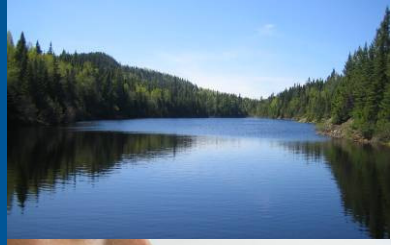
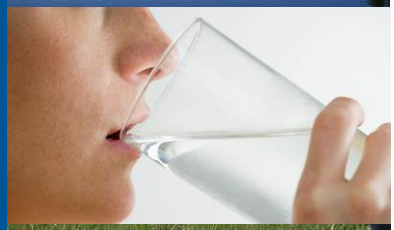






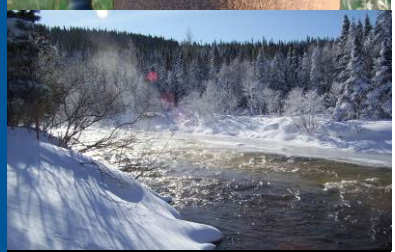

Real Time Water Quality Report
Minipi River

Deployment Period 2010-07-23 to 2010-08-22

2010-09-03

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

- After being cleaned and freshly calibrated the **DataSonde®** for Minipi River was installed on July 23, 2010, and remained deployed continuously until August 22, 2010, a 30 day period. On July 23, 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.

- During deployment all parameters are ranked *Excellent*, except for temperature (˚C) which was ranked *Good*. The Temperature sensor on any sonde is the most important. All other parameters can be broken down into three groups, Temperature dependant, Temperature compensated and Temperature independent. Because the temperature sensor is not isolated from the rest of the sonde the entire sonde must be at the same temperature before the sensor will stabilize. The values take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray temperature of the water body. Specific Conductivity (µS/cm) was ranked at *Good*; this could be a reflection on comparing the data between two different methods of water sampling, one value is taken from the instrument and the other value is identified by a grab sample. Specific conductivity data collected by grab samples are liable to change over time and as the temperature adjusts in the sample. In some environments specific conductance changes are continuous. To ensure an accurate comparison value the grab sample needs to correspond directly with the exact place/time of the data collected by the instrument.

- Due to time constraints during this maintenance period the calibration drift was not able to be calculated for this instrument, therefore we are unable to rank the parameter at removal.

- 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 (Stage). 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**
2010-07-23 Deployment SN:47384	Temp (°C)	Good
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Good
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2010-08-22 Removal SN:47384	Temp (°C)	N/A
	pH (units)	N/A
	Sp. Conductivity (uS/cm)	N/A
	Dissolved Oxygen (%)	N/A
	Turbidity (NTU)	N/A

Table 2: QA/QC Data Comparison Rankings for deployment between July 23 and August 22, 2010

DATA INTERPRETATION

TEMPERATURE

- The water temperature (**Figure 1**) ranged from a minimum of 15.66˚C to a maximum of 19.65˚C.
- The temperature ranges are depicting the steady increase in water temperature from July into August as the climate gets warmer.
- Stage can be defined as the height of the surface of a river or other fluctuating body of water above a set point. The set point is the bottom axis of this graph.
- It may seem that there is a correlation between temperature and stage; however it is possible that both parameters are influenced by the increase in air temperature and climatic change. Water temperature increases with warmer temperatures and stage decreases through evaporation and/or less rainfall.
- There is slight evidence that water temperature may have been influenced by a rainfall event that occurred around August 4, 2010. The temperature values of Minipi River level out slightly around this time.
- There is no evidence of fouling on the temperature probe, therefore was no need to correct the raw data for temperature.

