Real-Time Water Quality Deployment Report

Rattling Brook Network

September 22, 2016 to November 3, 2016

Newfoundland Labrador

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

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2016-09-22 to 2016-11-03

General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- The turbidity sensor at Rattling Brook below Bridge station showed an unexpected offset part way through the deployment period, rising from a background level of ~ 0 NTU to ~ 30 NTU. Despite the offset, variability was as expected. Turbidity data for bridge station has been corrected to allow analysis.
- 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

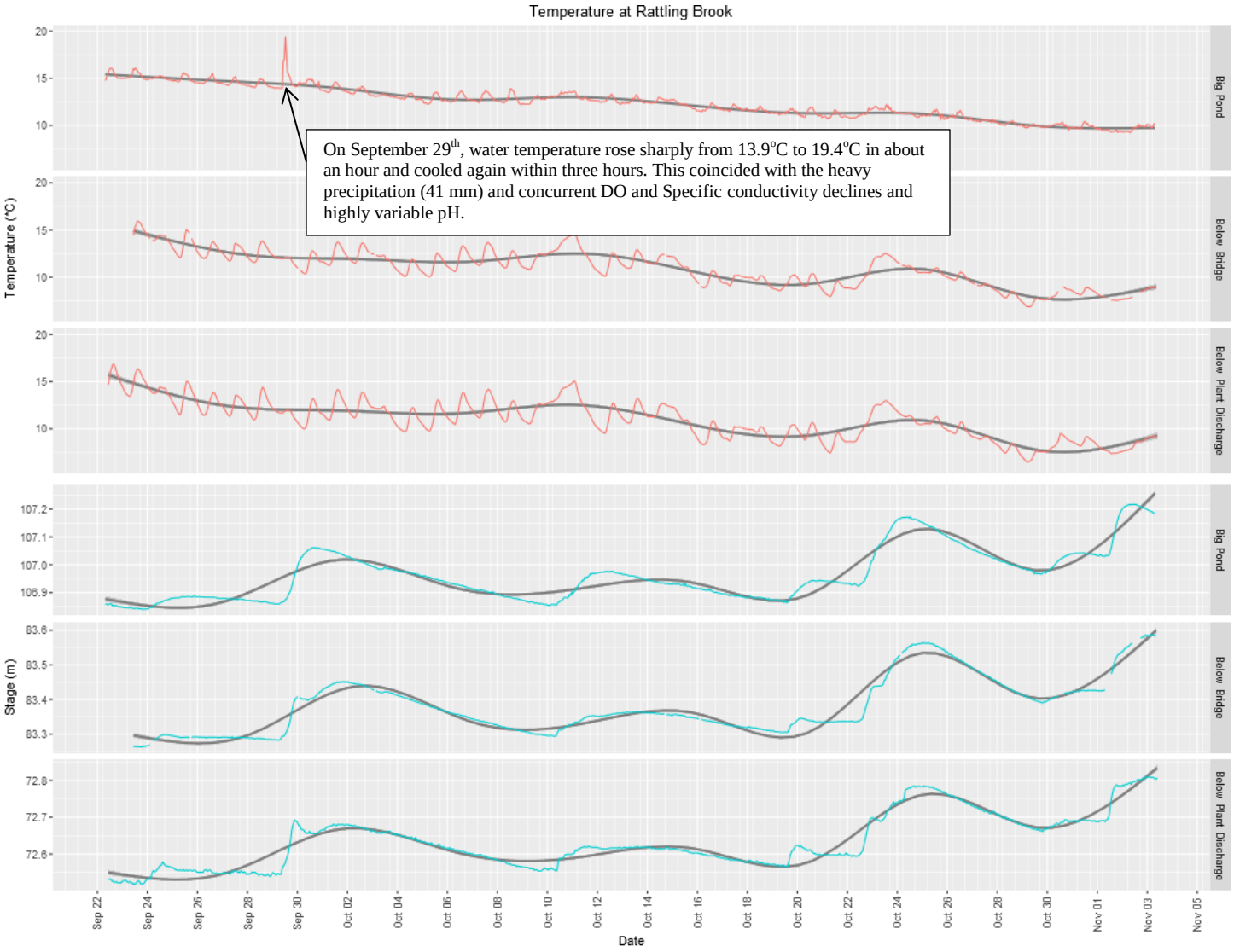
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2016-09-22	Deployment	Fair	Excellent	Excellent	Excellent	Excellent
	2016-11-03	Removal	Excellent	Excellent	Good	Excellent	Excellent
Rattling Brook below Bridge	2016-09-22	Deployment	Excellent	Good	Good	Excellent	Excellent
	2016-11-03	Removal	Excellent	Poor	Excellent	Excellent	Poor
Rattling Brook below Plant Discharge	2016-09-22	Deployment	Poor	Excellent	Excellent	Excellent	Excellent
	2016-11-03	Removal	Excellent	Excellent	Excellent	Excellent	Excellent

