Real-Time Water Quality Deployment Report

Rattling Brook Network

September 21, 2021 to November 2, 2021

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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2021-09-21 to 2021-11-02

General

- Department of Environment and Climate Change 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 (https://wateroffice.ec.gc.ca/index_e.html)*.

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

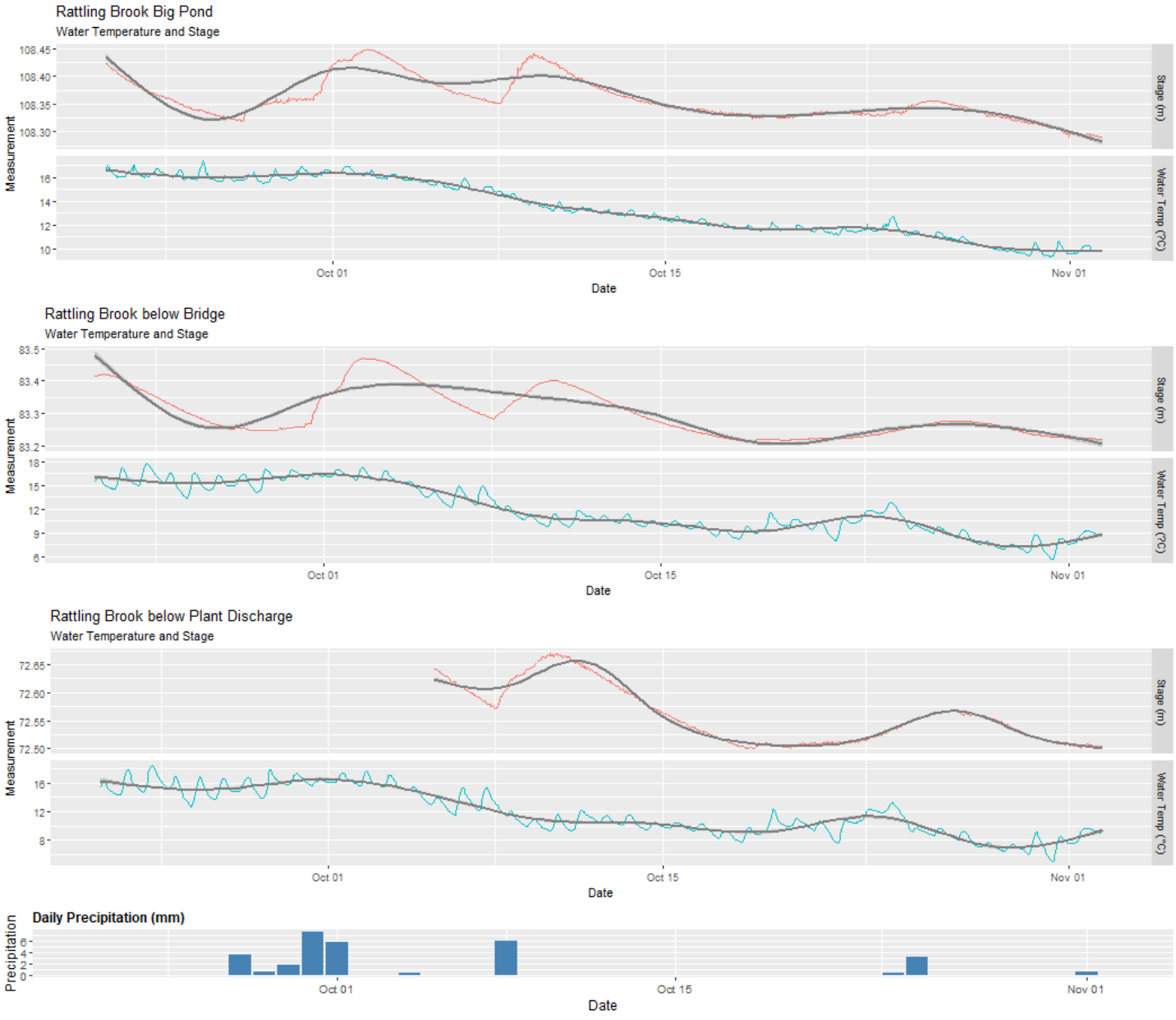
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	September 21	Deployment	Good	Good	Fair	Excellent	Good
	November 2	Removal	Good	Fair	Poor	Fair	Good
Rattling Brook below Bridge	September 21	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	November 2	Removal	Excellent	Good	Good	Fair	Good
Rattling Brook below Plant Discharge	September 21	Deployment	Excellent	Good	Good	Excellent	Excellent
	November 2	Removal	Excellent	Fair	Good	Fair	Good

