# Real-Time Water Quality Deployment Report

## Rattling Brook Network

**February 28, 2017 to April 20, 2017**

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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2017-02-28 to 2017-04-20

## General

- Department of Municipal Affairs and staff monitors the real-time web pages consistently.
- The turbidity sensor at Rattling Brook below Bridge suffered a calibration offset during the deployment. Since the dataset continued to show the expected variation and patterns associated with the station, the apparent offset was subtracted from the dataset and is presented in the turbidity section. It will not be included in archived data or the annual report.
- A fault with the QAQC sonde's handheld computer prevented the recording of data during the removal operations. As a result, no rankings are available for the removal.
- 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**

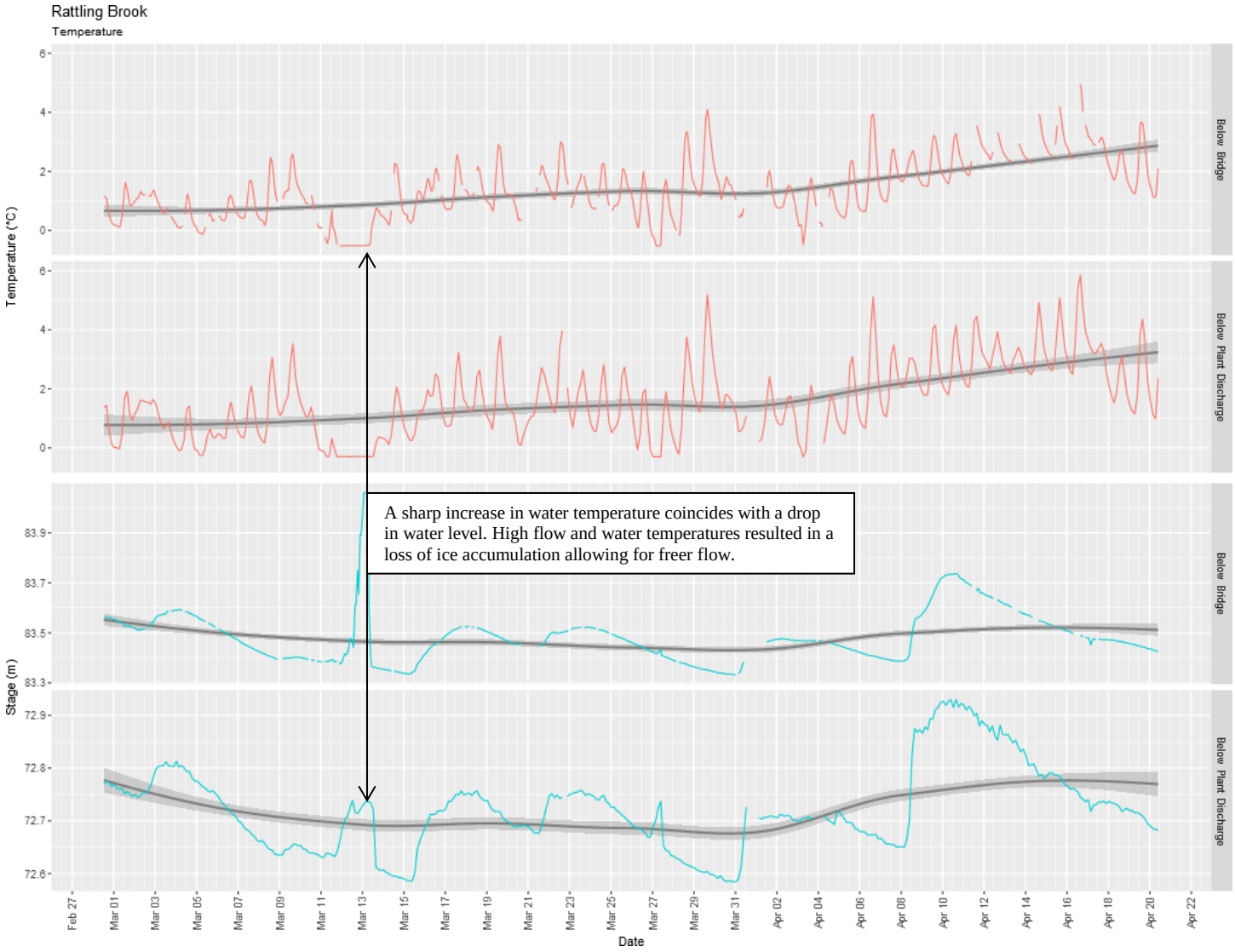
| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Rattling Brook below Bridge | February 28, 2017 | Deployment | Excellent | Poor | Good | Excellent | Good |
| | April 20, 2017 | Removal | NA | NA | NA | NA | NA |
| Rattling Brook below Plant Discharge | February 28, 2017 | Deployment | Excellent | Poor | Good | Excellent | Excellent |
| | April 20, 2017 | Removal | NA | NA | NA | NA | NA |