- pH sensor drift at Bridge station resulted in a “Poor” QAQC ranking for this month. Additionally, a “Poor” ranking was attained for turbidity at Bridge station due to the unexpected offset in the sensor. This will be examined for repair.

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	12.39	12.45	9.25	19.40
Below Bridge	10.94	11.07	6.87	15.93
Below Plant Discharge	10.98	11.04	6.47	16.89

- Water temperature declined as expected at each station from September to October. Water temperatures are expected to continue declining into late December and January.

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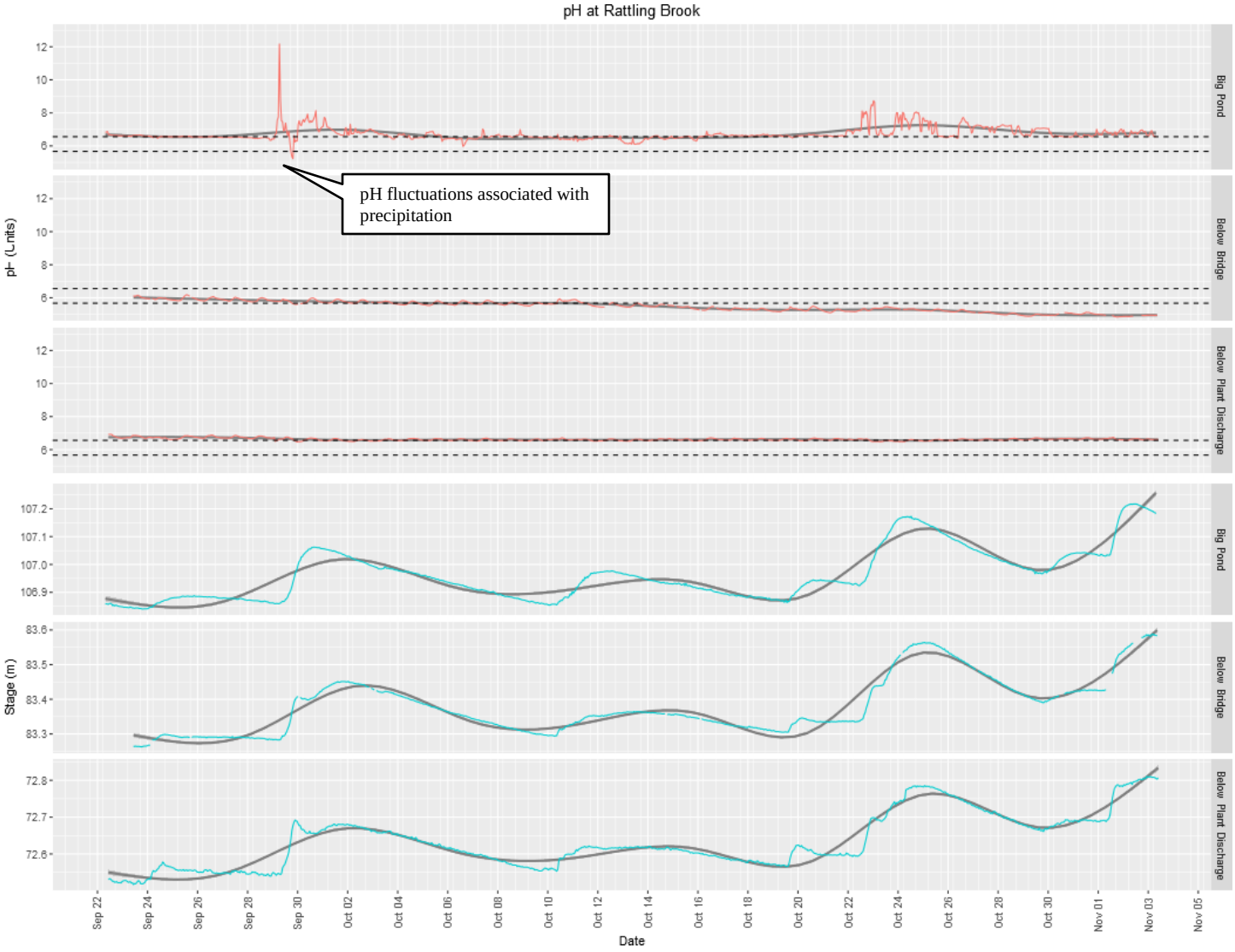
pH

