Real-Time Water Quality Deployment Report

Rattling Brook Network

June 8, 2017 to July 20, 2017

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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2017-06-08 to 2017-07-20

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Environment Canada's Argentia weather station has discontinued reporting weather since mid-April 2017. Water data has been taken from St. John's Airport, approximately 85 km away. While this shouldn't be considered an accurate reflection of conditions in Long Harbour, it can provide insight into the general state of weather.
- 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.

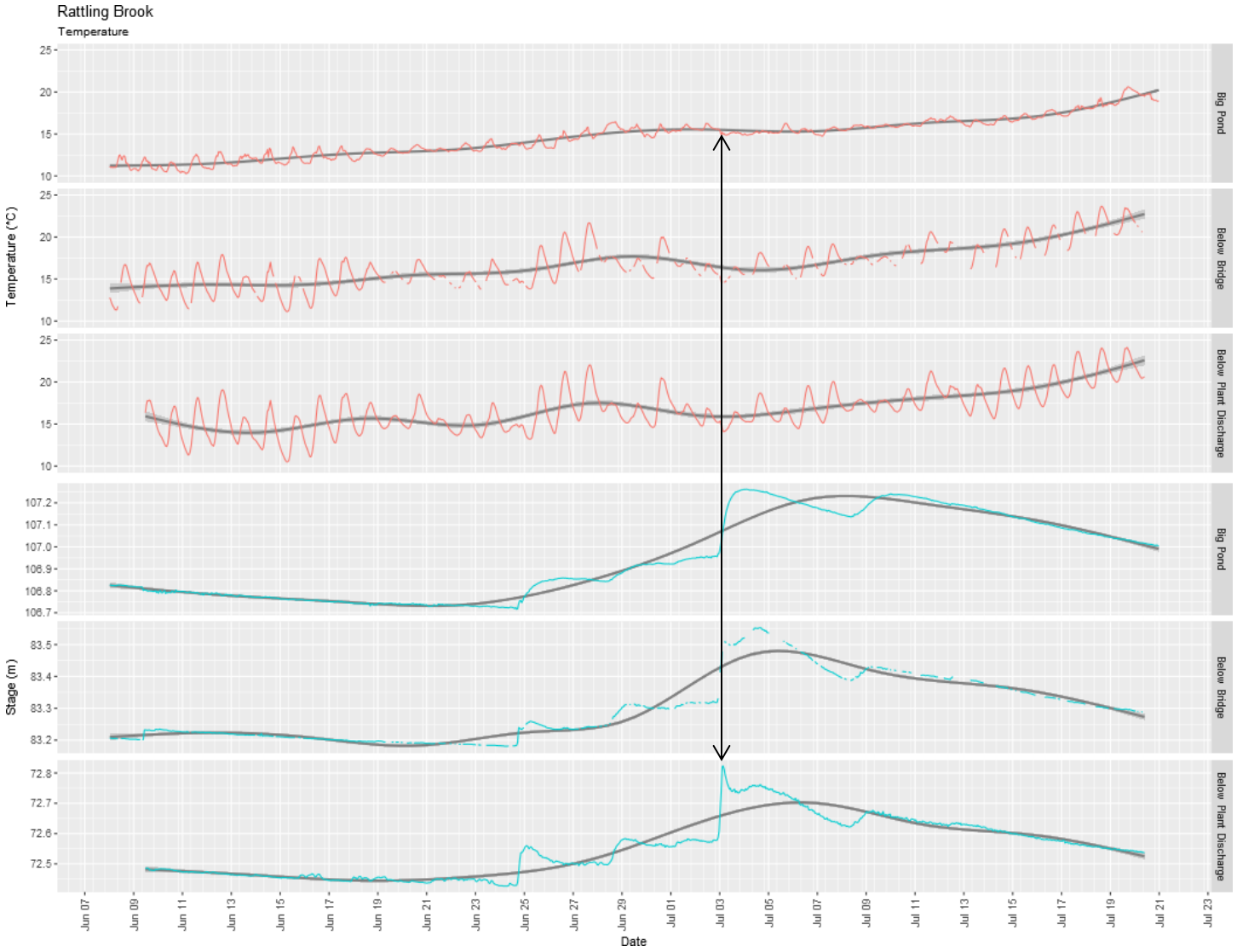
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	June 8, 2017	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	July 20, 2017	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	June 8, 2017	Deployment	Excellent	Good	Excellent	Excellent	Good
	July 20, 2017	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	June 9, 2017	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	July 20, 2017	Removal	Excellent	Excellent	Excellent	Excellent	Excellent

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	14.65	15.08	10.27	20.61
Below Bridge	16.57	16.38	11.12	23.67
Below Plant Discharge	16.76	16.53	10.49	24.13

- The late spring to mid-summer warming trend is clear at all three stations during this deployment period. Occasional instances of temperature depression were seen during water level increases, such as on July 2nd and 3rd during approximately 23 mm of rain.

