Real-Time Water Quality Deployment Report

Leary's Brook at Prince Philip Drive

October 27th to November 19th, 2010

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

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NF02ZM0178 – Leary's Brook at Prince Philip Drive
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General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Extreme siltation has become a problem since Hurricane Igor on September 21st. The result is frequent burial and fouling of the Hydrolab in Leary's Brook severely hampering useful data collection. On November 8th, the Hydrolab became partially buried by silt carried from the relatively small rainfall event of 12 mm.
    - On November 18th, during a brief field visit to check on Leary's Brook station, the Hydrolab and casing was cleared of silt. Values were then recorded as expected.
    - Data between November 8th to November 18th is unreliable and does not reflect actual stream values.

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.

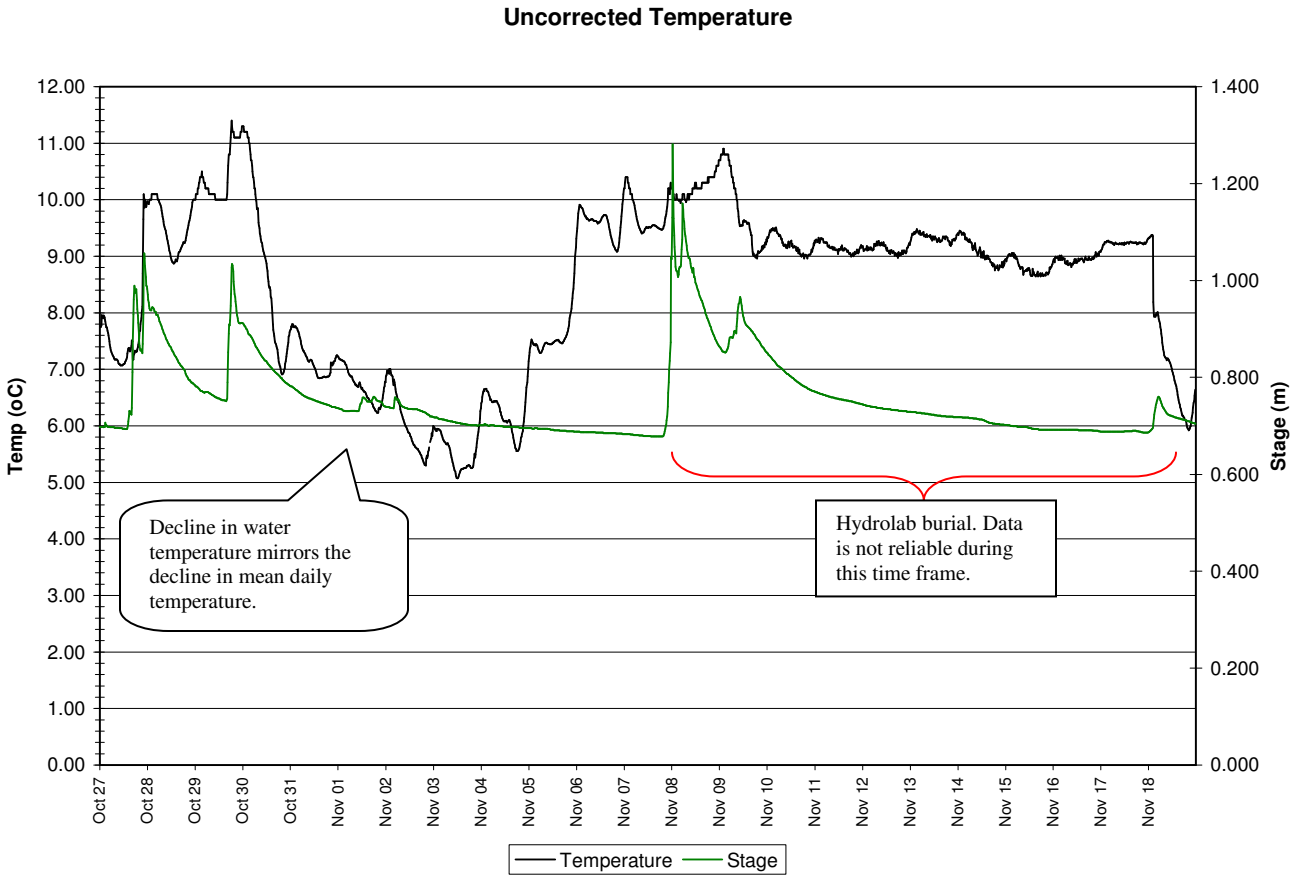
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Leary's Brook at Prince Philip Drive	October 27th, 2010	Deployment	Excellent	Poor	Fair	Excellent	Excellent
	November 19th, 2010	Removal	Excellent	Excellent	Good	Good	Good

