Real-Time Water Quality Deployment Report

Rattling Brook Network

August 30, 2018 to October 11, 2018

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

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2018-08-30 to 2018-10-11

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Most water quality parameters appear to be falling within expected ranges for this time of year. The major driving force for water quality fluctuations was a wet and cool weather event on September 18th.
- 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.

Table 1: Qualitative QAQC Ranking

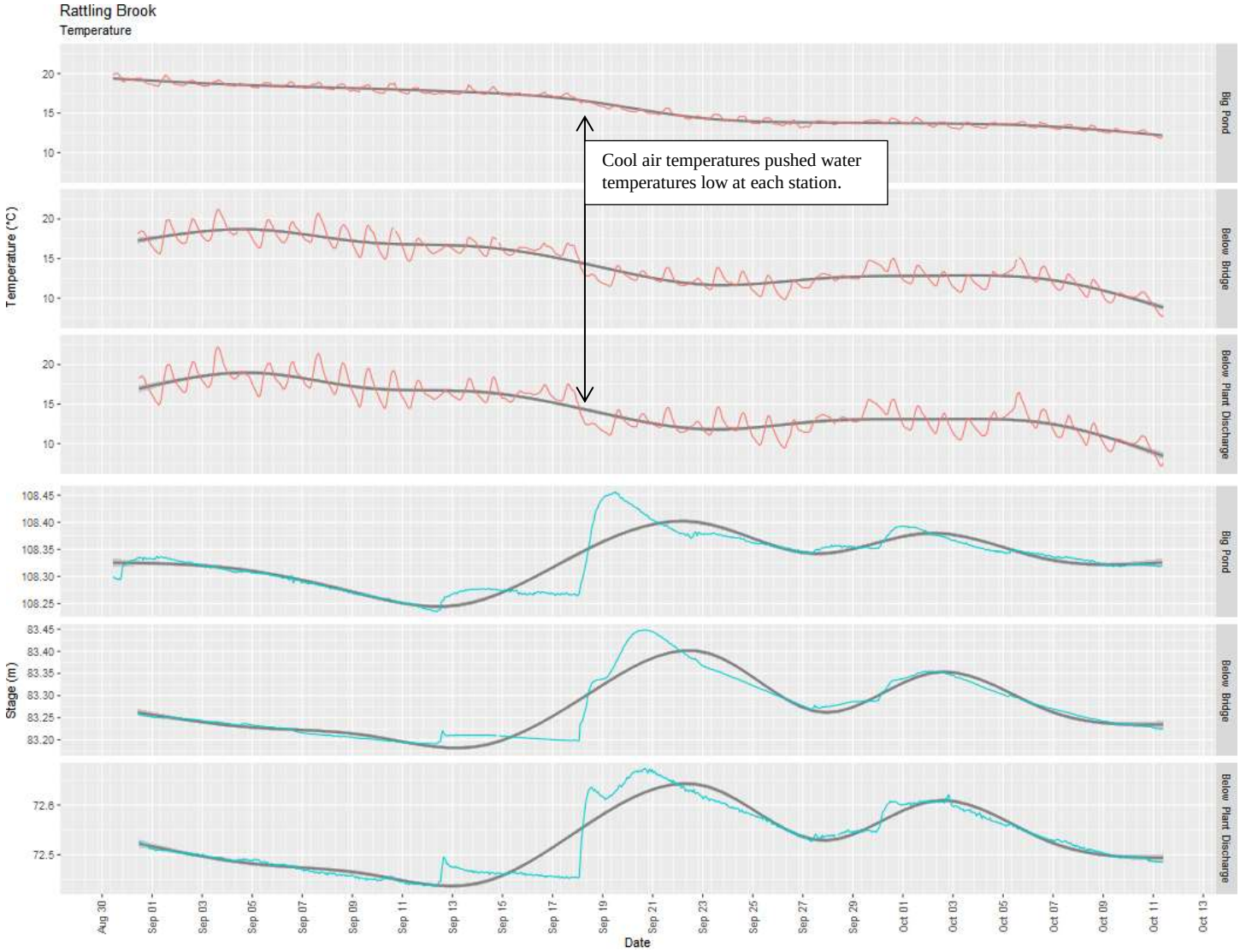
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	August 30, 2018	Deployment	Good	Good	Excellent	Excellent	Excellent
	October 11, 2018	Removal	Excellent	NA	Excellent	Fair	Excellent
Rattling Brook below Bridge	August 31, 2018	Deployment	Excellent	Excellent	Excellent	Good	Excellent
	October 11, 2018	Removal	Fair	NA	Excellent	Marginal	Excellent
Rattling Brook below Plant Discharge	August 31, 2018	Deployment	NA	NA	NA	NA	NA
	October 11, 2018	Removal	Excellent	NA	Excellent	Fair	Excellent

