Real-Time Water Quality Deployment Report

Leary's Brook at Prince Philip Drive

December 15, 2010 to April 27, 2011

Newfoundland Labrador

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

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General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- This deployment report discusses the water quality events recorded over the course of 132 days from December 12, 2010 to April 27, 2011.
- pH data from January 24th to February 23rd was omitted due to a sensor failure.

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

Date	Action	Comparison Ranking				
		Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
December 15, 2010	Deployment	Excellent	Fair	Good	Excellent	Excellent
January 19, 2011	Removal	Excellent	Good	Good	Good	Poor*
January 19, 2011	Deployment	Excellent	Marginal	Good	Excellent	Excellent
February 23, 2012	Removal	Good	Fair	Good	Marginal	Good
February 23, 2012	Deployment	Fair	Excellent	Marginal	Excellent	Poor†
March 30, 2011	Removal	Excellent	Excellent	Good	Good	Excellent
March 30, 2011	Deployment	Excellent	Fair	Good	Excellent	Good
April 27, 2011	Removal	Fair	Excellent	Poor‡	Excellent	Excellent

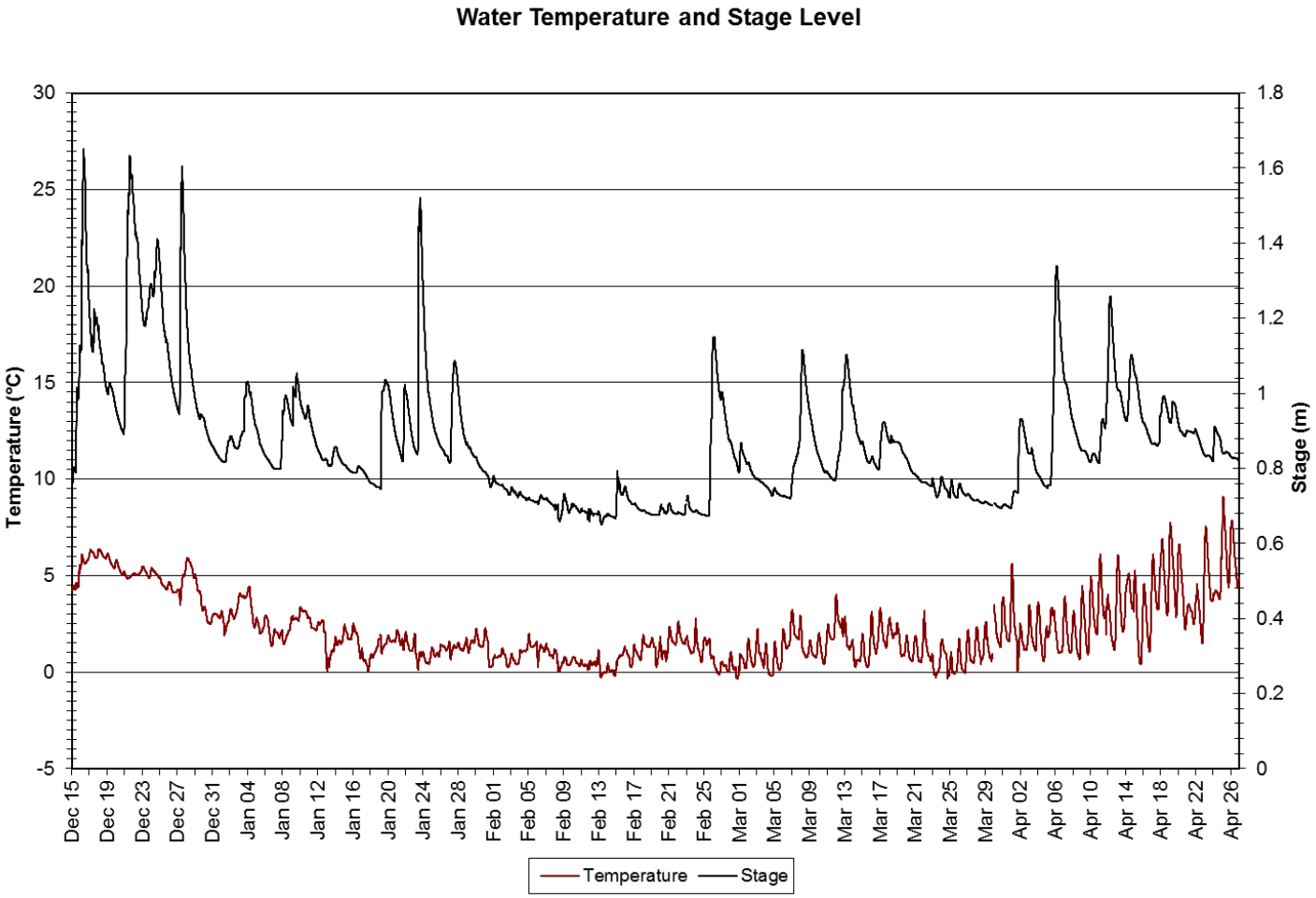
* At removal time the Field Sonde reported 14.8 NTU while the QAQC Sonde reported 0.0 NTU.

