

Memo

To: Jackie Wells
From: Matthew Gosse
cc: James McCarthy
Date: 15 January 2021
Re. Muskrat Falls Reservoir Methylmercury Monitoring – October 2020 Update

Dear Ms. Wells,

In order to provide additional monitoring coverage of possible changes in methylmercury concentrations in water during headpond and reservoir formation, the provincial government requested an additional sampling program be implemented by Nalcor. Nalcor provided a program description to government and engaged Wood Environment & Infrastructure Solutions (Wood) to implement the sampling program. This memo provides a summary of the latest monthly data collected (October 2020) of Total Methylmercury. October 2020 is the second month in year two after full reservoir creation. While not considered analysis, the results will be continually added to the annual trend (see Figure 2 below)

Methylmercury

The Muskrat Falls Methylmercury Monitoring Program is specifically designed to monitor methylmercury (total and dissolved) as well as total mercury and various parameters which could affect methylation (i.e. total phosphorus, DOC, and temperature) and transport (i.e., TSS). Methylmercury is the organic form of mercury, which is bioavailable and biomagnifies within the food chain (Mergler et al. 2007, Chen et al. 2014).

Headpond Formation and Reservoir Creation

Headpond formation was completed in early February 2017, with the first set of impoundment samples being collected February 6, 2017. The inundation to full supply water level (38.5-39 m elevation) began on August 7, 2019 and was completed on September 5, 2019. The first complete year of water quality data with full reservoir formation was collected between September 9, 2019 through August 25, 2020. Year two of full reservoir formation began in September 2020.

Sampling Program Overview

Water sampling began in October 2016, with initial samples being collected before any headpond/reservoir formation began in order to capture natural methylmercury concentrations. Headpond formation in February 2017 initiated weekly water sample collection from 11 of the 13 sample locations (Figure 1). Throughout headpond formation, inundation had not affected sample locations N2 and N3, therefore they were omitted from the weekly sampling regime until full reservoir inundation, as per WRMD request.



Figure 1: Map of sampling locations for the Muskrat Falls Methylmercury Monitoring Program

133 Crosbie Road
 PO Box 13216
 St. John's, NL A1B 4A5
 Tel +1 709 722 7023
 woodplc.com

Wood Environment & Infrastructure Solutions
 Registered office:
 2020 Winston Park Drive, Suite 700, Oakville, ON L6H 6X7
 Registered in Canada
 No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

With the completion of reservoir formation in September 2019, samples are currently being collected from all 13 sampling locations, including N2 and N3. As per Independent Expert Advisory Committee (IEAC) recommendation, each location is now sampled weekly when water temperatures exceed 6°C. When water temperatures are below 6°C, sampling occurs on a bi-weekly basis unless there is a change in water elevation of the reservoir by Nalcor which would re-trigger weekly sampling.

Since this program began in October 2016, over 2,000 samples have been collected and analysed.

Measured Methylmercury – October 2020

The most recent results received from the lab were collected on October 28, 2020. All laboratory analysis is currently being completed by AGAT Laboratories, with a subset of methylmercury also being analysed by Flett Research as a means of QA/QC. The results of this annual analysis will be presented at a future date.

During October 2020, the highest mean concentrations of Total and Dissolved methylmercury were measured at English Point (N7; Table 1). Samples collected in October were highly variable, for example concentrations on October 6th, 2020 were relatively high compared to other samples in October which resulted in large confidence intervals.

Table 1: Summary of methylmercury concentrations, October 2020

| Sample Site | Total Methylmercury | | | Dissolved Methylmercury | | |
|-------------|---------------------|-------------|------------|-------------------------|--------------------|----------------|
| | Sample Size | Mean (ng/L) | Max (ng/L) | Sample Size | Mean (ng/L) | Max (ng/L) |
| N1 | 4 | 0.033 | 0.038 | 4 | 0.022 | 0.024 |
| N2 | 4 | 0.035 | 0.040 | 4 | 0.026 | 0.029 |
| N3 | 4 | 0.040 | 0.050 | 4 | 0.031 | 0.035 |
| N4 | 12 | 0.054 | 0.070 | 12 | 0.036 | 0.051 |
| N5 | 4 | 0.049 | 0.064 | 4 | 0.038 | 0.049 |
| N6 | 4 | 0.053 | 0.067 | 4 | 0.037 | 0.051 |
| N7 | 4 | 0.059 | 0.082 | 4 | 0.040 | 0.050 |
| N8 | 5 | 0.044 | 0.057 | 5 | 0.025 | 0.029 |
| N9 | 4 | 0.038 | 0.051 | 4 | 0.017 | 0.022 |
| N10 | 4 | 0.012 | 0.015 | 4 | 0.010 ¹ | - ¹ |
| N11 | 3 | 0.014 | 0.021 | 3 | 0.012 | 0.017 |
| N12 | 4 | 0.011 | 0.012 | 4 | 0.010 ¹ | - ¹ |
| N13 | 4 | 0.014 | 0.019 | 4 | 0.010 | 0.011 |

Note All values below detection limits have been included in calculations at the detection limit (0.010 ng/L)

All sample depths, where applicable, have been included in summary values

¹ All values were below detection limits

Figure 2 provides the annual trend in mean monthly Total Methylmercury concentrations through Year One and Year Two since full reservoir creation. The graph will be extended through Year Two as data continues to become available.

