Real Time Water Quality Report

Labrador Iron Mines Schefferville Network

Deployment Period 2012-07-14 to 2012-08-21

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Conservation
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General

- The Water Resources Management Division, in partnership with Labrador Iron Mines Ltd. and Environment Canada, maintain two real-time water quality and water quantity stations in close proximity to the James Property deposits, near Schefferville, QC.
- The official name of each station is *James Creek Above Bridge* and *Unnamed Tributary Below Settling Pond*, hereafter referred to as the *James Creek* station and the *Unnamed Tributary* station, respectively.
- Unnamed Tributary station monitors water outflow from a series of multi-cell retention and settling ponds.
- James Creek station monitors water outflow from the multi-cell retention and settling pond system mentioned above, as well as monitors outflow from Ruth Pit.
- The retention and settling pond system is comprised of four smaller man-made ponds that receive water primarily from groundwater wells constructed along the periphery of the James Property, in addition to storm water from the beneficiation area, flush water from the reject rock pipeline, and in case of pump failure, reject rock inside the pipeline that was destine to Ruth Pit. Outflow from the retention and settling pond system is directed into the Unnamed Tributary and James Creek. Priority is given to the outflow leading into the Unnamed Tributary, with surplus water directed into James Creek.
- Ruth Pit is used as a settling pond for reject rock originating from the beneficiation area at the Silver Yard, as well as receives water from pit dewatering pumps. The outflow from Ruth Pit is the start of James Creek.
- The Water Resources Management Division will inform Labrador Iron Mines Ltd. of any significant water quality events by email notification and by monthly deployment reports.
- This monthly deployment report, presents water quality and water quantity data recorded at the James Creek and Unnamed Tributary stations from July 14, 2012 to August 21, 2012.

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 deployment at the James Creek and Unnamed Tributary stations.

	James Creek (Sonde 49200)		Unnamed Tributary (Sonde 49201)	
Stage of deployment	Beginning	End	Beginning	End
Date	2012-07-14	2012-08-21	2012-07-14	2012-08-21
Temperature	Excellent	Excellent	Excellent	Excellent
pH	Fair	Excellent	Good	Excellent
Specific Conductivity	Excellent	Excellent	Excellent	Good
Dissolved Oxygen	Good	Excellent	Excellent	Excellent
Turbidity	Excellent	Fair	Excellent	Excellent

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

Deployment Notes

- The accuracy of pH data recorded at both stations was questionable. Multiple grab sample results indicate that pH levels of the Unnamed Tributary were not as low as was indicated by the real-time water quality instrument. Performance issues of this instrument were also noted at the end of deployment; pH readings would increase or decrease by 0.5 units depending on whether the instrument was connected to or disconnected from a laptop computer. A similar phenomenon occurred with the James Creek instrument, where a 0.12 unit increase in pH was observed when it was connected to a computer laptop. Work is currently being done to better understand this problem. It is suspected that this is an issue with the pH sensors.
- No tailings were discharged into Ruth Pit after August 16, 2012.

Data Interpretation

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

  (i.) Stage (m)
  (ii.) Temperature (^{o}C)
  (iii.) pH
  (iv.) Specific conductivity (μS/cm)
  (v.) Total dissolved solids (g/l)
  (vi.) Dissolved oxygen (mg/l)
  (vii.) Turbidity (NTU)

- A description of each parameter is provided in Appendix B.

Stage

- Stage values ranged from 0.813 m to 0.947 m at James Creek and from 1.093 m to 1.163 m at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 1).
- Daily fluctuations were observed at both stations with increases occurring in the afternoon and decreases occurring at night. These diurnal fluctuations were attributed to temperature-related atmospheric pressure changes.
- Rainfall events caused an increase in stage at both stations midway through the deployment period. Rainfall amounts midway through the deployment period were 142.6 mm, which fell over a 9 day period, from July 30, 2012 to August 7, 2012 (Appendix C).
- Stage values are based on a vertical reference that is unique to each station. As a result, absolute values of stage are not comparable between stations, but relative changes in stage are.

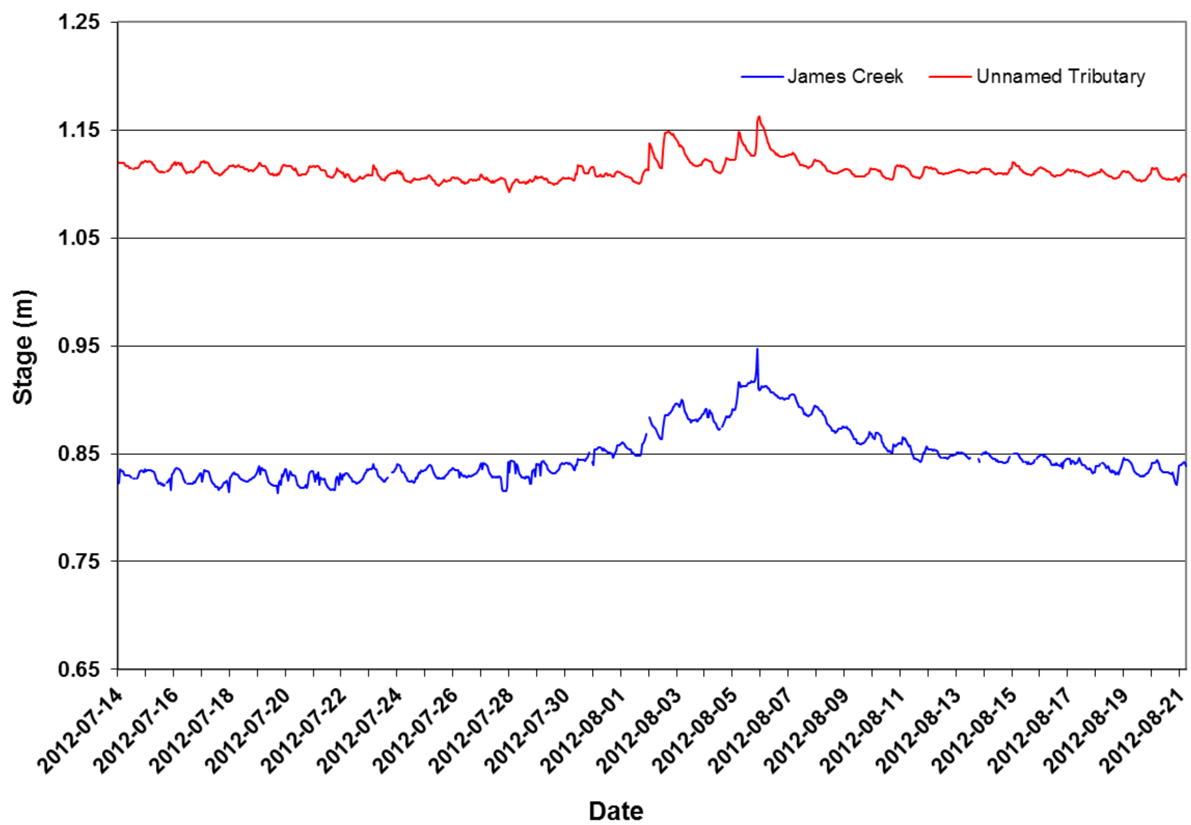

Figure 1. Hourly stage (m) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Temperature

