

# **Real Time Water Quality Report Southwest Brook below Southwest Pond**

**Deployment Period 2010-05-12 to 2010-06-29**

**2010-10-01**



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

## General

- This station is operated cooperatively with the Miawapukek 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.
- The graphs below may sometimes show vertical lines from the data string to zero or the bottom of the graph. These lines should be ignored, as they are an artefact of individual missing data points. We are working to resolve this issue.

## Maintenance and Calibration of Instrumentation

- Due to a programming problem, the regular **DataSonde**® that was intended to be deployed during this period could not be calibrated. Therefore, the **MiniSonde**® that is usually used for QA/QC purposes was deployed instead. After being cleaned and freshly calibrated the **MiniSonde**® was installed on May 12, 2010, and remained deployed continuously until June 29, 2010, a 44 day period.

## 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**.

Parameter	Rank				
	Excellent	Good	Fair	Marginal	Poor
Temperature (oC)	$\leq \pm 0.2$	$> \pm 0.2$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
pH (unit)	$\leq \pm 0.2$	$> \pm 0.2$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
Sp. Conductance ( $\mu\text{S}/\text{cm}$ )	$\leq \pm 3$	$> \pm 3$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$
Sp. Conductance $> 35 \mu\text{S}/\text{cm}$ (%)	$\leq \pm 3$	$> \pm 3$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$
Dissolved Oxygen (mg/L) (% Sat)	$\leq \pm 0.3$	$> \pm 0.3$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
Turbidity $< 40$ NTU (NTU)	$\leq \pm 2$	$> \pm 2$ to 5	$> \pm 5$ to 8	$> \pm 8$ to 10	$> \pm 10$
Turbidity $> 40$ NTU (%)	$\leq \pm 5$	$> \pm 5$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$

