Real-Time Water Quality Deployment Report

Rattling Brook Network

November 13, 2015 to December 10, 2015

Newfoundland Labrador

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

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2015-11-13 to 2015-12-10

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- A fault with the datalogging equipment resulted in a power failure and dataloss for the Bridge station after November 19, 4:30 pm. The dissolved oxygen sensor failed earlier on November 17, 6:30 pm.
- 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

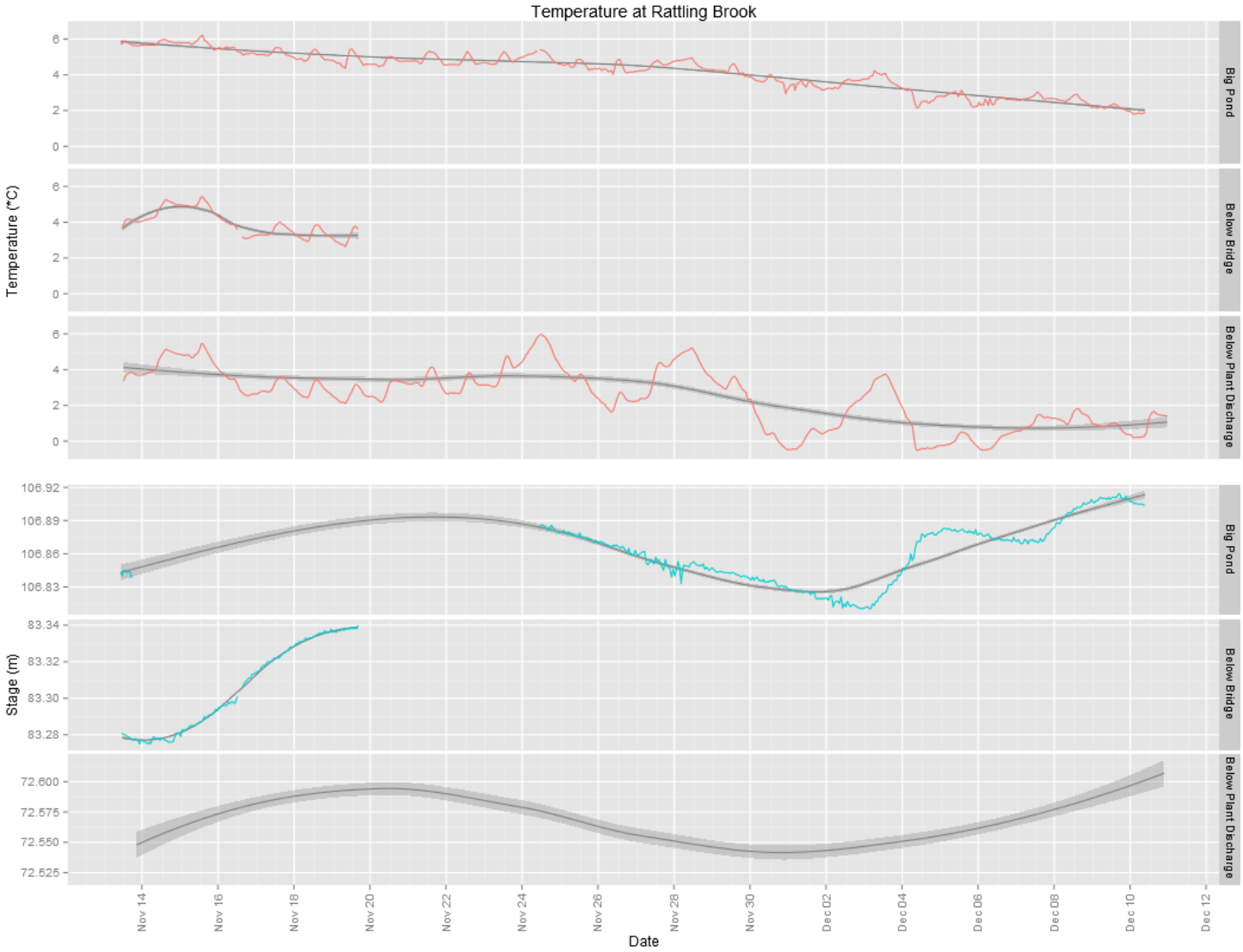
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	November 13, 2015	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	December 10, 2015	Removal	Good	Good	Poor	Poor	Excellent
Rattling Brook below Bridge	November 13, 2015	Deployment	Excellent	Fair	Excellent	Excellent	Fair
	December 10, 2015	Removal	NA	NA	NA	NA	NA
Rattling Brook below Plant Discharge	November 13, 2015	Deployment	Good	Fair	Excellent	Excellent	Good
	December 10, 2015	Removal	Excellent	Excellent	Poor	Poor	Good

