Real-Time Water Quality Report

Canada Fluorspar (NL) Inc, Real-Time Water Quality Stations

Deployment Period
November 17, 2016 to January 25, 2017

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Municipal Affairs & Environment
Water Resources Management Division

Prepared by:

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General

The Water Resources Management Division (WRMD), in partnership with Water Survey of Canada - Environment and Climate Change Canada (WSC-ECCC), maintain real-time water quality and water quantity monitoring stations on Outflow of Grebes Nest Pond and Outflow of Unnamed Pond south of Long Pond.

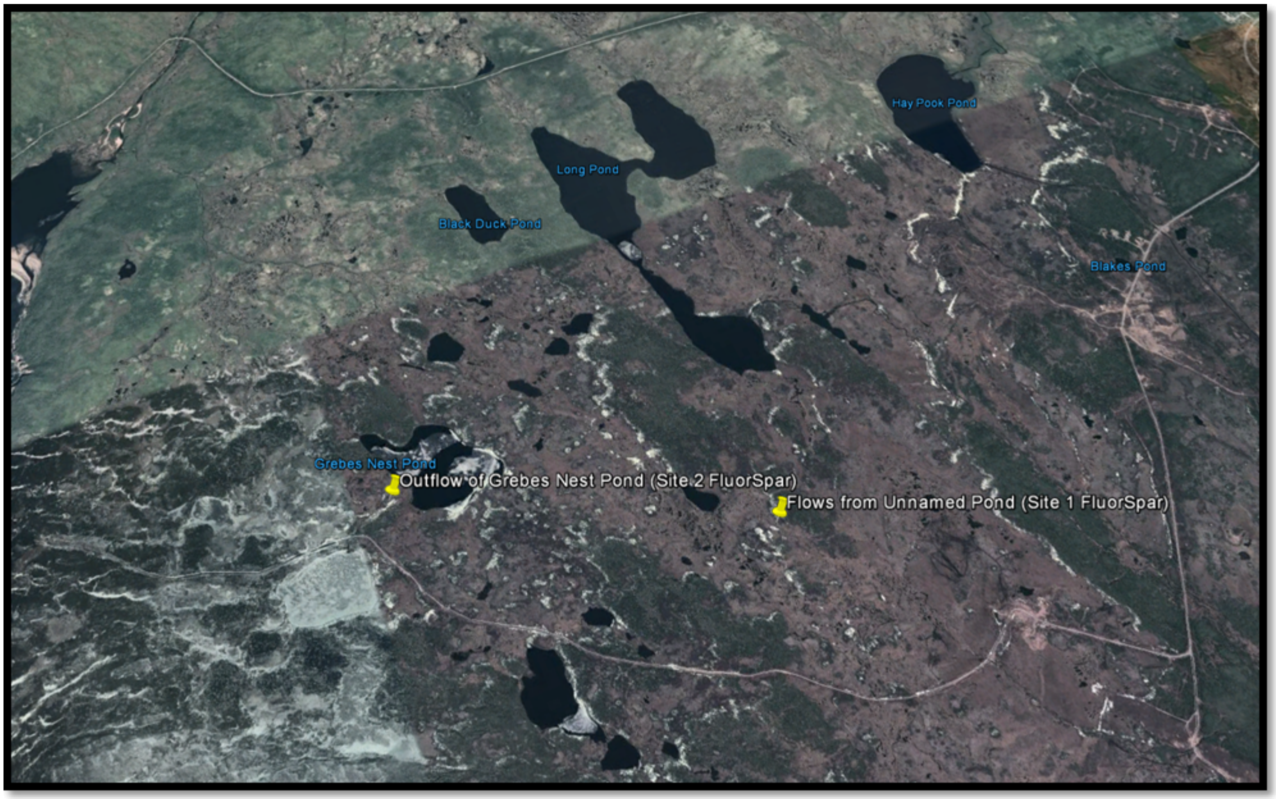

Figure 1: Real-Time Water Quality and Quantity Stations at Canada Fluorspar Inc

The real-time water quantity/quality station downstream from Grebes Nest Pond was labeled "Outflow of Grebes Nest Pond". The location of Outflow of Grebes Nest Pond station is established downstream of the pit dewatering effluent outfall upstream of John Fitzpatrick Pond. The stream is approximately 1.0 to 2.0 meters wide. The brook sustains a sufficient pool for the instrumentation to be placed in (Figure 2). The pool depth is approximately 0.5 to 1.0 metres. The GPS coordinates for this site are as follows**: N46 54 35.9 W055 27 45.6**.

The station hut was placed on the left bank looking downstream approximately 5 metres from the stream. This station will provide real-time water quality and quantity data to ensure emerging issues associated with the open pit (from both the construction and operational phases)are detected, to allow the appropriate mitigation measures to be implemented in a timely manner, thus reducing any adverse effect on the downstream systems.

The real-time water quantity/quality station labeled "Outflow of Unnamed Pond south of Long Pond" is established downstream of the Tailings Management Facility (TMF). This station will provide near real-time water quality and quantity data to ensure emerging issues associated with the TMF are detected, to allow the appropriate mitigation measures to be implemented in a timely manner, thus reducing any adverse effect on the downstream systems. The location of Outflow of Unnamed Pond south of Long Pond was selected due to accessibility to the brook and the sufficient pool available to place the water quality and quantity instruments (See Figure 3). The stream initiates from a small unnamed pond and meanders through a marsh environment alongside TMF. The stream is approximately 1.0 to 2.0 meters wide. Where the instrument is deployed, there is a depth of approximately 1.0 to 1.5 meters. The GPS coordinates for this site are as follows: **N46 54 14.1 W055 26 37.5**. The station hut was placed on the right bank looking downstream approximately 8 meters from the stream (Figure 3).

Outflow of Grebes Nest station was installed before Outflow of Unnamed Pond south of Long Pond due to weather constraints and the logistics of installing the station hut at Outflow of Unnamed Pond. This report covers the period from the initial deployment of Outflow of Grebes Nest Pond station on November 17th, 2016 to removal on January 25th, 2017 (Figure 2). Outflow of Unnamed Pond station was installed on December 6th, 2016 and the instrument deployed from December 6th through to January 25th, 2017 (Figure 3). It was determined in January that the ice conditions at each of the stations could potentially damage the instruments, so the instruments were removed for the winter season and will be deployed when the brooks are ice-free in the spring.

Figure 2: Real-Time Water Quality and Quantity Station at Outflow of Grebes Nest Pond.

Figure 3: Real-Time Water Quality and Quantity Station at Outflow of Unnamed Pond south of Long Pond.

Quality Assurance and Quality Control

As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.

At deployment and removal, a QA/QC Sonde is temporarily deployed alongside the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments**.** Based on the degree of difference between the parameters on the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

WRMD staff (Municipal Affairs and Environment (MAE)) is responsible for maintenance of the real-time water quality monitoring equipment, as well as recording and managing the water quality data. Tara Clinton, under the supervision of Renee Paterson, is MAE's main contact for the real-time water quality monitoring operation at Canada Fluorspar (NL) Inc, and is responsible for maintaining and calibrating the water quality instrument, as well as grooming, analyzing and reporting on water quality data recorded at the station.

WSC staff (Environment and Climate Change Canada (ECCC)) under the management of Howie Wills, play an essential role in the data logging/communication aspect of the network and the maintenance of the water quantity monitoring equipment. WSC-ECCC staff visit the site regularly to ensure the data logging and data transmitting equipment are working properly. WSC is responsible for handling stage and streamflow issues. The quantity data is raw data that is transmitted via satellite and published online along with the water quality data on the Real-Time Stations website. Quantity data has not been corrected or groomed when published online or used in the monthly reports for the stations. WSC is responsible for QA/QC of water quantity data. Corrected stage and streamflow data can be obtained upon request to WSC.

Table 1: Instrument Performance Ranking classifications for deployment and removal

	Rank				
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

It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of: temperature dependant, temperature compensated and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

Table 2: Instrument performance rankings

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Grebes Nest Pond	Nov 17	Deployment	Good	Good	Excellent	Excellent	Excellent
	Jan 25	Removal	Excellent	Fair	Fair	Excellent	Excellent
Unnamed Pond	Dec 5	Deployment	Good	Good	Good	Excellent	Excellent
	Jan 25	Removal	Excellent	Poor	Poor	Good	Excellent

At deployment of the field instrument, at Outflow of Grebes Nest Pond site, the ranking of the field data against the QAQC data was: 'Good' for water temperature and pH, and 'Excellent' for conductivity, dissolved oxygen and turbidity data. All rankings for the water quality parameters were acceptable for the initial deployment of the field instrument at this station. During removal of the instrument the rankings for the data were, 'Excellent' for the temperature, dissolved oxygen and turbidity data and the pH and conductivity data ranked as 'Fair'.

At deployment of the field instrument at Outflow of Unnamed Pond south of Long Pond the data ranked as the following; water temperature, pH and conductivity data ranking as 'Good' and dissolved oxygen and turbidity data ranked against the QA sonde as 'Excellent'. All rankings for the water quality parameters were of acceptable range for deployment. At the end of the deployment the data was ranked again to compare and the results were water temperature and turbidity ranked as 'Excellent' with dissolved oxygen ranking as 'Good'. pH and conductivity data when ranked against the QA indicated 'Poor'. The poor rankings could be a result of ice interference in the brook. There was a lot of ice buildup around where the instrument was placed in the brook.

Concerns or Issues during the Deployment Period

Outflow to Unnamed Pond south of Long Pond station stopped transmitting on December 29th 2016. The instrument was still recording data internally however it was unable to transmit the data in real-time. This issue is being looked into with follow up bench testing and instrument performance, testing and evaluation.

During the site visit to these real-time stations it was observed that there was ice covering the brook and build up along the bank into the water. It was determined that it would be best to remove the instruments from the brooks to prevent any damage by the ice or during the spring thaw.

The spikes in stage data indicate ice present in the brook. The ice disrupts the water quantity instruments' ability to read accurate stage data. The spikes should not be considered as high stage events.

Toward the end of the deployment the pH data at Outflow of Unnamed Pond south of Long Pond had started to drift from calibration. It was determined that it was not representing the brook so the data was removed from January 16th 2017 to the end of deployment.

The spikes in the stage data present at Outflow of Unnamed Pond south of Long Pond were removed from the stage data. The spikes were large and skewing the graphs. **Please note that the stage data in this document is raw data**. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

Outflow of Grebes Nest Pond

Water Temperature

Water temperature ranged from -0.03°C to 10.76°C during this deployment period (Figure 4). The water temperature at this station displays diurnal variations of the temperature. At the beginning of the deployment there is a gradual decrease in the water temperature as the air temperatures drop (Appendix I). The water temperatures maintain a range between below zero and 2°C from early December to the end of deployment.

During the site visit to Outflow of Grebes Nest Pond in January it was determined that the ice coverage on the brook may interfere or even damage the instrument. It was decided to remove the instruments for the winter season and redeploy during the spring.

