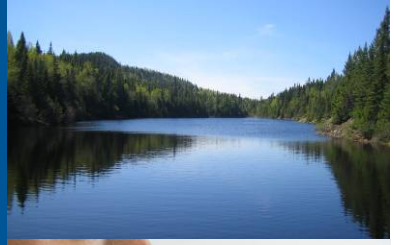
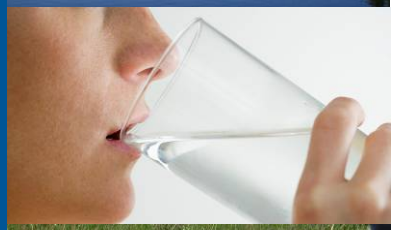



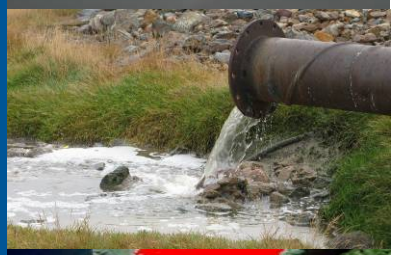


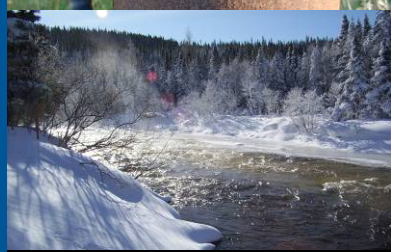

Real Time Water Quality Report Southwest Brook below Southwest Pond

Deployment Period 2012-12-09 to 2013-01-23

2013-01-29

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division

General

- This station is operated cooperatively with the Miawpukek First Nation (Conne River) as a Pilot Project for Drinking Water Source Monitoring. This is the only known application of Real Time Water Quality Monitoring for a drinking water source for any First Nations community in Canada.
- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated, with site visits being carried out as warranted.
- Operators at Conne River are informed of any significant water quality events or instrumentation problems by WRMD.
- Site visits for QA/QC purposes are conducted by WRMD approximately four times per year.
- Monthly calibration and maintenance is undertaken by Cyrus Lambert at the Conne River Water Treatment Plant.

Maintenance and Calibration of Instrumentation

- The regular **DataSonde®** (s/n 44422) was cleaned and freshly calibrated and installed on December 9, 2012 and remained deployed continuously until January 23, 2013, a 44 day period.
- The regular QA/QC **MiniSonde®** (s/n 44998) was cleaned and freshly calibrated and used during the deployment and removal for QA/QC measurements.

Quality Assurance / Quality Control (QA/QC) Measures

- As part of the QA/QC protocol, 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. See **Table 1**.

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

Table 1

- Upon deployment and removal, a QA/QC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for each recorded parameter are compared between the two instruments. Based on the difference between parameters recorded by the Field **DataSonde®** and QA/QC **MiniSonde®** a qualitative statement (Ranking) is usually made on the data.

- The ranking at the beginning and end of the deployment period are shown in **Table 2**.

- Dissolved Oxygen ranked 'Fair" upon deployment; having a difference of 0.53 mg/L and 3.7%. Dissolved Oxygen ranked "Poor" upon removal, having a difference of 1.10 mg/L and 7.5%. The numbers from the QA/QC Sonde were unusually high during both events and will be investigated prior to subsequent field work being undertaken.

- pH ranked "Poor" upon removal. Given that the probe was frozen into the ice during the last few days of deployment, this is not unusual. Erroneous pH data for this period have been removed from the data set.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Southwest Brook below Southwest Pond (NF02ZE0033)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2012-12-09 Deployment	Temp (^{o}C)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Fair
	Turbidity (NTU)	Excellent
2013-01-23 Removal	Temp (^{o}C)	Excellent
	pH (units)	Poor
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Poor
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of -0.18 ˚C to a maximum of 2.67 ˚C, with temperatures fluctuating right around zero for most of the deployment period.
- There is less diurnal variation when stage is increased.