- A YSI Exo2 was used as a QAQC sonde during the removal operations. Unexpectedly substantial differences between some Field and QAQC sonde parameters lead to rankings that appear to be unfair to actual conditions. This may have been the result of a bad calibration. The dissolved oxygen sensor on the QAQC sonde at deployment, for example, produced a very low oxygen concentration of 77% at Big Pond station. This value is highly unlikely, especially in the winter.

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	4.16	4.49	1.78	6.20
Below Bridge	3.93	3.88	2.63	5.44
Below Plant Discharge	2.46	2.68	-0.51	5.96

- Water temperature fell continuously at Big Pond and Discharge stations throughout the deployment period as air temperatures decreased into late fall.

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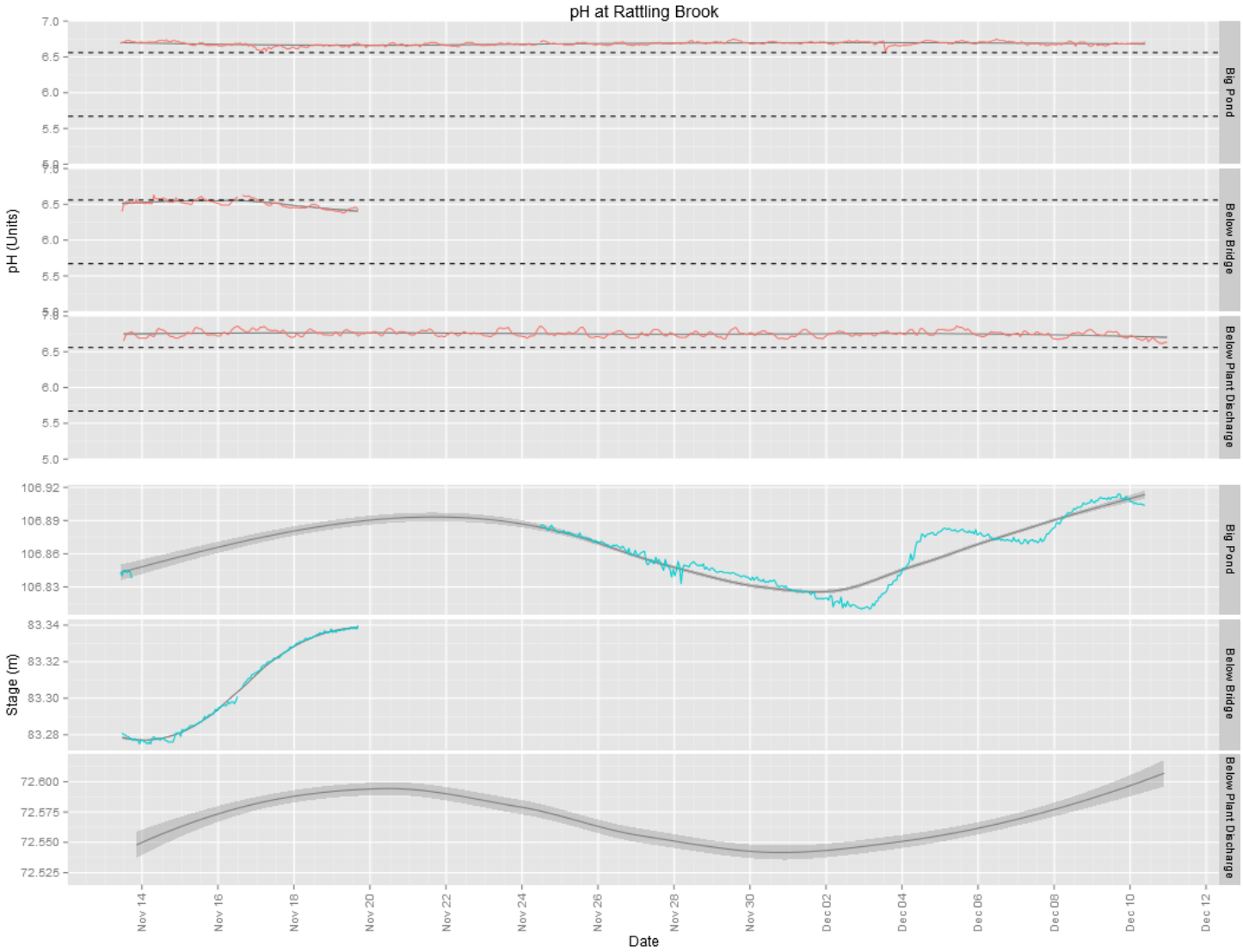
pH

