Review of Regional Cumulative Effects Assessment of Hydro-electric Development on the Churchill, Burntwood and Nelson Rivers: A Case for Community Consultation

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Executive Summary

The missing piece in the licensing for Manitoba Hydro Projects in the North is a Regional Cumulative Effects Assessment (RCEA). The Manitoba Clean Environment Commission (CEC) called for the completion of a RCEA of hydro-electric development in the north in its reports on public hearings into the effects of the Bipole III Transmission Project and Wuskwatim Generating Station. The CEC noted the significant impacts of hydro-electric development on the environment and people of the north and recommended a more robust consultation process with Aboriginal communities to glean traditional knowledge and building trusting relationships. In 2016, Manitoba and Manitoba Hydro tabled their Regional Cumulative Effects Assessment of Hydro-electric Development on the Churchill, Burntwood and Nelson Rivers. This document is important as it is intended to address missing pieces in the Environmental Impact Assessments and should draw a clear, accurate and complete picture of pre-, post- and future development impacts. TCN and Halket Environmental Consultants have reviewed the Assessment and find that it is not a solid foundational document for confident and proper decision making.

Key Findings:

The RCEA:

- Failed to follow guidelines for a CEA process as recommended by the Canadian Environmental Assessment Agency (2014);
- Did not consider Riparian and Littoral habitats;
- Did not establish a reference case for most Valuable Components VCs;
- Did not establish accurate pre-, and post-development cases or a reasonably foreseeable future development case;
- Did not use suitable metrics and benchmarks for mercury in fish tissue and uses geographical divisions that do not line up making it difficult if not impossible to trace cause and effect pathways between the differing geographic divisions; and
- Did not examine the impact of a lower water regime on Lake Sturgeon in the Churchill River.

Options and Recommendations:

This review presents two options for action and presents a case to support Option 2. The options are:

1. A step-back of the RCEA to allow for a robust community consultation. This option would likely lead to changes to the VCs, a better pre-development case, and a richer understanding of the environmental and human impact of development.
2. Restarting the RCEA process over according to the CEAA guidelines. This would allow for better data collection, the correction of errors, a more robust analysis of issues of concern, and improved understanding and relationship-building with the Aboriginal community.

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1. Introduction

In its 2013 Report on the Public Hearings for Bipole III Transmission Project, the Clean Environment Commission (CEC) recommends that Manitoba Hydro and the Manitoba Government conduct a Regional Cumulative Effects Assessment (RCEA) for all Manitoba Hydro projects and associated infrastructure in the Nelson River sub-watershed. The CEC further recommends that this RCEA be completed prior to the licensing of any additional projects in the Nelson River sub-watershed after the Bipole III project. Since 2013, two other major Manitoba Hydro projects have been reviewed by the CEC for licensing under the Manitoba Environment Act (Keeyask Generating Station) and the Water Power Act (Lake Winnipeg Regulation) without the input and learnings from a RCEA. The assessment of cumulative effects is the missing piece in the licensing of all previous Manitoba Hydro projects.

In 2016, in response to the CEC recommendation, Manitoba and Manitoba Hydro completed a RCEA of Hydro-electric Development in the Churchill, Burntwood and Nelson River Systems. The RCEA is an important piece of work that must encompass and assess fully the effects of hydroelectric development in this Region of Interest (ROI). The intent of this review of the RCEA is to provide an independent resource to the CEC on the adequacy of that RCEA. This assessment is based on the experience of Tataskweyak Cree Nation (TCN) over the last 60 years in the Resource Management Area (RMA) and a comparison to the technical guidelines for conducting a CEA put forward by Canadian Environmental Assessment Agency (2014).

The Tataskweyak Cree Nation Community and Resource Management Area

The TCN's RMA straddles the Churchill, Burntwood and Nelson Rivers. In the south, it extends from the lower Burntwood River through Split Lake and on to Stephens Lake. In the north, TCN's RMA includes a section of the Churchill River from its outlet at Northern Indian Lake to its confluence with the Braden Lake River system.