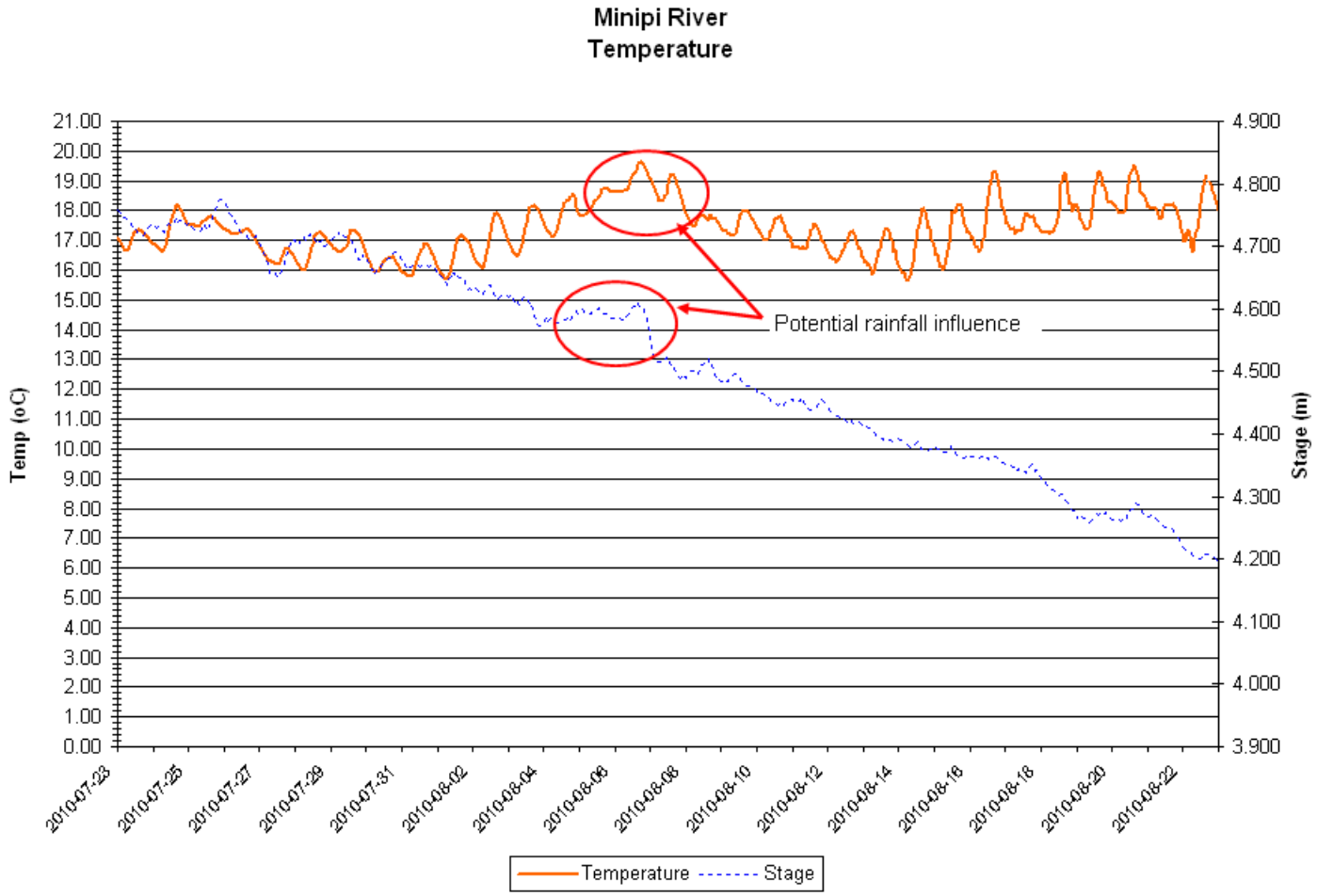

Figure 1: Water Temperature at Minipi River

pH

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 6.64 to a maximum of 7.04.
- pH during this deployment period is reasonably stable with no evidence of changes in the values.
- The background pH of Minipi River is historically constant around the minimum limit for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* recommended range.
- As fouling and calibration drift did not occur, no data corrections were necessary for pH.

