Real-Time Water Quality Deployment Report

Minipi River below Minipi Lake

September 25 to
November 7, 2012

Newfoundland Labrador

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

Contents

General

- Department of Environment and Conservation staff monitors the real-time web pages regularly.
- This deployment report discusses water quality related events occurring at the station on Minipi River below Minipi Lake.
- On September 25, 2012, a real-time water quality monitoring instrument was deployed at the station on the Minipi River below Minipi Lake. The instrument was deployed for a period of 43 days. The instrument was removed on November 7th, 2012 for the winter season and will be deployed in the spring of 2013, when conditions permit.

Quality Assurance and Quality Control

- As part of the Quality Assurance and Quality Control protocol (QA/QC), 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.
  - ► At deployment and removal, a QA/QC Sonde is temporarily deployed along side the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments**.** Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

Table 1: Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (°C)	<=+/-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

- It should be noted that 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 may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

Minipi River below Minipi Lake, Newfoundland and Labrador

- Deployment and removal comparison rankings for the station on Minipi River deployed between September 25 and November 7, 2012 is summarized in Table 2.

Table 2: Comparison rankings for Minipi River station September 25 and November 7, 2012.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Minipi River	Sept 25, 2012	Deployment	Excellent	Good	Excellent	Not ranked	Excellent
	Nov 7, 2012	Removal	Excellent	Poor	Excellent	Good	Excellent

- At the Minipi River station, all parameters besides dissolved oxygen ranked either 'good' or 'excellent' at deployment. Dissolved oxygen was not ranked due to an issue with the QA/QC sonde.

- At removal, temperature, conductivity, dissolved oxygen and turbidity ranked either 'excellent' or 'good'. pH was ranked poor, the field sonde gave a reading of 6.86, while the QA/QC sonde gave a reading of 5.44, this number seems particularly low. The reason for the poor ranking could be due to the amount of time the QA/QC sonde was given to stabilize. Due to the colder temperature on that day, more time could have been needed for the instrument to adjust.

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from September 25 to November 7 at the station on Minipi River below Minipi Lake.
- 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 QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Minipi River below Minipi Lake

- Water temperature ranged from 3.38 to 13.63°C during this deployment period (Figure 1).
- Water temperature decreases throughout the deployment period. This is expected due to the decreasing ambient air temperature of the season (Figure 2).

