Real Time Water Quality Report

Labrador Iron Mines Schefferville Network

Annual Deployment Report 2015

2015-06-02 to 2015-10-05

Government of Newfoundland & Labrador
Department of Environment and Conservation
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Acknowledgements

The 2015 summer/fall season marks the final deployment period for real-time monitoring at the Labrador Iron Mines (LIM) operation in Schefferville, QC. All real-time monitoring will be suspended for the 2016 field season and onwards and will not be reactivated until such time that mining operations are active once again.

The Real-Time Water Quality/Quantity Monitoring Program at the James deposit near Schefferville was fully funded by Labrador Iron Mines (LIM) and its success was dependent on a joint partnership between LIM, Environment Canada (EC), and the Newfoundland & Labrador Department of Environment & Conservation (ENVC). Managers and program leads from each organization, namely Renee Paterson (ENVC), Larry Ledrew (LIM), and Howie Wills (EC), were committed to the operation of this network and ensuring that it continually provides meaningful and accurate water quality/quantity data.

In addition to funding this program, LIM also provided support to ENVC and EC staff during site visits, including transportation, food, workspace, tools, and field assistance. LIM also provided storage facilities, information on LIM mining operations, and station checks when water quality events arose. LIM employees involved in carrying out these duties include Karen Phong and Christian Gabriel.

EC plays an essential role in the data logging/communication aspect of the network. In particular, EC staff of the Water Survey of Canada, including Perry Pretty, Roger Ellsworth, Taylor Krupa, Dwayne Ackerman and Mike Ludwicki, visited network stations regularly to ensure that the data logging and data transmitting equipment was working properly. EC also plays the lead role in dealing with stage and flow issues.

ENVC is responsible for recording and managing water quality data. Ian Bell, under the supervision of Renee Paterson, is ENVC's main contact for Real-Time Water Quality Monitoring operations at the James deposit, and was responsible for maintaining and calibrating water quality instruments, as well as grooming, analyzing and reporting on water quality data recorded at the stations. Paul Rideout with the Water Resources Management Division provided assistance with field work for three deployments during the 2015 field season. Instrument performance evaluation and repairs, during the winter of 2015 were conducted in-house by Tara Clinton.

Introduction

- The Newfoundland & Labrador Department of Environment & Conservation (ENVC), in partnership with Labrador Iron Mines (LIM) and Environment Canada (EC), established two real-time water quality/quantity (RTWQ) stations in September 2010 at the James Iron Ore deposit in western Labrador, near Schefferville, QC. An additional station was established in 2013 at Houston Creek, near the Houston deposit (Figure 1).

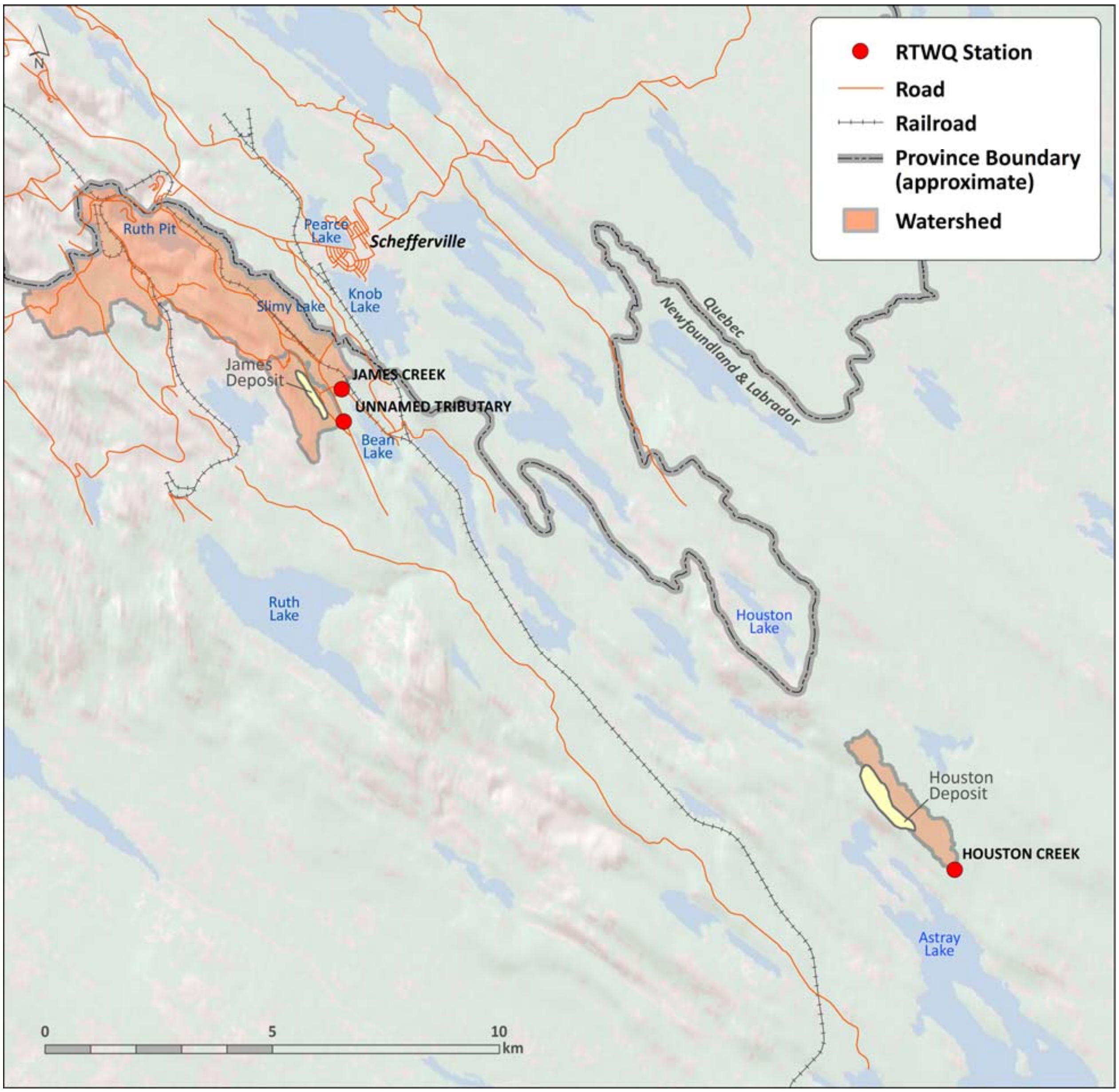

Figure 1. Map of Schefferville Project Area in Western Labrador showing three RTWQ Monitoring Stations at James Creek , Unnamed Tributary and Houston Creek.

