Newfoundland & Labrador

Real Time Water Quality 2024 Annual Report

Calibre Mining: Valentine Gold Mine Network

2024-01-01 to 2024-12-31

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

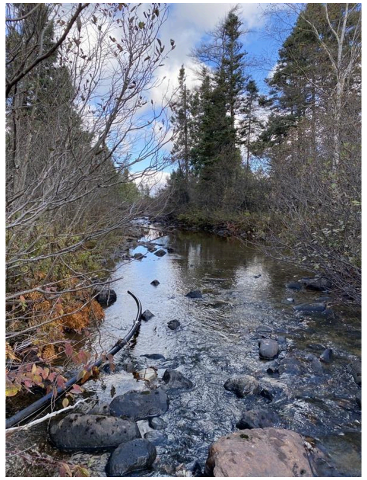
Calibre Mining: Valentine Gold Mine Network

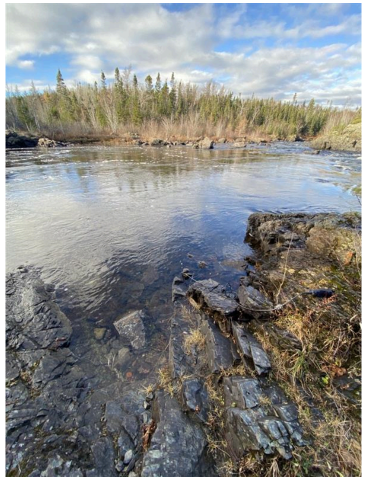
The Real-Time Water Quality (RTWQ) network at Calibre Mining's Valentine Gold Mine was successfully established in 2022 by the Newfoundland and Labrador Department of Environment and Climate Change (ECC) - Water Resources Management Division (WRMD), in collaboration with Calibre Mining (formerly Marathon Gold). Since 2022, the network has steadily expanded and plays a key role in identifying and tracking emerging water quality or quantity issues on site. Real-time continuous monitoring enables early detection of potential water quality or quantity issues, allowing for prompt response and timely implementation of mitigation measures. Each water quality instrument is programmed with an internal log file, which ensures continuous data collection even during short periods when real-time data transmission is interrupted.

The network currently comprises fourteen stations strategically located across the mine site. Six are surface water stations that record and transmit hourly measurements for temperature, pH, specific conductivity, dissolved oxygen concentration, and turbidity. Two additional parameters—total dissolved solids and dissolved oxygen percent saturation—are derived from the measured data. Water elevation is also measured at each station. The remaining eight stations are groundwater monitoring wells that record and transmit hourly measurements for temperature, pH, conductivity, oxidation-reduction potential (ORP), and water elevation. YSI EXO1 (vented) sondes are used in the groundwater wells, while YSI EXO3 sondes are deployed at the surface water stations. Site visits for surface water stations are conducted every 4–6 weeks to replace instruments with freshly calibrated units, collect grab samples, and perform any necessary maintenance. Groundwater site visits occurred every 10–12 weeks to switch out instruments, purge the wells, collect grab samples and complete necessary maintenance. Deployment reports are generated at the end of each deployment period for surface water. Groundwater data is compiled and reported annually, along with annual surface water data.

This annual deployment report covers groundwater data collected between January 1 and December 31, 2024. Surface water hydrometric data is reported for the same period, while water quality data spans from June to November 2024.





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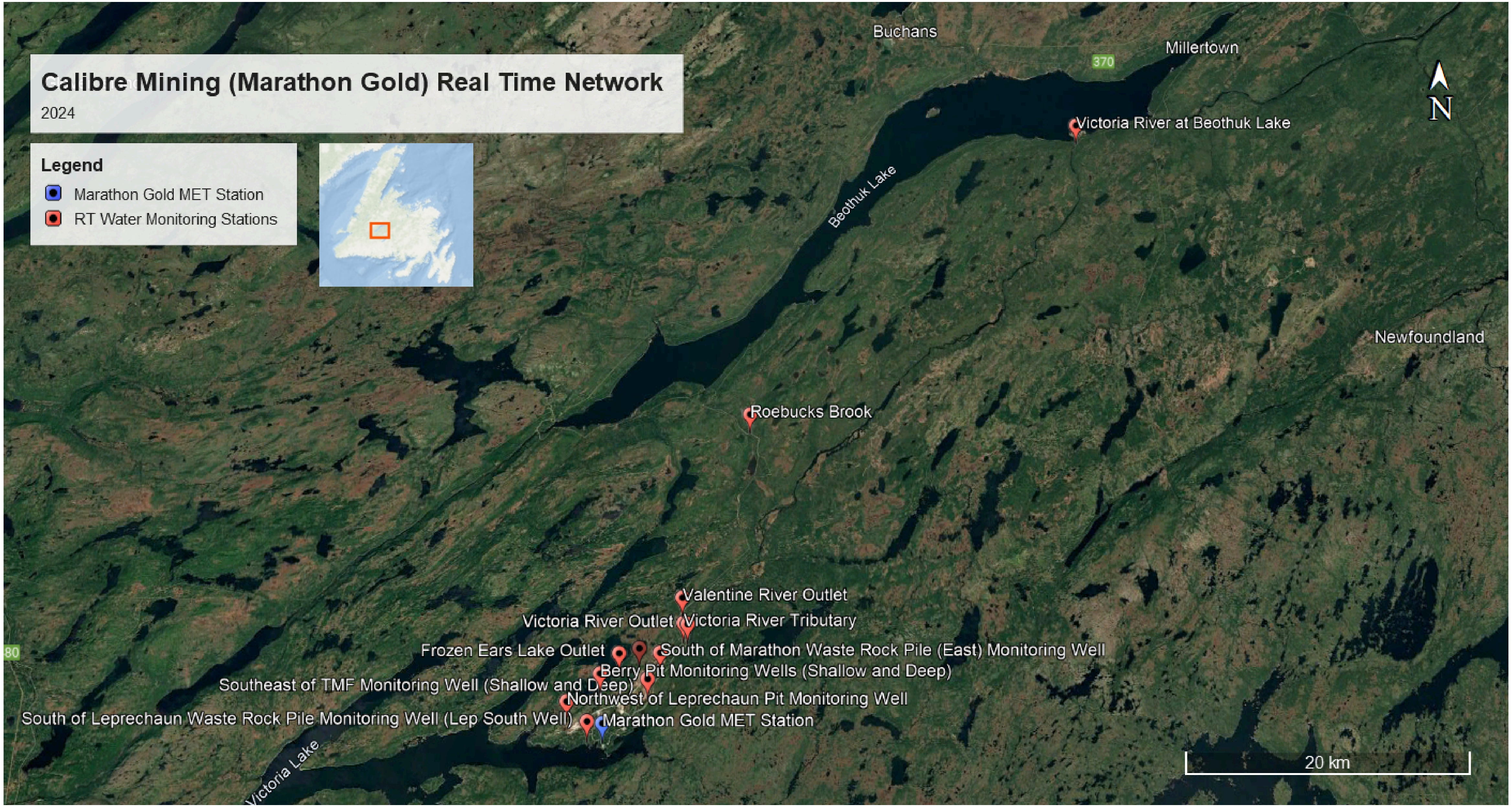


Quality Assurance and Quality Control Procedures

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 (elevation), 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
pH	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Water Temperature	≤ ± 0.2°C	≤ ± 0.21 - 0.5°C	≤ ± 0.51 - 0.8°C	≤ ± 0.81 - 1°C	> ± 1°C
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
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
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

During surface water deployments and removals, 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.

Additionally, grab samples are collected during deployment to compare pH, specific conductivity and turbidity values between the field instrument and grab samples. Variability in results may be attributed to differences in the sampling location or depth relative to the sonde's deployment site or insufficient equilibration time for the sonde when initial field data was collected.

During groundwater deployments and removals, grab samples are collected to compare against initial in-situ logged data. Values for pH and specific conductivity are compared between the instrument and the grab sample. There are a few circumstances which may cause QA/QC rankings below excellent. Typically when the well is pumped to provide water for the grab sample, the pumping can disturb the water column including any diluted salts and inorganic materials that are present in the groundwater. Additionally, in-situ instrument measurements are recorded shortly after the freshly calibrated instrument is deployed. The limited time for the sonde to reach equilibrium with its surroundings can occasionally lead to variations in values between grab sample results and instrument measurements.

Hydrometric Data

Water Resources Management Division hydrometric (stage and flow) data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown in this report is provisional and has not undergone quality control checks.

QAQC

Surface Water Deployment Rankings

There were four surface water deployment periods during the 2024 monitoring season. Instruments were initially deployed between June 4–11, and subsequently switched out for a freshly calibrated instruments on July 24–25, September 9–11, and October 9–10. Final removal of the instruments for the season occurred on November 12–13.