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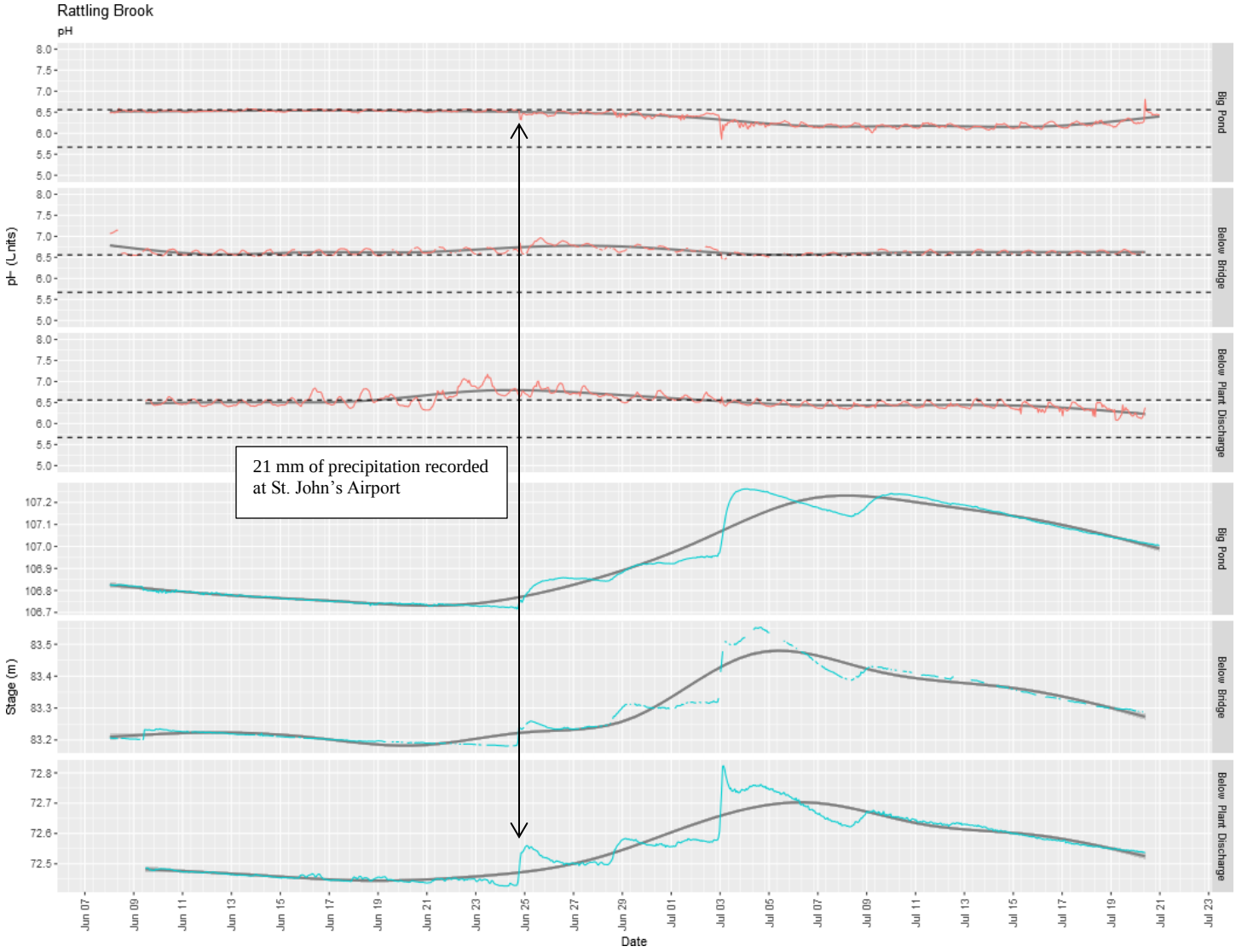
pH

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	6.38	6.45	5.86	6.81
Below Bridge	6.64	6.62	6.45	7.15
Below Plant Discharge	6.53	6.50	6.08	7.17

- pH did not show major changes at either of the stations in the Rattling Brook network. Instead, a slow, but subtle decline was observed in response to precipitation after June 24th. Most values were found to be within, or just above Site Specific Guidelines (dashed lines in figure above).

