



Real-Time Water Quality Deployment Report

Voisey's Bay Network

May 30 to July 10, 2021



Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division

Contents

REAL TIME WATER QUALITY MONITORING	2
QUALITY ASSURANCE AND QUALITY CONTROL	2
DATA INTERPRETATION	4
REID BROOK AT OUTLET OF REID POND	6
CAMP POND BROOK BELOW CAMP POND	12
REID BROOK BELOW TRIBUTARY	18
TRIBUTARY TO REID BROOK	24
CONCLUSIONS	30
REFERENCES	31
APPENDIX A: COMPARISON GRAPHS	32
APPENDIX B: WATER PARAMETER DESCRIPTION	37
APPENDIX C: GRAB SAMPLE RESULTS	39

Prepared by:
Brenda Congram
Environmental Scientist
Water Resources Management Division
Department of Environment and Climate Change
brendacongram@gov.nl.ca

Real Time Water Quality Monitoring

Staff with the Department of Environment and Climate Change monitor the real-time web pages regularly.

This deployment report discusses water quality related events occurring at four stations in the Voisey's Bay Network: Reid Brook at Outlet to Reid Pond; Camp Pond Brook below Camp Pond; Tributary to Reid Brook; and Reid Brook below Tributary.

On May 30, 2021, Vale Environment staff deployed real-time water quality monitoring instruments at the four real-time stations in the Voisey's Bay network. Instruments were removed by Vale Environment Staff on July 10, 2021. This was the first deployment for the 2021 season.

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. This procedure is based on the approach used by the United States Geological Survey.

At deployment and removal, a QA/QC instrument is temporarily deployed adjacent to the field instrument. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the degree of difference between parameters recorded by the field instrument and QA/QC instrument at deployment and at removal, a qualitative statement is made about the data quality (Table 1).

Table 1: Ranking classifications for deployment and removal

Parameter	Rank				
	Excellent	Good	Fair	Marginal	Poor
Temperature (oC)	<=+/-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 instrument is the most important. All other parameters can be broken down into three groups: temperature dependent; temperature compensated; and temperature independent. Because the temperature sensor is not isolated from the rest of the instrument, the entire instrument must be at the same temperature before the 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.

Deployment and removal comparison rankings for the Voisey's Bay Network stations are summarized in Table 2.

Table 2: Comparison rankings for Voisey's Bay Network stations

Station Voisey's Bay	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Reid Brook at Outlet	May 30	Deployment	Good	Good	Excellent	Excellent	Excellent
	July 10	Removal	Excellent	Fair	Excellent	Excellent	Excellent
Camp Pond Brook	May 30	Deployment	Excellent	Good	Good	Excellent	Excellent
	July 10	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Reid Brook below Tributary	May 30	Deployment	Excellent	Good	Good	Poor	Excellent
	July 10	Removal	Excellent	Good	Excellent	Excellent	Excellent
Tributary to Reid Brook	May 30	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	July 10	Removal	Excellent	Good	Excellent	Good	Poor

Reid Brook at Outlet of Reid Pond

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- At removal, all parameters ranked as 'excellent' with the exception of pH, which ranked as 'fair'.

Camp Pond Brook below Camp Pond

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- At removal, all parameters ranked as 'excellent'.

Reid Brook below Tributary

- At deployment, all parameters ranked as either 'excellent' or 'good' with the exception of dissolved oxygen, which was 'poor'. The discrepancy in dissolved oxygen is likely attributed to the field sonde not being given adequate time to acclimate; this is supported by the first transmitted reading from the field sonde being much closer to that of the QA/QC sonde.
- At removal, all parameters ranked as either 'excellent' or 'good'.

Tributary to Reid Brook

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- At removal, all parameters ranked as either 'excellent' or 'good' with the exception of turbidity, which was 'poor'. This discrepancy is attributable to significant sediment build-up around the turbidity sensor on the field sonde.

It is important to note that, in general, there are several conditions under which a less than ideal QA/QC ranking may be obtained. These include, but are not limited to: placement of the QA/QC sonde in relation to the field sonde; the amount of time each sonde is given to stabilize before readings are recorded; and deteriorating performance of one or more of the sensors.

Data Interpretation

The following graphs and discussion illustrate significant water quality-related events from May 30th to July 10th, 2021 in the Voisey's Bay Real-Time Water Quality Monitoring Network.

With the exception of water quantity data (stage and flow), all data used in the preparation of the graphs and subsequent discussion below adhere to stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

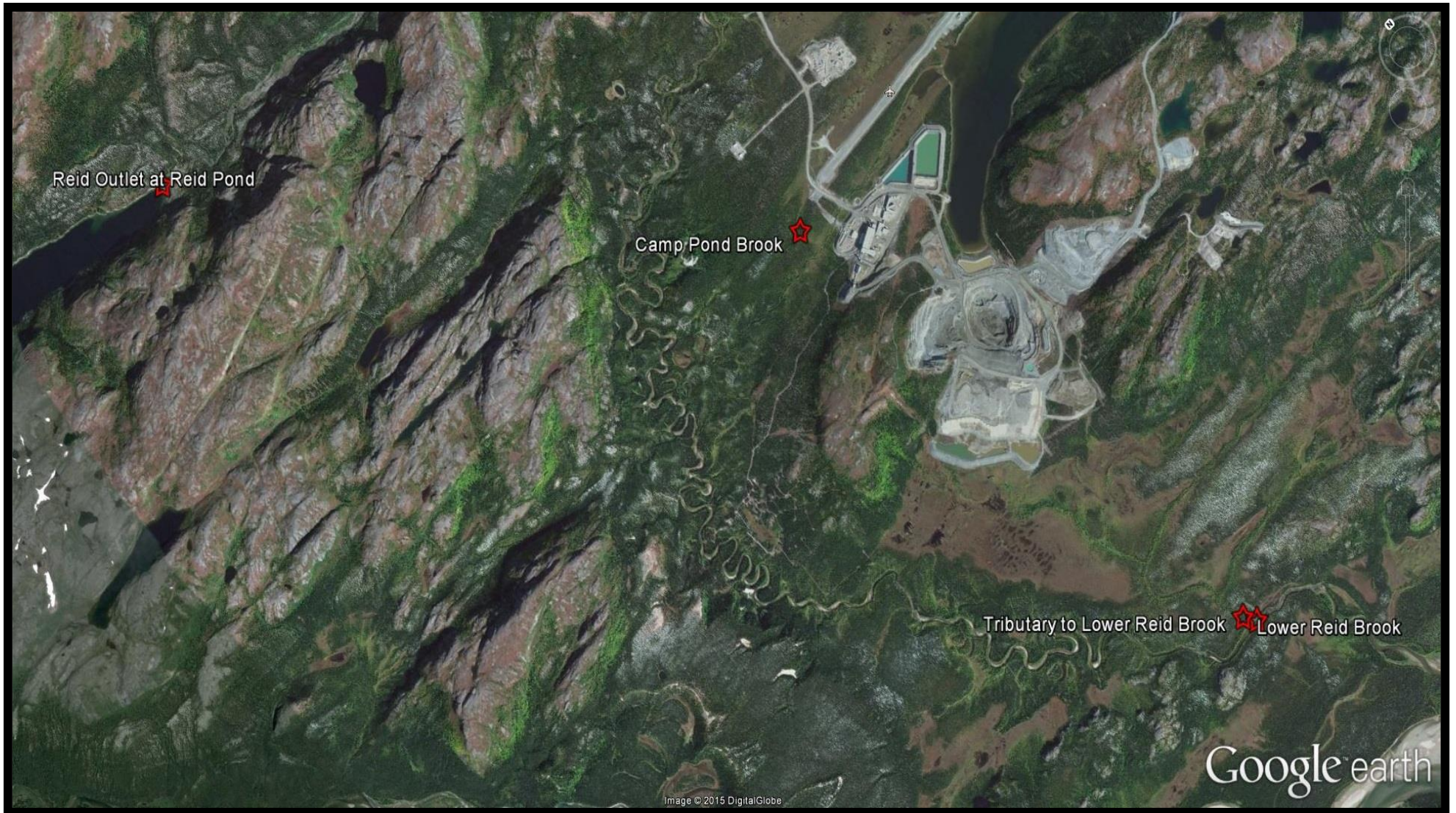


Figure 1: Voisey's Bay Network Station Locations

Reid Brook at Outlet of Reid Pond

Water Temperature

Over the deployment period, water temperature ranged from 1.29°C to 13.28°C, with a median value of 3.31°C (Figure 2). The very stable water temperature observed over the first half of deployment can be attributed to Reid Pond still being covered with ice. As evidenced in the graph below, air temperature fluctuates to a much greater extent each day compared to water temperature. Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Water temperature slowly increased over the course of the deployment period, as did air temperature. This water body takes longer to acclimatize to changes in temperature as it has a much larger surface area compared to the brooks at the other RTWQ stations in this network.

Please note the stage data used 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.

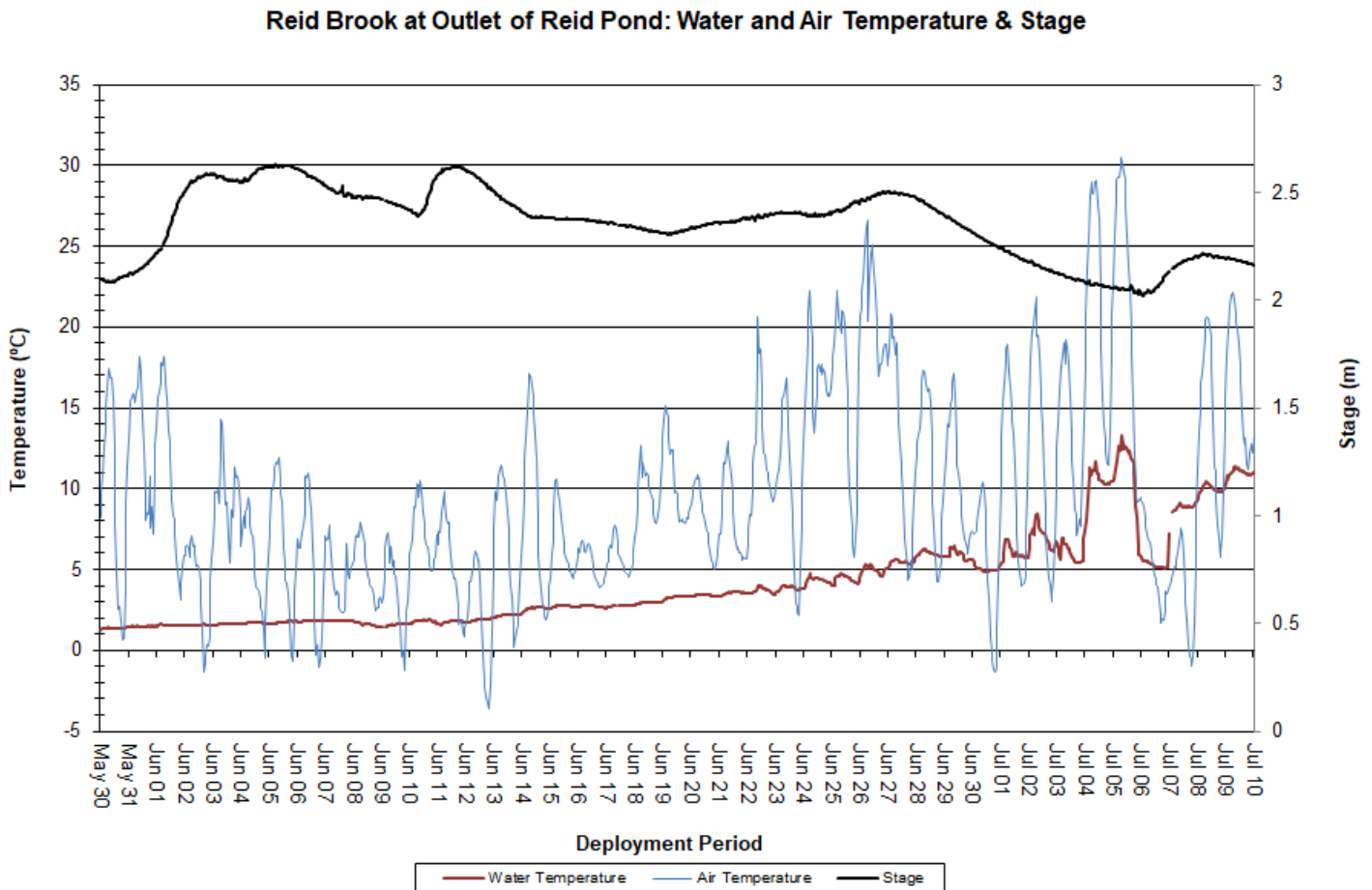


Figure 2: Water and Air Temperature & Stage at Reid Brook at Outlet of Reid Pond

pH

Over the deployment period, pH values ranged from 6.07 pH units to 6.72 pH units, with a median value of 6.44 pH units (Figure 3).

pH levels were below the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period. This is not unusual for this station.

Please note the stage data used 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.

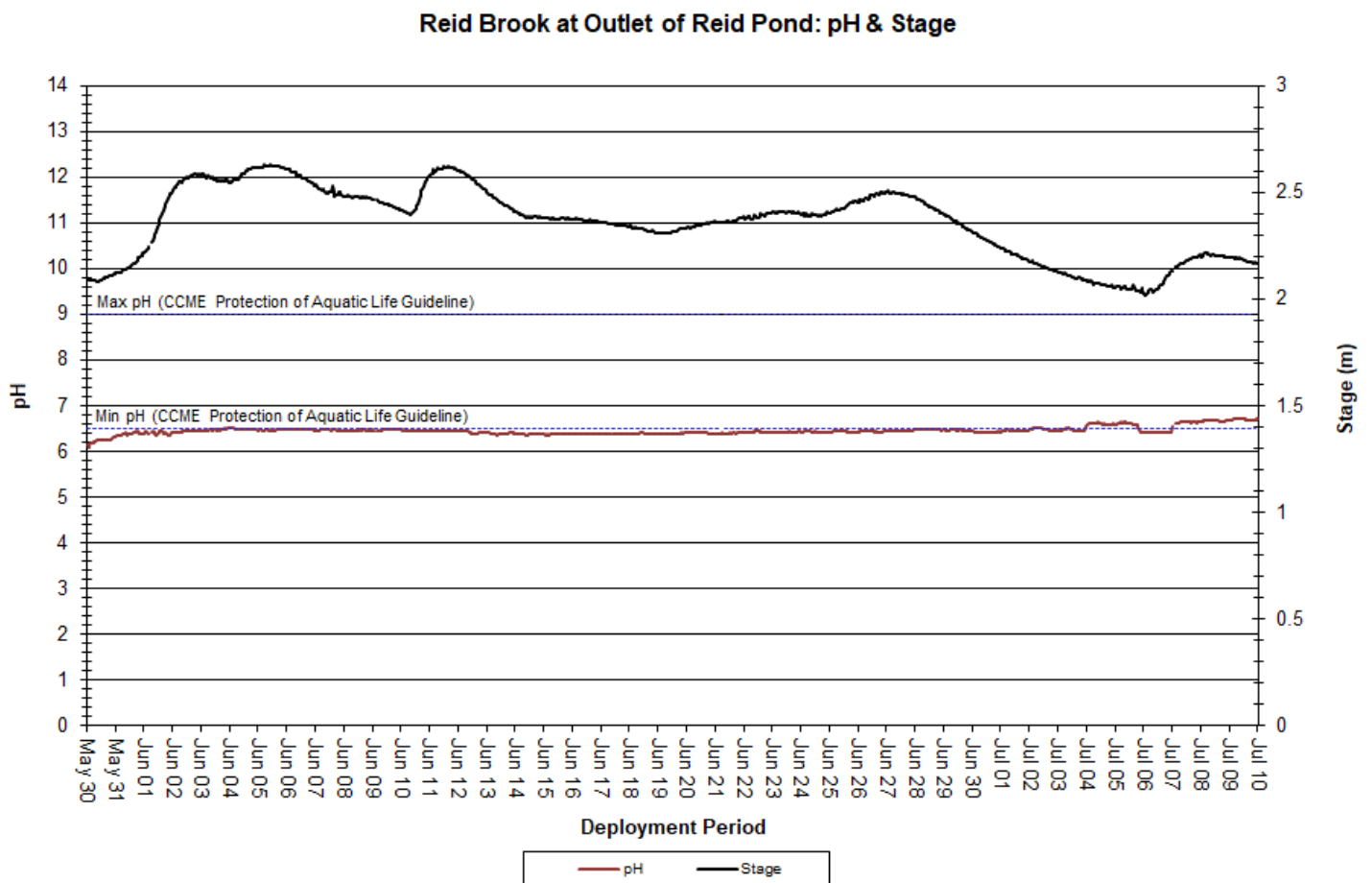


Figure 3: pH & Stage at Reid Brook at Outlet of Reid Pond

Specific Conductivity

Over the deployment period, specific conductivity levels ranged from 10.4 μ S/cm to 12.7 μ S/cm, with a median value of 10.8 μ S/cm. Conductivity at Reid Brook remained very stable across the deployment period. This is to be expected as this water body is pristine in nature and is far removed from any anthropogenic disturbances that could affect water quality.

The relationship between conductivity and stage level is generally inversed. When stage levels decrease, specific conductivity levels increase, as the decreased amount of water in the river system concentrates the solids that are present. Similarly, as stage levels rise, conductivity levels will dip in response. This relationship is not as evident at Reid Brook as it is at other stations in the Voisey's Bay network (Figure 4).

Please note the stage data used 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.