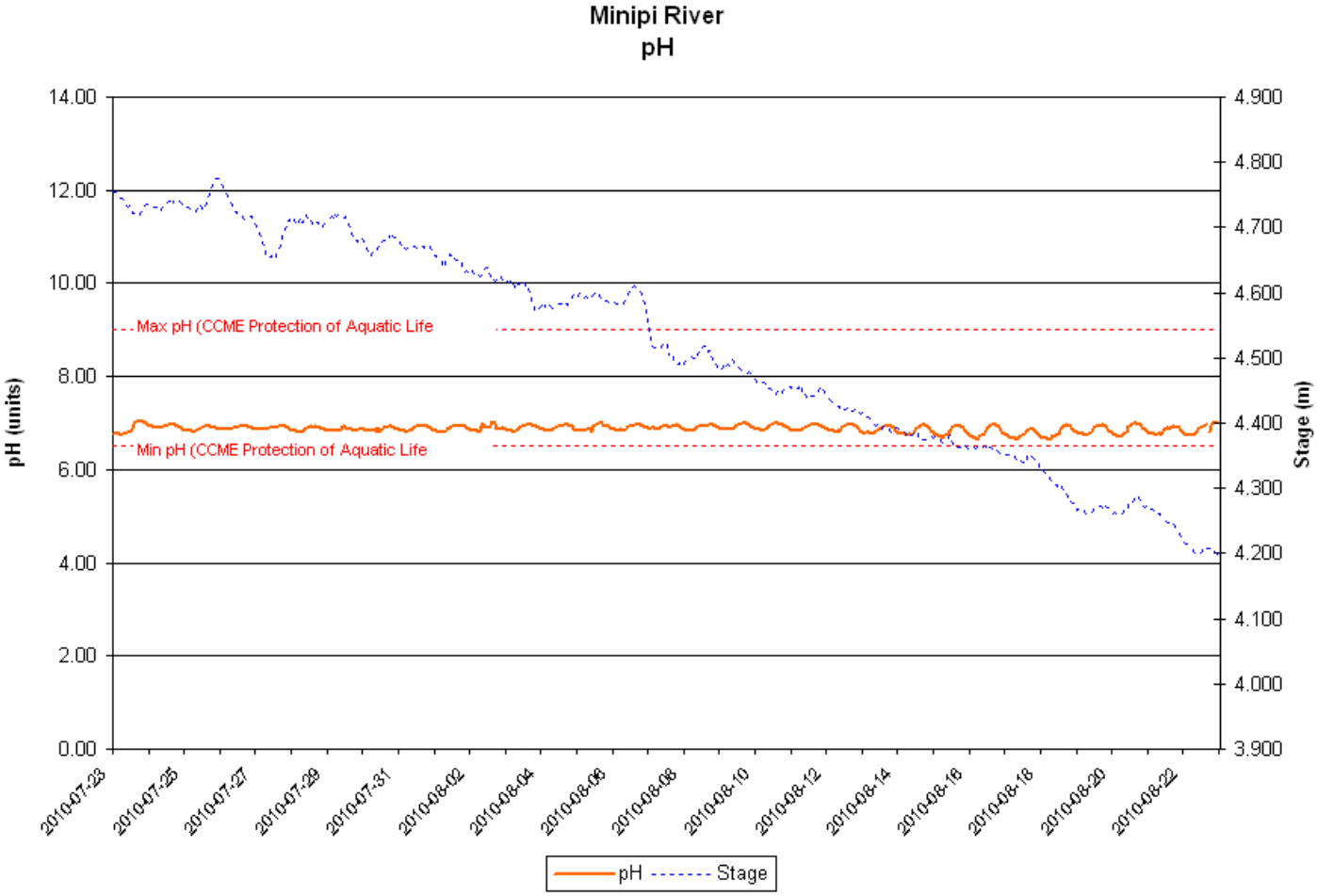

Figure 2: pH values at Minipi River

SPECIFIC CONDUCTIVITY

- The specific conductivity **(Figure 3)** ranged from a minimum of 14.0 µS/cm to a maximum of 16.0 µS/cm over the deployment period.
- Specific Conductivity remained reasonably constant during the deployment month. There are several small increases in the values although still within the historical range for Minipi River. The difference between 14.0 µS/cm and 16.0 µS/cm is minimal; it appears significant due to the scale of the graph.
- As fouling and calibration drift were not evident, no data corrections were required for Specific Conductivity.

