Real-Time Water Quality Deployment Report

Rattling Brook Network

July 19, 2019 to Sept 17, 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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2019-07-19 to 2019-09-17

General

- All monitored water quality parameters values were within expected levels for this time of year.
- Monitoring equipment at Big Pond station was switched out with a freshly calibrated instrument in a single day, leading to a deployment period one day longer than the other two stations.
- Department of Municipal Affairs and Environment staff monitor the real-time web pages consistently.
- 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

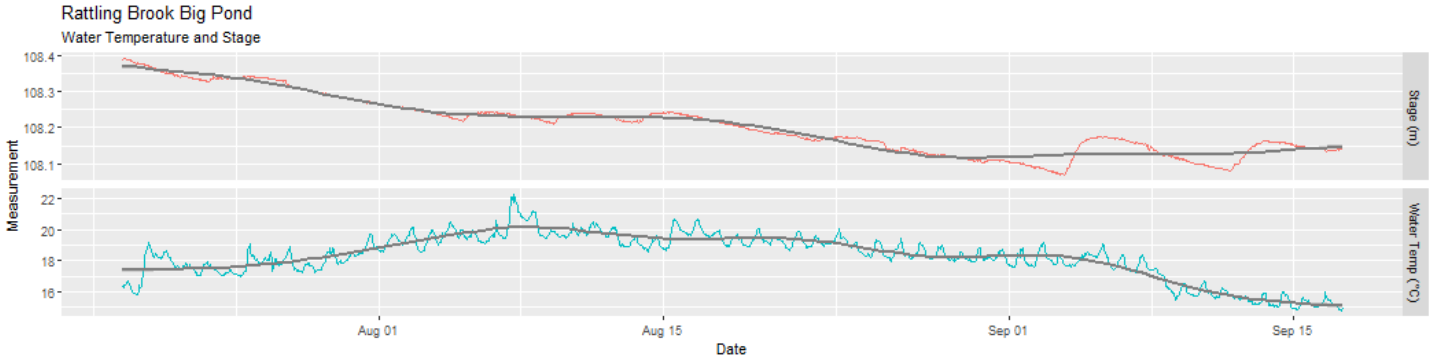
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	July 19, 2019	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	Sept 17, 2019	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	July 19, 2019	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	Sept 17, 2019	Removal	Excellent	Excellent	Good	Excellent	Excellent
Rattling Brook below Plant Discharge	July 19, 2019	Deployment	Good	Good	Excellent	Excellent	Excellent
	Sept 17, 2019	Removal	Good	Good	Excellent	Excellent	Excellent

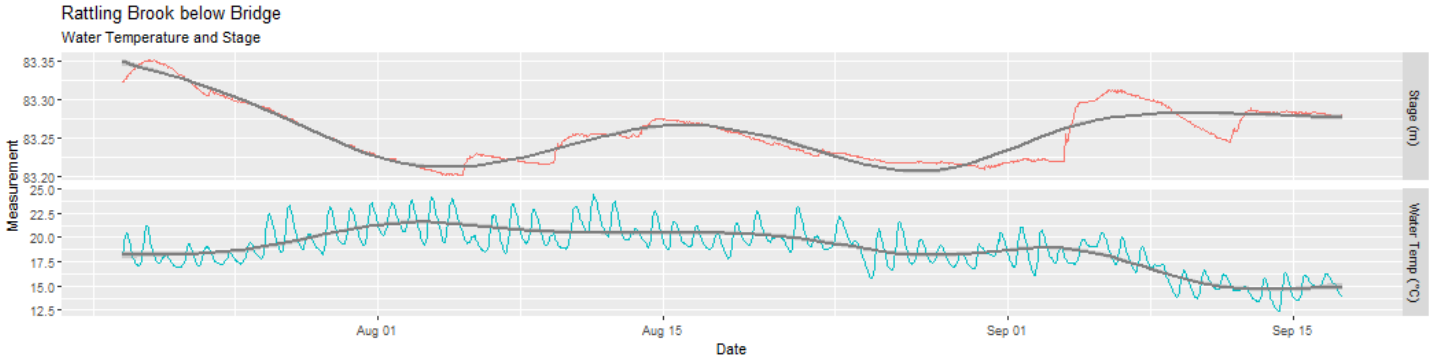
- QAQC rankings were all “Excellent” to “Good”.

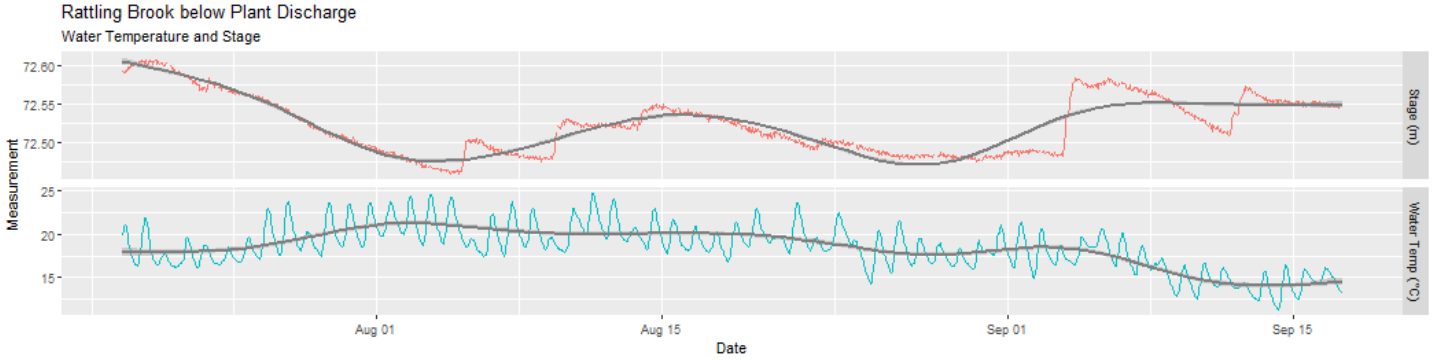
Data Interpretation

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.