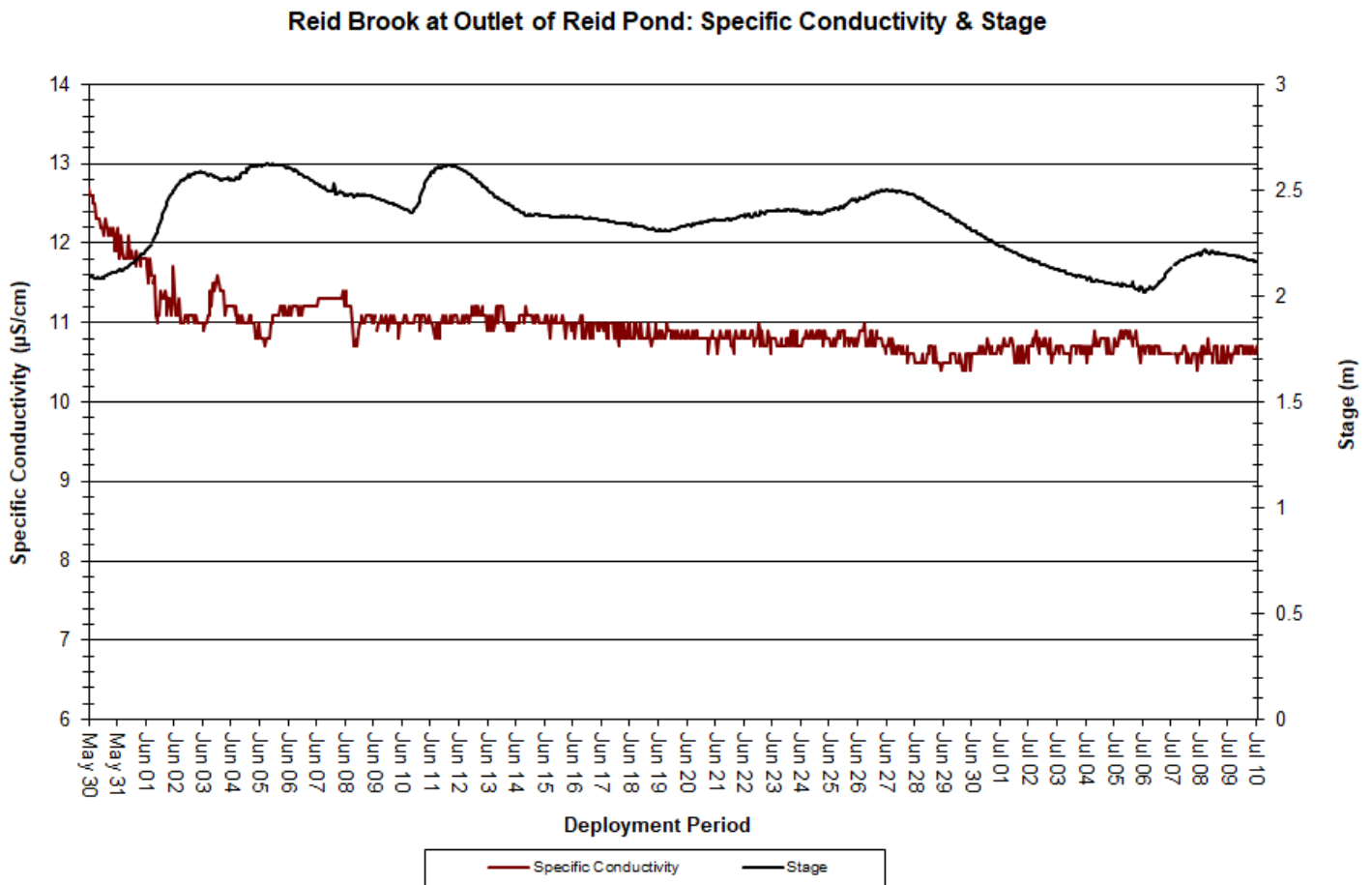


Figure 4: Specific Conductivity & Stage at Reid Brook at Outlet of Reid Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration levels ranged from 11.54mg/L to 14.48mg/L, with a median value of 12.68mg/L. Percent saturation levels for dissolved oxygen ranged from 89.8% saturation to 112.3% saturation, with a median value of 95.7% saturation (Figure 5).

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

Dissolved oxygen concentration values remained above the CCME's Guidelines for the Protection of Early Life Stages (9.5 mg/L) and Other Life Stages (6.5 mg/L) for the duration of deployment. Dissolved oxygen concentrations were steady, but slowly decreasing, across the deployment period; this is not unexpected given that water temperatures were steady, but slowly increasing, across the same period. Dissolved oxygen concentrations are generally higher in water at lower temperatures, and vice versa.

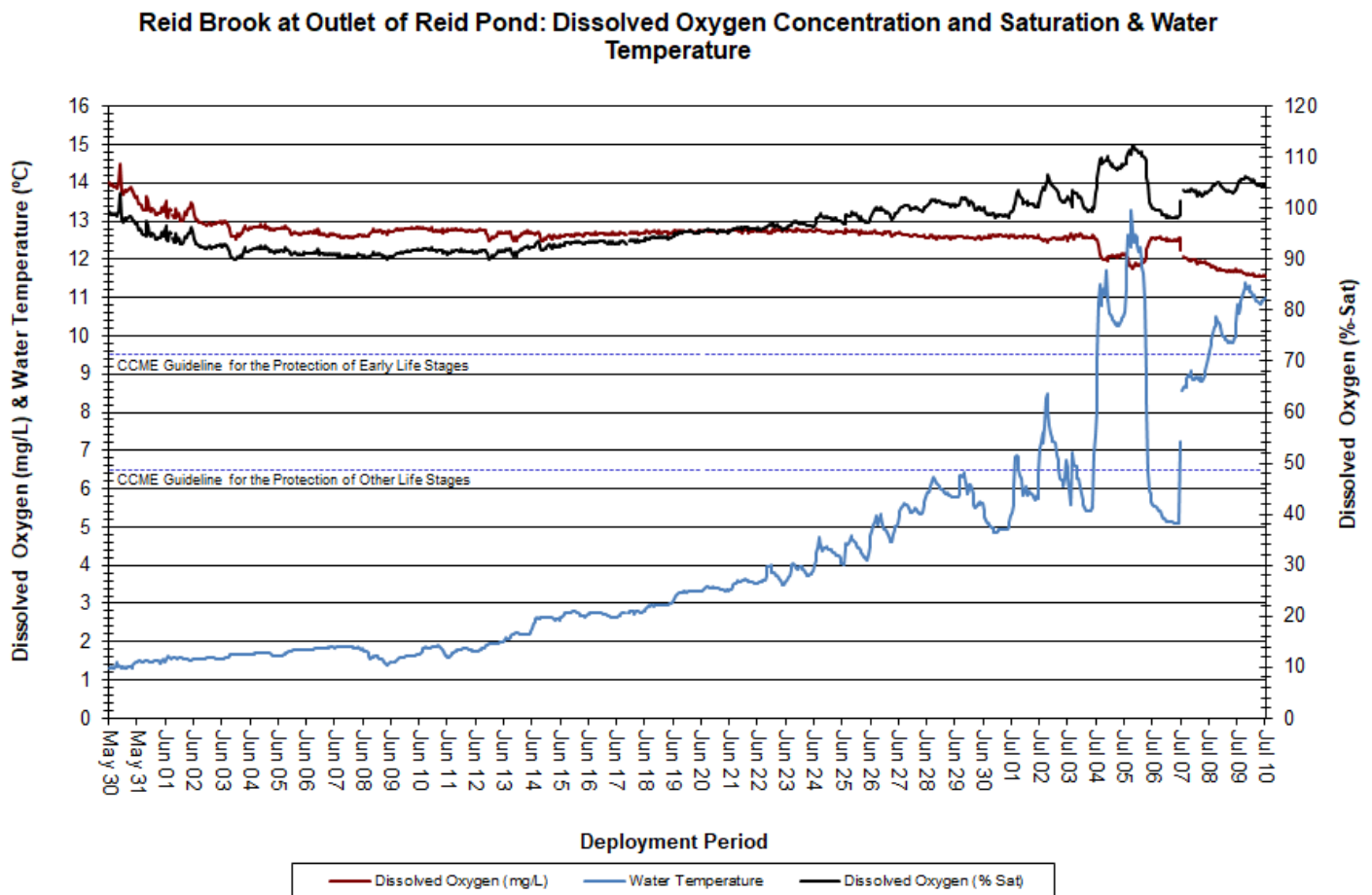


Figure 5: Dissolved Oxygen Concentration and Saturation & Water Temperature at Reid Brook at Outlet of Reid Pond

Turbidity

Over the deployment period, turbidity levels ranged from 0.4NTU to 5.0NTU, with a median value of 0.9NTU (Figure 6). This indicates that there was very little background turbidity at this station during deployment.

All water bodies have a natural level of turbidity. A significant increase in turbidity is of concern when monitoring water quality. Higher turbidity readings would normally be expected during heavy rainfall or runoff events. Generally, turbidity levels increase for a short period of time and then return to within a baseline range. Turbidity values can also increase when there is a decrease in water level, which causes natural material in the water body to become concentrated.

It is not unusual for this station to see very little variability in turbidity levels, as it is pristine in nature and far removed from anthropogenic influences that may affect water quality.

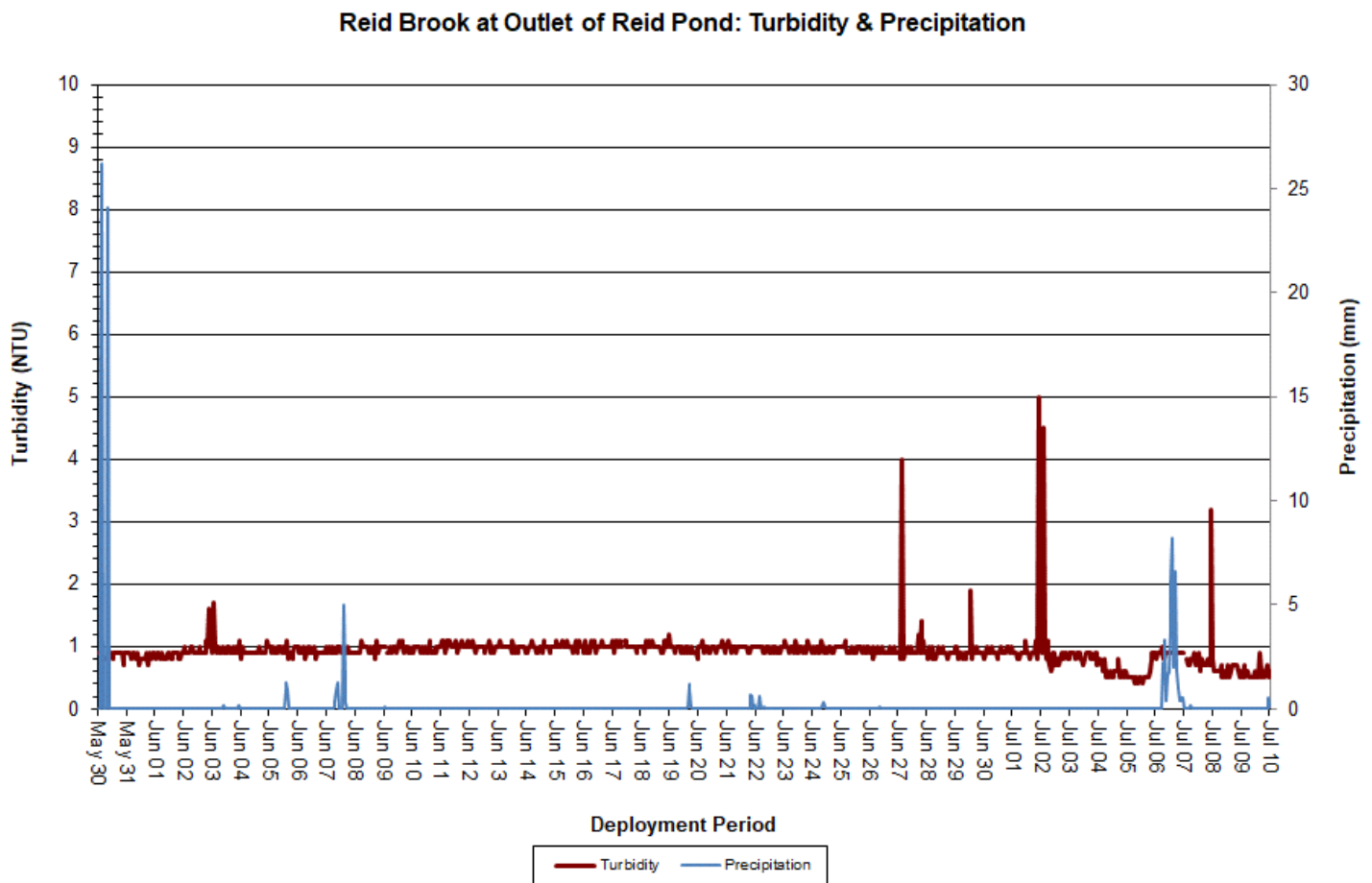


Figure 6: Turbidity & Precipitation at Reid Brook at Outlet of Reid Pond

Stage, Flow & Precipitation

Stage is an important parameter, as it provides an estimate of water level at a station and can explain some of the events that are occurring with other parameters (e.g. specific conductivity, DO, and turbidity). Stage will generally increase during rainfall events (Figure 7) and during any surrounding snow or ice melt; however, direct snowfall will not cause a significant increase in stage.

Over the deployment period, stage values ranged from 2.019m to 2.628m, with a median value of 2.38m. Flow values ranged from 3.71m³/s to 16.85m³/s, with a median value of 9.53m³/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 7).

Please note the stage and flow data used 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.

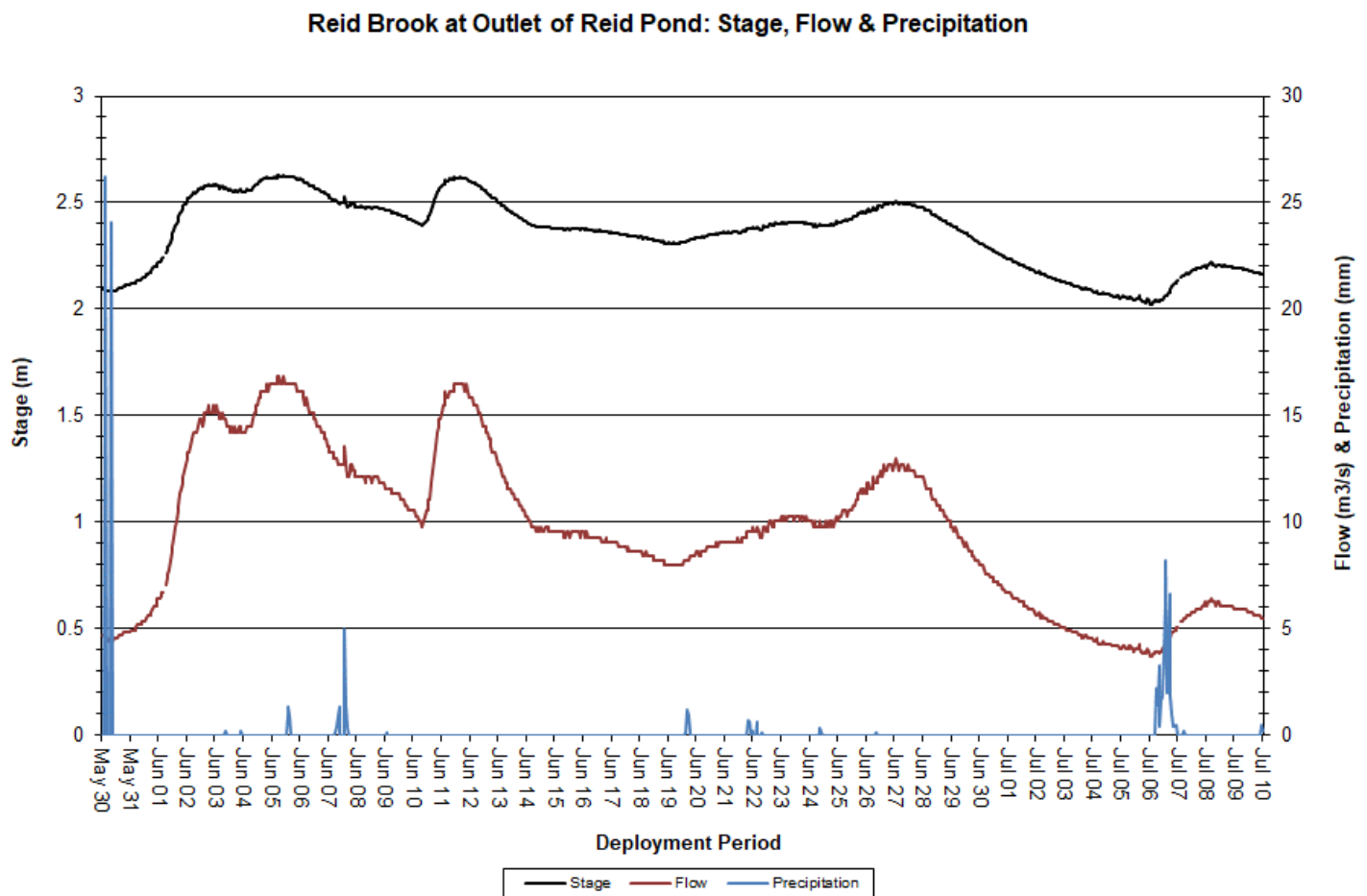


Figure 7: Stage, Flow & Precipitation at Reid Brook at Outlet of Reid Pond

Camp Pond Brook below Camp Pond

Water Temperature

Over the deployment period, water temperature ranged from 2.66°C to 21.23°C, with a median value of 10.38°C (Figure 8).

Water temperature at this station displays diurnal variations. There was a gradual increase in water temperature over the course of deployment. This is to be expected as air temperatures generally increased with the change from spring to summer (Figure 8). Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Camp Pond Brook is sensitive to changes in ambient air temperature and fluctuates considerably depending on the weather and time of day. This station typically has the highest water temperatures and greatest fluctuations when compared to the other stations in the network.

Please note the stage data used 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.

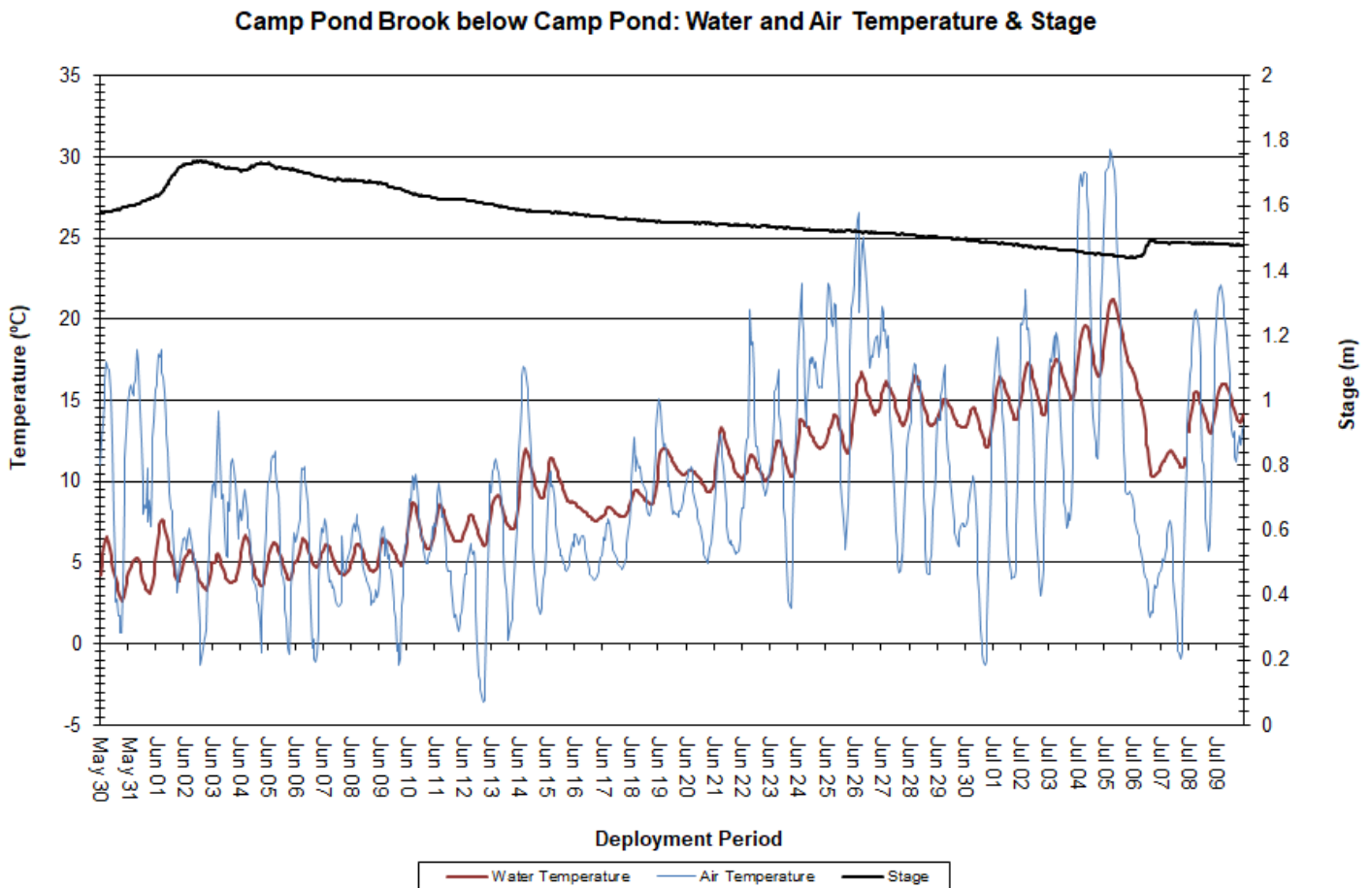


Figure 8: Water and Air Temperature & Stage at Camp Pond Brook below Camp Pond

pH

Over the deployment period, pH values ranged from 6.30 pH units to 6.79 pH units, with a median value of 6.54 pH units (Figure 9).

pH levels were relatively stable over the course of deployment, hovering above and below the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period.

