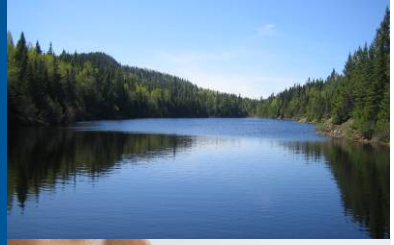
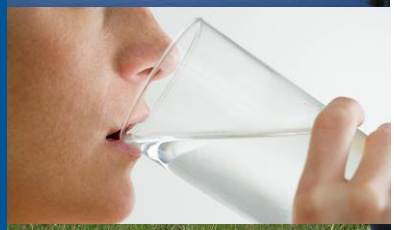






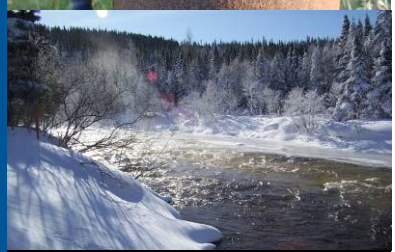

Real Time Water Quality Report
Minipi River

Deployment Period 2010-05-20 to 2010-06-24

2010-06-31

Newfoundland Labrador

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

General

- Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis.

Maintenance and Calibration of Instrumentation

- May 20, 2010 was the initial deployment after being removed from Minipi River during the winter months. The removal of the instrument during winter prevents any ice damage to the instrument thus prolonging the instruments lifespan.
- After being cleaned and freshly calibrated the **DataSonde®** for Minipi River were installed on May 20, 2010, and remained deployed continuously until June 24 2010, a 35 day period. On May 20, 2010, the instrument was checked *in situ* against a freshly calibrated **MiniSonde®** to verify that it was functioning properly, and had no significant drift.

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) (% Sat)	<=+/-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: Ranking limits for Parameters

- Upon deployment, a QA/QC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field **DataSonde®** for specific conductivity, pH and turbidity parameters. Based on the difference between parameters recorded by the Field **DataSonde®**, QAQC **MiniSonde®** and grab sample a qualitative statement is made on the data quality upon deployment.
- At the end of a deployment period, readings are taken in the water body from the Field **DataSonde®** 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 rankings at the beginning and end of the deployment period are shown in **Table 2** for Minipi River.

- All parameters are ranked *Excellent*, except for pH and Dissolved Oxygen (mg/L) during deployment. The pH sensor generally takes the longest to stabilize when placed in a water body. The values take some time to climb to the appropriate pH reading, if a reading is taken too soon it may not accurately portray pH. The *Poor* ranking of pH may be due to this. Dissolved Oxygen (mg/L) was ranked at *Fair*; this could be a reflection on comparing the data between two different instruments. Dissolved Oxygen readings can vary by sensors and be influenced by inter-sensor factors (i.e. age of Luminescent film, age of sensor, fouling on sensor).

- 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.

Minipi River Station		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2010-05-20 Deployment SN:47384	Temp (^{o}C)	Excellent
	pH (units)	Poor
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Fair
	Turbidity (NTU)	Excellent
2010-06-24 Removal SN:47384	Temp (^{o}C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Good
	Turbidity (NTU)	Excellent

Table 2: QA/QC Data Comparison Rankings for deployment between May 20 and June 24, 2010

DATA INTERPRETATION

TEMPERATURE

- The water temperature (**Figure 1**) ranged from a minimum of 0.0 ˚C to a maximum of 13.39˚C.
- The instrument was not deployed during the winter months, therefore the temperature ranges are depicting the steady increase in water temperature from May onwards.
- There appears to be no correlation with stage.
- As neither fouling nor calibration drift occurred on the temperature probe, there was no need to correct the raw data for temperature.

