

Real Time Water Quality Deployment Report

Learys Brook at Prince Philip Drive

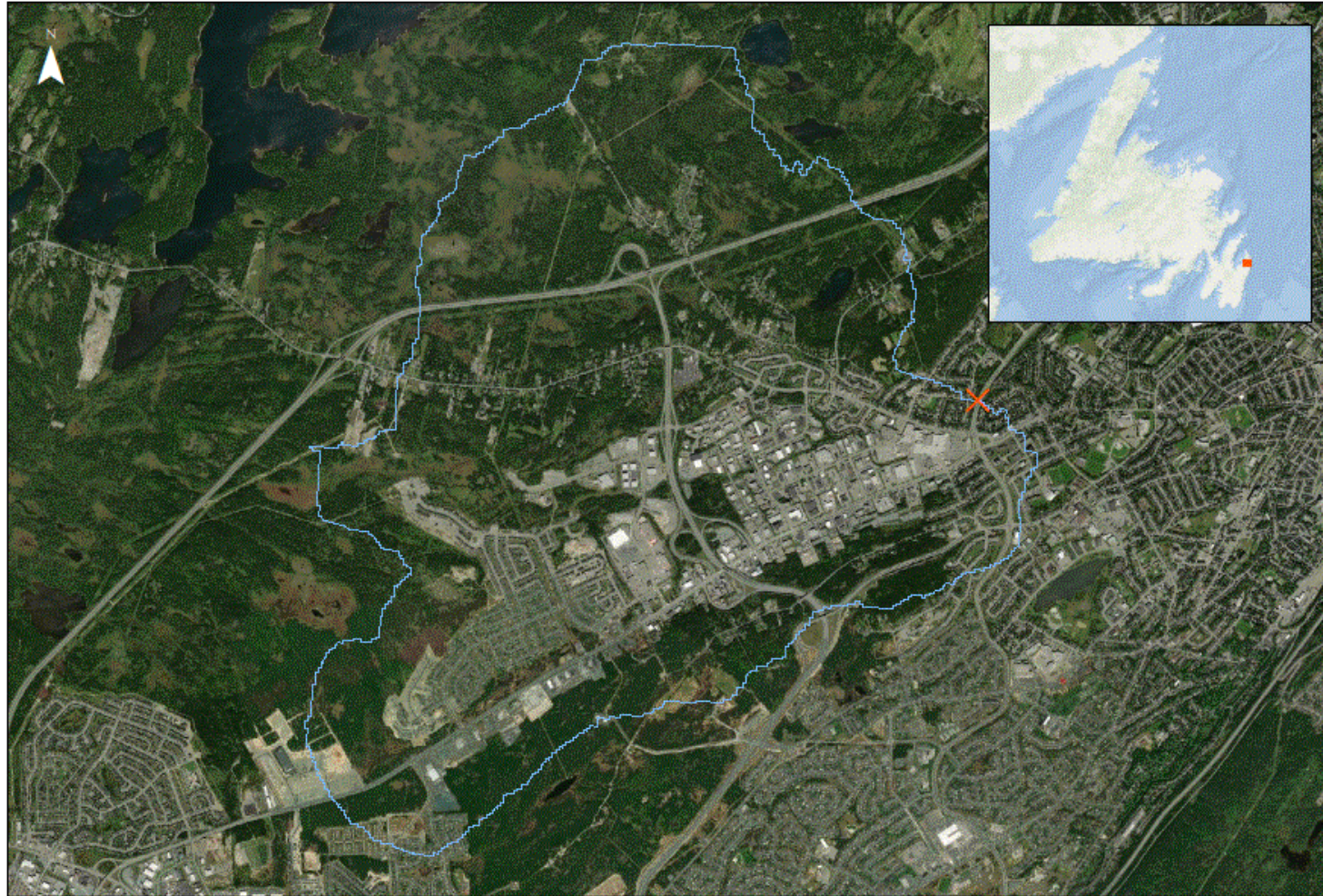
NF02ZM0178

2024-12-10 to 2025-01-21



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

Learys Brook at Prince Philip Drive



Learys Brook at Prince Philip Drive
NF02ZM0178

0 0.75 1.5 3 Kilometers

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 Philip Drive. This was WRMD's first real time water quality station, 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 watershed is outlined in the figure to the left in light blue. 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. Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown in this report is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

