REVIEW OF KHLP'S APPROACH TO THE KEEYASK GENERATION PROJECT CUMULATIVE EFFECTS ASSESSMENT

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OUTLINE

1. Cumulative effects: a brief overview

2. Our approach

3. Synthesis of our key findings

4. Significance of the Keeyask decision

1. Cumulative effects

"…changes to the environment that are caused by an action in combination with other past, present and future human actions." (CEA Practitioner's Guide)

"…the incremental effects likely to result from the Project on the environment when the effects are combined with the effects of other past, present or future projects or human activities…" (Keeyask EIS p. 7-1)

1.1 Cumulative environmental effects

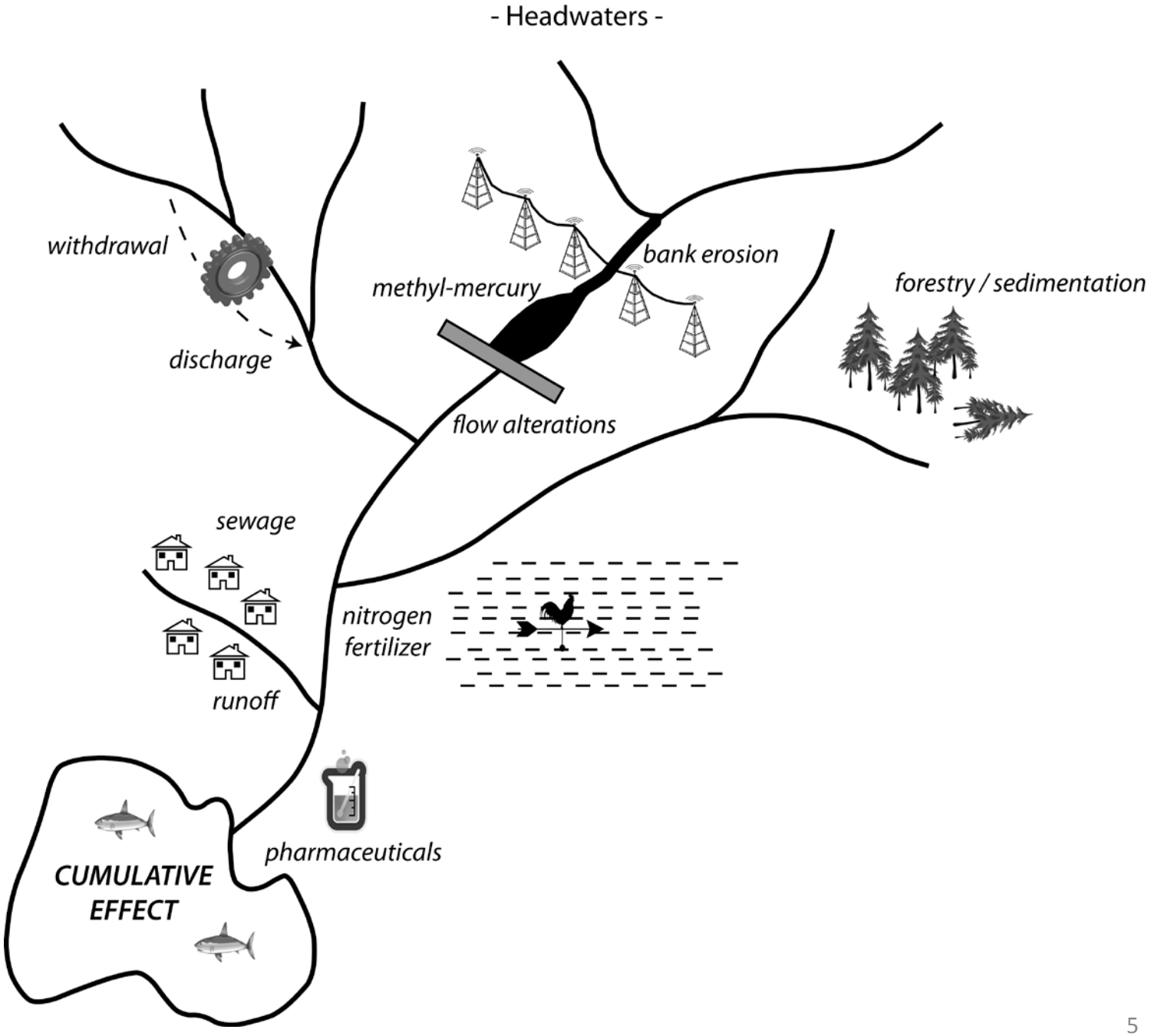
- ‘progressive nibbling’
- ‘death by a thousand cuts’
- ‘tyranny of small decisions’

