processes may be reduced, for example a predicted reduction in filamentous algae
 76 (Resp. to EIS Guidelines, Sec.6.4.4.1.2).

77 The carbon cycle is a complex process involving the movement of carbon within the
 78 environment (aquatic, terrestrial and atmospheric) in a variety of forms through a web
 79 of interconnected biotic and abiotic processes. While the Keeyask environmental
 80 assessment studies did not include a full carbon cycle analysis, important components
 81 (outputs, effects) of this cycle were considered in various areas of the assessment. The
 82 components considered were those required to facilitate the assessment of Project
 83 effects on the valued ecosystem components (VECs, listed in Response to EIS Guidelines,
 84 Appendix 6C). Components of the carbon cycle that were considered are noted below.

- 85 • As noted above, the aquatic assessment considered likely effects of the Project on
 86 organic carbon (AE SV, Sec. 2.5.2.2.6), interactions with other water quality
 87 parameters, and effects of these changes on other aquatic factors such as
 88 phytoplankton and aquatic plants.
- 89 • A key output of the complex carbon cycle is greenhouse gas emissions that include
 90 carbon dioxide (CO₂) and methane (CH₄). Technical Memorandum GN 9.5.5 (A Life
 91 Cycle Assessment of Greenhouse Gases and Select Criteria Air Contaminants;
 92 provided in the CD included with the Responses to Interrogatories, CEC Round 1)
 93 presents the details on the quantification of life cycle GHG emissions including the
 94 terrestrial and aquatic land use changes that were considered. Technical
 95 Memorandum GN 9.5.6 (Reservoir Greenhouse Gases; provided in the CD included
 96 with the Responses to Information Requests – CEC Round 1) provides the
 97 methodology and estimates associated with the reservoir GHG emissions that were
 98 incorporated into the life cycle assessment.
- 99 • An important effect of the carbon cycle is the potential reduction of dissolved
 100 oxygen in the water due to the decay and consumption of organic matter. This
 101 exerts biochemical and sediment oxygen demands that consume dissolved oxygen
 102 from the water column. Project effects on dissolved oxygen were modeled (Resp. to
 103 EIS Guidelines, Sec. 6.3.10) and the results were used in the assessment of Project
 104 effects on the aquatic environment (e.g., water quality, Resp. to EIS Guidelines, Sec.
 105 6.4.3.1.2).

- 106 • In the terrestrial environment carbon-cycle, the peatland wetland types generally
107 function as both sources of CO₂ and CH₄ emissions and sinks where carbon
108 accumulates or is stored. Wetland function is a terrestrial environment VEC that was
109 assessed to identify how the Project may affect the range of wetland functions
110 including carbon storage (Terrestrial Environment Supporting Volume, Sec. 2.8.2.4).
111 The ability to store carbon is one of several wetland functions that are considered
112 when evaluating the degree to which a wetland type contributes to overall wetland
113 function. For existing wetlands that are not within the future reservoir shoreline,
114 this assessment concluded that residual Project effects on wetland function are
115 within regionally acceptable limits (Terrestrial Environment Supporting Volume
116 2.8.4.3).

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 1.0 Introduction; p. N/A**

3 **CEC Rd 1 PFN-0025**

4 **PREAMBLE:**

5 The lake sturgeon stocking program is indirectly discussed in the EIS materials, using
 6 generalities; no actual program is proposed with time-lines, goals, objectives,
 7 methodology, etc. Various aspects of a stocking program are discussed, and the
 8 material provides context but no actual information on the program itself. Assessment
 9 of sturgeon stocking program success requires a minimum of 15-20 years (generation
 10 time for lake sturgeon) to obtain accurate results.

11 What is proposed within the EIS materials is a plan that consists of the following stages;
 12 planning, pre-implementation phase and next-steps (2012-2037). The next steps phase
 13 involves conducting a preliminary lake sturgeon stocking trial in spring 2012. It states
 14 that following the preliminary trial, a ten-year plan to encompass the construction
 15 phase of the Keeyask project, would be developed.

16 **QUESTION:**

17 Please respond to the following questions:

- 18 1. Provide the results of the preliminary sturgeon stocking trial conducted in spring of
 19 2012.
- 20 2. How will sturgeon populations be monitored to determine type or if a stocking
 21 program is required?
- 22 3. Provide a description of the sturgeon stocking program complete with time-lines,
 23 goals (long-term and short-term), objectives, methodology, safety information and
 24 reference materials.
- 25 a. The program should be relevant for both the construction and operation
 26 phase of the project
- 27 b. The program should plan for a stocking program that is in effect for 30, 50
 28 to 100 years.
- 29 c. Ensure that the program is sensitive to overall aquatic ecosystem health.
- 30 d. Ensure that the program is in line with provincial strategies.

31 **RESPONSE:**

- 32 1. *Provide the results of the preliminary sturgeon stocking trial conducted in spring of*
 33 *2012.*

34 In summary, the intent of the 2012 program was to capture mature sturgeon at First
 35 Rapids on the Burntwood River, test the use of a hormone to stimulate gamete
 36 production, and test the gamete collection, handling and transport protocol. In total, 29
 37 Lake Sturgeon were captured immediately downstream of First Rapids; however, of
 38 these, 22 were identified as spawning males but none were suspected to be spawning
 39 females. Therefore, there were no eggs collected from Lake Sturgeon in the Burntwood
 40 River in 2012, and the remainder of the program could not be conducted at this
 41 location. However, immediately prior to the program on the Burntwood River, the field
 42 crew participated in the spawn collection program conducted by Manitoba Conservation
 43 and Water Stewardship and the Nelson River Sturgeon Board on the upper Nelson River
 44 at the Landing River. Female and male sturgeon were collected at this site, and the tests
 45 of the hormone, and the gamete collection, handling and transport protocol (to Grand
 46 Rapids hatchery) were successful.

47 2. *How will sturgeon populations be monitored to determine type or if a stocking*
 48 *program is required?*

49 The Partnership has committed to a 25-year stocking program to mitigate effects of the
 50 Keeyask Project on Lake Sturgeon populations. The duration of this program will be
 51 extended until self-sustaining populations are established in the target areas (upper
 52 Split Lake, Keeyask reservoir, and Stephens Lake). An extensive monitoring program will
 53 be initiated during construction and continue during operation. This program will
 54 include assessment of the adult population size, recruitment, year-class strength and
 55 the proportion of wild vs. hatchery-reared that compose a cohort. The Partnership will
 56 review results of annual monitoring in consultation with Fisheries and Oceans Canada
 57 and Manitoba Conservation and Water Stewardship Fisheries Branch to determine if
 58 stocking needs to continue. The size of the adult population, numbers and length
 59 distribution (as an indicator of age) of spawning fish present each year, growth and
 60 condition of young fish, year-class strength (i.e., whether most year-classes are
 61 represented in young (0-10 year olds) fish), and the presence of wild spawned fish will
 62 all be considered.

63 3. *Provide a description of the sturgeon stocking program complete with time-lines,*
 64 *goals (long-term and short-term), objectives, methodology, safety information and*
 65 *reference materials. a. The program should be relevant for both the construction and*
 66 *operation phase of the project b. The program should plan for a stocking program*
 67 *that is in effect for 30, 50 to 100 years. c. Ensure that the program is sensitive to*
 68 *overall aquatic ecosystem health. d. Ensure that the program is in line with*
 69 *provincial strategies.*

70 The "Keeyask Lake Sturgeon Stocking Strategy – Draft: For discussion with Fisheries and
 71 Oceans Canada and Manitoba Conservation and Water Stewardship" is provided in the

72 AE SV Appendix 1A Part 2. This document outlines proposed methods, program
 73 duration, monitoring, and provides a list of reference documents. The strategy provides
 74 for a three-phased approach: planning phase; pre-implementation phase; and
 75 implementation phase. Work is currently being conducted on topics identified in the
 76 pre-implementation phase. As noted in the document, a detailed plan for the
 77 implementation phase will be developed as information from the pre-implementation
 78 studies becomes available and in consultation with Manitoba Conservation and Water
 79 Stewardship and Fisheries and Oceans Canada. Involvement of these two agencies will
 80 ensure that the program meets requirements in terms of safety (i.e., disease control)
 81 and is in line with the Manitoba Lake Sturgeon strategy. Planning will incorporate
 82 considerations related to ecosystem health, such as selection of brood stock in
 83 consideration of the need to maintain genetic diversity, monitoring to avoid over-
 84 stocking, and disease management.

85 The objectives of the three phases are presented in Section 1.2 of the stocking strategy
 86 and are reproduced below:

87 “Maintaining or developing sustainable lake sturgeon populations in the Project
 88 area following development of the Keeyask GS is an important post-Project
 89 objective. In addition, the overall mitigation program developed for the Keeyask
 90 GS should consider the regional goal of recovery of lake sturgeon in the Nelson
 91 River, with the specific intent that development of the Keeyask GS should not
 92 preclude the recovery of lake sturgeon in the Nelson River, as set out in the DFO
 93 (2010) RPA.

94 During development of the stocking strategy, several information gaps were
 95 identified that need to be addressed before the strategy can be finalized. In
 96 addition, this strategy provides for an adaptive approach, as it is expected that
 97 all aspects of the strategy, including spawn collection, rearing and release, will
 98 be refined as additional information is obtained.

99 The program is comprised of three phases (note that conduct of these phases
 100 may overlap and that phases are not independent):

- 101 1. Planning phase – this phase provides the overall framework for the
 102 program, and refined the objectives to enable creation of a site-specific
 103 plan. During this phase, the need for additional information was identified
 104 and addressed through specific data collection programs. Specific activities
 105 included identification of:
 - 106 a. Target locations for stocking
 - 107 b. Target numbers, fish ages and duration of stocking program
 - 108 c. Source of brood stock

- 109 2. Pre-implementation phase – this phase addresses the practical issues
 110 related to implementation of the stocking program and includes
 111 investigations to address potential issues. It should be noted that additional
 112 requirements for field trials will likely be identified as investigations
 113 continue. Specific activities identified to date include:
 114 a. Assessment of brood stock collection
 115 i. Assessment of numbers of mature fish by spawning location
 116 ii. Assessment of the use of a hormone to facilitate collection
 117 of eggs and milt
 118 b. Assessment of rearing
 119 i. Investigations of potential lake sturgeon diseases and
 120 disease transmission
 121 ii. Evaluation of rearing conditions with respect to
 122 temperature and food supply
 123 c. Monitoring and assessment of post-release success
 124 i. Assessment of survival rates (to enable refinement of
 125 stocking target numbers)
 126 ii. Comparison of survival rates of fingerling and yearling fish
 127 iii. Measurement of movements from area of release
 128 3. Implementation phase – this phase would mark the transition from a
 129 planning/information gathering program to implementation with the
 130 objective of supporting the sturgeon population in the directly affected
 131 area, and assisting in long-term recovery in the Keeyask region. A detailed
 132 plan for this phase will be developed after results of the planning and pre-
 133 implementation phase are available. However, it is recognized that the
 134 implementation phase would be comprised of three stages:
 135 a. Construction – during this phase, priority would be given to stocking
 136 into areas where spawning may be disrupted due to construction
 137 activities, in particular in Stephens Lake and, to a lesser extent, Gull
 138 Lake. The intent would be to improve recruitment during years
 139 when construction related activities may affect spawning success.
 140 b. Operation – this phase would comprise approximately the first two
 141 decades of operation, when the largest physical changes in the
 142 environment are expected. The effectiveness of habitat mitigation
 143 measures and stocking will be assessed during this phase based on
 144 results of monitoring programs aimed at determining recruitment
 145 success, and in particular contributions of hatchery-reared and wild
 146 fish to each cohort. Adjustments to the stocking program may be
 147 necessary based on results of monitoring.

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- c. Long term – stocking in this phase would be designed to provide long-term sustainable populations within MU3. The need for and locations of stocking would depend on the results of monitoring to determine population status.”

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 1.0 Introduction; p. N/A**

3 **CEC Rd 1 PFN-0026**

4 **PREAMBLE:**

5 Lake sturgeon stocking programs are generally part of a larger management and
 6 recovery strategy that involves additional rehabilitation techniques, habitat restoration,
 7 harvest management, enforcement and public awareness. There is currently a Manitoba
 8 Lake Sturgeon Management Strategy (2012) available, developed by Manitoba
 9 Conservation and Water Stewardship. The strategy outlines provincial goals and
 10 objectives for lake sturgeon stocking programs.

11 **QUESTION:**

12 Please respond to the following questions:

- 13 1. Does the Manitoba Hydro lake sturgeon stocking program meet the goals and
 14 objectives of the Manitoba Lake Sturgeon Management Strategy (2012)? If so,
 15 please provide a comparative chart, clearly identifying how all the goals and
 16 objectives are met. If not, then why not?
 17 2. Provide a table outlining all the additional methods employed to sustain the
 18 sturgeon population in the Nelson River region; a. Rehabilitation techniques b.
 19 Harvest management c. Enforcement d. Public awareness e. Aquatic environment
 20 mitigation and monitoring program

21 **RESPONSE:**

- 22 1. *Does the Manitoba Hydro lake sturgeon stocking program meet the goals and*
 23 *objectives of the Manitoba Lake Sturgeon Management Strategy (2012)? If so,*
 24 *please provide a comparative chart, clearly identifying how all the goals and*
 25 *objectives are met. If not, then why not?*

26 By the “Manitoba Hydro lake sturgeon stocking program” it is assumed that the
 27 reviewer is referring to the Keeyask Lake Sturgeon Stocking Strategy developed by the
 28 Partnership.

29 The overall Lake Sturgeon management goals, as listed in the Manitoba Lake Sturgeon
 30 Management Strategy are:

- 31 • To ensure that existing populations are protected from depletion.
 32 • In areas with suitable habitat, restore Lake Sturgeon populations to levels where
 33 they can be considered stable and self-sustaining.

34 The proposed stocking program addresses the second goal, as stocking is one of, and
35 arguably, the most effective means of restoring severely depleted populations where
36 habitat is available.

37 As requested by the reviewer, a comparative table outlining how the stocking strategy
38 meets the provincial goals and objectives is provided below. Given that many of the
39 goals and objectives extend beyond the issue of stocking, responses reflect work
40 associated with the Keeyask Project assessment, mitigation and monitoring.

Manitoba Provincial Lake Sturgeon Management Objectives Keyask Stocking Program

<i>Sturgeon Boards</i>	
1. Continue to support the work of the Nelson River Sturgeon Board and Saskatchewan River Sturgeon Management Board.	Working with Nelson River Sturgeon Board at the Landing River spawn collection site and sharing information on all study results.
2. Increase representation on the boards by inviting other First Nations and communities on the rivers to join.	Not applicable
3. Continue efforts to establish a sturgeon board for the Winnipeg River.	Not applicable
4. Working in cooperation with the sturgeon boards to develop stock specific management plans where they are desirable.	Not applicable
5. Assist Resource Management Boards with a mandate for resource management planning in developing plans to manage lake sturgeon stocks in their Resource Management Areas. Where the interests of sturgeon boards and Resource Management Boards overlap, Fisheries Branch will work to integrate their actions and plans where possible.	Not applicable
<i>Stock Assessment</i>	
1. Continue to work with the Nelson River Sturgeon Board to assess lake sturgeon stocks in the Nelson River upstream of Kelsey Generating Station and remain current on lake sturgeon studies conducted by Manitoba Hydro and its partners on the Nelson River downstream of Kelsey Generating Station.	Working with Nelson River Sturgeon Board and sharing information on all study results.
2. Continue to work with the Saskatchewan River Sturgeon Management Board in the Saskatchewan River.	Not applicable



Manitoba Provincial Lake Sturgeon Management Objectives Keyask Stocking Program

<p>3. Continue to conduct stock assessment on the Winnipeg River and work with researchers and Manitoba Hydro in assessing additional reaches.</p>	<p>Not applicable</p>
<p>4. Undertake or require stock surveys to be undertaken in areas where information is lacking. The following areas are considered priorities: Churchill River: Missi Control Structure to Churchill. Assiniboine River: stocked lake sturgeon. Nelson River East Channel: stocked lake sturgeon. Saskatchewan River: Cedar Lake. Hayes River: utilization by fish also utilizing the Nelson River.</p>	<p>Conducted surveys on the Assiniboine River and the Nelson River east channel to obtain information in support of the stocking plan. Stock surveys have also been completed for portions of the lower Churchill River and selected tributaries of the Hayes River.</p>
<p><i>Lake Sturgeon Culture</i></p>	
<p>1. Develop a Directive on lake sturgeon stocking which addresses issues with the: Suitability of stocking as a management tool in different situations. Identification and protection of suitable brood stocks. Standardization of conditions on Scientific Collection and Live Fish Handling permits to ensure that management objectives are met.</p>	<p>Working with MCWS on issues such as the Scientific Collection and Live Fish Handling permits to ensure that sturgeon are protected.</p>
<p>2. Continue communication with other organizations involved in lake sturgeon culture in order to improve techniques and success rate.</p>	<p>Working with Mr. Joe Hunter from the Rainy River hatchery, researchers at University of Manitoba, Fisheries and Oceans research scientist, MCWS (as noted above)</p>
<p>3. Ensure that conditions on Scientific Collection and Live Fish Handling permits issued for lake sturgeon culture activities are standardized and ensure that the Branch’s management objectives are being met.</p>	<p>Working with MCWS on issues such as the Scientific Collection and Live Fish Handling permits to ensure that sturgeon are protected.</p>



Manitoba Provincial Lake Sturgeon Management Objectives Keyeyask Stocking Program

4. Ensure that all lake sturgeon stocking activities follow existing Introductions and Transfers processes.	Working with MCWS to ensure that this is met (i.e, no transfer between watersheds)
5. Improve spawn taking techniques to enhance yields and consistency while minimizing stress on brood fish.	On-going assessment during preliminary phase of stocking strategy.
6. Examine the degree to which imprinting during rearing and spawning site fidelity are issues and how they could impact stocking success.	Not being conducted – may be a research program if stocked fish are observed to leave the area
7. Determine the optimal size for stocking (fry, fingerling, yearling, et cetera)	Work on-going (survey at stocking sites on the upper Nelson River)
8. Improve culture techniques, including optimizing feeding, density and temperature factors.	Work is on-going at the Grand Rapids hatchery, including feeding trials using formulated diets.
<i>Genetic Integrity</i>	
1. Consult with experts and other jurisdictions to establish current best practices. Use these practices to establish guidelines and ensure that they are followed for lake sturgeon culture and stocking in Manitoba.	Stocking strategy references guidelines developed for other jurisdictions.
2. Support efforts to determine the degree to which different lake sturgeon stocks differ genetically and the degree of diversity within those stocks.	On-going genetics studies being conducted in support of the Keyeyask stocking strategy.
3. In the absence of specific information on the genetic structure of existing stocks, stocking should be limited to within Designatable Units (DUs).	Stocking will be conducted within a single DU.
<i>Disease</i>	
1. Support research that determines the extent to which lake sturgeon herpesvirus and iridovirus are endemic in wild populations.	Research is being conducted by a Fisheries and Oceans scientist in support of the Keyeyask stocking strategy.

