Real-Time Water Quality Deployment Report

Lower Churchill River Network

August 21/22 to
September 27, 2024

Newfoundland Labrador

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

Contents

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Real Time Water Quality Monitoring

- Staff with the Department of Environment and Climate Change monitor real-time water quality data on a regular basis.
- This deployment report discusses water quality related events occurring at four stations on the Lower Churchill River: Churchill River below Metchin River, Churchill River above Grizzle Rapids, Churchill River below Muskrat Falls and Churchill River at English Point.
- A real-time water quality monitoring instrument was deployed at Churchill River below Metchin River on August 21st. Instruments were deployed at Churchill River above Grizzle Rapids, below Muskrat Falls and at English Point on August 22nd.
- The instruments at Churchill River above Grizzle Rapids, below Muskrat Falls and at English Point were removed on September 27th, for deployment periods of 36 days.
- The instrument at Churchill River below Metchin River was not removed on September 27th; however, for the purposes of this report, data from this station will be reported as if it had been. The instrument at this station was deployed continuously from August 21st through October 30th. A deployment period of 37 days will be used for reporting purposes.

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 alongside 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 on the data quality (Table 1).

Table 1: Instrument Performance Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (C)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35µS/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 Lower Churchill River stations deployed from August 21/22 to September 27, 2024 are summarized in Table 2.

Table 2: Comparison rankings for Lower Churchill River stations August 21/22 to September 27, 2024

Churchill River Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Below Metchin River	August 21, 2024	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	September 27, 2024	Removal	N/A	N/A	N/A	N/A	N/A
Above Grizzle Rapids	August 22, 2024	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	September 27, 2024	Removal	Excellent	Poor	Fair	Fair	Excellent
Below Muskrat Falls	August 22, 2024	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	September 27, 2024	Removal	Excellent	Good	Excellent	Poor	Poor
At English Point	August 22, 2024	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	September 27, 2024	Removal	Excellent	Good	Excellent	Good	Excellent

- **Churchill River below Metchin River**
  - At deployment, all parameters ranked as 'excellent'.
  - Comparison rankings are not available for removal since this instrument was not physically removed on the date in question.
- **Churchill River above Grizzle Rapids**
  - At deployment, all parameters ranked as 'excellent'.
  - At removal, temperature and turbidity were 'excellent', conductivity and dissolved oxygen were 'fair', while pH was 'poor'. This discrepancy for pH is likely due to a sensor failure on the field sonde.
- **Churchill River below Muskrat Falls**
  - At deployment, all parameters ranked as 'excellent'.
  - At removal, all parameters again ranked as either 'excellent' or 'good', except for dissolved oxygen and turbidity, which ranked as 'poor'. This discrepancy is likely due to the field sonde being located in very little water at the time of removal.
- **Churchill River at English Point**
  - At deployment, all parameters ranked as either 'excellent' or 'good'.
  - At removal, all parameters again ranked as either 'excellent' or 'good'.

Data Interpretation

- The following graphs and discussion illustrate water quality related events occurring from August 21/22 to September 27, 2024 on the Lower Churchill River Network.
- With the exception of water quantity data (stage & 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.

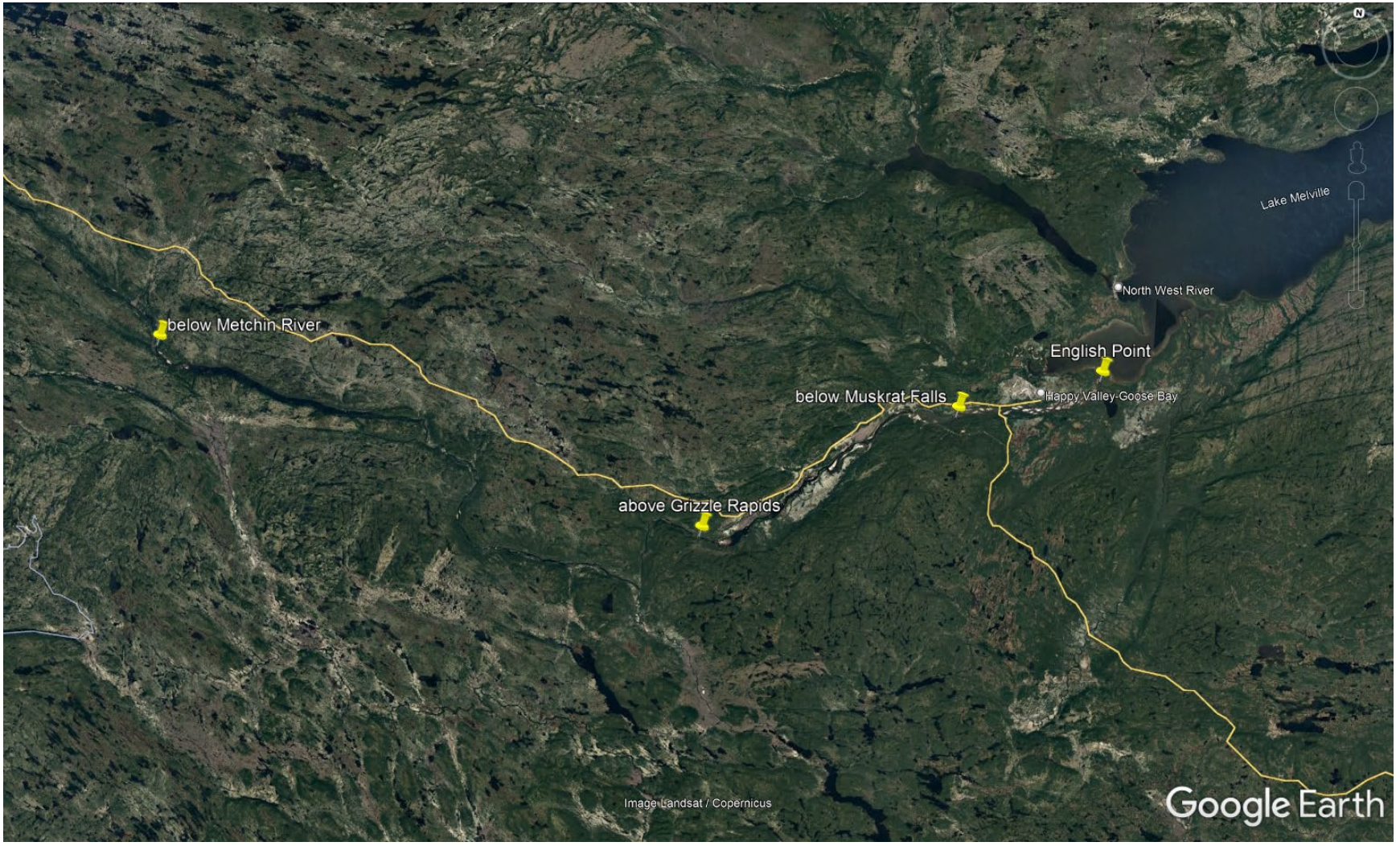

Figure 1: Lower Churchill Network of Real-Time Water Quality Stations

Churchill River below Metchin River

Water Temperature

- Over the deployment period, water temperature ranged from 2.8°C to 19.6°C, with a median value of 15.5°C (Figure 2). Air temperature data was obtained from the Metchin River near TLH Weather Station.
- Water temperature was slowly decreasing over the course of deployment, which is to be expected as air temperatures were also slowly decreasing into the fall season. Water temperature data exhibits a diurnal pattern as expected, and closely correlates with ambient air temperatures.
- Increased fluctuations in water temperature data from September 22nd onwards are likely attributable to the instrument being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

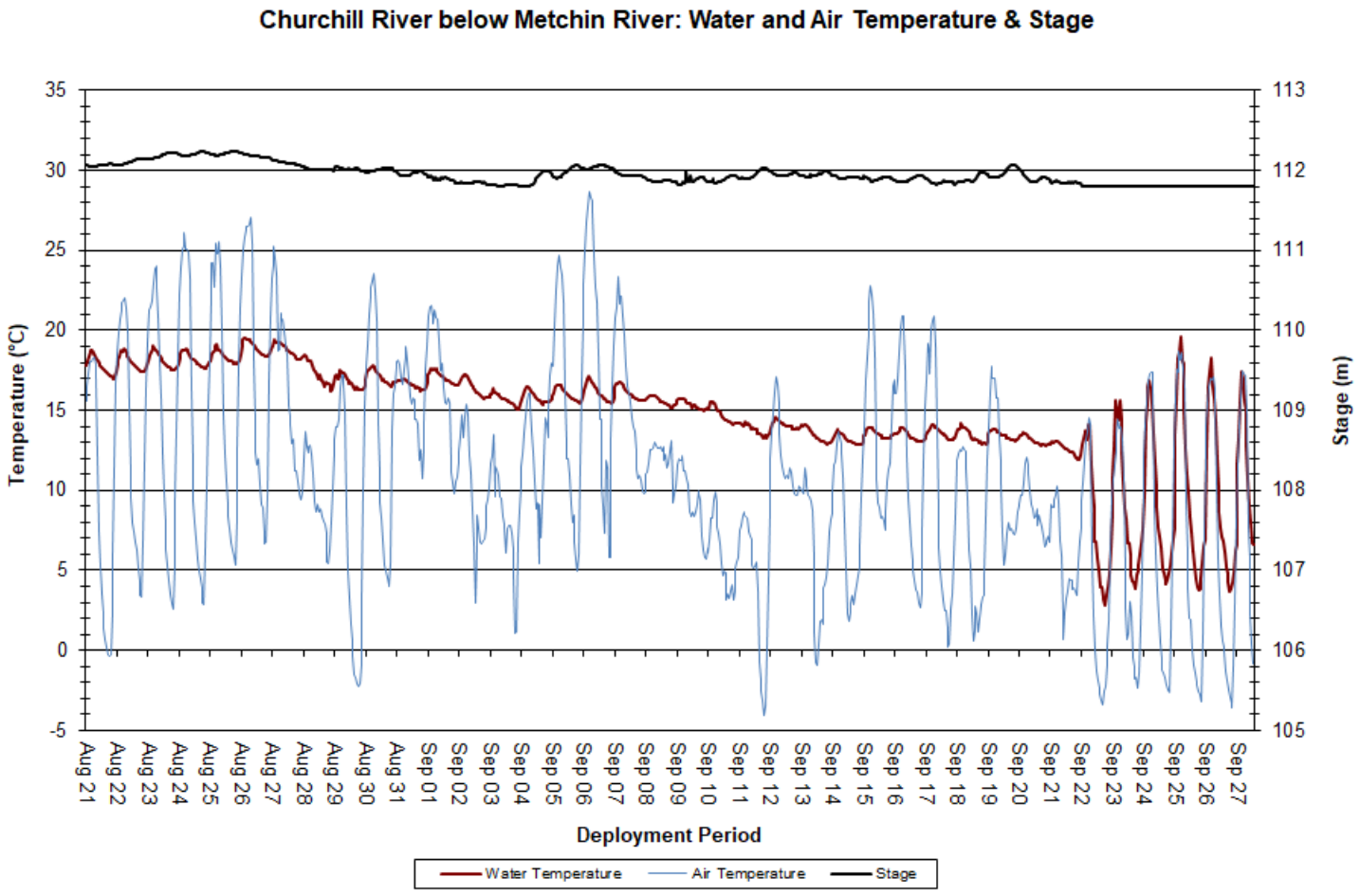

Figure 2: Water and Air Temperature & Stage at Churchill River below Metchin River

pH

- Over the deployment period, pH values ranged from 0 to 14 pH units, with a median value of 7.06 (Figure 3).
- pH values were quite stable over the majority of deployment, remaining within the CCME's Guidelines for the Protection of Aquatic Life for the majority of deployment.
- Photosynthesis uses up hydrogen molecules; this causes the concentration of hydrogen ions to decrease, which in turn causes pH to increase. For this reason, pH may be higher during daylight hours and during the growing season when photosynthesis is at a maximum. This is illustrated by the diurnal fluctuations in pH values (Figure 3).
- Increased fluctuations in pH data from September 22nd onwards are likely attributable to the instrument being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

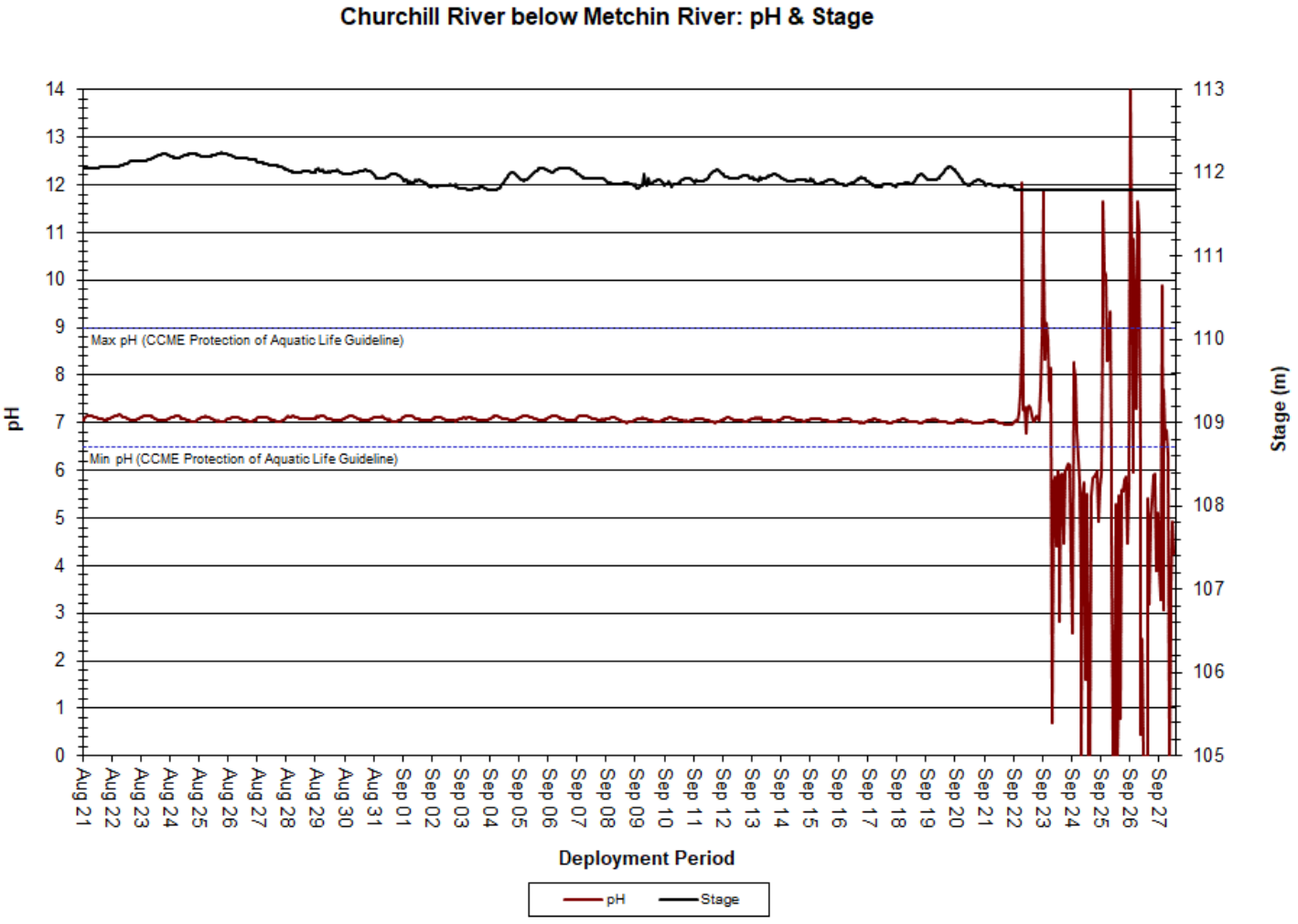

Figure 3: pH & Stage at Churchill River below Metchin River

Specific Conductivity

- Over the deployment period, specific conductivity ranged from 0µS/cm to 28.5µS/cm, with a median value of 25.2µS/cm (Figure 4).
- The relationship between conductivity and stage is generally inversed. When stage levels increase, specific conductivity levels decrease as the increased amount of water in the river system dilutes solids that are present. This relationship is only somewhat evident in the graph below (Figure 4).
- Specific conductivity dropping to zero from September 22nd onwards is likely attributable to the instrument being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