i. It is easy to dismiss the significance of any single action

ii. What may appear to be a small disturbance, can be cumulatively significant

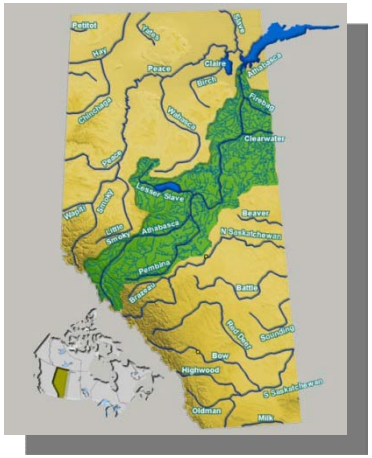
iii. A cumulative environmental effect is based on the understanding that each individual disturbance or impact, regardless of its magnitude, can represent a high marginal cost to the environment and/or society.

The high cost of incremental decisions is at the heart of cumulative effects


- Headwaters -
withdrawal
discharge
methyl-mercury
bank erosion
forestry / sedimentation
flow alterations
sewage
nitrogen
fertilizer
runoff
pharmaceuticals
CUMULATIVE
EFFECT

Example: Athabasca River, AB

Land-Use	1966-1976	1996-2006
Pulp mills discharging	1	5
Agricultural area (acres)	47,218,170 (1981)	52,058,898 (2001)
Water withdrawal (m^3/year)	12,069,340	595,580,497
Operating oil sands leases	2	3,360



- **Headwater low flow:** 10% decrease over the time period
- **Mouth low flow:** 30% decrease over the time period
- **Temperature:** 1.4 C warmer
- **Significant changes:** chloride, sulphate, sodium, dissolved oxygen

Squires A, Westbrook C, and Dubé M 2010. An approach for assessing cumulative effects in a model river, the Athabasca River Basin. *Integrated Environmental Assessment and Management* 6(1): 119-134.

1.2 How does this happen?

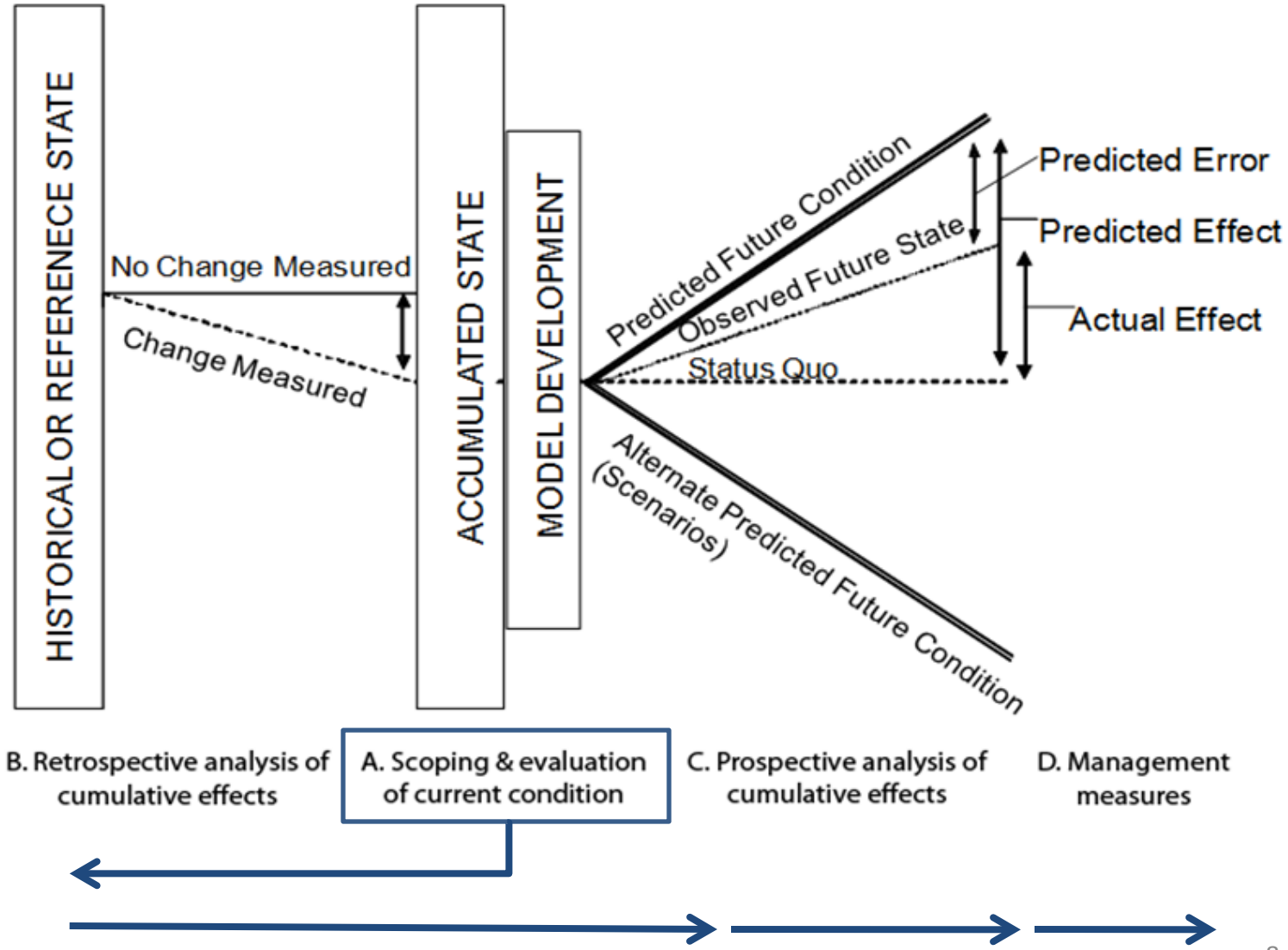
- For each action, the effects are deemed ‘marginal’ or ‘relatively insignificant’ when compared to other types or magnitudes of change or disturbances – i.e. ‘a small drop in the bucket’