Parameter	Excellent ▲	Good	Fair	Marginal	Poor
pH	$\leq \pm 0.2$ units	$\leq \pm 0.21 - 0.5$ units	$\leq \pm 0.51 - 0.8$ units	$\leq \pm 0.81 - 1$ units	$> \pm 1$ units
Water Temperature	$\leq \pm 0.2^{\circ}\text{C}$	$\leq \pm 0.21 - 0.5^{\circ}\text{C}$	$\leq \pm 0.51 - 0.8^{\circ}\text{C}$	$\leq \pm 0.81 - 1^{\circ}\text{C}$	$> \pm 1^{\circ}\text{C}$
Dissolved oxygen	$\leq \pm 0.3$ mg/L	$\leq \pm 0.31 - 0.5$ mg/L	$\leq \pm 0.51 - 0.8$ mg/L	$\leq \pm 0.81 - 1$ mg/L	$> \pm 1$ mg/L
Turbidity	$\leq \pm 2$ turbidity units or $\leq \pm 5\%$, whichever is greater	$\leq \pm 2.1-5$ turbidity units or $\leq \pm 5.1-10\%$, whichever is greater	$\leq \pm 5.1-8$ turbidity units or $\leq \pm 10.1-15\%$, whichever is greater	$\leq \pm 8.1-10$ turbidity units or $\leq \pm 15.1-20\%$, whichever is greater	$> \pm 10$ turbidity units or $> \pm 20\%$, whichever is greater
Specific Conductance	$\leq \pm 3$ $\mu\text{S}/\text{cm}$ or $\leq \pm 3\%$, whichever is greater	$\leq \pm 3.1-10$ $\mu\text{S}/\text{cm}$ or $\leq \pm 3.1-10\%$, whichever is greater	$\leq \pm 10 - 15$ $\mu\text{S}/\text{cm}$ or $\leq \pm 10.1-15\%$, whichever is greater	$\leq \pm 15.1 - 20$ $\mu\text{S}/\text{cm}$ or $\leq \pm 15.1-20\%$, whichever is greater	$> \pm 20$ $\mu\text{S}/\text{cm}$ or $> \pm 20\%$, whichever is greater

At both 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 the QA/QC Sonde, a qualitative statement is made regarding data quality.

Several factors can contribute to QA/QC rankings below “excellent,” including the relative placement of the QA/QC Sonde to the Field Sonde, the stabilization time allowed before recording measurements, and potential deterioration of sensor performance.

Of all sensors, temperature is the most critical. Other parameters fall into three groups: temperature-dependent, temperature-compensated, and temperature-independent. Because of the temperature sensor’s location on the sonde, the entire instrument must equilibrate before the sensor stabilizes. During this period, readings may gradually adjust; if recorded prematurely, they may not accurately represent in-situ conditions.

QAQC Rankings

Parameter	Deployment Ranks	Removal Ranks	Grab Sample Ranks
Dissolved Oxygen (mg/l)	Excellent	Excellent	
pH	Good	Excellent	Excellent
Specific Conductivity ($\mu\text{S}/\text{cm}$)	Excellent	Poor	Excellent
Temperature ($^{\circ}\text{C}$)	Excellent	Excellent	
Turbidity (NTU)	Good	Excellent	Excellent

Upon deployment, all parameters ranked as good or excellent, indicating minimal discrepancies between the field sonde and the QAQC sonde. Deployment grab sample comparisons also ranked excellent for all three parameters. Upon removal, all parameters ranked excellent, with the exception of specific conductivity, which ranked poor. This poor ranking was likely due to biofouling on the sensor that accumulated during the deployment period, causing values to read slightly higher, or slight upward sensor drift.