Manitoba Provincial Lake Sturgeon Management Objectives Keyask Stocking Program

<p>2. Support the development of practical tests for these diseases that can be used to screen brood sources and eggs before admitting them into a hatchery.</p>	<p>Research is being conducted by a Fisheries and Oceans scientist. A test for the namao virus has already been developed and is now being refined for commercial use.</p>
<p>3. Develop a Directive and implement protocols to reduce the risk for transmission of these diseases both within hatcheries and back into the wild.</p>	<p>Stocking strategy will follow directive.</p>

Fish Passage

<p>1. Continue to monitor developments in upstream fish passage designs. At this time there are no feasible designs for lake sturgeon passage on the scale needed to address the kind of facilities found in Manitoba. This is an area of active research within North America and a continual effort to keep current is necessary.</p>	<p>Partnership is working in cooperation with Fisheries and Oceans Canada and Manitoba Conservation and Stewardship to address fish passage at the Keeyask Generating Station. Work will involve experimental transport programs to test the response of translocated fish.</p>
<p>2. If a feasible design is developed, consider whether or not fish passage should be established on a site-specific basis with respect to Manitoba's fisheries management objectives.</p>	<p>The need for and development of fish passage at the Keeyask site will consider Manitoba's fisheries management objectives.</p>
<p>3. Encourage research examining the tendency of lake sturgeon to move downstream over barriers.</p>	<p>Monitoring at the Keeyask Project will include tracking of Lake Sturgeon in the reservoir and would record downstream movements.</p>

Water Regime

<p>1. To develop a better understanding of habitat availability and lake sturgeon use in the following reaches: (i) Lower Churchill River in the vicinity of the mouth of the Little Churchill - this is an important population in an area that is potentially extremely limiting. Conditions in dry years may be even more limiting.</p>	<p>Surveys of habitat and Lake Sturgeon in the lower Churchill River and the lower Nelson River are being conducted for other programs, but not directly the Keeyask Project.</p>
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Manitoba Provincial Lake Sturgeon Management Objectives Keyyask Stocking Program

(ii) Lower Nelson River downstream of Limestone Generating Station - this area is subject to daily changes in flows as the upstream generating stations meet peak demands. This results in significant dewatering of habitat in the area immediately downstream of Limestone Generating Station.

(iii) Nelson River downstream of Whitemud Falls - This area is subject to seasonal flow changes arising from Jenpeg Generating Station and Lake Winnipeg regulation. Flows typically decline in the spring and summer, dewatering large stretches of habitat in this reach.

Habitat Enhancement

1. Stay current on literature and methods from other jurisdictions. Examine these for opportunities to apply these methods in Manitoba.

The Partnership is remaining abreast of on-going developments.

2. Stay current on research being conducted by Manitoba Hydro and consider the application of this research at existing and proposed future generating stations.

The Partnership and Manitoba Hydro are sharing results of research with MCWS.

Future Hydroelectric Development

1. Ensure that Fisheries Branch possesses the information and expertise to contribute to environmental review of future hydroelectric projects.

The environmental assessment conducted for the Keyyask Project collected detailed information on affected Lake Sturgeon populations and has worked closely with MCWS to discuss the effects, mitigation and monitoring.



1 2. Provide a table outlining all the additional methods employed to sustain the sturgeon population in the Nelson River region.

2 The additional methods employed by Manitoba Hydro to sustain the sturgeon populations in the Nelson River region are part of

3 a province-wide program. Included in the technical reports provided as additional information to the Keeyask EIS is a 2012

4 report on Manitoba Hydro’s Lake Sturgeon Stewardship and Enhancement Program (LSSEP). The LSSEP represents a long-term

5 commitment and incorporates research, monitoring, stocking and mitigation activities already underway and expanding. Work

6 under the LSSEP is geographically extensive – being conducted in the Nelson, Churchill, Saskatchewan, Winnipeg, Assiniboine

7 and Hayes rivers – and collaborative – involving First Nations, sturgeon boards/committees, academic researchers, DFO,

8 Manitoba Conservation and Water Stewardship, and hired consultants. The following table is excerpted from the LSSEP report

9 and summarizes activities conducted by Manitoba Hydro to support the recovery of Lake Sturgeon in the Nelson River. MCWS is

10 also conducting activities in the region.

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
Nelson River - below Kelsey GS					
Population and Habitat Studies	Split Lake (including Burntwood and Grass rivers), Clarke Lake, Gull Lake, Stephens Lake, Long Spruce Forebay, Limestone Forebay, Lower Nelson River,	1986-2010	FLCN, CNP, YFFN, MFB, consultants	Collect information on relative abundance, size and condition, population estimates, movements, and identify important habitats (spawning, nursery)	These studies have made a significant contribution to our current understanding of populations and habitat in the Nelson River, and have also made significant contributions in understanding Lake Sturgeon ecology in Manitoba. These studies provide a foundation of information that will be used to identify, develop, and implement mitigation and

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
	Angling Lake				compensation measures.
Spawning Studies	Limestone GS, Lower Limestone Rapids, Angling River, Weir River, Split Lake, Gull Lake	1988-2010	YFFN, CNP, FLCN, consultants	Characterize the spawning populations and habitats	These studies have evaluated the abundance of spawning sturgeon and identified known and suspected spawning locations. These results will help to identify, develop and implement mitigation and/or compensation measures. The characterization of the known spawning habitat has contributed to the understanding of spawning habitat requirements for sturgeon.
Juvenile Studies	Split Lake (including the Burntwood and Grass rivers and Clark Lake), Gull Lake, Stephens Lake (including the base of Gull	2006-2010	consultants, YFFN, CNP, FLCN	Collect information on juvenile relative abundance, habitat preferences, size and condition data	Evaluating the presence/abundance of juveniles provides an indication that adults are spawning successfully, and appropriate juvenile habitat is available. Previous to this work (and research funded by MH),

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
	Rapids), Long Spruce Forebay, Limestone Forebay, Lower Nelson River below Limestone GS				juvenile habitat was not well understood in large rivers. This work has made significant contributions to our understanding of juvenile sturgeon habitat requirements. This information will be critical to recovery planning and the development/ implementation of future habitat enhancements.
Movement Studies	Clark Lake to Stephens Lake Radio and Acoustic Telemetry, Limestone Forebay and Lower Nelson River Acoustic and Radio telemetry	1986-2009, 2011	MFB, consultants, FLCN, CNP, YFFN	Collect information on spawning habitats, movement patterns (including movements over Birthday and Gull Rapids), and increase our understanding of adult and juvenile habitat preferences	Studying the movement of sturgeon in this reach has determined that most sturgeon reside in a fairly small home range. Although several Lake Sturgeon moved through Gull Rapids, these observations were not during the spawning season, and may have been incidental or due to foraging. These studies have not produced evidence to suggest that Lake Sturgeon in Stephens Lake migrate past Gull Rapids to spawn. These studies

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
					suggest that provision of passage may not be necessary or beneficial for the sustainability of the downstream or upstream populations of Lake Sturgeon.
TK Studies	Lower Nelson River	2007	FLCN	Record traditional knowledge and cultural importance of sturgeon to FLCN	These traditional knowledge studies have provided information on Lake Sturgeon populations and habitat that will be useful in planning mitigation and compensation measures, and will contribute to a general understanding of the species and populations in the Nelson River.
Nelson River - above Kelsey GS					
Population and Habitat Studies	Cross Lake to Kelsey GS	1993-2011	NRSB	Determine relative abundance, size and condition, habitat preferences and generate a	The NRSB has completed many studies on populations and habitat on the Nelson River upstream of the Kelsey GS, which have made substantial

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
				population estimate	contributions to the understanding of Lake Sturgeon in this reach. These studies have helped to evaluate the recovery potential and provide a foundation for identification, development and implementation of recovery actions.
Population and Habitat Studies	Nelson River from Sea Falls to Pipestone Lake	2011	consultants	Determine the relative abundance and population structure of Lake Sturgeon to examine the success of 10 years of sturgeon stocking by NRSB (postponed to 2012 due to high flow conditions)	This study will provide information on Lake Sturgeon population and habitat in an area where little is known about the sturgeon population. The abundance of sturgeon will give some indication of the success of the conservation stocking efforts of the NRSB, which will be relevant to future stocking programs.

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
Spawning Studies	Landing River	1993-1997	NRSB	Characterize the spawning population, size and condition, and evaluate habitat	These spawning studies identified the presence and abundance of spawning sturgeon in the Landing River area. This information helped to plan conservation stocking efforts undertaken by the NRSB.
Spawning Studies	Playgreen Lake	1995	consultant	Document historical and potential Lake Sturgeon spawning habitat	Knowledge of historical spawning habitats will help to understand habitat required for spawning, and to identify areas that could be used (or enhanced to be made suitable) for spawning in the future.
Movement Studies	Sipiwesk Lake to Kelsey GS Radio Telemetry		NRSB	Delineate populations and determine habitat preferences	Determining the extent to which Lake Sturgeon move within a river will help to determine the normal home range of a Lake Sturgeon, and to assess the habitat types used by Lake Sturgeon.

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
Harvest Studies	Landing River, Bear Island, Cross Lake	1993-1997	NRSB, UM/NRI	Generate a domestic harvest estimate, for consideration in stock management	Domestic harvest, on a depleted sturgeon population is a threat to the recovery of Lake Sturgeon. Determining the level of harvest (and the level of the threat) is critical for effective recovery planning for sturgeon, and may be used in the future in the management of domestic harvest.
TK Studies	Sipiwesk Lake to Split Lake – Wabowden/ Thicket Portage/ Pikwitonei	1997	NRSB/UM/NRI	Assemble historical documents and record traditional knowledge, collect information on the commercial fishery, and increase public awareness	Quantification of the commercial harvest will be useful in describing the populations prior to/during commercial harvest, and therefore provide a greater understanding of the impact of commercial harvest on Lake Sturgeon populations.
TK Studies	Cross Lake	1998-2002	UM/NRI	Record traditional knowledge, increase public awareness	These traditional knowledge studies have provided information on Lake Sturgeon populations and habitat that will

Table 2: Summary of population and habitat studies and activities completed by Manitoba Hydro to support the recovery of Lake Sturgeon in Manitoba.

Activity	Waterbodies	Year(s)	Participants	Objectives	Relevance for Sturgeon Recovery
					be useful in planning mitigation and compensation measures, and will contribute to a general understanding of the species and populations in the Nelson River.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 1.2.2.4 Selection of VECs; p. Table 1-1**

3 **CEC Rd 1 PFN-0027**

4 **PREAMBLE:**

5 VECs are selected in order to act as indicators of ecosystem health. Aquatic VECs
 6 selected include; water quality, walleye, northern pike, lake sturgeon and lake whitefish.
 7 All other potential VECs were not selected on the basis that they were not deemed
 8 important for resource use by local people. The fish species selected as VECs are higher
 9 up in the foodchain, and therefore will take longer to respond to subtle changes in the
 10 aquatic environment compared to other ecosystem components. Furthermore,
 11 quantifying simply the number of fish in a given area is not a measure of ecosystem or
 12 VEC health. Specific parameters of the VEC aside from mercury concentrations must be
 13 assessed; reproductive capability, size, general health, etc, need to be measured and the
 14 culmination of those measured results be compared in a matrix to determine overall
 15 VEC health.

16 **QUESTION:**

17 Please answer the following questions:

- 18 1. Explain the rationale behind selecting only the ecosystem components that are
 19 regarded as important for resource as the aquatic VECs? a. How does this rationale
 20 support the purpose of selecting VECs to monitor and measure ecosystem health?
 21 2. Are the VECs selected strong/appropriate indicators of ecosystem health? Explain.
 22 3. What parameters of the VECs are being measured to determine the health and
 23 vitality of the VEC? a. Provide the data in matrix format off what particular biological
 24 parameters of each VEC are being measured and how those parameters are being
 25 quantified for comparison to baseline data?

26 **RESPONSE:**

27 The aquatic VECs were selected on the basis of the six criteria listed in the Response to
 28 EIS Guidelines Section 5.3.1: overall importance/value to people; key for ecosystem
 29 function; umbrella indicator; amenable to scientific study in terms of analysis of existing
 30 and post-Project conditions; potential for substantial Project effects; and regulatory
 31 requirements.

32 The ecosystem-based approach as it applies to the aquatic environment is discussed in
 33 the Aquatic Environment Supporting Volume Section 1.2. As discussed in this section, a
 34 range of ecosystem components were studied based on their role in the ecosystem and
 35 linkages to Project effects (see AE SV Section 1.2.2.3 for further discussion). The VECs

36 were a subset of these components and were selected on the basis of the six criteria
37 listed above (see AE SV Section 1.2.2.4 for further discussion). It should be noted that
38 the environmental assessment and future monitoring will address effects to VECs and as
39 well as other environmental components, referred to as supporting topics, that have
40 been identified as being important to the understanding of Project effects on the
41 environment.

42 The parameters that are being measured for each VEC during post-Project monitoring
43 will include those that were measured during the environmental assessment. For
44 example, for VEC fish species, monitoring will include estimates of relative abundance,
45 condition factor and length-at-age relationships.

1 **REFERENCE: Volume: Physical Environment Supporting Volume;**
2 **Section: 2.1 Climate Change reference to IPCC 2001; 2.2.1.2**
3 **Climate Change Future Scenarios Date to 2001; p. N/A**

4 **CEC Rd 1 PFN-0028**

5 **QUESTION:**

6 The EIS makes an assumption of no change in variability or frequency of weather events
7 compared to present day (pg. 100). "It is contradictory to use climate modeling that
8 assumes no change in variability, yet changes in variability are predicted. This
9 contradicts the IPCC that states, "type, frequency and intensity of extreme storm events
10 are expected to change as earth's climates changes" (pg 111).

- 11 • What does Manitoba Hydro see as the variability of weather and climate in the
12 region, based on IPCC statement above?

13 **RESPONSE:**

14 Please see response to CEC Rd 1 PFN-0023.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.4.8 Mercury in Wildlife; p. N/A**

3 **CEC Rd 1 PFN-0029**

4 **QUESTION:**

- 5 1. What are the results from the 'historic records for mercury concentration in
6 indicator species' near the RSA ?
7 2. Have any studies regarding mercury concentration in mink, or otter in the RSA, or
8 LSA prior to filing the Keeyask EIS?
9 3. Have any studies regarding mercury concentration in these and other mammals
10 been done since those cited in this section of the EIS?

11 **RESPONSE:**

12 Responses for each question are provided below.

- 13 1. *What are the results from the 'historic records for mercury concentration in indicator*
14 *species' near the RSA?*
15 2. *Have any studies regarding mercury concentration in mink, or otter in the RSA, or*
16 *LSA prior to filing the Keeyask EIS?*

17 Historical results of mercury concentrations in indicator species (mink and river otter)
18 near the Regional Study Area can be found in TE-SV-8.0, Section 8.4.3.1, p. 8-26. Studies
19 referenced in this section were done prior to filing of the Keeyask EIS.

- 20 3. *Have any studies regarding mercury concentration in these and other mammals*
21 *been done since those cited in this section of the EIS?*

22 One additional sample was collected from a caribou following those cited in the EIS. This
23 sample is currently being processed in the laboratory. Future monitoring will include
24 sampling of beaver, muskrat, mink and river otter, annually, until mercury
25 concentrations have reached their maximum, then every three years afterwards until
26 levels reach pre-impoundment levels, up to 30 years (TE-SV-8.0, Section 8.4.4.4, Table 8-
27 18. P. 8-40). For more detail please see the preliminary draft of the Terrestrial Effects
28 Monitoring Plan available at Keeyask.com.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 PFN-0030**

4 **QUESTION:**

5 The EIS indicates on page 6 – 29 that “river flows to the LSA originate from the Upper
6 Nelson River, the Burntwood River and the local inflow.

7 Will Manitoba Hydro made available statistics or data for these rivers flows, over time?
8 This request is in an IR based on the preference of the Keeyask project managers and is
9 to be used in the Land and Water Changes analysis, funded by CEC.

10 **RESPONSE:**

11 Please see CEC Rd 1 PFN-0031 for the existing environment Split Lake outflow data and
12 statistics. Environment Canada provides daily discharge data, free of charge, to the
13 public for the Nelson and Burntwood Rivers. The table included in this response lists the
14 site names, site IDs and years where data is available. The data can be downloaded from
15 the following Environment Canada website:

16 <http://www.wsc.ec.gc.ca/applications/H2O/index-eng.cfm>

17

Burntwood River

Station ID	Station Name	Data Years	Data Type
05TE001	Burntwood River Above Three Point Lake	1977 - 1985	Flow
05TE002	Burntwood River Above Leaf Rapids	1985 - 2011	Flow & Level
05TG001	Burntwood River Near Thompson	1956 - 2011	Flow & Level
05TG005	Burntwood River Above Manasan Falls	1989 - 2011	Level

Nelson River

Station ID	Station Name	Data Years	Data Type
05UB001	Nelson River At Norway House	1913 - 2010	Level
05UB002	Nelson River Near Warren Landing	1957 - 1973	Level
05UB003	Nelson River At Warren Landing	1959 - 1987	Level
05UB005	Playgreen Lake At Entrance To East Nelson River	1967 - 2010	Level
05UB008	Nelson River (East Channel) Below Sea River Falls	1967 - 2010	Flow
05UB009	Nelson River (West Channel) At Jenpeg	1967 - 2010	Flow
05UD004	Nelson River Above Bladder Rapids	1958 - 1994	Flow
05UE004	Nelson River Below Sipiwesk Lake	1951 - 1958	Flow
05UE005	Nelson River At Kelsey Generating Station	1960 - 2010	Flow
05UF006	Nelson River At Kettle Generating Station	1987 - 2010	Flow
05UF007	Nelson River At Long Spruce Generating Station	1987 - 2010	Flow

- 18 Hydrometric data collected over the last year at Manitoba Hydro's monitoring network
 19 is publicly available from Manitoba Hydro's website:
 20 http://www.hydro.mb.ca/corporate/water_regimes/hydrological_data.shtml
 21 Additional water regime information including some data and statistics can be found in
 22 Physical Environment Supporting Volume Section 4 and Appendices.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
2 **6.2.3.2.6 Surface Water and Ice Regime; p. N/A**

3 **CEC Rd 1 PFN-0031**

4 **QUESTION:**

5 The pattern of discharge flows from Split Lake 1977 – 2006 are provided on Figure 6 – 3,
6 and discussed on page 6 – 29.