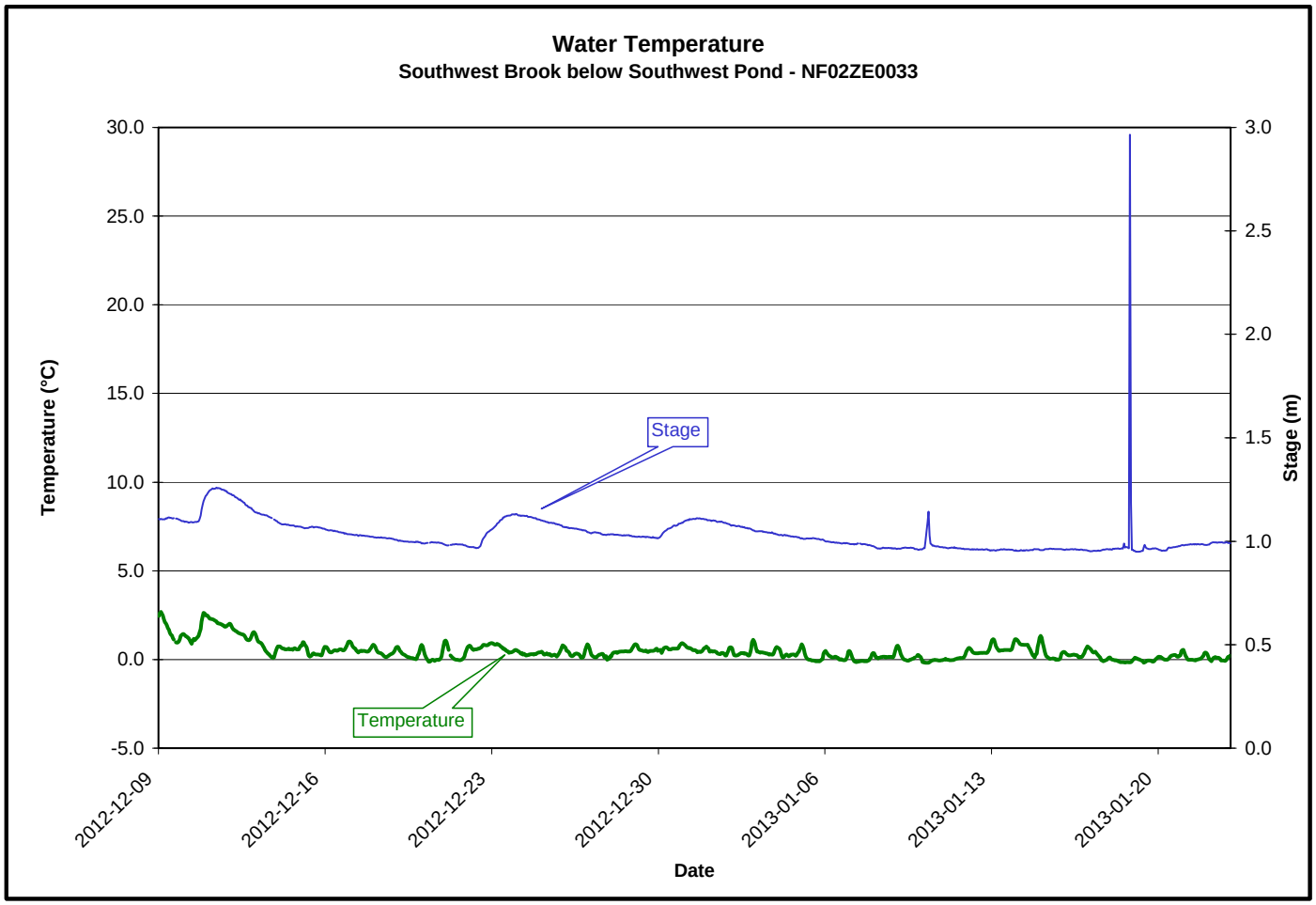

Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 5.22 to a maximum of 7.38 with all the values falling well below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for most of the deployment period.

- During the last few days, pH increased to an unusual value. Subsequent investigation revealed that the unit was frozen in the ice. Accordingly, it was removed for cleaning calibration and subsequent re-deployment. Erroneous pH data for this period have been removed from the data set.

- The background pH of this stream is normally lower than the lower limit of the recommended range.