- At deployment, pH and Conductivity were ranked as "Poor" and "Fair", respectively, while other parameters were ranked as "Excellent". The "Poor" ranking of pH is related to a large difference between the Field sonde and grab sample. pH was ranked as "Excellent" upon removal, indicating that the problem is likely related to the grab sample.
- Parameters were ranked unexpectedly high on the 19th despite being buried for ten days prior to removal.

Data Interpretation

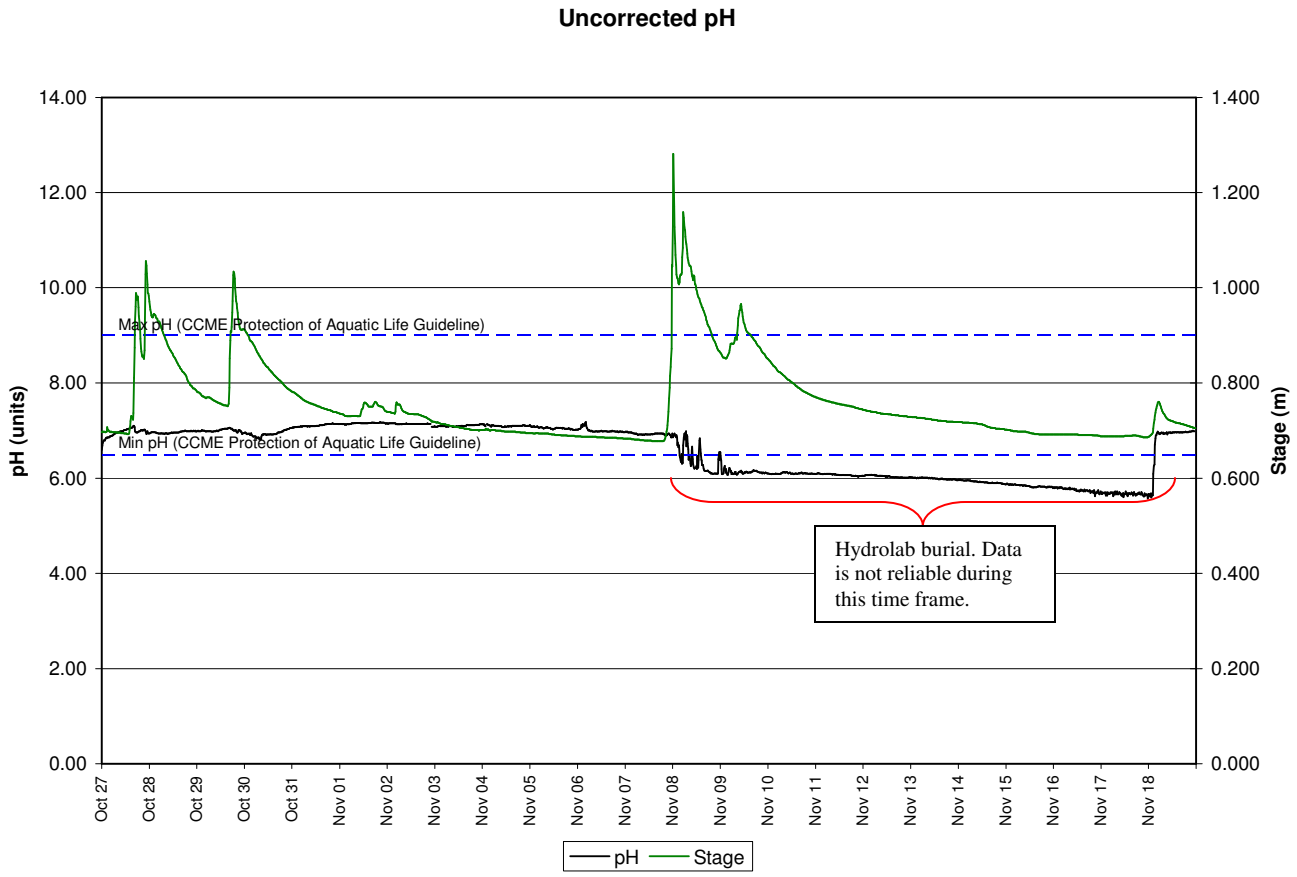
- No correction was applied to the temperature record for this deployment period; data presented below are raw.
- Water temperature from October 27th to November 8th ranged from 11.4 to 5.07°C with a mean value of 7.89°C. Following November 8th, water temperature shows a comparatively stable appearance as a result of the insulating effect of silt.