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	6.73	6.61	5.23	12.17
Below Bridge	5.48	5.50	4.84	6.19
Below Plant Discharge	6.62	6.62	6.46	6.94

- Perturbations in pH were observed at Big Pond station while Bridge station showed a slow, but downward trend (likely related to sensor drift). Plant Discharge station showed a relatively stable pH. Instability at Big Pond station appears to be related to variable precipitation and temperature over a period of four days.

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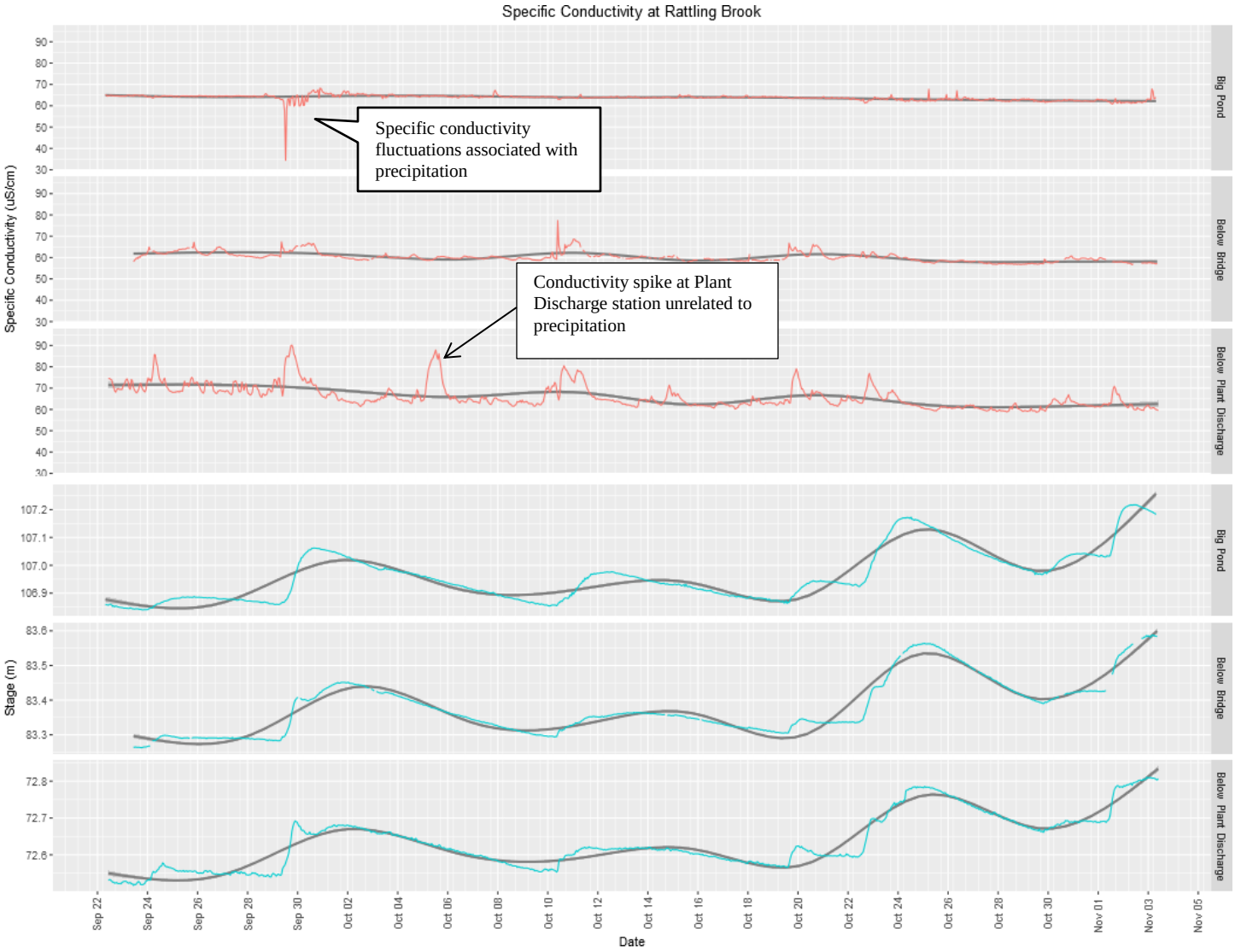
Specific Conductivity

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	63.8	63.9	34.4	68.3
Below Bridge	60.2	59.9	56.6	77.4
Below Plant Discharge	66.0	64.4	58.7	90.2

- A downward trend in specific conductivity was observed at each station during this deployment period with occasional incidences of peaks mostly associated with precipitation and stage level increase.

