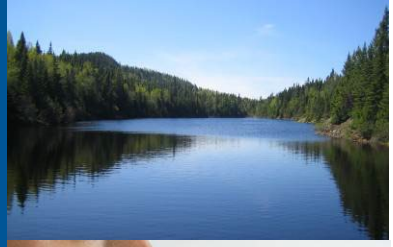
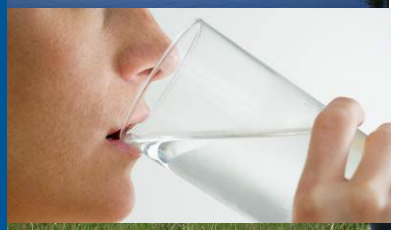






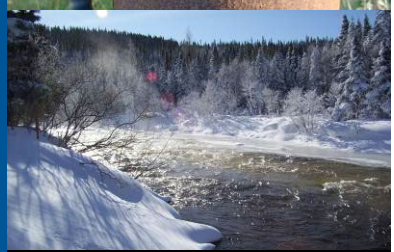

Real Time Water Quality Report

Humber River at Humber Village

Deployment Period
2024-03-20 to 2024-05-14

Newfoundland Labrador

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

General

The following report is a summary of water quality monitoring data collected in real-time at the Humber River at Humber Village Bridge station from March 20 to May 14, 2024.

Figure 1: Humber River at Humber Village Bridge Real Time Water Quality station location

This station operates year-round as part of the Provincial Real Time Water Quality (RTWQ) monitoring network. A multi-parameter sonde is deployed in the river and records parameters of interest including: temperature (°C); pH; dissolved oxygen (mg/L); specific conductivity (µS/cm); total dissolved solids (g/L) and turbidity (NTU). Staff at the Department of Environment and Climate Change (Water Resources Management Division-WRMD) monitor the data for potential environmental impacts. The sonde undergoes routine maintenance/calibration on a regular basis, after which the instrument is redeployed, generally within 24 hours.

Quality Assurance/Quality Control (QA/QC)

A routine QA/QC performance test is administered on the instrument at the beginning and end of each deployment period. The methodology of this protocol can be found in Appendix A.

The purpose is to determine the accuracy of the instrument's sensors by cross-examining its initial readings against a control sonde which is deployed at the same time to compare parameters. Depending on these readings, the sensors of each parameter receive a qualitative rank (Appendix A) based on whether readings fall within a specified threshold. This will further ensure the integrity of the data's accuracy, so that the monitoring station delivers reliable results.

With the exception of water quantity data (i.e. stage), all other data used in the preparation of graphs and subsequent discussion below adhere to the stringent QA/QC protocol. The stage data is raw data that is transmitted via satellite and published on WRMD's webpage. It has not been corrected for backwater effect. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Table 1: QA/QC water quality performance results for the beginning and end of deployment period.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Humber River at Humber Village Bridge	March 20	Deployment	Excellent	Good	Good	Excellent	Excellent
	May 14	Removal	Fair	Poor	Poor	Excellent	Excellent

All performance rankings at deployment were 'good' or 'excellent'.

At removal, pH and conductivity ranked 'poor'. This may be due to the values not having stabilized before they were recorded or some sensor drift with the field sonde.

Deployment Notes

This deployment took place over the course of 54 days (March 20 to May 14, 2024), during which there were no significant interruptions or data loss.

Data Interpretation

The following interpretations for the Humber River stations will cover the following six parameters: Stage (m); (2) Temperature (°C); (3) pH; (4) Specific Conductivity (µS/cm); (5) Dissolved Oxygen (mg/L); (6) Turbidity (NTU).

Temperature

- Throughout the deployment period, water temperatures ranged between 1.31 °C and 5.71 °C, with an average temperature of 2.85 °C.
- Water temperatures began a steady climb upward in early April. This is expected as Spring approaches and air temperatures begin to warm.
- Water temperature values display a natural diurnal pattern with temperatures increasing during the day and decreasing overnight. The magnitude of variation was influenced by daily air temperature fluctuations as well as precipitation events.