- The magnitude of a project’s impacts are ‘measured against’ or ‘compared to’ the effects of other projects, versus focusing foremost on the TOTAL environmental effects.

- Cumulative effects are often argued to be the responsibility of other project proponents

You cannot determine the true significance of a project’s effects without considering cumulative effects

1.3 Assessing cumulative environmental effects



2. Our approach

2.1 What we reviewed

EIS Supporting Documentation and Other Reports
▪ Environmental Impact Statement (Response to EIS Guidelines)
▪ Select Environmental Impact Statement project maps and GIS shape files
▪ Physical Environment SV
▪ Aquatic Environment SV
▪ Terrestrial Environment SV
▪ Keeyask Cree Nations Partners Environmental Evaluation
▪ *Cumulative Effects Assessment Practitioners Guide* (Hegmann et al. 1999)
▪ CEAA Operational Policy Statement (OPS) on cumulative effects (2007)
▪ Select Information Requests and responses focused on cumulative effects (Rounds 1-3)
▪ Keeyask Traditional Plans Workshop Summary (Supplemental Filing # 1)
▪ Updated Caribou Sections (Supplemental Filing # 2)

2.2 The questions we asked

Four basic stages of CEA methodology guided our review:

- Adequacy of scoping practices for CEA
- Retrospective analysis of baseline conditions and cumulative effects
- Prospective analysis of potential cumulative effects
- Cumulative effects management measures

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i. What was done well?

ii. What needs to be improved?

3. Synthesis of key findings

3.1 Cumulative Effects Scoping

3.1.1 Some good practice elements

- Adopts relatively broad regional boundaries, ecologically-based
- Does consider a range of past, current, & future projects
- Does consider VECs that would experience significant adverse direct effects

3.1.2 Effects of some current and future projects not adequately captured

Example 1. Bipole I & II transmission right-of-way (T-RoW)

If Bipole III is a relevant future project; existing T-RoWs should be scoped in. Bipole I & II not specifically named, therefore not captured in later analysis.

Example 2. Wuskwatim Generation Project

Identified as a past or current project. Turbines in operation < 2 yrs. Effects will unfold over many decades: missed in prospective analysis.

Example 3. Conawapa Generation Project

Keeyask

Will potentially affect water quality (Ch 7, Table 7-3); Wuskwatim & could too; many past projects to consider; yet Conawapa scoped out of CEs analysis for fish (Ch 7, Table 7-3) .

3.1.3 Uncertain future temporal limits adopted for the CEA

Options include (Hegmann et al. 1999 CEA Practitioner's Guide):

- end of the operational life cycle of the project
- after project abandonment and reclamation has been complete
- after recovery of VECs to pre-disturbance conditions

"Ultimately, the focus of the assessment **was on the future** rather than on the past, i.e., on examining the vulnerability of each VEC today **and in the future** without the Project, …in order to help in identifying the extent to which incremental effects on a VEC from additional changes caused by the Project could potentially result in a cumulative significant adverse effect on the VEC" (KHLP's response to CEC Rd 1 CAC-0012).