At the time of deployment across all four deployment periods at all stations, parameters ranked between "fair" to "excellent". The majority of rankings were "good" or "excellent", with only a few ranking as "fair". Dissolved oxygen (DO) ranked as "fair" at Frozen Ears and Victoria River at Beothuk Lake during deployments in June. This may be indicative of deteriorating sensor performance on the QAQC sonde. A different QAQC sonde was used during deployment for these two stations compared to the other four stations. During the July deployment, the "fair" ranking for pH at Roebucks is related to deteriorating sensor performance - as this sensor failed mid-way through the deployment period on August 2, 2024. The "fair" ranking for temperature at Victoria River at Beothuk Lake is likely due to variability in placement of the QAQC sonde compared to the field sonde. Given that the majority of rankings were between "good" and "excellent" throughout the year, this shows minimal discrepancies between the QAQC sonde and field sonde indicating quality data.

At the time of removal across all four deployment periods at all stations, parameters ranked between "fair" to "excellent", with the majority of rankings being "good" or "excellent". During the June-July removals, dissolved oxygen ranked "fair" at Frozen Ears, Beothuk Lake at Victoria River and Victoria River Tributary. As previously mentioned, this is likely due to deteriorating performance of the DO sensor on the QAQC sonde. During the July - September removals, DO ranked "fair" at Victoria River Outlet which is likely a result in placement of the QAQC sonde compared to the field sonde. There is no removal data for pH at Roebucks Brook for this deployment period due to sensor failure mid-way through the deployment period. There was no removal data at Roebucks Brook for the October-November deployment, due to lack of data caused by instrument power failure experienced at that station after October 22, 2024.

Grab sample comparisons ranked between "poor" to "excellent" at all stations throughout the season. The "poor", "marginal" and "fair" rankings are likely a result in differences in placement of the sonde versus sampling location. For example, water elevation was substantially high during deployments in June therefore it was difficult to safely collect samples where the sondes were placed at some of the stations. Less than ideal rankings can also result from the field sonde not having enough time to equilibrate to its surroundings before the initial measurements were recorded to compare against grab sample data.

Since the sondes were removed for the winter season at the end of the October-November deployment period, grab samples were collected during removal as well. Grab samples ranked "excellent" or "good", except pH at Roebucks Brook which ranked "fair". Since there was no removal field sonde data at Roebucks Brook, the grab samples were compared to the QAQC data. The "fair" ranking is likely due to placement of QAQC sonde or insufficient time for the QAQC sonde to equilibrate.

Surface Water QAQC Deployment Rankings

June - July Surface Water QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Deployment	Removal Rank
Frozen Ear Lake Outlet	Dissolved Oxygen (mg/l)	Fair		Fair
Frozen Ear Lake Outlet	pH	Excellent	Good	Excellent
Frozen Ear Lake Outlet	Specific Conductivity (µS/cm)	Excellent	Marginal	Good
Frozen Ear Lake Outlet	Temperature (°C)	Excellent		Excellent
Frozen Ear Lake Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Roebucks Brook	Dissolved Oxygen (mg/l)	Excellent		Good
Roebucks Brook	pH	Excellent	Good	Excellent
Roebucks Brook	Specific Conductivity (µS/cm)	Good	Good	Good
Roebucks Brook	Temperature (°C)	Excellent		Excellent
Roebucks Brook	Turbidity (NTU)	Excellent	Good	Excellent
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent		Good
Valentine River Outlet	pH	Excellent	Good	Excellent
Valentine River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent		Excellent
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Fair		Fair
Victoria River at Beothuk Lake	pH	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Excellent	Poor	Good
Victoria River at Beothuk Lake	Temperature (°C)	Excellent		Excellent
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Marginal	Excellent
Victoria River Outlet	Dissolved Oxygen (mg/l)	Excellent		Good
Victoria River Outlet	pH	Good	Good	Excellent
Victoria River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Victoria River Outlet	Temperature (°C)	Excellent		Excellent
Victoria River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Tributary	Dissolved Oxygen (mg/l)	Excellent		Fair
Victoria River Tributary	pH	Excellent	Excellent	Excellent
Victoria River Tributary	Specific Conductivity (µS/cm)	Good	Marginal	Excellent
Victoria River Tributary	Temperature (°C)	Excellent		Excellent
Victoria River Tributary	Turbidity (NTU)	Excellent	Excellent	Excellent

July - September Surface Water QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Deployment	Removal Rank
Frozen Ear Lake Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent
Frozen Ear Lake Outlet	pH	Good	Excellent	Excellent
Frozen Ear Lake Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Good
Frozen Ear Lake Outlet	Temperature (°C)	Excellent		Excellent
Frozen Ear Lake Outlet	Turbidity (NTU)	Excellent	Good	Excellent
Roebucks Brook	Dissolved Oxygen (mg/l)	Excellent		Excellent
Roebucks Brook	pH	Fair	Excellent	No data
Roebucks Brook	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Roebucks Brook	Temperature (°C)	Excellent		Excellent
Roebucks Brook	Turbidity (NTU)	Excellent	Excellent	Excellent
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent
Valentine River Outlet	pH	Excellent	Excellent	Good
Valentine River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent		Excellent
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Excellent		Excellent
Victoria River at Beothuk Lake	pH	Excellent	Excellent	Good
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Good	Good	Excellent
Victoria River at Beothuk Lake	Temperature (°C)	Fair		Excellent
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Outlet	Dissolved Oxygen (mg/l)	Excellent		Fair
Victoria River Outlet	pH	Good	Fair	Good
Victoria River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Good
Victoria River Outlet	Temperature (°C)	Excellent		Good
Victoria River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Tributary	Dissolved Oxygen (mg/l)	Excellent		Good
Victoria River Tributary	pH	Excellent	Good	Excellent
Victoria River Tributary	Specific Conductivity (µS/cm)	Excellent	Good	Excellent
Victoria River Tributary	Temperature (°C)	Excellent		Excellent
Victoria River Tributary	Turbidity (NTU)	Good	Good	Good

Surface Water QAQC Deployment Rankings

September - October Surface Water QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Deployment	Removal Rank
Frozen Ear Lake Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent
Frozen Ear Lake Outlet	pH	Excellent	Excellent	Good
Frozen Ear Lake Outlet	Specific Conductivity (µS/cm)	Good	Good	Good
Frozen Ear Lake Outlet	Temperature (°C)	Excellent		Excellent
Frozen Ear Lake Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Roebucks Brook	Dissolved Oxygen (mg/l)	Excellent		Excellent
Roebucks Brook	pH	Good	Fair	Excellent
Roebucks Brook	Specific Conductivity (µS/cm)	Excellent	Good	Good
Roebucks Brook	Temperature (°C)	Excellent		Excellent
Roebucks Brook	Turbidity (NTU)	Excellent	Excellent	Good
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent
Valentine River Outlet	pH	Good	Excellent	Good
Valentine River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent		Excellent
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Excellent		Excellent
Victoria River at Beothuk Lake	pH	Good	Excellent	Good
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Good	Excellent	Good
Victoria River at Beothuk Lake	Temperature (°C)	Excellent		Good
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent
Victoria River Outlet	pH	Good	Fair	Excellent
Victoria River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Good
Victoria River Outlet	Temperature (°C)	Excellent		Excellent
Victoria River Outlet	Turbidity (NTU)	Excellent	Excellent	Good
Victoria River Tributary	Dissolved Oxygen (mg/l)	Excellent		Excellent
Victoria River Tributary	pH	Excellent	Good	Excellent
Victoria River Tributary	Specific Conductivity (µS/cm)	Good	Good	Excellent
Victoria River Tributary	Temperature (°C)	Excellent		Excellent
Victoria River Tributary	Turbidity (NTU)	Excellent	Excellent	Excellent

October - November Surface Water QAQC Rankings

Station	Parameter	Deployment Rank	Deployment Grab Sample	Removal Rank	Removal Grab Sample
Frozen Ear Lake Outlet	Dissolved Oxygen (mg/l)	Good		Excellent	
Frozen Ear Lake Outlet	pH	Good	Fair	Excellent	Excellent
Frozen Ear Lake Outlet	Specific Conductivity (µS/cm)	Excellent	Good	Excellent	Good
Frozen Ear Lake Outlet	Temperature (°C)	Excellent		Excellent	
Frozen Ear Lake Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent	Excellent
Roebucks Brook	Dissolved Oxygen (mg/l)	Excellent		No data	
Roebucks Brook	pH	Excellent	Good	No data	Fair
Roebucks Brook	Specific Conductivity (µS/cm)	Excellent	Excellent	No data	Excellent
Roebucks Brook	Temperature (°C)	Excellent		No data	
Roebucks Brook	Turbidity (NTU)	Excellent	Excellent	No data	Good
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent	
Valentine River Outlet	pH	Good	Good	Good	Excellent
Valentine River Outlet	Specific Conductivity (µS/cm)	Good	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent		Excellent	
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Excellent		Excellent	
Victoria River at Beothuk Lake	pH	Excellent	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Temperature (°C)	Good		Excellent	
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Excellent	Excellent	Excellent
Victoria River Outlet	Dissolved Oxygen (mg/l)	Excellent		Excellent	
Victoria River Outlet	pH	Good	Good	Excellent	Excellent
Victoria River Outlet	Specific Conductivity (µS/cm)	Good	Excellent	Excellent	Excellent
Victoria River Outlet	Temperature (°C)	Excellent		Excellent	
Victoria River Outlet	Turbidity (NTU)	Excellent	Good	Excellent	Excellent
Victoria River Tributary	Dissolved Oxygen (mg/l)	Excellent		Excellent	
Victoria River Tributary	pH	Excellent	Excellent	Excellent	Excellent
Victoria River Tributary	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent	Good
Victoria River Tributary	Temperature (°C)	Excellent		Excellent	
Victoria River Tributary	Turbidity (NTU)	Excellent	Excellent	Excellent	Excellent

QAQC

Groundwater Deployment Rankings

There were three groundwater deployment periods throughout 2024. Instruments were initially installed at new stations between June 12–13 or switched out at pre-existing stations between June 19–20. Subsequent replacements with freshly calibrated instruments occurred on September 11 and again from November 12–14.