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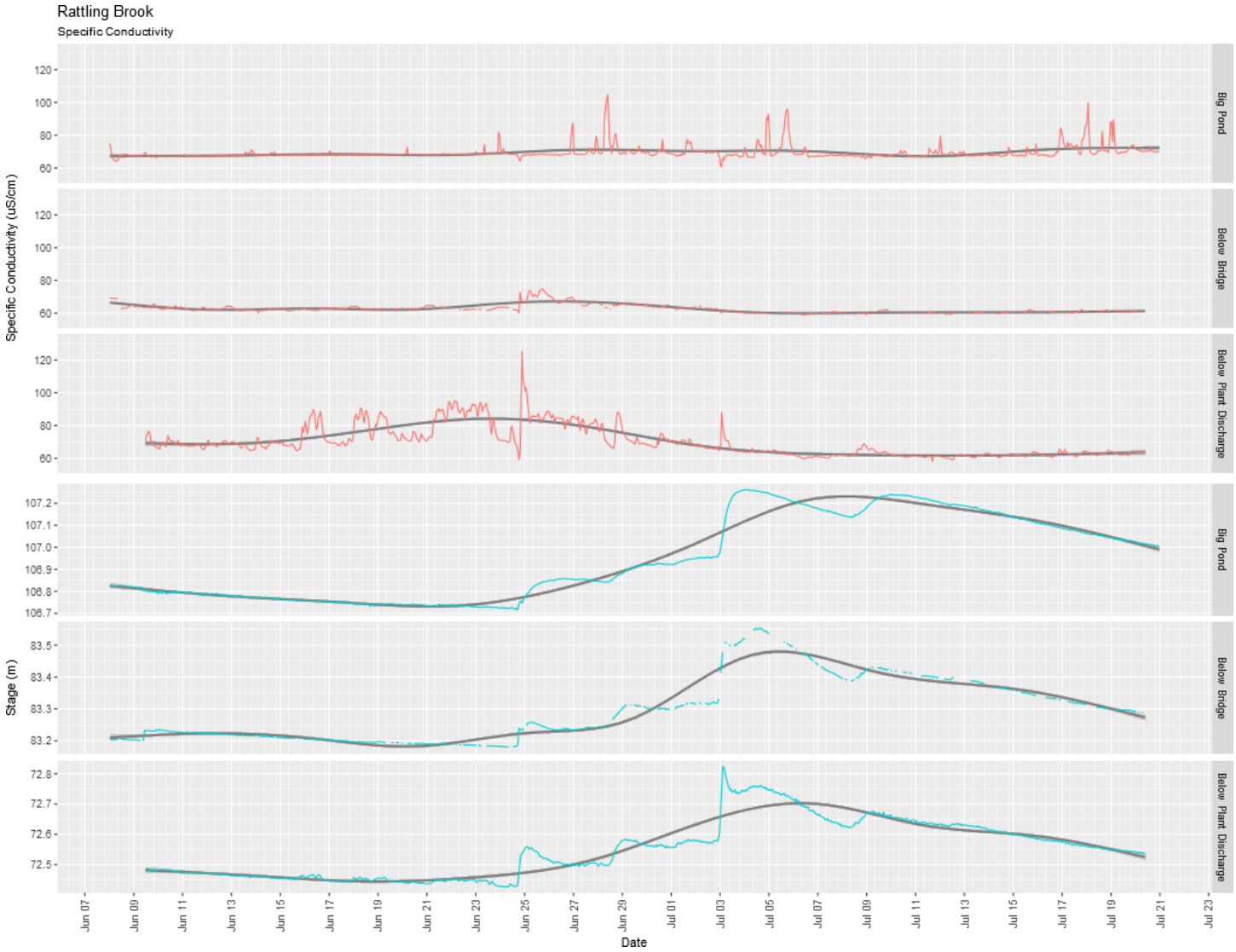
Specific Conductivity

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	69.3	68.2	60.6	104.8
Below Bridge	62.7	62.3	58.6	74.9
Below Plant Discharge	70.0	67.7	58.1	125.4

- Big Pond and Plant Discharge stations showed a greater degree of variation compared to Bridge station. Work on a dam at the outflow of Big Pond beginning in July may have contributed to some observed variability while variability at Plant Discharge station may be related to settling pond dewatering.

