



Real-Time Water Quality Deployment Report

Voisey's Bay Network

August 1/13 to September 9, 2023



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

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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 August 1, 2023, Vale Environment staff deployed real-time water quality monitoring instruments at three of the real-time stations in the Voisey's Bay network. Instruments were removed by Vale Environment Staff on September 9, 2023. The instrument at Camp Pond Brook below Camp Pond was deployed on August 13, 2023. It was not removed until October 21, 2023, but for the purposes of this report data will be reported as if it had been removed on September 9, 2023.

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	August 1	Deployment	Excellent	Fair	Excellent	N/A	Excellent
	September 9	Removal	Excellent	Good	Excellent	N/A	Excellent
Camp Pond Brook	August 13	Deployment	Excellent	Good	Poor	Poor	Excellent
	September 9	Removal	N/A	N/A	N/A	N/A	N/A
Reid Brook below Tributary	August 1	Deployment	Good	Good	Excellent	Excellent	Excellent
	September 9	Removal	Fair	Excellent	Marginal	Excellent	Good
Tributary to Reid Brook	August 1	Deployment	Good	Good	Good	Excellent	Excellent
	September 9	Removal	Excellent	Marginal	Fair	Excellent	Excellent

Reid Brook at Outlet of Reid Pond

- At deployment, temperature, conductivity and turbidity were 'excellent', while pH was 'fair'. A comparison ranking is not available for dissolved oxygen due to missing data from the QA/QC sonde.
- At removal, temperature, conductivity and turbidity were 'excellent' and pH was 'good'. A comparison ranking is not available for dissolved oxygen due to missing data from the QA/QC sonde.

Camp Pond Brook below Camp Pond

- At deployment, temperature and turbidity were 'excellent', pH was 'good', while conductivity and dissolved oxygen were 'poor'. The discrepancy with conductivity may be due to a sensor or calibration issue; this is supported by a good comparison between the QA/QC sonde and the grab sample. The discrepancy with dissolved oxygen is due to a zero reading from the QA/QC sonde.
- Comparison rankings are not available for removal, as this instrument was not physically removed from the water on the date in question.

Reid Brook below Tributary

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- At removal, pH and dissolved oxygen were 'excellent', turbidity was 'good', temperature was 'fair', and conductivity was 'marginal'.

Tributary to Reid Brook

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- At removal, temperature, dissolved oxygen and turbidity were 'excellent', conductivity was 'fair', and pH was 'marginal'.

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 August 1st and 13th to September 9th, 2023 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.

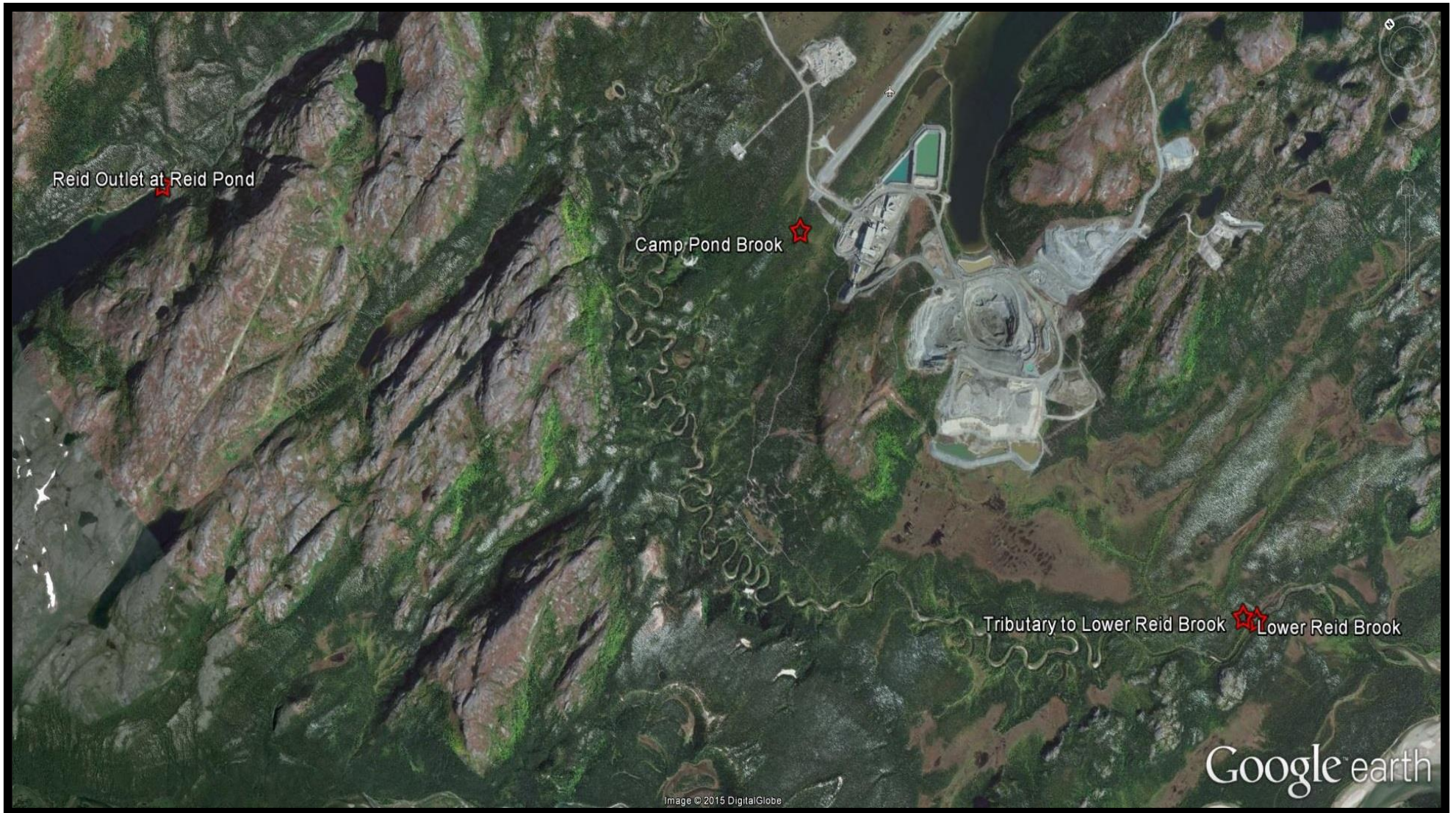


Figure 1: Voisey's Bay Network Station Locations

Reid Brook at Outlet of Reid Pond

Water Temperature

Over the deployment period, water temperature ranged from 12.17°C to 19.52°C, with a median value of 14.98°C (Figure 2). 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 Weather Station.

Water temperature slowly decreased 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.

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

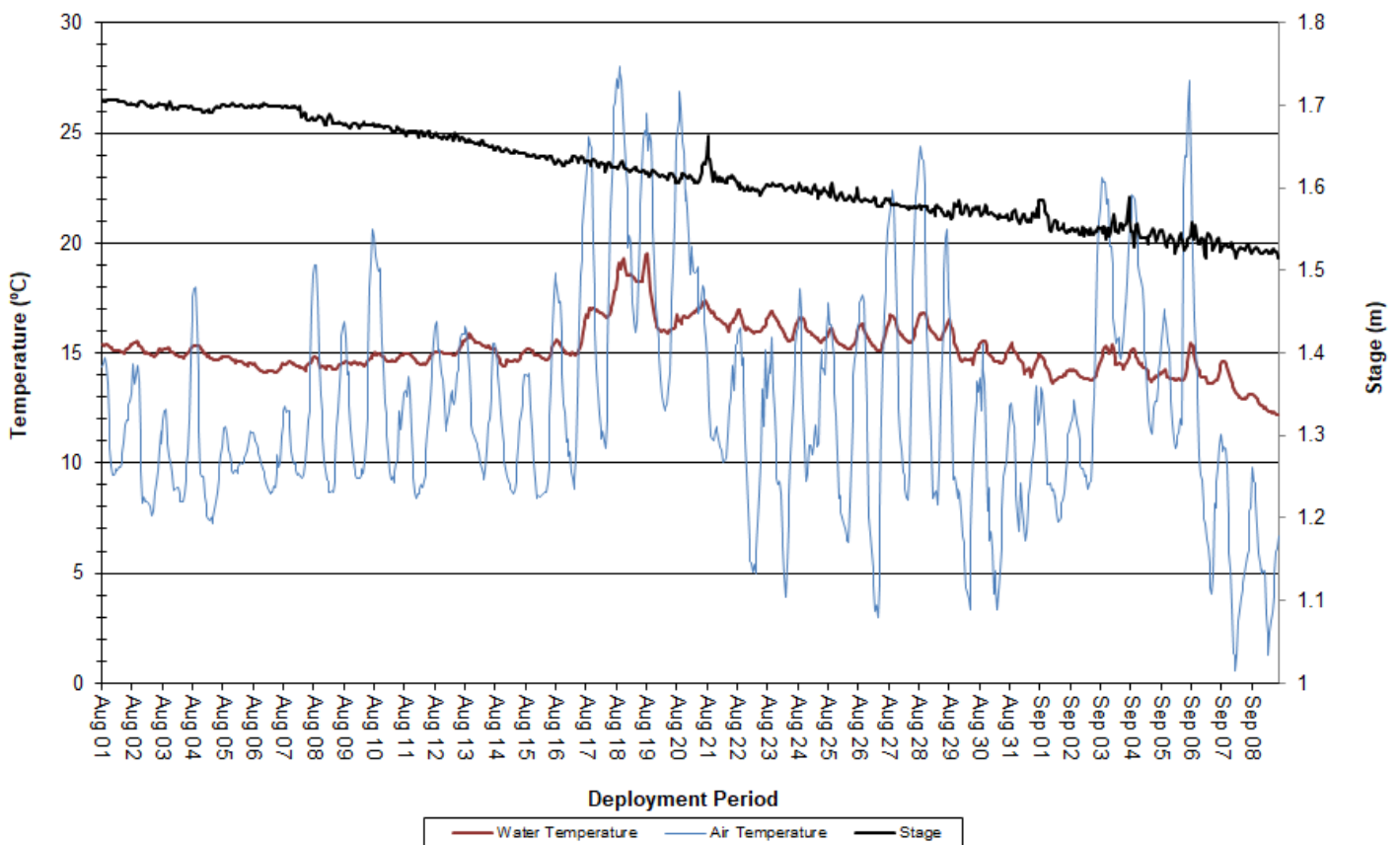


Figure 2: Water and Air Temperature & Stage at Reid Brook at Outlet of Reid Pond

pH

Over the deployment period, pH values ranged from 6.82 pH units to 7.47 pH units, with a median value of 7.13 pH units (Figure 3).

pH levels remained within the CCME's Guidelines for the Protection of Aquatic Life for the duration 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.

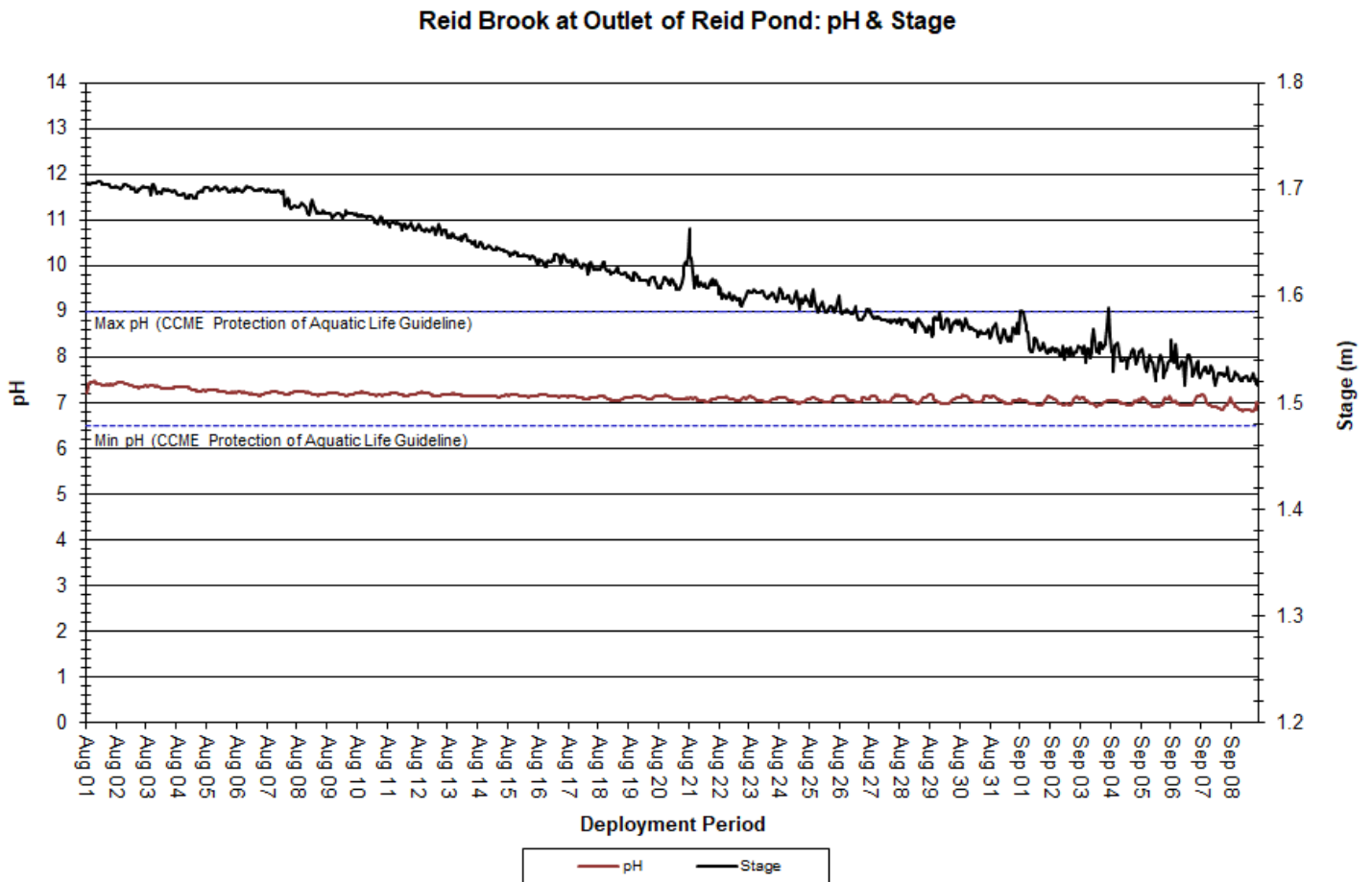


Figure 3: pH & Stage at Reid Brook at Outlet of Reid Pond

Specific Conductivity

Over the deployment period, specific conductivity levels ranged from 12 μ S/cm to 14 μ S/cm, with a median value of 13 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.

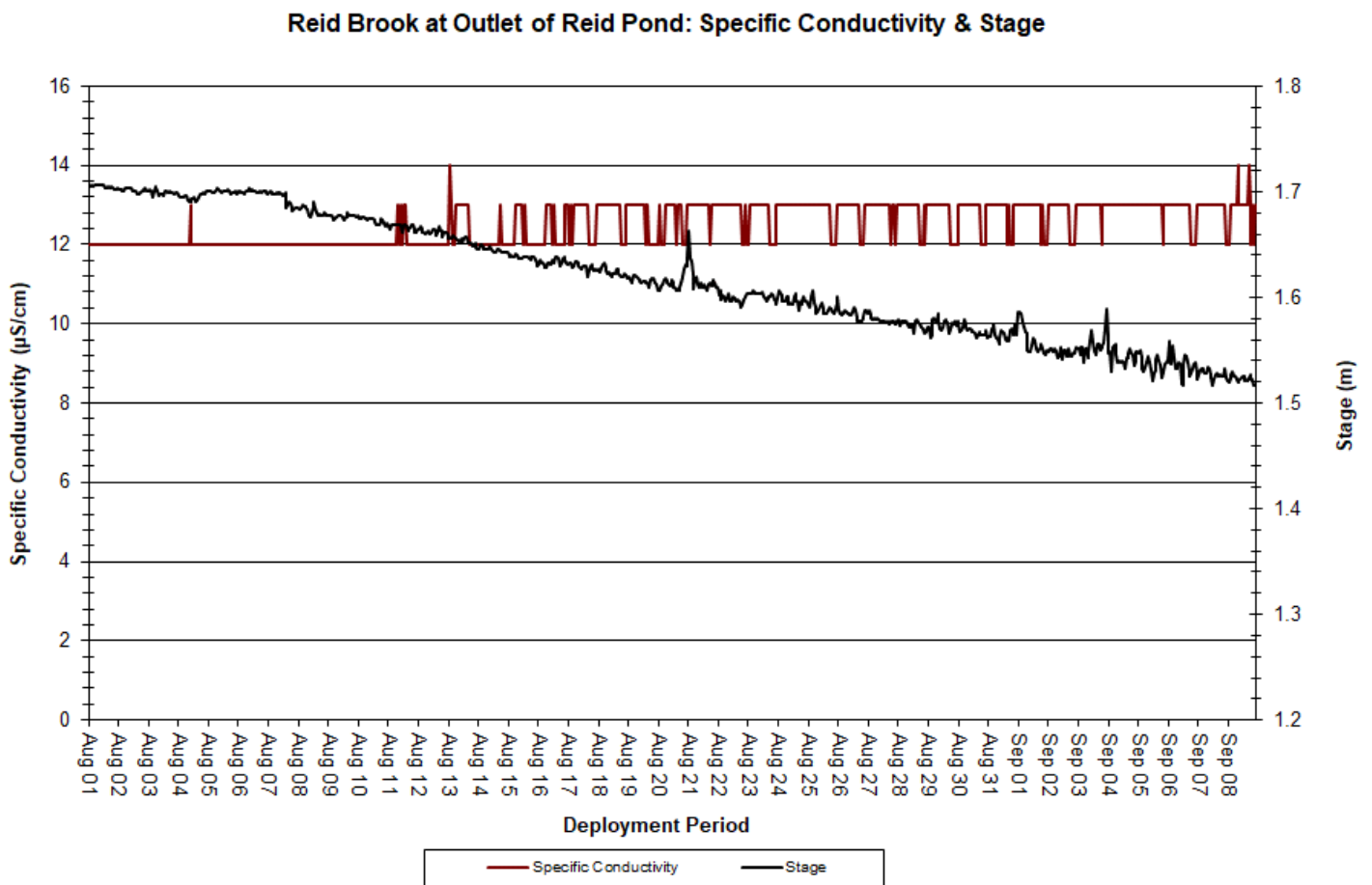


Figure 4: Specific Conductivity & Stage at Reid Brook at Outlet of Reid Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration levels ranged from 9.22mg/L to 10.39mg/L, with a median value of 9.88mg/L. Percent saturation levels for dissolved oxygen ranged from 86.9% saturation to 108.0% saturation, with a median value of 98.2% 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 Guideline for the Protection of Early Life Stages for the majority of deployment; instances where levels fell below the Guideline correspond closely with higher water temperatures. Dissolved oxygen concentration values remained above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment. Dissolved oxygen concentrations were relatively stable across the deployment period, and are generally higher in water at lower temperatures, and vice versa.

