



**Newfoundland and Labrador Hydro
Churchill River
Real Time Water Monitoring Network
Annual Report
2008**

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Introduction

- In fall 2008, the Real Time Water Monitoring Network was successfully established by Department of Environment and Conservation (DOEC) and Environment Canada (EC) staff in cooperation with NL Hydro officials. The objective of the network is to identify and track any emerging water quality or quantity management issues and ensure protection of ambient water resources along the Churchill River. The information currently being collected will serve as a baseline from which changes throughout the several phases of the Lower Churchill Hydro Electric Project can be monitored.
- The network consists of water quality and quantity monitoring at 6 locations along the Churchill River from just above Churchill Falls to just below Muskrat Falls. Four stations measure water quality including water temperature, pH, specific conductivity, dissolved oxygen, percent saturation, total dissolved solids and turbidity. These stations are primarily the responsibility of the DOEC and will be the focus of subsequent monthly and annual reports by DOEC staff. In addition to the 4 water quality monitoring stations, 2 new additional stations combine to make 6 water quantity monitoring stations. These 6 stations measure water level and/or flow data and are primarily the responsibility of EC. However, if needed, DOEC staff reporting on water quality will have access to water quantity information if necessary to understand and explain water quality fluctuations.
- The locations, names and parameters recorded at each station are summarized in **Table 1**.

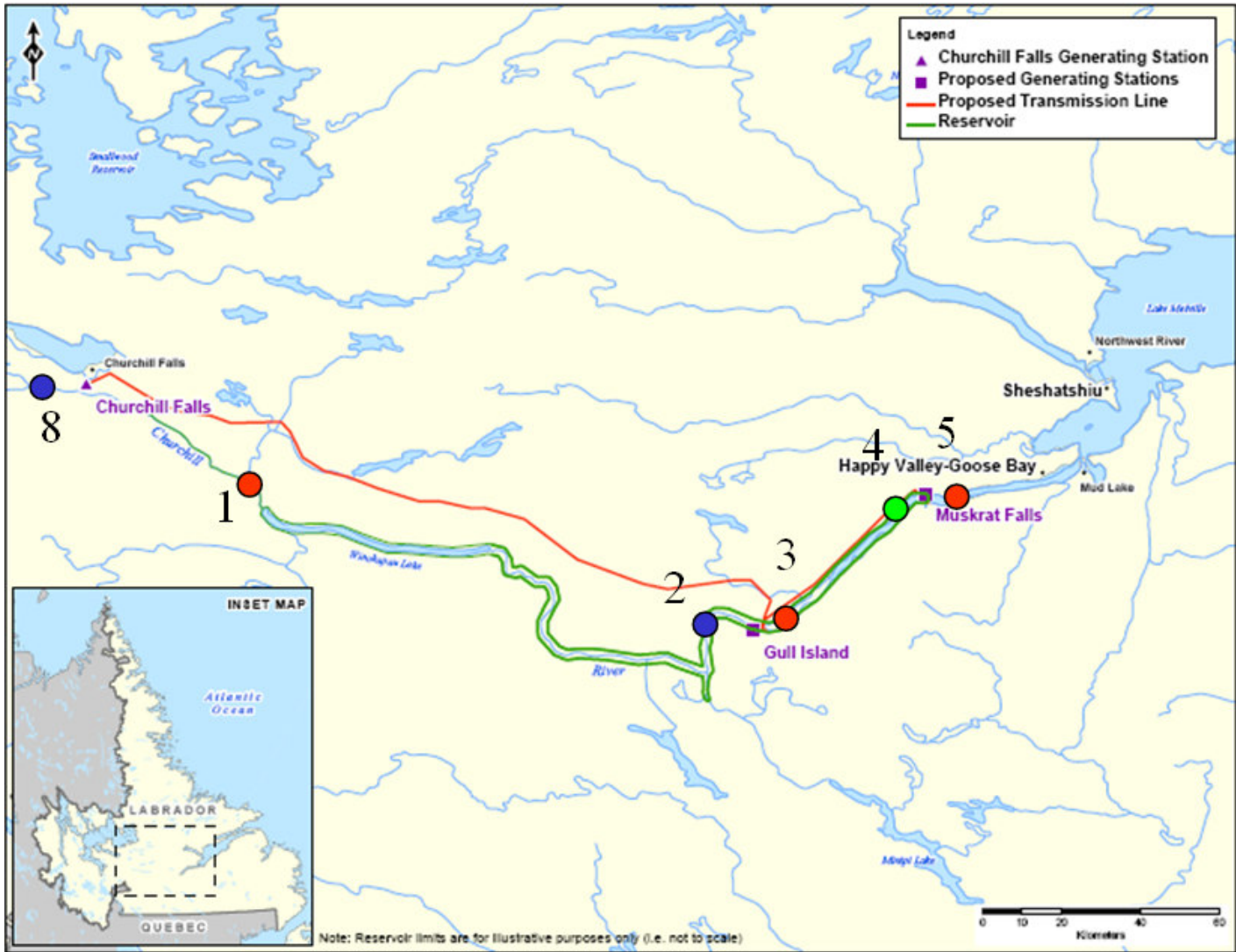
Table 1: Station Names, coordinates and parameters measured for Churchill River real-time water monitoring network.