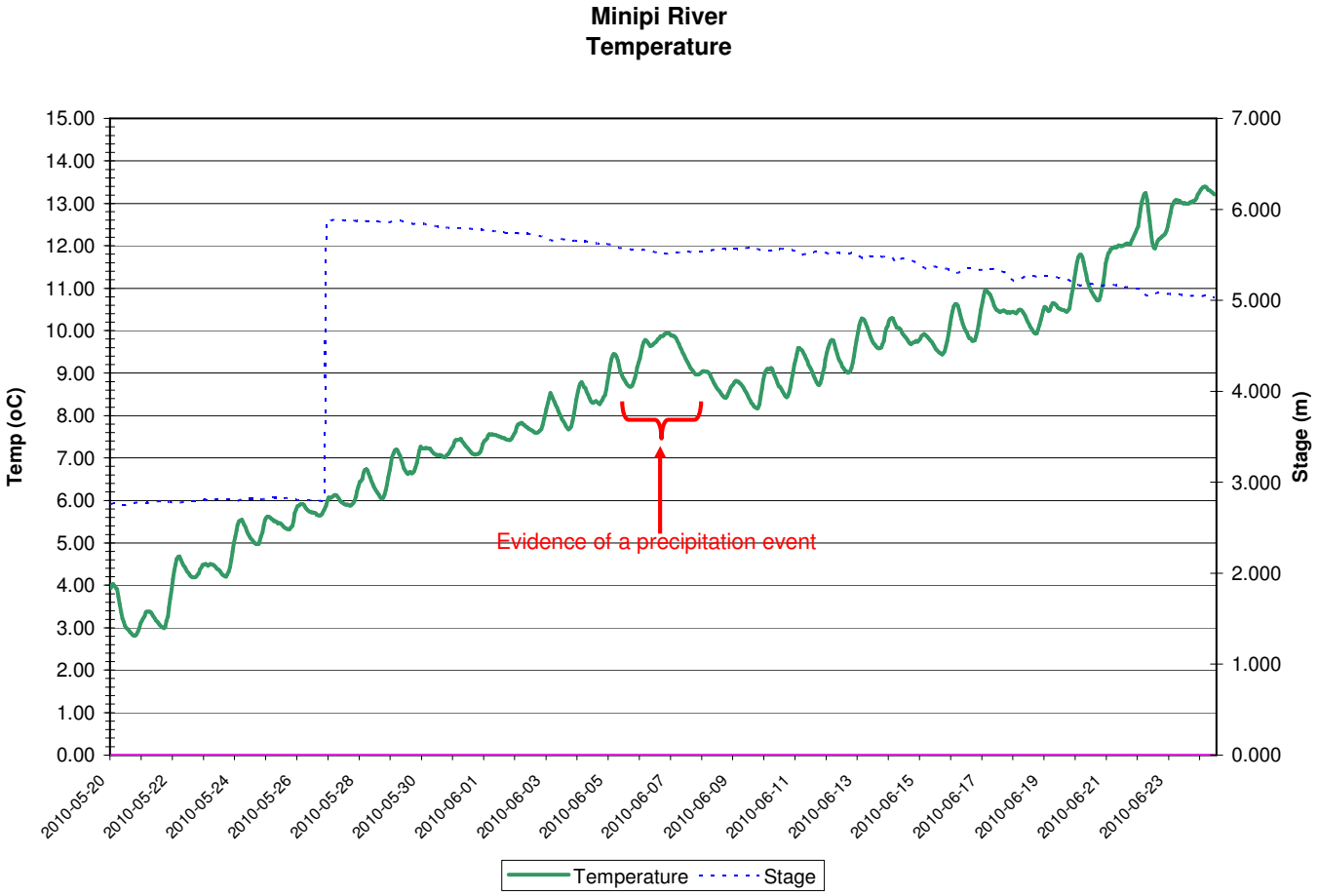

Figure 1: Water Temperature at Minipi River

pH

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 5.76 to a maximum of 6.90.
- There is a slight dip in values around June 24, 2010, 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 Minipi River is historically constant at the minimum limit for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* recommended range.
- As fouling and calibration drift were negligible, no data corrections were required for pH.