Most parameters ranked as “good” or “excellent” at all stations throughout the year for deployments and removals. However, there were several instances of “fair,” “marginal,” or “poor” rankings. Consistently lower rankings were observed at the Southeast of TMF shallow monitoring well. This site includes both a shallow and a deep well in the same aquifer. The shallow well is purged and sampled first, with grab samples collected during purging, while in-situ sonde measurements are recorded after deployment. The deep well is purged immediately afterward, but due to their hydraulic connection, drawdown from the deep well continues to influence the shallow well, often resulting in less representative in-situ readings and lower QAQC rankings.

In contrast, stations such as Southwest of Marathon Pit and South of Marathon Waste Rock Pile consistently received “good” to “excellent” rankings for both parameters across most deployments. Rankings at the South of Leprechaun Waste Rock Pile varied from “poor” to “excellent,” while the North of Leprechaun Pit Monitoring Well showed more moderate results, ranging from “marginal” to “excellent.”

The Berry Pit Monitoring Wells (shallow and deep) were newly installed on November 13, 2024. Deployment QAQC rankings at these locations were “good” or “excellent” for both pH and specific conductivity. No removal data is available for the November deployment period, as instruments remain in place over the winter. During this time, the tops of wells often freeze, making instruments inaccessible until spring, when they will be retrieved once conditions allow.

Groundwater QAQC rankings can often fall below “good” for several reasons. Prior to sample collection, wells are typically purged, a process that can disturb sediments and introduce fresh water into the well, causing fluctuations in water quality until the water column stabilizes. These disturbances may result in discrepancies between grab sample results and initial in-situ field sonde measurements. Shallow wells or those with high sediment loads are particularly susceptible to lower QAQC rankings due to increased disturbance from pumping. WRMD is currently reviewing QAQC procedures with the intent to incorporate secondary measures to better analyze groundwater deployment data and support qualitative comparisons.

June Groundwater QAQC Rankings

Station	Parameter	Deployment Rank	Removal Rank
Southwest of Marathon Pit - Monitoring Well	pH	Excellent	Good
Southwest of Marathon Pit - Monitoring Well	Specific Conductivity (µS/cm)	Good	Fair
Southeast of TMF Monitoring Well (Shallow)	pH	Fair	Excellent
Southeast of TMF Monitoring Well (Shallow)	Specific Conductivity (µS/cm)	Poor	Poor
Southeast of TMF Monitoring Well (Deep)	pH	Good	Good
Southeast of TMF Monitoring Well (Deep)	Specific Conductivity (µS/cm)	Poor	Excellent
South of Marathon Waste Rock Pile (East)	pH	Good	Good
South of Marathon Waste Rock Pile (East)	Specific Conductivity (µS/cm)	Good	Excellent
South of Leprechaun Waste Rock Pile Monitoring Well	pH	Fair	Excellent
South of Leprechaun Waste Rock Pile Monitoring Well	Specific Conductivity (µS/cm)	Good	Fair
Northwest of Leprechaun Pit Monitoring Well	pH	Fair	Fair
Northwest of Leprechaun Pit Monitoring Well	Specific Conductivity (µS/cm)	Fair	Excellent

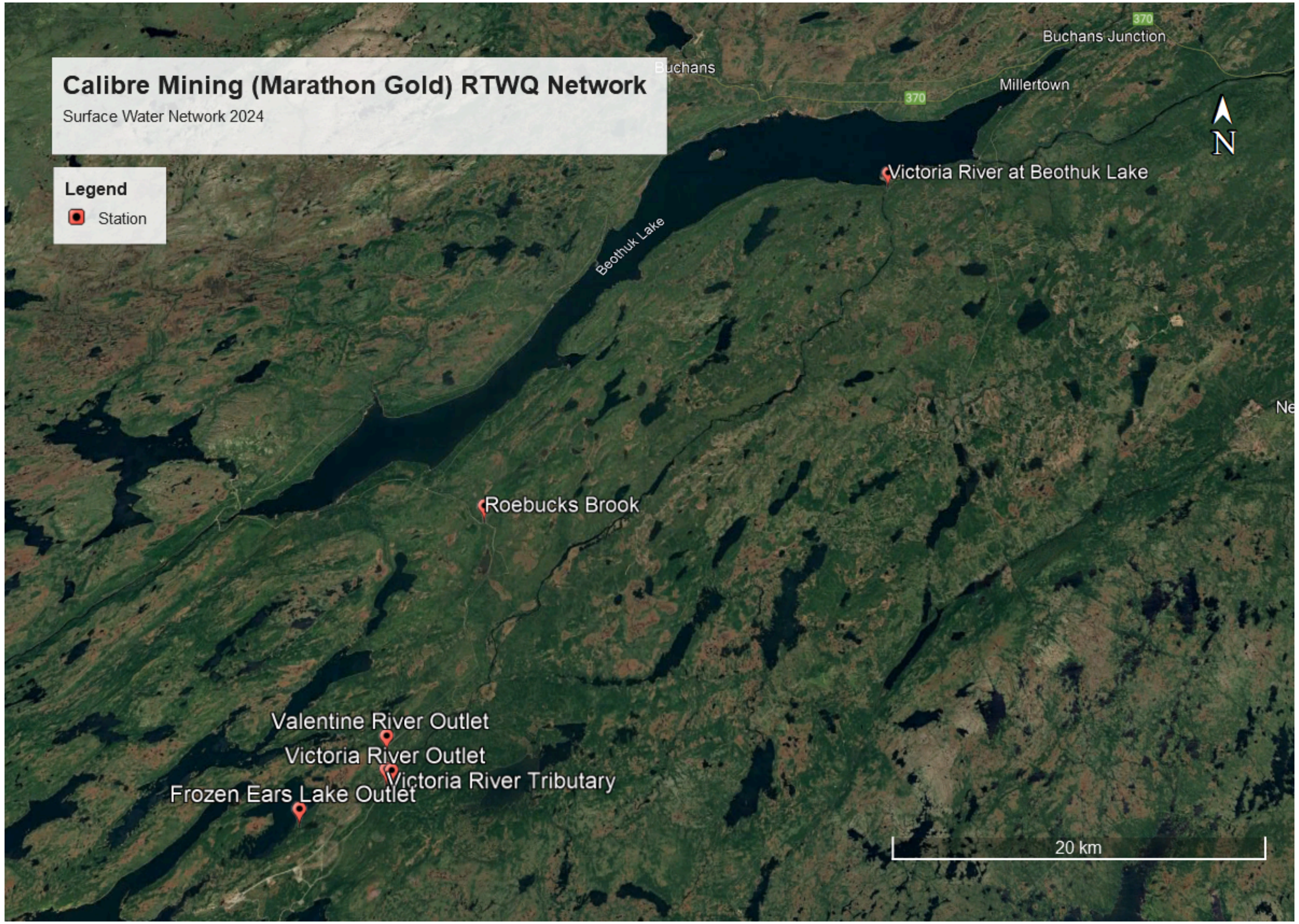
September Groundwater QAQC Rankings

Station	Parameter	Deployment Rank	Removal Rank
Southwest of Marathon Pit - Monitoring Well	pH	Good	Excellent
Southwest of Marathon Pit - Monitoring Well	Specific Conductivity (µS/cm)	Good	Good
Southeast of TMF Monitoring Well (Shallow)	pH	Good	Fair
Southeast of TMF Monitoring Well (Shallow)	Specific Conductivity (µS/cm)	Marginal	Poor
Southeast of TMF Monitoring Well (Deep)	pH	Fair	Good
Southeast of TMF Monitoring Well (Deep)	Specific Conductivity (µS/cm)	Excellent	Excellent
South of Marathon Waste Rock Pile (East)	pH	Good	Good
South of Marathon Waste Rock Pile (East)	Specific Conductivity (µS/cm)	Excellent	Excellent
South of Leprechaun Waste Rock Pile Monitoring Well	pH	Good	Poor
South of Leprechaun Waste Rock Pile Monitoring Well	Specific Conductivity (µS/cm)	Excellent	Poor
Northwest of Leprechaun Pit Monitoring Well	pH	Fair	Marginal
Northwest of Leprechaun Pit Monitoring Well	Specific Conductivity (µS/cm)	Excellent	Fair