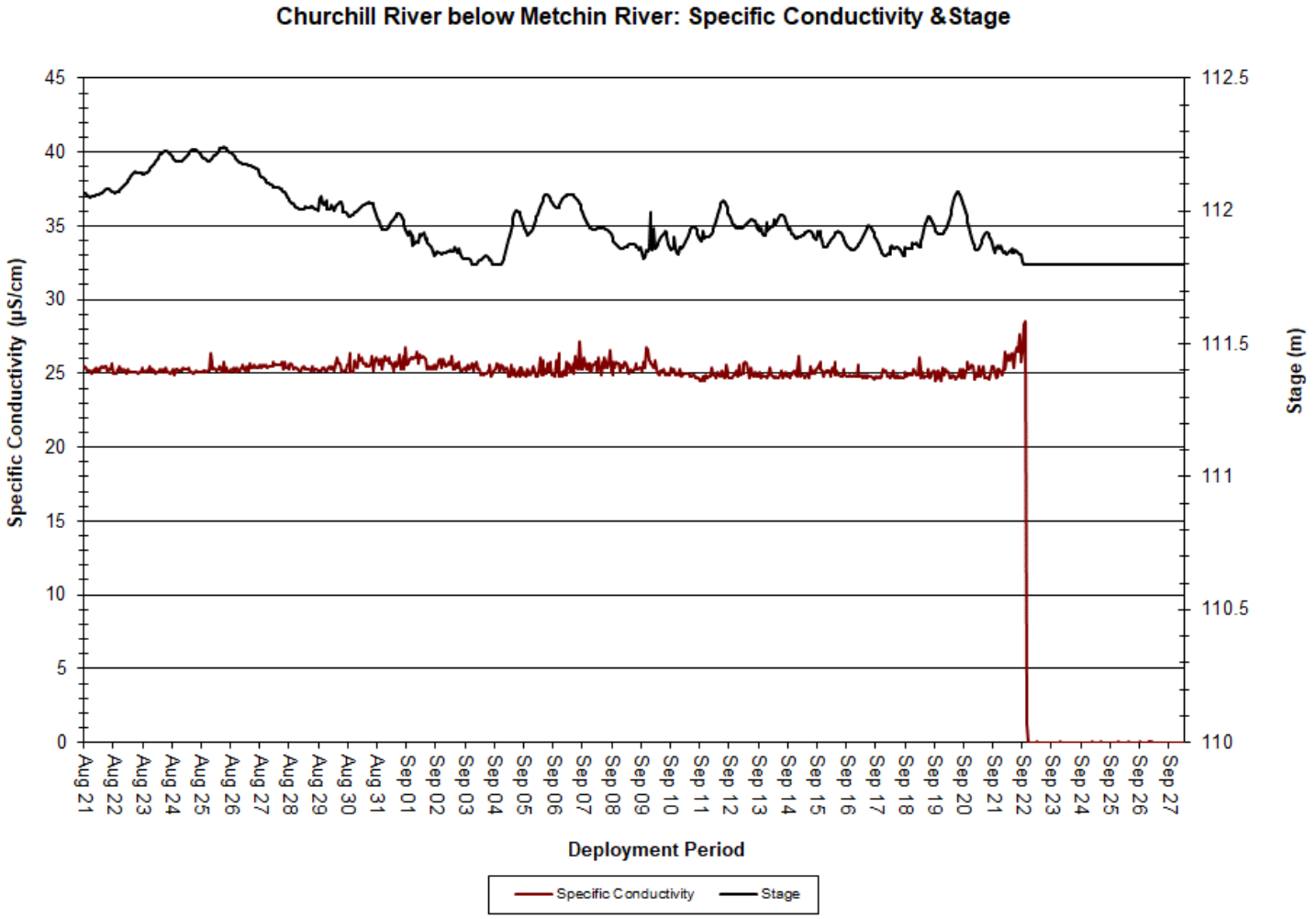

Figure 4: Specific Conductivity & Stage at Churchill River below Metchin River

Dissolved Oxygen

- Over the deployment period, dissolved oxygen content ranged from 0mg/L to 13.69mg/L, with a median value of 9.58mg/L. Saturation of dissolved oxygen ranged from 0% to 104.0%, with a median value of 96.6% (Figure 5).
- There is an evident relationship between water temperature and dissolved oxygen. Over the deployment period, dissolved oxygen levels were increasing, as water temperatures were decreasing. Dissolved oxygen also follows a diurnal pattern as water temperatures rise and fall under the influence of ambient air temperatures. Generally, dissolved oxygen levels are higher in a waterbody during cooler temperatures.
- Dissolved oxygen levels were below the CCME's Guideline for the Protection of Early Life Stages for the beginning of deployment, which is to be expected as water temperatures were higher across the same period. Dissolved oxygen levels rose above the CCME's Guidelines for the Protection of Early Life Stages around September 10th and stayed there for the remainder of deployment as water temperatures dropped. Dissolved oxygen levels remained above the CCME's Guideline for the Protection of Other Life Stages for the majority of deployment.
- Increased fluctuations in dissolved oxygen data from September 22nd onwards are likely attributable to the instrument being located out of, or in very little, water.

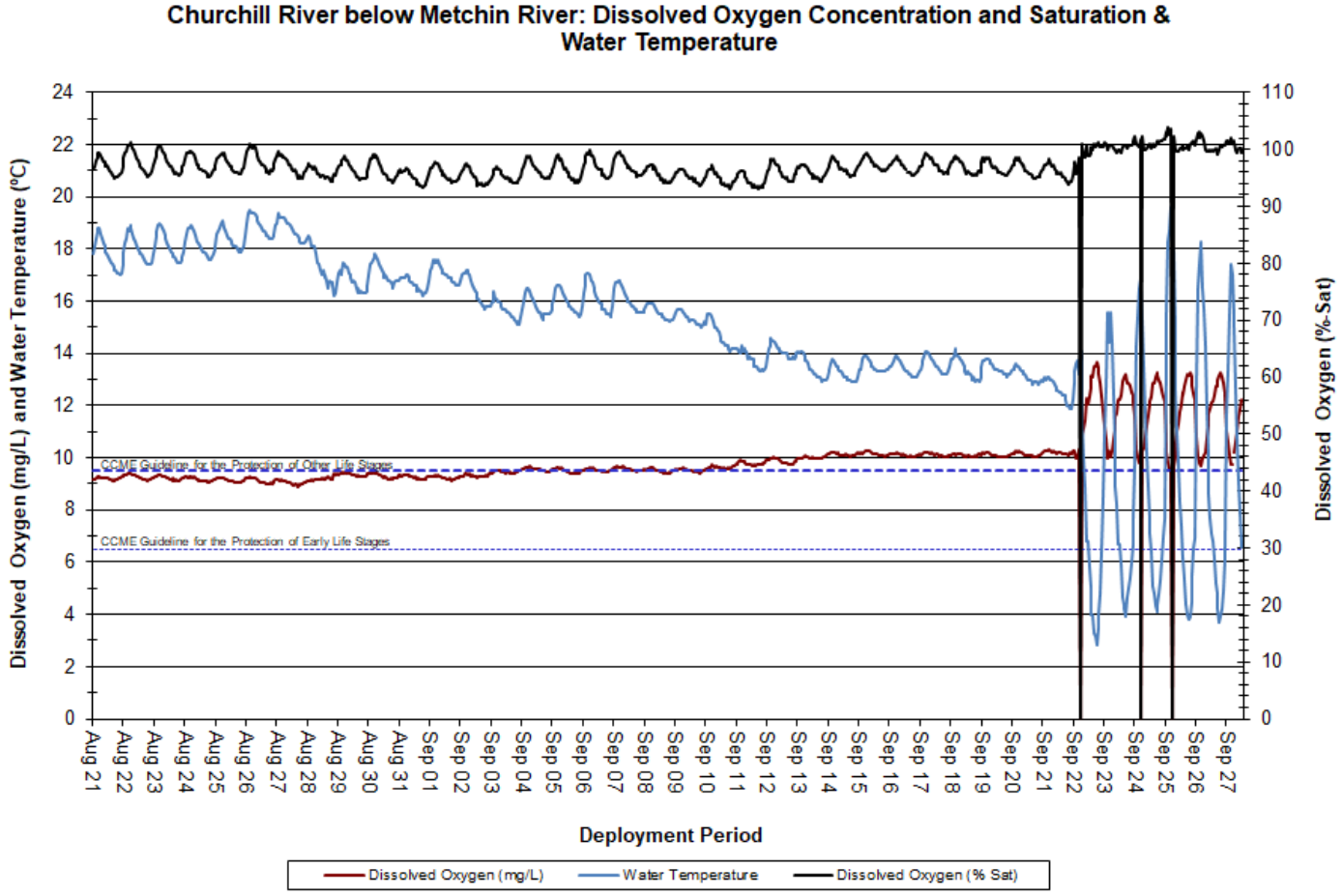

Figure 5: Dissolved Oxygen & Water Temperature at Churchill River below Metchin River

Turbidity

- Over the deployment period, turbidity ranged from 0 NTU to 10.8 NTU, with a median value of 0 NTU (Figure 6), which indicates a very low level of natural background turbidity in the waterbody. Precipitation data was obtained from the Metchin River near TLH Weather Station.
- This station is located at a wide and deep section of the Churchill River and therefore turbidity levels are typically less susceptible to precipitation events as compared to other areas.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

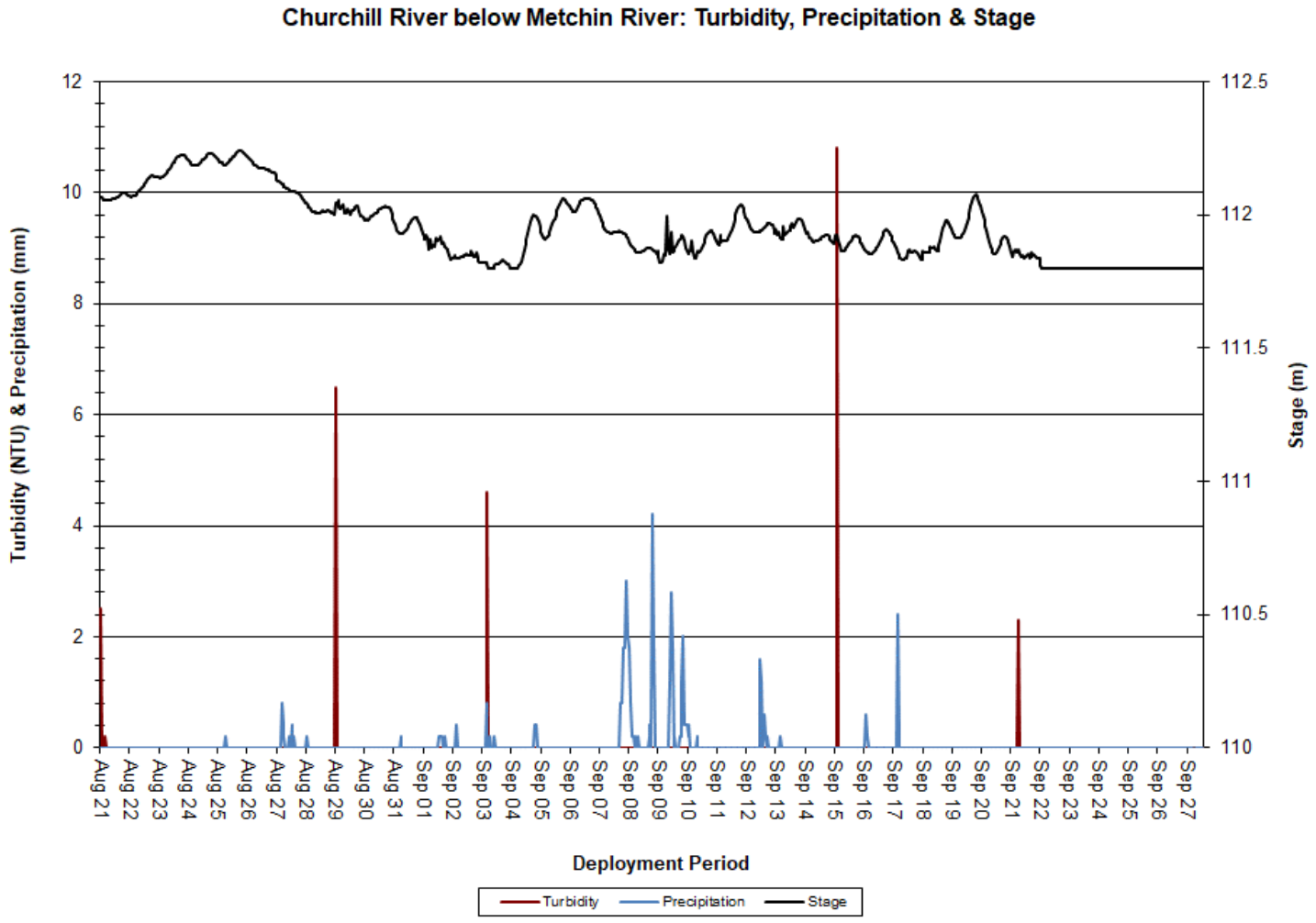

Figure 6: Turbidity, Precipitation & Stage at Churchill River below Metchin River

Stage and Flow

- Over the deployment period, stage levels ranged from 111.797m to 112.241m, with a median value of 111.924m. Flow ranged from 759.843m^3/s to 997.963m^3/s, with a median value of 836.738m^3/s (Figure 7). Precipitation data was obtained from the Metchin River near TLH Weather Station.
- Stage and flow were relatively stable, but somewhat decreasing, over the course of deployment. Precipitation events across the same period somewhat correlate with increases in both stage and flow (Figure 8).
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

