Real Time Water Quality Deployment Report

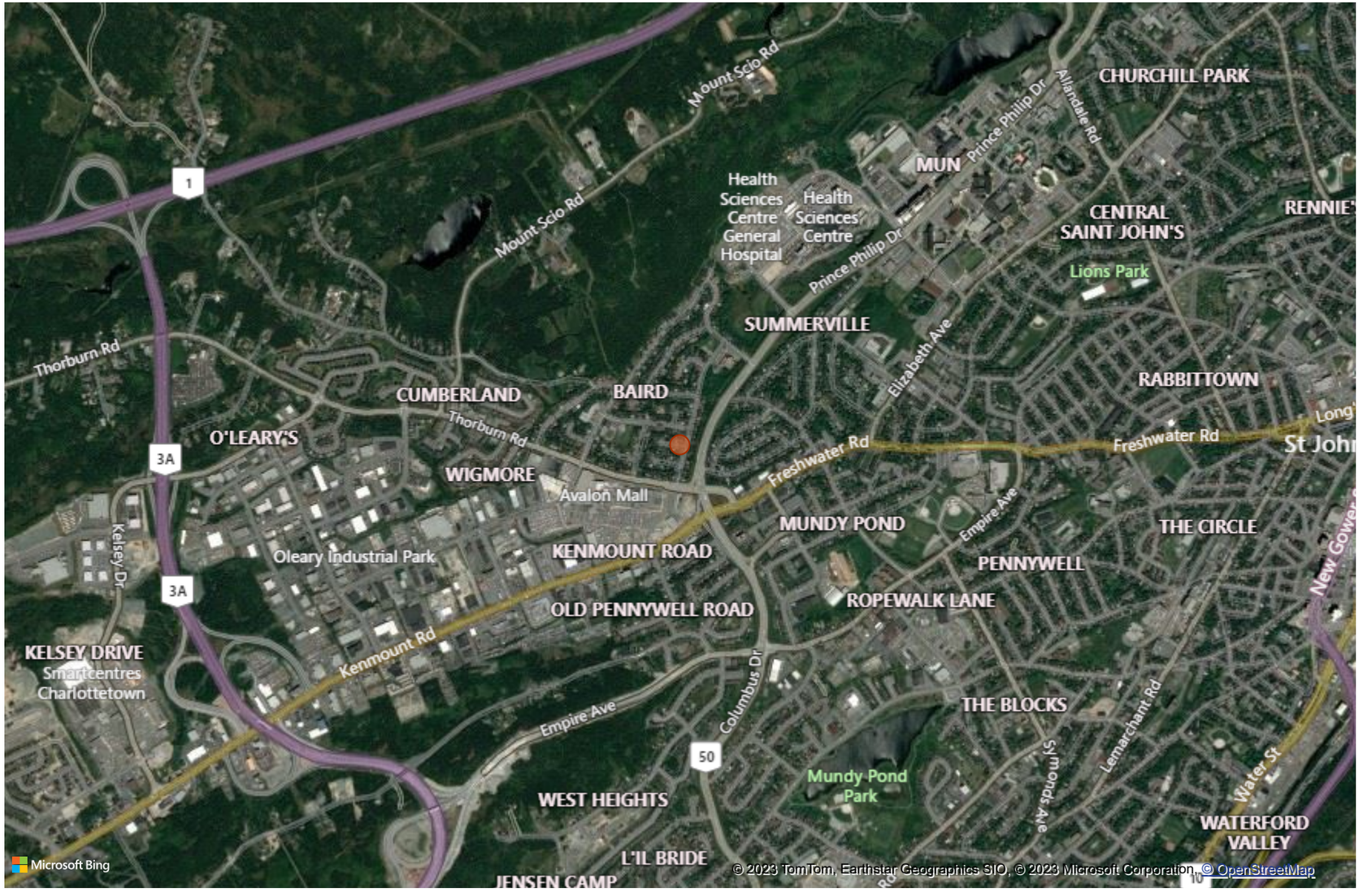
Learys Brook at Prince Philip Drive

NF02ZM0178

2023-02-09 to 2023-03-22

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

Learys Brook at Prince Philip Drive



The Water Resources Management Division (WRMD), in partnership with Environment and Climate Change Canada (ECCC), maintains a real-time water quality and water quantity monitoring station at Leary's Brook, adjacent to Prince Phillip Drive. This was WRMD's first real time water quality station, which was established in 2001. The real-time station allows for assessment and management of the water body. The purpose of this real-time station is to monitor, process, and publish hydrometric (water quantity) and real-time water quality data at the station.

The headwaters for Learys Brook are Hummocky Marsh and Yellow Marsh. Waters from these two marshes converge near the Avalon Mall and the river is then culverted underneath the mall parking lot. Oxen Pond which is located in Pippy Park also drains into the brook before it is culverted. The brook flows northeast from the mall parking lot through a developed section of St. John's and drains into Long Pond.

Quality Assurance and Quality Control

As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.

Parameter	Excellent	Good	Fair	Marginal	Poor
Dissolved oxygen	≤ ± 0.3 mg/L	≤ ± 0.31 -0.5 mg/L	≤ ± 0.51 - 0.8 mg/L	≤ ± 0.81 - 1 mg/L	> ± 1 mg/L
