Real-Time Water Quality Deployment Report

Rattling Brook Network

March 20, 2024 to April 18, 2024

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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2024-03-20 to 2024-04-18

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

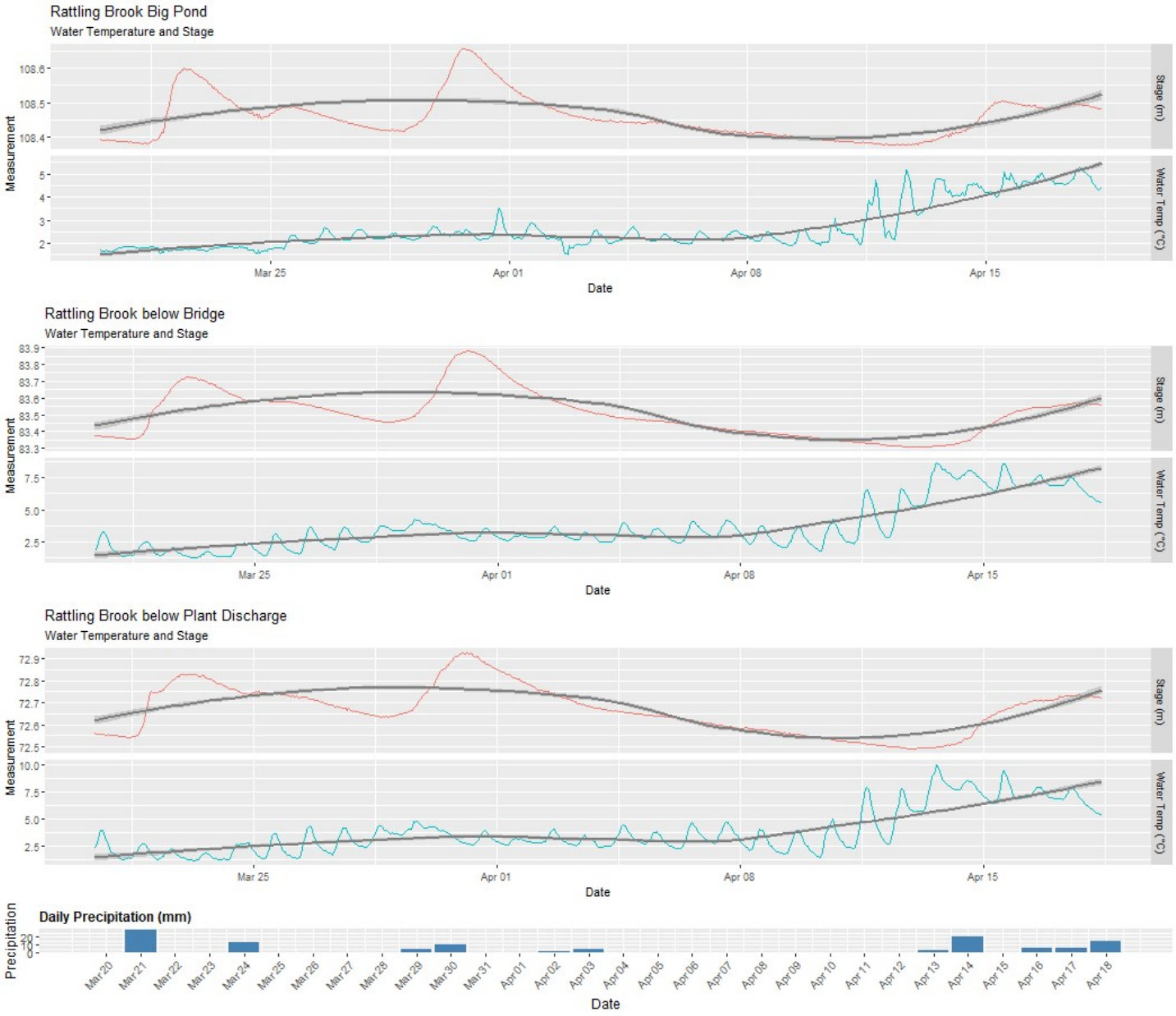
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	December 18	Deployment	Excellent	Excellent	Marginal	Marginal	Excellent
	April 18	Ongoing	Excellent	Fair	Fair	Excellent	Excellent
Rattling Brook below Bridge	March 20	Deployment	Excellent	Excellent	Good	Fair	Poor
	April 18	Removal	Excellent	Fair	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	March 20	Deployment	Excellent	Excellent	Good	Good	Excellent
	April 18	Removal	Excellent	Fair	Good	Excellent	Excellent