- The Big Pond Conductivity sensor ranked ‘Poor’ during removal. The field sonde read 67.3 while the QA/QC sonde read 88.6 (µS/cm). This ‘Poor’ ranking is possibly a result of the location of the QA/QC sonde deployed in a disturbed area where sediment suspended into the water column.
- Big Pond Turbidity data was omitted (not being representative of the conditions of the water body) from Oct 10-12 due to debris surrounding the sensor causing erroneous data.
- Plant Discharge Stage data was omitted until October 5th as it wasn’t representative of the conditions of the river.

- 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	Max	Min	Median	Mean
Big Pond	17.41	9.32	13.16	13.44
Below Bridge	17.78	5.71	11.08	11.95
Below Plant Discharge	18.42	5.06	11.03	11.87

- Trend lines show seasonal water temperature decline at all three stations.

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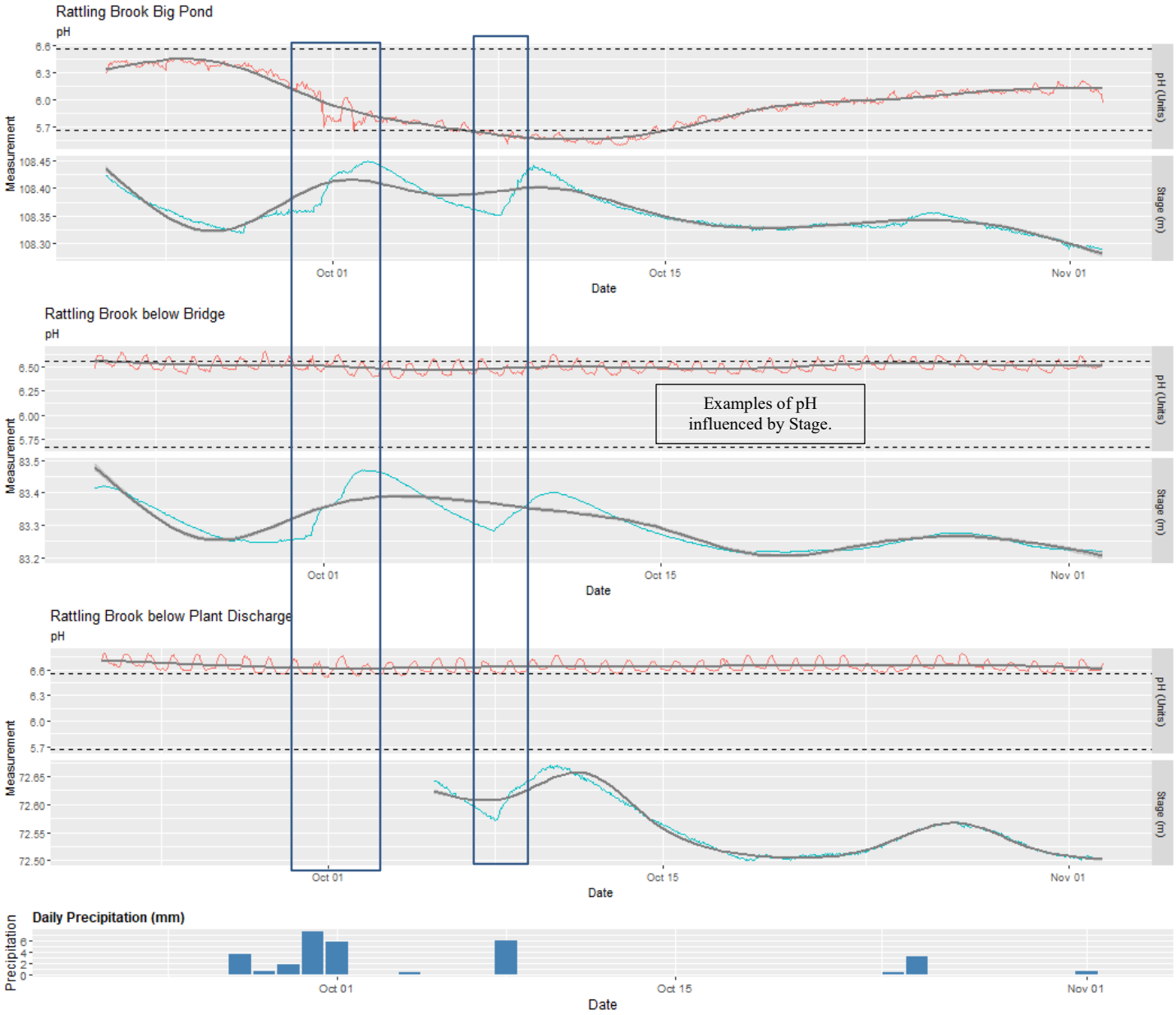
pH

