



# Real-Time Water Quality Deployment Report

Teck: Duck Pond Operations

November 15, 2018 to May 30, 2019



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



**General**

- In this report, the abbreviations EPB and TGPB are used to denote East Pond Brook and Tributary to Gill’s Pond Brook stations, respectively.
- Department of Municipal Affairs and Environment staff monitors 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.

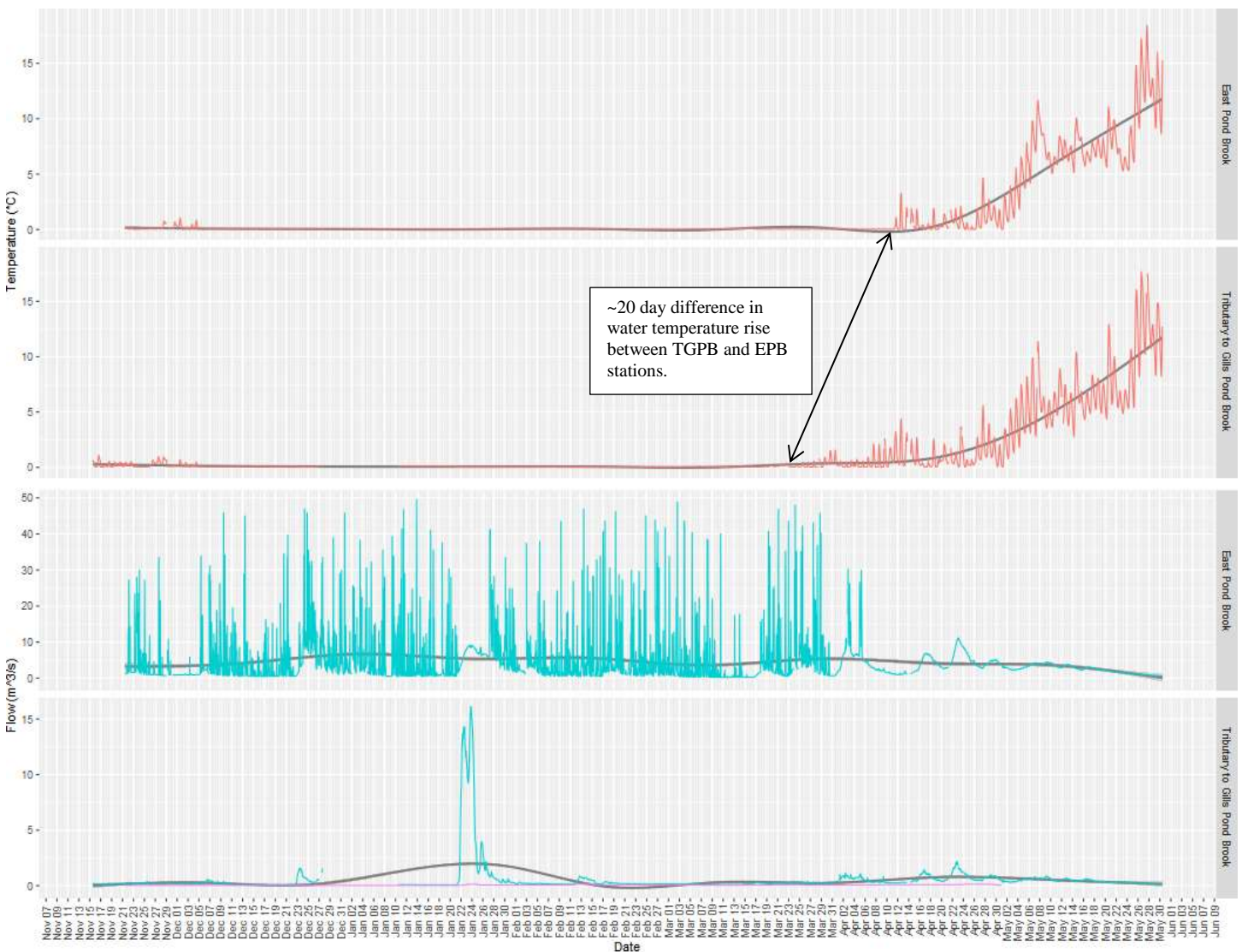
**Table 1: Qualitative QAQC Ranking**

| Station                        | Date       | Action     | Comparison Ranking |           |              |                  |           |
