

Real-Time Water Quality Deployment Report

Rattling Brook Network

June 24, 2016 to August 4, 2016



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



General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- A battery failure at Big Pond station resulted in telemetry loss at the end of the deployment. Water Quality data was recovered from an internal log file; however water level data was not recovered.
- Since July, wildlife officials have been in the vicinity of Plant Discharge station in an attempt to relocate a small population of beavers. These removal efforts may be implicated in some turbidity events at Plant Discharge station.
- Hydrometric data included in this report is provisional and used only for illustrative purposes. Corrected and finalized data may be retrieved from the Water Survey of Canada website (http://www.ec.gc.ca/rhc-wsc/)*.

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	pН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	June 24, 2016	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	August 4, 2016	Removal	Excellent	Fair	Excellent	Excellent	Excellent
Rattling Brook below Bridge	June 24, 2016	Deployment	Good	Good	Good	Excellent	Excellent
	August 4, 2016	Removal	Good	Poor	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	June 24, 2016	Deployment	Excellent	Good	Good	Excellent	Excellent
	August 4, 2016	Removal	Excellent	Fair	Excellent	Excellent	Excellent

Table 1:	Qualitative	QAQC	Ranking
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• A "Poor" ranking was attained for pH during removal at Bridge station on August 4th, 2016. At this time, the field sonde read 6.12 while the QAQC sonde read 7.38. Since the Field sonde appeared to read less than what might be expected and the QAQC sonde appeared to read more than what might be expected, the calculated difference was especially high.

Data Interpretation

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.



• Water temperature increased over the deployment period, reaching a high of 25.00°C at Plant Discharge station. Since water temperatures tend to decline into August, this is likely the highest water temperature to be observed in 2016.

pН

pH is used to give an indication of the acidity or basicity of a solution. A pH of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.



 pH levels at Big Pond and Plant Discharge stations were stable over the course of the deployment period with a downward trend apparent at Bridge station. During this deployment, most values at Big Pond and Bridge stations fell within the Site Specific Guidelines indicated by dashed lines in the figure above. Plant Discharge station exhibited pH levels more alkaline than the established guidelines.

Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25° C to allow comparison across variable temperatures.



Slight upward trends in conductivity were observed at Big Pond and Bridge stations from June 24th to August 4th; a more substantial trend upwards was seen at Plant Discharge station during the same time period. Variation in conductivity was also more substantial at Plant Discharge station.

Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.



During this time of year, it is expected to find dissolved oxygen concentrations lower than the CCME guideline of 9.5 mg/l for the protection of cold water biota (dashed line). Cooler water temperatures near the end of the deployment period allowed oxygen concentrations to rise at Bridge and Plant Discharge stations.

Turbidity

Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



• Turbidity levels at all three stations were low throughout the deployment period with a few instances of above-background levels.

Appendix



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