

From: [Gover, Aubrey](#)
To: [Watkins, Michelle](#); [Harvey, Brian](#)
Cc: [Bowles, Ron](#); [Barnes, Janice](#)
Subject: FW: ENVC Emerging Issue Note - Mercury
Date: Thursday, November 26, 2015 10:36:06 AM
Attachments: [ENVC Mercury Information Note Nov 25 2015.docx](#)

Please assign and note deadline.

Aubrey Gover
Deputy Minister
Labrador and Aboriginal Affairs Office
Government of Newfoundland and Labrador

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From: Parsons, Walter
Sent: Thursday, November 26, 2015 9:32 AM
To: Gover, Aubrey; Barfoot, Scott; English, Tracy
Cc: Bowles, Ron
Subject: ENVC Emerging Issue Note - Mercury

Good morning,

Cabinet Secretariat has received the attached emerging issue note from ENVC regarding Mercury and its impact on the LCP. Please forward any comments you may have to me by end of business today. Apologies for the short timeline for review.

Thank you,
Walter
x5215

Information Note
Department of Environment and Conservation

Title: Mercury and its impact on the Lower Churchill Project.

Issue: To provide context on GNL's involvement thus far on mercury and associated downstream impacts in relation to the Lower Churchill Project.

Background and Current Status:

Project Overview:

- On March 15, 2012, Nalcor's Lower Churchill Generation Project was released from Environmental Assessment (EA) after a comprehensive independent panel review process, subject to an extensive list of terms and conditions.
- Nalcor, in consultation with government departments, has received approval for most of the EA release conditions with the exception of:
 - Wetland/Riparian Compensation Plans
 - Human Health Risk Assessment Plan/Environmental Effects Monitoring Plan
- All regulatory approvals and EA release conditions are subject to Aboriginal consultation prior to approval and issuance (30 days minimum consultation).
- The independent panel made a number of recommendations related to the mercury issue. These recommendations and Government's response can be found in Annex A.
- The Panel concluded that there will be significant adverse effects on:
 - Fish habitat and fish assemblage;
 - Wetland/riparian habitat; and
 - Fishing and seal hunting in Lake Melville should consumption advisories be required for that area.
- One of the key findings of the panel review was regarding the issue of methylmercury accumulation in the reservoir due to flooding and the possibility of bio-accumulation in country foods (in particular fish and seals) in Lake Melville. The Nunatsiavut Government (NG) expressed concern that this may impact on their treaty rights to fish as set out in the Labrador Inuit Land Claims Agreement.
- In July 2013, the Department of Environment and Conservation (ENVC) issued a permit to "Alter a Body of Water" to allow for the construction of a dam, powerhouse and other related infrastructure for the generation facility at Muskrat Falls. The NG applied to the courts to quash the permit claiming the province failed to consult and accommodate the NG with respect to the impacts of methylmercury accumulation in the water and henceforth on their treaty fishing rights. On January 12, 2015, the Trial Division dismissed the application by the NG in favor of the province citing the matter was dealt with during the Environmental Assessment review process where the NG was fully engaged.

Mercury Information:

- Mercury (Hg) is a metal element found naturally in the environment. Traces of mercury are present in most foods, dental amalgams, and certain vaccines. It is also present in the atmosphere, and can accumulate in the organic matter of forest litter and soils, and migrate into the subsoil (and groundwater) or be washed into lakes and streams.
- Low levels of mercury can be found in fish in pristine environments.
- Methylmercury is an organic chemical compound formed from inorganic mercury by anaerobic organisms in aquatic systems. Naturally occurring inorganic mercury is taken up by aquatic bacteria and transformed to methylmercury by the process of methylation (see Figure 1, attached). Methylmercury is the most toxic form of mercury in the environment.
- When flooding occurs, mercury present in the submerged forest floor and vegetation is mobilized. The presence of organic matter (in the form of newly submerged vegetation) in combination with anaerobic (oxygen depleted) conditions can stimulate microbial growth and lead to elevated methylmercury levels. Methylmercury production is supported by increased decomposition in flooded areas.
- Methylmercury is taken up by fish and other aquatic species and not excreted but instead bio-accumulates in the tissue and can cause adverse human health effects. Consumption advisory is a tool used to limit exposure to prevent these adverse effects.
- As per information from Health Canada: "...methylmercury is absorbed through the digestive tract and distributed throughout the body. It readily enters the brain, where it may remain for a long period of time. In a pregnant woman, it can also cross the placenta into the fetus, building up in the fetal brain and other tissues. Methylmercury can also be passed to the infant through breast milk. A child's developing nervous system is particularly sensitive to methylmercury. Depending on the level of exposure, the effects can include a decrease in I.Q., delays in walking and talking, lack of coordination, blindness and seizures. In adults, extreme exposure can lead to health effects such as personality changes, tremors, changes in vision, deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and even death."
- Mercury in fish from the Churchill River system in Labrador has been studied for over thirty years since the creation of the Smallwood Reservoir. Mercury levels in most species in the Churchill River were elevated immediately following impoundment and have since declined as have the levels in several estuarine species.
- Numerous species have been studied in the Churchill River system (from reservoir to estuary). To date, there are only three fish consumption advisories on the Churchill River System. Consumption advisories exist in other areas (e.g., Star Lake) and for specific species elsewhere (e.g., tuna).