**Table 1**

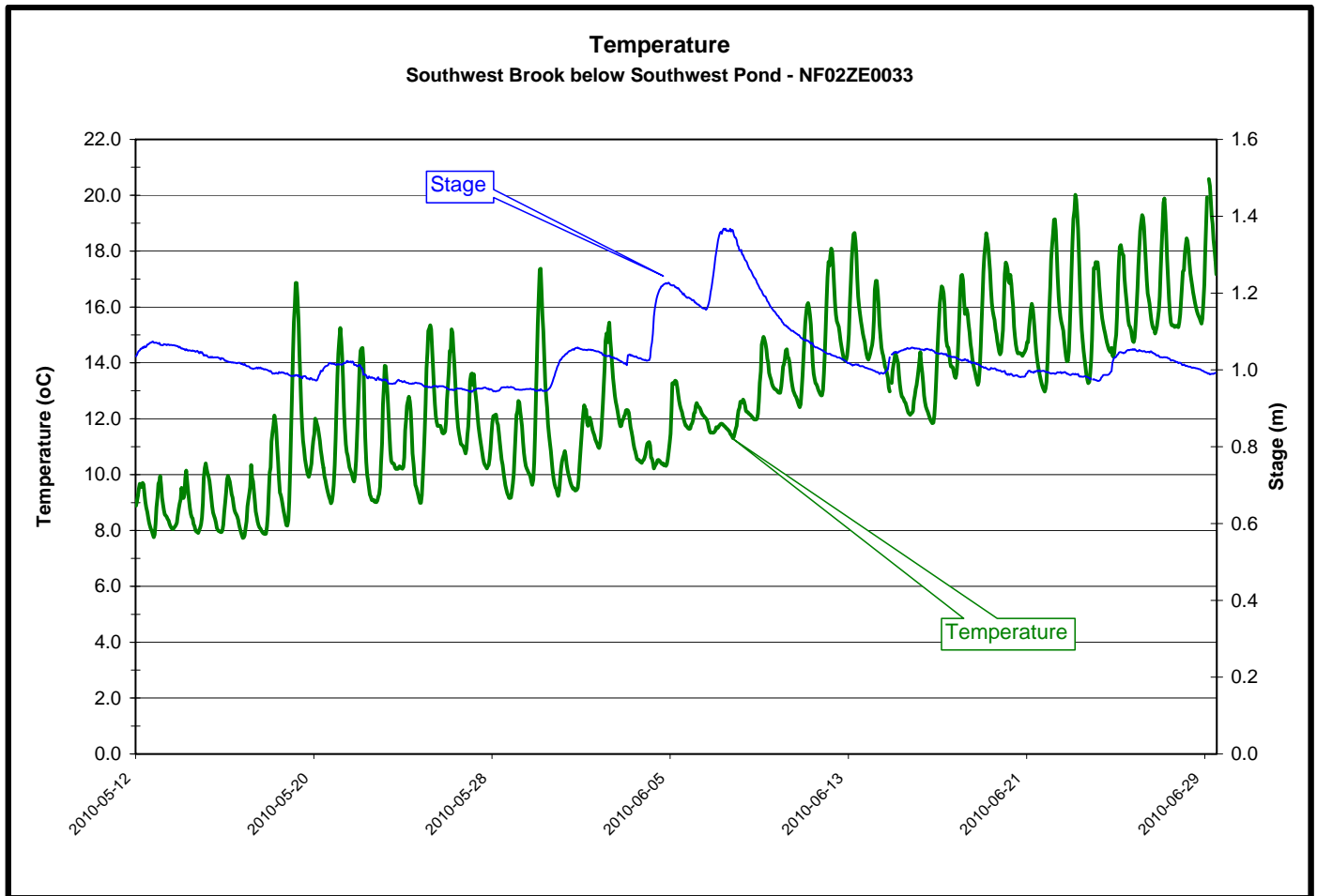
- Upon deployment, a QA/QC **MiniSonde**<sup>®</sup> is usually temporarily deployed along side the Field **DataSonde**<sup>®</sup>. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is usually taken to compare with the Field **DataSonde**<sup>®</sup> for specific conductivity, pH and turbidity parameters. Based on the difference between parameters recorded by the Field **DataSonde**<sup>®</sup>, QA/QC **MiniSonde**<sup>®</sup> and grab sample a qualitative statement is usually made on the data quality upon deployment. However, in this particular deployment, no QA/QC instrument was available and no grab sample was collected, thus no qualitative statements can be made.
- At the end of a deployment period, readings are taken in the water body from the Field **MiniSonde**<sup>®</sup> (usually **DataSonde**<sup>®</sup>) 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 upon removal.
- The ranking at the end of the deployment period are shown in **Table 2**.
- With the exception of water quantity data (Stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent Quality Assurance and Quality Control (QA/QC) protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request. Where appropriate, corrected data for water quality parameters are indicated.

Southwest Brook below Southwest Pond (NF02ZE0033)		
Date (yyyy-mm-dd)	Parameter	Ranking
2010-05-12 Deployment	Temp (°C)	n/a
	pH (units)	n/a
	Sp. Conductivity (uS/cm)	n/a
	Dissolved Oxygen (mg/L)	n/a
	Turbidity (NTU)	n/a
2010-06-29 Removal	Temp (°C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Good
	Dissolved Oxygen (%)	Excellent
	Turbidity (NTU)	Excellent

