Real-Time Water Quality Deployment Report

Leary's Brook at Prince Philip Drive

February 23rd, 2010 to May 11th, 2010

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

Real-Time Water Quality Deployment Report
NF02ZM0178 – Leary's Brook at Prince Philip Drive
February 23rd, 2010 to May 11th, 2010

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- This deployment report interprets the time period from February 23rd, 2010 to May 11th, 2010; a period of 78 days.
- An unforeseen parameter order problem was not detected prior to installation and twenty one hours of data was lost from the records for dissolved oxygen concentration and turbidity.

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 along side the Field Sonde. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field Sonde for specific conductivity, pH and turbidity parameters. Based on the degree of difference between parameters recorded by the Field Sonde, QAQC Sonde and grab sample a qualitative statement is made on the data quality in Table 1 upon Deployment.
  - At the end of a deployment period, readings are taken in the water body from the Field Sonde before and after a thorough cleaning in order to assess the degree of biofouling. During calibration in the laboratory, an assessment of calibration drift is made and the two error values are combined to give Total Error (T_e). If T_e exceeds a predetermined data correction criterion, a correction based on T_e is applied to the dataset using linear interpolation. Based on the value for T_e, a qualitative statement is also made on the data quality in Table 1 upon Removal.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Leary's Brook	February 23, 2010	Deployment	Good	Excellent	Marginal	Excellent	Excellent
	May 11, 2010	Removal	Excellent	Fair	Good	Excellent	Poor

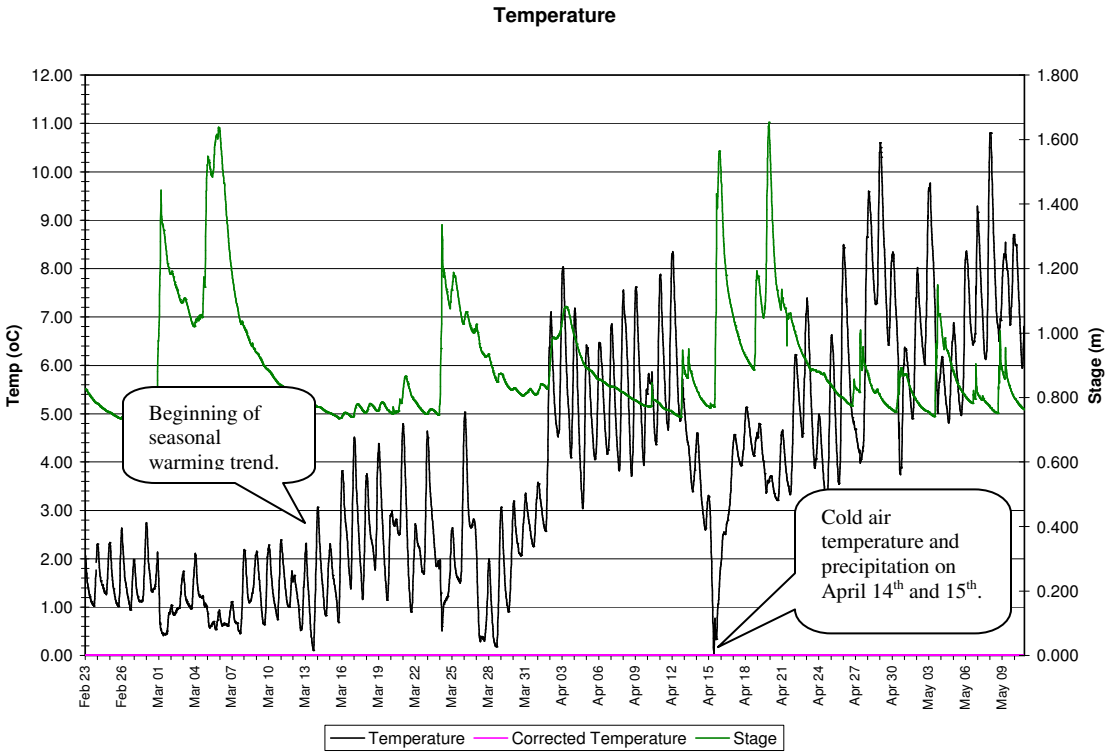
- Due to fouling on the turbidity sensor, the turbidity record was determined to be "Poor" upon removal. Total error for turbidity was found to be 112.95 NTU because of an accumulation of debris.