The community sits on the north Shore of Split Lake, at the confluence of the Nelson Rivers and Burntwood Rivers. The Nelson River flows into Split Lake from the south and the Burntwood River flows into Split Lake from the west. Both of these Rivers have been affected by hydro-electric development and water regulation for the purpose of generating hydro-electric power. This has significantly changed the flow regimes and water quality over the last 60 years resulting in changes to water levels, currents, water quality, shoreline, ecosystem and community life of Split Lake. TCN community members also hunt and trap along the lower Churchill River which borders the RMA to the north. The lower Churchill River has experienced changes to its ecosystem mainly stemming from the reduced flow from Southern Indian Lake at Missi Falls. In terms of the Hydraulic divisions within the RCEA, the TCN RMA covers Hydraulic Zones 9-Waskwatim to Split Lake, Hydraulic Zone 10-Split Lake to Gull Rapids and Hydraulic Zone 11-Stephens Lake to Limestone Generating Station and Hydraulic Zone 5-Lower Churchill River. In terms of Land divisions it straddles the Western and Eastern Boreal Shield Ecozones, Taiga Shield Ecozone and Hudson Plain Ecozone. Each Ecozone being composed of a number of Terrestrial Regions.

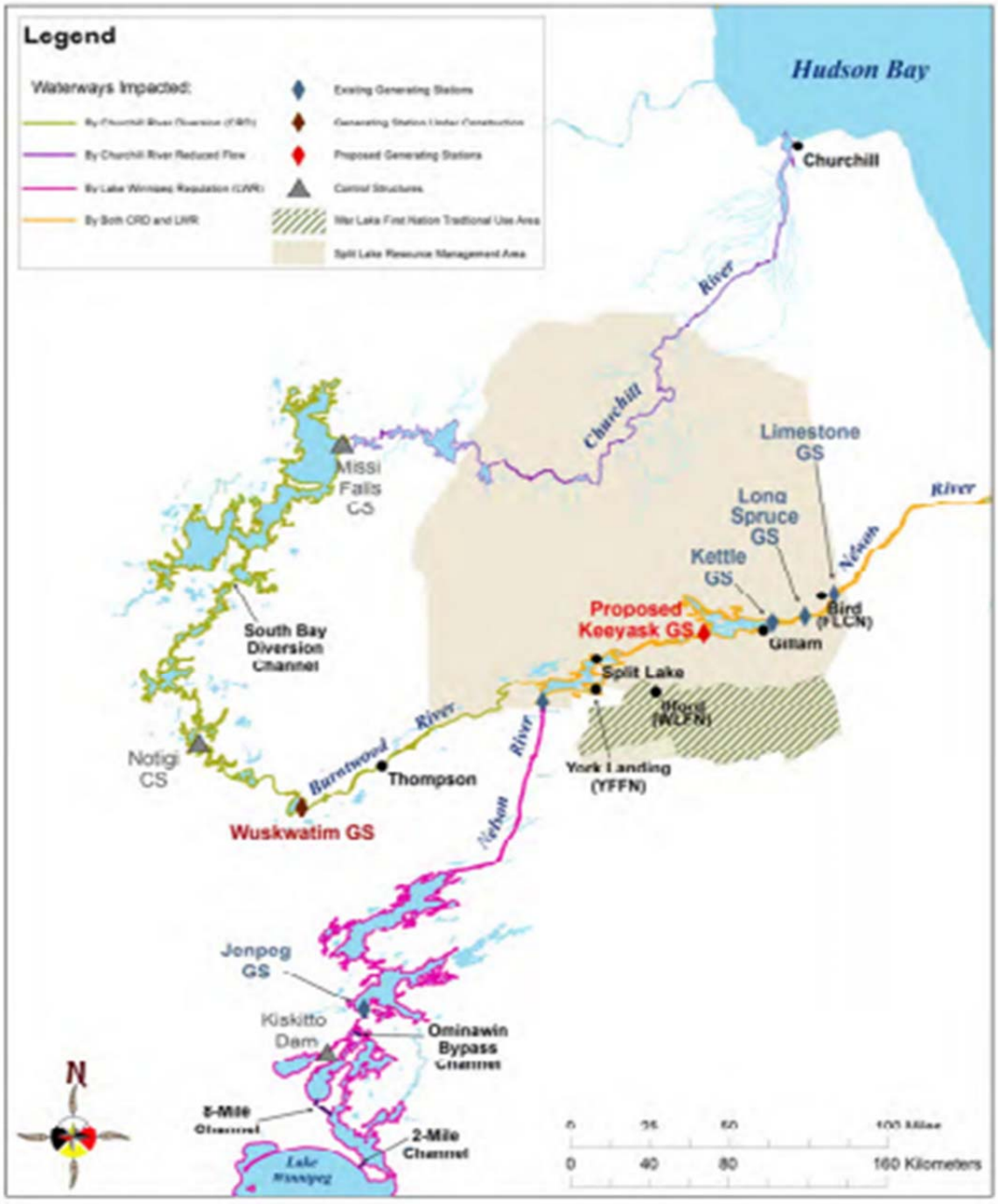

Figure 1. Map of Tataskweyak Cree Nation Resource Management Area (CNP 2012).