Monitoring Commitments:

- Nalcor is executing a comprehensive Environmental Effects Monitoring Program that includes measuring current mercury levels in the environment, including the water, soil, fish

and other animals, as well as for people living in communities adjacent to the lower Churchill River. Monitoring will continue after the reservoir is created to identify changes in mercury levels as well as any actions needed to ensure the health and safety of those living nearby, such as consumption advisories on foods consumed by local residents.

- All monitoring plans will be described in Nalcor's Fish Habitat and Compensation Plan and Aquatic Environmental Effects Monitoring Plan. This process is regulated by Fisheries and Oceans Canada and approved through a *Fisheries Act* authorization.
- Clearing for the Muskrat Falls reservoir is ongoing. Vegetation and trees in the reservoir will be removed to the extent practical and where activities can be carried out safely by our contractors. Prior to the start of construction, detailed analysis of this approach indicated that it would be best from an environmental protection, safety and technical perspective to maintain vegetated buffer on water bodies and along steep slopes in the future Muskrat Falls reservoir. It is anticipated that removal of all of the vegetation would lead to a negligible reduction in methyl mercury levels downstream of the generating facility.
- Nalcor has submitted a Human Health Risk Assessment (HHRA) Plan/ Environmental Effects Monitoring Plan for review. The purpose of the HHRA is to outline the key tasks and activities that will occur as part of Nalcor's commitments and requirements in relation to conducting a final baseline pre-inundation HHRA that focuses on human exposures and risks to mercury (Hg) and methylmercury (MeHg) in key country food items. The HHRA plan is intended to serve as a general framework or process document for the key components of the baseline HHRA program, which includes a dietary survey (DS) and a human biomonitoring program, in addition to the HHRA study.
- Results of monitoring programs and information about current mercury levels in the project area are available on the Muskrat Falls Project website.
- Nalcor has consulted with Aboriginal groups, key stakeholders, and the general public in Upper Lake Melville to gain insight into the concerns of community members.
- In addition to Nalcor's monitoring, the Water Resources Management Division is monitoring water on a real-time basis (Lake Melville – water quantity; English Point – water quantity/quality). Grab samples for full suite of physical and chemical parameters (including total mercury) are collected approximately four times per year (in the open water season) at both stations. To date total mercury results are below detection limit.
- The NG has partnered with scientists from Memorial University, Harvard and ArcticNet to monitor the water quality in Lake Melville for potential changes during the Muskrat Falls hydroelectric project and specifically bioaccumulation of methylmercury in traditional food sources.
- The Harvard study entitled "Freshwater Discharges Drive High Levels of Methylmercury in Arctic Marine Biota" was released in fall 2015.

Analysis:

- Two Ministerial level meetings were held on January 9, 2013 to discuss potential funding for the Lake Melville research and monitoring program. The first meeting was between Honourable Tom Hedderson (then Minister of Environment and Conservation) and the NG Minister of Lands and Natural Resources Darryl Shiwak followed by a second meeting between Honourable Tom Marshall (then Minister of Natural Resources) and Minister Darryl Shiwak. A follow-up letter, dated March 1, 2013, from Honourable Tom Marshall to Minister Darryl Shiwak, indicated that there was no funding available to assist the NG with its research and monitoring program. The NG proceeded on their own to have the study completed.
- A meeting was held on October 30, 2015 to discuss Harvard research findings from the paper entitled “Freshwater Discharges Drive High Levels of Methylmercury in Arctic Marine Biota”. This meeting was attended by senior officials from Labrador and Aboriginal Affairs (LAAO), ENVC and NG. Senior officials from the NG provided a presentation that focused on the downstream aspects of the development and the outcomes of the Harvard research study.
- At the October meeting the NG made four specific requests of government, which has since been articulated in a written letter from Minister Shiwak of the NG (letter attached as Annex C), who also requested a meeting with the Minister of ENVC post-election. In short they want Government to:
 - Fully clear the future Muskrat Falls reservoir;
 - Negotiate an Impact Management Agreement;
 - Establish an independent Expert Advisory Committee; and
 - Grant Inuit joint decision-making authority over downstream environmental monitoring and management.
- Provincial officials communicated that they are still in the process of reviewing findings of the study, and made no specific comments on the study itself. Additionally, it was communicated that they appreciate receiving the presentation and, as previously committed, will fully and fairly review any material provided by the NG in relation to downstream impacts.
- During the election campaign, the NG launched a media campaign “Make Muskrat Right” which outlines the NG’s concerns with the impact of methylmercury on the health of Inuit, and encouraged people to sign a petition that urges the Government of Newfoundland and Labrador and the Government of Canada to review what it claims to be new evidence from the Harvard study.
- The Nunatukavut Community Council and Amnesty International support the concerns of the NG. Also according to the NG the David Suzuki Foundation supports changes to the Muskrat Falls project.
- A recent NG news release outlined the views of a former member of the Lower Churchill Environmental Assessment Panel, Meinhard Doelle who posted on the issue in his law blog

on November 20, 2015. According to the news release Mr. Doelle has called for immediate government action on the Muskrat Falls project to address the risk of methylmercury contamination, as well as legislation reform on follow-up from environmental assessments.

- It was determined from the study that concentrations of methylmercury are extremely low throughout the cold, saline deep waters of Lake Melville. Methylmercury concentrations in the upper few meters of the water are enriched from riverine inputs (e.g., settlement near the riverbanks) as opposed to deeper water. Total mercury concentrations are increased by spring snowmelt when concentrations in rivers and the surface waters of the estuary are significantly higher than in the fall.
- Mercury concentrations were expressed as pM (picomolar) and fM (femtomolar) in the paper. These units are much lower than the achievable detection limit (generally in micrograms per liter, µg/L) in practical industry analytical methods and for appropriate guideline comparison.
- The guidelines for inorganic mercury and methylmercury in water are as follows:

CCME Water Quality Guidelines Protection of Aquatic Life:

	Mercury (Hg) Inorganic CCME Guideline (µg/L)
Freshwater	0.026
Marine	0.016
	Methyl Mercury (MeHg) Organic CCME Guideline (µg/L)
Freshwater	0.004

Health Canada Canadian Drinking Water Quality Guidelines:

	Mercury (Hg) Inorganic CDWQ Guideline (µg/L)
Drinking Water	1.0

- There were no alarming results from this study. The reported numbers in comparison to the CCME guidelines (more stringent than the drinking water guidelines) are insignificant. The reported data is almost zero when converted to established guideline units.
- Soil flooding experiments indicate that near term changes expected from reservoir creation will increase methylmercury inputs to the estuary by 25 to 200%, overwhelming climate driven changes over the next decade. The orders of magnitude were not discussed, nor were any guidelines for comparison purposes. In the paper, data is presented in percentage, a form which amplifies the results visually.
- The study does not provide clear indications as to the potential impacts associated with mercury that the reservoir flooding above Muskrat Falls will have on downstream users.
- Key highlights from the above noted study, include:
 - The mercury levels in fish in Goose Bay and Lake Melville are very low, and in many cases range near the limits of detection for mercury in fish tissue.

