**EIS Review Form**

| Comment Number | Volume / Document | Page | Context / Preamble<br>e.g., provide applicable background/rationale for providing the comment | Specific Department Comment / Request for Additional Information: |
|---|---|---|---|---|
| 1 | AE SV 1 | 1-8, 1-27 | 1.2.2.4 - selection of VECs - Considering the importance of the benthic community to fish populations, should it be included as a VEC? | Please confirm. |
| 2 | AE SV 2 | 4-21 | Changes to trophic levels in Stephen's Lake area, aquatic macrophytes. Page 4-33 states aquatic plants and attached algae downstream of coffer dams and excavation areas may be somewhat negatively affected. Page 4-34 then states based on a low rate of deposition, downstream sedimentation is not expected to have a measurable effect on vegetation. | Please clarify the potential down stream effects to vegetation by TSS. |
| 3 | AE SV 3 | 6-29 | 6.4 Project Effects - In the list of potential effects it appears the following are missing: disruption of rearing and feeding habitat, and disruption of movement between Gull Lake and Stephens Lake. | Please provide a rationale why these project effects were not included in the list. Consider adding to project effects list. |
| 4 | R-EIS Gdlines | 7-30 | Cumulative Effects assessment - Linear Feature Density discrepancy between Section 7.5.2.2.3 Mammals and Section 7.5.2.3.1 Habitat, Ecosystems and Plants | On page 7-30 linear feature density is not expected to change. However on page 7-32 under intactness linear feature density will increase in the regional study area. These statements are contradictory. Please clarify. |
| 5 | Map Figure Folio | Map 4-10 | Biophysical Environmental Mitigation Areas Map - A potential high quality wetland area identified on the map will be fragmented by the south access road development. The road location has the potential to impact the wetland mitigation. | Please provide a rationale for developing the wetland mitigation in an area that is also identified for the development of proposed south access road corridor. |
| 6 | R-EIS Gdlines | 4-33 | Sequencing of Project Phases Figure - Figure 4-5 is not presented in the EIS document as stated (Relates to timing sequences). | Please provide or refer the reviewer to the location of the Figure in the EIS. |
| 7 | R-EIS Gdlines | 4-6 | There is no consideration of a "No GO scenario" as required in the EIS Guidelines. | Please provide justification or refer the reviewer to the relevant section of the EIS. |
| 8 | R-EIS Gdlines | 1B-1 | Applicable Legislation - The *Canadian Environmental Assessment Act* has applicability to the entire project as proposed. It is not clear what the "Town Centre Complex Project" is referring to. There is no mention of the Federal *Species Act Risk Act* or the Federal *Migratory Birds Convention Act* and its applicability to the project. | Please be aware of the applicable federal legislation. |
| 9 | R-EIS Gdlines | | Assessment of Accidents and Malfunctions - There is no assessment of the effects of accidents and malfunctions as required in the EIS Guidelines. There is little discussion on contingency and emergency response procedures developed in the event of an accident or malfunction. The EIS does not include a list of emergency response plans to be developed and implemented over the life of the project. | Please provide this information. |
| 10 | R-EIS Gdlines | | EIS Guidelines required the proponent to provide the present mercury and methylmercury data and analysis in soil. The is very little detail provided. | Please provide this information. |
| 11 | PI SV | p. 2-6, P. 2-4 | The EIS refers to materials that will be submitted at a later date, either as part of a supplemental filing, (e.g. material that will be related to Round Three of the Public Involvement Program) or other information that may be collected in future (e.g. study on use of the area by the Metis, under negotiation). There is some uncertainty about the information that will be available for public review and for review by regulators before the completion of the environmental assessment. | Besides the responses to information Requests arising from this initial review of the EIS, list all other studies, information, or reports that the proponent is planning to include as part of supplemental filing before the conclusion of the EIS review phase, and the estimated date of filing this information. |
| 12 | PI SV | -1 and follo | The tables list the events held and the comments received from groups during workshops, open houses, and meetings. Other meetings or contact with Cross Lake/Pimicikamak First Nation are not included in this listing, presumably because the information about the Keeyask project occurred in a slightly different context (CLFN/PCN - Article 9 discussions under the NFA). Although this was provided in a different context, it would be helpful to have the relevant information also included in the summary table, for the purpose of sorting and comparing. | Include the CLFN/PCN information (now currently noted in Appendix 4) and other groups in the table for sorting and comparison purposes. |
| 13 | PI SV | Appendix 1 | Table 1 is sorted alphabetically by group; Table 2 is sorted alphabetically by issue. | For presentation in the document, it is recommended that a consistent format be used or state why the format was changed. For sorting electronically, please make these available on request as a non-pdf file. |
| 14 | SEE-RU-HR SV | p.1-7 | CEAA requires consideration of environmental effects, including the effects of changes to the environment on the current use of lands and resources for traditional purposes by aboriginal persons. The EIS notes that the effects on domestic resource use are predicted for KCN communities only, and therefore the primary mitigation involves the effective implementation of the Adverse Effects Agreement offsetting programs (see as an example p 1-27, s. 1.2.4.1.1 Domestic Fishing Construction Phase Effects and Mitigation) which apply only to the KCN communities and members. Use in the Local Study Area by other Aboriginal groups has not been identified through the Public Involvement Program; however, the EIS also acknowledges that this information may be outstanding, in that there are ongoing discussions with the MMF and CLFN/PCN regarding how the resources are used by those communities. Further, notes from the PIP meeting with Shamattawa indicate that this community believes that their treaty rights may be impacted, implying effects to resource use. Finally, the proponent acknowledges that contact with some potentially affected Aboriginal groups has not been completed. The extent of hunting and fishing by Aboriginal groups or persons other than the KCN communities or members is not identified 'to date.' | We require further information to confirm the extent of use (or lack of use) for traditional purposes by Aboriginal persons of the resources likely to be affected by the project. If further information is collected indicating resource use by Aboriginal persons not party to the Adverse Effects Agreements, assess these effects and describe measures that will be undertaken to mitigate effects to current use of lands and resources by Aboriginal persons not party to the Adverse Effects Agreements off-setting programs. |

| | | | | |
|---|---|---|---|---|
| 1 | | 3-2 | "Biological components of the aquatic habitat were based on the period during which field studies conducted in the area, generally between 1997 and 2006. This period included both high and low flows, and therefore would indicate interannual variability related to flows." | Detailed background reports have not been provided in the EIS. These should be made available for review. |
| 2 | | 3-2 | "No analysis of trends in aquatic habitat was conducted, since the water regime was established in 1977 and has been operated within set bounds since that time." | However, has aquatic habitat and changes in fish stocks changed since 1977, despite apparent constancy? Moreover, habitat changes were not actually assessed to affirm this claim. Can the existing environment be adequately portrayed if not assessed/sampled? This also does not account for natural changes in habitat with flow events outside of regulation. For example, a flow/ice event approximately 10 years ago changed the flow patterns at Gull Rapids, creating a new channel that flows northeast to Stephens Lake. |
| 3 | | 3-2 | "Substrate composition could not be determined immediately upstream, within, or downstream of rapid sections due to safety concerns. " | How far is immediate? Substrate composition be should be confirmed in the dewatered areas in Gull Rapids prior to any construction. Resolution should be similar to that already conducted in the vicinity of Gull Rapids. This information is crucial proper accounting of habitat destruction in the rapids. |
| 4 | | 3-5 | "For the purposes of predicting habitat conditions in the post-Project environment and quantifying areal changes in habitat area between the pre and post-Project environments, conditions at 95th percentile flow (pre-Project) and full supply level (FSL) in the reservoir post-Project were used. " | This analysis is incomplete. While the 95th percentile accommodates the majority of flows, changes in fish habitat at lower flows are not shown and may be more crucial. Moreover, the 95th percentile flow will be relatively uncommon. The 50th percentile would represent a more normal flow condition and changes in this habitat are not presented. |
| 5 | | 3-5 | "intermittently-exposed zone" | Uncertain as to whether the "intermittently-exposed zone" is in the forebay, below the GS or both. There is no mention or study of the effects of water control on dewatering and re-watering areas below the GS and whether habitat losses and fish fills will occur as a result of this. |
| 6 | | 3-6 | Section 3.2.4.1.2 | Is the habitat classification in Section 3.2.4.1.2 related to suitability for fish habitat? Its use for Fish Community Assessments (Section 5) is challenged as the methodology is unproven and thereby likely unacceptable. The use of Habitat-based CPUE modelling was not supported by DFO, due to: 1) the tremendous interannual and spatial variation in CPUE, often requiring several years of trend through time data, 2) only one published example of this method was provided and it this was from a marine environment and 3) very small samples sizes that do not account for variation. |
| 7 | | 3-8 | Depth Zones Section | In reviewing methods for aquatic habitat assessment in Appendix 3A, while the amount of bathymetric surveying was quite impressive, the validation of sonar data does not appear to be structured and repeated such that there is statistical confidence in the results obtained. There in no description of a comparison between the results expected and results observed and therefore the fidelity of the observations. |
| 8 | | 3-25 | "The main effects on habitat availability are losses due to dewatering, and disruption to available lotic habitat due to diversion." | Given that the impacts will extend for several consecutive years, impacts to fish habitat in the Nelson River and Stephens Lake can be considered as permanent and not as a temporary disruption. |
| 9 | | 3-25 | "Substrate quality will also be disrupted due to erosion, transport, and deposition of bank and cofferdam materials into the downstream are primarily due to river staging in the Gull Rapids area. " | Loss in some cases is expected to be permanent, at least in part (e.g. sand lens below Gull Rapids). As such, part of this impact needs to be described in the context of permanent loss. |
| 10 | | 3-25 | "New lentic habitat will be created below the south dam, but will vary in area due to inflows and construction activity, until the spillway construction is complete. " | In fact, the spillway is expected only to be operated every four years, so the "new" habitat will be of limited use. |
| 11 | | 3-26 | "The total area dewatered during Stage I of construction is estimated to be 131.5 ha, inclusive of the Project infrastructure that accounts for about 30.6 ha (Table 3-6, Map 3-24)....The total area dewatered during Stage II of construction is estimated to be 123.9 ha, of which the Project infrastructure accounts for about 29.2 ha (Table 3-6, Map 3-24). Note that in Map 3-24, the infrastructure that is permanently flooded in Stage II of construction (i.e. substrate alteration), is shown within the dewatered areas for Stage I." | With reference to Table 3-6 and Map 3-24, given that areas will be dewatered and coffer dams in place for at least three years (Stage 1) and 1-3 additional years (Stage II), each of these impacts should be defined as permanent losses, not as disruptions. Much or all the area in the dewatered area will be utilized as borrow and/or river bed alteration (blasting) to facilitate flow to the new GS and spillway - as such permanently altered. Moreover, neither the table or map (or text) account for the change in habitat use (and therefore value) from limited spawning habitat to, at best, feeding areas. |