Data Interpretation

- Water temperature data for this deployment period is uncorrected because Total Error fell below the data correction criterion.
- This deployment period is marked by a continuation of the winter water temperature plateau followed by the warming trend expected with the onset of spring. From February 23rd to March 13th, the temperature was cold with no discernable trend up or down. March 14th onwards displays the warming trend with some short-term drops in water temperature.

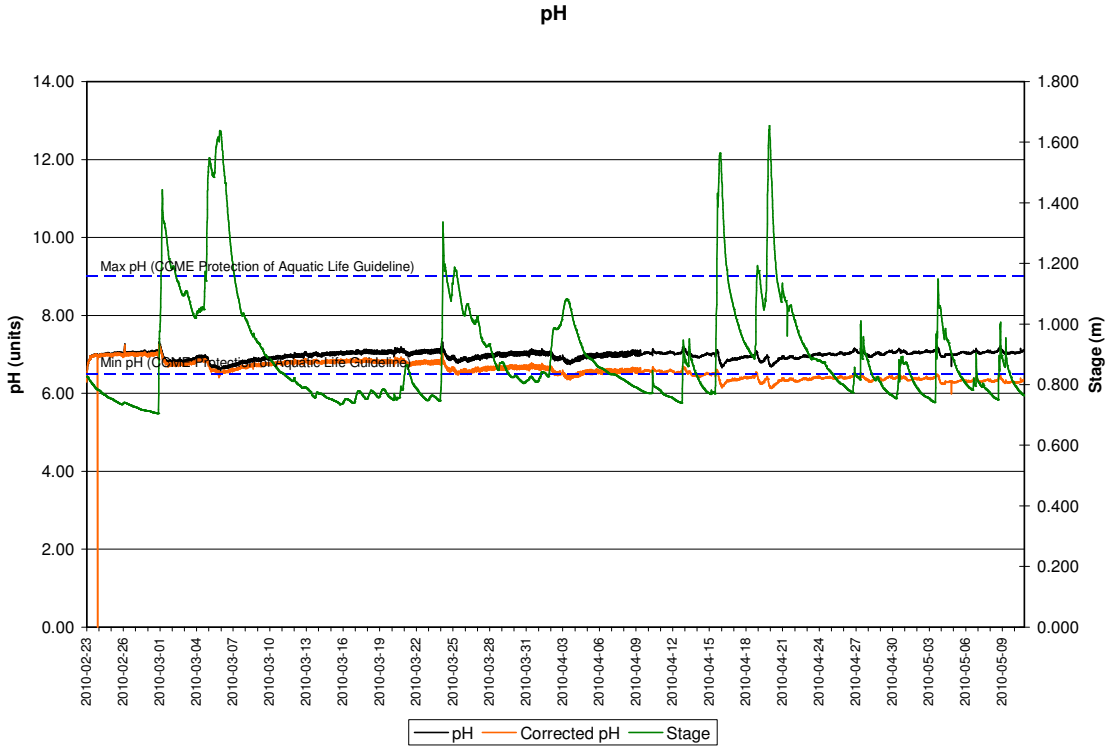
- On April 15th and 16th, a drop of 3.24°C in nine hours occurred. Water temperature fell to a low of 0°C and rebounded to normal within 24 hours. During this time interval, a high volume of precipitation fell when air temperatures were below zero causing a chilling effect in Leary's Brook.