pH	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Specific conductance	≤ ± 3 µS/cm or ≤ ± 3%, whichever is greater	≤ ± 3.1-10 µS/cm or ≤ ± 3.1-10%, whichever is greater	≤ ± 10 - 15 µS/cm or ≤ ± 10.1-15 %, whichever is greater	≤ ± 15.1 - 20 µS/cm or ≤ ± 15.1-20 %, whichever is greater	> ± 20 µS/cm or > ± 20 %, whichever is greater
Turbidity	≤ ± 2 turbidity units or ≤ ± 5%, whichever is greater	≤ ± 2.1-5 turbidity units or ≤ ± 5.1-10 %, whichever is greater	≤ ± 5.1-8 turbidity units or ≤ ± 10.1-15 %, whichever is greater	≤ ± 8.1-10 turbidity units or ≤ ± 15.1-20 %, whichever is greater	> ± 10 turbidity units or > ± 20 %, whichever is greater
Water temperature	≤ ± 0.2°C	≤ ± 0.21 - 0.5°C	≤ ± 0.51 - 0.8°C	≤ ± 0.81 - 1°C	> ± 1°C

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

There are a few circumstances which may cause QA/QC rankings below excellent, including the placement of the QA/QC sonde in relation to the field sonde, the amount of time each sonde was given to stabilize before readings were recorded, and deteriorating performance of one of the sensors.

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

QAQC Rankings

Parameter	Deployment Ranks	Removal Ranks	Grab Sample Ranks
Dissolved Oxygen (mg/l)	Excellent	Poor	
pH	Excellent	Excellent	Good
Specific Conductivity (µS/cm)	Good	Good	Good
Temperature ('C)	Fair	Excellent	
Turbidity (NTU)	Excellent	Good	Excellent

Heavy precipitation between February 17th and the 20th caused disturbances to the sensors. Turbidity was most drastically impacted; however, the debris cleared on its own within a few days.

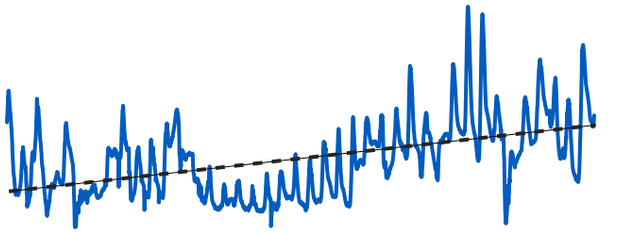
Water Temperature

1.24	1.22	-0.03	4.07
Average (°C)	Median (°C)	Minimum (°C)	Maximum (°C)