Water Temperature

3.98
Average (°C)

3.77
Median (°C)

1.25
Minimum (°C)

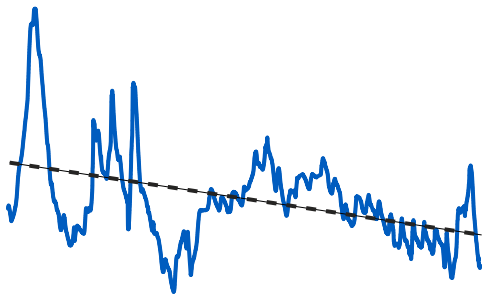
9.54
Maximum (°C)



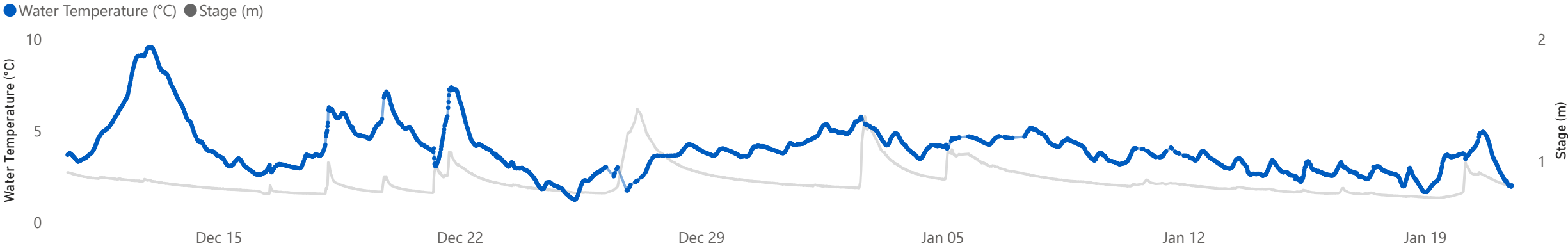
Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures, and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which 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 2024-12-10 until 2025-01-21. The minimum water temperature, 1.25°C, occurred on 2024-12-25. The maximum water temperature, 9.54°C, occurred on 2024-12-12. Water temperature usually falls overnight and rises during the day. Leary's Brook is a shallow, urban waterway; water temperatures in shallow streams respond quickly to changes in air temperature. Water temperature exhibited a decreasing trend over the deployment period, consistent with declining air temperatures during the winter months. Several instances of short-term temperature increases coincided with stage rises, likely reflecting the influence of slightly warmer rainwater entering the water column during precipitation events.

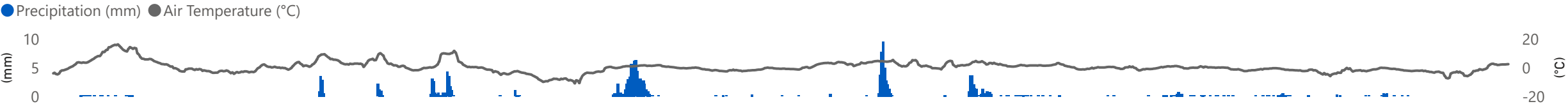
Water Temperature Trendline



Water Temperature and Stage at Leary's Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. John's



pH

6.82
Average pH

6.82
Median pH

6.58
Minimum pH

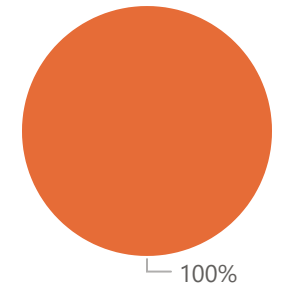
7.05
Maximum pH



pH relates to the free hydrogen ions in water and it is a measure of acidity in water. 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. Water parameter maps can be found on the [Water Resources Management website](#).