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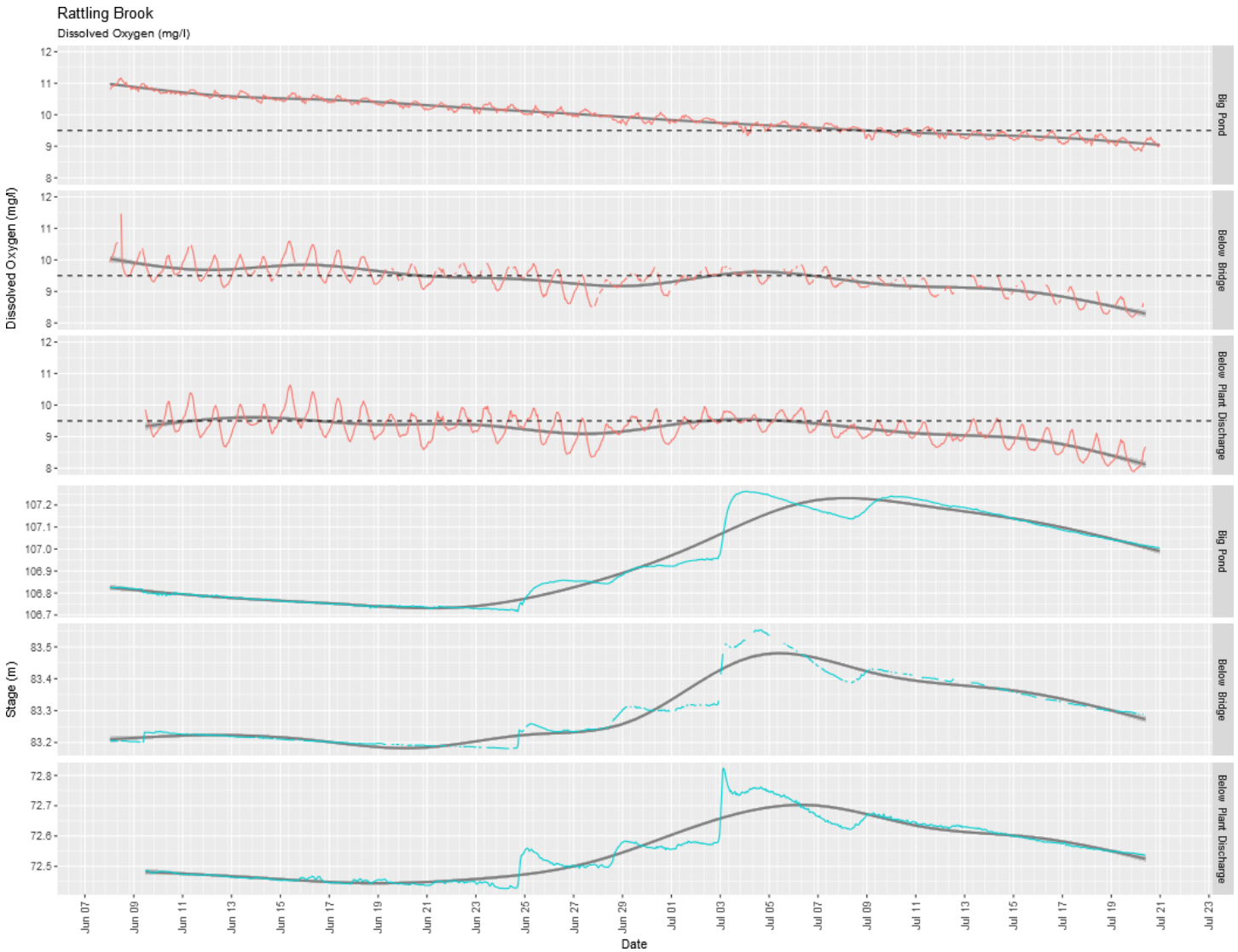
Dissolved Oxygen

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	9.93	9.93	8.84	11.17
Below Bridge	9.41	9.44	8.19	11.47
Below Plant Discharge	9.25	9.27	7.90	10.64

- With warming water temperatures comes a decline in dissolved oxygen concentration. By the second week of June, most values were beginning to fall below the upper CCME guideline for the protection of early life stage aquatic life. This is generally expected for the time of year.

