Real-Time Water Quality Deployment Report

Rattling Brook Network

April 18, 2019 to May 23, 2019

Newfoundland Labrador

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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2019-04-18 to 2019-05-23

General

- Department of Municipal Affairs and Environment staff monitor the real-time web pages consistently.
- Issues with dissolved oxygen and pH sensors at Big Pond station meant that some data was not presented in this report. Due to the sensor issues, QAQC rankings were not calculated for these parameters at Big Pond 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.

Table 1: Qualitative QAQC Ranking

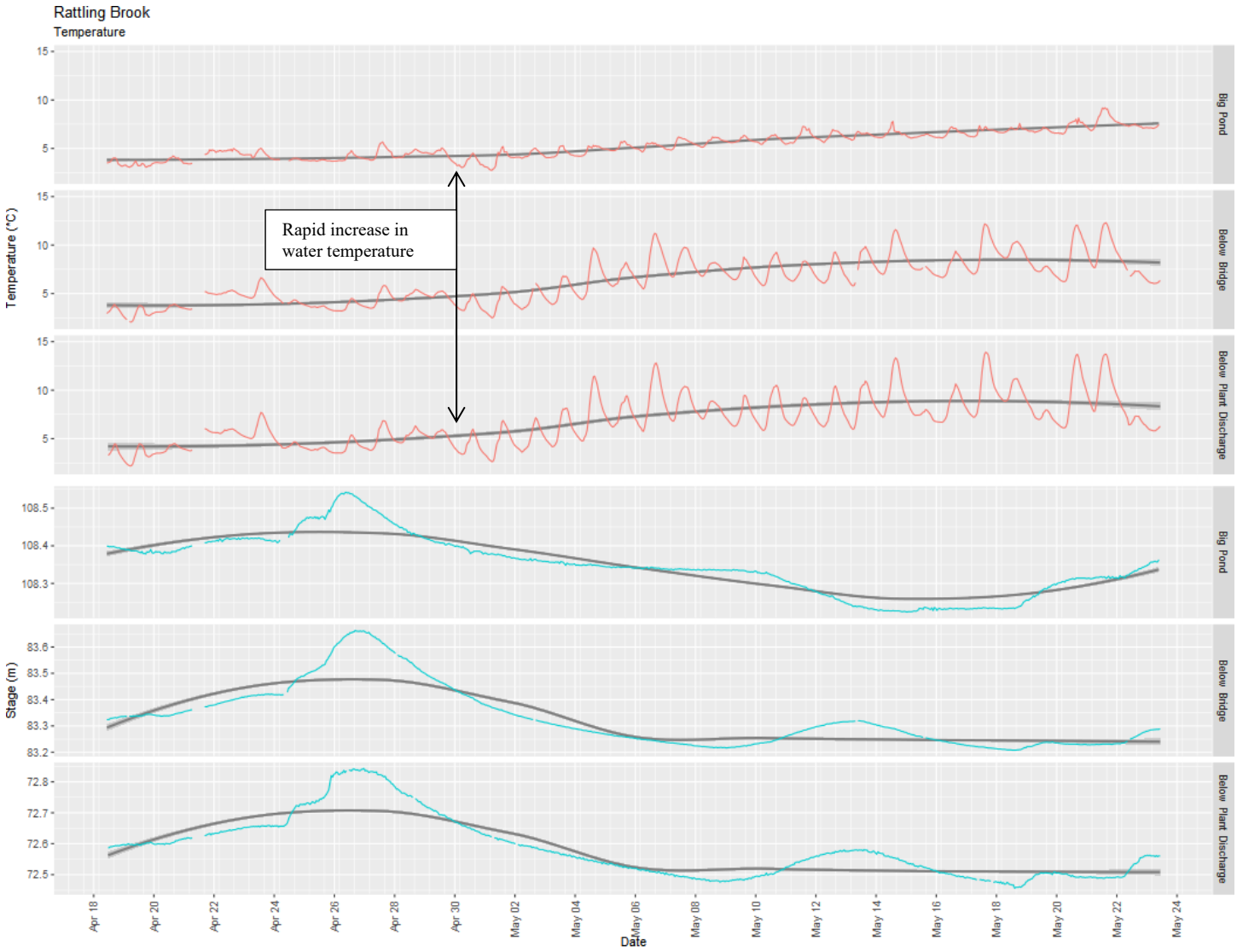
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 18, 2019	Deployment	Excellent	NA	Good	NA	Marginal
	May 23, 2019	Removal	Good	NA	Excellent	NA	Excellent
Rattling Brook below Bridge	April 18, 2019	Deployment	Good	Marginal	Good	Excellent	Excellent
	May 23, 2019	Removal	Good	Excellent	Good	Excellent	Good
Rattling Brook below Plant Discharge	April 18, 2019	Deployment	Excellent	Marginal	Good	Excellent	Excellent
	May 23, 2019	Removal	Excellent	Fair	Excellent	Excellent	Good