- The official name of each station is *James Creek Above Bridge*, *Unnamed Tributary Below Settling Pond*, and *Houston Creek above Road Culvert,* hereafter referred to as the *James Creek* station, the *Unnamed Tributary* station, and the *Houston Creek* station, respectively (Figure 2).

a. Unnamed Tributary b. James Creek c. Houston Creek

Figure 2. RTWQ stations are located alongside (a) the Unnamed Tributary, (b) James Creek and (c) Houston Creek.

- Houston Creek station monitors water outflow from the Houston deposit which is scheduled for future development. The station was idled at the end of 2014 as plans for developing the ore body in that area were delayed and there was to be no activity in the area during 2015. (Figure 1).
- 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 destined to Ruth Pit. Unnamed Tributary station monitors water outflow from this area, however it is is currently idled as dewatering operations have ceased and flow in this stream is significantly reduced.
- During the spring of 2014 dewatering operations were decommissioned, and there was no further outflow from the retention and settling pond system into the Unnamed Tributary and/or James Creek (Figure 1).
- James Creek station monitors water outflow from the multi-cell retention and settling pond system, as well as outflow from Ruth Pit (Figure 1). Ruth Pit is used as a settling pond for reject rock originating from the beneficiation area at the Silver Yard, as well as receiving water from pit dewatering pumps. As there were no active mine operations during 2014 and pit dewatering operations were suspended, there was less water flowing into Ruth Pit than in previous years.

As of the end of the 2015 field season the James Creek station is now idled until such time that mining operations recommence.

- Six water parameters are measured at each station, including five water quality parameters (i.e., temperature, pH, specific conductivity, dissolved oxygen and turbidity) and one water quantity parameter (i.e., stage).
- Water quality parameters are recorded on an hourly basis, typically from late-May to mid-October, when streams are ice-free. ENVC is responsible for collecting and managing this dataset.
- Stage is recorded year-round on an hourly basis. EC is responsible for collecting and managing this dataset.
- EC is responsible for logging and transmitting all water quality and water quantity data to a central repository via satellite communications.
- The purpose of the real-time network at these stations is to monitor, process, and distribute water quality and water quantity data to LIM, ENVC, and EC, for assessment and management of water resources, as well as to provide an early warning of any potential or emerging water issues, such that mitigative measures can be implemented in a timely manner.
- ENVC informs LIM of any significant water quality events by email notification. Monthly and annual deployment reports serve to document water parameters measured at these stations.
- This annual deployment report, presents water quality and water quantity data recorded at the James Creek station from June 2, 2015 to October 5, 2015. It should be noted that during this field season there were serious technical issues with the power supply and data transmission for James Creek Station and there was significant missing data as a result.

Quality Assurance & Quality Control

- Water quality parameters are measured at each station using a Hydrolab DataSonde instrument (Figure 3).

Model DS5 © 2005 Hach Company

Figure 3. Hydrolab DataSonde used for monitoring five water quality parameters.

- To ensure accurate data collection, water quality instruments are subjected to quality assurance procedures, in order to mitigate any errors caused by biofouling and/or sensor drift.

- Quality assurance procedures include: (i) a thorough cleaning of the instrument, (ii) replacement of any small sensor parts that are damaged or unsuitable for reuse, and (iii) the calibration of four instrument sensors (i.e., pH, specific conductivity, dissolved oxygen, and turbidity sensors)[1].
- Quality assurance procedures are carried out every four to five weeks, before the start of a new deployment period. Deployment start and end dates are summarized in Table 1.

Table 1. Water quality instrument deployment start and end dates for 2015 at James Creek and Houston Creek.

Station	Start date	End date	Duration (days)	Instrument
James Creek	2015-06-02	2015-07-07	35	49200
	2015-07-07	2015-08-03	27	49199
	2015-08-03	2015-08-31	28	49201
	2015-08-31	2015-10-05	35	49200

- As part of quality control procedures, instrument performance is tested at the start 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 2 shows the performance ratings of the instrument sensors (i.e., temperature, pH, conductivity, dissolved oxygen and turbidity) deployed at James Creek.
- Based on quality control procedures, instrument sensor performance ranged from poor-to-excellent in 2015 (Table 2).
- **With the exception of water quantity data (stage height), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QA/QC protocol. The stage data is raw data that is transmitted via satellite and published on our web page. 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 2. Instrument sensor performance at the start and end of each deployment period for the James Creek RTWQ station.

Station	Stage of deployment	Date (yyyy-mm-dd)	Instrument	Temperature (°C)	pH	Specific conductivity (µS/cm)	Dissolved oxygen (mg/L)	Turbidity (NTU)
James Creek	Start	2015-06-02	49200	Excellent	Excellent	Excellent	Excellent	Excellent
	End	2015-07-07	49200	*	*	*	*	*
	Start	2015-07-07	49199	Excellent	Good	Excellent	Excellent	Poor
	End	2015-08-03	49199	Excellent	Excellent	Good	Excellent	Poor
	Start	2015-08-03	49201	Excellent	Excellent	Good	Excellent	Good
	End	2015-08-31	49201	*	*	*	*	*
	Start	2015-08-31	49200	Excellent	Excellent	Excellent	Excellent	Excellent
	End	2015-10-05	49200	Excellent	Good	Excellent	Excellent	Excellent

* No communication with field sonde so unable to rate performance.

[1] By design, the DataSonde temperature sensor cannot be calibrated using Hydras 3LT software; it is a factory calibration.

- The turbidity sensor at the James Creek station was given a poor performance rating at the beginning and end of the second deployment which was most likely caused by a calibration error.

Deployment Notes

- All mining operations at LIM were idled for the 2015 season.

Data Interpretation

- Performance issues and data records were interpreted for each station during the deployment period for the following six parameters:

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

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

Stage

- Figure 4 displays stage values recorded at James Creek June 2, 2015 to October 5, 2015. These values are provisional. A complete dataset of quality assured and quality controlled stage values should be available upon request through EC after March 2016 (http://www.ec.gc.ca/rhc-wsc/default.asp).
- Stage values ranged from 515.749 m to 515.834 m at James Creek from June 2, 2015 to October 5, 2015 (Figure 4).
- Weekly trends in stage at the James Creek corresponded well with rainfall events (Figure 4 inset). Spikes in the stage height associated with several rainfall events are highlighted on the graph inside red ovals.