Figure 1: Water Temperature at Leary's Brook from February 23rd, 2010 to May 11th, 2010



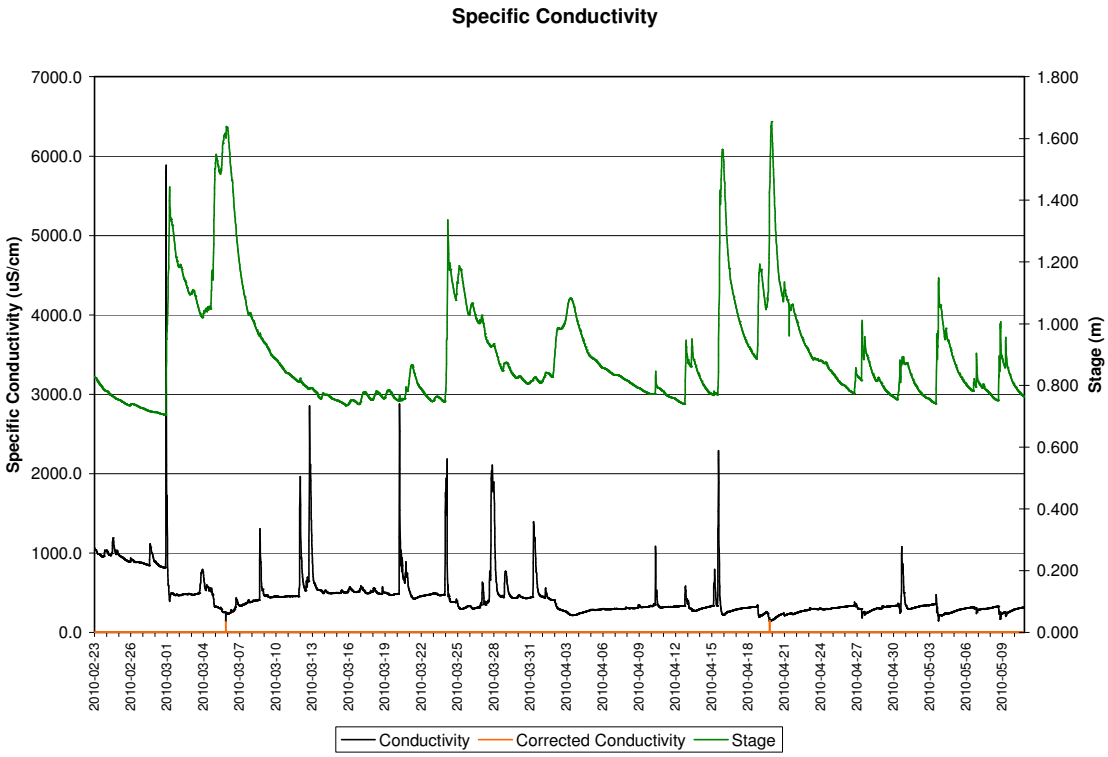
- A correction factor of -0.76 was applied to the record for pH over this deployment period due to Total Error exceeding the data correction criterion. Raw and corrected data are presented in Figure 2.
- Corrected pH values ranged from 7.26 to 5.98. Values generally fell within the range set by the CCME Guidelines for the Protection of Aquatic Life (6.5 – 9.0) in the early part of the deployment. However, as the deployment went on, pH values frequently fell below the lower limit. Because this decline is slow and not punctuated by drastic fluctuations in pH, no cause for concern is warranted (the pH of water bodies in this region of the province are commonly acidic in nature).