Figure 1: Water Temperature at Leary's Brook at Prince Philip Drive from October 27th to November 19th, 2010



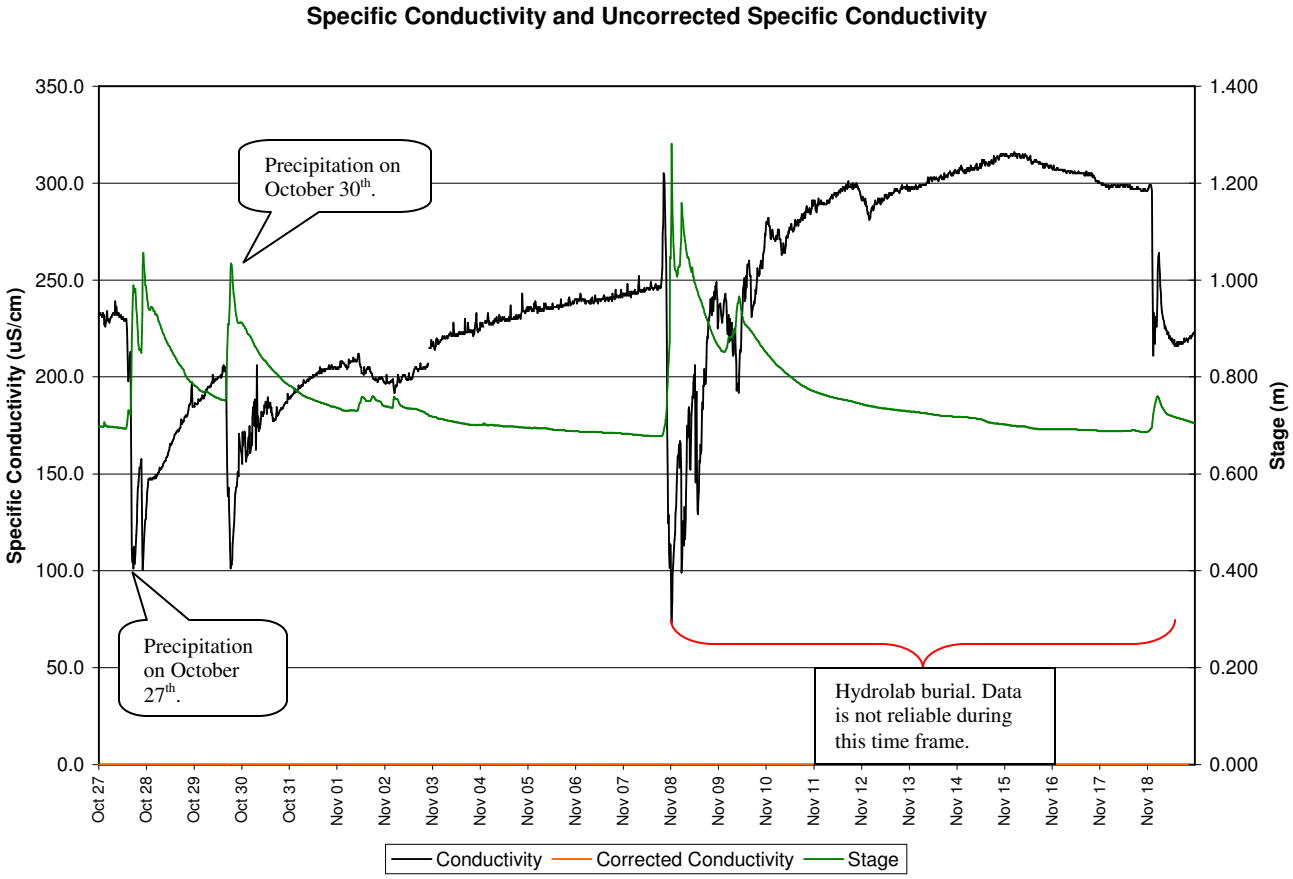
- No correction was required for pH during this deployment since the data correction criterion was not exceeded by the calculated Total Error.
- pH ranged from 6.59 to 7.18 units from October 27th to November 8th and an average value of 7.04 was calculated. All values were within the guideline range set by the CCME (6.5 to 9.5) for the protection of aquatic life.
- After the burial of the Hydrolab, a slow and steady decline in pH was registered indicating that pH in the anoxic stream bed is significantly more acidic than the water column.