The Split Lake community has been directly affected by hydro-electric development since the building of Kelsey Generating Station in 1957. The community has also experienced other project-related impacts. TCN has been directly affected by the environmental changes made by Lake Winnipeg Regulation (LWR) and the Churchill River Diversion (CRD) and the effects of Kettle, Limestone, and Long Spruce and Wuskwatim Generating Stations and other associated hydro-electric infrastructure developments, particularly Bipole III. The full effects of Keeyask Generating Station are still to be felt. Therefore, the completeness and fullness of the RCEA is of significant interest to TCN.

In the CEC hearing at Split Lake, TCN community members told the CEC "In the past, our resource area was pristine. Today we cannot drink the water from the Split, we cannot swim in the water, our beaches have disappeared, our fishery has changed, and we cannot eat the fish because mercury levels are too high. That's why we looked forward to this assessment as a way of explaining what happened to our environment."

Aboriginal communities in Canada face multiple health inequities. When considering disparities of health in the Aboriginal population, some discussion has focussed on individual lifestyle factors and choices, but in Split Lake the comments by young people in the community are particularly compelling evidence that the notion of *choice* is simply false. They are no longer able to swim in their water. Fish are brought in from off-development lakes for the community to eat because their own fish is no longer safe. Without including this first-person testimony in a real and meaningful way, the RCEA provides an incomplete picture of the true impact of hydro-electric development.

The CEC is well aware of the impact that communities have experienced, and continue to experience, as a result of existing Manitoba Hydro projects. In fact, during the Bipole III hearings, the CEC noted that, "…it became apparent that past hydro-electric developments in northern Manitoba have had a profound impact on communities in the area of these projects, as well as on the environment upstream and downstream." Further, the CEC has noted that some review processes have not been conducted in a culturally sensitive manner and that important information could be gleaned by direct and respectful communication with community members. In the Bipole III Transmission Project Report on Public Hearings, the CEC noted the importance of, "establishing a relationship with people in Aboriginal communities who would then share stories and knowledge." This review provides a strong basis for the inclusion of community members, as both key stakeholders and as local experts on the impact of hydro-electric development.

This review is composed of 4 sections, including this brief introduction. Section 2 presents a brief analysis of the RCEA. The approach and completeness of the RCEA is analyzed in the light of the technical guidance given by the Canadian Environmental Assessment Agency for completing a Cumulative Effects Assessment. Section 3 outlines the findings of the review. And Section 4 provides options and recommendations.

2. Analysis of the RCEA

Manitoba and Manitoba Hydro break the RCEA into the five broad components of: Hydro-electric Development, People, Physical Environment, Water and Land. The first component, Hydro-electric Development, provides a detailed history of hydro-electric development in the ROI. People provides a summary of Manitoba and Manitoba Hydro's understanding of the types of socio-economic effects experienced to varying degrees throughout the ROI. Physical Environment describes key changes to the physical environment resulting from hydro-electric development, including changes to the water regime, ice regime, erosion and sedimentation, area flooded and the terrestrial landscape. Water provides quantitative or qualitative descriptions of change over time to the aquatic environment based on a series of Regional RSCs. Land provides either quantitative or qualitative descriptions of change over time to the terrestrial environment based on a series of RSCs.

The following sections provide a more detailed analysis of the gaps and problems in the RCEA. The technical guidance for a CEA, developed by the Canadian Environmental Assessment Agency (2014), is used as a standard for comparison purposes. This report illustrates where that guidance has not been followed, with specific examples where the RCEA departs from the guidance, and the ramifications for not doing so.

2.1. Failure to Follow Best Practice Recommendations for a CEA

The Canadian Environmental Assessment Agency technical guidance for a CEA process (CEAA 2014) suggests that an RCEA start with a scoping process that incorporates the following steps. The outcome of scoping is the selection of the VCs that are carried forward for analyses:

1. A scoping process begins by acquiring scientific evidence and input from the broader public and Aboriginal groups. Scoping includes several steps to identify:
    a. potential value components (VCs);
    b. VC sensitivity to the Project and other past and future developments through cause-and-effect pathways;
    c. the identification of VC-appropriate spatial and temporal scales of assessment;
    d. selection of appropriate metrics and associated benchmarks, thresholds, and methods of analyses;
    e. establishment of a reference condition to represent the pre-development natural state of the VCs; and
    f. identification of reasonably foreseeable future developments.
2. An analysis stage assesses the cumulative effects of the Project, as well as past and reasonably foreseeable future Projects, on each VC at the VC-appropriate spatial and temporal scales. The analyses should respect the source-pathway-receptor model to establish the relationship between the disturbances and the VC. Project effects that continue to affect the VC into the future must be recognized and accounted for.