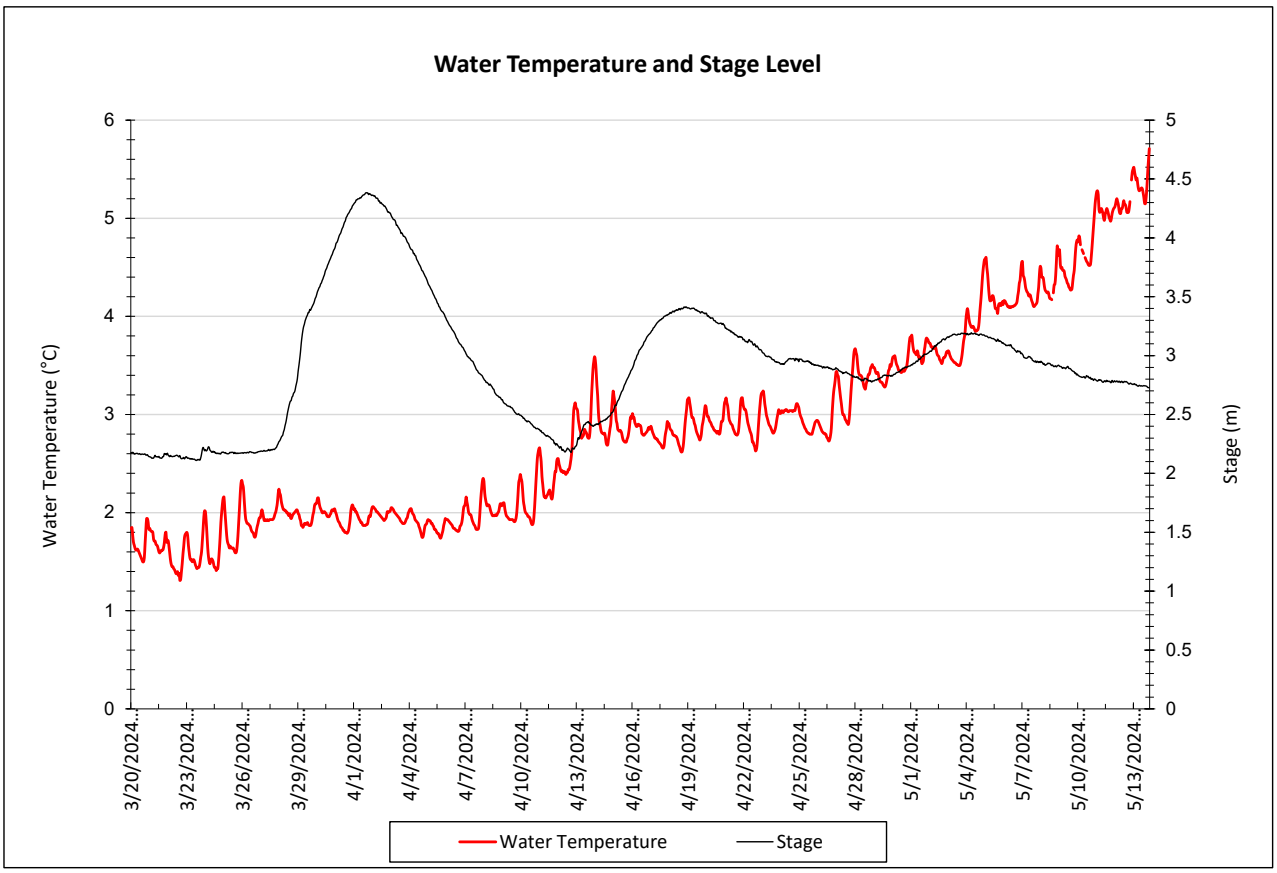

Figure 2: Water Temperature and Stage at Humber River at Humber Village Bridge

pH

- pH ranged between 7.02 and 7.20 during the deployment period, with an average of 7.12 pH units.
- The pH data was very consistent during this deployment and was not affected by the large stage increase in April and May, likely related to spring melt and runoff.
- Throughout the deployment, pH remained within the acceptable range for the protection of aquatic life as outlined by the Canadian Council of Ministers of the Environment (CCME) (2007).

