Real-Time Water Quality Deployment Report

Rattling Brook Network

August 5, 2016 to September 22, 2016

Newfoundland Labrador

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

Real-Time Water Quality Deployment Report

Rattling Brook Network

2016-08-05 to 2016-09-22

General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- Elevated turbidity levels were seen at Plant Discharge station for the duration of this deployment. Background levels on this instrument were near 20 NTU. It must be noted that these values are not accurate but are retained only to show changes and variation over time.
- 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

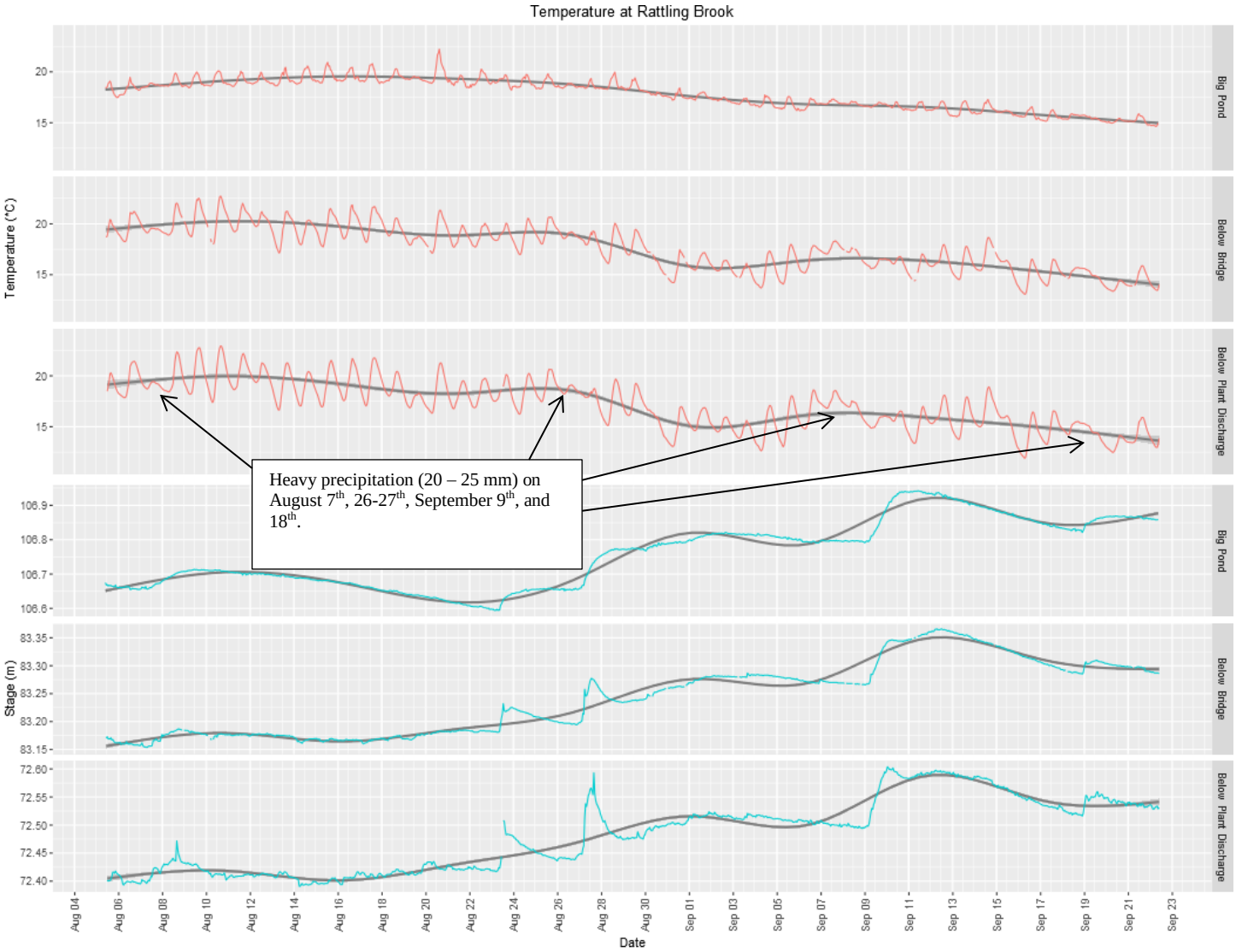
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2016-08-05	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	2016-09-22	Removal	Good	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	2016-08-05	Deployment	Excellent	Good	Excellent	Excellent	Good
	2016-09-22	Removal	Poor	Poor	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	2016-08-05	Deployment	Good	Good	Good	Excellent	Poor
	2016-09-22	Removal	Poor	Poor	Excellent	Excellent	Poor

- Notable differences in temperature and pH values were found between the QAQC and Bridge field sondes during removal. These differences could be explained by unusually high inter-instrument variation – potentially as a result of sensor error on the QAQC sonde.
- “Poor” values were recorded for turbidity at Plant Discharge Station at deployment and removal due to a sensor issue on the field sonde.