- The older ringed seals are carrying relatively greater mercury burdens than fish. Mercury concentrations in the livers of older animals have been consistently high and above the recommended Health Canada guideline (0.5 ppm).
- Any impact on the downstream environment and potential risk to the local population will require the attention of federal agencies (i.e. Department of Fisheries and Oceans; Health Canada; Environment Canada; etc.) to take appropriate risk management measures.
- The Aquatic Environmental Effects Monitoring Plan – Baseline Conditions Report was finalized in July 2015. As indicated in the report “*sampling of mercury in fish and ringed seal tissue was also conducted. Mercury in ringed seals was recently added to the baseline sampling and the database is not yet large enough to assess the natural variability; collection is ongoing. There are several years of baseline mercury data for fishes in the lower Churchill River. Mercury analysis conducted in 2014 continued to show a decreasing trend in mercury concentrations in all sampling areas (i.e. above and below Muskrat Falls, Goose Bay, and Lake Melville); with the majority of the samples collected being below detection limits (0.05 mg/kg)*”.
- A revised HHRA Plan / Environmental Effects Monitoring Plan was submitted by Nalcor on March 17, 2015. Comments by the NG were requested by July 12, 2015 (30 days) and have been received. The NG had commented on the prior version and indicated the Plan does not contain sufficient detail to enable a technical review. Nalcor has included a Table of Concordance in reply to the NG. The Plan was reviewed by Health Canada and Department of Health and Community Services with no concerns expressed on the latest version. The Plan remains under review.
- Nalcor has indicated the Dietary Survey and Human Bio-monitoring Report would be finalized in November 2015 and sent to government agencies to review.
- Nalcor and the NG have both started collecting data including dietary surveys and human bio-monitoring e.g. collection of hair samples. The Human Health Environmental Effects Monitoring Plan however is still under review (as per the Aboriginal Consultation Guidelines for Regulatory Approval Applications provided to the NG on May 30, 2012).

Action Being Taken:

- Regulatory agencies will continue to oversee the monitoring of methylmercury and impacts of the Lower Churchill Project on the downstream environment.
- Any impact on the downstream environment and potential risk to the local population will require the attention of federal agencies (i.e. Department of Fisheries and Oceans; Health Canada; Environment Canada; etc.) to take appropriate risk management measures.

Prepared/approved by: P.Carter / M.McComiskey / R.Paterson / B.Cleary Director EA /
H.Khan Director WRMD / M. Goebel, ADM/C. Janes

November 25, 2015

Annex A
Joint Review Panel Recommendations regarding Mercury

Rec. #4.5 - Full clearing of the Muskrat Falls reservoir

Response: the Government of Newfoundland and Labrador agrees with the principle of maximizing the utilization of the forest resource. With limited opportunities to use the resource, and the likely insignificant reductions in mercury levels associated with full versus partial clearing, the Government supports partial harvesting of the flood zone. If an economic opportunity to use the resource materializes, consideration will be given to harvesting additional fibre.

Rec. #6.5 - Pilot study for methylmercury mitigation through soil removal

Response: the Government of Newfoundland and Labrador notes this recommendation is directed to Natural Resources Canada and Nalcor.

Rec. #13.9 - Possible requirement for consumption advisories in Goose Bay or Lake Melville

Response: the Government of Newfoundland and Labrador accepts the intent of this recommendation. If consumption advisories are required as a result of the downstream mercury assessment, then Nalcor should consult with downstream resource users on further mitigation measures, including the potential for compensation.

Rec. #15.5 - Lower Churchill Project Monitoring and Community Liaison Committee

Response: the Government of Newfoundland and Labrador accepts the intent of this recommendation to establish an Environmental Monitoring and Community Liaison Committee. As identified in the Governments' response to recommendation 15.1, a committee will be established by Nalcor to provide feedback and advice to the Proponent and Government on the effects of the Project. The Government is committed to ensuring consultation with affected Aboriginal groups, communities, and relevant stakeholders to address public concerns and communicate monitoring results.

ANNEX B

Figure 1

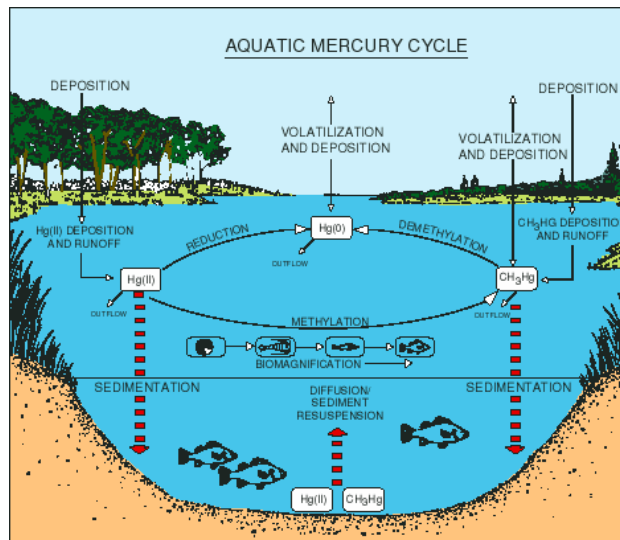


Figure 1: The mercury cycle: Various forms of mercury are converted from one form to the next (USGS, 2008).