- Water temperature ranged from 9.3˚C to 15.6˚C at James Creek and from 5.8˚C to 15.9˚C at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 2).
- Water temperatures at both stations display large diurnal variations. This is typical of shallow water streams and ponds that are highly influenced by diurnal variations in ambient air temperatures.
- Weekly trends in water temperature corresponded well with ambient air temperatures recorded by Environment Canada at the Schefferville weather station (Figure 2 inset, Appendix C).
- Water temperatures at the Unnamed Tributary were on average 1.84°C colder than water temperatures at James Creek. Indeed, water flowing into the Unnamed Tributary is close to its groundwater source, and has less exposure to ambient air temperatures, as compared to the surface water source that primarily feeds into James Creek.

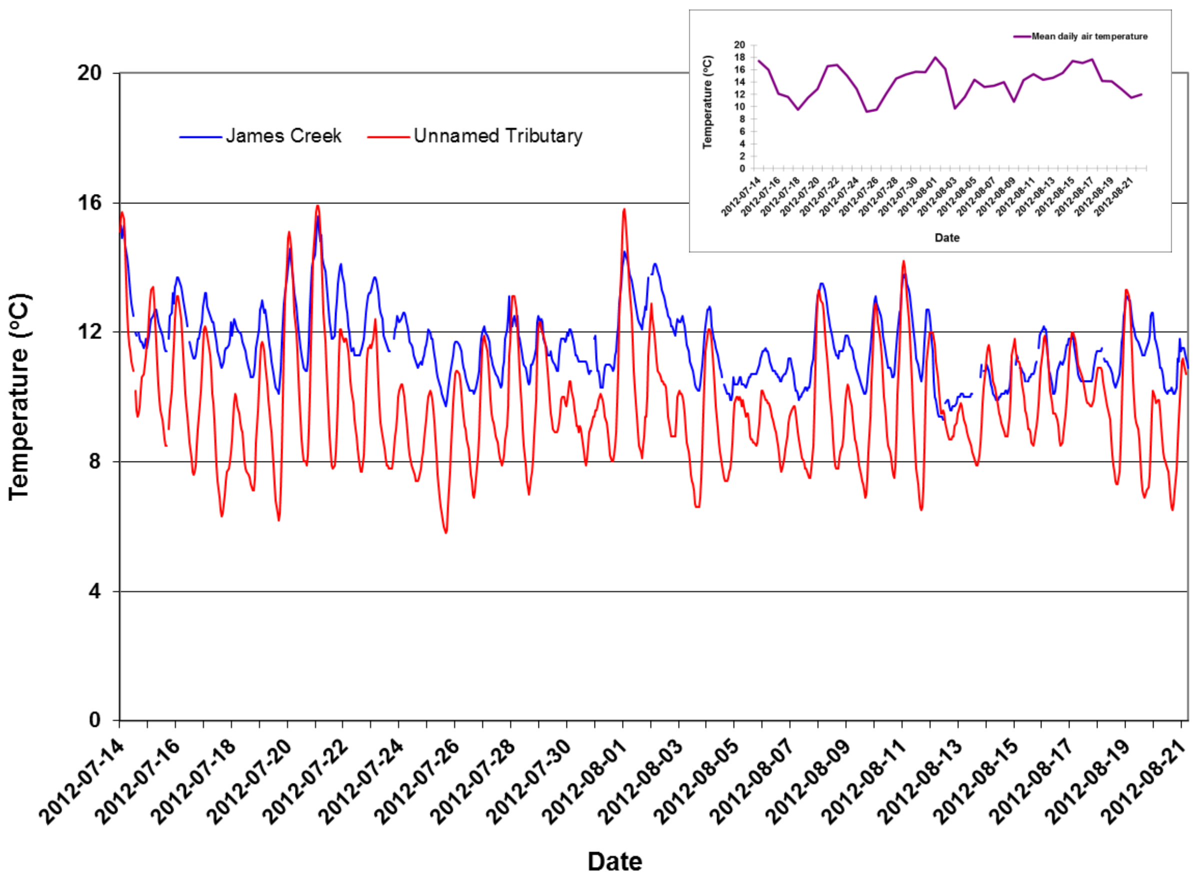

Figure 2. Hourly water temperature (°C) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012. The inset chart shows air temperature during the same period, as recorded by Environment Canada at the Schefferville weather station.