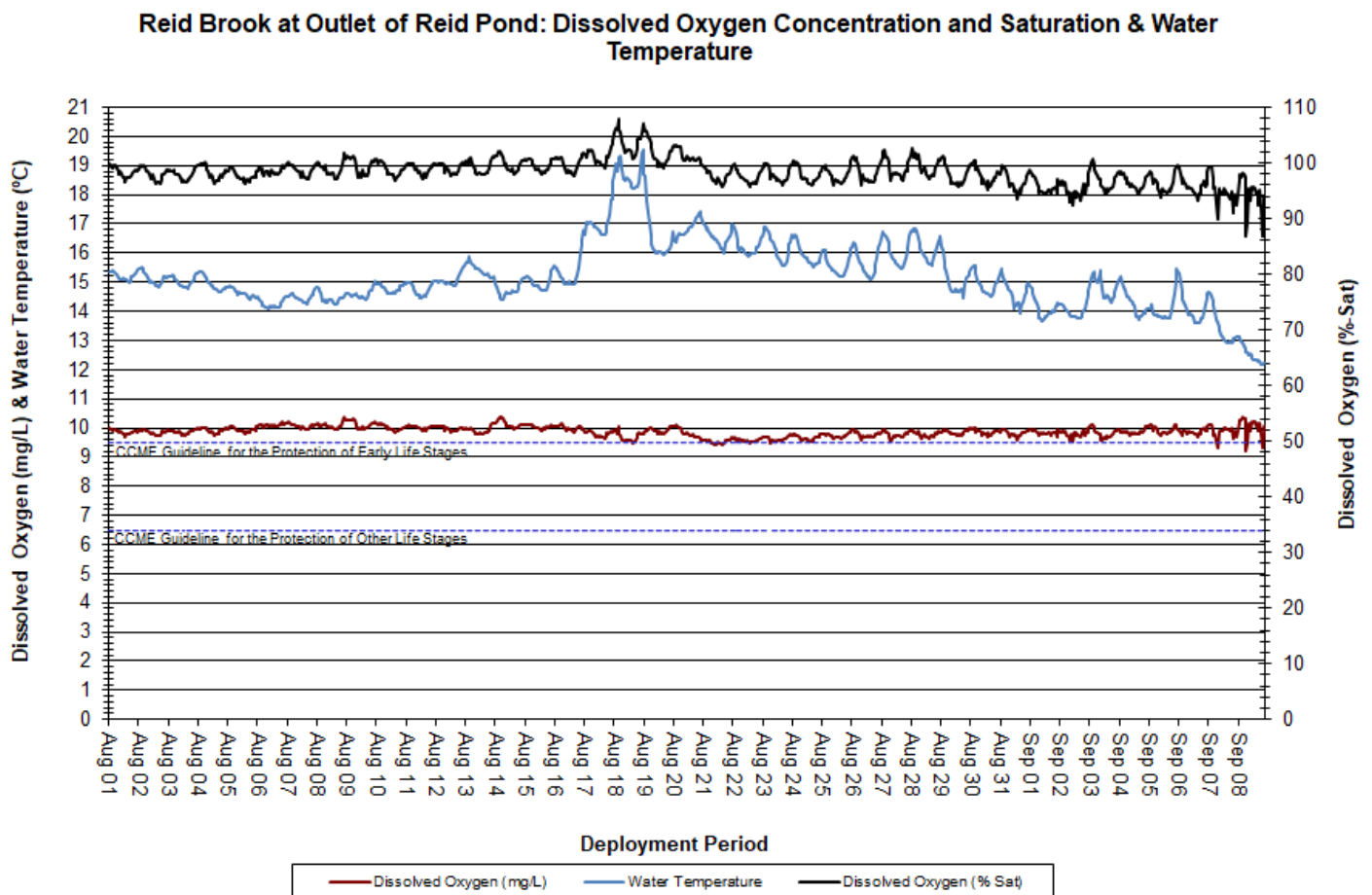


Figure 5: Dissolved Oxygen Concentration and Saturation & Water Temperature at Reid Brook at Outlet of Reid Pond

Turbidity

Over the deployment period, turbidity levels remained at ONTU (Figure 6). This indicates that there was a low level of 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 low turbidity levels, as it is pristine in nature and far removed from anthropogenic influences that may affect water quality.

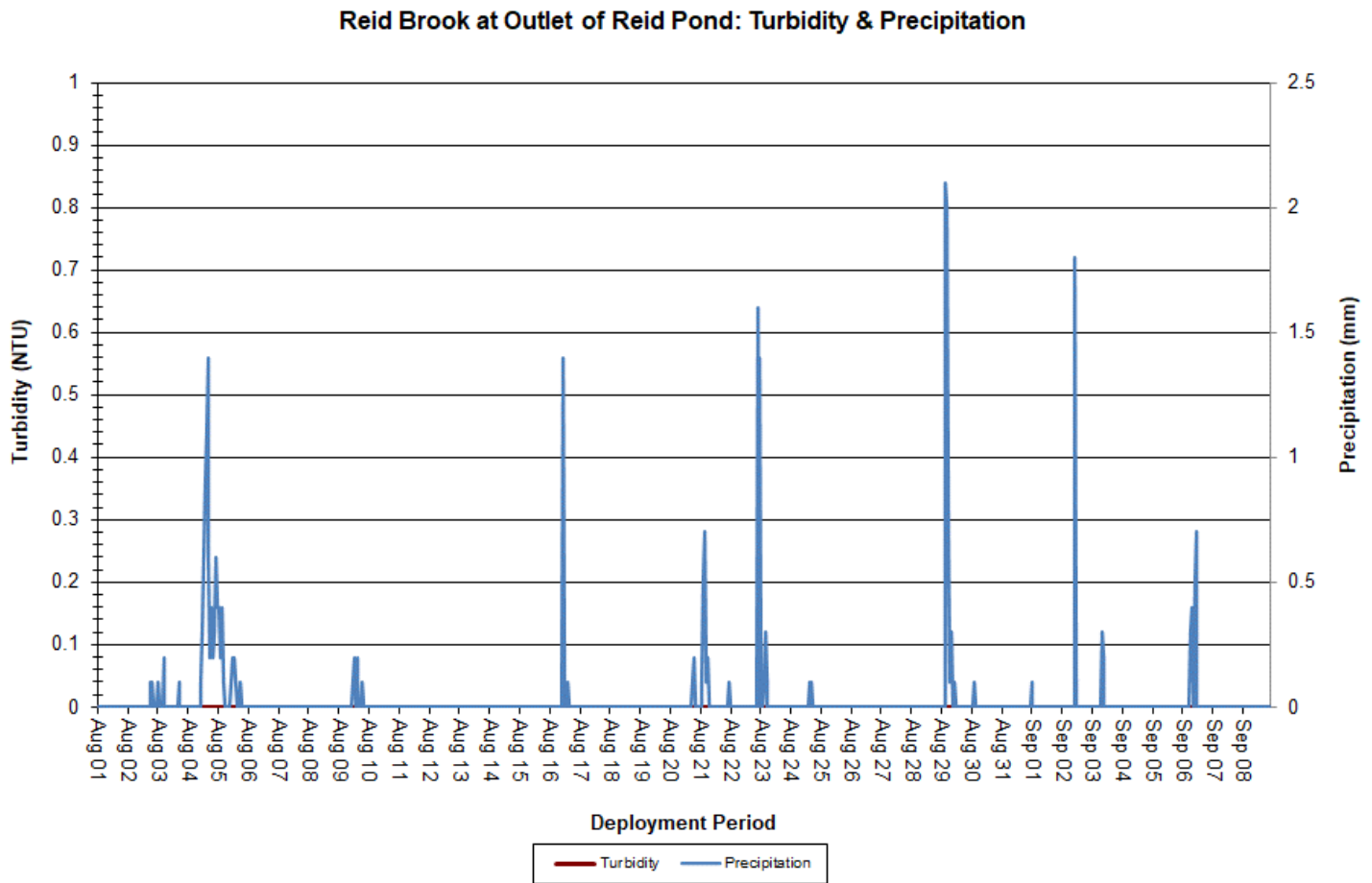


Figure 6: Turbidity & Precipitation at Reid Brook at Outlet of Reid Pond

Stage and Flow

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 1.516m to 1.707m, with a median value of 1.614m. Flow values ranged from 0.267m³/s to 0.869m³/s, with a median value of 0.475m³/s. Precipitation data was obtained from the Voisey's Bay 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.

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

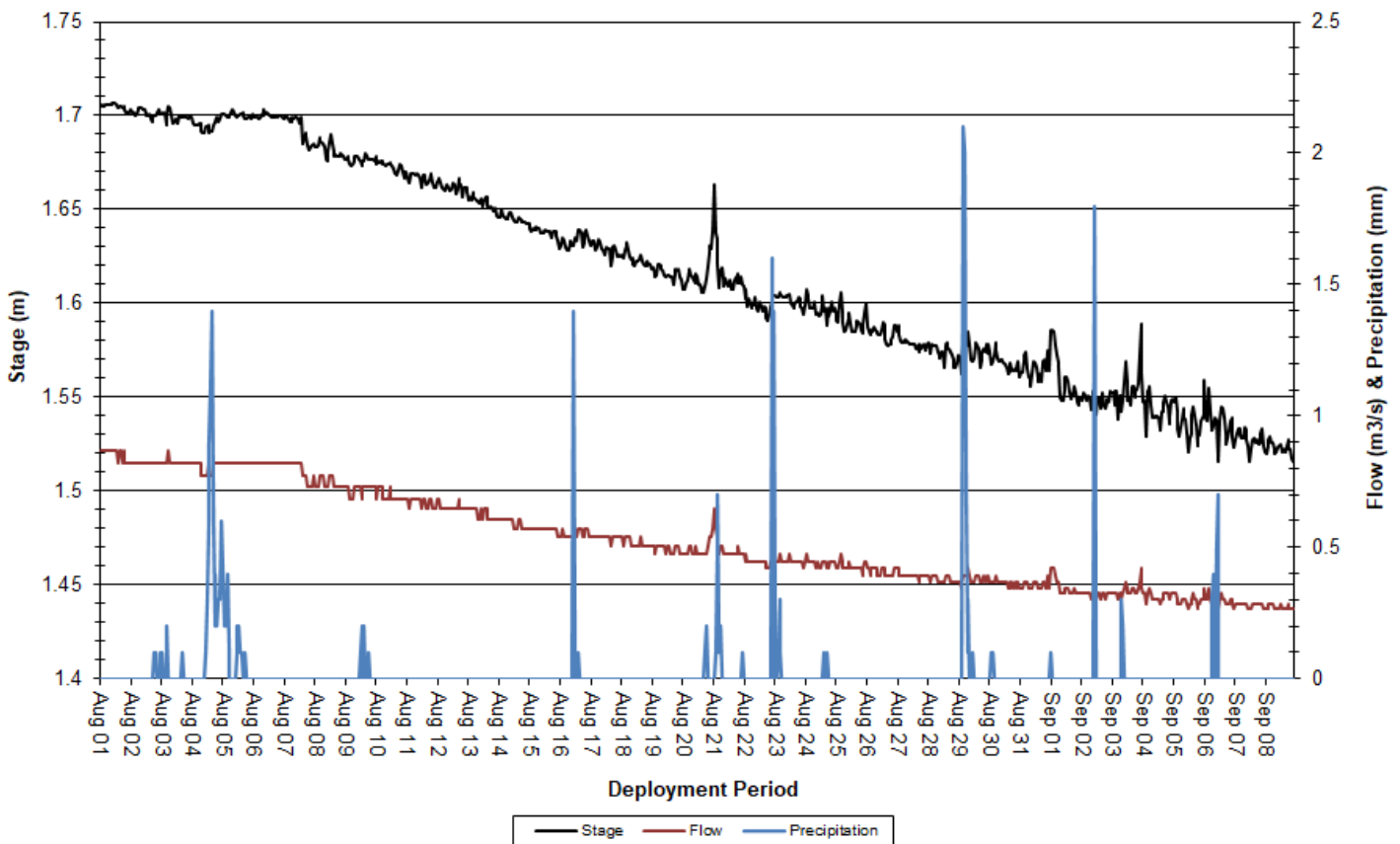


Figure 7: Stage, Flow & Precipitation at Reid Brook at Outlet of Reid Pond

Camp Pond Brook below Camp Pond

Water Temperature

Over the deployment period, water temperature ranged from 8.99°C to 21.3°C, with a median value of 14.9°C (Figure 8).

Water temperature at this station displays diurnal variations. Water temperature was variable over the course of deployment and correlated closely with air temperatures across the same period (Figure 8). Air temperature data was obtained from the Voisey's Bay 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.

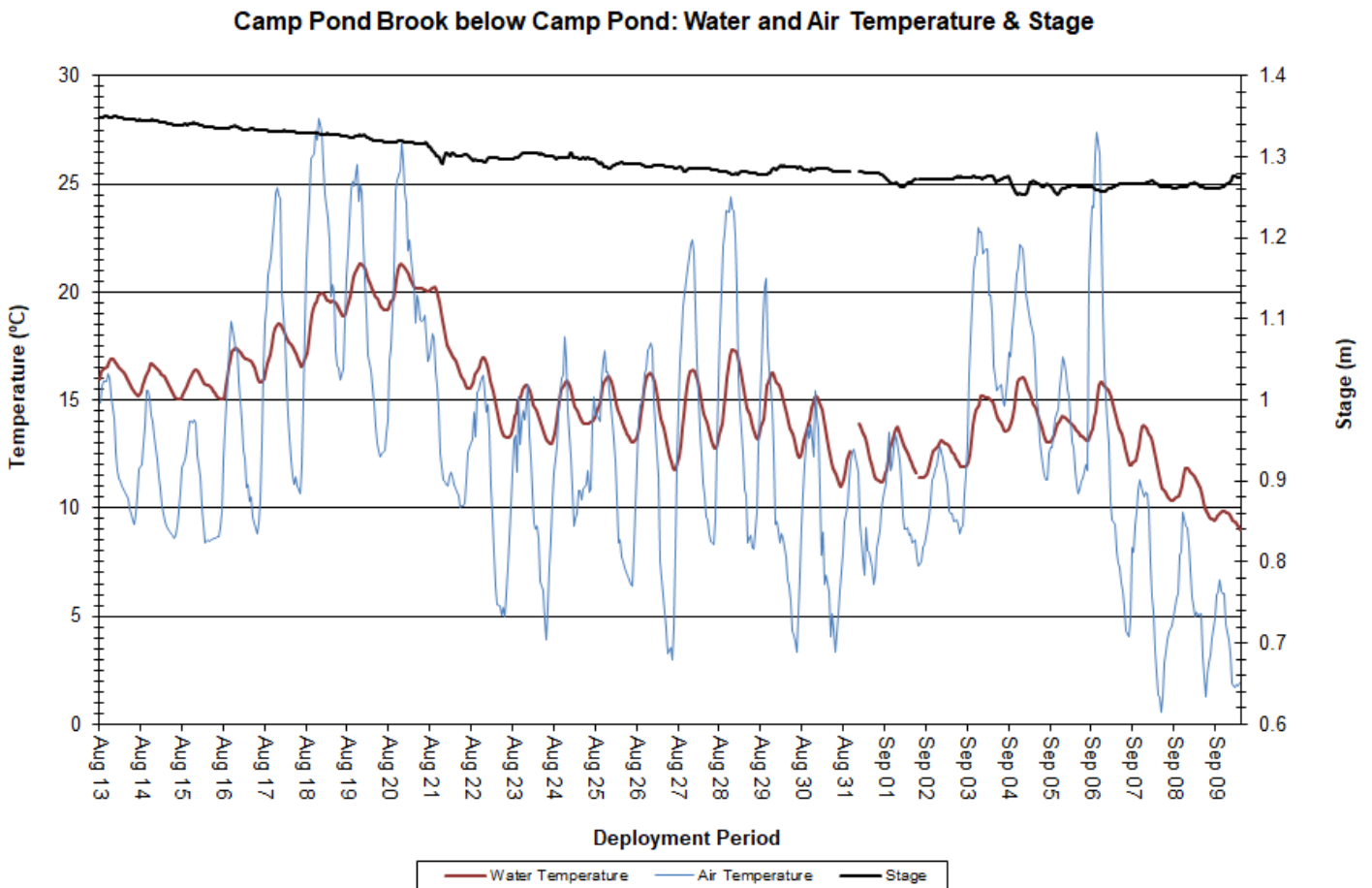


Figure 8: Water and Air Temperature & Stage at Camp Pond Brook below Camp Pond

pH

Over the deployment period, pH values ranged from 6.61 pH units to 7.23 pH units, with a median value of 6.92 pH units (Figure 9).

pH levels were relatively stable over the course of deployment, remaining within the CCME's Guidelines for the Protection of Aquatic Life for the duration 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.

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.