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	6.68	6.69	6.57	6.75
Below Bridge	6.51	6.51	6.38	6.63
Below Plant Discharge	6.75	6.75	6.61	6.86

- pH values were consistent at Big Pond and Plant Discharge stations throughout the deployment period with only the remnants of diurnal variation left at Plant Discharge station (compared to those observed in July and August). This is indicative of the slowdown in the activity of aquatic life within Rattling Brook.
- All values at Big Pond and Plant Discharge station were slightly above the Site Specific Guidelines (dashed lines) of 5.67 – 6.56.

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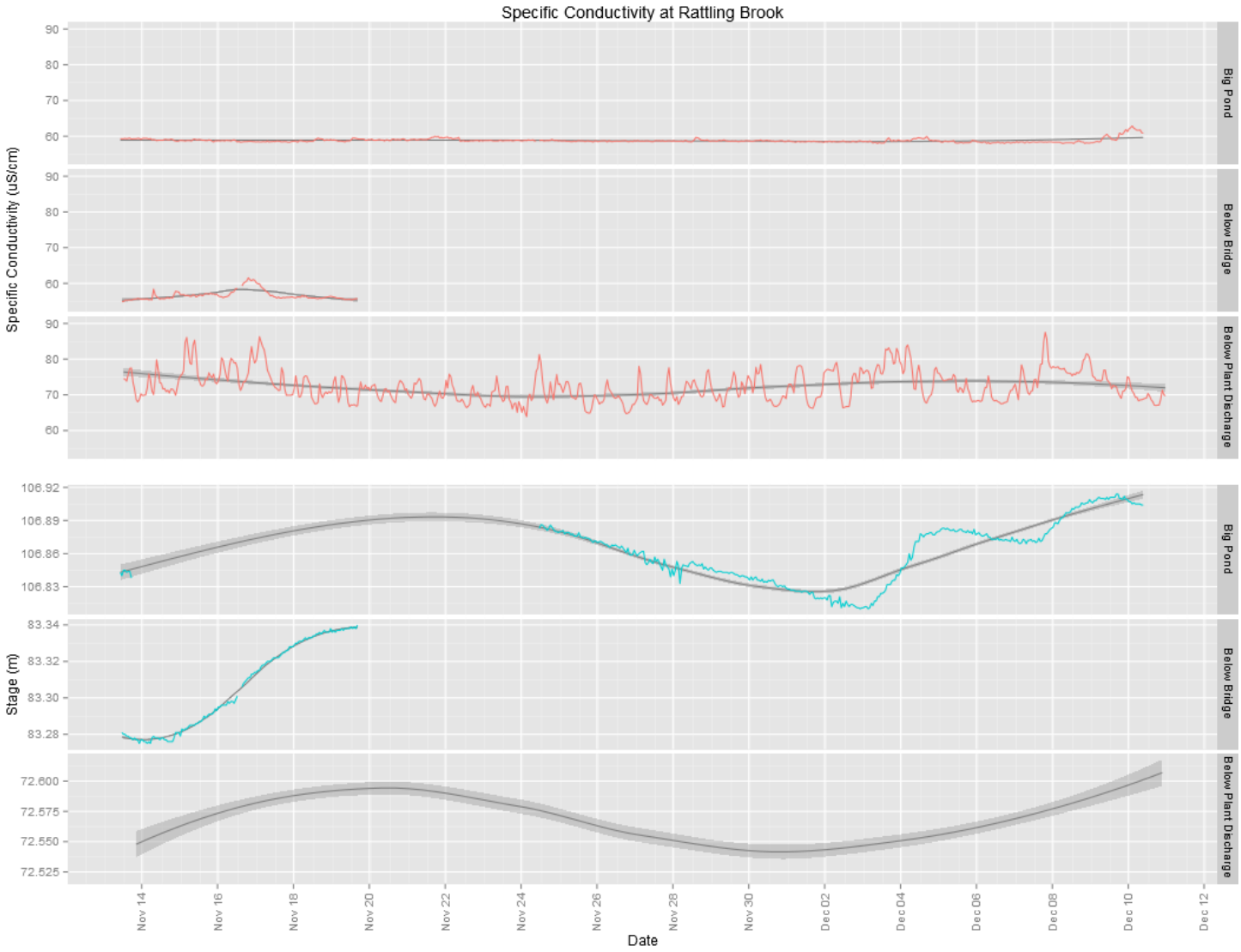
Specific Conductivity