pH

- pH values presented in Figure 3 and described below were considered inaccurate. There was a decreasing trend in pH observed at both stations, starting one week after deployment, which was attributed to a problem with the pH sensors. The data is displayed here for the purpose of documenting these inaccuracies.
- pH values ranged from 7.07 units to 8.40 units at James Creek and from 6.26 units to 7.59 units at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 3).
- pH values at both stations fluctuated daily with peaks typically occurring in the late afternoon/ early evening. These variations coincide with the photosynthetic cycling of CO_2 by aquatic organisms.
- Weekly trends in pH were apparent at both stations; pH decreased from June 22, 2012 to August 6, 2012 and increased slightly from August 6, 2012 to August 21, 2012.
- The decrease observed starting around June 22, 2012, was likely attributed to an issue with the sensor, based on: (i) grab sample results, (ii) sensor performance at the end of deployment, and (iii) a similar decreasing trend observed during another deployment period with these same sensors.
    i. Average pH values recorded at the Unnamed Tributary station from July 30 to August 21 was 6.64 units and ranged between 6.26 units and 7.19 units. Four grab samples collected upstream[1] of the Unnamed Tributary station indicated that pH levels were at the high end of this range (i.e., 6.96 units on July 30, 7.12 units on August 6, 7.03 units on August 13, and 7.00 units on August 20). One additional grab sample collected at the Unnamed Tributary station on August 19 (7.16 units) also indicated a higher pH level when compared to the station instrument values.
    ii. It was also noted at the time of instrument removal on August 21, 2012, that pH readings at both stations appeared to be influenced by a computer connection. This was studied more closely at the Unnamed Tributary station, where pH increased by 0.34 units during the 7 minutes the field instrument was connected to a laptop computer. When the computer was disconnected from the instrument for 2 minutes, pH readings decreased to 6.74 units, and when the computer was reconnected a second time to the instrument, pH again climbed to 7.26 units in 3 minutes. A more subtle increase in pH was observed at the James Creek station, where field instrument pH readings increased by 0.12 units over a period of eight minutes after the field instrument was connected a computer laptop. The dependence of pH on a computer connection will be investigated.
    iii. A similar decreasing trend in pH, approximately 9-10 days after deployment was also observed during the August 22, 2012 to September 26, 2012 deployment period.

[1] As a compliance measure, LIM staff acquire weekly grab samples approximately 765 meters upstream of the Unnamed Tributary station. It is assumed that water quality between the LIM grab sampling site and the Unnamed Tributary station was not impacted.

- A second instrument was deployed alongside the field instrument at the Unnamed Tributary station to test for sensor drift. Results of this test will be presented in the annual report.
- Rainfall events may have also caused a decrease in pH at both stations midway through the deployment period. Rainfall amounts were 142.6 mm, which fell over a 9 day period, from July 30, 2012 to August 7, 2012 (Appendix C).
- On average, pH was 0.69 units higher at James Creek than at Unnamed Tributary. Although the accuracy of pH data recorded at both stations was questionable, pH is typically higher at James Creek, which is primarily fed by surface flow from Ruth Pit that receives mining effluents.
- Due to data inaccuracies, we could not assess whether the pH values fell within the acceptable range 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).

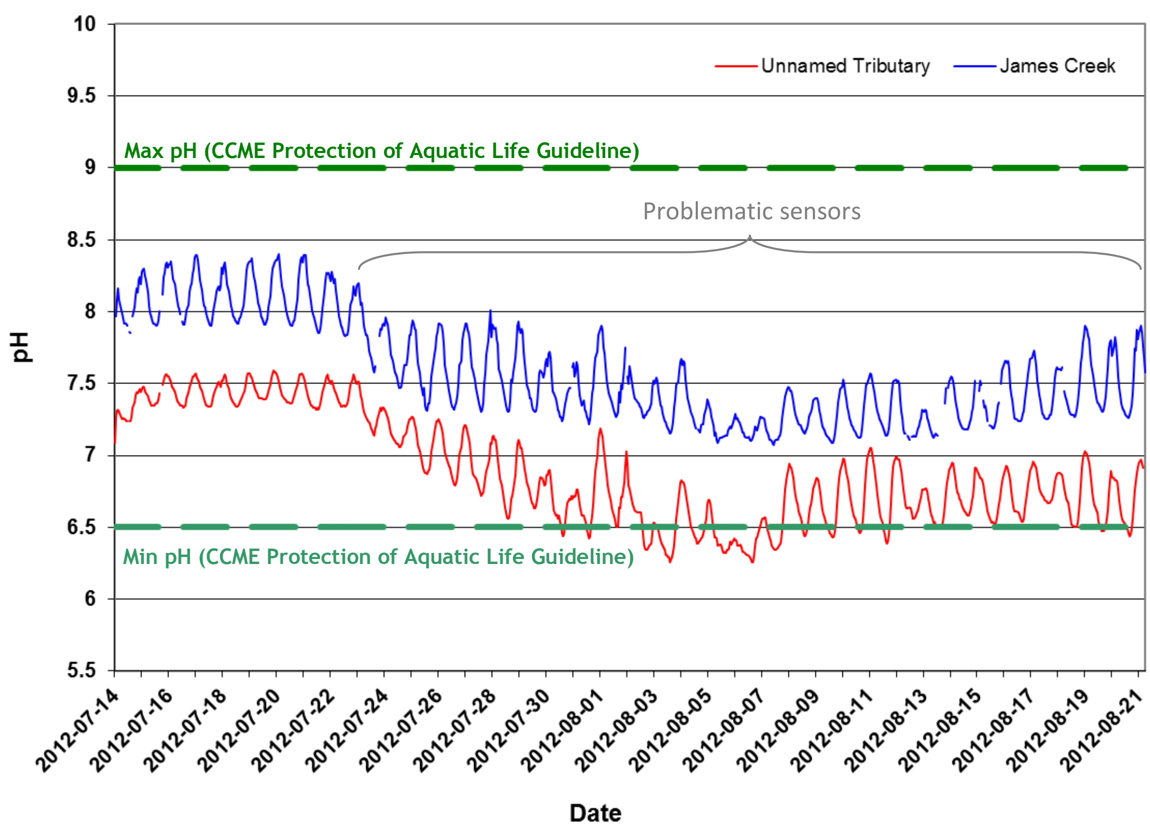

Figure 3. Hourly pH values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Specific Conductivity

- Specific Conductivity ranged from 130.3 μs/cm to 152.5 μs/cm at James Creek and from 54.3 μs/cm to 66.6 μs/cm at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 4).
- Rainfall events caused a minor disturbance in specific conductivity at both stations, starting around July 30, 2012. Rainfall amounts were 142.6 mm, which fell over a 9 day period, from July 30, 2012 to August 7, 2012 (Appendix C).
- On average, specific conductivity was 78.9 μS/cm higher at James Creek than at Unnamed Tributary. This difference can be attributed to higher concentrations of dissolved solids entering into James Creek from Ruth Pit due to surface runoff from adjacent disturbed areas, as well as from iron ore tailings deposited into Ruth Pit.