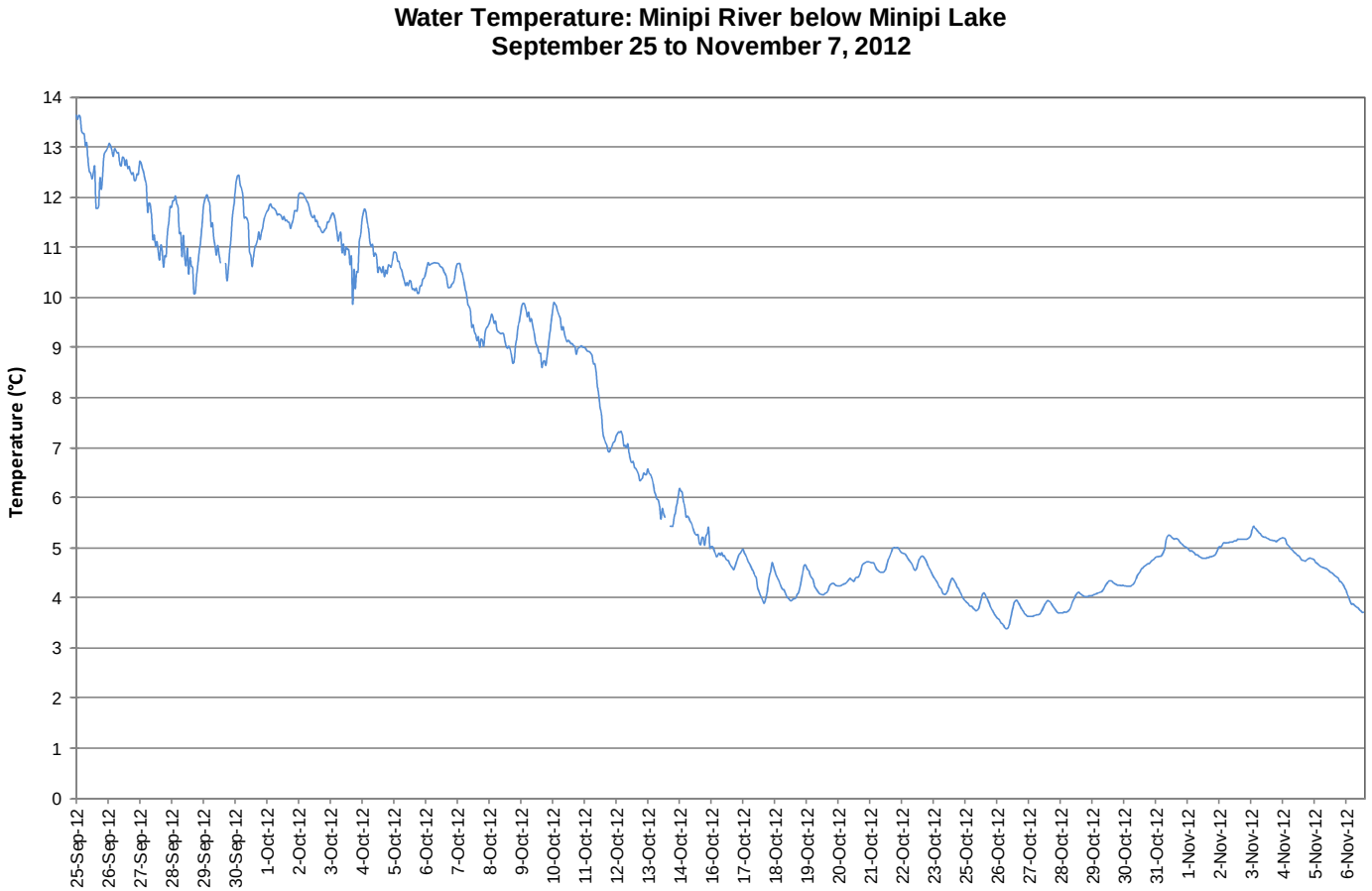

Figure 1: Water temperature at Minipi River below Minipi Lake

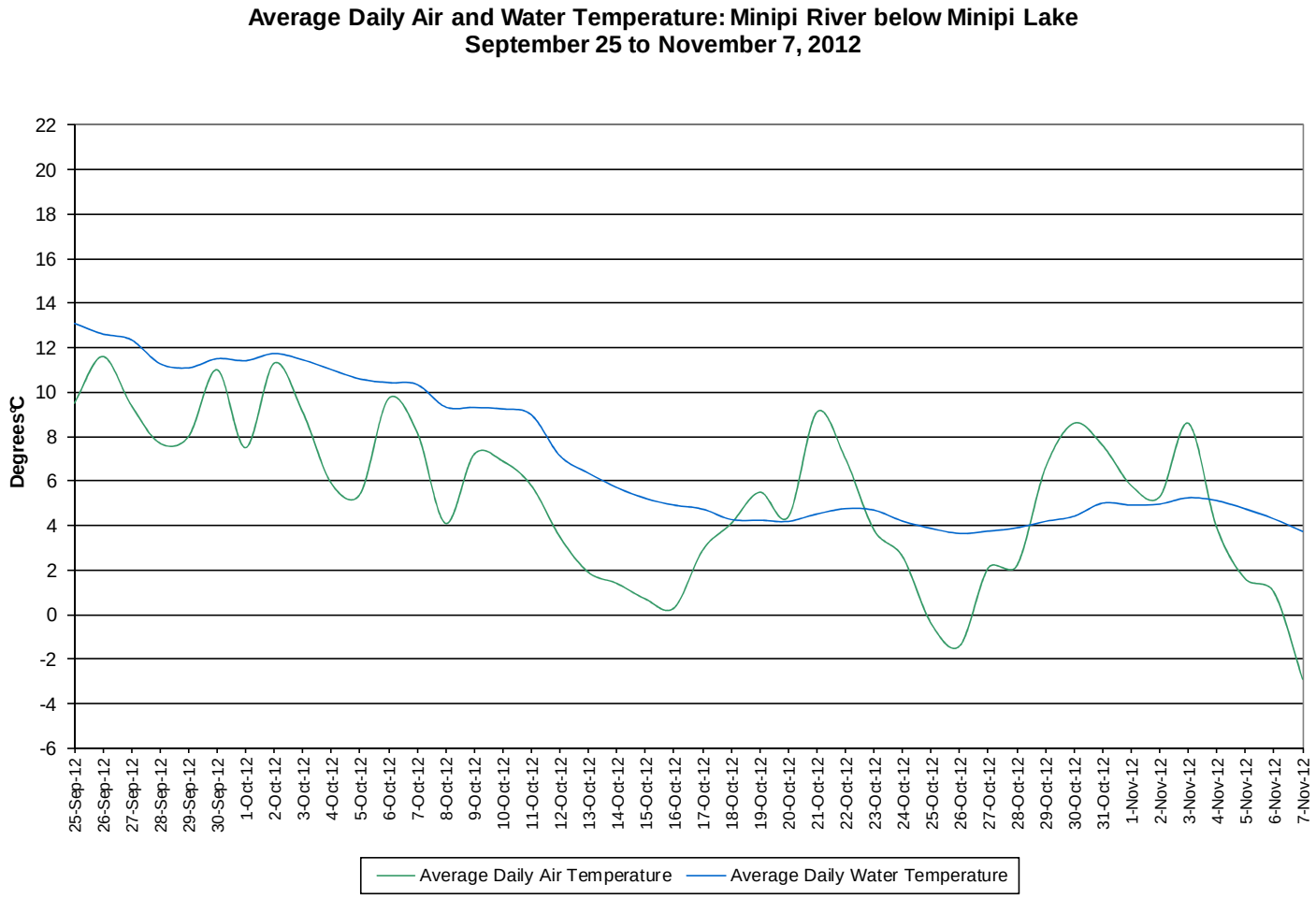

Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake

(weather data collected at Goose Bay)

- pH ranges between 6.69 and 7.07 pH units throughout the deployment period (Figure 3). The average pH is 6.89 units.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly during the day and night.
- There is a slight decrease in pH on October 21st, during significant precipitation.