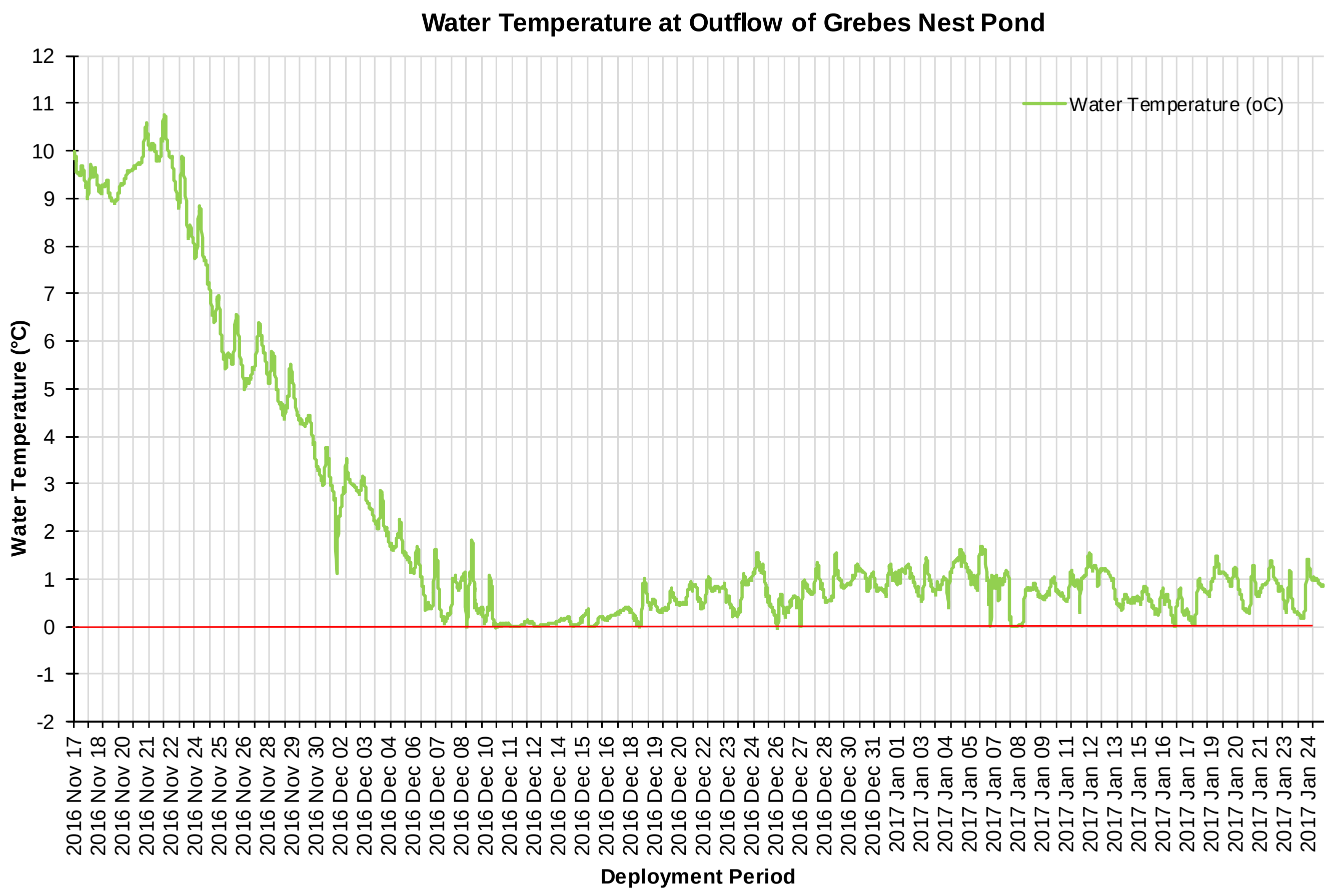

Figure 4: Water temperature (°C) values at Outflow of Grebes Nest Pond

pH

Throughout the deployment period, pH values ranged between 5.16 pH units and 6.99 pH units (Figure 5) and are reasonably consistent. The pH data remain below the minimum Guideline for Protection of Aquatic Life. The Canadian Council of Ministers of the Environment (CCME) guidelines is just a basis by which to compare the pH data within a dataset. Every brook is different with its own natural background range. It is not uncommon for Newfoundland and Labrador waters to be below the CCME pH guideline.

During this deployment, pH dipped several times, on November 27th, December 18th, December 30th and January 8th, 2016 (Figure 5). There is a slight increase in water and air temperatures as well as precipitation recorded on these dates; this indicates that the dips in pH are likely a result of significant rainfall. Natural processes such as rainfall and snow melt will alter the pH of a brook for a period of time.

The spikes in stage data indicate ice present in the brook. The ice disrupts the water quantity instruments' ability to read accurate stage. These spikes are not high stage events. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

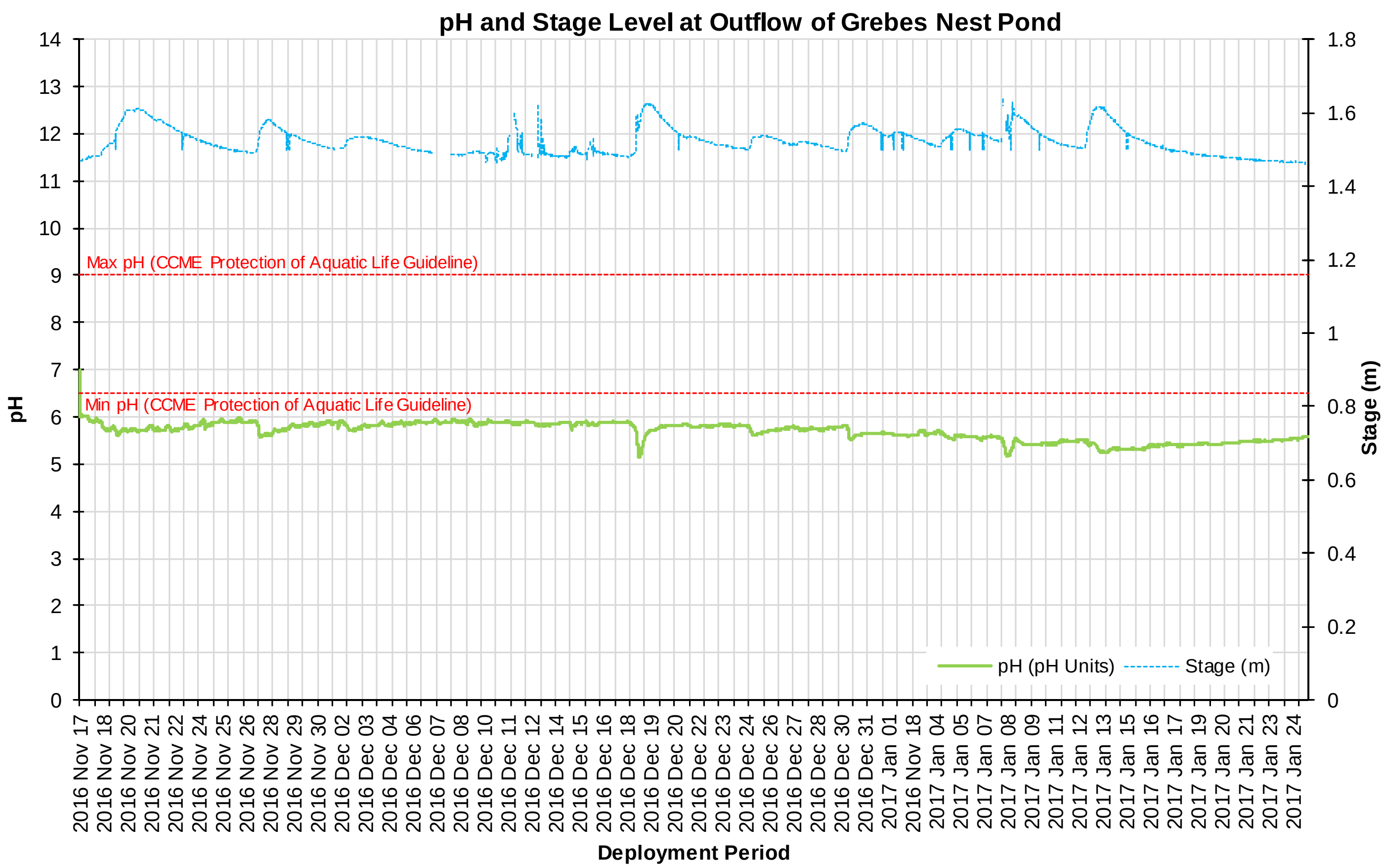

Figure 5: pH (pH units) and stage level (m) values

Specific Conductivity & Total Dissolved Solids

The conductivity levels were within 29.1 µS/cm and 121.2 µS/cm during this deployment period. TDS (a calculated value) ranged from 0.0200 g/L to 0.0800 g/L (Figure 6). TDS is a calculated measurement that the instrument provides once conductivity levels have been recorded.

The relationship between conductivity and stage level is generally inversed. When stage levels rise, the specific conductance levels drop in response, as the increased amount of water in the river system dilutes the solids that are present. This is evident on Figure 6 in several places but most noticeably on January 13th, 2017.

It is also common to see an increase in conductivity with an increase in stage. This is evident on December 18th to December 20th 2016 where there is a spike in conductivity and an increase in stage. There is also an increase in air temperature indicating that this event is likely a result of rainfall (Appendix A2). Rainfall can flush natural organic matter into the brook, increasing the conductivity levels for a short period of time (Figure 9, Precipitation graph).

The sharp spikes in stage data indicate ice present in the brook. The ice disrupts the water quantity instruments' ability to read accurate stage. These spikes are not high stage events. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

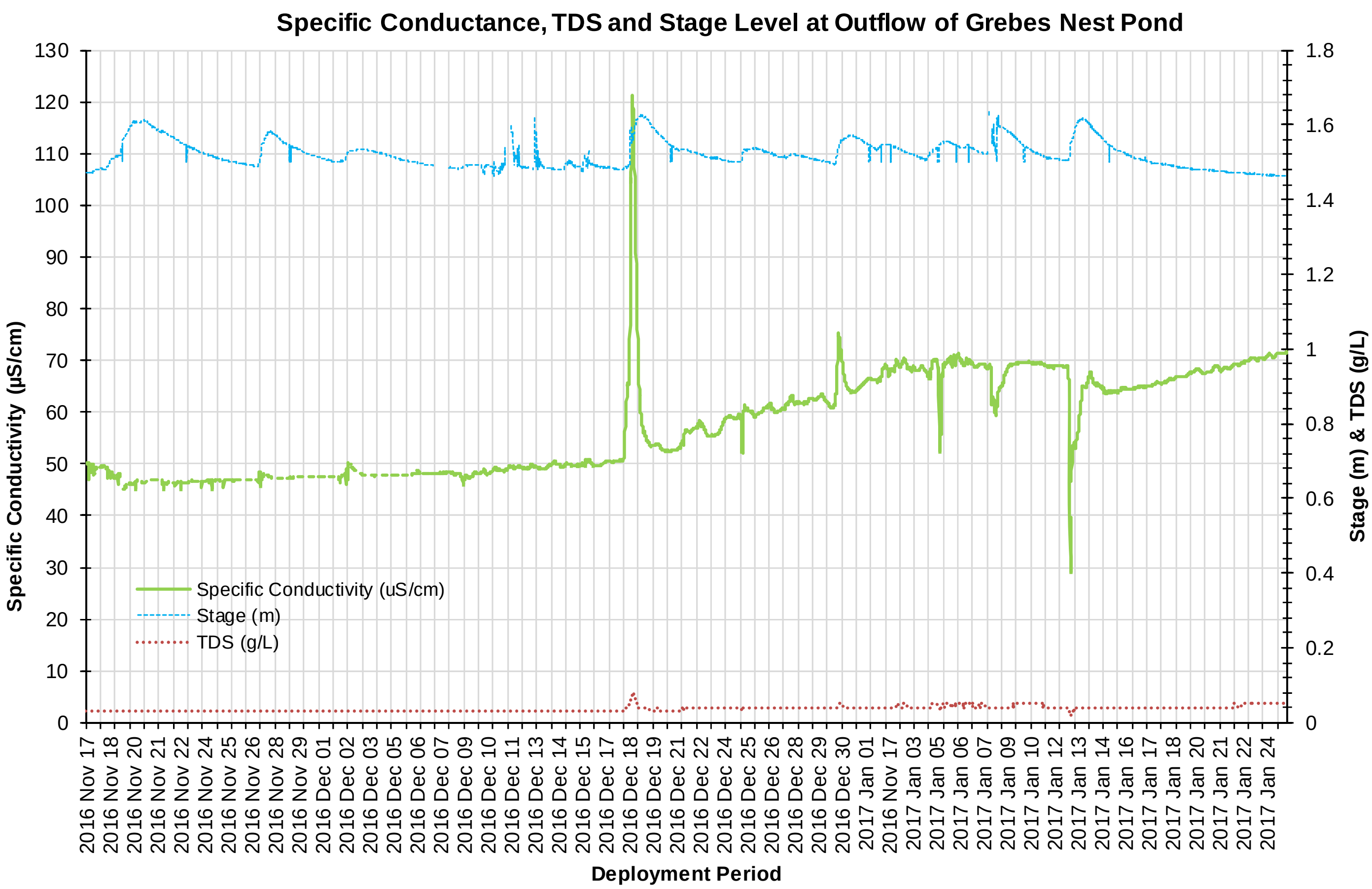

Figure 6: Specific conductivity (µS/cm), TDS (g/L) and stage (m) values

Dissolved Oxygen

The water quality instrument measures dissolved oxygen (mg/L) with the dissolved oxygen probe and then the instrument calculates percent saturation (% Sat) taking into account the water temperature.

During the deployment the dissolved oxygen concentration levels ranged within a minimum of 10.54 mg/L to a maximum of 14.30 mg/L. The percent saturation levels for dissolved oxygen ranged within 88.2% Saturation to 99.9% Saturation (Figure 7).

The dissolved oxygen concentration remained above the CCME Dissolved Oxygen Guideline for the Protection of Early Life Stages (9.5mg/L). As the fall season changed to winter there was a natural decrease in water temperature, the water temperature decrease will influence the dissolved oxygen to increase in the brook. This is evident from November into early December as the dissolved oxygen concentration starts to climb.