† Turbidity conditions were high at the time of deployment – the Field Sonde reported 172.3 NTU while the QAQC Sonde reported 110.7 NTU. The difference between the two, resulting in a "Poor" ranking may represent a difference in sensitivity between the two instruments.

‡ This "Poor" ranking is the result of a of fouling, possibly caused by the maintenance procedure itself: Field Sonde read 3651 µS/cm while the QAQC Sonde read 374.2 µS/cm. Just before the maintenance, the Field sonde read near 0 NTU.

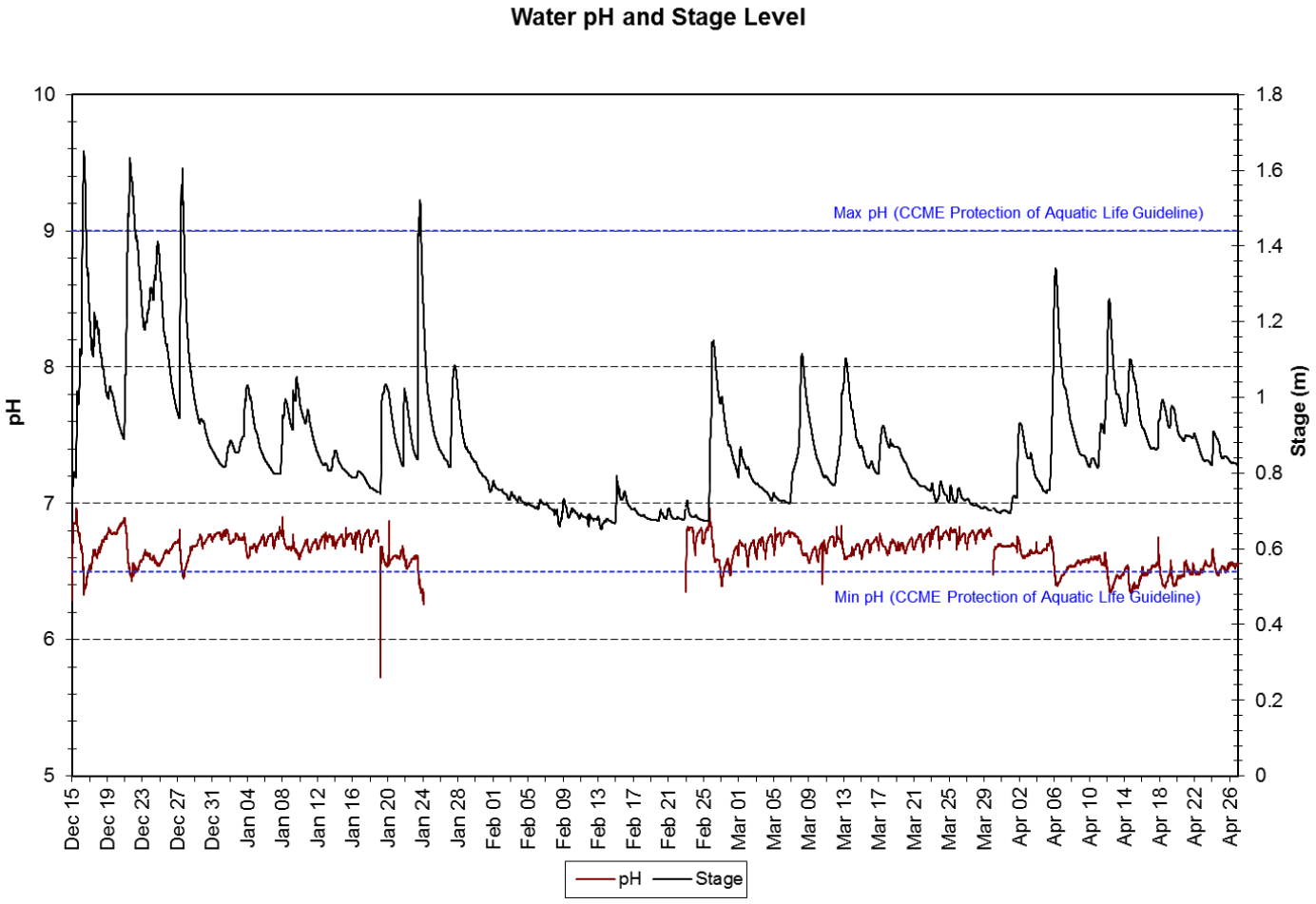
Data Interpretation

Figure 1: Water Temperature at Leary's Brook station from December 15, 2010 to April 27, 2011



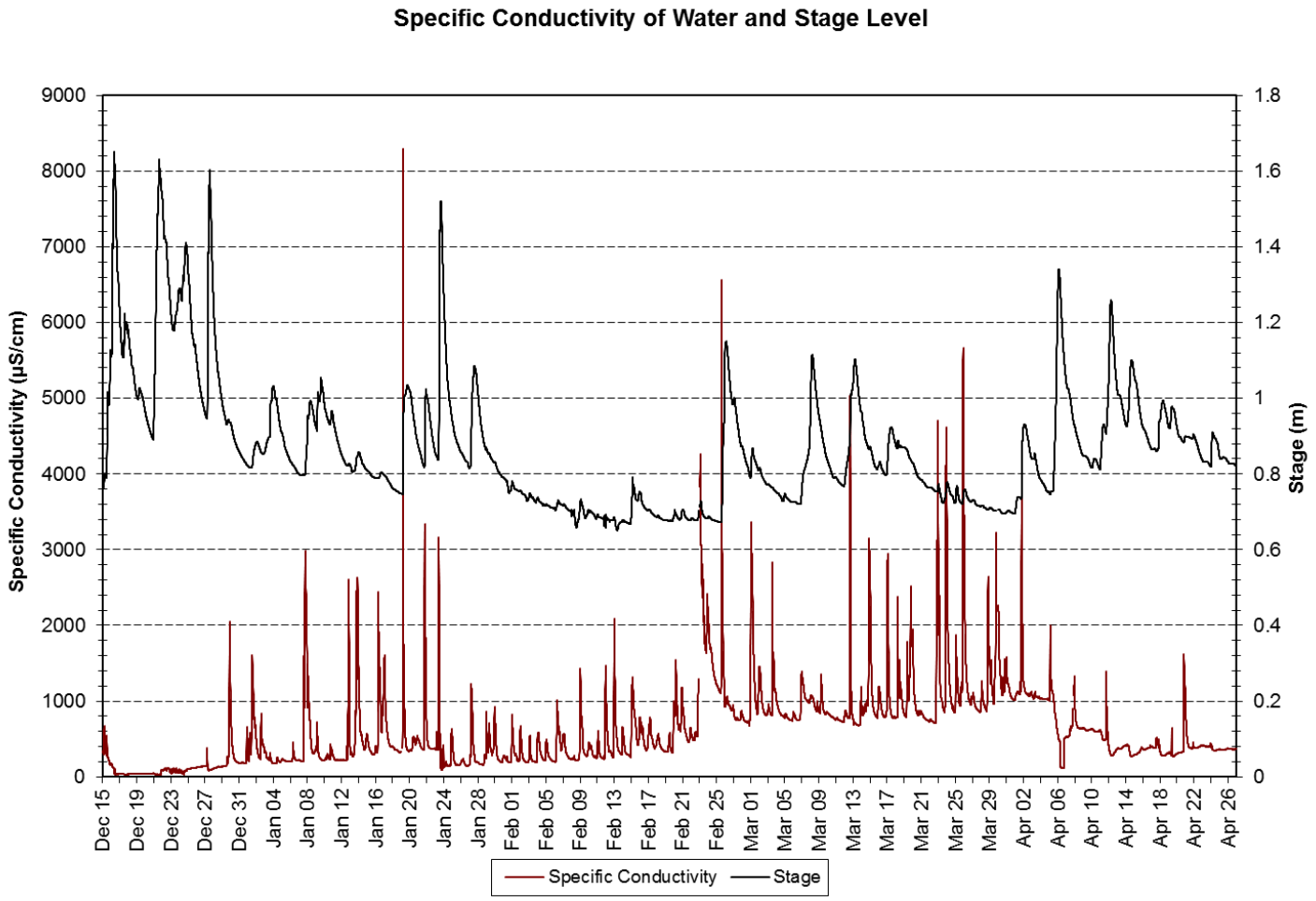
- From December to March, water temperature does not vary a great deal between day and night. Soon after, water temperatures begin to trend upwards and diel cycles in temperature become clear.
- Temperatures fell between -0.36^{o}C to 9.10^{o}C (median value: 1.65^{o}C).