Yet…

Future temporal limit adopted for the CEA is unclear

- operational life of the project not stated

Effects of construction & near-future interactions generally well accounted for, but longer-term consequences largely ignored

- description of the cumulative effects of the project including future projects and activities (see Ch. 7, 7-31 to 7-36)
- no attempt to characterize induced actions (Hegmann et al. 1999)

Limited temporal and spatial dimensions generally narrow impact analysis to inclusion of immediate effects of a specific environmental attribute at an individual site (Smit and Spaling 1995)

3.1.4 Truncated spatial limits

Spatial limits for good practice CEA in project-based assessment, by definition, must be broader than that which is necessary to capture direct effects because cumulative effects are of an additive, interactive, synergistic, and often indirect nature (Hegmann et al. 1999).

Example 1. CEC expressed concern about the truncated spatial limits of Study Zone 5 Regional Study Area.

KHLP's response (to CEC Rd 2 CEC-0103a):

"To support the regional, ecosystem-based approach used for the terrestrial assessment…the Study Zone appropriate to capture a population for a VEC was selected as the VEC's Regional Study Area…On this basis, the assessment evaluates the VEC populations **directly affected** by the Keeyask Project, **rather than** using a study area delineated by the locations of all **past, current, and future projects** to assess effects on those VECs".

Example 2. The Keeyask Project includes infrastructure & operations that are regionally disruptive, far beyond the Project area. Possible indirect effects:

- of transmission line corridor construction/vegetation maintenance?
- changes to provincial economy?
- changes to water flow on Nelson River, upstream impacts to Lake Winnipeg?

The CEA is not scoped broadly enough to capture indirect cumulative impacts that may be eventually be experienced further afield by communities & environments beyond the project region.

CEA tends to be concerned with larger scale VECs such as within entire…watersheds…and broad social and economic VECs such as quality of life and provincial economy (Hegmann et al. 1999)

3.2 Retrospective analysis of cumulative effects

3.2.1 Identification/use of condition trends in the CEA process

EIS sec. 5.3.1 (p. 5-5): "The existing environment…a description of the existing environmental setting of the study area, including trends, conditions, and the major influences of past and present projects and activities, in shaping the current and future environmental setting without the project."

Good practice example: Response to IR CEC Rd 2 (CEC-0102c) & CEC Rd1 (CEC-0020):

- spatial data for terrestrial habitat conditions presented for historical, existing, Keeyask footprint & future activities
- linear disturbances & core area changes presented across space & for different time periods

3.2.2 Thresholds (or targets) against which cumulative change is assessed

Few thresholds identified in the EIS are actually used in the CEA

- **Exceptions:** habitat thresholds for caribou pop. & linear feature benchmarks

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Example 1: TSS guidelines reported for water quality, but not applied to assess the significance of cumulative effects

Example 2: Benchmarks (% changes), for priority plants reported in EIS Ch 6 (sec. 6.5.4.2.1), but are NOT carried forward in the CEA to examine significance.

How does future cumulative loss measure-up against the benchmarks identified in Chapter 6 of the EIS?

- < 1% = small magnitude; 1% - 10% = moderate magnitude; > 10% = high magnitude,

3.3 Prospective analysis of cumulative effects

Cumulative effects assessment is ultimately about the future…

Response to CEC Rd 1 CAC-0012 (p. 3):

"Ultimately, the focus of the assessment was on the future rather than on the past, i.e., on examining the vulnerability of each VEC today and in the future without the Project (due to whatever factors might affect this vulnerability), in order to help in identifying the extent to which incremental effects on a VEC from additional changes caused by the Project could potentially result in a cumulative significant adverse effect on the VEC."

- Keeyask CEA is sound in principle…but relatively weak in practice.

3.3.1 Limited attention to 'futures' analysis: descriptive vs. analytical

Section 2.10 TE-SV: "As described in the Response to the EIS Guidelines Section 7.2, VECs… This section provides that assessment."

- total 'assessment' of CEs for future projects upon which EIS Ch 7 is based & conclusions drawn = 3.5 pages of a 319 page technical report.

TE-SV Terrestrial Plants: 3.5 pg. descriptive text about potential cumulative effects in a 138-pg document

- a description of current & past conditions & distributions of plants
- no reference to any supporting analysis for future effects

AE-SV: describes past & current conditions and synthesizes water quality & sediment, including trends

- little analysis of future effects in combination with other projects and activities
- word 'cumulative' does not appear in the water & sediment quality section of the AE-SV

3.3.2 Assumptions and analyses to support conclusions about future cumulative effects

EIS Scoping Document (sec. 5.1 Project Effects):

"In reporting on the assessment of potential environmental effects, the EIS will describe the approach and methods used to identify and assess the effects, and it will also provide a record of assumptions and analyses that support the conclusions."