Rainfall events will influence the dissolved oxygen levels to drop for a short period of time. Rainfall was likely the source of the dips in dissolved oxygen data on December 17-18th 2016 and January 7-8th, 2017.

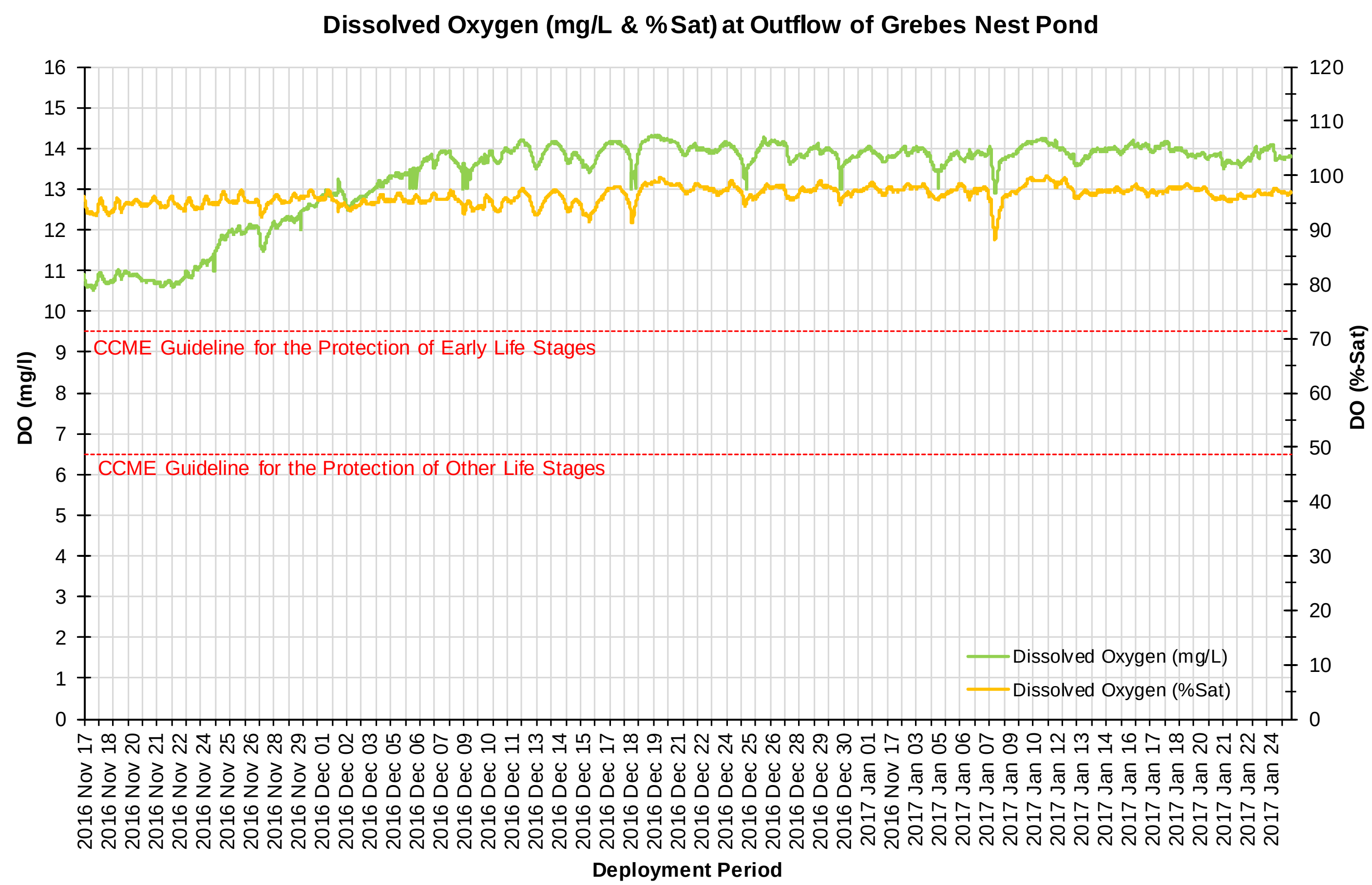

Figure 7: Dissolved Oxygen (mg/L & Percent Saturation) values.

Turbidity

Turbidity levels during the deployment ranged within 0.4 NTU and 6.1 NTU (Figure 8). The deployment data had a median of 0.6 NTU.

During rainfall or runoff, higher turbidity readings are expected. Generally the turbidity levels increase for a short period of time and then return to within the range of the baseline. However if - after a turbidity event - the values do not decrease and there is greater frequency and higher values being recorded then these outcomes would be of concern.

At this station, the higher turbidity events throughout this deployment period correlate with increases in stage potentially from precipitation. Rainfall and subsequent runoff can increase the presence of suspended material in water. The turbidity data does return to lower levels after the high peaks. This site has a significant streamflow rate which can flush turbid water or sediments quickly through the brook.

The sharp spikes in stage data indicate ice present in the brook. The ice disrupts the water quantity instruments' ability to read accurate stage. These spikes are not high stage events. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

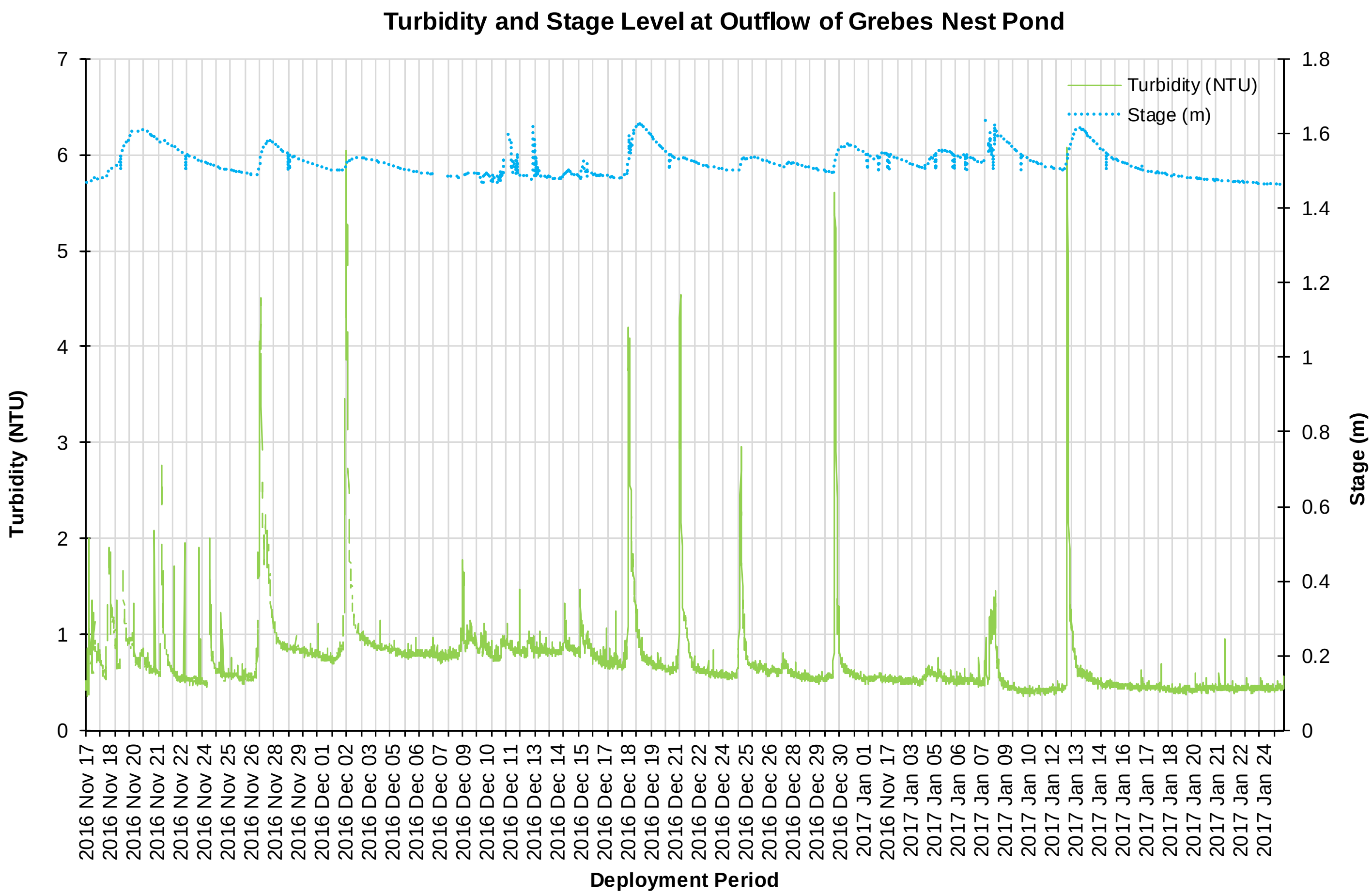

Figure 8: Turbidity (NTU) and stage level (m) values.

Stage and Precipitation

Please note the stage data graphed below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

Stage is important to display as it provides an estimation of water level at the station and can explain some of the events that are occurring with other parameters (i.e. Specific Conductivity, DO, turbidity). Stage will increase during rainfall events (Figure 9) and during any surrounding snow or ice melt as runoff will collect in the brooks. However, direct snowfall will not cause them to rise significantly.

During the deployment period, the stage values ranged from 1.47m to 1.64m. The larger peaks in stage do correspond with substantial rainfall events as noted on Figure 7. Precipitation data was obtained from Environment Canada's St. Lawrence weather station. Precipitation ranges for the deployment period were a minimum of 0.0 mm and a maximum of 34.4 mm on January 8th, 2017, with November 27th 2016 also having high total precipitation readings.

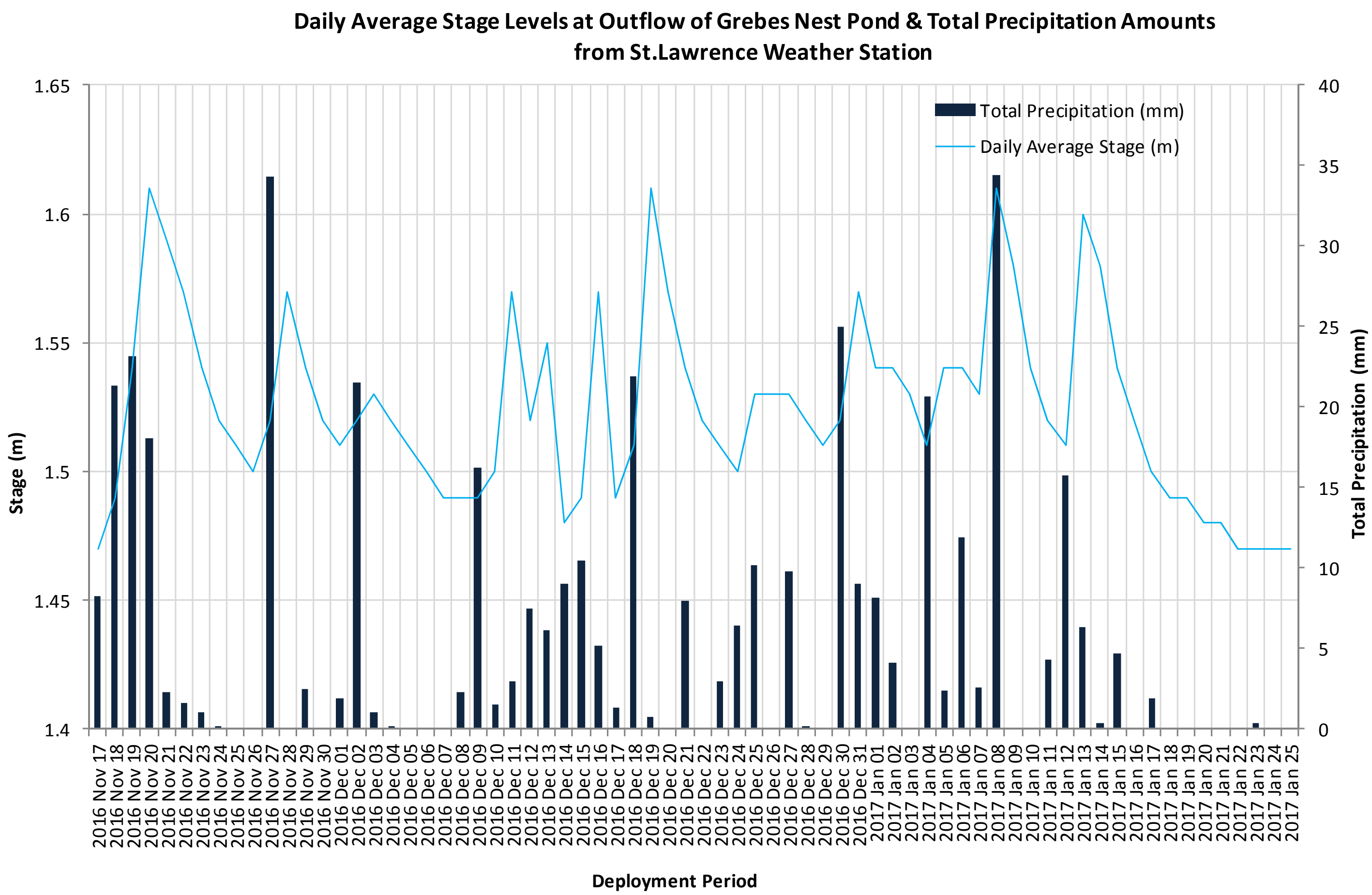

Figure 9: Daily average stage values and daily total precipitation.