Figure 2: pH at Leary's Brook at Prince Philip Drive from October 27th to November 19th, 2010



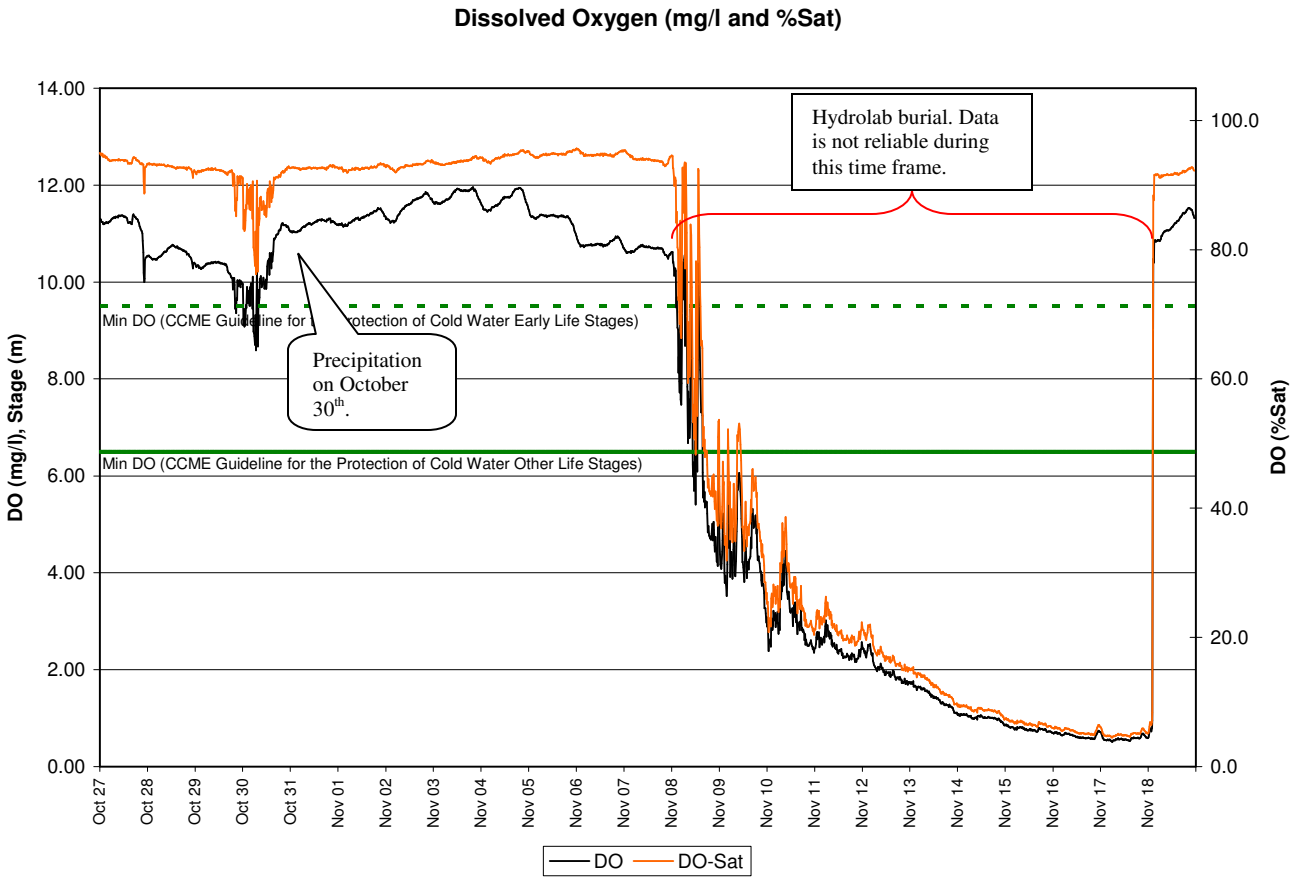
- Conductivity ranged from 73.2 to 316.0 µS/c, with a median value of 236 µS/cm.
- An apparent upward trend in conductivity is punctuated with a series of drops associated with increases in stage level. In late October, a four day rainy period saw two pronounced dips in conductivity caused by runoff. Conductivity values increase to expected levels for Leary's Brook following Hydrolab burial on November 8th, however it is difficult to tell if they represent actual stream conditions given the impact of burial on other sensors.

