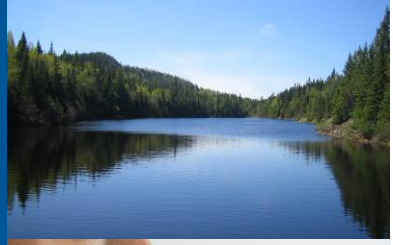




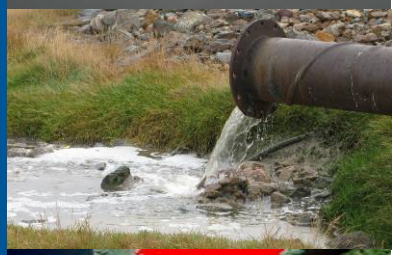


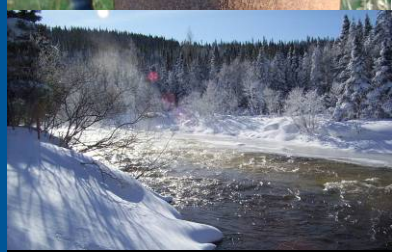

Real Time Water Quality Report

Humber River at Humber Village

Deployment Period
2013-05-10 to 2013-06-11

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

- This station is operated as part of the Provincial Real Time Water Quality (RTWQ) network.
- This station is operated year round.
- Staff of the Water Resources Management Division (WRMD) monitors the real-time web page on a daily basis. Any unusual observations are investigated.
- This site is easily accessed and the instrument is normally removed on a monthly to bi-monthly basis for maintenance and calibration and is reinstalled within one to two days.
- This monthly deployment report, presents water quality and water quantity data recorded at the Humber River at Humber Village station from May 10, 2013, to June 11, 2013.

Quality Assurance / Quality Control

- Water quality instrument performance is tested at the beginning and end of its deployment period. The process is outlined in Appendix A.
- Instruments are assigned a performance rating (i.e., poor, marginal, fair, good or excellent) for each water quality parameter measured.
- Table 1 shows the performance ratings of five water quality parameters (i.e., temperature, pH, specific conductivity, dissolved oxygen and turbidity) measured by instruments deployed at the water monitoring stations.

Table 1: Water quality instrument performance at the beginning and end of the deployment

	Humber River	
Stage of deployment	**Beginning**	**End**
Date	2013-05-10	2013-06-11
Temperature	Excellent	Fair
pH	Excellent	Excellent
Specific Conductivity	Excellent	Excellent
Dissolved Oxygen	Excellent	Excellent
Turbidity	Excellent	Excellent

The performances of all sensors were rated excellent at the beginning of the deployment period, while all sensors were rated fair to excellent at the end of the deployment period (Table 1).

Deployment Notes

- Water quality monitoring for this deployment period started on May 10, 2013 at 3:30 pm and continued without any significant operational issues until June 11, 2013, at 12:20 pm when the instrument was removed for routine calibration and maintenance.

Data Interpretation

- Data records were interpreted for each station during the deployment period for the following six parameters:

(i.) Stage (m)
(ii.) Temperature (°C)
(iii.) pH
(iv.) Specific conductivity (µS/cm)
(v.) Dissolved oxygen (mg/l)
(vi.) Turbidity (NTU)

Stage

- Stage values ranged from 2.31 m to 4.63 m at Humber River, with corresponding flow ranging from 278.00 m^3/sec to 776.00 m^3/sec from May 10, 2013 to June 11, 2013 (Figure 1).

- There are two noticeable peaks in stage height and flow during the deployment period (See inside red ovals – Figure 1) which is related to a combination of significant rain and/or snow melt typical of the spring runoff period.

