



# Real-Time Water Quality Deployment Report

Teck: Duck Pond Operations

September 25, 2018 to November 15, 2018



Government of Newfoundland & Labrador  
Department of Municipal Affairs and Environment  
Water Resources Management Division  
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## General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Tributary to Gill’s Pond Brook and East Pond Brook stations are abbreviated as TGPB and EPB, respectively, throughout this report.
- A station outage at Tributary to Gill’s Pond Brook resulted in a mid-deployment data loss before telemetry resumed.
- 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**

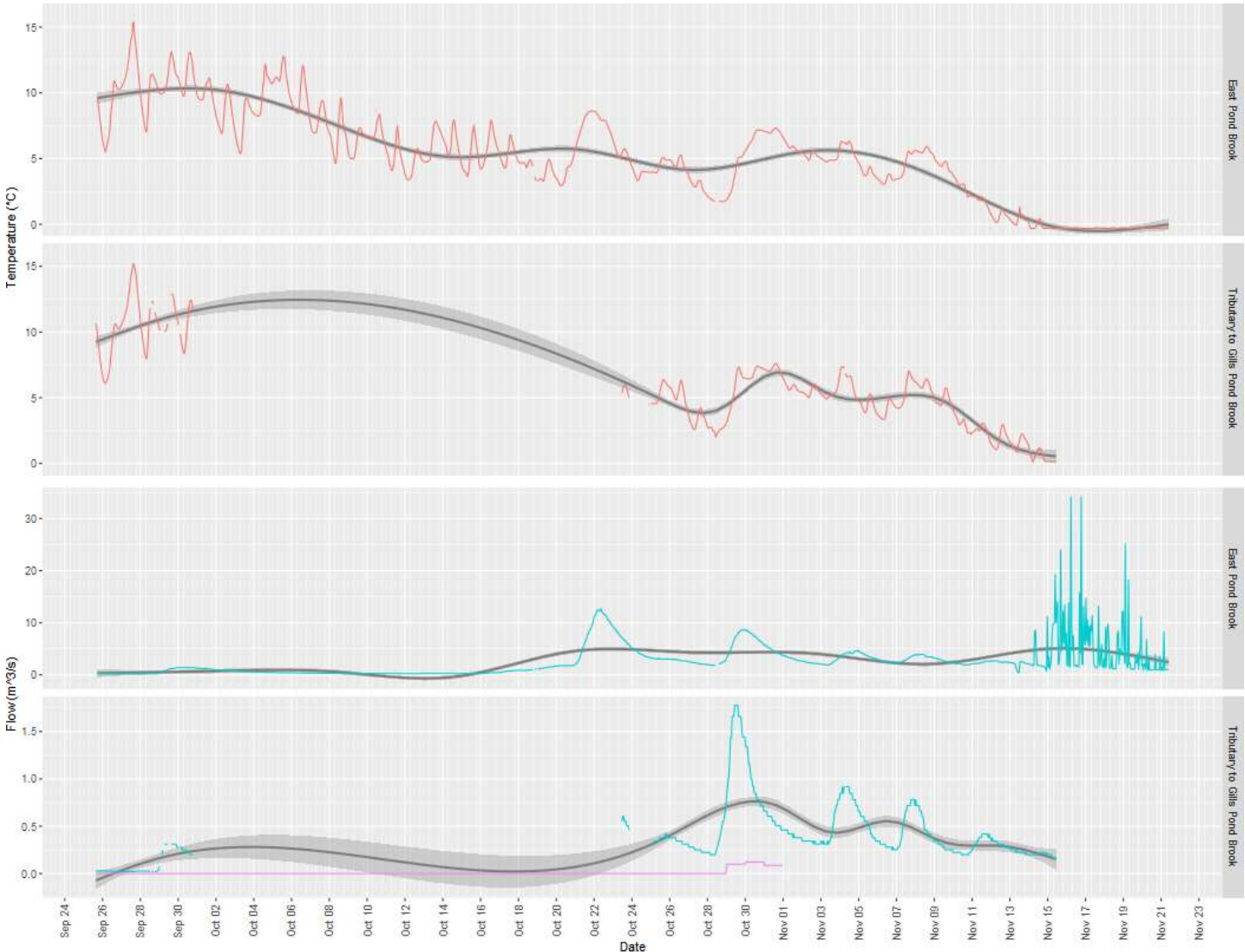
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Tributary to Gill’s Pond Brook	September 25, 2018	Deployment	Excellent	Good	Good	Fair	Excellent
	November 15, 2018	Removal	Excellent	Marginal	Excellent	Poor	Poor
East Pond Brook	September 25, 2018	Deployment	Good	Fair	Excellent	Fair	Good
	November 21, 2018	Removal	Fair	Excellent	Excellent	Fair	Good

- QAQC rankings were reasonable at deployment time with some degradation occurring over the course of the deployment period. The TGPB turbidity sensor was notably fouled during the deployment as can be seen in the graph towards the end of this report.