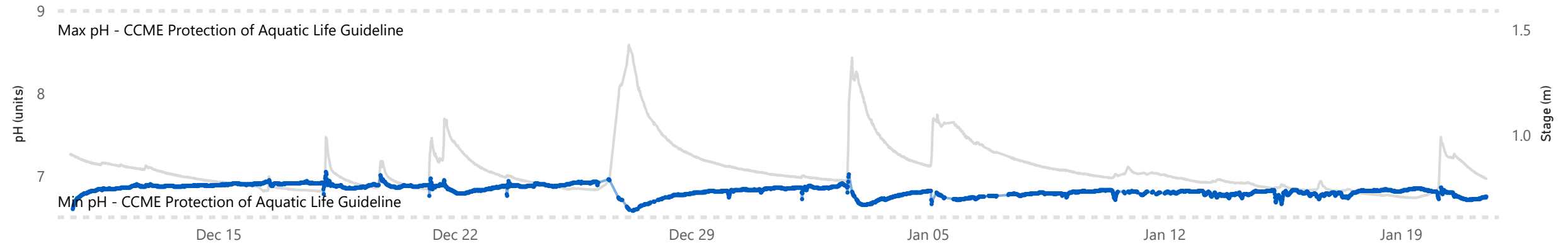
pH data for this deployment was collected from 2024-12-10 until 2025-01-21. The minimum pH, 6.58 pH units, occurred on 2024-12-27. The maximum pH, 7.05 pH units, occurred on 2024-12-18. Daily fluctuations were observed, which are common due to temperature changes and photosynthetic activity of aquatic plants. Throughout the deployment, 100% of pH values remained within the CCME guideline range of 6.5 to 9.0 pH units. Overall, pH was stable, with minor dips and spikes coinciding with stage increases and precipitation events. Precipitation can temporarily lower pH, as rainwater is naturally more acidic; however, values typically returned to background levels within several days.

● Within Guidelines



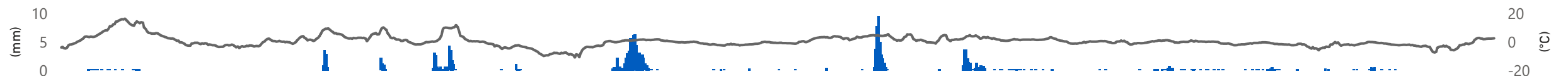
pH and Stage at Learys Brook at Prince Philip Drive

● pH (units) ● Stage (m)



Precipitation and Air Temperature at Pippy Park in St. John's

● Precipitation (mm) ● Air Temperature (°C)