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	58.8	58.7	57.9	62.9
Below Bridge	56.6	56.2	54.9	61.6
Below Plant Discharge	72.4	71.7	63.9	87.5

- Specific conductivity was much higher and more variable at Plant Discharge station than upstream at Big Pond and Bridge station (for the little data available) because of discharge from settling ponds.

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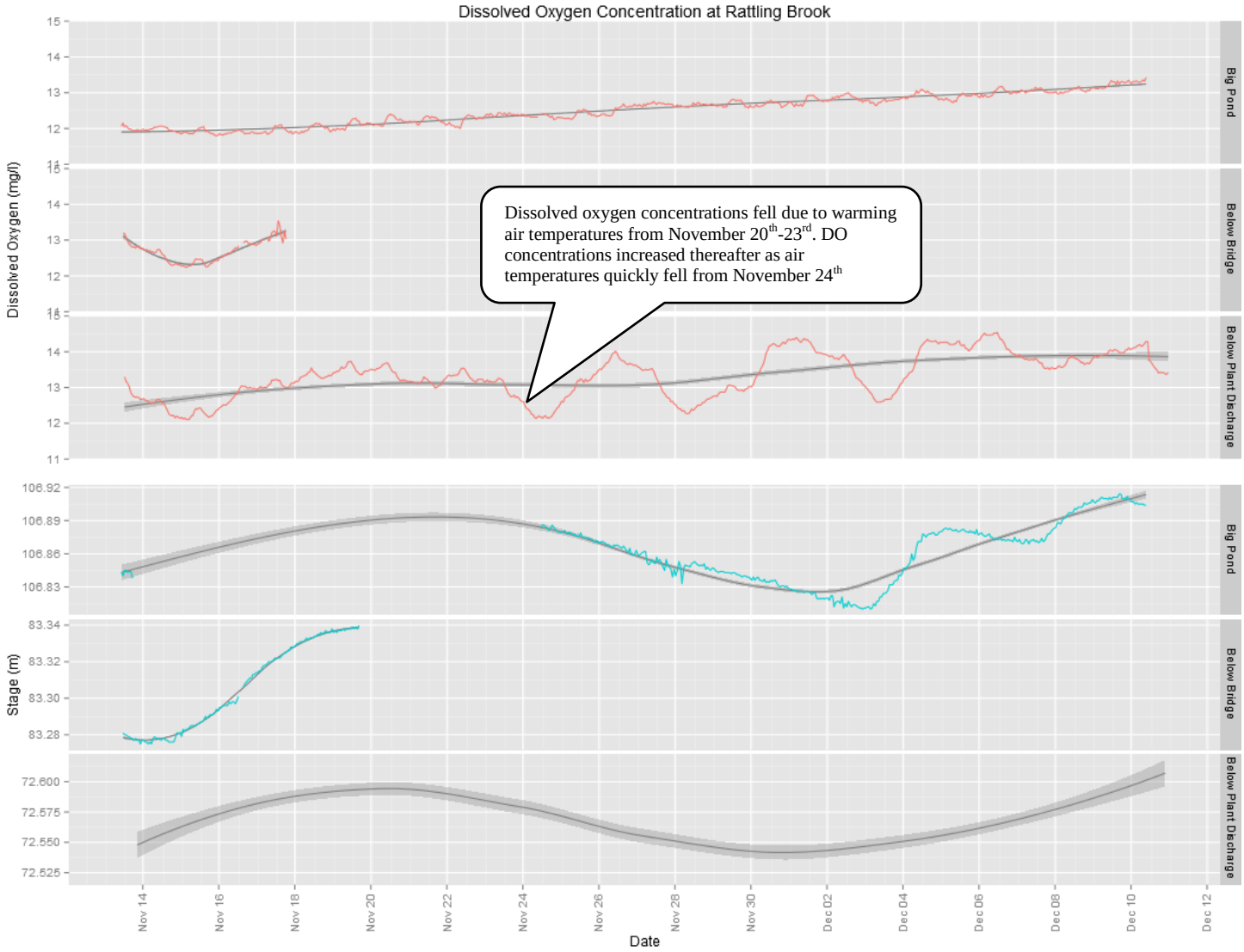
Dissolved Oxygen

