

# Real-Time Water Quality Deployment Report

## **Rattling Brook Network**

September 1, 2017 to November 2, 2017



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



## General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Ongoing development of a flow control structure at the outflow of Rattling Brook Big Pond resulted in very high water levels at the initiation of this deployment period. As work progressed, a temporary coffer dam was removed in latter October causing water levels to fall below the long-term average. As such, equipment was left stranded at Big Pond during the final days of the deployment period – data has been omitted.
- 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	<b>Dissolved Oxygen</b>	Turbidity
Rattling Brook Big Pond	September 1, 2017	Deployment	Excellent	Good	Good	Excellent	Excellent
	November 2, 2017	Removal	Fair	Excellent	Fair	Excellent	Excellent
Rattling Brook below Bridge	September 1, 2017	Deployment	Good	Excellent	Good	Excellent	Excellent
	November 2, 2017	Removal	Excellent	Poor	Fair	Excellent	Excellent
Rattling Brook below Plant Discharge	September 1, 2017	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	November 2, 2017	Removal	Good	Excellent	Fair	Excellent	Excellent

Table 1: Qualitative QAQC Ranking

• A calibration drift in the pH sensor at Bridge Station resulted in a "Poor" ranking at removal time.

## **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.

Rattling Brook



• Water temperature descended nearly consistently from September into November, as expected. A slight warming trend was seen at Bridge and Plant Discharge stations near the end of the deployment period. The cooling trend is expected to continue until late December before leveling off for the winter.

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.



- Overall, pH levels appeared to increase at Big Pond and Plant Discharge stations while Bridge station showed a steady decline – though this is likely the result of a calibration drift as suggested by the "Poor" QAQC ranking achieved at the end of the deployment interval.
- The magnitude of pH shift was much larger at Big Pond station. This was seen to occur during a substantial water level decrease over the course of the deployment as work progressed on the flow control structure.

#### 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  $25^{\circ}$ C to allow comparison across variable temperatures.



• Some variation was seen in conductivity at each station during this deployment period, but was generally stable overall.

#### **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.



 Cooling temperatures resulted in rising levels of dissolved oxygen during this deployment period. By October 11<sup>th</sup>, most dissolved oxygen values were greater than the CCME guidelines for protection of early and other life stage cold water organisms.

#### 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.



 Despite work in the vicinity of Big Pond station related to the development of a flow control structure, turbidity values were low for the duration of the deployment period. Occasional events were seen downstream at Bridge and Plant Discharge stations; however these were concurrent with large water level increases.

## Appendix

• Note: The Argentia weather station has been offline since April, 2017. Until the station resumes historical data collection, St. John's airport data will be used as a stand-in.