Specific Conductivity

743.66

Average $\mu\text{S}/\text{cm}$

412

Median $\mu\text{S}/\text{cm}$

237

Minumum $\mu\text{S}/\text{cm}$

7737

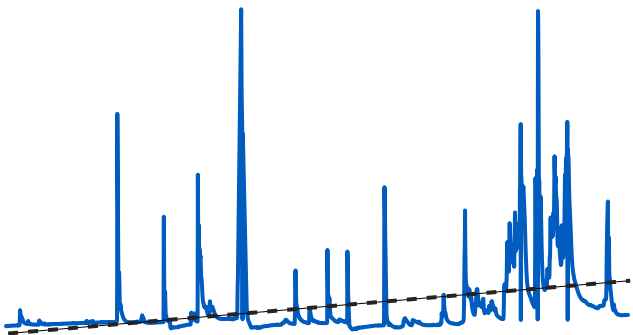
Maximum $\mu\text{S}/\text{cm}$



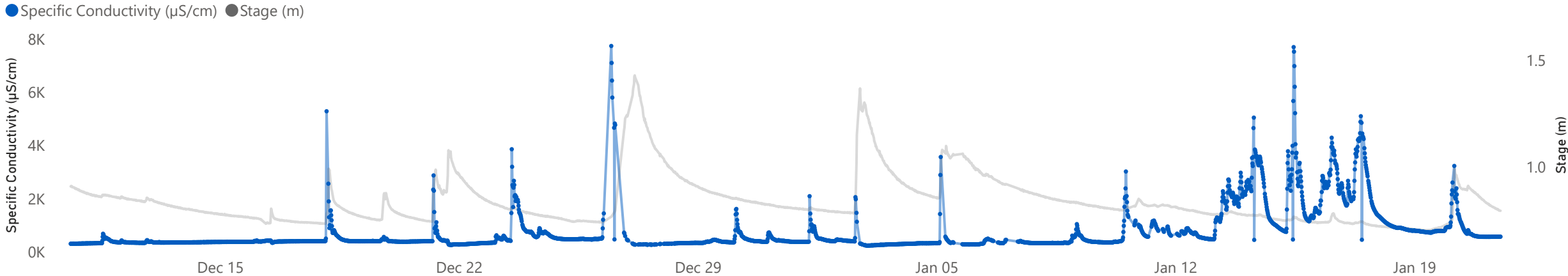
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across temperatures. Water parameter maps can be found on the [Water Resources Management website](#).

Specific conductance data for this deployment was collected from 2024-12-10 until 2025-01-21. The minimum specific conductance, 237 $\mu\text{S}/\text{cm}$, occurred on 2025-01-02. The maximum specific conductance, 7737 $\mu\text{S}/\text{cm}$, occurred on 2024-12-26. Precipitation and specific conductivity are often correlated, as rainwater typically has lower conductivity than surface water. In contrast, urban waterways frequently exhibit spikes in conductivity during winter months due to the application of road salts. During this deployment, specific conductivity values were elevated, particularly toward the end of the period. Overall, the data show an increasing trend in conductivity, consistent with the influence of road salt inputs.

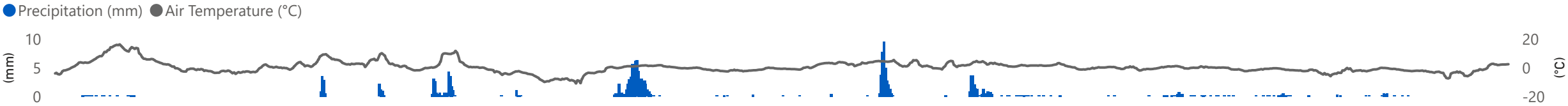
Specific Conductivity Trendline



Specific Conductivity and Stage at Learys Brook at Prince Philip



Precipitation and Air Temperature at Pippy Park in St. John's



Chloride Concentration

204.88

Average mg/L

110.87

Median mg/L

62.92

Minimum mg/L

2.24K

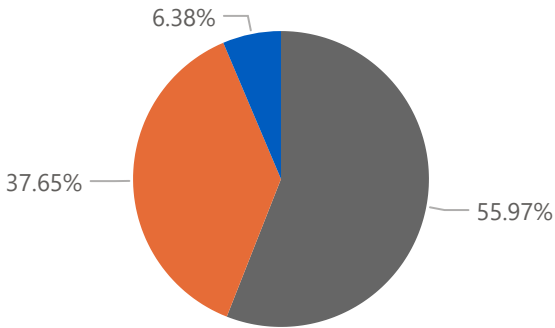
Maximum mg/L



Chloride ions are calculated from specific conductivity values. Chloride is naturally found in waterways due to local geology, sea spray, and other processes. Human activities including roadway de-icing can also lead to increased concentrations of chloride. High concentrations of chloride can be toxic to aquatic life, and harm vegetation. CCME has established [freshwater quality guidelines for the protection of Aquatic Life](#). The CCME short term water quality guideline for chloride is 640mg/L and the CCME long term water quality guideline for chloride is 120mg/L.