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.



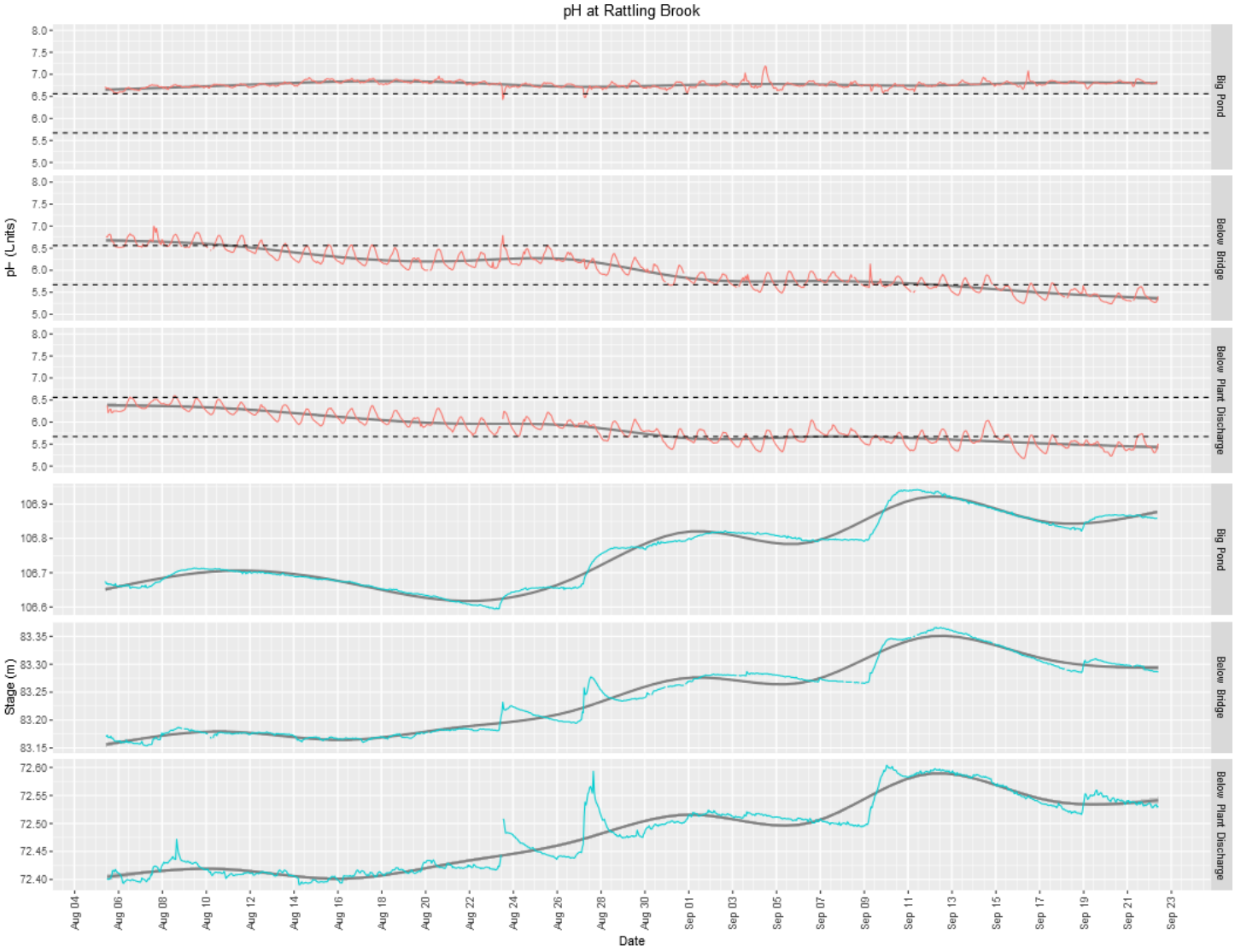
Station	Mean	Median	Min	Max
Big Pond	17.80	18.14	14.64	22.24
Below Bridge	17.63	17.77	13.09	22.73
Below Plant Discharge	17.17	17.22	11.89	22.94

- Water temperature slowly declined at all three stations over the course of the deployment period as air temperatures decline into fall.
- A few temporary perturbations were seen in relation to high flow and precipitation.