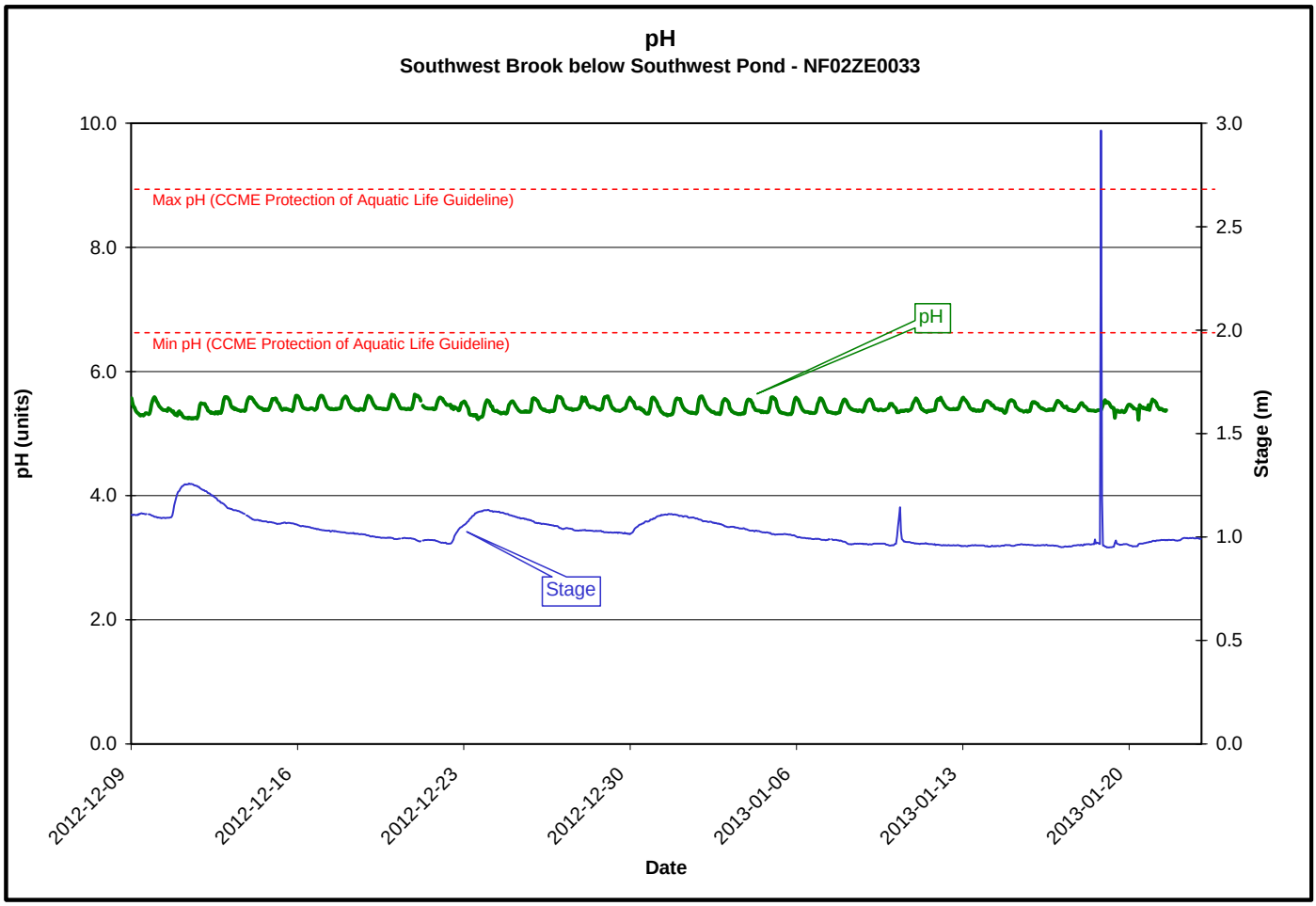

Figure 2

- The specific conductivity **(Figure 3)** ranged from a minimum of 17.8 µS/cm to a maximum of 20.5 µS/cm over the deployment period.
- During this deployment period, there was very little change in specific conductivity.
- A direct relationship with stage is sometimes evident, with minor peaks in specific conductivity following some increases in stage.

