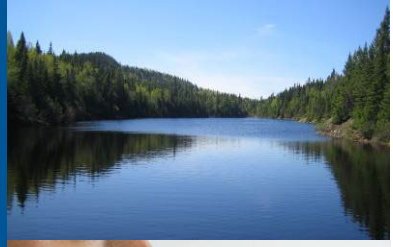
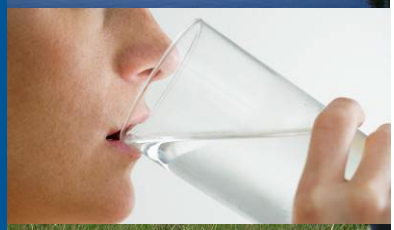



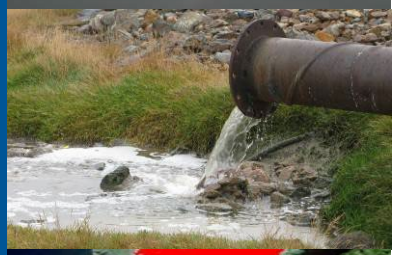


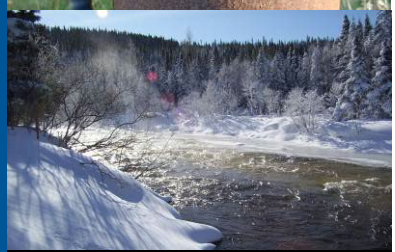

# Real Time Water Quality Report

# Humber River at Humber Village

## Deployment Period
## 2024-05-14 to 2024-08-21

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 May 14 to August 21, 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 | May 14, 2024 | Deployment | Good | Fair | Poor | Excellent | Excellent |
| | August 21, 2024 | Removal | Excellent | Poor | Poor | Excellent | Excellent |

All performance rankings at deployment and removal were 'poor', 'fair', 'good' or 'excellent'.

It was later determined that the 'poor' conductivity rankings were related to a conductivity sensor on the QA/control sonde that was faulty and required replacement. The 'poor' and 'fair' rankings of pH were due to a pH sensor on the field sonde that failed and required replacement.

## Deployment Notes

This deployment took place over the course of 97 days (May 14 to August 21, 2024), which is an extended deployment due to a failure of the pH sensor and delivery of the replacement sensor.

## 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 5.73 °C and 21.43 °C, with an average temperature of 13.47 °C.
- Water temperatures increased throughout much of the deployment, peaking in early August. Water temperatures correspond with ambient air temperatures as spring progresses into summer.
- 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.