*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.



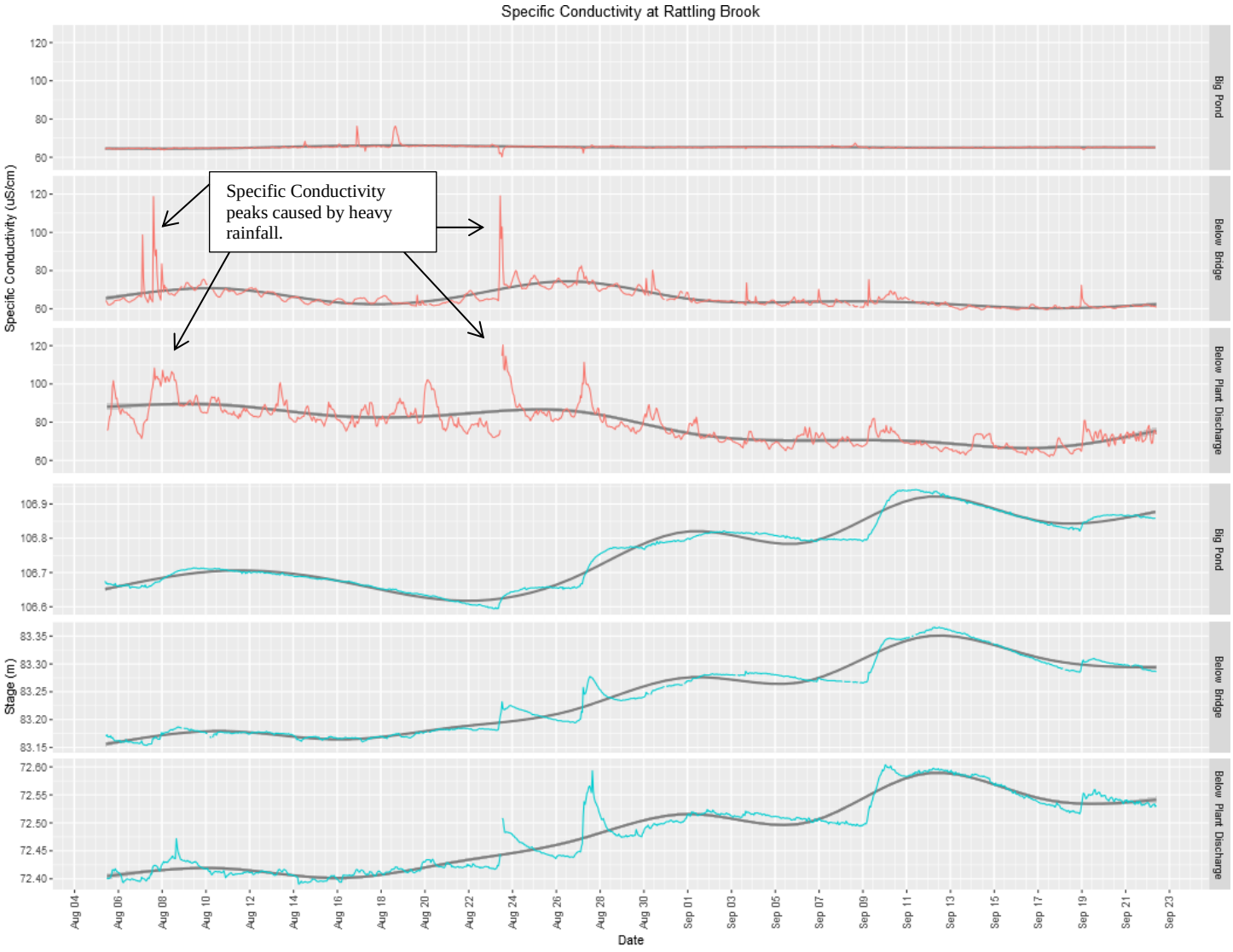
Station	Mean	Median	Min	Max
Big Pond	6.77	6.77	6.43	7.19
Below Bridge	6.01	6.01	5.24	7.00
Below Plant Discharge	5.85	5.82	5.17	6.60

- pH at Big Pond station was stable throughout the deployment period, while declines were observed at Bridge and Plant Discharge stations.
- pH values were mostly above the Site Specific Guidelines (dashed lines) at Bridge station while they fell within the guidelines at Bridge and Discharge stations for much of the deployment before falling below near the end of the deployment.