**Table 2**

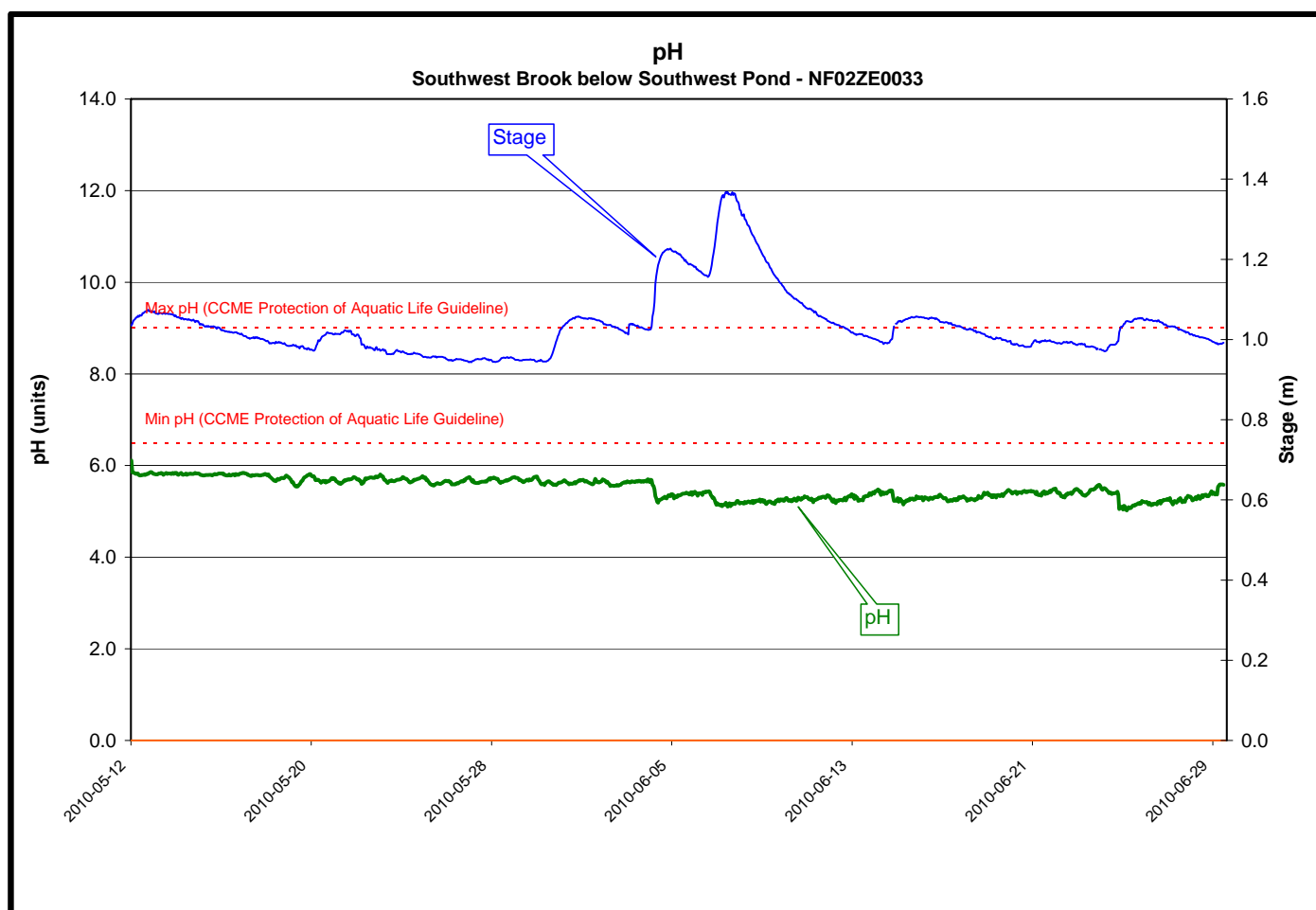
### Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of 7.73 °C to a maximum of 20.58 °C, with temperature increasing throughout the deployment period.
- While there appears to be little correlation with stage, there is far less diurnal variation during periods of increased stage, presumably due to precipitation, cloud cover and lower daytime ambient air temperatures.
- As fouling and instrument drift were negligible, no data corrections are made for temperature.