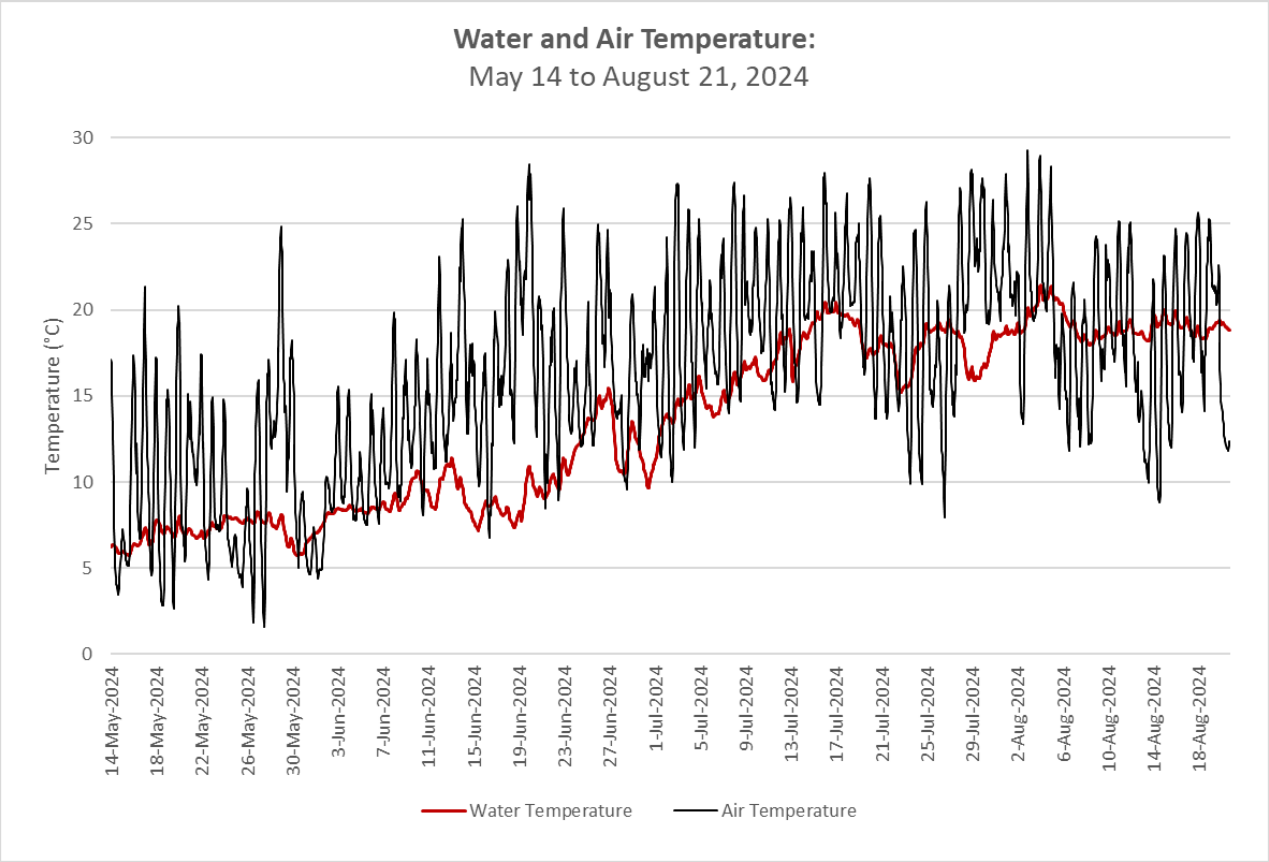


**Figure 2: Water Temperature and Stage at Humber River at Humber Village Bridge**

## pH

- pH ranged between 7.0 and 7.22 during the deployment period, with an average of 7.10 pH units.
- The pH data was very consistent early in the deployment, however readings began to drift upwards in late June as the sensor began to fail. A QA sonde was periodically used to confirm elevated pH readings were inaccurate while awaiting delivery of replacement sensor.
- pH readings remained within the acceptable range for the protection of aquatic life as outlined by the Canadian Council of Ministers of the Environment (CCME) (2007) until its failure in late June.