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	Max	Min	Median	Mean
Big Pond	6.46	5.50	5.96	5.95
Below Bridge	6.66	6.38	6.50	6.50
Below Plant Discharge	6.79	6.52	6.63	6.64

- pH values were reduced mid-deployment for a long period due to multiple precipitation events (stage increases) with the majority of values within the site-specific guidelines (5.67-6.56 pH Units).

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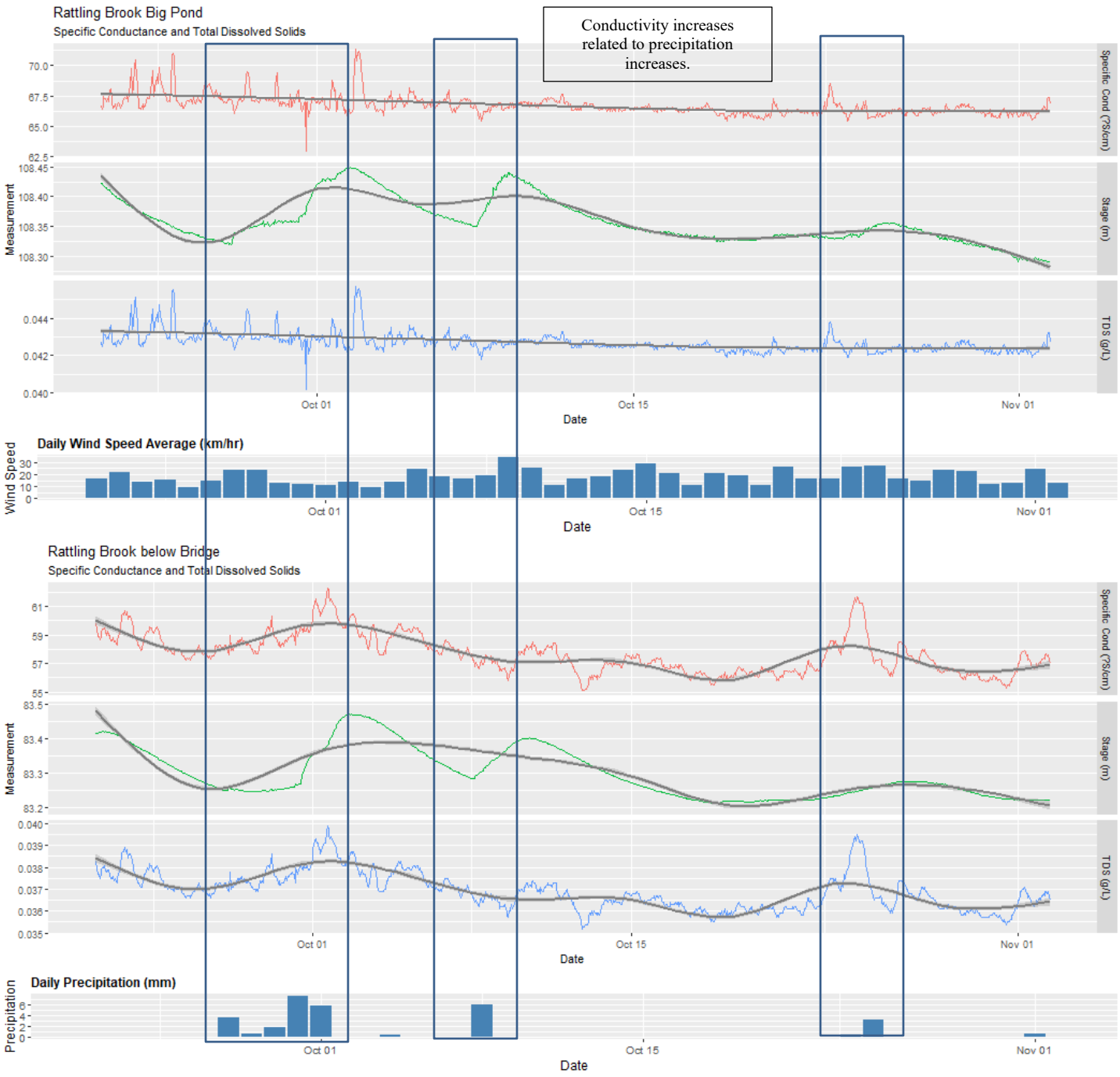
Specific Conductivity