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

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.



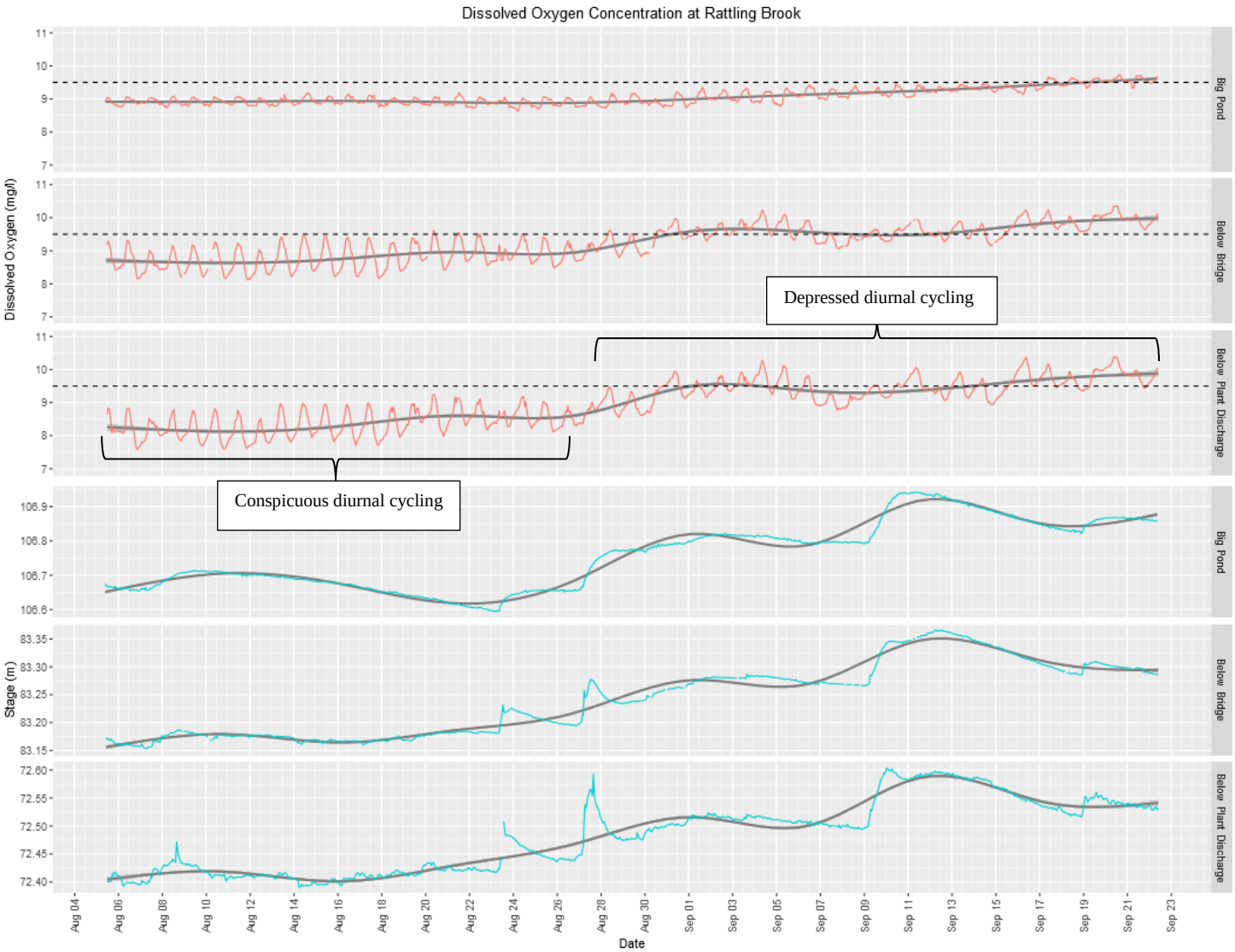
Station	Mean	Median	Min	Max
Big Pond	65.3	65.3	60.2	76.3
Below Bridge	65.7	64.3	59.6	119.1
Below Plant Discharge	78.2	77.3	61.9	120.4

- An influx of rain-derived freshwater is likely responsible for the decline in conductivity at Bridge and Plant Discharge stations during this deployment period. Average and median conductivity values are similar at Big Pond and Bridge stations, although variation increases substantially along the river.
- Conductivity is typically higher at Plant Discharge station than upstream.