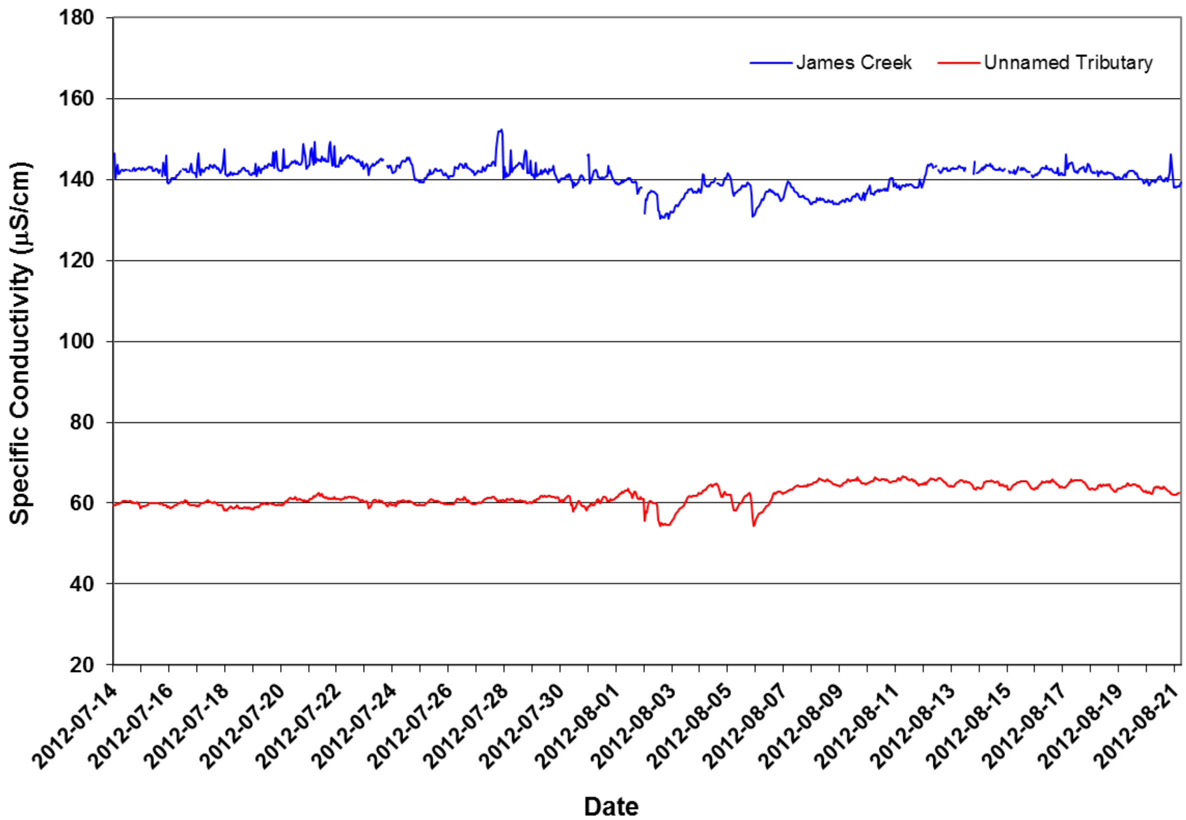

Figure 4. Hourly specific conductivity (μs/cm) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Total Dissolved Solids

- Total Dissolved Solids (TDS) values ranged from 0.0834 g/l to 0.0976 g/l at James Creek and from 0.0347 g/l to 0.0426 g/l at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 5).
- TDS is calculated directly from conductance and temperature, and as a result TDS values show a similar trend to specific conductance (Figure 4).
- TDS values were on average 0.0505 g/l higher at James Creek compared to Unnamed Tributary. This difference can be attributed to surface runoff from adjacent disturbed areas, as well as from iron ore tailings deposited into Ruth Pit.

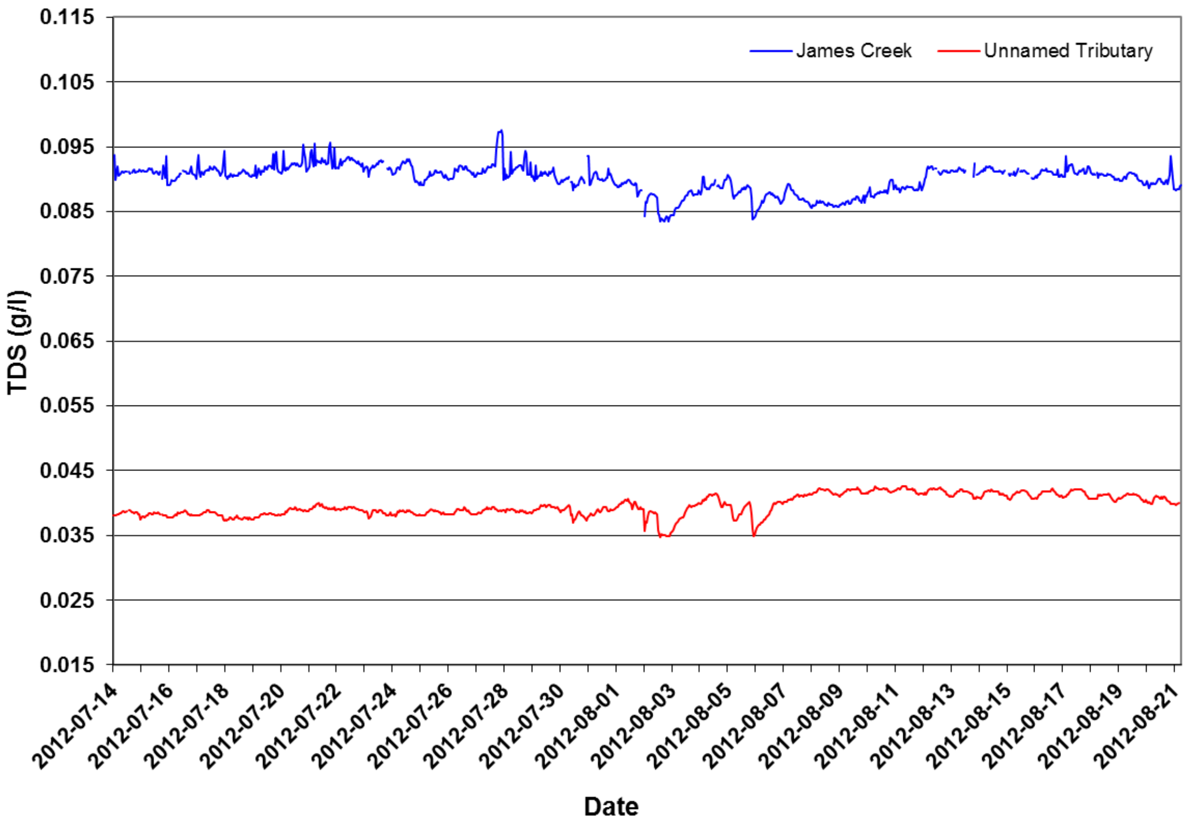

Figure 5. Hourly TDS (g/l) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Dissolved Oxygen