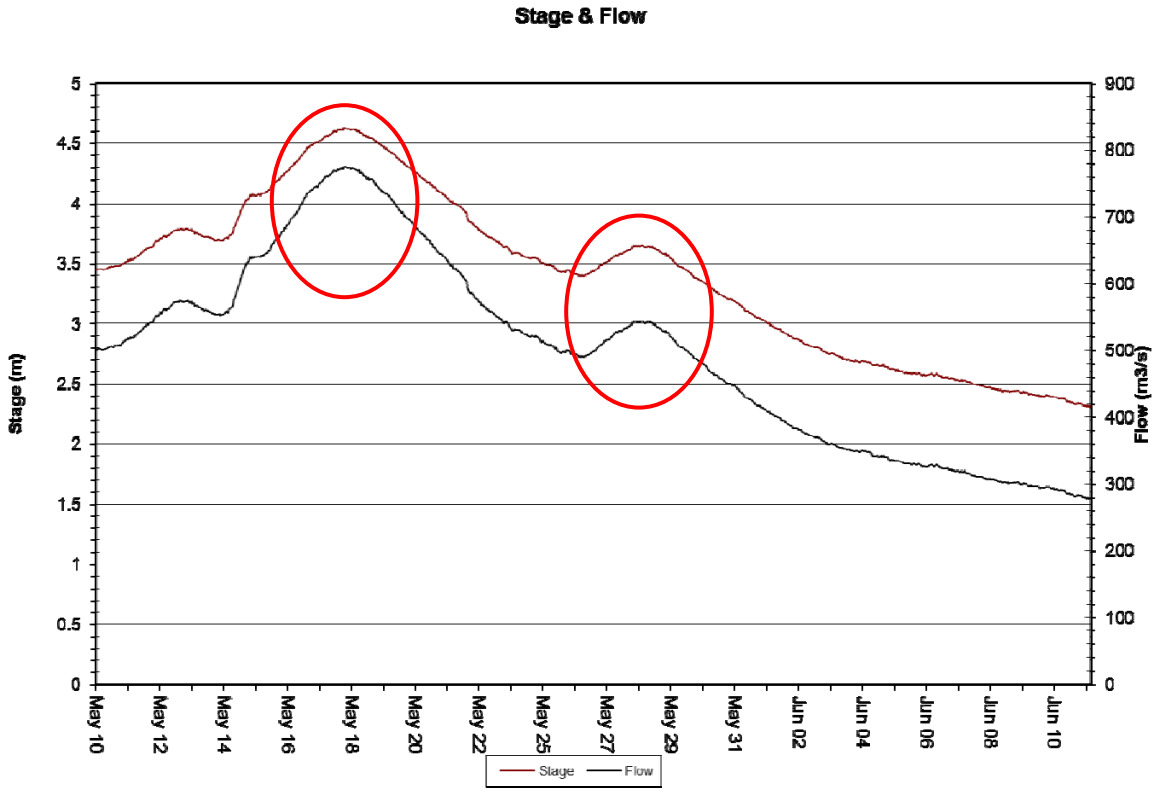

Figure 1: Stage Height (m) at Humber River from May 10, 2013, to June 11, 2013

Temperature

- Water temperature ranged from 3.89˚C to 8.58˚C at Humber River from May 10, 2013, to June 11, 2013 (Figure 2).
- Water temperature displays diurnal variations which are related to diurnal variations in ambient air temperatures.
- There is a gentle increasing temperature trend over the deployment period which is consistent with the late spring season.