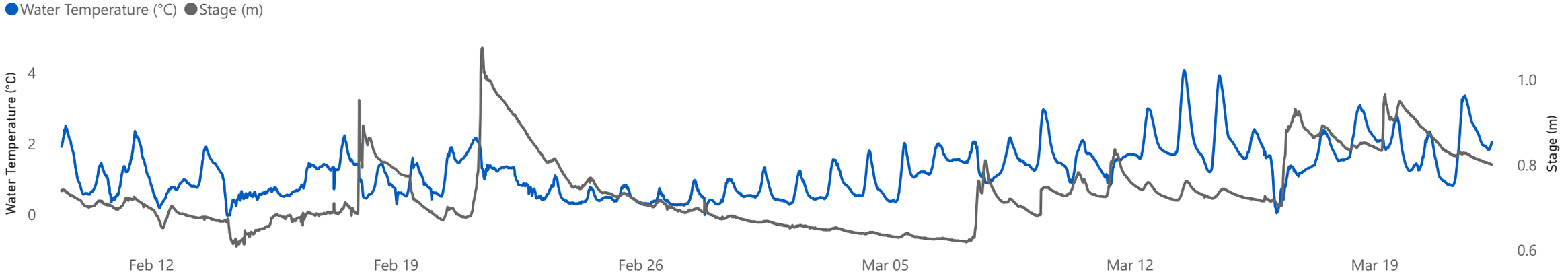
Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which eliminates the canopy protection they offer. Water temperature also affects other parameters monitored including dissolved oxygen and specific conductivity.

Water temperature data for this deployment was collected from 2023-02-09 until 2023-03-22. The minimum water temperature, -0.03°C, occurred on 2023-02-14. The maximum water temperature, 4.07°C, occurred on 2023-03-13. Water temperatures usually fall overnight and rise during the day. Learys Brook is a shallow urban waterway; water temperatures in shallow streams respond quickly to changes in air temperature. During this deployment period, water temperature shows an overall warming trend, which is expected for a late winter/early spring deployment.

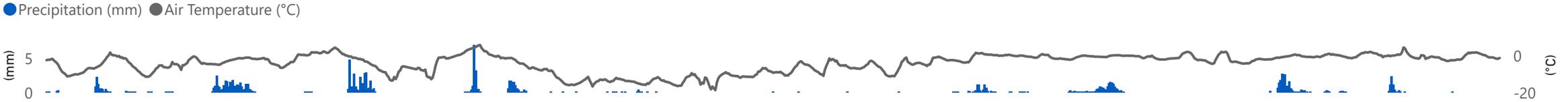
Water Temperature Trendline



Water Temperature and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns

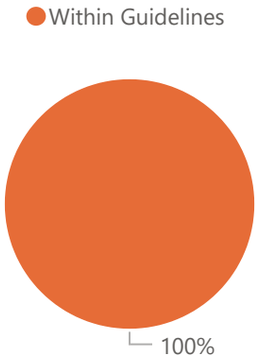


pH

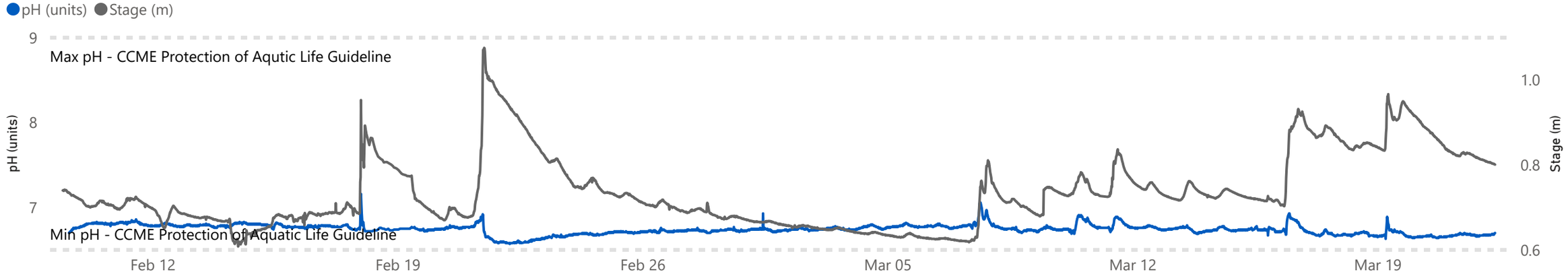
6.74	6.74	6.57	7.16
Average pH	Median pH	Minimum pH	Maximum pH