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

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.



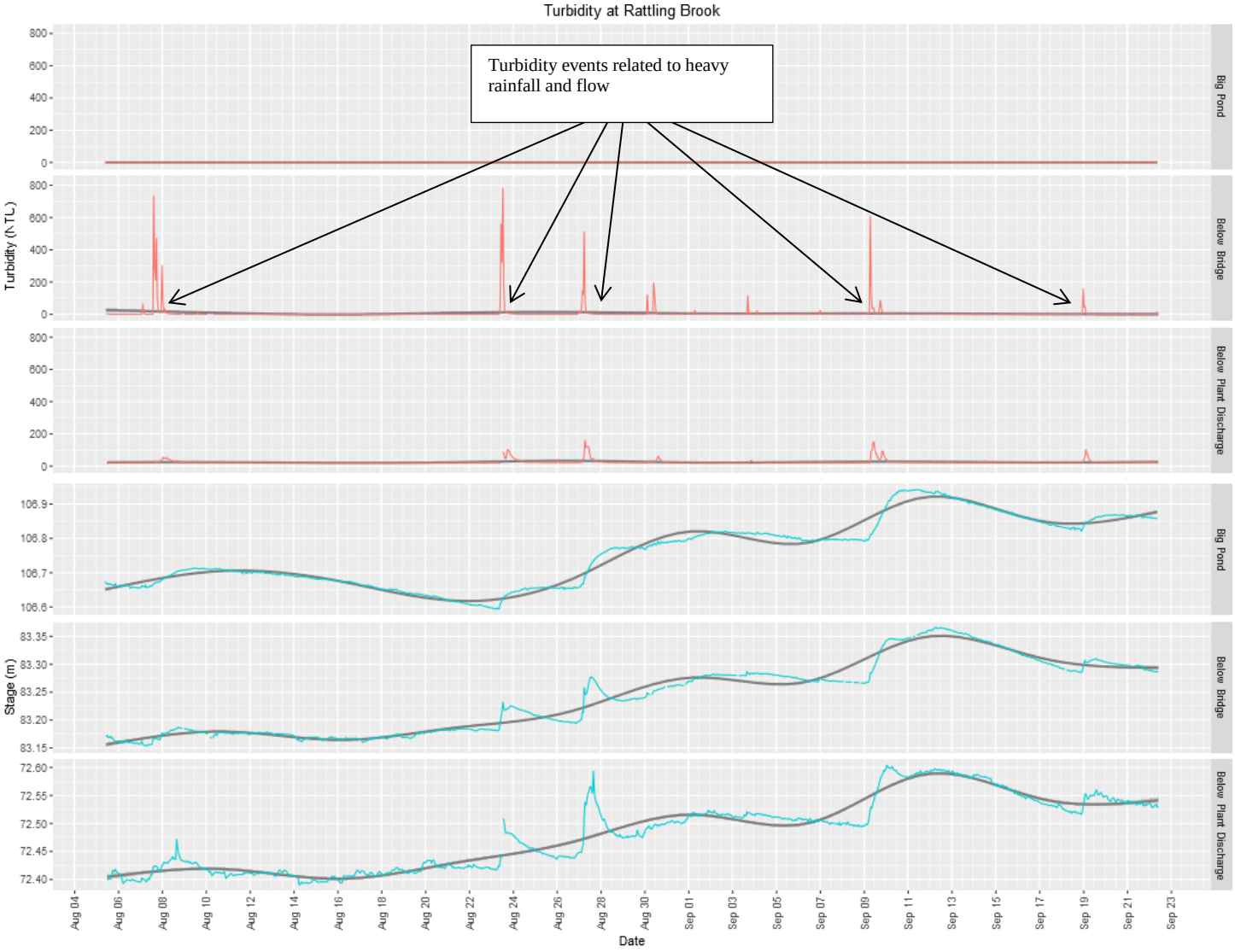
Station	Mean	Median	Min	Max
Big Pond	9.08	9.02	8.62	9.73
Below Bridge	9.23	9.30	8.12	10.37
Below Plant Discharge	8.96	8.97	7.58	10.40

- As water temperature declines, dissolved oxygen concentration increases. Early in the deployment period, diurnal cycling is conspicuous and drops in magnitude as the deployment period proceeds. This could be the result of aquatic productivity declining into the fall or as a result of rising water levels from precipitation.

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

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.