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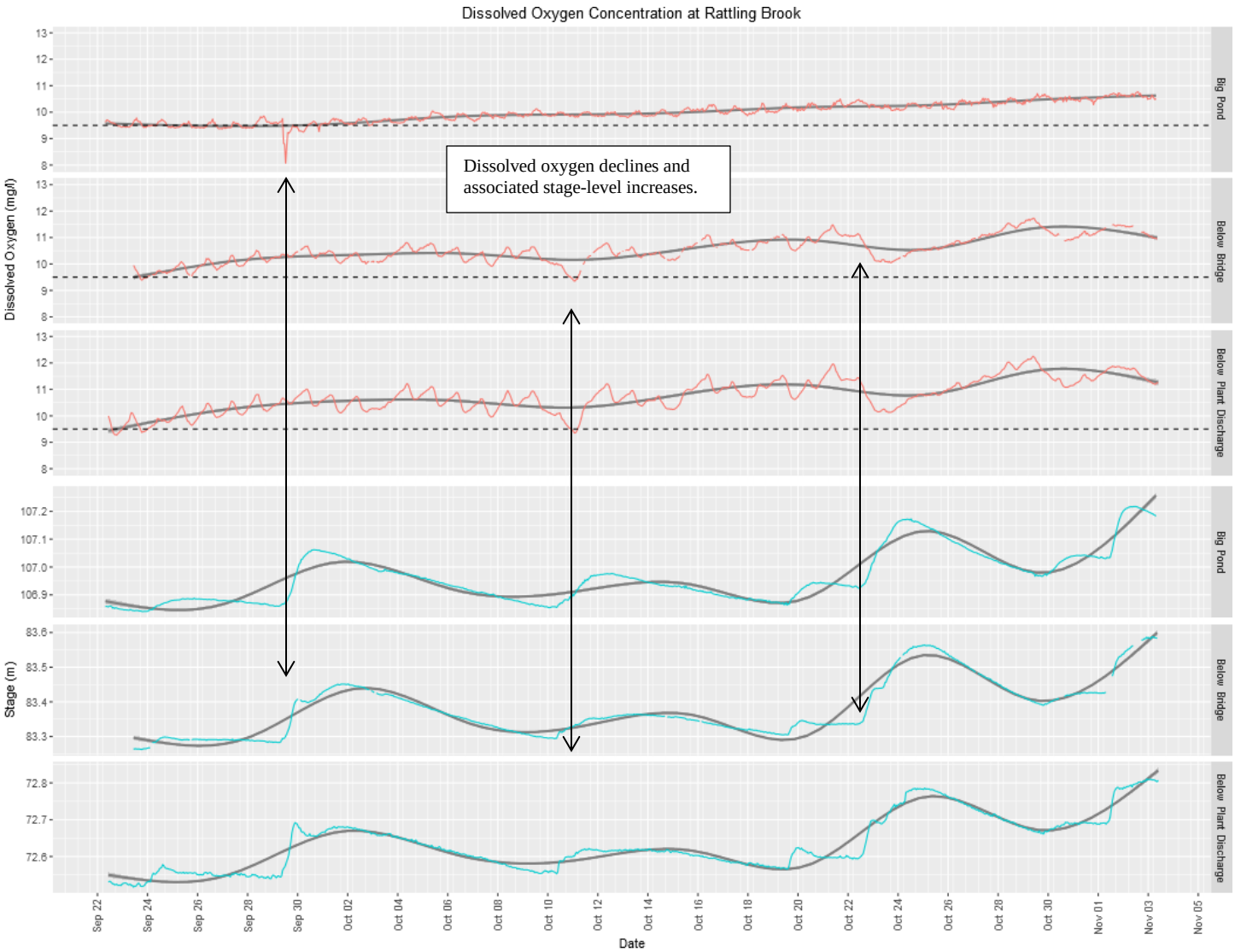
Dissolved Oxygen

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	9.98	9.97	8.07	10.76
Below Bridge	10.54	10.51	9.35	11.73
Below Plant Discharge	10.75	10.72	9.27	12.26

- Dissolved oxygen concentration increased over the deployment interval coincident with declining water temperatures. Most values were found to be above 9.5 mg/l CCME guideline for the protection of cold water organisms.