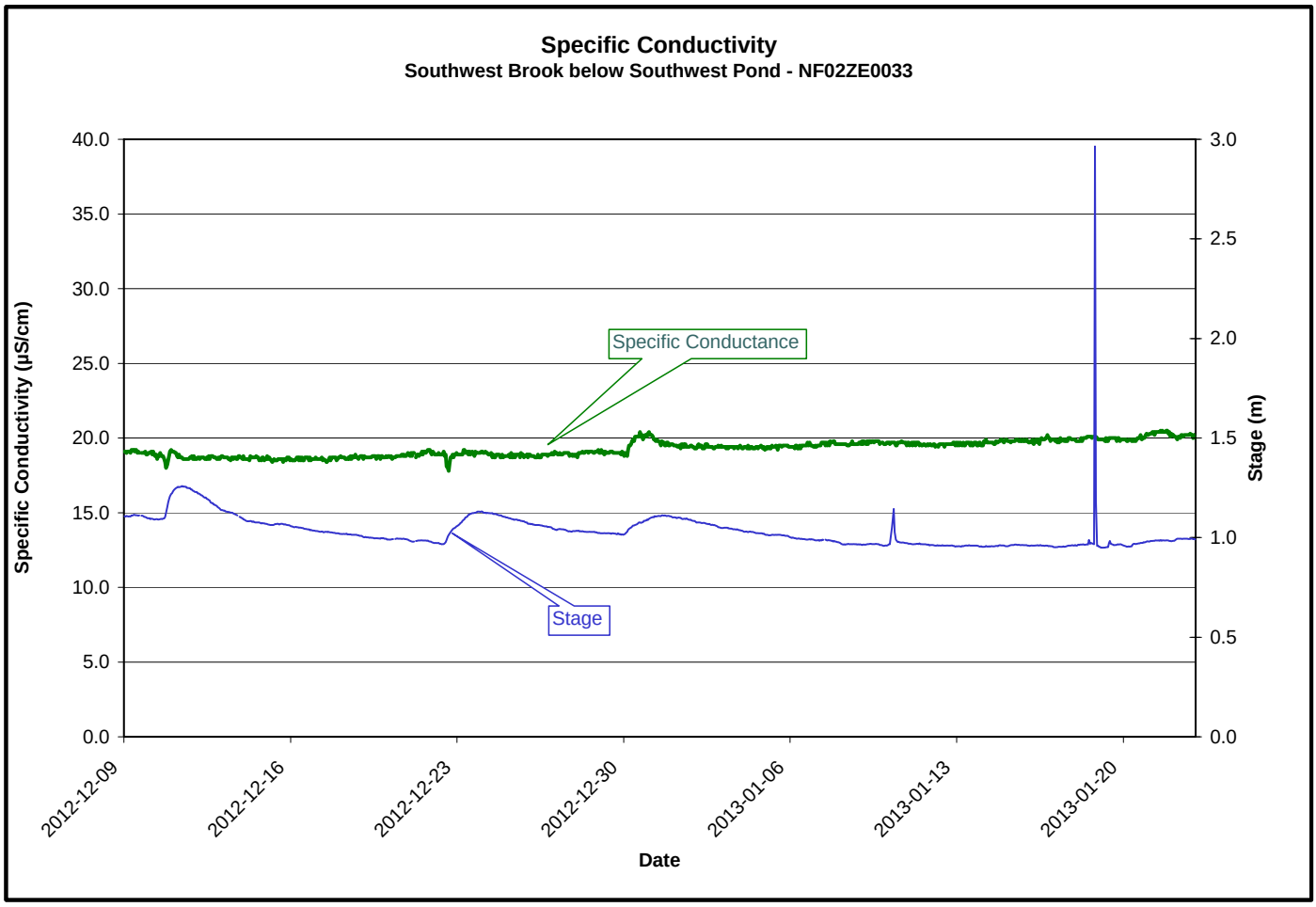

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 12.67 mg/L to a maximum of 13.51 mg/L over the deployment period; with the percent saturation ranging between 89.4 and 94.4.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature.
- Throughout the deployment period dissolved oxygen values consistently fell above the upper limit recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).
- Based upon the fact that Dissolved Oxygen % Saturation had minimal change over the deployment period, we can be confident that the Dissolved Oxygen mg/L values are accurate.