- Big Pond water temperature data is not available in real time due to a datalogger change and programming issue. This will be rectified once Water Survey Canada visits the station to update the program.
- Rattling Brook below Bridge turbidity sensor ranked ‘poor’ upon removal. While removing the sonde it was noted that the turbidity sensor had small rocks in the casing.

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	5.27	1.52	2.27	2.66
Below Bridge	8.65	1.26	3.04	3.66
Below Plant Discharge	10.03	1.15	3.17	3.81

- Trend lines indicate that the water temperature is increasing at all three station as expected in the spring.

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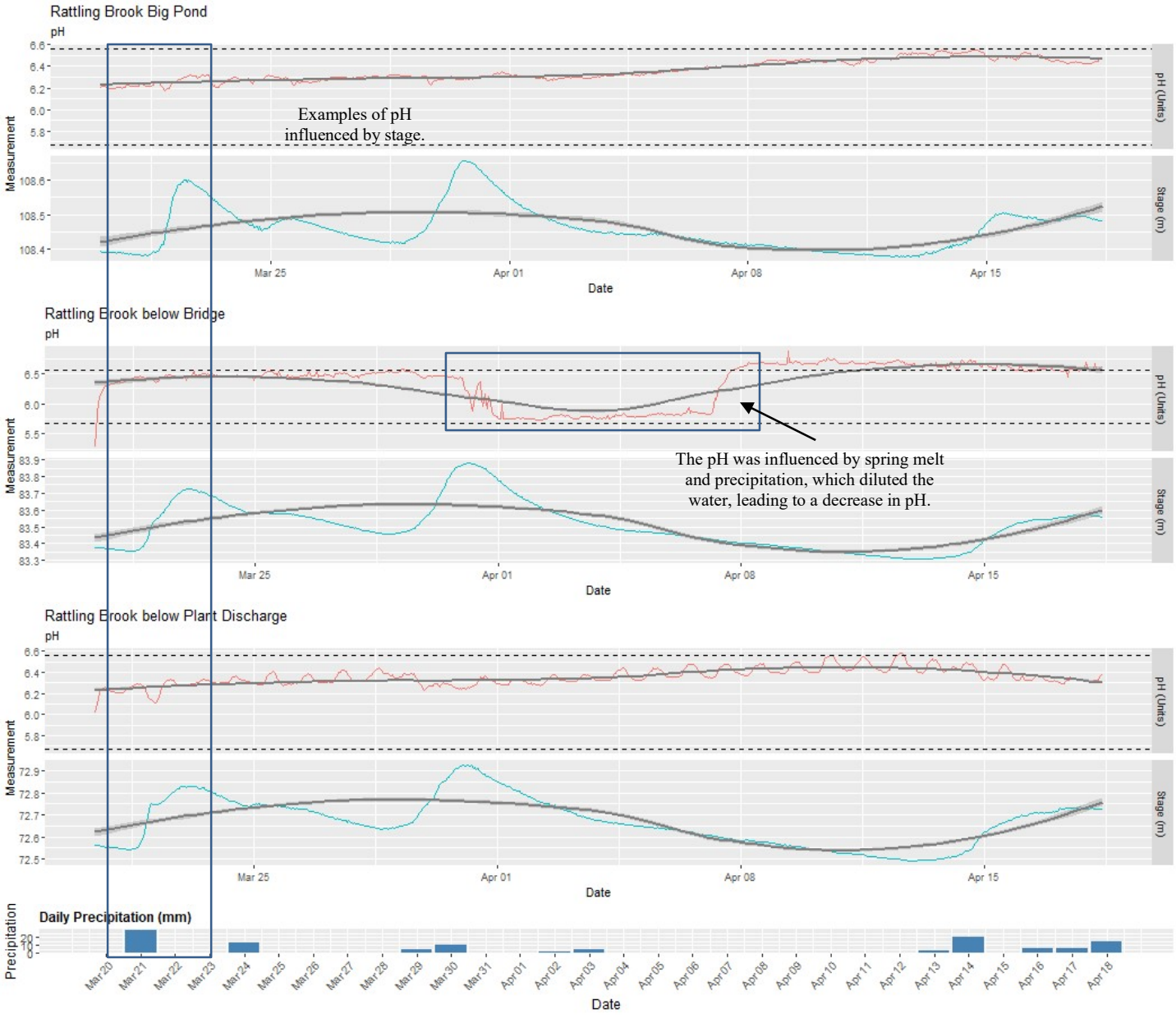
pH