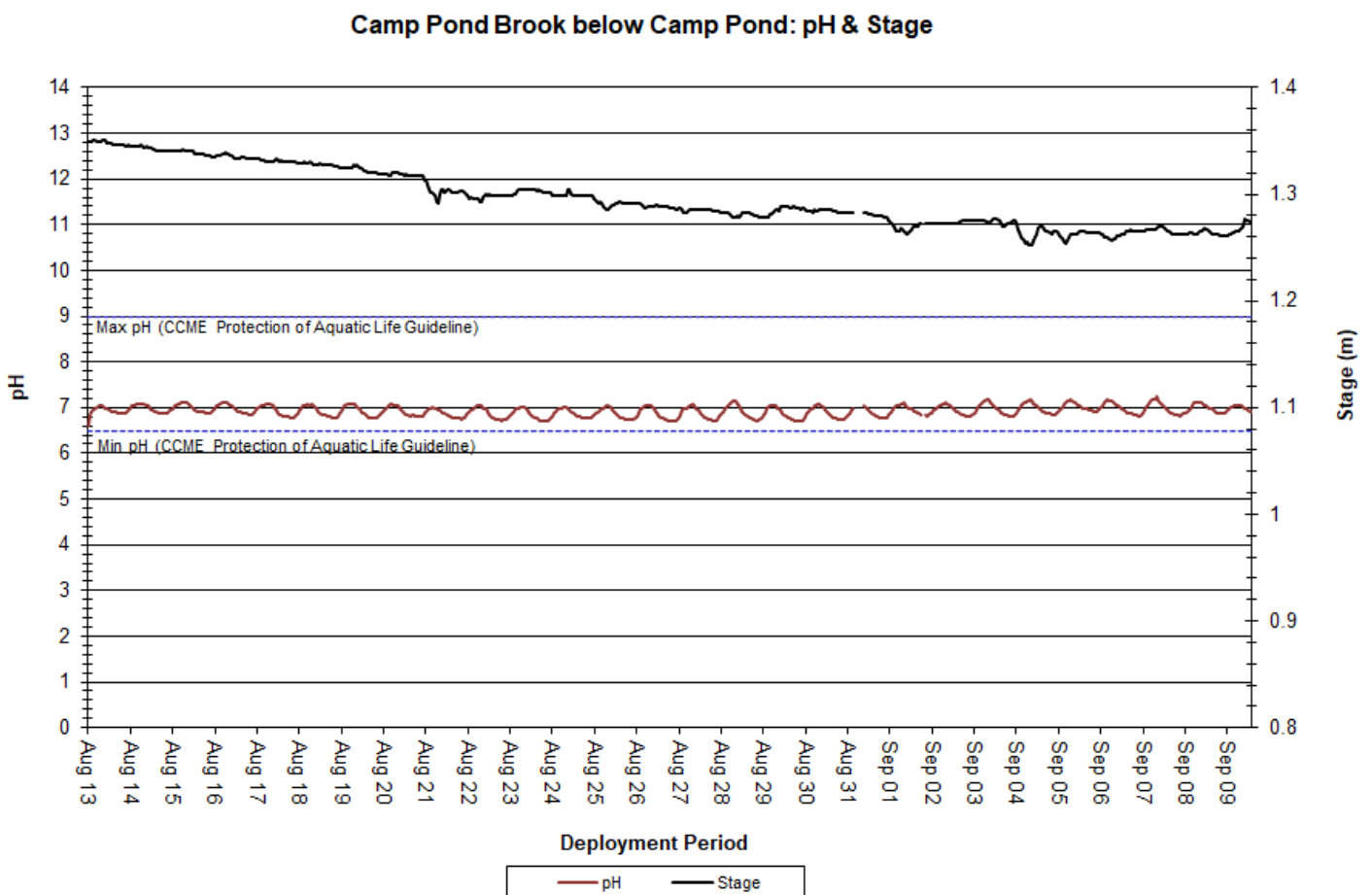


Figure 9: pH & Stage at Camp Pond Brook below Camp Pond

Specific Conductivity

Over the deployment period, specific conductivity ranged from 102.5 μ S/cm to 178.7 μ S/cm, with a median value of 134.5 μ S/cm (Figure 10).

Conductivity levels were increasing across the deployment period as stage was decreasing. A decrease in water level generally serves to concentrate suspended materials in the water column, in turn increasing specific conductivity (Figure 10). Sudden increases in stage also typically correspond with sudden temporary increases in specific conductivity at this station, which is evident in the graph below.

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.

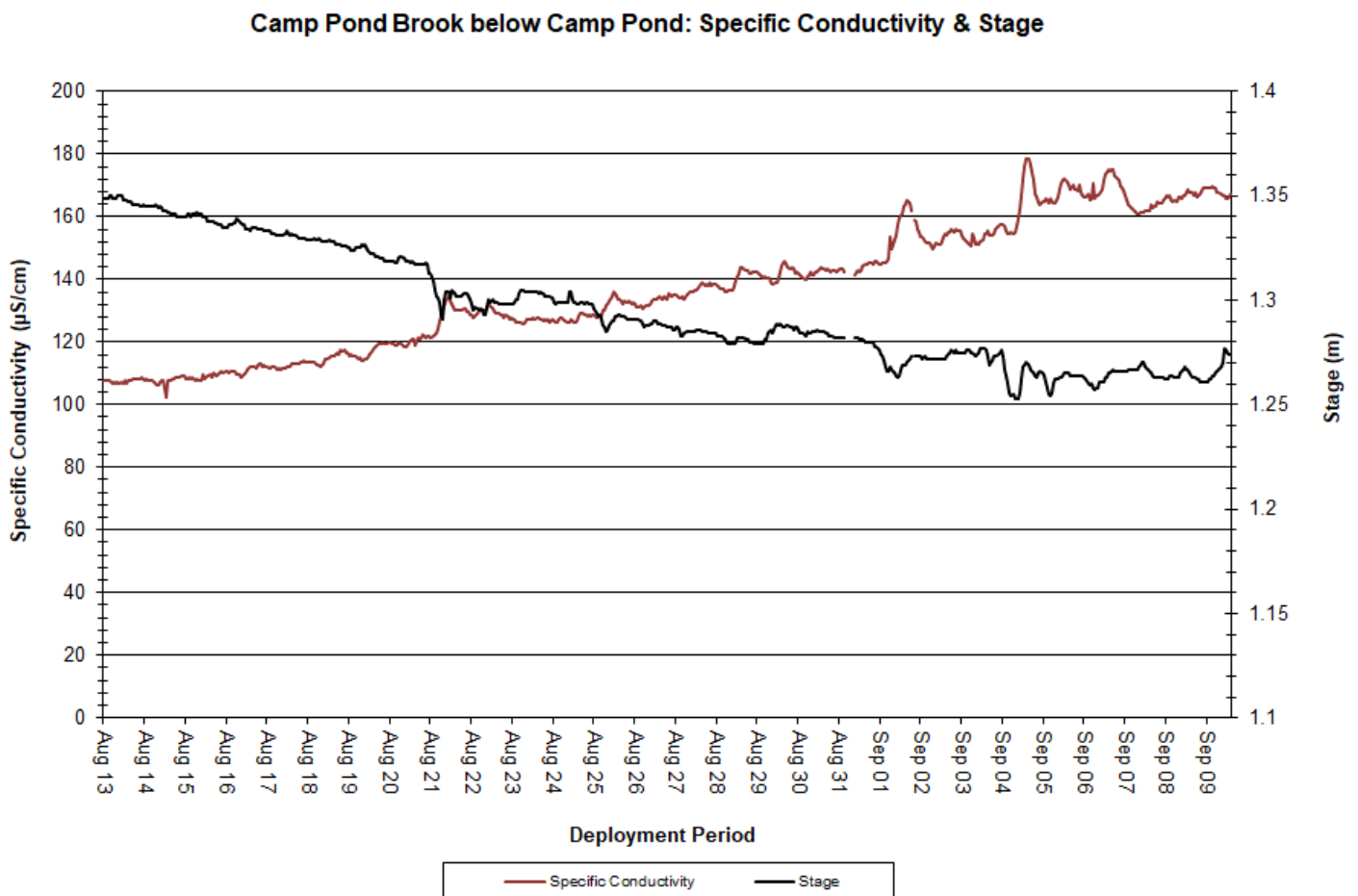


Figure 10: Specific Conductivity & Stage at Camp Pond Brook below Camp Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 7.66mg/L to 10.99mg/L, with a median value of 9.32mg/L. Saturation of dissolved oxygen ranged from 85.2% saturation to 103.1% saturation, with a median value of 92.9% (Figure 11).

Dissolved oxygen concentrations were variable across the deployment period, as water temperatures were similarly variable across the same period. 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 hovered above and below the CCME's Guideline for the Protection of Early Life Stages for the majority of deployment. Periods where dissolved oxygen concentrations rose above the Guideline correlated closely with periods of cooler water temperatures, which is to be expected. Dissolved oxygen concentrations remained above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment (Figure 11).

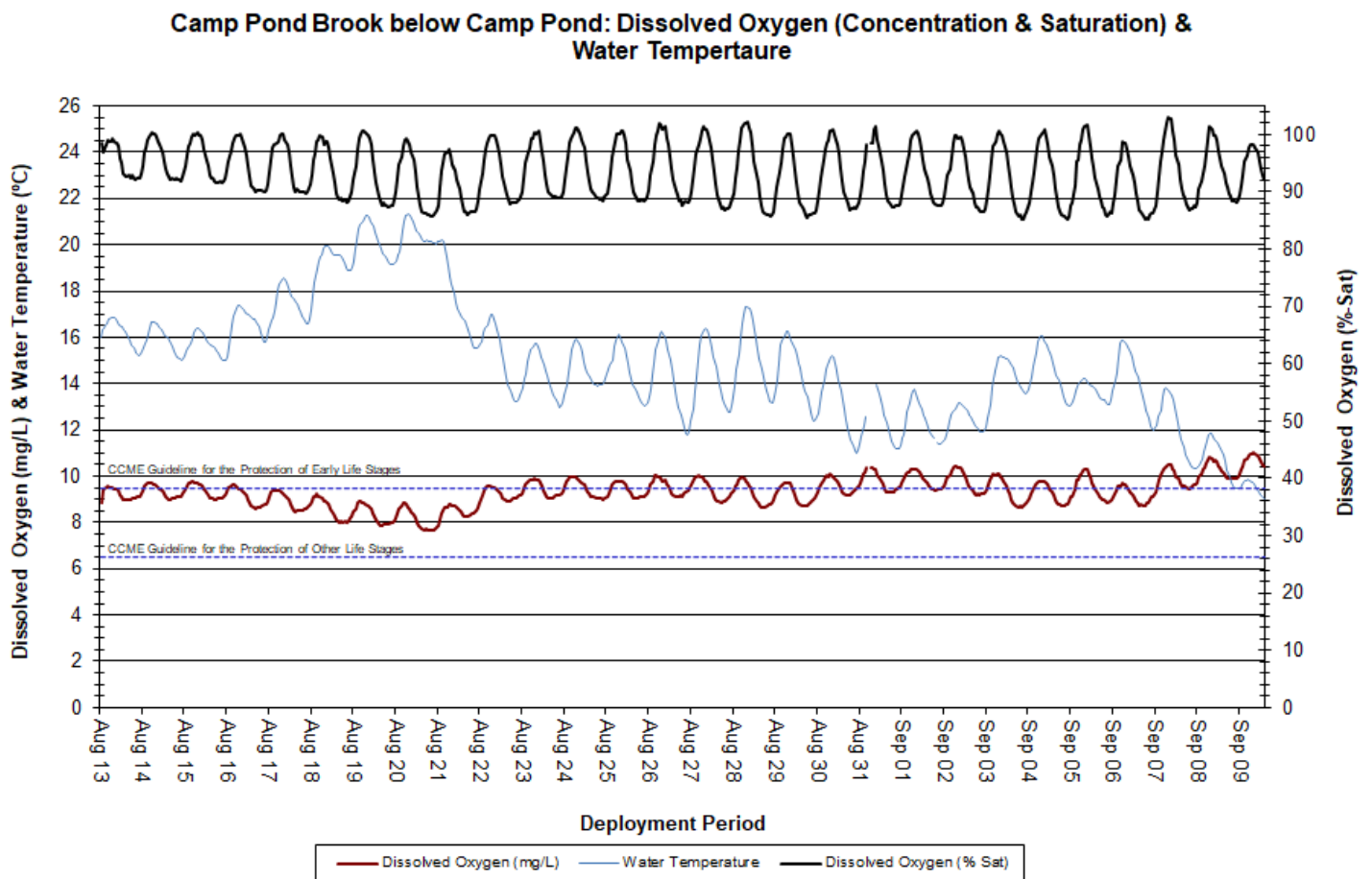


Figure 11: Dissolved Oxygen & Water Temperature at Camp Pond Brook below Camp Pond

Turbidity

Over the deployment period, turbidity ranged from 0NTU to 7.3NTU, with a median value of 0.4NTU (Figure 12). A median value of 0.4NTU indicates that there was a very low level of natural background turbidity at this station.

Higher turbidity levels are commonly observed at this station and often correlate with precipitation events and subsequent runoff entering Camp Pond Brook (Figure 12). Precipitation data was obtained from the Voisey's Bay Weather Station.

Camp Pond Brook below Camp Pond: Turbidity & Precipitation

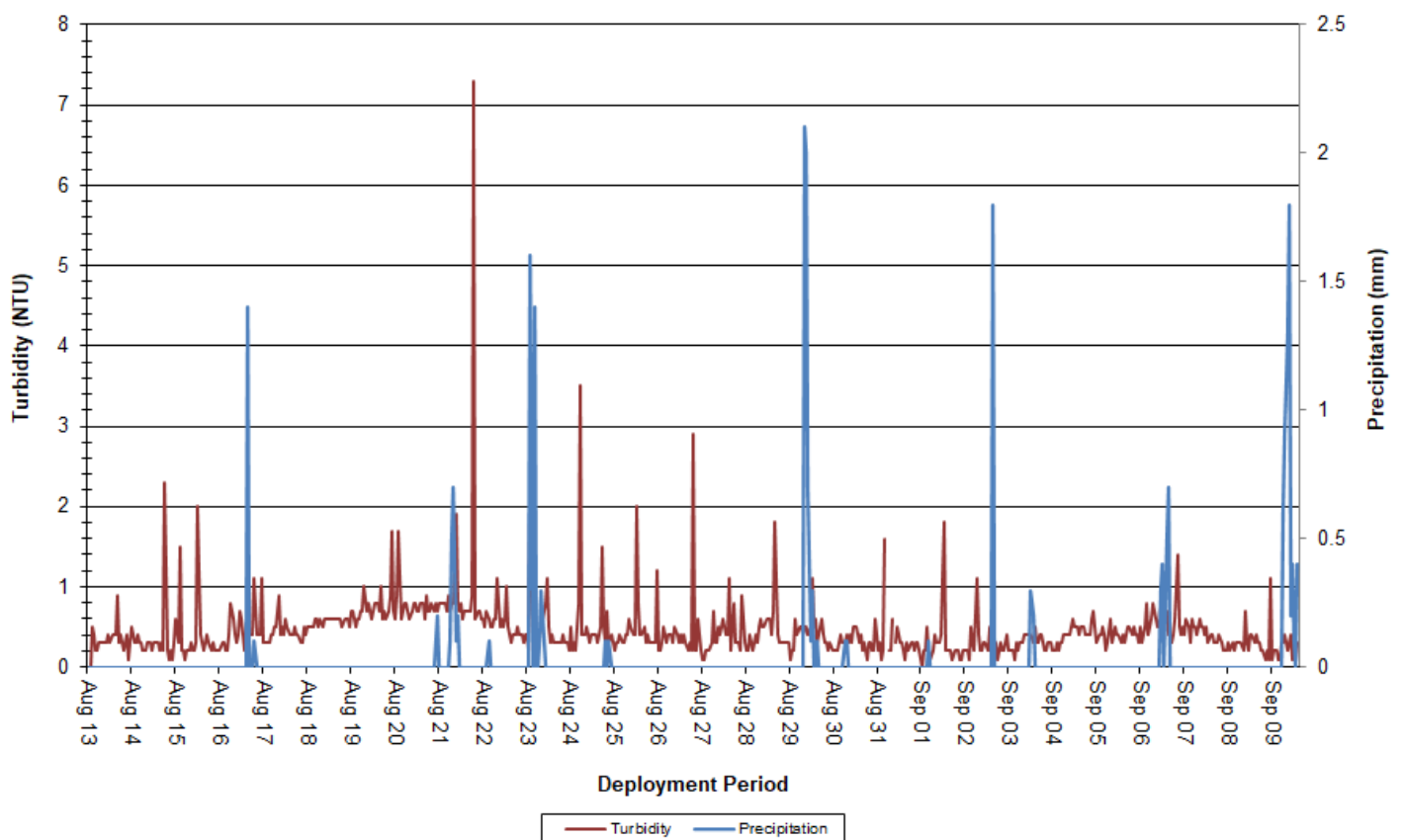


Figure 12: Turbidity & Precipitation at Camp Pond Brook below Camp Pond

Stage and Flow

Over the deployment period, stage values ranged from 1.253m to 1.35m, with a median value of 1.288m. Stream flow values ranged from 0.066m³/s to 0.235m³/s, with a median value of 0.112m³/s. Precipitation data was obtained from the Voisey's Bay Weather Station (Figure 13).

Stage and flow were slightly decreasing over the deployment period. Increases in both stage and flow were often attributable 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

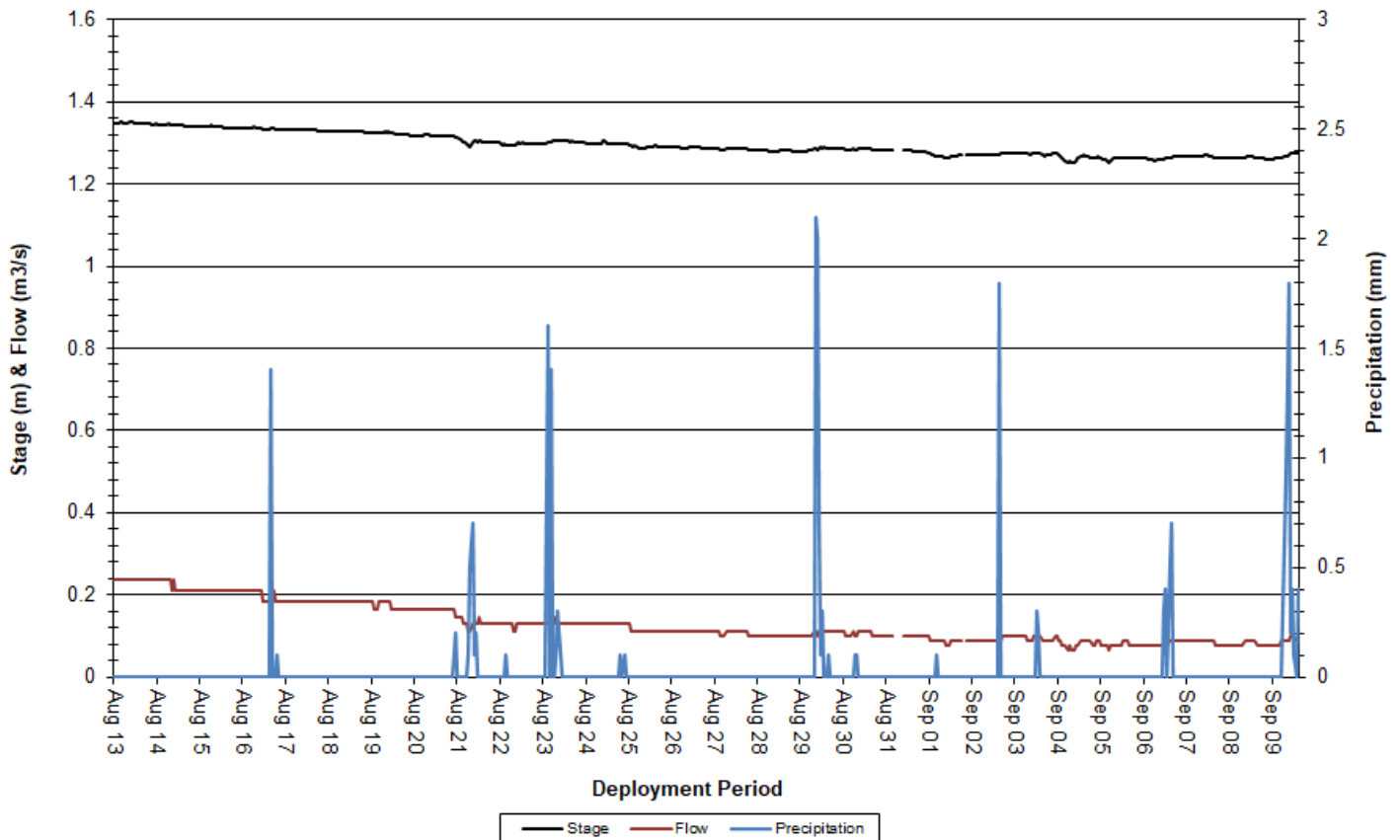


Figure 13: Stage, Flow & Precipitation at Camp Pond Brook below Camp Pond

Reid Brook below Tributary

Water Temperature

Over the deployment period, water temperature ranged from 7.96°C to 21.05°C, with a median value of 13.05°C (Figure 14).