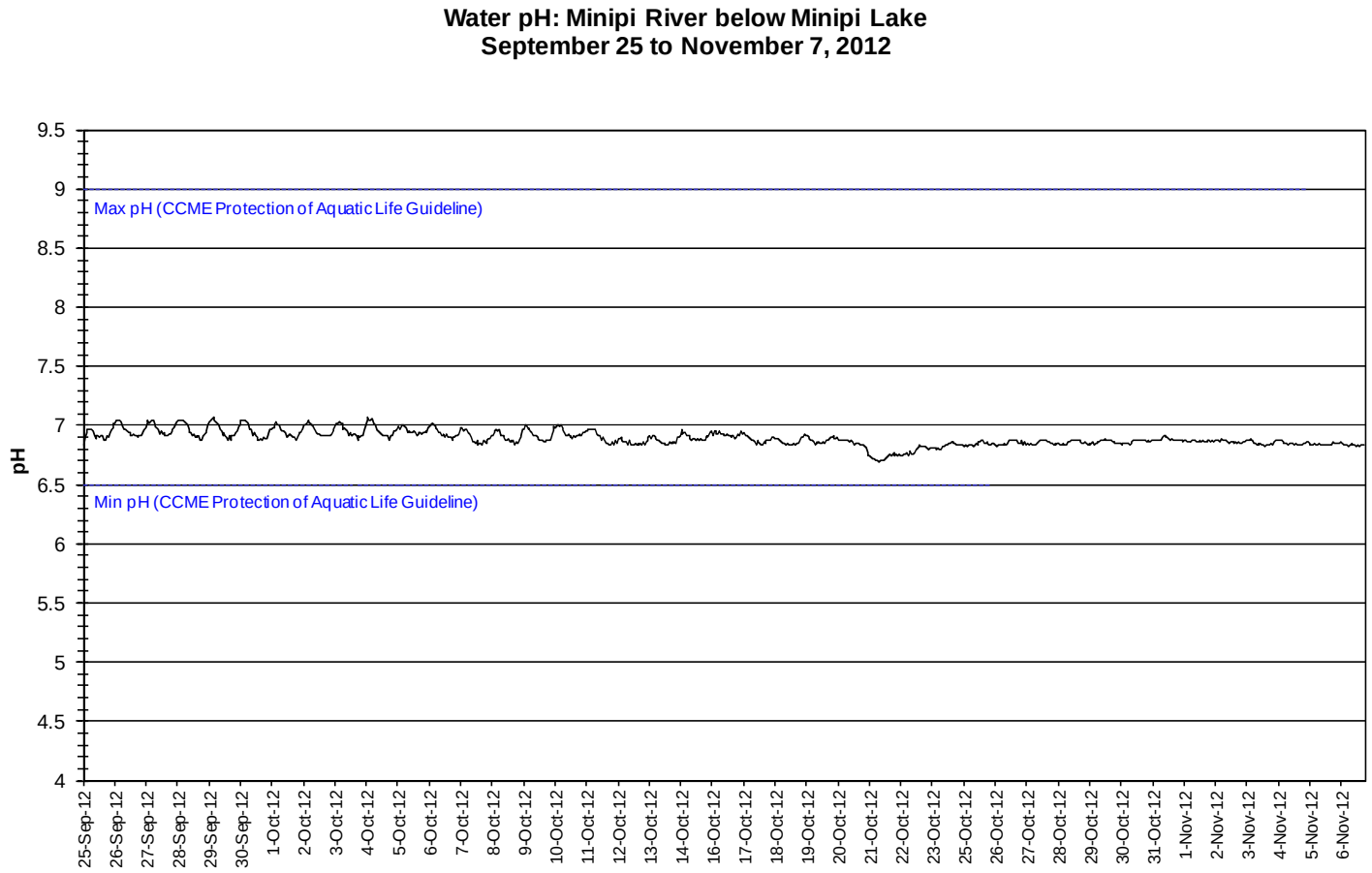

Figure 3: pH at Minipi River below Minipi Lake

- Specific conductivity ranges from 12.8 to 15.8 µs/cm.
- Specific conductivity is relatively stable at this station throughout stage fluctuations.
- Stage decreases slightly during the 20-21 of October. There was significant precipitation during this time.