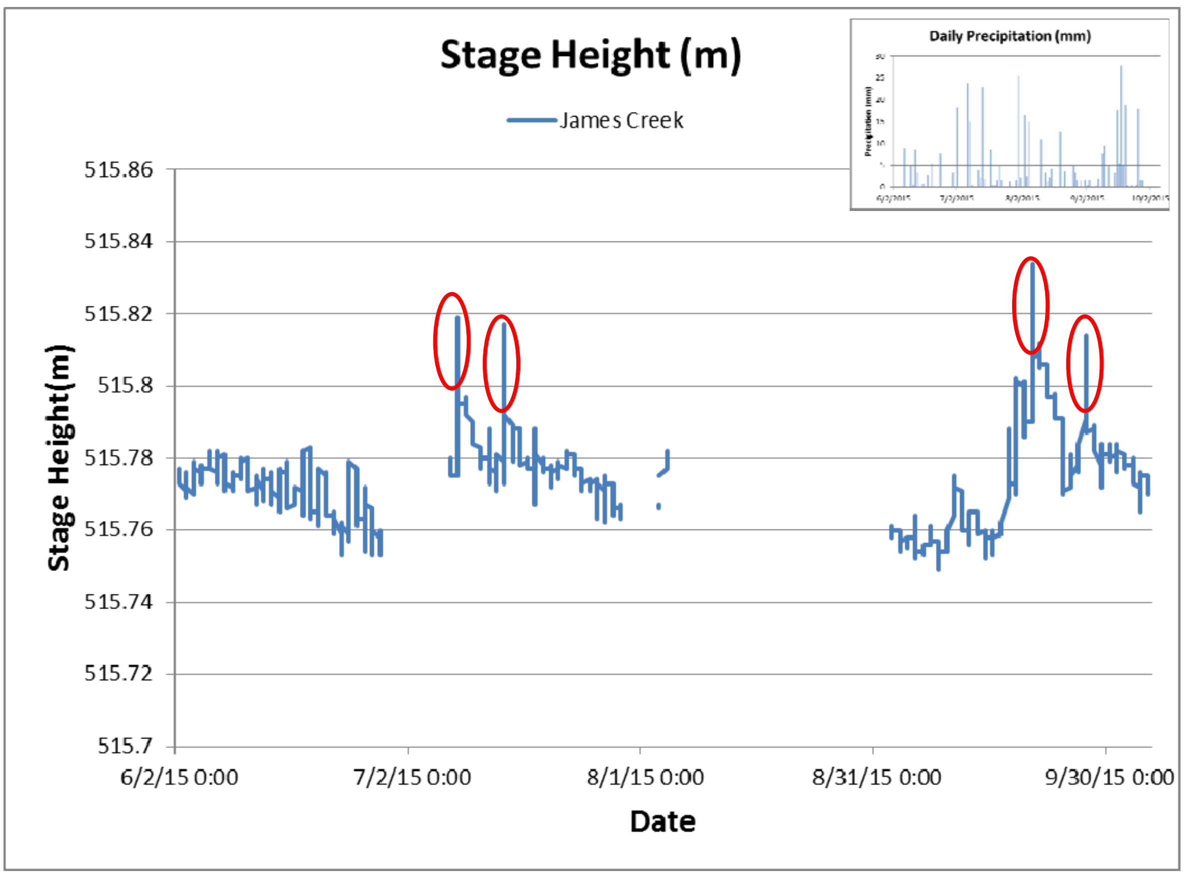

Figure 4. Hourly stage (m) values recorded at James Creek from June 2, 2015 to October 5, 2015. The inset chart shows daily precipitation (mm) recorded at the Schefferville weather station during the same time period. All data was recorded by Environment Canada.

Temperature

- Water temperature ranged from 3.45 ˚C to 17.0˚C at James Creek from June 2, 2015 to October 5, 2015 (Figure 5).
- Water temperatures at James Creeks displayed 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 5 inset & Appendix C).

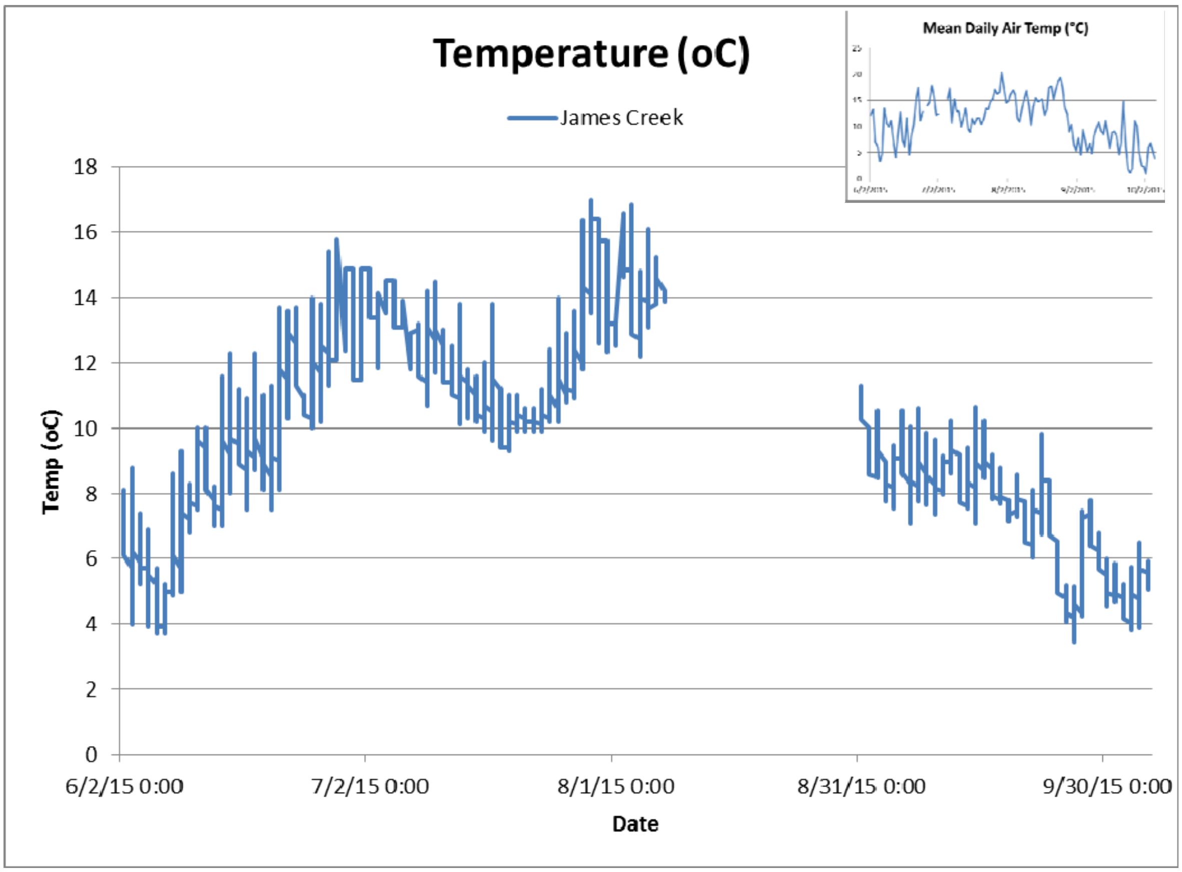

Figure 5. Hourly water temperature (^oC) values recorded at James Creek from June 2, 2015 to October 5, 2015. Inset chart shows mean daily air temperature during the same period, as recorded by Environment Canada at the Schefferville weather station.

pH

- pH values ranged from 7.73 units to 8.83 units at James Creek from June 2, 2015 to October 5, 2015 (Figure 6).
- All pH values at James Creek were 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).
- pH values at James Creek fluctuated daily with peaks typically occurring in the late afternoon/ early evening. These variations coincide with diurnal temperature trends as well as the photosynthetic cycling of CO_2 by aquatic organisms.