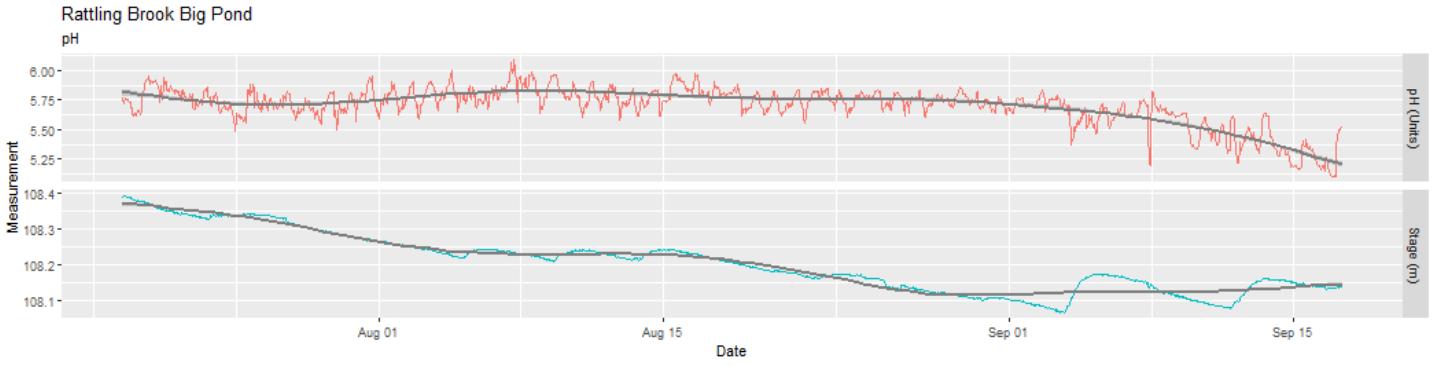
Station	Mean	Median	Min	Max
Big Pond	18.27	18.43	14.74	22.26
Below Bridge	18.92	19.11	12.40	24.42
Below Plant Discharge	18.47	18.55	11.25	24.67

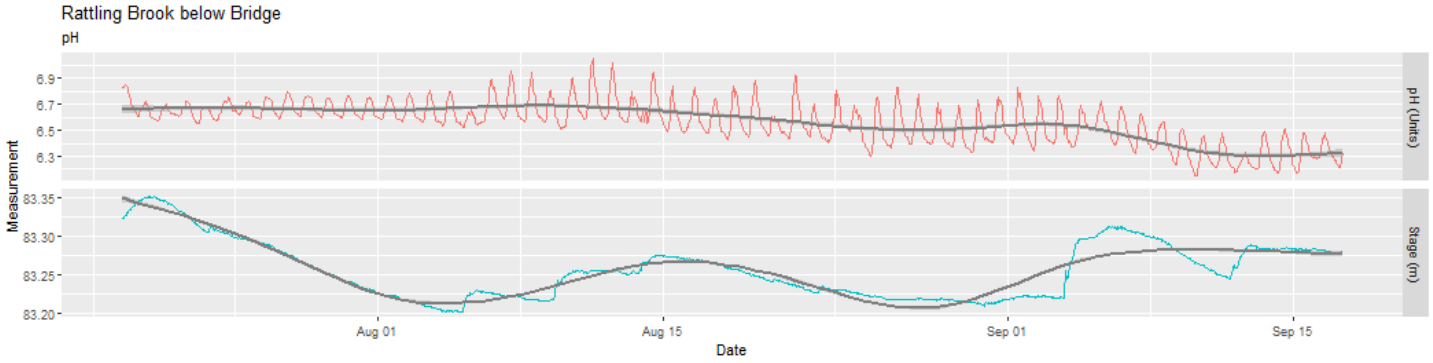
- Water temperatures increased steadily until approximately August 1st when a plateau in temperatures was observed. A cooling trend is also noted as seasonal changes occur from mid August into September.

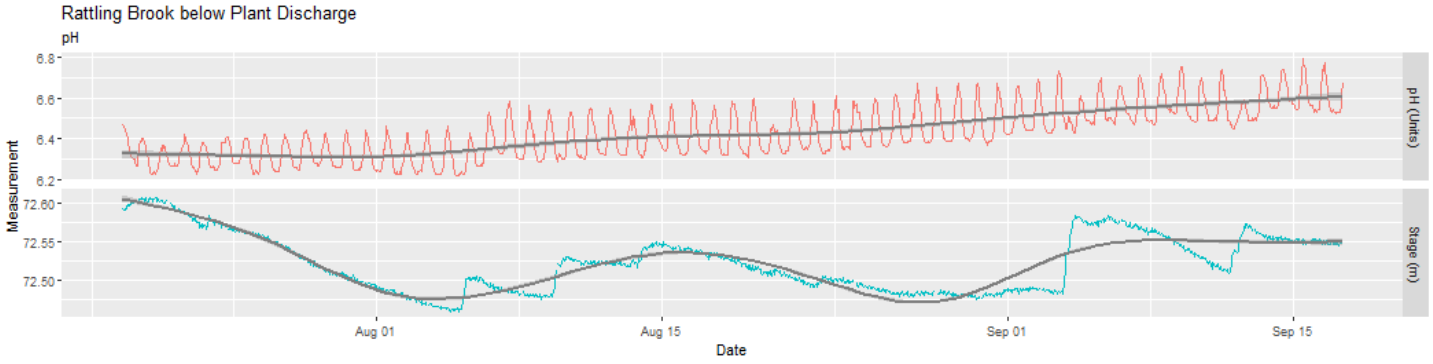
*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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	5.70	5.73	5.10	6.09
Below Bridge	6.56	6.59	6.15	7.05
Below Plant Discharge	6.41	6.43	6.22	6.79