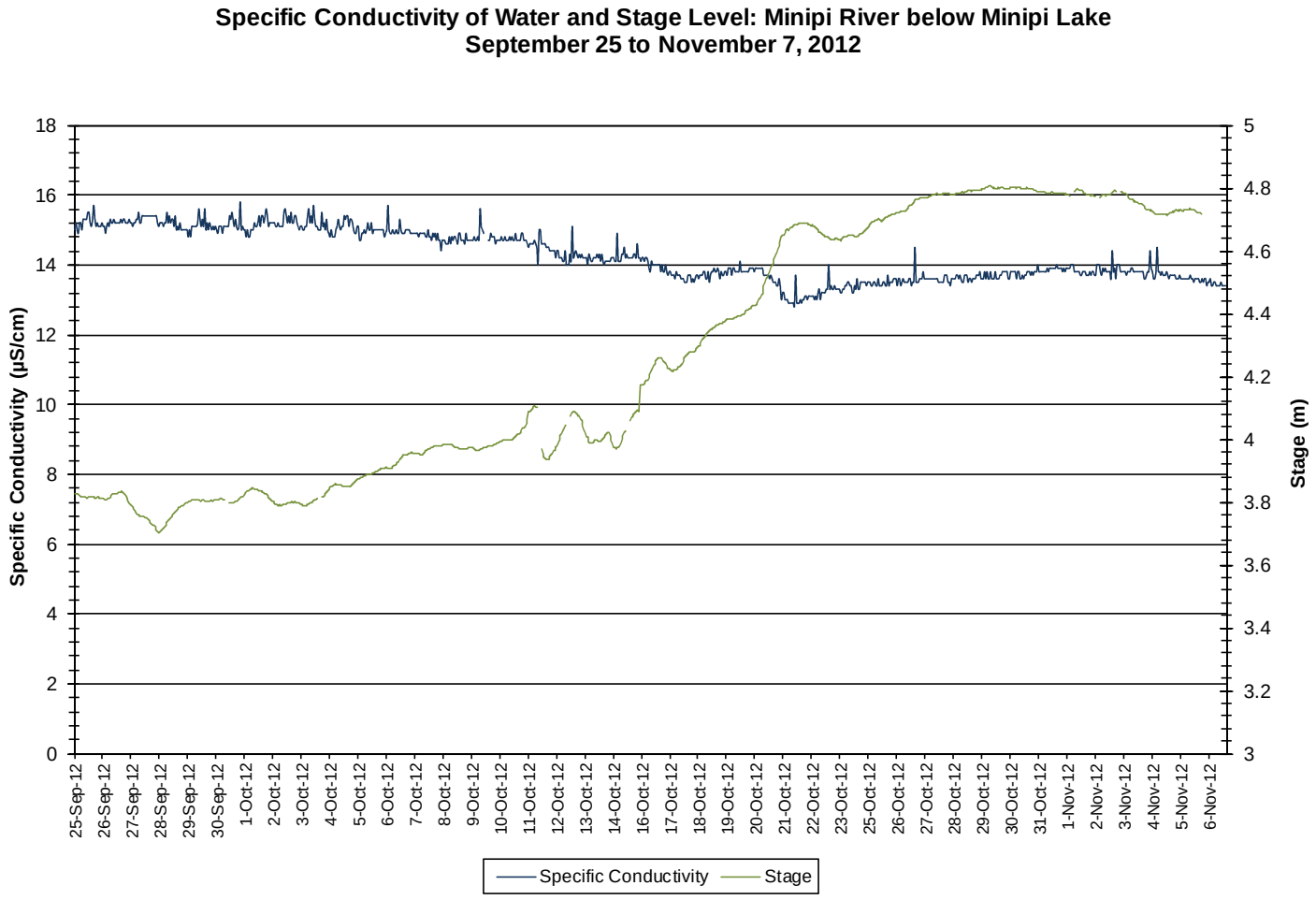

Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake

- The saturation of dissolved oxygen ranged from 89.9 to 98.6% and a range of 9.74 to 12.76mg/l was found in the concentration of dissolved oxygen with a median value of 11.76mg/l (Figure 5).
- All values were above the minimum CCME Guideline for the Protection of Other Life Stage Cold Water Biota of 6.5 mg/l and the minimum CCME Guideline for the Protection of Early Life Stage Cold Water Biota value of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.