November Groundwater QAQC Rankings

Station	Parameter	Deployment Rank
Southwest of Marathon Pit - Monitoring Well	pH	Excellent
Southwest of Marathon Pit - Monitoring Well	Specific Conductivity (µS/cm)	Excellent
Southeast of TMF Monitoring Well (Shallow)	pH	Poor
Southeast of TMF Monitoring Well (Shallow)	Specific Conductivity (µS/cm)	Poor
Southeast of TMF Monitoring Well (Deep)	pH	Good
Southeast of TMF Monitoring Well (Deep)	Specific Conductivity (µS/cm)	Excellent
South of Marathon Waste Rock Pile (East)	pH	Good
South of Marathon Waste Rock Pile (East)	Specific Conductivity (µS/cm)	Good
South of Leprechaun Waste Rock Pile Monitoring Well	pH	Fair
South of Leprechaun Waste Rock Pile Monitoring Well	Specific Conductivity (µS/cm)	Excellent
Northwest of Leprechaun Pit Monitoring Well	pH	Fair
Northwest of Leprechaun Pit Monitoring Well	Specific Conductivity (µS/cm)	Excellent
Berry Pit Monitoring Well (Shallow)	pH	Good
Berry Pit Monitoring Well (Shallow)	Specific Conductivity (µS/cm)	Excellent
Berry Pit Monitoring Well (Deep)	pH	Good
Berry Pit Monitoring Well (Deep)	Specific Conductivity (µS/cm)	Excellent

Valentine Gold Mine Surface Water Network



Calibre Mining's real-time monitoring network includes six surface water stations. These stations play a critical role in environmental management by enabling early detection of potential contamination and providing insight into water quality and quantity. The integration of real-time monitoring allows for rapid response and early mitigation in the event of any contamination concerns.

Victoria River Outlet, Valentine River Outlet, and Roebucks Brook water quality stations were installed in November 2022. Victoria River Tributary was installed in November 2023. Frozen Ears Lake Outlet and Victoria River at Beothuk Lake were both installed in June 2024. Please refer to Appendix I for full site descriptions.

Station Name	Station Number	Latitutde	Longitude
Frozen Ear Lake Outlet	NF02YN0052	48.3877	-57.1387
Victoria River Outlet	NF02YN0047	48.4080	-57.0724
Victoria River Tributary	NF02YN0050	48.4083	-57.0765
Valentine River Outlet	NF02YN0048	48.4242	-57.0775
Roebucks Brook	NF02YN0049	48.5436	-57.0131
Victoria River at Beothuk Lake	NF02YN0051	48.7434	-56.6776

Surface Water - Temperature

Newfoundland Labrador

Water Temperature Annual Statistics (°C)

Station Name	Minimum	Maximum	Average	Median
Frozen Ears Lake Outlet	0.68	32.01	15.52	16.83
Roebucks Brook*	4.98	29.11	16.33	16.54
Valentine River Outlet	0.88	28.61	15.54	16.90
Victoria River at Beothuk Lake	1.66	28.13	15.70	17.48
Victoria River Outlet	2.43	27.24	15.56	16.70
Victoria River Tributary	0.03	27.30	14.67	15.93

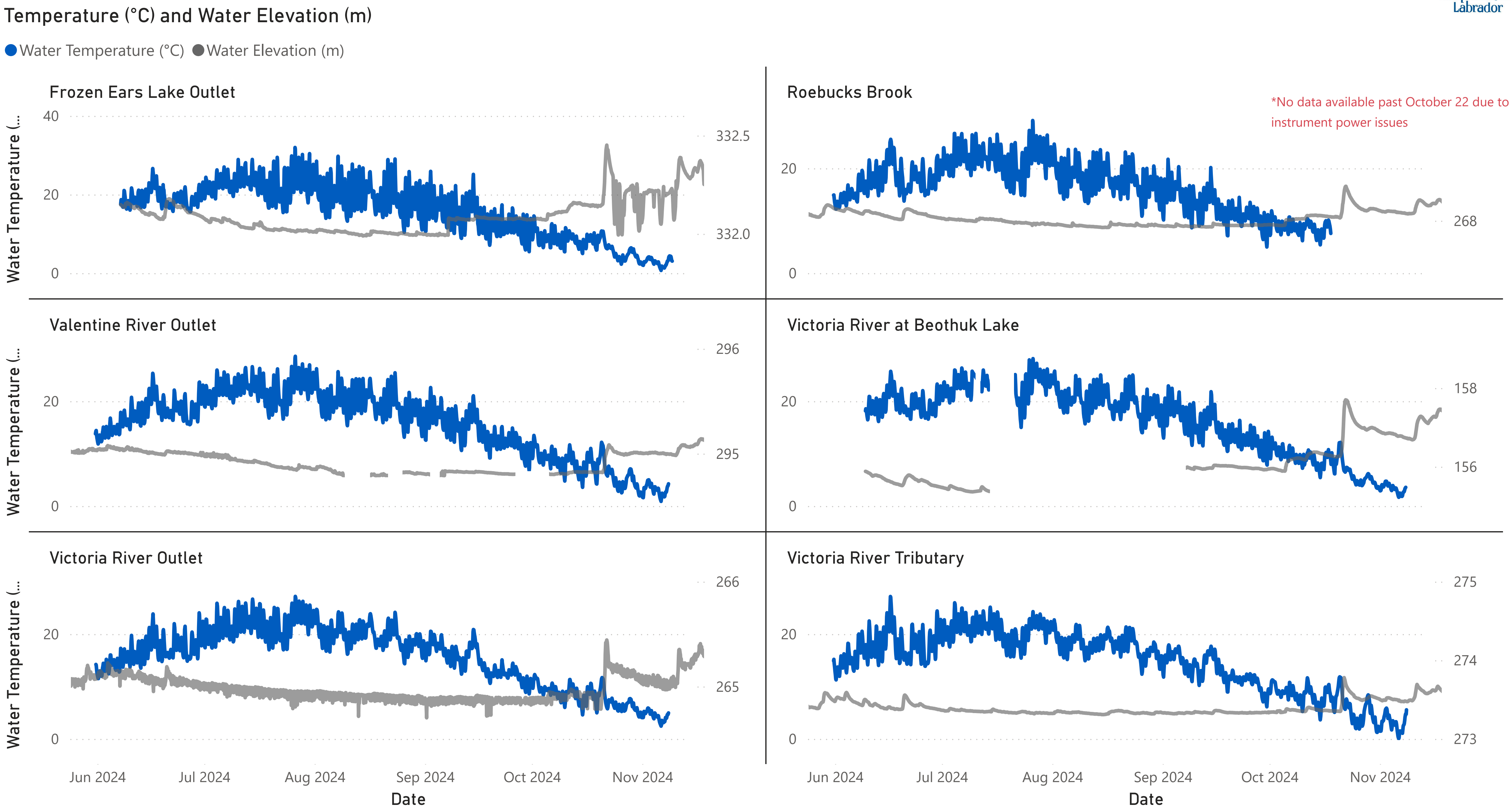
*Data missing from October 22-November 12

Water temperature is a critical parameter for wildlife, as many organisms cannot regulate their own body temperatures and instead depend on surrounding air and water conditions. Water temperature can be influenced by industrial inputs or alterations to natural environments, such as the removal of trees and vegetation, which eliminates the protective canopy they provide. Additionally, water temperature impacts other monitored parameters, including dissolved oxygen and specific conductivity.

From June to November, water temperature data across all six stations exhibited expected seasonal and diurnal trends. Graphs show a clear pattern of rising temperatures in spring, peaking in mid-summer, followed by a gradual decline during the transition to fall.

Median temperatures were comparable across all stations. Slightly elevated temperatures were observed at Victoria River at Beothuk Lake. At Roebucks Brook, the minimum recorded temperature was higher than at other stations. This is attributable to a data gap from October 22 to November 12—when the lowest seasonal temperatures typically occur. Meanwhile, Frozen Ears Lake Outlet recorded higher maximum temperatures, which can be explained by the shallow nature of the outlet and the absence of canopy cover, making it more susceptible to atmospheric warming and direct solar radiation.