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	6.55	6.17	6.32	6.36
Below Bridge	6.87	5.28	6.47	6.36
Below Plant Discharge	6.58	6.01	6.35	6.36

- pH values remained steady, with the majority hovering around the upper site-specific guidelines (5.67-6.56 pH Units) for all three stations. Big Pond pH sensor likely drifted out of calibration due to a long deployment.

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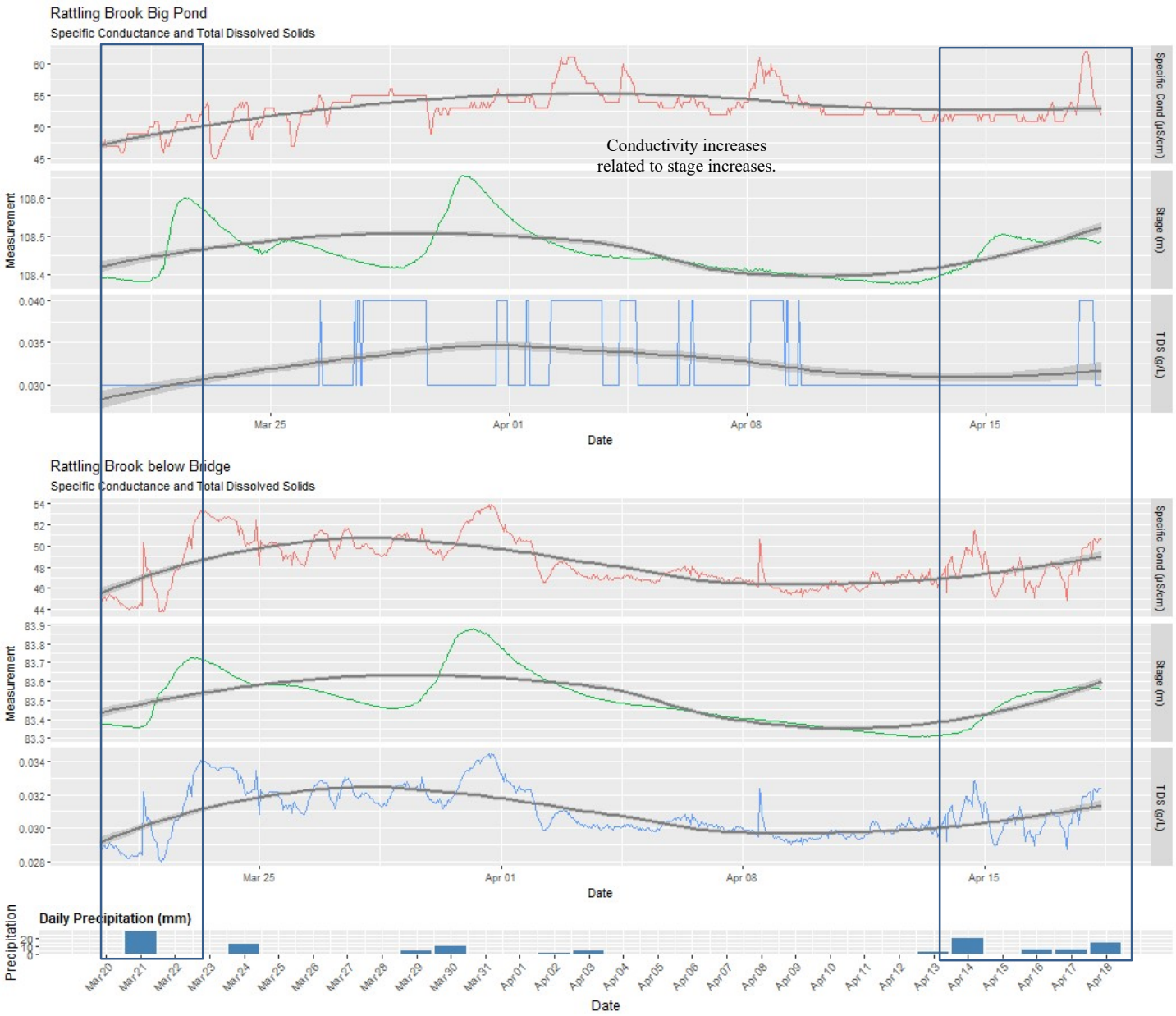
Specific Conductivity