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.



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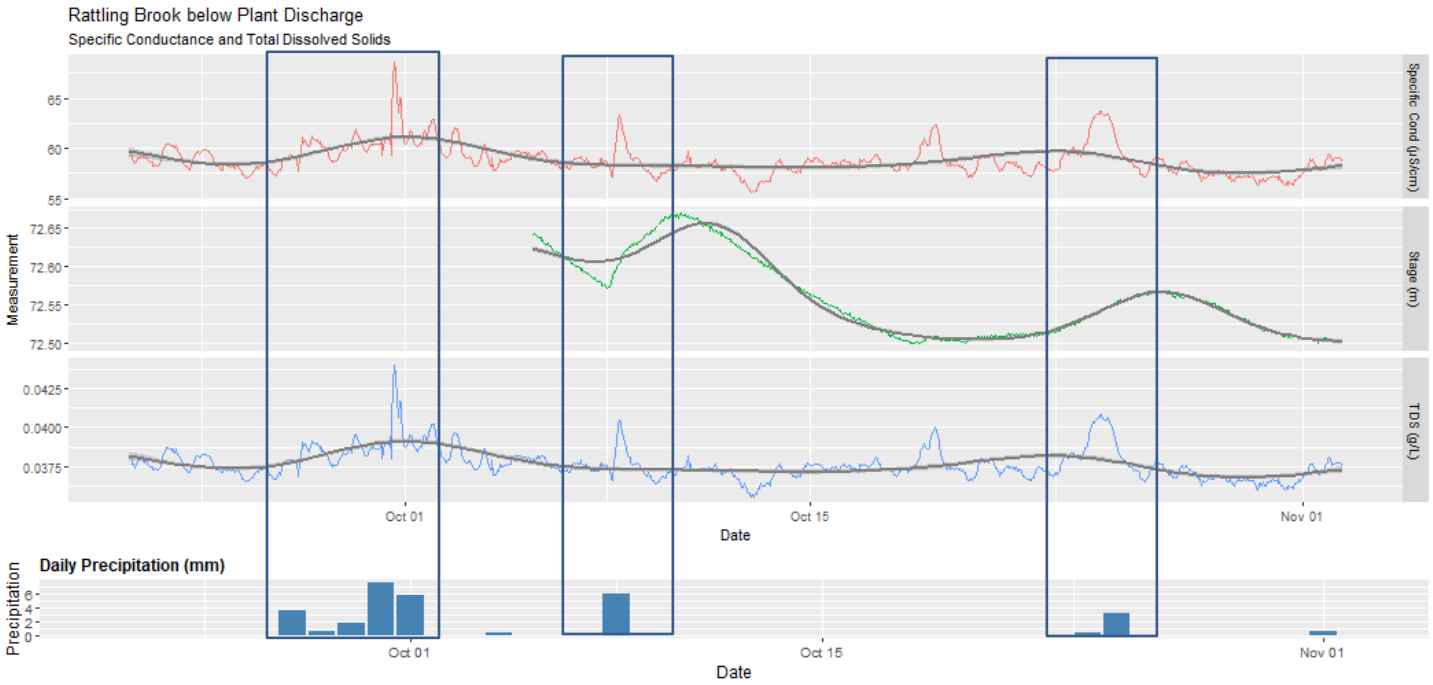

Station	Max	Min	Median	Mean
Big Pond	71.4	62.9	66.6	66.7
Below Bridge	62.3	55.1	57.6	57.7
Below Plant Discharge	68.7	55.6	58.6	58.8

- Specific conductivity fluctuated at all stations but showed no major trends during the deployment period. There are increases at Big Pond not related to precipitation. This may be due to wave action from the pond occasionally stirring up sediment around the sonde, increasing the conductivity.