Water Temperature Station Graphs



Surface Water - pH

Annual pH Statistics (pH Units)

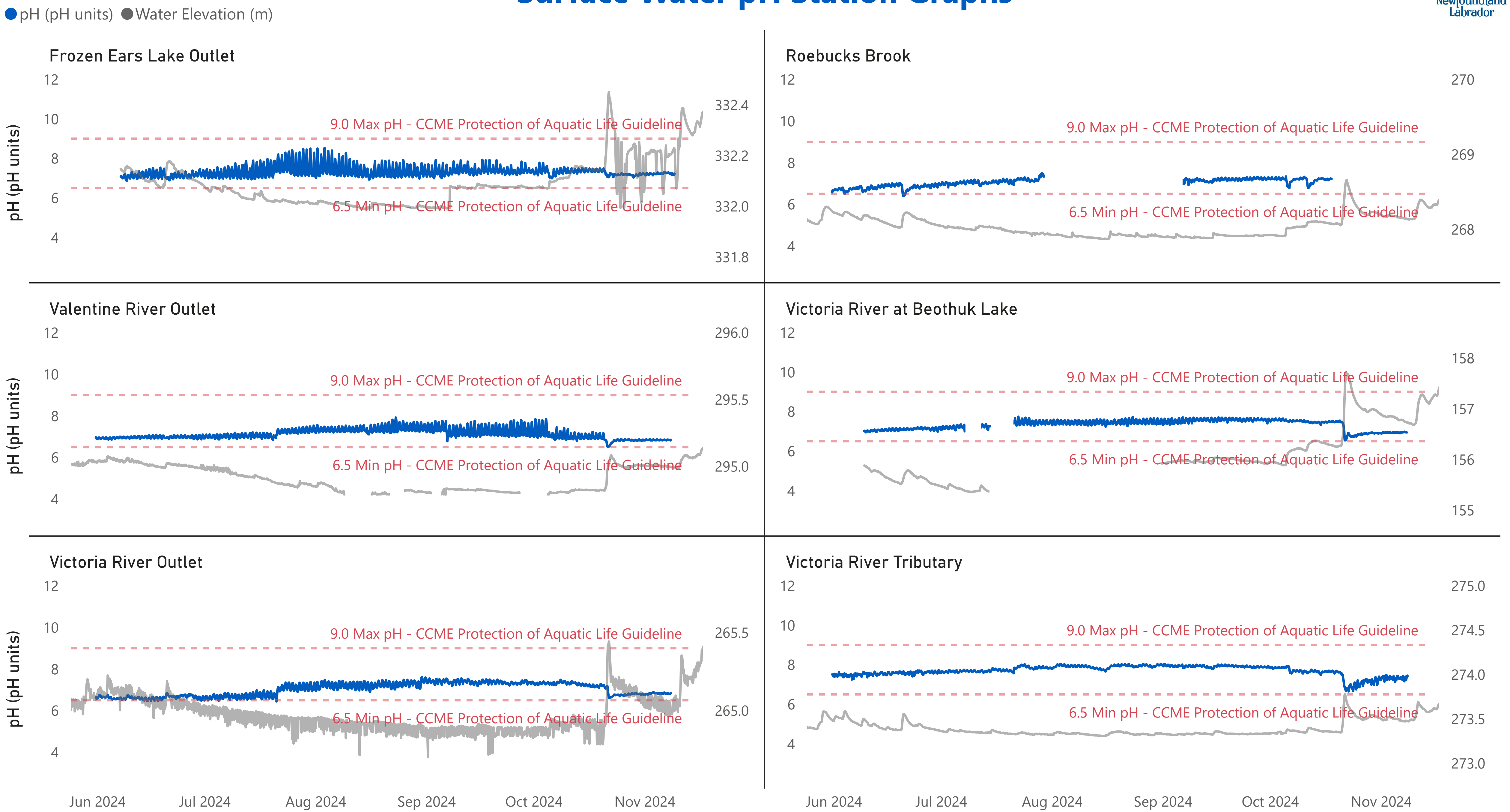
Station Name	Minimum	Maximum	Average	Median
Frozen Ears Lake Outlet	6.72	8.53	7.31	7.26
Roebucks Brook	6.39	7.49	7.04	7.08
Valentine River Outlet	6.47	7.92	7.12	7.06
Victoria River at Beothuk Lake	6.54	7.77	7.34	7.42
Victoria River Outlet	6.42	7.61	7.03	7.10
Victoria River Tributary	6.65	8.05	7.70	7.73

pH relates to the free hydrogen ions in water, and it is a measure of acidity in water. pH is a critical parameter because it influences the solubility of minerals and chemicals, the availability of nutrients, and the biological processes that occur in aquatic ecosystems. 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. The 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 remained generally stable and consistent throughout the deployment season at all six stations. Medians were comparable at all six stations, although values at Victoria River Tributary were slightly higher than the other stations. Values remained within the CCME Guidelines for the Protection of Aquatic Life for the majority of the season at all stations, with the occasional brief dip below the minimum guideline.

Higher fluctuations can be observed at Frozen Ears Lake Outlet, especially around August, potentially as a result of significant biological activity. The Frozen Ears Lake Outlet station is an exposed area with no vegetation cover, characterized by shallow, slow-moving water, and is particularly sensitive to air temperature changes. These conditions can promote photosynthesis, respiration, and potential algal growth, leading to pronounced diurnal variation. Precipitation events also influenced pH at all stations, as rainwater's lower acidity can temporarily dilute the water column and lower pH, while runoff may sometimes elevate it by disturbing sediment or introducing additional material into the system. However, pH levels typically return to baseline within a few days to weeks. Substantial decreases in pH can be observed around October 25th at all stations, coinciding with a water elevation increase and can be attributed to a significant precipitation event that occurred concurrently. pH levels slowly started rising to background levels within the weeks to follow.

Surface Water pH Station Graphs



Surface Water - Specific Conductivity

Newfoundland Labrador

Annual Specific Conductivity Statistics (µS/cm)

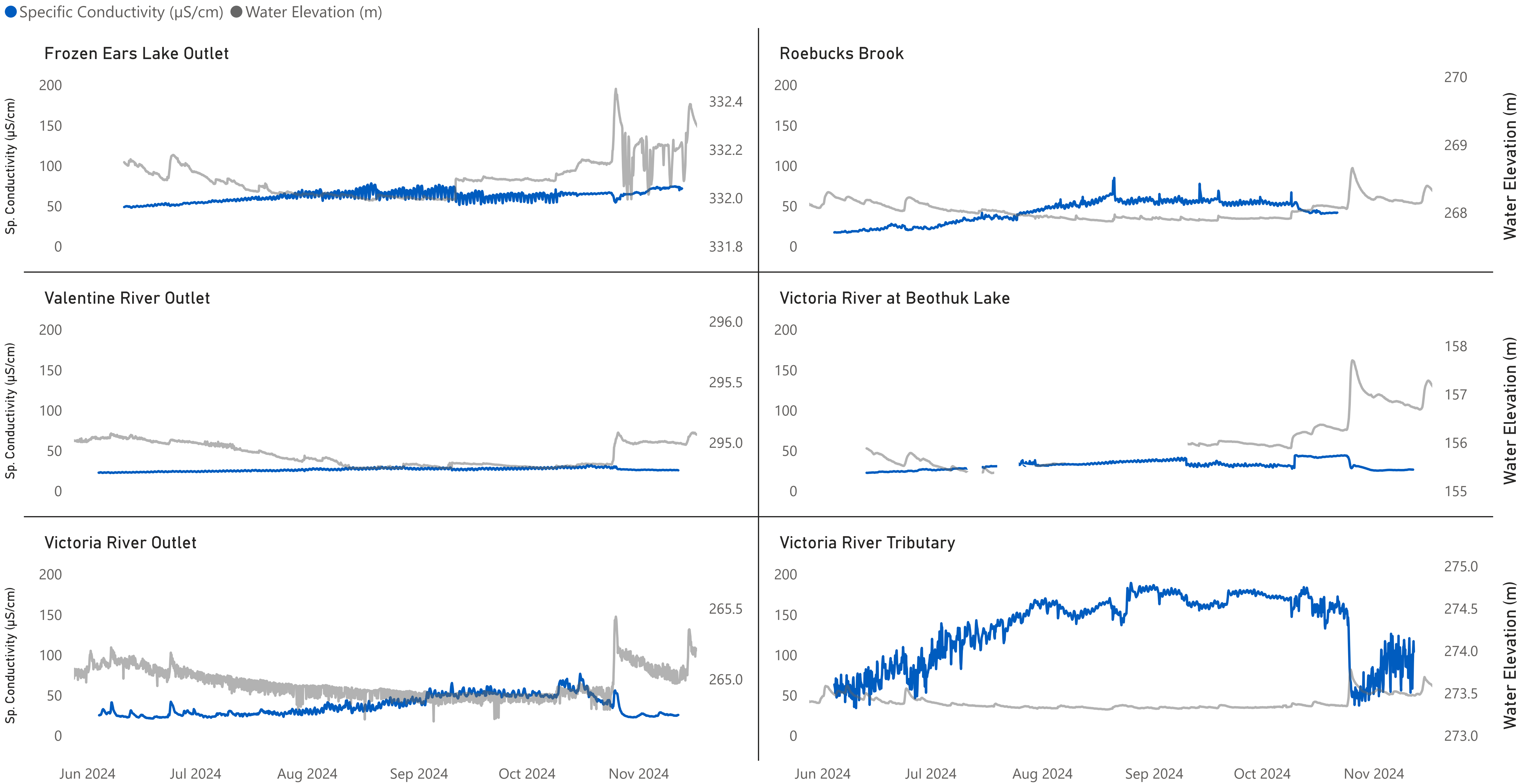
Station Name	Minimum	Maximum	Average	Median
Frozen Ears Lake Outlet	**47.86**	**78.24**	**62.32**	**63.22**
Roebucks Brook	**17.11**	**84.95**	**43.15**	**46.97**
Valentine River Outlet	**22.31**	**32.27**	**26.61**	**26.65**
Victoria River at Beothuk Lake	**22.52**	**44.39**	**32.28**	**32.12**
Victoria River Outlet	**21.17**	**76.71**	**37.27**	**32.86**
Victoria River Tributary	**34.19**	**189.31**	**133.51**	**151.49**