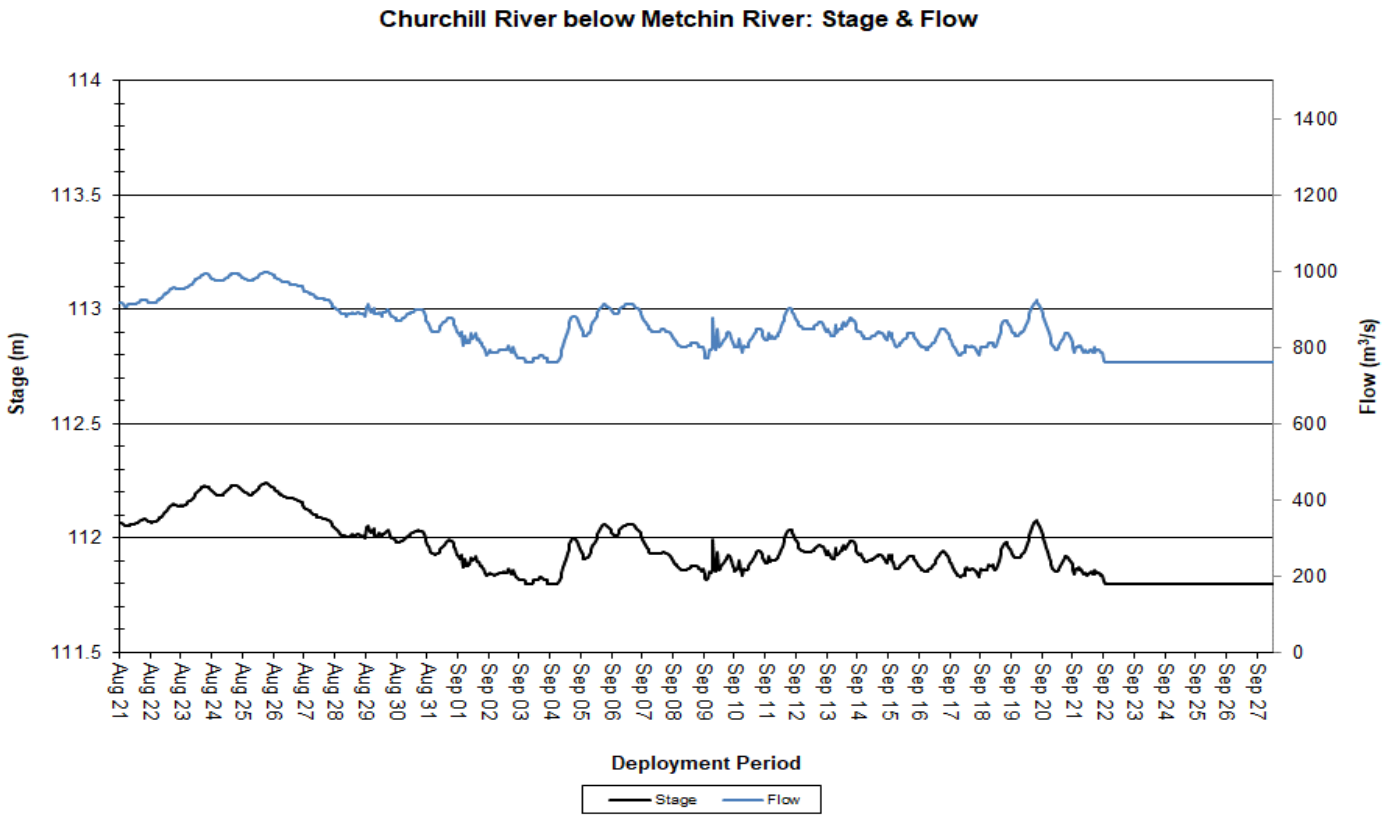

Figure 7: Stage & Flow at Churchill River below Metchin River

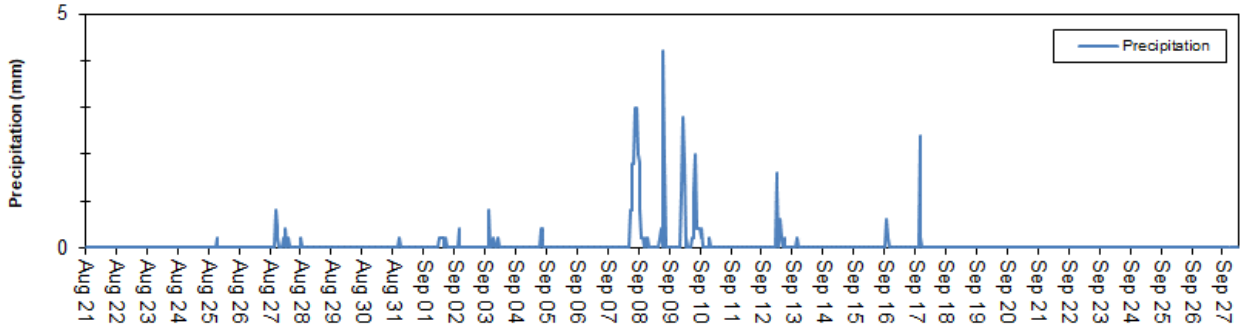

Figure 8: Precipitation at Churchill River below Metchin River

Churchill River above Grizzle Rapids

Water Temperature

- Over the deployment period, water temperature ranged from 12.3°C to 20.1°C, with a median value of 16.2°C (Figure 9). Air temperature data was obtained from the Metchin River near TLH Weather Station.
- Water temperature slowly decreased across the deployment period. This trend is to be expected as air temperatures also decreased through August and September. Water temperature data exhibits a diurnal pattern, and closely correlates with ambient air temperatures.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

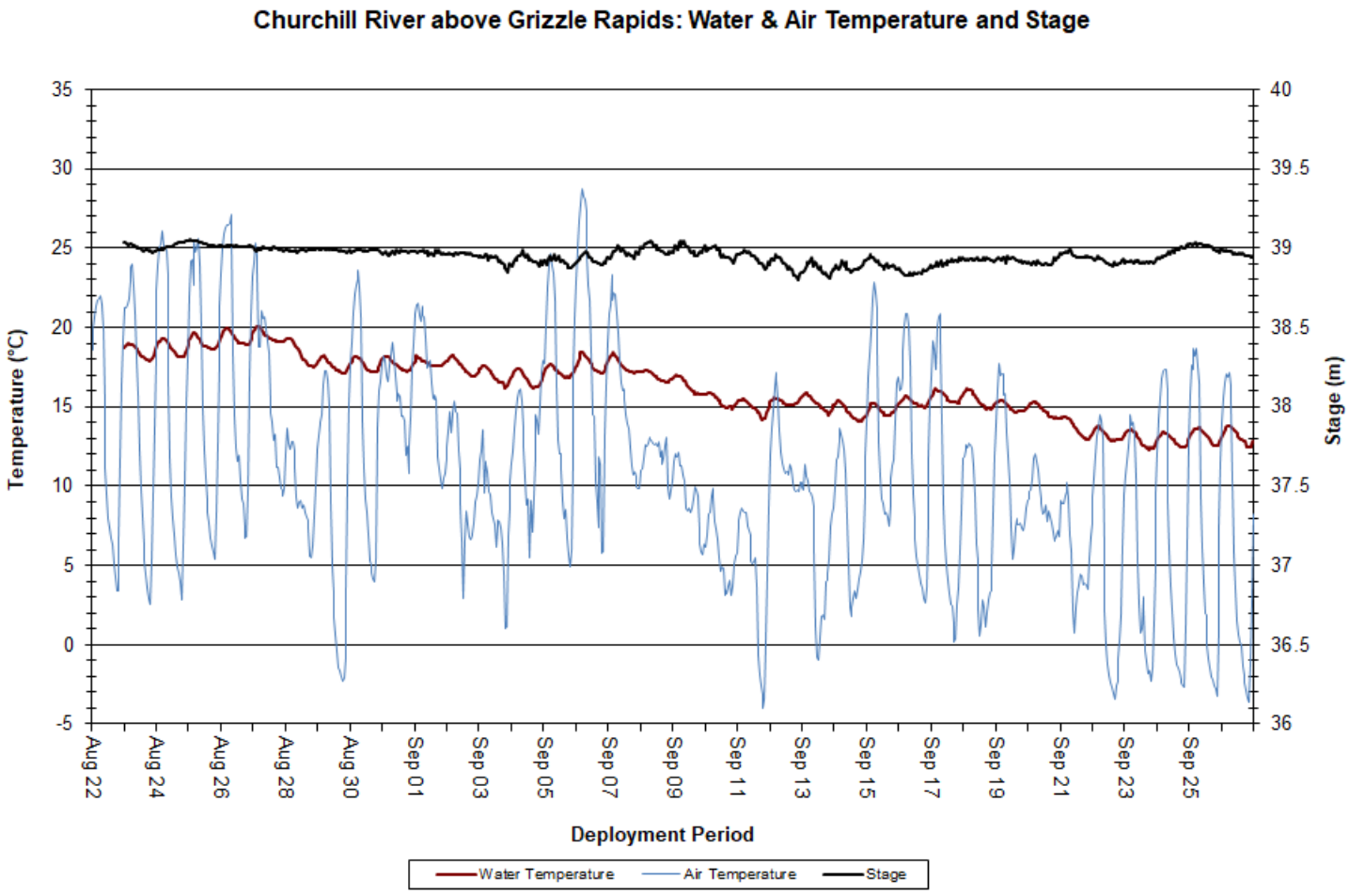

Figure 9: Water and Air Temperature & Stage at Churchill River above Grizzle Rapids

pH

- Over the deployment period, pH values ranged from 0 pH units to 14 pH units, with a median value of 14 (Figure 10).
- Sustained, erratic pH data as exhibited here is indicative of a sensor failure on the field sonde (Figure 10).
- Photosynthesis uses up hydrogen molecules; this causes the concentration of hydrogen ions to decrease, which in turn causes pH to increase. For this reason, pH may be higher during daylight hours and during the growing season when photosynthesis is at a maximum.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

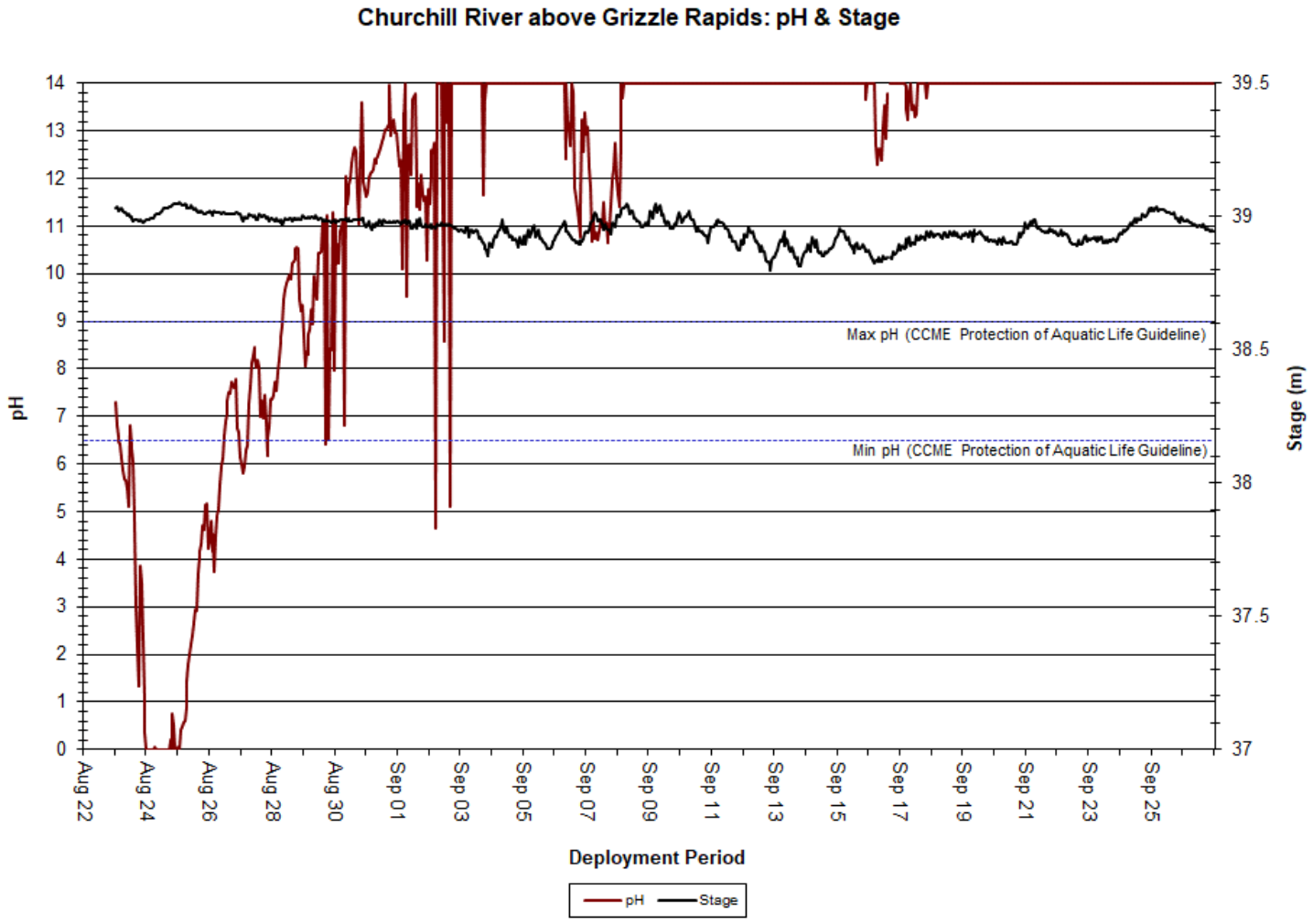

Figure 10: pH & Stage at Churchill River above Grizzle Rapids

Specific Conductivity

- Over the deployment period, specific conductivity ranged from 10.5µS/cm to 35.6µS/cm, with a median of 18.5µS/cm (Figure 11).
- The relationship between conductivity and stage is generally inversed. When stage levels increase, specific conductivity levels generally decrease as the increased amount of water in the river system dilutes solids that are present. This relationship is only somewhat evident in the graph below, likely because this station is located at a deep and wide section of the Churchill River and other factors in the water column influence conductivity levels.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

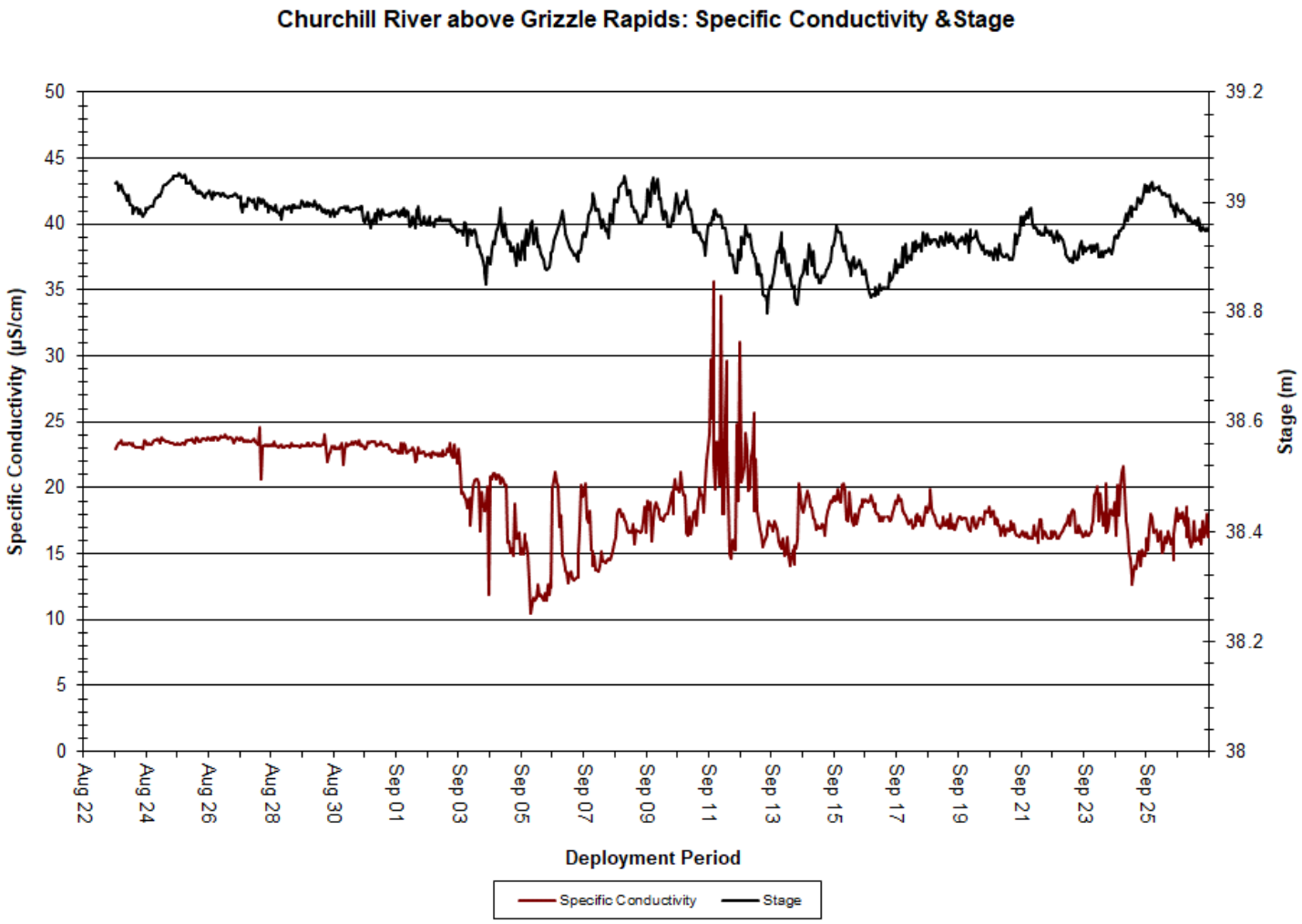

Figure 11: Specific Conductivity & Stage at Churchill River above Grizzle Rapids

Dissolved Oxygen

- Over the deployment period, dissolved oxygen content ranged from 8.70mg/L to 10.33g/L, with a median value of 9.40mg/L. Saturation of dissolved oxygen ranged from 92.2% saturation to 100.5% saturation, with a median value of 95.8% (Figure 12).
- There is an evident relationship between water temperature and dissolved oxygen. Over the deployment period, dissolved oxygen levels gradually increased as water temperatures decreased through August and September. Dissolved oxygen also follows a diurnal pattern as water temperatures rise and fall under the influence of ambient air temperatures. Generally, dissolved oxygen levels are higher in a waterbody during cooler temperatures.
- Dissolved oxygen levels were below the CCME's Guideline for the Protection of Early Life Stages for the first half of deployment, rising above the guideline on September 11th. Dissolved oxygen levels were above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment.