Natural events such as rainfall and snow melt will alter the pH of a brook for a period of time - pH levels will decrease slightly during and after high stage levels. This is a natural process and may have contributed to lower pH levels observed at the beginning of the deployment period.

Please note the stage data used 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.

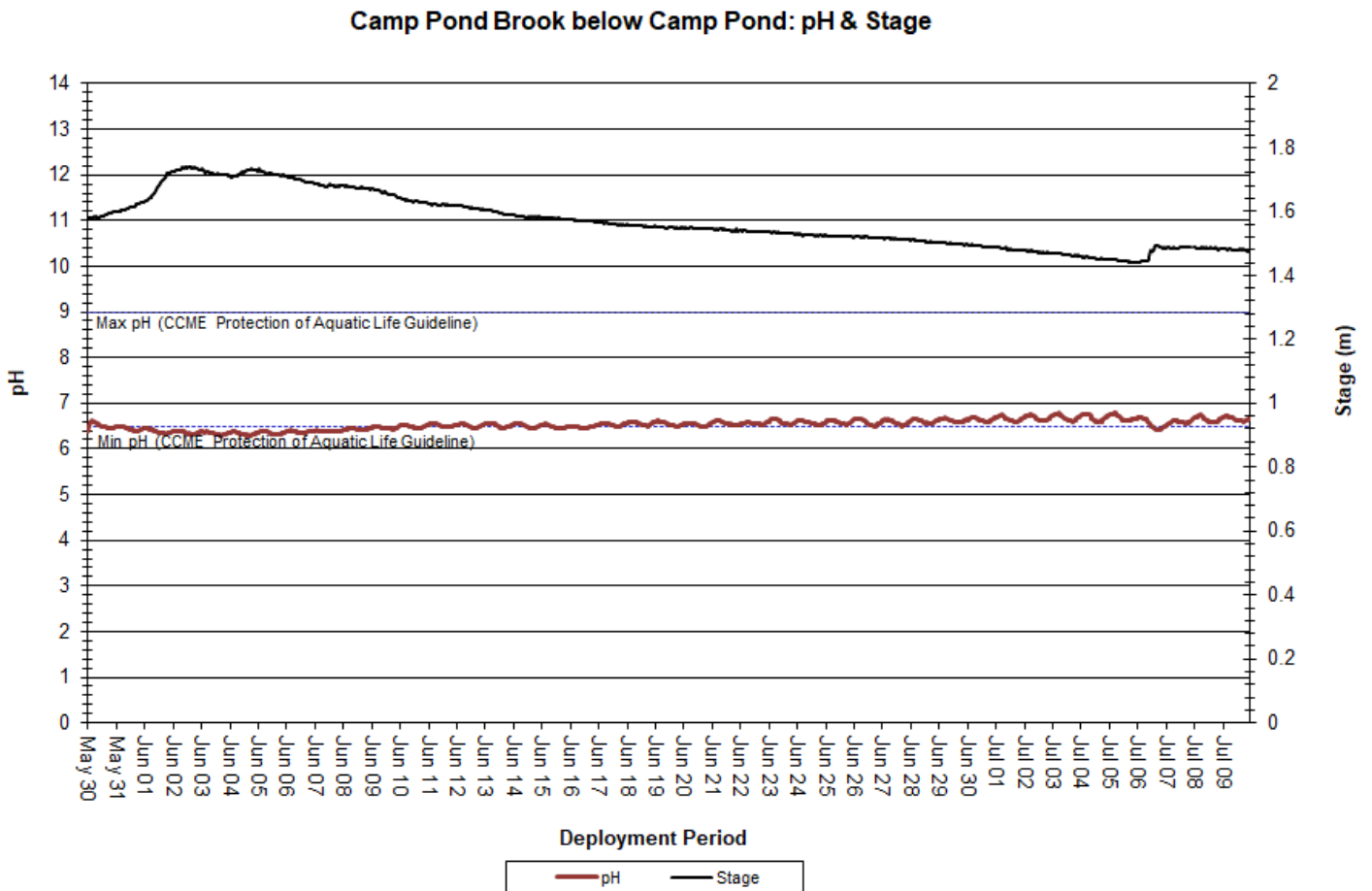


Figure 9: pH & Stage at Camp Pond Brook below Camp Pond

Specific Conductivity

Over the deployment period, specific conductivity ranged from 20.2 μ S/cm to 53.1 μ S/cm, with a median value of 29.2 μ S/cm (Figure 10).

Conductivity levels were variable but slowly increasing across the deployment period as stage gradually decreased. A decrease in water level generally serves to concentrate suspended materials in the water column, in turn increasing specific conductivity (Figure 10).

Please note the stage data used 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.

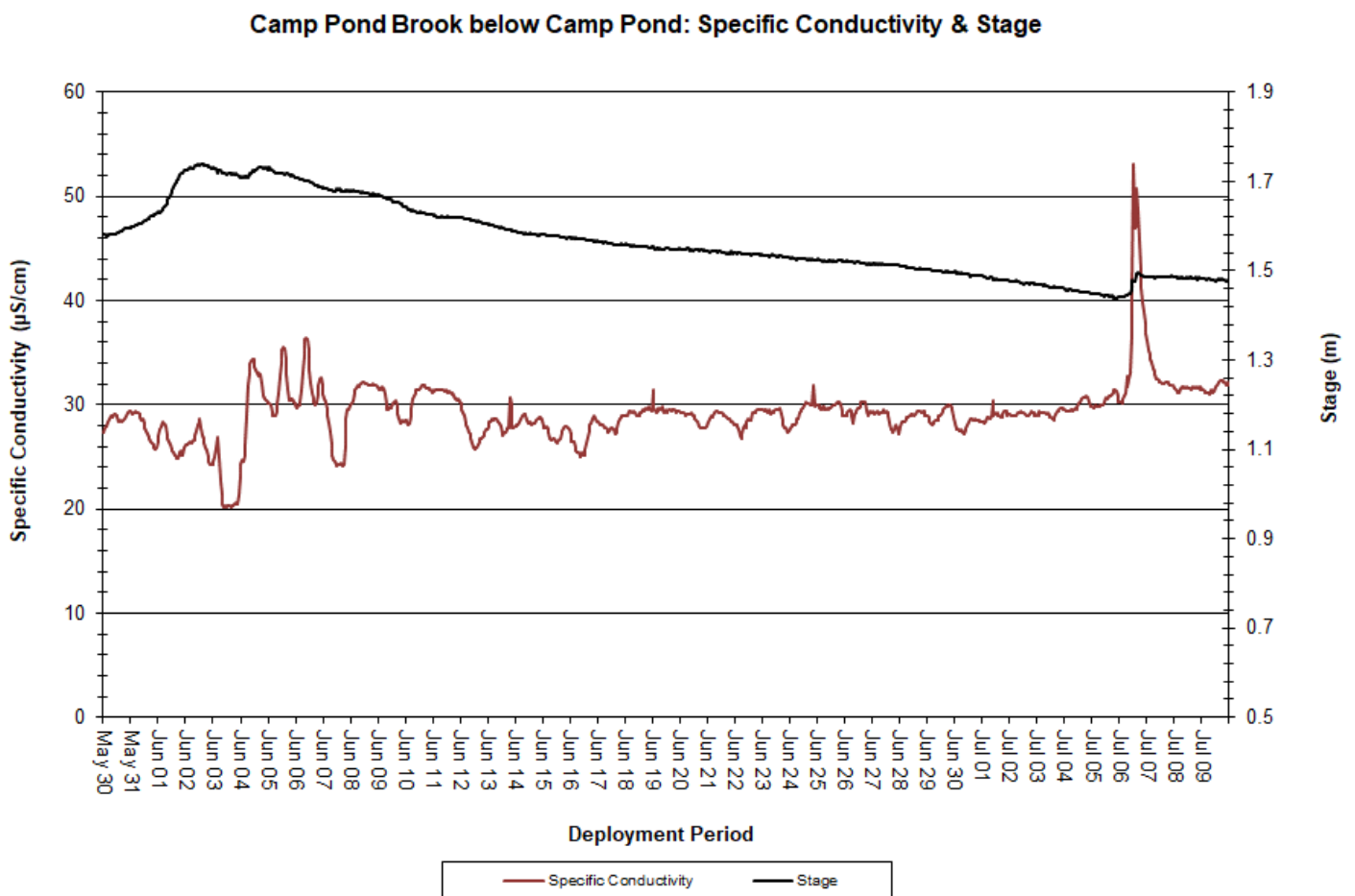


Figure 10: Specific Conductivity & Stage at Camp Pond Brook below Camp Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 8.68mg/L to 12.37mg/L, with a median value of 10.80mg/L. Saturation of dissolved oxygen ranged from 82.4% saturation to 101.8% saturation, with a median value of 94.7% (Figure 11).

Dissolved oxygen concentrations were slowly decreasing across the deployment period, as water temperatures slowly increased through June and July. This observation is to be expected as water temperature directly influences the level of dissolved oxygen present in the water column; as water temperatures increase, dissolved oxygen concentrations decrease, and vice versa.

Dissolved oxygen concentrations remained above the CCME's Guidelines for the Protection of Early and Other Life Stages until early July, after which they periodically fell below the CCME's Guideline for the Protection of Early Life Stages (Figure 11).

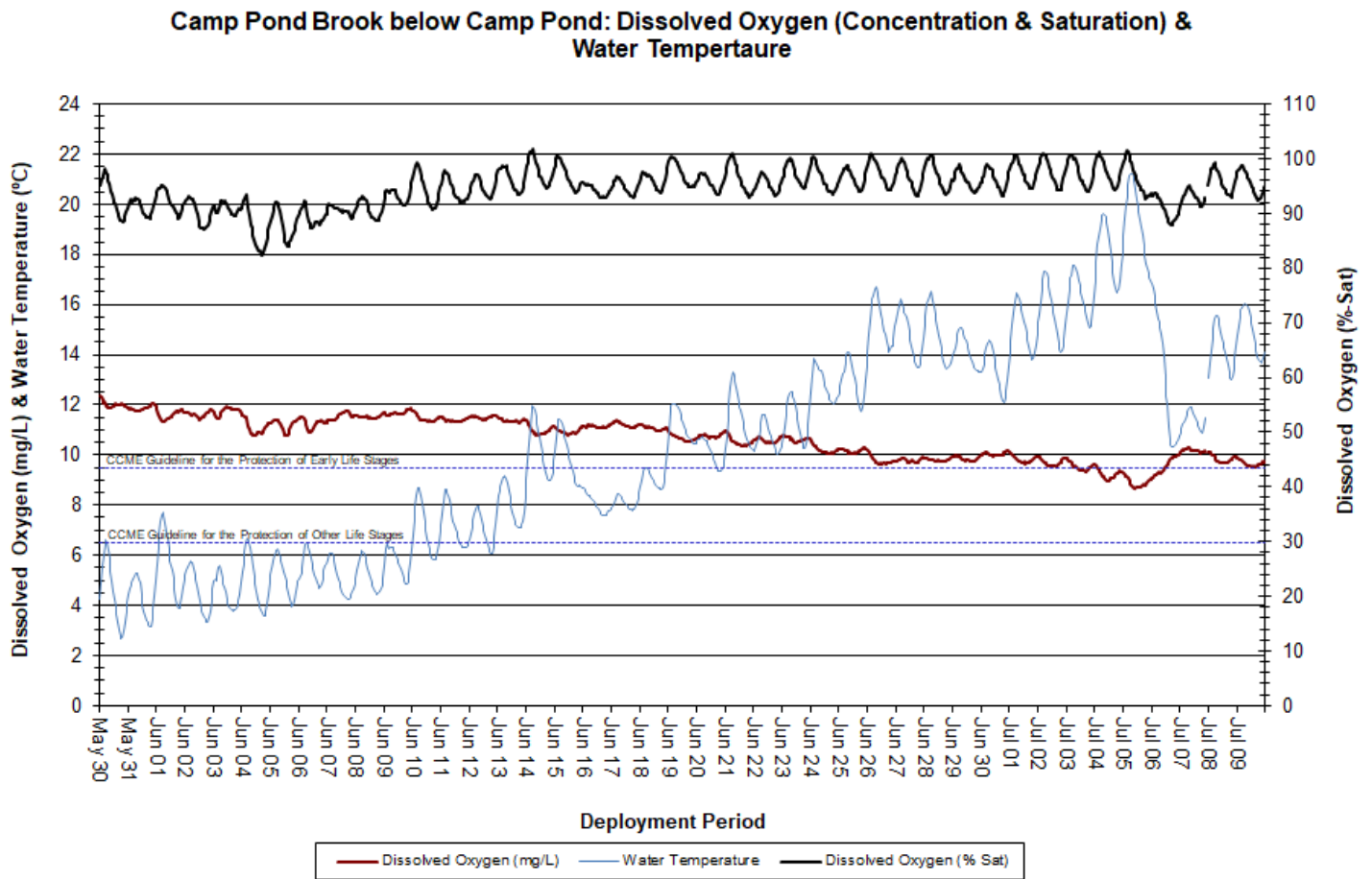


Figure 11: Dissolved Oxygen & Water Temperature at Camp Pond Brook below Camp Pond

Turbidity

Over the deployment period, turbidity ranged from 0.1NTU to 80.0NTU, with a median value of 1.7NTU (Figure 12). A median value of 1.7NTU indicates that there was a low level of natural background turbidity at this station.

Higher turbidity levels are commonly observed at this station and are likely attributable to precipitation events and subsequent runoff entering Camp Pond Brook (Figure 12). Precipitation data was obtained from the Voisey's Bay airstrip weather station.

Camp Pond Brook below Camp Pond: Turbidity & Precipitation

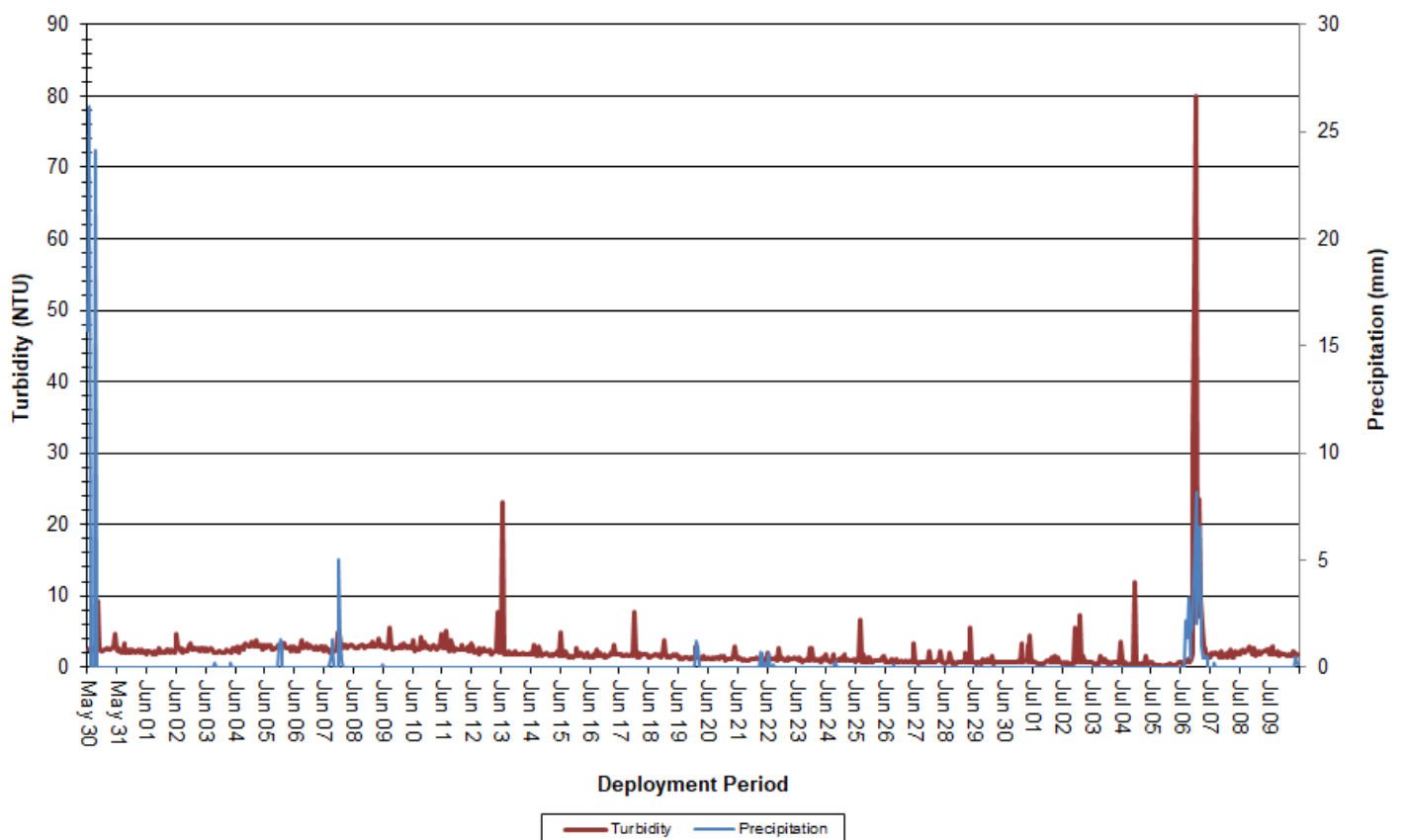


Figure 12: Turbidity & Precipitation at Camp Pond Brook below Camp Pond

Stage, Flow and Precipitation

Over the deployment period, stage values ranged from 1.44m to 1.74m, with a median value of 1.55m. Stream flow values ranged from 0.631m³/s to 2.856m³/s, with a median value of 1.259m³/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 13).