7 Will Manitoba Hydro make available the statistics or data for this discharge flow
8 information over time? This request is in an IR based on the preference of the Keeyask
9 project managers and is to be used in Land and Water Change analysis, funded by the
10 CEC.

11 **RESPONSE:**

12 The following table is the existing environment flow data (m^3/s) that is represented in
13 Figure 6-3 of the Response to EIS Guidelines. Note that the table includes monthly
14 average flows and Figure 6-3 illustrates daily average flows. The statistics for this flow
15 data are provided in the Physical Environment Supporting Volume Table 4.3-1.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1977									2083	2236	2809	2881	
1978	2820	2804	2997	2625	2331	2231	2271	2375	2455	3352	3663	3625	2796
1979	3574	3633	3586	3228	4026	5266	5277	4201	2574	2866	3481	3364	3759
1980	3159	3111	3316	3181	2510	2077	1981	2108	2494	2869	3185	3169	2762
1981	3183	3298	2959	1971	2228	2007	2448	2113	2293	2569	3140	2995	2597
1982	2564	2570	2461	2380	3184	2474	2378	2607	2964	3523	3551	3484	2847
1983	3355	3258	3119	3166	3180	3041	2829	2888	2914	3191	3497	3286	3143
1984	3340	3252	3319	3216	2949	2914	2797	2670	2599	2855	3039	3245	3016
1985	3144	3246	2918	2950	3356	3104	3268	2969	3049	3311	3463	3569	3196
1986	3787	3794	3677	3340	4946	5191	4444	3229	3134	3292	3389	3686	3827
1987	3607	3425	3365	3212	3021	2420	2399	2228	2344	2475	2791	2873	2844
1988	2750	2745	2575	2019	2769	2176	1756	1683	1700	1895	2227	2303	2216
1989	2229	2186	2122	2004	2398	1882	2026	2398	2605	2723	2756	2861	2351
1990	2915	2772	2569	2159	2566	2550	2246	2176	2437	2767	2898	2826	2572
1991	2647	2493	2325	2213	2497	2136	2183	2235	2190	2473	2652	2590	2386
1992	2751	2777	2616	2422	2755	2595	2317	2336	2507	3715	3816	3353	2830
1993	3351	3569	3280	2518	2074	1656	1809	2606	4097	3596	2960	3478	2912
1994	3614	3426	3107	2801	3064	2594	2716	2706	2655	2892	3063	3088	2976
1995	3349	3238	3134	3117	3002	2837	2556	2954	3103	3391	3200	3111	3082
1996	3159	3059	3049	2974	3518	4657	5082	4597	3291	3585	3408	3729	3680
1997	3609	3666	3777	3807	4481	5381	5357	4840	3731	3594	3884	4029	4184
1998	3992	3955	3710	3694	3774	4063	4246	3726	2882	2842	2854	2829	3546
1999	2846	2925	2654	2664	2582	2775	2756	2680	2784	3078	3114	3162	2834
2000	3300	3495	3391	3242	3072	2801	3376	3500	3617	3753	3680	3540	3397
2001	3793	3943	3804	3498	4433	4727	4998	4329	3605	3542	3477	3378	3962
2002	3502	3194	3000	2656	2817	3092	3141	3333	3276	3204	3046	3247	3126
2003	3253	2978	2844	2431	2294	1941	1938	1878	1499	1401	1574	1828	2151
2004	1834	1890	1980	1781	2178	2929	3451	3351	3300	3608	3829	3618	2816
2005	3909	4265	4103	4331	5058	5804	6046	6388	6491	5961	4400	4143	5080
2006	4179	4249	4340	4521	5084	5183	4515	4275	3392	2562	2635	3289	4018
Mean	3225	3214	3107	2901	3177	3190	3193	3082	2936	3104	3183	3219	3114
Min	1834	1890	1980	1781	2074	1656	1756	1683	1499	1401	1574	1828	2151
Max	4179	4265	4340	4521	5084	5804	6046	6388	6491	5961	4400	4143	5080

1 **REFERENCE: Volume: Project Description Supporting Volume;**
 2 **Section: 4.1 Overall System Effects; p. N/A**

3 **CEC Rd 1 PFN-0032**

4 **PREAMBLE:**

5 The EIS materials state that the Churchill River Diversion (CRD) and the Lake Winnipeg
 6 Regulation (LWR) determine the seasonal flow patterns in the Nelson and Burntwood
 7 rivers, and consequently the flows available for all the generation stations along those
 8 rivers, including Keeyask.

9 **QUESTION:**

10 Answer to the following questions:

- 11 1. Will there be no change in water levels to the Keeyask reservoir arising from the
 12 LWR and/or CRD.
- 13 2. Under special operating conditions or emergencies, can the CRD or LWR be used to
 14 augment river flows to support power generation for facilities along the Nelson
 15 River?
- 16 3. Confirm that there will be no increase to LWR water levels in order to support
 17 seasonal flows for Wuskwatim, Keeyask and Conawapa.

18 **RESPONSE:**

19 Each of the above questions is answered below.

- 20 1. *Will there be no change in water levels to the Keeyask reservoir arising from the LWR*
 21 *and/or CRD.*

22 As explained in the Project Description Supporting Volume Sections 4.2.1 (Peaking Mode
 23 of Operation) and 4.2.2 (Base Loaded Mode of Operation) the Keeyask reservoir will
 24 fluctuate within a 1 m operating range during peaking or base load modes of operation.
 25 Within the 1 m operating range, the level is dependent on inflow conditions and the
 26 requirements of Manitoba Hydro's Integrated Power System to meet the power
 27 demands at any given time. The reservoir would not deviate outside of the 1 m
 28 operating range because of LWR and CRD operations. LWR and CRD establish the
 29 monthly inflow pattern to Keeyask and make up the majority of the inflows to the
 30 Project, as compared to the relatively smaller local tributary inflows from downstream
 31 of LWR and CRD.

32 2. *Under special operating conditions or emergencies, can the CRD or LWR be used to*
 33 *augment river flows to support power generation for facilities along the Nelson*
 34 *River?*

35 Special or Emergency operating conditions are expected to be short term (hours or
 36 days), in most cases. Flows resulting from changes to LWR and CRD operation take
 37 weeks to travel to the Keeyask site and at the other lower Nelson River generating
 38 stations. For this reason CRD and LWR are not able to augment Nelson River flows in
 39 response to immediate power generation losses (such as load rejections, as identified in
 40 Project Description Supporting Volume Sections 4.2.3).

41 3. *Confirm that there will be no increase to LWR water levels in order to support*
 42 *seasonal flows for Wuskwatim, Keeyask and Conawapa.*

43 No changes to the operating licences /conditions of LWR are anticipated either to
 44 support flows for Wuskwatim, Keeyask and Conawapa, or for other reasons. Lake
 45 Winnipeg Regulation water levels are influenced by factors including water inflows,
 46 energy supply and energy demand. In accordance with existing licences/conditions,
 47 Lake Winnipeg Regulation (LWR) is used by Manitoba Hydro to balance
 48 seasonal/monthly supply and demand of energy. The Wuskwatim, Keeyask and
 49 Conawapa generation projects will be operated as part of Manitoba Hydro's integrated
 50 system within the constraints of licences granted for its facilities, including the Lake
 51 Winnipeg Regulation licence.

52 Wuskwatim, Keeyask and Conawapa are not anticipated to change the range of water
 53 levels previously experienced in relation to LWR. Consistent with historical
 54 observations, Manitoba Hydro expects the monthly average water levels will change
 55 from year to year within the range of historic levels, on the assumption that the ranges
 56 of inflows remain the same as historical flows.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.5.3.1 Construction Period; p. N/A**

3 **CEC Rd 1 PFN-0033**

4 **PREAMBLE:**

5 EIS materials indicate that the greatest increase in total suspended solids (TSS) in
 6 Stephens Lake will occur during the construction phase of the Keeyask project.
 7 However in the materials that reference Stephens Lake TSS (2.5.2.3.4 total Suspended
 8 Solids/Turbidity), there is no reference to an increase in TSS during the construction
 9 period. The construction phase of the project involves dewatering areas within
 10 Stephens Lake, building cofferdams and other infrastructure. Even though large
 11 amounts of water will not be moving into Stephens Lake during the construction phase,
 12 it is unreasonable to state that there will be no disturbance to sediment nor
 13 introduction of TSS.

14 **QUESTION:**

15 Please respond to the following questions:

- 16 1. Explain why TSS within Stephens Lake, was not considered as a contributing factor in
 17 causing turbidity during the construction phase of the Keeyask Project?
 18 2. Provide a description of the water quality monitoring program for Stephens Lake
 19 during the construction period of the Keeyask Project.
 20 3. How frequently will Stephens Lake be monitored during the construction phase of
 21 the project for increased TSS and sediment?

22 **RESPONSE:**

23 The pre-amble indicates that Section 2.5.2.3.4 of the Aquatic Environment Supporting
 24 Volume (AE SV) does not reference total suspended solids (TSS) increases during
 25 construction. This is because the section referenced deals with operation phase effects
 26 on TSS. Construction phase effects are discussed in Section 2.5.1 of the AESV, and a
 27 detailed discussion of predicted effects of the Project on TSS during construction is
 28 provided in Section 2.5.1.1. This includes a discussion of predicted effects on TSS in
 29 Stephens Lake during construction. The referenced section did not state there would be
 30 no disturbance to sediment nor introduction of TSS: however, it does state that during
 31 operation TSS concentrations released downstream from Keeyask into Stephens Lake
 32 will be lower than concentrations that would be expected without the Project.

33 Additionally, the dewatered areas will not be within Stephens Lake proper. There will be
 34 a dewatered within the tailrace summer cofferdam during construction just
 35 downstream of Gull Rapids and in Gull Rapids downstream of the south dam during

36 construction and operation (see locations in Response to EIS Guidelines, Map 4.-17 and
37 4-18).

38 Each of the specific questions is answered below.

39 1. *Explain why TSS within Stephens Lake, was not considered as a contributing factor in*
40 *causing turbidity during the construction phase of the Keeyask Project?*

41 Both TSS and turbidity from within Stephens Lake (i.e., not related to the Project) and
42 conditions in the Nelson River inflow from upstream of the Project are contributing
43 factors towards turbidity in the lake during construction. Both contribute to the
44 background TSS/turbidity conditions (i.e., the TSS/turbidity that would otherwise be
45 present without the Project) upon which construction effects to TSS/turbidity are
46 overlaid. The AE SV (Sec. 2.5.1.1.3) discusses TSS increases predicted to occur just
47 downstream of the Project due to in-stream construction, which was predicted as part
48 of the construction period sedimentation analysis (Response to EIS Guidelines, Sec.
49 6.3.8.1). The predicted increases would be incremental additions to the background
50 TSS/turbidity downstream of the Project. These background conditions will vary over
51 time depending on actual ambient conditions at the time when in-stream work occurs.
52 This additional TSS will be transported in Stephens Lake to the Kettle Generating
53 Station, however about 30% of this additional TSS will be deposited as it is transported
54 between the Project and the Kettle GS (Response to EIS Guidelines, Sec. 6.3.8.1). Thus,
55 for each in-stream activity that increases TSS, the largest incremental increases occur
56 just downstream of Gull Rapids and diminish as the TSS is transported downstream to
57 the Kettle GS.

58 2. *Provide a description of the water quality monitoring program for Stephens Lake*
59 *during the construction period of the Keeyask Project.*

60 3. *How frequently will Stephens Lake be monitored during the construction phase of*
61 *the project for increased TSS and sediment?*

62 Several preliminary management and monitoring plans have been developed for the
63 Project²⁴, and described in Chapter 8 of the Response to EIS Guidelines.

64 The preliminary Sediment Management Plan for In-stream Construction (the SMP)
65 includes continuous, real-time monitoring of turbidity upstream and downstream of
66 construction activities when in-stream work is occurring. The purpose of real-time
67 monitoring is to detect increases in TSS/turbidity due to in-stream work so that
68 corrective actions can be taken if these increases exceed specified action levels. The

²⁴ <http://keeyask.com/wp/the-project/environmental-assessment-process/preliminary-environmental-protection-program>

69 SMP also describes routine bi-weekly maintenance of monitoring equipment, which will
70 include collection of in-situ water samples for laboratory testing.

71 Preliminary drafts of the Aquatic Effects Monitoring Plan (AEMP) and the Physical
72 Environment Monitoring Plan (PEMP) include monitoring activities in Stephens Lake
73 during construction. In addition to the real-time monitoring of turbidity in Stephens
74 Lake under the SMP, the PEMP includes additional continuous (not real-time)
75 monitoring using turbidity loggers deployed at certain locations in the lake in open
76 water and winter conditions (PEMP, Sec. 4.2). Periodic discrete (grab) water samples
77 and manual turbidity readings will be obtained during routine maintenance of turbidity
78 loggers, which is to occur approximately every three weeks. Additional discrete
79 sampling is planned to occur two to four times per year at certain sites. The AEMP
80 includes water-quality monitoring at sites in Stephens Lake during construction (AEMP,
81 Sec. 2.1), and the timing and frequency will depend on the in-stream work taking place.
82 Both plans include additional monitoring downstream of the Kettle Generating Station
83 at times when larger effects of construction on TSS are anticipated. Water samples will
84 be sent to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited
85 analytical laboratory for water quality testing that will include measurement of TSS
86 among other parameters, as described in the AEMP (Sec. 2.1.2.3, Table 3) and PEMP
87 (Sec. 4.2.2).

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: 4.1 Overall System Operation; p. N/A**

3 **CEC Rd 1 PFN-0034**

4 **PREAMBLE:**

5 The EIS materials state that the Churchill River Diversion (CRD) and the Lake Winnipeg
6 Regulation (LWR) determine the seasonal flow patterns in the Nelson and Burntwood
7 rivers, and consequently the flows available for all the generation stations along those
8 rivers, including Keeyask.

9 **QUESTION:**

10 Please respond to the following questions:

- 11 1. In order to conduct a land-water change over time analysis, as funded by the CEC,
12 please provide the complete set of inflow files/records since the LWR and CRD have
13 been in operation for the Burntwood-Nelson River system.

14 **RESPONSE:**

15 Please see responses to CEC Rd 1 PFN-0031 and PFN-0031.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.5 Water Quality; p. Table 2-13 Residual Effects on Water**
 3 **Quality**

4 **CEC Rd 1 PFN-0035**

5 **PREAMBLE:**

6 Residual effects on water quality for Split Lake and Stephens Lake reservoir are
 7 predicted to be negligible for the construction and operation phases of the Keeyask
 8 project.

9 **QUESTION:**

10 Please respond to the following questions:

- 11 1. Explain how these conclusions were arrived at?
 12 2. Provide the water quality baseline data for the Split Lake and Stephens Lake.
 13 3. How are the water levels in Stephens Lake predicted to fluctuate in response to the
 14 Keeyask Project?

15 **RESPONSE:**

16 Responses for each question are provided below.

- 17 1. *Explain how these conclusions were arrived at?*

18 The water quality assessment was founded upon a detailed characterization of current
 19 water quality conditions, modeling, comparisons to provincial and national water quality
 20 objectives and guidelines for the protection of aquatic life, scientific literature, notable
 21 information pertaining to reservoirs, and use of a proxy area (i.e., Stephens Lake). The
 22 water quality assessment used information presented in the Physical Environment
 23 Supporting Volume (PE SV), including results of modeling of effects of the Project on
 24 total suspended solids and dissolved oxygen and temperature and predicted effects on
 25 water levels (i.e., open water hydraulic zone of influence). The approach applied and
 26 information sources used for the water quality assessment are described in Section 2.3
 27 of the Aquatic Environment Supporting Volume (AE SV).

- 28 2. *Provide the water quality baseline data for the Split Lake and Stephens Lake.*

29 The study area for the water quality assessment ranged from the inflows to Split Lake
 30 through Stephens Lake and the lower Nelson River to Gillam Island. As such, the water
 31 quality assessment, which includes a detailed description of recent water quality
 32 conditions, describes water quality in Split Lake and Stephens Lake. Specific sections of
 33 the AE SV in which this information is presented are: Split Lake (Section 2.4.2.3),

34 Stephens Lake (Section 2.4.2.5), overview (Section 2.4.2.1). Additional data tables and
35 figures are presented in Appendices 2H and 2J.

36 3. *How are the water levels in Stephens Lake predicted to fluctuate in response to the*
37 *Keeyask Project?*

38 It is predicted that the range of water levels on Stephens Lake will not be affected by the
39 Keeyask Project once it is operational (PE SV 4.4.2.3). Stephens Lake will continue to be
40 controlled within a 2 m operating range for 90% of the time with water levels between
41 141.1 m (Kettle GS Full Supply Level) and 139.2 m (5th percentile operating level). A
42 slight gradient will exist along the river reach between the Keeyask GS powerhouse
43 tailrace and Stephens Lake and the maximum drop in elevation over this 3 km reach is
44 expected to be approximately 0.1 to 0.2 m and will be a function of the Keeyask
45 powerhouse discharge and the Stephens Lake level at the time.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
 2 **Section: 2.5.1.3.3 Treated Sewage Effluent; p. N/A**

3 **CEC Rd 1 PFN-0036**

4 **PREAMBLE:**

5 The EIS materials predict that since sewage effluent will be treated (limit Total
 6 phosphorous levels to 1mg/L) and due to high river discharge, there will be limited
 7 effects of nutrient loading in the lower Nelson River. Phosphorous is a limiting nutrient
 8 for macrophyte and phytoplankton growth. Increases in baseline P levels would
 9 inadvertently alter the density of plant and algae in the Stephens Lake reservoir.

10 **QUESTION:**

11 Please respond to the following questions:

- 12 1. What is the predicted flow rate of treated effluent being released into Stephens
 13 Lake per hour, during the construction and operation phases of the project? Explain.
- 14 2. Where will the effluent from the Keeyask Project be released? Stephens Lake?
- 15 3. Will the phosphorous and nitrogen rich effluent released into Stephens Lake impact
 16 growth of blue-green algae and other phytoplankton.
- 17 4. Do the predicted phosphorous levels also include contributions from other nutrient
 18 rich effluent sources originating from the project; peatland flooding, waste water,
 19 concrete batch plant effluent, dewatering etc?
- 20 5. Has the impact to nitrogen and phosphorous ratios been investigated? If not, why
 21 not?