| | | | | |
|---|---|---|---|---|
| 12 | | 3-28 | "The construction of two temporary causeways will be built to access the N-5 and G-3 borrow areas.....for about seven years during the construction period. " | This would be considered a permanent loss of fish habitat. |
| 13 | | 3-28 | "3.4.1.6 Loss/Alteration of Habitat at South Access Road Stream Crossings." | Any loss if habitat (riparian, stream bed, etc) will be permanent (this is not clear currently in the EIS). Also, there is no mention of sizing culverts to maintain 3Q10 fish passage for fish that contribute to an aboriginal, recreational or commercial fishery. |
| 14 | | 3-34 | Pages 3-34 to 3-36 | Depositional areas and changes described on pages 3-34 to 3-36, but does not talk about changes to specific habitats. |
| 15 | | 3-43 | "A detailed monitoring plan will be provided in the Aquatic Effects Monitoring Plan" | When will this be provided? Should be in the EIS. |
| 16 | | 3-43 | "This monitoring plan will be implemented during the construction phase of the Project, and will continue into the operational phase. " | Should be provided in the EIS and must be provided prior to issuance of regulatory decision. Providing input on monitoring frequency is impossible without seeing detailed monitoring plan. |
| 17 | | 6-4 | "Information on movements through Gull Rapids was used to help determined whether fish passage might be required for the Keeyask Project. Lake sturgeon habitat use in the existing environment was described in part by calculating gillnet catch-per-unit-effort (CPUE) in various habitat types." | CPUE is, in general, a very limited metric for estimating population size and even more limited to describe habitat use. Description of CPUE needs to be interpreted with caution. Comparison of CPUE between years requires that sampling is standardized and/or an unbiased sample design is employed. Sampling usually needs to be conducted over several years to account for interannual bias. Variation in any metric such as CPUE needs to be reported. |
| 18 | | 6-5 | 6.2.4 Assessment Approach "Habitat Suitability Index models were developed in consultation with Fisheries and Ocean Canada...." | While HSI curves were agreed to, the use of these curves in habitat modelling was not. |
| 19 | | 6-8 | "Over-harvesting, both historical (primarily commercial) and at the time of publishing (domestic), were the biggest problems faced by the sturgeon stocks.....Because of the time required for sturgeon to reach sexual maturity and catchable size, impacts of previous hydroelectric developments would be slow to appear in the population." | The historical loss and fragmentation of sturgeon habitats in the Lower Nelson River (e.g. spawning grounds) is not well addressed in the EIS. Impacts from, for example, the loss of recruitment, may take decades to be realized in a long lived species such as sturgeon. Moreover, these comments do not completely agree with conclusions on impacts to and recovery potential of lake sturgeon in Designated Unit (Lake Sturgeon DU3 RPA - DFO 2010). |
| 20 | | 6-18 | "Four adults and 20 sub-adults were captured between Birthday and Gull Rapids during other Keeyask gillnetting studies conducted during summer and fall of 1999-2009 (Table 6-6). The sub-adult catch (number(n) = 15fish) during the summer of 2009 index gillnetting program included ten relatively small sturgeon (191-230 mm total length) believe to have hatched in spring 2008. Based on these captures and the 15 YOY captured in 2008 it appears that there was relatively high recruitment in this reach in 2008. " | These are very small sample sizes to derive any credible assumptions on any life history parameter. Floy tagging results are too generalistic to derive specific conclusions on life history patterns. |
| 21 | | 6-19 | "It is assumed most of the spawning lake sturgeon captured in or near the (Gull) rapids moved upstream from Stephens Lake as none of the sturgeon that were tagged upstream between Birthday and Gull Rapids were recaptured in spawning condition in the Gull Rapids vicinity (see Section 6.3.2.7)." | This claim is not supported for several reasons: 1) the capture rate of sturgeon (including spawning) was very low and therefore probability of catching a sturgeon from any given area is diminished, 2) unless fish movements are tracked over time, where they originate cannot be definitive. While sturgeon may have originated from Stephens Lake, they may also have originated elsewhere in the Nelson River. Unfortunately, the data cannot provide this discrimination. |
| 22 | | 6-15 | "Under the 5th, 50th, and 95th percentile flow scenarios, HSI models for lake sturgeon spawning habitat in the existing environment show that there is a WUA of between 13ha and 18ha within and at the base of Gull Rapids..... Under the 5th, 50th, and 95th percentile flow scenarios, HSI models for lake sturgeon spawning habitat in the existing environment show that there is a WUA of between 13 ha and 18 ha within and at the base of Gull Rapids. Two additional variables were added to the HSI model to account for observations made during egg deposition studies: 1) the direction of river flow, and 2) distance from the origin of white water and/or a hydraulic feature." | It is recognized that only in the spawning HSI model were additional parameters used in addition to the traditional parameters of depth, substrate and velocity. Also recognizing that in using these additional parameters in the WUA of lake sturgeon spawning habitat is greatly reduced (in most cases at 100 fold). Given the potential magnitude of these affects, please provide published examples of the use of the distance and direction parameter in other studies. |
| 23 | | | Lake sturgeon spawning HSI Modelling and commensurate maps | Please present WUA for all lake sturgeon spawning habitat for all presented flows using just the depth, substrate and velocity suitability curves. |
| 24 | | | Appendix 6D | Please present Habitat Units (HU's) for all tables in section 6D. |
| 25 | | | Chapter 6 | For all HSI maps, outline of existing environment (the shorelines of the Nelson River and Stephens Lake) should be shown in the post project environment maps. The additional aquatic area gained by creation of the forebay should be illustrated and given a suitability of 0, recognizing that this is terrestrial habitat that will undergo substantial change before it becomes productive aquatic habitat (EIS suggests at least 5 years). |
| 26 | | 6-16 | Maps 6-48, 6-49 | Unclear as to how sand/gravel habitat will be created post project in the forebay, particularly in years 1-5. Does this include compensatory measures proposed in Appendix 1A? |
| 27 | | | Chapter 6 | HSI model verification for existing environment not conducted. Can model verification be conducted prior to construction? Can verification of physical environment be conducted prior to construction. Post project verification of HSI and physical models should be conducted. |
| 28 | | 6-19 | "The model also suggests that there is more spawning habitat available at the base of the rapids than within them, due to the prevalence of excessively high velocities within the rapids proper." | Is this a valid conclusion at all flows? How would spawning habitat distribution change without constraining the model by distance and flow direction? |

| | | | | |
|---|---|---|---|---|
| 29 | | 6-19 | "Currently, lake sturgeon spawn within Gull Rapids and larvae drift downstream into lower velocity areas of the river or the western portion of Stephens Lake where an area of gravel/sand and sand has formed (Section 3). Lake sturgeon larvae have been reported to drift up to 60km downstream of the spawning site (Appendix 6A). Therefore, larvae spawned further upstream may also be drifting downstream through Gull Rapids and settling in these areas." | This statement does not reconcile with another conclusion in the EIS that movement through Gull Rapids is not required for lake sturgeon life history. Why? |
| 30 | | 6-19 | Rearing | Did the condition of y-o-y lake sturgeon between various capture sites (Caribou Island, Stephens Lake, etc) differ? |
| 31 | | | Overwintering | Overwintering habitat, use and movements not well documented in the EIS |
| 32 | | 6-27 | Fish Movements – Importance of Movements. | Conclusions in this section that upstream or downstream movement of adult lake sturgeon are not spawning migrations do not agree with local traditional knowledge that Gull Rapids and Birthday Rapids are important spawning grounds for Stephens Lake sturgeon. |
| 33 | | 6-27 | Fish Movements – Importance of Movements. | Acoustic and telemetry tagging clearly show movement of Lake sturgeon through Gull Rapids. However, due to the limited number of telemetry data, conclusions on habitat use and the types of migration (e.g. spawning) are not practical. |
| 34 | | | Fish Movements – Importance of Movements. | Habitat impacts as a result of the loss of migration upstream and downstream through Gull Rapids (Stage II construction) should be recognized. |
| 35 | | 6-29 | "Disruption of spawning activity due to disturbance by construction activity and habitat loss/alteration." | Spawning habitat loss in for much of Gull Rapids will be permanent. Resumption of spawning may occur in the remaining natural (and constructed) spawning habitat, but this is uncertain. |
| 36 | | 6-31 | "The cofferdams will not affect lake sturgeon in the Nelson River upstream of Gull Rapids as those fish use habitat upstream of the rapids." | This is not a reasonable conclusion, given little long term information on documented sturgeon habitat use and movement and no evidence of distinct populations (6.3.2.5) between Stephens Lake and Clark Lake. |
| 37 | | 6-32 | "Increase in lake sturgeon movements upstream to Split and Clarke lakes due to velocity changes as a result of impoundment (e.g. reduction in velocity at Birthday Rapids)." | This avoidance of slack water habitat will extend too much of the forebay, not just at Birthday Rapids. The HSI curves for all sturgeon life stages are heavily influenced by velocity, a recognition that lake sturgeon select high velocity riverine environments. |
| 38 | | 6-32 | "Habitat changes in the reservoir due to changes in water levels and flow that will result in the loss or alteration of existing habitat (riverine channels in Gull Lake....and the creation of new habitat.." | The creation of "new" habitat in the forebay should be discounted to half that of the current riverine environment. Recognizing that the forebay will not stabilize ecologically for a number of years, productiviy will be low or none existent initially. Productivity will, however, increase with time. As a result, WUA's for all post project HSI analyses should be calculated in consideration of this change in productivity over time using a defensible methods approach (K. Minns, pers. comm.). This approach would discount the value of habitat in the post project environment for the number of years required for the full productivity of the new forebay to be realized. At a minimum, this appears to be 5 years, but could be indefinite ("...downstream emigration was documented for lake sturgeon moving out of the (new) Limestone reservoir within the first five years after impoundment (NSC 2012). Over time, some lake sturgeon that move upstream may return downstream to the reservoir.") This suggests that not only will usable habitat be lost in the reservoir, but the loss of a natural population this area may occur as well. While conservation stocking is proposed to mitigate this, there is no proof that the stocked sturgeon will remain in the new forebay either. |
| 39 | | 6-32 | "Alteration of habitat in the river channel between Gull Rapids and Stephens Lake." | Much of the habitat in this reach will be permanently destroyed with only small portions undergoing alteration. |
| 40 | | | 6.4.1.2.7 Net Effects of Construction with Mitigation | Given information presented in this EIS, it is highly uncertain that permanent loss of Gull Rapids as spawning, migration and rearing habitat for lake sturgeon (and several other species) can be mitigated. This is due to: 1) lack of detailed information for the proposed lake sturgeon stocking program and uncertainty regarding the acceptability of this program (see comments on stocking), 2) questionable representation of the amount and value of spawning habitat currently in and around Gull Rapids and 3) lack of understanding of the importance of maintaining migration through Gull Rapids and the avoidance of habitat fragmentation in the Nelson River. |
| 41 | | 6-35 | "The majority of lake sturgeon captured in these reservoirs are taken in the upper, more riverine areas. Researchers on the Winnipeg River have also found that sturgeon are most abundant in the upper reaches of the reservoirs where conditions are more characteristic of riverine conditions." | This contradicts the conclusions elsewhere in the EIS that the new forebay will create highly suitable habitat for all life stages of lake sturgeon. |
| 42 | | 6-35 | "The existing environment HIS model for lake sturgeon spawning habitat indicates that there is a WUA of between 9 and 12 ha from Clarke Lake to Gull Rapids." | As previously mentioned, the method of calculating spawning habitat WUA's will need to be revisited as the estimate of 9 to 12 ha is likely a substantial underestimate. |
| 43 | | 6-37 | "The majority of the lake sturgeon captured in the Long Spruce and Limestone reservoirs are taken in the upper end of the reservoirs where conditions are more characteristic of riverine habitat (NSC 2012). These observations suggest that, while the amount of usable foraging habitat (i.e., WUA) upstream of the Keeyask GS will be higher in the post-Project environment, not all this habitat may be selected by either sub-adult or adult fish." | This suggests that post the project environment WUA for these life stages may need to be modified using this system specific observations. |
| 44 | | 6-40 | "To compensate for the loss of spawning habitat, several areas will be developed to provide suitable spawning habit" | All proposed compensation works should have relevant suitability curves applied and commensurate WUA and HU's calculated. |