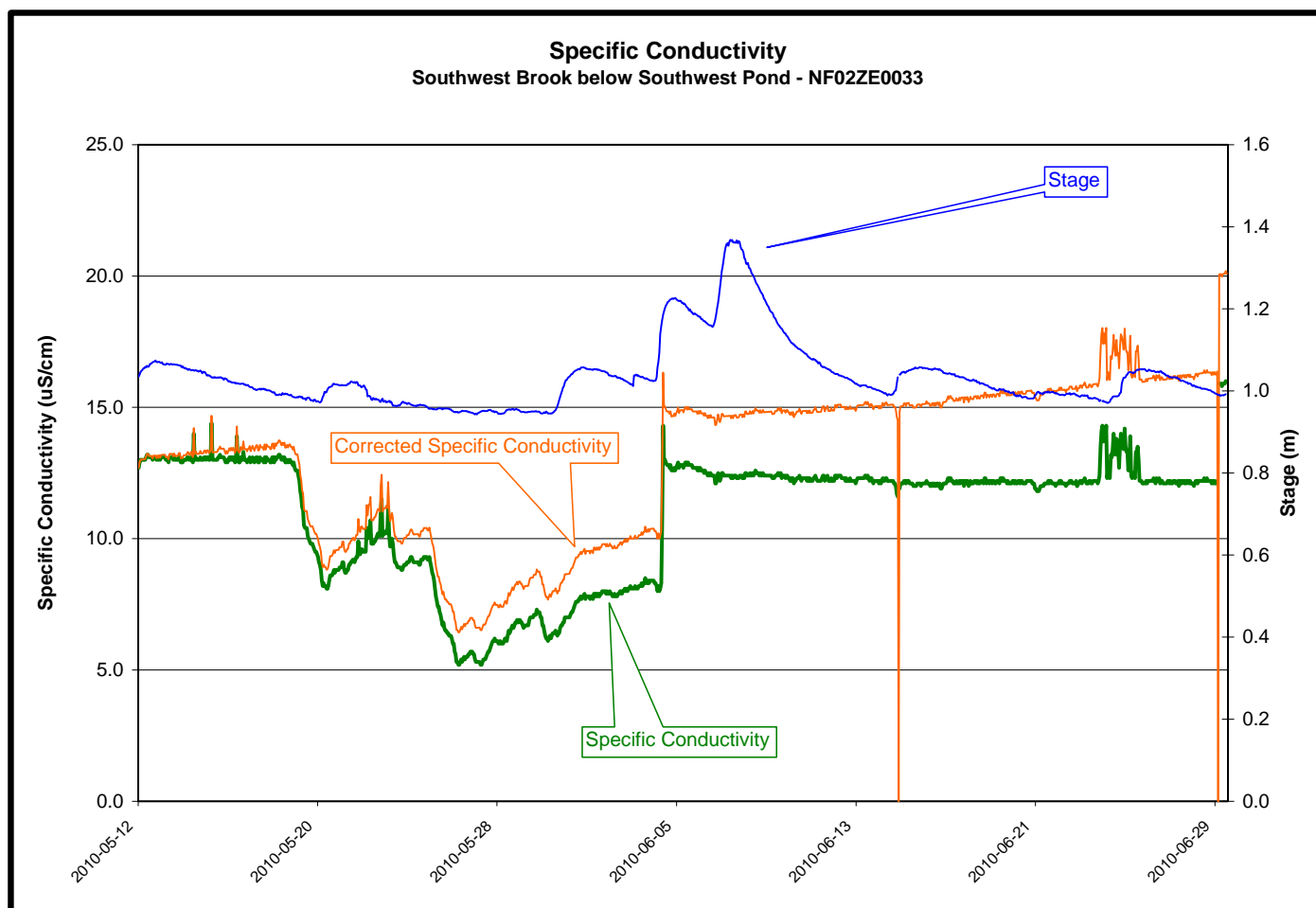


**Figure 1**

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 5.02 to a maximum of 6.11 with all the values falling below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- The background pH of this stream is normally lower than the lower limit of the recommended range.
- There appears to be an inverse correlation with discharge.
- As fouling and instrument drift were negligible, no data corrections are made for pH.

**Figure 2**

- The specific conductivity (**Figure 3**) ranged from a minimum of 6.4  $\mu\text{S}/\text{cm}$  to a maximum of 20.2  $\mu\text{S}/\text{cm}$  over the deployment period.
- There is a significant decrease in specific conductivity from May 18, 2010 until June 4, 2010. Return to normal levels seems to have been triggered by a sudden increase in stage, suggesting that the probe may not have been fully submerged during this period.
- There is a marked increase in specific conductivity on June 24, 2010, just prior to an increase in stage, suggesting that the increase was triggered by a precipitation event.
- Over the deployment period there was a Total Error of 4.2  $\mu\text{S}/\text{cm}$ . The majority of this error (4.0  $\mu\text{S}/\text{cm}$ ) is due to instrument drift over the course of the 44 days. Accordingly, a correction factor has been applied to the raw data.