Figure 2: pH at Leary's Brook from February 23rd, 2010 to May 11th, 2010



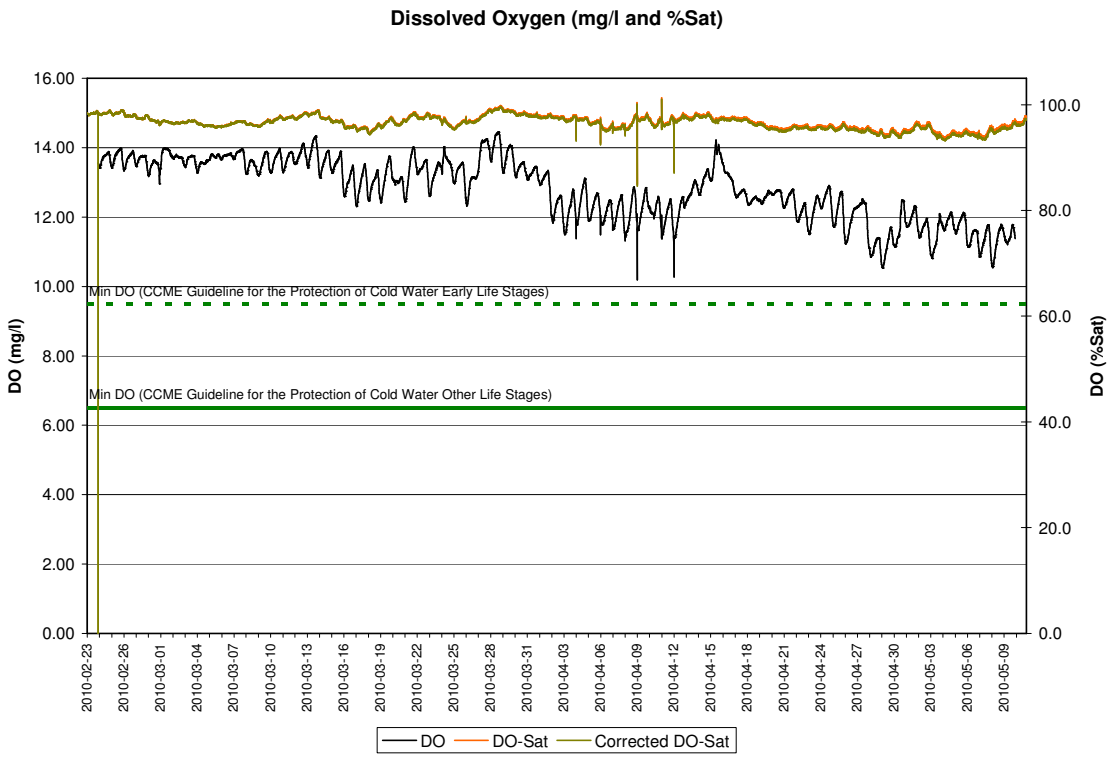
- The data correction criterion for specific conductivity was not exceeded during this deployment and no correction was required to the record. The data presented in Figure 3 is raw.
- A range of 5885.9 to 133.1 µS/cm was found in the record – consistent with the high values found during snow clearing and ice control due to road salt application. A decline is seen in the record as time goes on with periodic spikes in association with precipitation events.
- Peaks in Stage level (water height) correspond to peaks in specific conductivity. Obvious incidents of this behavior are seen on March 1st, March 24th, and April 15th. During these spikes in stage and conductivity, bouts of precipitation were recorded in the temperature and precipitation graph in the Appendix.

Figure 3: Specific Conductivity at Leary's Brook from February 23rd, 2010 to May 11th, 2010