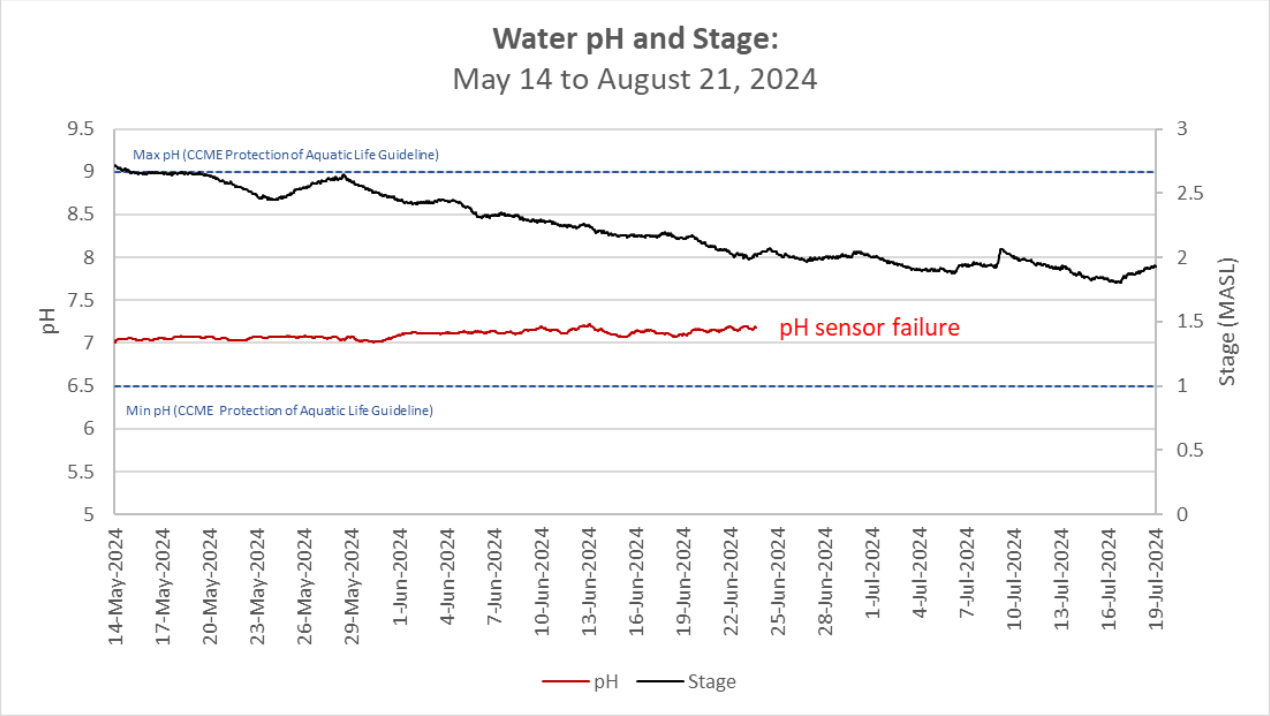


**Figure 3: pH values recorded at Humber River at Humber Village Bridge**

## Specific Conductivity

- Throughout the deployment period, specific conductivity ranged between 37.97 µS/cm and 47.62 µS/cm, with an average of 40.76 µS/cm.
- With such a small range of values, specific conductivity was relatively stable during this deployment, influenced occasionally by increases/decreases in stage. The large volume of water in the river prevents large changes and ranges in specific conductivity values.