Specific conductivity is a common indicator of the concentration of dissolved ions in water, such as salts, nutrients and metals. Higher concentrations of dissolved ions result in higher specific conductivity, while pure water exhibits low conductivity. Specific conductivity is often affected by precipitation. During precipitation events, rainwater can temporarily dilute the water column, resulting in a short-term decrease in conductivity. However, high precipitation events can also cause a temporary increase in conductivity if sediment from the bottom of the waterbody is disturbed around the sensor or if runoff carrying dissolved ions enters the water column.

Across the six stations, specific conductivity generally remained low and stable throughout the deployment period, reflecting relatively pristine conditions. Most stations exhibited predictable seasonal variation, with minor increases during periods of low water flow when ion concentrations can become more concentrated. Notably, Victoria River Tributary exhibited the highest conductivity values and the largest fluctuations, particularly between July and late October. This may be attributed to its location downstream of a densely wooded and boggy area, combined with the small size of the river, which may make it more sensitive to environmental changes. In contrast, Valentine River Outlet maintained very consistent and low conductivity values, showing minimal variability throughout the deployment period. Frozen Ears Lake Outlet displayed gradual increases in conductivity over the summer months, possibly reflecting high dissolved ion concentration due to increased evaporation during warm, dry periods. Roebucks Brook and Victoria River at Beothuk Lake also showed slight upward trends through the summer and early fall, with some increases coinciding with drier conditions. At several stations, including Victoria River Tributary and Victoria River at Beothuk Lake, a pronounced drop in conductivity around late October corresponds with a notable rise in water elevation, indicative of a significant precipitation event that diluted ion concentrations. Conductivity increased at Victoria River Outlet from that same precipitation event due to the location of the sonde in the water body. The Victoria River Outlet is located near a large embankment, which likely contributes to runoff entering the waterbody close to the sonde's placement in the river. Furthermore, the sonde is positioned in a soft, muddy substrate, making it more susceptible to increased disturbance during precipitation events. This location may account for the observed increases in conductivity during elevation increases, as runoff introduces additional dissolved ions into the water column.

These trends demonstrate how specific conductivity is closely tied to water elevation, and how it can provide insight into watershed responses to natural changes.

Specific Conductivity Station Graphs



Surface Water - Dissolved Oxygen

Annual Dissolved Oxygen Statistics

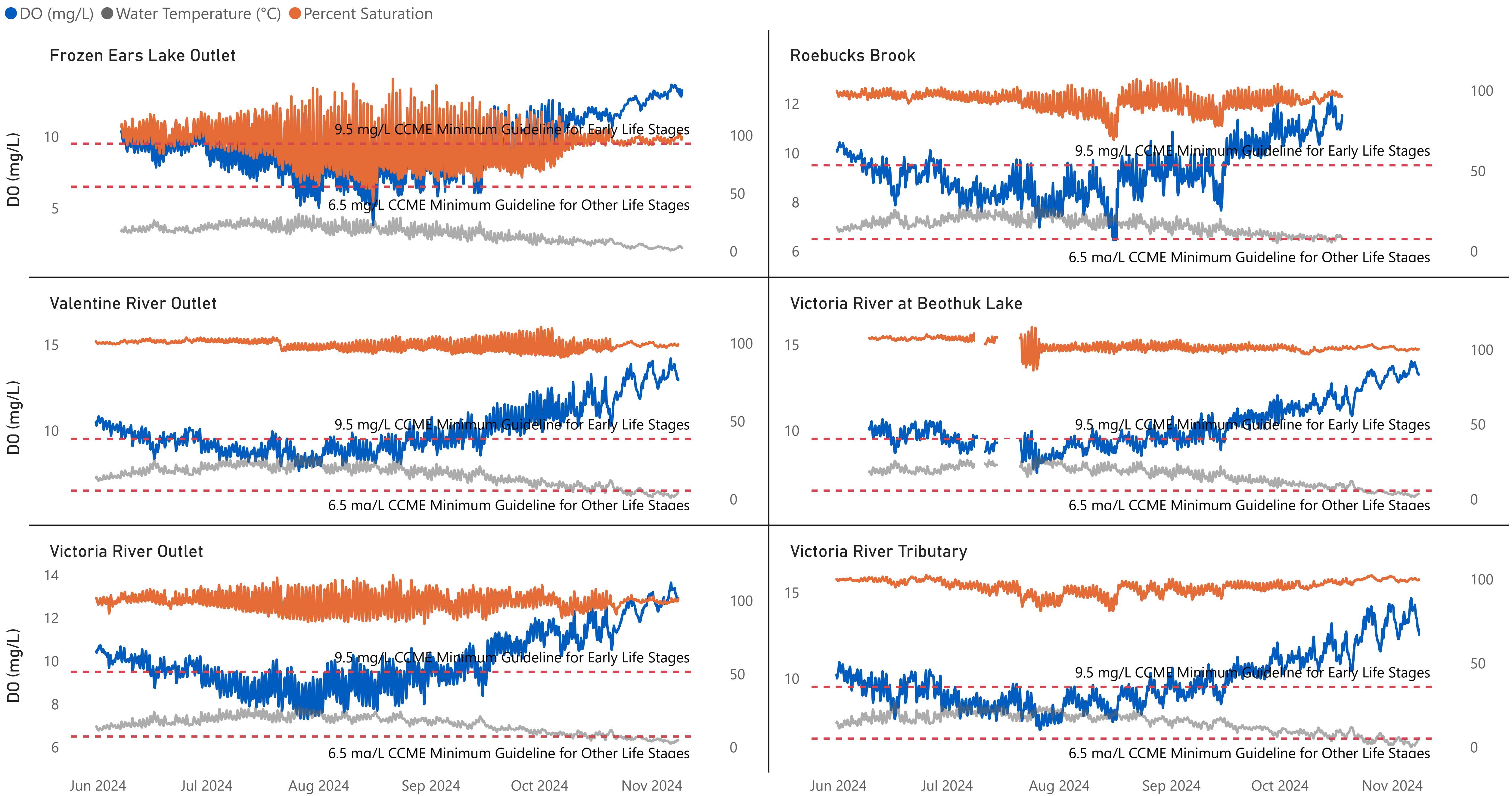
Station Name	Minimum (mg/L)	Minimum (% Sat.)	Maximum (mg/L)	Maximum (% Sat.)	Average (mg/L)	Average (% Sat.)	Median (mg/L)	Median (% Sat.)
Frozen Ears Lake Outlet	3.83	42.80	13.61	148.60	9.41	93.09	9.36	95.00
Roebucks Brook	6.45	69.40	12.37	107.10	9.26	93.58	9.15	94.60
Valentine River Outlet	7.64	90.80	14.18	110.30	10.03	98.93	9.63	99.50
Victoria River at Beothuk Lake	7.54	86.00	14.01	114.90	10.33	102.34	9.96	101.50
Victoria River Outlet	7.31	84.00	13.65	117.30	10.02	99.26	9.78	99.40
Victoria River Tributary	7.02	80.60	14.66	102.40	9.88	95.56	9.51	96.20

Dissolved oxygen (DO) is crucial for supporting aquatic life, and the CCME (Canadian Council of Ministers of the Environment) Freshwater Aquatic Life guidelines establish reference values to evaluate waterway health. The minimum DO guideline is 9.5 mg/L for early life stages in cold water species and 6.5 mg/L for other life stages. DO concentrations can fluctuate due to factors such as water temperature, atmospheric pressure, and the presence of other dissolved substances. Warmer water typically holds less dissolved oxygen than cooler water.