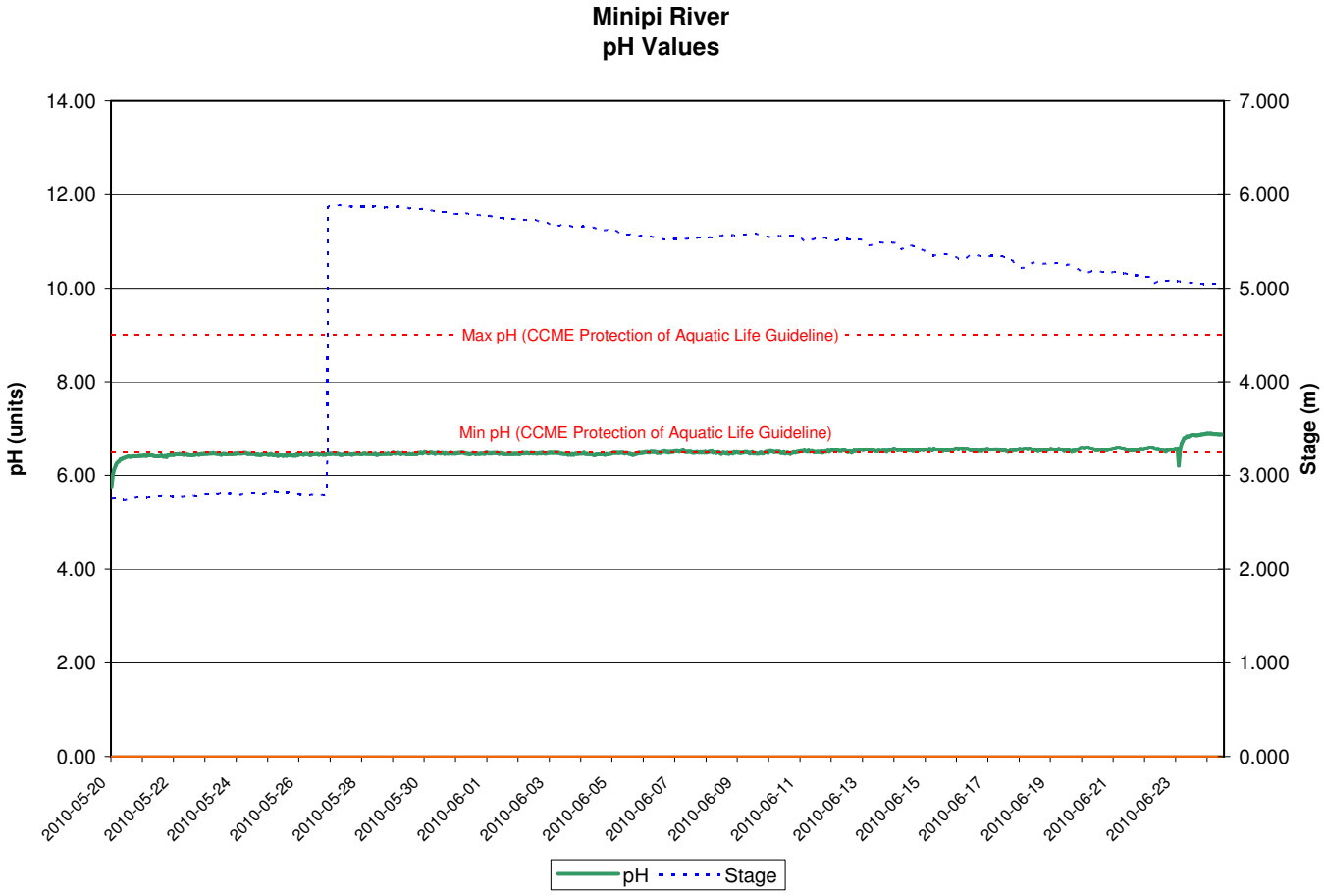

Figure 2: pH values at Minipi River

SPECIFIC CONDUCTIVITY

- The specific conductivity **(Figure 3)** ranged from a minimum of 11.0 µS/cm to a maximum of 13.0 µS/cm over the deployment period.
- Specific Conductivity remained reasonably constant during the deployment month. There are several slight dips in the values though still within the historical range for Minipi River.
- As fouling and calibration drift were negligible, no data corrections were required for Specific Conductivity.
- There is no apparent correlation between specific conductivity and stage.
- There is also evidence that a precipitation event occurred between June 8 to June 9, 2010, specific conductance dropped from ~12.0 µS/cm to ~ 11.0 µS/cm.