Good practice CE examples:

- intactness

Weak practice CE examples:

- water quality (sedimentation)
- wetlands
- priority plants

3.3.2.1 Intactness

TE-SV: feature density, core area effects, fragmentation effects

- current accumulated state & metrics (e.g. km/km^2, total and % area change) to identify total effects in LSA & RSA due to the combined actions of the Project & those future projects and activities

- management targets identified & rationale for interpretation of the significance of cumulative change (e.g. % of RSA in core area that is expected to remain over the first 30 years of the Project) (see TE-SV sec 2.10.2, Table 2-51)

- related to summer caribou habitat intactness estimates for undisturbed habitat in RSA

3.3.2.2 Water Quality

PE-SV: "While there will likely be temporal overlap in the construction and operation phases of all the foreseeable projects, none are expected to influence the sedimentation processes within the hydraulic zone of influence."

KCN disagree: "Elevated TSS levels are unlikely to have a measurable effect on the biota, given the short duration of larger inputs…" It is also noted that these levels will be elevated for at least 10 to 15 years. (EIS Chapter 7, sec. 5.1.2.1)

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2 issues:

- Whether & how the cumulative effects of other future disturbances in the watershed (e.g., forestry, mineral lease sites, linear features, river crossings, etc.) that cause vegetation disturbance or clearing result in increased sediment loading over time.

- Rationale for the conclusion that sediment levels would be elevated for at least 10 to 15 years, but there would be no adverse cumulative effects to biota, including sturgeon.

Example: P -SV, Appendix 7A Model Descriptions: critical shear stress for erosion to assess the deposition potential for silt, sand and gravel downstream of Gull Rapids near the young-of-the year habitat area for Lake Sturgeon

EIS Ch 6, sec. 6.4 & and AE-SV (sec. 2) sedimentation is "large for all aspects of shoreline erosion."

EIS Ch 7, Table 7-3 identifies the potential Conawapa GS as a project that overlaps with Keeyask & having a potential to cumulatively affect water quality.

- No other activities or disturbances in the area are identified as acting cumulatively with the Project's impacts to water quality, specifically sedimentation.

Our concerns:

i. Sedimentation caused by terrestrial disturbances receives limited (if any) attention in the CEA for future projects and activities.

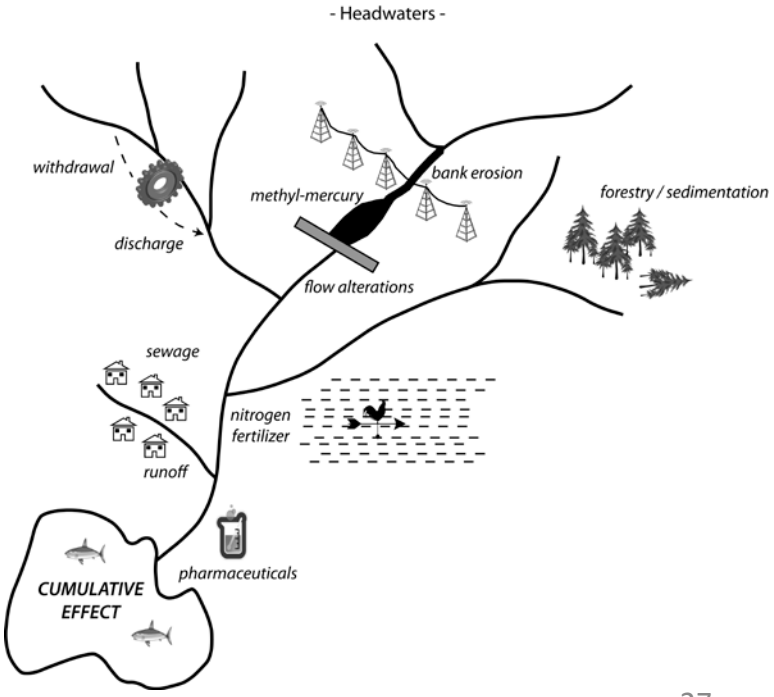
PE-SV (sec. 7.4.5) discusses interactions with Bipole III, Keeyask & Conawapa

- sediment loading as a result of these projects, & of other activities in the watershed (e.g. including forestry, access roads, lease sites, etc.), are not considered in any analytical framework or evaluated against WQ guidelines

ii. Lack of models, correlational analysis, or reference to studies from elsewhere to validate conclusions about future CEs in the watershed

- **roads, trails, river crossings, other linear features & cleared areas are a major source of fine sediments to streams in disturbed watersheds**

(Yarmolov and Stelfox 2011)



iii. Lake Sturgeon not identified in EIS Chapter 7 (Table 7-3) as a VEC included in CEA for future projects or activities.