- Dissolved Oxygen [DO] values ranged from 9.17 mg/l to 11.16 mg/l at James Creek and from 9.31 mg/l to 11.76 mg/l at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 6).
- DO (mg/l) fluctuated daily, with increases in DO observed in the afternoon and decreases observed at night. These diurnal variations can be attributed to the photosynthetic activity of aquatic organisms.
- Weekly trends in DO (mg/l) corresponded well with the inverse of water temperature (Figure 2), since colder water has a greater potential to dissolve oxygen compared to warmer water.
- On average, DO values were 0.25 mg/l higher at Unnamed Tributary compared to James Creek. This difference can be attributed to colder water temperatures at Unnamed Tributary than at James Creek (Figure 2).
- DO values at both stations were above cold water minimum guidelines set for aquatic life during other life stages (6.5 mg/l), but sometimes fell below guidelines set for early life stages (9.5 mg/l) period, as determined by the Canadian Council of Ministers of the Environment (2007).

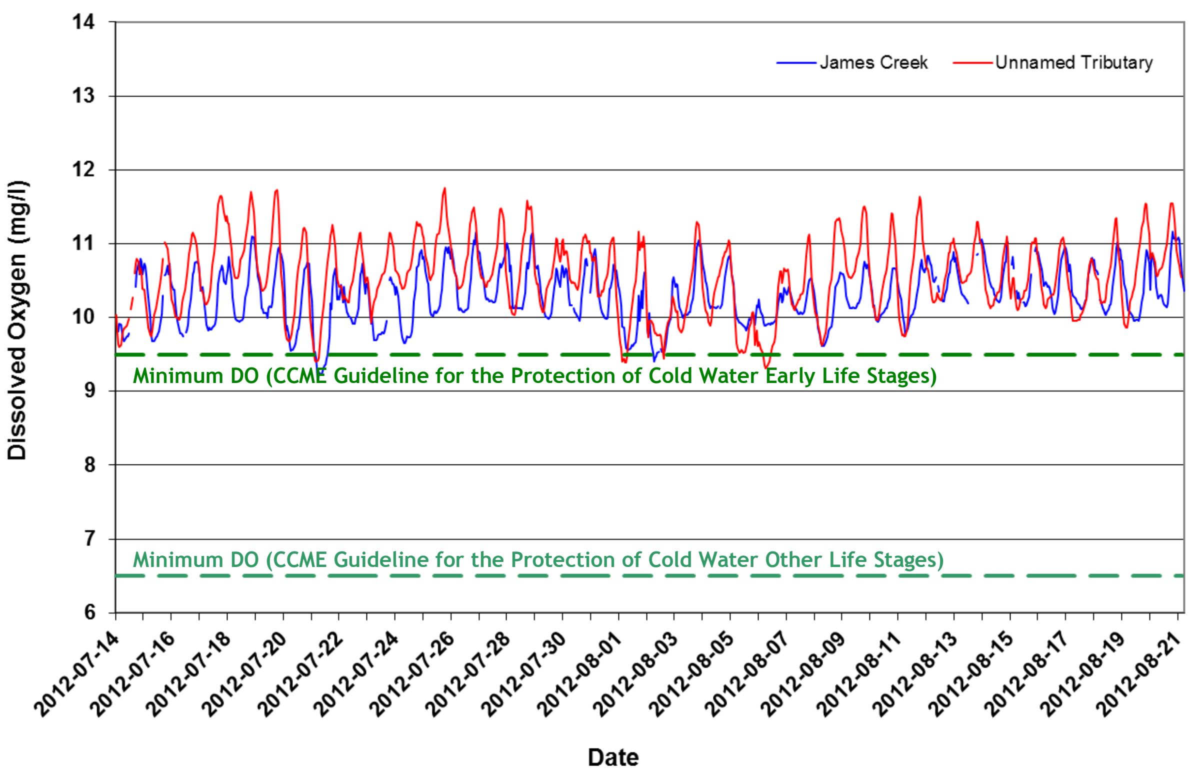

Figure 6. Hourly dissolved oxygen (mg/l) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Turbidity

- Turbidity values ranged from 1.1 NTU to 119.4 NTU at James Creek and from 0.0 NTU to 112.3 NTU at Unnamed Tributary from July 14, 2012 to August 21, 2012 (Figure 7).
- There were several turbidity events measured at the James Creek and Unnamed Tributary stations. Most of these events coincided with rainfall activity and increases in stage. This was the case at James Creek, where elevated amounts of turbidity starting midway through the deployment period corresponded well with increases in stage (Figure 1). Other turbidity events not associated with rainfall and stage were generally short-lived, and as such, were not of any great concern. These events may be attributed to biofouling, since biofouling caused by algae, leaves, periphyton, and other organic materials are common at these stations.