- A pH sensor failure on the QAQC sonde during removal meant no ranking could be calculated for pH. Also, a general sonde failure during removal at Plant Discharge station resulted in no QAQC rankings at that 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.



Station	Mean	Median	Min	Max
Big Pond	15.81	15.35	11.83	20.04
Below Bridge	14.36	13.57	7.67	21.21
Below Plant Discharge	14.48	14.02	7.15	22.20

- The declining trend from the previous deployment period continued into September, as expected. A mid-deployment perturbation in temperature, from a sharp drop in air temperature, occurred on September 18th and was observed at each station.

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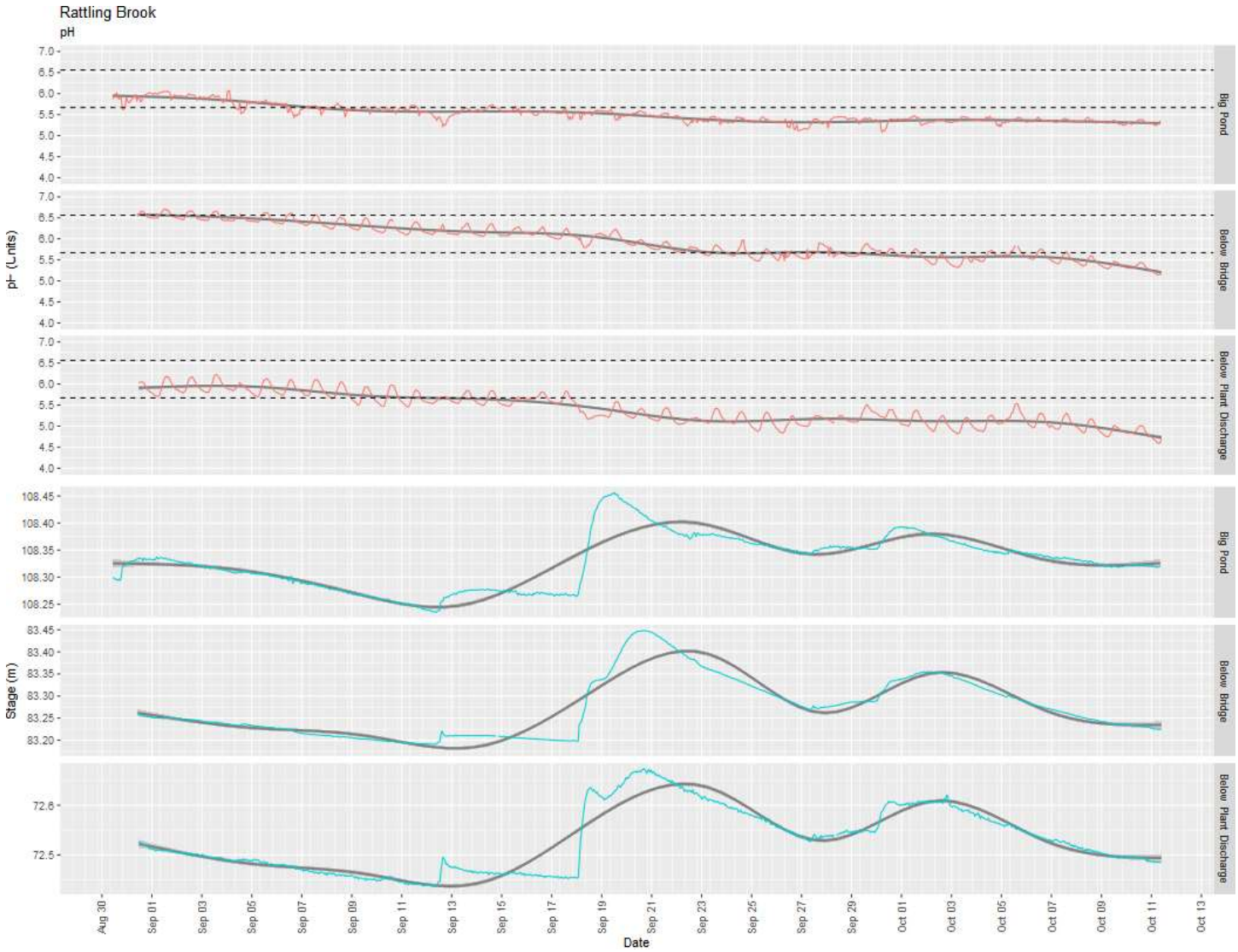
pH