3. Identification of mitigation measures should be incorporated throughout the scoping and analyses stages. Existing and proposed mitigation that can remove or reduce effects should inform VC selection and analyses.
4. A determination should be made of significance of cumulative effects on each VC following mitigation.
5. A follow-up program to verify the effectiveness of mitigation measures and assess the actual effects of cumulative development should be developed and propose.

This review finds little evidence to show that these steps were followed in scoping the RCEA, notably that the cumulative effects and broader impact of the project, as well as other development projects, are not fully assessed or understood. As a result, the RCEA findings are not based on a solid foundation.

2.2. Lack of Consultation at the Outset of the RCEA

With reference to Step 1 in the technical guidance, the RCEA did a very good job of acquiring published scientific evidence. As noted however, input from First Nations and other public groups was not sought during the scoping or analyses stages. This is a major shortcoming of the RCEA.

The "World View" and traditional knowledge of the Aboriginal community was not considered in the scoping process. A full appreciation of this "World View" would have altered the selection of Ecosystem components or VCs used in the RCEA. The lack of consultation meant that, in effect, the Ecosystem Components, VCs and metrics – the nuts and bolts of a RCEA – were selected internally by Manitoba Hydro and the Province without consultation with the broader public or First Nations, in other words, those most directly affected.

Furthermore, traditional knowledge would have augmented the information necessary to construct and verify reference conditions to represent pre-development natural states of the environment for the VCs, and metrics used in RCEA. It is unfortunate that the reference state was not established in the RCEA for VCs such as fish community. The reference states for many of VCs and metrics in the Land component are based solely on habitat mapping. Unfortunately, it was constructed from old and potentially inaccurate NTS map sheets and an aerial photograph of various scales, a process that the RCEA suggests has a good deal of subjectivity and error. The lack of traditional knowledge and verification in the RCEA has a number of implications, ranging from a loss of important historical and foundational information in the process to the development of a perception of cynicism in the relationship with the First Nations community, something that the CEC has specifically cautioned against.

The RCEA process envisaged public input starting at the completion of the RCEA:

> *"The Minister of Conservation and Water Stewardship has also asked the CEC to conduct a public outreach program with communities in the ROI and other interested stakeholders following submission of the Phase II Report. The CEC process represents the next stage of the RCEA and will provide communities and other stakeholders with an opportunity to share their views, perspectives*

and concerns regarding both past hydro-electric development and the RCEA documents. (Input from the public and First Nations)

Following completion of the Phase II report and the CEC public outreach program, Manitoba and Manitoba Hydro will review all of the RCEA documents, the outcomes of the public outreach program, as well as current monitoring and planning/licensing initiatives and consider the next steps." (P.2. Phase II, Part1, Preamble)

Waiting to involve the public until after the Phase II Report has already been submitted is too late in the process for engagement of First Nations. The major components, VCs metrics and benchmarks have already been chosen; the assessment completed using an approach devoid of traditional knowledge and input, and conclusions drawn. Fully involving the First Nations community at the outset of the review would certainly produce a different document as it would incorporate important community measures and identify conditions from which change could be assessed. As it stands, the RCEA has been presented as a "fait accompli" and TSN consulted as a last step.

2.3. Failure to Evaluate Effects on Littoral and Riparian Habitats

The river banks and shorelines along the Burntwood River, Split Lake and the Nelson River have experienced changes in water level and flow that have created new, and much different, shorelines. These new shorelines have experienced different rates of erosion and sedimentation than before development which in turn has affected water quality, riparian and littoral habitats and ecosystem health. The Churchill River downstream of MIssi Falls has experienced a tenfold decrease in average monthly flow which has lowered water levels and impacted riparian habitat in this area.

Riparian and littoral habitats along rivers and lakes have undergone major changes because of flooding and changes in flow due to hydro-electric development. These habitats form the cornerstones of northern ecosystems. Given the known impact of reservoirs and dams on the physical environment, and given the known impact that change to the physical environment has on human health, change to shorelines should be considered a priority in any review.

Discussions within TCN around the effects of hydro-electric development in their RMA invariably turn to the disruptions occurring along riparian or littoral zones. Erosion of lake shores and riverbanks, deposition of sediments forming fans and bars, the absence of beaches, medicinal plants, muskrat, beaver, frogs, poor water quality, increased turbidity and debris that covers the shore and makes access difficult are all topics that come up. All these concerns and issues are connected to the riparian or littoral zones.