Stage generally decreased across the deployment period. Increases in stage were observed on May 30th and July 6th, which can be attributed to observed rainfall events (Figure 13).

Please note the stage and flow data used 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.

Camp Pond Brook below Camp Pond: Stage, Flow & Precipitation

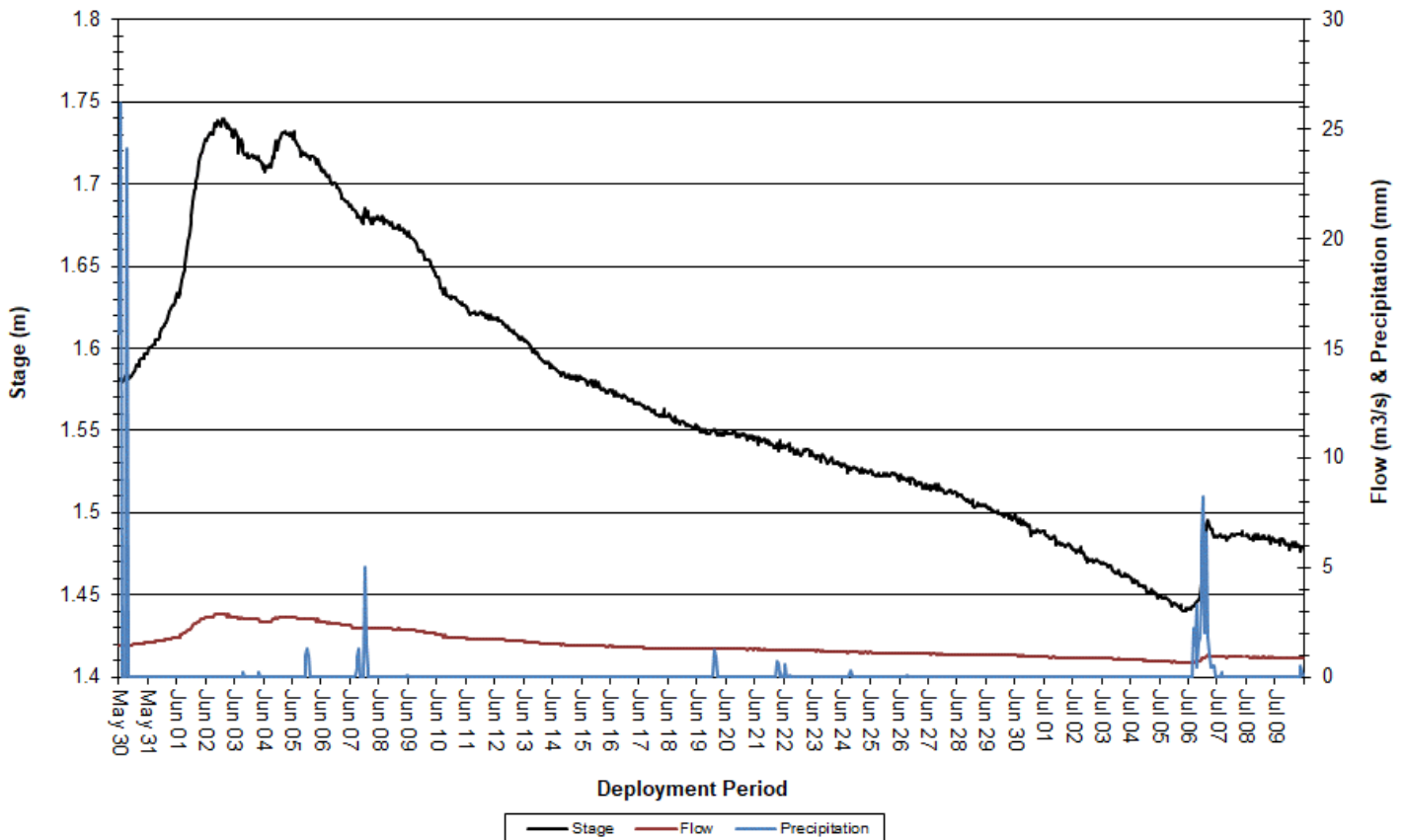


Figure 13: Stage, Flow & Precipitation at Camp Pond Brook below Camp Pond

Reid Brook below Tributary

Water Temperature

Over the deployment period, water temperature ranged from 1.44°C to 17.06°C, with a median value of 7.20°C (Figure 14).

Water temperature at this station displays diurnal variations, and there was a gradual increase in water temperature throughout the deployment period. This is to be expected as air temperatures also increased (Figure 14). Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Please note the stage and flow data used 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.

Reid Brook below Tributary: Water and Air Temperature & Stage

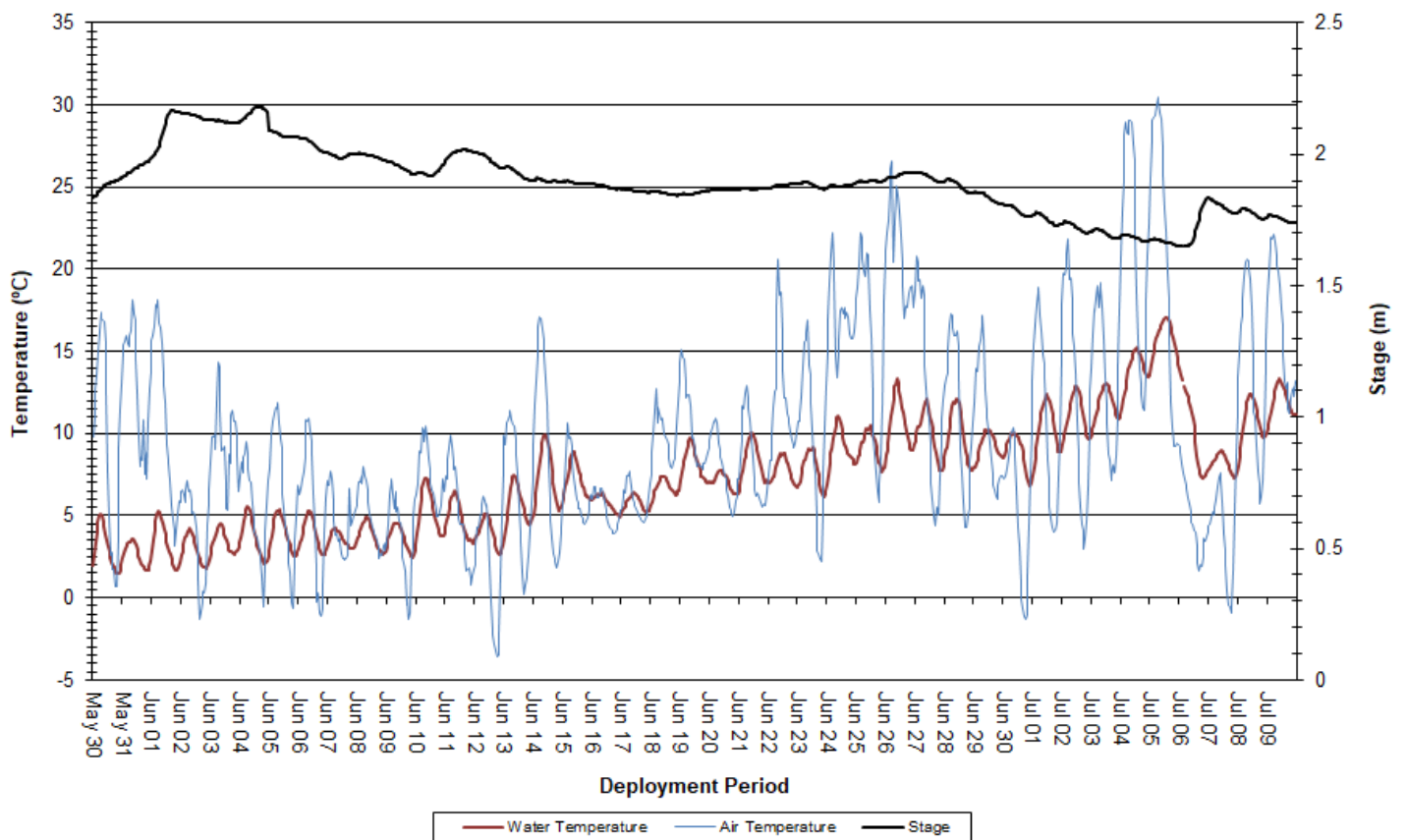


Figure 14: Water and Air Temperature & Stage at Reid Brook below Tributary

pH

Over the deployment period, pH ranged from 6.08 pH units to 7.05 pH units, with a median value of 6.74 (Figure 15).

pH was below the CCME's Minimum Guideline for the Protection of Aquatic Life at the beginning of the deployment period, but increased steadily and remained within the CCME's guidelines mid-June onwards.

Please note the stage and flow data used 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.

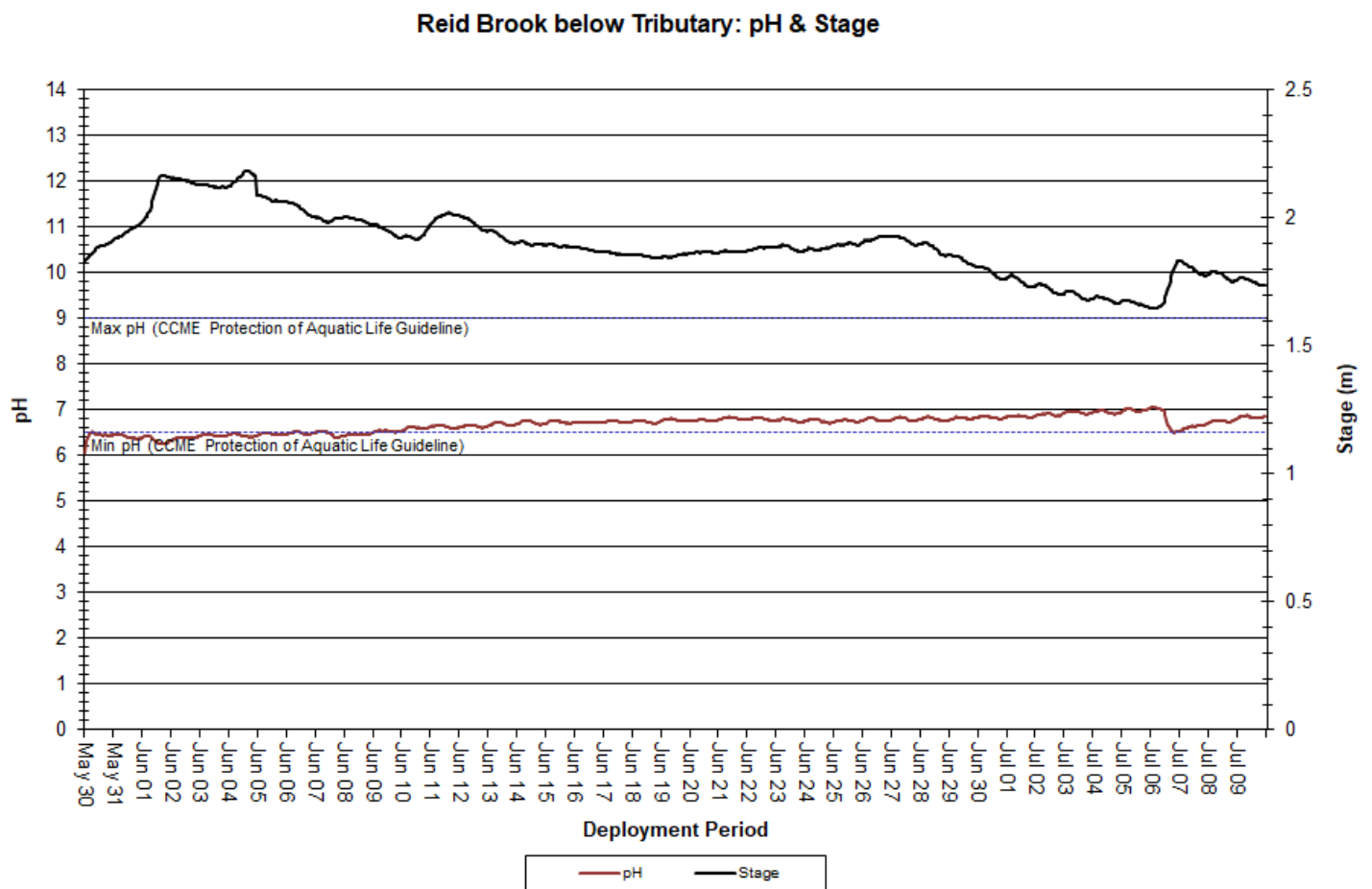


Figure 15: pH & Stage at Reid Brook below Tributary

Specific Conductivity

Over the deployment period, specific conductivity ranged from 12.8 μ S/cm to 25.7 μ S/cm, with a median value of 17.6 μ S/cm (Figure 16).

Specific conductivity generally increased over the course of the deployment period (Figure 16).

Specific conductivity and stage generally exhibit an inverse relationship: as one parameter increases, the other decreases. Increasing specific conductivity levels and corresponding decreasing water levels are characteristic of this station at this time of year.

Please note the stage and flow data used 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.

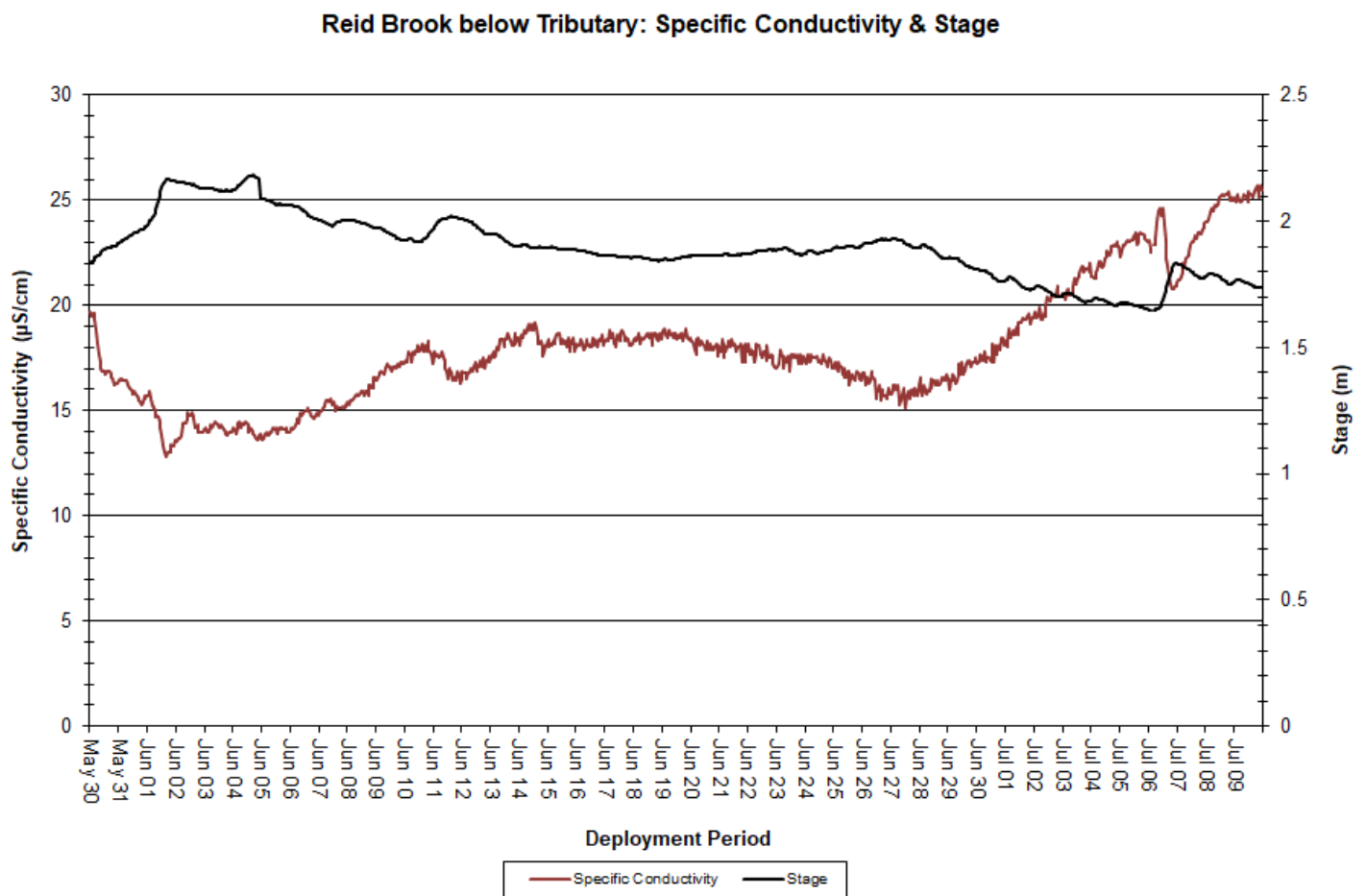


Figure 16: Specific Conductivity & Stage at Reid Brook below Tributary

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.35mg/L to 19.48mg/L, with a median value of 12.06mg/L. The saturation of dissolved oxygen ranged from 90.2% saturation to 151.2% saturation, with a median value of 99.4% (Figure 17).

Dissolved oxygen concentrations remained above the CCME's Guidelines for the Protection of Early Life Stages (9.5mg/L) and Other Life Stages (6.5 mg/L) for the majority of deployment. Dissolved oxygen concentration was fairly consistent, but generally decreasing, over the course of deployment. The sole fluctuation where dissolved oxygen concentrations fell below the CCME's Guideline for the Protection of Early Life Stages was closely connected to corresponding higher water temperatures. This is to be expected as water temperature and dissolved oxygen concentration generally exhibit an inverse relationship.