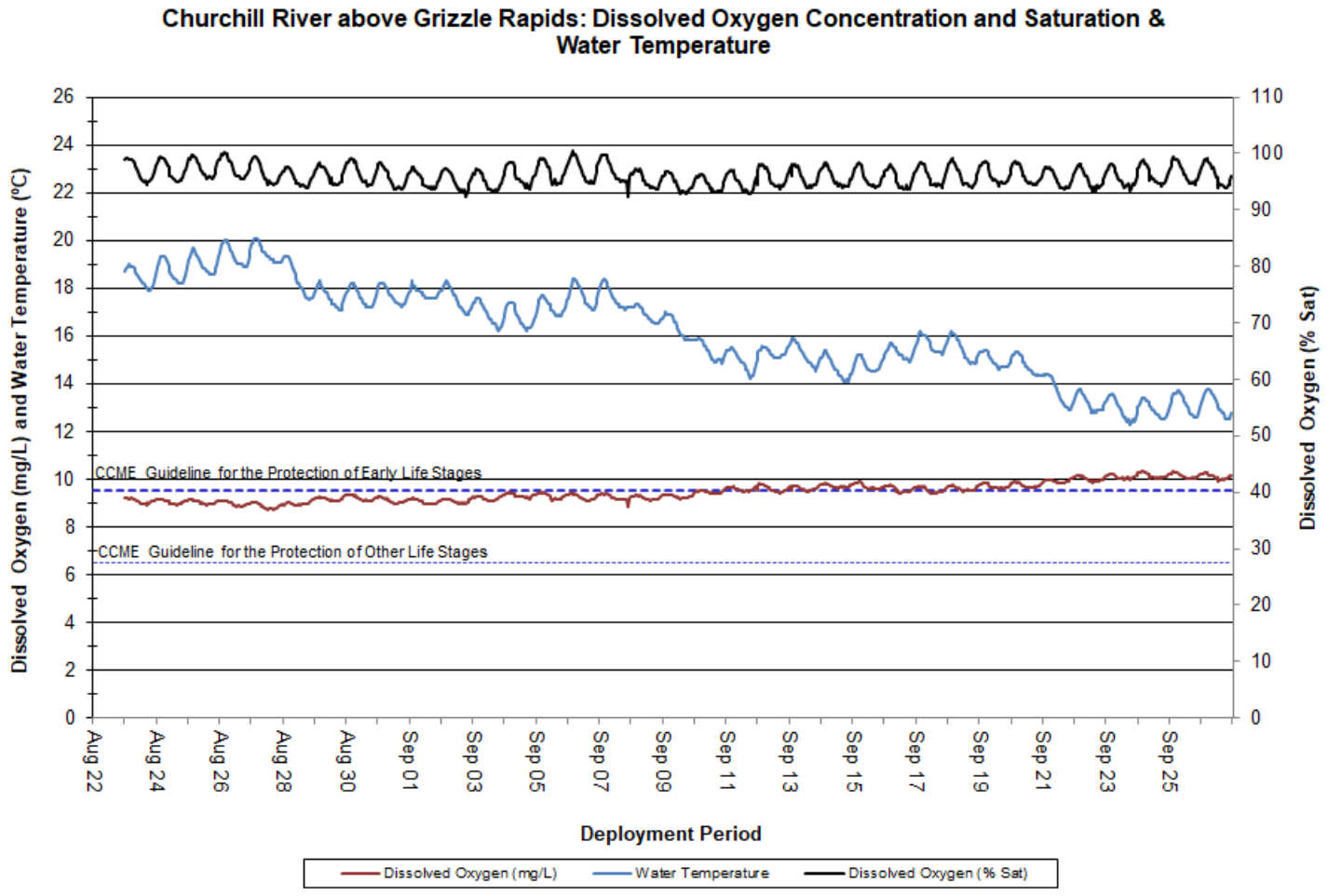

Figure 12: Dissolved Oxygen & Water Temperature at Churchill River above Grizzle Rapids

Turbidity

- Over the deployment period, turbidity ranged from 0 NTU to 1.0 NTU, with a median value of 0 NTU (Figure 13). A median value of 0 NTU indicates a very low level of natural background turbidity in the waterbody. Precipitation data was obtained from the Metchin River near TLH Weather Station.
- There were very few turbidity spikes observed over the deployment period (Figure 13). This station is located at a wide and deep section of the Churchill River and therefore turbidity levels are less susceptible to precipitation events as compared to other areas.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

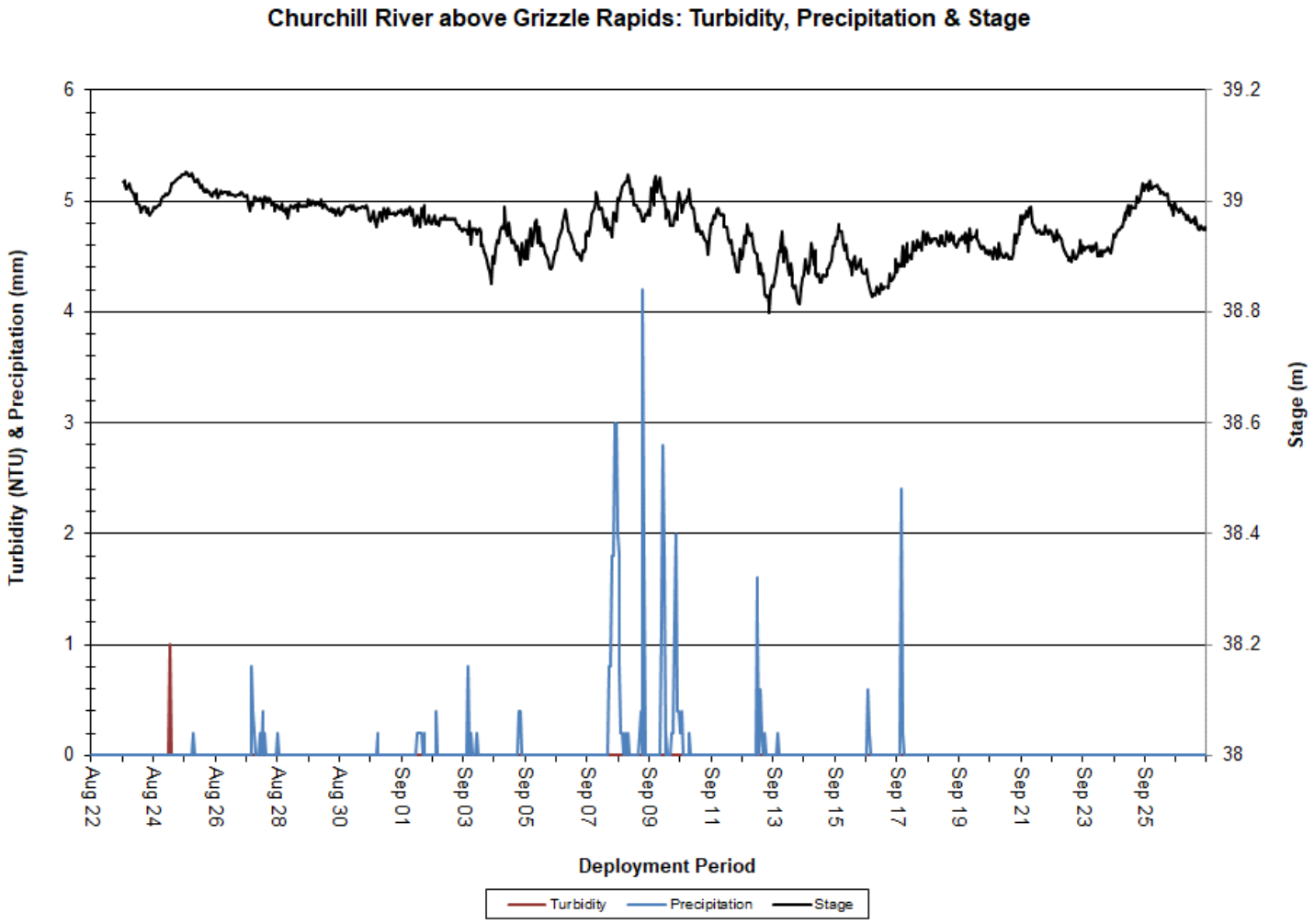

Figure 13: Turbidity, Precipitation & Stage at Churchill River above Grizzle Rapids

Stage

- Over the deployment period, stage ranged from 38.798m to 39.053m, with a median value of 38.957m (Figure 14). Precipitation data was obtained from the Metchin River near TLH Weather Station.
- Stage was relatively stable across the deployment period, with precipitation events often correlating with slight increases in stage (Figure 14).
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

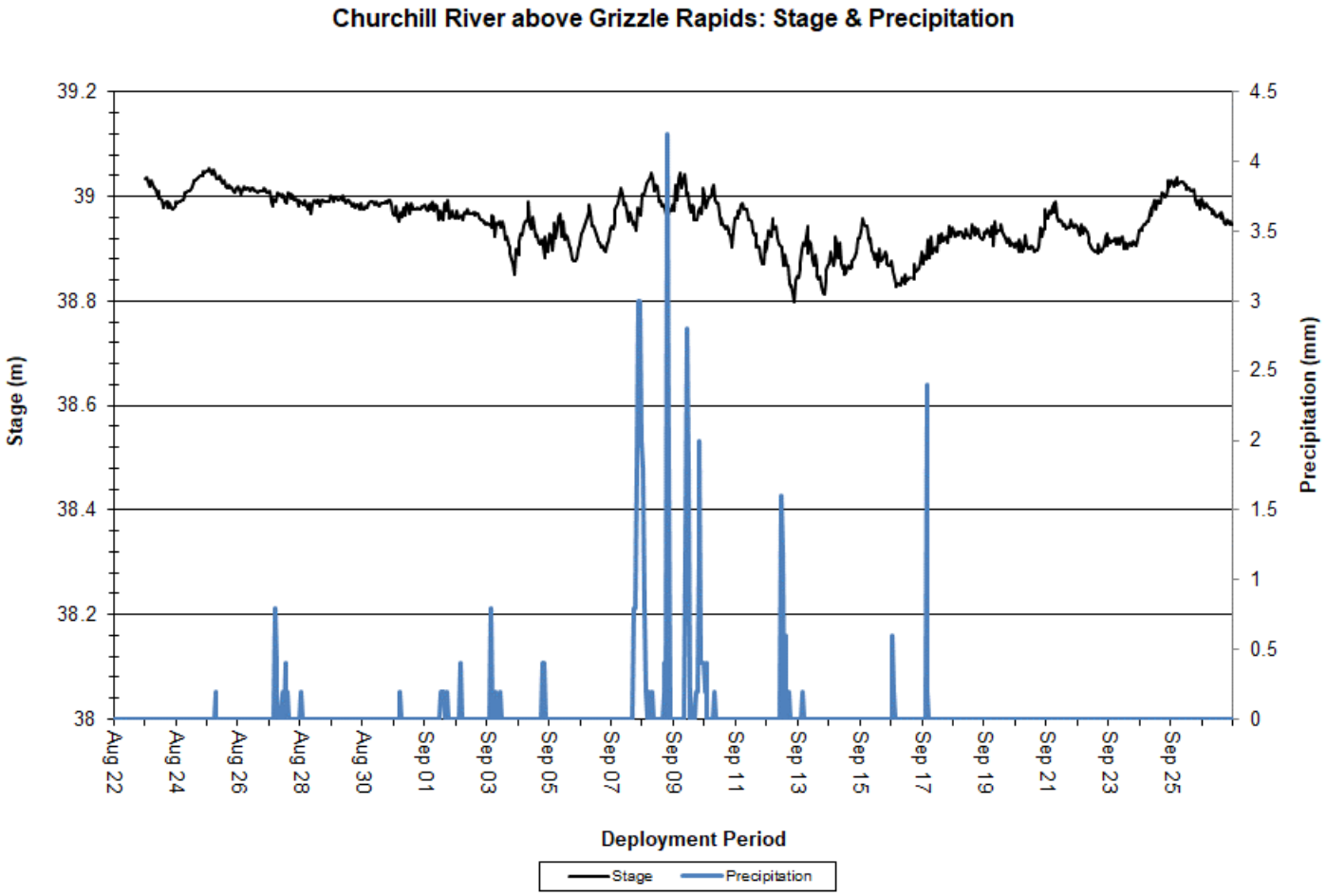

Figure 14: Stage & Precipitation at Churchill River above Grizzle Rapids

Churchill River below Muskrat Falls

Water Temperature

- Over the deployment period, water temperature ranged from 0.9°C to 22.5°C, with a median value of 17.6°C (Figure 15). Air temperature data was obtained from the Muskrat Falls MET Station.
- Water temperature slowly decreased over the course of the deployment period. This is to be expected as ambient air temperatures also decreased through August and September.
- Increased fluctuations in water temperatures throughout the deployment period and from September 24th onwards are likely attributable to the field sonde being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