- Most pH values were found between the site-specific guidelines (5.67-6.56 pH Units) during this deployment period. Big pond station was found to maintain a low-position between the upper and lower guidelines. Bridge station increased to near high-guideline levels, and Plant Discharge station was found to maintain mid-guideline levels.

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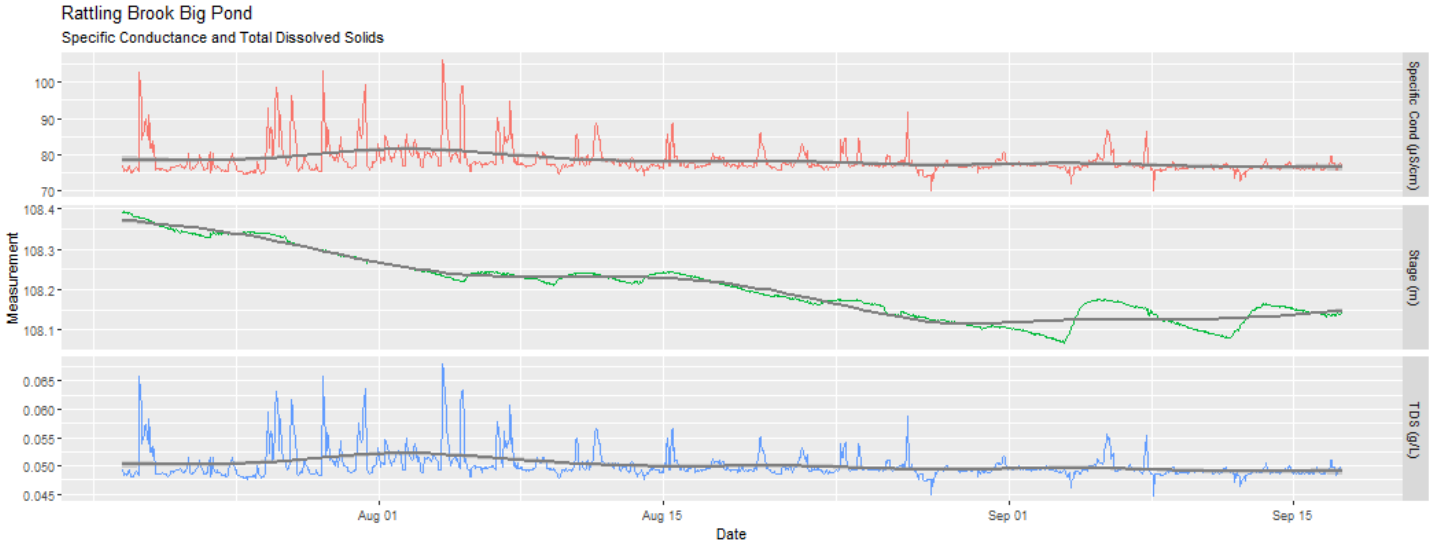
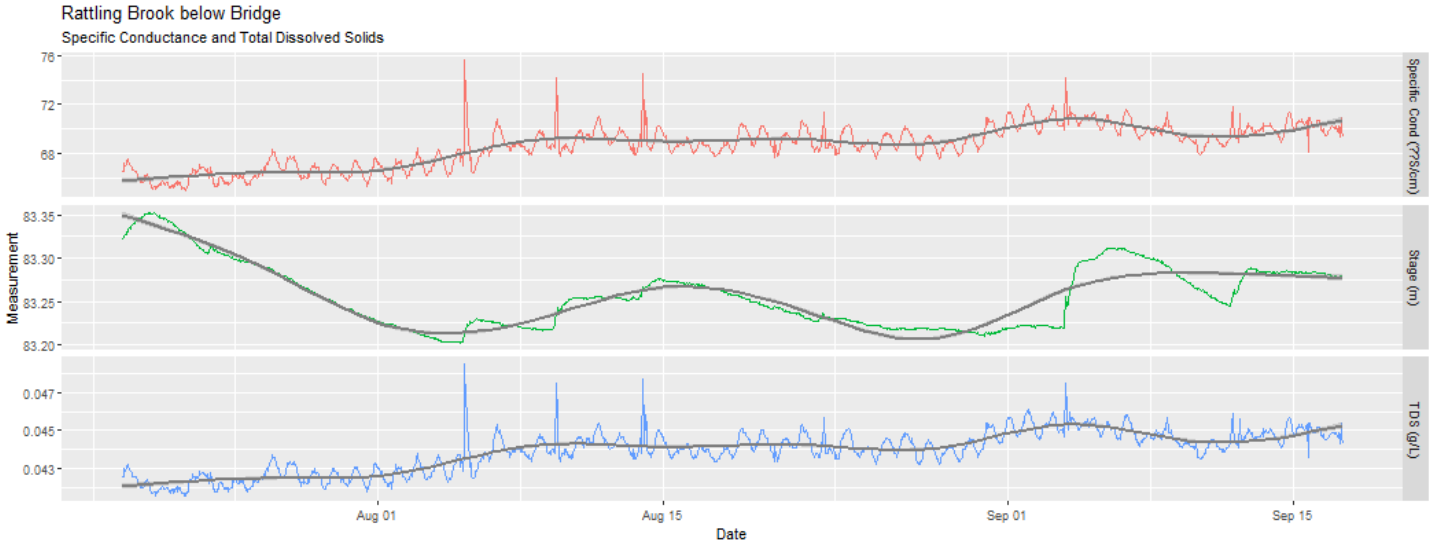
Specific Conductivity