- Due to the sensor issues, QAQC rankings were not calculated for dissolved oxygen and pH at Big Pond station.

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.



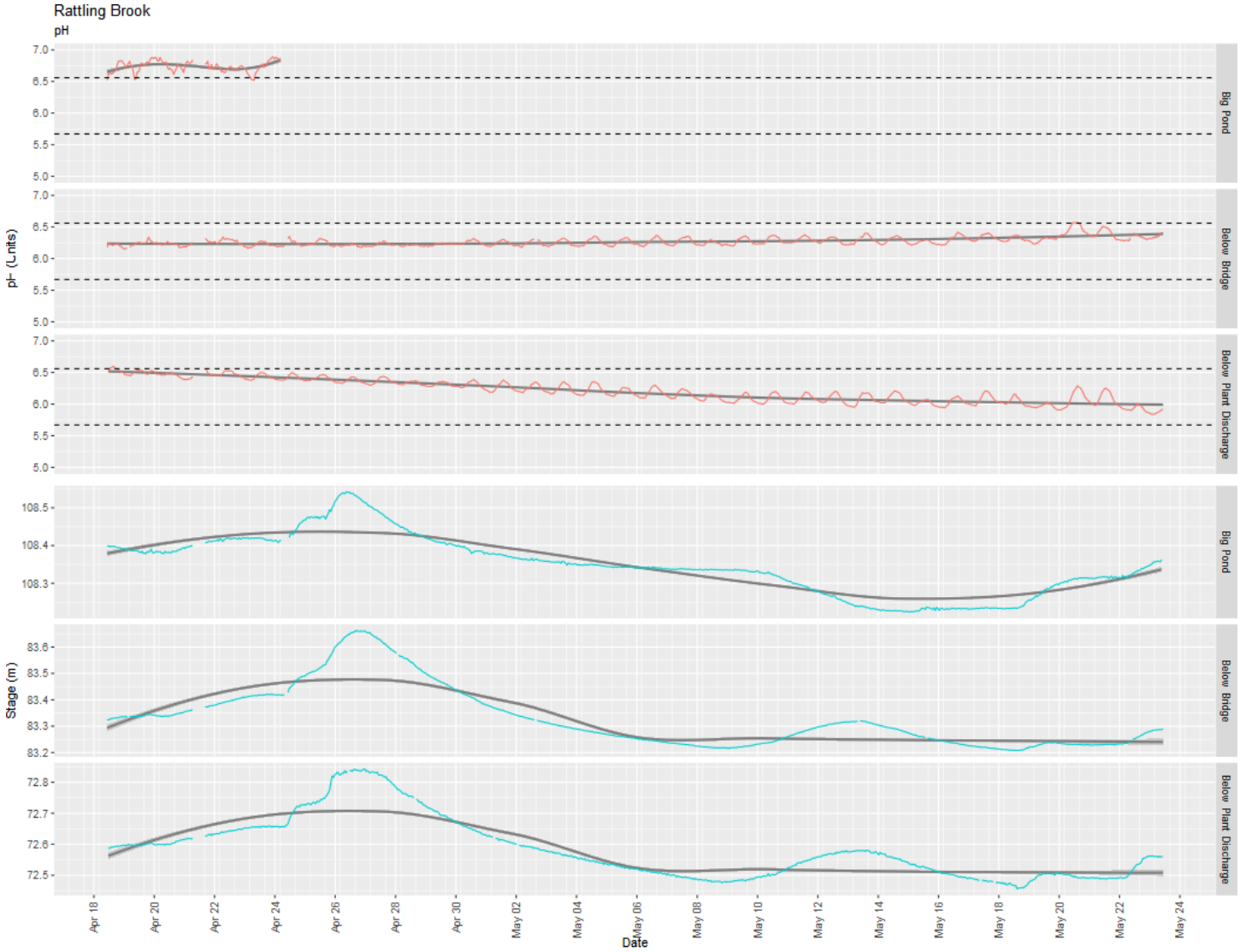
Station	Mean	Median	Min	Max
Big Pond	5.35	5.25	2.74	9.19
Below Bridge	6.34	6.34	2.06	12.30
Below Plant Discharge	6.81	6.59	2.18	13.91