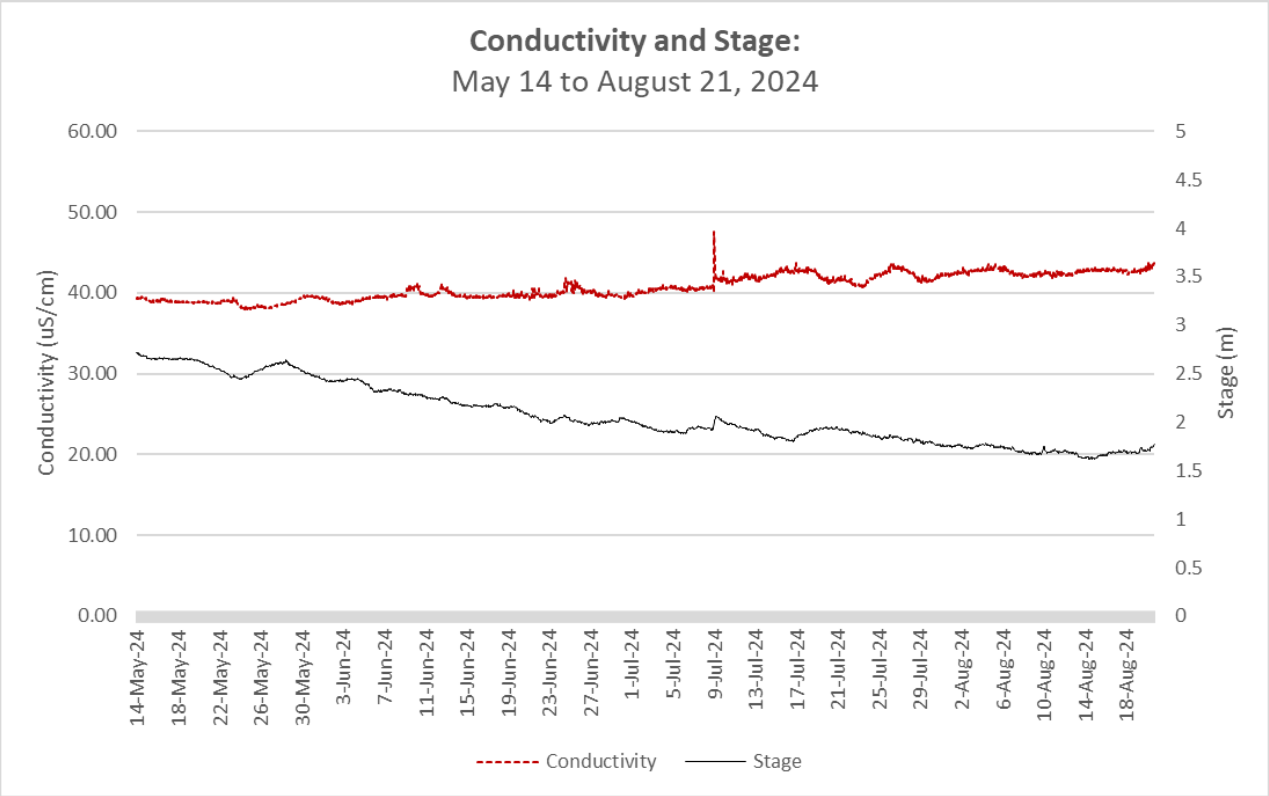


**Figure 4: Specific Conductivity at Humber River at Humber Village Bridge**

## Dissolved Oxygen

- During the deployment period, dissolved oxygen concentrations ranged from 8.8 mg/L to 12.80 mg/L, with an average of 10.63 mg/L. Dissolved oxygen percent-saturation ranged from 95.7% to 105.1%, with an average of 100.77%.
- Dissolved oxygen is inversely related to water temperature: oxygen levels increase in lower water temperatures and decrease in higher water temperatures.
- Dissolved oxygen decreased throughout the deployment period. As water temperature began to increase in early June, DO began to decrease.
- All concentrations remained above the threshold of the CCME guideline for the protection of other life stages while concentrations were above the protection of early life stages (CCME, 2007) guideline until July when water temperature increased enough to lower dissolved oxygen below 9.5mg/L.

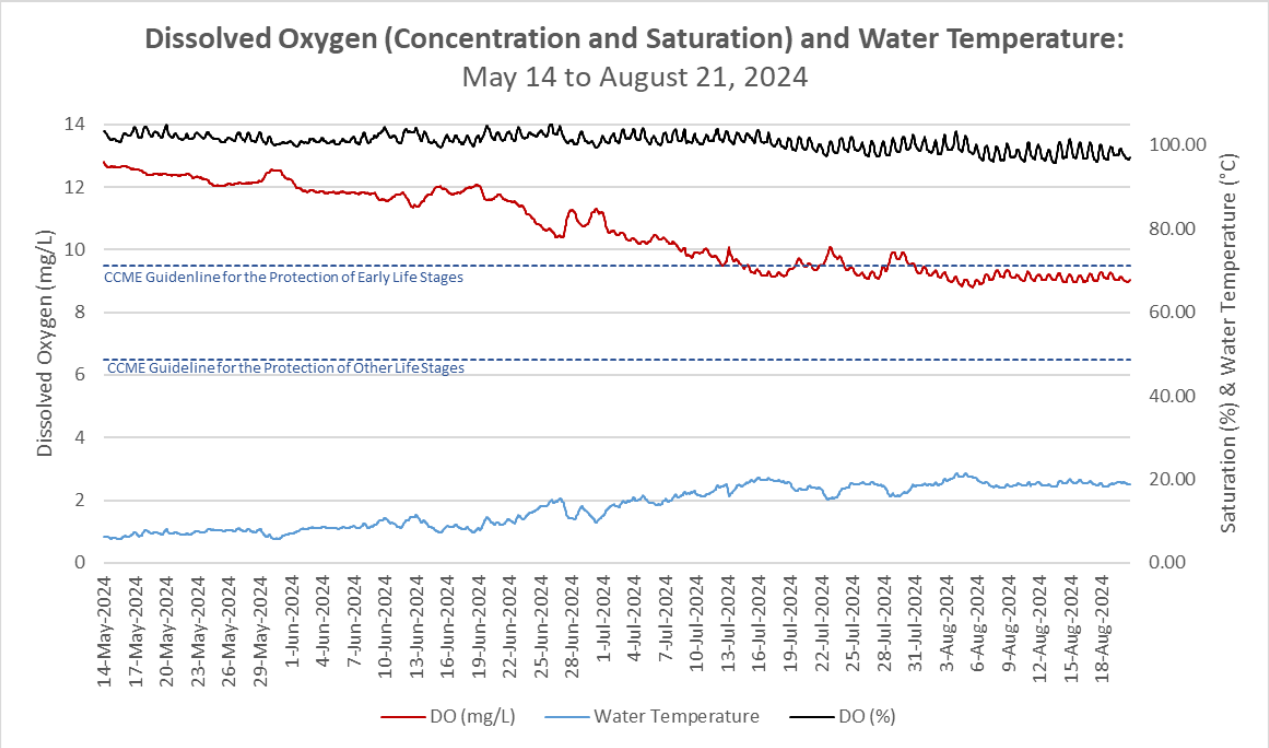


**Figure 5: DO (mg/L & % saturation) with Water Temperature (°C) at Humber River at Humber Village Bridge**

## Turbidity, Stage & Precipitation

- Throughout the deployment period, turbidity ranged from 0.1 NTU to 267 NTU, with an average turbidity of 0.6 NTU.
- Turbidity was relatively stable with one major, short-term increase during a period of heavy rain and increasing stage levels on July 9th, 2024.
- Stage ranged from 1.61 m to 2.71 m, averaging at 2.07 m.