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.



Station	Mean	Median	Min	Max
Big Pond	5.51	5.46	5.08	6.07
Below Bridge	5.94	5.87	5.14	6.71
Below Plant Discharge	5.40	5.33	4.59	6.22

- With falling water temperatures, productivity from aquatic vegetation declines, resulting in an excess of carbon dioxide that would normally be consumed through photosynthesis. The excessive carbon dioxide tends to form a weak carbonic acid solution, lowering pH. By mid-deployment (September 18th), pH had dropped to the lower site specific guideline at both Big Pond and Plant Discharge stations.

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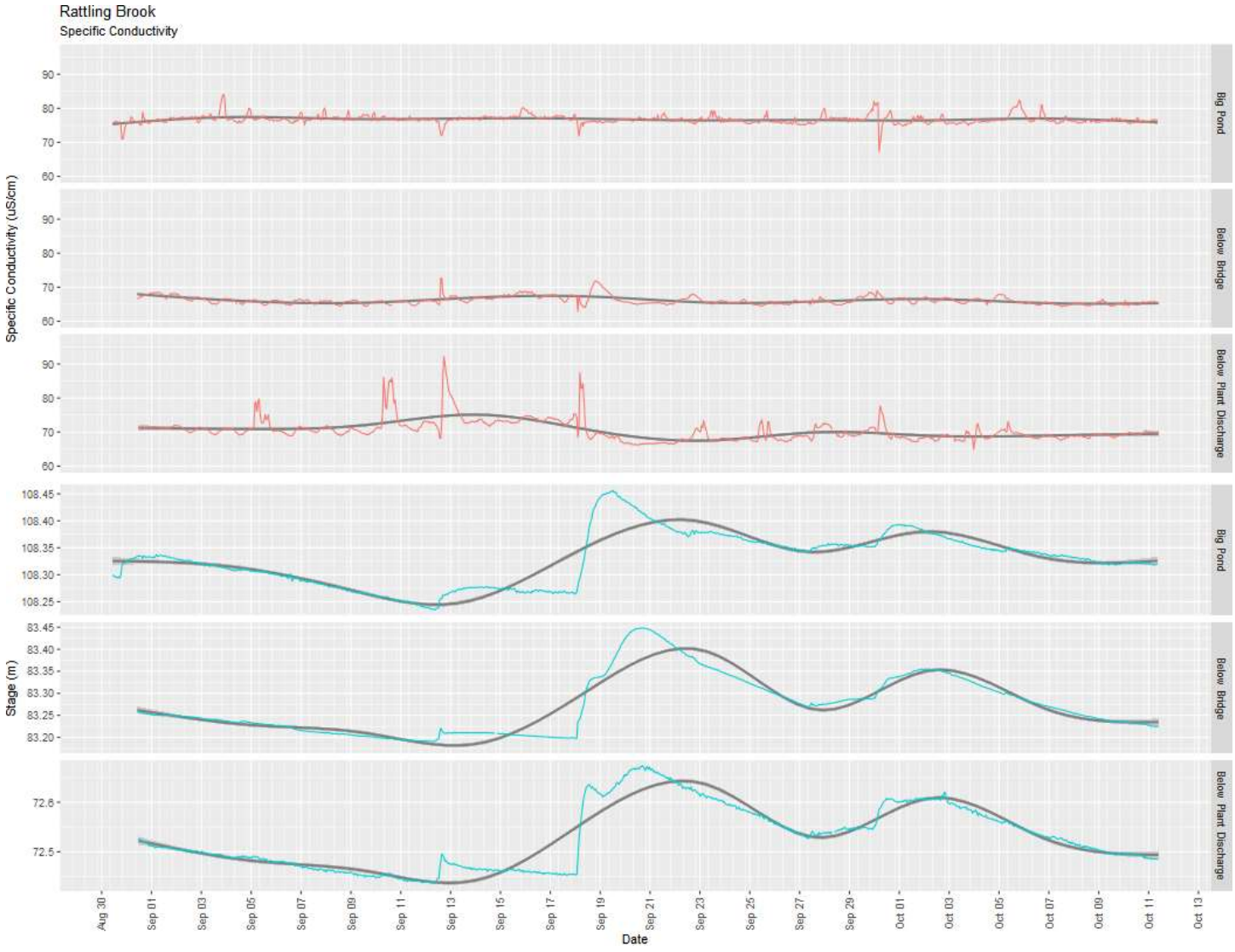
Specific Conductivity

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.



Station	Mean	Median	Min	Max
Big Pond	76.7	76.6	67.3	84.1
Below Bridge	66.1	65.9	62.9	72.7
Below Plant Discharge	70.5	69.8	64.9	92.2

- Although numerous peaks can be identified in the figure above, specific conductivity was broadly stable at Big Pond and Below Bridge stations during this deployment period. The mid-deployment rain and temperature event (September 18th) imposed a slight downward pressure on conductivity values at Plant Discharge station for much of the remaining deployment period, but a small recovery was underway into early- to mid-October.