22 **RESPONSE:**

23 for clarification purposes, as stated in the following excerpt from Section 4.2.3.1 p. 4-7
 24 of the Aquatic Effects Supporting Volume (SV), phosphorus is not limiting to algal
 25 growth in the main stem of the Nelson River around Keeyask.

26 "Suitable growing conditions for phytoplankton are strongly influenced by the
 27 stability of the water column. Studies in several northern Manitoba lakes and
 28 reservoirs have indicated that the available phosphorus does not limit
 29 phytoplankton growth (e.g., Southern Indian Lake, Hecky and Kilham 1988).
 30 Rather, phytoplankton growth is limited by wind-induced turbulence in
 31 combination with turbid water. It is unlikely that phytoplankton are a major
 32 source of production in most regions in the study area given that the water is
 33 turbid, wind-induced wave action causes considerable mixing, and retention
 34 time of water is relatively short.

35 The range of chlorophyll *a* concentrations observed in Keeyask waterbodies was
 36 indicative of low to moderate levels of primary productivity (oligo- to
 37 mesotrophic conditions). Overall, there is poor correlation between phosphorus
 38 and chlorophyll *a* in the study area, which indicates that factors other than
 39 nutrients limit algal growth (Section 2.4.2.1.5). This is further supported by
 40 concentrations of phosphorus and the low phytoplankton biomass observed in
 41 the study area. A higher trophic status would be assigned to the study area on
 42 the basis of phosphorus concentrations than on the basis of chlorophyll *a*
 43 concentrations. Phosphorus concentrations in the study area reflect meso-
 44 eutrophic to eutrophic conditions based on the Canadian Council of Ministers of
 45 the Environment categorization schemes (CCME 2004)."

46 Responses to each specific question are outlined below.

47 1. *What is the predicted flow rate of treated effluent being released into Stephens Lake*
 48 *per hour, during the construction and operation phases of the project? Explain.*

49 The main camp wastewater treatment plant will be in use during construction of the
 50 generating station and will operate temporarily into the operation phase of the
 51 generating station, during demobilization of the workforce/camp.

52 The main camp wastewater treatment plant will be constructed and operated according
 53 to Manitoba *Environment Act* Licence No. 2952R. Clause 13 a) in Schedule B to the
 54 licence states:

55 "The Licencee shall operate and maintain the sewage treatment plant in such a
 56 manner that the maximum daily flow rate is not in excess of 1,700 cubic metres
 57 over any 24-hour period"

58 2. *Where will the effluent from the Keeyask Project be released? Stephens Lake?*

59 Manitoba *Environment Act* Licence No. 2952R Clause 17 states "The Licencee shall not
 60 discharge effluent from the sewage treatment plant except to the main channel of the
 61 Nelson River downstream of the generating station and construction camp location."

62 3. *Will the phosphorous and nitrogen rich effluent released into Stephens Lake impact*
 63 *growth of blue-green algae and other phytoplankton.*

64 As stated in the response to question 2) above, wastewater effluent will be discharged
 65 to the main channel of the Nelson River.

66 Section 2.5.1.3.3 of the Aquatic Effects SV, below, describes the effects of nutrients in
 67 wastewater effluent from the main camp on nutrients in the lower Nelson River.

68 "Treated sewage effluent from the construction camp will be discharged to the
 69 lower Nelson River. Effluent quality will meet or exceed the specifications
 70 identified in Manitoba *Environment Act* Licence (Licence No. 2952) and TP (total
 71 phosphorus) will not exceed 1 mg/L at the end-of-pipe. Effluent would contain
 72 unionized ammonia at a concentration not to exceed 1.25 mg/L (at a
 73 temperature of 15°C±1°C). The effects of treated sewage on nutrients in the
 74 lower Nelson River are expected to be negligible due to high river discharge and
 75 effluent treatment; small, localized effects may occur in the immediate vicinity
 76 of the outfall prior to full mixing."

77 Based on the above assessment, the effects on phytoplankton in the lower Nelson River
 78 as a result of nutrients from wastewater effluent are also expected to be negligible.

79 4. *Do the predicted phosphorous levels also include contributions from other nutrient*
 80 *rich effluent sources originating from the project; peatland flooding, waste water,*
 81 *concrete batch plant effluent, dewatering etc?*

82 Section 2.5.1.3 of the Aquatic Effects SV, below, describes the sources of phosphorus
 83 from construction activities and assessment of the effects on nutrients in the lower
 84 Nelson River.

85 "2.5.1.3 Nutrients

86 2.5.1.3.1 Cofferdam Placement and removal and Impoundment and
 87 Diversion during River Management

88 Nutrient concentration in the lower Nelson River may be affected by
 89 impoundment and river diversion during the construction period. Effects due to
 90 reservoir impoundment are discussed in detail in the assessment of operation-
 91 related effects in Section 2.5.2.2 below.

92 Increases in TSS (total suspended solids) in the lower Nelson River due to
 93 cofferdam/groin placement and removal and water diversion may increase
 94 concentrations of TP and TN (total nitrogen). The magnitude of these increases
 95 would depend on the concentrations of these nutrients in the particulate
 96 materials released during these activities. However, given the relatively low
 97 increases in TSS predicted during the construction period, effects on nutrients
 98 associated are expected to be small. Effects would be greatest in July 2015,
 99 September 2017, and September 2019 when TSS is predicted to be greatest.

100 2.5.1.3.2 Site Drainage/Runoff

101 As described in section 2.5.1.1, and detailed in the Keeyask GS EnvPP (*Keeyask*
 102 *Generation Project Generating Station Construction Environmental Protection*

103 *Plan*), stormwater will not be directly released to a waterbody unless it has been
 104 treated to meet applicable provincial and federal effluent licences,
 105 authorizations and permits (Keeyask GS EnvPP). Any sediment-laden water* will
 106 be directed to adequately sized, multi-cell settling pond(s) for treatment prior
 107 to release to surface waters, and various sediment and erosion control
 108 measures will be employed throughout construction to minimize release of
 109 sediments to surface waters (Keeyask GS EnvPP). These measures will also
 110 minimize release of nutrients to surface waters and the effects on the Nelson
 111 River are considered to be negligible. In addition, use of detergents or solvents
 112 containing phosphates for cleaning equipment and vehicles will not be
 113 permitted (Keeyask GS EnvPP).

114 * "Sediment laden water" is not intended to include stormwater runoff/drainage from around the
 115 site, which will be mitigated through implementation of erosion and sediment control works.

116 2.5.1.3.3 Treated Sewage Effluent

117 Treated sewage effluent from the construction camp will be discharged to the
 118 lower Nelson River. Effluent quality will meet or exceed the specifications
 119 identified in Manitoba *Environment Act* Licence (Licence No. 2952) and TP (total
 120 phosphorus) will not exceed 1 mg/L at the end-of-pipe. Effluent would contain
 121 unionized ammonia at a concentration not to exceed 1.25 mg/L (at a
 122 temperature of 15°C±1°C). The effects of treated sewage on nutrients in the
 123 lower Nelson River are expected to be negligible due to high river discharge and
 124 effluent treatment; small, localized effects may occur in the immediate vicinity
 125 of the outfall prior to full mixing."

126 Section 2.5.2.2.9 of the Aquatic Effects SV provides a detailed discussion on the
 127 magnitude of nutrient increases expected as a result flooding the reservoir, including
 128 peatland flooding, during the Keeyask Project.

129 5. *Has the impact to nitrogen and phosphorous ratios been investigated? If not, why*
 130 *not?*

131 The impact to nitrogen and phosphorus ratios has not been investigated. This is because
 132 there are negligible impacts from nutrients associated with the Keeyask project on the
 133 existing nutrients in the lower Nelson River.

1 **REFERENCE: Volume: Aquatic Environment Supporting Volume;**
2 **Section: 1A.2.1 Structures in Water - Construction Scheduling; p.**
3 **N/A**

4 **CEC Rd 1 PFN-0037**

5 **PREAMBLE:**

6 The construction of in-water structures will be scheduled to avoid sensitive periods for
7 fish; spawning periods.

8 **QUESTION:**

9 Please respond to the following questions:

- 10 1. How will the integrity of fish habitat be monitored throughout Keeyask construction
11 and operation phases, and the different seasons?
12 2. How does the Environmental Protection Program for aquatic habitat make
13 provisions to protect sensitive fish habitat?
14 3. What are the standards for maintenance and monitoring of sensitive fish habitat?

15 **RESPONSE:**

16 Responses to each of the above questions are answered below.

- 17 1. *How will the integrity of fish habitat be monitored throughout Keeyask construction*
18 *and operation phases, and the different seasons?*

19 The Aquatic Effects Monitoring Program (AEMP) will be designed to measure the actual
20 effects of the Project, test predictions and identify unanticipated effects. Topics that will
21 be addressed for aquatic habitat are as follows:

- 22 • The development of nearshore habitat, including areas that would be suitable for
23 the growth of aquatic macrophytes in the Keeyask reservoir;
24 • Changes in substrate composition upstream and downstream of the GS;
25 • Potential deposition of sediment over constructed and sensitive habitats; and
26 • Potential blockage of fish access to tributaries.

27 Measurements of water velocity and depth to verify predictive models will be collected
28 as part of the Physical Environment Monitoring Plan.

29 In general, the monitoring methods will be comparable to those used to collect
30 information for the existing environment (e.g., substrate surveys).

31 2. *How does the Environmental Protection Program for aquatic habitat make*
 32 *provisions to protect sensitive fish habitat?*

33 *The Keeyask Generation Project: Generating Station Construction Environmental*
 34 *Protection Plan (EnvPP) - Draft summarizes scheduling to avoid sensitive periods for fish*
 35 *in Table 5.1 of Section 5.3 (page 5-2):*

36 "All in-water work or construction activities that may affect
 37 watercourse/bodies, fish mobility or habitat are restricted between May 15 and
 38 July 15 (Lake Sturgeon spawning) and September 16 to May 15 (Lake Whitefish
 39 spawning).

40 During these periods no in-water work (below the ordinary high water mark) is
 41 to occur, unless prior authorization is received from the Department of Fisheries
 42 and Oceans Canada."

43 The EnvPP also provide mitigation related to use of explosives in the vicinity of fish
 44 habitat (Section 5.19.1 – pages 5-15 and 5-16):

45 "5.19.1 Blasting in and/or near Fish Bearing Waters

- 46 1. *The Guidelines for the Use of Explosives In or Near Canadian Fisheries*
 47 *Waters* will be adhered to.
- 48 2. Ammonium nitrate fuel oil will not be used in or near a watercourse/body.
- 49 3. After loading a charge in a hole, the hole will be back-filled with angular
 50 gravel to the level of the substrate/water interface or the hole collapsed to
 51 confine the force of the explosion to the formation being fractured.
- 52 4. The angular gravel will have a particle size of approximately one-twelfth
 53 (1/12th) the diameter of the borehole.
- 54 5. All "shock-tubes" and detonation wires will be recovered and removed after
 55 each blast.
- 56 6. No explosive will be detonated in or near fish habitat that produces, or is
 57 likely to produce, an instantaneous pressure change (i.e., overpressure)
 58 greater than 100 kPa (14.5 psi) in the swimbladder of a fish.
- 59 7. No explosive will be detonated that produces, or is likely to produce, a peak
 60 particle velocity greater than 13 mm•s-1 in a spawning bed during the
 61 period of egg incubation.
- 62 8. Mitigation measures to reduce blasting effects will be used wherever *The*
 63 *Guidelines for the Use of Explosives in or near Canadian Fisheries Waters*
 64 (DFO, 1998) cannot be achieved.
- 65 9. Blasting will take place in the dry as much as practicable."

66

67 The EnvPP also describes activities and approaches near and in water in Section 5.23,
68 and for winter stream crossings in Section 5.23.1.

69 "5.23 Construction near and In Water (Cofferdams, dykes, Causeways, etc.)

- 70 1. The schedule for in-water work will follow **Error! Reference source not**
71 **found..**
- 72 2. During construction, the use of heavy equipment in and near
73 watercourse/bodies will be restricted to limits prescribed in regulatory
74 permits and authorizations.
- 75 3. Measures to protect against erosion, siltation and hydrological alteration
76 will be implemented in disturbed areas that are within 50 m of any off-
77 system marsh identified in **Error! Reference source not found.**
- 78 4. Where required, clearing below the ordinary high water mark on steep or
79 potentially unstable slopes will be conducted by hand.
- 80 5. Disturbed banks will be restored, where practicable.
- 81 6. A 30 metre buffer of vegetation from the ordinary high water mark will be
82 left in place until immediately preceding placing rock in water.
- 83 7. Granular (and larger) material used will consist of screened, blast rock or
84 boulders with low fines content.
- 85 8. Impervious fill will be placed in tranquil water.
- 86 9. A fish salvage will be conducted in areas where they could become isolated,
87 prior to and during dewatering, to minimize the number of stranded fish.
- 88 10. Impounded water will be tested for TSS by the Site Environmental Officer
89 before release. If the TSS concentration is < 25 mg/L, the water can be
90 released directly to the Nelson River. If the water does not meet these
91 criteria, it will be treated prior to release.
- 92 11. Excavated materials will be removed to the extent practicable from within
93 the dewatered area before removing the cofferdam.
- 94 12. Removal of the cofferdam will be done "in the dry" as much as practicable
95 to mitigate suspension and transport of sediment.
- 96 13. Prior to removal of cofferdams, the water levels inside and outside of the
97 isolated area will be equalized, where appropriate, to mitigate suspension
98 and transport of sediment in the river.
- 99 14. The inner rockfill groin of cofferdams will be removed as much as
100 practicable using the outer groin for protection from the bulk of the flow,
101 which will minimize mobilization of fine material into the river.
- 102 15. Excavation in the wet will be conducted in tranquil waters, as much as
103 practicable.

- 104 16. The installation of headwalls or rock will be carried out at the earliest
 105 possible time following culvert installation (causeway) in order to prevent
 106 erosion and sedimentation.
- 107 17. The Site Environmental Officer will inspect the culverts (causeway) each
 108 spring and fall during the project for debris/blockage, alignment and
 109 structural changes to determine if fish passage may be affected.

110 5.23.1 Winter Stream Crossings

- 111 1. Snow fills and ice bridges will be constructed in accordance with the
 112 construction guidelines listed in the Department of Fisheries and
 113 Oceans Operational Statement (2010) for Manitoba, Ice Bridges and
 114 Snow Fills which can be found in **Error! Reference source not found.**
- 115 2. Snow fills at stream crossing will be constructed using clean snow only
 116 (i.e. free of dirt and debris) and only when there are sufficient depths
 117 available to protect the banks. Construction will begin (where
 118 applicable):
- 119 • After the stream has frozen to the bottom;
 - 120 • After the stream has ceased to flow; and/or
 - 121 • Once there is enough ice over the stream to prevent snow loading
 122 from damming any free water beneath the ice.
- 123 3. Care will be taken to not scrape dirt and debris into the snow fill during
 124 its construction.
- 125 4. All snow fill material will be removed as soon as the work is complete,
 126 and prior to the spring melt. It will be placed above the ordinary high
 127 water mark to minimize sedimentation and erosion. Care will be taken
 128 to not disturb the streambed or banks.
- 129 5. A "V" shaped notch will be placed at the centre of any ice bridges prior
 130 to the start of the spring thaw."

- 131
- 132 3. *What are the standards for maintenance and monitoring of sensitive fish*
 133 *habitat?*

134 An Aquatic Effects Monitoring Plan will be developed and reviewed by Fisheries and
 135 Oceans Canada and Manitoba Conservation and Water Stewardship as part of the
 136 regulatory approvals process for this Project. Input of these agencies will ensure that
 137 monitoring meets appropriate standards.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.8.4.3 Residual Effects Conclusions (to**
 3 **Wetlands); p. N/A**

4 **CEC Rd 1 PFN-0038**

5 **PREAMBLE:**

6 EIS materials indicate the overall residual effects of the project on wetland function are
 7 expected to be adverse, irreversible and continuous in frequency but low in ecological
 8 context. However on a global, national and provincial level, wetland impacts are
 9 considered nil, as significant amounts of wetlands on that scale are not impacted.
 10 Losses to native wetland types is predicted to be less than 10% in the historical area.

11 **QUESTION:**

12 Please answer the following questions:

- 13 1. Why did Manitoba Hydro compare the loss of wetlands in Manitoba on a global and
 14 national scale? Why is that a relevant analysis?
- 15 2. What is the current state of wetlands in Manitoba?
- 16 3. Did Manitoba Hydro seek to incorporate aspects of peatland conservation outlined
 17 within the Manitoba Government Tomorrow Now – Green Plan?
- 18 4. For what length of time were the residual effects to wetlands calculated for? 30
 19 years?
- 20 5. What model was used to assess for loss of wetlands over time, and did this model
 21 incorporate;
 - 22 a. Future Manitoba Hydro projects?
 - 23 b. Climate change?
 - 24 c. Anthropogenic activity?

25 **RESPONSE:**

26 The Partnership did not compare wetland loss on a global scale. Specific wetlands that
 27 have been identified as being globally or nationally significant by Ramsar, the North
 28 American Waterfowl Management Plan and/or Ducks Unlimited would have been
 29 considered for avoidance if they were in the Project zone of influence on wetlands. No
 30 such wetlands occur in the Project area.

31 The focus of the wetland assessment is on the state of wetlands in the Keeyask region
 32 rather than all of Manitoba. The Keeyask region includes extensive wetlands, the
 33 majority of which are in a relatively natural condition with the main exception being
 34 wetlands along the Nelson River.

35 The Partnership worked to reduce Project effects on peatlands in a variety of ways that
36 conserve peatlands. For an overview of the approach, please see the response to TAC
37 Public Rd 2 EC-0030.

38 Regarding residual Project effects on wetlands, quantitative predictions extend from the
39 start of the construction phase to the end of the first 30 years of Project operation, and
40 qualitative predictions are provided for the balance of the operation phase (Terrestrial
41 Environment Supporting Volume Section 2.2.5.2).