Water temperature at this station displays diurnal variations and was variable but slightly decreasing across the deployment period. This is to be expected as air temperatures exhibited a similar trend (Figure 14). Air temperature data was obtained from the Voisey's Bay 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

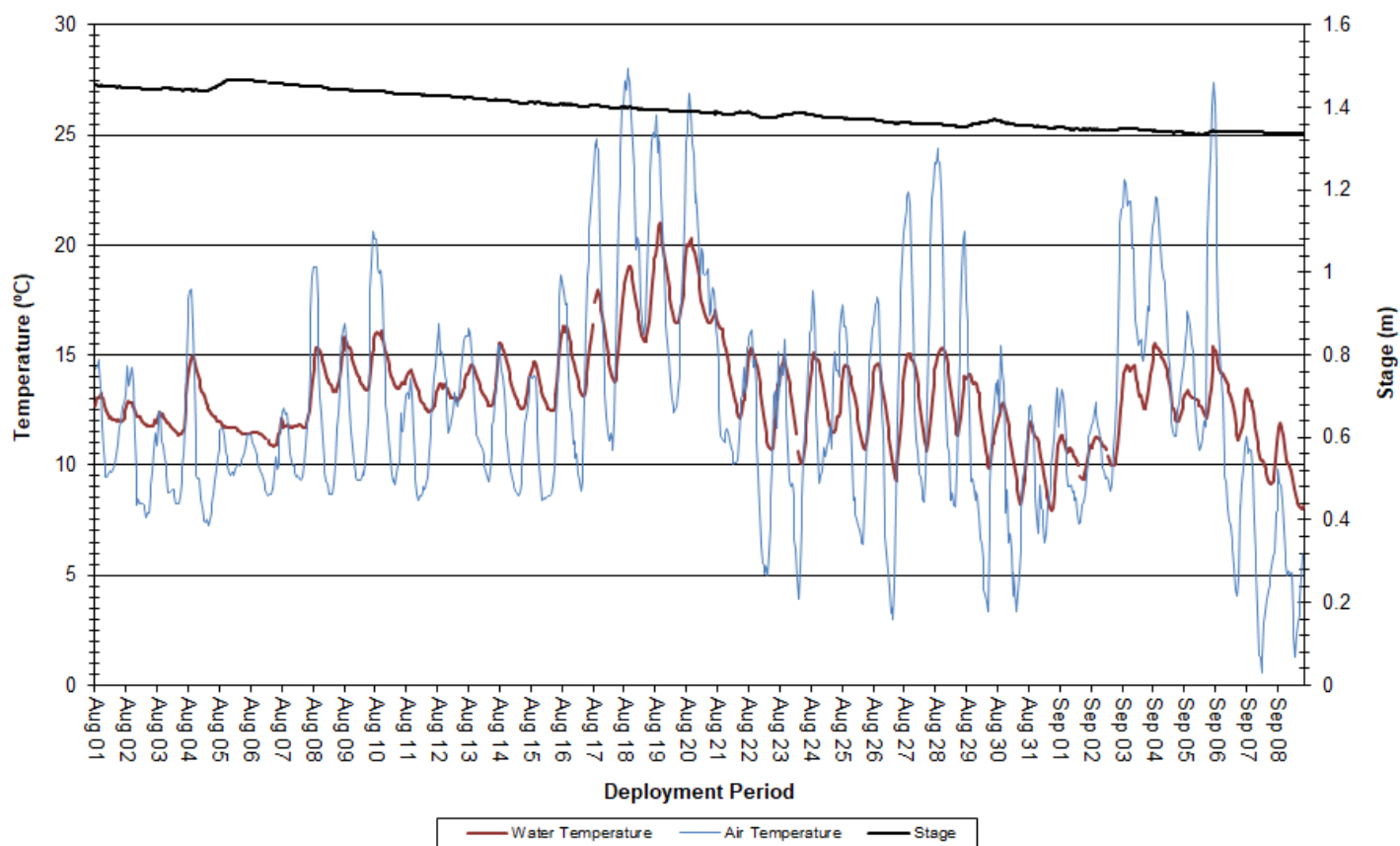


Figure 14: Water and Air Temperature & Stage at Reid Brook below Tributary

pH

Over the deployment period, pH ranged from 6.59 pH units to 7.23 pH units, with a median value of 6.93 (Figure 15).

pH was within the CCME's Guidelines for the Protection of Aquatic Life for the duration 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.

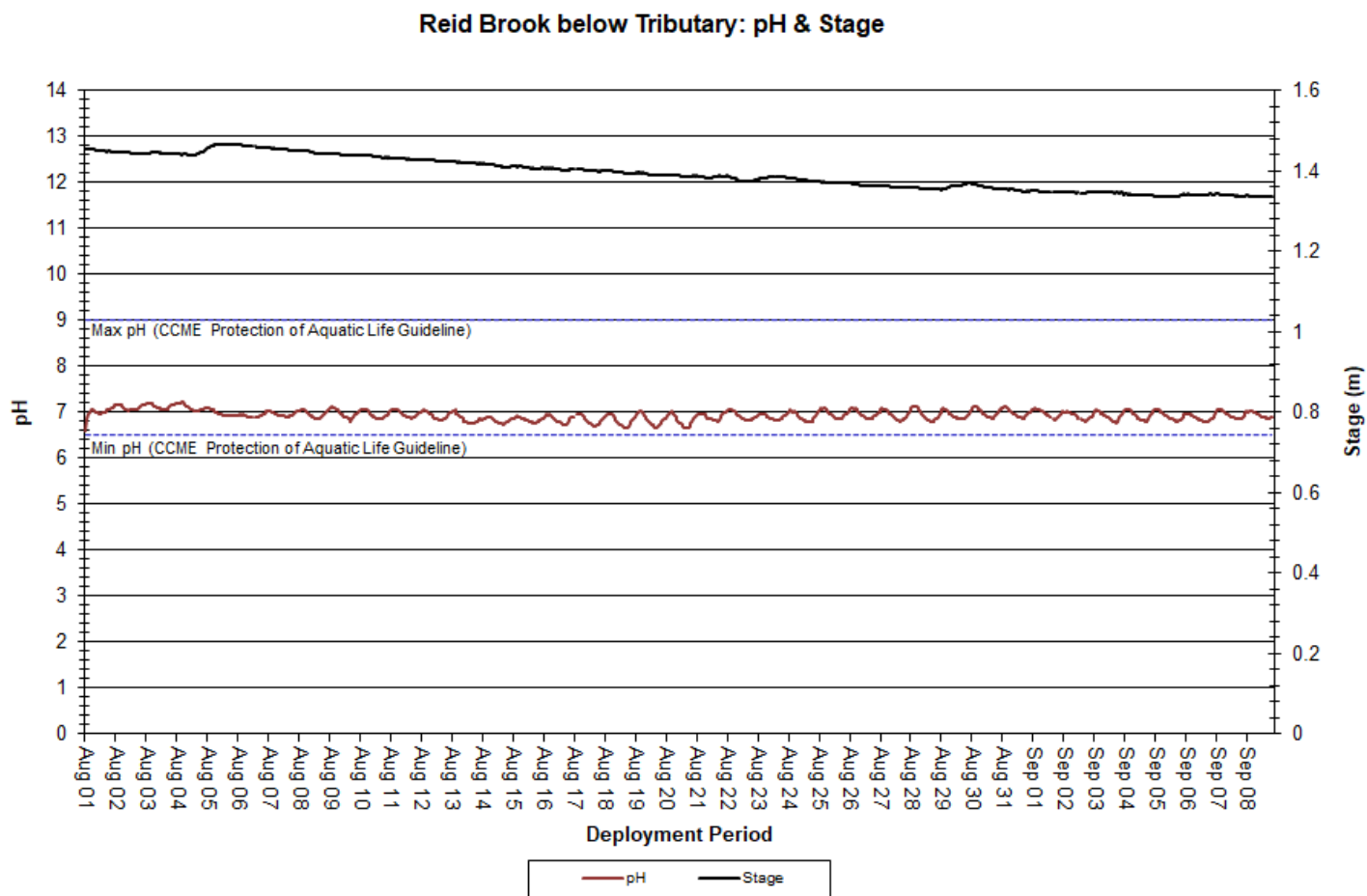


Figure 15: pH & Stage at Reid Brook below Tributary

Specific Conductivity

Over the deployment period, specific conductivity ranged from 34.5 μ S/cm to 48.3 μ S/cm, with a median value of 42.1 μ S/cm (Figure 16).

Specific conductivity was variable but stable 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. This relationship is somewhat 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.

Reid Brook below Tributary: Specific Conductivity & Stage

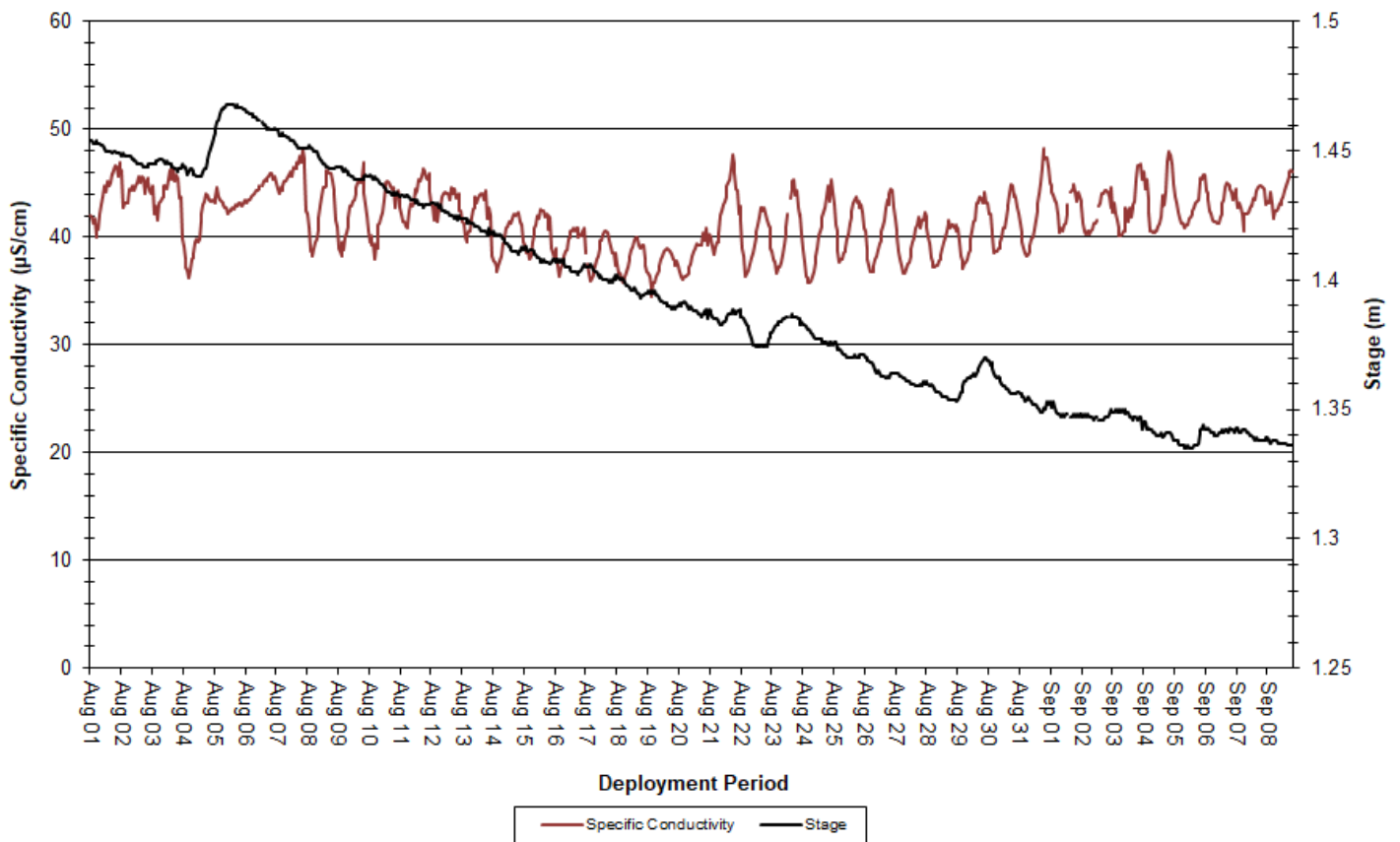


Figure 16: Specific Conductivity & Stage at Reid Brook below Tributary

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 8.80mg/L to 11.75mg/L, with a median value of 10.43mg/L. The saturation of dissolved oxygen ranged from 90.3% saturation to 110.6% saturation, with a median value of 98.3% (Figure 17).

Dissolved oxygen concentrations remained above the CCME's Guideline for the Protection of Early Life Stages for the majority of deployment; instances where levels fell below the Guideline correlate closely with higher water temperatures. Dissolved oxygen concentrations remained above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment. Dissolved oxygen concentrations were relatively stable over the course of deployment, which is to be expected as water temperatures followed a similar trend across the same period.

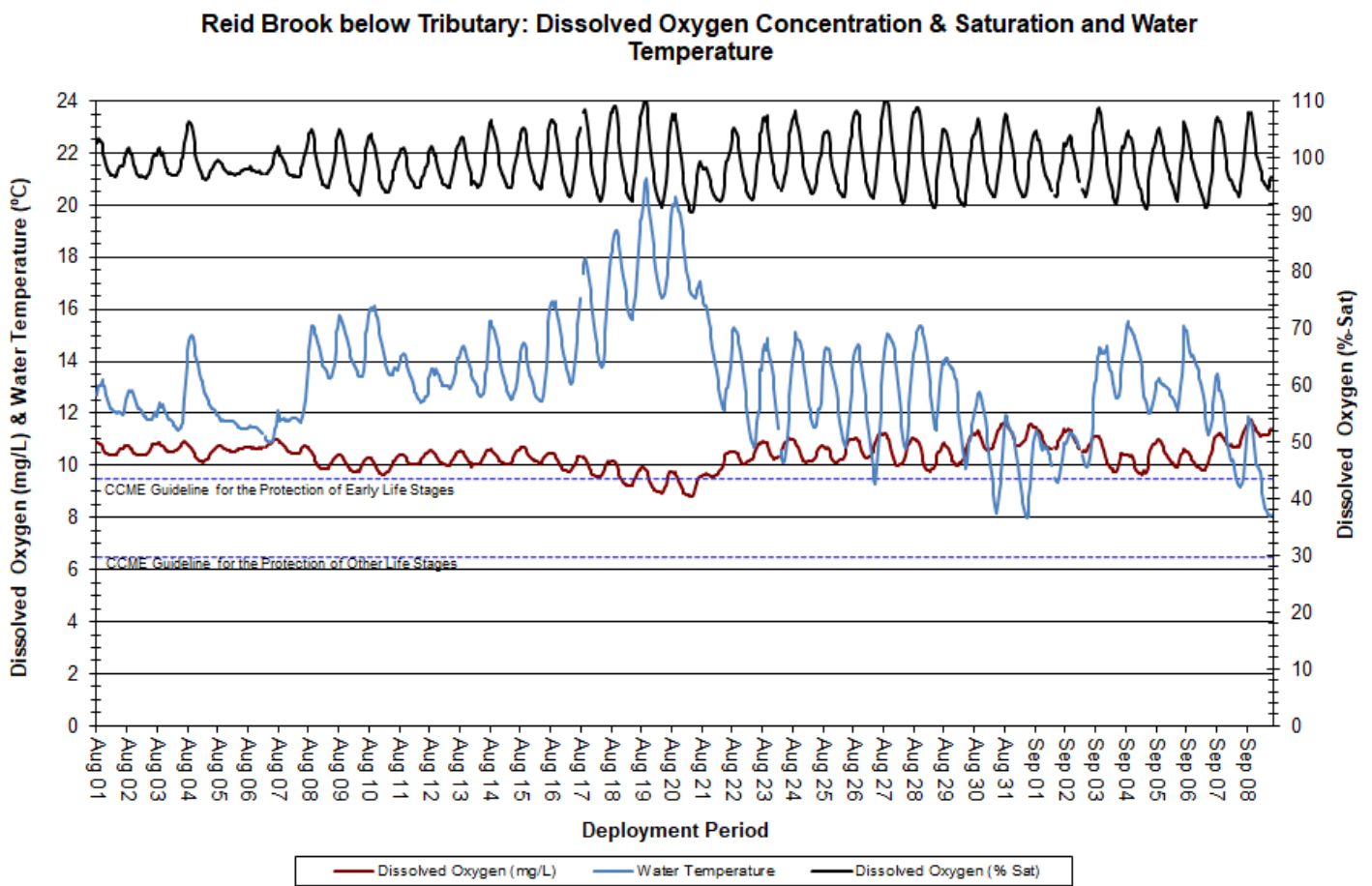


Figure 17: Dissolved Oxygen & Water Temperature at Reid Brook below Tributary

Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 7.4 NTU, with a median value of 0 NTU (Figure 18). A median turbidity value of 0 NTU indicates a very low level of 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 Weather Station.