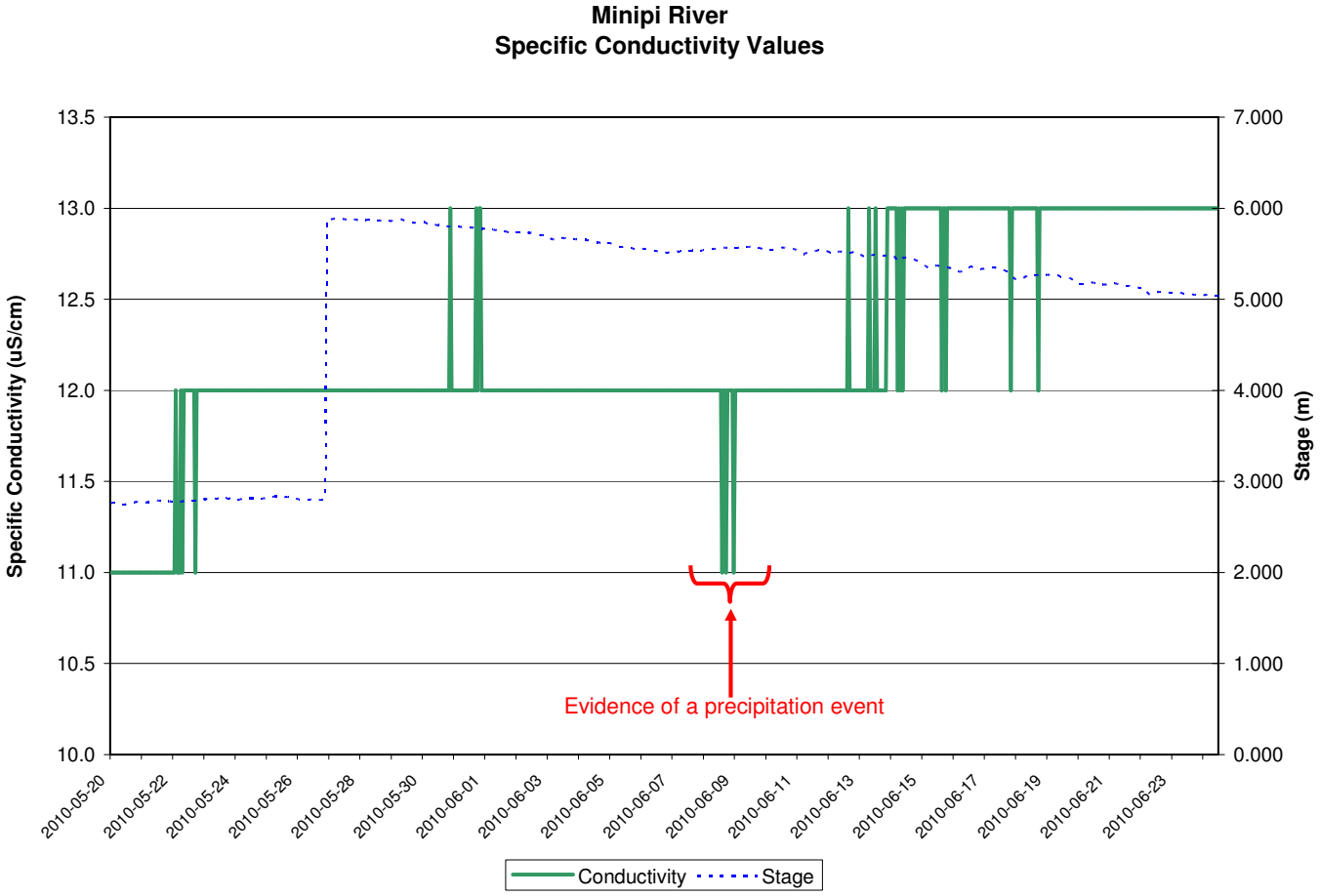

Figure 3: Minipi River Specific Conductivity Values

DISSOLVED OXYGEN

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 9.98 mg/L to a maximum of 12.89 mg/L over the deployment period.
- Dissolved oxygen is inversely proportional to water temperature. Throughout the deployment period, all dissolved oxygen values fell above the limits 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).
- There was evidence of fouling and calibration drift with the Dissolved Oxygen (%Sat) values therefore the data was automatically corrected. The corrected data is marked in grey.
- Dissolved Oxygen had a total error of -3.50 (% Sat), this was used to correct the raw data for Dissolved Oxygen (% Sat). Dissolved Oxygen (mg/L) is not corrected however it is shown on Figure 4, in dark green.
- The data for Dissolved Oxygen (%Sat) did require correction the drift was minimal, and we can be confident that the Dissolved Oxygen mg/L values are reasonably accurate.