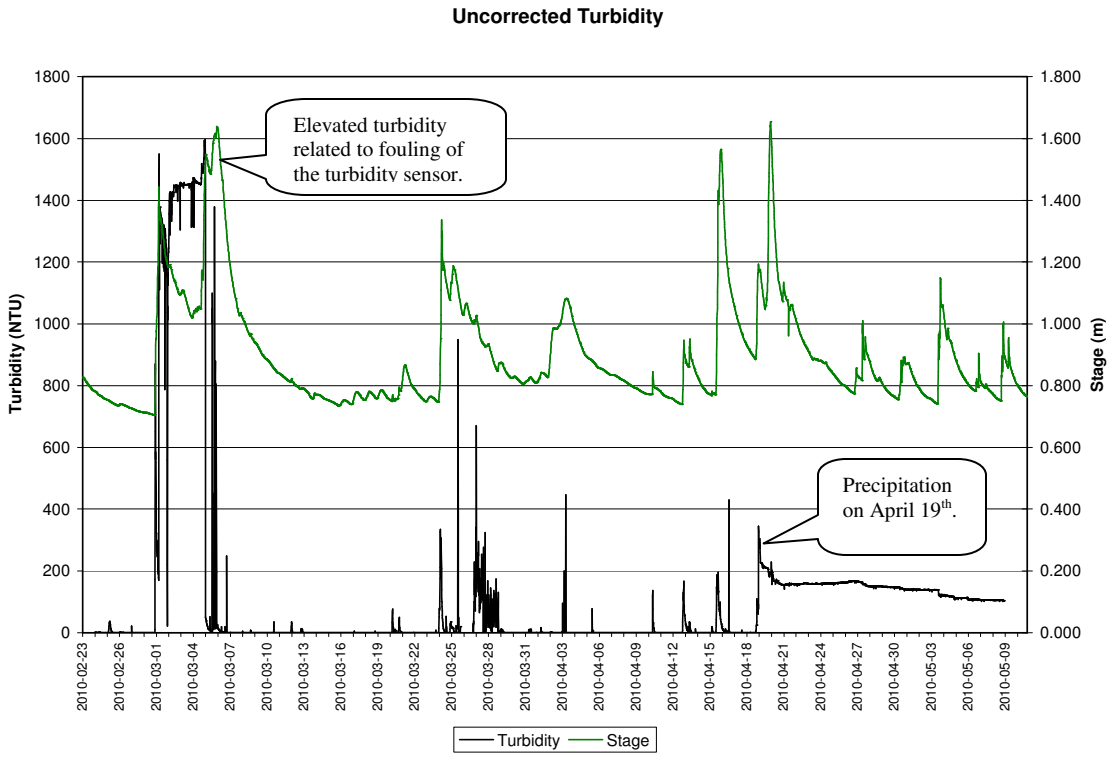
- A correction of -0.50% was applied to the Percent Saturation of Dissolved Oxygen.
- Saturation of dissolved oxygen ranged from 101.3 to 84.9% during this interval. Saturations above 100% are related to high-flow conditions where water turbulence forces more oxygen to dissolve in the water body than normal. Concentrations less than 100% can be related to several factors including: consumption by aquatic organisms and oxidation of dissolved compounds.
- The inverse relationship between the concentration of dissolved oxygen and water temperature leads to the expected decline in DO concentration during this deployment period. All values, however, are above the CCME Guideline for the Protection of Aquatic Life.

Figure 4: Dissolved Oxygen at Leary's Brook from February 23rd, 2010 to May 11th, 2010



- The turbidity values reported in Figure 5 are raw and uncorrected. Several incidents of sensor fouling occurred during this deployment resulted in periods of inaccurate and highly-inflated turbidity readings. These fouling incidents tend to occur during periods of heavy precipitation and high stage levels.
- During dry spells, turbidity is generally found to be low and close to zero. In conjunction with precipitation, turbidity fluctuates due to runoff from surrounding roadways and parking lots. Turbidity tends to be high and of short duration in Leary's Brook due to the highly developed watershed. Precipitation quickly washes silt and debris from hard surfaces and into the river channel where high flows clear the river in a short period of time.
- Two notable precipitation events overwhelmed the turbidity sensor and caused prolonged periods of fouling.
    - 180.4 mm of precipitation fell between March 1st and 6th.
    - 69.8 mm of precipitation fell between April 19th and 22nd.