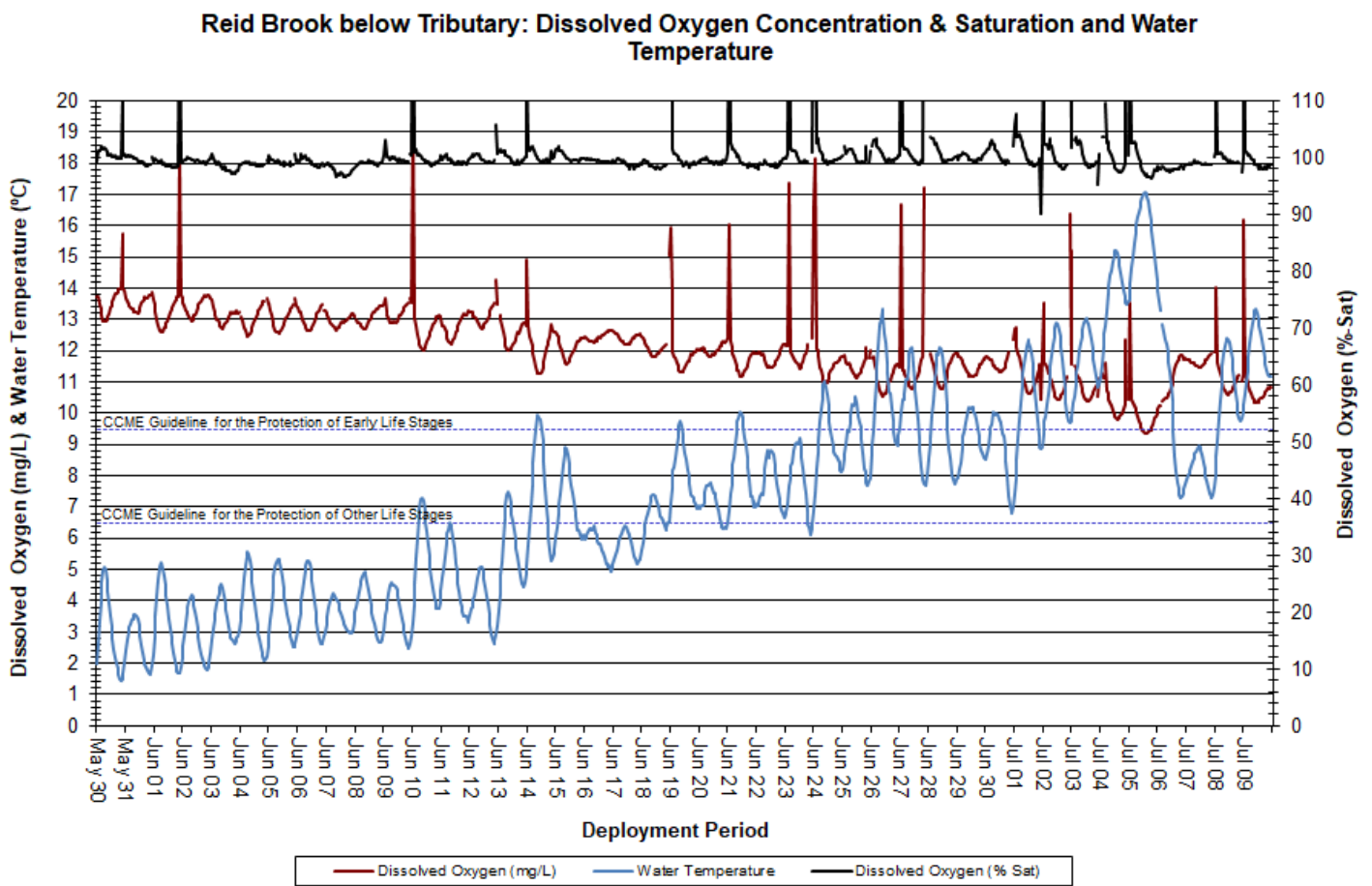


Figure 17: Dissolved Oxygen & Water Temperature at Reid Brook below Tributary

Turbidity

Over the deployment period, turbidity ranged from 0.0 NTU to 1371 NTU, with a median value of 0.7 NTU (Figure 18). A median turbidity value of 0.7 NTU indicates that there was very little background turbidity at this station.

The majority of the turbidity events observed at this station closely correlated with rainfall events (Figure 18), which can cause mixing of solids in the water column. Precipitation data was obtained from the Voisey's Bay airstrip weather station.

Reid Brook below Tributary: Turbidity & Precipitation

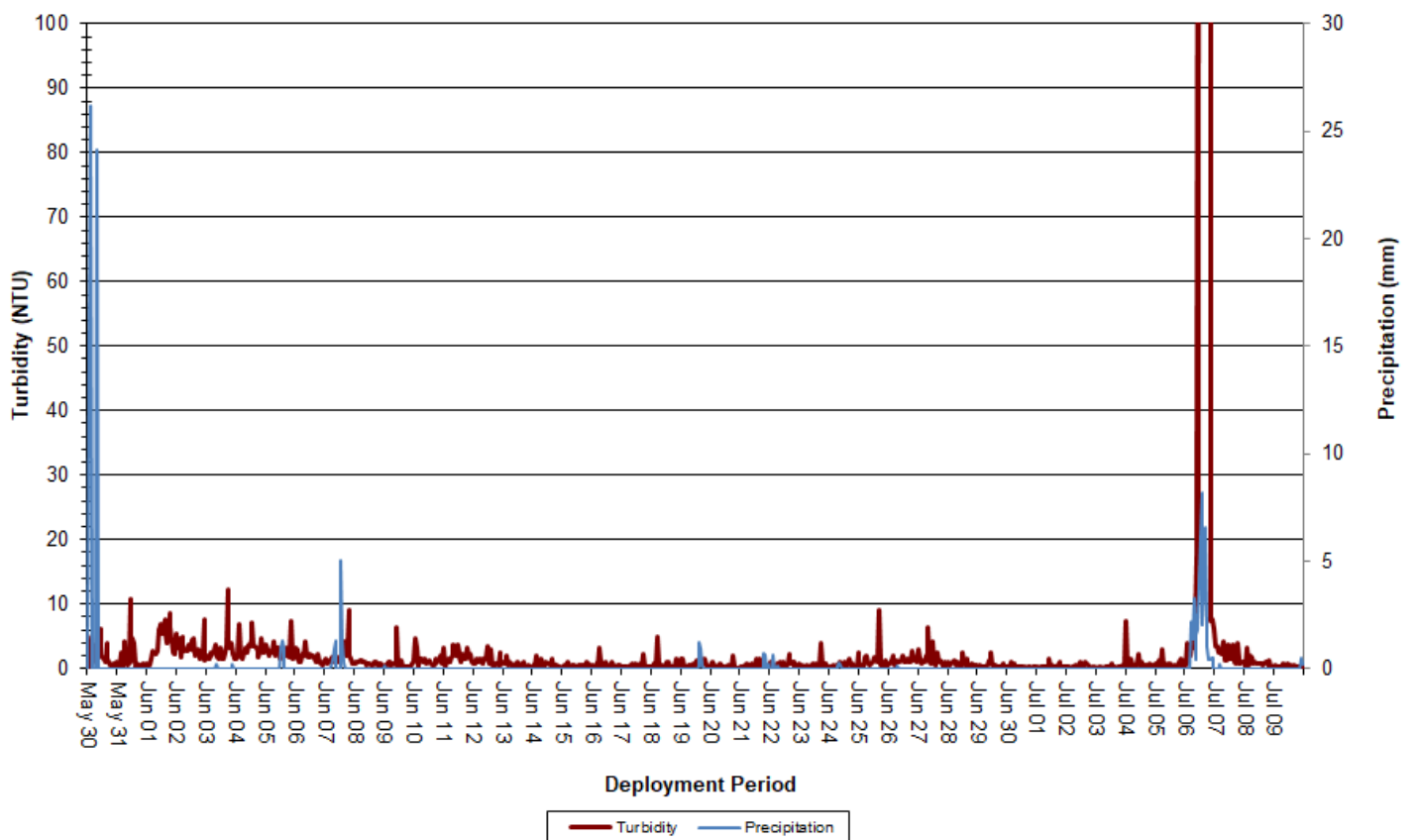


Figure 18: Turbidity & Precipitation at Reid Brook below Tributary

Stage and Flow

Over the deployment period, stage values ranged from 1.649m to 2.183m, with a median value of 1.887m. Stream flow values ranged from 6.101m³/s to 34.20m³/s, with a median value of 15.932m³/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 19).

Stage and flow generally decreased across the deployment period. Increases in both stage and flow were generally attributable to observed rainfall events (Figure 19).

Please note the stage and flow data used 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.

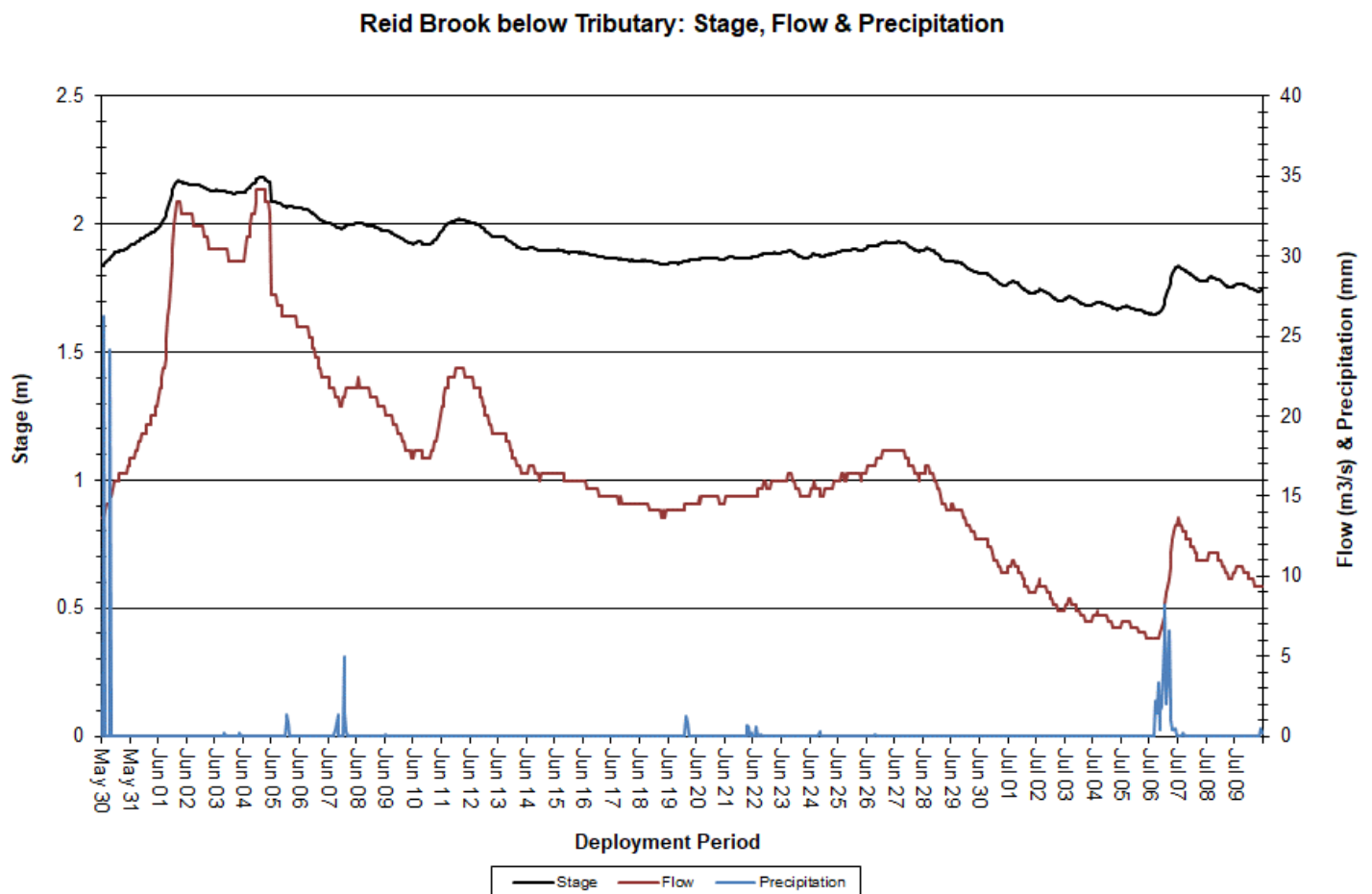


Figure 19: Stage, Flow & Precipitation at Reid Brook below Tributary

Tributary to Reid Brook

Water Temperature

Over the deployment period, water temperature ranged from 1.3°C to 17.0°C, with a median value of 8.2°C (Figure 20). Streams and brooks are sensitive to changes in the ambient air temperature, thus water temperature will fluctuate considerably depending on the weather and the time of day. Air temperature fluctuates to a greater extent compared to water temperature. Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Water temperature data displays a natural diurnal pattern. As expected, water temperatures increased gradually over the course of deployment through spring and summer, and correlated closely with ambient air temperatures.

Please note the stage and flow data used 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.

Tributary to Reid Brook: Water and Air Temperature & Stage

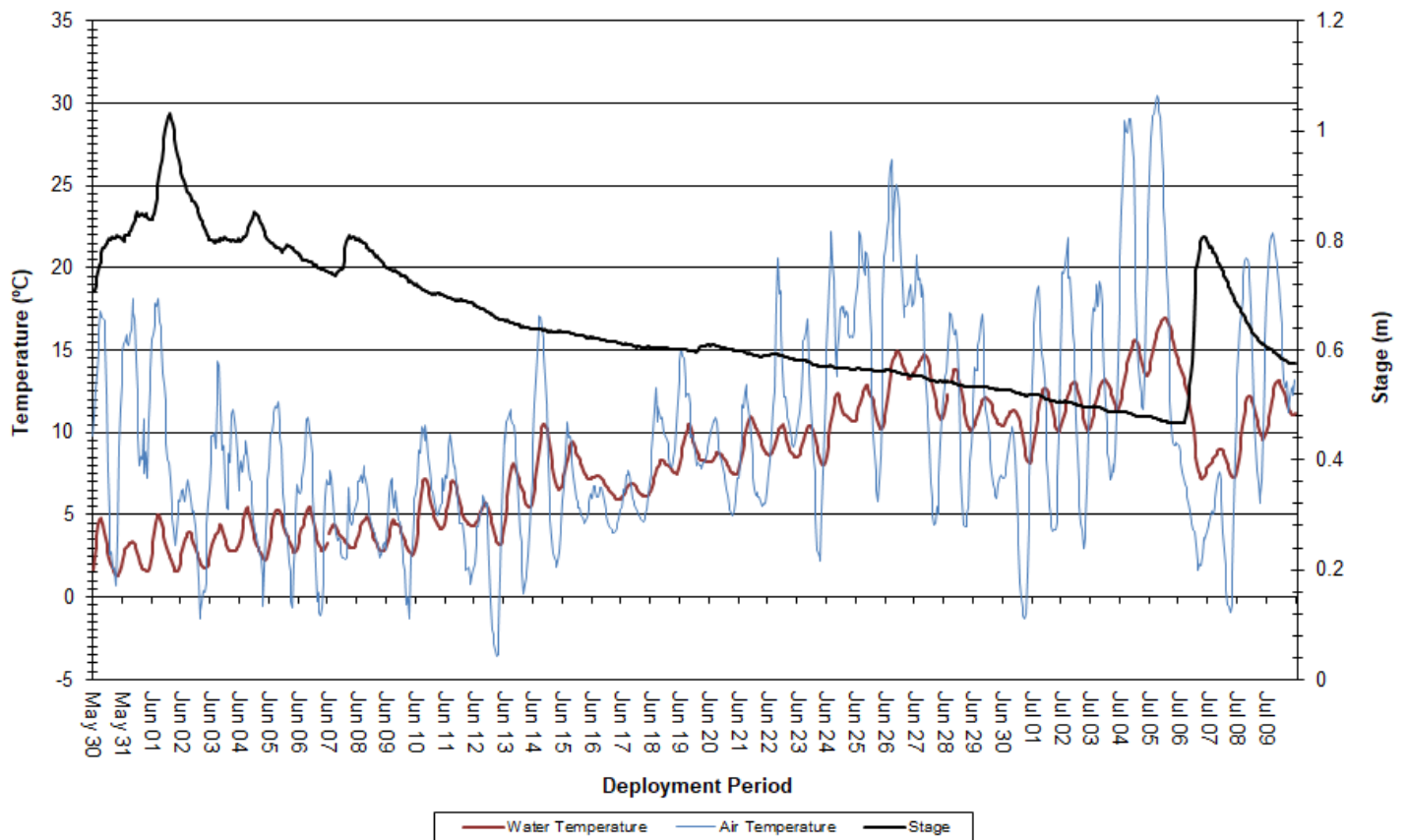


Figure 20: Water and Air Temperature & Stage at Tributary to Reid Brook

pH

Over the deployment period, pH ranged from 5.75 pH units to 6.95 pH units, with a median value of 6.71 (Figure 21).

pH values were within the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period.

Please note the stage and flow data used 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.

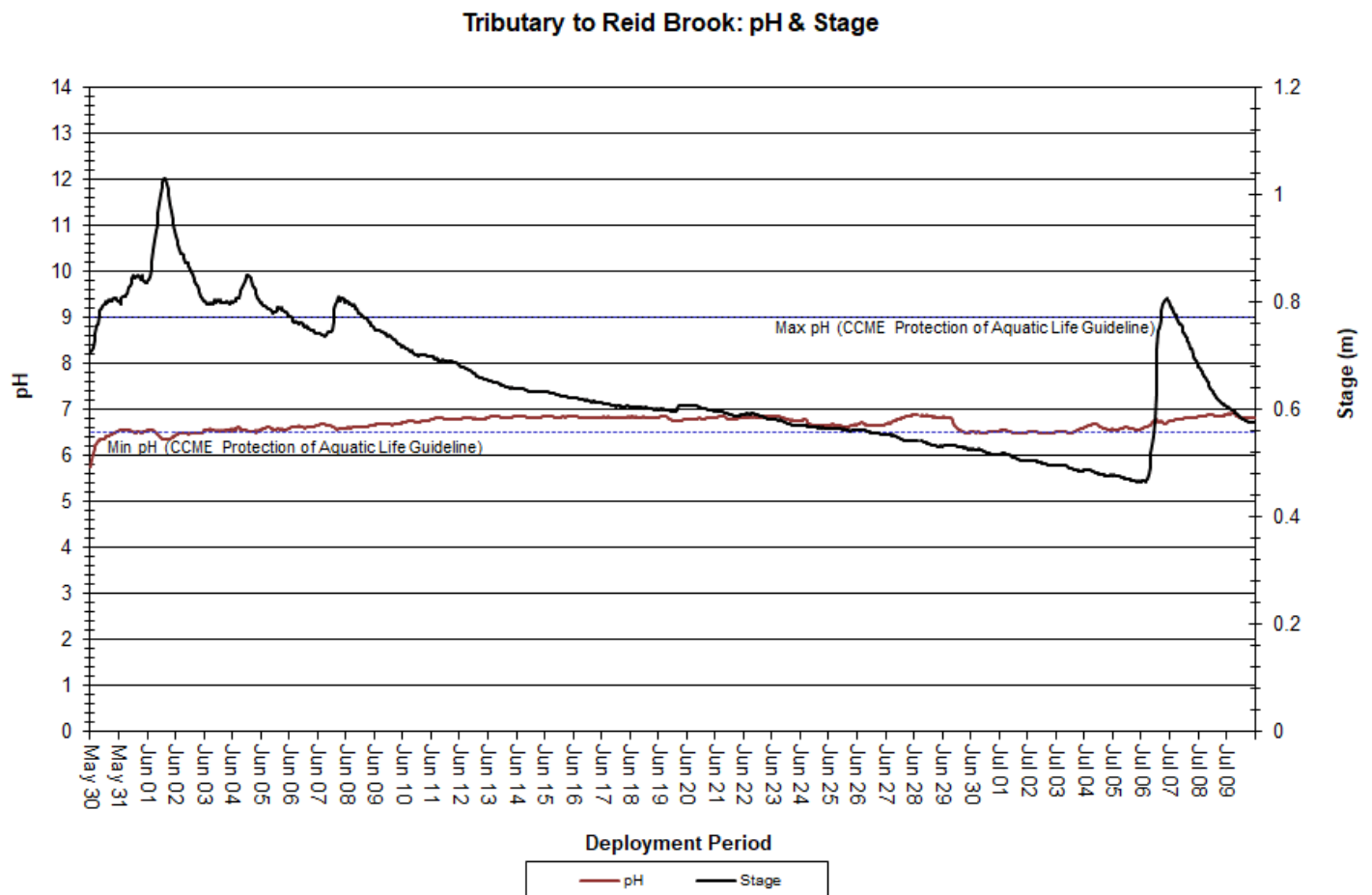


Figure 21: pH & Stage at Tributary to Reid Brook

Specific Conductivity

Over the deployment period, specific conductivity ranged from 11.6 μ S/cm to 27.3 μ S/cm, with a median value of 16.0 μ S/cm (Figure 22).

