

# Real-Time Water Quality Deployment Report

# **Rattling Brook Network**

May 15, 2013 to June 20, 2013



Government of Newfoundland & Labrador Department of Environment and Conservation Water Resources Management Division St. John's, NL, A1B 4J6 Canada



# General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Some communication dropouts were encountered during the deployment at Plant Discharge station. These issues were resolved part way through the deployment period.

# Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.
  - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde.
     Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
  - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Station	Date	Action	Comparison Ranking				
			Temperature	рН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	May 15, 2013	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	June 20, 2013	Removal	Good	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	May 14, 2013	Deployment	Good	Good	Excellent	Excellent	Excellent
	June 20, 2013	Removal	Good	Good	Fair	Excellent	Poor
Rattling Brook below Plant Discharge	May 15, 2013	Deployment	Excellent	Excellent	Excellent	Excellent	Good
	June 20, 2013	Removal	Excellent	Excellent	Excellent	Excellent	Excellent

Table 1: Qualitative QAQC Ranking

 During removal of the Hydrolab at Bridge station on June 20<sup>th</sup>, turbidity values were found to be unrealistically high (13.9 NTU) for the observed conditions. Indeed, the QAQC sonde recorded a more reasonable 1.2 NTU.

# **Data Interpretation**

### Water Temperature

## Figure 1: Water Temperature at Rattling Brook Big Pond from May 15<sup>th</sup> to June 20<sup>th</sup>



#### Water Temperature and Stage Level

• Water temperature increased steadily to a maximum of 14.25°C during this deployment period as is expected for the season.

# Figure 2: Water Temperature at Rattling Brook below Bridge from May 14<sup>th</sup> to June 20<sup>th</sup>



Water Temperature and Stage Level

Water temperatures were much more variable than those seen at Big Pond during this deployment. Water temperatures dipped noticeably from May 17<sup>th</sup> to May 22<sup>nd</sup> in response to cool air temperatures.





Water Temperature and Stage Level

 Plant Discharge station showed the greatest degree of variation of all three stations this month, and also showed the highest median temperature. pН

# Figure 4: pH at Rattling Brook Big Pond from May 15<sup>th</sup> to June 20<sup>th</sup>



#### Water pH and Stage Level

• pH values were mostly stable during this deployment period. All values were within the Site Specific Guidelines for the Rattling Brook system.

## Figure 5: pH at Rattling Brook below Bridge from May 14<sup>th</sup> to June 20<sup>th</sup>



#### Water pH and Stage Level

- pH values at Bridge station declined throughout the duration of the deployment period. The decline in pH appears to be the result of a loss of calibration during the deployment. Interestingly, the loss of calibration seems to occur around the same time as mean air temperature receded in mid-May from ~6.5°C to ~3°C. At the time of removal, the QAQC sonde read 6.56 compared to 5.20 by the Field Sonde.
- This issue will be corrected during the next maintenance window.

# Figure 6: pH at Rattling Brook below Plant Discharge from May 15<sup>th</sup> to June 20<sup>th</sup>



#### Water pH and Stage Level

• pH levels were consistently above the Site Specific Guideline for the Rattling Brook system, but below the CCME Guideline of 9.5, for the protection of cold water biota. Values were relatively stable throughout the deployment period.

## Specific Conductivity





Specific Conductivity of Water and Stage Level

A few instances of spiking Conductivity values were observed during this deployment period

# Figure 8: Specific Conductivity at Rattling Brook below Bridge from May 14<sup>th</sup> to June 20<sup>th</sup>



#### Specific Conductivity of Water and Stage Level

- Median conductivity was similar at Bridge and Big Pond stations, although much more variable at Bridge station.
- A large spike was observed on June 8<sup>th</sup> through June 12<sup>th</sup> as a result of approximately 38 mm of precipitation on June 8<sup>th</sup>.

# Figure 9: Specific Conductivity at Rattling Brook below Plant Discharge from May 15<sup>th</sup> to June 20<sup>th</sup>



#### Specific Conductivity of Water and Stage Level

- Conductivity values were higher downstream at Plant Discharge station with a greater degree of variation compared to Bridge station.
- A similar peak in conductivity was seen from June 8<sup>th</sup> to 12<sup>th</sup> in relation to the large amount of precipitation observed on June 8<sup>th</sup>.

## **Dissolved Oxygen**





**Dissolved Oxygen Concentration and Saturation** 

• Dissolved oxygen concentrations fell consistently at Big Pond station during this deployment period in accordance with rising water temperatures. All values were above the CCME Guidelines for the protection of cold water biota.

## Figure 11: Dissolved Oxygen at Rattling Brook below Bridge from May 14<sup>th</sup> to June 20<sup>th</sup>



#### **Dissolved Oxygen Concentration and Saturation**

 Downstream at Bridge station, oxygen concentrations were found to be somewhat lower due to warmer waters. Concentrations straddled the CCME Guideline for the protection of early life stage biota. This is typical and expected for the time period.

## Figure 12: Dissolved Oxygen at Rattling Brook below Plant Discharge from May 15<sup>th</sup> to June 20<sup>th</sup>



#### **Dissolved Oxygen Concentration and Saturation**

 Due to highly variable water temperatures, dissolved oxygen values were found to be similarly variable. Plant Discharge waters show a higher peak concentration and lower minimum concentration compared to Bridge station. Median oxygen concentration at Plant Discharge station was lower than both Big Pond and Bridge stations.

## Turbidity





Water Turbidity and Stage Level

• Turbidity was low throughout the deployment period at Big Pond station with a few instances of > 0 NTU readings. In each case, values greater than zero occurred in isolation and did not show increasing trends.

# Figure 14: Turbidity at Rattling Brook below Bridge from May 14<sup>th</sup> to June 20<sup>th</sup>



Water Turbidity and Stage Level

• Turbidity values indicated a declining trend through the beginning of deployment until June 9<sup>th</sup>. A large rainfall and sharply rising stage/flow level was associated with turbidity as a result of mobilized sediment and silt from overland flow. Over the course of several days, turbidity declined to values seen prior to June 9<sup>th</sup>.

# Figure 15: Turbidity at Rattling Brook below Plant Discharge from May 15<sup>th</sup> to June 20<sup>th</sup>



#### Water Turbidity and Stage Level

Turbidity was shown to be slightly higher median turbidity at Plant Discharge; through Bridge station had a greater maximum turbidity value. A large peak in turbidity was echoed at Discharge station due to heavy rains on June 8<sup>th</sup> and 9<sup>th</sup>. Levels declined over several days.

# Conclusions

Most water quality parameters fall within the expected ranges for the May and June time period. As a result
of in-stream work undertaken in 2012 at Forgotten Pond, turbidity remains elevated at Bridge and Plant
Discharge stations compared to historical levels.

# Appendix



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