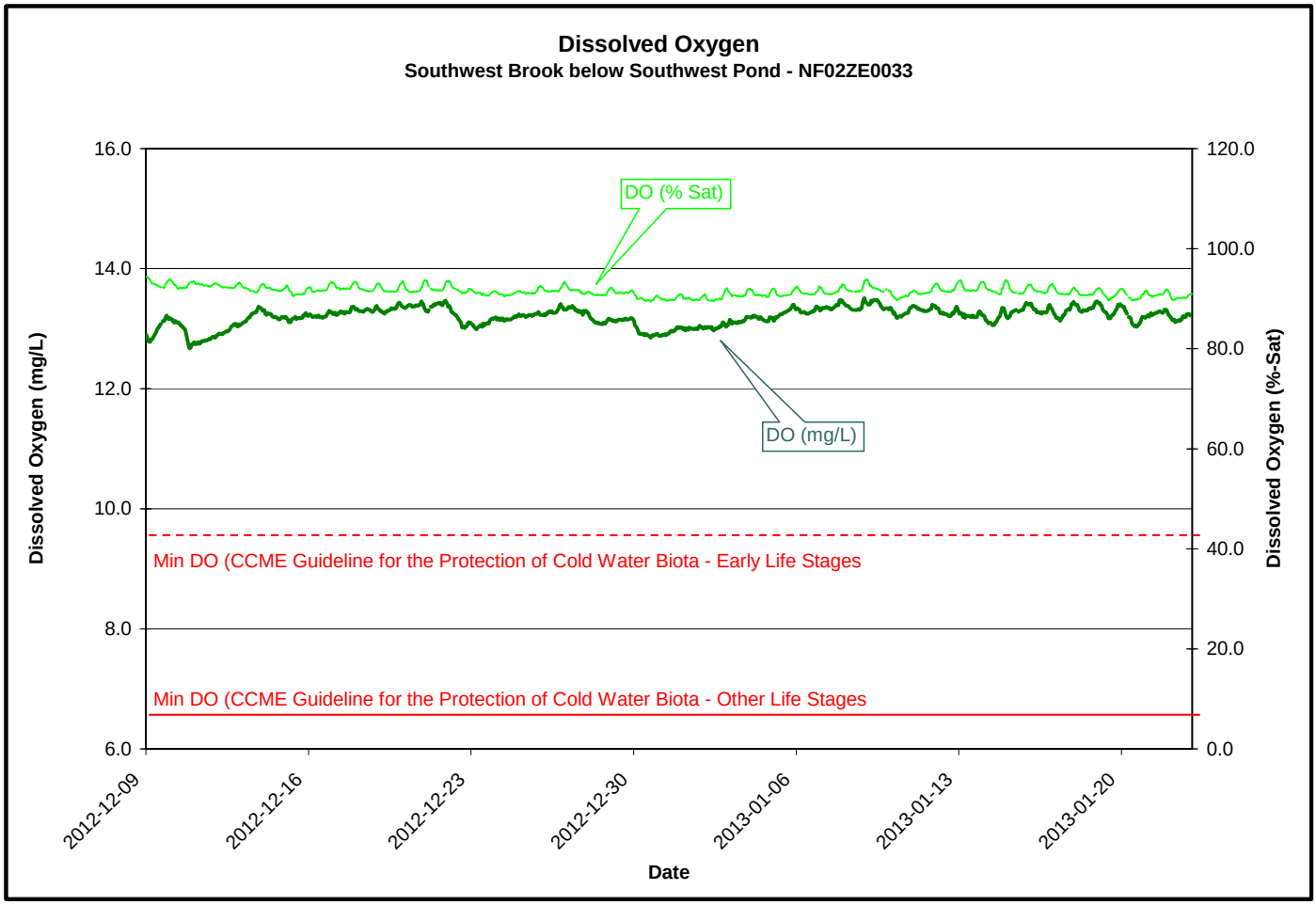

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 20.5 NTU.
- Turbidity was minimal during most of this deployment period, with only one minor and short term event recorded. It is likely that this reading was caused by natural in-stream debris or air bubbles passing near the sensor.
- Turbidity readings of this frequency, intensity and duration are normal.