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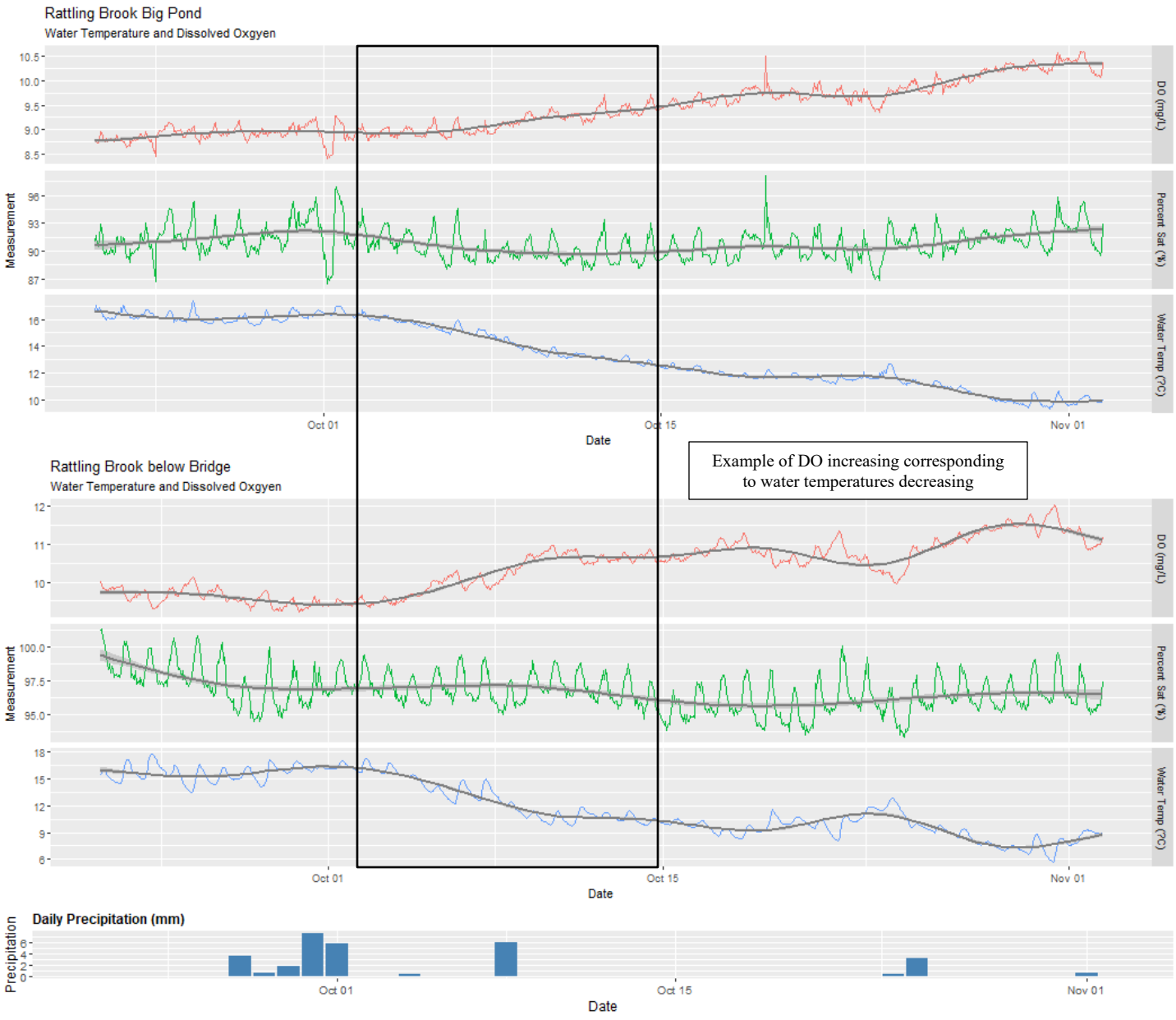
Dissolved Oxygen

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 oxidation reactions.