| | | | | |
|---|---|---|---|---|
| 45 | | 6-41 | "Lake sturgeon could also use habitat in the river below the spillway in years when the spillway is operating at sufficient discharges during the spawning and egg incubation peri" | Please provide details on performance/success of lake sturgeon spawning habitat use and successful hatch from similar structures developed at the Grand Rapids and Limestone GS's. |
| 46 | | 6-41 | "The capture of 3 month old (approximate) YOY sturgeon over cobble/boulder substrate along the south shore between the rapids and the lake, suggests that older YOY can survive in what is thought to be less than optimal habitat..." | Were YOY found to consistently utilize these habitats? If so, did they exhibit diminished condition or fitness? |
| 47 | | 6-41 | "Because the number of lake sturgeon residing downstream of Gull Rapids is considerably reduced compared to historic levels, a stocking program will be implemented to avoid possible effects of a temporary reduction in rearing habitat should it occur" | Given the loss of known high quality YOY habitat north of Caribou Island (future forebay), the known YOY rearing habitat below Gull Rapids must be protected. |
| 48 | | 6-43 | "The phased approach to fish passage.....will permit trial implementation of fish passage for lake sturgeon with minimal risk to the Stephens Lake population." | The stated risk to the Stephens Lake sturgeon population is not identified. Note, the proponent has been requested to investigate the cost/benefits of various fish passage designs, including cost, environmental cost/benefit, etc. The proponent has retained a consultant for this investigation, which has produced a preliminary report on this comparison. The detailed results of this report should be made available in the EIS for review. |
| 49 | | 6-43 | "The phased approach to fish passage.....will permit trial implementation of fish passage for lake sturgeon with minimal risk to the Stephens Lake population." | Trap and truck was identified as the fish passage option for Keeyask, this method has traditionally been used at high head dams and information behind the rational for the selection of this option would be helpful. What criteria will be used to determine if and when trap and truck should be implemented? |
| 50 | | 6-43 | "Sturgeon moving downstream from the Keeyask reservoir would need to pass either the spillway (when its in operation) or past the trash racks and turbines.....Although experimental studies of turbine effects have not been conducted with lake sturgeon, studies of fish movements in the Limestone reservoir have recorded downstream passage by lake sturgeon both over the spillway and past the turbines." | What is the survival of sturgeon that pass: 1) through the turbines and 2) over the spillway? How does this survival change with size? What provisions for safe downstream passage have been considered? |
| 51 | | 6-43 | "There is no information available on turbine mortality rates for sturgeon. " | Mortality rate for sturgeon should be based on: 1) known mortality for species of a similar size (e.g. pike) for both spillway and turbine and 2) the number of individuals passing the turbines can be calculated based on fish passage studies (e.g. Missi Falls) and a commensurate relative abundance estimates. |
| 52 | | | Appendix 6B Field Data Collection and Analysis | Gillnet and larval drift sampling described in Appendix 6B should be viewed as reconnaissance or "search" sampling. Sampling does not appear to be an index and therefore any statistics related to CPUE as an indication of population size or relative abundance should be viewed with caution. |
| 53 | | | Appendix 6B Field Data Collection and Analysis | With the exception of adult spring spawning data collection, other sampling periods are quite short. |
| 54 | | | Appendix 6B Field Data Collection and Analysis | Details on mark recapture information is lacking in terms of annual movements. Raw data used for population estimates should be made available. |
| 55 | | 3-32 | Management Plans to be Developed | All cited management plans should be provided as part of the EIS submission. |
| 56 | | | Construction Mitigation - DFO notes that timing for the majority of in-stream work is scheduled between July 16 to September 15 | In 2015, construction of the spillway cofferdam is scheduled for July 16 to October 4 (extending into the Whitefish spawning period)...what additional mitigation and/or construction techniques are proposed during this sensitive period? |
| 57 | | | Construction Mitigation - DFO notes that timing for the majority of in-stream work is scheduled between July 16 to September 15 | Please provide detailed contingency plans for construction techniques proposed should a request to extend construction beyond proposed dates occur. DFO would appreciate the opportunity to review contingency plans in advance to ensure appropriate decisions with a timely response can be provided. |
| 58 | | | Monitoring | DFO notes that there are no monitoring plans submitted within the EIS. We look forward to reviewing the following management and monitoring plans (as proposed to be developed in chapter 8 of the EIS):<br>o Sediment Management Plan<br>o Fish Habitat Compensation Plan<br>o Waterways Management Plan<br>o Aquatic Effects Monitoring Plan<br>o Physical Environment Monitoring Plan |
| 59 | | | Monitoring | How will peat deposition be monitored? And assumptions in the EIS verified? (ex. Estimate only 1% of peat will be transported downstream) |
| 60 | | | Monitoring | Please provide a detailed map of baseline sedimentation sampling sites and proposed monitoring sites? Ideally, future monitoring sites should be located near the baseline sampling sites for accurate comparisons. |
| 61 | | | Bed Load | Between 2005-2007, approximately 350 bedload samples were collected, but this yielded few measurable samples (Appendix 7B). The EIS reports an estimated an average bedload of 4 g/m/s. How reasonable is this estimate given the insufficient samples to estimate the annual bedload discharge? What method(s) will be used to monitor bedload? |
| 62 | | | Bed Load | It seems that only 50th percentile flow examined – why not 5th and 95th? |
| 63 | | | Sedimentation - TSS | Is the relationship between turbidity/TSS developed using local (Gull Lake/Stephens Lake) data? Was there be an ongoing calibration of the turbidity/TSS relationship to reduce induced error? |
| 64 | | | Sedimentation - TSS | Background TSS assumed to be 20 mg/l. EIS does not explain the rationale for using this number when the range is 5mg/l to 30mg/l. |

| | | | | |
|---|---|---|---|---|
| 65 | | | Sedimentation - TSS | Assumption that 70% of all fine particles will remain in suspension past Kettle GS. How can they determine this? Has this been modelled? How will the model/assumptions be tested? |
| 66 | | | Sedimentation - TSS | Suggest that discrete data loggers (TSS) are better than continuous collection data loggers. Discrete loggers should be verified using point sampling to verify data loggers especially in the first year. The use of discrete data loggers for existing environment and post project post project environment. The continuous data loggers are too variable and subject to error due to bio-fouling. |
| 67 | | | Sedimentation - TSS | EIS proposes to have the first post project monitoring station 1km downstream of the construction site in the "fully mixed zone". The location of the first monitoring station downstream of Keeyask construction site is too far away. It is recommended that a turbidity/TSS monitoring site be placed close to the construction site. |
| 68 | | | Sedimentation - TSS | Can the Proponent provide an analysis showing that its monitoring will have a high degree of confidence, or the power, to detect TSS above the action threshold (regulatory guideline)? |
| 69 | | | Sedimentation - TSS | The Proponent appears not to discuss effects of TSS specific to the individual VEC fish species. The Proponent's impact assessment appears to rely primarily on lethal TSS concentration effects. Can the Proponent provide an expanded discussion of sub-lethal or chronic impact risk assessment for anticipated TSS changes? |
| 70 | | | Sedimentation - TSS | Existing environment sedimentation models based on low, med and high flows (2059, 3032 and 4,327 cms). Do these relate to percentile flows? Post-project sedimentation modelling simulated under 50th percentile for year 1, 5, 15 and 30 years after impoundment, and under 5th and 95th percentile flow for 1 and 5 years after impoundment. Why different flow regimes for different time periods? The post-project sedimentation environment was also simulated under the 50th and 95th percentile flows using the eroded shore mineral volumes as estimated, considering peaking mode of operation for the time frames of 1 and 5 years after impoundment. Proposed monitoring to valid models? |
| 71 | | | Peatland Erosion. | Did not look at peat downstream of the generating station, claiming that peat would not go past the GS (only 1% would get past the GS – is this reasonable?). What monitoring is proposed to confirm this? |
| 72 | | | Peatland Erosion. | Visual distribution (maps) of peatland deposition not presented in the EIS. How will peat deposition impact on known/suspected areas of fish habitat in the future forebay? |
| 73 | | | Deposition - EIS states deposition loads will not change post project – about 3cm/year, based on about 30cm of sediment deposited in ten years since Kettle GS was built. "Based on extensive modelling (using Stephens Lake) and field verification", the majority of mineral sediments resulting from shoreline erosion are predicted to deposit in near shore areas...after year 1, rates predicted at 0-3 cm/y. Offshore = 0-1 cm/y after year 1. The south nearshore areas in gull lake predicted to experience highest deposition rate of 4-6 cm/y for year 1 under baseloaded conditions. | Do not provide sedimentation rates based on a range of flows. No detail on sampling conducted to establish baseline other than at Kettle GS. How will the sedimentation model be tested for accuracy? What monitoring will be conducted to validate model assumptions? |
| 74 | | | Sedimentation | Given the variation in sedimentation rates over time and the challenges in estimating sedimentation level, does the sedimentation analysis include a sensitivity analysis to reflect possible ranges in sedimentation and the effects on fish and fish habitat both upstream and downstream? |
| 75 | | | The EIS notes "Placement and removal of cofferdams/groins during Stage II Diversion will occur over three years (2017, 2018, and 2019) during the open water seasons. Most of these activities are predicted to result in increases in TSS of less than 5 mg/L above background, which would be within the...CCME guidelines for the protection of aquatic life. The exceptions include placement of the South Dam Rock Fill Groin, which is predicted to result in TSS increases of up to 15 mg/L above background, with increases of greater than 5 mg/L for a period of approximately 10 days in early September 2017. An increase in TSS of 7 mg/L for a period one month is also predicted during removal of the Tailrace Summer Level Cofferdam in September/October 2019. | The Proponent predicts several instances of average TSS increases greater than the CCME guideline for longer term impacts (e.g., inputs lasting between 24 h and 30 d should not exceed 5 mg/L above background). Are there additional opportunities, both reasonable and practical, to further prevent and mitigate sediment releases such that the guidelines can be met? For example, if a given TSS exceedance is in part due to shoreline erosion, would pre-emptive shoreline stabilization be an option? |
| 76 | | | The EIS notes "Prediction of the post-impoundment...environment upstream...was carried out by...numerical modelling...Depth-average mineral suspended sediment concentrations were estimated for average (50th percentile) flow for prediction periods of 1 year, 5 years, 15 years and 30 years after impoundment. Sediment concentrations were also predicted for low (5th percentile) and high (95th percentile flow conditions for...1 year and 5 years after...impoundment. While outside the zone of hydraulic influence, a qualitative assessment was carried out for...sedimentation...in Stephens Lake..." | Can the Proponent provide some explanation, or direct reviewers to its location, of why TSS modeling at selected flow percentiles, e.g., 50th percentile or 5th and 95th percentile, or other model settings, provide good estimates of likely effects on the aquatic environment? |