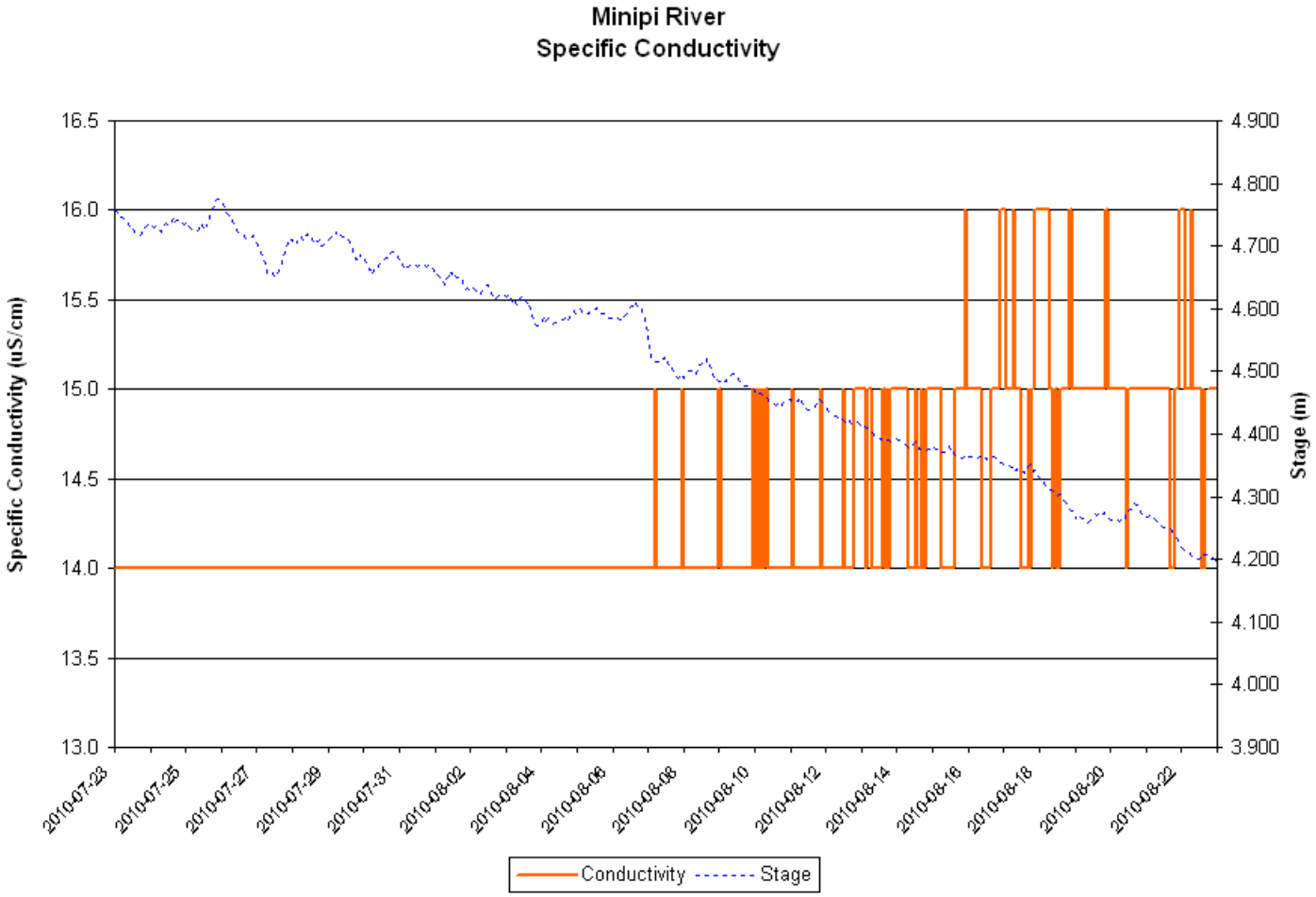

Figure 3: Minipi River Specific Conductivity Values

DISSOLVED OXYGEN

- The dissolved oxygen (DO) (**Figure 4**) values ranged from a minimum of 8.25 mg/L to a maximum of 10.18 mg/L over the deployment period.
- Throughout the deployment period, the dissolved oxygen (mg/L) values fell just below the limits recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Cold Water/Early Life Stages – above 9.5 mg/L). Though still above the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Cold Water/Other Life Stages – above 6.5 mg/L).
- For the majority of the deployment period the DO values remained constant.
- DO (%Saturation) did not require correction.