|--------------------------------|------------|------------|--------------------|-----------|--------------|------------------|-----------|
|                                |            |            | Temperature        | pH        | Conductivity | Dissolved Oxygen | Turbidity |
| East Pond Brook                | 2018-11-21 | Deployment | Fair               | Excellent | Excellent    | Excellent        | Good      |
|                                | 2019-05-30 | Removal    | Good               | Excellent | Excellent    | Excellent        | Excellent |
| Tributary to Gill’s Pond Brook | 2018-11-15 | Deployment | Excellent          | Excellent | Excellent    | Excellent        | Excellent |
|                                | 2019-05-30 | Removal    | Good               | Excellent | Excellent    | Good             | Excellent |

## 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.*



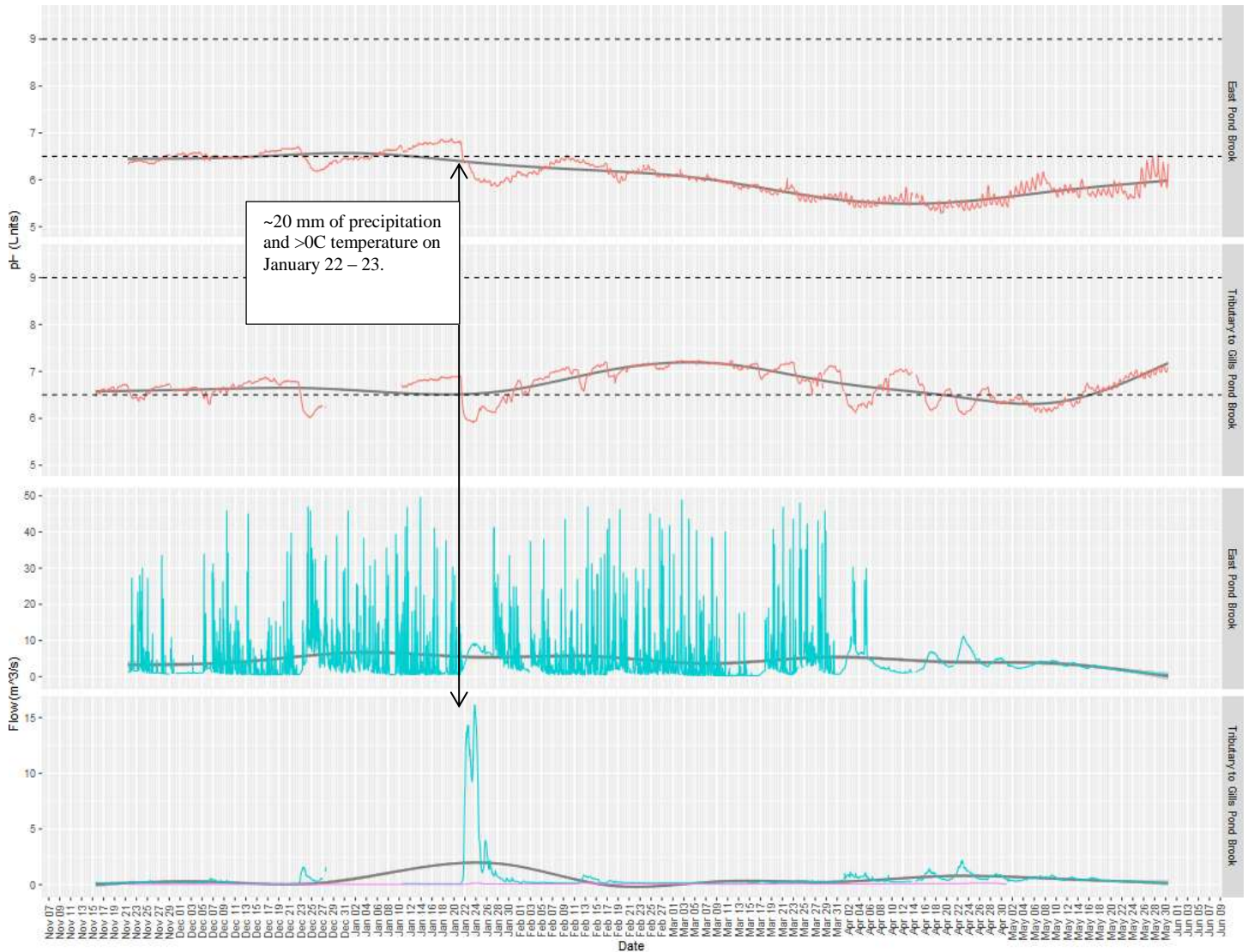
| Station                       | Mean | Median | Min  | Max   |
|-------------------------------|------|--------|------|-------|
| East Pond Brook               | 1.30 | 0.03   | 0.00 | 18.45 |
| Tributary to Gills Pond Brook | 1.33 | 0.08   | 0.00 | 17.68 |