Station Name	Latitude	Longitude	Owner	Water Quantity*	Water Quality**
Churchill River 6.15km below Lower Muskrat Falls	53 14 15.5	60 40 30.8	NL HYDRO	◆	◆
Churchill River Below Grizzle Rapids	52 57 50	61 24 29.8	DOEC	◆	◆
Churchill River Above Grizzle Rapids	52 58 12.3	61 26 43.4	NL HYDRO	◆	
Churchill River Below Metchin River	53 14 22.4	63 17 5.7	NL HYDRO	◆	◆
Churchill River above Churchill Falls Tailrace	53 31 28.7	64 06 53.8	NL HYDRO	◆	
Churchill River Above Upper Muskrat Falls	53 14 52	60 47 21	NL HYDRO	◆	◆

* Water quantity includes water level and flow data

** Water quality includes data for water temperature, pH, dissolved oxygen, percent saturation, turbidity, TDS, and specific conductivity data

- Real time water quality (RTWQ) instruments (often referred to by its manufacturer's name, Datasonde) were deployed for a one month period between September and October 2008. Due to the intense winters in the Labrador Region, the RTWQ instrumentation is deployed from late spring to mid fall depending on the ice conditions. The hydrological equipment at all 6 stations, which records water quantity, remains in the river year round.
- In 2009, the four RTWQ stations will be deployed month to month from early June to October along the Churchill River at each of the sites. The four RTWQ sites are equipped with protection shelters to house equipment and data loggers as well as certified helicopter landing pads (**Appendix A**). All four sites are helicopter accessible only.



- Real Time Water Quality and Quantity Station (NL Hydro)
- Real Time Water Quality and Quantity Station (DOEC)
- Real Time Water Quantity only station

Figure 1: Map of Churchill River in Labrador showing Real Time Water Quality and Quantity monitoring stations. (See Table 2 for station numbering).

Table 2: Station name and map number.

Station Name	Map Number
Churchill River Below Metchin River	1
Churchill River Above Grizzle Rapids	2
Churchill River Below Grizzle Rapids	3
Churchill River Above Upper Muskrat Falls	4
Churchill River 6.15km below Lower Muskrat Falls	5
Churchill River above Churchill Falls Tailrace	8

Maintenance and Calibration of RTWQ Datasonde

- It is recommended that regular maintenance and calibration take place on a monthly basis to ensure accurate data collection. This procedure is the responsibility of the DOEC staff and is performed preferably every 30 days. Maintenance includes a thorough cleaning of the instrument and replacement of any small sensor parts that are damaged or unsuitable for reuse. Once the instrument is cleaned, DOEC staff carefully calibrates each sensor attachment for pH, specific conductivity, dissolved oxygen and turbidity. In the event a Datasonde needs more complex repairs, the instrument will be sent to Campbell Scientific Canada Corp. in Edmonton, Alberta. The cost of these repairs will be the responsibility of NL Hydro.
- An extended deployment period (>30 days) can result in Datasonde sensor drift which may result in skewed data. The Datasonde sensors will still work to capture any water quality event even though the exact data values collected may be inaccurate.
- Installation and removal dates for each station in the 2008 deployment season are summarized in **Table 3**.

Table 3: Installation and removal dates for Deployment Periods.

RTWQ Station	Installation	Removal	Days
Churchill River 6.15km below Lower Muskrat Falls	28-Sep-08	25-Oct-08	27
Churchill River Below Grizzle Rapids	27-Sep-08	24-Oct-08	27
Churchill River Below Metchin River	26-Sep-08	24-Oct-08	28
Churchill River Above Upper Muskrat Falls	28-Sep-08	25-Oct-08	27

Data Interpretation

- Instruments were deployed from September 26-28 to October 24-25. This short test deployment period was an opportunity to check data logger communication with the instrument and establish deployment strategies at each of the new stations.
- Data was successfully recorded by the Datasonde, stored in the data logger and transmitted from the site into the database. However, because these sites had not yet been set up on the DOEC website, transmitted data was not saved. The data collected between September and October 2008 is still available from the data loggers at each site and will be retrieved by the EC Water Survey of Canada staff in spring 2009.
- The RTWQ Stations along the Churchill River Stations have since been added in to the automatic data retrieval system and now allow for the data to be saved in the database. Water quantity data is currently available online from the DOEC website (http://www.env.gov.nl.ca/wrmd/RTWQ/RTWQ_Stations.asp). When the RTWQ instruments are deployed in spring 2009, the water quality data will also be available from this site.
- Currently, technical difficulties at two of the water quantity stations (below Metchin River and 6.15km below Lower Muskrat Falls) are preventing data transmission. It is likely that this data is not lost but rather being saved in the data logger. The data will be retrieved by EC Water Survey of Canada Staff when they return to these sites in spring 2009.