Because TCN has consistently raised concerns about the health of the shorelines, the community was gravely concerned that shorelines did not merit separate consideration as a component or VC in the RCEA. Shorelines are an integral part of the TCN way of life, human health and health of the environment. If adequately consulted, community members would have demanded that littoral and riparian habitats be treated as a separate component in the RCEA with VCs such as shoreline type, bed strata, water quality, land and water plants, algae, fish community and water mammals. Because shorelines were not included in the RCEA as a separate VC, analysis of effects on shorelines was segmented between the Physical Environment, Water, Land and People sections of the report and the cumulative impacts of hydro-electric development on shorelines were not fully evaluated.

Pre-development shoreline types were mapped and compared to existing environment shoreline types as a metric in the Terrestrial Habitat VC. However, the effects of the changes to shoreline types on other VCs were not followed up on in the analysis. These other VCs that are related to and could shed light on the effect of the changes to shorelines are in the Physical Environment, Erosion and Sedimentation, Water Quality in the Water component and Aquatic Furbearers and Waterfowl in the Land component. Unfortunately, these VCs are also evaluated over different geographical zones. Physical Environment and Water used hydraulic zones whereas Land used ecozones. The borders of these geographical divisions do not line up making it difficult if not impossible to trace cause and effect pathways between the differing geographic divisions. This confusing and lax presentation is a failing of the RCEA which should be addressed.

Despite these evident issues, the RCEA does not examine the direct effects of hydro-electric development on littoral or riparian habitat. By dividing up the RCEA into the components of Land and Water, the effects on the boundary zone between land and water, the riparian and littoral habitats is missed. Given the importance of this zone to the community, and the impact of the loss of shoreline and beaches on the community's way of life, this is a serious omission.

2.4. Pre, Post and Future-Development Cases

In its simplest form, the assessment of change for a CEA is dependent on the comparison of the pre-development case to a post-development case and future development case. Failure to establish these cases leads to a failure to assess change. The RCEA has better success when establishing a present day or post-development case for most of the VCs considered. However, it fails to adequately establish the pre-development natural state for many of the VCs of interest as is recommended in "Step 1e" of the technical guidance. Further, the RCEA does not define a reasonably foreseeable future development case, as is recommended in "Step 1f" of the CEAA Technical Guidance.

For Split Lake, the pre-development case for Fish Community was not established. However, the RCEA recognizes that there has been a substantial change to the fish community in Split Lake from the mid-eighties to 2013:

> "*a substantial decline in total fish numbers in Split Lake between the 1980s and the current period (2009–2013) with a concomitant change in the fish community from one dominated by Mooneye and Lake Whitefish in the 1980s, to predominantly Walleye, Northern Pike, and Sauger by the late 1990s to present. In the mid-1980s, species composition in Stephens Lake was similar to that recorded in Split Lake, though total abundance was lower. In the subsequent decades, a change similar to that in Split Lake was observed with a decline in total abundance, and a reduction in Lake Whitefish, Mooneye, and Cisco with an increase in the relative abundance of Walleye and Northern Pike." P. 5.3-84. Phase II Part V Water.*

There are several different options that could have been explored in developing a pre-development case. An accurate pre-development condition could have been completed with insight from the traditional knowledge of the fisher community in Split Lake with input from nearby reference lakes unaffected by hydro-electric development. For Split Lake, a reasonable reference lake which has a good deal of information on its pre-development fish community is Southern Indian Lake. There are also other lakes that could have been used to supplement the information from Southern Indian Lake and establish the pre-development case. Considering that the fish population in Split Lake would have aged only 7 years from the start of CDR and LWR in 1976 to the first sampling date in 1983, an early development case, and likely a reasonable pre-development case, could have been established by back casting the state of the Lake in 1983 to the early seventies. A more complete picture could have been established using traditional knowledge, augmented with reference to fish populations in other lakes, unaffected by hydro-electric development. A computer model of Split Lake could also have helped with the establishment of the reference condition. The failure to do this basic work in creating an accurate understanding of the pre-development means that the RCEA does not present adequate comparative data upon which to base decisions.

The lack of a reference case then leads to speculation about the possible cause of the change to the fish community in Split Lake.

> *"The CRD increased the amount of flow to Split Lake and together with LWR has altered the seasonal flow pattern. The change in abundance and species composition between the 1980s and current conditions is correlated with increased flow; however, it is not known whether observed differences reflect the prolonged dry period versus the prolonged wet period." P. 5.3-84. Phase II Part V Water.*

The last part of this quote adds unnecessary uncertainty to the conclusion that flow changes are the sole source of the change to the fish community. Did the fish communities in nearby reference lakes unaffected by hydro-electric development show this same change? This question is not raised or answered to substantiate the wet and dry period comment which appears out of thin air.