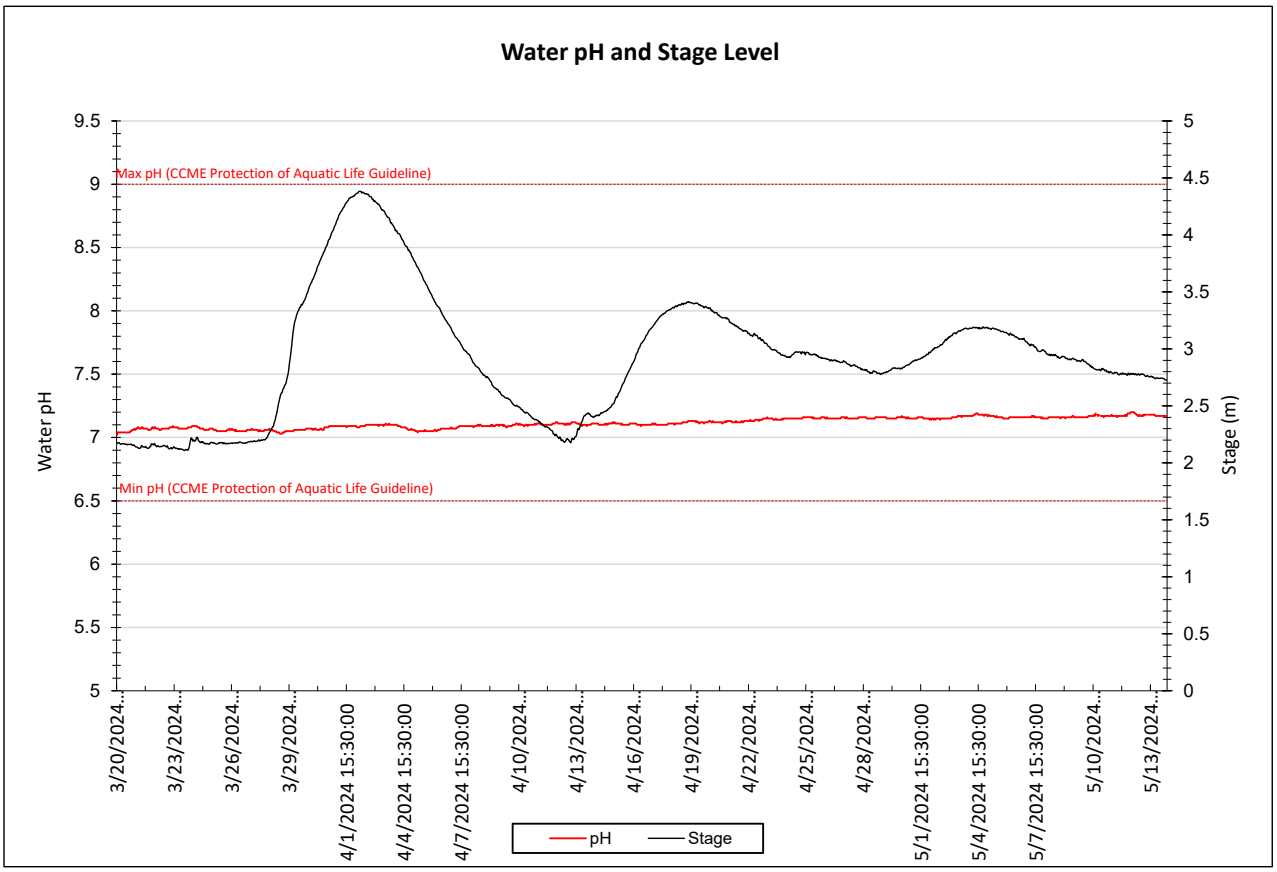

Figure 3: pH values recorded at Humber River at Humber Village Bridge

Specific Conductivity

- Throughout the deployment period, specific conductivity ranged between 39.5 µS/cm and 42.8 µS/cm, with an average of 41.2 µS/cm.
- With such a small range of values, specific conductivity was very stable during this deployment, influenced occasionally by increases in stage as additional freshwater into the river results in dilution. The large volume of water in the river prevents large changes and ranges in specific conductivity values.