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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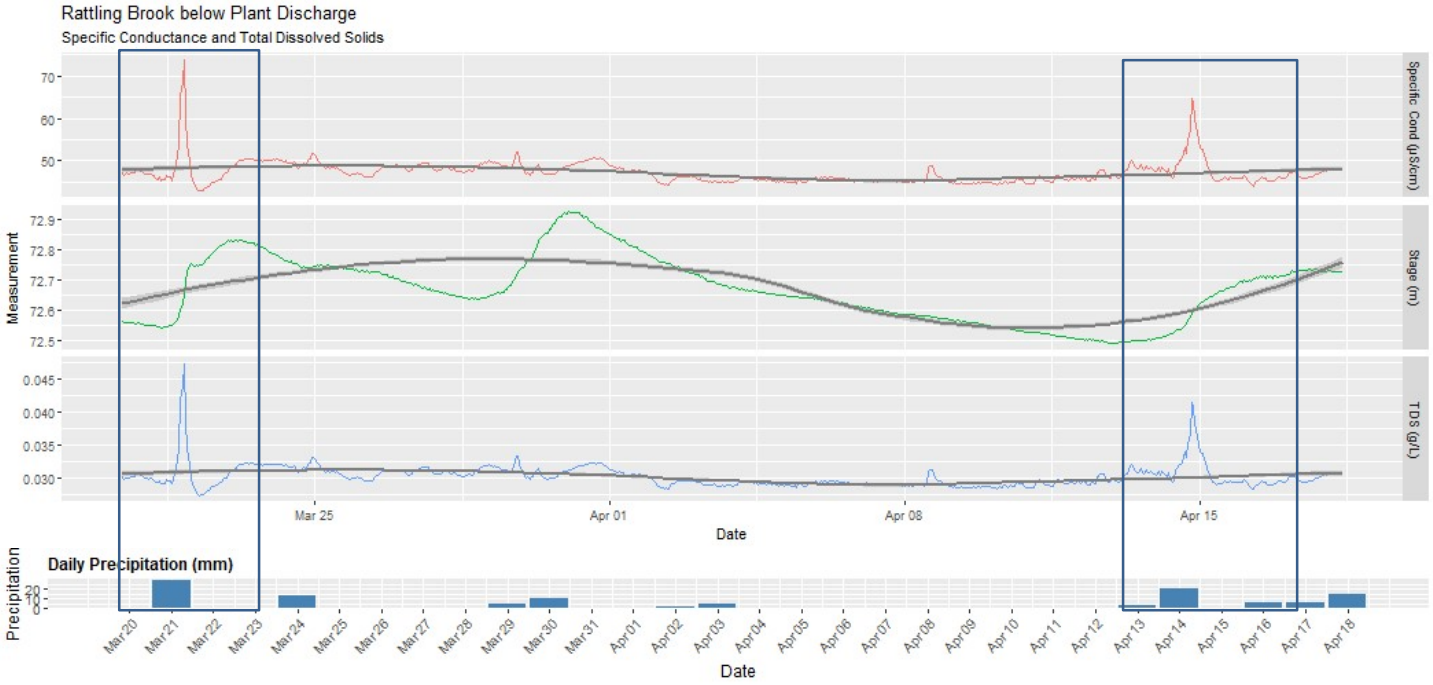

Station	Max	Min	Median	Mean
Big Pond	62.0	45.0	53.0	53.0
Below Bridge	53.9	43.8	47.7	48.3
Below Plant Discharge	73.9	42.9	46.6	47.2

- Specific conductivity was relatively stable at all stations with most peaks occurring during precipitation events. Specific conductivity tends to be highly variable during this time of year due to frequent precipitation and melting periods, all adding water to the system and disturbing sediments.