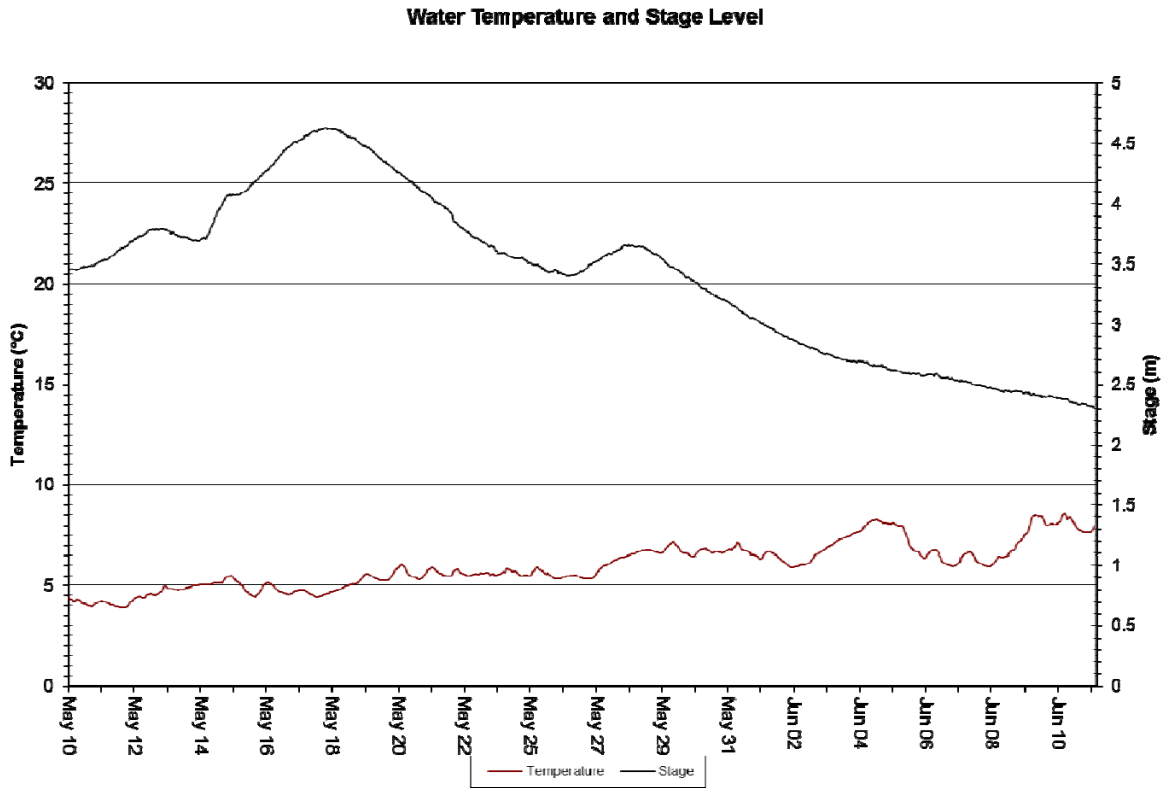

Figure 2: Temperature (°C) at Humber River from May 10, 2013, to June 11, 2013

pH

- pH values ranged from 6.81 units to 6.97 units at Humber River from May 10, 2013, to June 11, 2013 (Figure 3).
- pH was very stable throughout the deployment period.
- With a mean value of 6.88, pH values recorded at Humber River were within the guidelines for pH for the protection of aquatic life (i.e., 6.5 to 9.0 units), as defined by the Canadian Council of Ministers of the Environment (2007).