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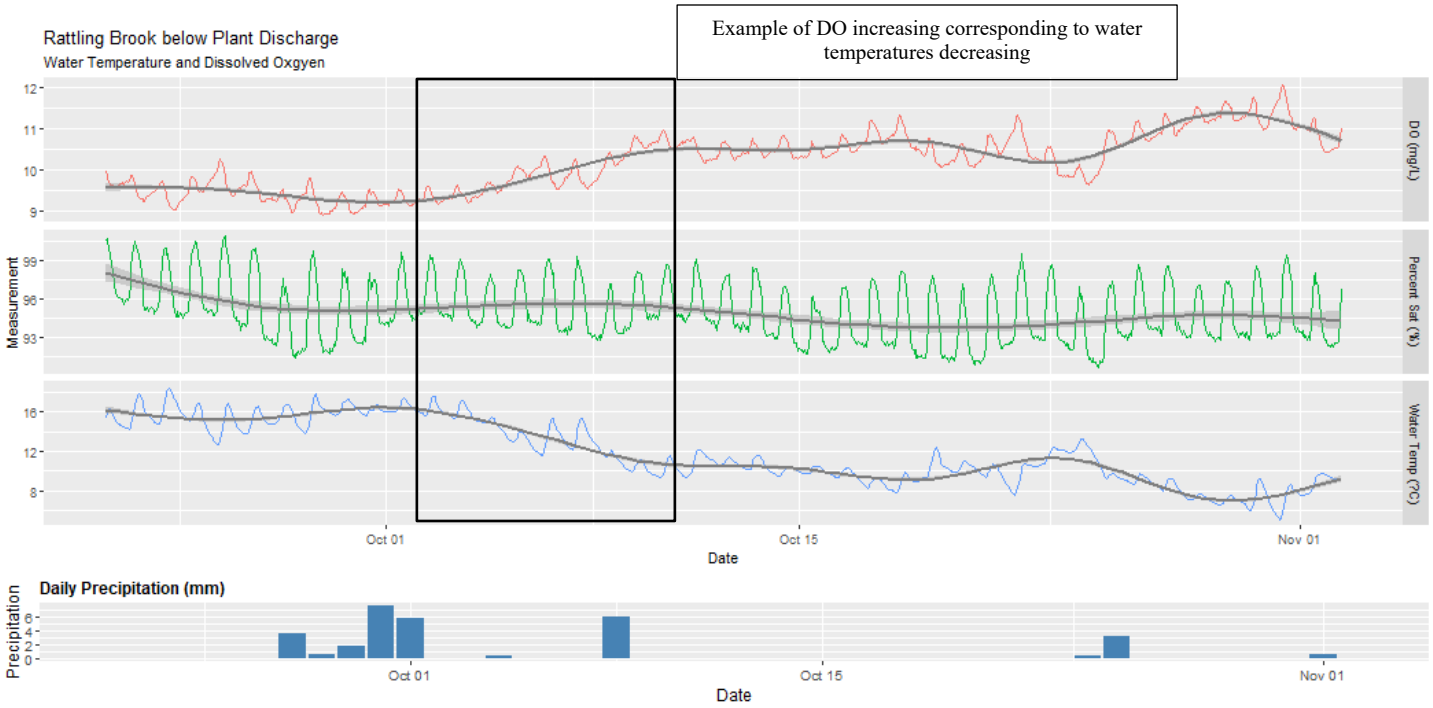

Station	Max	Min	Median	Mean
Big Pond	10.61	8.39	9.33	9.41
Below Bridge	12.03	9.21	10.53	10.37
Below Plant Discharge	12.09	8.90	10.28	10.21

- Falling water temperature trends led to increased dissolved oxygen throughout the deployment period.
- During this deployment period, all values remained above the minimum CCME Aquatic Guideline for other life stages (6.5 mg/l). By the end of the deployment period, all measurements were found to be above the CCME Guideline of 9.5 mg/L for the protection of early life stage cold-water biota.