Conclusion

Outflow of Grebes Nest Pond currently flows through a functional mine site. At this phase of the mines progress, the natural environment is constantly being disturbed by construction and mining related activities. The brook's watershed is bordered by marshland, this could also influence the material present in the water column. These factors combined can impact the water quality parameters during climatic events such as, precipitation, snow and spring thaw melt.

When reviewing the graphs as a whole it is evident that the larger precipitation events did create varying effects with the water quality parameters pH, conductivity, dissolved oxygen and turbidity. The movement in the water temperature data indicates that, air temperatures influenced the drop in the water temperature, which in turn, influenced the dissolved oxygen concentration in the brook. Shallower brooks are highly influenced by air temperatures.

For most of the deployment the pH values were reasonably consistent, there were changes in the pH during high stage events, however the data returned to a consistent level. The large peak in specific conductivity on December 18 – 20th, was a result of significant rainfall and subsequent snow melt during that timeframe. There were fluctuations in the turbidity data, whereby several increases in turbidity seemed to be a result of high stage levels which were resulting from rainfall. The turbidity levels did not pass a maximum of 6.1 NTU which is low for a natural brook and not a level of concern.

The water quality data for Outflow of Grebes Nest Pond was as expected of a slightly impacted brook. After perturbations in the data, the parameters did return to the previous levels observed. Overall the water quality parameters recorded at Outflow of Grebes Nest Pond displayed events expected of a brook in an environment influenced by anthropogenic activities.

Outflow of Unnamed Pond south of Long Pond

Water Temperature

Water temperature ranged from -0.15°C to 3.00°C during this deployment period (Figure 10). This station was initially installed in December 2016 hence the cooler water temperature ranges than that of Outflow of Grebes Nest Pond. The brook was already having surface ice form on the top of the water.

The water temperature at this station has more variation in the data than the previous station. Outflow of Unnamed Pond is a shallower brook and it more likely to be influenced by air temperature changes and climatic changes. The natural diurnal variation of the water temperature is evident for the most part.

On December 8th and 9th, 2017 there is a large increase and decrease in water temperature. The weather station in St. Lawrence indicates that there was an increase and decrease in air temperature and a rainfall event during this time frame (Appendix A1). These factors were likely the cause of the movement in water temperature. After this event the water temperatures maintain a range below 2°C to the end of deployment.

During the site visit to Outflow of Unnamed Pond south of Long Pond in January it was determined that the ice coverage on the brook may interfere or even damage the instrument. It was decided to remove the instruments for the winter season and redeploy during the spring.

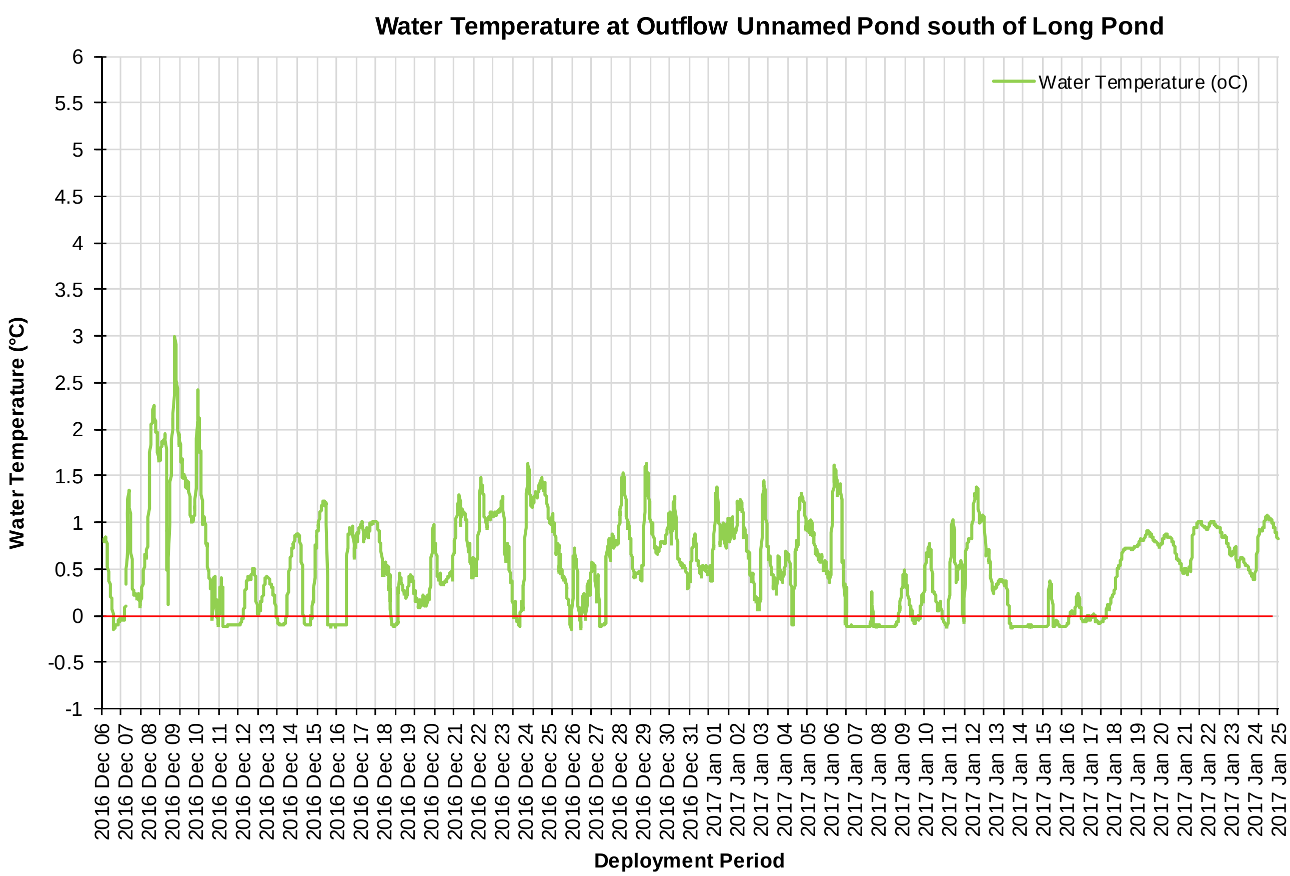

Figure 10: Water temperature (°C) values at Outflow of Unnamed Pond south of Long Pond

pH

Throughout the deployment period, pH values ranged between 4.57 pH units and 5.47 pH units (Figure 11). The pH levels are reasonably consistent during the deployment and remained below the minimum Guideline for Protection of Aquatic Life. The Canadian Council of Ministers of the Environment (CCME) guidelines is just a basis by which to compare any dramatic change in the pH data within a dataset. Every brook is different with its own natural background range. It is not uncommon for Newfoundland and Labrador waters to be below the CCME pH guideline.

Natural processes such as rainfall and snow melt will alter the pH of a brook for a period of time. This is evident on Figure 11, during and after high stage levels the pH data decreases slightly for short period of time. This is a natural process.

Data was removed from January 16th to January 25th, as the pH data had started to drift and was not representing the water body. Drift can be caused by biofouling on the sensor. This data was not included in any statistical analysis for this report.

The stage data for this brook had significant spikes, the high values were removed therefore there is gaps in the stage data on the graph. The ice disrupts the water quantity instruments' ability to read accurate stage. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

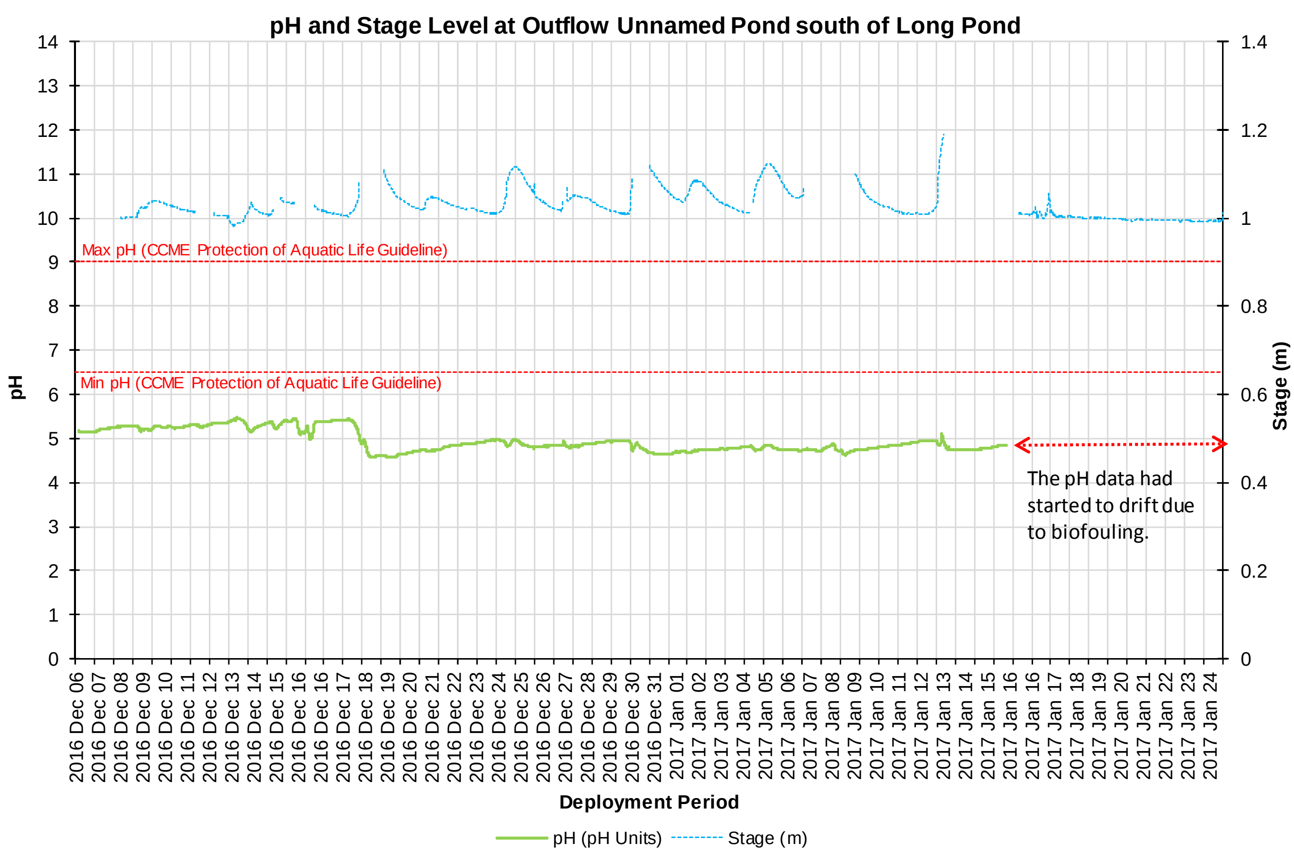

Figure 11: pH (pH units) and stage level (m) values

Specific Conductivity & Total Dissolved Solids

The conductivity levels were between 56.6 µS/cm and 111.6 µS/cm during this deployment period. TDS (a calculated value) ranged from 0.0700 g/L to 0.0400 g/L (Figure 12). TDS is a calculated measurement that the instrument provides once conductivity levels have been recorded.

There is a general relationship between conductivity and stage, whereby the interaction between the two water quality parameters is inversed. For example, when stage levels rise, the specific conductance levels will decrease in response. As the stage level increases, the increased amount of water in the river dilutes the suspended solids that are present. This response is evident on December 25th, 2016 (Figure 12).

However, during high stage events it is also possible to see an increase in conductivity; these events are generally created through additional material being flushed into the water column. This is evident on December 18th to December 20th 2016 with a spike in conductivity and a spike in stage. When compared to the St. Lawrence weather station data, there is evidence of increased air temperatures, likely resulting in a rainfall event. The higher conductivity is a result of natural organic matter that was flushed into the brook (Figure 15).