Figure 3: Specific Conductivity at Leary's Brook at Prince Philip Drive from October 27th to November 19th, 2010



- Dissolved oxygen was heavily impacted by the Hydrolab burial on November 8th. Following a heavy rainstorm, oxygen saturation slid from the mid-90% to a low of 4.5%. Such low oxygen saturation indicates burial in the anoxic conditions of Leary's Brook substrate.
- Prior to the instrument burial, values for oxygen saturation ranged from 76.2 to 95.7%.
- Oxygen concentration also crashed during anoxic burial. Prior to this incident, the concentration of oxygen in the water column ranged from 8.59 to 11.96 mg/l. In the anoxic environment, the concentration of DO fell to 0.51 mg/l

Figure 4: Dissolved Oxygen at Leary's Brook at Prince Philip Drive from October 27th to November 19th, 2010



- Excessive sediment transport and turbidity has been ongoing since Hurricane Igor on September 21st. During the hurricane much of the shrubbery and grass was pulled from the stream edges. The effect is frequent, highly variable turbidity spikes and burial of sensors. A figure is included below to show the change in frequency and variability of turbidity before and after the storm.
- During this deployment period, turbidity ranged from 0.0 to 2896.0 NTU with a median value of 643.0 NTU. Such a high median value is very unusual for Leary's Brook where the median value for Turbidity is usually 0 NTU.

Figure 5: Turbidity at Leary's Brook at Prince Philip Drive from October 27th to November 19th, 2010