| | | | | |
|---|---|---|---|---|
| 77 | | | The EIS notes "Placement and removal of cofferdams/groins during Stage II Diversion will occur over three years (2017, 2018, and 2019) during the open water seasons. Most of these activities are predicted to result in increases in TSS of less than 5 mg/L above background, which would be within the...CCME guidelines for the protection of aquatic life. The exceptions include placement of the South Dam Rock Fill Groin, which is predicted to result in TSS increases of up to 15 mg/L above background, with increases of greater than 5 mg/L for a period of approximately 10 days in early September 2017. An increase in TSS of 7 mg/L for a period one month is also predicted during removal of the Tailrace Summer Level Cofferdam in September/October 2019..." | If increases in TSS exceeding the CCME guidelines appear to be unavoidable, can the Proponent provide additional discussion and rationale (or direct reviewers to the location of that information in the EIS) for why the exceedances, in the Nelson River at Keeyask case, are not likely significant adverse environmental effects. For example, can the Proponent indicate that an exceedance of 7 mg/L TSS above background for 30 days in September/October is not likely to be in the sublethal or lethal severity of effect range for fish, fish eggs or larvae, benthic macroinvertebrates, or other aquatic organisms. In addition, can the Proponent say that the exceedance when added to the expected background range for that time of year is within the anticipated natural range of TSS in the Nelson River at the Project site, and in one case downstream to the estuary, at that time of year? |
| 78 | | | The EIS notes "data collected in the open water periods of 2005 to 2007 indicates...suspended sediment concentration generally lies within the range of 5 mg/L to 30 mg/L...from Clark Lake to Gull Rapids...sediment concentrations can vary within their normal range at a given location in a given day...variations...over a short period...can be due to many reasons, including local turbulences in the waterbody, changes in the meteorological environment, and local bank erosion processes...suspended sediment concentrations...In the open water period...2001 to 2004...show similar ranges (2 mg/L to 30 mg/L with an average of 12 mg/L)...A report prepared by Lake Winnipeg, Churchill and Nelson Rivers Study Board in 1975...documents a suspended sediment concentration range of 6 mg/L to 25 mg/L with an average of 15 mg/L based on...measurements in 1972 and 1973. Field studies...on the Burntwood and...Lower Nelson River reach also show a concentration range of 5 mg/L to30 mg/L (Acres...2004...2007b, KGS Acres 2008b...KGS Acres 2008c)...Suspended sediment concentration measurements during...winter...(January to April), of 2008 and 2009 reveal that sediment concentration variations in the winter period are larger than the open water period. A limited data set collected at monitoring locations in Gull Lake show a concentration range of 3 mg/L to 84 mg/L, with an average of 14.6 mg/L..." | The Proponent provides some ranges, point estimates, and expected durations of TSS changes. Would it be possible to provide, or direct reviewers to where this information is in the EIS, sample sizes and standard deviations for estimates? Where intervals that are not ranges, would it be possible to specify the level of confidence? E.g., are they 95% confidence intervals for a mean? |
| 79 | | | The EIS notes, for mineral, as opposed to organic sediments:... "mineral TSS is generally predicted to decrease in the shallow and deep areas of the reservoir with the Project, most notably under high flows (95th percentile), although small increases (1–4 mg/L) are projected in some areas under some conditions (i.e., different flows and years of operation). The predicted changes in mineral TSS are also relatively similar for the peaking and base loaded modes of operation for median and high flows. In general, the predicted decreases (or occasionally increases) in mineral TSS are less than 5 mg/L under low, median, and high flows in shallow and deep areas for Years 1 and 5 of operation. The major exception would occur under high flows in reaches 7 and 8 (at the downstream end of present day Gull Lake) and most notably reach 9 (the reservoir immediately upstream of the GS) where larger decreases (up to 14 mg/L below background) are expected..." | The Proponent predicts TSS decreases. Impacts of TSS decreases appear not to be discussed. While there are no present federal guidelines e.g., in the CCME, has the Proponent considered the potential impacts of TSS decreases? |
| 80 | | | The EIS says "Mineral TSS would generally remain within the chronic Manitoba PAL water quality objective and the CCME PAL guideline (a change of less than or equal to 5 mg/L relative to background, where background TSS is less than or equal to 25 mg/L). The exceptions would occur in the immediate reservoir (reach 9) and reach 8 (the area north of Caribou Island) under high flow conditions, where decreases may be larger than the Manitoba water quality objective..." | When discussing TSS decreases the Proponent refers to TSS guidelines as being for changes. In fact, the guidelines talk about increases only – not changes in general – so that they do not really apply to decreases in TSS. Can the Proponent explain in more detail its criteria for discussing changes? |
| 81 | | | Water Quality: Project Effects, Mitigation, and Monitoring...Construction Period...Total Suspended Solids, Turbidity, and Water Clarity..." p 2-44 - 2-45 "Cofferdam Dewatering... Water that is trapped or accumulates behind cofferdams will be discharged to the Nelson River. An end- of- pipe criterion of 25 mg/L will be applied such that where met, water behind cofferdams will be directly released to the Nelson River. Where this target is not met, cofferdam water will be pumped to settling ponds and discharged to the Nelson River when the end-of-pipe TSS concentration is less than 25 mg/L (PDSV, Keeyask GS EnvPP). Effects on TSS in the Nelson River are expected to be negligible in the fully mixed condition; small, localized increases in TSS may occur near these point sources..." | The Proponent refers to its proposed end-of-pipe allowed TSS of 25 mg/L for several activities. However, according to the CCME, that criteria is only acceptable for short term (e.g., 24 h) TSS increases. Can the Proponent provide additional information on the expected duration of activities for which it proposes the 25 mg/L criteria. For longer term TSS increases (e.g., inputs lasting between 24 h and 30 d), can the Proponent provide prevention measures that will meet the guideline of an increase not greater than 5 mg/L? |
| 82 | | | The EIS notes "An Environmental Protection Program has been developed to mitigate, manage and monitor environmental effects during the Project construction and operation phases. While descriptions of the existing environment are based on measurement and observation, descriptions of effects and mitigation designed to address adverse effects are predictions based on technical scientific studies and analysis, professional judgement and Aboriginal traditional knowledge. Monitoring will determine if these predictions are correct and if mitigation measures are working as expected. If unexpected effects are detected, the program will also define processes for determining appropriate adaptive management programs and practices. The Environmental Protection Program covers the "who, what, when, where and how" of protecting and monitoring the environment. Manitoba Hydro has a contractual responsibility for implementing the program delegated by the Partnership. The Program will consist of three types of plans...1. Environmental Protection Plans, to provide detailed, site-specific environmental protection measures to be implemented by the contractors and construction staff to minimize environmental effects from construction of the generating station and the south access road;... 2. Environmental Management Plans, focused on specific environmental issues, such as sediment management, access management, fish habitat and heritage resources; and...3. Environmental Monitoring Plans, to describe monitoring the effects of construction and operations on the biophysical, physical and socioeconomic environments using both technical science and Aboriginal traditional knowledge. ..." | The Proponent refers to monitoring and Environmental Protection Plans (EnvPP) for sediment management. Are these described in detail in the EIS? While mitigation measures are described in the EIS that assist in preventing sediment deposition, DFO has been unable to find details of monitoring or action plans (management) for mitigation. If the detailed information is not shown in the EIS, can the Proponent provide that information separately from the EIS to continue the Environmental Assessment? The Environmental Protection, Environmental Management, and Environmental Monitoring plans are of significant interest to reviewers determining if there is likely to be a significant adverse effect after taking mitigation into account mitigation. |

| | | | | |
|---|---|---|---|---|
| 83 | | | "Water Quality: Project Effects, Mitigation, and Monitoring...Construction Period...Total Suspended Solids, Turbidity, and Water Clarity..." p 2-40 ff "Cofferdam Placement and Removal...during Stage I and II Diversions have the potential to increase TSS in the Nelson River...results...presented in detail in the PE SV, section 7.4.1...Predicted increases in TSS refer to the fully mixed condition, approximately 1 km downstream of Gull Rapids..." | The Proponent notes that it has modeled TSS downstream at 1km from the construction area in the fully mixed zone. Will the Proponent be able to monitor TSS closer to the construction areas? What sort of area might be affected by construction TSS increases greater than those predicted upstream of the fully mixed zone. What are the, at source, sediment loading TSS concentrations likely to be, how extensive might they be in area, and what might their durations be? |
| 84 | | | Information does not appear to be present in the EIS but is required to determine if monitoring can adequately determine potential problems and appropriate actions taken to mitigate unexpected events. | Can the Proponent provide an analysis showing that its monitoring will have sufficient power with high confidence, to detect TSS above the action threshold (regulatory guideline)? For example, how likely is it that the Proponent can detect environmental changes that result in elevated TSS that exceed critical effect sizes such as 5 mg/L above background? Will the number of samples collected during monitoring be sufficient to correctly conclude, with a confidence of say 95% (i.e., a high confidence), that there is a difference of, say, 5 mg/L or more above background? |
| 85 | | | The EIS, in the aquatic effects supporting document section 2 on water and sediment quality, notes: "There are few studies that have reported the acute or chronic toxicity of TSS to fish species represented in the Aquatic Environment Study Area. Lawrence and Scherer (1974) reported that the 96-hour lethal concentration (LC50) for lake whitefish (Coregonus clupeaformis) was 16,613 mg/L. McKinnon and Hnytka (1988) found relatively high increases in TSS (instantaneous maximum = 3,524 mg/L and 1-day average concentration = 524 mg/L) caused by winter pipeline construction did not have any direct effect (no downstream emigration and no mortalities) on the fish community of Hodgson Creek, NT. This study is notable as four of the fish species found in Hodgson Creek - northern pike (Esox lucius), lake chub (Couesius plumbeus), longnose sucker (Catostomus catostomus), and burbot (Lota lota) - are also found in the Aquatic Environment Study Area. As indicated in Section 5.4.2, northern pike may spawn in the nearshore areas of the Keeyask reservoir, even during the initial years of operation. Therefore, early life history stages of northern pike may be exposed to elevated concentrations of TSS for several years post-impoundment. No information on the acute or chronic toxicity of TSS to northern pike eggs or larvae could be located. Information for early life history stages of other species represented in the Aquatic Environment Study Area..." | The Proponent discusses effects of TSS specific to the individual VEC fish species. However, much of the Proponent's impact assessment appears to rely primarily on general and lethal TSS concentration effects. Can the Proponent provide an expanded discussion of sub-lethal or chronic impact severity of effect risk assessment for anticipated TSS changes? |
| 86 | | | "Keeyask Generation Project Environmental Impact Statement Supporting Volume Aquatic Environment June 2012" (disc 2), p1A-2ff... Restricted activity timing windows...DFO...In northern Manitoba, no in-water or shoreline work is allowed during the 15 April – 30 June, 15 May – 15 July, and 1 September -15 May periods where spring, summer, and fall spawning fish respectively are present, except under site- or project-specific review and with...implementation of protective measures...Based on data from Keeyask field investigations...proposed area-specific timing windows for restricted in-water construction activities are...15 May – 15 July for spring and summer spawning fish and 15 September – 15 May for fall spawning fish...scheduling of construction activities that require working in water have been developed and modified to the extent practicable to avoid or minimize the potential for disturbance to fish in the Keeyask area during spawning, and egg an fry development periods...Adjustments to scheduling...to restrict construction and removal of structures to times of ...year when sensitive life stages of fish are least likely to be present are summarized in Table 1A-2..." | A key mitigation is timing of in-water activity to avoid impacts on VEC fish species. Can the Proponent describe its contingency plans for unavoidable changes in scheduling. E.g., if a TSS episode exceeding the CCME guidelines is relatively benign for adult whitefish migration to spawning areas, is the same episode when delayed due to schedule changes similarly benign for incubating whitefish eggs? What sort of information would be available to rapidly assess the potential risk of a schedule change? What criteria would the Proponent use to trade-off costs to the project and costs to a VEC fish species? |
| 87 | | | Previous daily TSS sediment monitoring at the Wuskwatim GS construction site had frequent problems with bio-fouling of sensors. | Can the Proponent provide additional information on its anticipated TSS monitoring showing that problems with previous monitoring, e.g., bio-fouling of sensors, has been anticipated and solved? |
| 88 | | | Details of the development of the turbidity/TSS relationship do not appear to be provided. DFO feels it is necessary to know details of the relationship and plans for ongoing calibration to assess whether monitoring will be adequate for effective adaptive management. | Can the Proponent provide additional information on its plans for developing a turbidity/TSS relationship, assuming that is being considered, and details of procedures for calibrating the relationship to changing conditions of sediment characteristics, variation with water depth, seasonal variation, and generally correcting for "drift" from the initial relationship? |
| 89 | | | Appendix 1A - Part2 | How will potential risks associated with Sturgeon stocking and interactions with wild stock be addressed? Loss of genetic integrity, ecologic imbalance and community structure shift? |
| 90 | | | Appendix 1A - Part2 | Assuming sturgeon exhibit natal philopatry for spawning locations, significant genetic structure may be apparent even if there is considerable mixing of groups between spawning events. Will this be accounted for when choosing individual broodstock? |
| 91 | | | Appendix 1A - Part2 | Has consideration for the effects of the location of the new hatchery facility on imprinting been made? |
| 92 | | | Appendix 1A - Part2 | Because the chances of capturing a ripe female from which to collect eggs is low, the use of ovaprim is suggested, yet long term effects are unknown. How will this be addressed? |
| 93 | | | Appendix 1A - Part2 | Should the original population be decimated, how will the population within the Gull Reach be maintained? |
| 94 | | | Appendix 1A - Part2 | The recruitment model/unexploited scenario mimics the Wisconsin guideline. There is acknowledgement that these numbers may be too low given the guideline was developed based on rivers smaller that the Nelson. How will final numbers be derived? |