The stage data for this brook had significant spikes, the high values were removed therefore there is gaps in the stage data on the graph. The ice disrupts the water quantity instruments' ability to read accurate stage. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

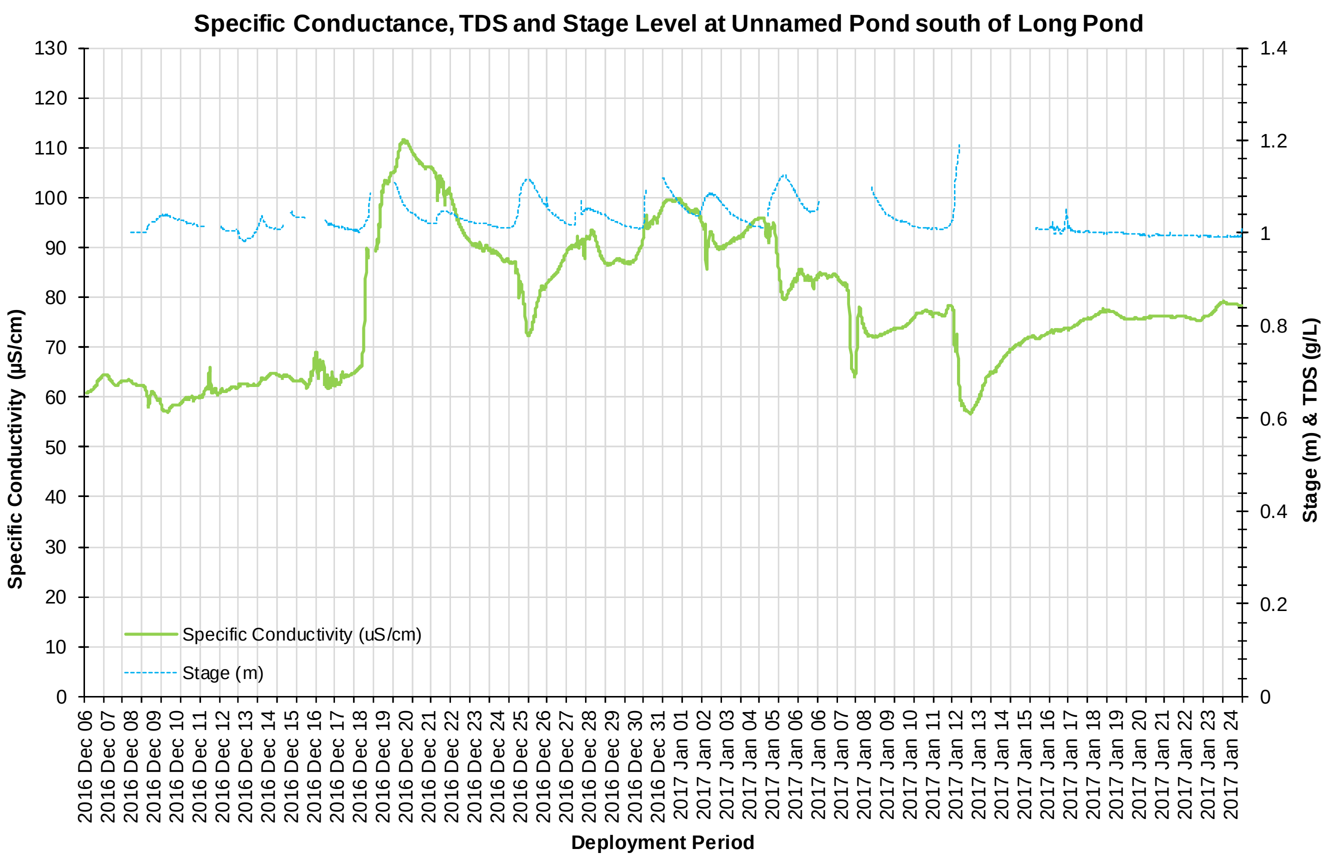

Figure 12: Specific conductivity (µS/cm), TDS (g/L) and stage (m) values

Dissolved Oxygen

The water quality instrument measures dissolved oxygen (mg/L) with the dissolved oxygen probe and then the instrument calculates percent saturation (% Sat) taking into account the water temperature.

During the deployment the dissolved oxygen concentration levels ranged within a minimum of 13.32 mg/L to a maximum of 15.16 mg/L. The percent saturation levels for dissolved oxygen ranged within 91.3% Saturation to 104.3% Saturation (Figure 13).

The dissolved oxygen concentration was above the CCME dissolved oxygen guideline for the Protection of Early Life Stages (9.5mg/L). There is a natural diurnal pattern that occurs with dissolved oxygen, as the water temperatures decrease in the evening the dissolved oxygen will increase and as the water temperatures increase during daylight hours the dissolved oxygen will decrease. This is evident on Figure 13. The lower dips in dissolved oxygen are likely linked to slightly warmer temperatures for that time frame.

Rainfall events will influence the dissolved oxygen levels to drop for a short period of time. Rainfall was likely the source of the dips in dissolved oxygen data on December 16th and 18th, 2016.

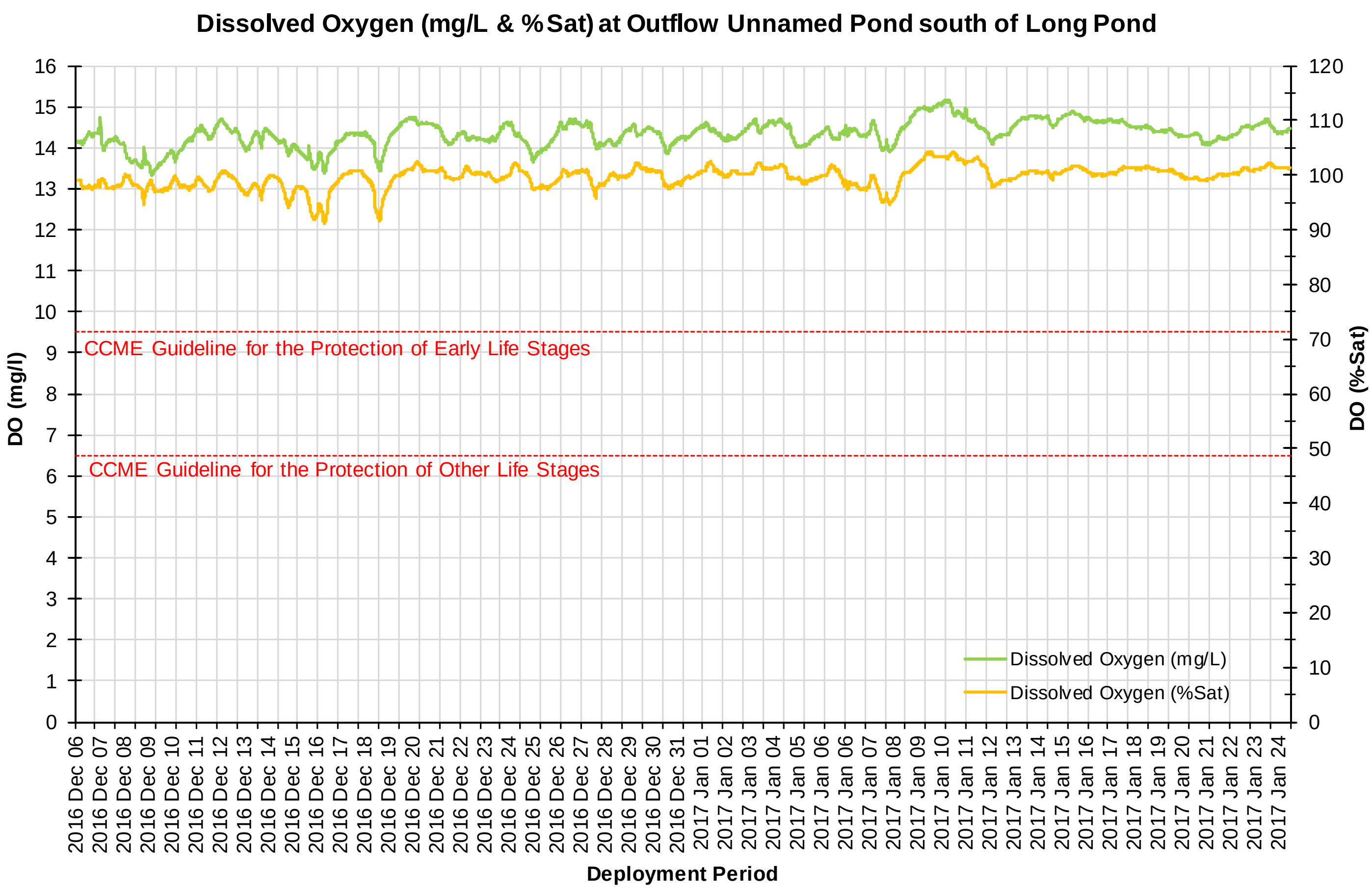

Figure 13: Dissolved Oxygen (mg/L & Percent Saturation) values.

Turbidity

Turbidity levels during the deployment ranged within 0.0 NTU and 1.3 NTU (Figure 14). The deployment data had a median of 0.0 NTU. These are very low turbidity values indicating that there is minimal background turbidity occurring at this site.

At this station, the turbidity events throughout this deployment period correlate with increases in stage potentially from precipitation. Rainfall and subsequent runoff can increase the presence of suspended material in water. The turbidity data does return to lower levels after the high peaks.

The stage data for this brook had significant spikes, the high values were removed therefore there is gaps in the stage data on the graph. The ice disrupts the water quantity instruments' ability to read accurate stage. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

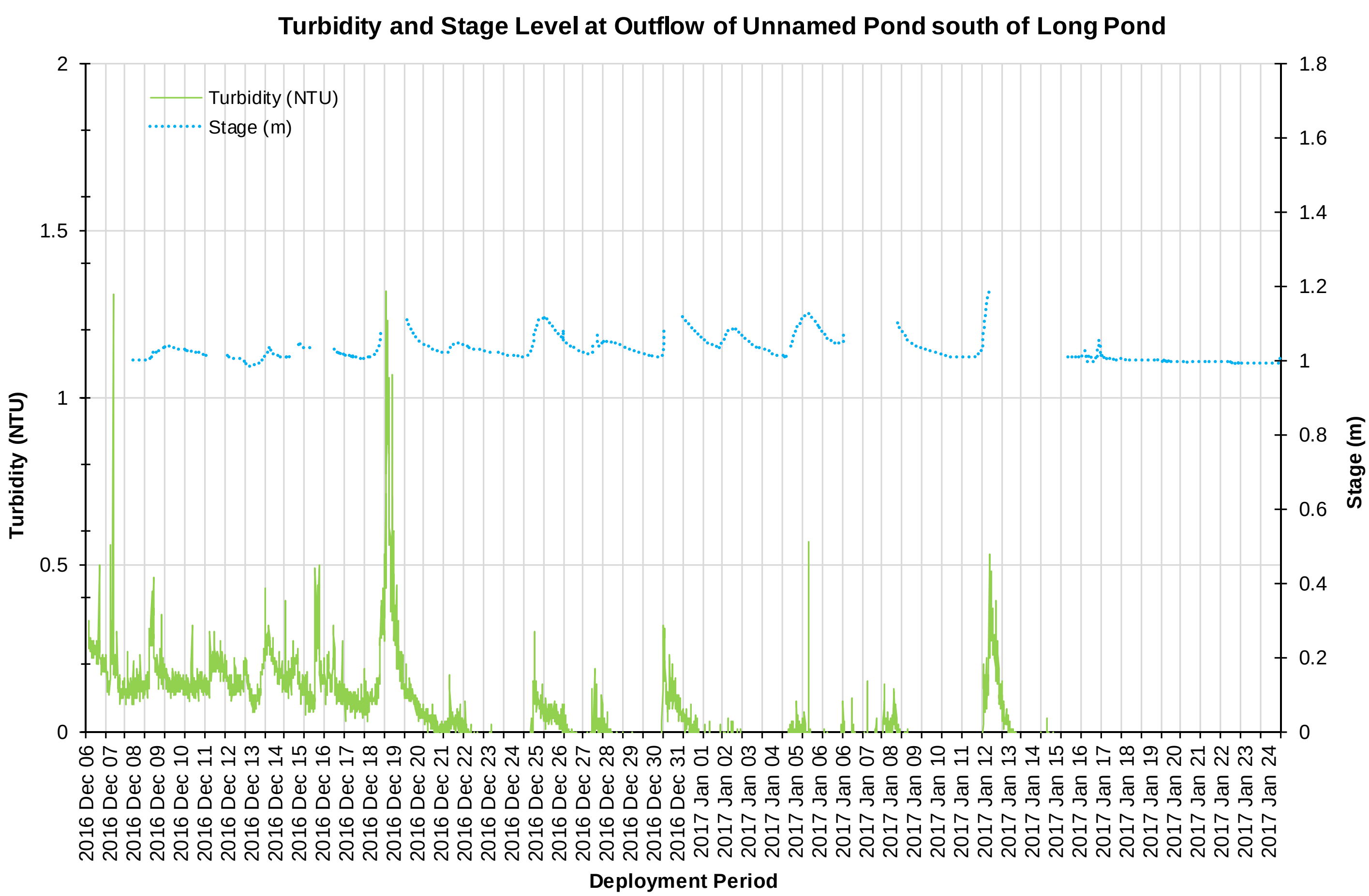

Figure 14: Turbidity (NTU) and stage level (m) values.