Throughout the 2024 deployment season, DO levels remained generally stable and consistent across most stations, except for Frozen Ears Lake Outlet, which exhibited significant fluctuations, particularly from mid-June to October. At the majority of stations, DO followed expected diurnal patterns influenced by photosynthesis during daylight hours and respiration at night, along with broader seasonal trends driven by water temperature. DO levels typically declined through the spring-to-summer transition, reaching their lowest values by mid-summer when water temperatures were at their peak, then gradually increased during the fall months as temperatures dropped. Throughout the deployment season, DO levels at most stations, with the exception of Frozen Ears (and a brief dip at Roebucks Brook), stayed above the CCME guideline for the protection of other life stages (6.5 mg/L). DO levels were below the CCME guideline for early life stages (9.5 mg/L) from June until October, which was expected as water temperatures were warmer during this time frame. Once water temperatures started decreasing in the fall, DO levels rose above the 9.5 mg/L guideline value. At several stations, a noticeable reduction in variability of percent saturation levels occurred after a precipitation event on October 25th. After precipitation, when water levels rise, the larger volume of water becomes less sensitive to air temperature changes, resulting in more stable temperatures. Since water temperature and DO levels are inversely related, the stabilization of temperature helps reduce fluctuations in DO concentration, leading to more stable percent saturation.

The Frozen Ears Lake Outlet station is an exposed area with no vegetation cover, characterized by shallow, slow-moving water, and is particularly sensitive to air temperature changes. Additionally, DO at this station may be influenced by reduced aeration and/or stagnant pools of water due to low water levels, as well as potentially significant biological activity during the summer. These conditions led to pronounced diurnal variations in DO levels, as illustrated in the figure on the next page.

Dissolved Oxygen Station Graphs



Surface Water - Turbidity

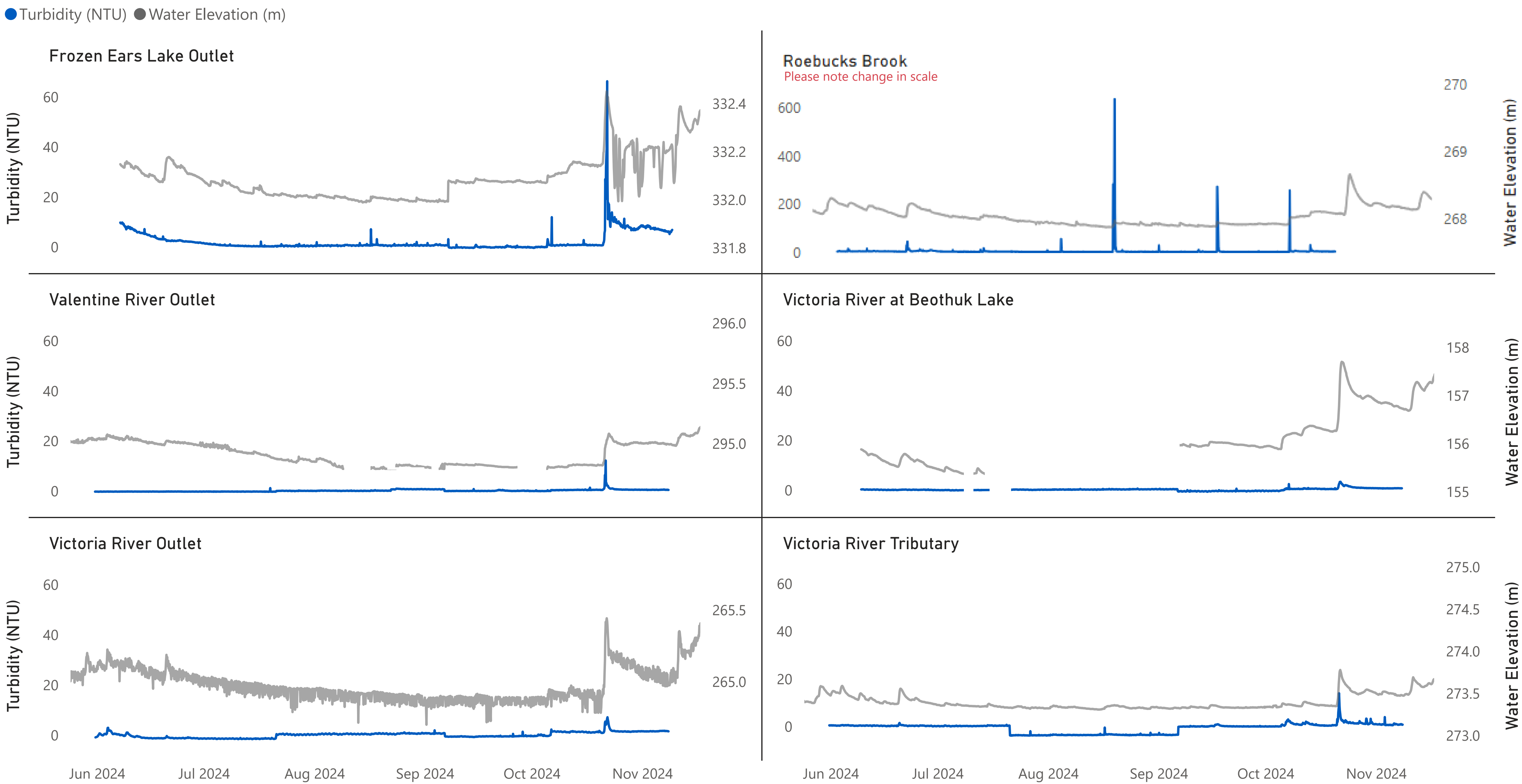
Annual Turbidity Statistics (NTU)

Station Name	Minimum	Maximum	Average	Median
Frozen Ears Lake Outlet	-0.41	66.28	2.11	0.69
Roebucks Brook	0.12	637.68	3.53	0.95
Valentine River Outlet	-0.35	40.36	0.13	0.02
Victoria River at Beothuk Lake	-0.64	4.72	0.27	0.25
Victoria River Outlet	-1.64	7.10	0.07	0.21
Victoria River Tributary	-3.79	14.31	-0.63	0.22

Turbidity, a measure of the cloudiness or clarity of water, can be a key indicator of water quality and overall ecosystem health. High turbidity levels can reduce light penetration for aquatic plants, disrupt benthic habitats and potentially harm fish gills or damage monitoring equipment. Turbidity often increases during precipitation events as runoff carries silt and debris into the waterbody. Negative turbidity values occur when the water being measured has lower turbidity than the zero standards used during calibration. While these values are inaccurate, they were retained in the dataset to observe trends and explore the relationship between turbidity, water elevation, and other parameters. Reducing the occurrence of negative turbidity readings will be a focus during the 2025 field season.

Throughout the 2024 deployment season, turbidity levels at all six monitoring stations remained consistently low and stable. Median values were below 1 NTU at each site, reflecting clear water conditions. These medians were comparable across stations, with only brief and occasional turbidity spikes, typically coinciding with increases in water elevation following precipitation events. Roebucks Brook exhibited higher turbidity values and more frequent spikes compared to other sites, with the highest recorded levels in the dataset. This pattern is likely attributed to its downstream location from a gravel access road, where rainfall events generate silt-laden runoff that temporarily elevates turbidity. In most cases, turbidity levels returned to background conditions within days to weeks after each precipitation event.