42 Changes to wetlands over time are evaluated through the wetland function VEC using
43 the amounts of the mapped wetland types, and through the terrestrial habitat and soil
44 quantity and quality supporting topics using the wetland ecosite types. The assessments
45 for wetland function, terrestrial habitat and soil quantity and quality assumed that all of
46 the wetlands inside the Project Footprint and within 50 m of it would be lost during
47 construction. These estimates of habitat loss are cautious for several reasons. It is
48 estimated that substantial portions of the borrow areas will not be used (Section
49 2.3.6.2.1). It is also likely that portions of the remaining potential disturbance areas will
50 not be used. In addition, the Preliminary Draft Environmental Protection Plans (EnvPP)
51 (see Section 5.12 in both the Draft Generating Station Construction EnvPP and Draft
52 South Access Road EnvPP) include measures intended to minimize clearing and
53 disturbance outside of the permanent Project components (e.g., in the remaining
54 potential disturbance areas). Finally, based on evidence from studies on groundwater
55 and edge effects, indirect Project effects on wetlands habitat during construction were
56 generally expected to extend much less than 50 m from the Project Footprint
57 (Terrestrial Environment Supporting Volume Section 2.3.6.2.1).

58 Reservoir expansion and groundwater changes are the primary pathways for changes to
59 Project effects on wetlands during operation. The spatial extent of reservoir expansion
60 is predicted using the integrated peatland disintegration and mineral erosion model
61 described in the Physical Environment Supporting Volume Section 6.2.1.5. Predictions
62 regarding groundwater-related effects on wetlands due to the reservoir are based on
63 observations from other Nelson River areas affected by past hydroelectric development.
64 Using these proxy areas, it was assumed that all wetlands within 50 m would be
65 affected, but this width will vary depending on shoreline topography and ecosite
66 conditions. Riparian and deep wet peatland types are expected to be affected for their
67 entire extents while the width of effects on the remaining types would decrease with
68 increasing slope (Terrestrial Environment Supporting Volume Sections 2.2.3, 2.2.5.2 and
69 2.3.6.3.1). This was expected to be an overestimate of actual effects based on
70 observations from the proxy areas.

71 Past and current projects and activities are incorporated in the impacts as human
72 features and in the residual effects assessment by using the estimated areas of each

73 wetland type prior to human infrastructure development (i.e., approximately 1950) as
74 the baseline for the magnitude evaluation. The additional cumulative effects of future
75 projects and activities are evaluated in the Terrestrial Environment Supporting Volume
76 Section 2.10.3.

77 The ongoing effects of past climate change on terrestrial habitat and wetlands are
78 described in the Terrestrial Environment Supporting Volume Sections 2.3.3.2 and 2.8.3.3
79 while the sensitivity of the Project effects predictions to future climate change are
80 evaluated in Sections 2.11.2, 2.11.6 and 2.11.7.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: N/A; p. Figure 1-5 Nested Study area**
 3 **Methodology for Hypothetical Project**

4 **CEC Rd 1 PFN-0039**

5 **PREAMBLE:**

6 Methodology used to determine effect on terrestrial wildlife presents an oversimplified
 7 model to predict project impact on wildlife migratory patterns and population density in
 8 a specified area. In the diagram, moose were selected as the population in question,
 9 and depicted as having only 5 animals being impacted by the Keeyask Project.

10 **QUESTION:**

11 Answer the following questions:

- 12 1. Outline the limitations of the methodology used to conduct the nested study
 13 analysis, and outline the limitations of the methodology?
 14 2. What assumptions are used to conduct the nested study?
 15 a. Does the methodology assume a static migratory pattern for wildlife?
 16 b. Does the methodology account for change in migratory patterns induced by
 17 the Keeyask project for one species, influencing that of another; wolves?

18 **RESPONSE:**

19 To clarify the Preamble to this question, the depiction of five moose being displaced by
 20 the Project was a deliberately simplistic and hypothetical example in the introduction to
 21 the TE SV to illustrate a concept: how effects on individuals are assessed in the Local
 22 Study Area versus effects on populations that were assessed in the Regional Study Area
 23 using the nested approach (TE SV Section 1.3.5). It was not intended as an effects
 24 assessment on moose or to imply that only five moose would be affected by the Project.
 25 As indicated in Section 7.3.6.4.4 of the TE SV, the moose population in the Moose
 26 Regional Study Area (Study Zone 5) was estimated at 950 individuals, of which more
 27 than five will undoubtedly be affected by the Project. Please see Section 7.4.6.3 of the
 28 TE SV and Section 6.5.8.2 of the Response to EIS Guidelines for a detailed assessment of
 29 potential Project effects on moose.

- 30 1. *Outline the limitations of the methodology used to conduct the nested study*
 31 *analysis, and outline the limitations of the methodology?*

32 For each species or group, the nested study area methodology has two basic
 33 components. One involves identifying the areas where the Project could affect
 34 individual animals, which is referred to as the Local Study Area. The Local Study Area

35 delineates potential effects because only portions of the home ranges of some animals
 36 will be affected by the Project. The broader importance of these local effects was
 37 assessed by evaluating how the effects on individual animals translate into effects on
 38 the population in the Keeyask region. For habitat effects, for example, this was
 39 determined by relating changes in the Local Study Area to availability in the Keeyask
 40 population home range, which is referred to as the Regional Study Area.

41 The main considerations using this methodology are:

- 42 • Appropriate determination of population range
 - 43 ○ Potential limitations: If a population range is too large it could mask the
 - 44 effects of the Project. If a population range is too small it may not capture
 - 45 all of the effects of the Project.
- 46 • Understanding of population range boundaries
 - 47 ○ Potential limitations: For example, the nested study areas may represent an
 - 48 appropriate home range size, but do not encompass the actual home range
 - 49 of an individual or population.

50 Some individual animals affected by the Project could be located outside of the defined
 51 Local Study Area (e.g., moose in the Split Lake Resource Management Area (SLRMA)
 52 may be indirectly affected through Adverse Effects Agreement offsetting programs).

53 Where required in some circumstances, effects to species ranges were also considered
 54 beyond the defined study zones. For example, effects of the offsetting programs on
 55 moose were considered in the SLRMA and not exclusively in Study Zone 5, the Moose
 56 Regional Study Area.

57 2. *What assumptions are used to conduct the nested study?*

58 a. *Does the methodology assume a static migratory pattern for wildlife?*

59 The methodology accounts for the home range sizes of mammal VECs. Relatively small
 60 study zones were chosen as local and regional study areas for beaver (Study Zones 3 and
 61 4, respectively), which are not migratory and whose home ranges are small. Larger study
 62 zones were chosen as local and regional study areas for moose (Study Zones 4 and 5),
 63 which are not migratory and whose home ranges are larger. The largest study zone
 64 (Study Zone 6) was chosen as the regional study area for caribou in part to account for
 65 the large ranges of migratory caribou. Broader population considerations can extend
 66 beyond Zone 6. For example, variable migratory patterns for caribou were considered
 67 and noted in Section 7.4.8.2.1 of the TE SV and Section 7.5.2.2.3 of the Response to EIS
 68 Guidelines.

- 69 2. *What assumptions are used to conduct the nested study?*
70 *b. Does the methodology account for change in migratory patterns induced by*
71 *the Keeyask project for one species, influencing that of another; wolves?*

72 Migratory patterns for broad-ranging species are considered within and beyond the
73 nested study zones. For example, transient wolves that follow migratory caribou into
74 the area could potentially influence moose populations within the Moose Regional
75 Study Area, and as such, one species influencing another is considered in the nested
76 study analysis.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.9.4 Effects, Mitigation and Monitoring; p. N/A**

3 **CEC Rd 1 PFN-0040**

4 **PREAMBLE:**

5 Overall residual effects to soil quality and quantity are predicted to be adverse, but
 6 acceptable due to incremental additions of impacts such as; physical disturbance,
 7 altered depth to ground water or changes to the flows and/or nutrient status of surface
 8 and groundwater. No indication was provided with regard to time-frame for
 9 incremental changes/damages to soil. The soil quantity and quality monitoring
 10 program is referenced as being covered within the Terrestrial Environment Monitoring
 11 Plan. Currently there is no plan available within the EIS materials for review.

12 **QUESTION:**

13 Respond to the following questions:

- 14 1. How do incremental impacts to soil quality and quantity ameliorate the cumulative
 15 adverse effects of the project to soil quantity and quality?
- 16 2. What was the time-frame used to determine residual impacts to soil quantity and
 17 quality?
- 18 3. What are the residual effects to soil quantity and quality for 30, 50 and 100 years of
 19 project operation.
- 20 4. Mitigation measures are proposed during the construction phase of the project,
 21 however mitigation measures during operation phase of the project are lacking.
 22 Does Manitoba Hydro have a description of soil quality and quantity mitigation
 23 measures proposed for the operation phase of the Keeyask project? Please Provide.
- 24 5. Provide a copy of the Terrestrial Environment Monitoring Plan for review.

25 **RESPONSE:**

26 The Terrestrial Environment Supporting Volume Section 2.9.4.3 states: "Overall, the
 27 likely Project residual effects on soil quantity and quality are expected to be adverse but
 28 within an acceptable range because the small Project-related incremental addition to
 29 the amounts affected maintains the magnitude of cumulative effects well within the
 30 moderate range (*i.e.*, below 10% of historical area) for all of the fine ecosite types."
 31 There was no predicted amelioration of cumulative adverse effects as a result of the
 32 predicted incremental Project effects.

33 The timeframe used to determine residual impacts to soil quantity and quality was the
 34 same as that used for terrestrial habitat and the other key topics in the EIS (Terrestrial
 35 Environment Supporting Volume Section 2.9.2.1). Quantitative predictions were made

36 for the construction phase and the first 30 years of Project operation, and qualitative
37 predictions were made for the remaining portion of the first 100 years of Project
38 operation (the assumed life of the Project). Details regarding the timeframe and
39 rationale used are provided in Sections 2.2.5.2 and 1.3.6 of the Terrestrial Environment
40 Supporting Volume.

41 The residual effect to soil quantity and quality at years 30, 50 and 100 of Project
42 operation reflects those for terrestrial habitat because the habitat types are
43 combinations of vegetation and ecosite types (Terrestrial Environment Supporting
44 Volume Sections 2.3.4.1 and 2.9.2.1). A quantification of residual effects to soil quantity
45 and quality to year 30 is provided in the Terrestrial Environment Supporting Volume
46 Section 2.9.4.2.3. Residual effects beyond year 30 are expected to be the same as for
47 terrestrial habitat, which are described in Section 2.3.6.3.1.

48 Pertinent mitigation measures proposed for project construction will be continued
49 during operation (see Terrestrial Environment Supporting Volume Section 2.9.4.1.2).
50 Since ecosite is a component of habitat, the mitigation proposed for terrestrial habitat
51 and ecosystem diversity will also benefit soil quantity and quality. No further mitigation
52 is proposed because cumulative Project effects with other past and current actions
53 remain at either the low or well within the moderate magnitude range for the fine
54 ecosite types (Terrestrial Environment Supporting Volume Section 2.9.4.2.3).

55 A copy of the Preliminary draft Terrestrial Effects Monitoring Plan was filed on June 28,
56 2013 and is available on the Partnership's website.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
 2 **Section: 3.3.1.2 Waste Water and Solid Waste; p. N/A**

3 **CEC Rd 1 PFN-0041**

4 **PREAMBLE:**

5 The EIS materials do not discuss handling of hazardous waste materials; chemicals,
 6 explosives, corrosive materials, etc. It is clear explosives will be used, particularly for the
 7 construction phase of the Keeyask project.

8 **QUESTION:**

9 Please respond to the following questions:

- 10 1. What materials will be used that are classified as hazardous?
 11 2. How will hazardous materials be disposed of? Provide a description of hazardous
 12 waste disposal practices.
 13 3. How will personnel and the environment be protected from exposure to hazardous
 14 materials and waste?
 15 a. Will employees and contractors be trained to handle hazardous waste
 16 materials?

17 **RESPONSE:**

18 1. *What materials will be used that are classified as hazardous?*

19 Hazardous materials used during the project will be numerous, varied and may
 20 include, but are not limited to, flammable liquids (i.e. fuel, hydraulic oils), gases
 21 (such as propane or gases used for welding), toxic substances (such as antifreeze),
 22 explosives, batteries, etc. They can also include material that may be contaminated,
 23 such a rags, containers, soil, etc, by a hazardous substance.

24 2. *How will hazardous materials be disposed of? Provide a description of hazardous*
 25 *waste disposal practices.*

26 The *Draft Keeyask Generation Project: Generating Station Construction Environmental*
 27 *Protection Plan* (Draft GS EnvPP) and the *Draft Keeyask Generation Project: South Access*
 28 *Road Environmental Protection Plan* (Drafter SAR EnvPP) describe how hazardous
 29 materials will be disposed of during the project.

30 Section 4.2 of both EnvPPs states: "Hazardous materials, fuel containers and other
 31 materials will be removed from the site and managed according to *The Dangerous*
 32 *Goods Handling and Transportation Act.*"

33 With respect to transporting hazardous wastes destined for disposal, Section 5.7.1 of
34 both EnvPPs states:

- 35 • All hazardous materials including petroleum products will be transported, including
36 transfer between storage areas and work sites, according to *The Dangerous Goods*
37 *Handling and Transportation Act*.
- 38 • The contractor will establish a documented inspection process for all hazardous
39 materials and petroleum products.
- 40 • Transportation of Dangerous Goods labels will be present and legible on all
41 hazardous material and petroleum product containers.
- 42 • Containers will be correctly labelled to disclose contents, according to *The*
43 *Transportation of Dangerous Goods Regulation, SOR/2008-34*.
- 44 • Hazardous material and petroleum product containers will be inspected daily for
45 leaks.
- 46 • Product inventory and inspection sheets will be recorded daily and retained for
47 Manitoba Hydro and regulatory authorities (as required).
- 48 • A material inventory covered by Workplace Hazardous Materials Information
49 Systems will be maintained on-site.

50 Section 5.8 of both EnvPPs lists the measures to be followed regarding hazardous waste
51 disposal during the project:

- 52 • All used oil products (including empty containers and filters) and other hazardous
53 wastes will be collected and disposed of in approved storage containers.
 - 54 • All used oils and hazardous wastes will be removed from the site for recycling or
55 disposal at a licensed facility.
 - 56 • An inventory of materials shipped for recycling and/or disposal must be maintained,
57 as well as a record of receipt of materials from the licensed facility.
- 58
- 59 3. *How will personnel and the environment be protected from exposure to hazardous*
60 *materials and waste?*

61 Section 5.7 of both EnvPPs provides a list of specific measures to be followed with
62 respect to transportation and inventory control, storage, handling, refuelling and
63 disposal of hazardous materials. Following these measures will protect personnel and
64 the environment from exposure.

65 Spills cannot be guaranteed to be entirely prevented by following measures listed in
66 section 5.7. In the case of accidental spills, Section 4.1 of both EnvPPs states:

67 "Prior to construction, the contractor will prepare a Project-specific Emergency
68 Response Plan including prevention planning and response for both hazardous material

69 spills and fires. The plan will be reviewed and accepted by the Resident Manager or
70 delegate.

71 The contractor is responsible for all spills in their work areas. All spills will be reported to
72 the Resident Manager or delegate and regulators as required. The contractor will
73 appoint a Spill Response Coordinator for their work areas. Site clean-up and disposal of
74 contaminated material will be managed as stated in the Emergency Response Plan in
75 consultation with the Site Environmental Officer and the Resident Manager or
76 delegate."

77 The spill response plan will contain information on procedures to follow to prevent,
78 contain and clean up a spill, including, but not limited to a communication plan for
79 notifying others of the spill, what sort of personal protective equipment should be worn,
80 how contaminated material should be collected, shipped, stored and disposed,
81 procedure to follow to confirm the site has been properly cleaned up how to test the
82 area to ensure all contamination has been removed, follow-up reporting.

83 *a. Will employees and contractors be trained to handle hazardous waste*
84 *materials?*

85 Personnel responsible for handling hazardous waste on the Keeyask will have the
86 appropriate training to do so.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.10 Cumulative Effects with Other Projects; p.**
 3 **N/A**

4 **CEC Rd 1 PFN-0042**

5 **PREAMBLE:**

6 The cumulative impact of the Keeyask Generation project was assessed in conjunction
 7 with future Manitoba Hydro developments; Gillam Redevelopment project, Bipole III
 8 transmission line, Keeyask Transmission Project and the Conawapa Generation Project.
 9 For all assessments examining combined future project cumulative effects to intactness,
 10 ecosystem diversity and wetland function, no cumulative effect was reported. It was
 11 not discussed how the conclusions were arrived at, what baseline values or parameters
 12 were evaluated to calculate the cumulative impacts.

13 **QUESTION:**

14 Answer the following questions;

- 15 1. How was it determined that there were no overall net cumulative effects from all
 16 projects combined on the terrestrial environment?
 17 2. How were the terrestrial VECs evaluated during this assessment?
 18 3. How will the terrestrial VECs be assessed during construction and operation phases
 19 of the Keeyask project?
 20 4. The assessment needs to be repeated, using pre-Manitoba Hydro development data
 21 (1970s) as the baseline value. Qualitative and quantitative measures of change
 22 need to be established which are comparable/measurable between all project
 23 future projects.

24 Finally, Manitoba Hydro will have to provide the results of the assessment, and include a
 25 geographic depiction of cumulative impacts over time.

26 **RESPONSE:**

27 Responses to each of the above questions are provided below.

- 28 1. *How was it determined that there were no overall net cumulative effects from all*
 29 *projects combined on the terrestrial environment?*

30 The assessment does not conclude that there are no overall net cumulative effects from
 31 all projects combined on the terrestrial environment. In fact, residual adverse effects of
 32 the Project, acting in combination with other past, present and future projects are

33 determined for 13 of the terrestrial VECs, including ecosystem diversity, intactness and
34 wetland function (see Table 7-3 in the Response to EIS Guidelines).

35 For all VECs, including terrestrial VECs, the potential cumulative effects of Keeyask
36 acting in combination with past and current projects and activities is assessed in Chapter
37 6. Detailed methodology for how this assessment was undertaken for each VEC is
38 included in Chapter 6 and in the Terrestrial Environment Supporting Volume. VECs that
39 have the potential to experience incremental residual adverse effects as a result of
40 developing and operating Keeyask are further examined in Chapter 7 to determine the
41 potential for cumulative effects with reasonably foreseeable future projects and
42 activities that may overlap spatially or temporally. The results of this assessment for the
43 terrestrial environment are outlined in Section 7.5.2.3 of the Response to EIS Guidelines.