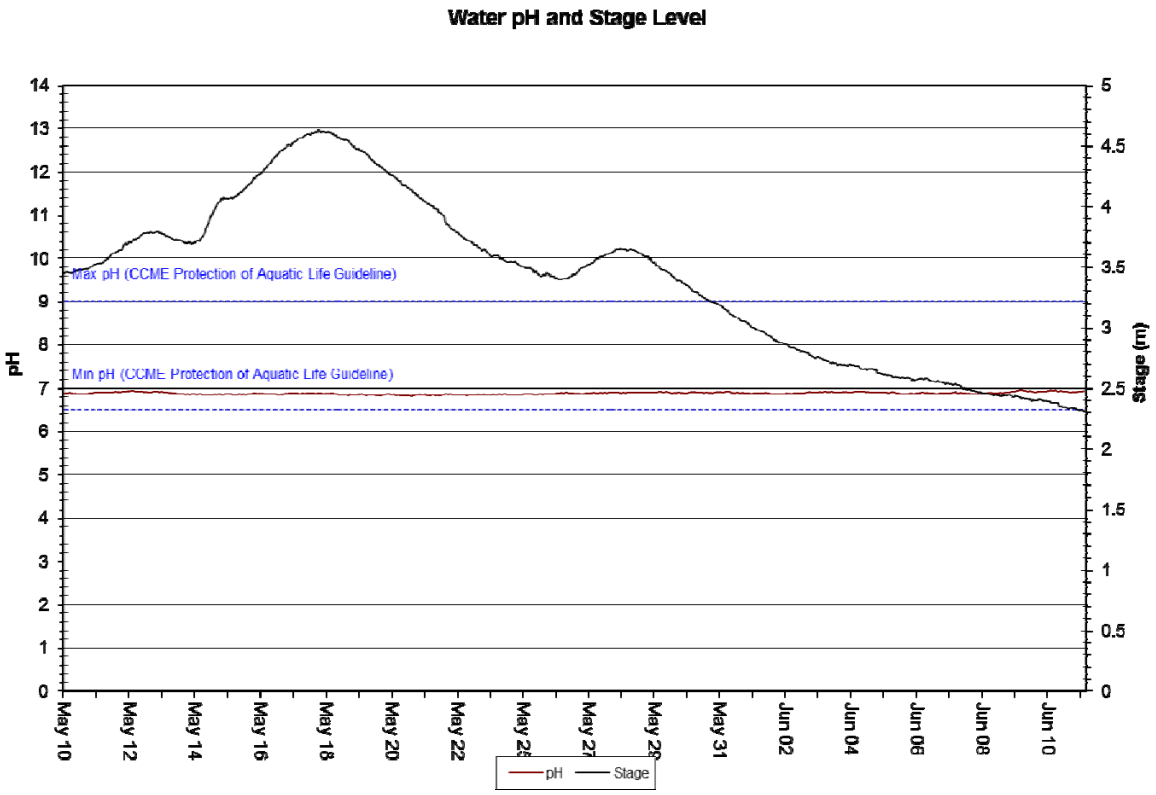

Figure 3: pH values recorded at Humber River from May 10, 2013, to June 11, 2013

Specific Conductivity

- Specific Conductivity ranged from 33.4 µS/cm to 41.4 µS/cm at Humber River from May 10, 2013, to June 11, 2013 (Figure 4).
- A significant dip in specific conductivity (see inside red oval – Figure 4) from May 17 to May 19 appears to correspond with a peak in stage height and flow.