- "Poor" rankings were recorded during deployment for the pH sensor. This appears to be due to unreasonably low values recorded from the QAQC sonde. Grab sample values support this theory. The field sonde pH values appear to be accurate.

## 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 |
|---|---|---|---|---|
| Below Bridge | 1.40 | 1.29 | -0.53 | 4.96 |
| Below Plant Discharge | 1.63 | 1.46 | -0.3 | 5.85 |

- This deployment period saw periods of winter-low (with negative temperatures) and a rise into warmer spring temperatures. Water temperatures are expected to continue climbing into the next deployment period. Evidence of active insect growth was found on equipment during the removal process.

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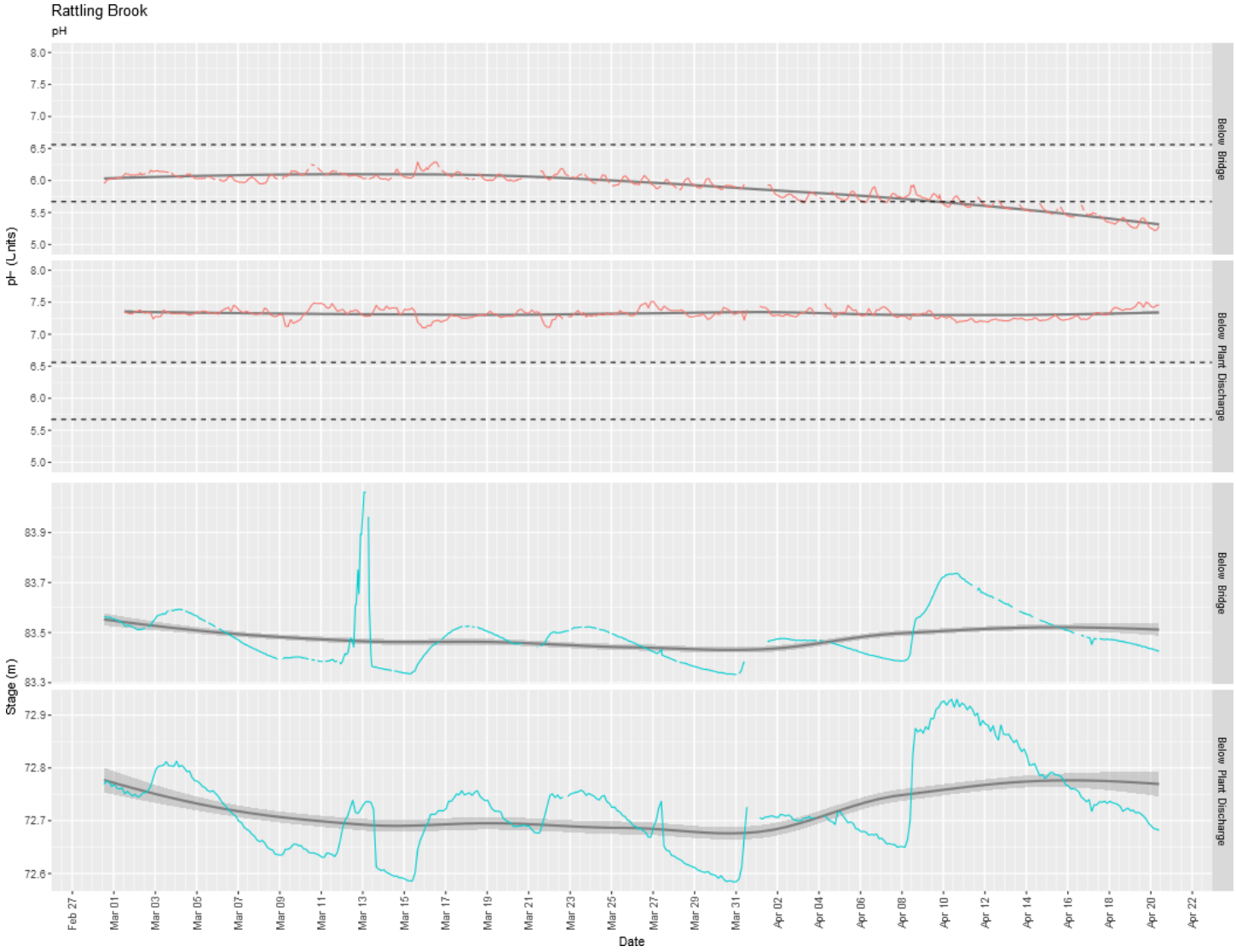
## pH