pH relates to the free hydrogen ions in water and it is a measure of acidity. A pH of 7 indicates a neutral pH, below 7 is considered acidic, and above 7 is considered basic. The Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life guideline provides a basis by which to judge the overall health of the brook. Their freshwater guidelines recommend a minimum pH of 6.5 and a maximum pH of 9.0; however, many rivers in Newfoundland and Labrador are naturally more acidic due to the local geology. pH contour maps for Newfoundland and Labrador can be found on the Water Resources Management Division's website.

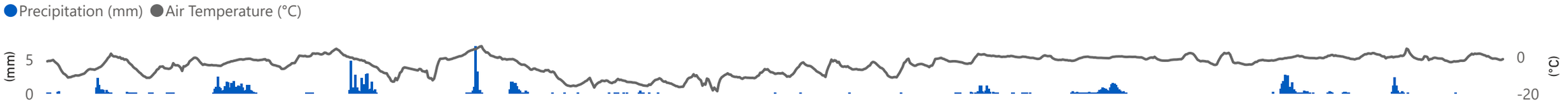
pH data for this deployment was collected from 2023-02-09 until 2023-03-22. The minimum pH, 6.57 pH units, occurred on 2023-02-22. The maximum pH, 7.16 pH units, occurred on 2023-02-17. Daily fluctuations are common due to changes in temperature and respiration of aquatic plants. During this deployment period, pH was within the guidelines 100% of the time. These values fall within the expected range for Learys Brook.



pH and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns



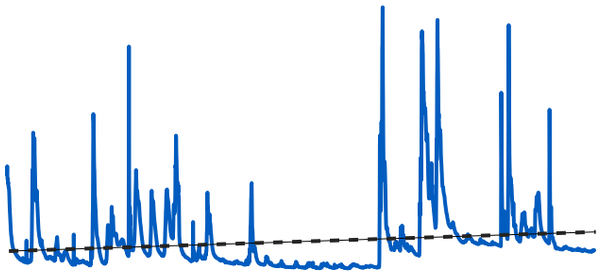
Specific Conductivity

1.99K	1.67K	1.01K	10.71K
Average µS/cm	Median µS/cm	Minumum µS/cm	Maximum µS/cm

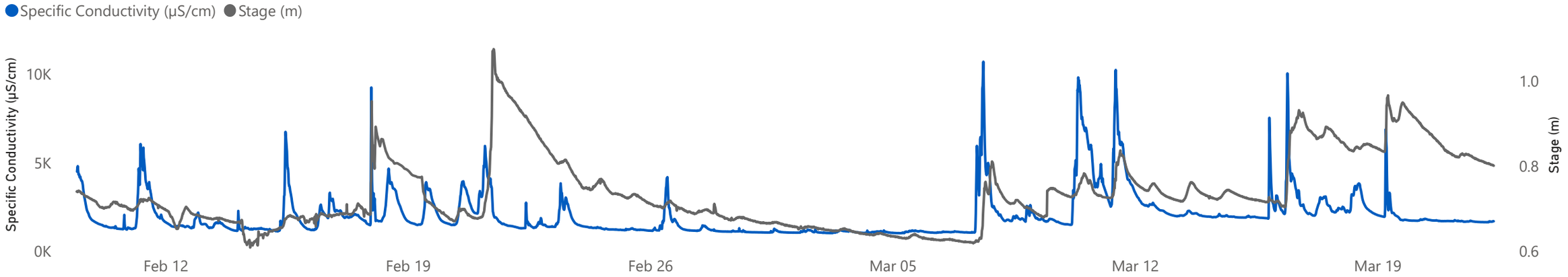
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across variable temperatures. Specific conductivity contour maps for Newfoundland and Labrador can be found on the Water Resources Management Division's website.