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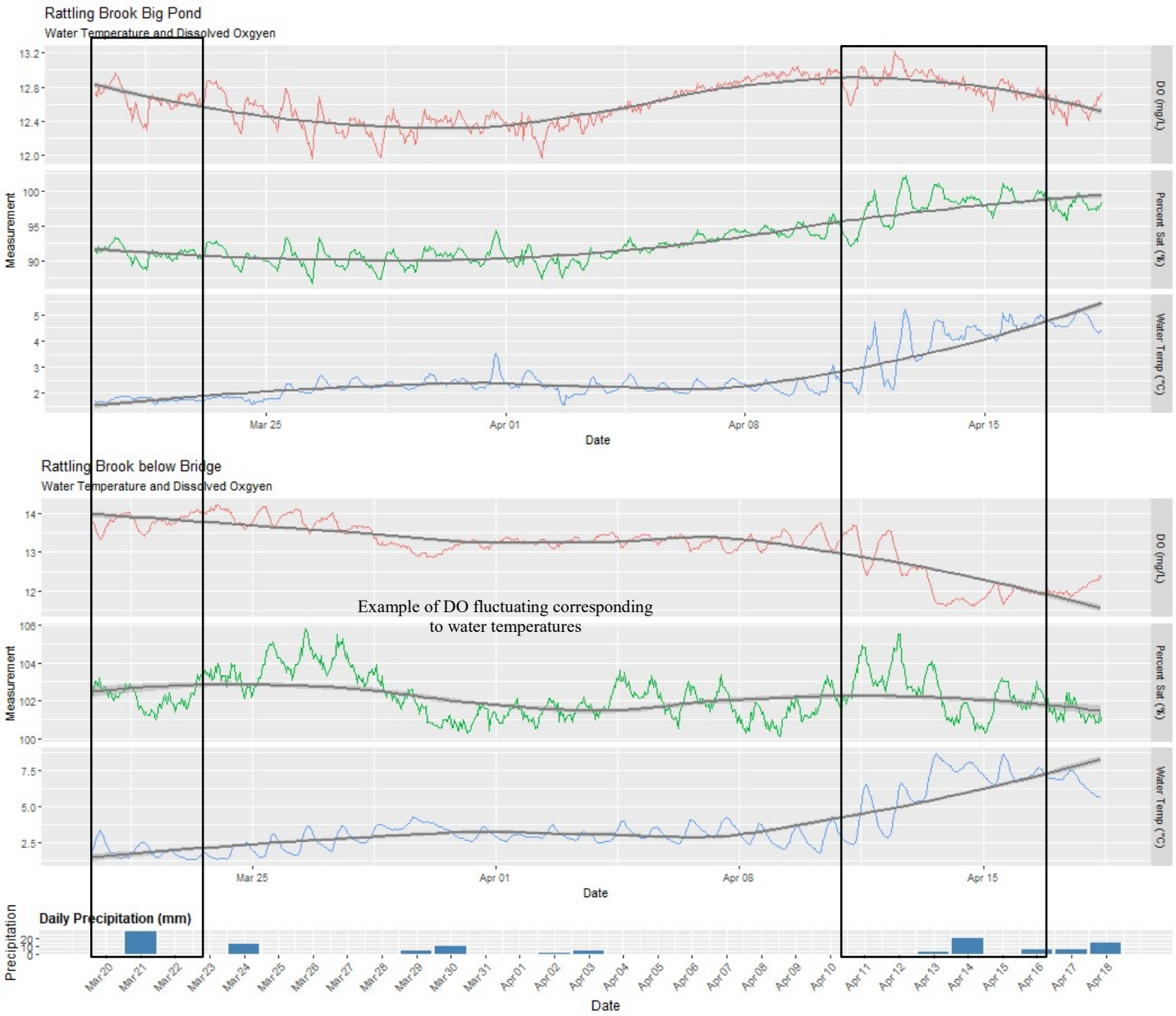
Dissolved Oxygen