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.





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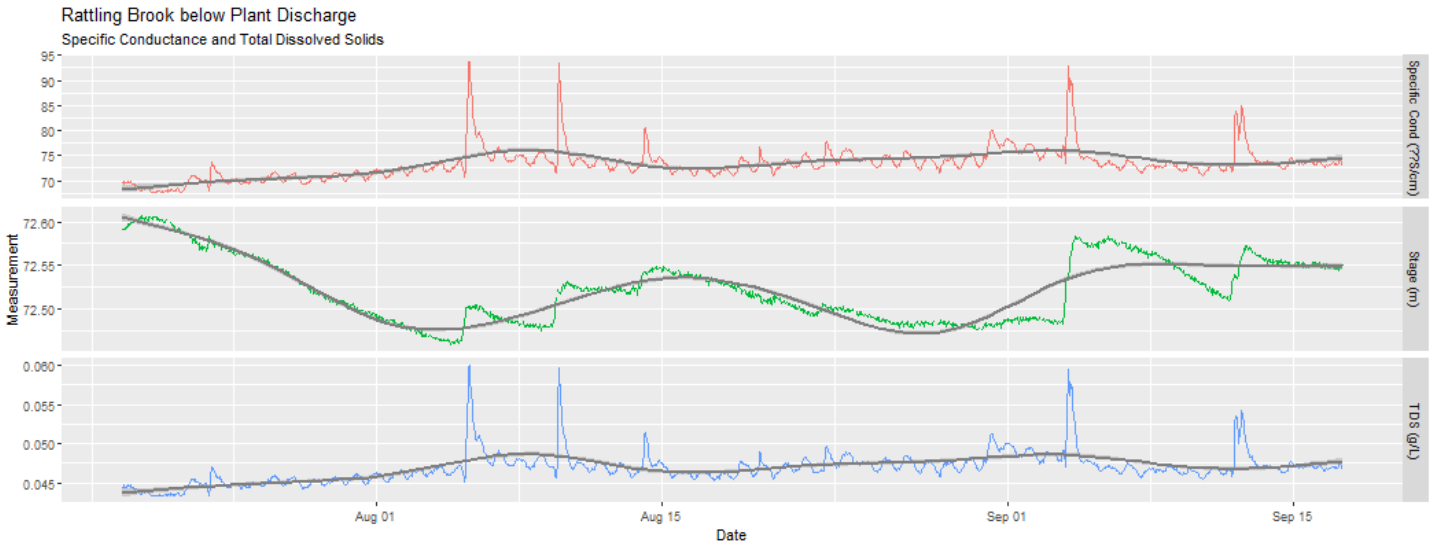

Station	Mean	Median	Min	Max
Big Pond	78.3	77.1	70.0	106.3
Below Bridge	68.6	68.8	64.9	75.7
Below Plant Discharge	73.3	73.1	67.6	93.8

- A large degree of variability in conductivity was observed at Big Pond station, especially in comparison to Bridge and Plant Discharge stations where conductivity was much more stable. Across the deployment period, the conductivity in the watershed fluctuated with the changes to stage level due to precipitation.
- Slight increases in conductivity over time were observed at Bridge and Plant Discharge stations.