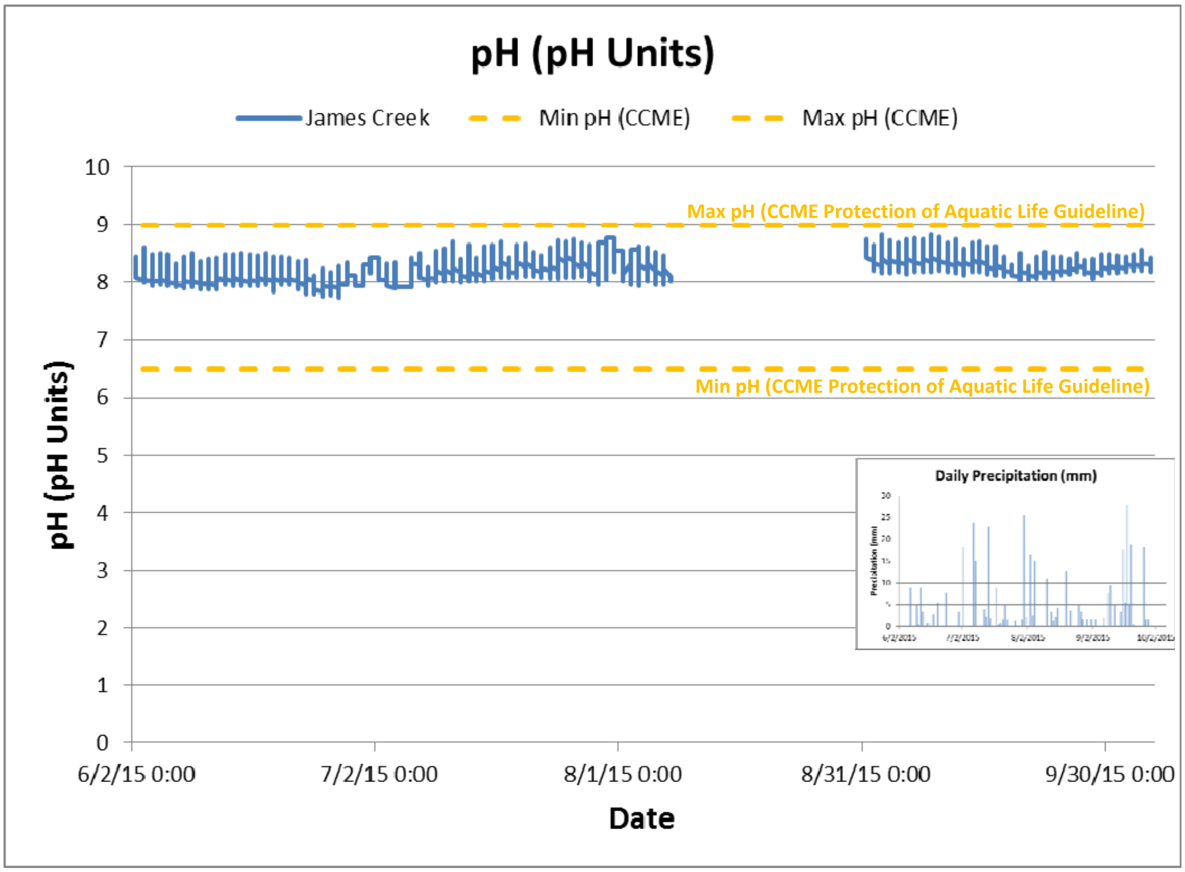

Figure 6. Hourly pH values recorded at James Creek from June 2, 2015 to October 5, 2015. The inset chart shows daily precipitation (mm) recorded at the Schefferville weather station during the same time period.

Specific Conductivity

- Specific Conductivity ranged from 118.7 µs/cm to 147.0 µs/cm at James Creek from June 2, 2015 to October 5, 2015 (Figure 7).
- Specific conductivity values at James Creek fluctuated daily with peaks typically occurring late evening/early morning. Diurnal fluctuations could be attributed to a number of variables including the diurnal temperature fluctuations as well as photosynthetic cycling of CO_2 by aquatic organisms.
- Specific conductivity was fairly stable at James Creek during the entire deployment season.