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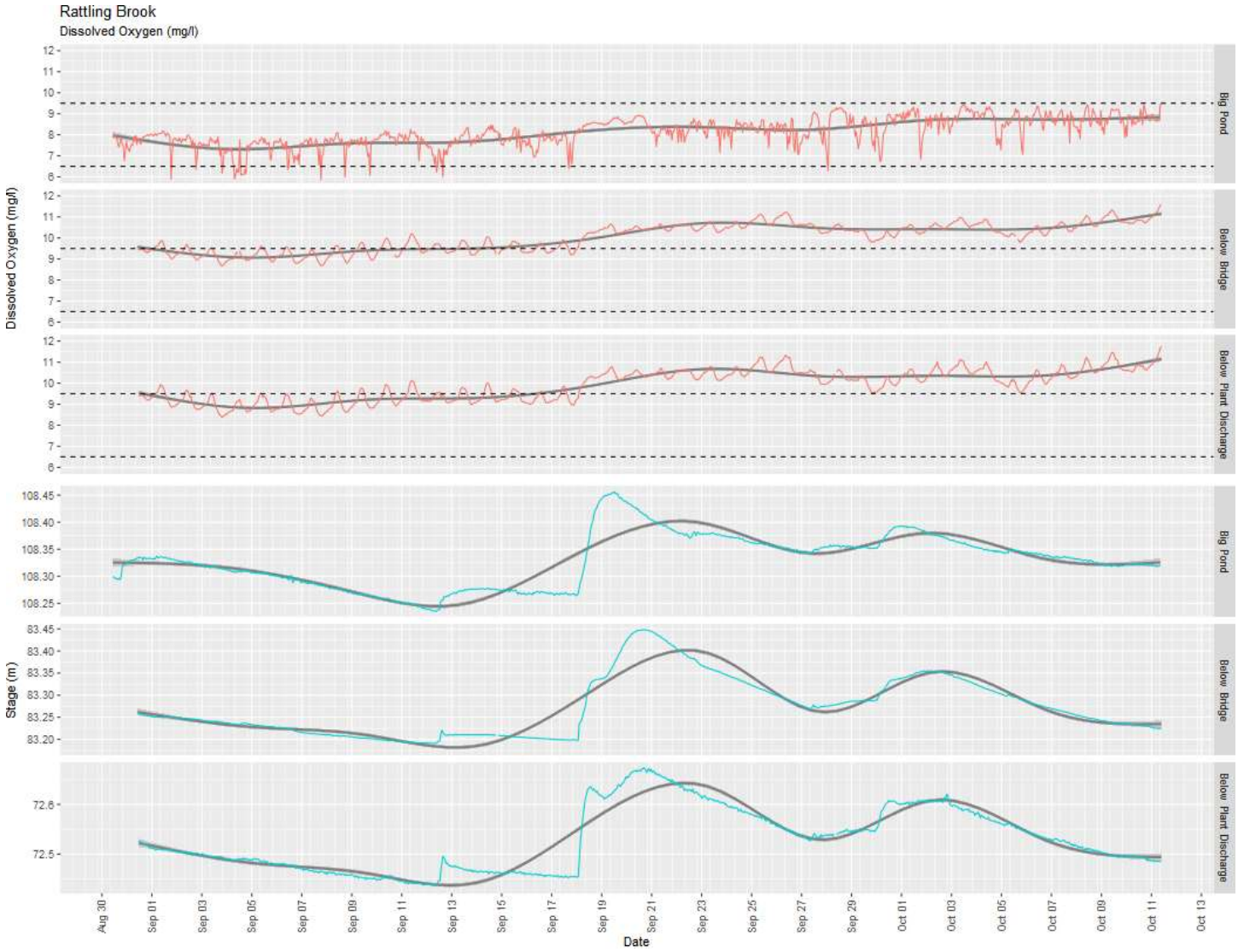
Dissolved Oxygen

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.



Station	Mean	Median	Min	Max
Big Pond	8.12	8.09	5.85	9.47
Below Bridge	10.03	10.22	8.66	11.59
Below Plant Discharge	9.90	10.06	8.38	11.75

- Dissolved oxygen values increased at each monitoring station during this deployment period. DO concentrations were above the upper CCME guideline at Below Bridge and Plant Discharge stations following the September 18th temperature and rain event. Big Pond station, however, continued to show somewhat low dissolved oxygen levels.