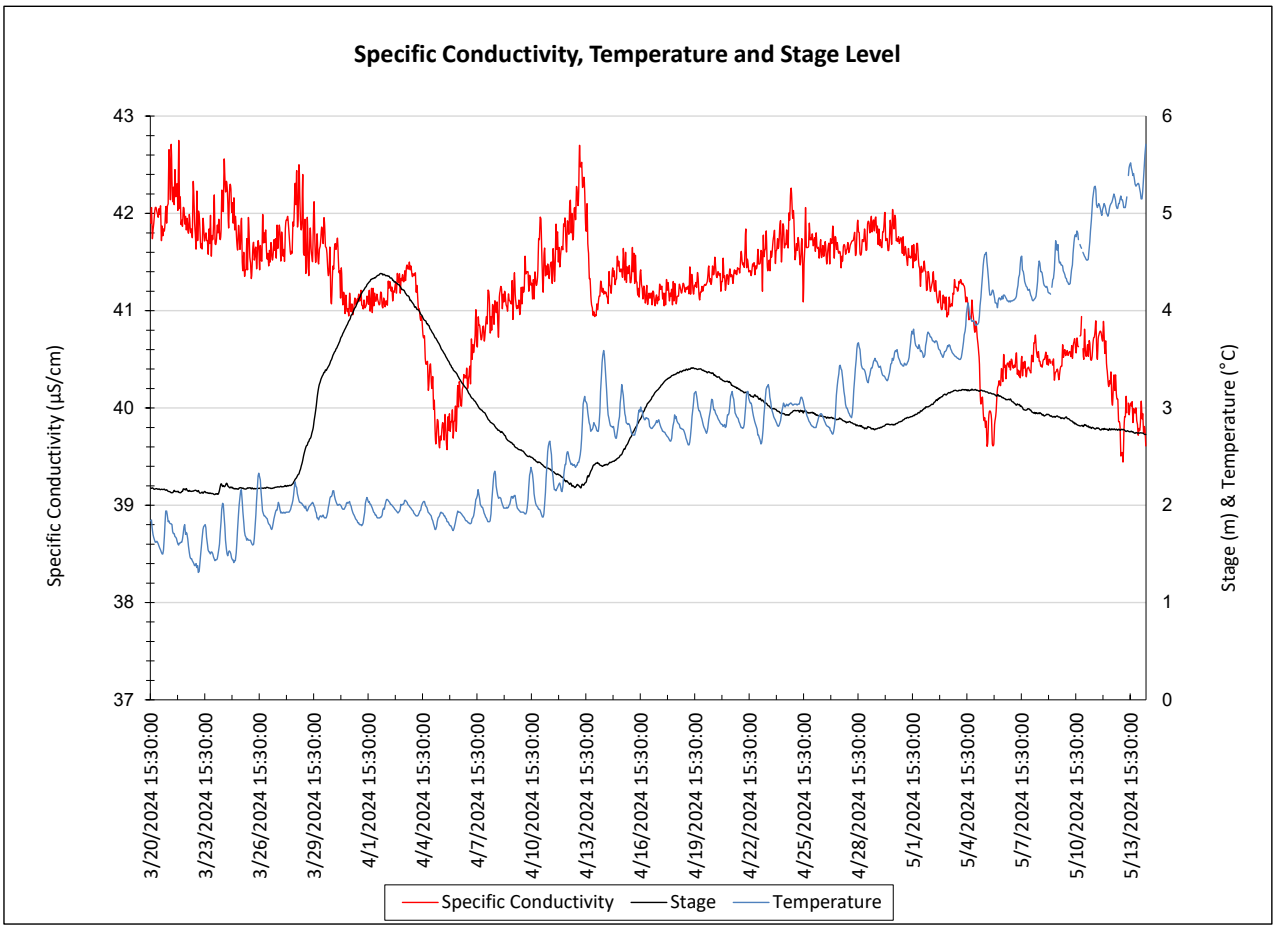

Figure 4: Specific Conductivity at Humber River at Humber Village Bridge

Dissolved Oxygen

- During the deployment period, dissolved oxygen concentrations ranged from 12.49 mg/L to 13.44 mg/L, with an average of 13.13 mg/L. Dissolved oxygen percent-saturation ranged from 94.3% to 100.7%, with an average of 97.1%.
- Dissolved oxygen is inversely related to water temperature: oxygen levels increase in lower water temperatures and decrease in higher water temperatures.
- Dissolved oxygen levels were very consistent during this deployment, which is expected as water temperatures were also consistent. When water temperatures began to rise in mid-April, dissolved oxygen levels began a corresponding slow, gradual decline.
- All values remained above the thresholds of the CCME guidelines for the protection of other life stages and the protection of early life stages (CCME, 2007).