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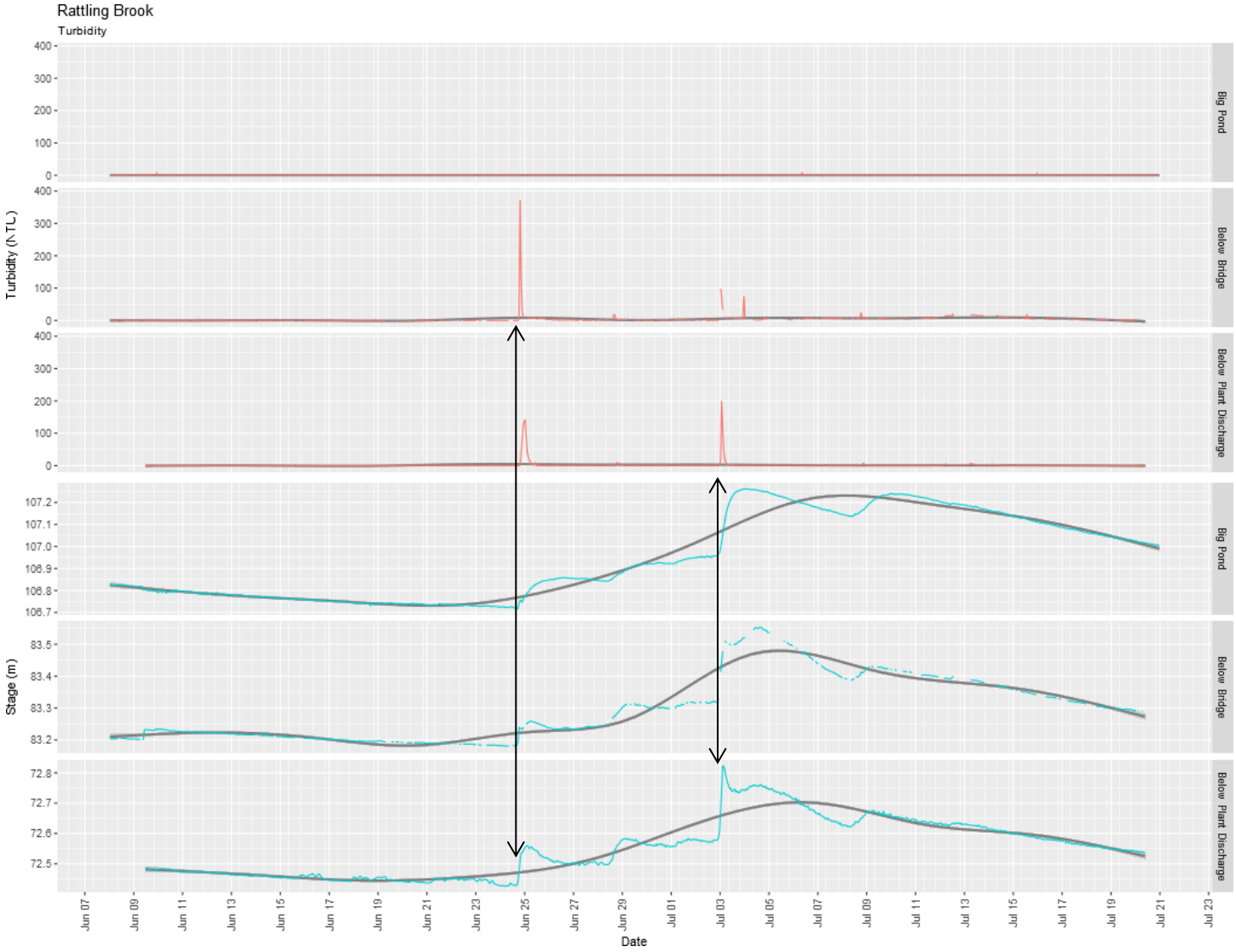
Turbidity

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	8.4
Below Bridge	3.6	0.7	0.0	371.7
Below Plant Discharge	1.4	0.0	0.0	198.6

- Infrequent turbidity events were experienced at Bridge and Plant Discharge stations during this deployment period, although they were very short in duration and associated with precipitation.