- erosion & sedimentation from linear disturbances (e.g. logging roads or access roads) contribute to impaired water quality in sturgeon habitat (Ferguson and Duckworth 1997)

- sedimentation of critical habitat the cause of a reduction in white sturgeon recruitment in the Nechaka River, British Columbia (McAdam et al. 2005)

- cumulative effects of flooding, land uses/clearing (e.g. forestry, access roads, transmission lines) & stream crossings can significantly increase the cumulative amount of sediment loading to that expected from natural processes (Yarmoloy and Stelfox 2011)

- sediment loading can have adverse effects on food production for fish & catchments subject to higher densities of landscape disturbance can be associated with lower fish population densities & factors of healthy habitat conditions (Jackson 2008)

3.3.3 Soundness of cumulative effects conclusions

- some conclusions about potential cumulative effects do not add up
- precision & confidence are presented in some conclusions that is supported by the analysis presented in the EIS

Example 1: Chapter 7 of the EIS, p. 7-27

"…the magnitude of decline in the beaver population is scientifically uncertain because large comparison rivers that are unaffected by hydroelectric development ...tend to have fewer beaver."

- but…(p. 7-36) it is concluded that there is "no measurable residual cumulative effects of the project in combination with other future projects are anticipated."

Example 2: "the additional affected [wetland] areas are expected to range from nil to relatively small so that cumulative area losses could remain in the small to moderate magnitude range, depending on the final locations of the transmission ROWs" (with reference to the Bipole III project) (see TE -V, p. 2-201)

- there is no futures model in the EIS to explore the range of possible outcomes associate with cumulative wetland loss

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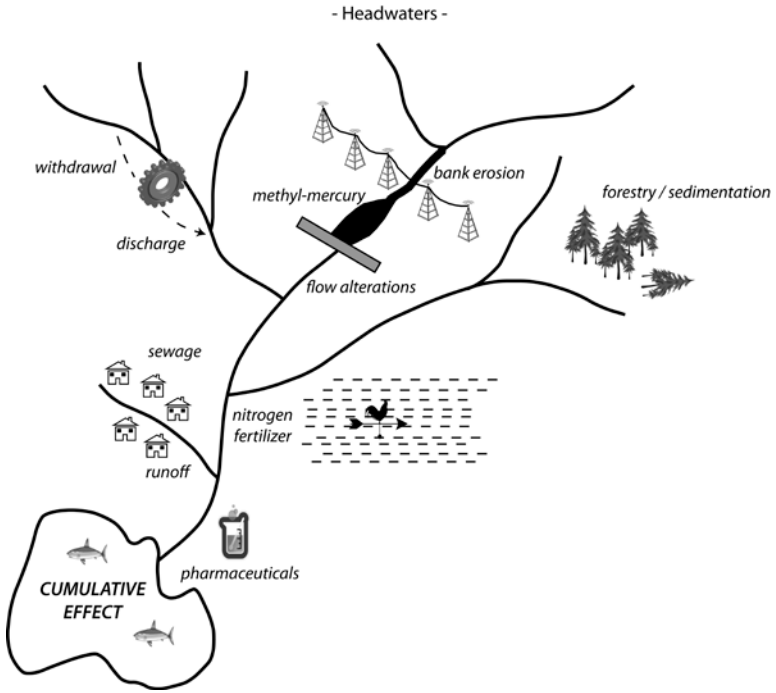
Example 3: With regard to intactness, "Overall, the likely residual Project effects on regional intactness are expected to be adverse but small because the Project Footprint is located in an area where intactness is already low due to past human activities" (EIS Ch 7, p. 7-28).

- i.e. intactness already low so any additional effect is small
- at odds with the basic principle of a 'cumulative' effect

Example 4: "…there is sufficient spatial separation [Bipole III & Keeyask] so that there is little or no overlap with effects of the Project …" & "…there would be some overlap with the release of sediment during in-stream construction activities of the Project and the potential future construction of the Conawapa…" but that these effects are "not expected to cause measurable incremental changes to the Project effects on the physical environment." (EIS Sec 7.3.4

- separation of effects ≠ separation of physical footprints
- cumulative effects to an aquatic system are associated with pathways of effects (i.e. the transport of water and sediment) versus physical footprints



3.4 Cumulative effects management

3.4.1 No anticipated cumulative effects despite a highly disturbed region

The KHLP **does not anticipate any cumulative effects of the project** on terrestrial and aquatic VECs. Same claim is ultimately made about socio-economic VECs, following proposed mitigation.