The RCEA goes on to state:

> *"Increasing water temperature is another factor that may affect the suitability of habitat for species such as Lake Whitefish and Walleye. Average air temperature in Gillam has increased 1.5–2.5°C over the past 50 years. There is no long-term water temperature record but increased air temperature*

> *likely increased water temperature. Warmer temperatures may create less favourable conditions for cold water species such as Lake Whitefish and more favourable conditions for cool water species such as Walleye." P. 5.3-85. Phase II Part V Water.*

Changes in water level, and flow because of the LWR and the CRD, plus altered currents in Split Lake, lower turbidity, change to water temperature and littoral habitat are all possible contributors to the change in the fishery. All of these causes are the direct effect of hydro-electric development on the Lake. However, only increased amount of flow was "correlated" with the change in the fishery while assessment of other VCs is not considered.

As to the future development case there is no future assessment of change to the fish community going forward. Will the fish community stay the same, continue to change, or revert to the condition in the eighties? This final piece of the assessment is missing from the RCEA.

More importantly, the failure to establish a reference case and future development case for a VC leads to failure of the RCEA to adequately assess change. The assessment of fish community is not the only VC where the pre-development and reasonably foreseeable future case is not established. For instance, a pre-development case regarding Ice Conditions on the lower Burntwood River has not been adequately addressed. This section of River was at first affected by increased flows from CRD and then the construction and operation of Wuskwatim Generating Station.

> "*The higher flows created by CRD in this hydraulic zone resulted in higher velocities along the Burntwood River, which may result in areas remaining ice free for longer periods. The present water regime consists of fast flowing reaches, which remain ice free, and connecting lakes or slow velocity reaches which freeze over early in the winter…The Wuskwatim EIS contains a detailed description of ice conditions along the Burntwood River and any effects of the Wuskwatim GS on ice conditions. P.4.3-83 Phase II Part IV Physical Environment.*

This is not an adequate assessment of how ice conditions have changed along the lower Burntwood River since the CRD. And referring to another document for the detailed description of ice conditions along the Burntwood and effects of the Waskwatim GS falls far short of the spirit of a CEA, especially when local knowledge of conditions was not sought to give a more complete picture.

The pre-development, or reference, case is not established and neither is a future development case that would include the effects of climate change. Examination of aerial photographs and satellite imagery together with traditional knowledge of ice conditions prior to hydro-electric development may have helped to establish a reference case that could shed light on the changes and impact on the people and wildlife that live in the area.

2.5. Selection of Appropriate Metrics and Associated Benchmarks, Thresholds and Methods of Analysis

The appropriate selection of metrics and benchmarks is an important aspect of assessing a VC properly. In the case of the VC, Mercury in Fish, the metric used in the assessment, standardized mean, is not an appropriate measure for mercury in fish tissue and that the benchmark used, Health Canada's 0.5 ppm level for mercury in fish tissue for the sale of retail fish, is also not appropriate. The use of the metric and benchmark in combination result in conclusions that underestimate the mercury levels in fish and impact on the people and ecosystem.

First, the mercury data shown in the graphs presented in the RCEA depict mercury levels in fish over time using either the arithmetic or standard mean. The arithmetic mean or average is simply the average mercury level in a sample of fish of a particular species. The standard mean is a more abstract measurement. It is found by calculating the mercury level in a fish of standard length from a linear regression equation. The standard lengths used in the RCEA for Northern Pike, Walleye, and Lake Whitefish were 550, 400, and 350 mm, respectively. The linear regression equation is found by best fitting a straight line to the plotted muscle mercury concentrations and fork lengths for the sample on log-log paper.

Fish are a regular part of the traditional diet of TCN. Because fish accumulate mercury over their life time, older and, normally, larger fish have higher levels than younger, smaller fish. Members of the community do not eat fish until they reach "take-home" (400mm or larger) size. Therefore, the average of a sample that includes young fish is not representative of the mercury levels in the fish regularly consumed. It is more a measure of the lowest mercury level in a take-home catch of fish. This begs the question of whether the mean or average mercury level in a sample of fish of different ages is appropriate for use in the RCEA. Also, the standard mean represents the mercury level in fish that are at the smaller end of the spectrum of fish consumed by the people of TCN.