Stage and Precipitation

The stage data for this brook had significant spikes, the high values were removed therefore there is gaps in the stage data on the graph. The ice disrupts the water quantity instruments' ability to read accurate stage. Please note the stage data on the graph below, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

Stage is important to display as it provides an estimation of water level at the station and can explain some of the events that are occurring with other parameters (i.e. Specific Conductivity, DO, turbidity). Stage will increase during rainfall events (Figure 15) and during any surrounding snow or ice melt. However, direct snowfall will not cause stage to rise significantly.

During the deployment period, the stage values ranged from 0.98m to 1.59m. The larger peaks in stage do correspond with substantial rainfall events as noted on Figure 15. Precipitation data was obtained from Environment Canada's St. Lawrence weather station. Precipitation ranges for the deployment period were a minimum of 0.0 mm and a maximum of 34.4 mm on January 8th, 2017.

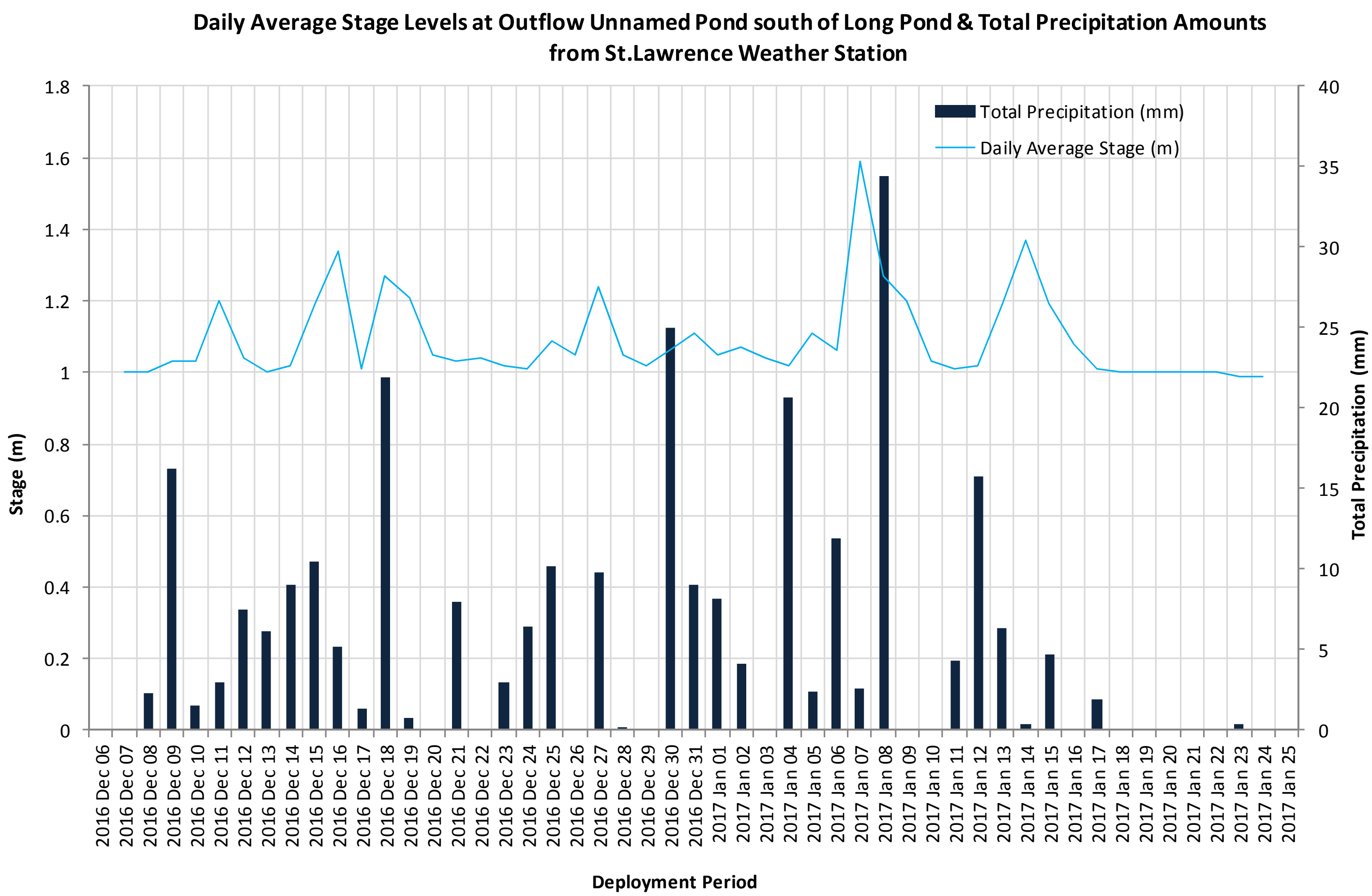

Figure 15: Daily average stage values and daily total precipitation.

Conclusion

As with many shallower brooks and streams, precipitation and runoff events play a significant role in influencing the water quality within the water body. The Outflow of Unnamed Pond south of Long Pond runs through undeveloped areas that include natural wetlands and marshlands, the brook skirts along the construction activity that is ongoing. This type of watershed background will influence the water quality parameters. This station is the furthest away from the anthropogenic activities that would be occurring on the mine site.

It is evident that the larger precipitation events did create varying effects with the water quality parameters pH, conductivity, dissolved oxygen and turbidity. The changes in water temperature indicates were influenced by the air temperatures, this in turn, influenced the dissolved oxygen concentration in the brook.

For most of the deployment the pH values were reasonably consistent. Any change in pH data corresponded with a rise or dip in the stage level during the same timeframe. The specific conductivity dips were a result of high stage levels and rainfall events. The one large increase in conductivity on December 20th, 2016 was also during a slight dip in stage after a couple of days of rainfall. It is possible that as the stage dipped, the conductivity became more concentrated for a short period of time. There was very little movement in the turbidity data over the deployment, with turbidity not getting higher than 1.3 NTU.

The watershed for this brook will undergo anthropogenic changes as the mining activities increase however the brook should not be impacted significantly. The health of a brook can be determined by how quickly it returns to a consistent parameter level after a water quality event.

APPENDIX A

WATER TEMPERATURE AND AIR TEMPERATURE COMPARISON

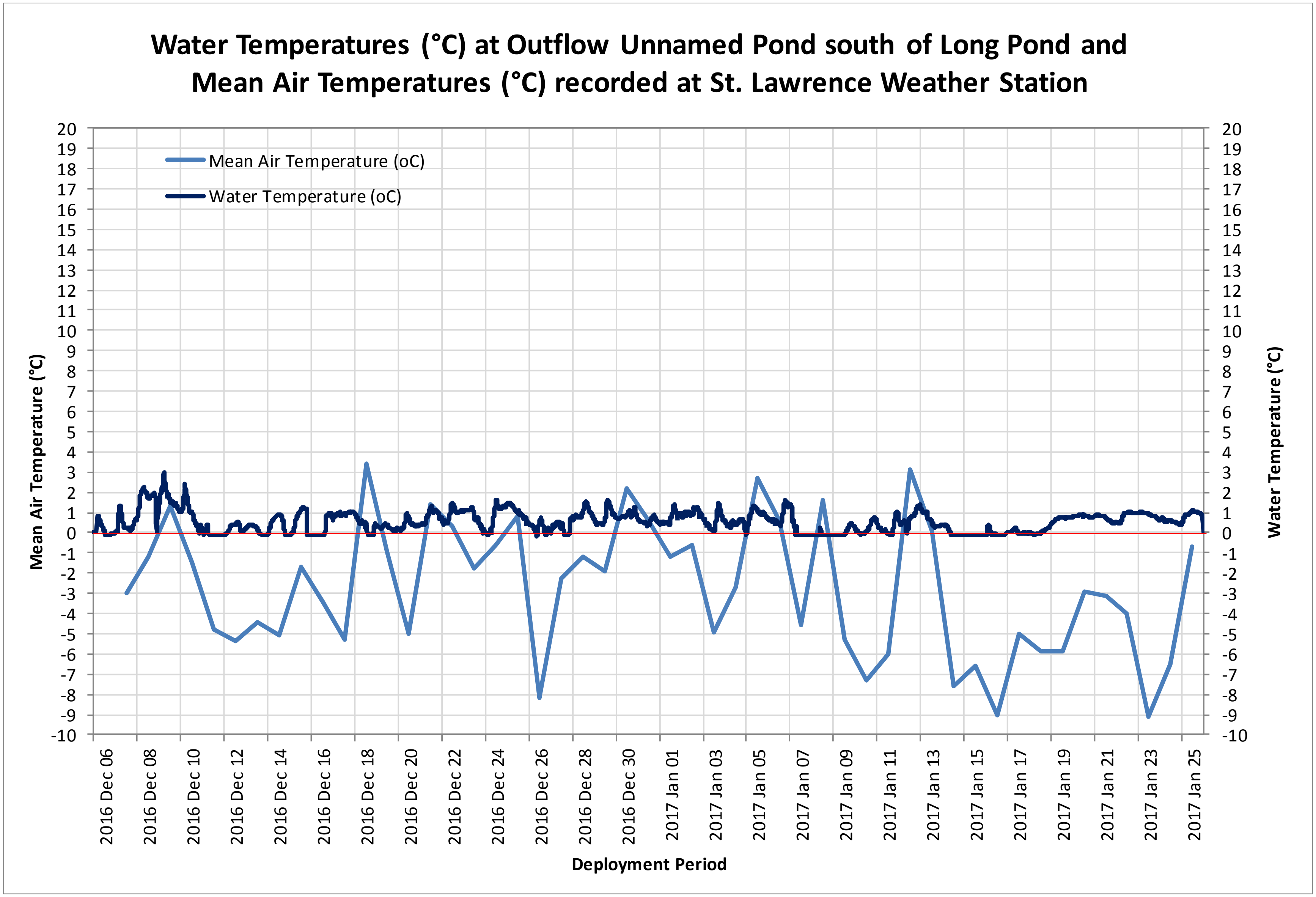

Figure A1: Water Temperatures at Outflow of Unnamed Pond south of Long Pond and Mean Air Temperatures recorded at St. Lawrence Weather Station