- Between April 18th to 30th, water temperature showed a slight increase at each station. Following this time frame, the increase accelerated somewhat and diurnal cycling of water temperatures became much more pronounced. Ambient air temperature following April 30th (illustrated in the Appendix) tended to be greater than 0ºC.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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	6.74	6.74	6.52	6.89
Below Bridge	6.27	6.26	6.15	6.57
Below Plant Discharge	6.21	6.19	5.84	6.60

- pH levels at Bridge and Plant Discharge stations were almost entirely within the Site Specific Guidelines outlined by the dashed lines in the figure above. Rises and falls occurring over the course of the day are associated with aquatic vegetation productivity. In this process, there is a net consumption of dissolved carbon dioxide by plants during the day, allowing pH to rise. At night, there is a net production of carbon dioxide, pushing pH down.

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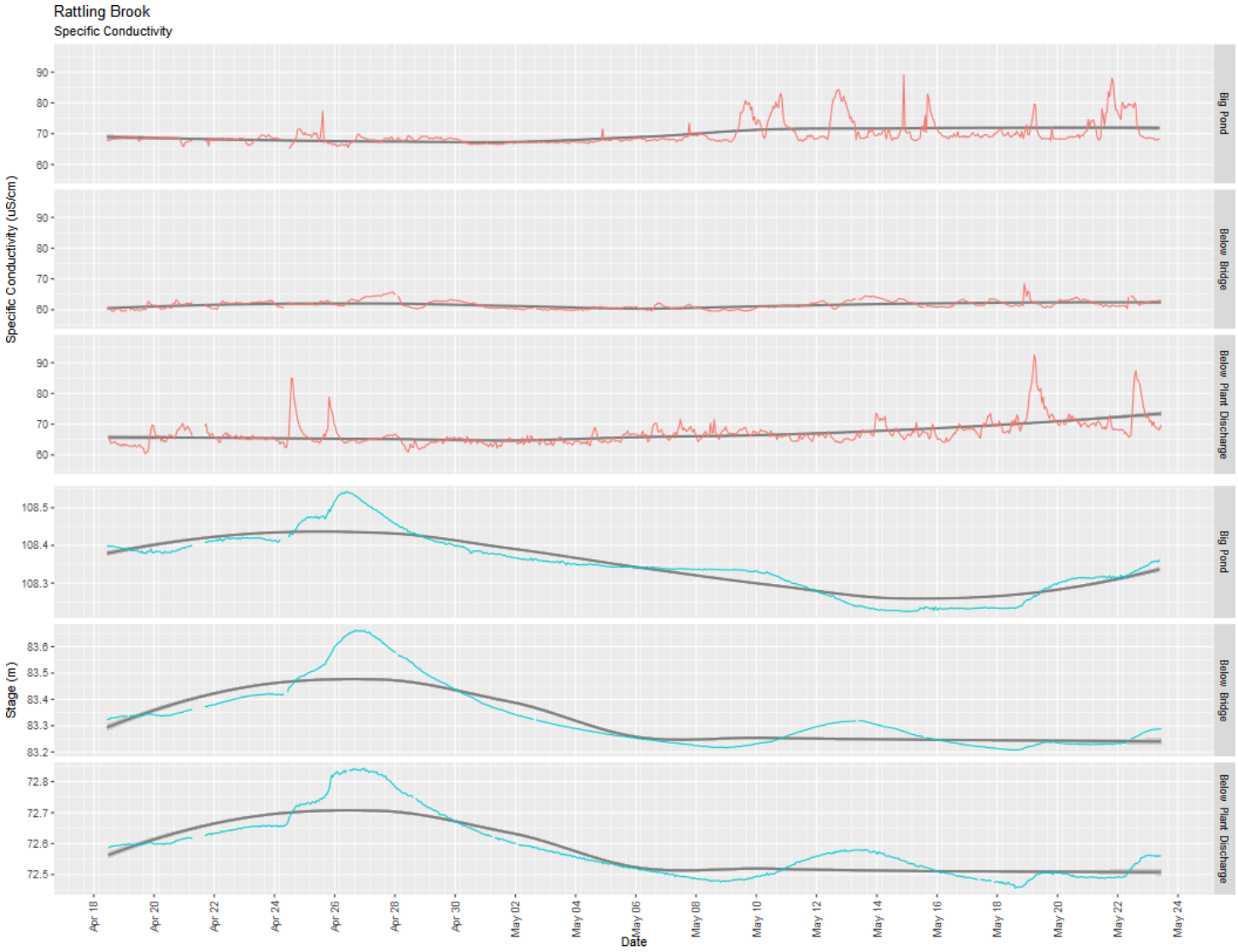
Specific Conductivity

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 25ºC to allow comparison across variable temperatures.



Station	Mean	Median	Min	Max
Big Pond	69.7	68.5	65.3	89.2
Below Bridge	61.7	61.5	59.4	68.4
Below Plant Discharge	67.0	66.1	60.4	92.4

- The latter portion of this deployment period saw an increase in specific conductivity at each station. This was most obvious at Plant Discharge station, with smaller increases at Big Pond and Bridge stations, respectively. Changes in specific conductivity may be related to ongoing springtime flow variation and is likely to return to baseline as spring progresses.