*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 |
|---|---|---|---|---|
| Below Bridge | 5.88 | 5.98 | 5.22 | 6.29 |
| Below Plant Discharge | 7.32 | 7.31 | 7.1 | 7.51 |

- For the initial portion of the deployment period, pH levels at Bridge station remained well within the Site Specific Guidelines (SSGs, dashed lines). Towards mid-deployment, a slow decline to below SSGs was recorded. This may be due to a loss of calibration or the result of spring time melt.
- pH levels at Plant Discharge station were stable with no apparent trend during this deployment period.

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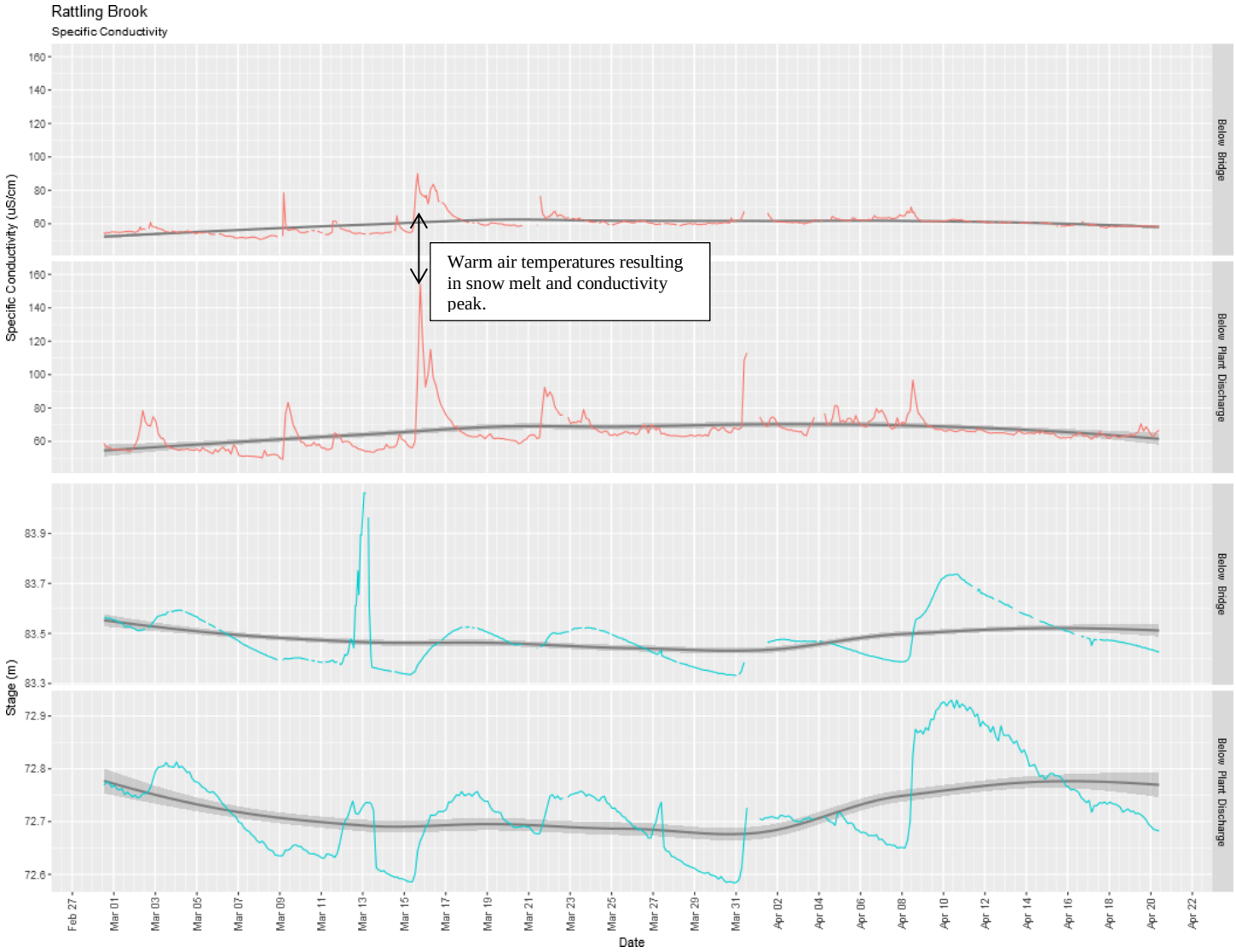
## Specific Conductivity

*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 |
|---|---|---|---|---|
| Below Bridge | 59.8 | 60.1 | 50.5 | 90 |
| Below Plant Discharge | 65.7 | 64.6 | 49.4 | 154.1 |

- Specific conductivity peaked at both stations near mid-deployment during the height of spring runoff. A very slight falling trend is evident at both stations near the end of the deployment period. This trend is expected to extend into the next deployment period as water continues to freshen following the release of salts and solids bound to snow and ice.