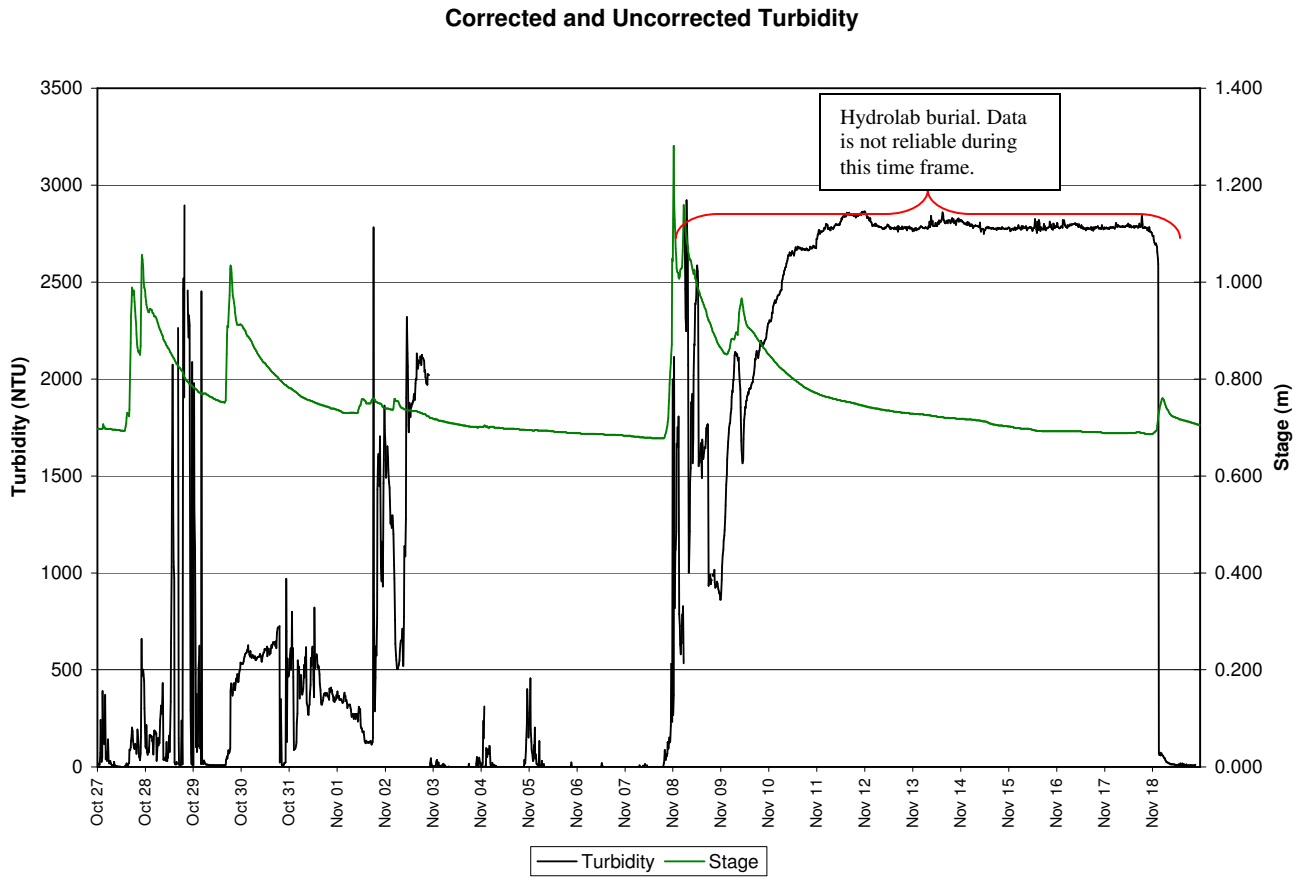
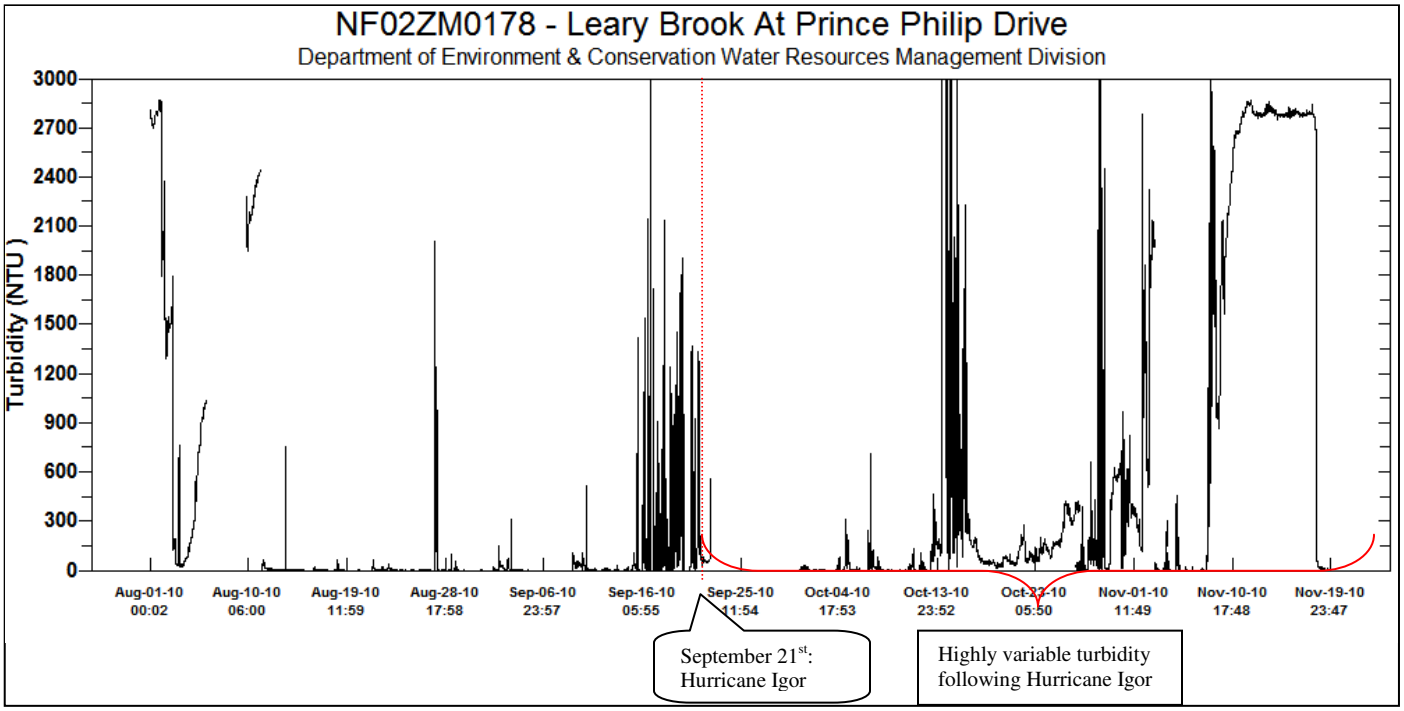