**Figure 3**

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.91 mg/L to a maximum of 10.88 mg/L over the deployment period. With the percent saturation ranging between 95.3 and 108.7.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature.
- In the latter third of the deployment period dissolved oxygen values fell below 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).
- Lower dissolved oxygen values during the summer months are considered to be solely a function of the naturally increasing temperatures.
- The QA/QC protocol revealed a slight increase of 1.6 % in dissolved oxygen (% Sat) over the 44 day deployment period. The majority of this increase (1.3 %) was due to instrument drift. Accordingly, the correction factor has been applied to the raw data.
- Based upon the fact that Dissolved Oxygen % Saturation had minimal drift, we can be confident that the Dissolved Oxygen mg/L values are accurate.

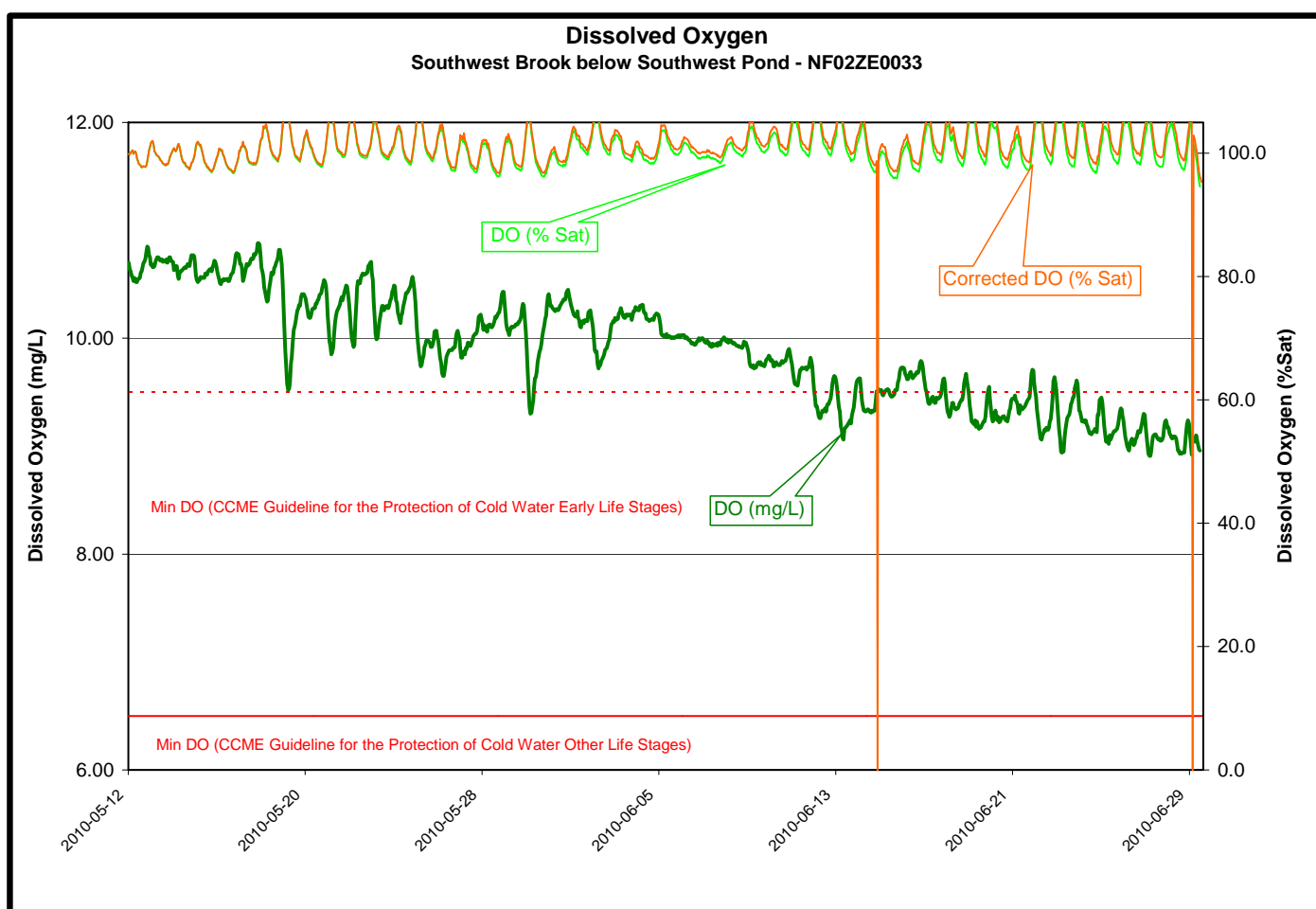
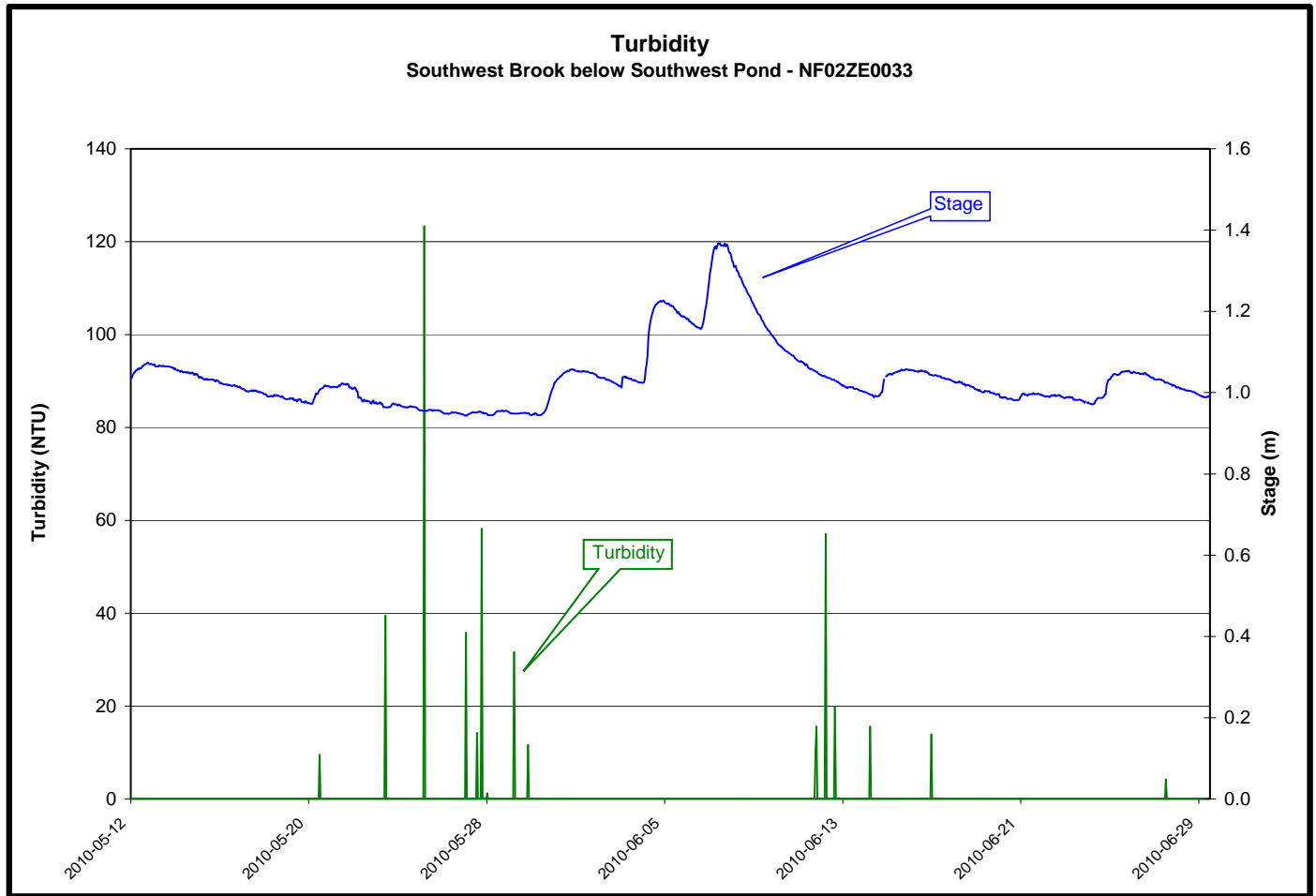