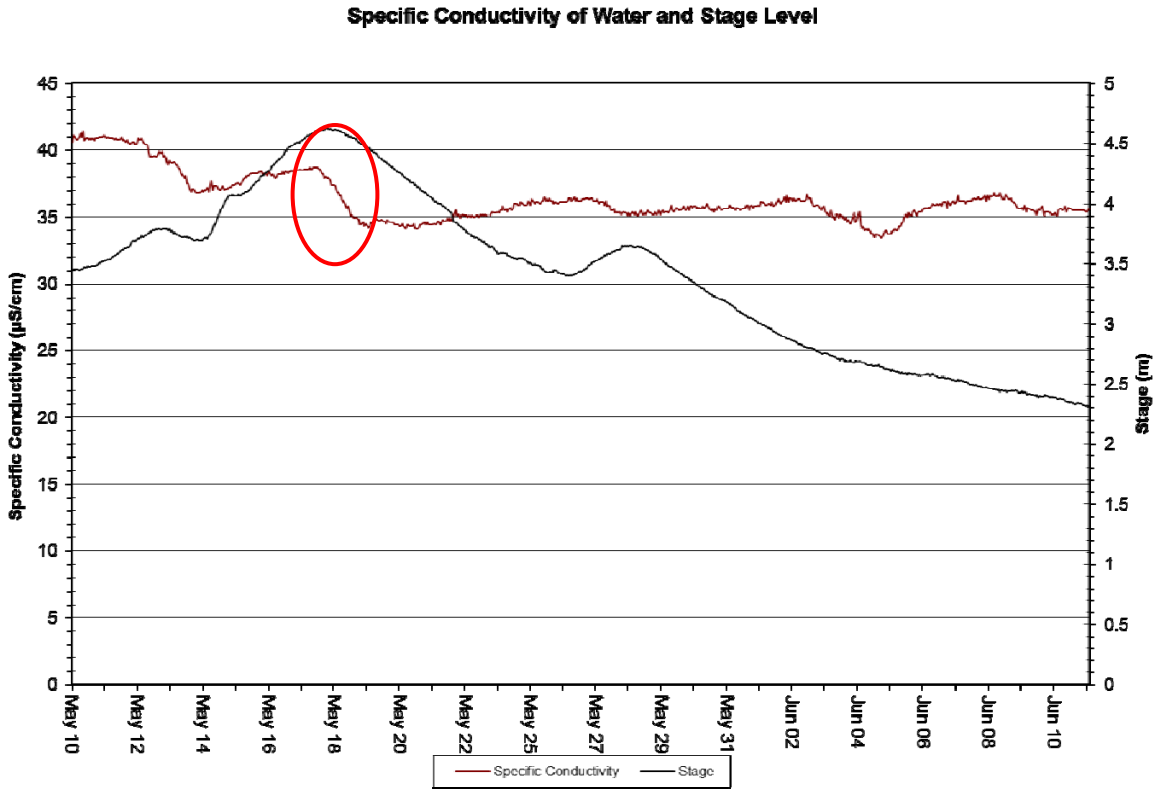

Figure 4: Specific conductivity (µs/cm) at Humber River from May 10, 2013, to June 11, 2013

Dissolved Oxygen

- Dissolved Oxygen [DO] values ranged from 11.71 mg/l (98.2% saturation) to 13.37 mg/l (102.5% saturation) at Humber River from May 10, 2013, to June 11, 2013 (Figure 5).
- DO (% saturation) shows diurnal fluctuations which can be attributed to the diurnal temperature fluctuations.
- The DO values at Humber River were above the cold water minimum guideline set for aquatic life during early life stages (9.5 mg/l), and above minimum guideline set for other life stages (6.5 mg/l), as determined by the Canadian Council of Ministers of the Environment (2007).

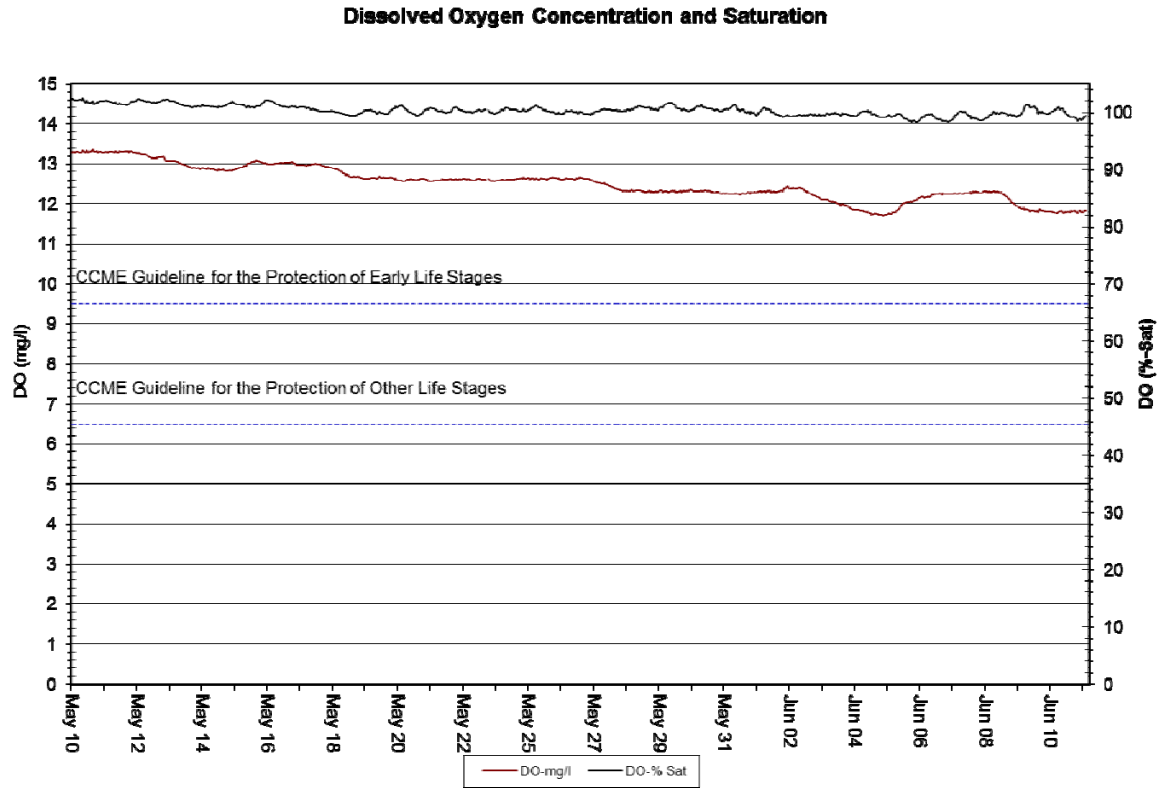

Figure 5: DO (mg/l & % saturation) at Humber River from May 10, 2013, to June 11, 2013

Turbidity

- Turbidity values remained at 0.0 NTU at Humber River for the duration of the deployment period (Figure 6).