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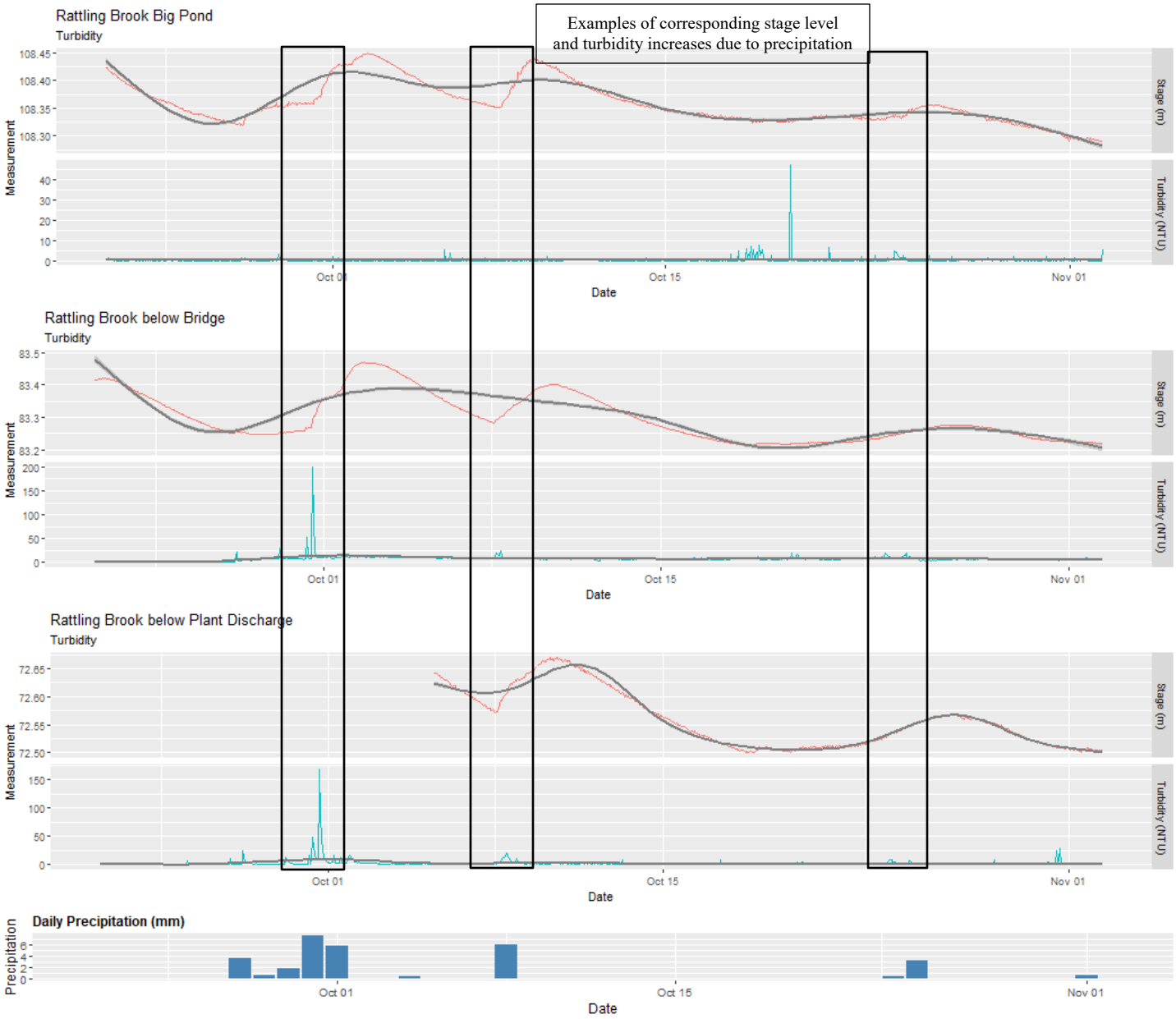
Turbidity

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	Max	Min	Median	Mean
Big Pond	47.1	0.0	0.0	0.3
Below Bridge	199.6	0.0	6.9	7.1
Below Plant Discharge	168.3	0.0	0.6	1.9

- Isolated turbidity events were experienced simultaneously with precipitation events and are of short duration.