| | | | | |
|---|---|---|---|---|
| 95 | | | Appendix 1A - Part2 | Need for a protocol to accrue the maximum benefit from the stocking program. Once genetic integrity has been disrupted how can the situation be reasonably corrected? "Given uncertainties surrounding genetic mixing of stocks, the initial stocking plan will likely attempt to maintain the existing genetic structure and collect spawn from the same subpopulations as will be stocked. However given uncertainties and difficulties associated with spawn collection, a second contingency strategy may be required...spawn will be collected at sites that are genetically the most similar to proposed stocking locations." We require assurance that the genetic differences that exist pre development will persevere. Appropriate analysis will be required to address this. |
| 96 | | | Appendix 1A - Part2 | Disease control in stocked fish – how will this be monitored? Should a problem be identified, how will it be rectified? |
| 97 | | | Appendix 1A - Part2 | Concern over the acquisition of sufficient broodstock to avoid genetic variability. There is acknowledgement that collecting spawning individuals will be unlikely. Concern over reliance on the use of gametes from just a few individuals (EIS suggests 2 females per year) and the subsequent release of closely related offspring. Decrease in herozygosity/ genetic drift/allele loss and thereby lower genetic diversity. |
| 98 | | | Appendix 1A - Part2 | Given predications of accumulated sedimentation/peat accumulation and subsequent influences in water chemistry (including decreasing oxygen and increasing mercury levels) is stocking the forebay with sturgeon a rational option? |
| 99 | | | Appendix 1A - Part2 | Stocking will continue as long as required to achieve and maintain the stated DFO (2010) RPA for DU3. (pg 18) Long term program expected for a generation (25 years) or in perpetuity if needed. |
| 100 | | | Appendix 1A - Part2 | Given the challenges of detecting changes in sturgeon (growth, age, etc) over the short term, how will success/failure be determined? |
| 101 | | | Appendix 1A - Part2 | Given the challenges of detecting changes in - Phased approach to passage – have possible retrofit options been identified? - Have other forms of d/s passage been identified? |
| 102 | | | | The EIS indicates that the turbine has been designed to maximize fish survival compared to other Manitoba Hydro generating stations. A table to compare other turbines should be provided. It would be interesting to see how the Keeyask turbines compare to other stations such as Kelsey, Wuskwatim and Limestone. The table should include the principal features that were used in the selection of the Keeyask turbine. |
| 103 | | | | The EIS indicates 90 % survival for fish up to 500mm. Can this be further broken down into species, sex, maturity and length for the VEC fish species within the Keeyask Study area. An analysis/graphs of survival rates and injury rates should be provided. |
| 104 | | | | Several recommendations to minimize mortality that can be incorporated into hydro facilities include: using trashracks with reduced bar spacing while preventing further impingement, using temporary overlays with the existing trashracks to reduce clear spacing during migration periods, use of partial depth curtain wall over existing trash rack, installation of an inclined or skewed bar rack system upstream of the intake, barrier or stop nets set upstream in the forebay, and use of partial depth guide walls or an angled louver system upstream of the intakes coupled with a bypass system. Will the powerhouse be designed to incorporate some of these features if monitoring indicates that fish mortality is higher than predicted? Additional biological data and studies will be required post construction to better assess the requirements and potential mitigation for both potential downstream passage and protection. Also, these studies should determine the overall number of fish expected to pass through the turbines. |
| 105 | | | | Survival rates can be maximized for entrained fish if operation of the turbines is at maximum efficiency. How will Keeyask be operated to minimize mortality? |
| 106 | | | | What are acceptable mortality rates based on the fish community and population in the Keeyask study area? |
| 107 | | | | A detailed monitoring plan should be developed to assess mortality of fish passing through the station and spillway. How will this impact the fish community? |
| | | | | |
| 1 | AE SV 2 | 5C-59 | Critical review of the HHRA:<br>The baseline mercury levels in moose and snowshoe hare were not obtained from data collected in the Keeyask region but rather from data collected outside of Manitoba. The use of off-site data increases the degree of uncertainty in the conclusions presented in the HHRA regarding human exposures to this contaminant. The HHRA recommends monitoring mercury levels in wild game so data that is representative of the impacted region is obtained. | HC supports the recommendation in the HHRA that the monitoring of wild game be undertaken. This information would serve to validate some of the assumptions used in the HHRA (e.g. off-site data for moose and snowshoe hare) and also beneficially serve as baseline data for future Keeyask HHRAs and the assessment of risk related to other hydro generation projects planned within the region (e.g. Conawapa). |

| | | | | |
|---|---|---|---|---|
| 2 | AE SV 2 | 5-214 to 5-224 | Mercury and human health – proposed mitigation measures: Based on the results of the HHRA, fish consumption recommendations were developed. HC agrees with the need for such recommendations and in general, would also concur with the recommendations themselves.<br><br>However, HC notes that with respect to recommendations of "unrestricted eating" for all fish with less than 0.2 ppm mercury, the current edition of the Guidelines for the Consumption of Recreationally Angled Fish in Manitoba (2007) recommends that women of childbearing age and children under 12 years, limit their consumption of fish with less than 0.2 ppm mercury to 8 meals per month.<br><br>The HHRA recommends that fish consumption advisories be communicated to local First Nations and communities. Also, based on fish monitoring data, additional human health risk assessments will be undertaken every 5 years after peak mercury levels have been reached to determine if consumption advisories need to be changed. | HC advises adopting Manitoba's guidelines recommendation limiting consumption for women of childbearing age and children under 12 years with respect to fish with less than 0.2 ppm mercury to provide added protection of health for these sensitive receptors.<br><br>HC would consider this approach reasonable but would advise that if monitoring results show that mercury levels in fish are higher than the predicted maximum levels in the HHRA, prior to reaching their actual maximum levels, fish consumption advisories should be re-visited to ensure that they remain protective of human health. |
| 3 | AE SV 2 | 5-104 to 5-120 | Mercury and human health: The EIS indicates that communication products to address adverse health impacts will be developed. | It should be noted that the determination and implementation of risk management strategies for country foods in the project area fall under the responsibilities of provincial and/or municipal authorities.<br><br>However, HC considers accurate communication strategies a very important tool in the reduction of risk to Aboriginal health with regards to country foods. HC would be willing to review proposed risk management approaches and communication products to provide its opinion. |
| 4 | AE SV 2 | .5-214 to 5 224 | Gull eggs and plants: The HHRA does not assess plants or gulls eggs (identified by FN as important food source of concern during the workshop held to determine what they eat).<br><br>Gull eggs and wild plants would not be expected to represent significant contributors to mercury exposure and therefore the final conclusions with respect to potential health risks are not expected to change based on this additional data. However, as local population who consume country foods have specifically identified these foods as important food sources, gull eggs and wild plants should be included in order to confirm the expectations that these foods are acceptable to consume. | HC encourages the proponent to participate in the voluntary monitoring plans for gull eggs and plants to provide more comprehensive information on the potential adverse effects to these country foods. |
| 5 | AE SV 2 | SC-28 to SC-29; and 8-6 to 8-7 | Mercury in Ducks: In the HHRA mercury levels in whitefish were used to represent mercury levels in waterbirds. The proponent shows data collected from hydroelectric project areas in Québec to support this approach. The intent is to demonstrate that according to data from the Québec projects, mercury levels in waterbirds can be estimated by the levels of mercury in fish with similar diets and similar feeding habits (TE SV-2, Section 8.0 - *Wildlife and Mercury*, Table 8-4). Waterbirds that were identified as food sources in the Keeyask region are herbivorous/benthivorous and would have similar dietary patterns to whitefish.<br><br>The HHRA recommends mitigation measures including monitoring mercury in waterfowl and waterbirds. | HC suggests that the future monitoring data should be assessed to determine whether consumption of waterbirds and waterfowl poses a health risk and implement mitigation measures if an unacceptable risk has been identified. |
| 6 | AE SV 2 | SC-59; 49 | Mercury concentrations in fish from AEA offset lakes: The HHRA states "...measured mercury concentrations in fish from offset lakes (specifically identified by one of the Keeyask Cree Nations) have indicated that certain fish from the various background lakes in the study area may have mercury concentrations that warrant consumption recommendations (tissue concentrations of mercury above 0.2 ug/g)."<br><br>HC notes that in Table 7L-1, data report maximum mercury levels of 0.85, 0.71, and 0.61 ppm for walleye collected from Pelletier, Recluse, and Waskaiowaka Lakes from 2004-2006. Fish from these lakes are intended to provide traditional food source as indicated in the Adverse Effects Agreement Healthy Food Fish Program, in order to replace fish that may no longer be safe to consume as a result of increased methyl-mercury levels caused by the Keeyask Project. | HC advises that the proponent monitor mercury concentration in fish from the offset lakes to mitigate potential risks to human health arising from use of off-set lakes as a country foods source as a result of the project. Communication products may be required for use of these lakes (e.g., consumption recommendations for sensitive subgroups of the population). |
| 7 | AE SV 2 | 7-16 to 7-22 | Project Effects, Mitigation and Monitoring: HC understands that the proponent has proposed to monitor mercury in fish tissue on an annual basis until maximum concentrations are reached, and every 3 years thereafter until concentrations are stable. HC does not have any objections to this approach; however, the EIS does not provided a clear determinant of what constitutes "maximum concentration" and "stable". Mercury levels in fish are expected to steadily increase over a number of years, reach a maximum, and decline steadily thereafter but may fluctuate slightly over the course of this time. The number of years in which a decrease in mercury levels is observed to conclude that a maximum concentration has been reached, does not appear to have been determined.<br><br>The EIS includes an outline of monitoring planned for the mercury in fish tissue. However, the detailed monitoring program that will be provided in the Aquatic Effects Monitoring Plan (AEMP) is not yet provided and is related to regulatory licensing with DFO and Manitoba Conservation. | HC advises that the proponent provide a clear determinant in the EIS of what will constitute a "maximum concentration" and "stable" condition at which point fish tissue monitoring will be reduced to a frequency of every third year.<br><br>When the AEMP is available for review, HC is able to provide advice regarding potential effects and review of additional HHRAs to ensure fish consumption advisories remain protective of human health. |