Second, the mercury benchmark of 0.5 ppm used in the RCEA is too high. It is adopted as a benchmark in the RCEA because Health Canada applies a standard of 0.5 ppm total mercury for the general public consuming store-bought fish (Health Canada 2007a, b). TCN community members are not the general public consuming store-bought fish. As a First Nation where fish have formed a large part of the traditional diet for centuries, there are dangers posed by either the over-consumption of mercury-laden fish or the under-consumption of a previously healthy and traditional food source. For the general public consuming store-bought fish, Health Canada applies a standard of 0.5 ppm total mercury (Health Canada 2007a, b). The Manitoba guideline for aquatic life mercury tissue residue in fish for the protection of human consumers is also 0.5 ppm total mercury (MWS 2011).

Consider the following assessment benchmarks used by the United States Environmental Protection Agency to assess mercury in fish tissue for Pacific Northwest (PNW) lakes and the Keeyask Generation Project-Aquatics Monitoring Plan:

> "*Results were compared to USEPA's fish tissue methylmercury criterion of 300 µg kg-1 wet weight (ww) to protect the health of individuals who eat fish (USEPA 2001). This criterion is based on adult consumption rate of 17.5 grams (g) of fish per day. Two other screening values based on higher consumption rates relevant to the PNW were also compared to the mercury tissue results. A 'general population' screening value of 120 µg kg-1 ww is based on a consumption rate of approximately two fish meals per week (59.7 g/day) (Dave McBride, WA Department of Health, Pers. Comm. 1/28/15). This is the amount of fish the American Heart Association recommends eating as part of a healthy diet. Finally, a 'high consumer' screening value of 40 µg kg-1ww based on 175 g/day consumption rate was used for comparison. This is the Oregon State fish tissue standard (ODEQ 2014), which accounts for the portion of the population that eats more fish than average consumers. All screening values are for non-carcinogenic effects of mercury, which are discussed in detail in EPA's guidance on fish advisories (USEPA 2000b)." USEPA (2016) Assessment of Mercury in Fish Tissue from Pacific Northwest Lakes p.7.*

And,

> *"Comparisons will also include the 0.2 ppm total mercury guideline instituted as a "safe consumption limit" for people for people eating "large quantities of fish" (Wheatley 1979) and is still unofficially recognized by Health Canada today, and the Canadian and Manitoba tissue residue guidelines of 0.033 ppm methyl mercury for the protection of wildlife consumers of aquatic biota. (CCME 2000; MWS 2011)." Jansen (2016) Keeyask Generation Project Aquatic Effects Monitoring Report p.9.*

First of all, the EPA criterion of 0.3 ppm is lower that the health Canada standard for mercury in fish tissue for the commercial sale of fish; albeit the standard is for methyl mercury which usually is 80% to 95% of the total mercury content in fish tissue. However, the USEPA "general population" screening value of 0.122 ppm for two fish meals per week and a "high consumer" screening value of 0.04 ppm for four to six fish meals a week would be a much more appropriate benchmarks for the RCEA.

Considering that mercury levels in fish tissue are presented in the RCEA as average or standard means that underestimate the mercury in fish of a take-home size compounded by a benchmark that is too high, an inaccurate picture emerges of the mercury in fish in the area. As a potential hazard to human health, the RCEA should revisit this part of the story.

2.6. Assessment of Sturgeon in Lower Churchill River

The RCEA did not examine fully the effect of the lower water regime experienced along the lower Churchill River after the CRD, especially the effect of this regime on Lake Sturgeon. There is a feeling amongst the fishers of TCN that Lake Sturgeon in the Churchill River are on the verge of extinction. The RCEA sheds little light on this concern. Nor does it shed much light on the extent and condition of sturgeon population before the CRD. TCN traditional knowledge of this fishery prior to the CRD was not sought. Considering that the average monthly flows in the lower Churchill River are one tenth of what

they were prior to the CRD, and reduction in water levels of up to 4.6 m, it may be reasonably concluded that the CRD has reduced the available habitat for Lake Sturgeon and fragmented it.

For the assessment of Lake Sturgeon, the Churchill River was divided into three sections: i) the upper reach: Missi Falls to Redhead Rapids; ii) the middle reach: Redhead Rapids to Swallow Rapids, which includes the confluence with the Little Churchill River; and iii) the lower reach: Swallow Rapids to the estuary. Recent information from the upper reach of the Churchill River suggests that the reach is nearly devoid of Lake Sturgeon. Recent data suggest that Lake Sturgeon are relatively abundant and known to be recruiting in the middle reach. And similarly to the upper reach of Area 4, Lake Sturgeon are believed to be rare in the lower reach (RCEA 2016). The prediction as to the future state of this remnant population offered in the RCEA is:

> *"Despite the effects of hydro-electric development, recent studies suggest that sufficient habitat remains to sustain Lake Sturgeon populations within almost all reaches of the Nelson and Churchill rivers where the species historically occurred. However, due to the lack of pre-hydro-electric data we cannot determine the extent to which the carrying capacity of this habitat has been changed, or affected by habitat fragmentation, resulting from hydro-electric development. "p5.4-6. Phase II Part V Water.*

Considering the lack of attention and analysis given to Lake Sturgeon along the Churchill River, this last statement summarizing the effects of hydro-electric development seems like wishful thinking.