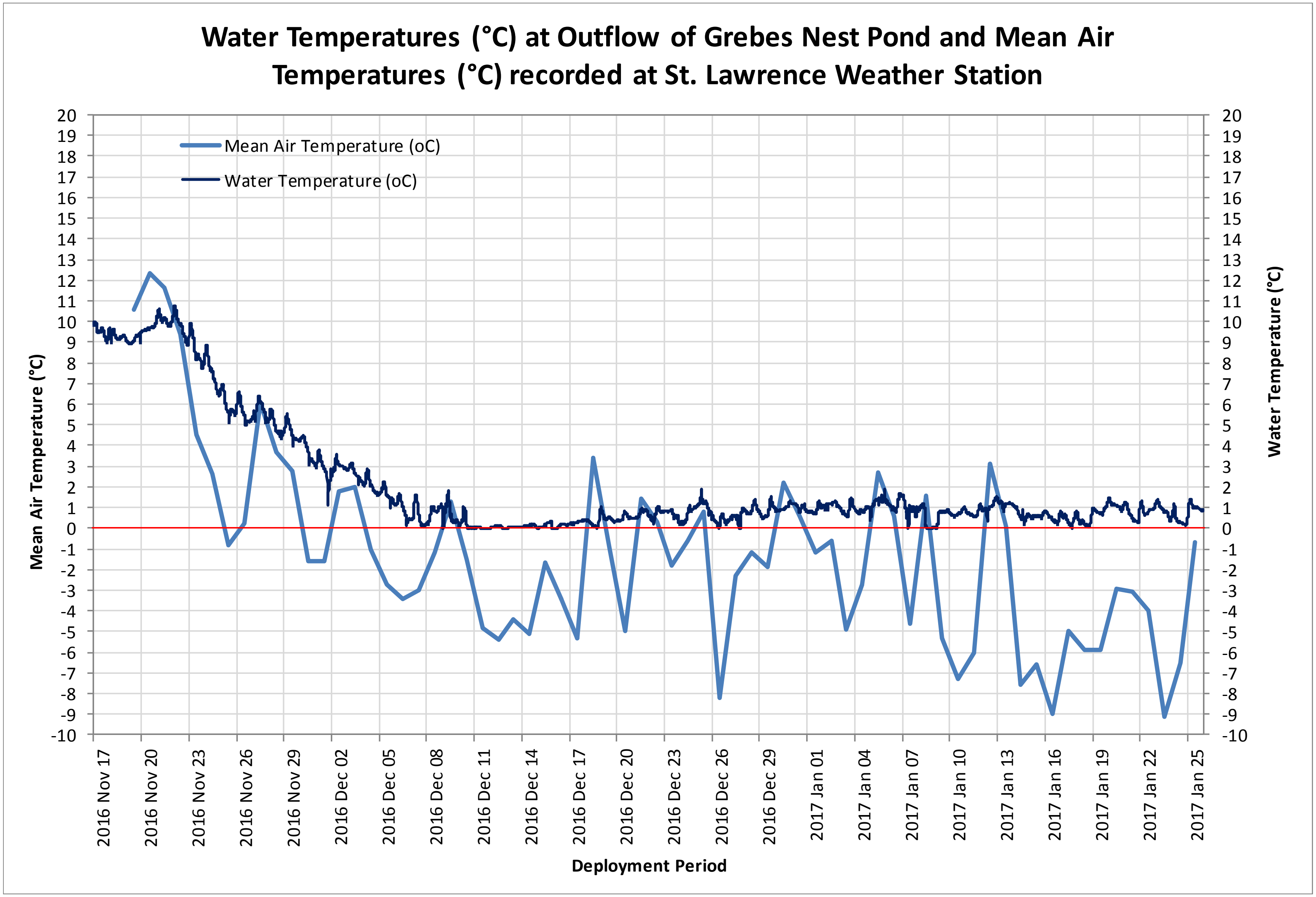

Figure A2: Water Temperatures at Outflow of Grebes Nest Pond and Mean Air Temperatures recorded at St. Lawrence Weather Station

APPENDIX B

COMPARISON GRAPHS OF CANADA FLUORSPAR (NL) INC REAL TIME STATIONS

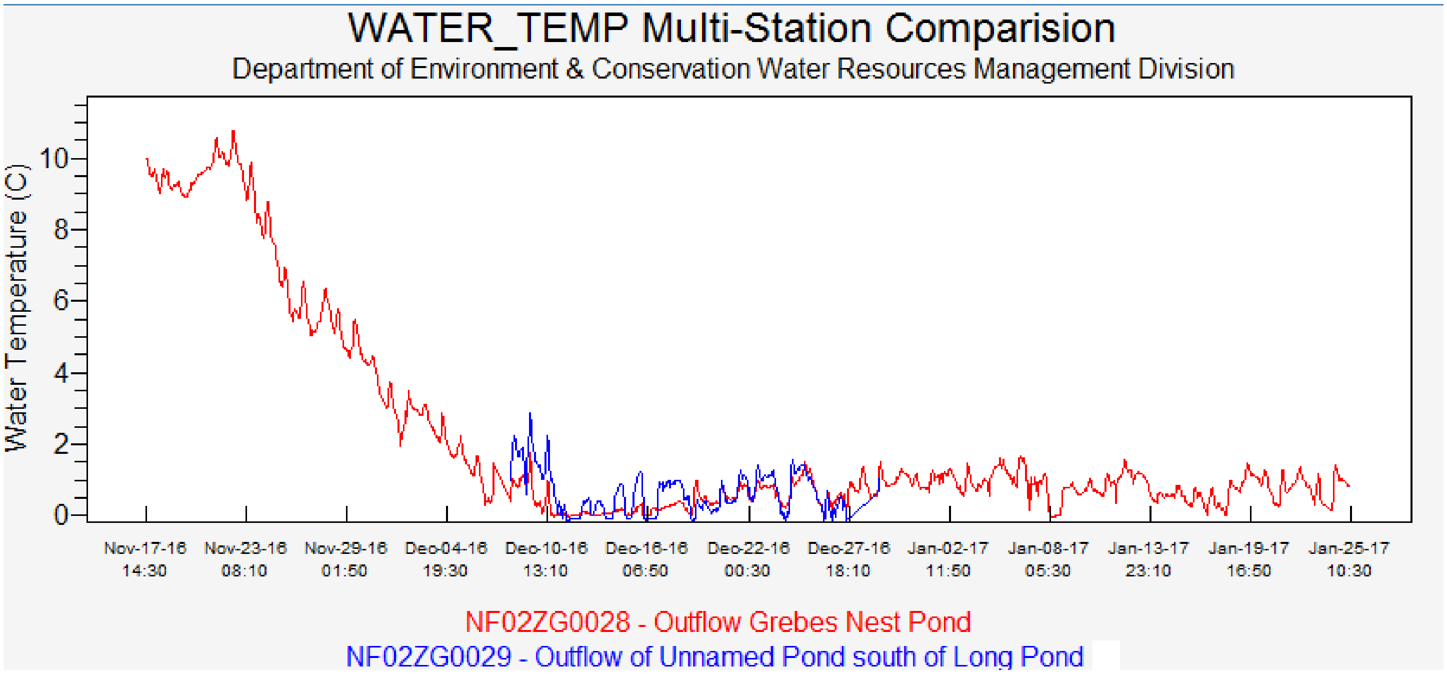

Figure B1: Comparison of Water Temperature (°C) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph, is raw data. It has not been corrected for backwater effect.

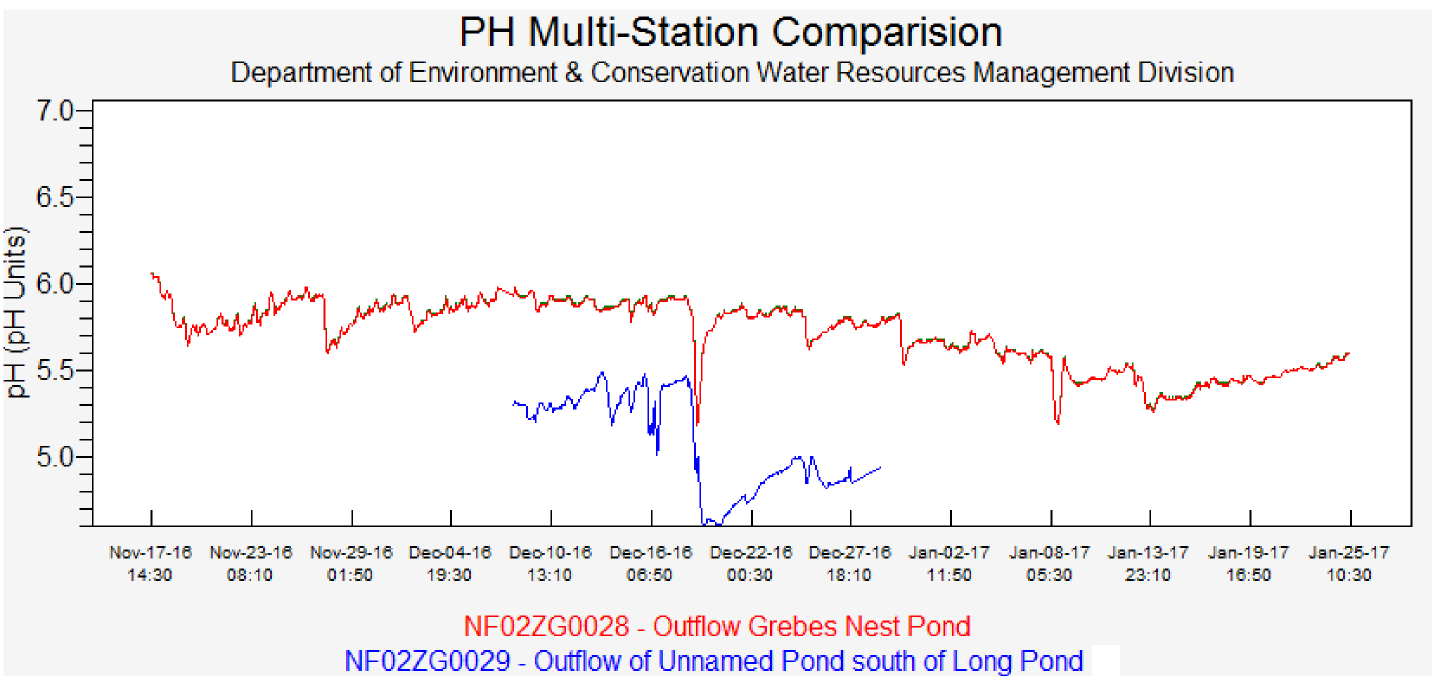

Figure B2: Comparison of pH (pH Units) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph below, is raw data. It has not been corrected for backwater effect.

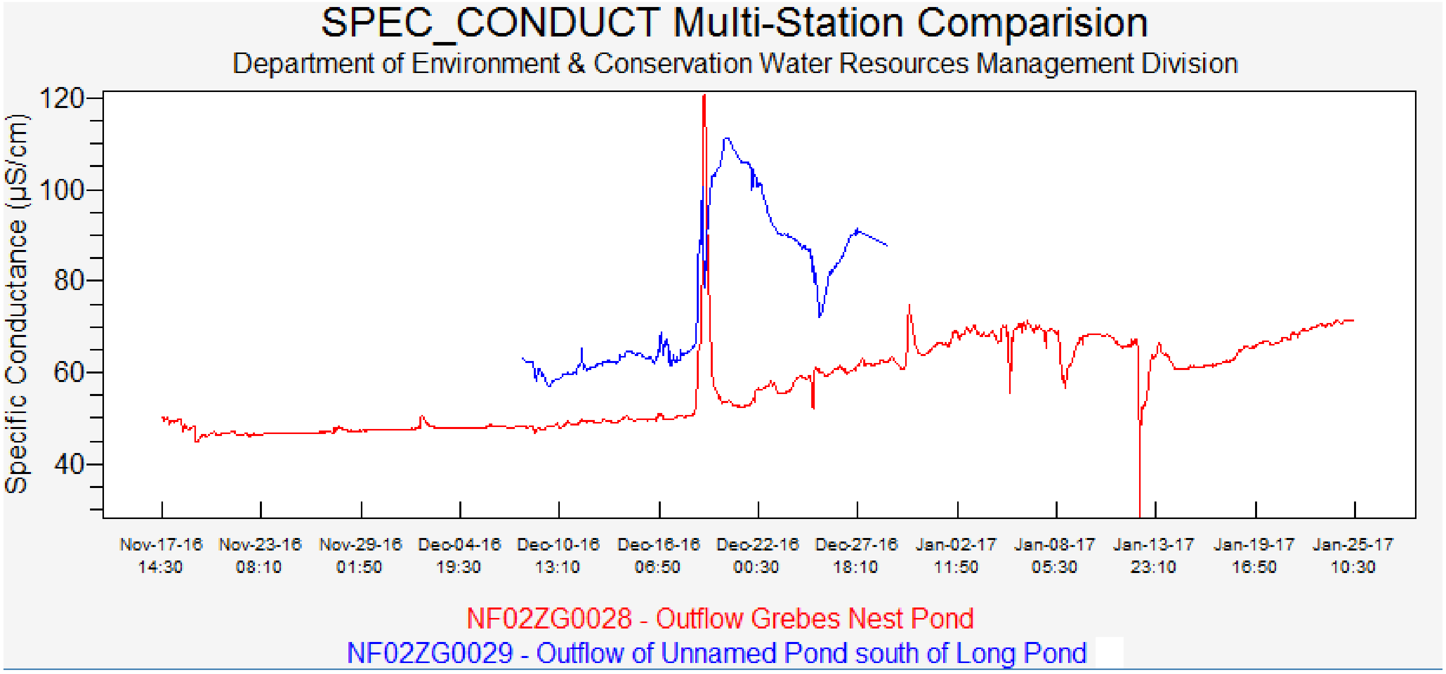

Figure B3: Comparison of Specific Conductivity (µS/cm) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph, is raw data. It has not been corrected for backwater effect.