- Dissolved Oxygen content increases throughout the deployment period, due to the decreasing water temperature. Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature.

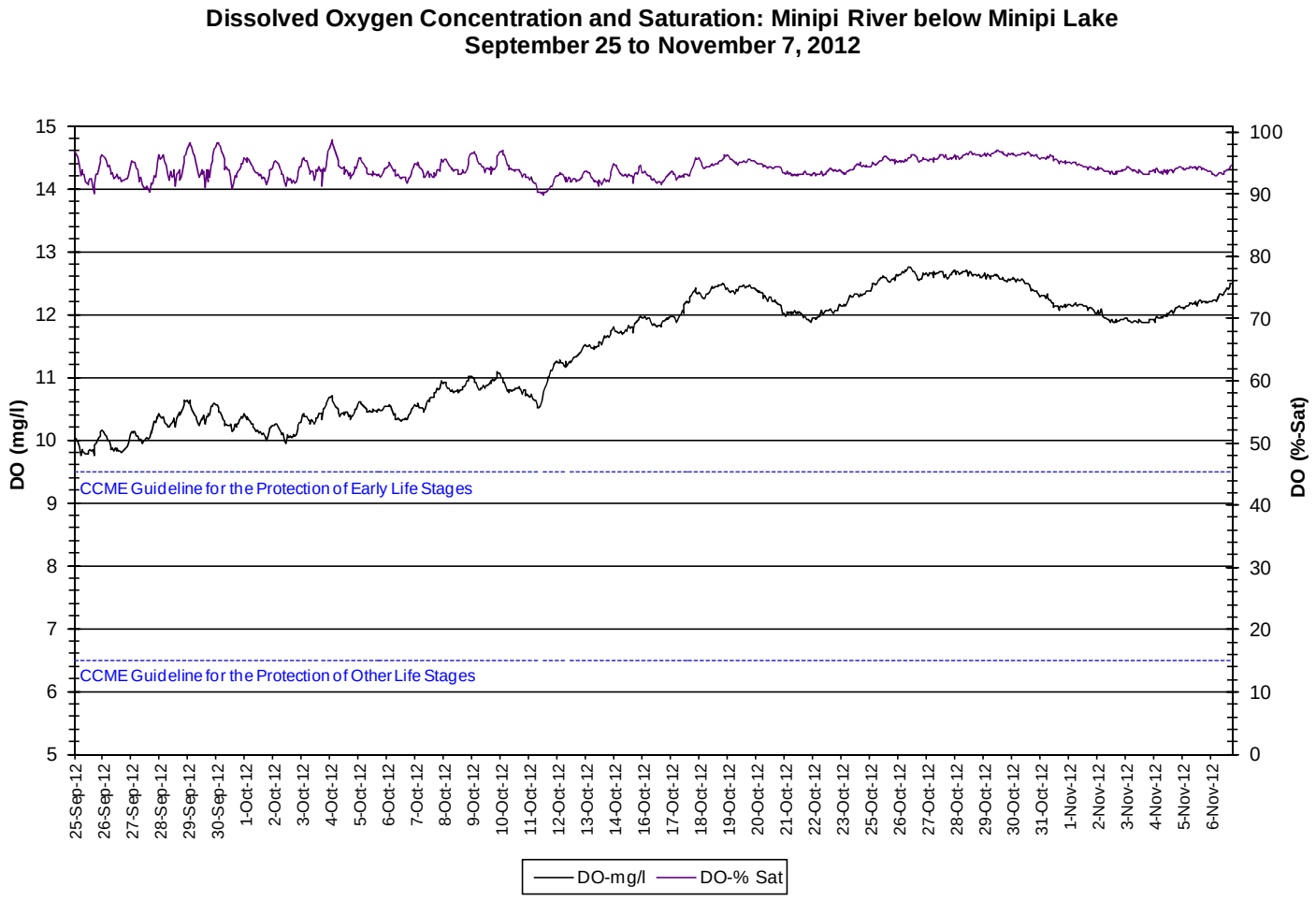

Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake

- Turbidity values typically remain at 0NTU for the majority of the deployment period (Figure 6).
- Turbidity readings >0NTU occur infrequently, at low magnitudes and for a maximum of 1 hour. This site is pristine with no background turbidity values.