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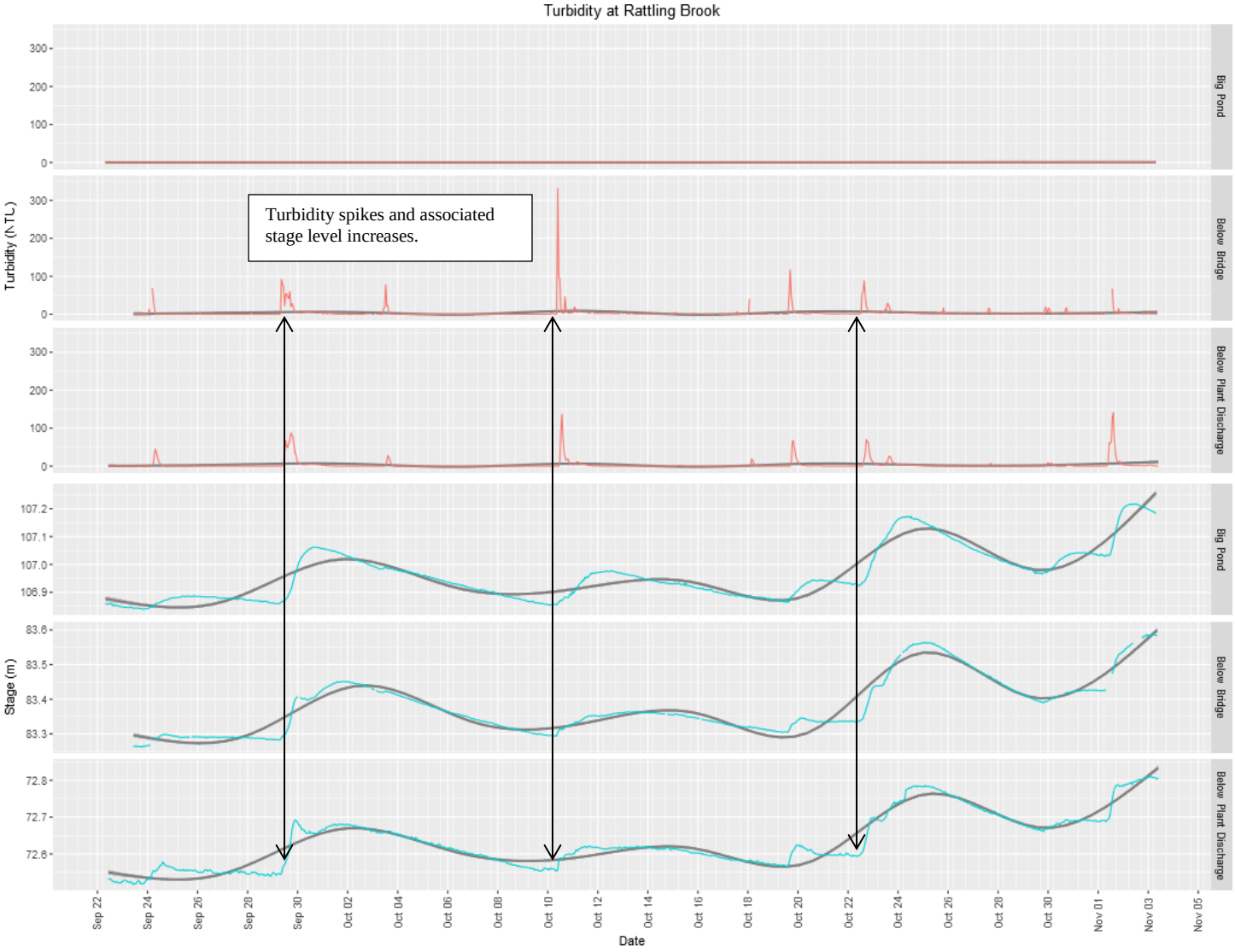
Turbidity

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	0.2	0.0	0.0	4.2
Below Bridge	3.9	0.9	0.0	331.3
Below Plant Discharge	3.4	0.0	0.0	140.9

- Turbidity levels were mostly low during this deployment period with occasional spikes related to precipitation.