Specific conductivity and stage generally exhibit an inverse relationship: as one parameter increases, the other decreases. This relationship is evident in the graph below.

Please note the stage and flow data used 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.

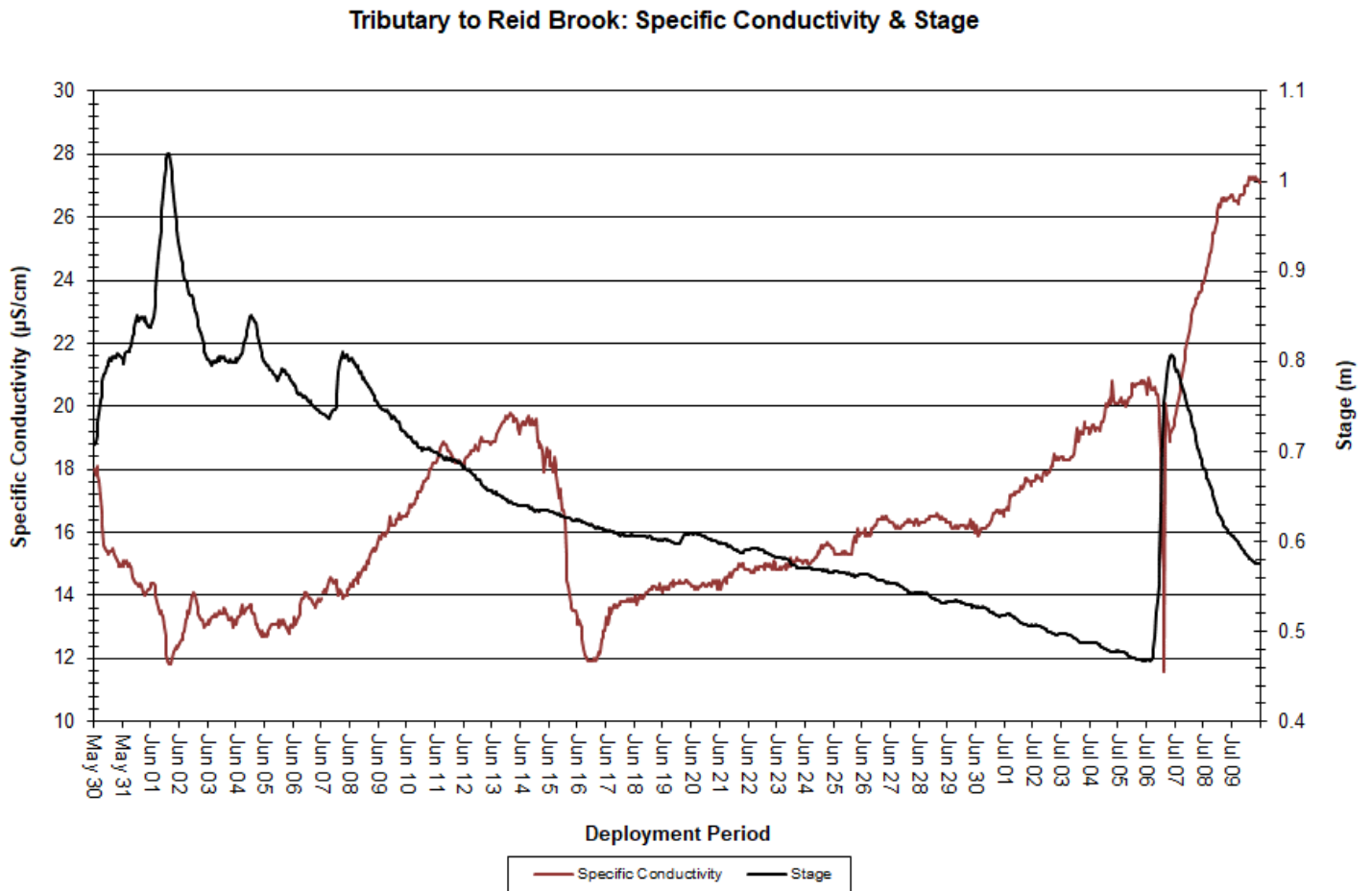


Figure 22: Specific Conductivity & Stage at Tributary to Reid Brook

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 0.02mg/L to 13.96mg/L, with a median value of 11.24mg/L. The saturation of dissolved oxygen ranged from 0.20% saturation to 100.5% saturation, with a median value of 95.1% (Figure 23).

Dissolved oxygen levels remained above the CCME's Guidelines for the Protection of Early and Other Life Stages for the first half of deployment; however, levels did periodically fall below the CCME's Guideline for the Protection of Early Life Stages from mid-June onwards. These occurrences correlate closely with warmer water temperatures, which is to be expected. There was also a period from June 29th through July 4th where levels fell below the CCME's Guideline for the Protection of Other Life Stages as well, which may have been due to sediment build-up around the sensor that caused discrepancies in the data.

Dissolved oxygen concentration displays a diurnal pattern. During nightfall, dissolved oxygen levels are higher as cooler temperatures allow for more DO to be stored in the water column. During the day, dissolved oxygen levels are lower. This is a result of warmer water temperatures and photosynthesis by aquatic plants, which decrease dissolved oxygen levels in the water column.

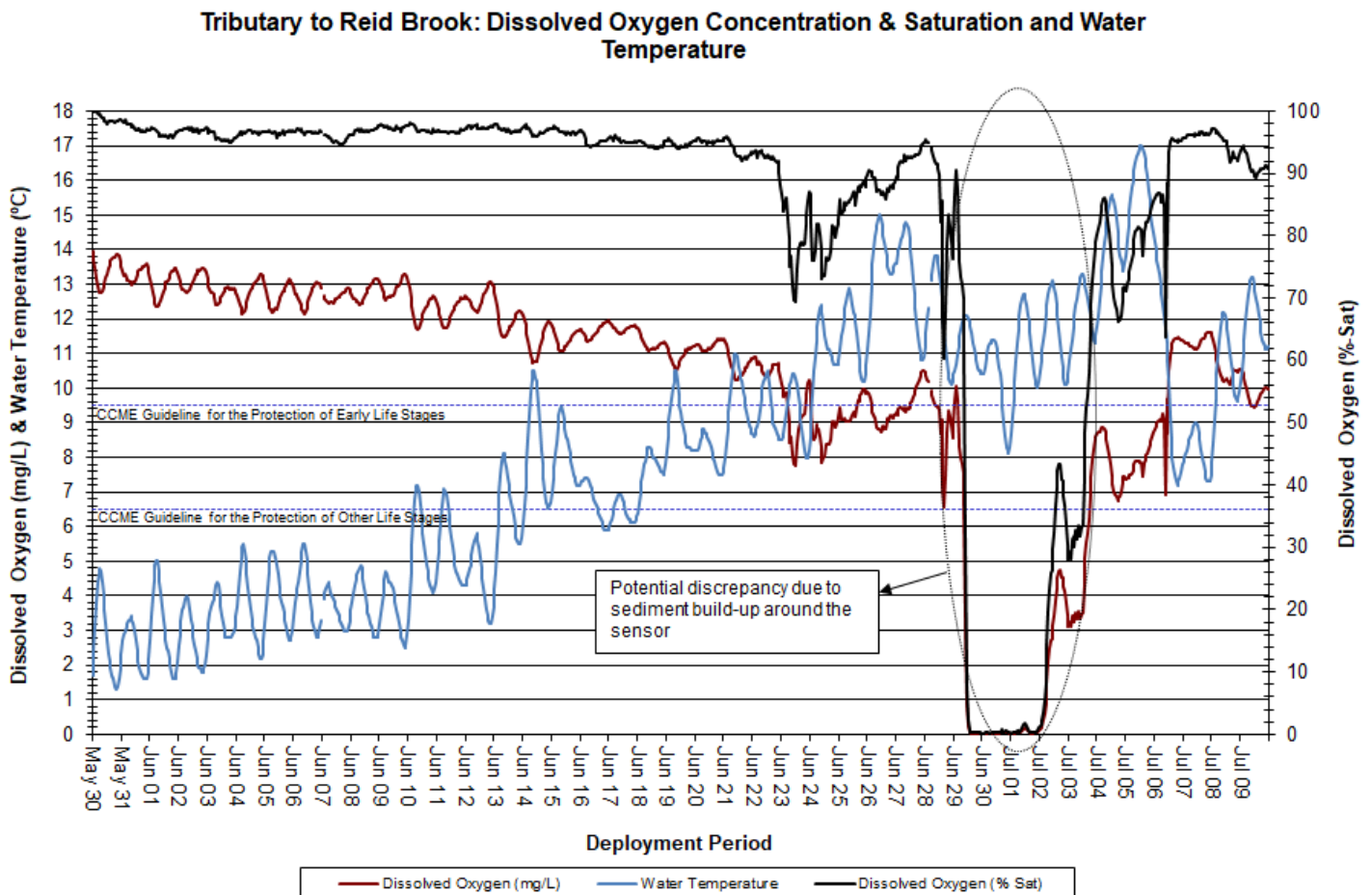


Figure 23: Dissolved Oxygen & Water Temperature at Tributary to Reid Brook

Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 3000 NTU, with a median value of 3000 NTU (Figure 24).

This site is particularly prone to variable turbidity as it has a sandy-clay bottom that is easily disturbed by precipitation events. The extended period of high turbidity observed from June 14th onwards is due to significant sediment build-up around the sensor, and is likely not a true representation of the overall water quality across that period.

Tributary to Reid Brook: Turbidity & Precipitation

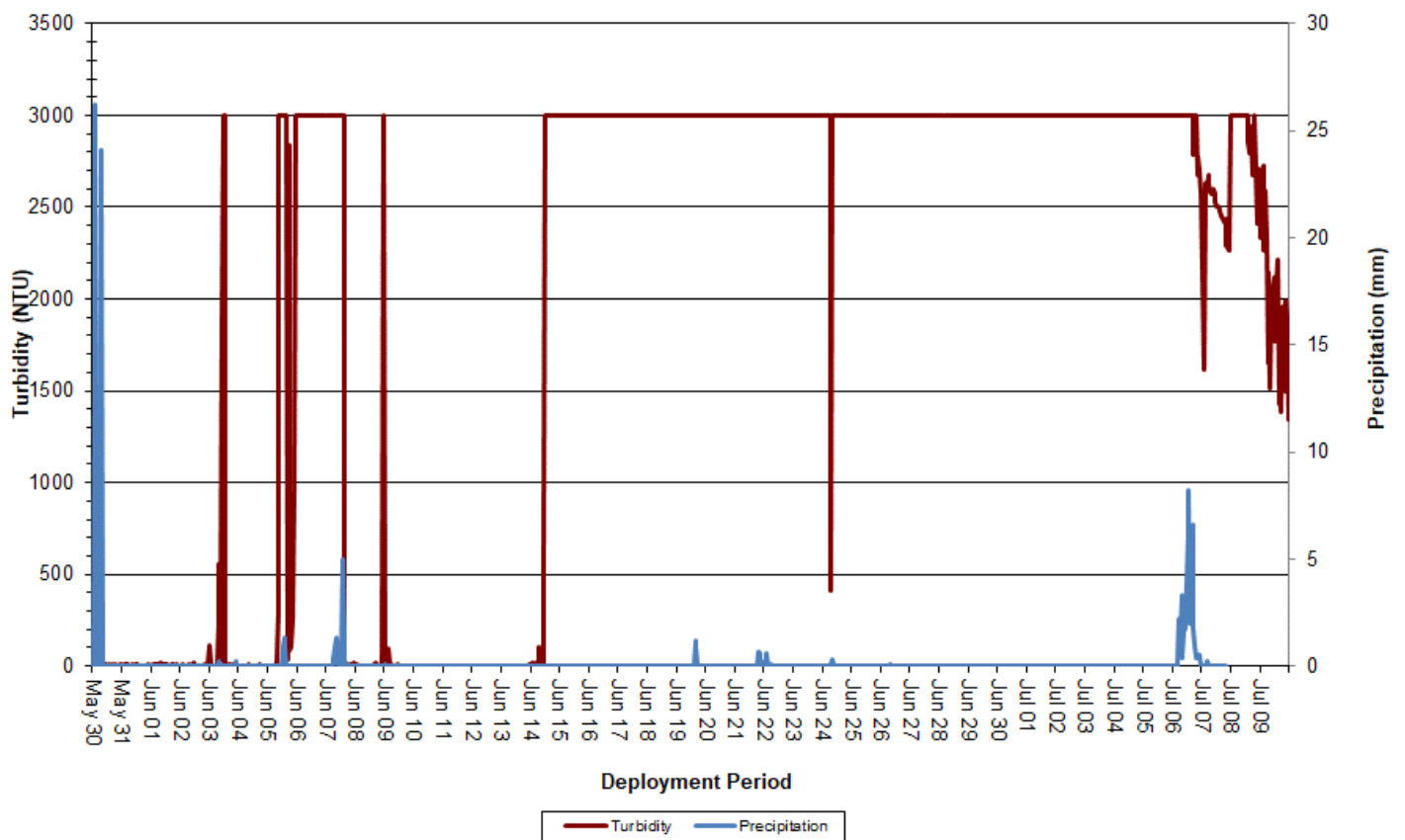


Figure 24: Turbidity & Precipitation at Tributary to Reid Brook

Stage and Flow

Over the deployment period, stage values ranged from 0.467m to 1.031m, with a median value of 0.611m. Stream flow values ranged from 0.112m³/s to 4.383m³/s, with a median value of 0.365m³/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 25).

Stage and flow were gradually decreasing across the deployment period. Increases in both stage and flow were generally attributable to observed rainfall events (Figure 19).

Please note the stage and flow data used 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.

Tributary to Reid Brook: Stage, Flow & Precipitation

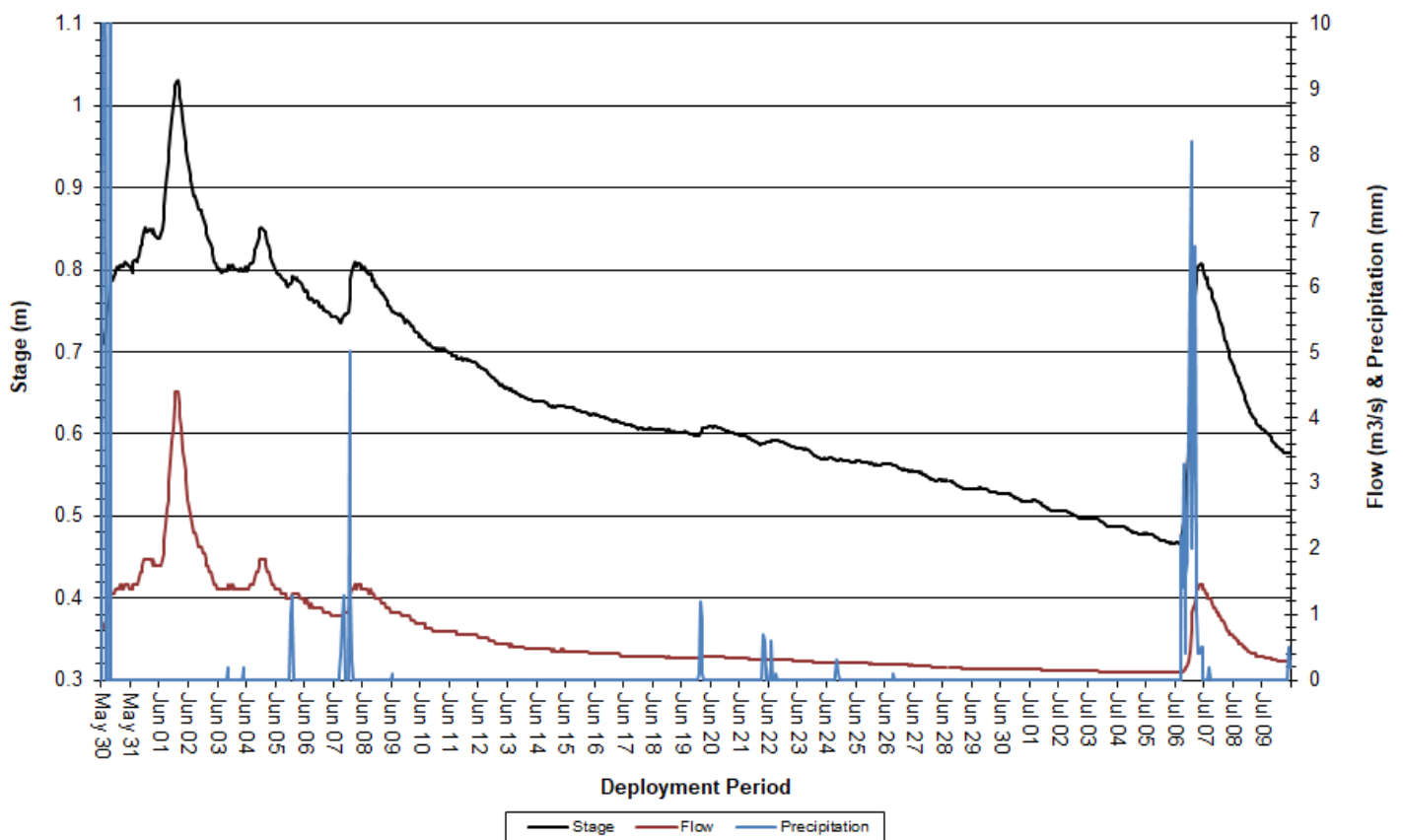


Figure 25: Stage, Flow & Precipitation at Tributary to Reid Brook

Conclusions

Water temperatures across all stations ranged from a minimum of 1.29°C at Reid Brook at Outlet of Reid Pond to a maximum of 21.23°C at Camp Pond Brook below Camp Pond. Overall, water temperature was increasing across the network. Stations at Camp Pond Brook, Tributary to Reid Brook, and Reid Brook below Tributary are more sensitive to changes in ambient air temperatures as these sites are brooks with continuously moving water. In contrast, Reid Brook at Outlet of Reid Pond is a large pond with a high surface area and deeper, slower-moving water, which was also ice-covered for much of this deployment period.

pH values across all stations ranged from a minimum of 5.75pH units at Tributary to Reid Brook to a maximum of 7.05pH units at Reid Brook below Tributary. pH values at all stations were relatively consistent across the deployment period.