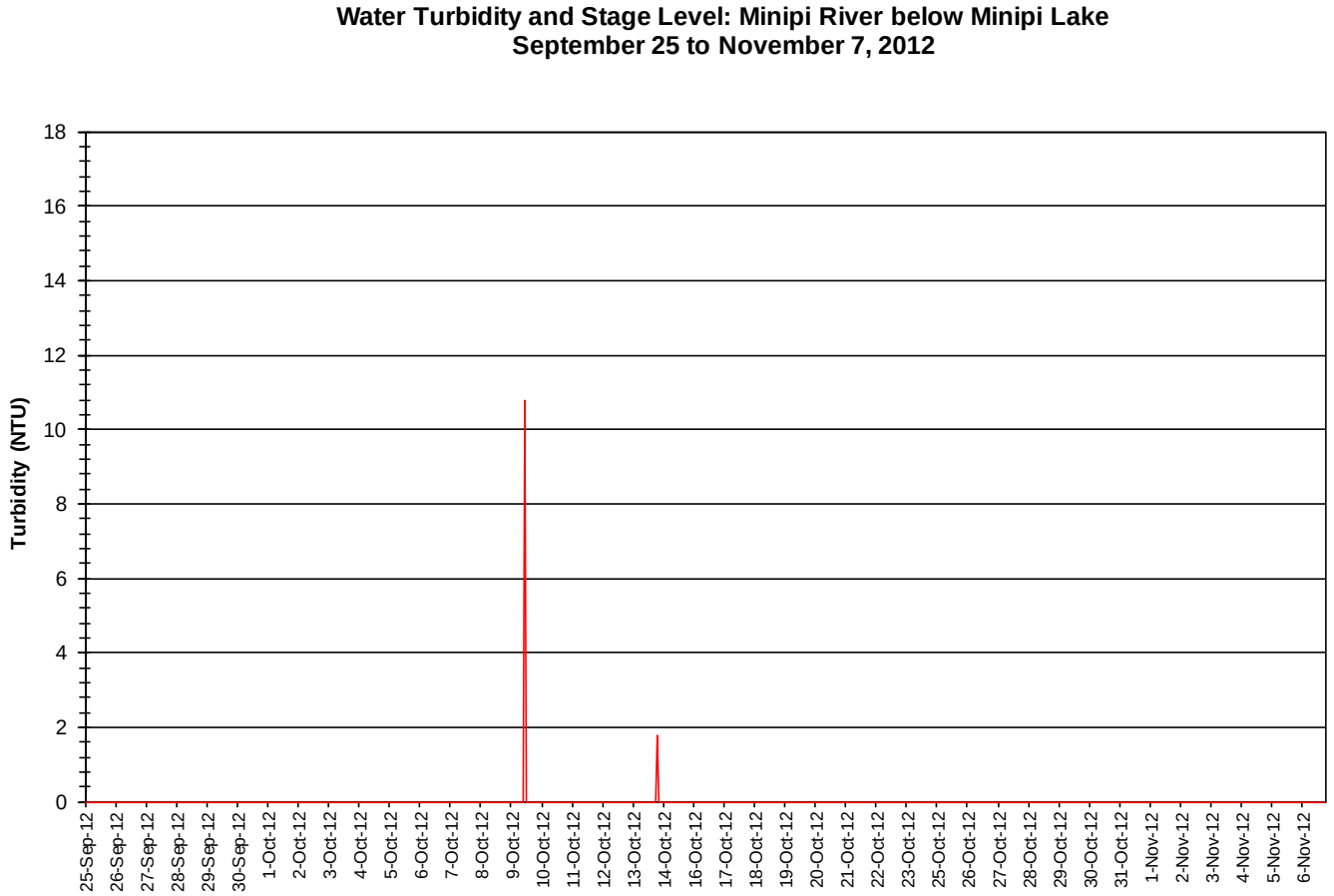

Figure 6: Turbidity and stage level at Minipi River below Minipi Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage varies throughout the deployment period with varying precipitation records.
- It is important to note the distance between where the precipitation data was collected (~100km to Goose Bay) and the area that drains the Minipi River at this point (~2300km^2). There is no significant correlation between precipitation and stage during this time at this station.