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	12.51	12.60	11.80	13.43
Below Bridge	12.69	12.69	12.24	13.54
Below Plant Discharge	13.33	13.33	12.11	14.54

- Dissolved oxygen concentrations increased slowly at Big Pond and Plant Discharge stations throughout the deployment period with some perturbations observed at Plant Discharge station

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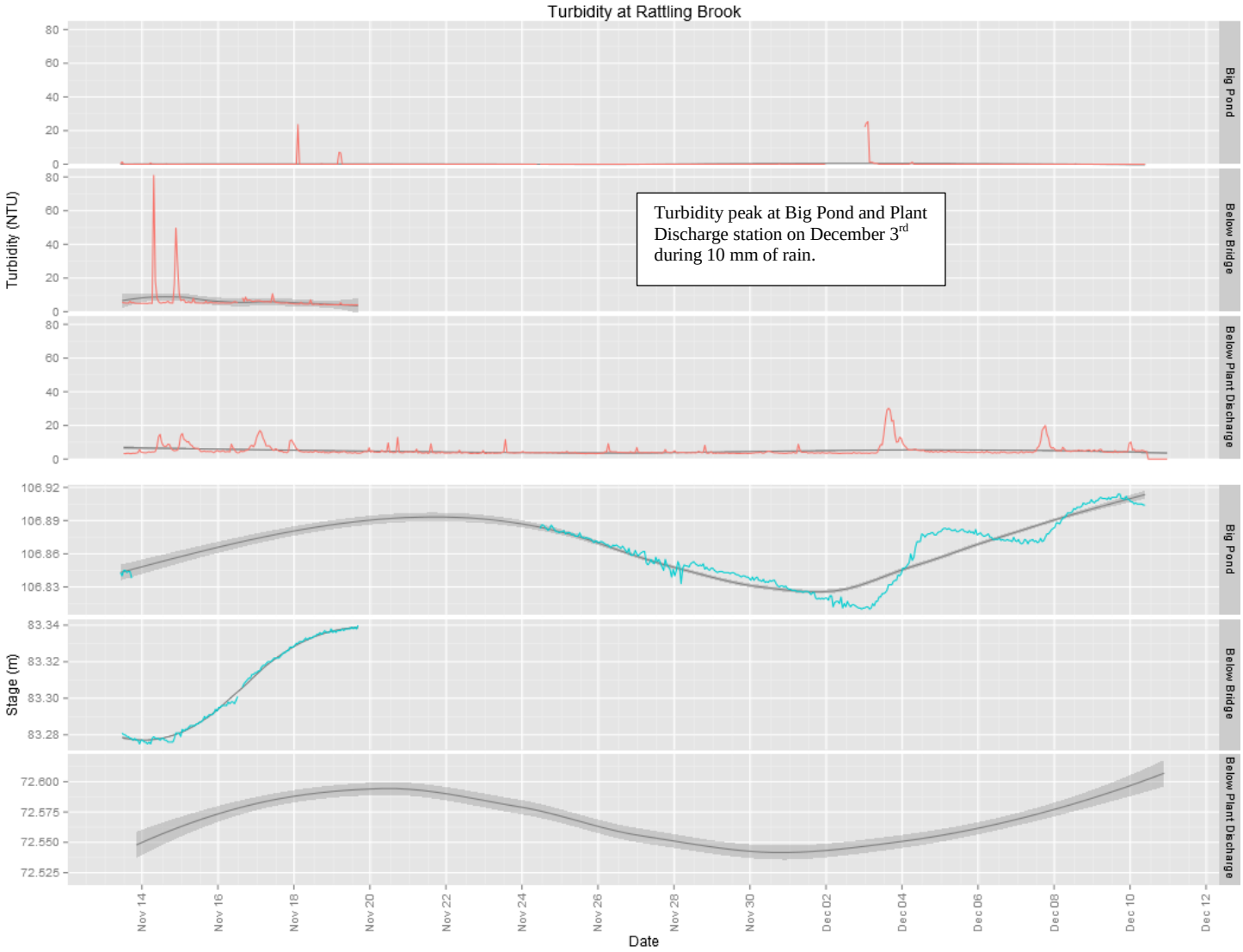
Turbidity

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	25.3
Below Bridge	6.5	5.2	3.9	80.9
Below Plant Discharge	4.9	4.0	0.0	30.2

- Turbidity levels were consistently low at Big Pond station throughout the deployment period. Plant Discharge station showed a light level of turbidity between 4 and 5 NTU for most of the deployment which is higher than other deployment periods in 2015.