Reid Brook below Tributary: Turbidity & Precipitation

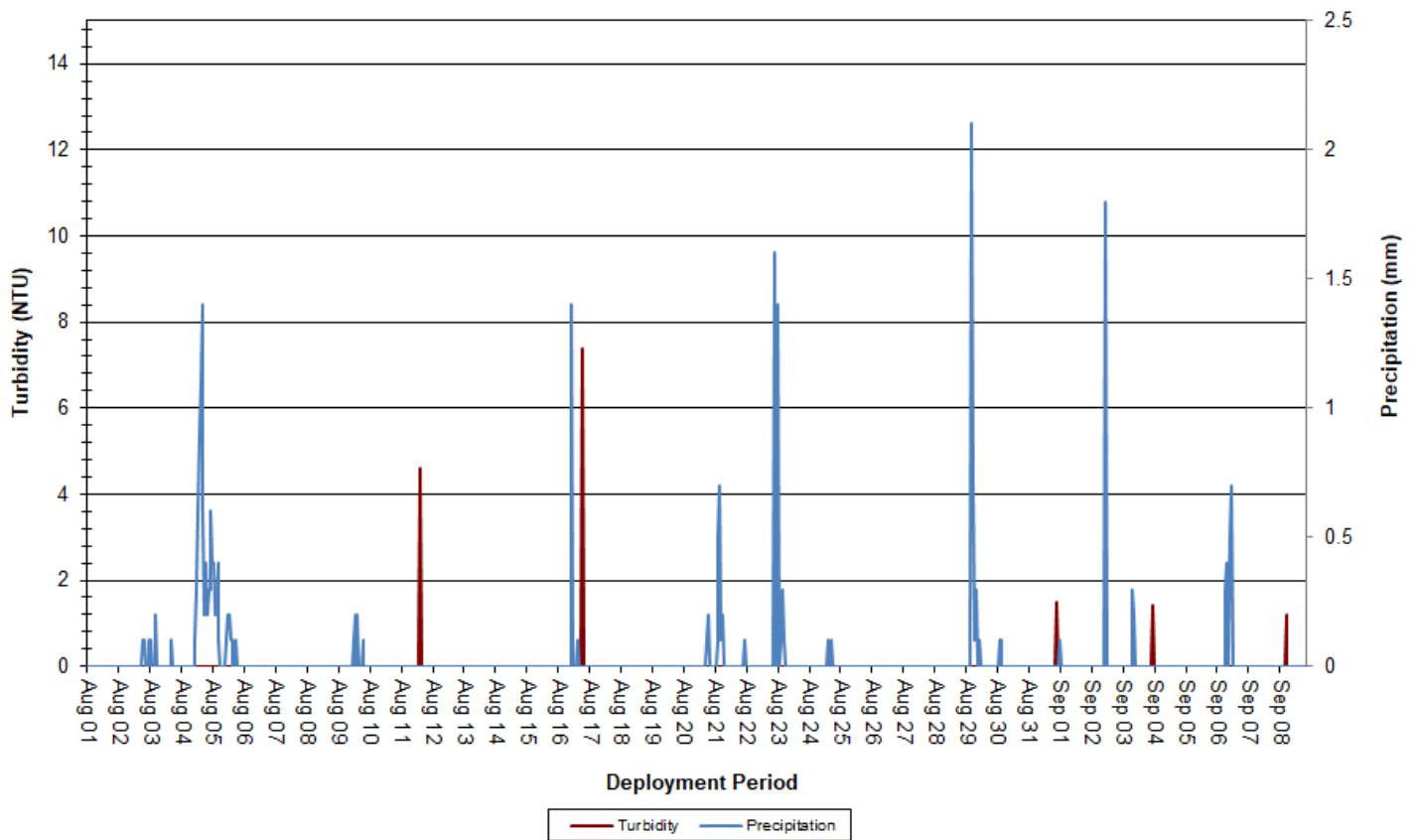


Figure 18: Turbidity & Precipitation at Reid Brook below Tributary

Stage and Flow

Over the deployment period, stage values ranged from 1.335m to 1.468m, with a median value of 1.389m. Stream flow values ranged from 0.517m³/s to 1.806m³/s, with a median value of 0.921m³/s. Precipitation data was obtained from the Voisey's Bay Weather Station (Figure 19).

Stage and flow were variable, but steadily 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.

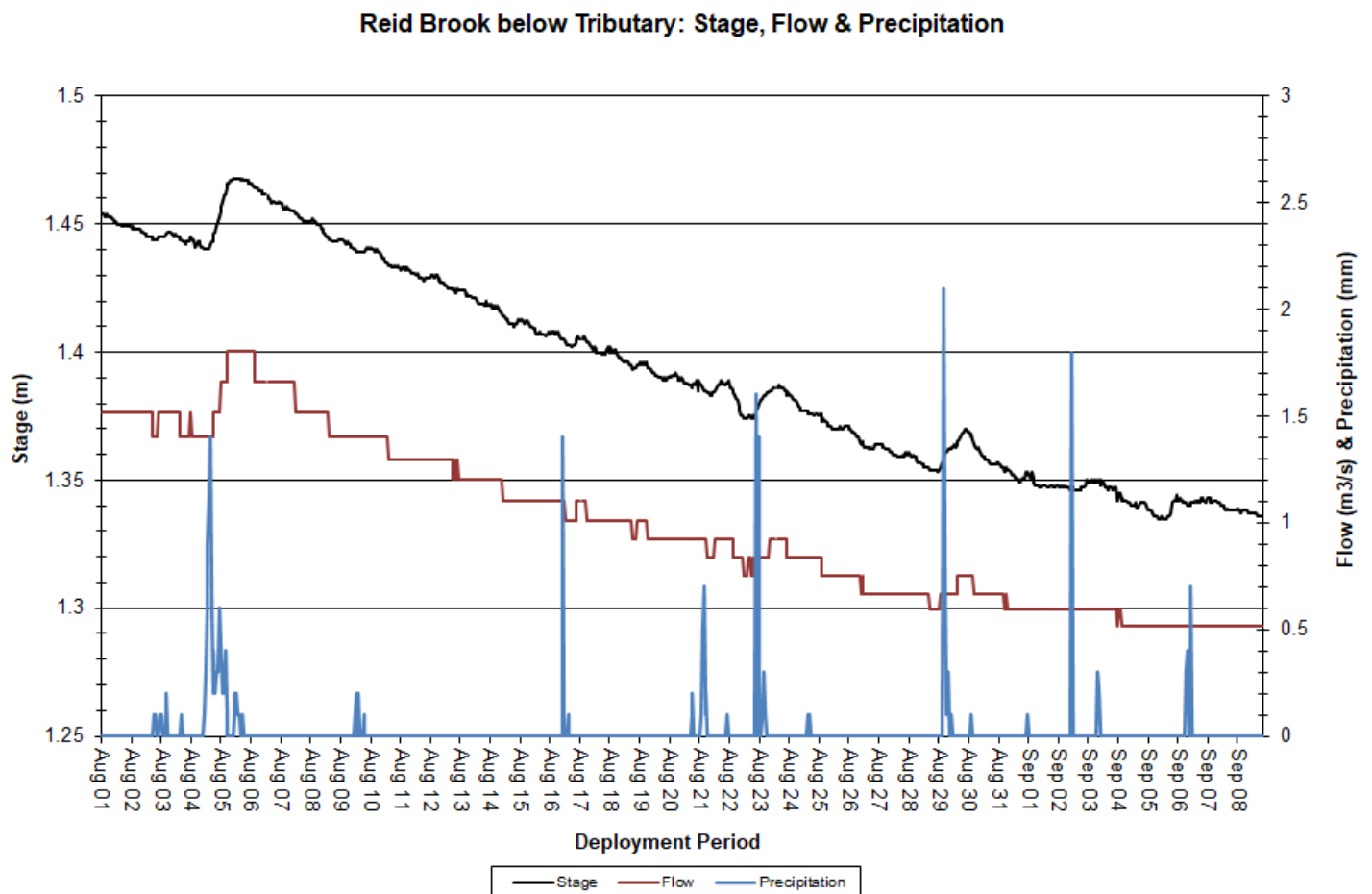


Figure 19: Stage, Flow & Precipitation at Reid Brook below Tributary

Tributary to Reid Brook

Water Temperature

Over the deployment period, water temperature ranged from 7.11°C to 15.9°C, with a median value of 11.82°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 Weather Station.

Water temperature data displays a natural diurnal pattern. Water temperatures were variable but generally decreasing over the course of deployment 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.

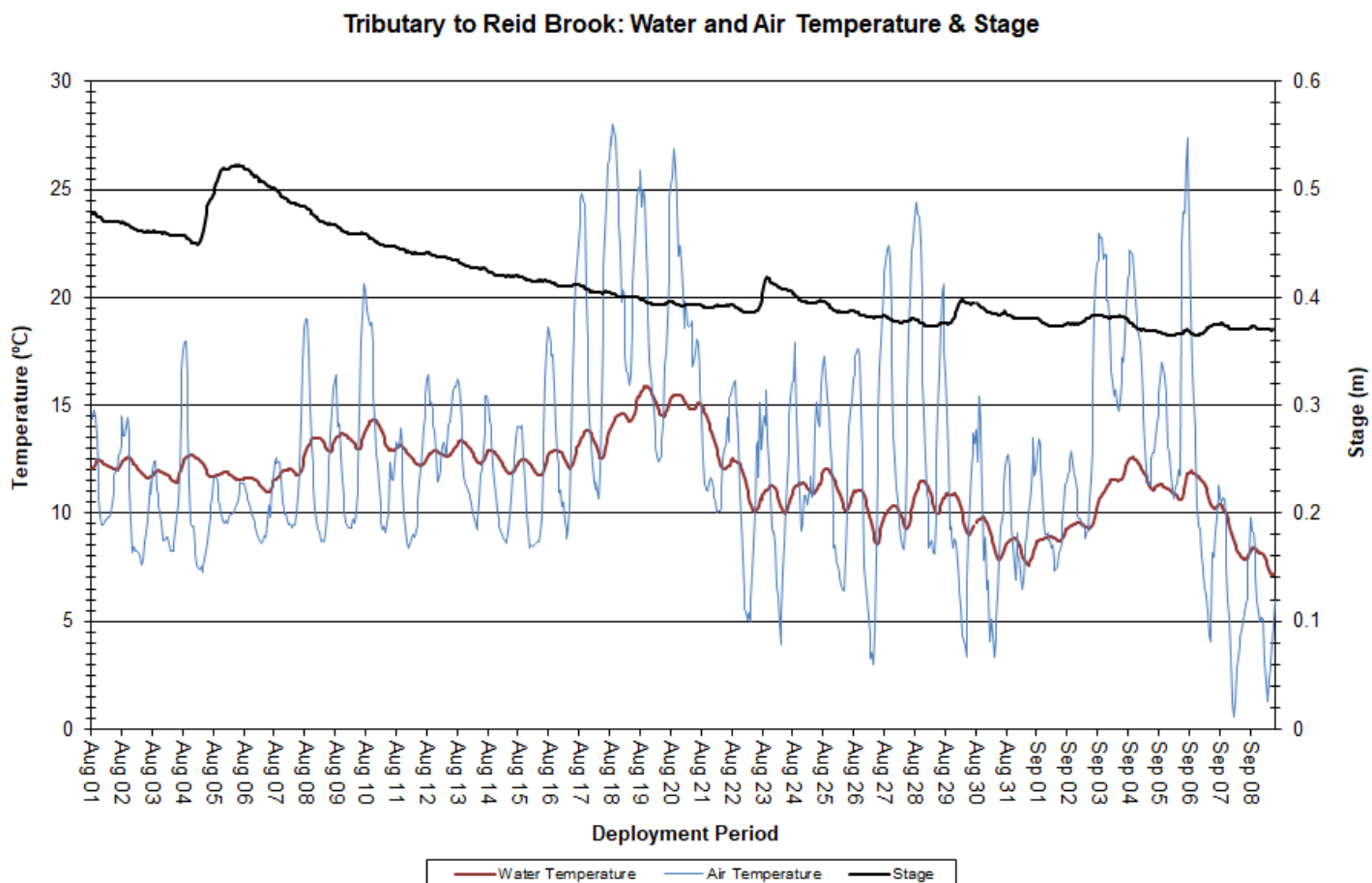


Figure 20: Water and Air Temperature & Stage at Tributary to Reid Brook

pH

Over the deployment period, pH ranged from 6.74 pH units to 7.17 pH units, with a median value of 7.02 (Figure 21).

pH values were quite stable and remained within the CCME's Guidelines for the Protection of Aquatic Life for the duration 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.

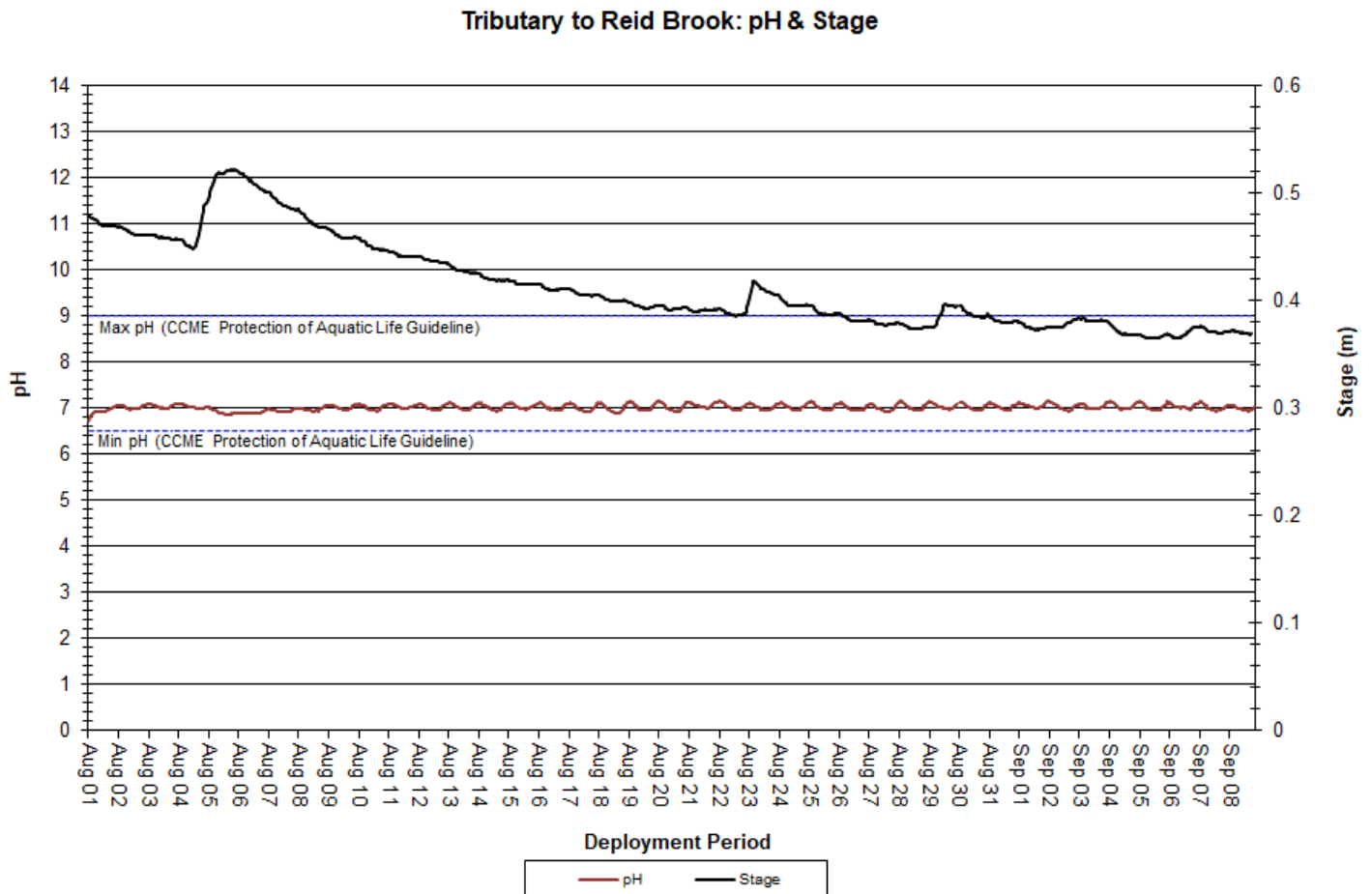


Figure 21: pH & Stage at Tributary to Reid Brook

Specific Conductivity

Over the deployment period, specific conductivity ranged from 42.5 μ S/cm to 54.2 μ S/cm, with a median value of 51.2 μ S/cm (Figure 22).

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

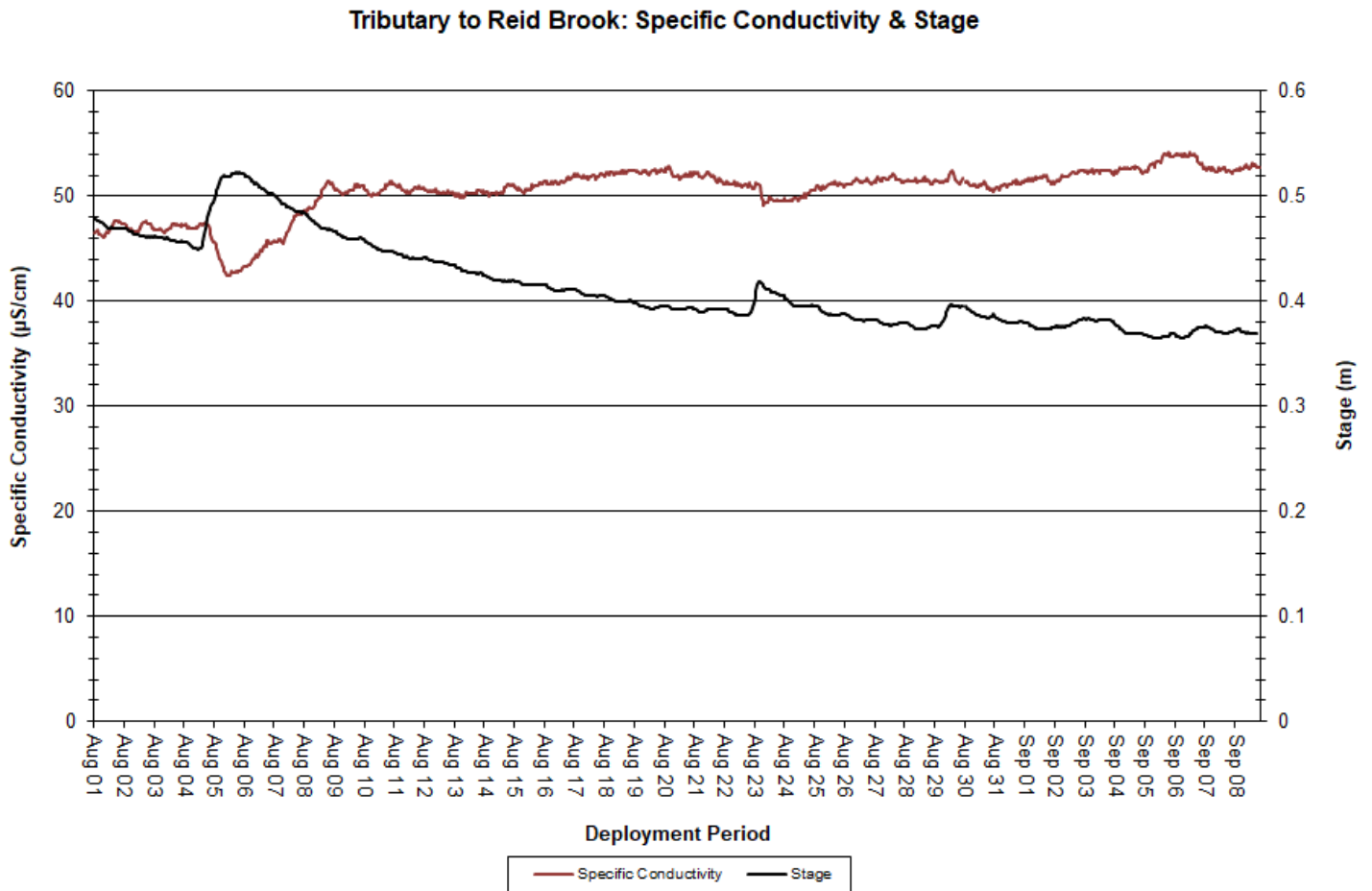


Figure 22: Specific Conductivity & Stage at Tributary to Reid Brook

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.33mg/L to 11.99mg/L, with a median value of 10.51mg/L. The saturation of dissolved oxygen ranged from 93.1% saturation to 101.8% saturation, with a median value of 96.9% (Figure 23).