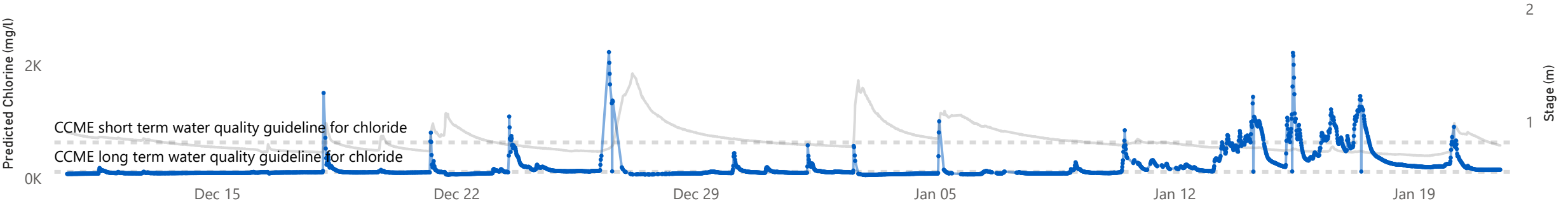
Data used to calculate chloride concentration for this deployment was collected from 2024-12-10 until 2025-01-21. The minimum predicted chloride concentration, 62.92 mg/L, occurred on 2025-01-02. The maximum predicted chloride concentration, 2,236.42 mg/L, occurred on 2024-12-26. In urban settings, road salts are a major source of chloride ions. Because predicted chloride concentration is calculated from specific conductivity, the trends will be similar. During this deployment the chloride concentration was above the short term guideline for 6.38% of the time, and above the long term guideline for 37.65% of the time.

- Within Guidelines
- Above Long Term ...
- Above Short Term ...



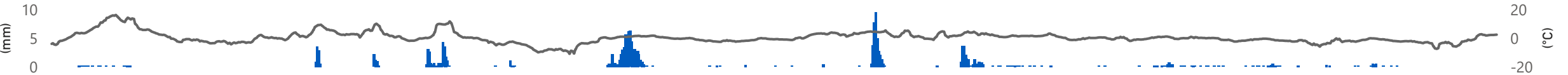
Predicted Chloride Concentration and Stage at Learys Brook at Prince Philip

● Predicted Chlorine (mg/l) ● Stage (m)



Precipitation and Air Temperature at Pippy Park in St. John's

● Precipitation (mm) ● Air Temperature (°C)



Dissolved Oxygen

12.65

Average (mg/L)

12.71

Median (mg/L)

11.01

Minimum (mg/L)

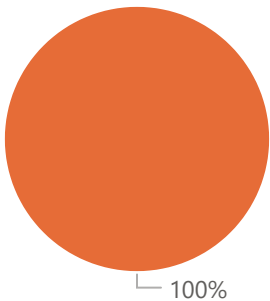
13.96

Maximum (mg/L)

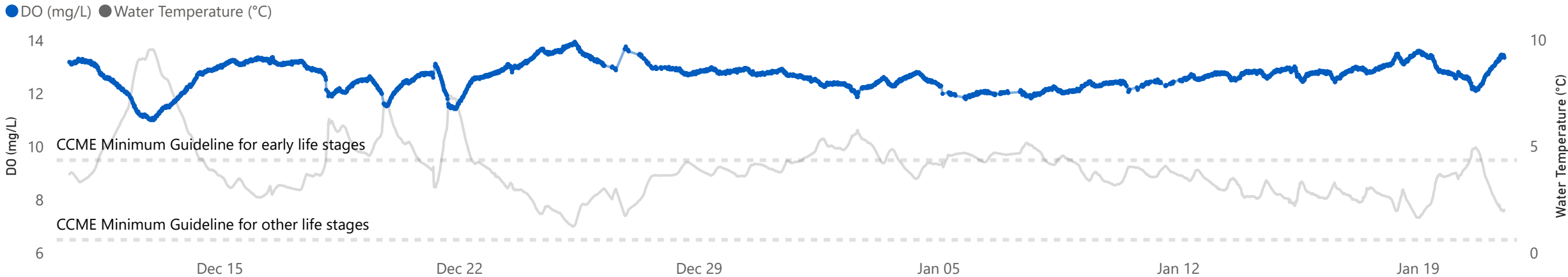
Dissolved oxygen (DO) in water is crucial for aquatic life. The [CCME \(Canadian Council of Ministers of the Environment\)](#) Freshwater Aquatic Life guidelines provide a basis by which to judge the overall health of waterways. The minimum guideline for early life stages in cold water is 9.5 mg/L and 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 2024-12-10 until 2025-01-21. The minimum DO reading, 11.01 mg/L, occurred on 2024-12-13. The maximum DO reading, 13.96 mg/L, occurred on 2024-12-25. Daily fluctuations are common due to changes in temperature and respiration of aquatic plants. Throughout this deployment period, DO remained above the CCME minimum guideline for the protection of early life stages and other life stages. This would be expected throughout the winter months when water temperature is lower and is capable of holding more oxygen.