## 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.*



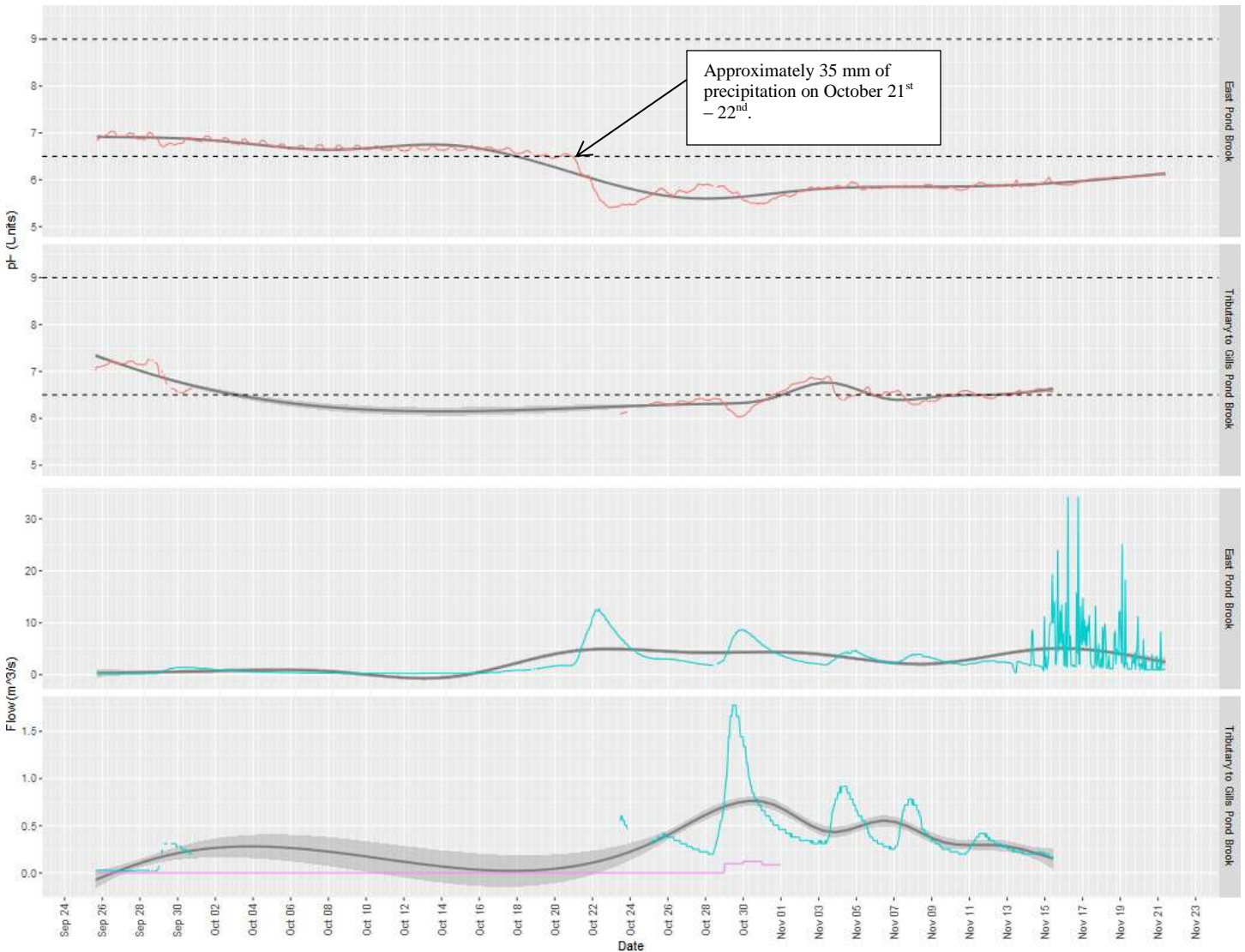
Station	Mean	Median	Min	Max
East Pond Brook	5.21	5.11	-0.32	15.39
Tributary to Gills Pond Brook	5.47	5.27	0.13	15.22

- Water temperatures declined towards their winter minima during this deployment period. Inclement weather on November 15 meant that equipment at EPB could not be removed and was left in the brook for an extra week allowing water to reach slightly negative temperatures. At these temperatures ice cover tends to form quickly.