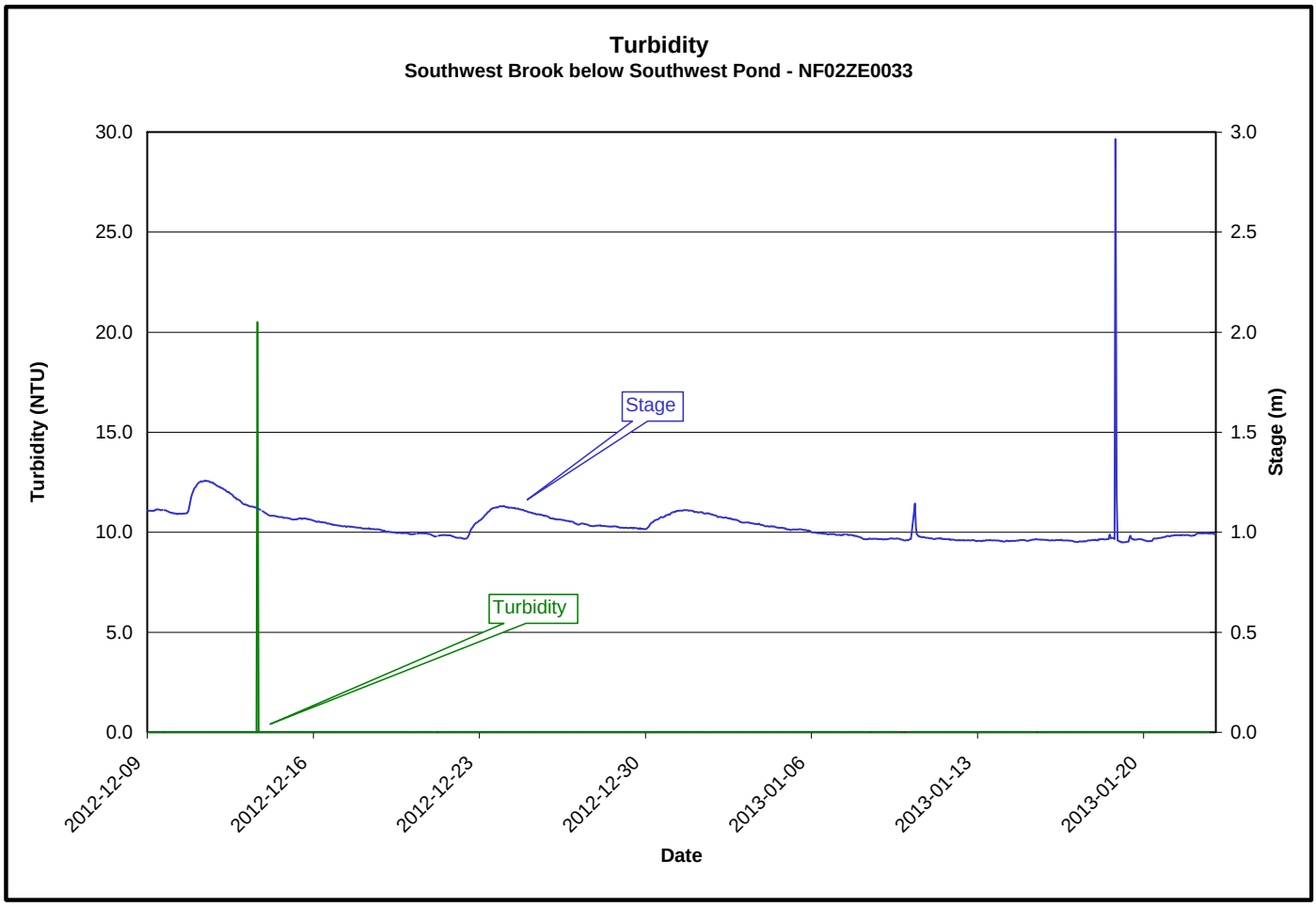

Figure 5

- The stage or water level ranged from a minimum of 0.95 m to a maximum of 2.97 m. The flow or discharge ranged from a minimum of 0.07 m^3/s to a maximum of 2.16 m^3/s (**Figure 6)**.
- The peak in stage (and thus flow) on January 19, 2013, is uncharacteristic and is likely due to the backwater effect due to in-stream icing conditions.
- The other increases in stage and flow are resultant from precipitation/runoff events.
- Stream stage and flow are within normal ranges.