| | | | | |
|---|---|---|---|---|
| 8 | AE SV 2 | 5-106 to 5-107 | Existing / Past Health Impacts from Mercury: There are three hydroelectric generating stations planned for the Nelson River (Wuskwatim [currently under construction], Keeyask and Conawapa). This area has been impacted by past hydroelectric developments. The EIS states "Based on their experiences with previous hydroelectric development and through the Federal Ecological Monitoring Program (FEMP), the issue of mercury and human health became a primary concern for the KCNs in relation to the Keeyask Project. HC conducted biomonitoring (blood and hair) sampling for mercury from 1976 until 1990 from local people within this region. For the most part, people from this area tested within acceptable range, but approximately 2% tested in "greater risk" range (Wheatly and Paradis, 1995)). HC notes that many environmental assessments involving hydro projects, where mercury levels are known to increase in biota, have considered hair mercury analysis of local populations in order to determine if any potential increased dietary exposure may pose a risk. It is important to note that the FEMP was a result of Claim 18 in 1981, under the Northern Flood Agreement (NFA), which alleged that Canada, Manitoba, and Manitoba Hydro had not met a responsibility of the NFA "to implement a long-term coordinated ecological monitoring and research program that would allow evaluation of impacts on communities" that signed the NFA and belonged to the Northern Flood Committee. Reference: Wheatly B, and Paradis S, Exposure of Canadian Aboriginal Peoples to Methylmercury. Water, Air, Soil Pol 1995; 80: 3-11. | HC suggests that the proponent consider the merit of conducting such analysis on the basis of whether it can adequately be confirmed that any increase in mercury exposure from the diet, based on empirical measurements in fish, would not have a significant impact on human health and report the results in the HHRA.<br><br>In the event where hair mercury analyses are conducted, HC is prepared to review the data and provide an opinion on the potential for adverse impacts with respect to human health. |
| 9 | AE SV 2 | 10-3 | This section states "The concept of using a precautionary approach has been an implicit foundation in the planning and design of the Project, using both technical science and aboriginal traditional knowledge (ATK)." | HC would like to inform the proponent of a biomonitoring initiative underway in Saskatchewan that may be considered to manage risk of traditional uses of land and potential impacts to human health resulting from the Project. The Alberta and Saskatchewan governments are looking to northern Saskatchewan to determine the impact of development on the health of people living in the north. Starting in August 2011, women in northern Saskatchewan who are pregnant have been asked to participate in a health biomonitoring study. Blood routinely drawn as part of their pre-natal health care is being tested for certain chemicals, including pesticides, lead and mercury.<br>http://www.health.gov.sk.ca/biomonitoring-common-questions<br>Should biomonitoring be undertaken by the proponent, as justified by previous biomonitoring results, it would be a means of identifying whether communication products are effective i.e., if consumption guidelines are being followed, or if populations are in the range of exposure that would pose unacceptable risk. |
| | | | | |
| 1 | PI SV | -24 and 2-2 | The south access road will cross the Butnau River with culverts | Provide details regarding the conceptual design and construction methodology of this crossing. |
| | | | | |
| 1 | PE SV 1 | 5-24 | This section states the following:<br>'In total, 25 granular and 16 rock samples from the Keeyask GS area were selected for laboratory testing. Samples were shipped to Maxxam Analytics in Burnaby, BC, for testing in spring 2010 (granular borrow samples, specific and bulk rock samples) and winter 2010-2011 (specific, and composite rock samples). The analysis requested for the granular materials included soluble metals using MEND guidelines for water-extractable metals (MEND 2000). The requested analyses on the rock samples included total sulphur, sulphate, neutralization potential and metal content using standard Maxxam methods and quality assurances and quality control procedures (Sobek et al., 1978, MEND 1991).' | EC notes that results of the rock assessment are not shown. In addition, as indicated by the Proponent, the requested analysis on the rock samples included total sulphur, sulphate, neutralization potential and metal content , but this list does not include acid potential.<br><br>EC requests that the Proponent provide the result of the static and kinetic tests. |
| 2 | PE SV 1 | 5-24 | In this section, the Proponent states that:<br>'With respect to the quarry rock, there are a number of different indicators for the generation of acidic drainage and therefore a weight-of-evidence approach is typically applied. Using this approach, the assessment of the Keeyask rock samples concluded that the risk of acidic drainage is low.' | EC requests that the Proponent:<br>• Clarify what the following statement implies: "assessment of the Keeyask rock samples concluded that the risk of acidic drainage is low". Since no results of the rock assessment are provided, EC is unsure if this statement implies that the rocks are non acid generating (NAG) or that the neutralizing potential/acid potential ratio (NP/AP) is greater than 3 or uncertain (between 1 and 2).<br>• Confirm that any borrow materials or quarry rocks that would be used for construction as well as road construction do not show the potential to generate acid. |
| 3 | R-EIS Guidelines | 4-7 | This section outlines that the powerhouse unit will contain electrical and mechanical equipment, including ventilation systems, domestic and fire water systems, cranes, water and wastewater treatment systems, compressed air, and oil storage facilities. | EC would like to make the Proponent aware of the new Wastewater System Effluent Regulations that may apply to the wastewater treatment component of the powerhouse depending of the volume of influent (100 m3/d) the system is designed to treat.<br><br>EC requests that the Proponent provide estimates on proposed wastewater influent volumes (including volumes associated with combined grey water, storm water and other wastewater steams) in order to determine whether this facility would be captured under the new wastewater regulations. |

| | | | | |
|---|---|---|---|---|
| 4 | R-EIS Guidelines | 6-216 | This section outlines the following:<br>'Total organic material released into the reservoir is predicted to be highest in the large bays on the north and south sides of the new reservoir... These effects are considered large in magnitude, medium in geographic extent, medium term in duration and continuous.' | There is little detail provided regarding mitigation measures which may be implemented to reduce elevated levels of organic materials in the reservoir, in this section as well as Chapter 8 (Monitoring and follow-up).<br><br>EC requests that the Proponent provide details regarding specific mitigation measures which will be considered and implemented to reduce elevated concentrations of organic materials in the surface water at each phase of the project. This may include but is not limited to an outline of various tools, techniques and materials. |
| 5 | AE SV 2 | 2-44 | This section states the following:<br>'Wastewater effluent, including concrete processing wastewater, will not be directly released to a waterbody unless it has been treated to meet applicable provincial and federal effluent licences, authorizations and permits.' | EC requests that the Proponent clarify if domestic wastewater and concrete processing wastewater will be combined into the same stream. |
| 6 | AE SV 2 | 2-44 | This section proceeds to outline the following:<br>'Wastewaters from concrete processing (i.e., concrete batch plant effluent) will be initially discharged to a two-cell settling pond to reduce TSS prior to discharge to the lower Nelson River and apply end-of-pipe discharge criterion of less than 25 mg/L for TSS... TSS currently ranges (on average) between 15 and 18 mg/L in the Keeyask area and discharge of the concrete batch plant effluent or aggregate wash water is predicted to cause a negligible change in TSS in the Nelson River.' | The main concern discussed regarding concrete wash water is elevated levels of TSS. Consideration should be given to the potentially deleterious effects that concrete wash water could have on the aquatic environment due to its strong alkalinity. Other contaminants associated with concrete wash water (such as chromium) will not be completely removed simply through settling ponds.<br><br>EC requests that the Proponent:<br>• Provide a detailed outline of mitigation measures to be followed for surface runoff and wastewater control<br>• Develop and provide alternative and more rigorous mitigation measures for the treatment of concrete wash water if shown to be warranted by testing of discharge quality. |
| 7 | AE SV 2 | 2-135 | Table 2-11 outlines that water treatment plant backwash will be treated if required, such that TSS will be less then 25 mg/L prior to discharge to the receiving environment. | EC requests the Proponent provide a full characterization of discharges to ensure they are not deleterious; noting that TSS should not be the only discharge parameter to be assessed against water quality objectives. |
| 8 | R-EIS Guidelines | 6-209<br>6-211<br>6-294 | Section 6.3.7.1 states that: 'Cofferdam designs, construction methodology and sequencing have been developed to minimize erosion and sediment inputs during construction. For example, fine cofferdam material exposed to erosion (waves, flow) would be covered with rock to prevent erosion. The residual construction effects associated with shoreline and erosion processes are expected to be small in magnitude, medium in geographic extent, short-term and sporadic during the construction period.' Similarly section 6.3.7.2 states that: 'Shoreline erosion will expand the reservoir by an additional 7 to 8 $km^2$ (2.7 to 3.0 $mi^2$) during the first 30 years of operation due to mineral bank erosion and peatland disintegration... The effects of the Project on shoreline erosion are considered to be large in magnitude, medium in geographic extent, and long-term in duration.' Table 6-19 outlines mitigation measures to reduce TSS and erosion during construction and operation.<br>Construction Mitigation includes: Measures to control sediment releases; and Management measures to maintain inputs at levels that are not harmful to aquatic life. Operation Mitigation includes: No mitigation required. | EC requests that the Proponent provide additional information on the mitigation measures to be carried out to minimize shoreline erosion, reduce soil loss and adverse impacts to water quality and the river bed during this project. |
| 9 | R-EIS Guidelines | 6-214 | This section outlines the following:<br>'As noted in the Shoreline Erosion section (Section 6.3.7.1), cofferdam designs, construction methodology and sequencing have been developed to minimize the introduction of sediment into the water. For example, cofferdam removal would be done "in the dry" as much as reasonably practical to prevent sediment entering the water. ' | The uses of cofferdam designs and construction methodology ('in the dry') are good examples of general approaches to mitigating against shoreline erosion however there is still little detail provided on a full range of design and construction techniques and tools which could be considered throughout construction, operation and decommissioning.<br><br>EC requests that the Proponent provide more detail regarding specific mitigation measures for each phase of the project (construction, operation and also decommissioning), including but not limited to an outline of various tools, techniques and materials which will be used to reduce erosion and a detailed description of how each will indeed mitigate against erosion. |