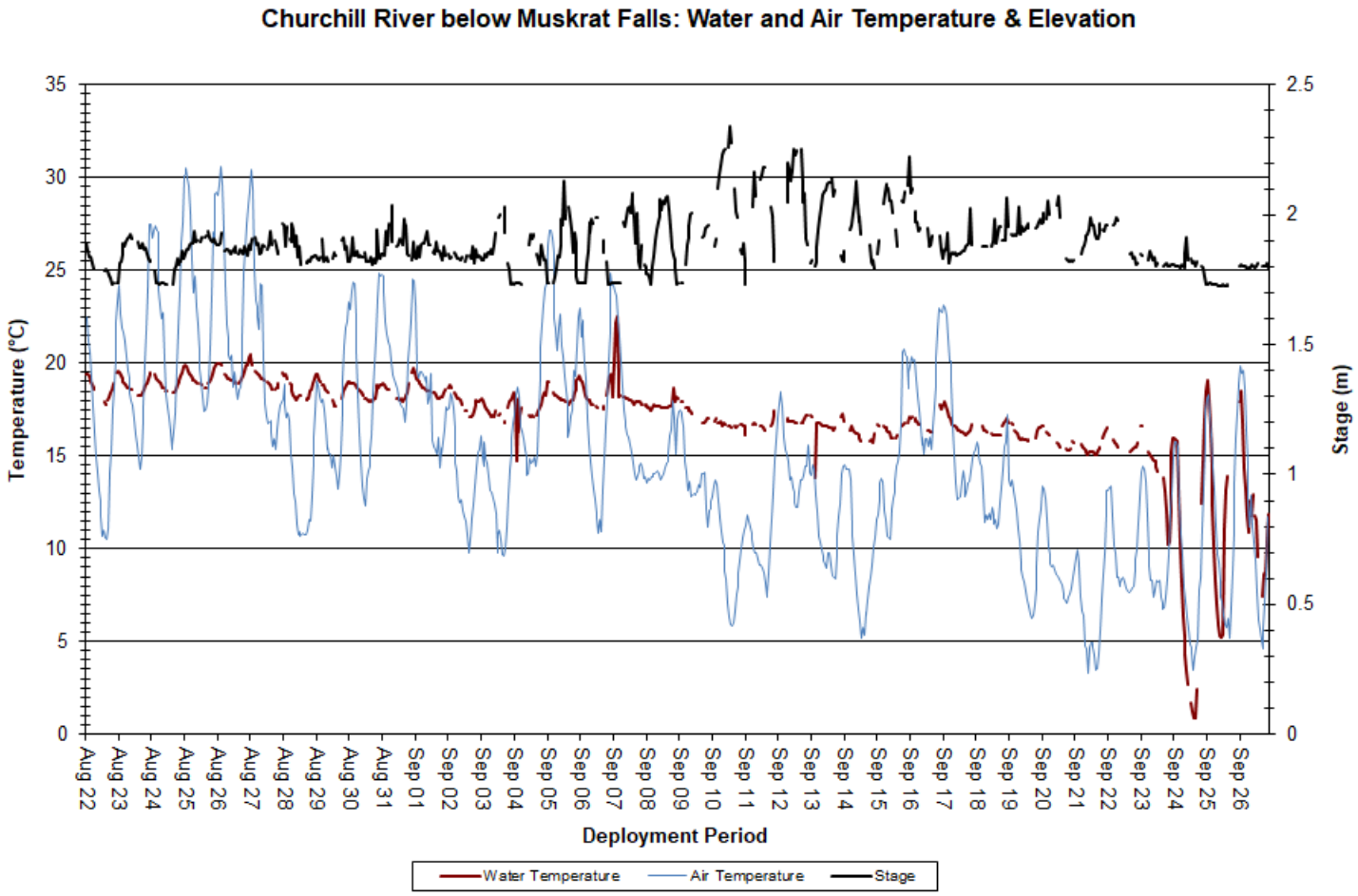

Figure 15: Water and Air Temperature & Stage at Churchill River below Muskrat Falls

pH

- Over the deployment period, pH ranged from 0 pH units to 14 pH units, with a median value of 6.71 (Figure 16).
- pH values were quite stable over the course of deployment and remained within the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period (Figure 16).
- Increased fluctuations in pH values throughout the deployment period and from September 24th onwards are likely attributable to the field sonde being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

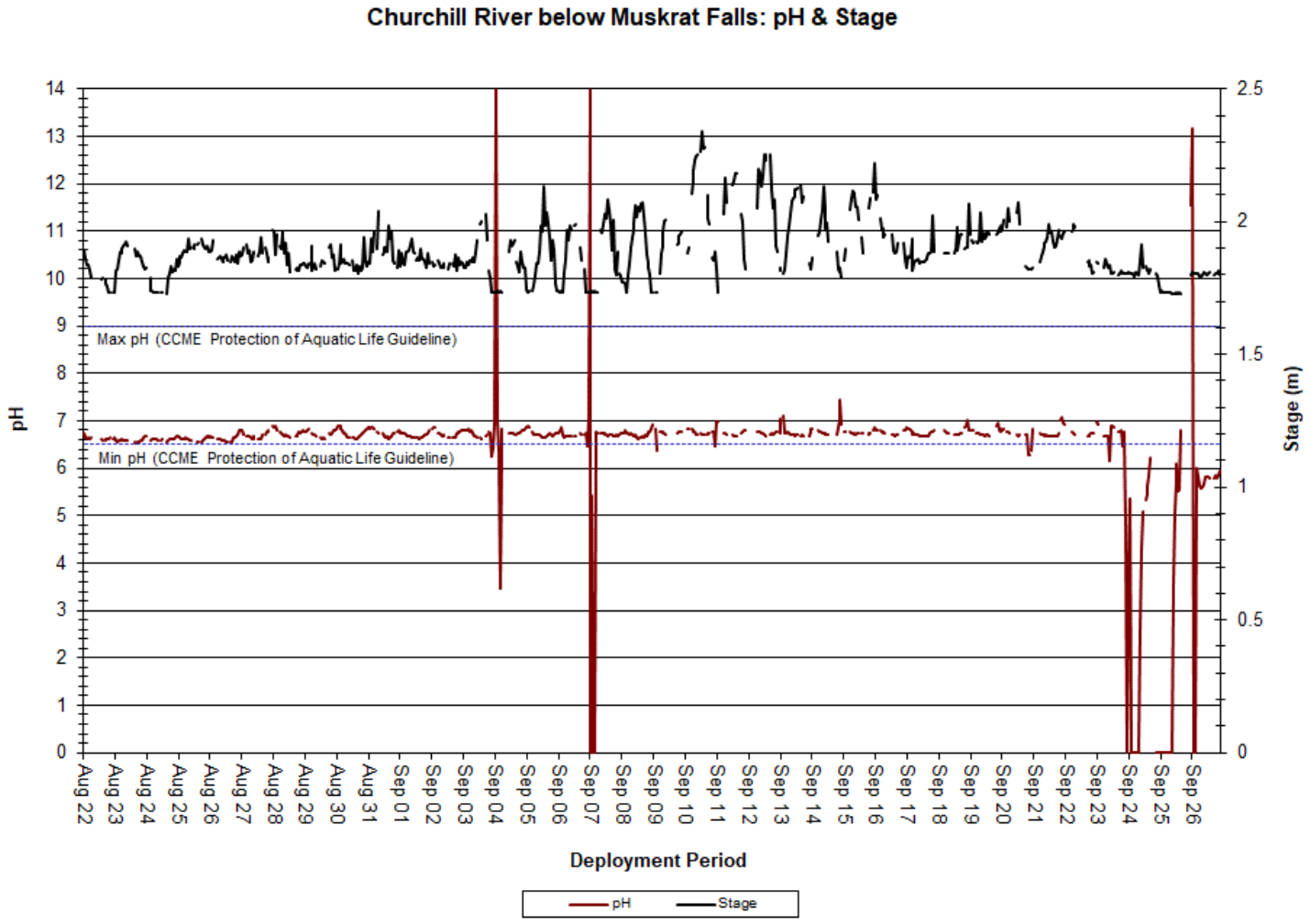

Figure 16: pH & Stage at Churchill River below Muskrat Falls

Specific Conductivity

- Over the deployment period, specific conductivity ranged from 0µS/cm to 26.9µS/cm, with a median value of 23.8µS/cm (Figure 17).
- The relationship between conductivity and stage is generally inversed. When stage decreases, specific conductivity increases as the decreased amount of water in the river system concentrates solids that are present, and vice versa. This relationship is only somewhat evident in the graph below, likely because this station is located at a deep and wide section of the Churchill River and other factors in the water column influence conductivity levels (Figure 17).
- Increased fluctuations in specific conductivity throughout the deployment period and from September 24th onwards are likely attributable to the field sonde being located out of, or in very little, water.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

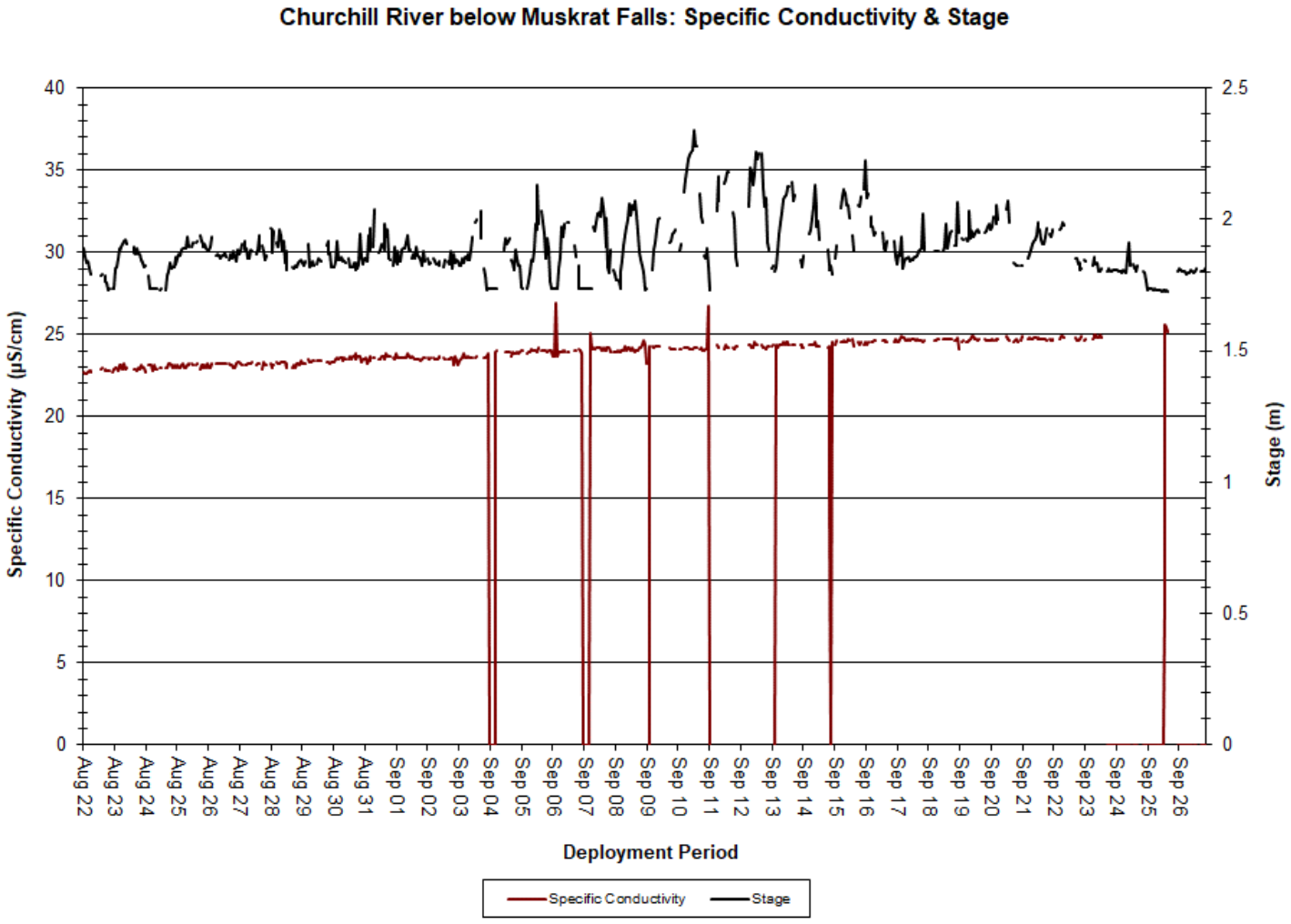

Figure 17: Specific Conductivity & Stage at Churchill River below Muskrat Falls

Dissolved Oxygen

- Over the deployment period, dissolved oxygen concentration ranged from 0mg/L to 8.67mg/L, with a median value of 0.01mg/L. Saturation of dissolved oxygen ranged from 0% to 94.3%, with a median value of 0.1% (Figure 18).
- Dissolved oxygen and water temperature exhibit an inverse relationship: as one parameter increases, the other decreases, and vice versa. Dissolved oxygen typically follows a diurnal pattern as water temperatures rise and fall under the influence of ambient air temperatures.
- Dissolved oxygen values fell to zero very shortly after deployment and remained unchanged for the duration of deployment, which is likely indicative of a sensor failure on the field sonde (Figure 18).

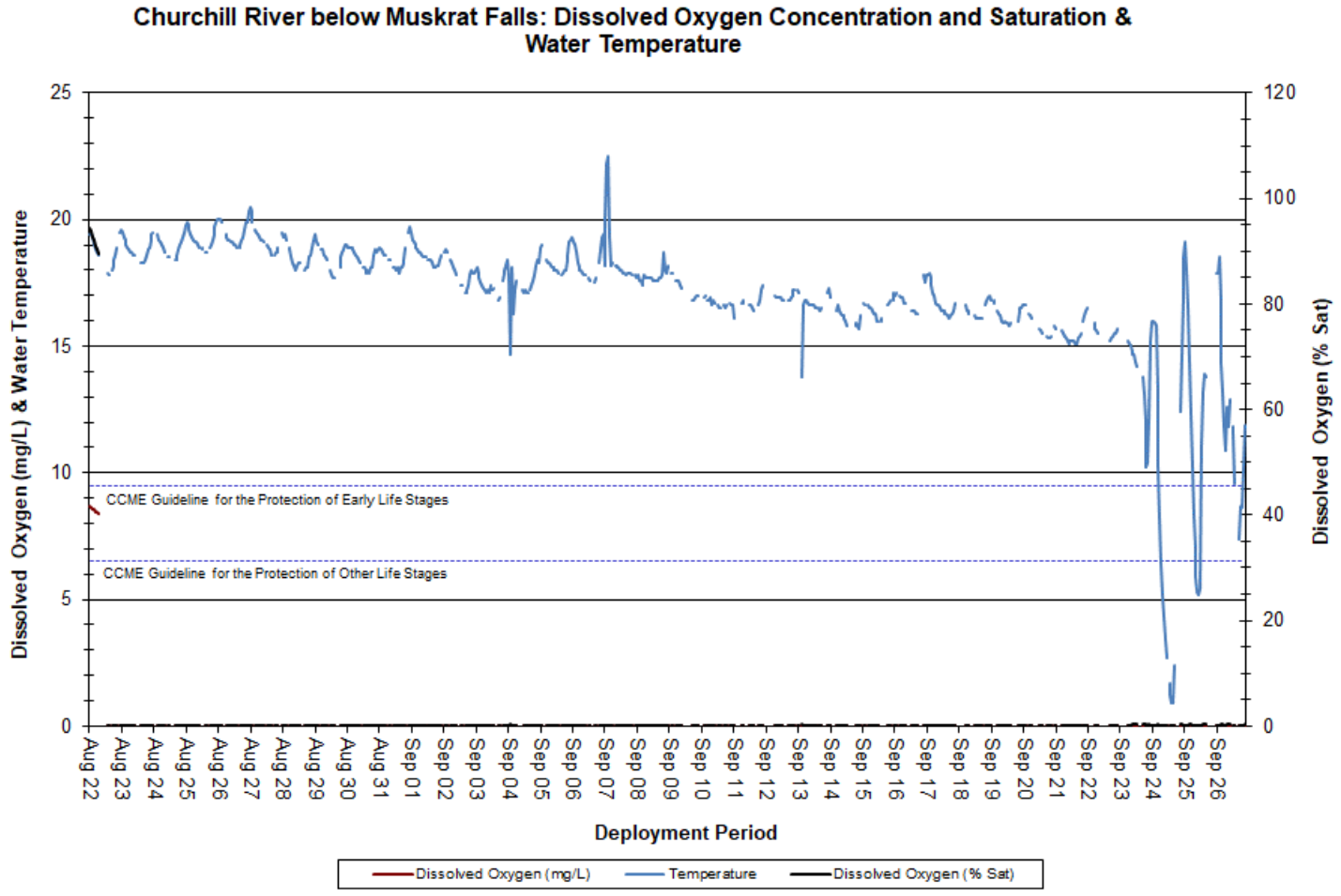

Figure 18: Dissolved Oxygen & Water Temperature at Churchill River below Muskrat Falls

Turbidity

- Over the deployment period, turbidity ranged from 0 NTU to 419 NTU, with a median value of 1.7 NTU. A median value of 1.7 NTU indicates a small amount of natural background turbidity in the waterbody, which is typical of this station. Precipitation data was obtained from the Muskrat Falls MET Station.
- There was limited correlation between turbidity events and precipitation events across the deployment period (Figure 19). Turbidity levels are often quite variable at this station, and do not always correlate with precipitation events given that this station is located on a wide and deep section of the Churchill River.
- From September 14th onwards, turbidity levels remained higher than baseline, which may indicate sediment build-up around the field sonde.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