Figure 2: pH at Leary's Brook station from December 15, 2010 to April 27, 2011



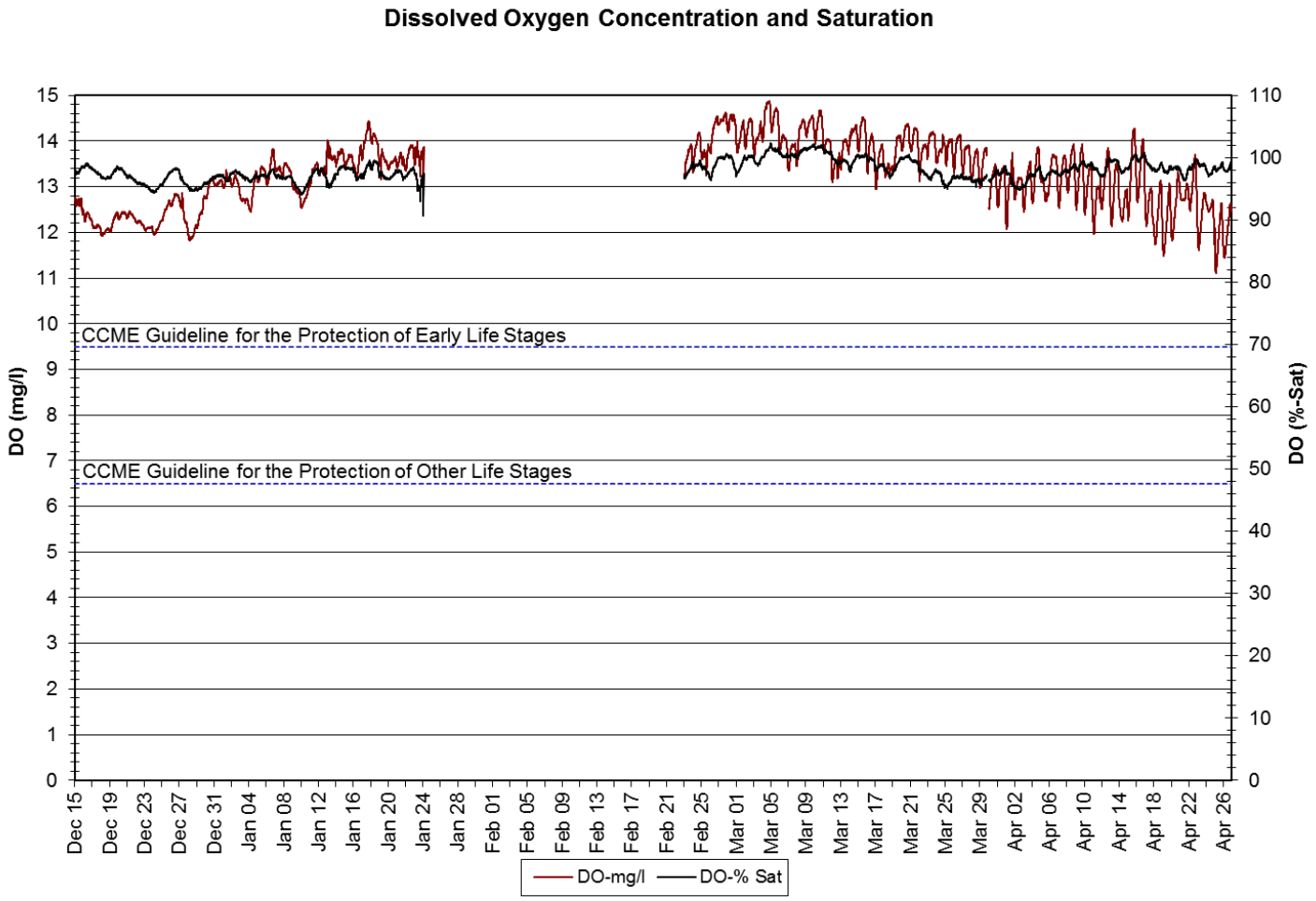
- A sensor failure required the removal of pH data from January 24th to February 23rd, resulting in a gap in the figure above.
- Most pH values were found to be on the lower end of the CCME Guidelines for the Protection of Aquatic Life. A range of 6.16 to 6.96 was found over this time period with a median value of 6.68.
- No obvious trends up or down were identified in pH at this time, though there may be a decrease near the end of the deployment period. pH will be watched for any deviations for typical values.

Figure 3: Specific Conductivity at Leary's Brook station from December 15, 2010 to April 27, 2011