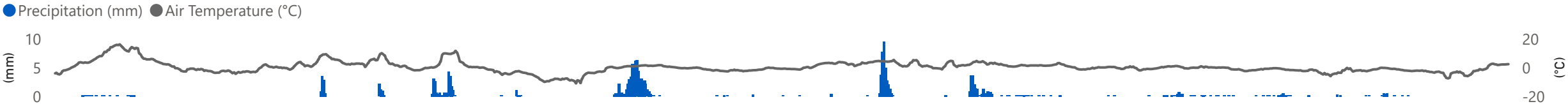
● Above Guidelines



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



Precipitation and Air Temperature at Pippy Park in St. John's



Turbidity

2.57

Average (NTU)

0.00

Median (NTU)

0.00

Minimum (NTU)

268.10

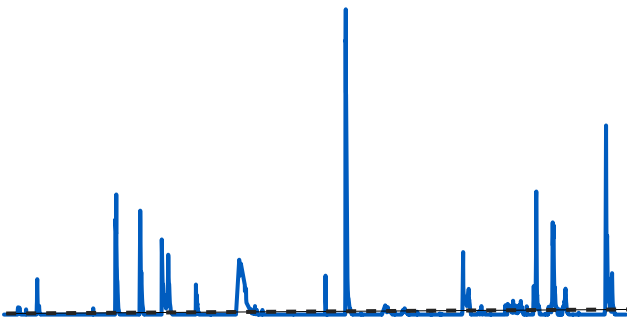
Maximum (NTU)



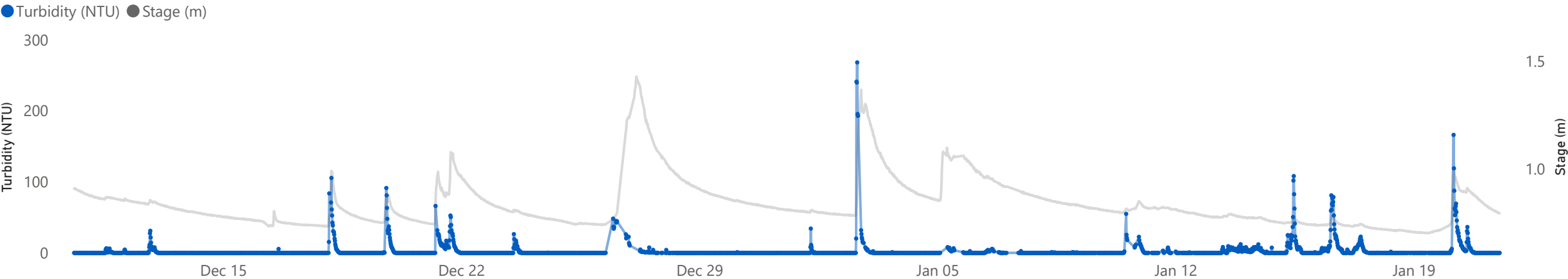
Increases in turbidity (cloudiness) are often caused by increased runoff during precipitation events. Runoff carries silt and other debris into the waterbody. Turbid conditions can prevent light from reaching plants, negatively impact benthic habitats, and clog or damage fish gills and equipment.