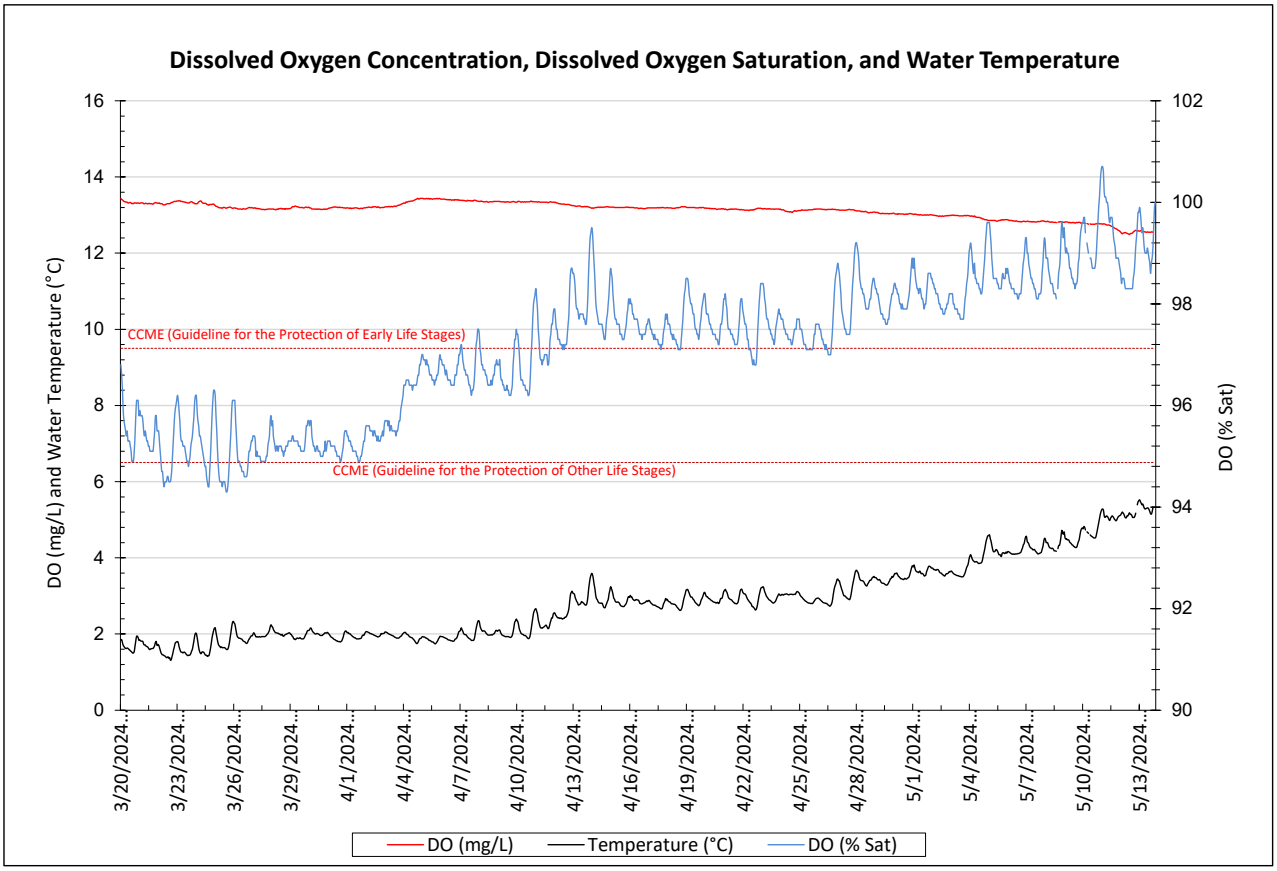

Figure 5: DO (mg/L & % saturation) with Water Temperature (°C) at Humber River at Humber Village Bridge

Turbidity, Stage & Precipitation

- Throughout the deployment period, turbidity ranged from 0.3 NTU to 7.4 NTU, with an average turbidity of 1.0 NTU.
- Turbidity was relatively stable with minor, short-term increases during periods of rising stage levels, particularly in late March. These higher turbid periods are likely influenced by runoff and water column mixing at this time.
- Stage ranged from 2.11 m to 4.38 m, averaging at 2.93 m. Stage experienced some significant increases during this deployment period but was decreasing as the deployment ended.