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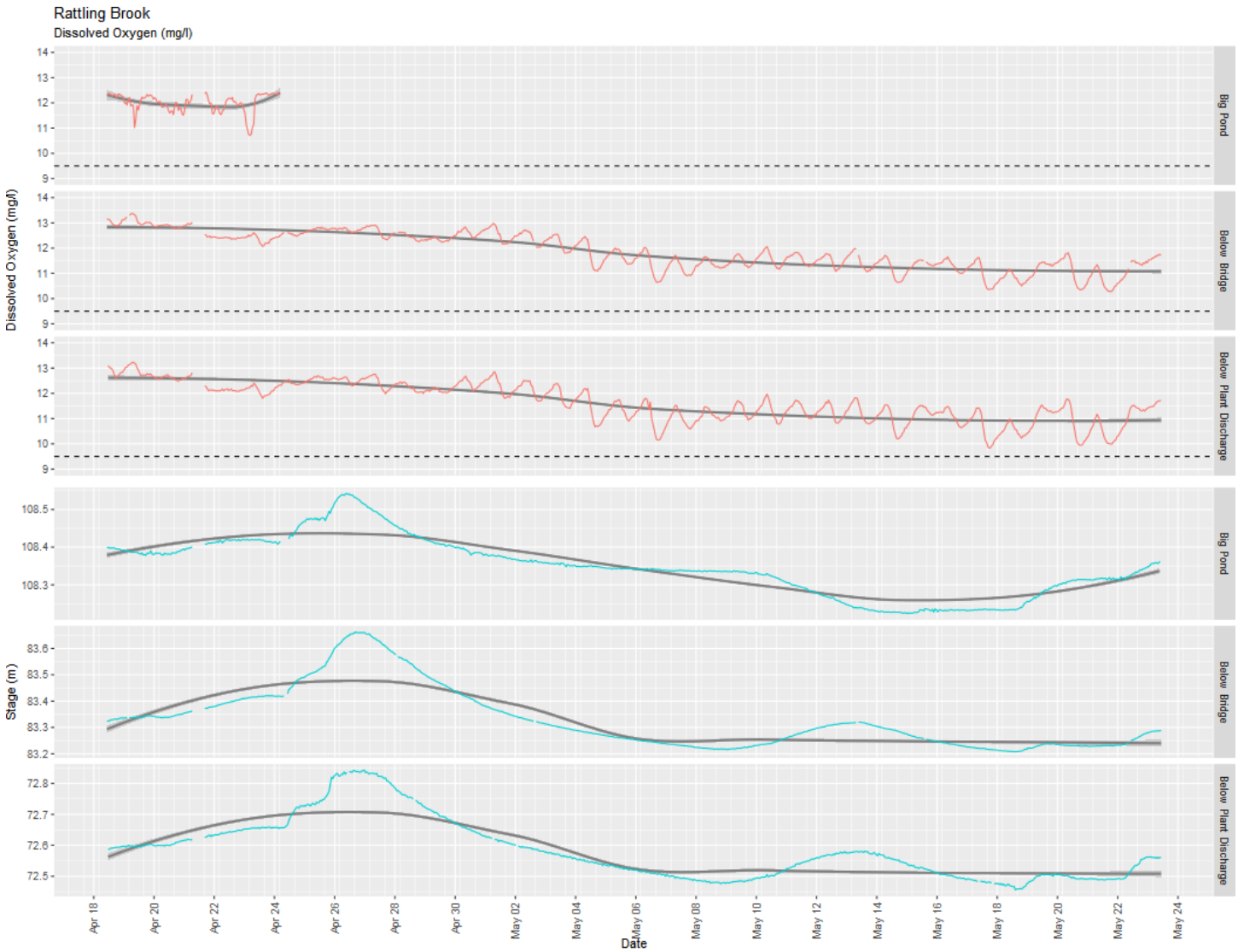
Dissolved Oxygen

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	11.99	12.06	10.71	12.42
Below Bridge	11.87	11.76	10.27	13.37
Below Plant Discharge	11.64	11.58	9.83	13.23

- Warming water temperatures naturally lead to a decline in dissolved oxygen concentrations. During this deployment period, all values were above the minimum CCME guideline for the protection of early life stage aquatic organisms (dashed lines in figure above).