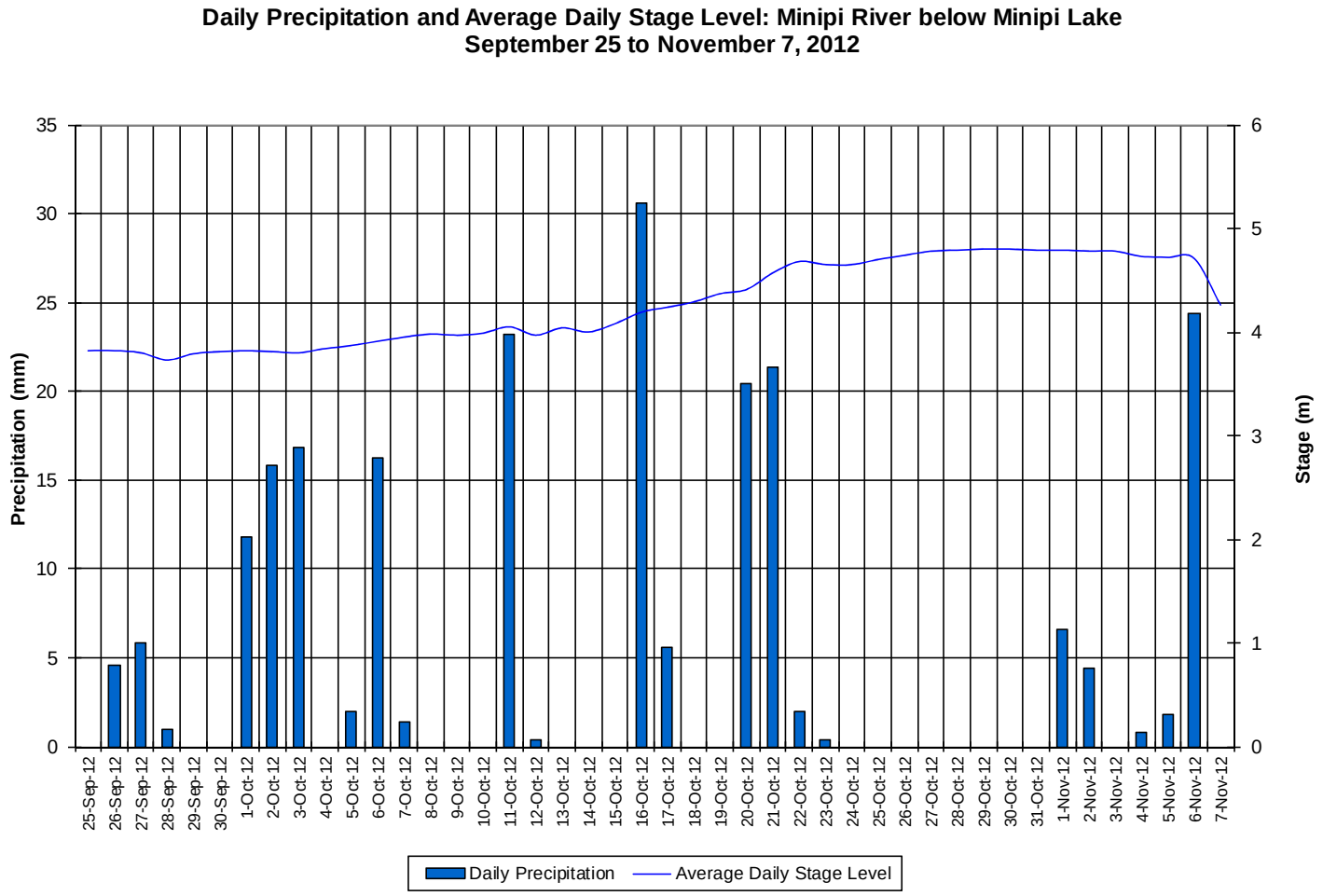

Figure 7: Stage and precipitation at Minipi River below Minipi Lake

Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on September 25 and removed on November 7, 2012. The instrument was removed for the winter season and will be deployed again in the spring of 2013, when conditions permit.
- In most cases, weather related events or increase/decreases in water level could be used to explain the fluctuations. All values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen.
- Temperature decreased, while dissolved oxygen increased. Specific conductivity decreased slightly and pH was stable. There were two turbidity events during the deployment period.