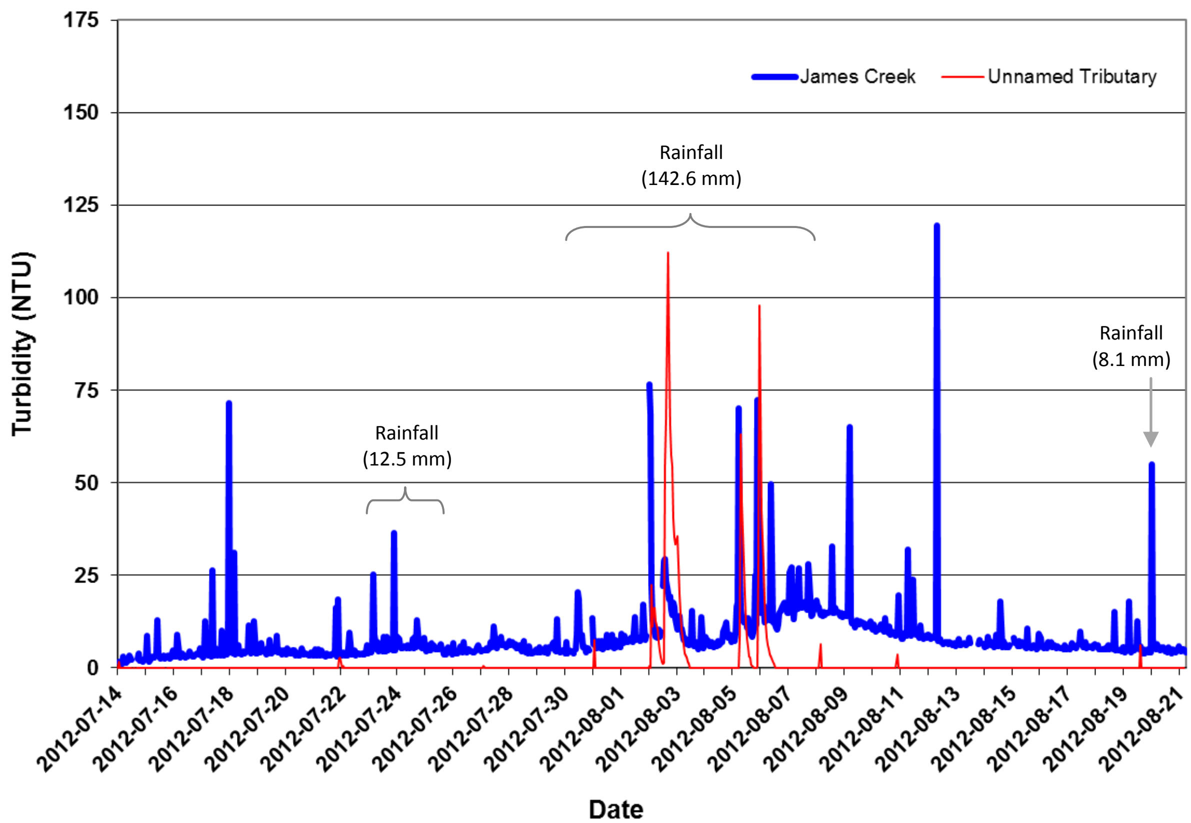

Figure 7. Hourly turbidity (NTU) values recorded at James Creek and Unnamed Tributary from July 14, 2012 to August 21, 2012.

Conclusion

- This monthly deployment report, presents water quality and water quantity data recorded at the James Creek and Unnamed Tributary stations from July 14, 2012 to August 21, 2012.
- No tailings were discharged into Ruth Pit after August 16, 2012.
- Sensor performance was rated fair to excellent at both stations at the beginning and end of the deployment period.
- Despite receiving a good and excellent performance rating, the accuracy of the pH sensor at both stations was questionable based on grab sample results, the influence of a computer connection on pH readings, and similar trends observed with these instruments during another deployment period. Work is currently being done to test the performance of these sensors, which will be documented in the annual report.
- Variations in water quality/quantity values recorded at each station are summarized below:
  - Daily variations in stage were attributed to temperature-related atmospheric pressure changes and weekly variations were attributed to rainfall events.
  - Fluctuations in water temperature corresponded with fluctuations in air temperature.
  - Daily variations in pH were attributed to the photosynthetic cycling of CO_2 by aquatic organisms, while the cause of weekly trends in pH was attributed to problems with the pH sensors, and possibly influenced by rainfall events.
  - Specific conductivity and TDS values were affected by rainfall events, but for the most part, were consistent during the deployment period.
  - DO (mg/l) variations were related to changes in water temperature and the photosynthetic activity and aerobic respiration of aquatic organisms.
  - Turbidity events were mostly attributed to rainfall activity.
- Field instruments for both stations were calibrated and redeployed on August 22, 2012.

References

Allan, D. (2010). Advanced Water Quality Instrumentation Training Manual. Edmonton, AB: Allan Environmental Services Inc. (pp. 160).

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/)

Hach (2006) Important water quality factors - H2O University. Hach Company. Online: http://www.h2ou.com/index.htm (accessed August 24, 2010).

Swanson, H.A., and Baldwin, H.L., 1965. A Primer on Water Quality, U.S. Geological Survey. Online: http://ga.water.usgs.gov/edu/characteristics.html (accessed August 24, 2010)

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 April 10, 2006, at http://pubs.water.usgs.gov/tm1d3

APPENDIX B
Water Parameter Description

Dissolved Oxygen - The amount of Dissolved Oxygen (DO) (mg/l) in the water is vital to aquatic organisms for their survival. The concentration of DO is affected by such things as water temperature, water depth and flow (e.g., aeration by rapids, riffles etc.), consumption by aerobic organisms, consumption by inorganic chemical reactions, consumption by plants during darkness, and production by plants during the daylight (Allan 2010).

pH - pH is the measure of hydrogen ion activity and affects: (i) the availability of nutrients to aquatic life; (ii) the concentration of biochemical substances dissolved in water; (iii) the efficiency of hemoglobin in the blood of vertebrates; and (iv) the toxicity of pollutants. Changes in pH can be attributed to industrial effluence, saline inflows or aquatic organisms involved in the photosynthetic cycling of CO_2 (Allan 2010).

Specific conductivity - Specific conductivity (μS/cm) is a measure of water's ability to conduct electricity, with values normalized to a water temperature of 25°C. Specific conductance indicates the concentration of dissolved solids (such as salts) in the water, which can affect the growth and reproduction of aquatic life. Specific conductivity is affected by rainfall events, the composition of inflowing tributaries and their associated geology, saline inflow (e.g., road salt), agricultural run-off and industrial inputs (Allan 2010; Swanson and Baldwin 1965).

Stage – Stage (m) is the elevation of the water surface and is often used as a surrogate for the more difficult to measure flow.

Temperature - Essential to the measurement of most water quality parameters, temperature (°C) controls most processes and dynamics of limnology. Water temperature is influenced by such things as ambient air temperature, solar radiation, meteorological events, industrial effluence, wastewater, inflowing tributaries, as well as water body size and depth (Allan 2010; Hach 2006).

Total Dissolved Solids - Total Dissolved Solids (TDS) (g/l) is a measure of alkaline salts dissolved in water or in fine suspension and can affect the growth and reproduction of aquatic life. It is affected by rainfall events, the composition of inflowing tributaries and their associated geology, saline inflow (e.g., road salt), agricultural run-off and industrial inputs (Allan 2010; Swanson and Baldwin 1965).