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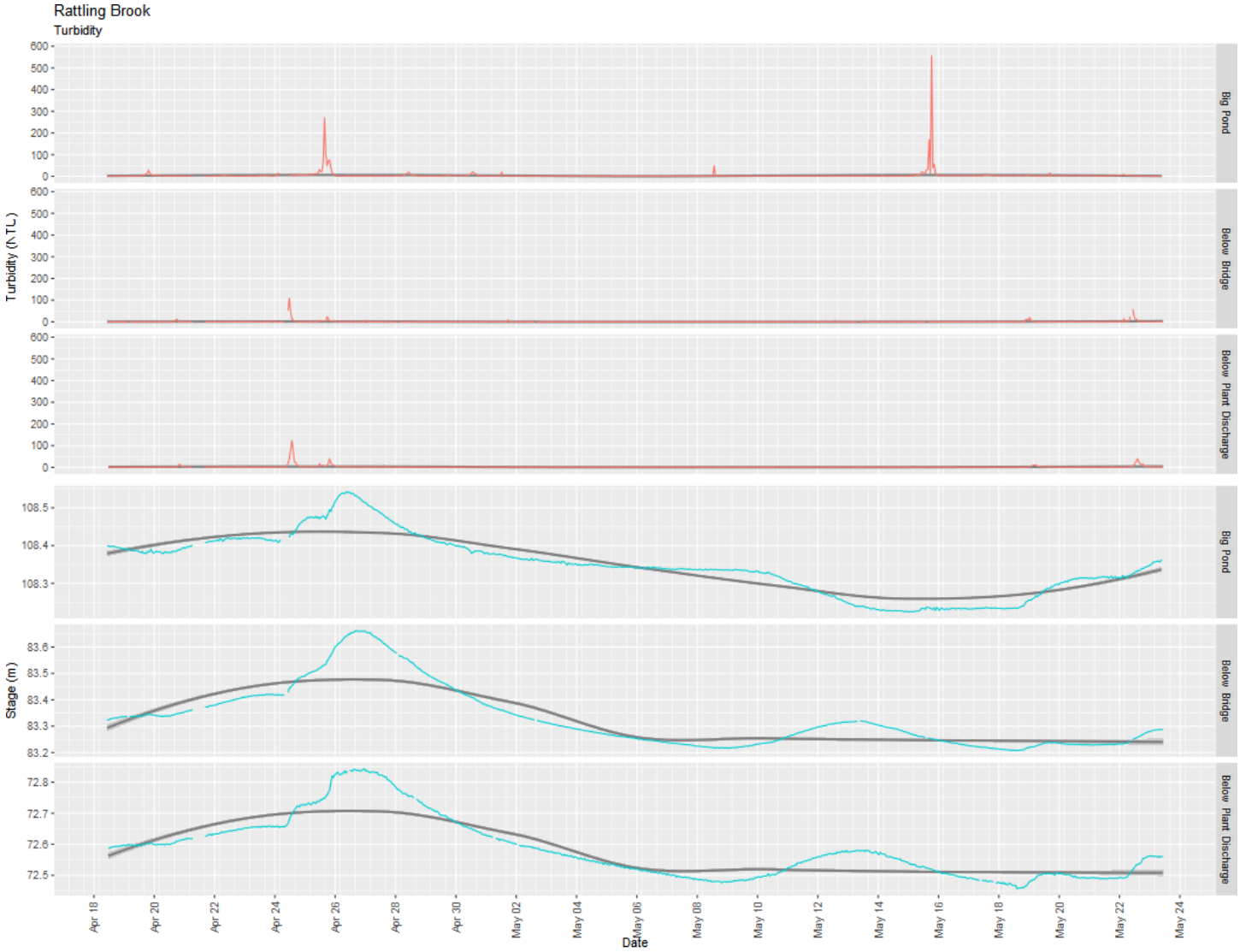
Turbidity

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	4.2	1.3	0.4	555.0
Below Bridge	0.8	0.0	0.0	107.8
Below Plant Discharge	1.9	0.7	0.1	123.4

- Turbidity levels were low at Bridge station during this deployment period with levels slightly above the norm at Big Pond and Plant Discharge stations. Elevated turbidity levels are likely related to variable flow rates seen during the spring time and are not cause for concern. Turbidity will be closely monitored to observe for trends of concern.