Specific conductance data for this deployment was collected from 2023-02-09 until 2023-03-22. The minimum specific conductance, 1,008.00 µS/cm, occurred on 2023-03-05. The maximum specific conductance, 10,713.00 µS/cm, occurred on 2023-03-07. Precipitation and specific conductivity are correlated. Rain water generally has a lower specific conductivity than surface water. However, urban waterways like Learys Brook tend to experience spikes in specific conductivity in the winter due to the presence of road salts. There was an increasing specific conductivity trend during this deployment period; this is expected at this time of year if temperatures remain low and road salts are still being applied to nearby surfaces.

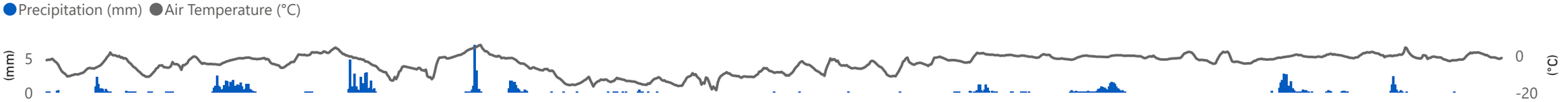
Specific Conductivity Trendline



Specific Conductivity and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns

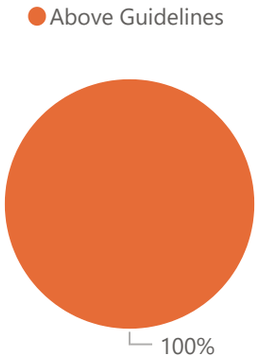


Dissolved Oxygen

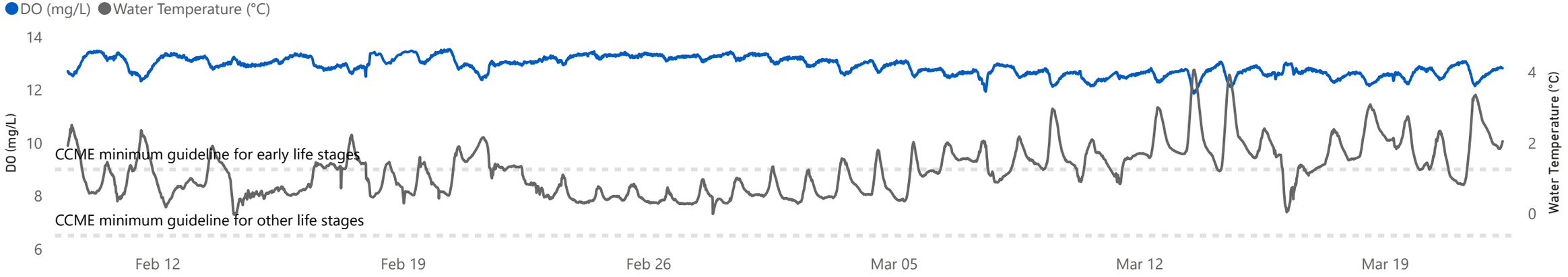
12.89	12.91	11.87	13.54
Average DO (mg/L)	Median DO (mg/L)	Minimum (mg/L)	Maximum (mg/L)

Dissolved oxygen (DO) in water is crucial for aquatic life. The CCME (Canadian Council of Ministers of the Environment) Freshwater Aquatic Life guidelines provide a basis by which to judge the overall health of waterways. The minimum guideline for early life stages in cold water is 9.5 mg/L and the minimum guideline for other life stages is 6.5 mg/L. DO and water temperatures are correlated; colder waters can hold higher concentrations of DO than warm waters.