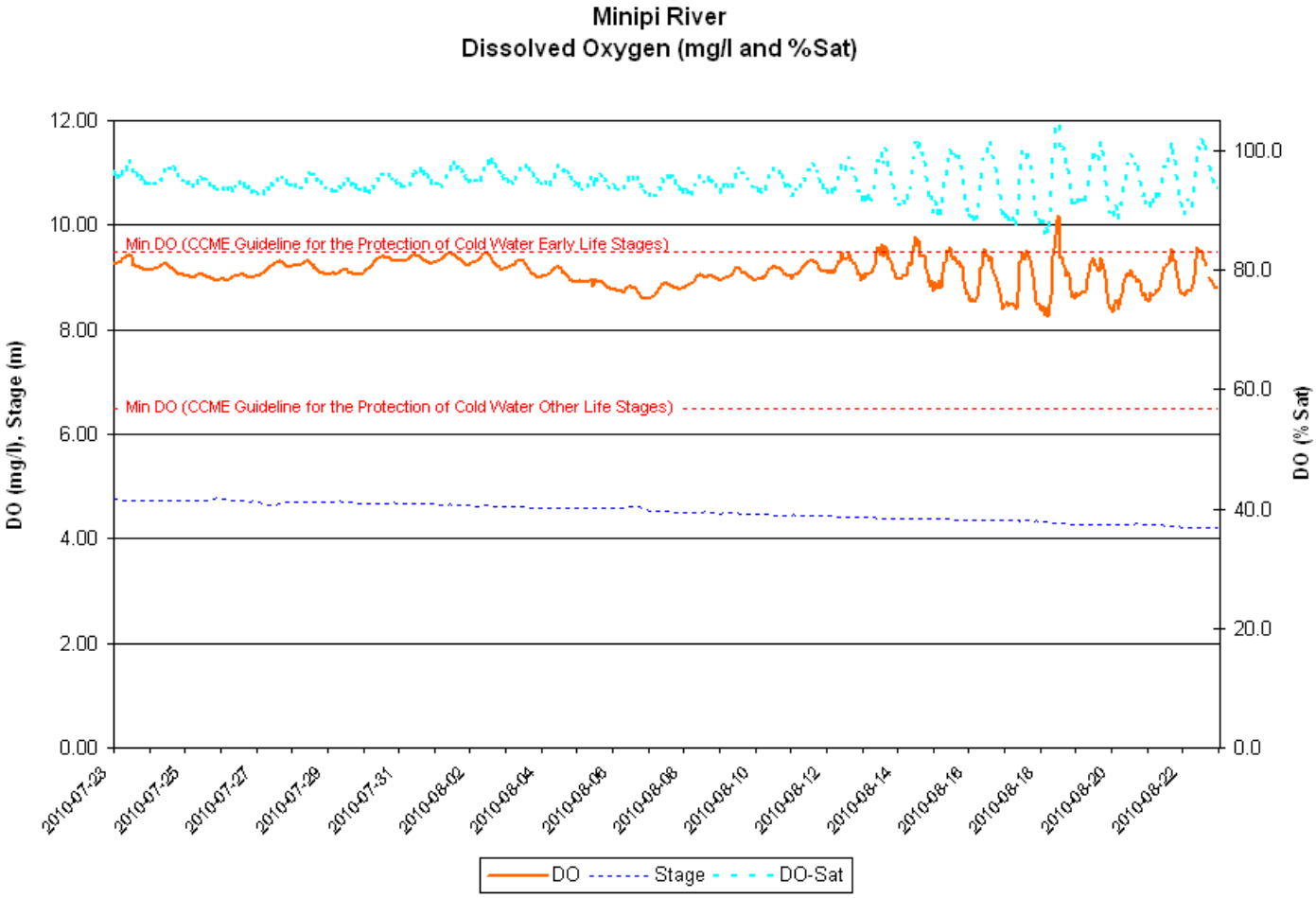

Figure 4: Dissolved Oxygen (mg/L & % Sat) at Minipi River

TURBIDITY

- The turbidity values (**Figure 5**) range from a minimum of 0.0 NTU to a maximum of 124.3 NTU over the deployment period.
- There was no evidence of fouling or calibration drift influence to the turbidity values, during this deployment period.
- Historically turbidity levels are low in Minipi River, the graph depicts two increases in turbidity on August 19, 2010 to 124.3 NTU then again on August 20, 2010 to 59.7 NTU, after both events the turbidity drops back down to 0.0 NTU. Both of these events correspond with an rainfall event that occurred on August 18th and 19th, 2010.