44 It was determined that the effects of future projects and activities that have the
45 potential to overlap spatially and temporally with the effects of the Keeyask Project
46 would not change the conclusions with respect to the regulatory significance of adverse
47 effects of the Project to Terrestrial VECs presented in Section 6.5 of the Response to EIS
48 Guidelines. This does not mean there are no cumulative effects, but that the nature of
49 these combined effects does not change the significance findings presented in Chapter
50 6. For example, in the case of intactness, it is noted that:

51 “Residual Project effects on intactness are expected to overlap with effects from
52 Gillam Redevelopment and all of the transmission projects. Based on the
53 anticipated locations of these other projects, total linear feature density would
54 increase but still remain in the lower half of the moderate magnitude effects
55 range (i.e., between 0.40 km/km² and 0.60 km/km²) for the Intactness Regional
56 Study Area and within the small magnitude range for the Regional Study Area
57 outside of the Thompson area. Although total core area would decline by
58 approximately 135 km², the percentage of the Regional Study Area in core area
59 is expected to remain higher than 80% of land area, which is well within the
60 range for low magnitude core area effects (i.e., 66% to 100% of land area).” (p.
61 7-32, Response to EIS Guidelines).

62 2. *How were the terrestrial VECs evaluated during this assessment?*

63 See answer to Question 1.

64 3. *How will the terrestrial VECs be assessed during construction and operation phases
65 of the Keeyask project?*

66 The assessment took place in the EIS, prior to development of the Keeyask Generation
67 Project.

68 Details on how the terrestrial VECs will be monitored during construction and operation
 69 phases of the Keeyask project can be found in the preliminary Terrestrial Effects
 70 Monitoring Plan which was filed with regulators on June 28, 2013. It is available on the
 71 Keeyask Hydropower Limited Partnership website (Keeyask.com).

72 4. *The assessment needs to be repeated, using pre-Manitoba Hydro development data*
 73 *(1970s) as the baseline value. Qualitative and quantitative measures of change*
 74 *need to be established which are comparable/measurable between all project future*
 75 *projects. Finally, Manitoba Hydro will have to provide the results of the assessment,*
 76 *and include a geographic depiction of cumulative impacts over time.*

77 For the environmental impact statement, assessing the cumulative effects of the Project
 78 followed the EIS Guidelines and the guidance provided by Hegmann *et al.* (1999). As
 79 discussed in Section 5.3 (Assessment framework) of the Response to EIS Guidelines, the
 80 assessment recognized that the lower Nelson River and adjoining waters, including
 81 areas affected by Lake Winnipeg Regulation (LWR) and the Churchill River Diversion
 82 (CRD), have been and continue to be an altered environment as a result of the initial
 83 diversion and regulation of waters in the early 1970s, as well as ongoing regulation and
 84 hydroelectric development, as approved under the *Water Power Act* (Manitoba).

85 CEC Rd 1 CEC-0021 provides in tabular form, a summary of habitat and other factors for
 86 each terrestrial VEC. Additional summary and mapping information is provided in the
 87 cumulative effects summary included with the response to CEC Rd 1 CEC-0020.

88 **REFERENCES:**

89 Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H.
 90 Spaling and D. Stalker. 1999. Cumulative Effects Assessment Practitioners Guide.
 91 Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for
 92 the Canadian Environmental Assessment Agency, Hull, Quebec.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
 2 **Volume; Section: 2.9.3.3 Current Trends; p. N/A**

3 **CEC Rd 1 PFN-0043**

4 **PREAMBLE:**

5 EIS materials discuss the loss of ground ice peatland fine ecosite types, which will be
 6 replaced by wet peatland fine ecosite types and open water.

7 **QUESTION:**

8 Respond to the following questions:

- 9 1. How will loss of ground ice peatland ecosites impact local ecology and ecosystem
 10 function?
 11 2. What mitigation and monitoring strategies will be implemented to limit loss of
 12 ground ice peatland ecosite types? 3) Which species will be affected by loss of
 13 ground ice peatland fine ecosite types?

14 **RESPONSE:**

15 The ecological and species implications of the complete loss of ground ice peatlands
 16 were not evaluated for the Project effects assessment since this is an ongoing response
 17 to a climate warming that occurred approximately 150 years ago. For this same reason,
 18 mitigation and monitoring are not planned.

19 As a general comment, the vegetation and soil conditions of the ground ice peatland
 20 fine ecosite types are similar to the veneer bog, sloped veneer bog and blanket bog fine
 21 ecosite types (see Terrestrial Environment Supporting Volume Section 2.3.4.1.2, Figures
 22 2-8 to 2-10; Section 2.3.4.2, Figure 2-25), which collectively are common and widely
 23 distributed.

24 The loss of ground ice peatland ecosite types could lead to the formation or
 25 enhancement of habitat for rusty blackbird and amphibians. It may also result in the
 26 reduction of some yellow rail habitat, however yellow rail are not dependent upon
 27 ground ice peatland (they use other habitats too).

28 Past climate change could influence future mammal habitat even if the Project does not
 29 proceed. Mammals most likely to be affected by the loss of ground ice peatland habitat
 30 are summer resident caribou and moose. Peatland complexes are important calving and
 31 rearing habitat for caribou (TE SV Section 7.3.6.3.3). Ground ice peatland types will
 32 generally be replaced by wetland peatland types and open water as an ongoing
 33 response to past climate change. Calving and rearing habitat for caribou will likely

34 decline if fewer islands in peatland complexes are available. Wet habitat that replaces
35 lost calving islands could provide caribou with protection from predators. Although both
36 components (calving and rearing and protection from predators) have value as caribou
37 habitat, the net effect of these changes on caribou is uncertain (TE SV Section 7.3.8.1).

38 While ground ice peatland types are not primary winter habitat for moose (TE SV
39 Section 7.3.6.4.4), they use peatland complexes for calving (TE SV Section 7.4.6.3.1). The
40 replacement of ground ice peatland types with wetland peatland types and open water
41 will likely reduce the amount of calving and rearing habitat for moose. As with caribou,
42 wet habitat that replaces lost calving islands could provide moose with protection from
43 predators, and the net effect of these changes is uncertain.

1 **REFERENCE: Volume: N/A; Section: Project Description Supporting**
2 **Volume; Terrestrial Environment Supporting Volume; p. N/A**

3 **CEC Rd 1 PFN-0044**

4 **PREAMBLE:**

5 The Keeyask Generation EIS LSA and RSA have overlap with Forest Management Units
6 86, and 76. Manitoba Hydro has included assessment information that include habitat
7 in these FMUs.

8 **QUESTION:**

- 9 1. What data sources regarding the FMUs did Manitoba Hydro use?
10 2. Did Manitoba Hydro contribute to the Manitoba Forest Resource Inventory due to
11 its technical and scientific studies?
12 3. Was the FRI data, or forest ecosystems data used in determining the Zones, which in
13 turn are the context for analysis for VECs?
14 4. This request is in IR form, and includes a request for the data regarding the
15 questions above.

16 This IR is based on the request of the Keeyask Generation project managers.

17 **RESPONSE:**

18 Responses to each of the above are provided below.

- 19 1. *What data sources regarding the FMUs did Manitoba Hydro use?*

20 Yes we did do use FMUs as part f our forestry assessment. This was an integral part of
21 the forebay clearing plan. However, the boundaries for terrestrial assessment were
22 based more on habitat requirements than forest harvesting boundaries . . . Boundaries
23 for the Valued Ecosystem Components (VECs) or supporting topics were determined
24 based on relevant ecological, biological and/or physical criteria (i.e., the Local and
25 Regional Study Areas for each VEC and supporting topic).

- 26 2. *Did Manitoba Hydro contribute to the Manitoba Forest Resource Inventory due to its*
27 *technical and scientific studies?*

28 The Partnership has been in communication with the Province of Manitoba about
29 providing Project data to the Forestry branch; however, no data has been contributed as
30 of yet.

- 31 3. *Was the FRI data, or forest ecosystems data used in determining the Zones, which in*
32 *turn are the context for analysis for VECs?*

33 FRI data was not used to determine the Study Zones. A buffer of the Project Footprint
34 was used to create the boundaries for Study Zones 2 and 3, and in part for Study Zone 4.
35 The boundaries for Study Zones 5 and 6 were delineated using surficial materials
36 mapping, fire history mapping and watershed boundaries. For an overview of how study
37 area boundaries were delineated, please see Section 2.1.4.2 of Appendix 2B in the
38 Terrestrial Environment Supporting Volume. Additional detail is provided in a technical
39 report entitled Terrestrial Habitats and Ecosystems in the Lower Nelson River Region:
40 Keyask Regional Study Area.

41 4. *This request is in IR form, and includes a request for the data regarding the questions*
42 *above. This IR is based on the request of the Keyask Generation project managers.*

43 Please see the response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: Project Description Supporting Volume;**
2 **Section: N/A; p. N/A**

3 **CEC Rd 1 PFN-0045**

4 **PREAMBLE:**

5 This IR is a series of requests for shapes files, and / or data regarding elements needed
6 to conduct the Life Cycle Assessment of the Keeyask Generation Project.

7 **QUESTION:**

8 The requests are in IR format as the request of the project managers.

- 9 1. Shape files for project infrastructure locations in the Keeyask Generation Project
10 RSA and LSA as identified in the EIS.
11 2. Shape files / data for the pre and post inundation polygons for project activities,
12 including minimum, average and maximum water elevations.
13 3. Shape files for the six project study zones (Table 6 – 6)
14 4. Existing, and future hydro projects on the Nelson River, affecting Stephens Lake
15 reservoir, or Gull Lake reservoir – shape files. (including all infrastructure)

16 **RESPONSE:**

17 Please see response to CEC Rd 1 MB Wildlands-0051.

1 **REFERENCE: Volume: N/A; Section: Project Description Supporting**
 2 **Volume; Terrestrial Environment Supporting Volume; p. N/A**

3 **CEC Rd 1 PFN-0046**

4 **PREAMBLE:**

5 Manitoba Hydro has indicated in text within the EIS the spatial and topography
 6 parameters of its information. The detail on Keeyask Generation project maps do not
 7 consistently show scale, or other data parameters. Often the data sources on these
 8 maps are secondary sources.

9 **QUESTION:**

- 10 1. What Digital Elevation Models were used for the Keeyask EIS maps, analysis, and
 11 conclusions?
 12 2. What resolution, resolutions did Manitoba Hydro use?
 13 3. Are the digital elevation models for water elevations use existing generation
 14 stations?
 15 4. How many water elevation locations were used – in the RSA and the LSA, and in the
 16 larger region?
 17 5. Are data and shape files pertaining to the questions above available ? This request
 18 is in IR format due to the request of the Keeyask project managers.

19 **RESPONSE:**

20 A response to each of the questions is provided below.

- 21 1. *What Digital Elevation Models were used for the Keeyask EIS maps, analysis, and*
 22 *conclusions?*
 23 2. *What resolution, resolutions did Manitoba Hydro use?*

24 Existing environment and post-Project Digital Terrain models (DTMs) were used for the
 25 Physical Environment and other studies. The existing environment DTM was generated
 26 from several topographic and bathymetric data sources that are shown in the Physical
 27 Environment Supporting Volume Map 4.2-2. The post-Project DTM was developed by
 28 modifying the existing environment DTM to include the planned physical structures
 29 (e.g., dams and dykes) and excavations (e.g., spillway approach and discharge channels)
 30 associated with the Keeyask Generating Station. Versions of both the existing
 31 environment and post-Project DTMs were produced at 2 m, 5 m, 10 m, and 25 m
 32 resolutions. These versions of the DTMs were made available to all the study teams.

- 33 3. *Are the digital elevation models for water elevations use existing generation*
 34 *stations?*

35 Water level data obtained from the Kettle GS was used in the Keeyask surface water and
 36 ice regime studies. This water level data represented the Stephens Lake water level and
 37 was used in the calculation of the inflow file to Keeyask.

38 4. *How many water elevation locations were used – in the RSA and the LSA, and in the*
 39 *larger region?*

40 Please refer to section 4.2.2 of the Physical Environment Supporting Volume which
 41 details the data and information sources used in the surface water and ice regime
 42 studies. Water levels upstream of Split Lake and downstream of the Kettle GS were not
 43 considered in the Keeyask studies as they were outside the hydraulic zone of influence
 44 of the project.

45 5. *Are data and shape files pertaining to the questions above available?*

46 The Keeyask Hydropower Limited Partnership website (www.keeyask.com) has a
 47 downloadable data set of GIS information that includes the polygons for infrastructure,
 48 borrow areas, excavated material placement areas and the future reservoir shoreline.

49 The DTM created for the environmental assessment studies was developed from
 50 publicly available data, as well as data that were obtained by or for Manitoba Hydro on
 51 behalf of the Partnership. . The DTM model is considered to be proprietary. Publicly
 52 available elevation data may be obtained from the follow web pages. This elevation
 53 contour data was developed as part of Geomatics Canada's National Topographic
 54 System (NTS). The NTS 1:50,000 scale tiles 054D05, 054D06, and 054D07 cover the
 55 Project area.

- 56 • Natural Resources Canada's GeoGratis Website – <http://geogratis.gc.ca/>
- 57 • Manitoba Conservation and Water Stewardship Manitoba Land Initiative's Website
 58 – <http://mli2.gov.mb.ca/>

59 Publicly available water regime data used in the Keeyask EIS (see section 4.2.2 of the
 60 Physical Environment Supporting Volume) can be obtained from hydrometric stations
 61 maintained by both Environment Canada's Water Survey of Canada (WSC) and
 62 Manitoba Hydro. Archived historic and real-time hydrometric data is available on the
 63 WSC website. Hydrometric information from Manitoba Hydro's monitoring network is
 64 also publicly available from the Manitoba Hydro website. Data are available free of
 65 charge from both of these sources. Additional information on data and data sources is
 66 provided in the responses to CEC Rd 1 PFN-0030 and PFN-0031.

- 67 • WSC – <http://www.ec.gc.ca/rhc-wsc/>
- 68 • Manitoba Hydro –
 69 http://www.hydro.mb.ca/corporate/water_regimes/hydrological_data.shtml

1 **REFERENCE: Volume: Project Description Supporting Volume;**
 2 **Section: N/A; p. N/A**

3 **CEC Rd 1 PFN-0047**

4 **QUESTION:**

5 Manitoba Hydro has described the models and scenarios used to arrive at its climate
 6 change effects content in the EIS.

- 7 1. Does Manitoba Hydro use flows of all green house gasses from each of the land
 8 areas in Table 2.1 for their conclusions?
 9 2. Did Manitoba Hydro use green house gas flows (carbon dioxide, methane etc) from
 10 reservoirs and build- no build scenarios?
 11 3. Which equations from IPCC documents, and others sources to calculate the
 12 emissions and scenarios in the EIS? In particular, which equations were used to
 13 generate Figure 2A-1 in the Climate SV? Provide data corresponding to the
 14 questions above.

15 This request is in IR format at the request of the Keeyask project managers.

16 **RESPONSE:**

17 Please also see the response to CEC Rd 1 MB Wildlands-0051. Responses to the specific
 18 questions noted above are provided in order below:

- 19 1. *Does Manitoba Hydro use flows of all green house gasses from each of the land*
 20 *areas in Table 2.1 for their conclusions?*

21 Manitoba Hydro considered greenhouse gas (GHG) implications associated with the land
 22 area types identified in Table 2.1 in the PD SV. Specific types of land disturbance are
 23 treated differently within the life cycle assessment. Section 4.3 of Technical
 24 Memorandum GN 9.5.5 (A Life Cycle Assessment of Greenhouse Gases and Select
 25 Criteria Air Contaminants; provided in the CD included with the Responses to
 26 Information Requests, CEC Round 1) presents the key land use change assumptions that
 27 were used to determine the GHG implications from reservoir and other project related
 28 land use changes. The life cycle assessment categorizes areas of land use change as
 29 either temporary or permanent. Areas such as borrow areas are considered temporary
 30 disturbances that are subject to equivalent regrowth within the time frame of the life
 31 cycle assessment and as such, are not included in the GHG emission calculations. Areas
 32 categorized as permanent include those that would remain permanently cleared or
 33 would be changed to a different form of above ground biomass. For these types of
 34 disturbances, the net change in above ground biomass (initial minus final) is considered.

35 For example, the biomass cleared for transmission right-of-ways are partially offset by
 36 new shrub and grassland biomass. For areas such as the roads and permanent
 37 infrastructure areas, the initial above ground biomass is not offset by any regrowth.
 38 Reservoirs are another area of permanent land-use change.

39 2. *Did Manitoba Hydro use green house gas flows (carbon dioxide, methane etc) from*
 40 *reservoirs and build- no build scenarios?*

41 Technical Memorandum GN 9.5.6 (Reservoir Greenhouse Gases; provided in the CD
 42 included with the Responses to Information Requests, CEC Round 1) explains that GHG
 43 emissions resulting from flooding are a result of the conversion of a portion of the
 44 flooded carbon in vegetation and soils primarily to carbon dioxide (CO₂) and methane
 45 (CH₄). Section 5 of Technical Memorandum GN9.5.6 provides details on the
 46 methodology that was used to determine reservoir GHG emissions. This section
 47 provides the Intergovernmental Panel on Climate Change (IPCC) methodology that was
 48 used to determine reservoir GHG emissions. IPCC median CO₂ and CH₄ flux values for
 49 the "polar/boreal wet region" were utilized in the GHG emission calculation for flooded
 50 lands. In addition to the aquatic emissions associated with flooding, Section 5 explains
 51 that GHG emission estimates include emissions from the clearing and assumed burning
 52 of the above ground biomass prior to flooding.

53 The Technical Memorandum GN9.5.5 provides details on the quantification of life cycle
 54 greenhouse gas emissions (incremental to a "no-build" scenario) that result from the
 55 construction, land use change, operation and eventual decommissioning of the Keeyask
 56 Generation Project.

57 3. *Which equations from IPCC documents, and others sources to calculate the*
 58 *emissions and scenarios in the EIS? In particular, which equations were used to*
 59 *generate Figure 2A-1 in the Climate SV? Provide data corresponding to the*
 60 *questions above.*

61 Section 5 in Technical Memorandum GN9.5.6 provides the references to the IPCC
 62 equations and methodology that were used to determine reservoir GHG emissions. This
 63 methodology accounts for the GHG emissions resulting from land clearing activities of
 64 the proposed Keeyask Reservoir and the GHG emissions that result from the conversion
 65 of a portion of the flooded carbon in vegetation and soils primarily to CO₂ and CH₄.