Turbidity data for this deployment was collected from 2024-12-10 until 2025-01-21. The minimum turbidity was 0.00 NTUs. The maximum turbidity, 268.10 NTUs, occurred on 2025-01-02. Turbidity remained low throughout the deployment, with a median value of 0 NTU. Short-term spikes coincided with stage increases following precipitation events, as runoff transported silt and debris into the waterway, temporarily elevating turbidity levels. In each case, turbidity returned to background conditions within several days of the event.

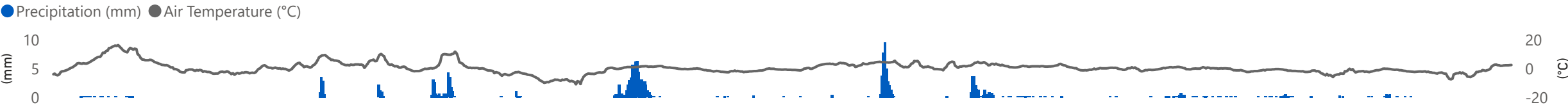
Turbidity Trendline



Turbidity and Stage at Learys Brook at Prince Philip Drive

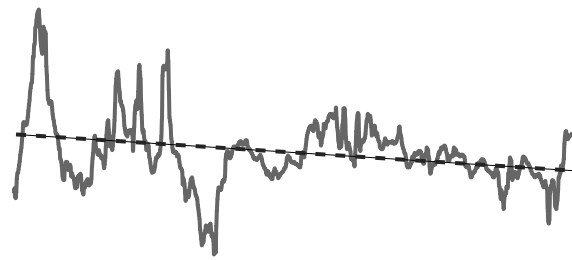


Precipitation and Air Temperature at Pippy Park in St. John's



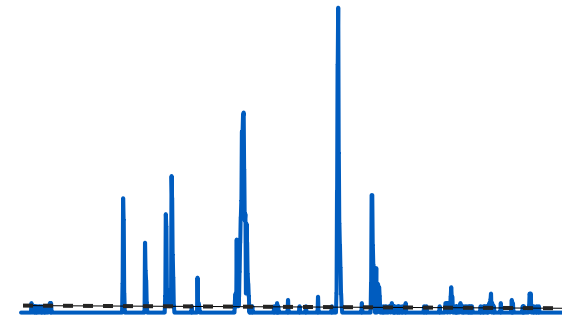
Meteorological and Hydrometric Data

Air Temperature Trendline



0.43	0.00
Average (°C)	Median (°C)
-10.80	16.20
Minimum (°C)	Maximum (°C)

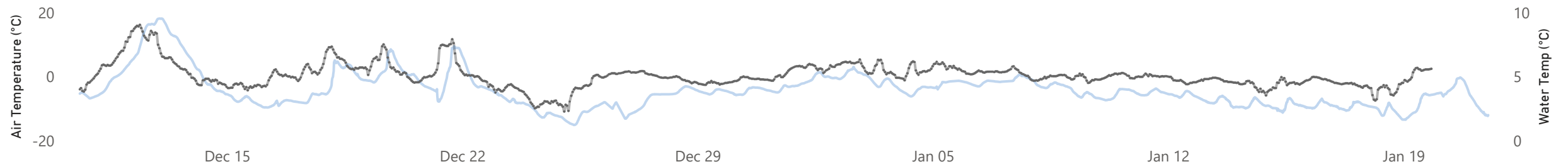
Precipitation Trendline



0.18	0.00
Average (mm/hr)	Median (mm/hr)
0.00	9.60
Minimum (mm/hr)	Maximum (mm/hr)

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

● Air Temperature (°C) ● Water Temperature (°C)



Precipitation from Pippy Park In St. John's and Stage from Learys Brook at Prince Philip Drive

● Precipitation (mm) ● Stage (m)