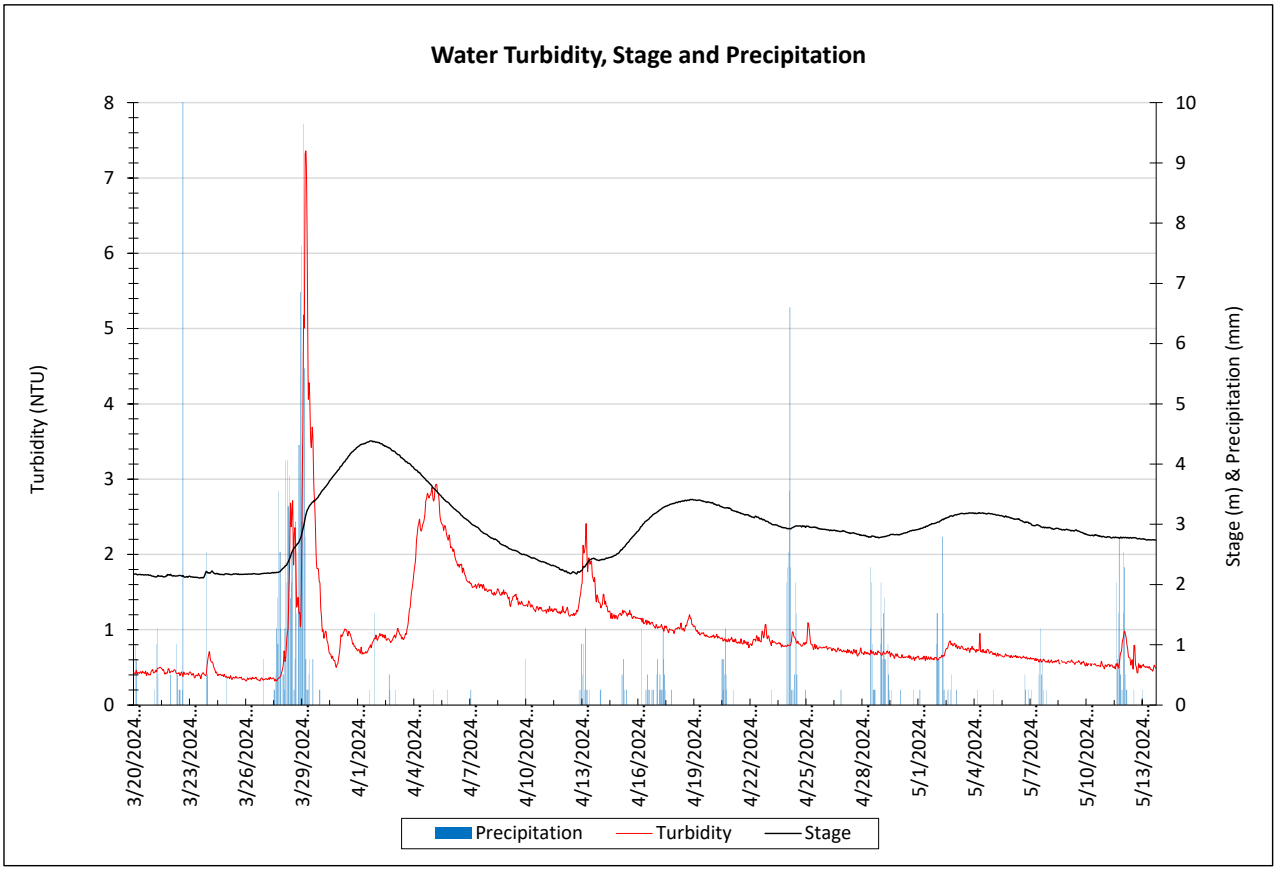

Figure 6: Turbidity, Stage & Precipitation at Humber River at Humber Village Bridge

Conclusions

- This deployment report summarizes the real time water quality and quantity monitoring data recorded at the Humber River at Humber Village Bridge station over a period of 54 days. No unusual events or data anomalies were evident. Some parameters were influenced by increased stage as the result of precipitation events and spring runoff during the deployment.

- All parameters displayed trends typical for this waterbody at this time of year. pH and dissolved oxygen values were within the recommended CCME guidelines for the Protection of Aquatic Life.

Prepared by:
Department of Environment and Climate Change
Water Resources Management Division

References

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated December, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg. (Website: http://ceqg-rcqe.ccme.ca/download/en/222/)

APPENDIX A

Quality Assurance / Quality Control Procedures

As part of the Quality Assurance / Quality Control (QA/QC) protocol, the performance of a station's water quality instrument (i.e., field sonde) is rated at the beginning and end of its deployment period. The procedure is based on the approach used by the United States Geological Survey (Wagner *et al.* 2006)[1].