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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	6.23	6.06	5.41	7.03
Tributary to Gills Pond Brook	6.56	6.51	6.03	7.25

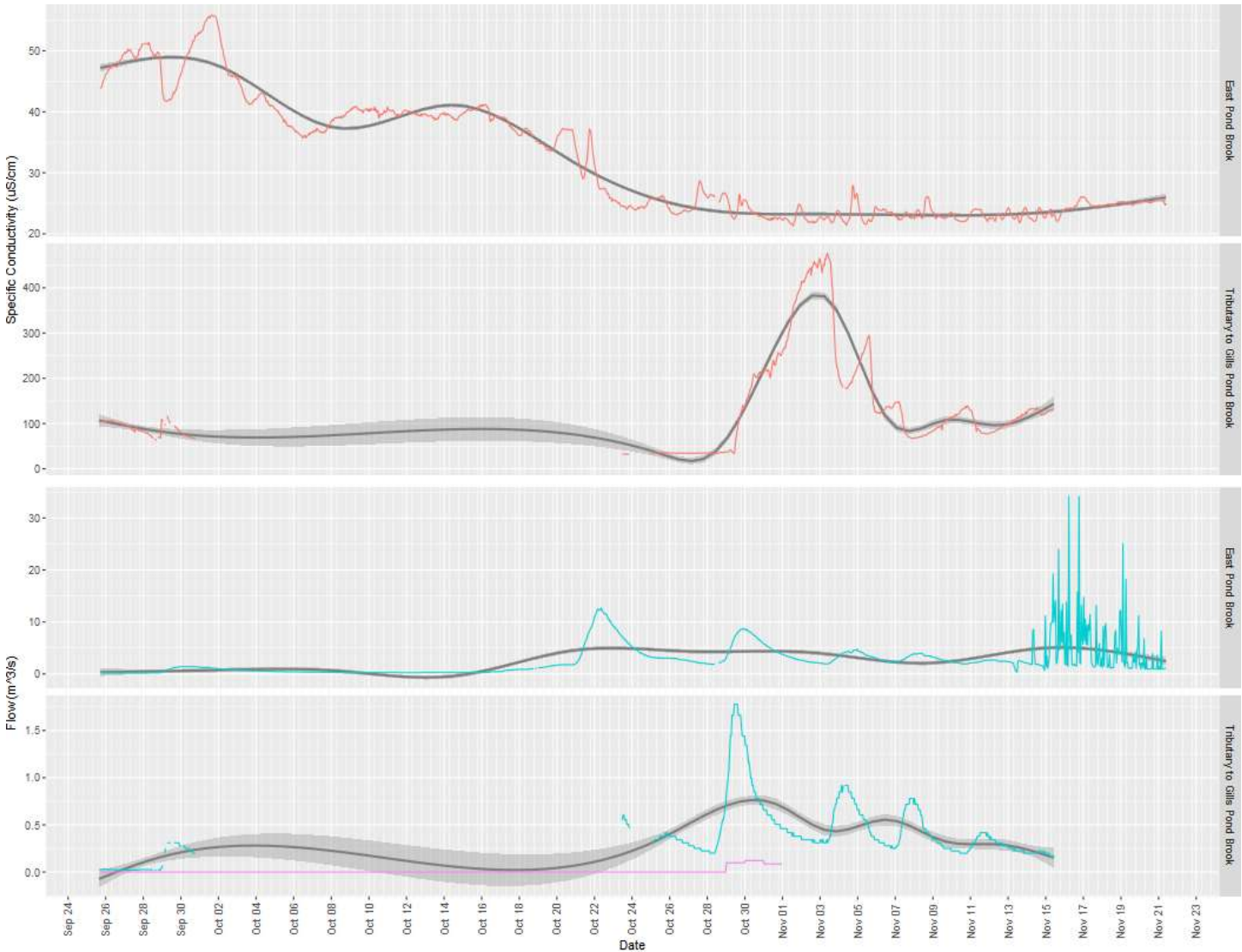
- Declining pH levels were observed at both stations and diurnal cycles ceased at EPB station by October 22. These two trends indicate a point at which the chemical characteristics of precipitation and runoff water overshadowed the variability in pH caused by aquatic life.
- A small rebound in pH in the weeks following heavy rainfall on October 21<sup>st</sup> and 22<sup>nd</sup> indicates that pH has begun to approach pre-rain event 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 25°C to allow comparison across variable temperatures.



Station	Mean	Median	Min	Max
East Pond Brook	32.1	26.3	21.3	55.9
Tributary to Gills Pond Brook	137.0	104.3	32.1	476.0

- Specific conductivity declined by almost 50% from the beginning to end of the deployment at EPB station, spurred largely by a general decline early in the deployment and by dilution from heavy precipitation later in the deployment.
- A short period of discharge from the Teck mine site means that conductivity at TGPB was likely relatively low prior to October 29<sup>th</sup>. During the period of discharge, conductivity peaked but declined afterwards.