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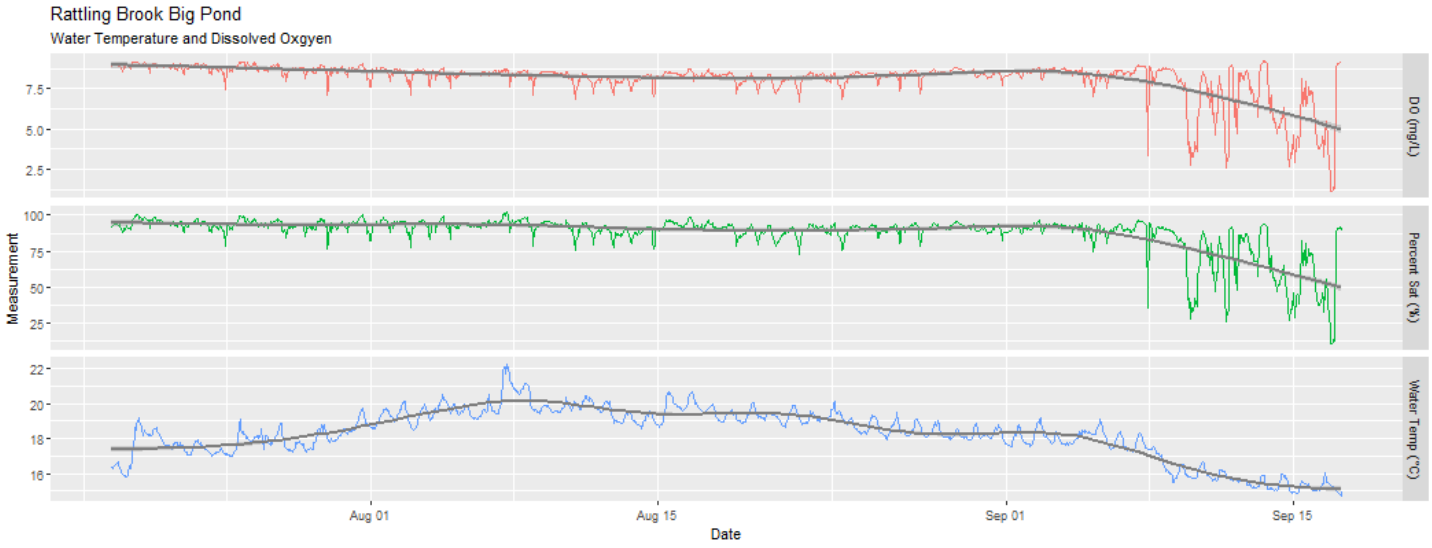
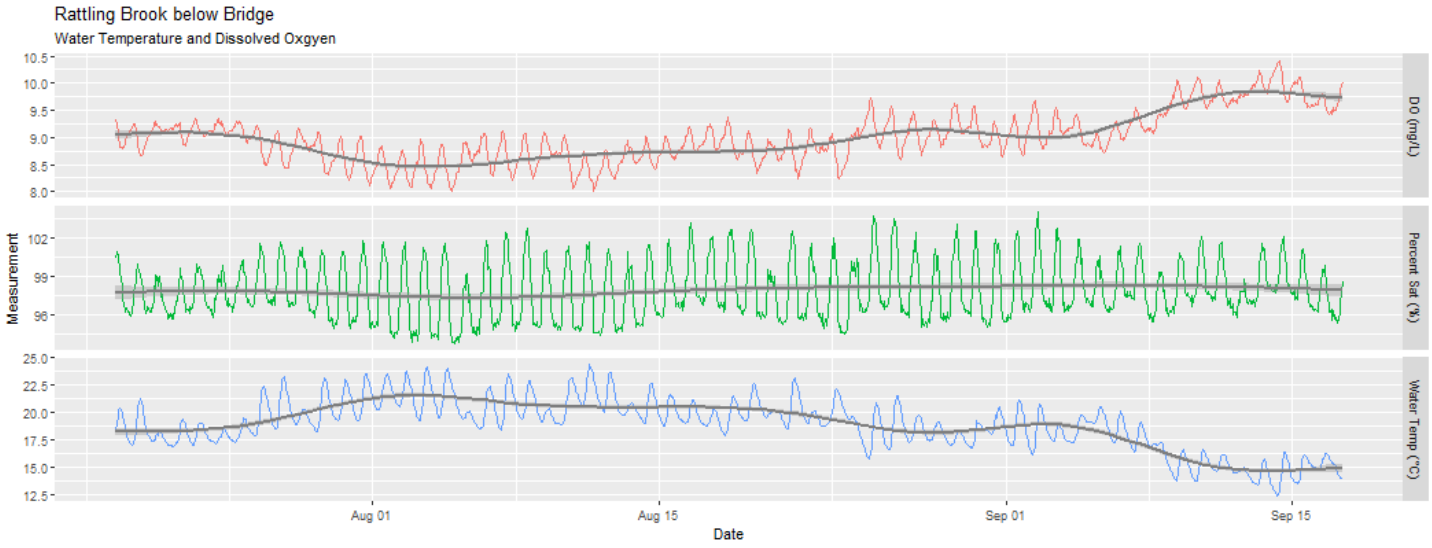
Dissolved Oxygen

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.





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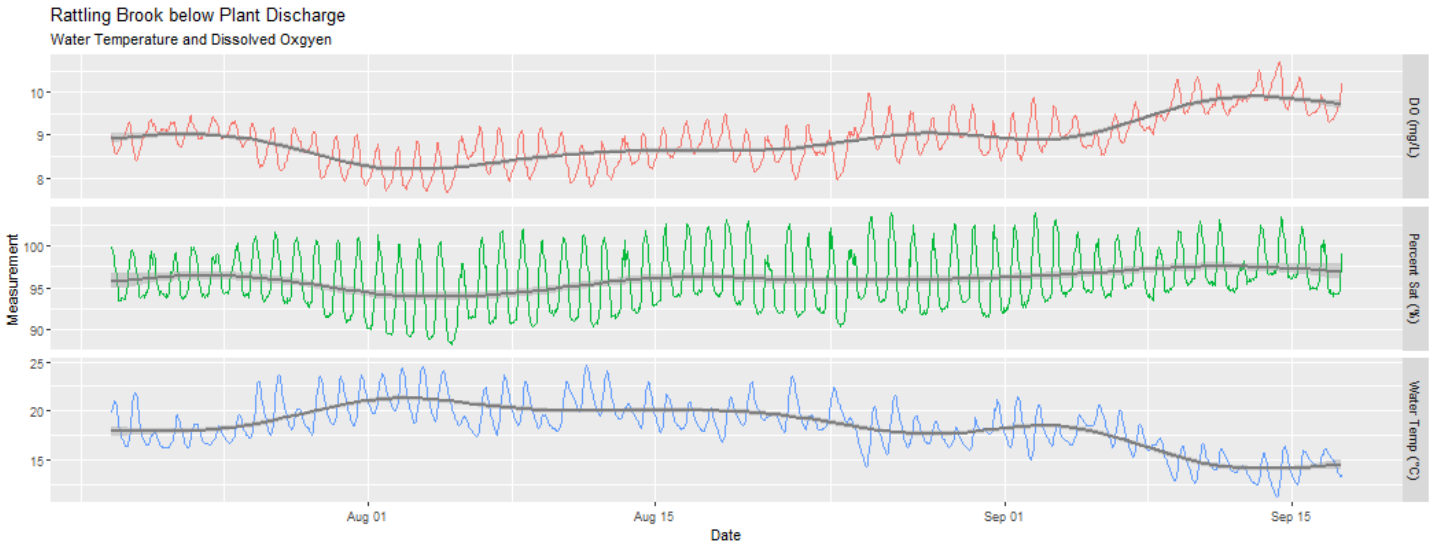