- Water temperature at TGPB increased in late March, however water temperature at EPB did not begin to increase until early April. This may be due to increasing discharge of effluent into TGPB from the upstream polishing pond.

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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  |
|-------------------------------|------|--------|------|------|
| East Pond Brook               | 6.08 | 6.07   | 5.29 | 6.88 |
| Tributary to Gills Pond Brook | 6.71 | 6.73   | 5.91 | 7.24 |

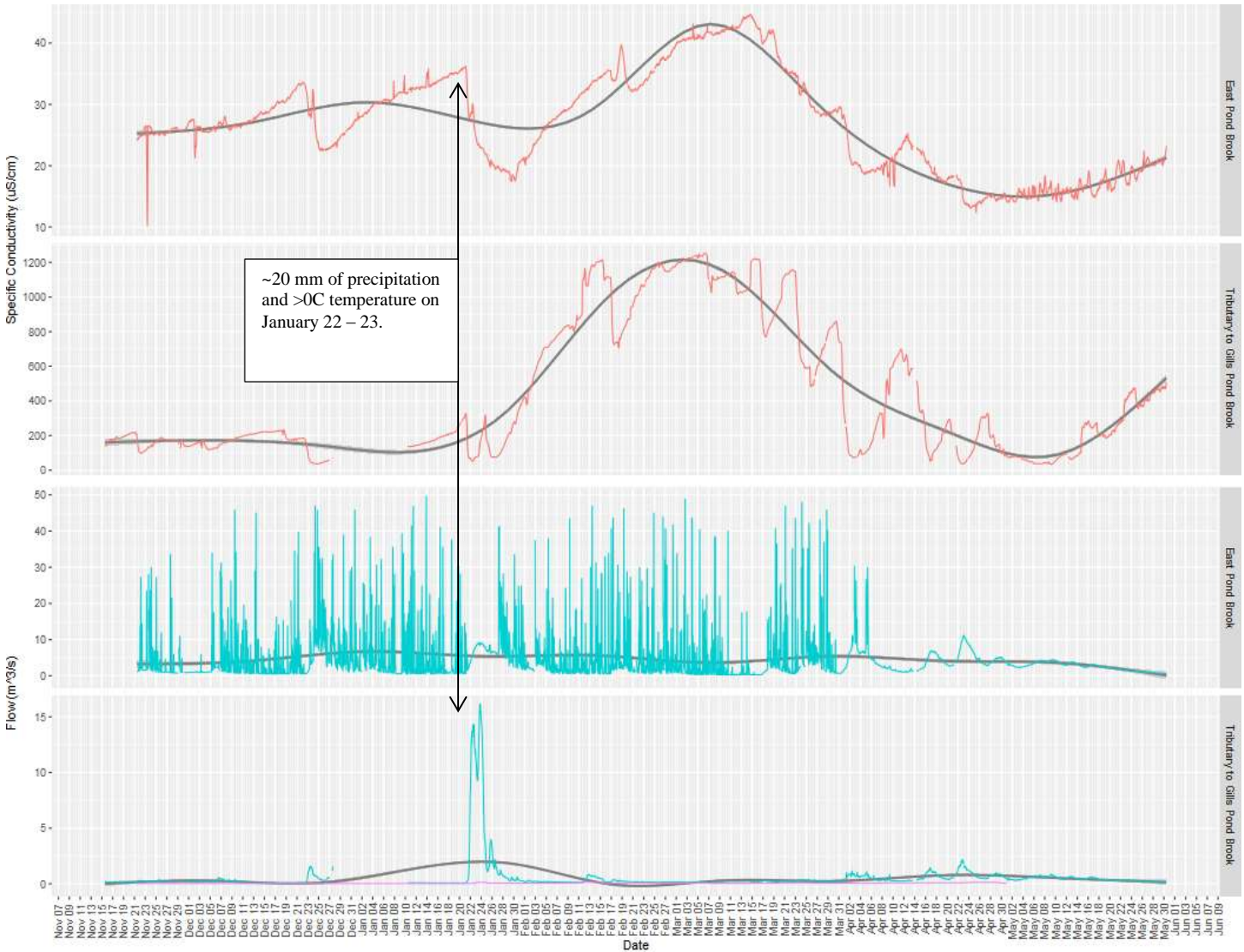
- Heavy precipitation and above-freezing temperatures on January 21<sup>st</sup> led to a marked rise in water level and sudden decrease in pH. A subsequent rebound in pH occurred over several weeks.
- pH levels tended to be higher at TGPB station compared to EPB station, likely due to the moderating effect of pH-controlled effluent from the Teck polishing pond. pH levels at EPB tended to fall just below the CCME guidelines (typical for this region of the province).

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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.