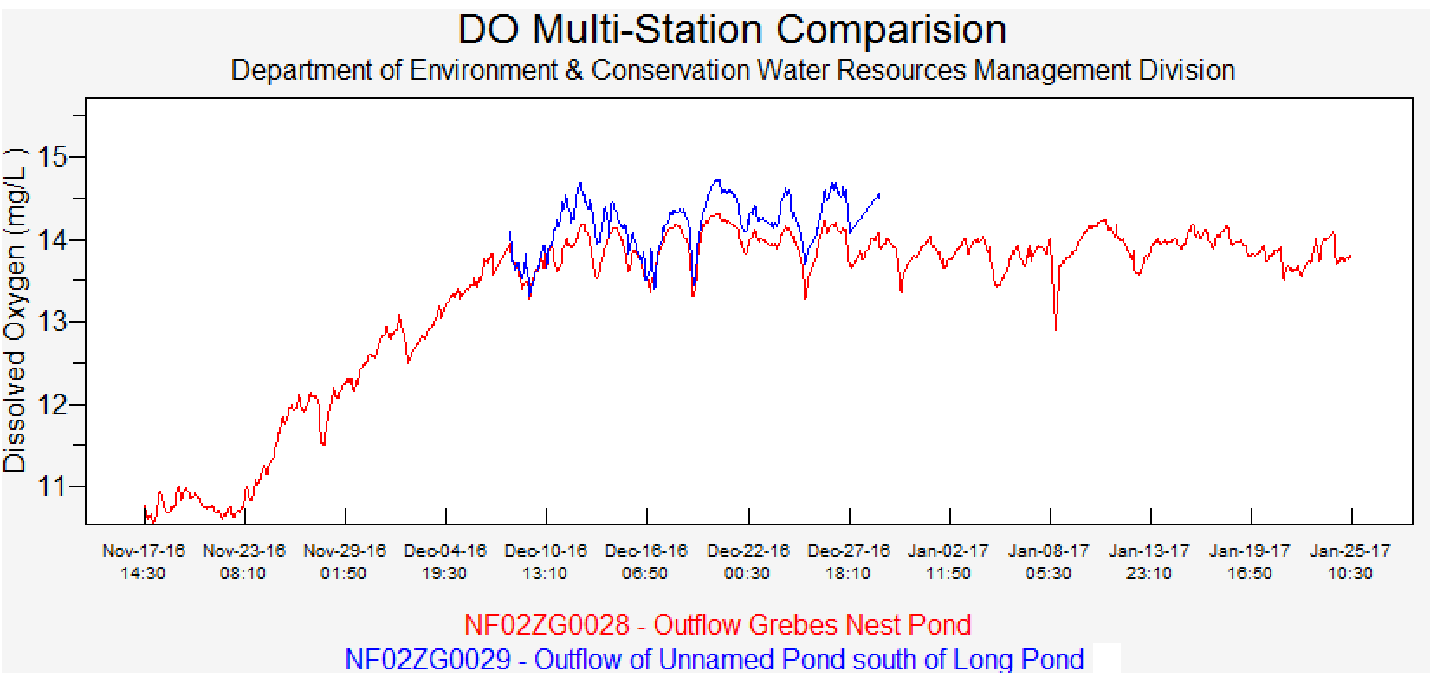

Figure B4: Comparison of Dissolved Oxygen (mg/L) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph, is raw data. It has not been corrected for backwater effect.

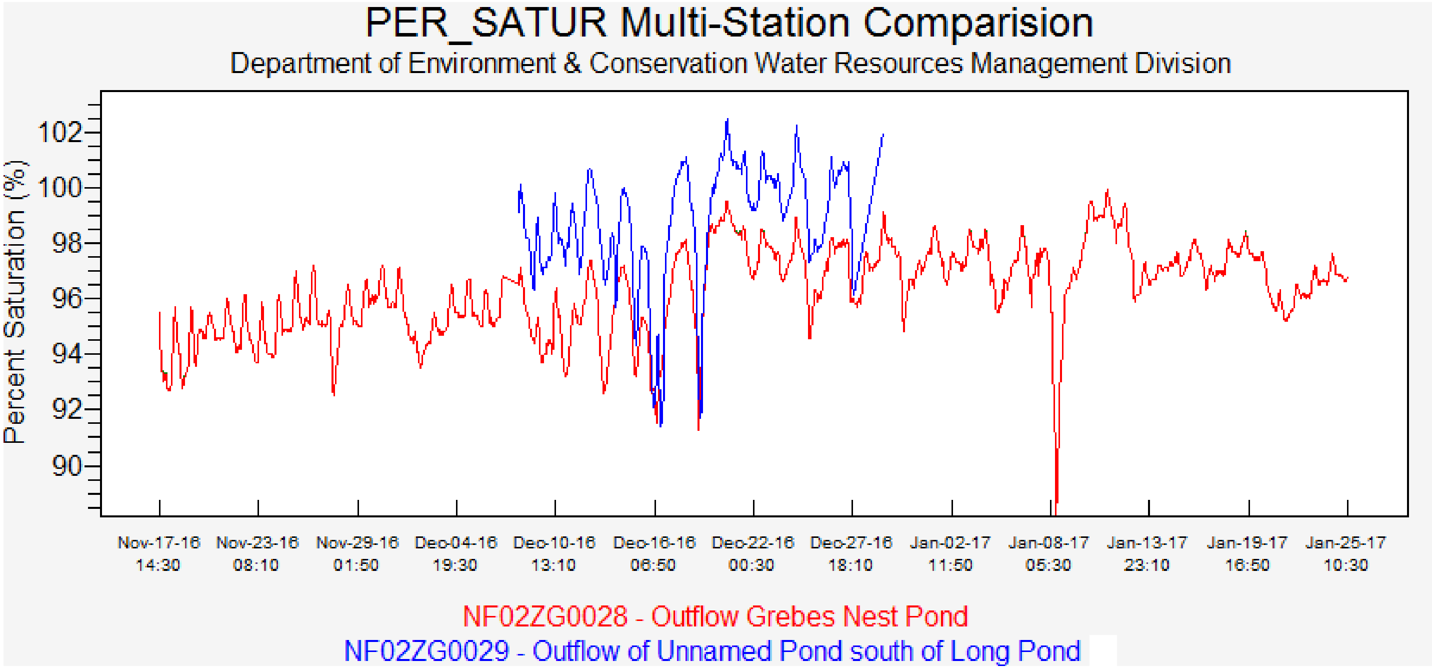

Figure B5: Comparison of Percent saturation of Dissolved Oxygen (%Sat) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note data on this graph, is raw data. It has not been corrected for backwater effect.

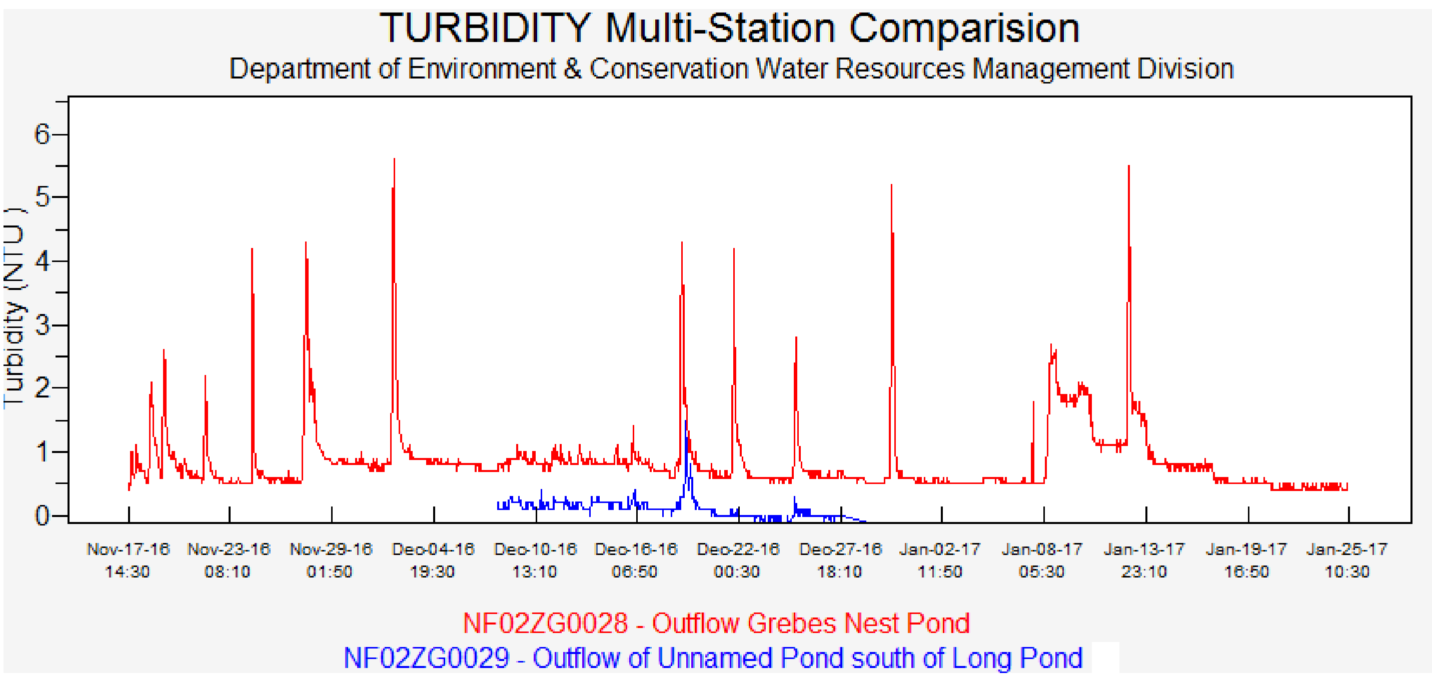

Figure B6: Comparison of Turbidity (NTU) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph, is raw data. It has not been corrected for backwater effect.

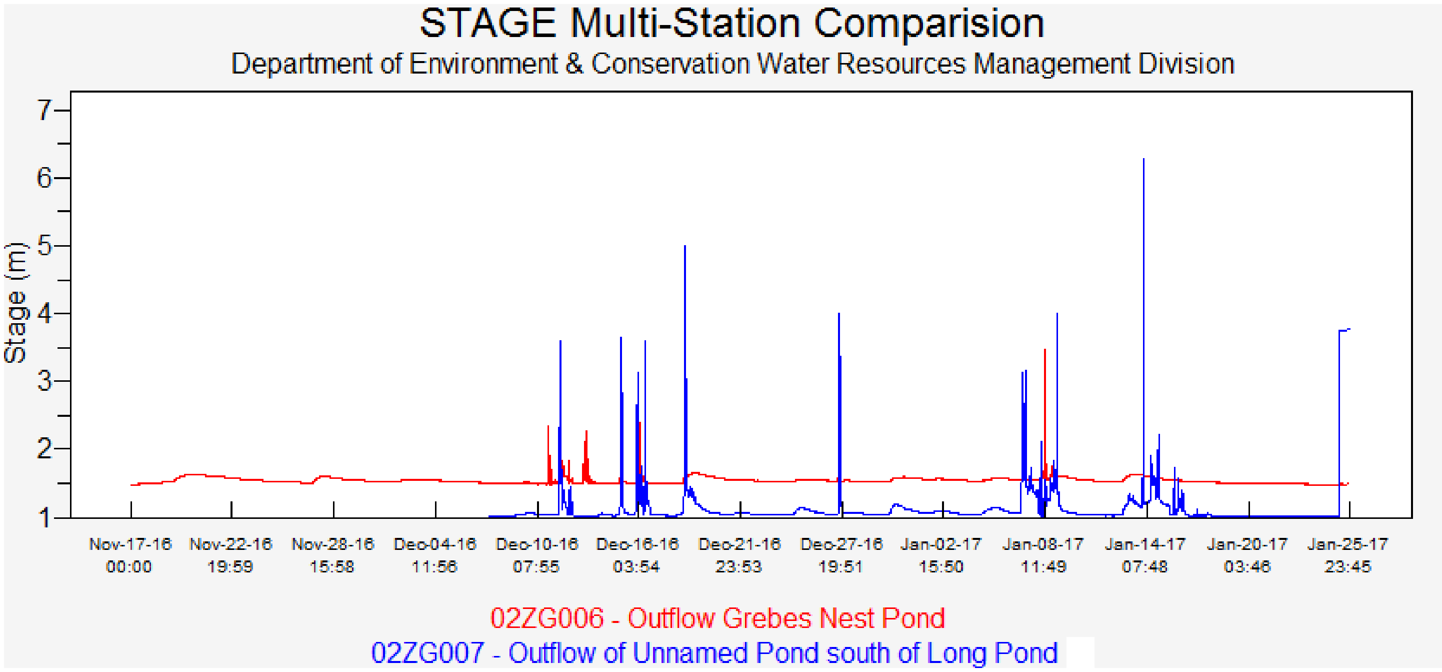

Figure B6: Comparison of Stage (m) at the Real-Time Stations at Canada Fluorspar (NL) Inc. Please note the data on this graph, is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.