Turbidity - Turbidity (NTU) is a measure of the translucence of water and indicates the amount of suspended material in the water. Turbidity is caused by any substance that makes water cloudy (e.g., soil erosion, micro-organisms, vegetation, chemicals, etc.) and can correspond to precipitation events, high stage, and floating debris near the sensor (Allan 2010; Hach 2006; Swanson and Baldwin 1965).

APPENDIX C

Environment Canada Weather Data – Schefferville (July 14, 2012 to August 21, 2012)

Date yyyy-mm-dd	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Avg Wind Spd km/hr	Avg Wind Dir deg
2012-07-14	23.9	10.9	17.4	0.6	0	-	-	-	-	8.5	186.5
2012-07-15	21.6	10.3	16	2	0	-	-	-	-	17.1	237.1
2012-07-16	16.3	7.8	12.1	5.9	0	-	-	1.3	-	13.8	278.3
2012-07-17	15.8	7.3	11.6	6.4	0	-	-	0.5	-	11.4	219.1
2012-07-18	13.3 (E)	5.7 (E)	9.5 (E)	8.5 (E)	0 (E)	-	-	-	-	10.5	263.8
2012-07-19	16.2	6.8	11.5	6.5	0	-	-	0.8	-	13.5	109.2
2012-07-20	20.1	5.6	12.9	5.1	0	-	-	-	-	13.3	269.6
2012-07-21	24.6	8.5	16.6	1.4	0	-	-	0	-	7.4	167.8
2012-07-22	23.1	10.5	16.8	1.2	0	-	-	-	-	13.2	189.2
2012-07-23	18.6	11.4	15	3	0	-	-	1.3	-	13.5	217.1
2012-07-24	16.5	9.2	12.9	5.1	0	-	-	10.4	-	12.7	234.1
2012-07-25	12.6	5.7	9.2	8.8	0	-	-	0.8	-	17.2	253.8
2012-07-26	13.1	5.9	9.5	8.5	0	-	-	0	-	15.9	240.0
2012-07-27	15.5	8.6	12.1	5.9	0	-	-	0.8	-	16.0	294.2
2012-07-28	19.7	9.5	14.6	3.4	0	-	-	0	-	8.9	233.0
2012-07-29	20.5	9.8	15.2	2.8	0	-	-	0	-	17.8	220.4
2012-07-30	18	13.3	15.7	2.3	0	-	-	13.1	-	14.3	225.8
2012-07-31	17.4	13.8	15.6	2.4	0	-	-	11.8	-	10.5	184.8
2012-08-01	23.2	12.8	18	0	0	-	-	0.8	-	9.6	211.3
2012-08-02	19.5	12.6	16.1	1.9	0	-	-	15.6	-	8.7	232.2
2012-08-03	13.1	6.2	9.7	8.3	0	-	-	39.5	-	14.9	301.3
2012-08-04	15.9	7.2	11.6	6.4	0	-	-	0	-	14.9	240.0
2012-08-05	19.2	9.6	14.4	3.6	0	-	-	32.9	-	15.3	191.5
2012-08-06	16.4	10	13.2	4.8	0	-	-	23.6	-	9.5	292.9
2012-08-07	16.6	10.1	13.4	4.6	0	-	-	5.3	-	7.3	205.3
2012-08-08	19.3	8.6	14	4	0	-	-	0	-	9.6	293.5
2012-08-09	13.1	8.5	10.8	7.2	0	-	-	0	-	11.0	325.8
2012-08-10	19.7	8.9	14.3	3.7	0	-	-	0	-	10.4	264.1
2012-08-11	21.6 (E)	8.9 (E)	15.3 (E)	2.7 (E)	0 (E)	-	-	0	-	7.3	172.7
2012-08-12	22.3	6.5	14.4	3.6	0	-	-	0.3	-	11.4	155.5
2012-08-13	16.5	12.9	14.7	3.3	0	-	-	1.8	-	10.0	130.8
2012-08-14	17.2	13.8	15.5	2.5	0	-	-	1.6	-	12.0	125.0
2012-08-15	21.2	13.5	17.4	0.6	0	-	-	6.1	-	12.0	154.2
2012-08-16	20.2	13.9	17.1	0.9	0	-	-	2.6	-	11.0	153.3
2012-08-17	20.5	14.8	17.7	0.3	0	-	-	0	-	13.4	147.9
2012-08-18	16.8	11.6	14.2	3.8	0	-	-	3.1	-	15.7	162.5
2012-08-19	18	10.1	14.1	3.9	0	-	-	0.3	-	10.2	198.3
2012-08-20	17.2	8.4	12.8	5.2	0	-	-	8.1	-	11.2	160.8
2012-08-21	13.8	9.1	11.5	6.5	0	-	-	0.3	-	-	-

- = Missing
E = Estimated
A = Accumulated

C = Precipitation occurred, amount uncertain
L = Precipitation may or may not have occurred
F = Accumulated and estimated
N = Temperature missing but known to be > 0

Y = Temperature missing but known to be < 0
S = More than one occurrence
T = Trace
* = The value displayed is based on incomplete data

† = Data for this day has undergone only preliminary quality checking

APPENDIX C (continued...)

Environment Canada Weather Data – Schefferville (July 14, 2012 to August 21, 2012)