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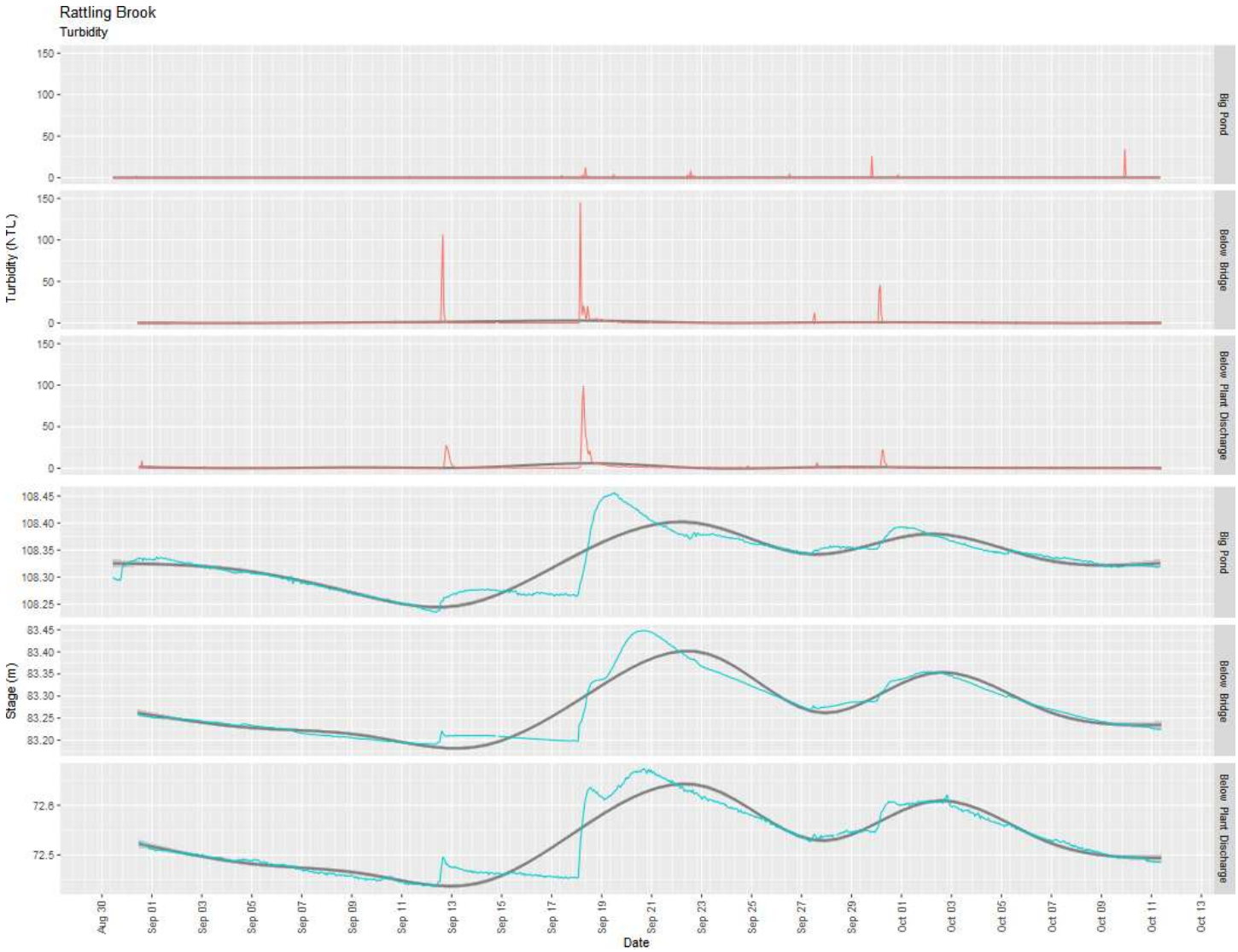
Turbidity

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.



Station	Mean	Median	Min	Max
Big Pond	0.1	0.0	0.0	33.9
Below Bridge	0.7	0.0	0.0	144.6
Below Plant Discharge	1.2	0.3	0.0	98.6

- Turbidity levels were low for this deployment period. Most turbidity peaks are associated with precipitation events and stage level increases; all of which resolved within a few hours.