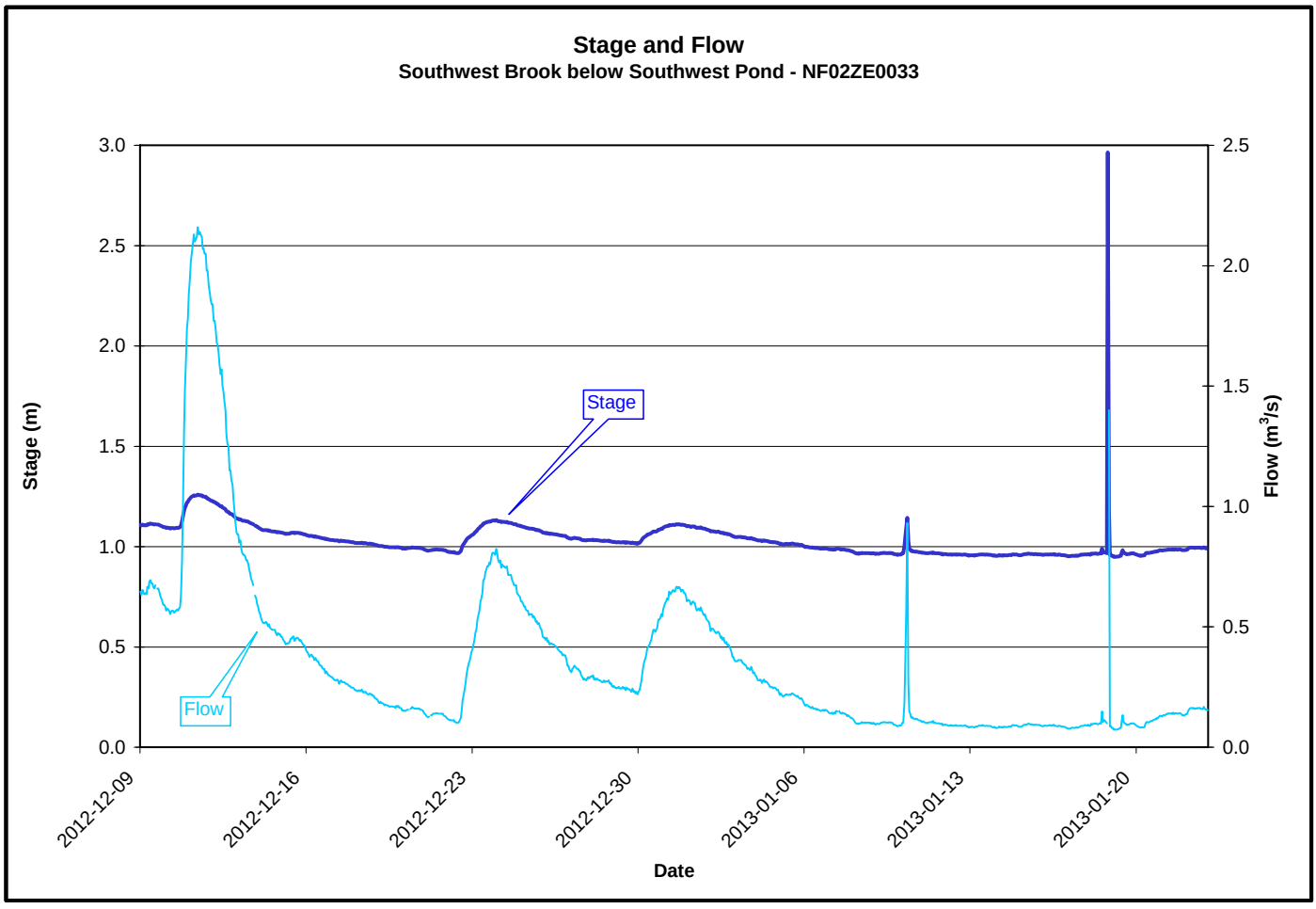

Figure 6

Prepared by:

Robert Wight
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Tel: 709-292-4280
Fax: 709-292-4365
e-mail: robertwight@gov.nl.ca