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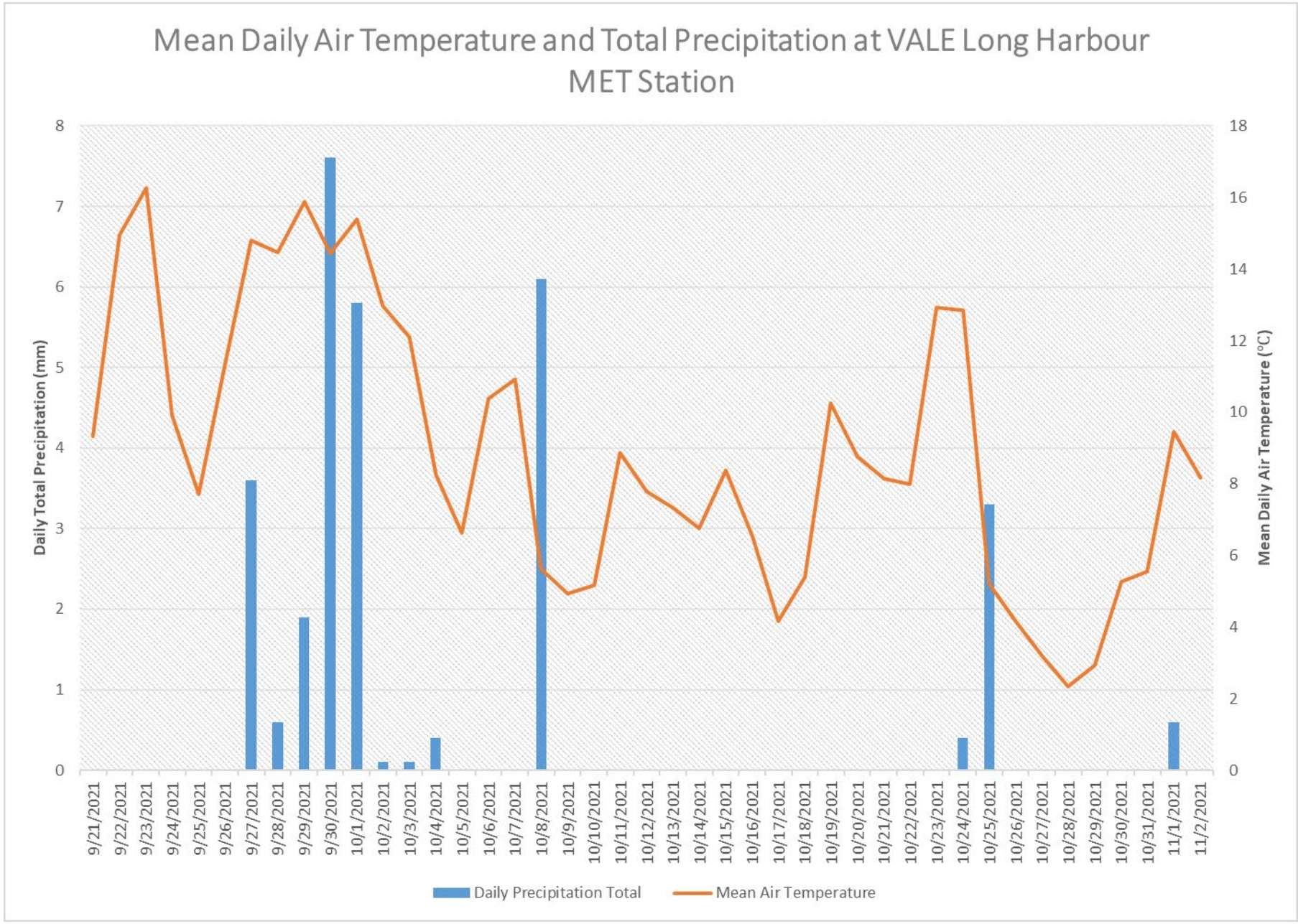
Appendix


Mean Daily Air Temperature and Total Precipitation at VALE Long Harbour MET Station
Daily Total Precipitation (mm)
Mean Daily Air Temperature (°C)
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1
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Daily Precipitation Total
Mean Air Temperature