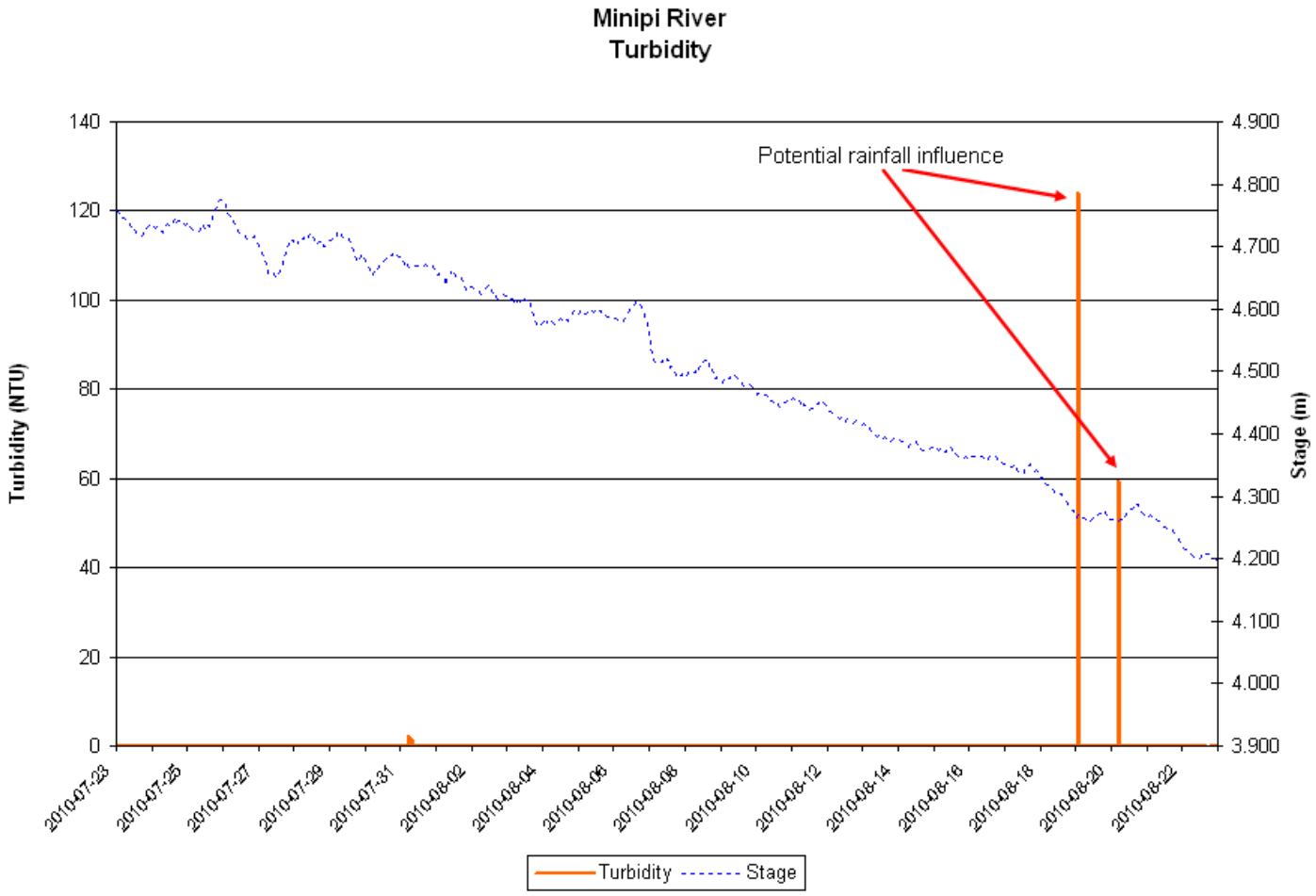

Figure 5: Turbidity Values for Minipi River

STAGE AND STREAM FLOW

- Stage can be defined as the height of the surface of a river or other fluctuating body of water above a set point. The set point is the bottom axis of this graph.
- The stage (**Figure 6**) ranged from a minimum of 4.195 m to a maximum of 4.776 m with the highest peaks corresponding with precipitation events.
- The stream flow ranged from minimum of 42.4 m³/s to a maximum of 81 m³/s. Stream flow can be influence by precipitation events and corresponding runoff.
- Stream flow will naturally decrease during the summer months as they are the hotter and drier months of the year creating greater evaporation and less runoff.

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 July 23 and August 22, 2010.
- According to the rainfall recorded in Happy Valley- Goose Bay, the highest rainfall was 15 mm on July 26, 2010 and the lowest rainfall recorded was 0.0 mm which occurred on several deployment days.