Station	Mean	Median	Min	Max
Big Pond	8	8.44	1.10	9.26
Below Bridge	8.99	8.96	8.0	10.42
Below Plant Discharge	8.90	8.87	7.66	10.72

- Dissolved oxygen concentrations declined during the height of the summer season in conjunction with rising water temperatures before increasing into September as water temperatures cooled. The instrument at Big Pond experienced DO issues which caused erratic measurements during the end of the deployment period.

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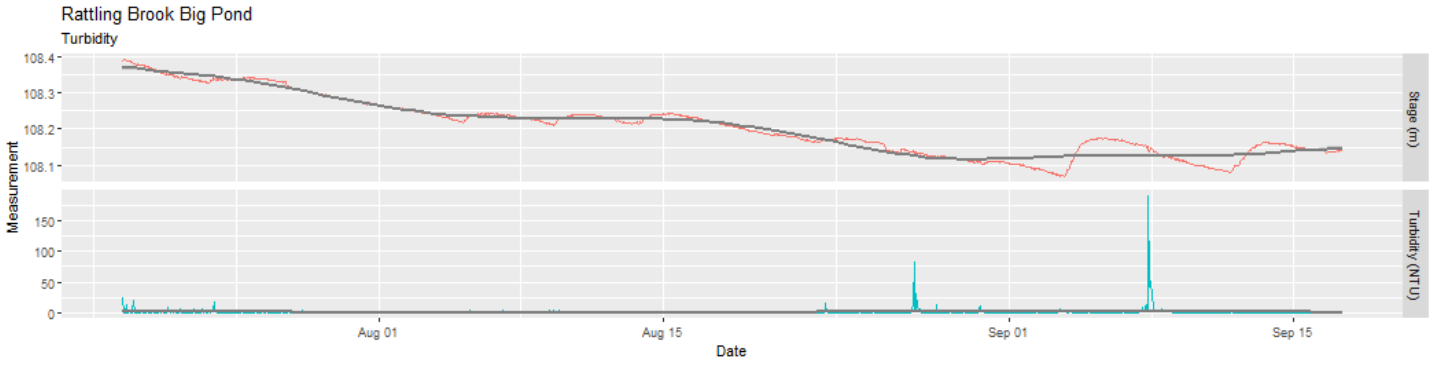
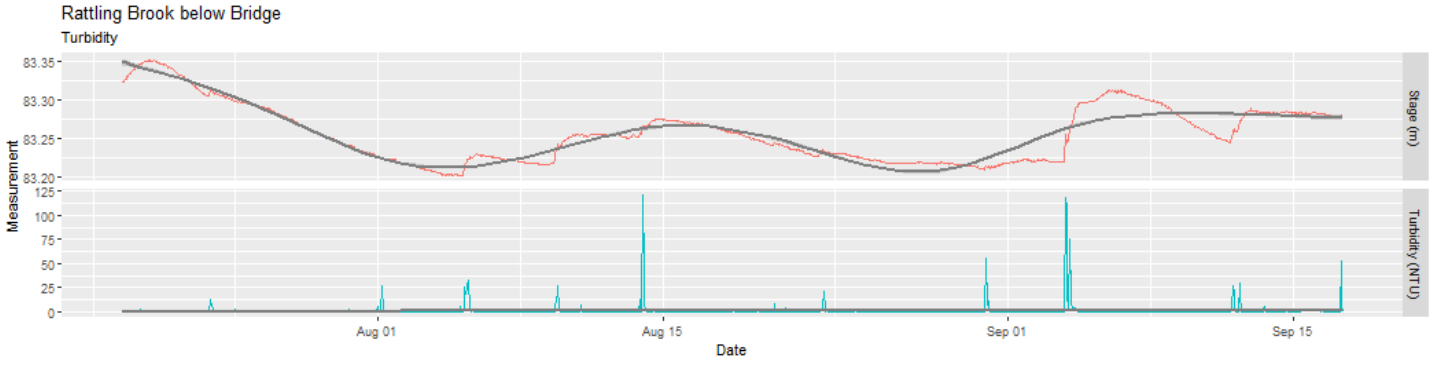
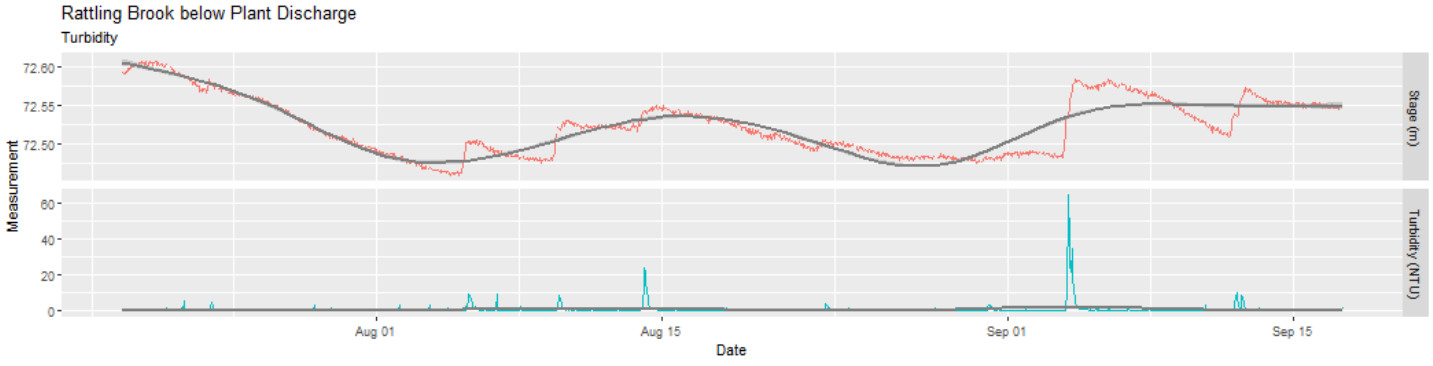
Turbidity