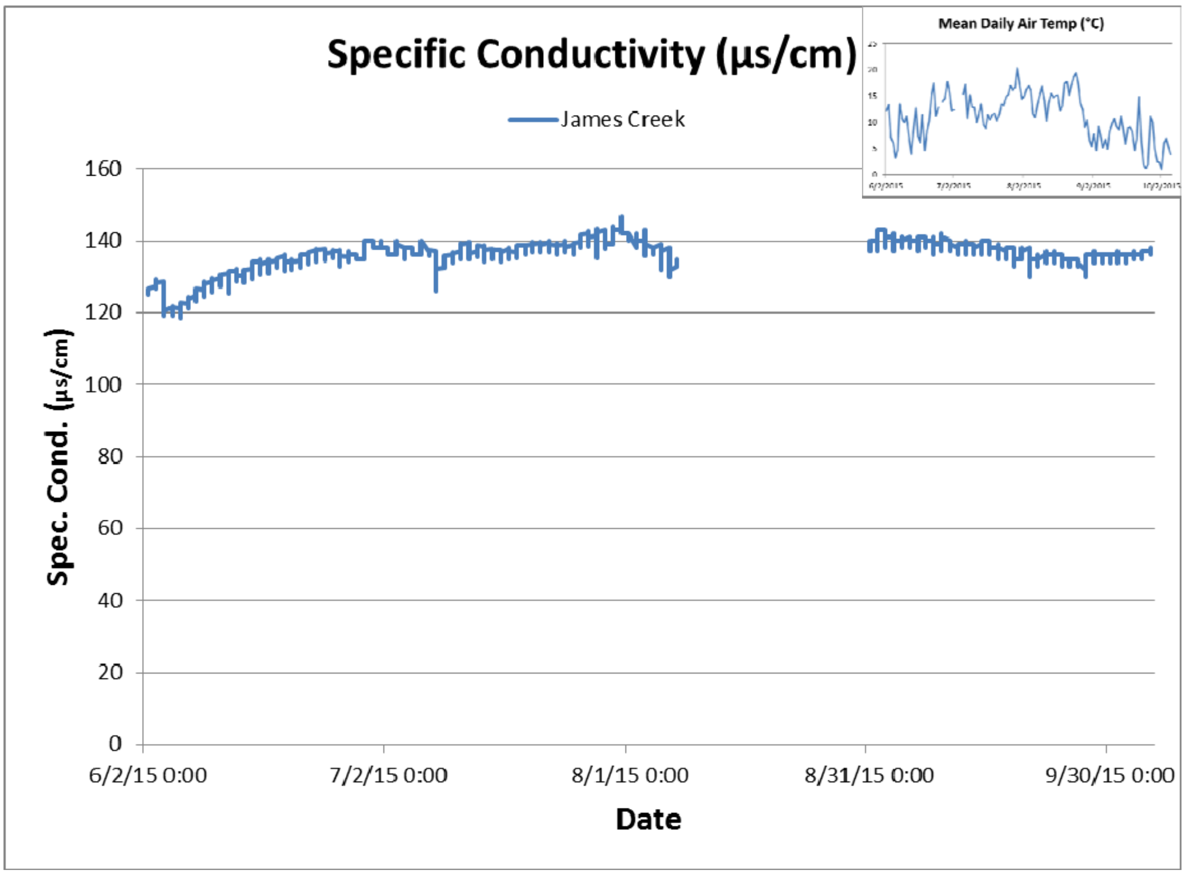

Figure 7. Hourly specific conductivity (µS/cm) values recorded at James Creek from June 2, 2015 to October 5, 2015. The inset chart shows daily precipitation (mm) recorded at the Schefferville weather station during the same time period.

Dissolved Oxygen

- Dissolved Oxygen (DO) values ranged from 8.63 mg/l (85.5%) to 12.87 mg/l (99.0%) at James Creek from June 2, 2015 to October 5, 2015 (Figure 8).
- DO levels at James Creek was were above the minimum guideline set for other life stages (6.5 mg/l), as determined by the Canadian Council of Ministers of the Environment (2007), for the whole deployment season. DO levels were just at or above the cold water minimum guideline set for aquatic life during the early life stages period(9.5 mg/l) for the critical time of salmonid spawning and invertebrate emergence.
- DO levels fluctuate daily, with increases in DO observed in the afternoon and decreases observed at night. These diurnal variations can be attributed to a number of variables including temperature and the photosynthetic activity of aquatic organisms.
- Weekly trends in DO corresponded well with the inverse of water temperature (Figure 8 inset), since colder water has a greater potential to dissolve oxygen compared to warmer water.

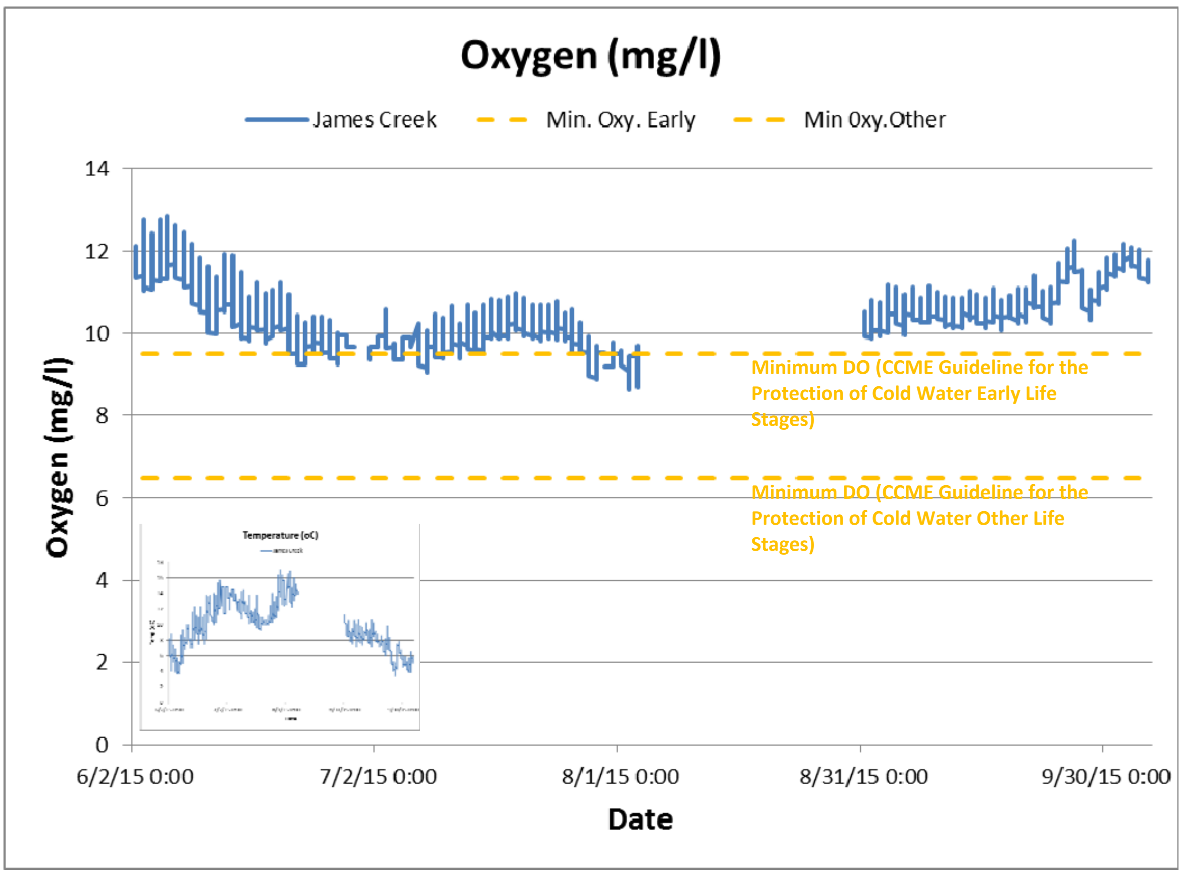

Figure 8. Hourly dissolved oxygen (mg/l) values recorded at James Creek from June 2, 2015 to October 5, 2015.

Turbidity

- Turbidity values ranged from 0.0 NTU to 72.9 NTU at James Creek from June 2, 2015 to October 5, 2015 (Figure 9).
- A period of significant precipitation in mid-September caused elevated and flucuating turbidity levels for a compariable period (see inside red oval).