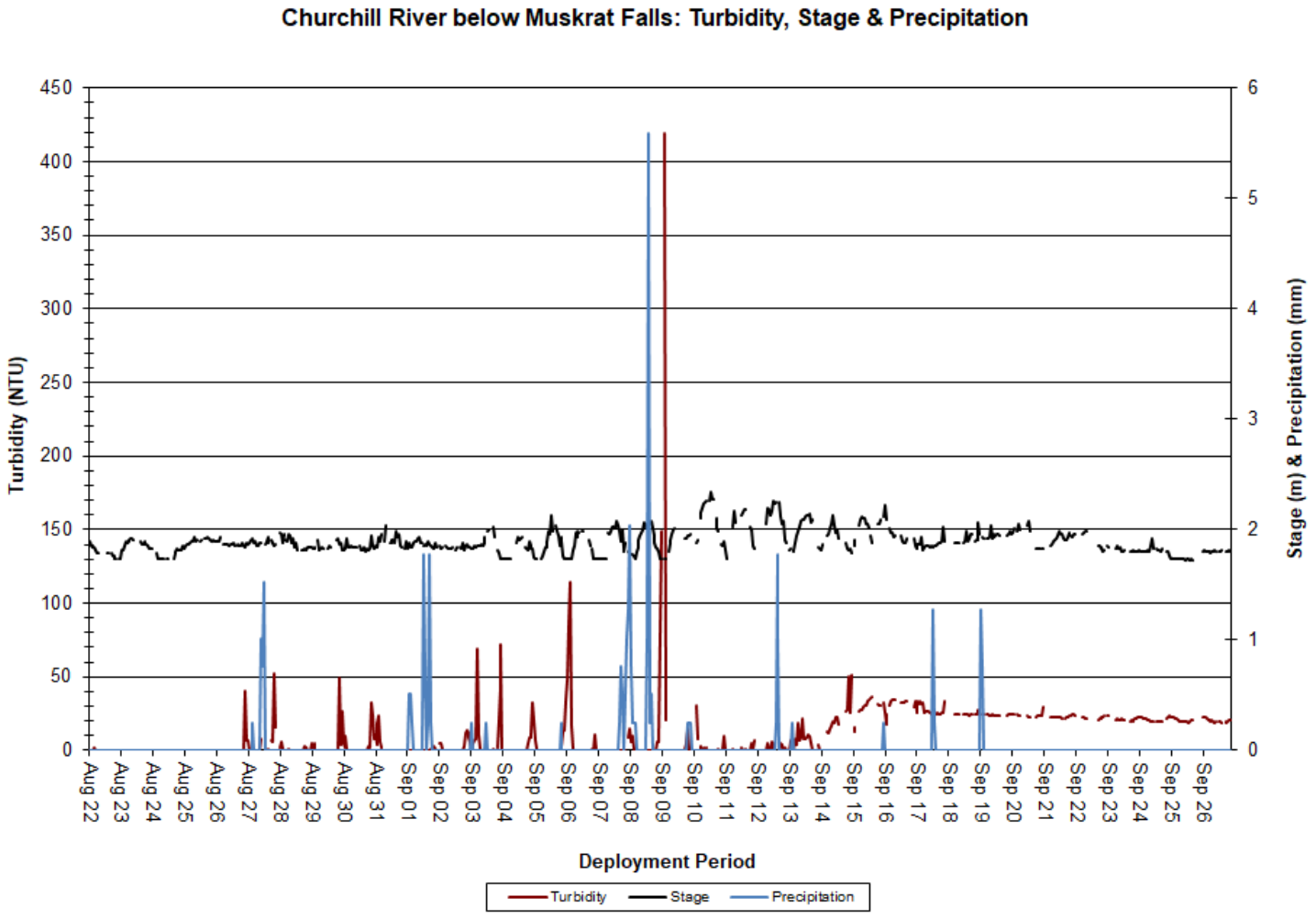

Figure 19: Turbidity, Precipitation & Stage at Churchill River below Muskrat Falls

Stage & Flow

- Over the deployment period, stage ranged from 1.727m to 2.341m, with a median value of 1.8675m. Flow ranged from 813.893m^3/s to 1332.705m^3/s, with a median value of 924.159m^3/s (Figure 20). Precipitation data was obtained from the Muskrat Falls MET Station.
- Stage and flow were variable but relatively stable over the course of deployment, and somewhat correlated with precipitation events. This is partly related to the fact that this station is located on a very wide section of the Churchill River and therefore is not as easily influenced by smaller precipitation events. Stage and flow at this station are also influenced by upstream activities at the Muskrat Falls hydroelectric project.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

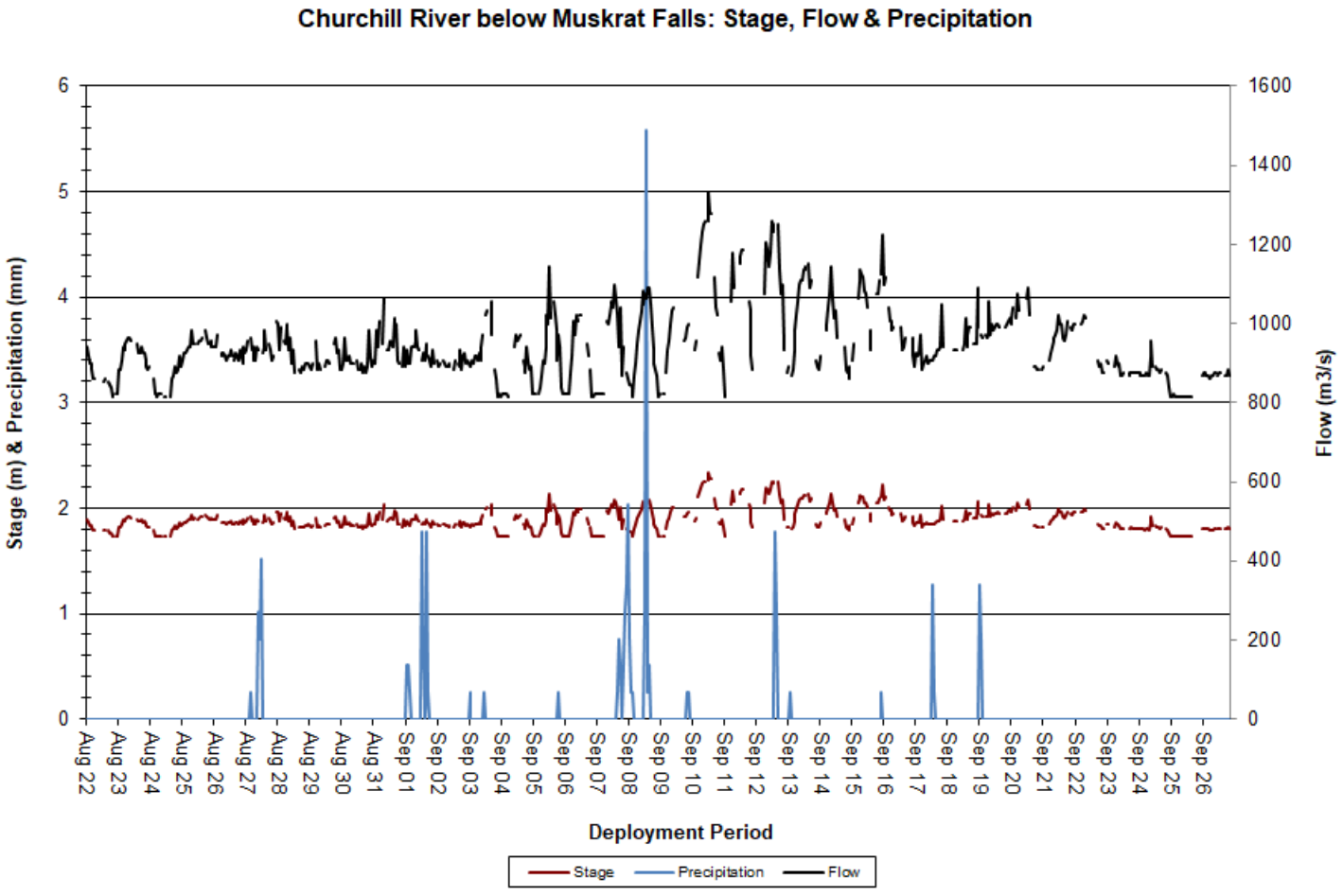

Figure 20: Stage, Flow & Precipitation at Churchill River below Muskrat Falls

Churchill River at English Point

Water Temperature

- Water temperature ranged from 13.3°C to 23.2°C, with a median value of 16.7°C (Figure 21). Air temperature data was obtained from the End of Mud Lake Road Weather Station.
- Water temperature decreased slowly across the deployment period. Water temperatures closely correlated with ambient air temperatures, which followed a similar trend across the same period.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

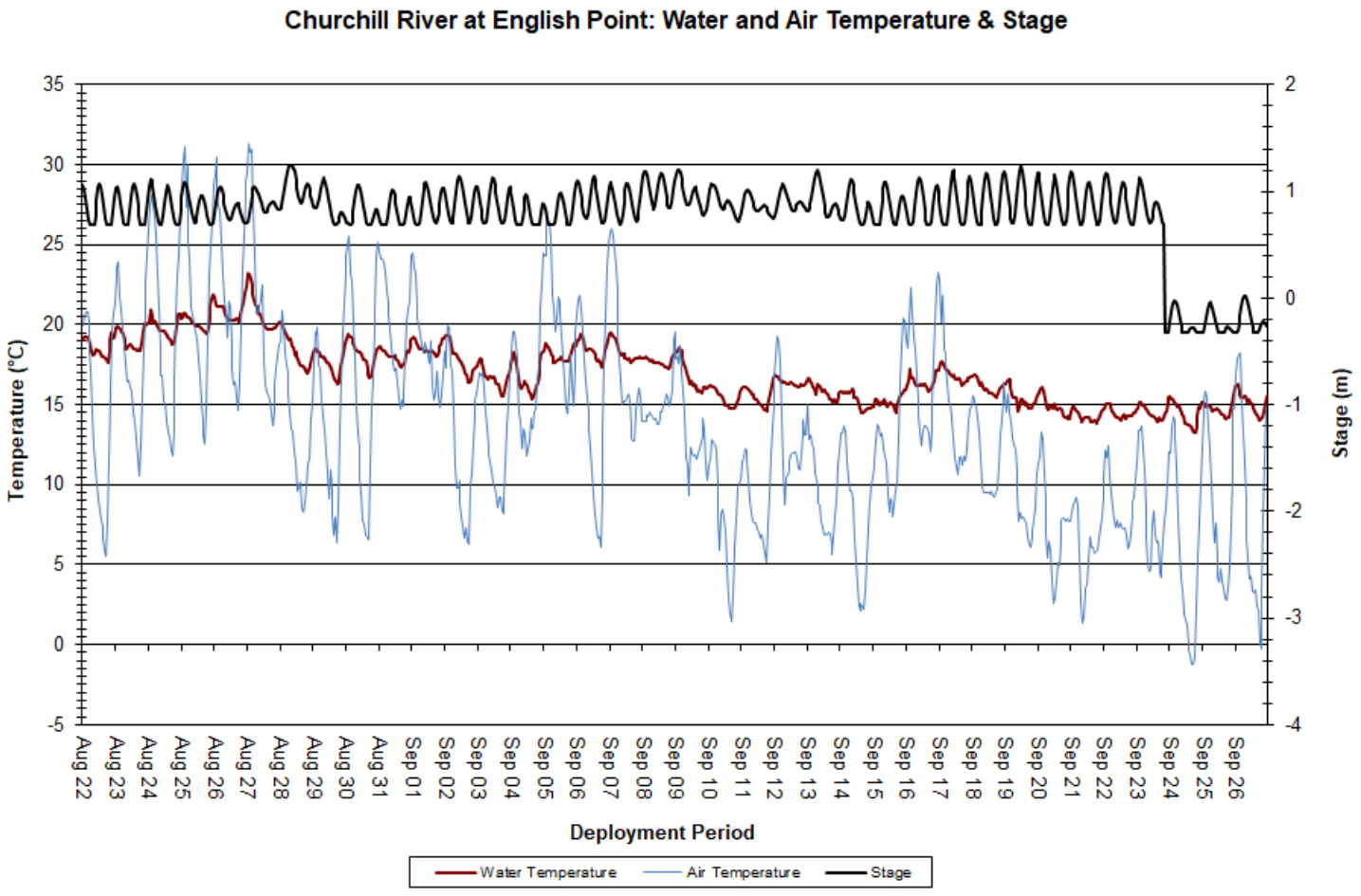

Figure 21: Water and Air Temperature & Stage at Churchill River at English Point

pH

- Over the deployment period, pH ranged from 6.97 pH units to 8.08 pH units, with a median value of 7.21 (Figure 22).
- pH values were relatively stable over the course of deployment. pH values were within the CCME's Guidelines for the Protection of Aquatic Life for the duration of deployment.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

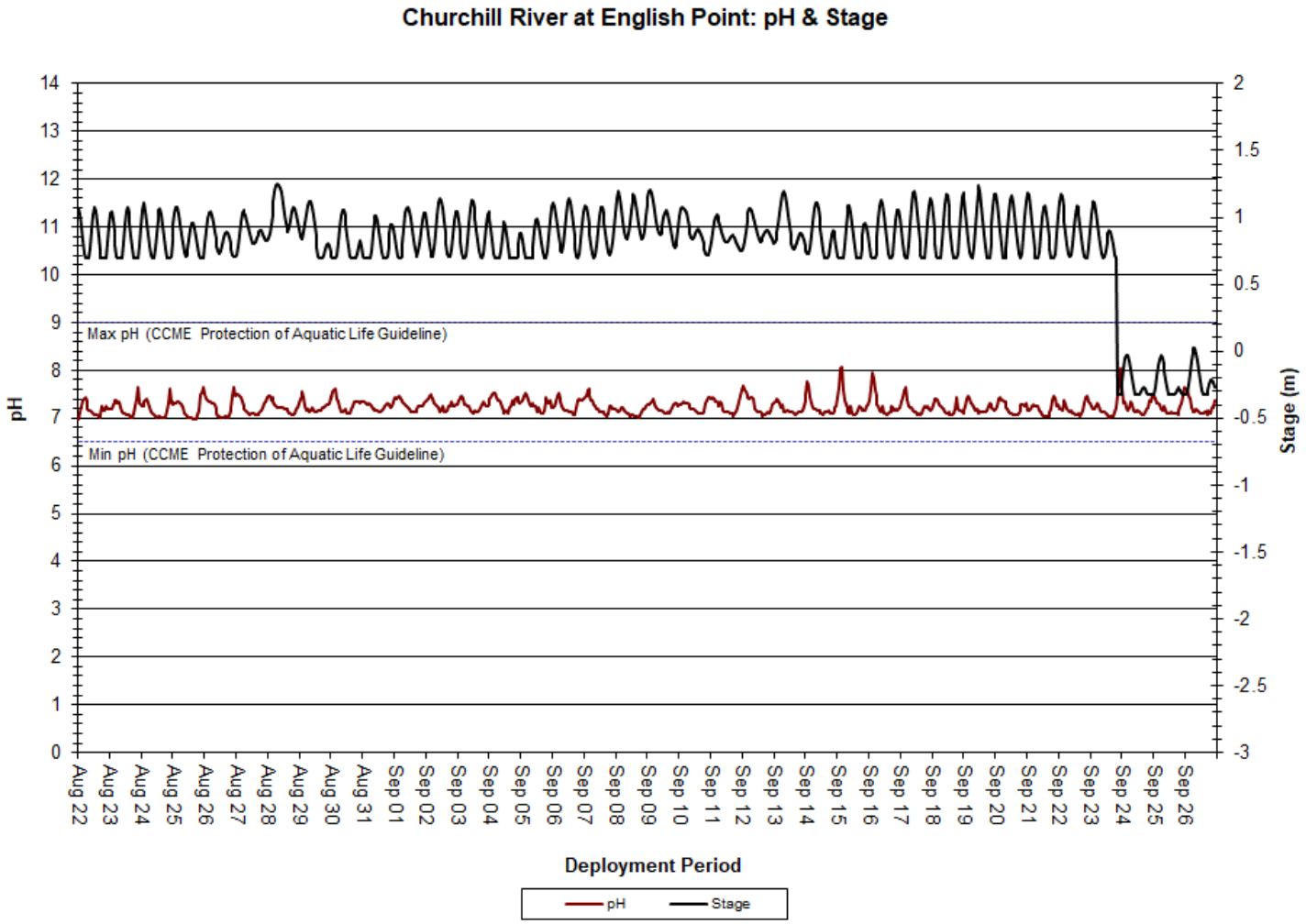

Figure 22: pH & Stage at Churchill River at English Point

Specific Conductivity

- Over the deployment period, specific conductivity ranged from 31.07µS/cm to 80.47µs/cm, with a median value of 39.14µS/cm (Figure 23).
- Specific conductivity fluctuates considerably at this location due to the tidal influences of the Atlantic Ocean on Lake Melville. As the tide comes in, specific conductivity increases as dissolved solids and salinity increase, and vice versa as the tide goes out. This increase and decrease in specific conductivity and stage occurs twice daily. This pattern is generally consistent throughout the deployment period (Figure 23).
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