Dissolved oxygen levels were variable, but slowly increasing, across the deployment period, which is to be expected given that water temperatures were variable and slowly decreasing across the same period. Dissolved oxygen levels remained above the CCME's Guideline for the Protection of Early Life Stages for the majority of the deployment period. Instances where dissolved oxygen concentrations fell below the Guideline correlated closely with warmer water temperatures, which is to be expected. Dissolved oxygen levels remained above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment.

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.

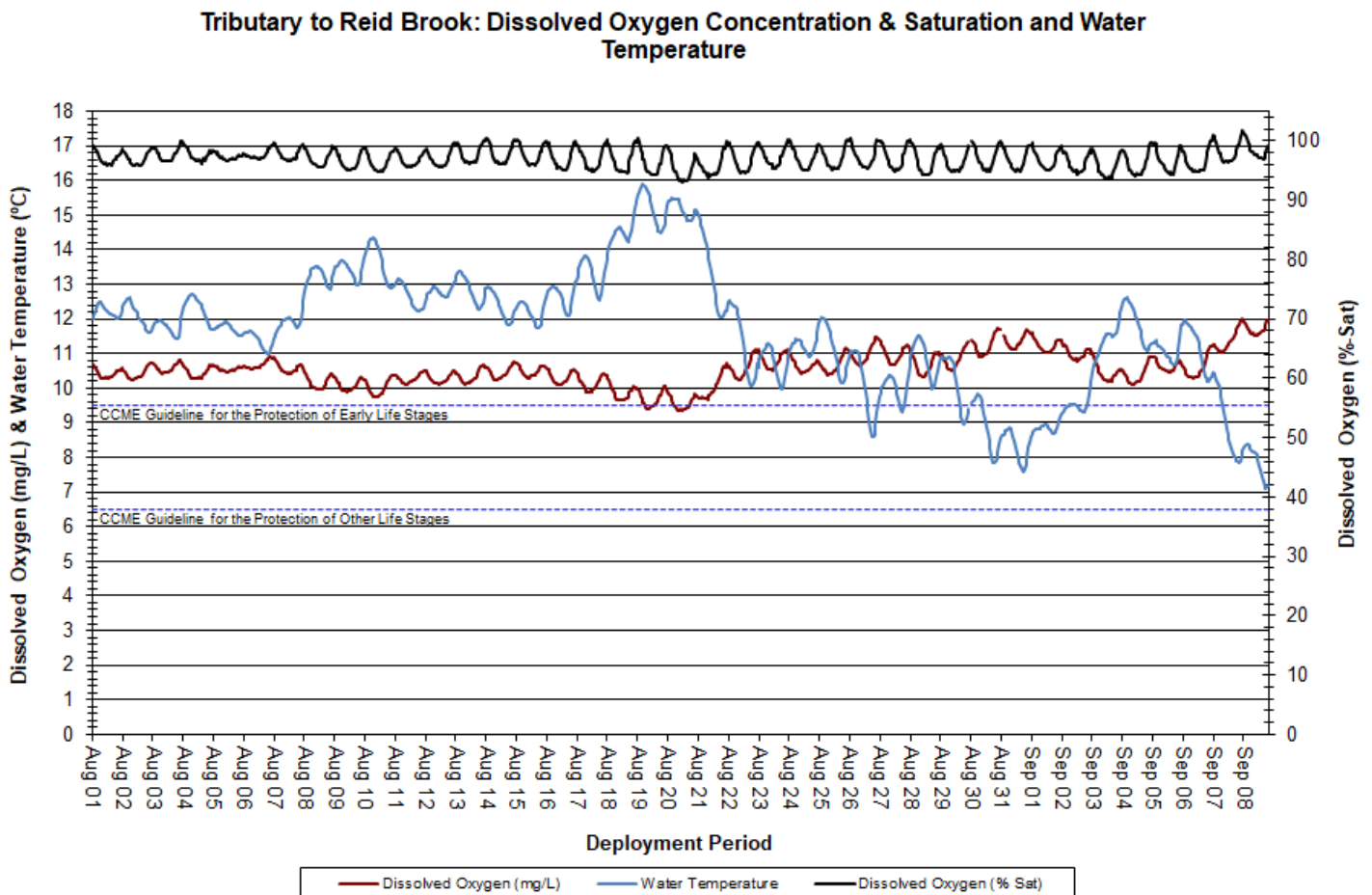


Figure 23: Dissolved Oxygen & Water Temperature at Tributary to Reid Brook

Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 61.4 NTU, with a median value of 0 NTU (Figure 24). A median value of 0 NTU indicates that there was a very low level of background turbidity at this station.

This site is particularly prone to variable turbidity as it has a sandy-clay bottom that is easily disturbed by precipitation events. Turbidity events somewhat correlated with observed rainfall events, and turbidity returned to baseline levels following each temporary increase (Figure 24).

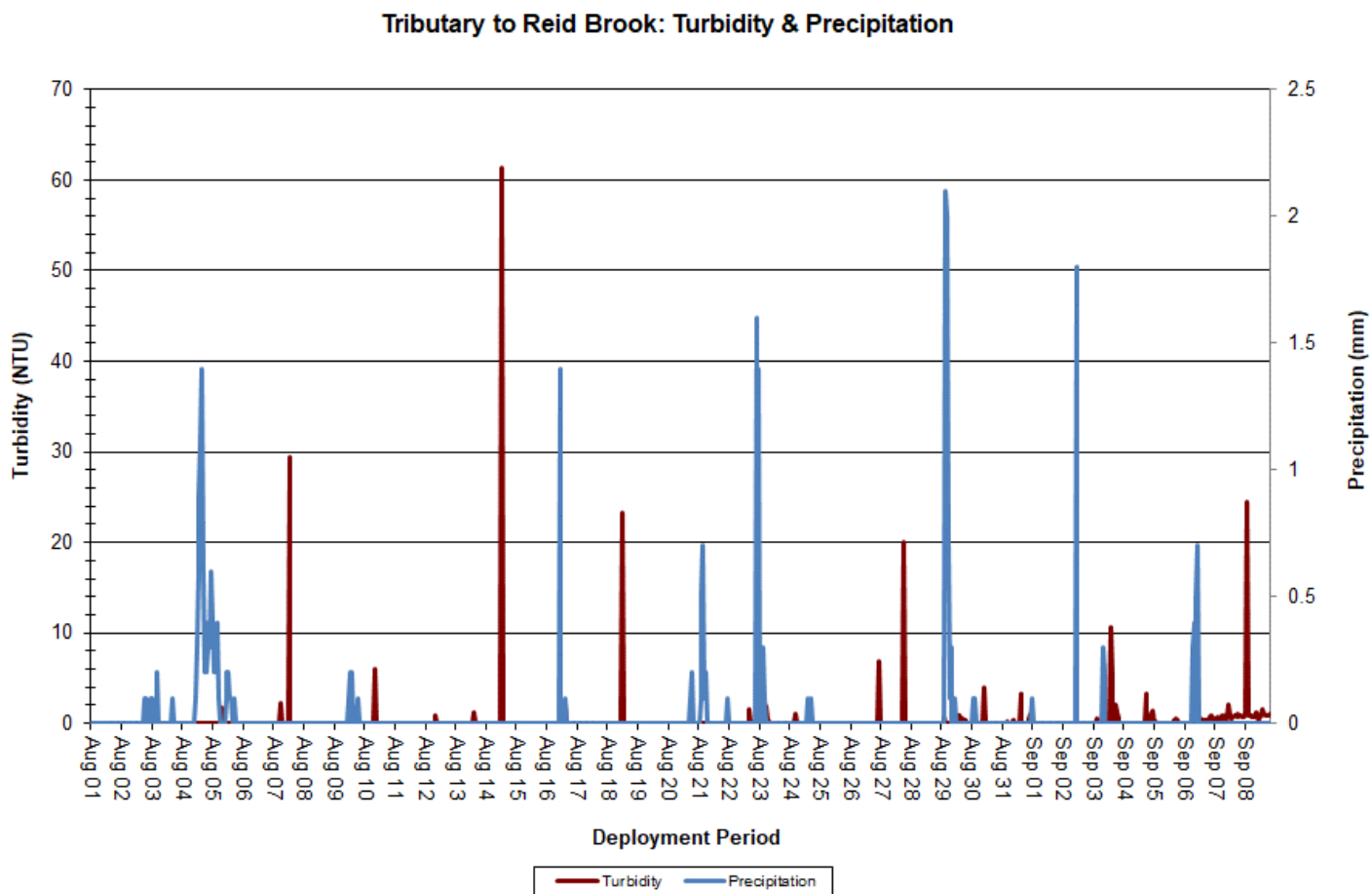


Figure 24: Turbidity & Precipitation at Tributary to Reid Brook

Stage and Flow

Over the deployment period, stage values ranged from 0.365m to 0.523m, with a median value of 0.398m. Stream flow values ranged from 0.052m³/s to 0.159m³/s, with a median value of 0.067m³/s. Precipitation data was obtained from the Voisey's Bay Weather Station (Figure 25).

Stage and flow were generally decreasing across the deployment period. Increases in both stage and flow correlated closely with observed rainfall events (Figure 25).

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

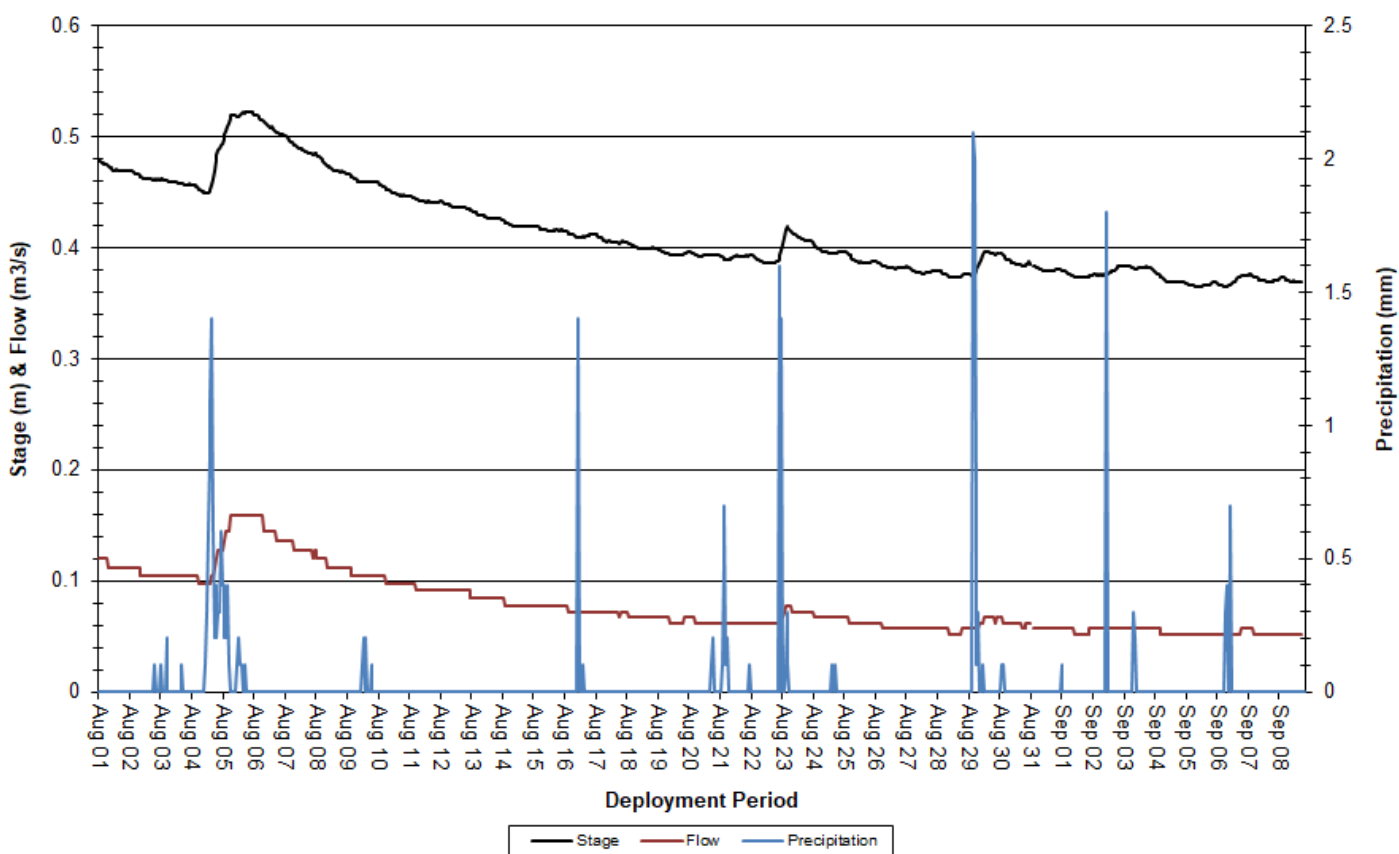


Figure 25: Stage, Flow & Precipitation at Tributary to Reid Brook

Conclusions

Water temperatures across all stations ranged from a minimum of 7.11°C at Tributary to Reid Brook to a maximum of 21.3°C at Camp Pond Brook below Camp Pond. Overall, water temperatures were slowly decreasing 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.

pH values across all stations ranged from a minimum of 6.59pH units at Reid Brook below Tributary to a maximum of 7.47pH units at Reid Brook at Outlet of Reid Pond. pH values at all stations were relatively consistent across the deployment period.

Specific conductivity across all stations ranged from a minimum of 12µS/cm at Reid Brook at Outlet of Reid Pond to a maximum of 178.7µS/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 134.5µS/cm.

Dissolved oxygen levels across all stations ranged from a minimum of 7.66mg/L at Camp Pond Brook below Camp Pond to a maximum of 11.99mg/L at Tributary to Reid Brook. Dissolved oxygen is generally increasing 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 Guideline for the Protection of Other Life Stages at all stations for the duration of deployment. Instances where dissolved oxygen concentrations fell below the CCME's Guideline for the Protection of Early Life Stages correlated closely with warmer water temperatures.

Turbidity levels across all stations ranged from a minimum of 0NTU at all stations to a maximum of 61.4NTU at Tributary to Reid Brook. Turbidity levels showed natural increases and decreases generally corresponding to precipitation events.

Air temperature and precipitation data were obtained from the Voisey's Bay Weather Station, which is located at the airstrip.

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
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- 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

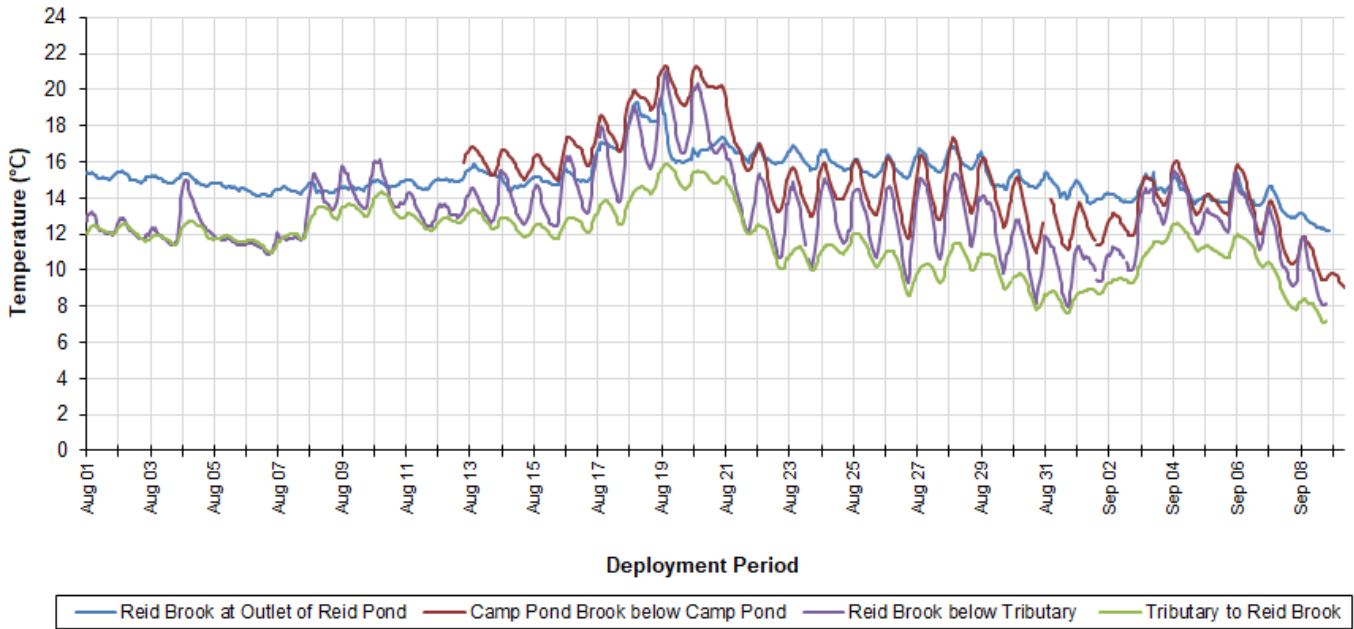


Figure A1: Comparison of Water Temperature (°C) between all Real-Time Stations in Voisey's Bay.

pH at Real-Time Water Quality Monitoring Stations

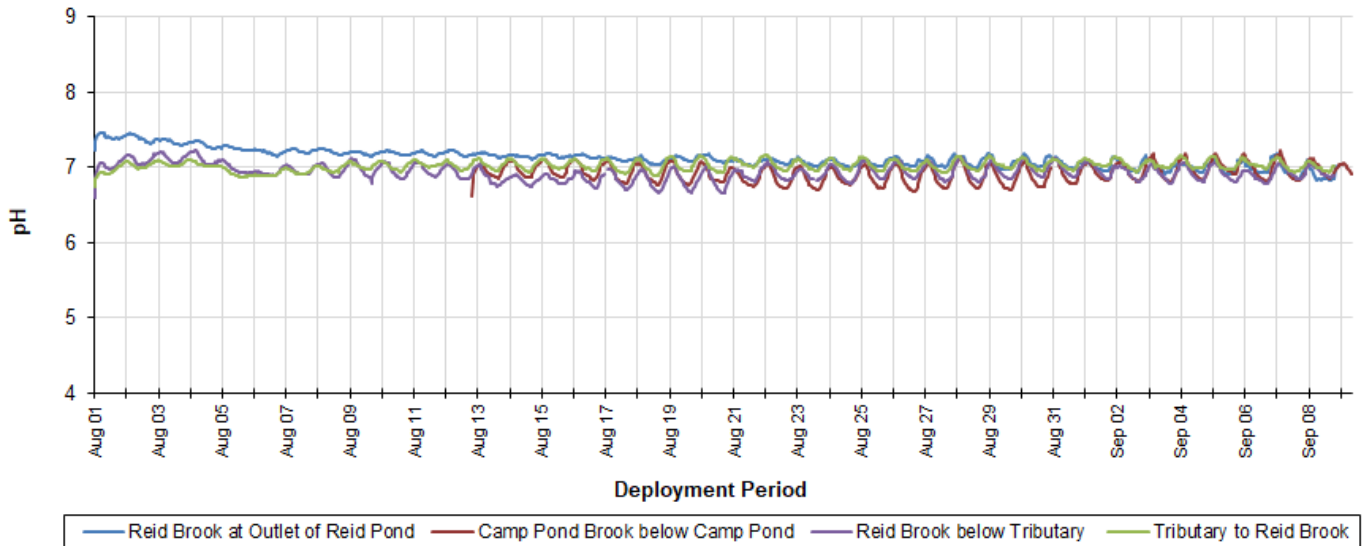


Figure A2: Comparison of pH between all Real-Time Stations in Voisey's Bay.