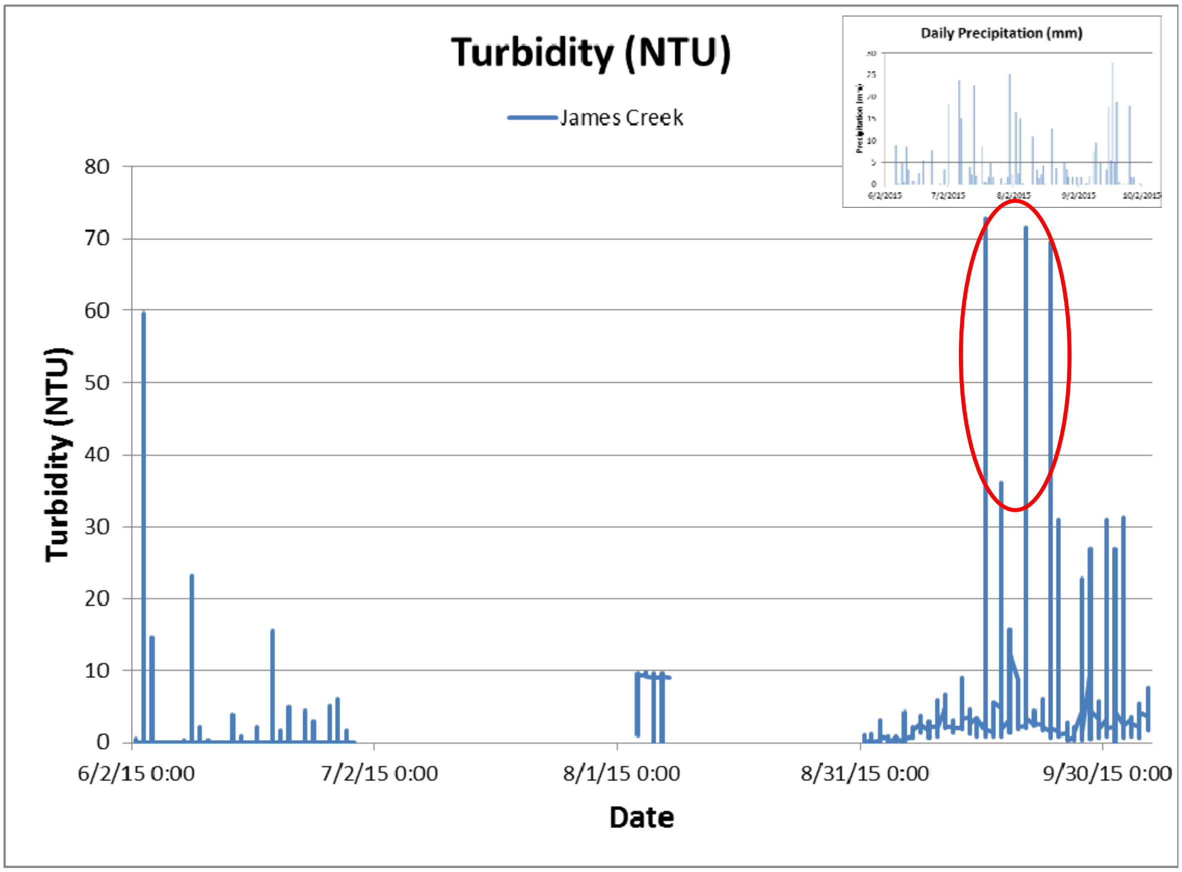

Figure 9. Hourly turbidity (NTU) values recorded at James Creek from June 2, 2015 to October 5, 2015. The inset chart shows daily precipitation (mm) recorded at the Schefferville weather station during the same time period.

Conclusions

- During the 2015 field season a water quality monitoring instrument was deployed at James Creek over four deployment periods between June 2, 2015 and October 5, 2015.
- There was no active mining activity at LIM during the 2015 field season.
- The performance ratings of all instrument sensors ranged between poor to excellent at the beginning and poor to excellent at the end of each of the four deployment periods. The poor

ranking for turbidity at the beginning and end of the second deployment period were most likely the result of a calibration error.

- Variations in water quality/quantity values recorded at James Creek are summarized below:

  STAGE: Stage values ranged from 515.749 m to 515.834 m at James Creek from June 2, 2015 to October 5, 2015. Weekly trends in stage at the James Creek corresponded well with rainfall events.

  WATER TEMPERATURE: Water temperature ranged from 3.45 ˚C to 17.0˚C at James Creek from June 2, 2015 to October 5, 2015. Water temperatures at James Creeks displayed large diurnal variations. Weekly trends in water temperature corresponded well with ambient air temperatures.

  pH: pH values ranged from 7.73 units to 8.83 units at James Creek from June 2, 2015 to October 5, 2015. All pH values at James Creek were 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). pH values at James Creek fluctuated daily with peaks typically occurring in the late afternoon/ early evening. These variations coincide with diurnal temperature trends as well as the photosynthetic cycling of CO_2 by aquatic organisms.

  SPECIFIC CONDUCTIVITY: Specific Conductivity ranged from 118.7 μs/cm to 147.0 μs/cm at James Creek from June 2, 2015 to October 5, 2015. Specific conductivity values at James Creek fluctuated daily with peaks typically occurring late evening/early morning. Specific conductivity was fairly stable at James Creek during the entire deployment season.

  DISSOLVED OXYGEN: DO values ranged from 8.63 mg/l (85.5%) to 12.87 mg/l (99.0%) at James Creek from June 2, 2015 to October 5, 2015. DO levels at James Creek was were above the minimum guideline set for other life stages (6.5 mg/l), as determined by the Canadian Council of Ministers of the Environment (2007), for the whole deployment season. DO levels were just at or above the cold water minimum guideline set for aquatic life during the early life stages period(9.5 mg/l) for the critical time of salmonid spawning and invertebrate emergence. DO levels fluctuate daily, with increases in DO observed in the afternoon and decreases observed at night. Weekly trends in DO corresponded well with the inverse of water temperature since colder water has a greater potential to dissolve oxygen compared to warmer water.

  TURBIDITY: Turbidity values ranged from 0.0 NTU to 72.9 NTU at James Creek from June 2, 2015 to October 5, 2015

Path Forward

- All Real Time Water Quality Monitoring at LIM sites will be suspended for the 2016 field season and will not be reactivated until such time that mining operations are active once again.
- All LIM Field instruments will undergo Performance Testing and Evaluation over the winter of 2016 and will be put into storage for future use.