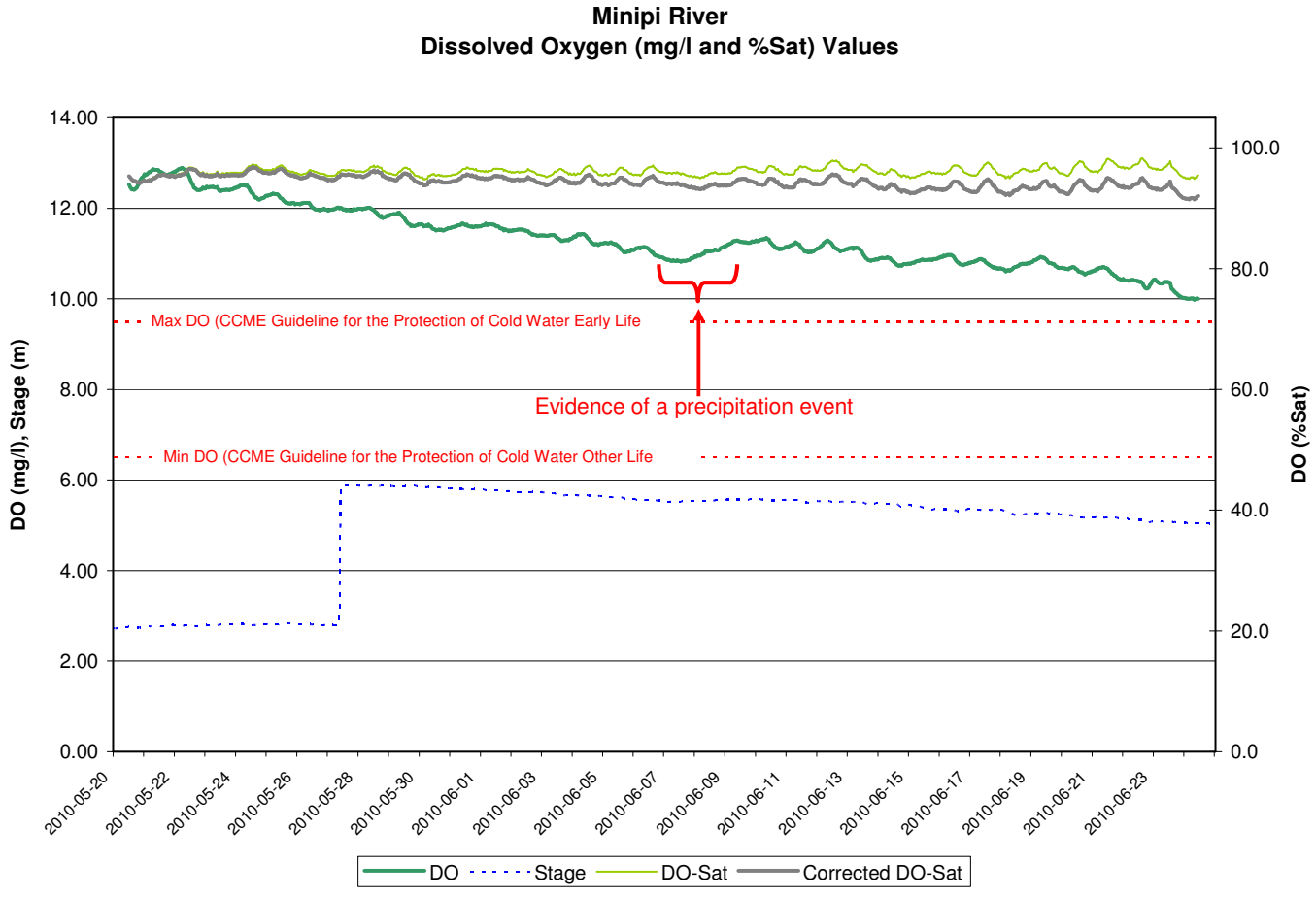

Figure 4: Dissolved Oxygen (mg/L & % Sat) at Minipi River

TURBIDITY

- The turbidity values **(Figure 5)** remained at 0.0 NTU throughout the deployment period.
- There was no evidence of fouling or calibration drift influence to the turbidity values.
- The precipitation event is not evident in the turbidity data at Minipi River. Turbidity is historically low at this river.
- Turbidity is displayed along the bottom of the graph (in green).