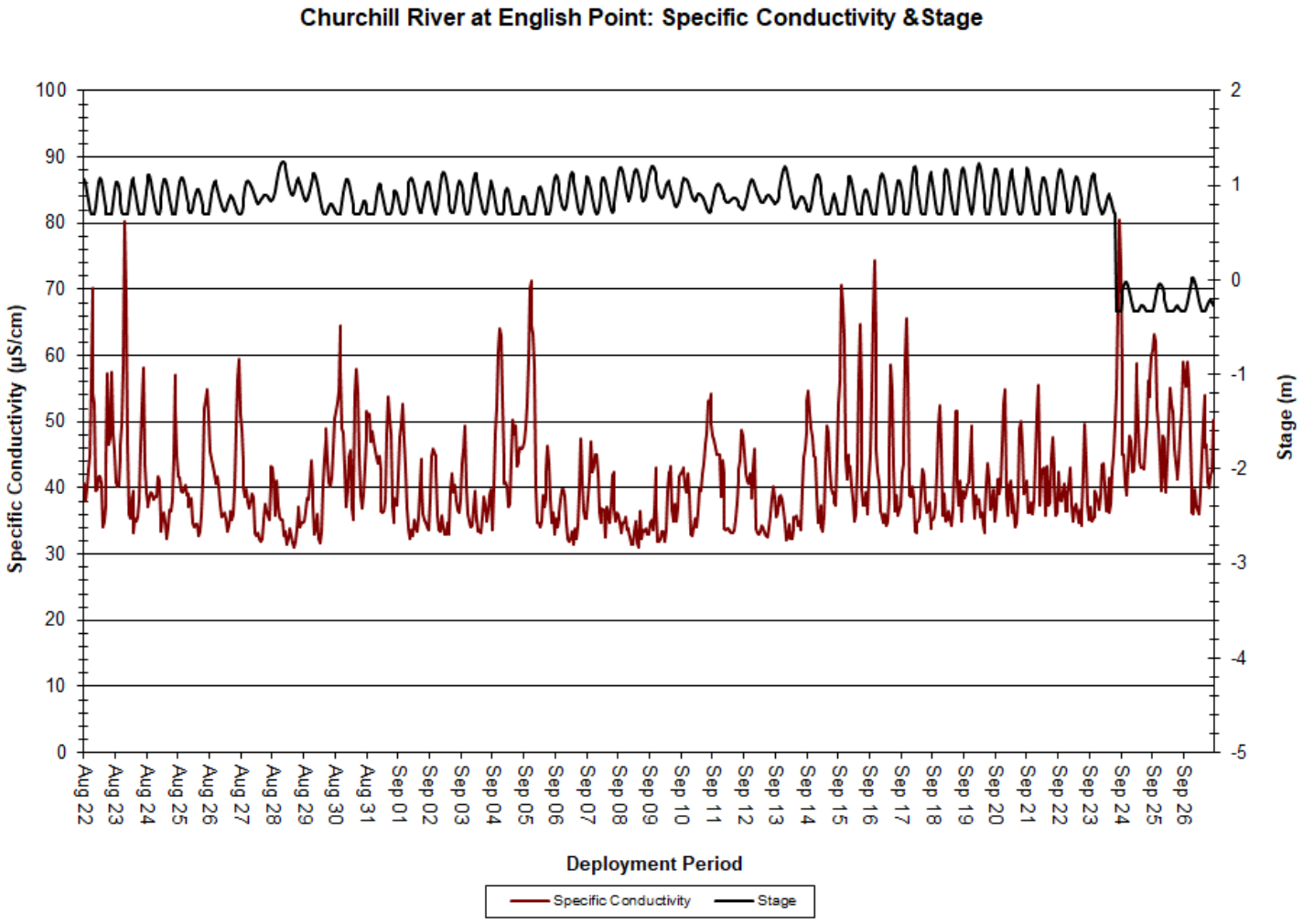

Figure 23: Specific Conductivity & Stage at Churchill River at English Point

Dissolved Oxygen

- Over the deployment period, dissolved oxygen concentration ranged from 8.48mg/L to 10.84mg/L, with a median value of 9.45mg/L. Saturation of dissolved oxygen ranged from 90.5% to 109.2% saturation, with a median value of 97.3% (Figure 24).
- There is an evident relationship between water temperature and dissolved oxygen. As water temperatures decreased over the deployment period, dissolved oxygen levels increased. Dissolved oxygen levels also follow a diurnal pattern as water temperatures rise and fall under the influence of ambient air temperatures. Generally, dissolved oxygen levels are higher in a waterbody during cooler temperatures.
- Dissolved oxygen levels were below the CCME's Guideline for the Protection of Early Life Stages for much of the deployment period; instances where levels rose above the guideline correlated closely with colder water temperatures. Dissolved oxygen levels were above the CCME's Guidelines for the Protection of Other Life Stages for the duration of deployment (Figure 24).

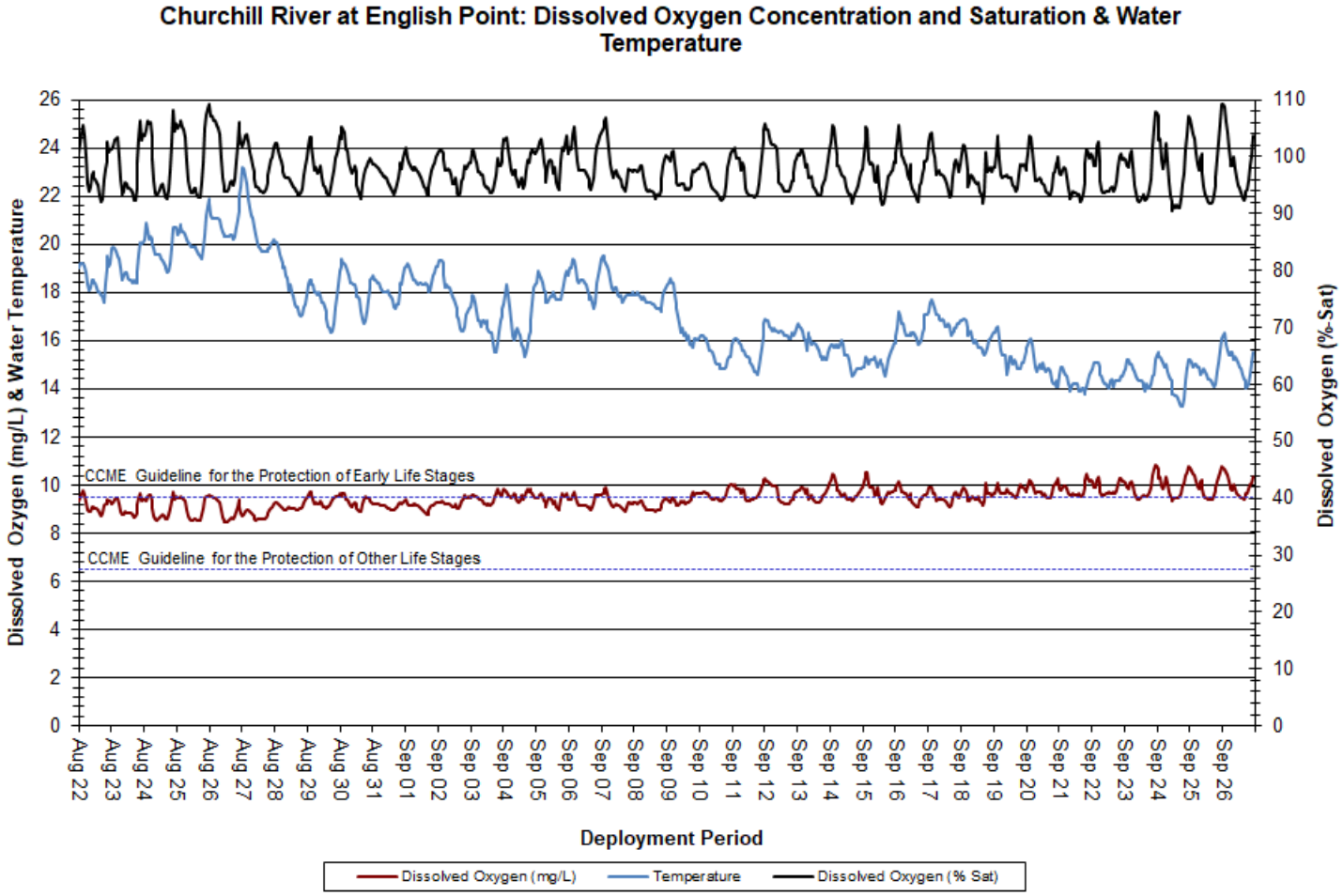

Figure 24: Dissolved Oxygen & Water Temperature at Churchill River at English Point

Turbidity

- Over the deployment period, turbidity ranged from 1.8 NTU to 157 NTU, with a median value of 3.5 NTU (Figure 25). A median value of 3.5 NTU indicates a low level of background turbidity; this is to be expected considering the sandy riverbed and tidal influences present at this station. Precipitation data was obtained from the Muskrat Falls MET Station.
- Turbidity events often correlate with precipitation events, as these can increase the presence of suspended material in water. High winds and tidal influences also contribute to turbidity events at this station by disturbing sediment from the riverbed (Figure 25). Wind speed data was obtained from the End of Mud Lake Road Weather Station.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

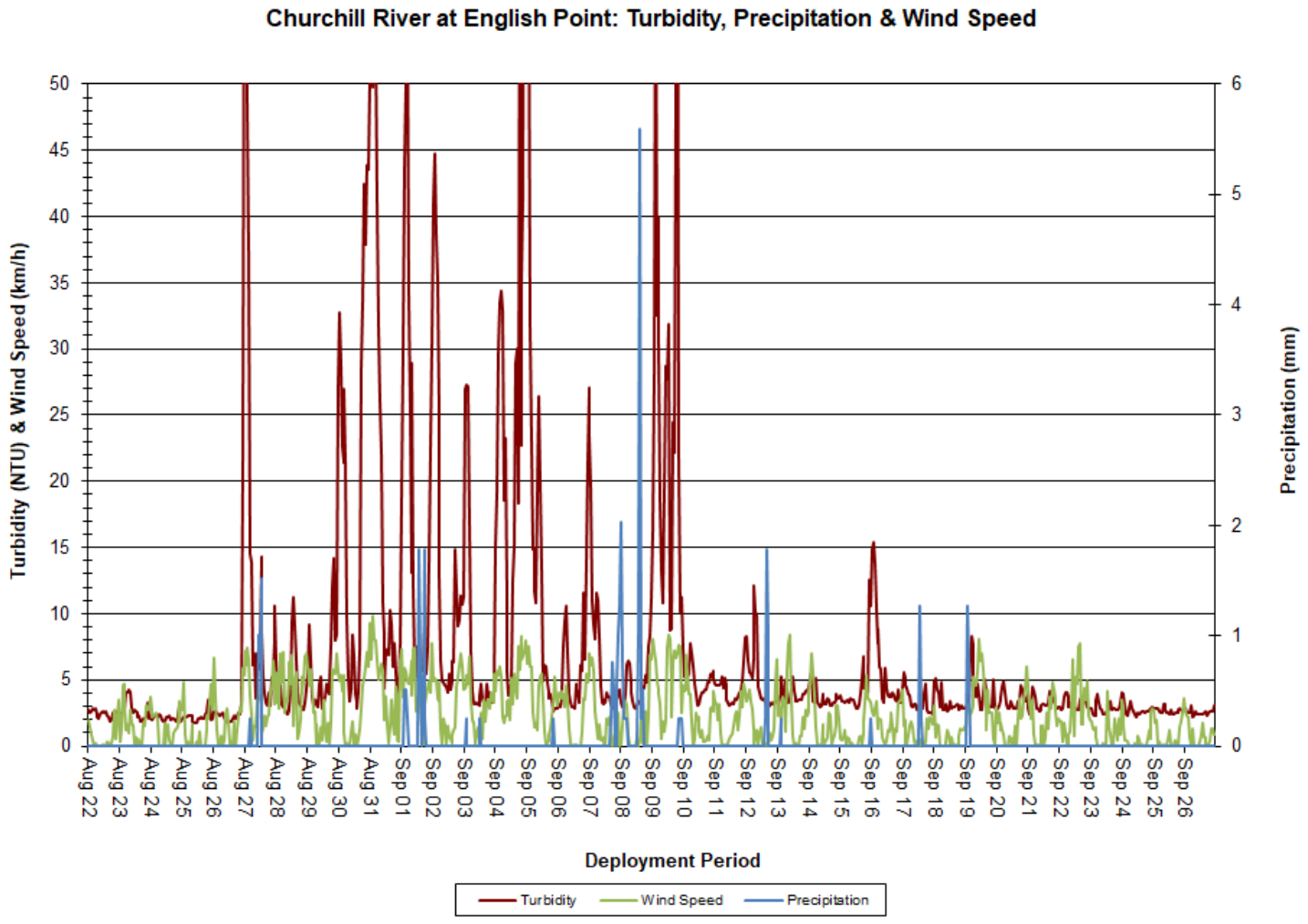

Figure 25: Turbidity, Precipitation & Wind Speed at Churchill River at English Point

Stage

- Over the deployment period, stage ranged from -0.328m to 1.245m, with a median value of 0.847m (Figure 26). Precipitation data was obtained from the Muskrat Falls MET Station.
- Stage fluctuates considerably at this location due to the tidal influences of the Atlantic Ocean. This pattern is consistent over the deployment period. Increases in stage often correlate with precipitation events.
- Water Survey of Canada (Environment and Climate Change Canada) is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