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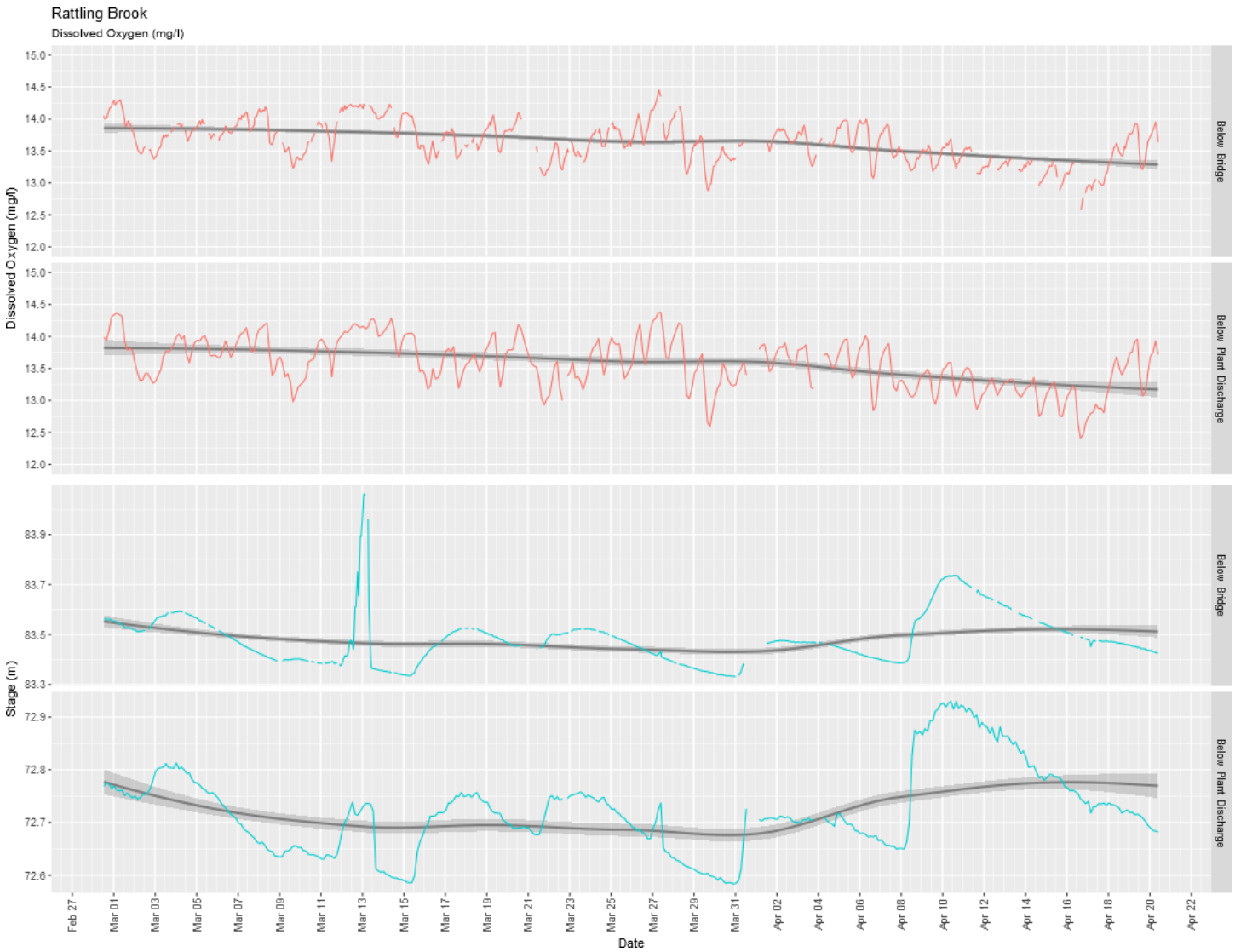
## Dissolved Oxygen

*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.*




| variable | Station | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| DO (mg/l) | Below Bridge | 13.64 | 13.64 | 12.58 | 14.45 |
| DO (mg/l) | Below Plant Discharge | 13.57 | 13.58 | 12.41 | 14.38 |

- A general increase in water temperature stands as the reason for declining dissolved oxygen concentrations during this deployment period. All values were found to be greater than the CCME guideline of 9.5 mg/l DO for the protection of early life stage aquatic organisms.