Quality Assurance and Quality Control

- Quality Assurance and Quality Control is a very important component of RTWQ monitoring and is regarded as an essential procedure to be performed attentively by DOEC staff during installation and removal. These measures have been put in place to ensure that the instruments are collecting accurate data. There are 2 main components to the QA/QC measures performed by DOEC staff.
 - i. Data from the water quality monitoring instrument in-situ (Datasonde) are compared to data from the QA/QC Datasonde at the time of deployment after maintenance/calibration procedures have been performed; data must fall within a specified range and are ranked from excellent to poor (**Table 4**).
 - ii. Grab water samples are taken from each station at the time of redeployment and sent to a laboratory for analysis. The results are then compared to those of the water quality monitoring instrument in-situ (Datasonde) and must fall within a specified range to receive a ranking (**Table 4**). Only three readings available from the lab for comparison – pH; conductivity; turbidity.

Table 4: Comparison Ranking Table. Differences between parameter values from in-situ field Datasonde and QA/QC Datasonde or laboratory results from grab samples are ranked from excellent to poor.

Parameters	Excellent	Good	Fair	Marginal	Poor
Temperature (°C)	≤±0.2	≥±0.2 to 0.5	≥±0.5 to 0.8	≥±0.8 to 1.0	≥±1.0
pH (unit)	≤±0.2	≥±0.2 to 0.5	≥±0.5 to 0.8	≥±0.8 to 1.0	≥±1.0
Dissolved Oxygen (mg/L)	≤±0.3	≥±0.3 to 0.5	≥±0.5 to 0.8	≥±0.8 to 1.0	≥±1.0
Conductance <35µS/cm (µS/cm) >35µS/cm (%)	≤±3 ≤±3	≥±3 to 10 ≥±3 to 10	≥±10 to 15 ≥±10 to 15	≥15 to 20 ≥15 to 20	≥±20 ≥±20
Turbidity <40 NTU (NTU) >40 NTU (%)	≤±2 ≤±5	≥±2 to 5 ≥±5 to 10	≥±5 to 8 ≥±10 to 15	≥8 to 10 ≥15 to 20	≥±10 ≥±20

Conclusions

The Real Time Water Monitoring Network has successfully been established with six sites along the Churchill River. At four of these sites, water quality will be recorded from late spring to late fall and is primarily the responsibility of DOEC staff. At all six stations, water quantity data is being measured with hydrological equipment that is primarily attended to by EC Staff. In 2008, instruments at the four RTWQ sites were deployed from September to October 2008 before being removed for the winter months. Water quantity will continue to be monitored at all six stations throughout the winter months.

Although this was a short deployment season, this exercise was necessary to verify connection properties with Datasondes to the data transmitter and prepare sites for a complete deployment season in 2009. The data was successfully transmitted and is currently stored on the data logger at each site and will be made available upon return to the site in spring 2009. Adjustments to the website have since been made to include the Churchill River sites in the data retrieval system which will store the data in the database.

Path Forward

In order for this agreement to be successful, it is essential to continually evaluate and move forward. The 2008 deployment season was merely the beginning of what is likely to be a strong and successful network and collection of water quality and quantity data for all parties involved.

The following is a list of activities to be carried out in the upcoming year.

- Continue to maintain open communication lines between DOEC, EC and NL Hydro employees involved with the agreement
- Deploy Real Time Water Quality instruments in spring 2009 when ice conditions allow.
- If necessary, change or improve deployment techniques to adapt to each site, ensuring secure and suitable conditions for real time water quality monitoring.
- NL Hydro will continue to be informed of data trends and any significant water quality event in the form of a monthly deployment report when the deployment season begins.
- NL Hydro will also receive an annual report summarizing the events of the deployment season.
- RTWQ Coordinator, Renee Paterson, is currently awaiting final decision concerning potential establishment of a RTWQ station near the community of Rigolet. She will amend the agreement and bring it up to date after the decision has been made.
- DOEC plan to establish two new real time water quality monitoring stations at Mud Lake and Lake Melville in the 2009 season. Data from these two stations will be available to NL Hydro.

Contacts

An additional staff member (Grace Gillis) has been added to the Water Resources Management Division based out of Happy Valley-Goose Bay. It will be her responsibility to maintain the RTWQ Stations along the Churchill River in the 2009 Deployment Season. Contact information for her as well as the RTWQ Coordinator and Section Management for DOEC and EC are below.

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Appendix A – Photographs of RTWQ Station Sites



Figure A-1: Photograph of protective hut below Muskrat Falls on September 28, 2008. This structure houses the data logger where information is stored. A cord runs from the hut to the RTWQ Datasonde.

Figure A-2: Photograph of protective electrical conduit that houses the cable connecting the Datasonde to the hut. Also visible is the cylindrical metal casing where the Datasonde is located during deployment.





Figure A-3: View of Churchill River from RTWQ station above upper Muskrat Falls.

Figure A-4: Photograph of protective hut at RTWQ station below Metchin River. Data logger (white box) inside the hut is also visible