At the beginning of the deployment period, a fully cleaned and calibrated QA/QC water quality instrument (i.e., QA/QC sonde) is placed *in-situ* with the fully cleaned and calibrated field sonde. After sonde readings have stabilized, water quality parameters, as measured by both sondes, are recorded. Field sonde performance for all parameters is rated based on differences recorded by the field sonde and QA/QC sonde. If the readings from both sondes are in close agreement, the QA/QC sonde can be removed from the water. If the readings are not in close agreement, there will be attempts to reconcile the problem on site (e.g., removing air bubbles from sensors, etc.). If no fix is made, the field sonde may be removed for recalibration.

At the end of the deployment period, a fully cleaned and calibrated QA/QC sonde is once again deployed *in-situ* with the field sonde. After Sonde readings have stabilized, water quality parameters, are measured by both sondes and recorded. Field sonde performance for all parameters is rated based on differences recorded by the field sonde and QA/QC sonde.

Performance ratings are based on differences listed in the table below:

	Rating				
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

[1] Wagner, R.J., Boulger, R.W., Jr., Oblinger, C.J., and Smith, B.A., 2006, Guidelines and standard procedures for continuous water-quality monitors—Station operation, record computation, and data reporting: U.S. Geological Survey Techniques and Methods 1–D3, 51 p. + 8 attachments; accessed April 10, 2006, at *http://pubs.water.usgs.gov/tm1d3*

APPENDIX B

WRMD Climate Station – Humber Village at Humber Village Bridge