Specific conductivity across all stations ranged from a minimum of 10.4µS/cm at Reid Brook at Outlet of Reid Pond to a maximum of 53.1µS/cm at Camp Pond Brook below Camp Pond. Conductivity values at Reid Brook at Outlet of Reid Pond were the lowest across the network. Camp Pond Brook below Camp Pond had the highest median value at 29.2µS/cm.

Dissolved oxygen levels across all stations ranged from a minimum of 0.02mg/L at Tributary to Reid Brook to a maximum of 19.48mg/L at Reid Brook below Tributary. Dissolved oxygen is generally decreasing at this time of year and varies diurnally as water temperature is greatly affected by ambient air temperature. Dissolved oxygen levels remained above the CCME's Guidelines for the Protection of Other Life Stages at all stations for the majority of deployment, but occasionally fell below the CCME's Guidelines for the Protection of Early Life Stages at three stations, correlating closely with warmer water temperatures.

Turbidity levels across all stations ranged from a minimum of 0.0 NTU at two stations to a maximum of 3000NTU at Tributary to Reid Brook. Turbidity levels showed natural increases and decreases generally corresponding to precipitation events, with the exception of Tributary to Reid Brook, which provided inaccurate turbidity readings due to significant sediment build-up around the sensors.

Air temperature and precipitation data were obtained from the Voisey's Bay weather station, which is located at the airstrip. This data appears to be quite accurate and no modifications were made.

Overall, the changes in water quality parameters over the course of this deployment can be explained by natural events. Camp Pond Brook below Camp Pond does have the potential for anthropogenic influences as the site is the closest to the inhabited area. It is important to note that during a change (a decrease or increase) in water quality, change only occurs for a short period of time and then water quality parameters return to baseline.

References

- Canadian Council of Ministers of the Environment. (2014) "Canadian water quality guidelines for the protection of aquatic life" Canadian Council of Ministers of the Environment. Retrieved from: http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/index.html
- Canadian Council of Ministers of the Environment. (2014) "Water Quality Guidelines for the Protection of Aquatic Life" Canadian Council of Ministers of the Environment. Retrieved from: <http://st-ts.ccme.ca/en/index.html?chems=162&chapters=1>
- OTT Hydromet (2017) "Hydrolab" Retrieved from: <http://www.ott.com/en-us/products/water-quality-2/hydrolab-ds5x-multiparameter-data-sonde-855/>
- Mike Sader (2017) "Turbidity Measurement: A Simple, Effective Indicator of Water Quality Change". OTT Hydromet. Retrieved from <http://www.ott.com/en-us/products/download/turbidity-white-paper/>
- Swanson, H.A., and Baldwin, H.L., (1965) "A Primer on Water Quality" U.S. Geological Survey. Retrieved from: <http://ga.water.usgs.gov/edu/characteristics.html>

APPENDIX A: Comparison Graphs

Water Temperature at Real-Time Water Quality Monitoring Stations

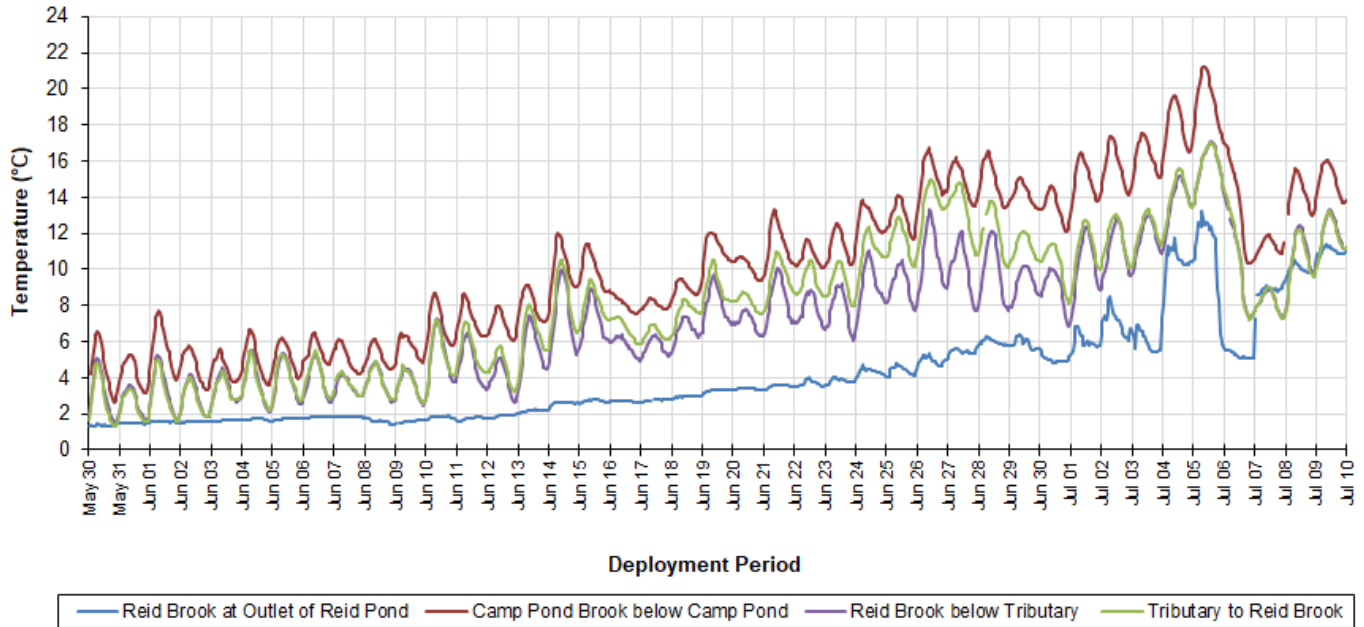


Figure A1: Comparison of Water Temperature (°C) between all Real-Time Stations in Voisey's Bay.

pH at Real-Time Water Quality Monitoring Stations

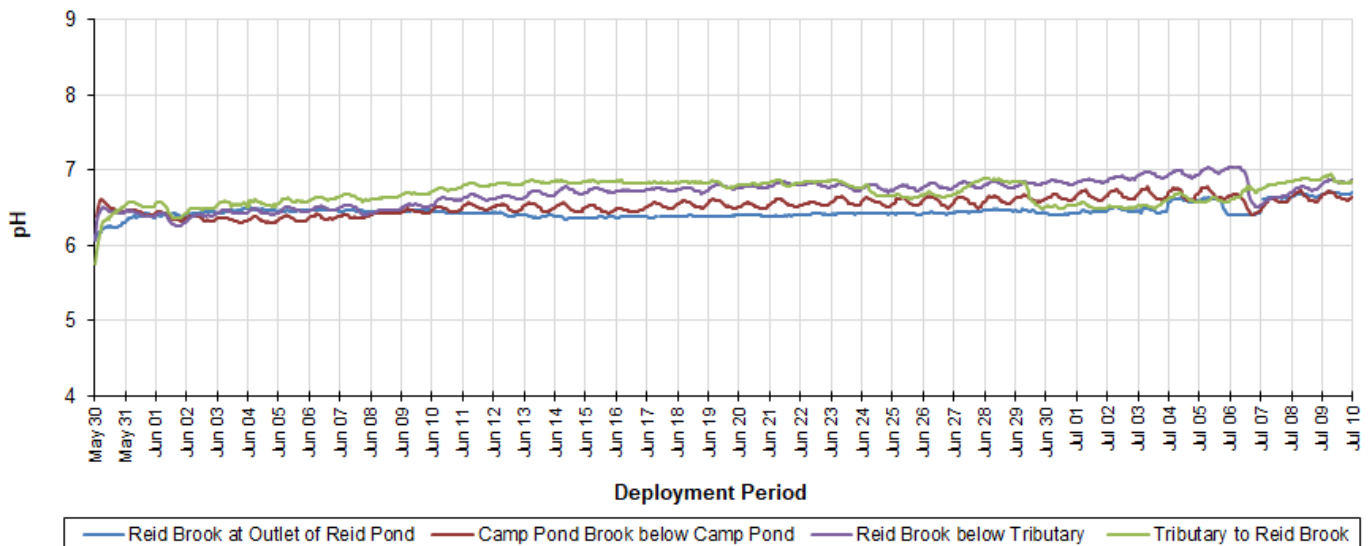


Figure A2: Comparison of pH between all Real-Time Stations in Voisey's Bay.

Specific Conductivity at Real-Time Water Quality Monitoring Stations

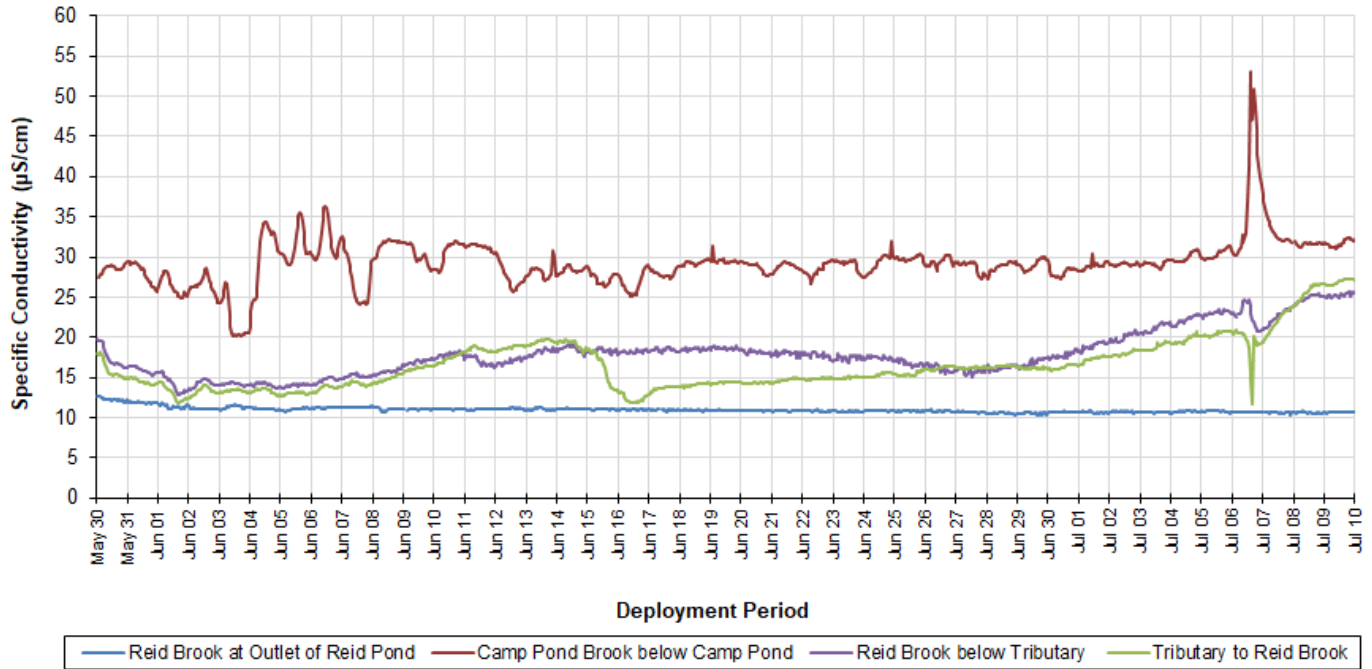


Figure A3: Comparison of Specific Conductivity (µS/cm) between all Real-Time Stations in Voisey's Bay.

Dissolved Oxygen Concentration at Real-Time Water Quality Monitoring Stations

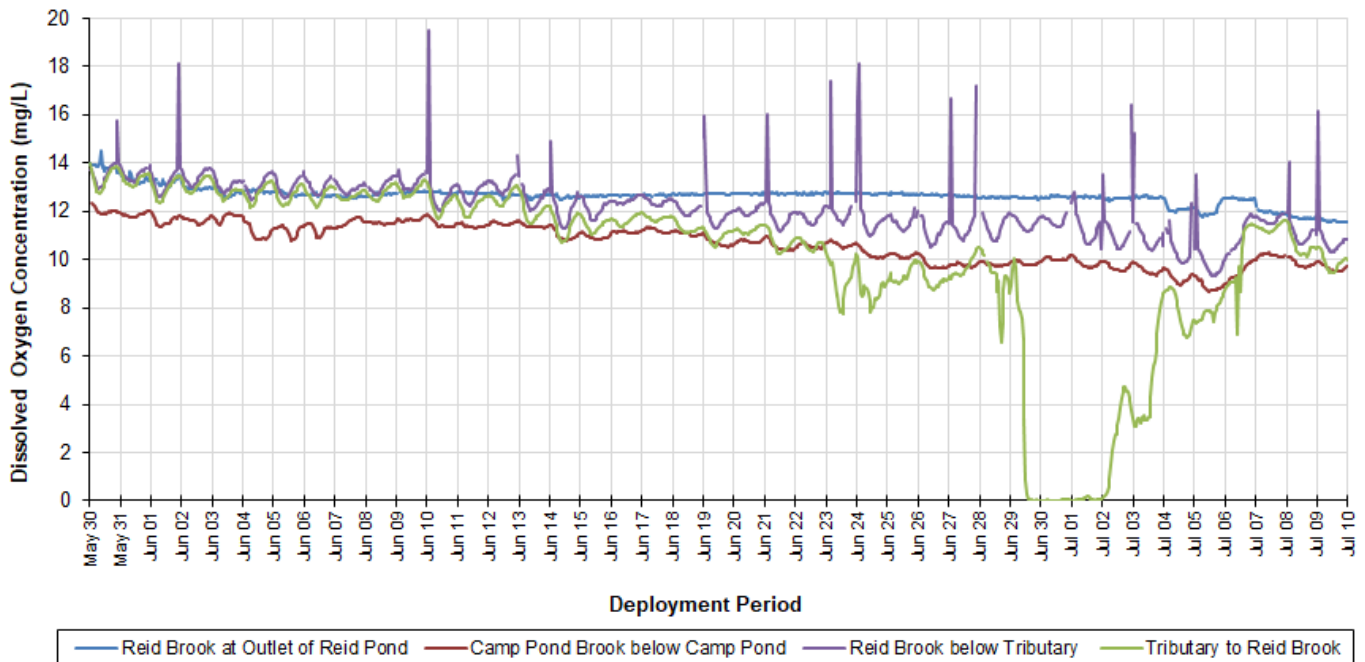


Figure A4: Comparison of Dissolved Oxygen (mg/L) between all Real-Time Stations in Voisey's Bay.

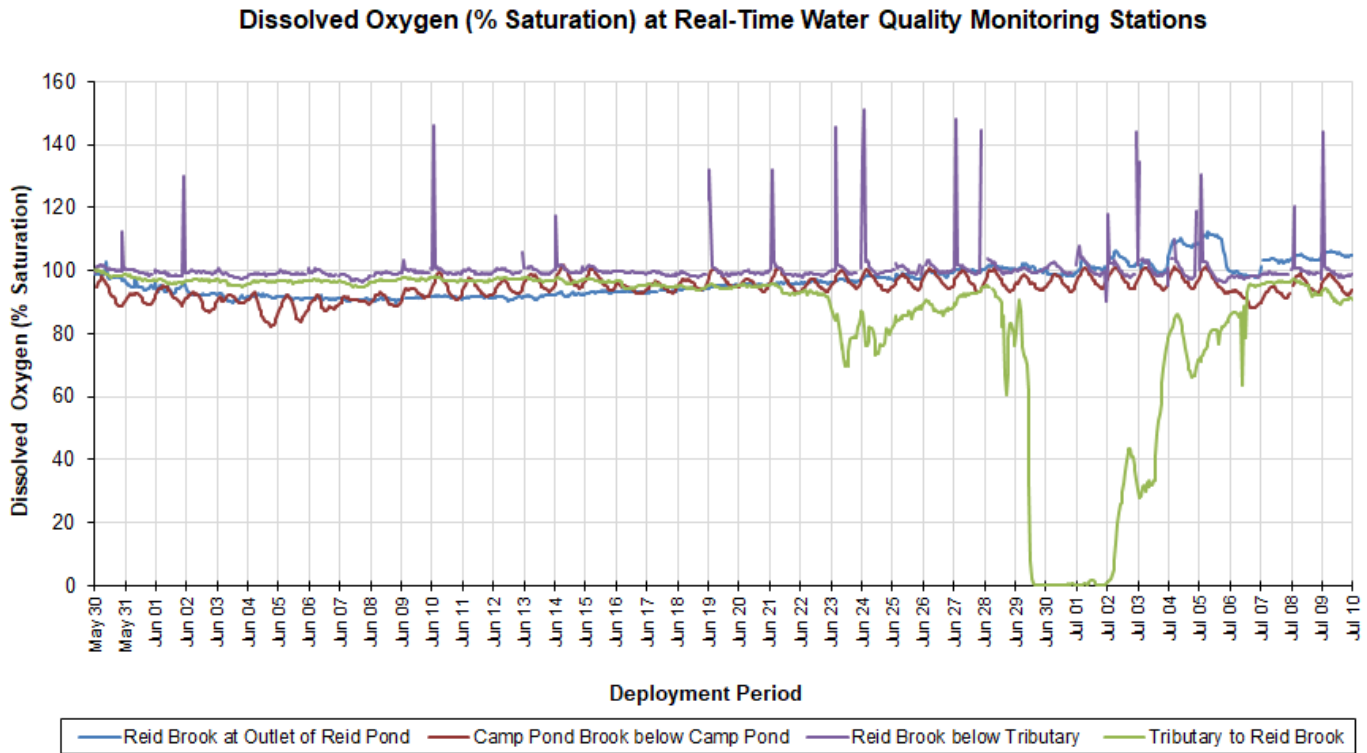


Figure A5: Comparison of Dissolved Oxygen (% Sat) between all Real-Time Stations in Voisey's Bay.

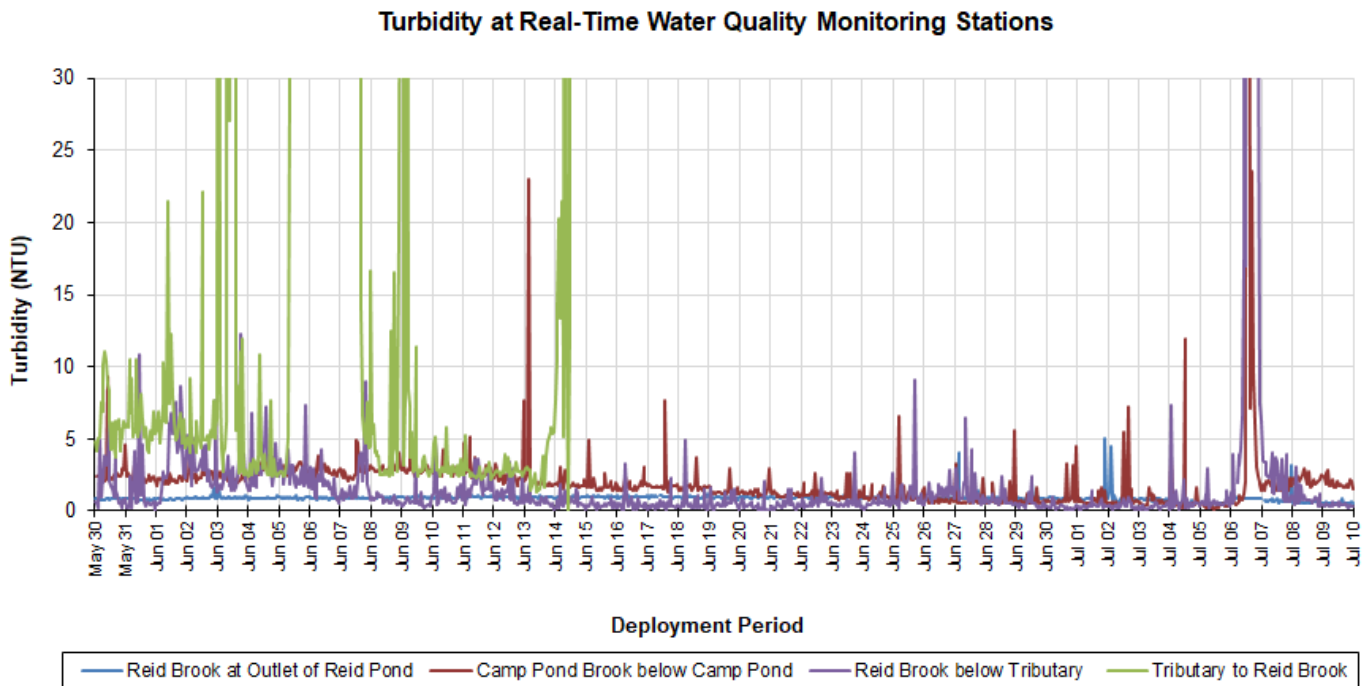


Figure A6: Comparison of Turbidity (NTU) between all Real-Time Stations in Voisey's Bay.