Significance may appear to decrease as the perceived effectiveness of mitigation measures increases (Hegmann et al. 1999)

Is too much confidence placed in proposed mitigation of direct effects, given highly disturbed state of the region?

Example: The claim 'no cumulative effects' made in spite of the fact that Chapter 7 also includes statements that suggest not all predicted cumulative effects in the region will be minor, including:

VEC	Predicted Cumulative Effect
Ecosystem diversity	"…cumulative area losses for all priority habitat types are predicted to remain in the small to **moderate** magnitude range" (p. 7-32)
Priority plant species	"…cumulative losses are predicted to remain in the nil to **moderate** range, depending on the species" (p. 7-33)
Fish	"…the technical analysis indicates that there are no adverse effects of the Project on fish populations" (p. 7-23) but that "Members of the KCNs…have stated that they **expect a larger spatial and temporal extent of effects** than indicated in the technical analysis" (p. 7-23). "As with water quality, Members of the KCNs at workshops to discuss Project effects and mitigation have stated that they expect a decline in the numbers and health of most fish species as a result of the Keeyask Project **and that adverse effects will extend to Split Lake**" (p. 7-20).

Regarding cumulative effects significance, Hegmann et al. (1999:48) suggest:

"make conservative conclusions (i.e. assume that an effect is more rather than less adverse)."

The past record of development and resulting regional environmental disturbance seriously challenges the notion that the Project **will not** contribute to processes of adverse cumulative environmental change already in motion, & that the incremental effects of the Project **would not** be cumulatively significant.

- common sense and the Keeyask EIS itself suggest otherwise

3.4.2 Masking or minimizing cumulative effects

Any local effect can be made to seem inconsequential if the regional study scale is large enough (Joao 2002)

The cumulative effects of any individual development project can only be properly appraised when evaluated in relation to the **total effects** of all past, present, & future projects on VEC sustainability (Hegmann et al. 1999; Keeyask EIS Chapter 7, p. 7-2).

Two common ways that effects can be masked/minimized:

i. By comparing them to the effects of other projects such that they seem relatively insignificant (e.g. Bipole III)

ii. By broadening geographic scale of reference (e.g. Keeyask)

Example 1: Moose

- "Small changes in habitat are expected compared to the regional availability" (Chapter 7, p. 7-31).

Example 2: Caribou

- "For summer residents, the cumulative reduction in intactness (1%) is small compared to the Regional Study Area" (Chapter 7, p. 7-35).

Example 3: Beaver

- "Regional beaver populations are highly likely to maintain viable levels…(but)…The regional population will most likely continue to be depressed on the Nelson River because of water level regulations, and because beaver are unlikely to successfully re-colonize new shoreline wetland habitat in the long-term" (Chapter 7, p. 7-36).

3.5 What does all of this mean?

Keeyask is relatively sound based on CEA principles, but weak on substance.

Conclusions about no significant adverse cumulative effects is suspicious:

- Temporal future CEA limits often vague or unspecified
- Prospective analysis is weak; little to no 'futures' assessment
- Limited data/reasoning to support conclusions
- Data uncertainties are explicit, but conclusions imply 'measurable' predictions
- Some thresholds identified, but not used to assess CE significance
- Regional study area used to minimize effects
- Several statements in the EIS (and SVs) indicate that there has been (and will be) effects, yet overall conclusion is no significant adverse CEs

Our recommendation = CEC's recommendation for Bipole III

- good CEA is needed *prior to* Keeyask approval

4. Significance of the Keeyask decision with regard to CEs?

4.1 The Keeyask EIS is clear in that:

1. The regional environment in which the Keeyask is proposed **has already been substantially altered by past development**

2. The Keeyask project will be **super-imposed on this disrupted environment**.

4.1.1 The EIS identifies adverse effects to aquatic environments

- "The aquatic environment in the lower Nelson River, including the area to be affected by the Project, has been substantially altered by past hydroelectric development and continues to experience those effects today" (EIS Ch 7, p. 7-16).

- "The aquatic environment of the Nelson River where the Project will be constructed has been substantially altered by hydroelectric developments, in particular the Churchill River Diversion (CRD) and Lake Winnipeg Regulation (LWR), and the construction of the Kettle GS. Effects of the Project will be super-imposed on this disrupted environment" (EIS Ch 6, p. 6-54).