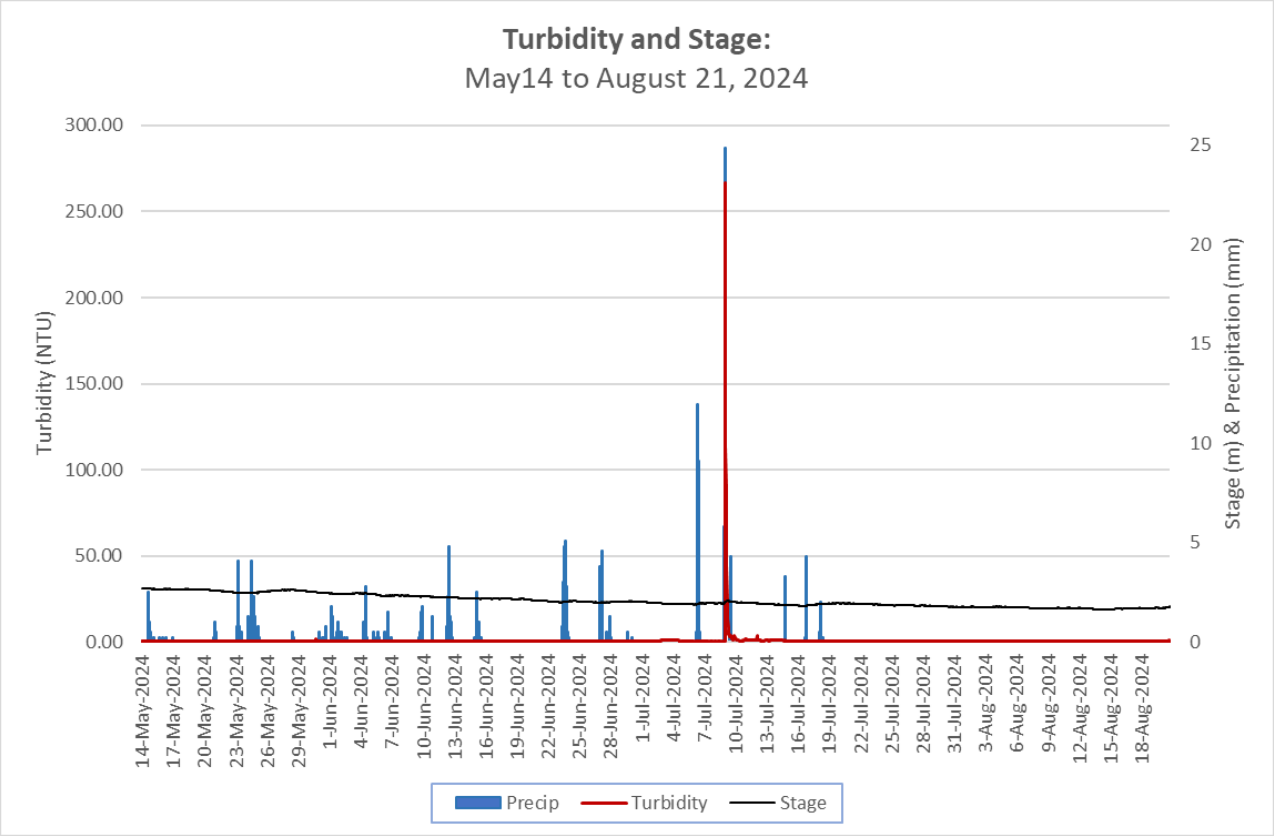


**Figure 6: Turbidity, Stage & Precipitation at Humber River at Humber Village Bridge**

## 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 97 days. The longer than usual deployment period was a result of awaiting the delivery of a replacement pH sensor. No unusual events or data anomalies were evident. Erroneous pH values were removed from the dataset. Some parameters were influenced by increased stage as a result of precipitation events.

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

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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**