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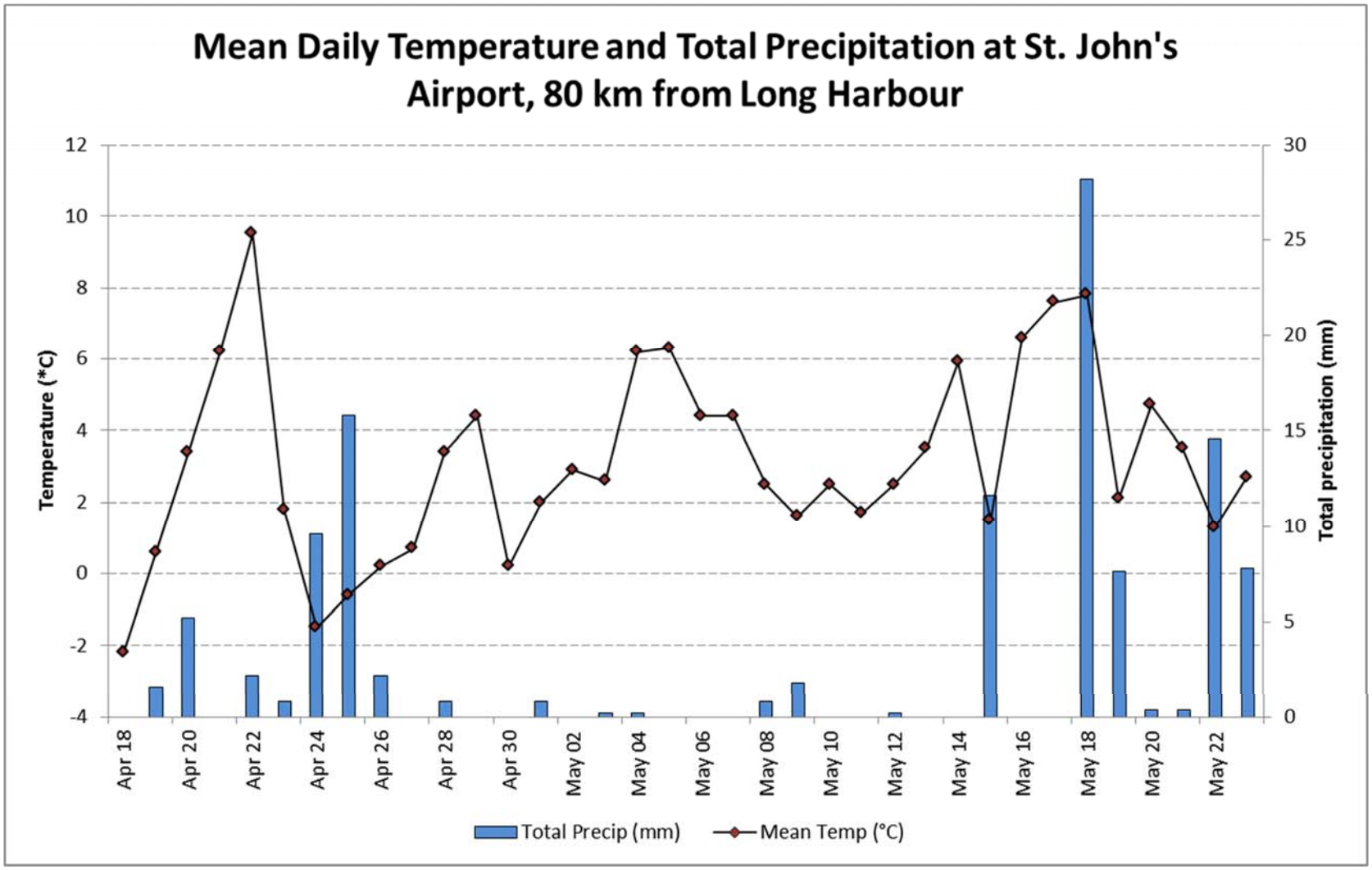
Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, 80 km from Long Harbour
Temperature (*C)
Total precipitation (mm)
12
10
8
6
4
2
0
-2
-4
30
25
20
15
10
5
0
Apr 18
Apr 20
Apr 22
Apr 24
Apr 26
Apr 28
Apr 30
May 02
May 04
May 06
May 08
May 10
May 12
May 14
May 16
May 18
May 20
May 22
Total Precip (mm)
Mean Temp (°C)