- The Keeyask Project "will affect open water levels for about 41 km upstream…[and] about 45 km^2 of initial flooding is predicted. This inundation, along with ongoing erosion, will affect water quality and terrestrial aquatic habitat " (EIS Ch. 7, p. 7-4).

4.1.2 The EIS identifies adverse effects to terrestrial environments

- "The terrestrial environment in the area to be affected by the Project has been substantially altered by past hydroelectric developments, linear developments (including transmission lines, highways, and rail lines), forestry and mining exploration, and other agents of change, and continues to experience those effects today" (EIS Ch 7, p. 7-23).

- "Priority habitat types that tend to occur along the Nelson River were also disproportionately affected by hydroelectric development, which flooded some reaches of the Nelson River and altered water regimes along its remaining length" (Ch. 7, p. 7-23 and 7-24).

4.1.3 The EIS identifies adverse effects to socio-economic environments

- "The socio-economic environment in the area to be affected by the Project has been substantially changed by past hydroelectric developments, linear developments (including transmission lines, highways, and rail lines), forestry and mining exploration, and other agents of change, and continues to experience those effects today" (EIS Ch 7, p. 7-37).

- "The Project is located close to communities that have been greatly affected by past hydroelectric and other developments. Each of the Keeyask Cree Nations has documented the history of its people, and the profound effect that hydroelectric development over the past 55 years has had on its relationships with the environment, changing its way of life and culture" (EIS Executive Summary p. 37).

4.1.4 The EIS identifies adverse effects to traditional use & culture

- "A sizeable portion of CNP's major waterways in their homeland ecosystem are no longer able to sustain their traditional ways due to alterations from hydroelectric development" (EIS Ch. 6, p. 6-20).

- "…more than 35 major generation, conversion and transmission projects have been undertaken by Manitoba Hydro in northeastern Manitoba affecting the traditional territories of the KCNs, their communities and members" (EIS Ch. 6, p 6-12).

- "The most detailed information is provided for the hydroelectric development era between 1957 and the present in order to depict how the construction and operation of these northern hydroelectric projects resulted in life-altering changes to the water, land and traditional way of life for First Nations members living in the Keeyask area" (EIS Ch. 6, p. 6-7).

- "Particularly influential have been the construction and operation of the four generating stations and the substantial water management projects of the LWR and CRD noted above, which taken together, have substantially adversely affected the land, water and traditional way of life of the KCNs" (EIS Ch 6, p. 6-13).

4.2 What is 'substantial'?

Merriam-Webster Dictionary

- substantial = 'being considerable in quantity', 'significantly great', 'major', 'consequential' and 'significant'

Notwithstanding an environment that has been 'substantially altered', 'substantially changed', 'disproportionately affected' & 'substantially adversely affected' …EIS Ch 7 (sec. 7.5.2.3) states:

> "Overall…review of other projects that could overlap with the effects of the Keeyask Project does not indicate any with the potential to results in cumulative adverse effects that require further mitigation for the Keeyask Project or would alter the conclusion with respect to the regulatory significance…"

BUT…"Based on the regulatory assessment…adverse effects of the Keeyask Project are expected for all terrestrial VECs, and these adverse effects are also expected to overlap with the other future projects or activities…" *(Ch. 7, p 7.31 – 7.32).*

4.3 Where does arguing semantics get us?

- regulatory significance vs. significance vs. substantially altered etc…

It **DOES NOT** change the reality that:

1. the environment has already been significantly altered by previous development
2. it continues to be affected today ; and AND
3. the Keeyask (& other future projects) will be superimposed on an already stressed environment

The EIS makes a strong case that the project may cause significant adverse cumulative effects.

Duinker and Greig (2006: 153): *"…continuing the kinds and qualities of CEA currently undertaken may be doing more harm than good."*

4.4 Keeyask - a critical CE decision point?

View 1: The incremental effects caused by further development in the Nelson River sub-watershed are insignificant given the magnitude of change and degree of hydrological alteration that has already occurred; any further incremental change doesn't matter given the already 'substantially altered' state of the sub-watershed & its communities.

OR

View 2: Given that the region has already been 'substantially' and that it is agreed past alterations have been cumulatively significant, any further development must be also considered cumulatively significant & should not proceed unless net positive contributions to the sustainability of the sub-watershed and its communities can be clearly demonstrated.

"The way our eyes follow the ball—and not the game—is dangerous."

- Ronald Wright, 2004 Massey Lecture

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