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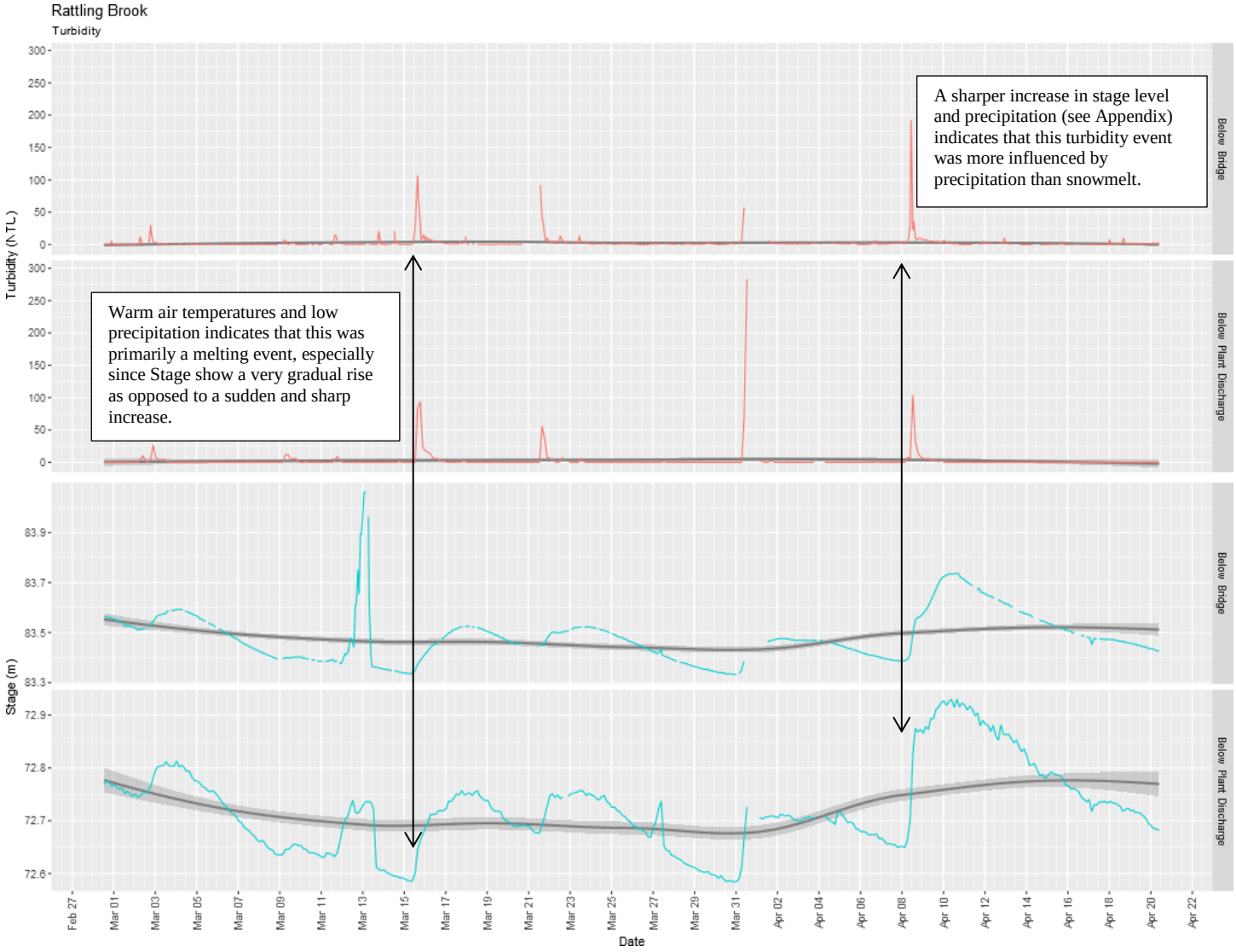
## Turbidity

*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 |
|---|---|---|---|---|
| Below Bridge | 2.6 | 0.8 | 0 | 191.8 |
| Below Plant Discharge | 2.8 | 0 | 0 | 283.1 |

- Turbidity levels were low during this deployment period and, generally, variation was only observed during high flow and melting events.