Specific Conductivity at Real-Time Water Quality Monitoring Stations

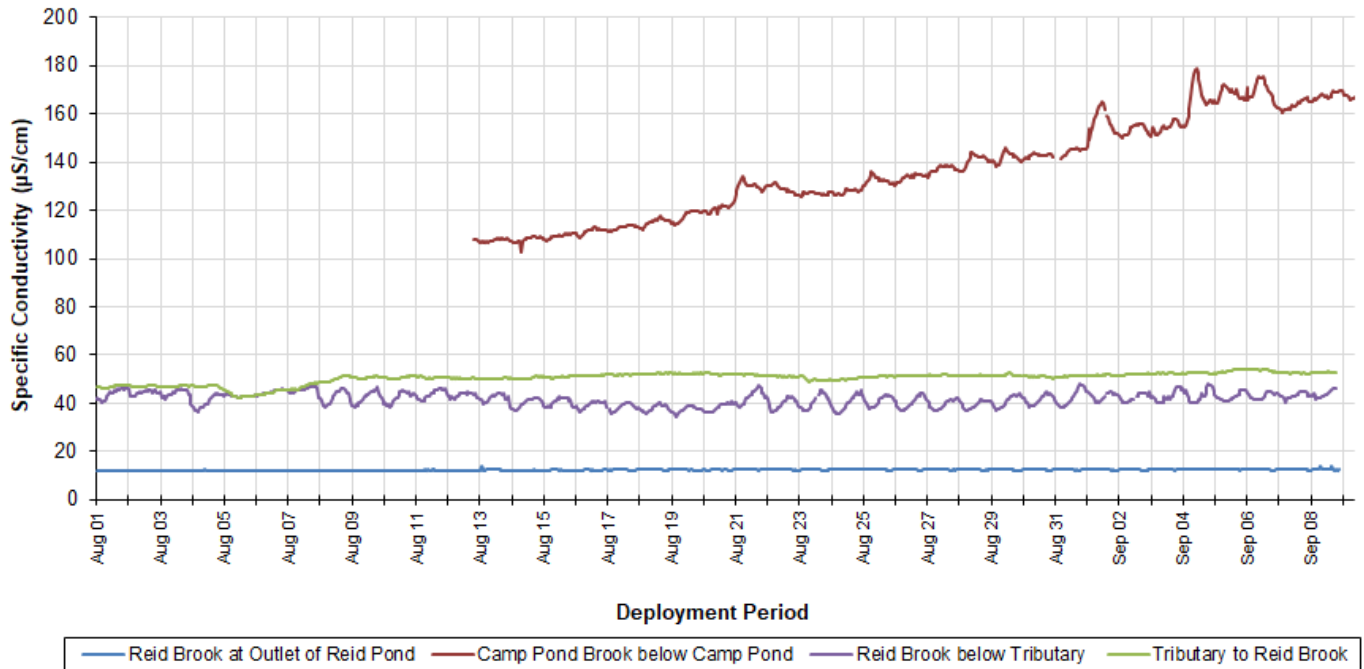


Figure A3: Comparison of Specific Conductivity ($\mu\text{S}/\text{cm}$) between all Real-Time Stations in Voisey's Bay.

Dissolved Oxygen Concentration at Real-Time Water Quality Monitoring Stations

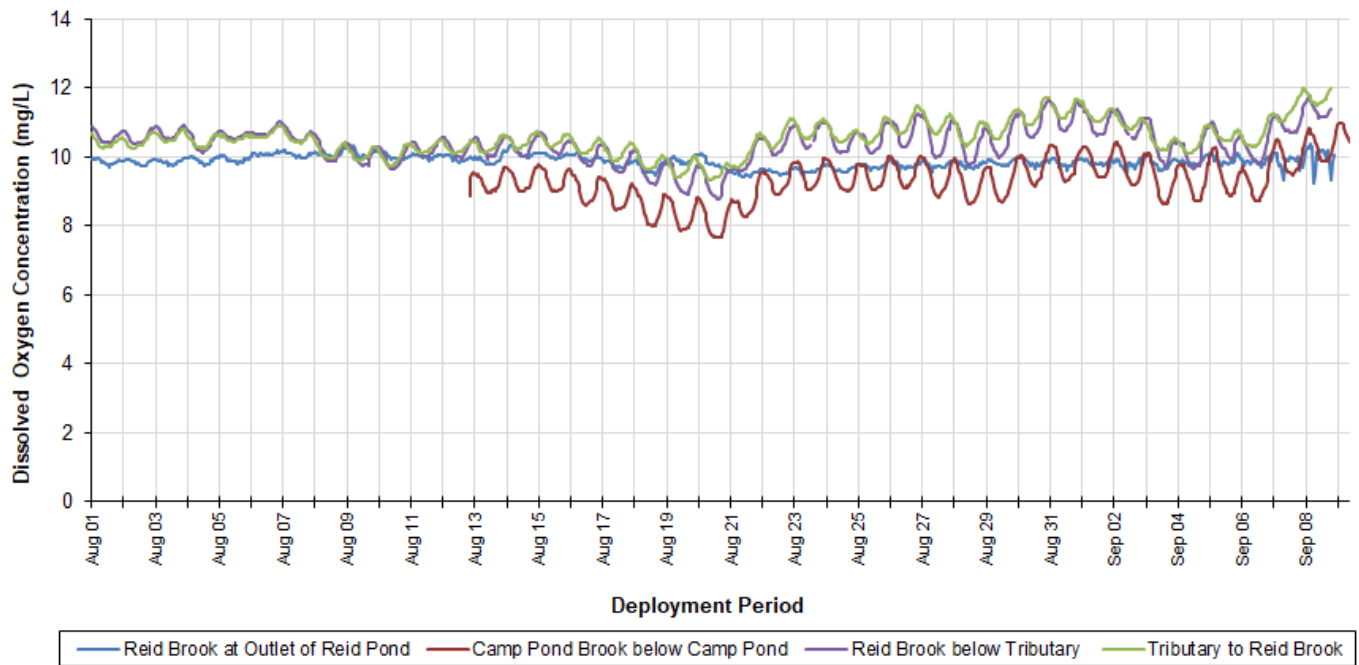


Figure A4: Comparison of Dissolved Oxygen (mg/L) between all Real-Time Stations in Voisey's Bay.

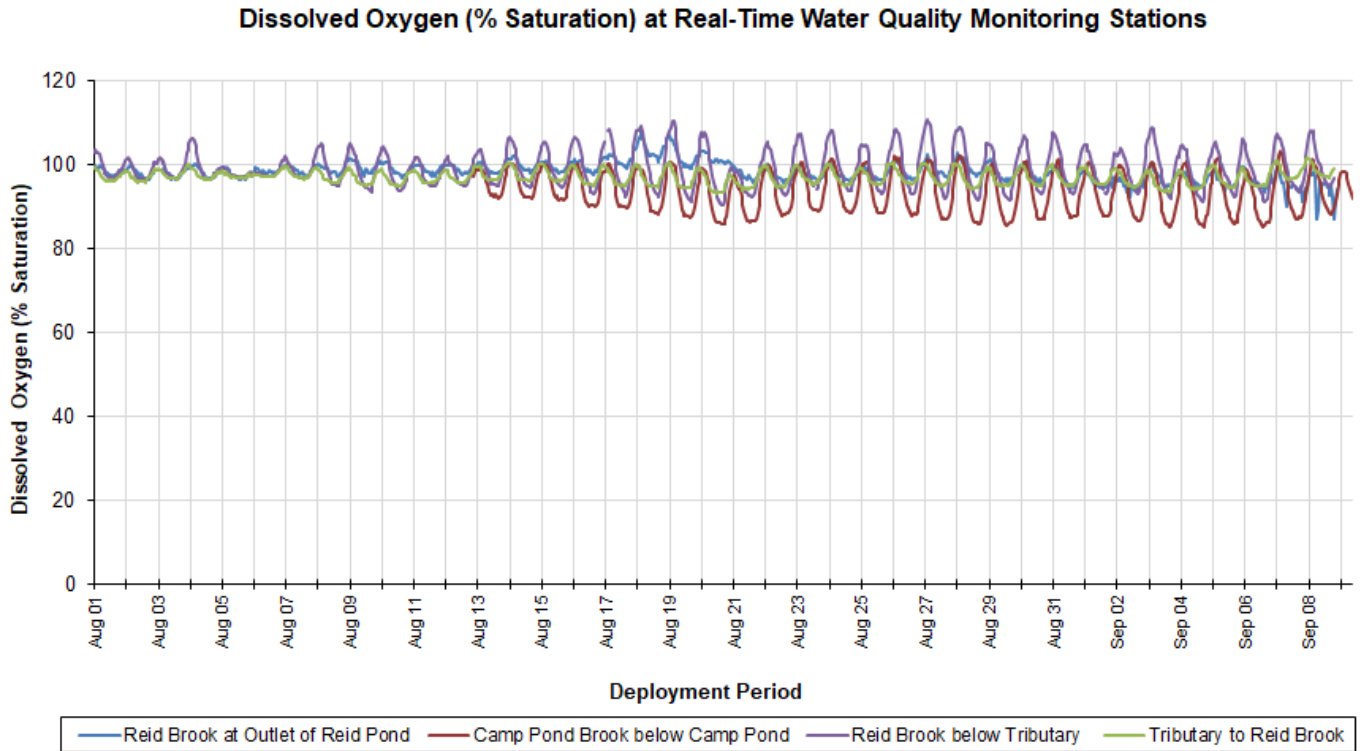


Figure A5: Comparison of Dissolved Oxygen (% Sat) between all Real-Time Stations in Voisey's Bay.

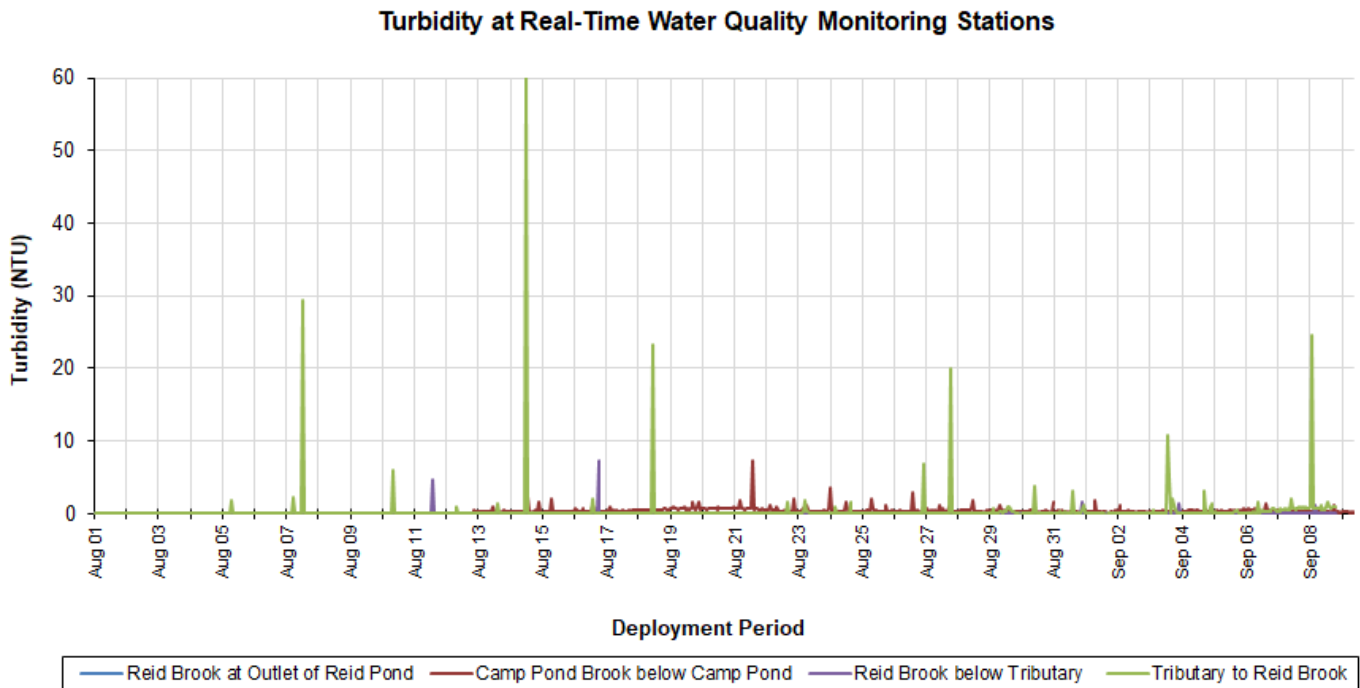


Figure A6: Comparison of Turbidity (NTU) between all Real-Time Stations in Voisey's Bay.

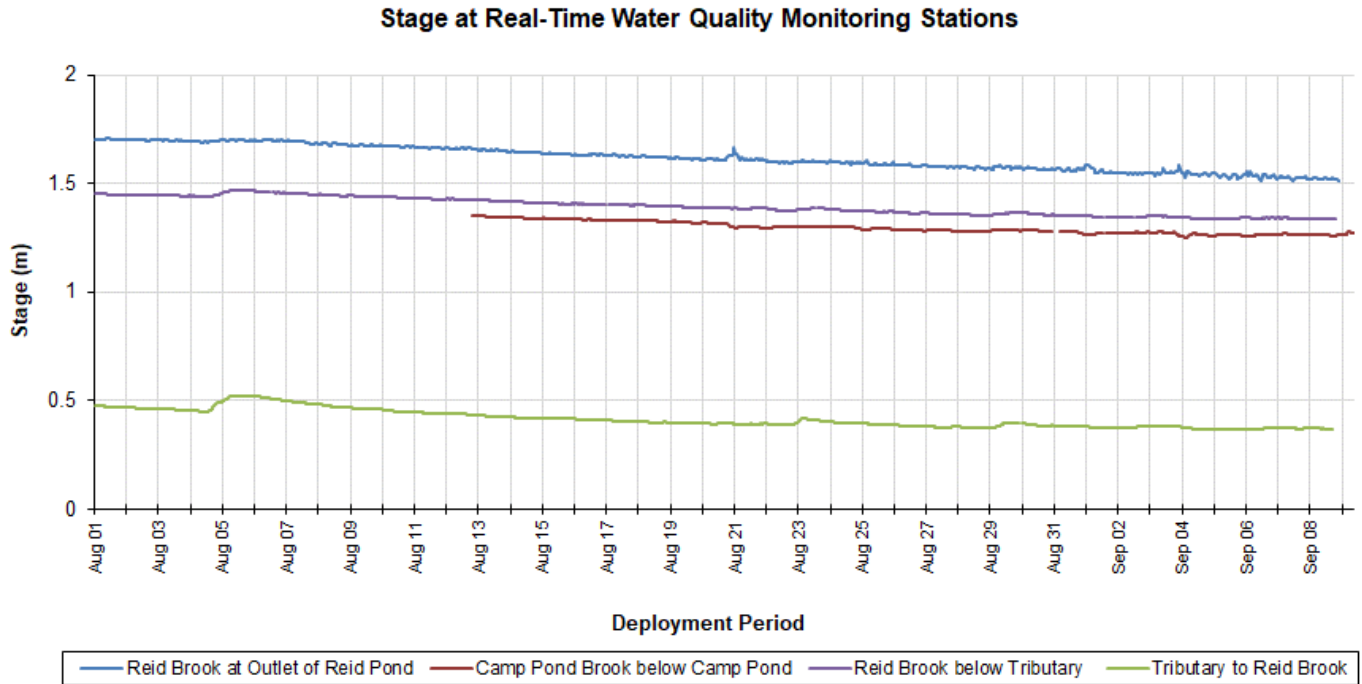


Figure A7: Comparison of Stage (m) between all Real-Time Stations in Voisey's Bay. Please note that stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