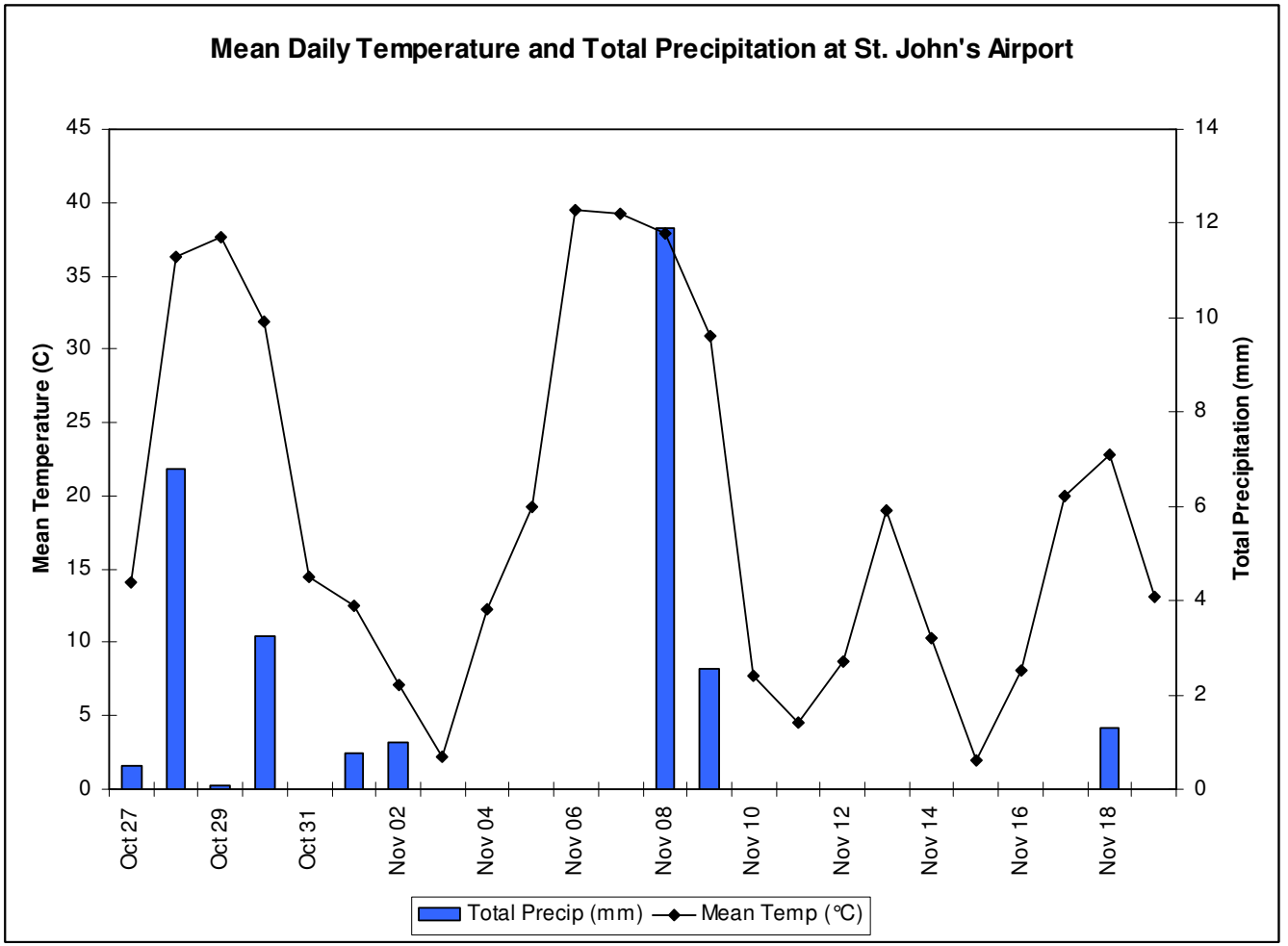
Figure 6: Turbidity at Leary's Brook before and after Hurricane Igor



Conclusions

- A burial of the Hydrolab on November 8th resulted in a failure to record useful data until the end of deployment on November 19th.
    - Such high turbidity has been a frequent problem since stream bank destabilization on September 21st. An effort will be made to find a deployment location that may be less prone to silt deposition. Movement is hampered, however, by the length of the Hydrolab communication cable.

Appendix



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