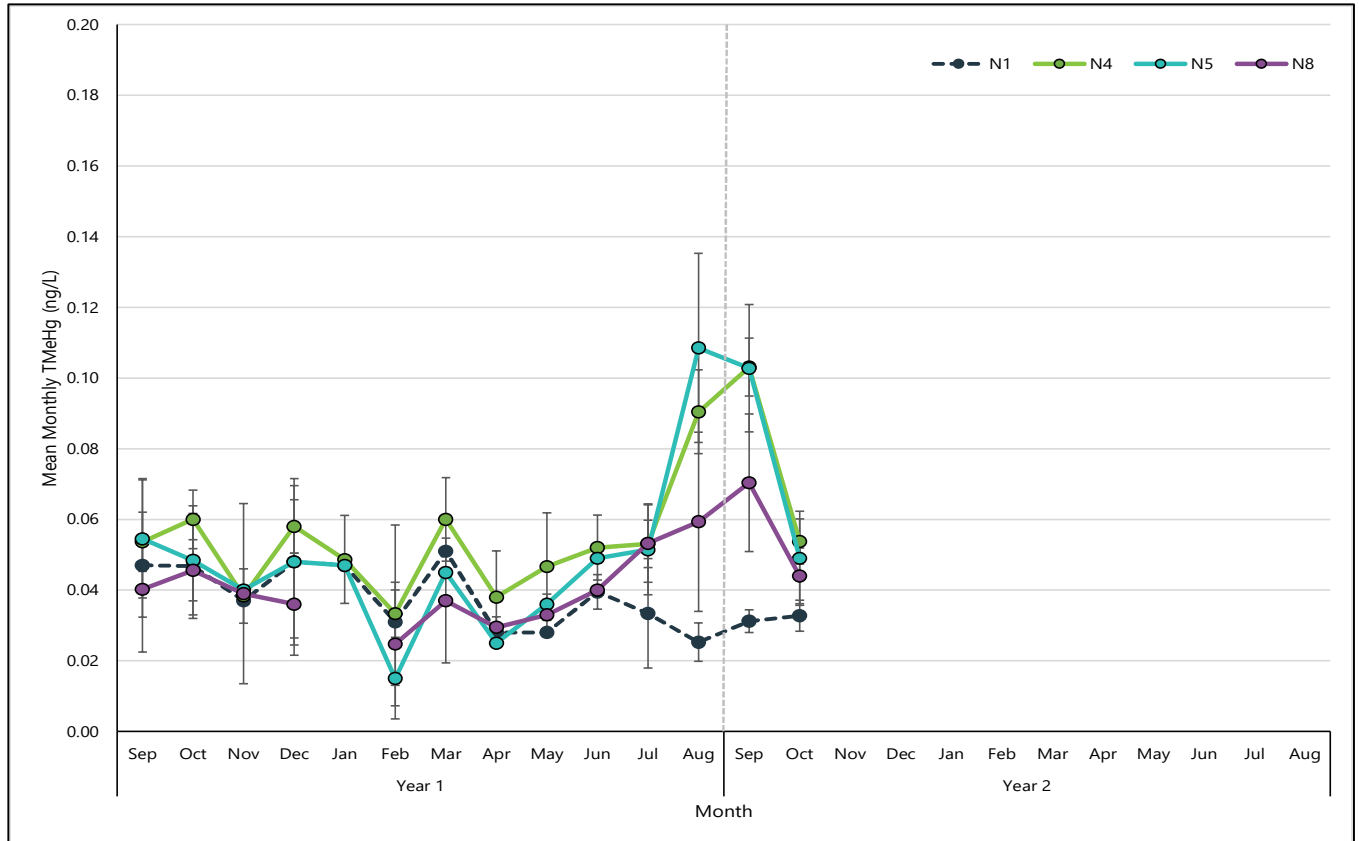


Figure 2: Summary of mean monthly Total methylmercury concentrations since the completion of Reservoir inundation (September 2019). Error bars represent the 95% Confidence interval of the mean concentration.

All water quality data related to this program is available from Nalcor’s website (muskratfalls.nalcorenergy.com).

Closure

Should you have any questions, comments or concerns regarding the information presented within this summary, please do not hesitate to contact us at your convenience.

Prepared by

Reviewed by

X 

Matthew Gosse, B.Sc.
Biologist

X 

James McCarthy, M.Sc., CFP
Senior Biologist/Ecosystems Group Lead

References

- Azimuth Consulting Group Partnership. 2017. Relationship between Muskrat Falls Reservoir elevation and mercury concentrations, Lower Churchill River October 2016 - September 2017. Nalcor Energy, St John's, NL.
- Chen, C. Y., M. E. Borsuk, D. M. Bugge, T. Hollweg, P. H. Balcom, D. M. Ward, J. Williams, and R. P. Mason. 2014. Benthic and Pelagic Pathways of Methylmercury Bioaccumulation in Estuarine Food Webs of the Northeast United States. PLoS ONE 9:e89305.
- Mergler, D., H. A. Anderson, L. H. M. Chan, K. R. Mahaffey, M. Murray, M. Sakamoto, and A. H. Stern. 2007. Methylmercury Exposure and Health Effects in Humans: A Worldwide Concern. *AMBIO: A Journal of the Human Environment* 36:3–11.
- Reed Harris Environmental Ltd. 2018. Updated analysis of predicted increases in methylmercury concentrations and downstream export from Muskrat Falls Reservoir. Nalcor Energy, St. John's, NL.
- W.F. Baird & Associates Coastal Engineers Ltd. 2018. Lake Melville Model Setup and Results. Nalcor Energy, St John's, NL.