| | | | | |
|---|---|---|---|---|
| 10 | R-EIS Guidelines | 6-214<br>8-13 | Section 6.3.8.1 outlines the following:<br>'A Sediment Management Plan will be in place during construction and will describe where monitoring is to be done and what actions might be taken if suspended sediment increases beyond specified thresholds... Monitoring of suspended solids and turbidity will be done at several locations upstream and downstream of the Project as part of physical environment monitoring plan (see Chapter 8). Monitoring under the Sediment Management Plan would only be in place during construction and is separate from the physical environment monitoring.'<br><br>Table 8-3 also describes the monitoring regime for managing sediment and maintaining water quality. | The information provided in chapters 6 and 8 does not specifically outline where sampling and monitoring will take place along the Nelson River and what actions might be taken if suspended sediment increases beyond specified thresholds.<br><br>EC requests that the Proponent:<br>• Provide more details in the Sediment Management Plan which includes, but is not limited to, proposed sampling locations (illustrated on a site plan, relative to proposed infrastructure), number of sampling locations, sampling and monitoring frequency, sampling parameters, type of samples to be collected, time of year sampling will take, and sampling methodology, detailed erosion and sedimentation prevention strategies, measures that will be used for reservoir preparation, best practices, and identify linkages to adaptive management, as required for a comprehensive Sampling Management Plan.<br>• Identify mitigation measure to be taken in the event of water quality exceedances. These details should be provided for each phase of the project (construction, operation and decommissioning). |
| 11 | PE SV 2 | 7-37 | Erosion of peatlands will result in the transportation and sedimentation of peat materials in the reservoir. The Proponent has identified peat transport zones and estimated volumes of material that would be mobilized over timelines up to 30 years. The EIS predicts some 1.3 million tones of peat within the reservoir, of which 10,000 to 13,000 tonnes are expected to travel downstream after year 1 if no peat management measures are implemented. | EC requests that the Proponent identify the peat management measures that will be undertaken; how peat inputs, behaviour and effects will be monitored over the operation of the project; and what and when adaptive management actions will be used as a contingency should effects be detected. |
| 12 | PE SV 1 | 6-56<br>7-35<br>9-6 | As peatland is flooded, floating peat mats will rise up with the rising water, and may be mobile within the reservoir. Organic sedimentation is expected to occur beyond the modeled 30 year horizon, but at reduced rates. The peat mats are predicted to sink to the bottom in some cases, and become overlain with silt. Predictions have been made respecting the effects on dissolved oxygen levels, due to decomposition of the organic material. Other changes to water quality may be associated with the addition of the peat materials. | EC requests that the Proponent:<br>• Describe the potential for further changes to the water chemistry in the reservoir, such as a drop in pH, concomitant increase in metals, increased color due to organic matter<br>• Confirm if "worst case" volumes of peat addition have been taken into account with respect to estimating mercury methylation<br>• Provide estimates of depth of lakebed to be covered |
| 13 | PE SV 2 | 7-43 | Real time monitoring of TSS will be done using turbidity as a surrogate. This is a commonly accepted practice, as it provides immediate data for management response. However, the relationship between TSS and turbidity must be determined on a site-specific basis, and be calibrated and validated as the project proceeds. | EC requests that the Proponent revise the sediment management plan to include a section that details monitoring of turbidity and TSS, including development of the regression model, calibration with field data, and ongoing validation and QA/QC. |
| 14 | | | Background TSS is estimated to average 10-20 mg/L. | EC requests that the Proponent describe the dataset and method used to determine the background value of 20 mg/L. |
| 15 | R-EIS Guidelines | p. 8-14 | Monitoring is described in general terms in Table 8-3. In addition, presentations made by the Proponent described proposed construction phase monitoring. In presentations on the proposed monitoring (April 11, 2012), it was proposed that there would be 3 sites for construction monitoring with thresholds set for mitigation actions to be taken. The sites include an upstream location (Site 1), downstream location (Site 2) and site near the outflow of Stephens Lake (Site 3). Turbidity will be monitored as a proxy for total suspended solids (TSS) and be compared to thresholds: increases at Site 2 of 25 mg/L above Site 1 for 1 hour would trigger investigation; increases of 200 mg/L above Site 1 would trigger mitigative action, and increases at Site 3 of 25 mg/L above Site 1 would trigger action. | Concerns with the proposed monitoring have been identified: The proposed sites allow for a considerable area of Stephens Lake to experience elevated TSS before triggering action. Monitoring Site 2 is sited well below the construction activity, and should be closer to the area of disturbance. Changes to Site 3 as proposed would mean that most or all of Stephens Lake had elevated TSS and turbidity.<br><br>EC requests that the Proponent provide further clarification of the proposed monitoring. EC requests that the Proponent develop a monitoring plan that identifies the effects associated with construction and operation of the proposed facility and planned mitigation. The plan should describe the sites to be monitored, timing, how comparisons to baseline will be drawn, identify thresholds that will trigger action, and provide details of how the field monitoring will be done, including quality assurance/quality control measures. |
| 16 | PD SV | 2-37<br>6-76<br>8-9 | The Proponent acknowledges that there will be increases in mercury associated with the reservoir impoundment, and states that there is no mitigation available. Levels are predicted to rise for a period of time before stabilizing then declining, over the order of three decades. Maximum concentrations do not appear to be provided. | EC requests that the Proponent conduct an assessment of downstream effects associated with mercury methylation including:<br>- identifying pathways for mercury throughout the food web, and incorporating lessons learned from the other hydroelectric projects;<br>- baseline mercury data collection in water, sediments and biota;<br>- revise modeling taking into account additional pathways, and particularly mercury accumulation in the benthos to predict the fate of mercury in the downstream environment; and<br>- identification of any additional mitigation or adaptive management measures. |

| | | | | |
|---|---|---|---|---|
| 17 | R-EIS Guidelines | p. 8-14 | The proposed monitoring includes sampling of fish for gill histology if peak sediment inputs exceed target levels. EC suggests that non-lethal techniques be investigated for use in evaluating the effects of elevated TSS on fishes; detection of effects associated with exceeding TSS thresholds may also be approached in a tiered fashion. | EC requests that the Proponent provide details on monitoring that would be done in response to threshold exceedance, and the rationale for what is proposed.<br>If levels in water approach thresholds for action, EC requests that the Proponent investigate effects on sediments and benthos should there be extended exposure to and settling out of particulate matter. DFO should be consulted on the advisability of sampling fishes. |
| 18 | R-EIS Guidelines | p. 6-362 | The Proponent has not included a discussion or impact assessment regarding these risks associated with lighting and collision; could find no reference to these in the EIS. | EC requests that the Proponent provide information regarding any design and mitigation measures that have been incorporated to minimize the adverse effects of lighting. EC also requests further information regarding the communication tower, and any other features planned for the project site that may create a specific collision hazard for migratory birds, as well as on the proponent's proposed mitigation measures to minimize the risk of collisions. |
| 19 | R-EIS Guidelines | p. 6-362 | In this section the Proponent has proposed the following mitigation in response to the loss of gull and tern breeding habitat:<br>"Deployment of artificial gull and tern nesting platforms (e.g., reef rafts), breeding habitat enhancements to existing islands (e.g., predator fencing or placement of suitable surface substrate), and/or development of an artificial island, or a combination of these measures, will be implemented to off-set the loss of gull and tern nesting habitat at Gull Rapids and areas upstream." | EC requests that the Proponent provide additional information regarding each mitigation measure (i.e., for artificial nesting platforms, island enhancements, or development of artificial islands), including information regarding the design, placement, development and implementation of each measure. EC also requests that the Proponent identify the decision-making process by and situations in which they would choose to a) deploy an artificial nesting platform, b) enhance an existing island, c) develop an artificial island, or d) implement a combination of these measures. |
| 20 | R-EIS Guidelines | 6-196<br>6-197<br>6-198 | The emissions estimates are compared to the total Manitoba road transport emissions. Comparing all of Manitoba to the emissions generated at the Project site don't appear to match in scale. | EC requests that the Proponent provide an explanation as to why a provincial scale was used for comparison with this project. |
| 21 | PE SV 1 | 3-9<br>3-11 | This section states that:<br>'The maximum potential daily loading due to Keeyask road transport for each reported air contaminant is "small in comparison" to daily emission loadings derived from total emissions reported to NPRI (2009) for all road transport activities in Manitoba.'<br><br>Also, by using table 3.4-2, EC calculated that the estimated total SOx, NOx & PM emissions from the project are 13.3%, 1.6% and 1.4% respectively of the total Manitoba road transport emissions. | EC requests that the Proponent provide further clarification on the criteria being used to determine the definition of a 'small' in this context. |
| 22 | PE SV 1 | 3-11<br>3-12 | This section further states that:<br>'Annual emissions associated with dam and facility construction are estimated to be highest for NOx at 382 tonnes per year; however, this is still less than 1% of the annual NOx loading estimate for road transport within the entire province.'<br>This is true for the number of tonnes, but both PM10 and SOx emissions have a higher percentage when compared to the 2009 emissions for MB road transport of 1.0% and 9.2% respectively. | EC requests that the Proponent provide clarification as to why they did not develop mitigation measures for SOx emissions. |
| 23 | PE SV 1 | 3-12 | This section states that:<br>'Acceptable dust-control measures will be used on the roadway, as necessary, to limit the amount of airborne dust.' | EC requests that the Proponent provide the criteria that will used to determine when the dust-control measures will be implemented and whether or not they be included in the EnvPP. |
| 24 | PE SV 1 | 3-19 | This table lists the magnitude of air quality impacts during construction as 'moderate', but in the preceding sections of text the magnitude is determined to be small. | There appears to be contradicting statements throughout this section on the magnitude of air quality impacts during construction of the Project.<br><br>EC requests that the Proponent provide clarification on the prediction of air quality impacts during the construction phase. |
| 25 | PE SV 1 | 3-20 | This section states that:<br>'Project effects on noise and air quality related to construction are considered to be moderate in magnitude and medium in their spatial extent from construction sites, and therefore, confined to localized areas within the study area. Consequently, noise and air monitoring programs are not planned for the Project.' | EC requests that the Proponent revise their EIS to include temporary air monitoring programs during the construction phase of the Project. |
| | | | | |
| 1 | R-EIS Gdlines-04 Project Description | p. 4-9 | The proponent plans to construct and utilize 3 landfill sites to dispose of waste. Details on the location and construction of the landfill sites are not provided. Therefore the potential effect on groundwater quality cannot be assessed. Information on the placement and construction of landfills provided in a hydrogeological context allows for the assessment of whether groundwater may become contaminated from such a facility. | Information on geographic location and depth of the landfill is requested. Discuss the type of liner to be used (natural, engineered). Discuss which hydrogeological units (and the characteristic properties of the units) are expected to be in contact with the waste. |
| 2 | R-EIS Gdlines-04 Project Description | p. 4-39 | The proponent plans to drill a potable water well for use during the construction phase of the project. Details on the location, construction and future usage of this well are not provided. | Provide details on the location, construction, and future usage of the potable well to be drilled and utilized during the project construction phase. |