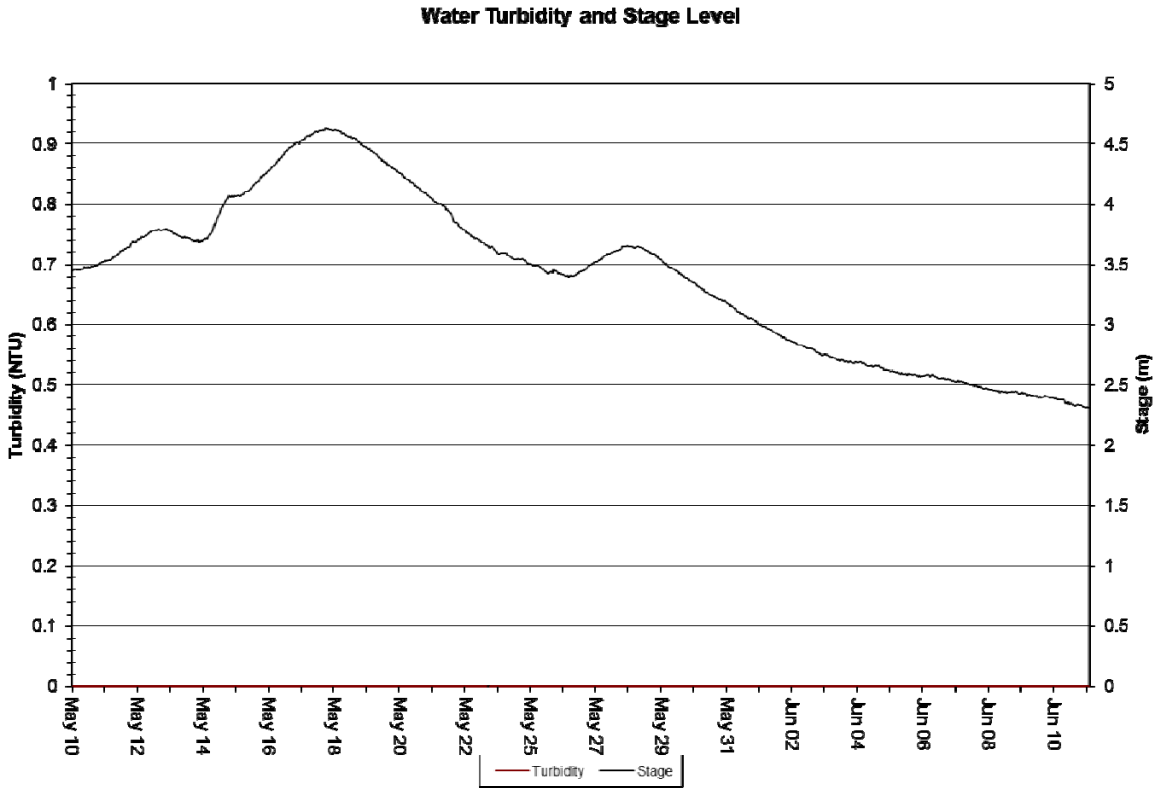

Figure 6: Turbidity (NTU) at Humber River from May 10, 2013, to June 11, 2013

Conclusion

- This monthly deployment report presents water quality and water quantity data recorded at Humber River from May 10, 2013, to June 11, 2013.
- The performances of all sensors were rated excellent at the beginning of the deployment period, while all sensors were rated fair to excellent at the end of the deployment period.
- Variations in water quality/quantity values recorded at each station are summarized below:
    - There are two noticeable peaks in stage height and flow during the deployment period which are related to a combination of significant rain and/or snow melt typical of the spring runoff period.