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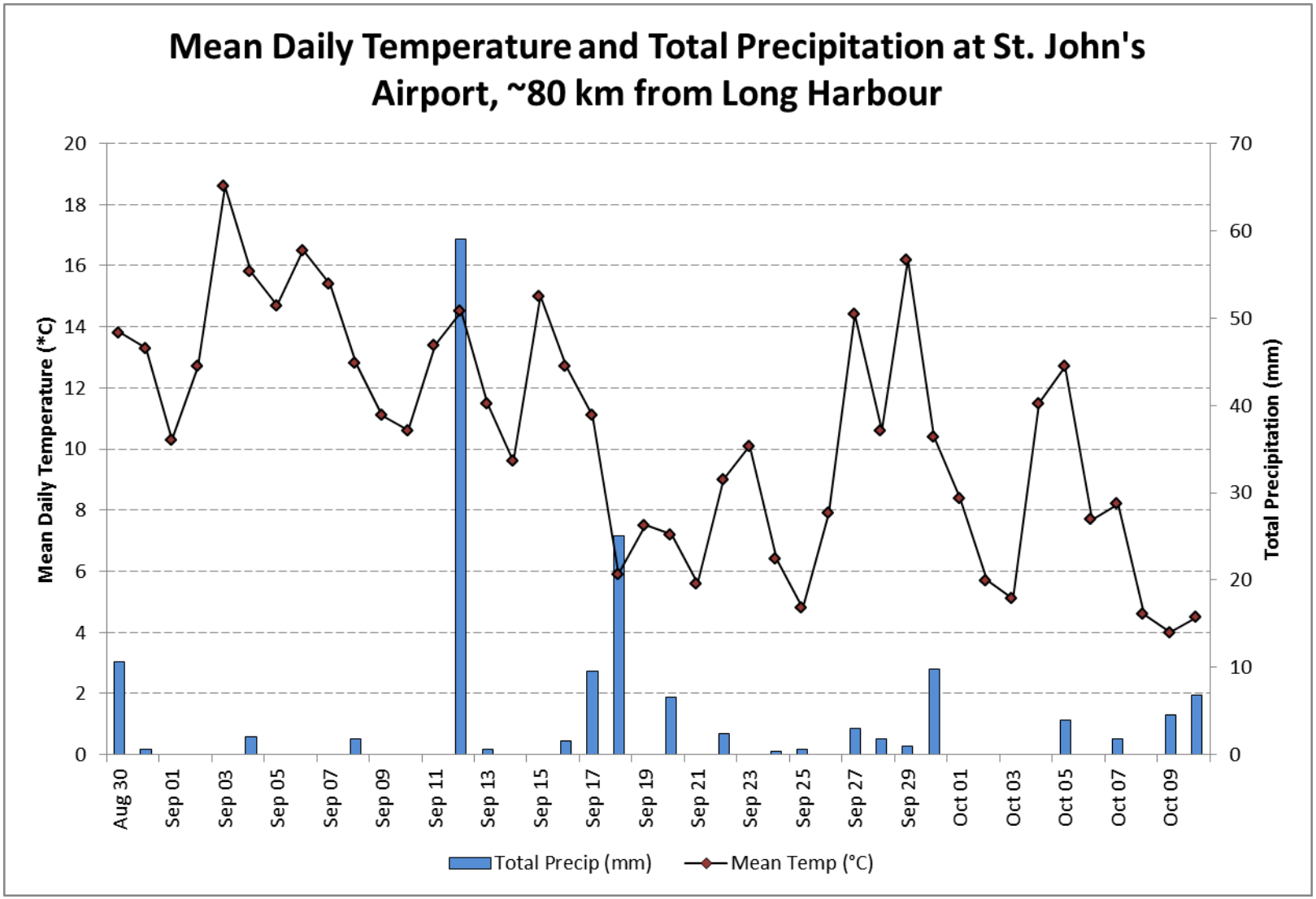
Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, ~80 km from Long Harbour
Mean Daily Temperature (*C)
Total Precipitation (mm)
20
18
16
14
12
10
8
6
4
2
0
70
60
50
40
30
20
10
0
Aug 30
Sep 01
Sep 03
Sep 05
Sep 07
Sep 09
Sep 11
Sep 13
Sep 15
Sep 17
Sep 19
Sep 21
Sep 23
Sep 25
Sep 27
Sep 29
Oct 01
Oct 03
Oct 05
Oct 07
Oct 09
Total Precip (mm)
Mean Temp (°C)