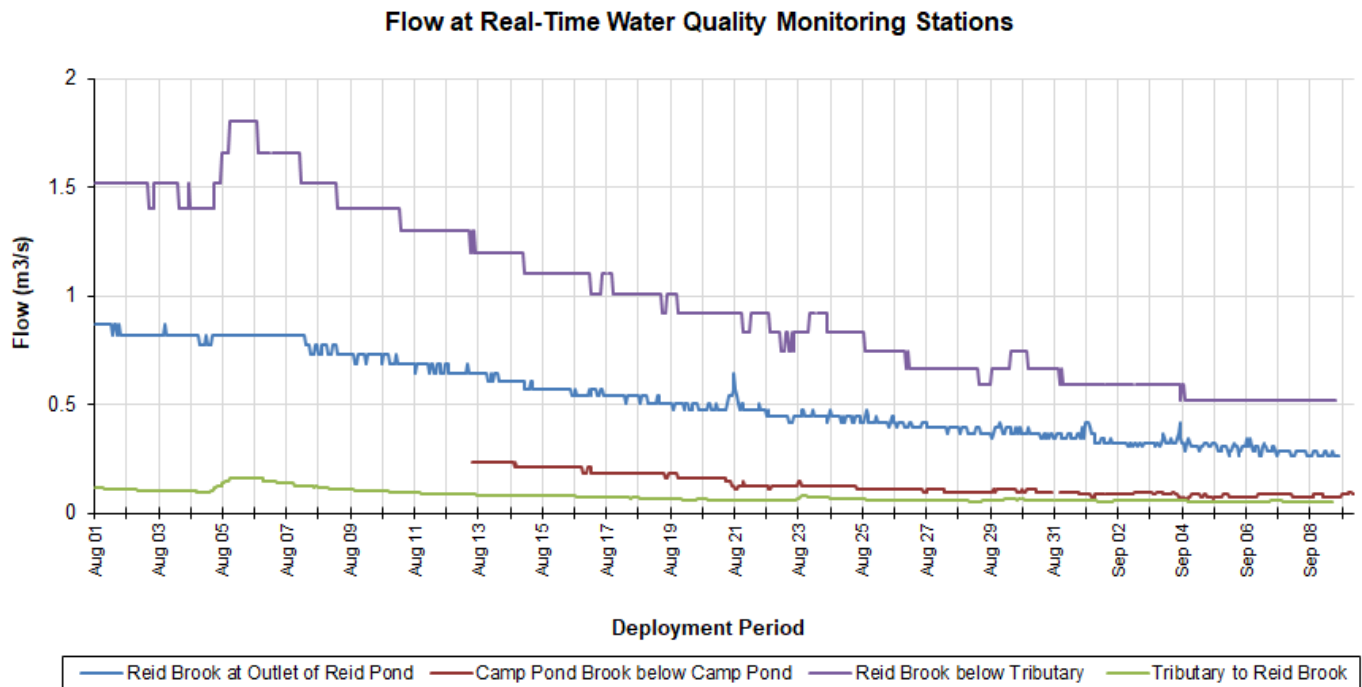


Figure A8: Comparison of Flow (m³/s) between all Real-Time Stations in Voisey's Bay. Please note that flow data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

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



Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WPE629 REID BROOK BELOW REID POND								
Sampling Date		2023/08/01						
Matrix		W						
Sample #		2023-1915-00-SI-SP						
Registration #		SA-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	4.2	1.0	mg/L	N/A	2023/08/23		8833475
Nitrate (N)	10	ND	0.050	mg/L	N/A	2023/08/25		8833480
Total dissolved solids (calc., EC)	-	7.5	1.0	mg/L	N/A	2023/08/23		8833884
Inorganics								
Conductivity	-	13	1.0	uS/cm	N/A	2023/08/22	LJV	8868385
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Total Alkalinity (Total as CaCO3)	-	4.1	2.0	mg/L	N/A	2023/08/22	LJV	8868393
Colour	-	5.9	5.0	TCU	N/A	2023/08/24	HGV	8871475
Dup.Colour	-	7.5	5.0	TCU	N/A	2023/08/24	HGV	8871475
Dissolved Fluoride (F-)	1.5	ND	0.10	mg/L	N/A	2023/08/22	LJV	8868380
Total Kjeldahl Nitrogen (TKN)	-	0.11	0.10	mg/L	2023/08/15	2023/08/16	RTY	8854269
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/08/24	HGV	8871474
Dup.Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/08/24	HGV	8871474
Nitrite (N)	1	ND	0.010	mg/L	N/A	2023/08/24	HGV	8871469
Dup.Nitrite (N)	1	ND	0.010	mg/L	N/A	2023/08/24	HGV	8871469
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2023/08/14	TGO	8847707
Dissolved Organic Carbon (C)	-	1.5	0.50	mg/L	N/A	2023/08/23	ACK	8869114
Total Organic Carbon (C)	-	1.5	0.50	mg/L	N/A	2023/08/10	CPP	8841617
pH		6.91		pH	N/A	2023/08/22	LJV	8868373
Total Phosphorus	-	ND	0.004	mg/L	2023/08/11	2023/08/16	SPC	8848418
Total Suspended Solids	-	ND	1.0	mg/L	2023/08/04	2023/08/16	RDM	8834594
Turbidity	-	0.37	0.10	NTU	N/A	2023/08/22	LJV	8868660

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AO= Aesthetic Objectives (AO) - apply to characteristics of drinking water that can affect its acceptance by consumers or interfere with practices for supplying good quality water.

If Screening Levels (SL) for gross alpha or gross beta are exceeded then concentration of the specific radionuclides of the CWQG should be analyzed.

Note 1 Turbidity guideline value of 0.3 NTU based on conventional treatment system. For slow sand or diatomaceous earth filtration 1.0 NTU and for membrane filtration 0.1 NTU.

Note 2 Aluminum guideline value of 0.1 mg/L is for treatment plants using aluminum-based coagulants, 0.2mg/L applies to other types of treatment systems.

Malathion updated January 24, 2023



BUREAU
VERITAS

Bureau Veritas Job #: C3N4674
Report Date: 2023/08/26

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-9

Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WPE629 REID BROOK BELOW REID POND								
Sampling Date								
Matrix								
Sample #								
Registration #								
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	0.001	ND	0.000013	mg/L	2023/08/15	2023/08/21	SGK	8852544
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	2.9	0.038	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Antimony (Sb)	0.006	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Arsenic (As)	0.010	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Barium (Ba)	2.0	0.0021	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Boron (B)	5	ND	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Cadmium (Cd)	0.007	ND	0.000010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Calcium (Ca)	-	1.3	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Chromium (Cr)	0.05	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Copper (Cu)	2	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Iron (Fe)	-	ND	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Lead (Pb)	0.005	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Magnesium (Mg)	-	0.26	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Manganese (Mn)	0.12	ND	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Nickel (Ni)	-	ND	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Potassium (K)	-	ND	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Selenium (Se)	0.05	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Sodium (Na)	-	0.74	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Strontium (Sr)	7.0	0.0048	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Uranium (U)	0.02	ND	0.00010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Zinc (Zn)	-	ND	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707

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If Screening Levels (SL) for gross alpha or gross beta are exceeded then concentration of the specific radionuclides of the CWQG should be analyzed.

Note 1 Turbidity guideline value of 0.3 NTU based on conventional treatment system. For slow sand or diatomaceous earth filtration 1.0 NTU and for membrane filtration 0.1 NTU.

Note 2 Aluminum guideline value of 0.1 mg/L is for treatment plants using aluminum-based coagulants, 0.2mg/L applies to other types of treatment systems.

Malathion updated January 24, 2023



Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WSJ053 CAMP POND BROOK BELOW CAMP POND Sampling Date 2023/08/13 Matrix W Sample # 2023-1918-00-S1-SP Registration # SA-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	16	1.0	mg/L	N/A	2023/08/30		8859585
Nitrate (N)	10	ND	0.050	mg/L	N/A	2023/08/31		8859494
Total dissolved solids (calc., EC)	-	28	1.0	mg/L	N/A	2023/08/31		8858470
Inorganics								
Conductivity	-	50	1.0	uS/cm	N/A	2023/08/30	LJV	8885835
Chloride (Cl-)	-	3.4	1.0	mg/L	N/A	2023/08/29	SUR	8878525
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2023/08/29	SUR	8878525
Sulphate (SO4)	-	5.4	1.0	mg/L	N/A	2023/08/29	SUR	8878525
Total Alkalinity (Total as CaCO3)	-	10	2.0	mg/L	N/A	2023/08/30	LJV	8885836
Colour	-	21	5.0	TCU	N/A	2023/08/30	HGV	8886152
Dissolved Fluoride (F-)	1.5	ND	0.10	mg/L	N/A	2023/08/30	LJV	8885837
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2023/08/28	2023/08/29	RTY	8881232
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/08/30	HGV	8886182
Nitrite (N)	1	0.043	0.010	mg/L	N/A	2023/08/31	HGV	8886185
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2023/08/21	HGV	8866007
Dissolved Organic Carbon (C)	-	3.3	0.50	mg/L	N/A	2023/08/30	SSI	8885872
Total Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2023/08/29	SSI	8882836
pH	-	7.02		pH	N/A	2023/08/30	LJV	8885833
Total Phosphorus	-	0.013	0.004	mg/L	2023/08/28	2023/08/29	SPC	8881239
Total Suspended Solids	-	ND	1.0	mg/L	2023/08/18	2023/08/28	DME	8862340
Turbidity	-	0.80	0.10	NTU	N/A	2023/08/30	LJV	8885930
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	0.001	ND	0.000013	mg/L	2023/08/29	2023/08/30	SGK	8883778

MAC: Guideline - Summary of Guidelines for Canadian Drinking Water Quality (SGCDWQ), Health Canada, Septemeber 2022

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If Screening Levels (SL) for gross alpha or gross beta are exceeded then concentration of the specific radionuclides of the CWQG should be analyzed.

Note 1 Turbidity guideline value of 0.3 NTU based on conventional treatment system. For slow sand or diatomaceous earth filtration 1.0 NTU and for membrane filtration 0.1 NTU.

Note 2 Aluminum guideline value of 0.1 mg/L is for treatment plants using aluminum-based coagulants, 0.2mg/L applies to other types of treatment systems.

Malathion updated January 24, 2023



BUREAU
VERITAS

Bureau Veritas Job #: C3O9708
Report Date: 2023/09/01

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-9

Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WSJ053 CAMP POND BROOK BELOW CAMP POND Sampling Date 2023/08/13 Matrix W Sample # 2023-1918-00-S1-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	2.9	0.041	0.0050	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Antimony (Sb)	0.006	ND	0.0010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Arsenic (As)	0.010	ND	0.0010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Barium (Ba)	2.0	0.0065	0.0010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Boron (B)	5	ND	0.050	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Cadmium (Cd)	0.007	ND	0.000010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Calcium (Ca)	-	4.3	0.10	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Chromium (Cr)	0.05	ND	0.0010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Copper (Cu)	2	0.0046	0.00050	mg/L	2023/09/01	2023/09/01	MTZ	8886701
Total Iron (Fe)	-	0.43	0.050	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Lead (Pb)	0.005	ND	0.00050	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Magnesium (Mg)	-	1.3	0.10	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Manganese (Mn)	0.12	0.019	0.0020	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Nickel (Ni)	-	0.016	0.0020	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Potassium (K)	-	0.66	0.10	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Selenium (Se)	0.05	ND	0.00050	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Sodium (Na)	-	2.7	0.10	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Strontium (Sr)	7.0	0.024	0.0020	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Uranium (U)	0.02	ND	0.00010	mg/L	2023/08/28	2023/08/29	JHY	8880818
Total Zinc (Zn)	-	0.014	0.0050	mg/L	2023/08/28	2023/08/29	JHY	8880818

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If Screening Levels (SL) for gross alpha or gross beta are exceeded then concentration of the specific radionuclides of the CWQG should be analyzed.

Note 1 Turbidity guideline value of 0.3 NTU based on conventional treatment system. For slow sand or diatomaceous earth filtration 1.0 NTU and for membrane filtration 0.1 NTU.

Note 2 Aluminum guideline value of 0.1 mg/L is for treatment plants using aluminum-based coagulants, 0.2mg/L applies to other types of treatment systems.

Malathion updated January 24, 2023



Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WPE631 REID BROOK BELOW TRIB								
Sampling Date		2023/08/01						
Matrix		W						
Sample #		2023-1917-00-SI-SP						
Registration #		SA-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	13	1.0	mg/L	N/A	2023/08/23		8833475
Nitrate (N)	10	ND	0.050	mg/L	N/A	2023/08/25		8833480
Total dissolved solids (calc., EC)	-	24	1.0	mg/L	N/A	2023/08/24		8833885
Inorganics								
Conductivity	-	42	1.0	uS/cm	N/A	2023/08/23	LJV	8870548
Chloride (Cl-)	-	3.8	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Sulphate (SO4)	-	3.5	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Total Alkalinity (Total as CaCO3)	-	11	2.0	mg/L	N/A	2023/08/23	LJV	8870549
Colour	-	34	5.0	TCU	N/A	2023/08/24	HGV	8871475
Dissolved Fluoride (F-)	1.5	ND	0.10	mg/L	N/A	2023/08/23	LJV	8870547
Total Kjeldahl Nitrogen (TKN)	-	0.17	0.10	mg/L	2023/08/15	2023/08/16	RTY	8854269
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/08/24	HGV	8871474
Nitrite (N)	1	ND	0.010	mg/L	N/A	2023/08/24	HGV	8871469
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2023/08/14	TGO	8847707
Dissolved Organic Carbon (C)	-	4.1	0.50	mg/L	N/A	2023/08/22	ACK	8869051
Total Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2023/08/10	CPP	8841617
pH		7.19		pH	N/A	2023/08/23	LJV	8870540
Total Phosphorus	-	0.006	0.004	mg/L	2023/08/11	2023/08/16	SPC	8848418
Total Suspended Solids	-	ND	1.0	mg/L	2023/08/04	2023/08/16	RDM	8834594
Turbidity	-	1.0	0.10	NTU	N/A	2023/08/23	LJV	8870683
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	0.001	ND	0.000013	mg/L	2023/08/15	2023/08/21	SGK	8852544
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	2.9	0.060	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707

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If Screening Levels (SL) for gross alpha or gross beta are exceeded then concentration of the specific radionuclides of the CWQG should be analyzed.

Note 1 Turbidity guideline value of 0.3 NTU based on conventional treatment system. For slow sand or diatomaceous earth filtration 1.0 NTU and for membrane filtration 0.1 NTU.

Note 2 Aluminum guideline value of 0.1 mg/L is for treatment plants using aluminum-based coagulants, 0.2mg/L applies to other types of treatment systems.

Malathion updated January 24, 2023



BUREAU
VERITAS

Bureau Veritas Job #: C3N4674
Report Date: 2023/08/26

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-9

Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WPE631 REID BROOK BELOW TRIB								
Sampling Date		2023/08/01						
Matrix		W						
Sample #		2023-1917-00-SI-SP						
Registration #		SA-0000						
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Antimony (Sb)	0.006	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Arsenic (As)	0.010	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Barium (Ba)	2.0	0.0056	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Boron (B)	5	ND	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Cadmium (Cd)	0.007	ND	0.000010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Calcium (Ca)	-	3.6	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Chromium (Cr)	0.05	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Copper (Cu)	2	0.00084	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Iron (Fe)	-	0.48	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Lead (Pb)	0.005	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Magnesium (Mg)	-	1.1	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Manganese (Mn)	0.12	0.0067	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Nickel (Ni)	-	0.0064	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Potassium (K)	-	0.43	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Selenium (Se)	0.05	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Sodium (Na)	-	2.6	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Strontium (Sr)	7.0	0.021	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Uranium (U)	0.02	ND	0.00010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Zinc (Zn)	-	ND	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707

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Malathion updated January 24, 2023



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Bureau Veritas Job #: C3N4674
Report Date: 2023/08/26

NL Department of Environment, Climate Change and
Municipalities
Your P.O. #: 220028978-9

Sample Details/Parameters	MAC	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WPE630 TRIB TO REID BROOK								
Sampling Date		2023/08/01						
Matrix		W						
Sample #		2023-1916-00-SI-SP						
Registration #		SA-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	16	1.0	mg/L	N/A	2023/08/23		8833475
Nitrate (N)	10	ND	0.050	mg/L	N/A	2023/08/25		8833480
Total dissolved solids (calc., EC)	-	26	1.0	mg/L	N/A	2023/08/24		8833885
Inorganics								
Conductivity	-	47	1.0	uS/cm	N/A	2023/08/23	LJV	8871126
Chloride (Cl-)	-	4.6	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Sulphate (SO4)	-	3.8	1.0	mg/L	N/A	2023/08/08	LKH	8841710
Total Alkalinity (Total as CaCO3)	-	11	2.0	mg/L	N/A	2023/08/23	LJV	8871127
Colour	-	38	5.0	TCU	N/A	2023/08/24	HGV	8871475
Dissolved Fluoride (F-)	1.5	0.10	0.10	mg/L	N/A	2023/08/23	LJV	8871123
Total Kjeldahl Nitrogen (TKN)	-	0.18	0.10	mg/L	2023/08/15	2023/08/16	RTY	8854269
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/08/24	HGV	8871474
Nitrite (N)	1	ND	0.010	mg/L	N/A	2023/08/24	HGV	8871469
Nitrogen (Ammonia Nitrogen)	-	0.052	0.050	mg/L	N/A	2023/08/14	TGO	8847707
Dissolved Organic Carbon (C)	-	4.6	0.50	mg/L	N/A	2023/08/23	ACK	8869114
Total Organic Carbon (C)	-	4.9	0.50	mg/L	N/A	2023/08/09	CPP	8841674
pH		7.23		pH	N/A	2023/08/23	LJV	8871122
Total Phosphorus	-	0.013	0.004	mg/L	2023/08/11	2023/08/16	SPC	8848418
Total Suspended Solids	-	2.2	1.0	mg/L	2023/08/04	2023/08/16	RDM	8834594
Turbidity	-	1.2	0.10	NTU	N/A	2023/08/23	LJV	8870683
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	0.001	ND	0.000013	mg/L	2023/08/15	2023/08/21	SGK	8852544
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	2.9	0.13	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707

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WPE630 TRIB TO REID BROOK								
Sampling Date		2023/08/01						
Matrix		W						
Sample #		2023-1916-00-SI-SP						
Registration #		SA-0000						
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Antimony (Sb)	0.006	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Arsenic (As)	0.010	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Barium (Ba)	2.0	0.0071	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Boron (B)	5	ND	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Cadmium (Cd)	0.007	0.000023	0.000010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Calcium (Ca)	-	4.2	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Chromium (Cr)	0.05	ND	0.0010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Copper (Cu)	2	0.0011	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Iron (Fe)	-	0.88	0.050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Lead (Pb)	0.005	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Magnesium (Mg)	-	1.3	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Manganese (Mn)	0.12	0.017	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Nickel (Ni)	-	0.0083	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Potassium (K)	-	0.46	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Selenium (Se)	0.05	ND	0.00050	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Sodium (Na)	-	3.0	0.10	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Strontium (Sr)	7.0	0.025	0.0020	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Uranium (U)	0.02	ND	0.00010	mg/L	2023/08/17	2023/08/22	JHY	8858707
Total Zinc (Zn)	-	ND	0.0050	mg/L	2023/08/17	2023/08/22	JHY	8858707

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