- Water temperature displays diurnal variations which are related to diurnal variations in ambient air temperatures.
- There is a gentle increasing temperature trend over the deployment period which is consistent with the late spring season.
- pH values show regular diurnal fluctuations which are related to the diurnal temperature fluctuations.
- pH was very stable throughout the deployment period.
- With a mean value of 6.88, pH values recorded at Humber River were within the guidelines for pH for the protection of aquatic life (i.e., 6.5 to 9.0 units), as defined by the Canadian Council of Ministers of the Environment (2007).
- A significant dip in specific conductivity from May 17 to May 19 appears to correspond with a peak in stage height and flow.
- DO (% saturation) shows diurnal fluctuations which can be attributed to the diurnal temperature fluctuations.
- The DO values at Humber River were above the cold water minimum guideline set for aquatic life during early life stages (9.5 mg/l), and above minimum guideline set for other life stages (6.5 mg/l), as determined by the Canadian Council of Ministers of the Environment (2007).
- Turbidity values remained at0.0 NTU at Humber River for the duration of the deployment period.

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, which may take up to five minutes in some cases, water quality parameters, as measured by both Sondes, are recorded to a field sheet. 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, which has already been deployment for 30-40 days. After Sonde readings have stabilized, water quality parameters, as measured by both Sondes, are recorded to a field sheet. 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 June 10, 2006, at *http://pubs.water.usgs.gov/tm1d3*

APPENDIX B
Environment Canada Weather Data – Corner Brook (May 10, 2013, to June 11, 2013)

Date/Time	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Cool Deg Days (°C)	Total Rain (mm)	Total Snow (mm)	Total Precip (mm)
5/10/2013	21	12	16.5	1.5	0	6.4	0	6.4
5/11/2013	7.5	2	4.8	13.2	0	1.8	0	1.8
5/12/2013	21	5	13	5	0	7.2	0	7.2
5/13/2013	17.5	14	15.8	2.2	0	6.2	0	6.2
5/14/2013	15	5	10	8	0	44	0	44
5/15/2013	16	9	12.5	5.5	0	0	0	0
5/16/2013	16	3	9.5	8.5	0	7	0	7
5/17/2013	5	3	4	14	0	2.2	0	2.2
5/18/2013	3	1	2	16	0	0	0.6	0.6
5/19/2013	6.5	0	3.3	14.7	0	0	0	0
5/20/2013	10.5	0	5.3	12.7	0	0	0	0
5/21/2013	13	0	6.5	11.5	0	8	0	8
5/22/2013	12	5	8.5	9.5	0	0	0	0
5/23/2013	16	4	10	8	0	16.8	0	16.8
5/24/2013	24	10	17	1	0	0.8	0	0.8
5/25/2013	21.5	11	16.3	1.7	0	7.8	0	7.8
5/26/2013	12	3.5	7.8	10.2	0	0.4	0	0.4
5/27/2013	13	7	10	8	0	1.8	0	1.8
5/28/2013	9	7	8	10	0	2.6	0	2.6
5/29/2013	11.5	1	6.3	11.7	0	0	0	0
5/30/2013	18.5	5	11.8	6.2	0	7.2	0	7.2
5/31/2013	15.5	8.5	12	6	0	0	0	0
6/1/2013	10.5	7.5	9	9	0	0	0	0
6/2/2013	10	5	7.5	10.5	0	2.1	0	2.1
6/3/2013	10.5	7	8.8	9.2	0	9.1	0	9.1
6/4/2013	19.5	7.5	13.5	4.5	0	1.5	0	1.5
6/5/2013	9.5	7	8.3	9.7	0	3	0	3
6/6/2013	10.5	4.5	7.5	10.5	0	0	0	0
6/7/2013	18	5.5	11.8	6.2	0	0	0	0
6/8/2013	19	4.5	11.8	6.2	0	5.9	0	5.9
6/9/2013	17.5	7.5	12.5	5.5	0	0	0	0
6/10/2013	19	9.5	14.3	3.7	0	0	0	0
6/11/2013	20.5	9.5	15	3	0	0	0	0