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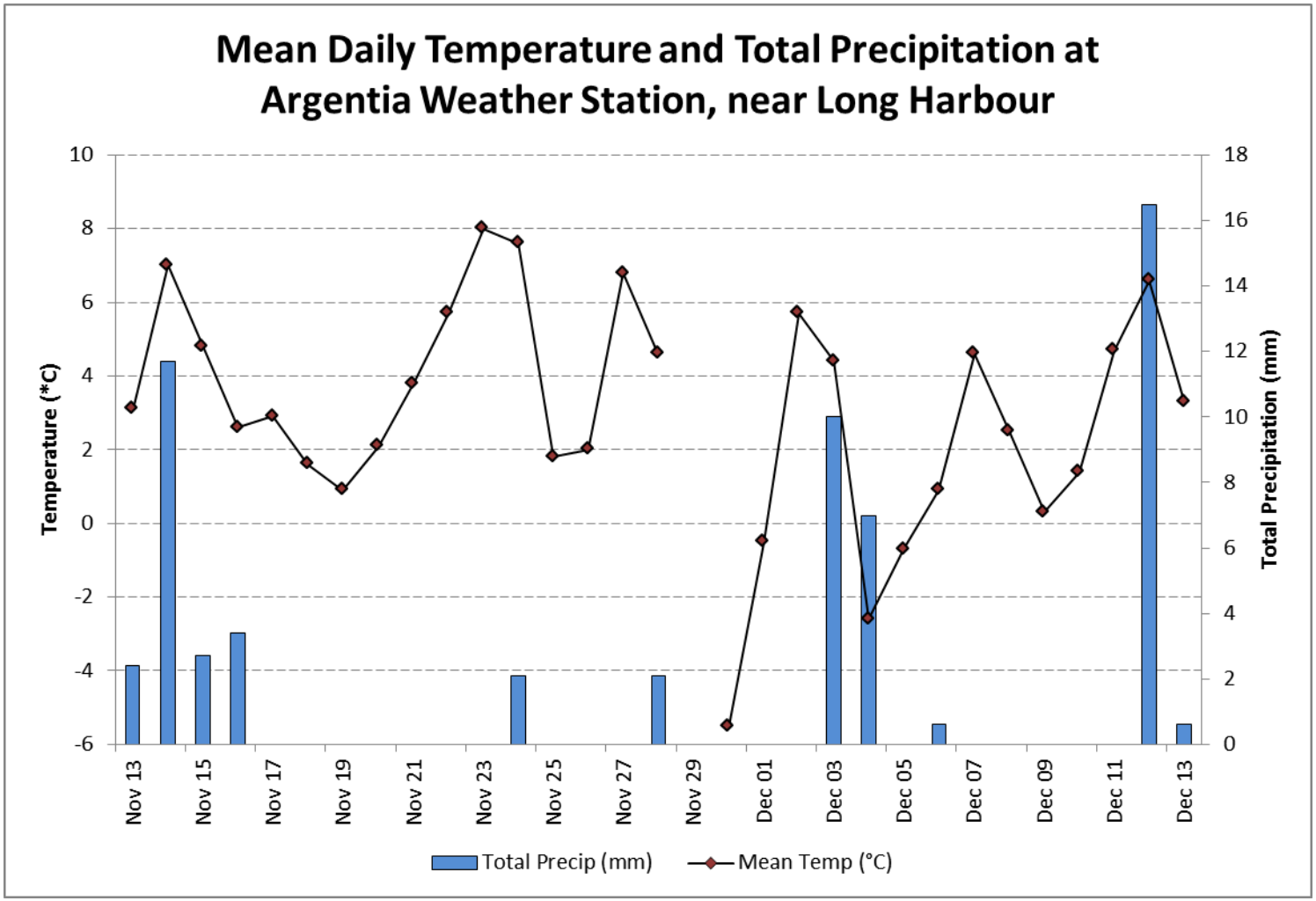
Appendix



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