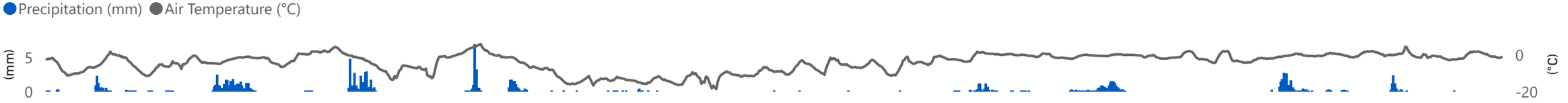
DO data for this deployment was collected from 2023-02-09 until 2023-03-22. The minimum DO reading, 11.87 mg/L, occurred on 2023-03-13. The maximum DO reading, 13.54 pH units, occurred on 2023-02-20. Daily fluctuations are common due to changes in temperature and respiration of aquatic plants. During this deployment period, DO was above minimum guidelines 100% of the time. This is expected for this time of year, because lower water temperatures are capable of supporting higher concentrations of dissolved oxygen.



Dissolved Oxygen and Water Temperature at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns



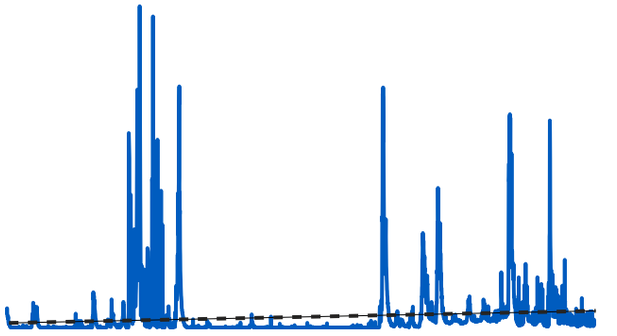
Turbidity

18.28	2.05	0.00	597.00
Average (NTU)	Median (NTU)	Minimum (NTU)	Maximum (NTU)

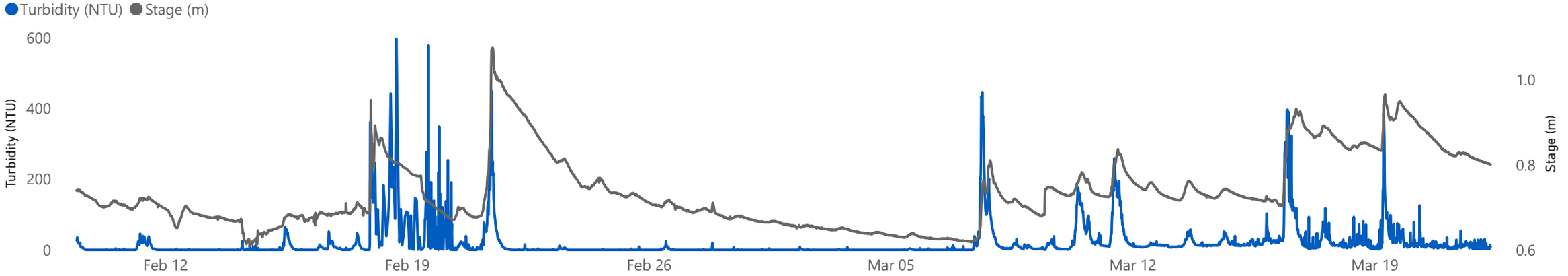
Increases in turbidity (cloudiness) are often caused by increased runoff during precipitation events. Runoff carries silt and other debris into the waterbody. Turbid conditions can prevent light from reaching plants, can negatively impact benthic habitats, and suspended debris can clog or damage fish gills or equipment.