The guidelines related to total mercury and methylmercury in fish tissue are as follows:

Health Canada - Canadian Standards (Maximum Levels) for Various Chemical Contaminants in Foods			
Mercury	Total	0.5 ppm	In the edible portion of all retail fish except escolar, orange roughy, marlin, fresh and frozen tuna, shark, and swordfish
		1 ppm	Edible portion of escolar, orange roughy, marlin, fresh and frozen tuna, shark, and swordfish
Health Canada - Provisional Tolerable Daily Intake (pTDI)			
		<i>Adults</i>	<i>Childbearing Age and <12years</i>
Methyl Mercury	Organic	0.47ug/kg bw/day**	0.2ug/kg bw/day**

* ISQG = Interim sediment quality guidelines, PEL = Probable Effect Level
 **bw/day = body weight/day

Annex C
Letter from Minister Shiwack

November 9, 2015

Via Email cjanes@gov.nl.ca and fax (709) 729-0112

Colleen Janes

Deputy Minister

Department of Environment and Conservation

Government of Newfoundland and Labrador

St. John's, NL

Tel: (709) 729-2572

Re: Harvard University mercury research results in relation to Muskrat Falls hydroelectric development in Labrador – protecting Inuit lands and health

Dear Ms. Janes,

The Nunatsiavut Government continues to be deeply concerned of the potential for the Muskrat Falls hydroelectric dam to cause serious harm to downstream Inuit communities.

This letter follows our October 30, 2015 meeting you and Government of Newfoundland and Labrador officials where we presented the results of a recent research paper entitled “Freshwater discharges drive high levels of methylmercury in Arctic marine biota” published in Proceedings of the National Academy of Sciences.

The Muskrat Falls hydroelectric development is currently being constructed on the Churchill River in Labrador. Nalcor Energy, the provincial energy corporation, predicted no measurable effect on Lake Melville, a large estuary that falls mostly within Labrador Inuit Settlement Area and on which nearby Inuit communities depend for their sustenance and health. The project was approved based in part on this assessment. However, the Joint Review Panel conducting the environmental assessment concluded Nalcor's claims were “unsubstantiated”. A subsequent independent, peer-reviewed Harvard University study released in early September 2015 and designed to fill this gap in knowledge shows that, in fact, we can expect significant increases in methylmercury inputs to Lake Melville as a result of Muskrat Falls (Harvard feature release from Monday September 7: <https://www.seas.harvard.edu/news/2015/09/poison-in-arctic-and-cost-of-clean-energy>). Consumed by humans, mercury can cross the blood-brain barrier, leading to cardiovascular effects in adults (e.g. higher risk of heart attack), and neurological and cognitive impairment among infants and children.

Inuit communities rely on Lake Melville for hunting and fishing. The estuary is crucial to the exercise and enjoyment of Aboriginal rights and

other human rights, including the right to culture, the right to health, and the right to livelihood. The Harvard-led research follows a recommendation for a new downstream effects assessment from the Lower Churchill Joint Review Panel report and adds significant new information relevant to the Muskrat Falls development.

In light of this new, independent and scientifically-defensible information, to reduce impacts on Inuit health and rights, the Nunatsiavut Government is requesting that the Government of Newfoundland and Labrador direct Nalcor Energy to:

1. **Fully clear the future Muskrat Falls reservoir** area of wood, brush and vegetation before flooding to reduce methylmercury inputs downstream into Inuit territory, consistent with recommendation 4.5 of the Joint Review Panel.
2. **Negotiate an Impact Management Agreement** with the Nunatsiavut Government before Muskrat Falls flooding and subsequent damaging downstream impacts occur, consistent with recommendation 13.9 of the Joint Review Panel.
3. **Establish an independent Expert Advisory Committee** of recognized academic experts to advise on the design of and audit, a rigorous, credible, and predictive monitoring program for downstream impacts of Muskrat Falls on the environment and health, using the best available scientific and Inuit knowledge.
4. **Grant Inuit joint decision-making authority over downstream environmental monitoring and management** of the Lower Churchill project.

Health and the right to a healthy environment are of fundamental importance to Inuit. Therefore, I would like to discuss each of these measures directly with the Minister of Environment and Conservation immediately subsequent to their appointment after the November 30, 2015 election and look forward to a reply confirming a meeting soon after this date.

Sincerely,

Darryl Shiwak
Minister, Lands and Natural Resources
E-mail: darryl.shiwak@nunatsiavut.com
Tel: (709) 947-3383 x201
Fax: (709) 947-3543

cc. Aubrey Gover, Deputy Minister of Labrador and Aboriginal Affairs
Via Fax 709-729-4900