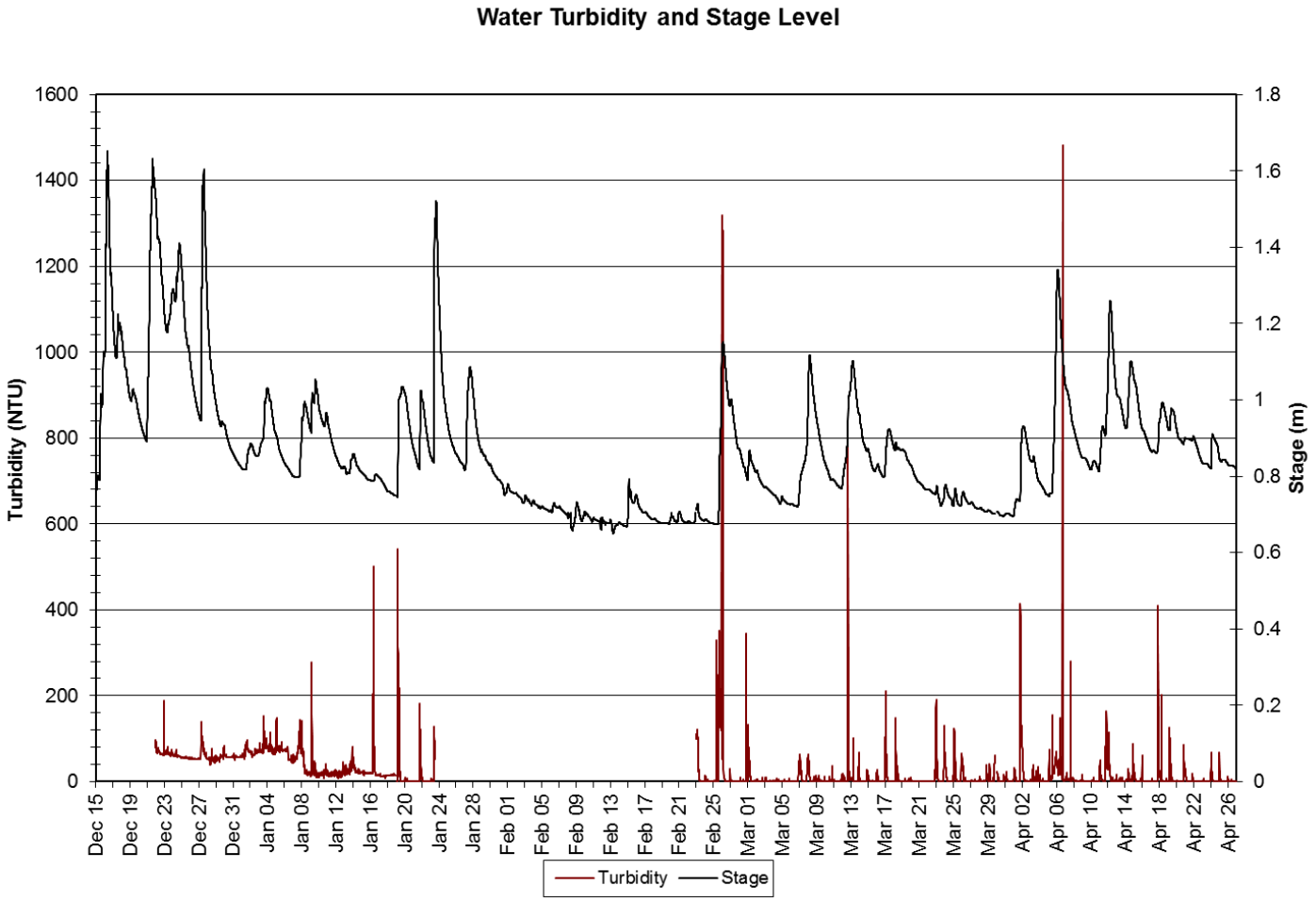
- Conductivity rises consistently throughout the winter months before declining in April. This trend is seen year after year and coincides with the application of road salt for ice-control purposes in St. John's. The trend is so typical and clear that the initiation of spring freshet can be observed from conductivity figures alone.
- Conductivity values fell between 23.9 and 8290.9 µS/cm (median value: 422.0 µS/cm).

Figure 4: Dissolved Oxygen at Leary's Brook station from December 15, 2010 to April 27, 2011