66 Appendix 2A of the Climate section of the Physical Environment Supporting Volume
 67 contains two figures that are both identified as Figure 2A.1, and these have been
 68 attached to this response.

69 The first Figure 2A.1 in Appendix 2A (page 2A-1) depicts a variety of lake processes, such
 70 as biological respiration and decay of organic matter, that produce GHG emissions in

71 natural environments. The IPCC equations and methodology are used to estimate the
72 increase in aquatic GHG fluxes associated with flooding.

73 The second Figure 2A-1 (page 2A-5) is a conceptual representation of observed and
74 estimated GHG flux emissions resulting from boreal reservoir creation. Being a
75 conceptual representation, there are no units on this figure and the profile shows only
76 one of a range of possibilities. The profile representing observed GHG emissions
77 illustrates an initial rise in emissions following reservoir creation, which peak within a
78 few years. The specific magnitude of this peak is dependent on many factors including
79 the quantity and type of flooded biomass.

ⁱ Aufhauser, E., Herzog S., Hinterleitner V., Oedl-Wieser, T. and Reisinger, E. "Principles for Gender-Sensitive Regional Development". On behalf of Austrian Federal Chancellery, Division IV/4 for Co-ordination of Regional Planning and Regional Policies, June 2003.

1 **REFERENCE: Volume: N/A; Section: Keeyask Transmission Project**
2 **EA Report Appendix E; p. N/A**

3 **CEC Rd 1 PCN-0001**

4 **QUESTION:**

5 Given that there will be more flow through turbines and less flow through the spillways
6 following Kelsey re-runnings, are there any changes predicted in the effects of
7 entrainment on various species and age classes of fish?

8 **RESPONSE:**

9 The Keeyask Transmission Project EA Report, to which this question refers, is not under
10 review by the Clean Environment Commission.

11 However, the Keeyask Generation Project cumulative effects assessment presented in
12 the Response to EIS Guidelines did consider the Kelsey GS. This cumulative effects
13 assessment considered a range of environmental components for the aquatic
14 environment, with particular emphasis on water quality, lake sturgeon, lake whitefish,
15 northern pike and walleye as Valued Environmental Components (VECs). The spatial
16 extent of the residual adverse effects of the Keeyask Generation Project on these VECs
17 indicated no potential overlap between the residual adverse effects of the Keeyask
18 Generation Project and those of the Kelsey Re-runnings Project on these aquatic VECs.

1 **REFERENCE: Volume: N/A; Section: TAC Public Rd 2 Aboriginal**
 2 **and/or Public Comments – 0002a; p. N/A**

3 **CEC Rd 1 PCN-0002**

4 **QUESTION:**

5 Please provide additional information that will aid in understanding the development of
 6 riparian habitats in the proposed new Keeyask reservoir. Specifically, what data exist
 7 that describe the vegetation in the proxy reservoirs including species richness and
 8 diversity, vegetation structure and wildlife utilization of riparian habitats compared to
 9 off reservoir shorelines.

10 **RESPONSE:**

11 Nelson River and off-system shore vegetation attributes, such as vegetation types,
 12 vegetation structure and plant species composition, are compared at several levels.
 13 Vegetation types are compared through the habitat analysis since the habitat types are
 14 combinations of vegetation and ecosite types. Due to strong differences in background
 15 conditions, the comparisons in the EIS and supporting report (ECOSTEM 2012) are
 16 typically provided by off-system versus on-system, and then by the Keeyask versus
 17 Stephens Lake reaches of the Nelson River. For some attributes, separate comparisons
 18 are provided for the habitat mapping data and the shore zone transect data.

19 General descriptions of the mapped shore zone habitat types, including plant species
 20 associations derived from transect data are provided in the Terrestrial Environment
 21 Supporting Volume Section 2.3.4.1.3 (p. 2-53 to 2-54). More detailed versions of these
 22 descriptions are provided in ECOSTEM Ltd. (2012). Section 3.3.2.1.2 provides
 23 information on scattered and widespread species in the shore zone.

24 The more general habitat mapping based comparisons for on-system versus off-system
 25 shore zone habitat are provided in the Response to EIS Guidelines Section 6.2.3.4.2 and
 26 the Terrestrial Environment Supporting Volume Sections 2.3.4.1.2, 2.3.4.1.3 and
 27 2.8.3.2.1, of which the latter two sections also include some comparisons for the
 28 Keeyask versus Stephens reaches of the Nelson River.

29 Analogous comparisons using shore zone transect data are in the Terrestrial
 30 Environment Supporting Volume Section 2.8.3.2.2. Figures 2-14 and 2-15 in Section
 31 2.3.4.1.2 provide summary descriptions and some photographic examples of shore zone
 32 habitat types by ecosite type. Terrestrial Environment Supporting Volume Section
 33 2.8.3.2.2 (p.2-175) and Table 2-43 focus on shoreline wetland habitat types that were
 34 derived from ground transect data. These habitat types were based on species
 35 composition, and were associated with site characteristics. Differences between the off-

36 system and Nelson River habitat types are highlighted. Table 2-43 illustrates differences
 37 between off-system and Nelson River marsh, particularly the differences in species
 38 richness and variety, as indicated by the number of typical species encountered.

39 Further information on shore zone species composition and richness in the Nelson River
 40 proxy areas is provided in the TE SV Section 3.3.2.1.2 (pp. 3-18 to 3-22), and in Table 3C-
 41 13 (p. 3C-24). This section focuses on the associations of widespread and scattered
 42 species in the shore zone, based on transect data where locations were stratified by
 43 study region (Keeyask, Stephens, Long Spruce and Limestone) and by substrate type.

44 More in-depth comparisons of the off-system, Keeyask and Stephens Lake proxy areas
 45 with respect to wetland vegetation characteristics, including species richness and
 46 diversity, vegetation structure, and environmental associations, are available in Section
 47 6.3.2.3 of ECOSTEM Ltd. (2012). Section 6.3.2.3 provides general shore zone mapping
 48 descriptions with respect to area and shoreline length, focuses on differences between
 49 off-system and Nelson River shoreline wetlands, and also highlights the major
 50 differences between the Keeyask and Stephens Lake reaches within the Nelson River.
 51 Section 6.3.2.3.1 provides an analogous description to the Terrestrial Environment
 52 Supporting Volume Section 2.8.3.2.2, comparing the on and off-system habitat types in
 53 more detail. Section 6.3.2.3.2 provides more detailed information on shoreline beach
 54 and bank characteristics, and dominant plant species composition and structure. Here,
 55 the Keeyask and Stephens Lake reaches are described separately and compared. Section
 56 6.3.2.3.3 examines these characteristics in the off-system shore zone.

57 Section 7.3.3 of ECOSTEM (2012) presents the detailed analysis of wetland transect
 58 data, including substrate types (Section 7.3.3.1), widespread and scattered plant species
 59 (Section 7.3.3.2), and classification of wetland habitat based on species data (Section
 60 7.3.3.3). A detailed comparison of the Nelson River and off-system shoreline wetlands
 61 based on these factors is provided in Section 7.3.3.4. Plant species lists for the
 62 comparisons are provided in Tables 7-33 to 7-37 in Section 7.3.3.2, and detailed
 63 characteristics of the wetland habitat types are provided in Table 7-38 in Section 7.3.3.3.
 64 These tables provide direct comparisons between all three of the shore zone study
 65 areas, including off-system, Keeyask reach and Stephens reach.

66 Wildlife utilization of riparian habitats is addressed for a variety of species in the
 67 Terrestrial Environment Supporting Volume. Various bird use of riparian habitat is
 68 mentioned in the following sections: kingfisher Sections 6.3.2.2.4 and 6.4.3.1.5 (p. 6-12
 69 to 6-13 and p.6-85 to 6-87); bald eagle Section 6.3.2.4.3 (p. 6-20 to 6-21); rusty blackbird
 70 Sections 6.3.2.4.5, 6.3.3.3, 6.4.1.4.2 and 6.4.4.1.1 (p. 6-22, 6-37, 6-54 to 6-56 and 6-98);
 71 species at risk Section 6.3.2.5.1 (Table 6.3-1; p. 6-24); willow ptarmigan Section 6.3.2.5.4
 72 (p. 6-30); shorebirds Sections 6.3.3.1.3 and 6.4.3.1.3 (p. 6-32 and p. 6-79 to 6-82);
 73 mallard Section 6.4.1.2 (p. 6-43 to 6-47); waterfowl Section 6.4.3.1.1 (6-73 to 6-76); and

74 songbirds Section 6.4.3.2.1 (p. 6-88 to 6-91). Reference to the use of reservoir
 75 shoreline/riparian habitat by birds is mentioned in the following sections: shorebird
 76 Section 6.3.2.2.2 (p. 6-11); songbird Section 6.3.2.3.1 (p. 6-13); Canada goose Section
 77 6.4.1.1 (p. 6-42); mallard Section 6.4.1.2 (p. 6-44); and waterfowl Section 6.4.3.1.1 (p. 6-
 78 75).

79 The relative importance of riparian habitat used by a variety of mammal species is found
 80 in the following sections: muskrat 7.2.3.1.4 (p. 7-21 to 7-22); mink Section 7.3.3.2.3 (p.
 81 7-25 and 7-26); river otter Section 7.3.3.3.3 (p. 7-28 and 7-29); snowshoe hare Section
 82 7.3.4.1.2 (p. 7-31 and 7-32); red fox Section 7.3.4.2.3 (p. 7-34 and 7-35); American
 83 marten Section 7.3.4.3.3 (p. 7-36 to 7-38); weasel Section 7.3.4.5.3 (p. 7-41 to 7-42); gray
 84 wolf Section 7.3.5.1.4 (p. 7-46 and 7-47); and black bear Section 7.3.5.2.3 (p. 7-48 and 7-
 85 49). The relative importance of riparian habitat used by mammal VECs is found in the
 86 following sections: beaver Section 7.3.6.2.4 (p. 7-58 to 7-60); caribou Section 7.3.6.3.5
 87 (p. 7-70 to 7-72); and moose Section 7.3.6.4.5 (p. 7-78 and 7-79). Rarity of mammal
 88 species utilizing riparian shorelines and lake perimeters is summarized in Table 7-30 (p.
 89 7-79 to 7-80)

90 **REFERENCES:**

91 ECOSTEM Ltd. 2012. Terrestrial Habitats and Ecosystems in the Lower Nelson River
 92 Region: Keeyask Regional Study Area. Technical report prepared for Manitoba
 93 Hydro.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 6.4**
 2 **Effects and Mitigation Aquatic Environment; TAC Public Rd 2**
 3 **Aboriginal and/or Public Comments – 0003a; p. N/A**

4 **CEC Rd 1 PCN-0003**

5 **PREAMBLE:**

6 The results of the stocking programs described in the response to a previous request for
 7 information on sturgeon stocking programs suggests very preliminary, and mostly
 8 anecdotal results of efforts to stock sturgeon in other parts of the Nelson River, and in
 9 other river systems. Testing of artificial spawning shoals has had mixed results and is still
 10 in the early stages. Current initiatives are promising and should certainly be pursued in
 11 areas of the river system where stocks are severely depleted due to habitat loss.

12 However, the environmental assessment suggests that a residual effect of the Project
 13 will be that stocking will increase the number of sturgeon in the reach of the Nelson
 14 River between the Kelsey Generating Station and the Kettle Generating Station.

15 It concludes that: *“During the operation period, no long-term adverse effects to lake*
 16 *sturgeon numbers in the area directly affected by the Project are expected due to*
 17 *mitigation measures that provide habitat for all life history stages both above and below*
 18 *the generating station, and an extensive stocking program.”*

19 **QUESTION:**

- 20 1. Please clarify whether this conclusion refers primarily to the numbers of sturgeon
 21 that may be found in this reach of the river at any one time, regardless of their age
 22 or reproductive capacity. In other words, if an area is stocked regularly with several
 23 thousand hatchery raised fingerlings or age 1 individuals, the numbers would be
 24 high for a time whether or not these fish survived longer-term.
- 25 2. Discuss further whether these conclusions as expressed in the EIS are warranted
 26 when the evidence for success of stocking initiatives is acknowledged to be very
 27 limited.
- 28 3. Clarify whether this conclusion is warranted given the acknowledged uncertainties
 29 surrounding the access and eventual use of future habitats by sturgeon, including
 30 proposed artificial shoals.
- 31 4. Explain whether there is sufficient evidence to conclude that the longer-term
 32 sustainability of existing reproducing populations of lake sturgeon will not be
 33 affected by this Project.

34 Party Prefixes:

- 35 • CEC Clean Environment Commission
- 36 • MCWS Manitoba Conservation and Water Stewardship
- 37 • KHLP Keeyask Hydropower Limited Partnership
- 38 • CAC Consumers' Association of Canada
- 39 • MMF Manitoba Métis Federation
- 40 • MWL Manitoba Wildlands
- 41 • PFN Peguis First Nation
- 42 • CFLGC Concerned Fox Lake Grassroots Citizens

43 **RESPONSE:**

44 In the preamble, the reviewer states "The results of the stocking programs described in
 45 the response to a previous request for information on sturgeon stocking programs
 46 suggests very preliminary, and mostly anecdotal results of efforts to stock sturgeon in
 47 other parts of the Nelson River, and in other river systems." By way of clarification, the
 48 response provided indicated that stocking has been commonly used as a rehabilitation
 49 tool in the past 30 years, that culture and rearing can now be conducted with relative
 50 certainty, that many programs have successfully released fish into the wild, and that the
 51 survival and growth of stocked fish has been demonstrated at numerous locations. In
 52 addition, the response provided information on stocking at several locations in
 53 Manitoba, including results of monitoring on the upper Nelson River that showed good
 54 survival of stocked yearling fish. Similarly, the response indicated that spawning
 55 structures had been installed at numerous locations outside of Manitoba with
 56 documented success. The response also provided results of initial monitoring conducted
 57 at tests of spawning shoals at the Pointe du Bois Generating Station on the Winnipeg
 58 River.

- 59 1. *Please clarify whether this conclusion refers primarily to the numbers of sturgeon*
 60 *that may be found in this reach of the river at any one time, regardless of their age*
 61 *or reproductive capacity. In other words, if an area is stocked regularly with several*
 62 *thousand hatchery raised fingerlings or age 1 individuals, the numbers would be*
 63 *high for a time whether or not these fish survived longer-term.*

64 The Partnership appreciates the need for clarification on this issue. As discussed in the
 65 AE SV Section 6.4.1.2 and 6.4.2.2.3, adult fish may initially emigrate from the reservoir in
 66 response to disturbance or other habitat alterations and thus an initial decrease in the
 67 population may occur. Therefore, as suggested by the question above, if many
 68 thousands of hatchery fingerlings were introduced, more sturgeon would be present in
 69 the area; however, the population would be comprised of few reproductive adults and
 70 many immature fish. It is anticipated, however, that some adults that initially emigrate

71 may return and over the long-term (i.e., 25 year time horizon), as hatchery fish mature,
 72 the adult population would increase. It should be noted that the quoted statement
 73 “During the operation period, no long-term adverse effects to lake sturgeon numbers in
 74 the area directly affected by the Project are expected due to mitigation measures that
 75 provide habitat for all life history stages both above and below the generating station,
 76 and an extensive stocking program” referred to “long-term” effects.

77 2. *Discuss further whether these conclusions as expressed in the EIS are warranted*
 78 *when the evidence for success of stocking initiatives is acknowledged to be very*
 79 *limited.*

80 For a discussion on the success of Lake Sturgeon stocking see CEC-0031-00001-00000-
 81 CEC Rd1-031 Section 1.2.

82 3. *Clarify whether this conclusion is warranted given the acknowledged uncertainties*
 83 *surrounding the access and eventual use of future habitats by sturgeon, including*
 84 *proposed artificial shoals.*

85 The Partnership has used the best available information in designing the proposed
 86 spawning shoals and other recreated habitats. Habitat suitable for each Lake Sturgeon
 87 life stage is expected to exist both upstream and downstream of the generating station
 88 following project construction. Therefore, the prediction that no long-term adverse
 89 effects are expected to this Lake Sturgeon population is warranted. Post-project
 90 monitoring will be conducted to determine the fate of Lake Sturgeon in the Keeyask
 91 reservoir and Stephens Lake and determine whether modifications to planned
 92 mitigation are required.

93 4. *Explain whether there is sufficient evidence to conclude that the longer-term*
 94 *sustainability of existing reproducing populations of lake sturgeon will not be*
 95 *affected by this Project.*

96 Given that the Project has not yet been developed, there is no evidence that the longer-
 97 term sustainability of existing Lake Sturgeon will not be affected by the Project.
 98 However, at this point, the Partnership predicts, based on the best available
 99 information, that the mitigation measures planned will improve or maintain Lake
 100 Sturgeon populations well into the future. Post-project monitoring will confirm or refute
 101 this prediction; in the even that populations do not respond as anticipated, mitigation
 102 measures will be modified such that the long-term goals can be achieved.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section:**
 2 **6.2.2.3.4 Lake Winnipeg and Churchill River Diversion; p. N/A**

3 **CEC Rd 1 PCN-0004**

4 **QUESTION:**

5 A much more in depth understanding of the effects of the suite of hydroelectric projects
 6 on the region as a whole is important to an understanding of cumulative effects of
 7 additional developments.

8 The description of the existing environment in the EIS section (6.2.2.3) includes some
 9 general information about past and ongoing hydroelectric development in this river
 10 basin, including some of the basic biophysical effects.

11 In the section on Lake Winnipeg Regulation the only references to the Cree experience
 12 with this comes from the Cree Partners reports in the Keeyask area. There is no mention
 13 of Pimicikamak even existing downstream of Jenpeg, nor of the effects of the LWR on
 14 the upper reaches of the river.

15 Please provide more information for the benefit of all reviewers about the broader
 16 range of biophysical, socio cultural, and economic effects that have been experienced by
 17 all Cree in the region due to the existing projects in this river system. This should not be
 18 considered beyond the scope of the EIS as it is relevant to cumulative effects for many
 19 VCs.

20 **RESPONSE:**

21 The region relevant to the assessment of effects of the Keeyask Project's biophysical
 22 environment is the Lower Nelson River downstream of Kelsey G.S., and, accordingly, this
 23 is the regional area focused on for the Existing Environment described in Section 6.2 of
 24 the Response to EIS Guidelines. In this context, Lake Winnipeg Regulation (LWR) and
 25 Churchill River Diversion (CRD) projects are addressed in Section 6.2.2.3.4 with regard to
 26 their past, present and ongoing effects on the study region in the Lower Nelson River
 27 area, and not as the basis to discuss the effects of LWR and CRD on areas and peoples
 28 outside the Lower Nelson River region. As noted at page 6-16, a fundamental feature of
 29 the Keeyask JKDA is that "no change to the CRD Licence, as modified by the Augmented
 30 Flow Program, or to the LWR Licence, will be required to operate the Keeyask Project"
 31 (JKDA Section 7.2.2).