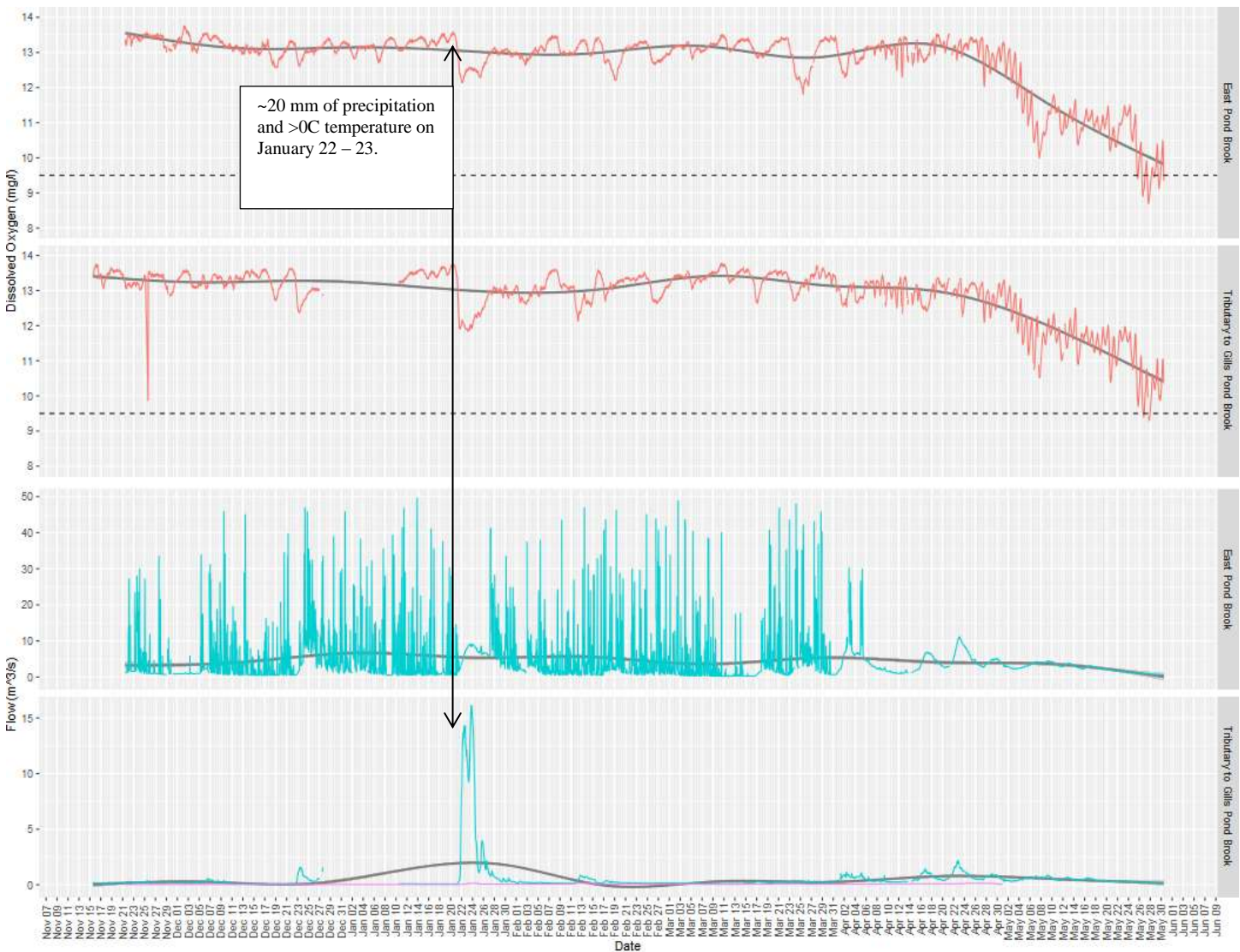
| Station                       | Mean  | Median | Min  | Max    |
|-------------------------------|-------|--------|------|--------|
| East Pond Brook               | 26.9  | 26.5   | 10.2 | 44.6   |
| Tributary to Gills Pond Brook | 445.9 | 225.0  | 33.5 | 1252.0 |

- Similar to the effect heavy precipitation and warm temperatures on January 21<sup>st</sup> had on pH, specific conductivity saw a substantial decline as river water was diluted by runoff and meltwater. A rebound occurred from late January until late February and early March as spring melt occurred.

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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.*