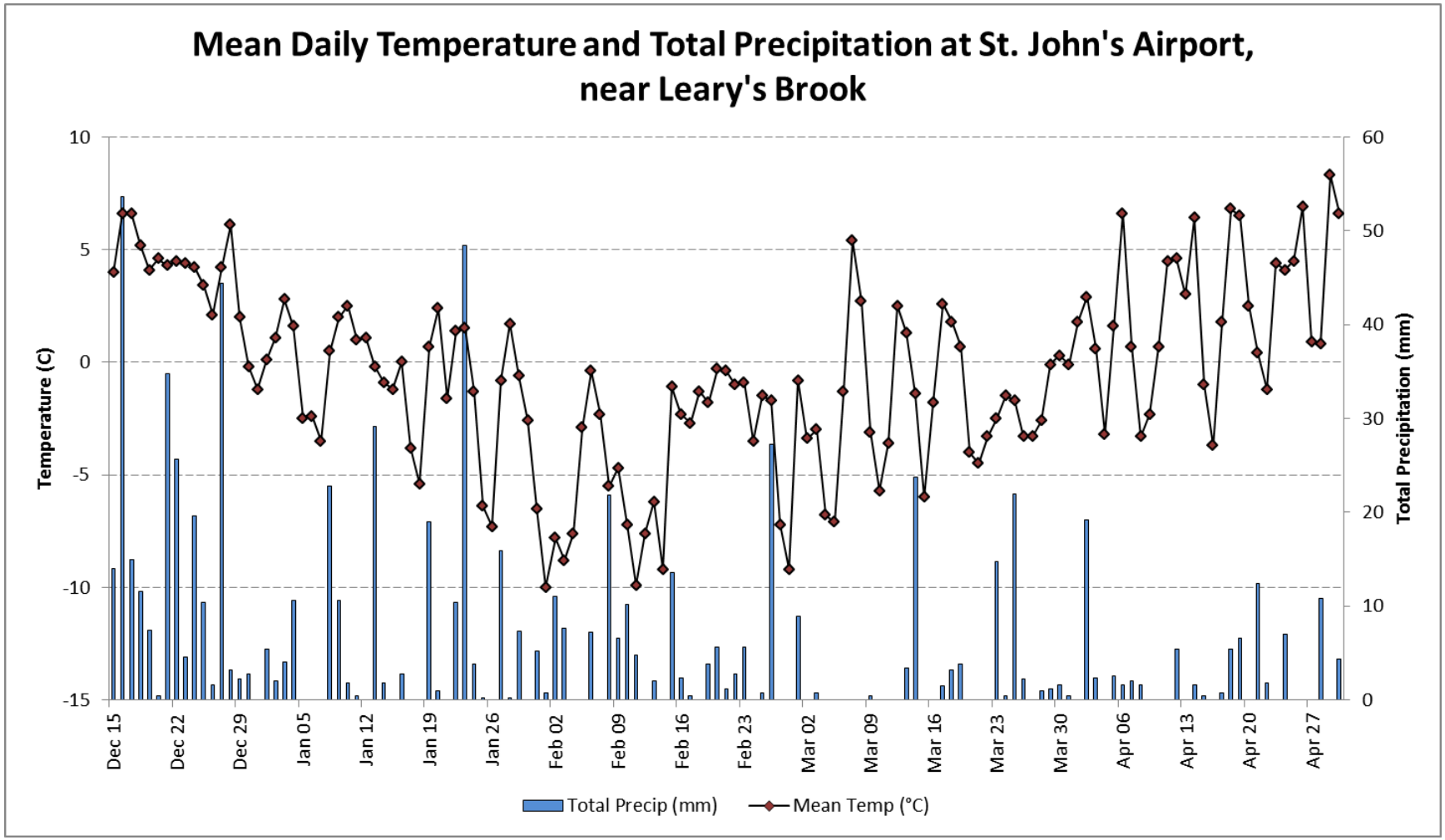
- A dissolved oxygen sensor problem required the removal of data from January 24th to February 23rd. As a result, a gap was left in the above graph.
- Dissolved oxygen concentration hits a deployment (and annual peak) of 14.88 mg/l on March 5. Normally, maximum oxygen concentrations are observed during the lowest water temperatures. While Leary's Brook was marginally warmer than the deployment lows in early March, a combination of cool water and vigorous flow from melt water was likely responsible for the high values.
- Oxygen concentrations ranged from 11.11 mg/l to 14.88 mg/l (median value: 13.37 mg/l). All values were found to be above the CCME Guidelines for the Protection of Early and Other Life Stage cold water biota.

Figure 5: Turbidity at Leary's Brook station from December 15, 2010 to April 27, 2011



- Turbidity values at Leary's Brook tend to be highly variable and dynamic. Visual observations confirm that turbidity events can last less than one hour turning the river opaque in only a few minutes and returning to clear conditions. This has been the case, especially, since Hurricane Igor. Since the record-breaking storm, a great deal of effort has been made to shore up the stream banks and deepen the river channel in some locations. This work often results in excavators and other heavy equipment in operations from within the river itself leading to turbidity spikes.
- During this time period, turbidity values centered on a median value of 1.7 NTU with a range of 0.0 NTU to 1481 NTU.

Appendix



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