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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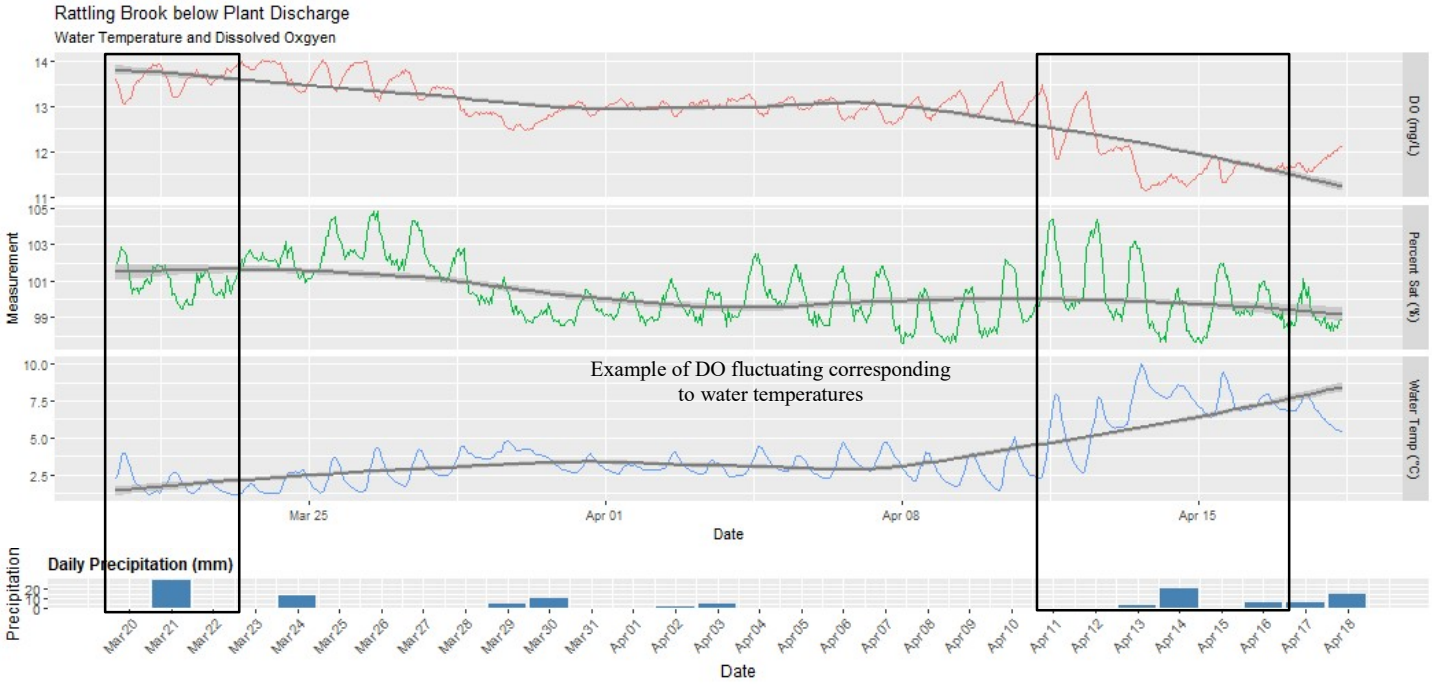

Station	Max	Min	Median	Mean
Big Pond	13.22	11.96	12.63	12.62
Below Bridge	14.24	11.62	13.29	13.16
Below Plant Discharge	14.05	11.14	13.01	12.88

- As shown on all three graphs, dissolved oxygen concentration declined slightly over the course of this deployment period as water temperatures increased from the annual winter low. All values remained above the CCME guidelines for aquatic life for early and other life stages of cold water biota.