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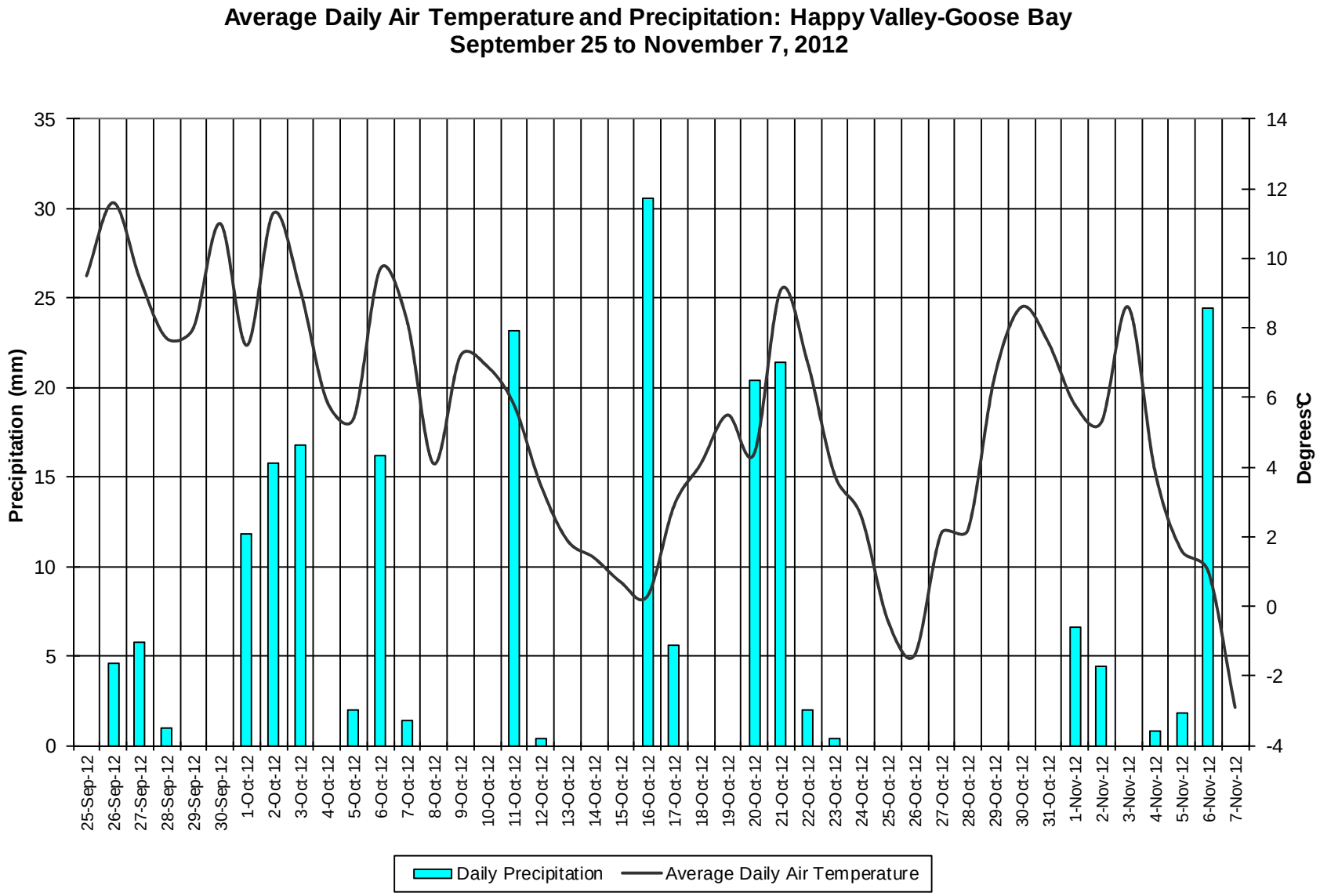
Appendix 1


Average Daily Air Temperature and Precipitation: Happy Valley-Goose Bay
September 25 to November 7, 2012
Precipitation (mm)
Degrees℃
35
30
25
20
15
10
5
0
14
12
10
8
6
4
2
0
-2
-4
25-Sep-12
26-Sep-12
27-Sep-12
28-Sep-12
29-Sep-12
30-Sep-12
1-Oct-12
2-Oct-12
3-Oct-12
4-Oct-12
5-Oct-12
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28-Oct-12
29-Oct-12
30-Oct-12
31-Oct-12
1-Nov-12
2-Nov-12
3-Nov-12
4-Nov-12
5-Nov-12
6-Nov-12
7-Nov-12
Daily Precipitation
Average Daily Air Temperature