3. Findings

Overall, this review of the RCEA finds that it does provide a comprehensive compilation of scientific studies and monitoring results completed for the region covered by the RCEA. However, the RCEA does not does not fully examine the effects of the LWR and the CRD as well as other hydro-electric development on the community and environment. Had TCN been consulted at the outset the RCEA could have addressed the community's concerns and it would be a different document. If the RCEA had followed CEAA Best Practice Guidelines and employed a full scoping stage that included consultation with TCN at the outset, important traditional and local knowledge, verification of historical conditions, experience and opinions would have been incorporated into the RCEA's approach and analyses. Unfortunately, the RCEA does not incorporate this important input, and it therefore remains an incomplete document that does not provide the foundational evidence and analysis to support good long-term decision making.

This report finds that the major failings of the RCEA are:

- The failure to consult with TCN during the scoping stage is perhaps the most notable failing as TCN's "World View," concerns and ideas are not covered in the RCEA. In its Report on Public Hearings for Waskwatim Generating Station (2004), the Clean Environment Commission (CEC) called on the Government of Manitoba to develop criteria and procedures to select and describe VCs for environmental assessments that include Traditional Scientific Knowledge and Western Scientific Knowledge approaches and if that approach had been followed in this case, a better document would have been produced. This process needs to fully engage First Nations, other Aboriginal communities and other interested parties." (p.119, CEC 2004.)

- One of the advantages of early consultation would have been an emphasis on shorelines beginning with the scoping stage. In the current environment, the shorelines in Hydraulic Zones 9, 10 and 11 are new because of the increased water levels and flow while in Hydraulic Zone 5 the flow is much reduced because of the CRD and the range of water levels greater than that experienced in the past. These changes have had profound effects on riparian and littoral habitats. By dividing the affected environment into Physical Environment, Water and Land in the RCEA and not having a separate VC for shoreline, the changes to the riparian and littoral habitats are overlooked.

- The failure to establish common geographic reference scales across the components hampers the assessments of the VCs in the RCEA. The geographic divisions should be consistent across all VCs. In the RCEA, Land is divided into Ecoregions, while the Physical Environment and Water categories are divided into Hydraulic Zones that do not conform with the Ecoregions. These differences could lead to inaccurate and poor decision making.

- The failure to establish fully fleshed out pre-development, post-development and reasonably foreseeable future cases hampers the assessment of change in the RCEA. The assessment of change and magnitude of change are derived from the comparison of the cases. This, simply put, was not completed in the RCEA.

- Inappropriate benchmarks and metrics were used for the assessment of mercury levels in fish tissue. As a traditional food source, the consumption of fish in the community is important – especially fish that are larger and potentially higher in mercury content. The dangers to human health and the impact on traditional diet mean that the RCEA needs a much more robust analysis of this measure.

- The RCEA did not examine fully the effect of the post-CRD low water regime on fish community on the Lower Churchill River, especially the effect of this regime on Lake Sturgeon. This is important concern as TCN fishers believe that this population is in danger of extinction and the analysis in the RCEA of the future state of the population is absent.

4. Options and Recommendations

The RCEA will be the basis for decision making for years to come, and as such it should be a model of good evidence and science, spotless analysis and trust. As it stands today, the RCEA is not a foundational document solid enough to support that decision making. This review provides the basis for 2 options for action:

1. Given the findings, including the gaps that have resulted from not including personal experience, traditional knowledge and the TCN "World View" there is a case for taking a step back to allow the RCEA to include public input from this and other reviews, meetings and sources. If properly considered, this input would likely result in changes to the VCs, a better pre-development case, and a richer understanding of the environmental and human impact of development; or

2. Given the errors in the selection of appropriate metrics, benchmarks, thresholds and methods of analysis, in addition to the lack of appropriate consultation, there is a case for starting the RCEA process over according to the CEAA guidelines. This would allow for better data collection, the correction of errors, a more robust analysis of issues of concern, and improved understanding and relationship-building with the Aboriginal community.

Tataskweyak Cree Nation and Halket Environmental Consultants recommend that the RCEA process be restarted according to CEAA guidelines and with proper consultation and relationship building – **Option 2.**

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