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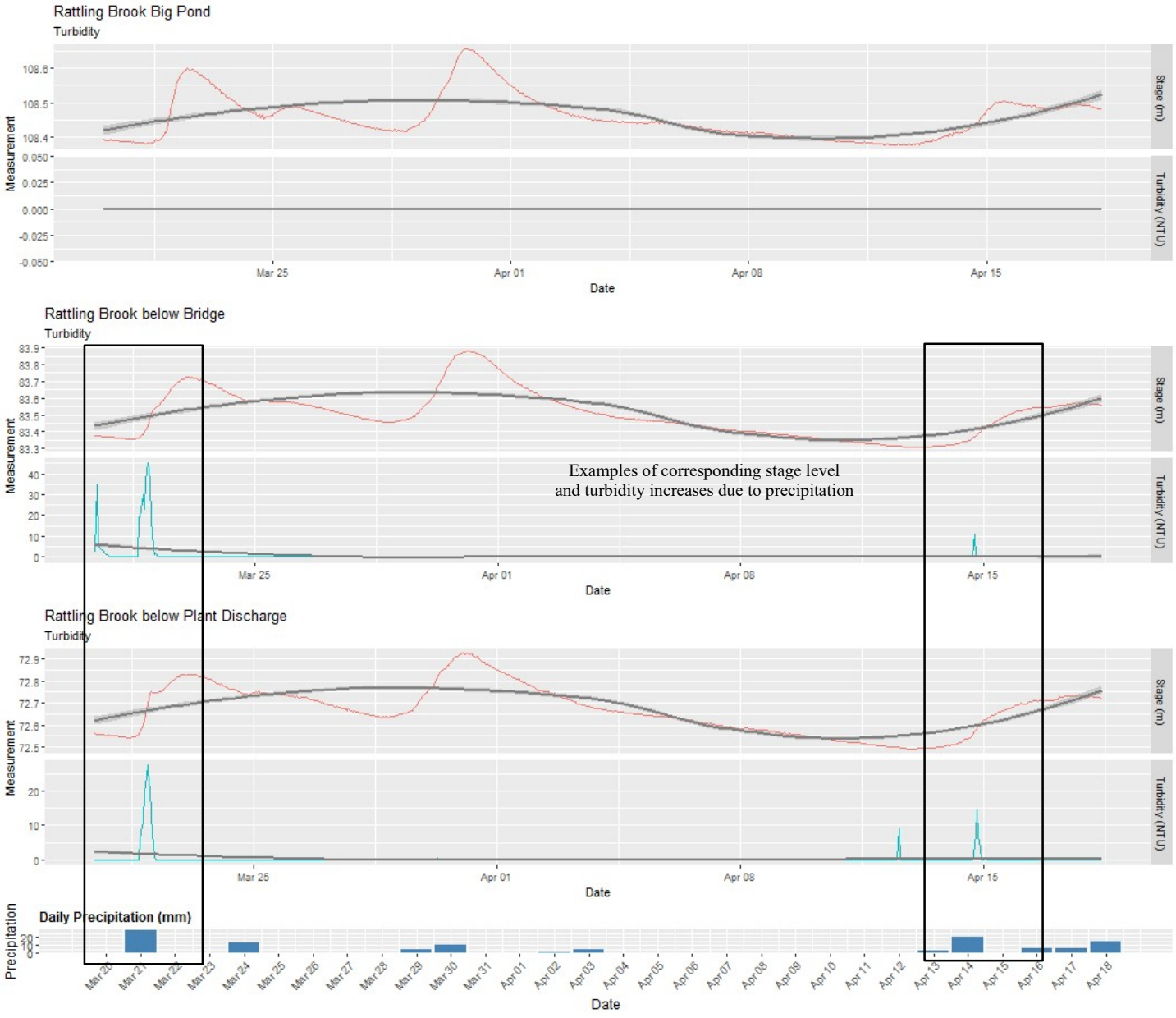
Turbidity

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	0.0	0.0	0.0	0.0
Below Bridge	45.1	0.0	0.0	0.5
Below Plant Discharge	27.5	0.0	0.0	0.3

- Big Pond was ice covered hence the 0.0NTU readings as sediment wasn't moving around without wave action. Turbidity was stable at Below Bridge and Plant Discharge with exception of during precipitation events.