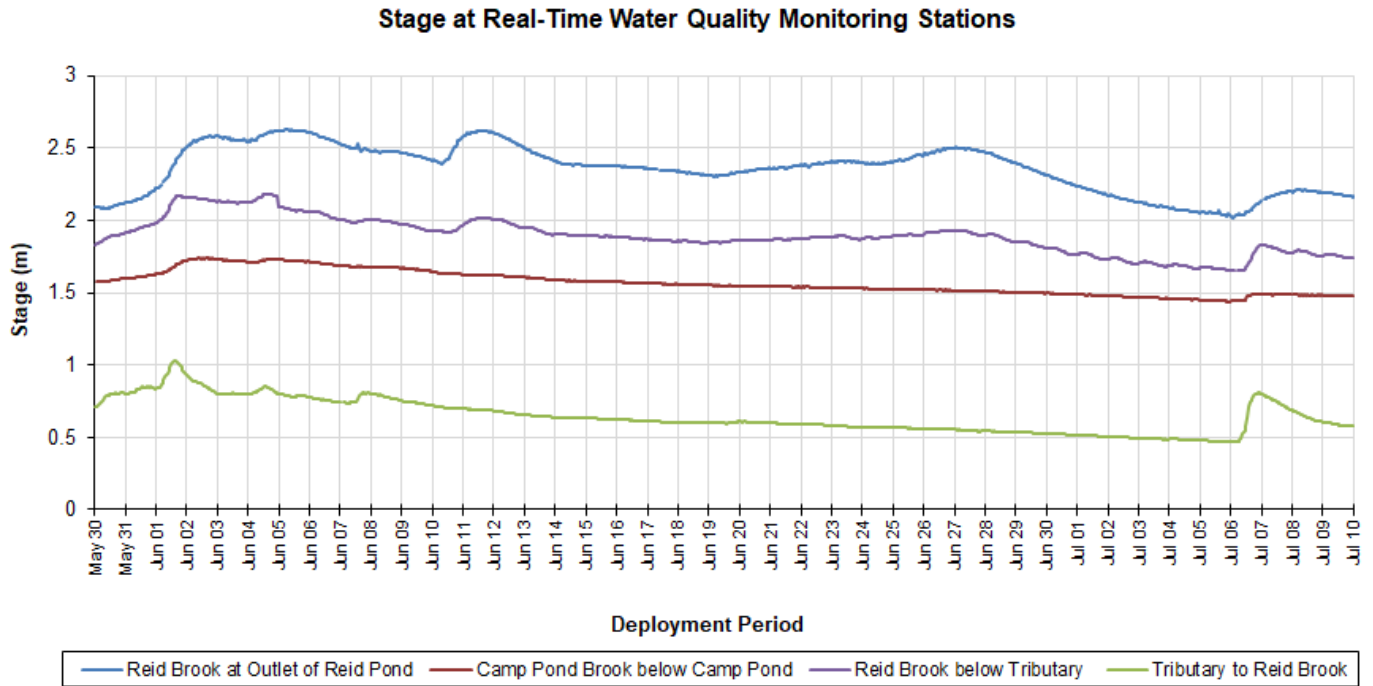


Figure A7: Comparison of Stage (m) between all Real-Time Stations in Voisey's Bay. Please note that stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

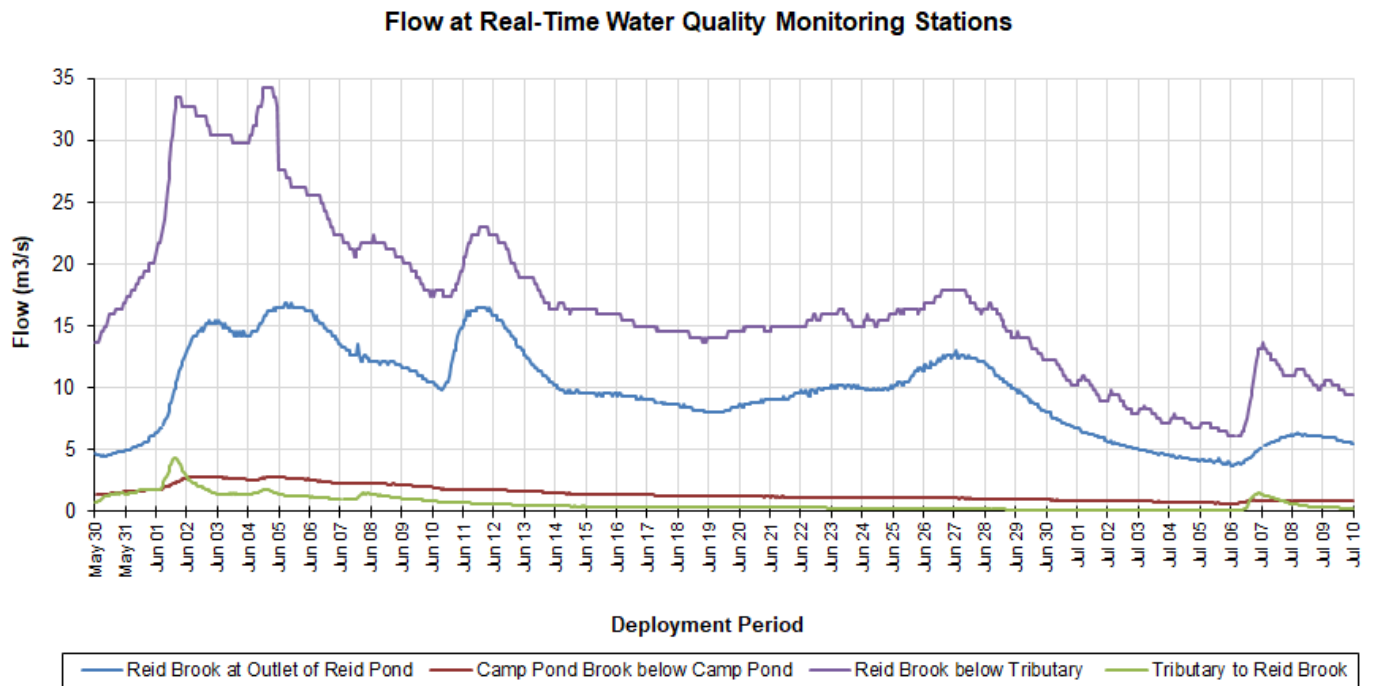


Figure A8: Comparison of Flow (m³/s) between all Real-Time Stations in Voisey's Bay. Please note that flow data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

APPENDIX B: Water Parameter Description

Dissolved Oxygen: The amount of Dissolved Oxygen (DO) (mg/L or % saturation) in the water is vital to the survival of aquatic organisms. 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 (CCME 2014).

Flow: Flow (m³/s) is a measure of how quickly a volume of water is displaced in streams, rivers, and other channels.

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 CO₂ (CCME 2014).

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 (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 (OTT Hydromet 2017).

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 (CCME 2014; 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 (Sadar, 2017).

APPENDIX C: Grab Sample Results



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS255 REID BROOK								
Sampling Date		2021/05/30 12:00						
Matrix		W						
Sample #		2021-1910-00-SI-SP						
Registration #		WS-S-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	5.4	1.0	mg/L	N/A	2021/06/08		7386604
Nitrate (N)	-	0.098	0.050	mg/L	N/A	2021/06/09		7386607
Total dissolved solids (calc., EC)	-	8.1	1.0	mg/L	N/A	2021/06/08		7386616
Inorganics								
Conductivity	-	15	1.0	uS/cm	N/A	2021/06/07	SHW	7392407
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2021/06/08	FD	7393312
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/06/08	FD	7393312
Sulphate (SO4)	-	1.0	1.0	mg/L	N/A	2021/06/08	FD	7393312
Total Alkalinity (Total as CaCO3)	-	7.0	5.0	mg/L	N/A	2021/06/08	MCN	7392532
Colour	-	15	5.0	TCU	N/A	2021/06/08	MCN	7392536
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/06/07	SHW	7392412
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	RTY	7393533
Nitrate + Nitrite (N)	-	0.098	0.050	mg/L	N/A	2021/06/08	MCN	7392538
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/06/08	MCN	7392539
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/06/07	MCN	7392401
Dissolved Organic Carbon (C)	-	2.6	0.50	mg/L	N/A	2021/06/07	YLG	7392388
Total Organic Carbon (C)	-	2.6	0.50	mg/L	N/A	2021/06/04	YLG	7389398
pH	-	6.63		pH	N/A	2021/06/07	SHW	7392410
Total Phosphorus	-	ND	0.004	mg/L	2021/06/08	2021/06/09	SSV	7395142
Total Suspended Solids	-	ND	1.0	mg/L	2021/06/04	2021/06/08	MKX	7389041
Turbidity	-	1.0	0.10	NTU	N/A	2021/06/07	SHW	7392575
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.081	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Barium (Ba)	-	0.0025	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Boron (B)	-	ND	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Calcium (Ca)	-	1.7	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Copper (Cu)	-	0.00071	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Iron (Fe)	-	ND	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Magnesium (Mg)	-	0.30	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Manganese (Mn)	-	0.0021	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Sodium (Na)	-	0.87	0.10	mg/L	2021/06/10	2021/06/10	BAN	7399635



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS255 REID BROOK								
Sampling Date		2021/05/30 12:00						
Matrix		W						
Sample #		2021-1910-00-SI-SP						
Registration #		WS-S-0000						
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Strontium (Sr)	-	0.0058	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Uranium (U)	-	ND	0.00010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Metals								
Mercury (Hg)	-	ND	0.00001	mg/L	2021/06/14	2021/06/14	GR1	7406163



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS258 CAMP POND BROOK								
Sampling Date		2021/05/30 11:25						
Matrix		W						
Sample #		2021-1913-00-SI-SP						
Registration #		WS-S-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	10	1.0	mg/L	N/A	2021/06/08		7386604
Nitrate (N)	-	0.073	0.050	mg/L	N/A	2021/06/09		7386607
Total dissolved solids (calc., EC)	-	17	1.0	mg/L	N/A	2021/06/08		7386616
Inorganics								
Conductivity	-	30	1.0	uS/cm	N/A	2021/06/08	SHW	7394542
Chloride (Cl-)	-	1.9	1.0	mg/L	N/A	2021/06/08	FD	7393312
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/06/08	FD	7393312
Sulphate (SO4)	-	4.0	1.0	mg/L	N/A	2021/06/08	FD	7393312
Total Alkalinity (Total as CaCO3)	-	9.5	5.0	mg/L	N/A	2021/06/08	MCN	7392532
Colour	-	32	5.0	TCU	N/A	2021/06/08	MCN	7392536
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/06/08	SHW	7394544
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	RTY	7393533
Nitrate + Nitrite (N)	-	0.073	0.050	mg/L	N/A	2021/06/08	MCN	7392538
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/06/08	MCN	7392539
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/06/07	MCN	7392401
Dissolved Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2021/06/07	YLG	7392388
Total Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2021/06/04	YLG	7389398
pH	-	6.82		pH	N/A	2021/06/08	SHW	7394543
Total Phosphorus	-	0.006	0.004	mg/L	2021/06/08	2021/06/09	SSV	7395142
Total Suspended Solids	-	1.8	1.0	mg/L	2021/06/04	2021/06/08	MKX	7389041
Turbidity	-	1.7	0.10	NTU	N/A	2021/06/07	SHW	7392575
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.12	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Barium (Ba)	-	0.0055	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Boron (B)	-	ND	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Cadmium (Cd)	-	0.000010	0.000010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Calcium (Ca)	-	2.7	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Copper (Cu)	-	0.0032	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Iron (Fe)	-	0.20	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Magnesium (Mg)	-	0.79	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Manganese (Mn)	-	0.0060	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Nickel (Ni)	-	0.017	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Sodium (Na)	-	2.0	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS258 CAMP POND BROOK								
Sampling Date 2021/05/30 11:25								
Matrix W								
Sample # 2021-1913-00-SI-SP								
Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Strontium (Sr)	-	0.015	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Uranium (U)	-	ND	0.00010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Zinc (Zn)	-	0.0057	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Metals								
Mercury (Hg)	-	ND	0.00001	mg/L	2021/06/14	2021/06/14	GR1	7406163



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS257 LOWER REID								
Sampling Date		2021/05/30 10:47						
Matrix		W						
Sample #		2021-1912-00-SI-SP						
Registration #		WS-S-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	7.3	1.0	mg/L	N/A	2021/06/08		7386604
Nitrate (N)	-	0.24	0.050	mg/L	N/A	2021/06/09		7386607
Total dissolved solids (calc., EC)	-	12	1.0	mg/L	N/A	2021/06/08		7386616
Inorganics								
Conductivity	-	21	1.0	uS/cm	N/A	2021/06/07	SHW	7392407
Chloride (Cl-)	-	1.9	1.0	mg/L	N/A	2021/06/08	FD	7393312
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/06/08	FD	7393312
Sulphate (SO4)	-	2.1	1.0	mg/L	N/A	2021/06/08	FD	7393312
Total Alkalinity (Total as CaCO3)	-	6.9	5.0	mg/L	N/A	2021/06/08	MCN	7392532
Colour	-	47	5.0	TCU	N/A	2021/06/08	MCN	7392536
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/06/07	SHW	7392412
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	RTY	7393533
Nitrate + Nitrite (N)	-	0.24	0.050	mg/L	N/A	2021/06/08	MCN	7392538
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/06/08	MCN	7392539
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/06/07	MCN	7392401
Dissolved Organic Carbon (C)	-	5.2	0.50	mg/L	N/A	2021/06/07	YLG	7392388
Total Organic Carbon (C)	-	5.1	0.50	mg/L	N/A	2021/06/04	YLG	7389398
pH	-	6.59		pH	N/A	2021/06/07	SHW	7392410
Total Phosphorus	-	0.010	0.004	mg/L	2021/06/08	2021/06/09	SSV	7395142
Total Suspended Solids	-	11	1.0	mg/L	2021/06/04	2021/06/08	MKX	7389041
Turbidity	-	1.7	0.10	NTU	N/A	2021/06/07	SHW	7392583
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.16	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Barium (Ba)	-	0.0042	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Boron (B)	-	ND	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Calcium (Ca)	-	2.0	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Copper (Cu)	-	0.0014	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Iron (Fe)	-	0.41	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Magnesium (Mg)	-	0.57	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Manganese (Mn)	-	0.0066	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Nickel (Ni)	-	0.0068	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Sodium (Na)	-	1.5	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS257 LOWER REID								
Sampling Date 2021/05/30 10:47								
Matrix W								
Sample # 2021-1912-00-SI-SP								
Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Strontium (Sr)	-	0.012	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Uranium (U)	-	ND	0.00010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Metals								
Mercury (Hg)	-	ND	0.00001	mg/L	2021/06/14	2021/06/14	GR1	7406163



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS256 TRIB TO REID BROOK								
Sampling Date		2021/05/30 10:21						
Matrix		W						
Sample #		2021-1911-00-SI-SP						
Registration #		WS-S-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	7.3	1.0	mg/L	N/A	2021/06/08		7386604
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/06/09		7386607
Total dissolved solids (calc., EC)	-	12	1.0	mg/L	N/A	2021/06/08		7386616
Inorganics								
Conductivity	-	21	1.0	uS/cm	N/A	2021/06/07	SHW	7392407
Chloride (Cl-)	-	2.1	1.0	mg/L	N/A	2021/06/08	FD	7393312
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/06/08	FD	7393312
Sulphate (SO4)	-	2.5	1.0	mg/L	N/A	2021/06/08	FD	7393312
Total Alkalinity (Total as CaCO3)	-	7.0	5.0	mg/L	N/A	2021/06/08	MCN	7392532
Colour	-	49	5.0	TCU	N/A	2021/06/08	MCN	7392536
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/06/07	SHW	7392412
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	RTY	7393533
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/06/08	MCN	7392538
Nitrite (N)	-	0.010	0.010	mg/L	N/A	2021/06/08	MCN	7392539
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/06/07	MCN	7392401
Dissolved Organic Carbon (C)	-	5.2	0.50	mg/L	N/A	2021/06/07	YLG	7392388
Total Organic Carbon (C)	-	5.3	0.50	mg/L	N/A	2021/06/04	YLG	7389398
pH	-	6.54		pH	N/A	2021/06/07	SHW	7392410
Total Phosphorus	-	0.006	0.004	mg/L	2021/06/08	2021/06/09	SSV	7395142
Total Suspended Solids	-	2.8	1.0	mg/L	2021/06/04	2021/06/08	MKX	7389041
Turbidity	-	0.96	0.10	NTU	N/A	2021/06/07	SHW	7392575
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.13	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Barium (Ba)	-	0.0040	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Boron (B)	-	ND	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Calcium (Ca)	-	2.0	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Copper (Cu)	-	0.0014	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Iron (Fe)	-	0.32	0.050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Magnesium (Mg)	-	0.57	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Manganese (Mn)	-	0.0058	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Nickel (Ni)	-	0.0070	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Sodium (Na)	-	1.6	0.10	mg/L	2021/06/07	2021/06/08	BAN	7392359



BUREAU
VERITAS

BV Labs Job #: C1F0490
Report Date: 2021/06/14

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-2

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
PSS256 TRIB TO REID BROOK								
Sampling Date 2021/05/30 10:21								
Matrix W								
Sample # 2021-1911-00-SI-SP								
Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Strontium (Sr)	-	0.012	0.0020	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Uranium (U)	-	ND	0.00010	mg/L	2021/06/07	2021/06/08	BAN	7392359
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/06/07	2021/06/08	BAN	7392359
ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)								
Metals								
Mercury (Hg)	-	ND	0.00001	mg/L	2021/06/14	2021/06/14	GR1	7406163