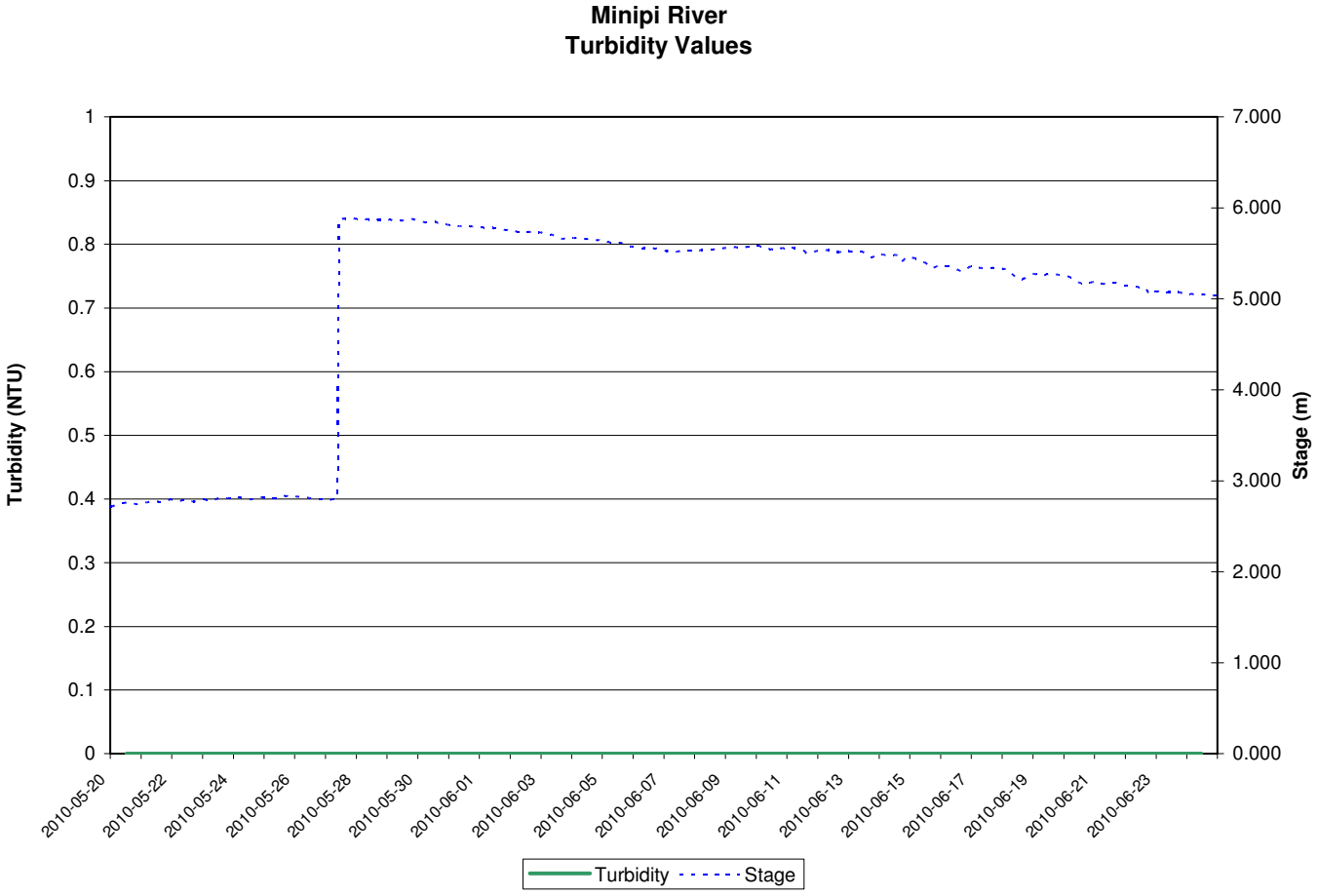

Figure 5: Turbidity Values for Minipi River

STAGE AND STREAM FLOW

- The stage (**Figure 6)** or water level ranged from a minimum of 2.717 m to a maximum of 5.886 m with the highest peaks corresponding with precipitation events.
- The stream flow ranged from minimum of 94.4 m³/s to a maximum of 195 m³/s. After high flows due to heavy precipitation the previous months, Minipi River stream flow started to drop during this deployment period.

PRECIPITATION

- The closest recorded rainfall to Minipi River is at a weather station in Happy Valley – Goose Bay. This station is monitored by Environment Canada, where the data is available at http://www.climate.weatheroffice.gc.ca/climateData/dailydata_e.html?Prov=XX&timeframe=2&StationID=6777&Day=1&Month=5&Year=2010&cmdB1=Go
- **Figure 6** indicates the range of precipitation for this area between May 20 and June 24, 2010.