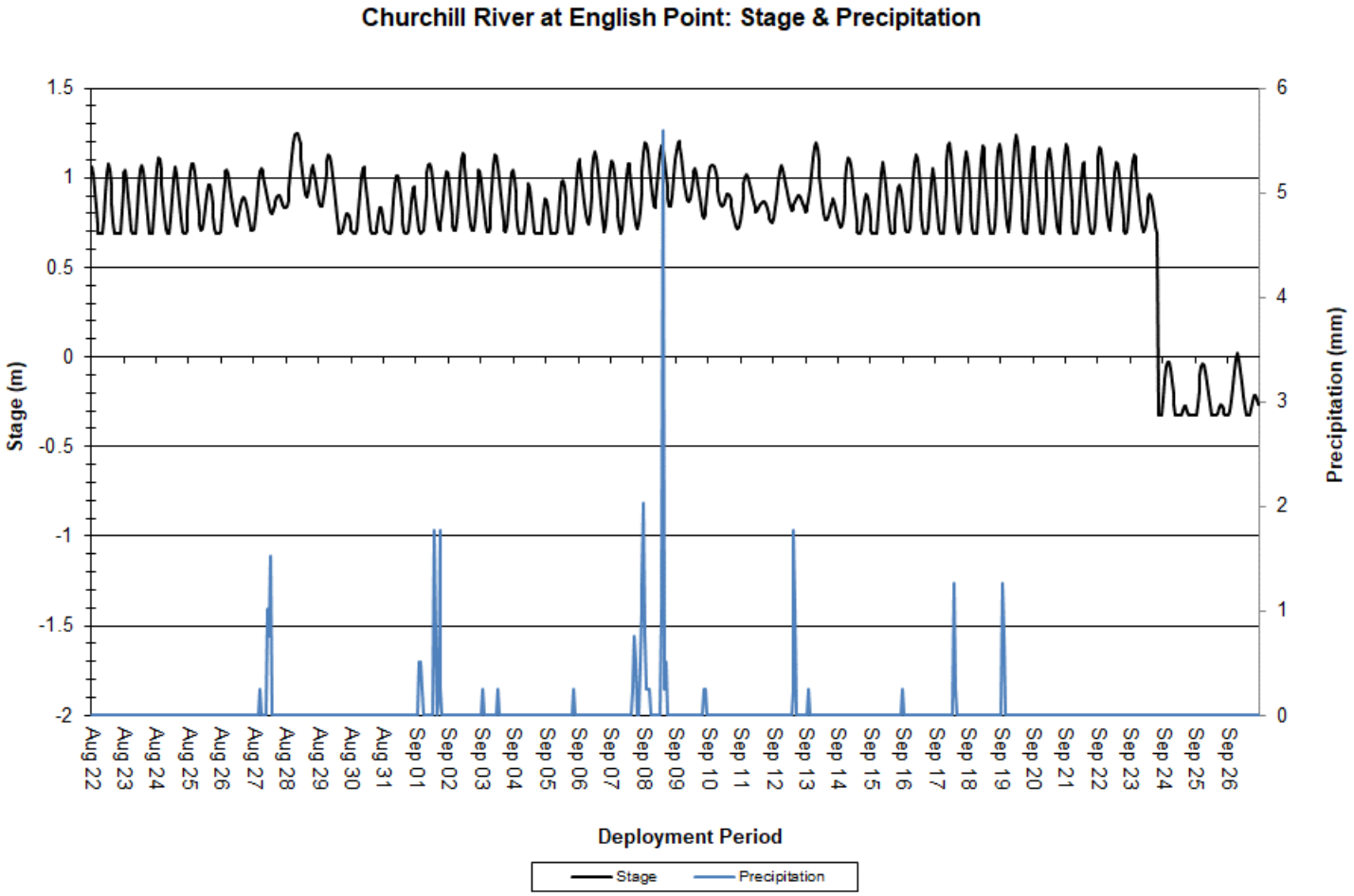

Figure 26: Stage & Precipitation at Churchill River at English Point

Conclusions

- Instruments at four water quality monitoring stations on the Lower Churchill River were deployed from August 21/22 through September 27, 2024.
- Water temperature decreased steadily at all stations over the course of deployment. This is to be expected based on ambient air temperature trends during the same period through August and September.
- pH was relatively stable at three stations over the course of deployment. pH was within the CCME's Guidelines for the Protection of Aquatic Life for the majority of deployment at those stations, except for instances where pH fell below the minimum Guideline due to low water levels. The field sonde at Churchill River above Grizzle Rapids likely experienced a pH sensor failure shortly after deployment.
- Specific conductivity was generally stable over the course of deployment at all stations. Since English Point is influenced by tides in Lake Melville, specific conductivity values at the Churchill River at English Point station had a much wider range, which is comparable to other deployments at this location.
- Dissolved oxygen levels slowly increased over the course of deployment at three stations as water temperatures decreased into the fall. Dissolved oxygen levels are generally higher in water at cooler temperatures. Dissolved oxygen levels eventually rose above the CCME's Guideline for the Protection of Early Life Stages at some point during deployment at three stations, and were above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment at those stations. The field sonde at Churchill River below Muskrat Falls likely experienced a dissolved oxygen sensor failure shortly after deployment.
- Turbidity events occurred at all stations and were generally related to precipitation, wind or tidal events. In all cases, turbidity values generally returned to background levels following each observed event.

References

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APPENDIX A

Water Parameter Description

Water Parameter Description

Dissolved Oxygen - The amount of Dissolved Oxygen (DO) (mg/l or % saturation) in the water is vital to aquatic organisms for their survival. The concentration of DO is affected by such things as water temperature, water depth and flow (e.g., aeration by rapids, riffles etc.), consumption by aerobic organisms, consumption by inorganic chemical reactions, consumption by plants during darkness, and production by plants during the daylight (USGS, 2017).

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 a measure of the relative amount of free hydrogen and hydroxyl ions in water. pH is an important indicator of chemically changing water, and determines the solubility and biological availability of nutrients and heavy metals in the water (USGS, 2017).

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 (Fondriest Environmental Inc, 2016).

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 aquatic processes. 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. In turn, water temperature has an influence on the metabolic rates and biological activity of aquatic organisms (Fondriest Environmental Inc, 2016b).

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 (Swenson 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 (Swenson and Baldwin 1965).

APPENDIX B

Grab Sample Results

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI30 CR BELOW MR Sampling Date 2024/08/21 11:10 Matrix DR Sample # 2024-6316-00-SI-SP Registration # SA-0000								
RESULTS OF ANALYSES OF DRINKING WATER								
Calculated Parameters								
Hardness (CaCO3)	-	12	1.0	mg/L	N/A	2024/08/30		9601164
Nitrate (N)	-	ND	0.050	mg/L	N/A	2024/09/03		9601167
Total dissolved solids (calc., EC)	-	14	1.0	mg/L	N/A	2024/09/04		9601735
Inorganics								
Conductivity	-	26	1.0	uS/cm	N/A	2024/09/03	M2C	9613961
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Total Alkalinity (Total as CaCO3)	-	10	2.0	mg/L	N/A	2024/09/03	M2C	9613964
Colour	-	16	5.0	TCU	N/A	2024/09/03	EMT	9609633
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/03	M2C	9613966
Total Kjeldahl Nitrogen (TKN)	-	0.11	0.10	mg/L	2024/08/29	2024/08/30	KJP	9608782
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2024/09/03	EMT	9609635
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/03	EMT	9609637
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/08/29	MCN	9607473
Dissolved Organic Carbon (C)	-	3.0	0.50	mg/L	N/A	2024/09/03	SSI	9613149
Total Organic Carbon (C)	-	3.2	0.50	mg/L	N/A	2024/08/30	SSI	9607340
pH	-	7.22		pH	N/A	2024/09/03	M2C	9613954
Total Phosphorus	-	0.005	0.004	mg/L	2024/08/30	2024/09/05	VKH	9611282
Total Suspended Solids	-	6.6	1.0	mg/L	2024/08/28	2024/08/30	DME	9603867
Turbidity	-	0.70	0.10	NTU	N/A	2024/09/04	M2C	9616102
MERCURY BY COLD VAPOUR AA (DRINKING WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/03	2024/09/03	JEP	9606905
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Aluminum (Al)	-	0.022	0.0050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Barium (Ba)	-	0.0080	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Boron (B)	-	ND	0.050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Calcium (Ca)	-	3.0	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Copper (Cu)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Iron (Fe)	-	0.096	0.050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Magnesium (Mg)	-	1.0	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347

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Bureau Veritas Job #: C4Q5891
Report Date: 2024/09/05

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI30 CR BELOW MR Sampling Date 2024/08/21 11:10 Matrix DR Sample # 2024-6316-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Manganese (Mn)	-	0.027	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Potassium (K)	-	0.29	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Sodium (Na)	-	0.63	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Strontium (Sr)	-	0.013	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Uranium (U)	-	ND	0.00010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/08/27	2024/08/29	JHY	9602347

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Report Date: 2024/09/05

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI31 CR ABOVE GR Sampling Date 2024/08/22 12:15 Matrix DR Sample # 2024-6317-00-SI-SP Registration # SA-0000								
RESULTS OF ANALYSES OF DRINKING WATER								
Calculated Parameters								
Hardness (CaCO3)	-	11	1.0	mg/L	N/A	2024/08/30		9601164
Nitrate (N)	-	ND	0.050	mg/L	N/A	2024/09/03		9601167
Total dissolved solids (calc., EC)	-	13	1.0	mg/L	N/A	2024/09/04		9601735
Inorganics								
Conductivity	-	24	1.0	uS/cm	N/A	2024/09/03	M2C	9613961
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Total Alkalinity (Total as CaCO3)	-	10	2.0	mg/L	N/A	2024/09/03	M2C	9613964
Colour	-	19	5.0	TCU	N/A	2024/09/03	EMT	9609640
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/03	M2C	9613966
Total Kjeldahl Nitrogen (TKN)	-	0.10	0.10	mg/L	2024/08/29	2024/08/30	KJP	9608782
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2024/09/03	EMT	9613080
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/03	EMT	9613081
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/08/29	MCN	9607473
Dissolved Organic Carbon (C)	-	3.1	0.50	mg/L	N/A	2024/09/03	SSI	9613149
Total Organic Carbon (C)	-	3.5	0.50	mg/L	N/A	2024/08/29	SSI	9607340
pH	-	7.23		pH	N/A	2024/09/03	M2C	9613954
Total Phosphorus	-	0.013	0.004	mg/L	2024/08/30	2024/09/05	VKH	9611282
Total Suspended Solids	-	9.8	1.0	mg/L	2024/08/28	2024/08/29	DME	9603971
Turbidity	-	0.39	0.10	NTU	N/A	2024/09/04	M2C	9616102
MERCURY BY COLD VAPOUR AA (DRINKING WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/03	2024/09/03	JEP	9606905
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Aluminum (Al)	-	0.064	0.0050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Barium (Ba)	-	0.0091	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Boron (B)	-	ND	0.050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Calcium (Ca)	-	2.9	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Copper (Cu)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Iron (Fe)	-	0.25	0.050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Magnesium (Mg)	-	0.95	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347

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Bureau Veritas Job #: C4Q5891
Report Date: 2024/09/05

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI31 CR ABOVE GR Sampling Date 2024/08/22 12:15 Matrix DR Sample # 2024-6317-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Manganese (Mn)	-	0.016	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Potassium (K)	-	0.31	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Sodium (Na)	-	0.65	0.10	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Strontium (Sr)	-	0.013	0.0020	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Uranium (U)	-	ND	0.00010	mg/L	2024/08/27	2024/08/29	JHY	9602347
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/08/27	2024/08/29	JHY	9602347

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI32 CR BELOW MF Sampling Date 2024/08/22 13:15 Matrix DR Sample # 2024-6318-00-SI-SP Registration # SA-0000								
RESULTS OF ANALYSES OF DRINKING WATER								
Calculated Parameters								
Hardness (CaCO3)	-	11	1.0	mg/L	N/A	2024/08/30		9601164
Nitrate (N)	-	ND	0.050	mg/L	N/A	2024/09/03		9601167
Total dissolved solids (calc., EC)	-	13	1.0	mg/L	N/A	2024/09/04		9601735
Inorganics								
Conductivity	-	23	1.0	uS/cm	N/A	2024/09/03	M2C	9613961
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Total Alkalinity (Total as CaCO3)	-	9.6	2.0	mg/L	N/A	2024/09/03	M2C	9613964
Colour	-	22	5.0	TCU	N/A	2024/09/03	EMT	9609640
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/03	M2C	9613966
Total Kjeldahl Nitrogen (TKN)	-	0.13	0.10	mg/L	2024/08/29	2024/08/30	KJP	9608782
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2024/09/03	EMT	9613080
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/03	EMT	9613081
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/08/29	MCN	9607473
Dissolved Organic Carbon (C)	-	3.5	0.50	mg/L	N/A	2024/09/03	SSI	9613149
Total Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2024/08/29	SSI	9607340
pH	-	7.12		pH	N/A	2024/09/03	M2C	9613954
Total Phosphorus	-	0.009	0.004	mg/L	2024/08/30	2024/09/05	VKH	9611282
Total Suspended Solids	-	12	1.0	mg/L	2024/08/28	2024/08/29	DME	9603971
Turbidity	-	0.68	0.10	NTU	N/A	2024/09/04	M2C	9616102
MERCURY BY COLD VAPOUR AA (DRINKING WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/03	2024/09/03	JEP	9606905
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Aluminum (Al)	-	0.12	0.0050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Barium (Ba)	-	0.010	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Boron (B)	-	ND	0.050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Calcium (Ca)	-	2.7	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Copper (Cu)	-	0.00059	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Iron (Fe)	-	0.23	0.050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Magnesium (Mg)	-	0.92	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325

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Bureau Veritas Job #: C4Q5891
Report Date: 2024/09/05

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI32 CR BELOW MF Sampling Date 2024/08/22 13:15 Matrix DR Sample # 2024-6318-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Manganese (Mn)	-	0.015	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Potassium (K)	-	0.37	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Sodium (Na)	-	0.70	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Strontium (Sr)	-	0.014	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Uranium (U)	-	ND	0.00010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/08/27	2024/08/29	MTZ	9602325

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI33 CR@ EP Sampling Date 2024/08/22 14:20 Matrix DR Sample # 2024-6319-00-SI-SP Registration # SA-0000								
RESULTS OF ANALYSES OF DRINKING WATER								
Calculated Parameters								
Hardness (CaCO3)	-	11	1.0	mg/L	N/A	2024/08/30		9601164
Nitrate (N)	-	ND	0.050	mg/L	N/A	2024/09/03		9601167
Total dissolved solids (calc., EC)	-	21	1.0	mg/L	N/A	2024/09/04		9601735
Inorganics								
Conductivity	-	38	1.0	uS/cm	N/A	2024/09/03	M2C	9613961
Chloride (Cl-)	-	4.2	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2024/08/28	LKH	9605123
Total Alkalinity (Total as CaCO3)	-	11	2.0	mg/L	N/A	2024/09/03	M2C	9613964
Colour	-	37	5.0	TCU	N/A	2024/09/03	EMT	9609640
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/03	M2C	9613966
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2024/08/29	2024/08/30	KJP	9608782
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2024/09/03	EMT	9613080
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/03	EMT	9613081
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/08/29	MCN	9607473
Dissolved Organic Carbon (C)	-	4.1	0.50	mg/L	N/A	2024/09/03	SSI	9613149
Total Organic Carbon (C)	-	4.7	0.50	mg/L	N/A	2024/08/29	SSI	9607340
pH	-	7.17		pH	N/A	2024/09/03	M2C	9613954
Total Phosphorus	-	0.009	0.004	mg/L	2024/08/30	2024/09/05	VKH	9611282
Total Suspended Solids	-	7.6	2.0	mg/L	2024/08/28	2024/08/29	DME	9603971
Turbidity	-	3.1	0.10	NTU	N/A	2024/09/04	M2C	9616102
MERCURY BY COLD VAPOUR AA (DRINKING WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/03	2024/09/03	JEP	9606905
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Aluminum (Al)	-	0.11	0.0050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Barium (Ba)	-	0.0089	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Boron (B)	-	ND	0.050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Calcium (Ca)	-	2.5	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Copper (Cu)	-	0.00079	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Iron (Fe)	-	0.32	0.050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Magnesium (Mg)	-	1.1	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325

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Bureau Veritas Job #: C4Q5891
Report Date: 2024/09/05

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABBI33 CR@ EP Sampling Date 2024/08/22 14:20 Matrix DR Sample # 2024-6319-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (DRINKING WATER)								
Metals								
Total Manganese (Mn)	-	0.012	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Potassium (K)	-	0.47	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Sodium (Na)	-	3.2	0.10	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Strontium (Sr)	-	0.017	0.0020	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Uranium (U)	-	ND	0.00010	mg/L	2024/08/27	2024/08/29	MTZ	9602325
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/08/27	2024/08/29	MTZ	9602325

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