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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.*



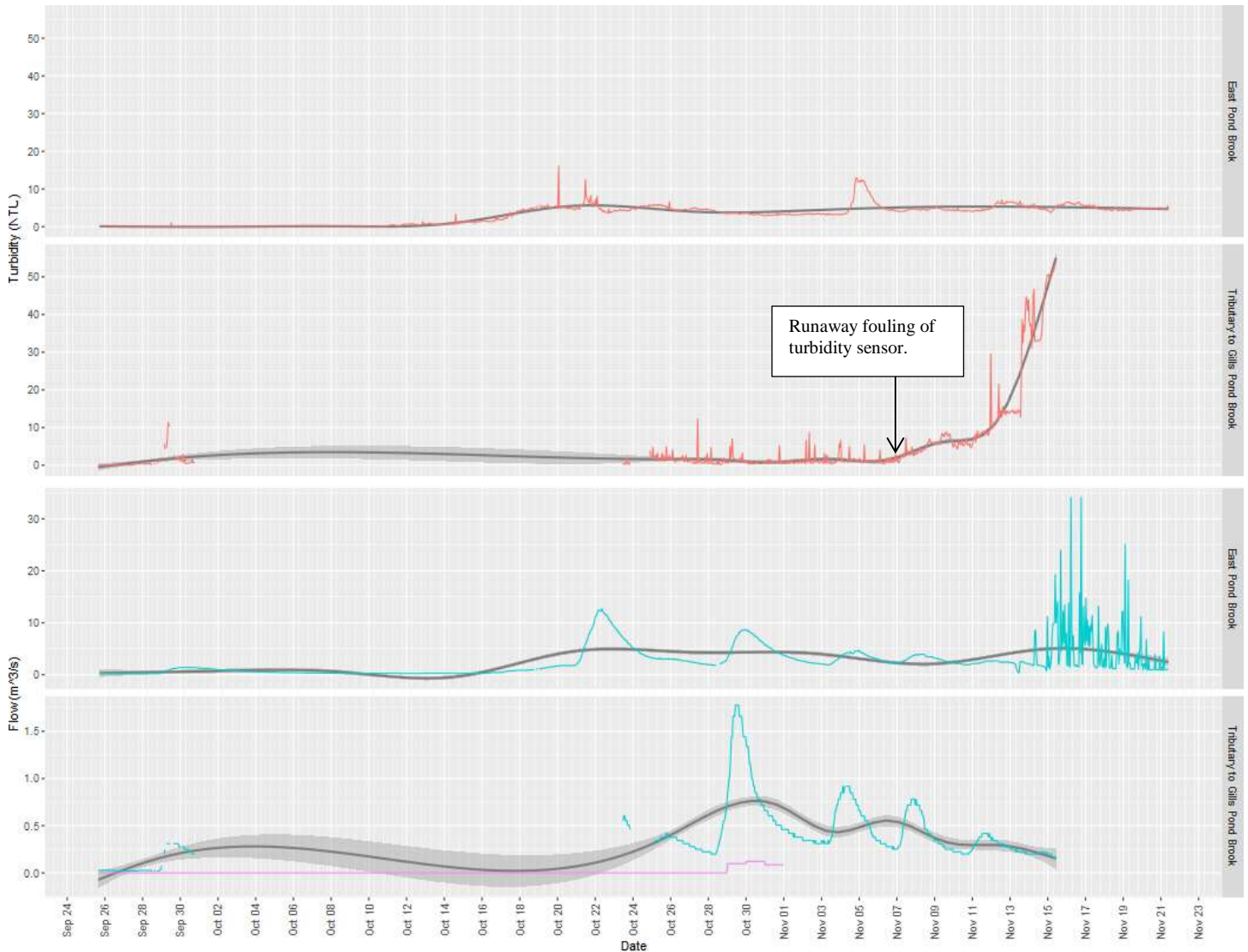
Station	Mean	Median	Min	Max
East Pond Brook	11.29	11.20	9.05	13.16
Tributary to Gills Pond Brook	11.11	11.13	9.14	12.53

- Declining water temperatures resulted in rising dissolved oxygen concentrations at both EPB and TGPB stations during this deployment period. Judging from the trend line in the figure above, concentrations were likely greater than CCME guidelines of 9.5 mg/l DO by October 14<sup>th</sup>.
- Concentrations observed at the end of the deployment are unlikely to change drastically until ice breakup.

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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	3.1	3.7	0.0	16.1
Tributary to Gills Pond Brook	5.6	1.3	0.0	53.4

- Compared to previous deployments, turbidity levels at both stations were moderately low compared to previous deployments – a median value of 3.7 NTU at EPB station is slightly higher than typical values encountered in previous deployments, but this is likely due to weather conditions.
- Runaway sensor fouling appears to have compromised readings at TGPB during the last week and a half of deployment.

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Appendix