32 Section 2.3 of the Response to EIS provides additional background regarding the 1977
 33 Northern Flood Agreement (NFA) which resulted from the CRD and LWR impacts on five
 34 First Nations and included, in addition to two of the KCNs, Norway House Cree Nation,

35 Cross Lake First Nation and Nelson House First Nation (now called Nisichawayasihk Cree
36 Nation [NCN]). Pursuant to Article 9 of the NFA, Manitoba Hydro continues to consult
37 with Cross Lake First Nation and with NCN as regards all new hydro developments in the
38 areas affected by CRD and LWR, including the Keeyask Project.

39 Additional details on elements of the CRD and LWR are also provided in Appendix 7A.

1 **REFERENCE: Volume: Terrestrial Environment Supporting**
2 **Volume; Section: 2.8 (TE SV); TAC Public Rd 2 EC-0030; p. N/A**

3 **CEC Rd 1 PCN-0005**

4 **PREAMBLE:**

5 The response to this information request states that:

6 *"... The vast majority of the potentially affected wetlands are inland bogs, which have*
7 *relatively low overall ratings for their contributions to various wetland functions.*

8 *... It is anticipated that some degree of wetland loss can be absorbed without adversely*
9 *affecting wetland function in regions where wetlands are abundant and remain in a*
10 *relatively pristine condition [Terrestrial Environment SV 2.8.1.1]*

11 *...Given the high prevalence of peatlands in the region, and the absence of swamp in the*
12 *Project zone of influence, off-system marsh was evaluated as being the only particularly*
13 *important wetland type." (p.2)*

14 Given the importance of understanding the status of regionally rare habitat types in
15 development decisions, and the fact that the Nelson River shoreline wetlands are the
16 main exception to naturally functioning wetlands in the region, more information is
17 needed about the effects of existing hydroelectric development on the fluvial wetlands
18 of the Nelson River as a whole. This should include the Churchill River. This is important
19 to the consideration of cumulative effects.

20 **QUESTION:**

21 Specifically:

22 What historical (pre-hydroelectric development) information exists about the existence,
23 extent, species composition and structure of fluvial marshes and swamps in the Nelson
24 River system?

25 Please comment on the utility and feasibility of mapping the pre-development riverine
26 habitat complexes in the Keeyask reaches and throughout the Nelson River using
27 historical air photos, and the contribution this could make to cumulative effects
28 assessment.

29 **RESPONSE:**

30 Historical information about the existence, extent, species composition and structure of
31 fluvial marshes in the Project study region is identified in the Response to EIS Guidelines
32 and related supporting technical volumes.

33 As reviewed in the response to CEC Rd 1 PCN-0004, the region relevant to the
34 assessment of the Keeyask Project's biophysical environmental effects is the Lower
35 Nelson River downstream of Kelsey G.S. and, accordingly, this is the regional area
36 focused on for the Existing Environment described in Section 6.2 of the Response to EIS
37 Guidelines. The Nelson River wetland assessment uses the reaches of the Nelson River
38 located between the Kelsey and Long Spruce Generating Stations because, from the
39 wetlands perspective, reaches downstream of Long Spruce G.S. represent distinctly
40 different ecological conditions.

41 The following historical information regarding fluvial marshes and swamps is available
42 for the Nelson River in the Project study region:

- 43 • Stereo air photos acquired in the early 1960s for the Keeyask, Stephens Lake and
44 Long Spruce reaches are of adequate scale and quality to photo-interpret marsh and
45 swamp;
- 46 • Marsh and swamp extent has been photo-interpreted for much of Nelson River
47 included in the air photos identified in the previous bullet (Terrestrial Environment
48 Supporting Volume Section 2.2.5.1), specifically for 91% of the shoreline length
49 between Clark Lake outlet and Kettle dam. A qualitative evaluation of marsh and
50 swamp extent has been completed for the Long Spruce reach;
- 51 • Oblique large scale air photos acquired over various years in the 1920's from the
52 outlet of Split Lake to the Long Spruce G.S. site; and,
- 53 • ATK provided some general information on marsh occurrence (Response to EIS
54 Guidelines Section 6.5.2).

55 Regarding the feasibility and utility of mapping the pre-development riverine habitat
56 complexes, this has already been completed for much of the Project region (previous
57 paragraph describes some of this mapping; see response to CEC Rd 1 PCN-0002 for
58 remaining information). Mapping was completed to the extent needed to assess Project
59 and cumulative effects on Nelson River wetlands for the relevant region.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
 2 **Cumulative Effects Assessment; p. N/A**

3 **CEC Rd 1 PCN-0006**

4 **PREAMBLE:**

5 The cumulative effects of multiple hydroelectric projects within a single river system is a
 6 topic of concern for Pimicikamak and for fluvial ecologists. Effects such as fragmentation
 7 of the river system, incremental conversion of fluvial habitats to reservoir habitats
 8 through series of impoundments, potential effects over time on regional populations of
 9 terrestrial and aquatic species due to incremental habitat loss and degradation are
 10 among the issues of concern.

11 Effects of past and ongoing activities that overlap, spatially and temporally, with effects
 12 on VCs directly due to the proposed Project are expected to be assessed as cumulative
 13 effects. Many EAs have limited the scope of this requirement and have been criticised
 14 for this approach.

15 Regional assessment areas are expected to have some ecological significance, such as
 16 the range of wide-ranging species. Rather than the range of individuals at present, the
 17 boundaries of metapopulations should be considered over longer periods of time as the
 18 lifespan of these projects is essentially without a foreseeable end.

19 In addition, using current environmental conditions as a baseline, does not necessarily
 20 “assess” the cumulative effects of past activities because the condition of the pre-
 21 development environment is not well understood. Nor are the mechanisms of change
 22 due to past development well explained or understood.

23 **QUESTION:**

- 24 1. Please explain how the effects of past projects are able to be assessed with only
 25 very limited reference to pre-development conditions.
 26 2. Discuss the availability and quality of pre-hydroelectric development data that exist.
 27 3. Explain how limiting the spatial boundaries of the assessment to the region
 28 immediately surrounding the Keeyask project can help us to understand the
 29 cumulative effects of river regulation on the same VCs throughout the watershed.
 30 4. Please discuss how the public and regulatory authorities can gain an appreciation of
 31 the incremental cumulative effects of successive hydroelectric projects in the
 32 absence of a regional strategic environmental assessment.

33 **RESPONSE:**

34 The following addresses each of the questions noted above in turn.

35 1. *Please explain how the effects of past projects are able to be assessed with only very*
 36 *limited reference to pre-development conditions.*

37 It is not correct to assert that only “very limited reference” is made to pre-development
 38 conditions that are relevant in this context.

39 The Response to EIS Guidelines in Chapter 6 and related technical supporting volumes
 40 have addressed pre-development conditions (and the availability and quality of pre-
 41 hydroelectric development data that exist) where relevant, and to the extent that
 42 information is available. Information on the effects of past projects is also provided in
 43 each of the KCNs evaluation reports. This information has been used to help explain the
 44 effects of past projects (including cumulative effects of river regulation) on each VEC
 45 impacted by the Project, thereby establishing the context for assessing the incremental
 46 effects of the Keeyask Generation Project on each VEC, and for determining how VECs
 47 may respond to/be affected by the development of Keeyask,

48 2. *Discuss the availability and quality of pre-hydroelectric development data that exist.*

49 As noted in 1. above, the availability and quality of pre-hydroelectric development data
 50 is described for each VEC in Chapter 6 of the Response to EIS Guidelines and in greater
 51 detail in the technical Supporting Volumes.

52 3. *Explain how limiting the spatial boundaries of the assessment to the region*
 53 *immediately surrounding the Keeyask project can help us to understand the*
 54 *cumulative effects of river regulation on the same VCs throughout the watershed.*

55 As reviewed in the response to CEC Rd 1 PCN-0004, the region relevant to assessment of
 56 the Keeyask Project’s biophysical environmental effects is the Lower Nelson River
 57 downstream of the Kelsey G.S. and, accordingly, this is the regional area focused on for
 58 the Existing Environment described in Section 6.2 of the Response to EIS Guidelines.

59 The assessment of Project effects (Response to EIS Guidelines, Chapter 6) considers the
 60 cumulative effects of the Project on each VEC combined with effects of other past and
 61 present projects. Where relevant, the regional study area for each VEC is adjusted to
 62 address the overall ecosystems, habitats or populations affected by the Keeyask
 63 Generation Project. Where relevant for terrestrial wildlife VECs (e.g., caribou), the
 64 Regional Study Area was selected so as to be large enough to support a viable
 65 population for the year-round resident species (see Response to CEC Rd 1 CEC-0022 for
 66 further information).

67 4. *Please discuss how the public and regulatory authorities can gain an appreciation of*
 68 *the incremental cumulative effects of successive hydroelectric projects in the*
 69 *absence of a regional strategic environmental assessment.*

70 The Chapter 6 assessment takes into account the context for each VEC in light of the
71 effects of past and current projects (including successive hydroelectric projects).
72 Although governments to date have not developed any one overall regional strategic
73 environmental assessment to guide ongoing resource developments in the Lower
74 Nelson River region, a number of different ongoing regional assessment processes exist
75 to address specific regional environmental and socio-economic development and
76 planning concerns.

77 By way of example, available regionally based environmental monitoring information
78 (e.g., of the watershed, of specific fish species, of specific mammals) exists and has been
79 utilized, including consideration of all available regional information regarding any VEC
80 species at risk listed as threatened or of special concern under SARA (or is being
81 considered for such listing today based on a COSEWIC recommendation).

82 In summary, where pre-Project development has provided a basis for concern about
83 ongoing sustainability or vulnerability of specific VECs that has led to ongoing regional
84 resource assessments (e.g., lake sturgeon and caribou in areas impacted by the Project
85 as well as in a broader regional context, public safety and worker interaction in specific
86 study region communities), the EIS assessment builds on existing regional information
87 and develops plans to address these concerns. Examples include the collaborative
88 regional work on caribou, the regional Lake Sturgeon Stocking Program and the Gillam
89 worker interaction Committee.

90 For further details, please see the Cumulative Effects Assessment Summary provided
91 with the response to CEC Rd 1 CEC-0020.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
 2 **Cumulative Effects Assessment; Page No.: 7-3**

3 **CEC Rd 1 PCN-0007**

4 **QUESTION:**

5 The Chapter discusses the potential for additional mitigation that may be required to
 6 address the adverse effects of the Project combined with the effects of future projects.

7 There is some discussion in the EIS about mitigation for past (ongoing) projects such as
 8 sturgeon stocking initiatives, the caribou management plan, the Cross Lake Weir etc.

9 Could the Proponent please provide a complete list of mitigation measures that have
 10 been implemented and/or planned throughout the Nelson and Churchill River systems
 11 to address the adverse effects of the existing hydroelectric projects.

12 Please provide a discussion of each measure including the results to date regarding the
 13 effectiveness of these measures.

14 Please provide a list of supporting documentation and any existing reports on
 15 implementation and monitoring of these mitigation measures.

16 **RESPONSE:**

17 There are a number of system wide mitigation and remedial measures that have been
 18 implemented along the Nelson and Churchill River systems, including, for example:

- 19 • Shoreline Stabilization Works: Manitoba Hydro provides shoreline protection of the
 20 severance lines (the water level at which Manitoba Hydro can operate). In addition,
 21 Manitoba Hydro provides funds for the construction of shoreline protection works
 22 and reinforcement around identified burial sites in affected waterways.
- 23 • Heritage Resources: Since the early 1970s, Manitoba Hydro has been conducting/
 24 participating in a variety of archaeological programs along the Churchill and Nelson
 25 River systems, working closely with First Nations and the Provincial Historic
 26 Resources Branch, which enforces *The Heritage Resources Act*.
- 27 • Water Level Forecast Notice Program: In order to ensure that people living next to
 28 waterways affected by Manitoba Hydro's operations are aware of projected flow
 29 conditions, Manitoba Hydro has a Water Level Forecast Notice Program. A water
 30 level forecast notice is provided to First Nations, Community Councils, resource user
 31 groups, government departments and other interested parties. The notices are
 32 comprised of a graph illustrating the anticipated levels or flows and an

- 33 accompanying letter with a narrative description of the anticipated trend for the
 34 period.
- 35 • Waterways Management Program: Manitoba Hydro has a Waterways Management
 36 Program in place to support and promote the safety of people travelling on
 37 waterways affected by Manitoba Hydro's operations. This program was initiated to
 38 address issues as a result of development of hydroelectric generation stations on
 39 the Saskatchewan and Nelson River systems including waterways affected by the
 40 Lake Winnipeg Regulation (LWR) and the Churchill River Diversion (CRD). The
 41 Waterways Management Program includes boat patrols, debris management and
 42 safe ice trails:
 - 43 ○ Boat Patrols: The purpose of the boat patrol program is to patrol affected
 44 waterways to reduce mobile debris, making waterways safer for users. Boat
 45 patrol crews use GPS and digital cameras to document debris that was
 46 picked up. The patrols work during open water season until just prior to
 47 freeze-up. Boat patrols map and record daily routes, mark deadheads and
 48 reefs, identify debris work areas, place hazard markers identifying safe
 49 travel routes for resource users, gather floating debris, deadheads, old nets,
 50 etc. and relocate them to safe areas.
 - 51 ○ Debris Management: The Debris Management Program includes identifying
 52 debris work locations, and collecting and burning debris. The Debris
 53 Management Program only deals with debris on shore. Mobile debris is
 54 collected by boat patrol crews. All debris collected is piled above the high
 55 water mark to prevent it from going back in the water. Debris piles
 56 accumulated throughout the summer are burned late in season typically
 57 after the first snowfall to minimize the risk of fire.
 - 58 ○ Safe Ice Travel: Manitoba Hydro works with affected communities to
 59 develop and maintain a Safe Ice Travel Program. The safe ice travel workers
 60 are seasonal Manitoba Hydro employees hired from Northern Aboriginal
 61 Communities. Trails are mapped, tested for ice thickness, cleared of
 62 obstruction, and routinely monitored and patrolled to provide a safe
 63 alternative to traveling on unchecked routes. Safe rest cabins that can be
 64 used in emergency situations may also be built into the trail network.

65 In addition to system wide programs, Manitoba Hydro works with First Nations,
 66 Community Councils, and resource user organizations on impacted waterways to
 67 develop additional mitigation and remedial works based on their unique environmental
 68 and socio-economic impacts.

69 The cited Chapter 7 in the Response to the EIS Guidelines deals with the cumulative
 70 effects of Keeyask acting in combination with other past, present and future projects.
 71 This cumulative effects assessment, like the rest of the environmental assessment, used

72 a 'VEC-based' approach. This means the spatial and temporal scope for the assessment
73 of Project effects to each VEC is based on a consideration of the potential for there to be
74 overlapping and cumulative effects on the VEC from other projects and activities.

75 The extent to which past and current projects, including associated mitigation
76 measures, have been considered in the effects assessment for Keeyask is also discussed
77 in the Response to EIS Guidelines in Chapters 6 (for all VECs and supporting topics) and
78 in the following supporting volumes: Physical Environment; Aquatic Environment;
79 Terrestrial Environment; and Socio-Economic, Resource and Heritage Resources. A full
80 description of the other projects and activities included in the cumulative effects
81 assessment can be found in Appendix 7-A of the Response to EIS Guidelines. The KCNs
82 also provide details on their experiences with past and current hydroelectric
83 developments in each community's evaluation reports.

84 It is not relevant or feasible for the Keeyask cumulative effects assessment to explore
85 the history and success of mitigation undertaken for each of the past and current
86 hydroelectric developments. Where relevant to a particular VEC, previous and/or
87 ongoing mitigation measures have been considered only in cases where:

- 88 • These mitigation measures serve to reduce the residual adverse effects of these
89 other projects and activities, thus changing the nature and magnitude of the effects
90 that may overlap with those of the Keeyask Generation Project; and
- 91 • The success (or not) of mitigation measures implemented for other projects and
92 activities in similar environmental circumstances to those at Keeyask helps to inform
93 the type of mitigation measures that could be implemented to address similar
94 adverse effects that are predicted to occur as a result of developing the Keeyask
95 Generation Project.

1 **REFERENCE: Volume: Response to EIS Guidelines; Section: 7.0**
2 **Cumulative Effects Assessment; p. N/A**

3 **CEC Rd 1 PCN-0008**

4 **QUESTION:**

5 What information exists that can be used to develop a quantitative analysis of the
6 aquatic habitats necessary for sturgeon life history that have been lost or degraded
7 throughout the Nelson River system?

8 **RESPONSE:**

9 The Partnership is aware that habitat information has been collected in the following
10 reaches of the Nelson River:

- 11 • Upper Split Lake area, which refers to the lower sections of four rivers near the
12 western end of Split Lake: the Nelson River (downstream of the Kelsey Generating
13 Station to Split Lake); the Grass River (below Witchai Lake Falls to the confluence
14 with the Nelson River); the Burntwood River (from First Rapids to Split Lake); and
15 the Odei River (First Falls to the confluence with the Burntwood River). These
16 surveys were conducted in support of the Keeyask Lake Sturgeon stocking plan.
- 17 • Clark Lake to Gull Rapids reach as part of the Keeyask Generation Project
18 environmental assessment;
- 19 • Nelson River between Gull Rapids and the inlet to Stephens Lake as part of the
20 Keeyask Generation Project environmental assessment;
- 21 • Long Spruce Forebay as part of Manitoba Hydro's Sturgeon Stewardship program;
- 22 • Limestone Forebay as part of the Conawapa environmental studies; and
- 23 • Nelson River downstream of the Limestone Generating Station as part of the
24 Conawapa environmental studies.

25 Habitat information that has been collected in these surveys generally addresses habitat
26 requirements for Lake Sturgeon as described in the AE SV Appendix 6A. The Manitoba
27 Lake Sturgeon Management Strategy (2012) provides a general description of key
28 habitat alterations in the upper Nelson River, from the outlet of Lake Winnipeg to the
29 Kelsey Generating Station.

30 In addition, bathymetric information has been collected on several of the lakes in the
31 Nelson River region; however, such information is not directly pertinent to Lake
32 Sturgeon habitat assessments.



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