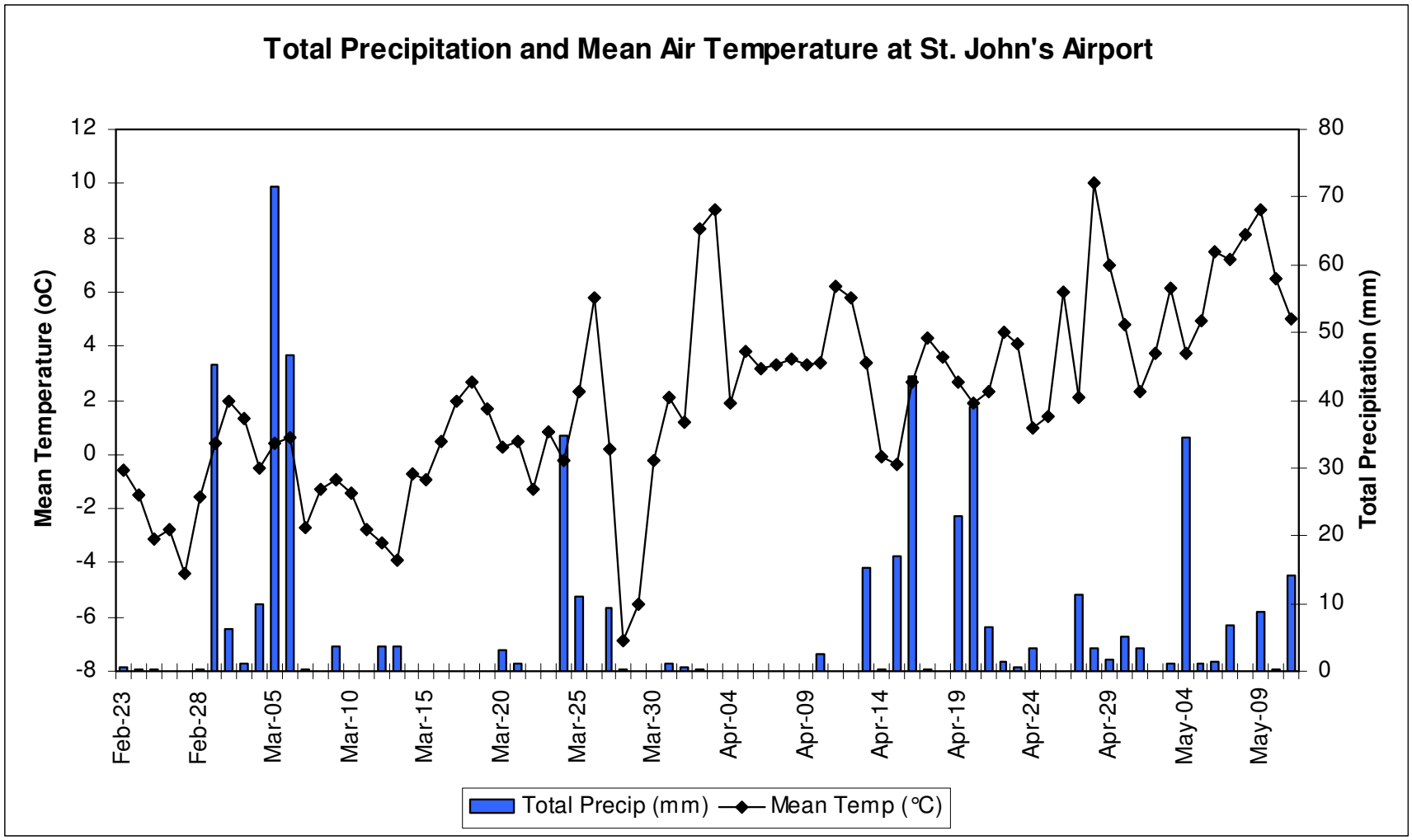
Figure 5: Turbidity at Leary's Brook from February 23rd, 2010 to May 11th, 2010



Conclusions

- Leary's Brook at Prince Philip Drive recorded data typical for this time of the year. Notable trends are increasing water temperatures, decreasing dissolved oxygen, decreasing specific conductivity and highly variable turbidity.
- A short period of data loss occurred on February 23rd to 24th because of a problem with the parameter order. This was corrected with a field trip.

Appendix



Prepared by:
Ryan Pugh
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.729.1681
Fax: 709.729.3020