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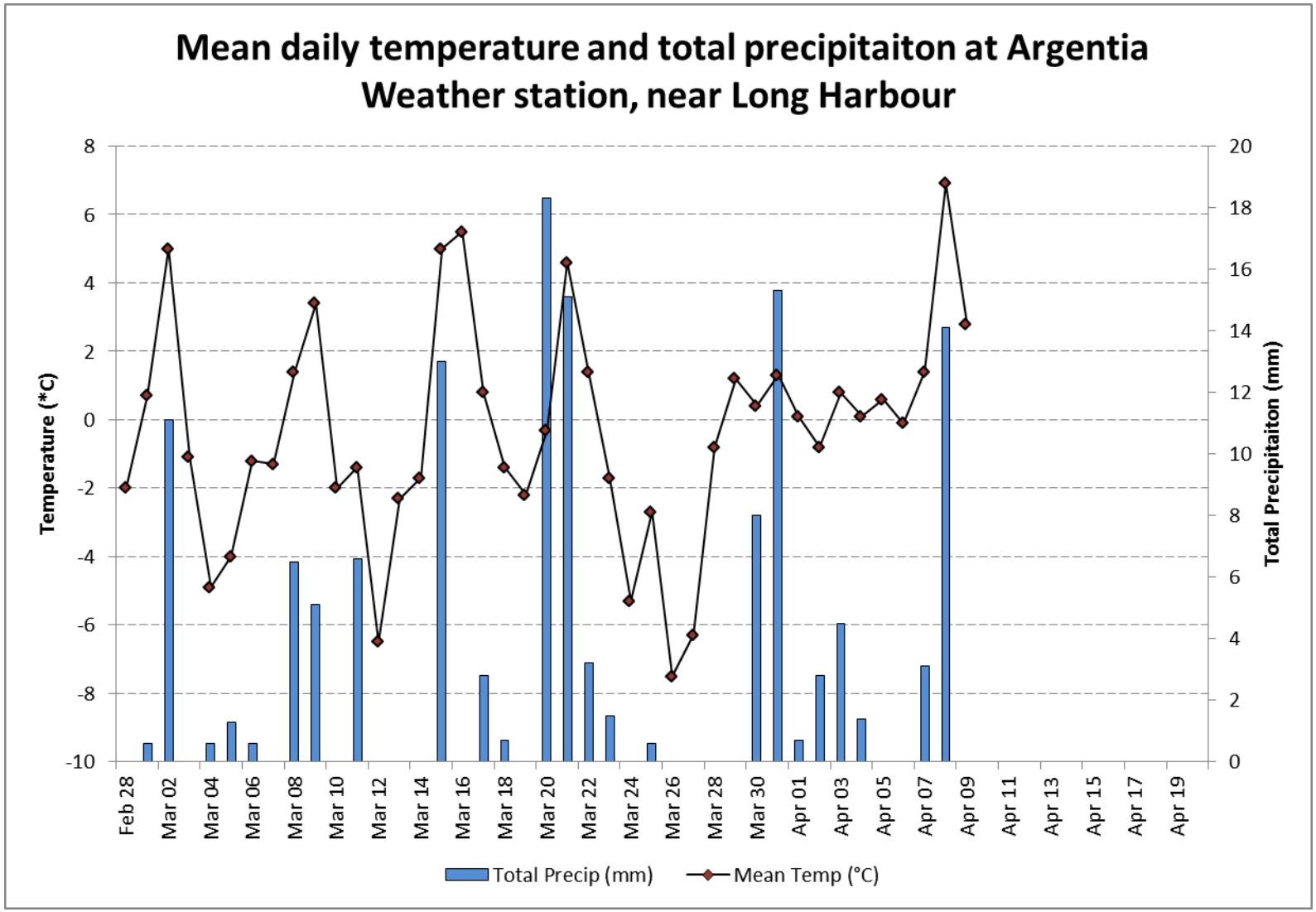
# Appendix


Mean daily temperature and total precipitaiton at Argentia Weather station, near Long Harbour
Temperature (*C)
Total Precipitaiton (mm)
8
6
4
2
0
-2
-4
-6
-8
-10
20
18
16
14
12
10
8
6
4
2
0
Feb 28
Mar 02
Mar 04
Mar 06
Mar 08
Mar 10
Mar 12
Mar 14
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Apr 03
Apr 05
Apr 07
Apr 09
Apr 11
Apr 13
Apr 15
Apr 17
Apr 19
Total Precip (mm)
Mean Temp (°C)