| | | | | |
|---|---|---|---|---|
| 3 | R-EIS Gdlines-04 Project Description | p. 4-40 to 4-41 | The proponent plans to drill a potable water well for use during the construction phase of the project. It is not clear if this well will be used beyond the construction phase or if it will be decommissioned following the construction phase. Decommissioning of wells no longer needed is required in order to protect groundwater. Abandoned wells can provide a conduit for groundwater contamination. | Clarify if the potable well to be drilled and utilized during project construction will be used beyond this phase or decommissioned. Provide details on the future decommissioning of this well. |
| 4 | R-EIS Gdlines-06 Environmental Effects Assessment | p. 6-48 | The proponent acknowledges an inconsistent relationship between water levels in groundwater and adjacent lakes. This assessment is based on only 8 monitoring wells drilled on site. In order to better understand the relationship between groundwater and surface water, data collection from additional monitoring wells is recommended. | NRCan recommends that the proponent construct and monitor additional monitoring wells for a better understanding of the baseline groundwater-surface water relationships. |
| 5 | R-EIS Gdlines-06 Environmental Effects Assessment | p. 6-50 | The proponent discusses baseline groundwater quality based on reference to the literature. They also mention that on-site groundwater analyses confirm this and discuss elevated zinc concentrations. However, there is no information provided with respect to on-site sampling. It is unclear how many on-site samples were collected and what parameters they were analyzed for. The analytical results are not presented. The absence of this information makes it impossible to assess if baseline conditions of groundwater quality have been adequately determined. | Provide the location of on-site groundwater monitoring well sampling sites. Provide information on the frequency of groundwater sampling from these sites. Provide information on sampling and laboratory methodologies, including a discussion of quality assurance and quality control. Present the analytical results of all field-derived and laboratory analyses. Provide a direct comparison, by means of a table, of groundwater quality determined from on-site measurements versus groundwater quality gleaned from the literature. It is recommended the following physical and chemical parameters be tested for in groundwater: alkalinity, temperature, pH, Eh, electrical conductivity (EC), major ions, nutrients, minor and trace constituents, and metals (including methyl mercury). |
| 6 | R-EIS Gdlines-06 Environmental Effects Assessment | p. 6-218 to 6-219 | The proponent considers the possibility of groundwater contamination as a result of accidents/spills and claims that with proposed protection measures no residual quality effects are predicted. However, they do not assess any other sources of possible contamination. These could include contamination resulting from the landfill (see NRCan comment 1) or contamination of groundwater caused by project-induced changes to the hydrogeological regime that result in potentially contaminated surface water flowing into the groundwater system. Modeled groundwater flow directions (post project) indicate that flow along the Nelson River is generally from groundwater towards the River. However, this may not be the case in the vicinity of the generator/dams. For example, groundwater on the south side of Gull Lake will decrease in velocity or flow away from the flooded zone (p. 6-219). | Discuss the possibility of flow from the Nelson River to groundwater in the vicinity of the generator/dams during the construction and operation phases of the project. Discuss the possibility of groundwater contamination from potentially contaminated surface water, including possible methyl mercury contamination. Discuss measures taken to avoid groundwater contamination in this area. |
| 7 | R-EIS Gdlines-06 Environmental Effects Assessment | p. 6-218 | The proponent states that future monitoring of groundwater levels in the project vicinity is not proposed. Monitoring of groundwater levels is an important means for validating the numerical groundwater model which is used to predict project-related effects to groundwater. Given that there were only 8 on-site groundwater monitoring wells, additional monitoring wells (see NRCan comment 4) and future monitoring of those wells is recommended. | NRCan recommends that future monitoring (pre-construction, construction, and operation phases) of groundwater levels continue in order to validate model predictions. |
| 8 | PE SV- Section 8 Groundwater | p. 8-2 to 8-15 | There is no mention of other possible groundwater users in this area. It is essential to know if there are any groundwater users within the defined study area, particularly those who may use the water as drinking water. Groundwater may become contaminated as a result of project activities and any existing groundwater wells may become contaminated as a result. | Clarify if there are any present or reasonably foreseeable future groundwater users in the groundwater study area (defined in Section 8.2.2). If there are, provide the location of the wells, well completion details, the existing water quality in the wells, and discuss whether the wells are used for drinking water. |
| 9 | PE SV- Section 8 Groundwater | p. 8-3 to 8-4 | The proponent acknowledges that potential changes to future groundwater quality resulting from the proposed project are assessed only in a qualitative manner. It is unclear why these potential changes were not assessed quantitatively, using the numerical groundwater model. | Provide justification for the absence of a quantitative assessment of changes to future groundwater quality. |
| 10 | PE SV- Section 8 Groundwater | p. 8-7 | The hydraulic conductivity range is given as 1x10-4m/s to 1x108 m/s. This must be a typo (should be 1x10-8), as this range is unrealistic. | Correct typo on page. |
| 11 | PE SV- Section 8 Groundwater | p. 8-12 | No reference is provided for this table of hydraulic conductivity values. It is unclear if these values are derived from the literature or from on-site data. | Clarify the source of the hydraulic conductivity data in Table 8.3-1. |
| 12 | PE SV- Section 8 Groundwater | p. 8-31 | The number and distribution of groundwater wells is insufficient to provide a good basis for numerical modeling. Only 8 on-site groundwater monitoring wells were used. Only 3 wells are proximal to the proposed generator/dams. As this is an area where the groundwater-surface water relationship is more complex and groundwater flow reversals could occur, a greater well density is warranted. Additionally, there is only 1 well west of Caribou Island. This is a very low number of wells considering that this area represents at least half of the area to be inundated by the reservoir. | To provide greater confidence in the numerical groundwater model it is recommended that additional groundwater monitoring wells be installed to monitor water levels. It is recommended that multi-level wells be installed in some locations in order to delineate vertical groundwater flow gradients. |
| 13 | PE SV- Section 8 Groundwater | Entire appendix | There is no mention of model verification or model validation for the numerical groundwater model. Verification is used to establish greater confidence in the model by using the set of calibrated parameter values and stresses to reproduce a second set of field data (above and beyond model calibration). Model validation is completed years after modeling is completed in order to determine if the model's prediction was accurate. This is particularly important for this project as there is considerable uncertainty in model predictions due to the lack of on-site data. | Provide details on model verification if it was conducted and plans for future model validation. |

| | | | | |
|---|---|---|---|---|
| 14 | 04-Supporting Volume, Responses to EIS Guidelines - Environmental Effects Assessment, Seismic activity, Physiography | p. 6-583, p. 6-28 to 6-29 | NRCan expert reviewed the information related to the seismic activity. Although the expert concurs that the known earthquake activity in the area is very low and that the potential for significant reservoir-triggered seismicity is also extremely low, the following sentence needs to be changed. "It is evident from the historical records since the 1600s and relatively recent seismic monitoring, which presents the distribution of magnitude 3 and greater earthquakes in Canada since 1627 (Natural Resources Canada 2008), that no major earthquakes, and hence no important earthquake generating fault movements, have occurred in Manitoba (Map 6-6)." | This sentence suggests that the earthquake reporting is complete in Manitoba for magnitude 3 and larger since 1927 based on an NRCan map that displays the known earthquakes between 1627 and 2008. This is not so. Potentially damaging earthquakes in this area of the Precambrian Shield could only be known since the late 19th century at the earliest when written reports from Manitoba started to be available. The earthquake detection in the area is about M 5 since approximately 1940 and M 5.5 and larger since about 1900 (extrapolated from Southern Saskatchewan in Basham et al., 1979). M 3 and larger could be detected only since the 1990's. Other studies may have looked at the detection completeness of this part of the Canadian Shield. Also, the proposed link between an absence of major earthquakes in recent times and no fault movements is incorrectly presented. Earthquake-induced surface ruptures could have been produced prior to earthquake reporting or detection by human beings. Pre-19th century fault movements could only be known from special geological studies, not deduced from our time-limited earthquake coverage. One must note, however, that even if the text is changed along the lines we present therein, it will not modify the conclusions of the report, i.e. that the design should use the accepted values of seismic hazard for this area of the Canadian Shield. The expert, however, would like the text to better reflect the seismological knowledge of Manitoba to minimize the risk of a false perception. |
| 15 | SEE-RU-HR SV | p. 5-14 | Description of local seismicity does not consider completeness of earthquake catalog. | See comment 14 |
| 16 | Supporting Volumes/Physiography | 5-5 to 5-6 | The nature of underlying bedrock (and overlying materials) is an important component, even in projects such as Keeyask where it provides not only the solid ground on which the Generating Station rests but also it may contain trace elements that may affect groundwater and surface water quality. | The Precambrian bedrock is described as consisting of greywacke gneisses, granite gneisses and granites. What are greywacke gneisses? Please provide a more detailed description of regional and local bedrock that includes information such as: local fracture/joint density, orientation, etc. |
| 17 | R-EIS Gdlines-04 Project Description | 4-34 | The proponent indicates that standing woody material, including dead and living trees and shrubs 1.5 m tall or taller, as well as fallen trees will be removed from the areas to be flooded. Reservoir clearing addresses boating safety issues and aesthetic issues and is also intended to reduce the production of methylmercury in the future reservoir. | The reduction of methylmercury production would be more effective if reservoir clearing included the removal of labile organic materials such as shrub foliage. Labile organic matter from flooded foliage is one of the main factors favouring the algal bloom that occurs in the first years after impoundment, and this in turn favours the methylation of mercury and its uptake in the reservoir foodweb. NRCan recommends consider whether this strategy could be applied for the Keeyask project. |
| 18 | R-EIS Gdlines-06 Environmental Effects Assessment | 6-288 to 6-291 | The proponent expects a significant increase of mercury concentrations in large piscivorous species, such as walleye and northern pike and to a lesser extent in lake whitefish. This increase is expected to peak within 3 to 5 years after flooding and to decrease gradually in the following 25 to 30 years. Peak concentrations on the order of 0.8 to 1.4 ppm (Table 6-18), well above the 0.5 ppm guideline for commercial marketing, are expected for walleye and northern pike. Given the amplitude of the mercury residual effect, monitoring of Hg concentrations in fish muscle tissue will take place until concentrations return to long-term stable levels. | The main measures proposed to mitigate the mercury issue in reservoir biota are (1) the clearing of trees and large shrubs prior to flooding and (2) the monitoring of Hg concentrations in large fish and (3) the ensuing publication of consumption advisories. In an effort to reduce as much as possible the increase of mercury concentrations, NRCan recommends that the proponent consider extending the reservoir clearing activities to areas expected to be affected by peatland disintegration (cf. section 6.3.7), one possible effect of which may be is to stretch beyond 30 years the period of strong mercury contamination in the Keeyask reservoir. This consideration should be discussed with relevant federal departments (e.g. Environment Canada) and provincial ministries. |
| 19 | EIS - Supporting volumes - 04 Aquatic Environment | 7-1 to 7-75 | This section presents a well documented and fairly comprehensive account of the mercury issue in boreal hydroelectric reservoirs, and more specifically in the Keeyask reservoir and nearby water bodies. It presents in a single document much of the information which is otherwise scattered in various other EIS documents. | However, this document presents no information on the variability of Hg concentrations in soils (particularly in organic horizons) that will be affected by reservoir flooding, whether immediately following impoundment or much later as a result of peatland disintegration. In NRCan's view this information, and its links with vegetation cover and wildfire history, are critical in the development of strategies to reduce the remobilization of mercury and to reduce methylation rates in flooded terrain. Moreover, the EIS documents contain no information on forest fire history, as had been requested in the Guidelines (section 8.1.3). NRCan recommends that this information be included in the EIS. |
| 20 | Sedimentation - Physical Environment, Supporting Volume | p. 7-16 - 7-1 | Quality of conclusions from limited data | The general lack of bedload through the Local Study Area is not surprising given that the Split and Clark lakes are immediately upstream and represent sediment traps. Also, the general low rates of bank erosion, lack of alluvial bars, and the coarse character of the channel bed are all consistent with a very limited transport and supply of bedload materials. |
| 21 | Sedimentation - Physical Environment, Supporting Volume | p. 7-39 - 7-4 | Content of summary assessments of the sedimentation resulting from the project | NRCan has no issues with the summary assessments of the sedimentation effects resulting from the project. |

| | | | | |
|---|---|---|---|---|
| 22 | Shoreline Erosion Processes - Physical Environment, Supporting Volume | p. 7-43 | Monitoring actual post-project effects contributes to improving the modelling of impacts from future projects | NRCan strongly encourages the monitoring of the changes in sedimentation resulting from the project. NRCan recommends that the proponent should consider undertaking a regular and detailed suspended sediment sampling program for different discharges, particularly in the first 10 years of the project, when change is most likely to be significant. |