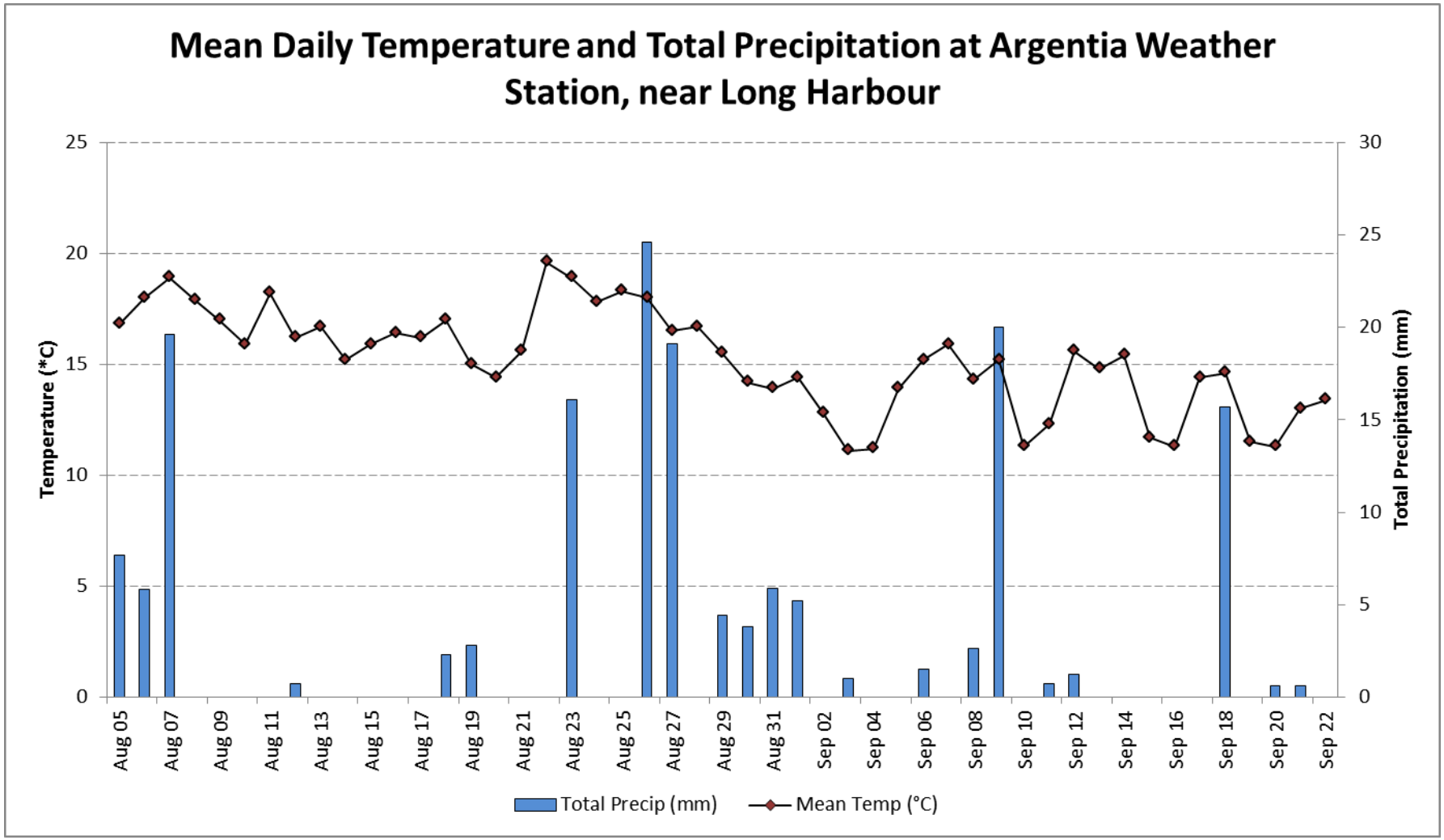


Station	Mean	Median	Min	Max
Big Pond	0.0	0.0	0.0	1.2
Below Bridge	6.7	0.0	0.0	781.0
Below Plant Discharge	25.2	22.0	10.6	159.4

- A consistent and stable baseline turbidity value near 20 NTU was observed at Plant Discharge station. Since this was apparent at deployment and removal with no notable turbidity present it can be assumed that there was some interference in readings throughout the deployment period.
- Turbidity levels were mostly low throughout the deployment period except for some events that are related to heavy precipitation and flow.

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

Appendix



Prepared by:
Ryan Pugh
Department of Environment and Climate Change
Water Resources Management Division
Phone: 709.729.1681
Fax: 709.729.3020