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 start 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 start 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 (^{o}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 ≤ 35 (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)	≤ ±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 (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 25ºC. 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 (^oC) 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 (June 2, 2015 to Oct.6, 2015)

Date/Time	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Cool Deg Days (°C)	Total Precip (mm)
6/2/2015	17.9	6.5	12.2	5.8	0	0
6/3/2015	18.8	7.9	13.4	4.6	0	0
6/4/2015	13.2	0.9	7.1	10.9	0	0
6/5/2015	11.4	0.5	6	12	0	0
6/6/2015	6.7	-0.2	3.3	14.7	0	0
6/7/2015	8.9	0.4	4.7	13.3	0	9
6/8/2015	19.5	7.4	13.5	4.5	0	0.2
6/9/2015	15.8	5.3	10.6	7.4	0	0.2
6/10/2015	12.8	7	9.9	8.1	0	4.7
6/11/2015	15	7.2	11.1	6.9	0	0.4
6/12/2015	9.2	4.8	7	11	0	8.8
6/13/2015	5.8	2.2	4	14	0	3.4
6/14/2015	13.9	2.5	8.2	9.8	0	0
6/15/2015	22.5	3	12.8	5.2	0	0.8
6/16/2015	12.3	2.3	7.3	10.7	0	0.8
6/17/2015	11.1	1.1	6.1	11.9	0	0
6/18/2015	21.5	1.4	11.5	6.5	0	2.7
6/19/2015	8.1	1.1	4.6	13.4	0	0
6/20/2015	15.8	1	8.4	9.6	0	5.5
6/21/2015	18.4	1.9	10.2	7.8	0	0
6/22/2015	23.5	6.9	15.2	2.8	0	0
6/23/2015	25.1	9.8	17.5	0.5	0	0
6/24/2015	14.1	8.3	11.2	6.8	0	7.7
6/25/2015	19.9	5.8	12.9	5.1	0	0
6/26/2015						
6/27/2015	21.1	6.8	14	4	0	0
6/28/2015	24.2	5	14.6	3.4	0	0.2
6/29/2015	24.2	11.4	17.8	0.2	0	0
6/30/2015	23.9	7.4	15.7	2.3	0	3.4
7/1/2015	18	6.3	12.2	5.8	0	0
7/2/2015	14.4	10.4	12.4	5.6	0	18.3
7/3/2015						
7/4/2015						
7/5/2015						
7/6/2015	22.2	8.6	15.4	2.6	0	0

Date/Time	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Cool Deg Days (°C)	Total Precip (mm)
7/7/2015	20.3	14.3	17.3	0.7	0	23.9
7/8/2015	14.4	7.2	10.8	7.2	0	15
7/9/2015	21.7	8.7	15.2	2.8	0	0.3
7/10/2015	18	7.9	13	5	0	0
7/11/2015	18.5	7.2	12.9	5.1	0	0
7/12/2015	13.3	6.6	10	8	0	4
7/13/2015	17.1	6.3	11.7	6.3	0	2.2
7/14/2015	18.2	8.7	13.5	4.5	0	22.8
7/15/2015	12.8	6.4	9.6	8.4	0	2
7/16/2015	11.6	6.1	8.9	9.1	0	0
7/17/2015	19	3.7	11.4	6.6	0	0
7/18/2015	11.6	9.3	10.5	7.5	0	8.8
7/19/2015	14.1	8.9	11.5	6.5	0	0.4
7/20/2015	14.4	9	11.7	6.3	0	0.6
7/21/2015	11.6	9.2	10.4	7.6	0	1.7
7/22/2015	12.9	10.1	11.5	6.5	0	4.7
7/23/2015	16.9	10	13.5	4.5	0	1.7
7/24/2015	17.7	8.8	13.3	4.7	0	0
7/25/2015	21.4	8.2	14.8	3.2	0	0
7/26/2015	21.4	9.2	15.3	2.7	0	0
7/27/2015	21.5	12.6	17.1	0.9	0	1.3
7/28/2015	22.5	9.8	16.2	1.8	0	0
7/29/2015	24.3	8.9	16.6	1.4	0	0.2
7/30/2015	27.4	13.1	20.3	0	2.3	1.5
7/31/2015	21.2	13.6	17.4	0.6	0	25.4
8/1/2015	19.8	9.1	14.5	3.5	0	2.3
8/2/2015	20.2	9.4	14.8	3.2	0	0
8/3/2015	20.8	11.6	16.2	1.8	0	16.5
8/4/2015	21.8	12.1	17	1	0	2.4
8/5/2015	21.2	10.7	16	2	0	15
8/6/2015	14.3	8.9	11.6	6.4	0	0.2
8/7/2015	15.6	6.2	10.9	7.1	0	0
8/8/2015	21.4	5.7	13.6	4.4	0	0
8/9/2015	23.2	7.1	15.2	2.8	0	0
8/10/2015	24.4	9.2	16.8	1.2	0	0
8/11/2015	18.1	10	14.1	3.9	0	10.9
8/12/2015	12.4	7.9	10.2	7.8	0	0
8/13/2015	16.8	10.7	13.8	4.2	0	3.4
8/14/2015	18.4	12.6	15.5	2.5	0	1.3

Date/Time	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Cool Deg Days (°C)	Total Precip (mm)
8/15/2015	17.3	12.1	14.7	3.3	0	2.2
8/16/2015	18.2	11.7	15	3	0	4.2
8/17/2015	23.4	7	15.2	2.8	0	0.2
8/18/2015	17.8	6.5	12.2	5.8	0	0
8/19/2015	20.6	5.8	13.2	4.8	0	0
8/20/2015	23.5	11.5	17.5	0.5	0	12.7
8/21/2015	22.4	12.9	17.7	0.3	0	0
8/22/2015	19.3	10.9	15.1	2.9	0	3.7
8/23/2015	22.2	11.9	17.1	0.9	0	0
8/24/2015	24.9	12.5	18.7	0	0.7	0
8/25/2015	25.2	13.6	19.4	0	1.4	0
8/26/2015	21.2	13.8	17.5	0.5	0	4.9
8/27/2015	19	8.6	13.8	4.2	0	3.3
8/28/2015	17.9	6.8	12.4	5.6	0	1.5
8/29/2015	12.7	5.5	9.1	8.9	0	0
8/30/2015	14.1	6.6	10.4	7.6	0	1.6
8/31/2015	11.1	1.6	6.4	11.6	0	0
9/1/2015	9.4	1.1	5.3	12.7	0	1.6
9/2/2015	13.8	1.8	7.8	10.2	0	0.3
9/3/2015	7.4	1.8	4.6	13.4	0	1.7
9/4/2015	15.5	3	9.3	8.7	0	0
9/5/2015	14.5	0.3	7.4	10.6	0	0.2
9/6/2015	12	-1.8	5.1	12.9	0	0.3
9/7/2015	13.2	0.2	6.7	11.3	0	1.9
9/8/2015	10.5	-1	4.8	13.2	0	0
9/9/2015	14.6	1.7	8.2	9.8	0	7.6
9/10/2015	11.2	8.4	9.8	8.2	0	9.6
9/11/2015	13.6	7.9	10.8	7.2	0	0
9/12/2015	11.8	6.5	9.2	8.8	0	4.9
9/13/2015	13.2	3.9	8.6	9.4	0	0
9/14/2015	19.4	2.9	11.2	6.8	0	0
9/15/2015	13.2	4.1	8.7	9.3	0	3.3
9/16/2015	8.2	3.3	5.8	12.2	0	17.7
9/17/2015	15.2	2.6	8.9	9.1	0	5.5
9/18/2015	15.4	2.7	9.1	8.9	0	27.8
9/19/2015	10.5	6	8.3	9.7	0	4.7
9/20/2015	6.5	2.8	4.7	13.3	0	18.8
9/21/2015	12.7	1	6.9	11.1	0	0.4
9/22/2015	19	10.4	14.7	3.3	0	0