Turbidity data for this deployment was collected from 2023-02-09 until 2023-03-22. The minimum turbidity was 0.00 NTUs. The maximum turbidity, 597.00 NTUs, occurred on 2023-02-18. During this deployment period, turbidity shows a slight increasing trend. This is typical for late winter/early spring when there are increased precipitation events. Learys Brook is very susceptible to turbidity because of the high volume of runoff from the surrounding roadways and parking lots. From February 17th to 20th debris, from a precipitation event, may have become trapped in the sonde cage causing erratic spikes in the data.

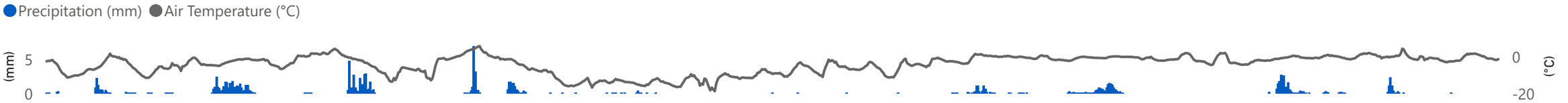
Turbidity Trendline



Turbidity and Stage at Learys Brook at Prince Philip Drive



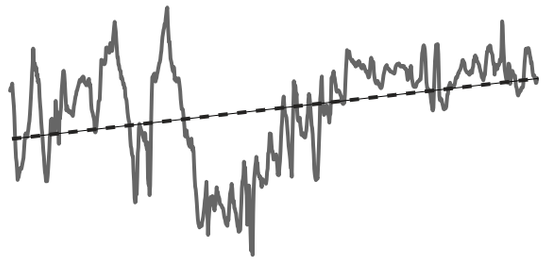
Precipitation and Air Temperature at Pippy Park in St. Johns



Meteorological and Hydrometric Data

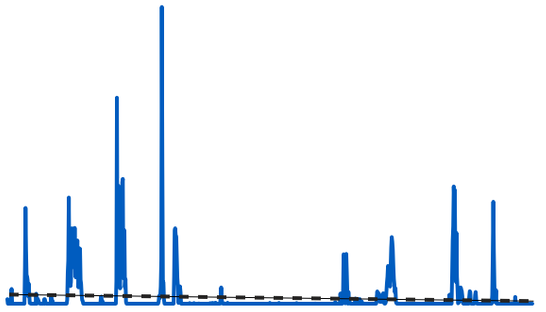
Newfoundland Labrador

Air Temperature Trendline



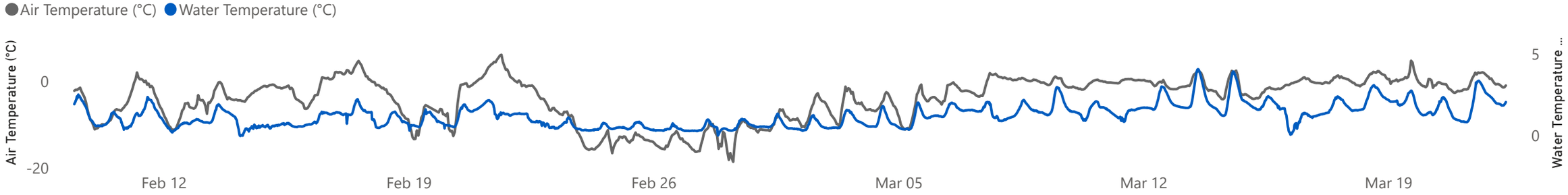
-3.98	-2.16
Average (°C)	Median (°C)
-18.61	6.11
Minimum (°C)	Maximum (°C)

Precipitation Trendline



0.14	0.00
Average (mm/hr)	Median (mm/hr)
0.00	6.92
Minimum (mm/hr)	Maximum (mm/hr)

Water Temperature from Learys Brook at Prince Philip Drive and Air Temperature from Pippy Park in St. Johns



Precipitation from Pippy Park in St. Johns and Stage from Learys Brook at Prince Philip Drive