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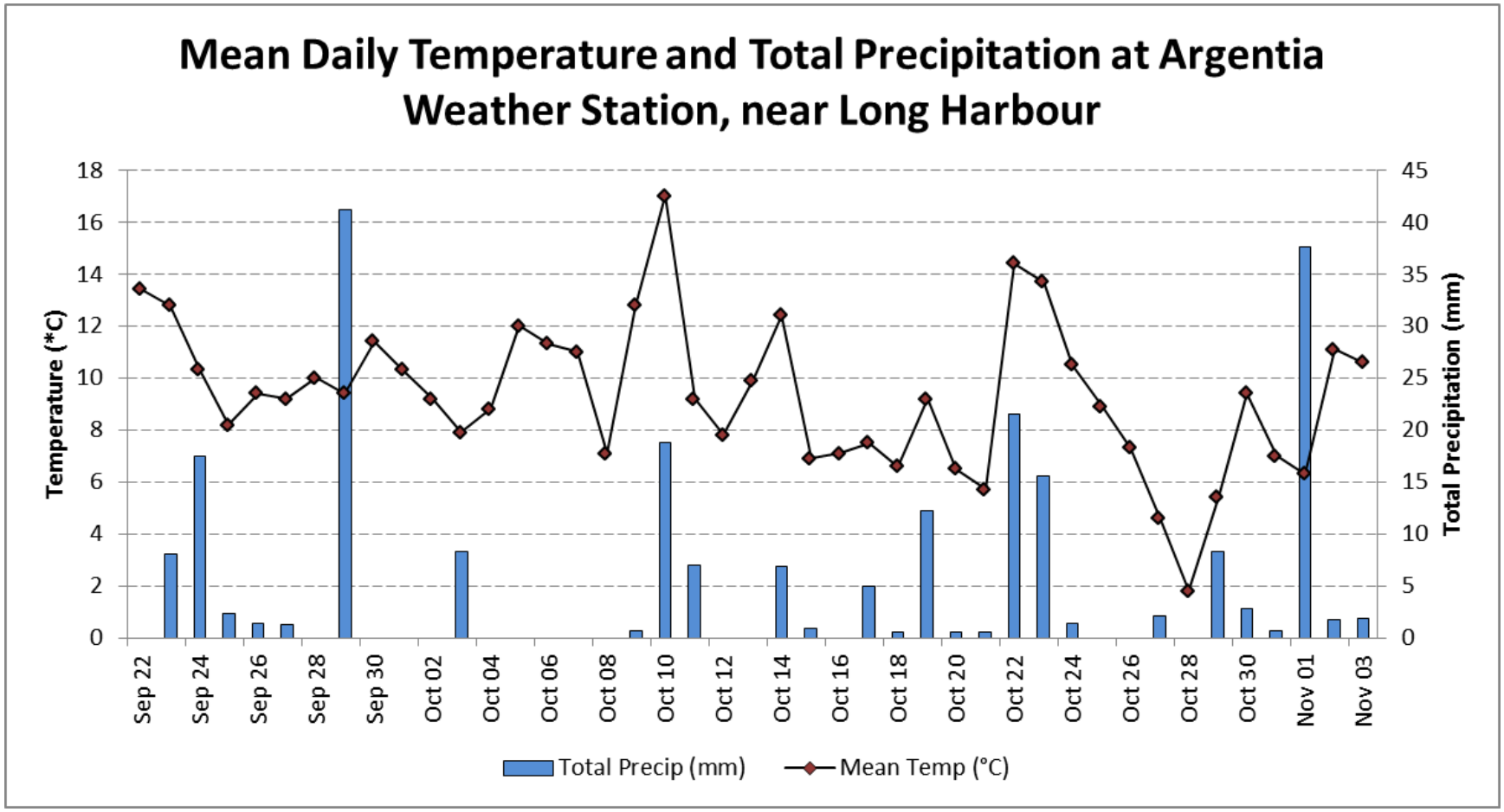
Appendix


Mean Daily Temperature and Total Precipitation at Argentia Weather Station, near Long Harbour
Temperature (*C)
Total Precipitation (mm)
18
16
14
12
10
8
6
4
2
0
45
40
35
30
25
20
15
10
5
0
Sep 22
Sep 24
Sep 26
Sep 28
Sep 30
Oct 02
Oct 04
Oct 06
Oct 08
Oct 10
Oct 12
Oct 14
Oct 16
Oct 18
Oct 20
Oct 22
Oct 24
Oct 26
Oct 28
Oct 30
Nov 01
Nov 03
Total Precip (mm)
Mean Temp (°C)