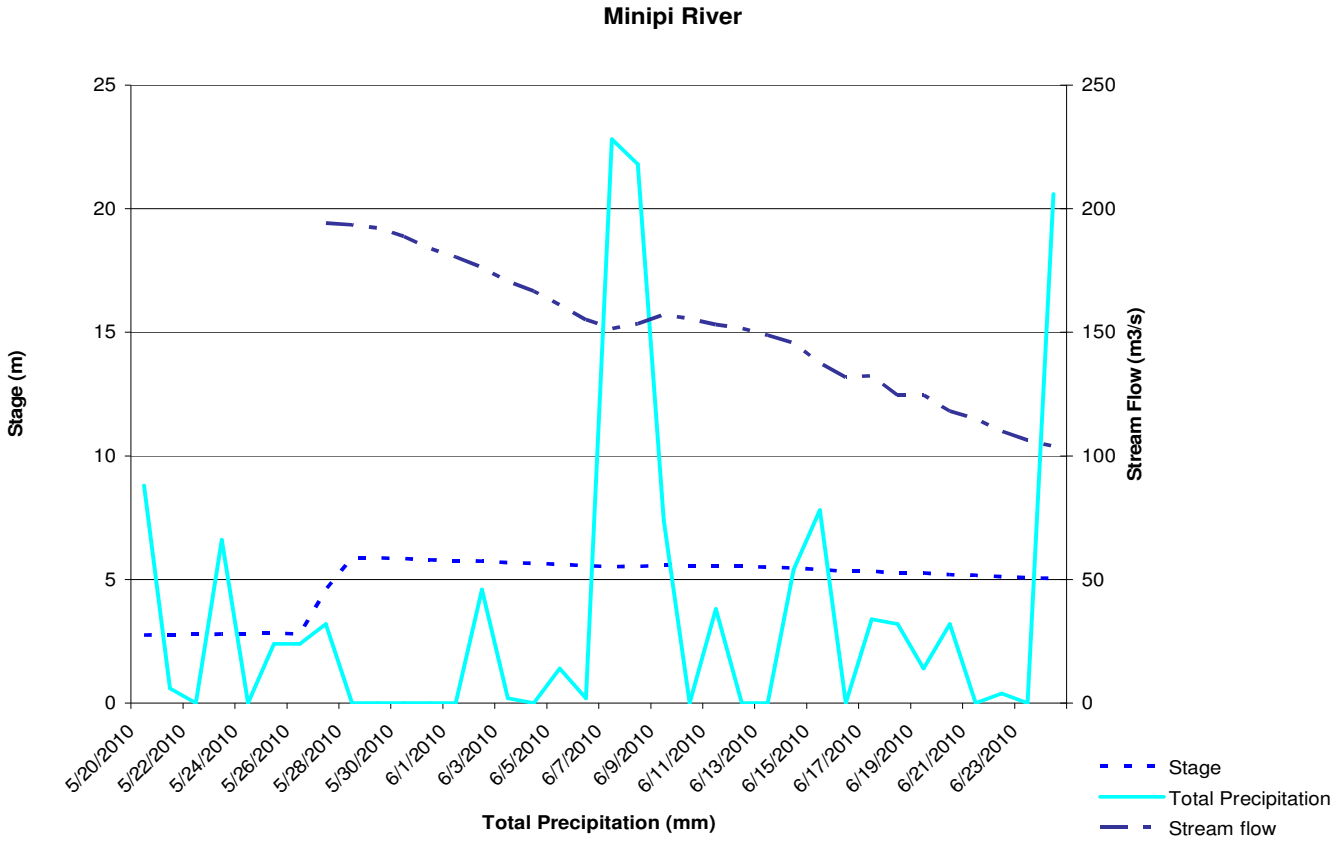

Figure 6: Minipi River stream flow and stage, compared with Happy Valley-Goose Bay precipitation.

CONCLUSION

The water quality monitoring instrument was deployed at the station on Minipi River below Minipi Lake between May 20 and June 24, 2010. During this deployment period, no momentous water quality events were recorded at the Minipi River Station below Minipi Lake. There was indication of a rainfall event on June 7 to June 11, 2010 which is apparent on temperature, specific conductivity and dissolved oxygen graphs. Typical seasonal patterns are still evident in temperature, dissolved oxygen and stage.

The values for dissolved oxygen are within the recommended guidelines as suggested by the *CCME Guidelines for the Protections of Aquatic Life.* The range of pH values is slightly below the *CCME Guidelines for the Protections of Aquatic Life;* however background pH for Minipi River indicates that these values are the norm for this station.

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