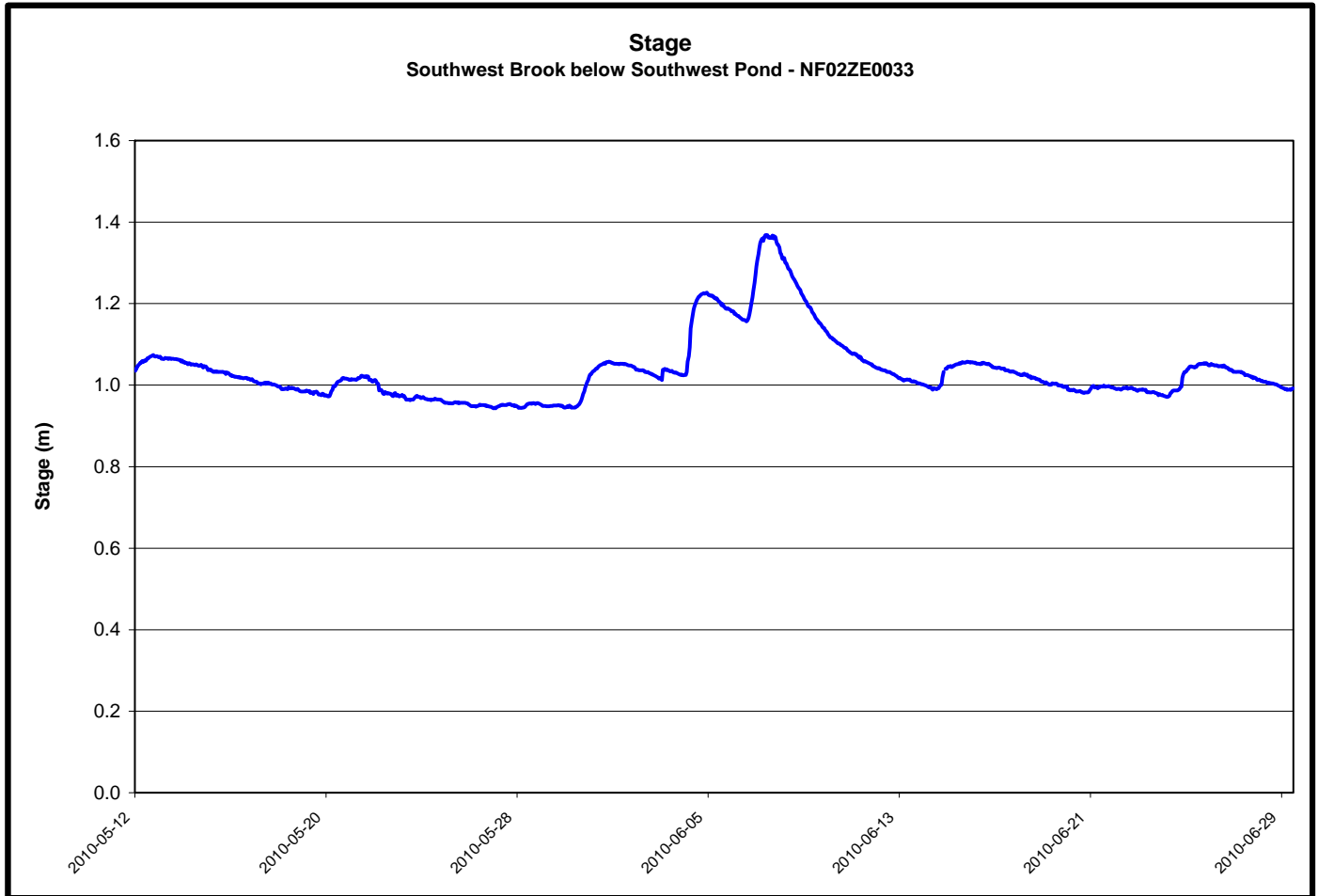
Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 123.3 NTU.
- There does not appear to be any correlation between turbidity and stage, although it is curious that turbidity values spike occasionally when stage is minimal.
- Turbidity values are unusual in this stream and will be the subject of further investigation.
- As there was minimal fouling or instrument drift, total error was negligible, thus no correction factor is applied to the raw turbidity data.

**Figure 5**



- The stage (**Figure 6**) or water level ranged from a minimum of 0.94 m to a maximum of 1.37 m with the highest peaks presumably resulting from precipitation events.



**Figure 6**

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