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	1.0	0.3	0.0	189.4
Below Bridge	0.9	0.0	0.0	121.2
Below Plant Discharge	0.6	0.0	0.0	64.7

- Turbidity levels were low for the majority of the deployment period at all three stations. Each turbidity event coincides with stage increases. This is likely due to the increased likelihood of mud and silt from the plant site and nearby roadways entering the river channel during numerous rain events (See Appendix).

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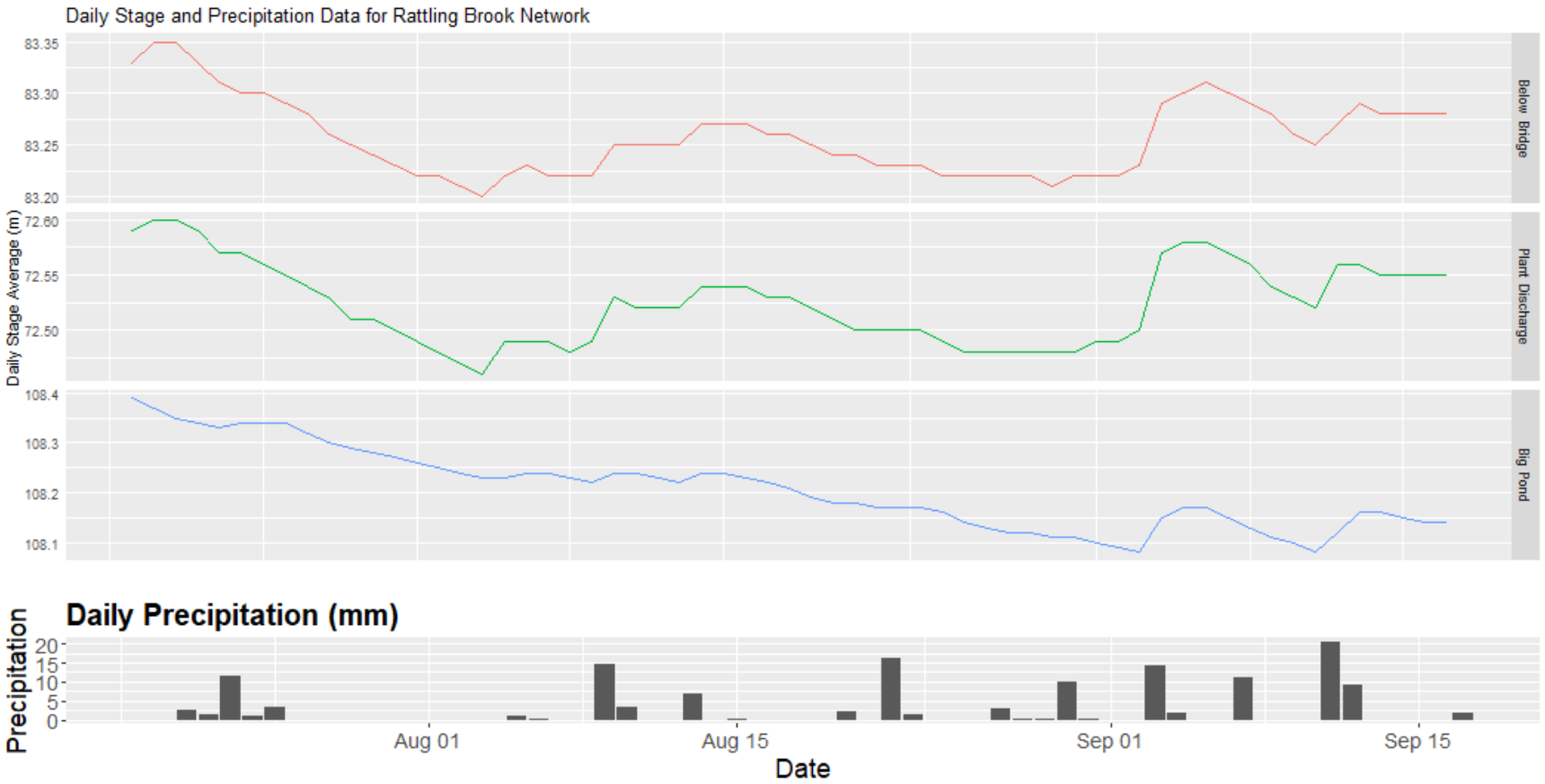
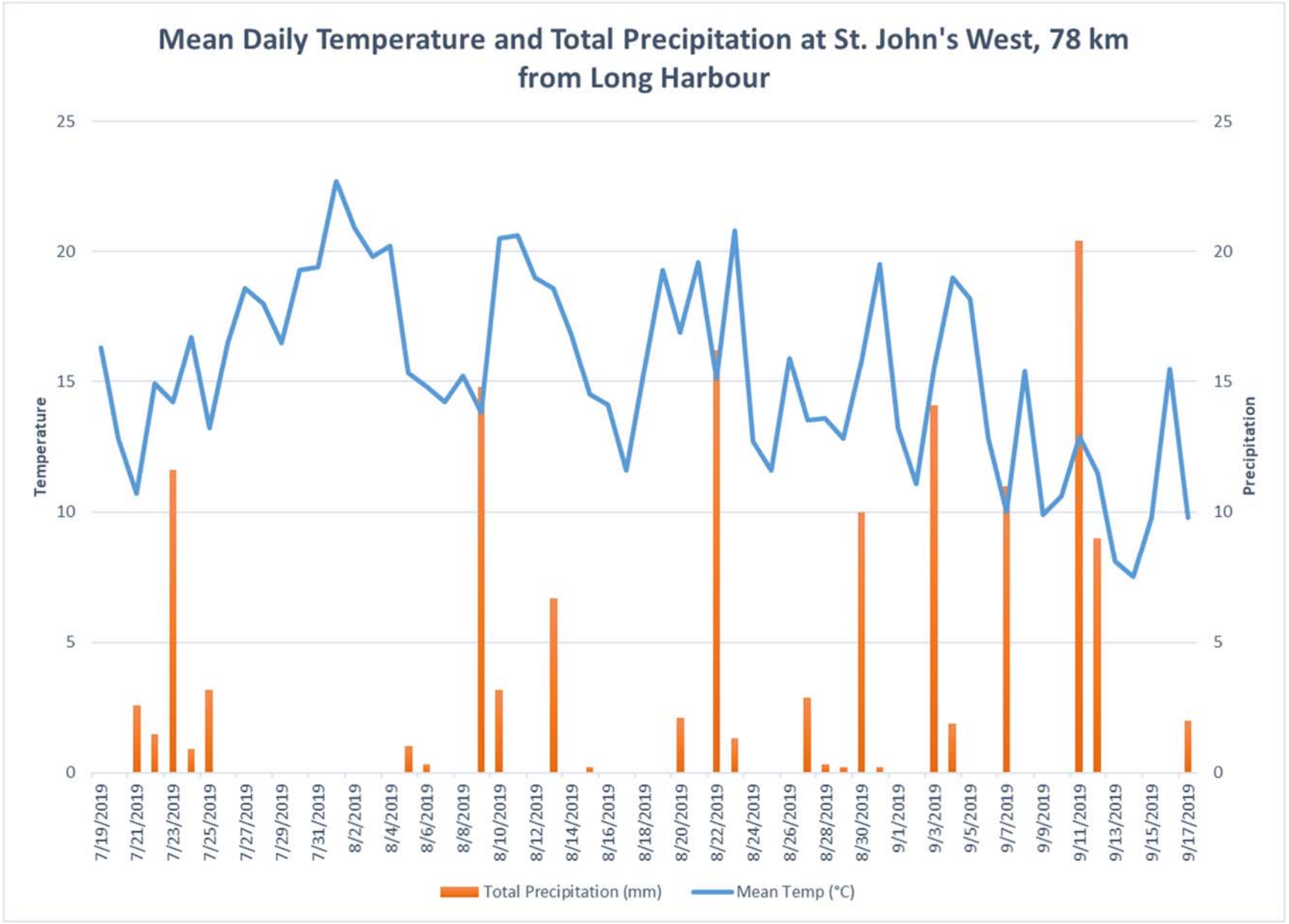
Appendix


Daily Stage and Precipitation Data for Rattling Brook Network
Daily Stage Average (m)
83.35
83.30
83.25
83.20
72.60
72.55
72.50
108.4
108.3
108.2
108.1
Below Bridge
Plant Discharge
Big Pond
Daily Precipitation (mm)
Precipitation
20
15
10
5
0
Aug 01
Aug 15
Sep 01
Sep 15
Date


Mean Daily Temperature and Total Precipitation at St. John's West, 78 km from Long Harbour
Temperature
Precipitation
25
20
15
10
5
0
7/19/2019
7/21/2019
7/23/2019
7/25/2019
7/27/2019
7/29/2019
7/31/2019
8/2/2019
8/4/2019
8/6/2019
8/8/2019
8/10/2019
8/12/2019
8/14/2019
8/16/2019
8/18/2019
8/20/2019
8/22/2019
8/24/2019
8/26/2019
8/28/2019
8/30/2019
9/1/2019
9/3/2019
9/5/2019
9/7/2019
9/9/2019
9/11/2019
9/13/2019
9/15/2019
9/17/2019
Total Precipitation (mm)
Mean Temp (°C)