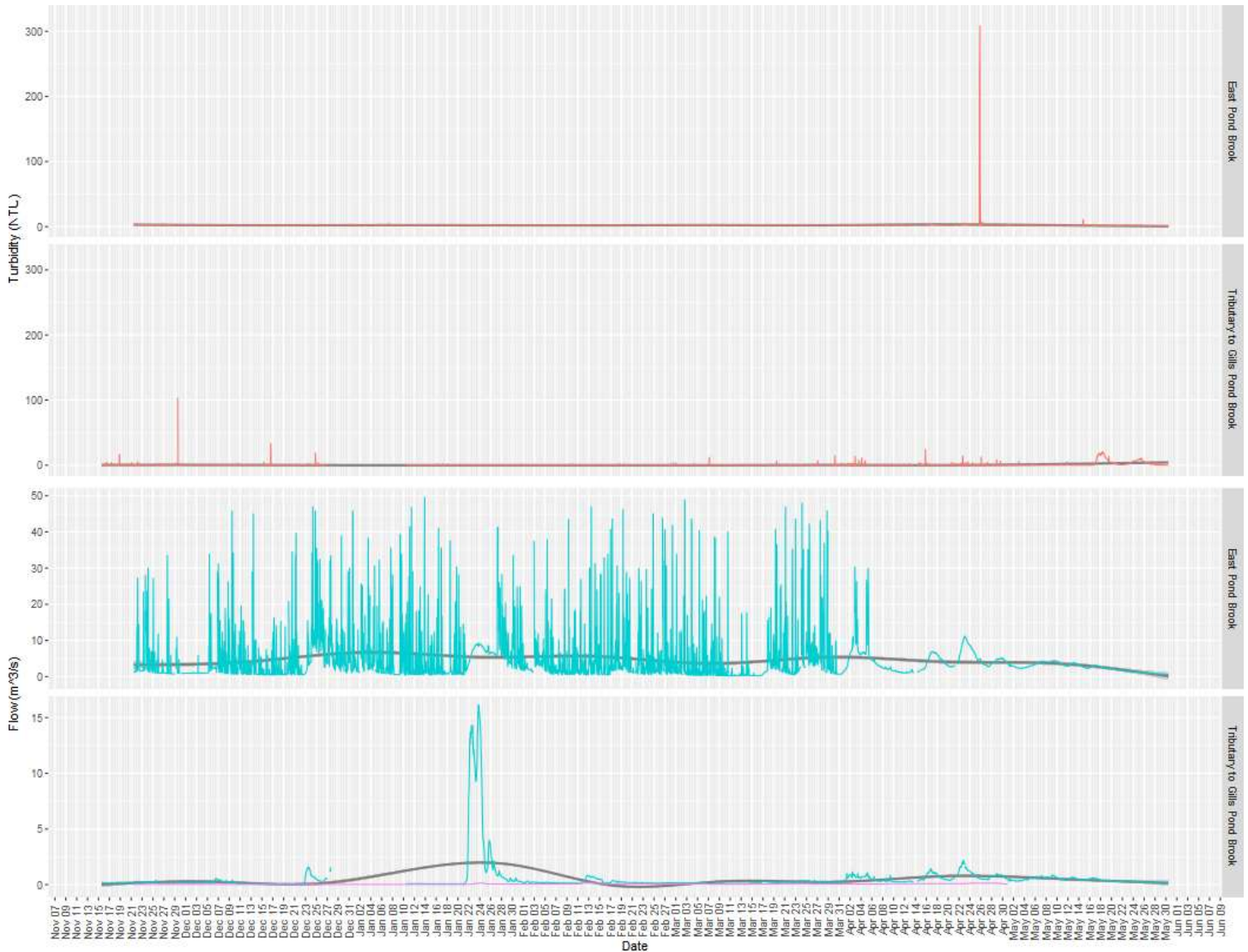
| Station                       | Mean  | Median | Min  | Max   |
|-------------------------------|-------|--------|------|-------|
| East Pond Brook               | 12.75 | 13.07  | 8.70 | 13.76 |
| Tributary to Gills Pond Brook | 12.88 | 13.13  | 9.30 | 13.78 |

- Dissolved oxygen levels were largely stable during the winter season, as is expected when ice cover predominates. During the late January warm storm event, dissolved oxygen concentrations dipped for a brief period before rebounding, however, all values were well within guidelines during this time.
- As water temperatures began to approach summer highs in late May, DO concentrations began to decline.

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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   |
|-------------------------------|------|--------|-----|-------|
| East Pond Brook               | 2.3  | 2.1    | 0.2 | 308.7 |
| Tributary to Gills Pond Brook | 0.6  | 0.0    | 0.0 | 103.7 |

- During this deployment period, turbidity levels were generally very low at EPB station and low at TGPB station. In general, this can be attributed to flow characteristics of each river. EPB tends to exhibit a slow laminar flow while TGPB exhibits a more vigorous, turbulent flow as water descends small pools and riffles.

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## Appendix