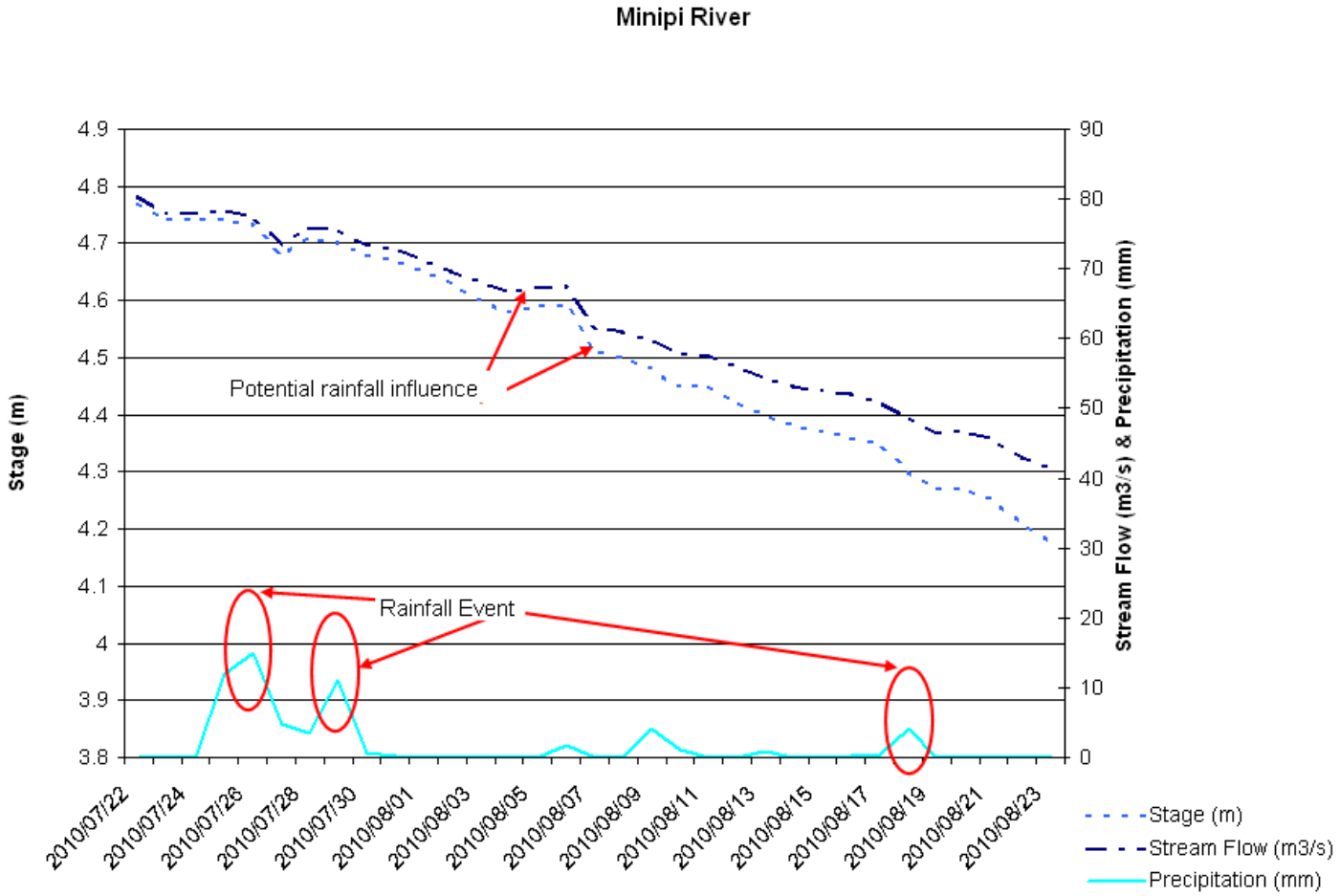

Figure 6: Minipi River stream flow and stage, compared with Happy Valley-Goose Bay precipitation.

CONCLUSION

The water quality monitoring instrument was deployed at the station on Minipi River below Minipi Lake between July 23, 2010 and August 22, 2010. During this deployment period, no momentous water quality events were recorded at the Minipi River Station below Minipi Lake. Typical seasonal patterns are evident in temperature, dissolved oxygen and stage as the air temperature increases during the summer months, natural continual changes will occur in the water body.

Throughout the deployment period, the dissolved oxygen (% Sat) values were slightly below the limits recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Cold Water/Early Life Stages – above 9.5 mg/L). However the values were still above the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Cold Water/Other Life Stages – above 6.5 mg/L). The range of pH values is within the lower scale of the *CCME Guidelines for the Protections of Aquatic Life;* background pH for Minipi River indicates that these values are the norm for this station.

Prepared by:

Tara Clinton
Water Resources Management Division
Department of Environment and Conservation
taraclinton@gov.nl.ca
(709) 729 5925