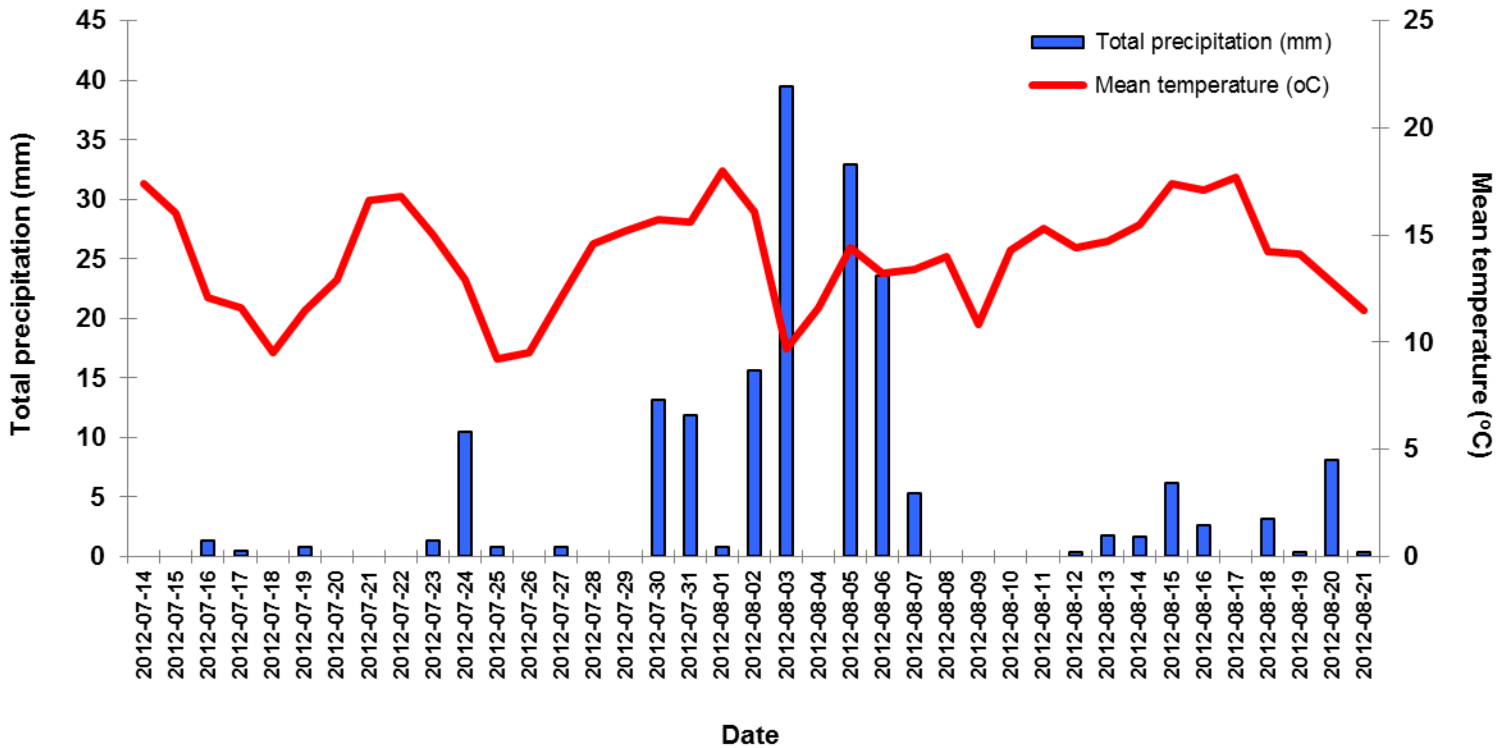

Figure 1. Daily precipitation and mean temperature recorded at the Schefferville Weather Station by Environment Canada from July 14, 2012 to August 21, 2012.

APPENDIX C (continued...)

Environment Canada Weather Data - Schefferville (July 14, 2012 to August 21, 2012)

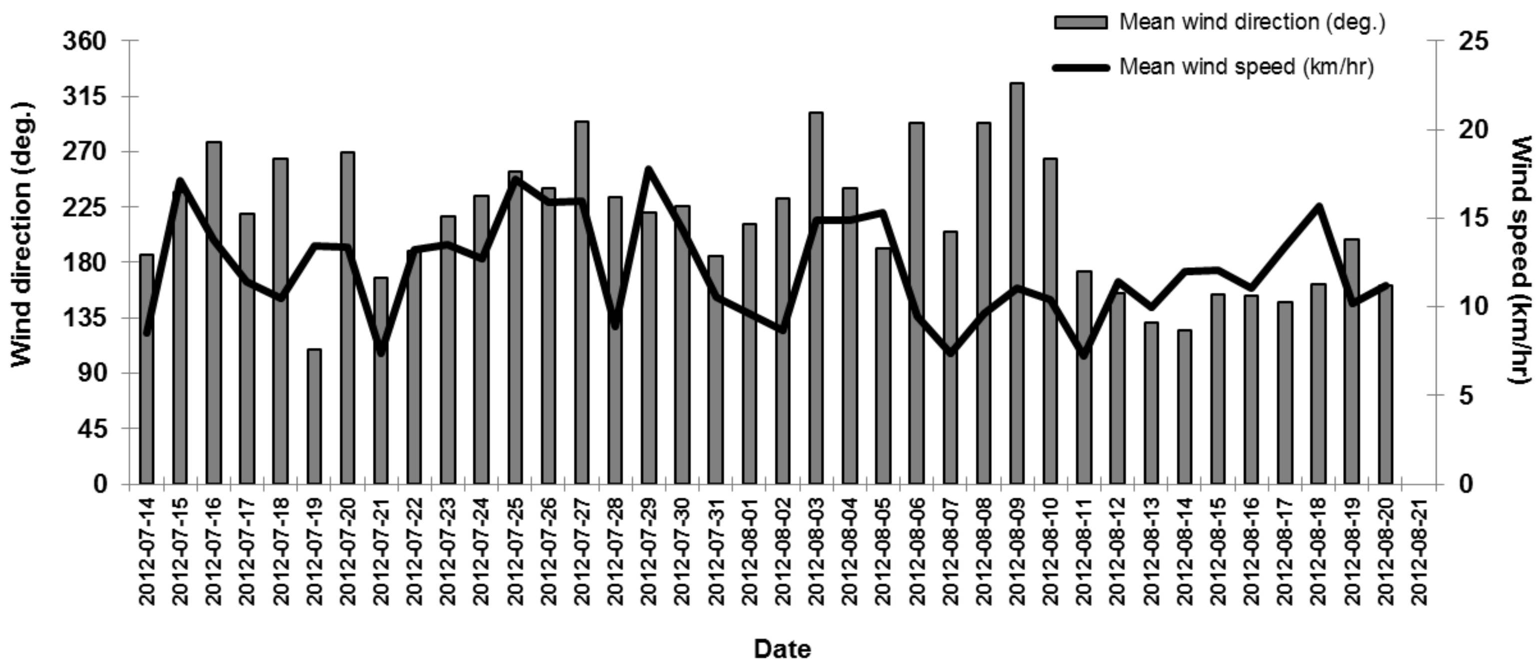

Figure 2. Mean daily wind direction and wind speed recorded at the Schefferville Weather Station by Environment Canada from July 14, 2012 to August 21, 2012.