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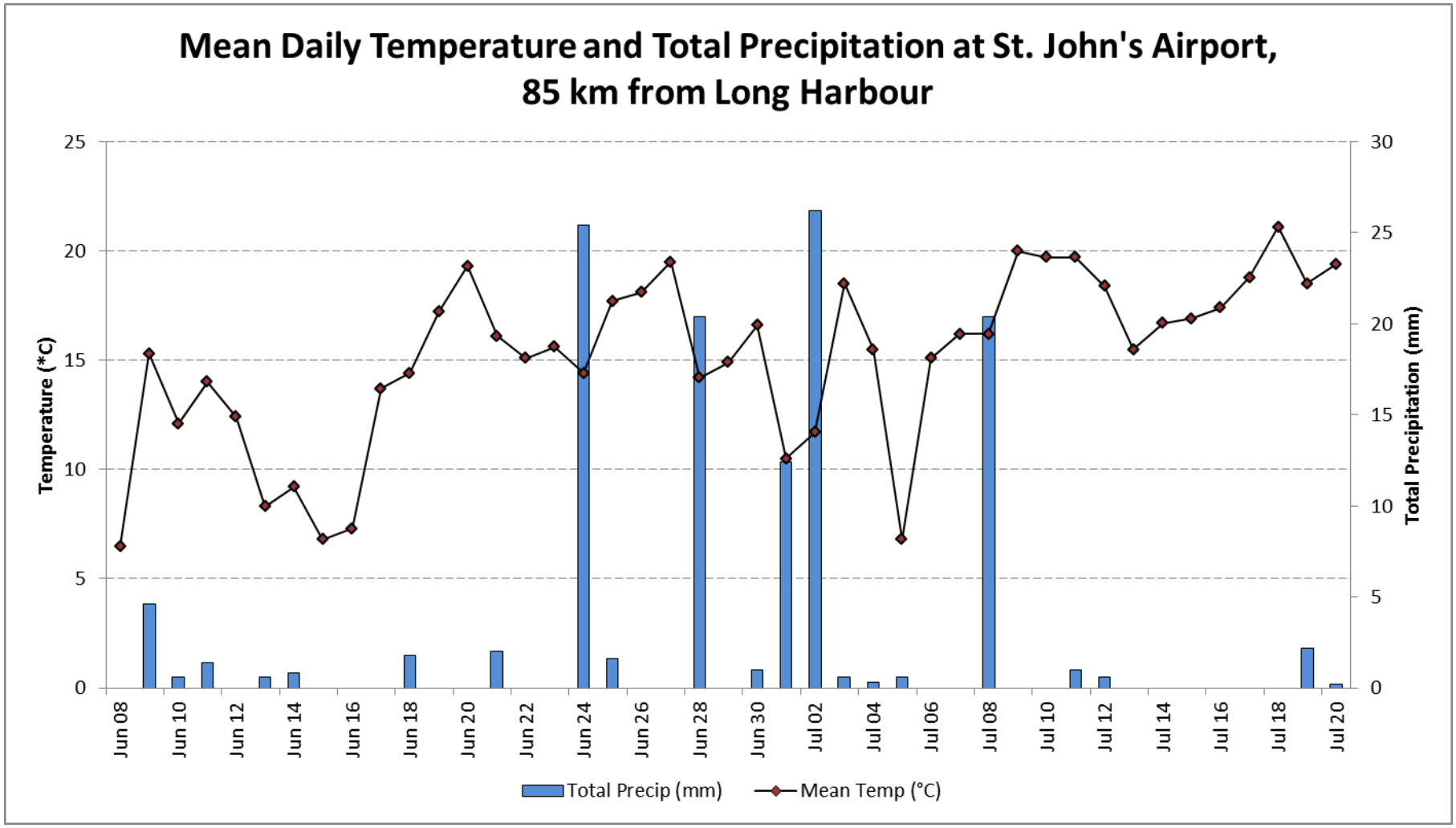
Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, 85 km from Long Harbour
Temperature (*C)
Total Precipitation (mm)
25
20
15
10
5
0
30
25
20
15
10
5
0
Jun 08
Jun 10
Jun 12
Jun 14
Jun 16
Jun 18
Jun 20
Jun 22
Jun 24
Jun 26
Jun 28
Jun 30
Jul 02
Jul 04
Jul 06
Jul 08
Jul 10
Jul 12
Jul 14
Jul 16
Jul 18
Jul 20
Total Precip (mm)
Mean Temp (°C)