Date/Time	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Cool Deg Days (°C)	Total Precip (mm)
9/23/2015	10.4	1.6	6	12	0	0.3
9/24/2015	4.5	-0.8	1.9	16.1	0	0
9/25/2015	3.6	-1.5	1.1	16.9	0	0.3
9/26/2015	5.7	-1.7	2	16	0	18.1
9/27/2015	16.5	5.6	11.1	6.9	0	1.5
9/28/2015	14.7	5.4	10.1	7.9	0	1.6
9/29/2015	8.6	1.1	4.9	13.1	0	0
9/30/2015	5.6	-0.7	2.5	15.5	0	0
10/1/2015	5	0	2.5	15.5	0	0.2
10/2/2015	5.1	-3.2	1	17	0	0
10/3/2015	12.3	-0.4	6	12	0	0
10/4/2015	13.4	0.4	6.9	11.1	0	0
10/5/2015	12.2	-1.6	5.3	12.7	0	0
10/6/2015	9.5	-1.8	3.9	14.1	0	0

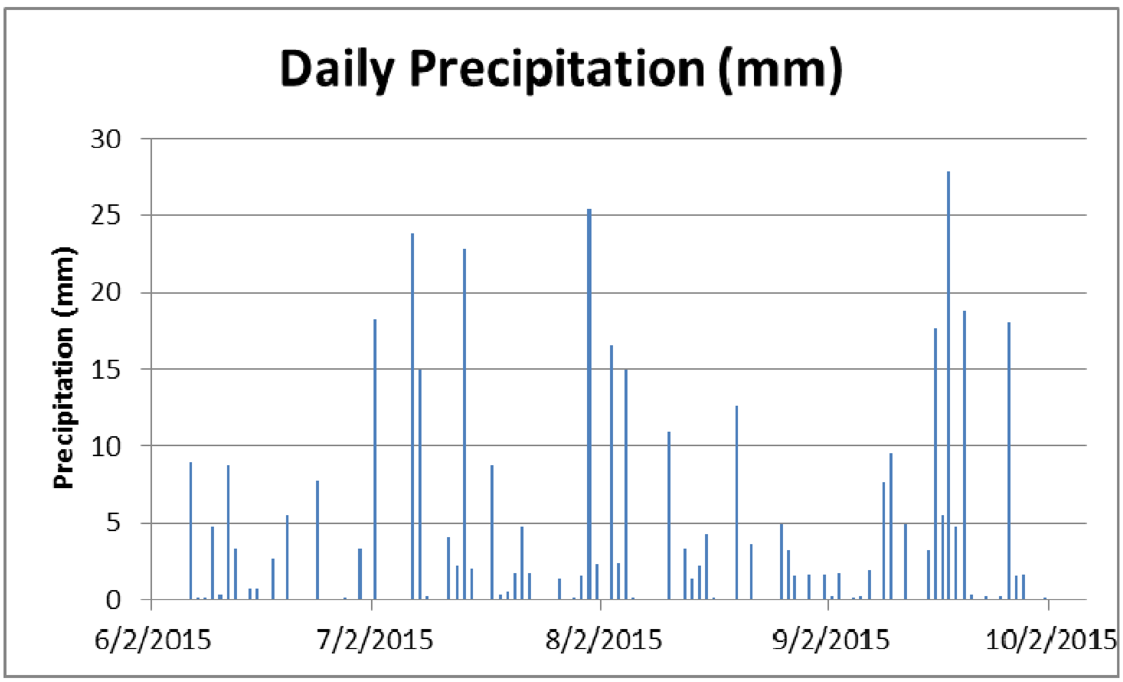

Figure 1. Daily precipitation recorded at the Schefferville Weather Station by Environment Canada from June 2, 2015 to October 5, 2015.

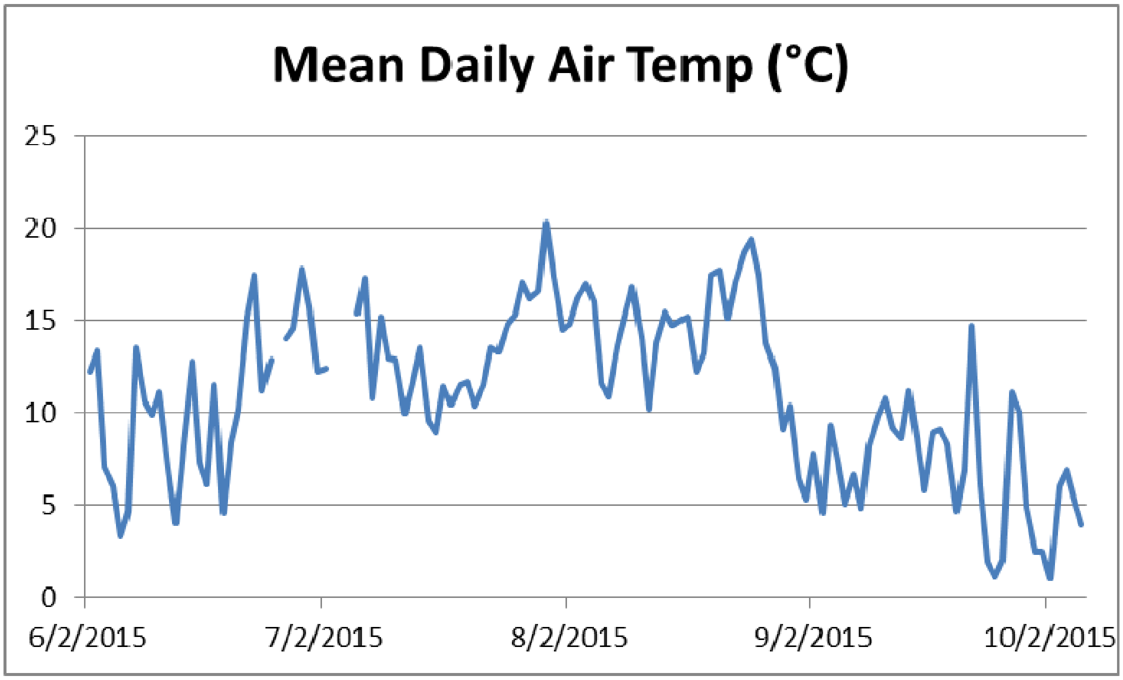

Figure 2. Mean Daily Temperature recorded at the Schefferville Weather Station by Environment Canada from June 2, 2015 to October 6, 2015.