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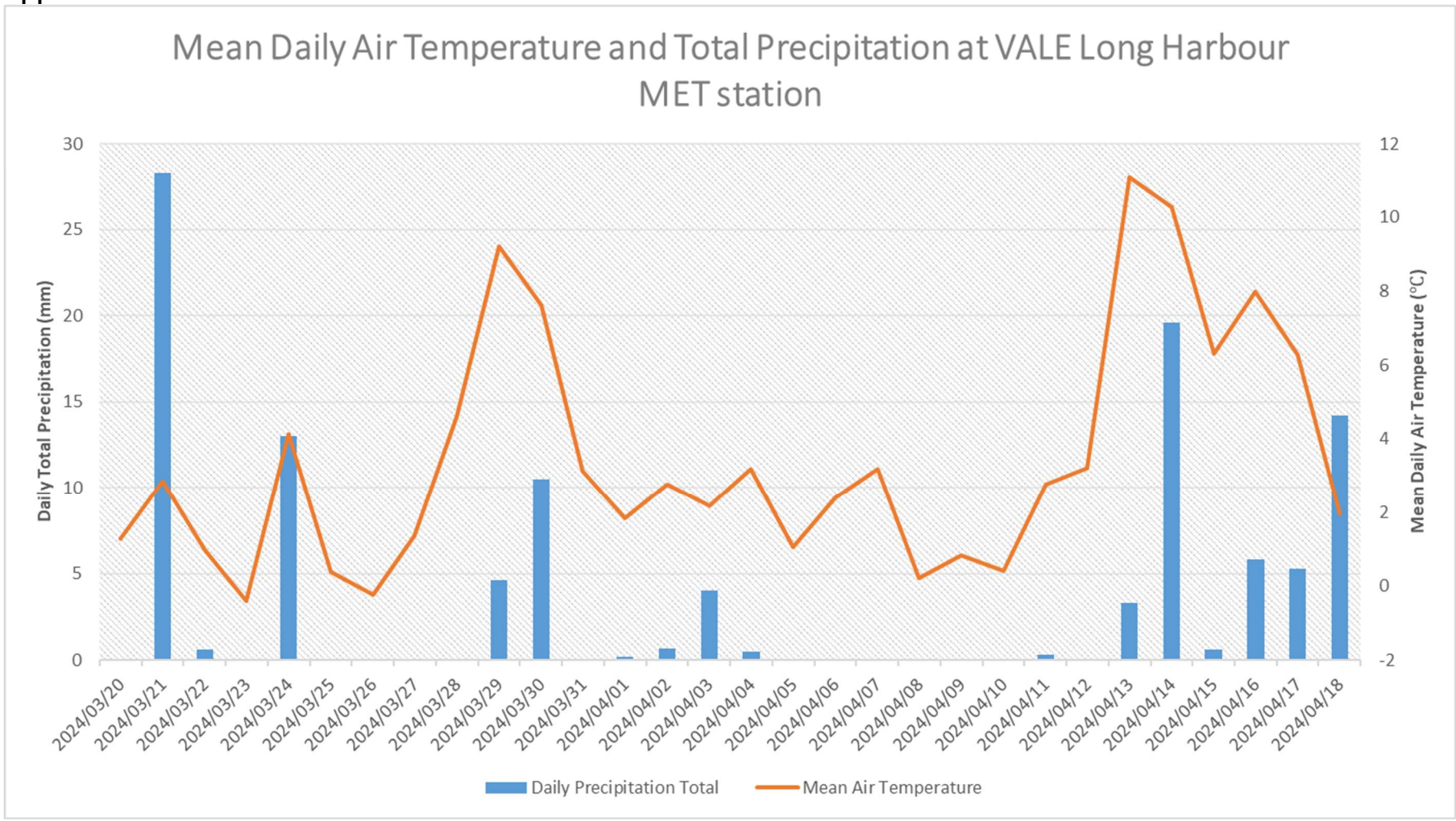
Appendix


Mean Daily Air Temperature and Total Precipitation at VALE Long Harbour MET station
Daily Total Precipitation (mm)
Mean Daily Air Temperature (°C)
30
25
20
15
10
5
0
12
10
8
6
4
2
0
-2
2024/03/20
2024/03/21
2024/03/22
2024/03/23
2024/03/24
2024/03/25
2024/03/26
2024/03/27
2024/03/28
2024/03/29
2024/03/30
2024/03/31
2024/04/01
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2024/04/04
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2024/04/09
2024/04/10
2024/04/11
2024/04/12
2024/04/13
2024/04/14
2024/04/15
2024/04/16
2024/04/17
2024/04/18
Daily Precipitation Total
Mean Air Temperature