Turbidity Station Graphs



Surface Water Elevation

Newfoundland Labrador

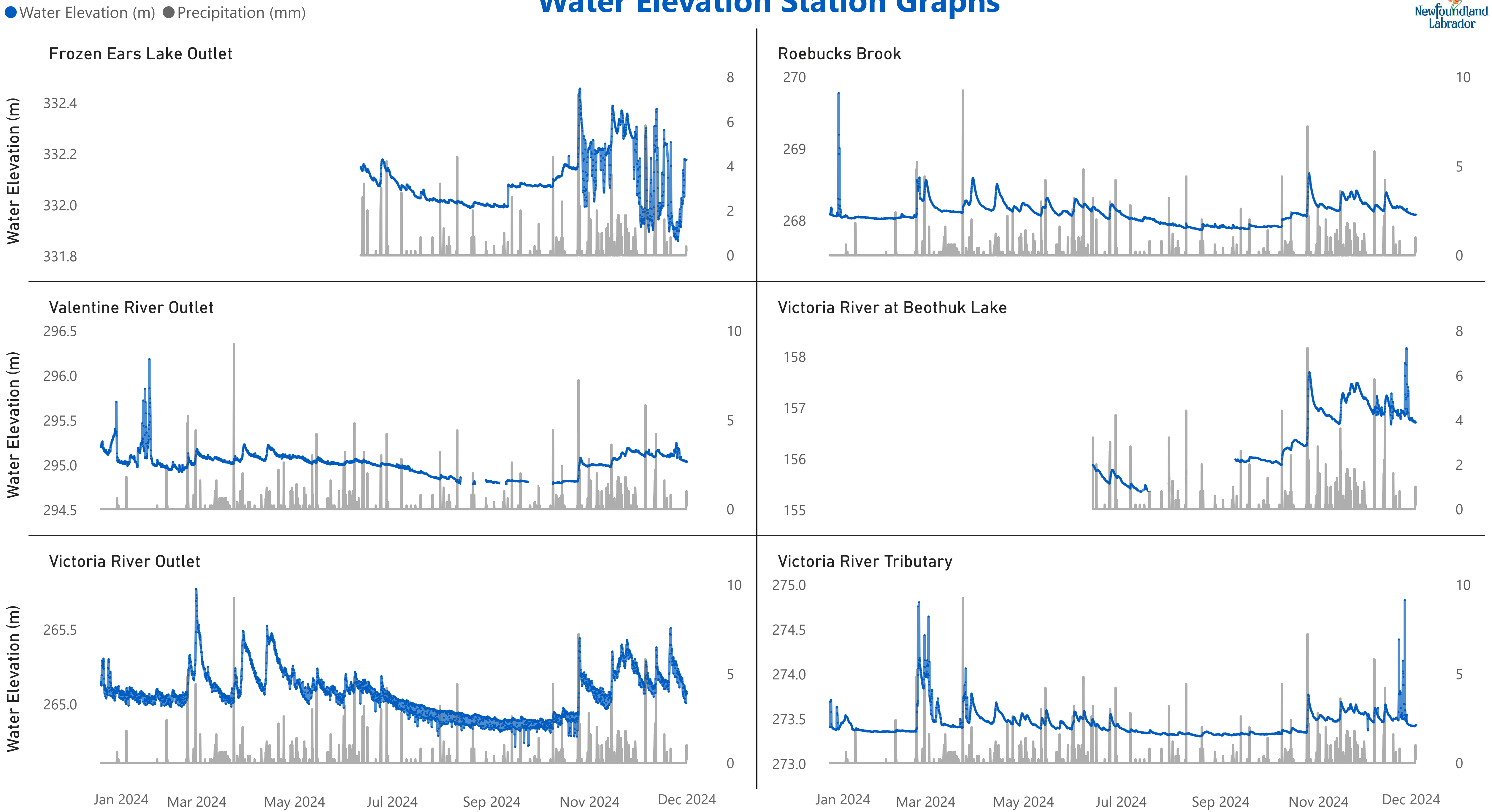
Annual Water Elevation Statistics (m)					
Station Name	**Minimum**	**Maximum**	**Range**	**Average**	**Median**
Frozen Ears Lake Outlet	**331.86**	**332.47**	**0.61**	**332.09**	**332.07**
Roebucks Brook	**267.87**	**269.98**	**2.11**	**268.10**	**268.10**
Valentine River Outlet	**294.79**	**296.23**	**1.44**	**295.00**	**295.02**
Victoria River at Beothuk Lake	**155.36**	**158.23**	**2.87**	**156.42**	**156.32**
Victoria River Outlet	**264.70**	**265.77**	**1.07**	**265.07**	**265.07**
Victoria River Tributary	**273.31**	**275.04**	**1.73**	**273.45**	**273.42**

Water elevation provides an estimate of the water level at a monitoring station and plays a vital role in analyzing trends in water quality data, particularly for parameters such as specific conductivity, pH, and turbidity. Water elevation generally rises during precipitation events as rainwater and runoff enter the water column. . By monitoring water elevation alongside rainfall data, we gain clearer insight into whether changes are driven by natural precipitation or potential industrial influences, and how these shifts may affect overall water quality. Precipitation data was obtained from the Calibre Mining (Marathon Gold) meteorological (MET) station, which is located on-site and maintained collaboratively by WRMD and Calibre Mining.

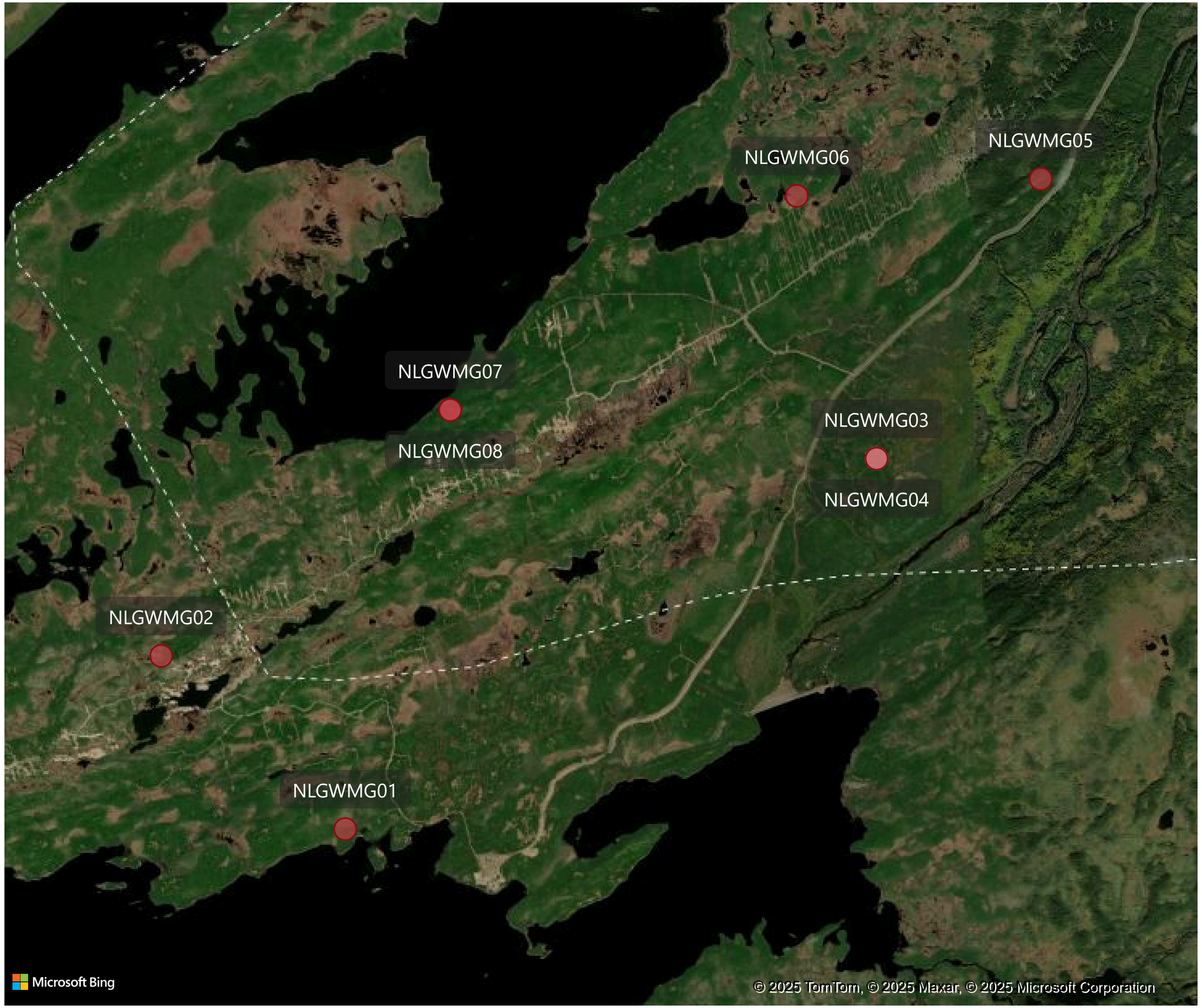
The graphs on the following page show water elevation data from January 1st to December 31st, 2024. Frozen Ears Lake Outlet and Victoria River at Beothuk Lake were newly installed stations in June 2024, thus there is no data for the first half of the year. Water elevation at all six stations varied throughout the year. A slight decline was observed during the summer months, likely due to unusually high air temperatures and limited rainfall. The lowest water levels were recorded by mid-to-late September, followed by a gradual increase and greater fluctuations from October onward as precipitation events became more frequent. The station graphs on the following page illustrate how precipitation events influenced water elevation, with clear spikes in elevation occurring during or shortly after rainfall.

Water elevation at Victoria River Outlet fluctuates more frequently due to an upstream dam where flow is regulated. Due to exceptionally low water levels, the hydrometric plate was exposed at two stations throughout the summer, resulting in a loss of data for that period. Missing data can be noted at Valentine River Outlet in August and October, and at Victoria River at Beothuk Lake from late June to early September. To prevent future data loss, the hydrometric plate at Victoria River at Beothuk Lake was relocated to a deeper part of the river.

Water Elevation Station Graphs



Calibre Mining: Groundwater Monitoring Wells



Calibre Mining's real-time monitoring network includes eight groundwater monitoring wells located across the site. These wells play a critical role in environmental management by enabling early detection of potential contamination, providing insight into groundwater flow patterns and water levels, and supporting regulatory compliance. The integration of real-time monitoring allows for rapid response and early mitigation in the event of any contamination concerns.

Two stations - Southeast of TMF (Tailings Management Facility) and Berry Pit - are equipped with both shallow and deep groundwater monitoring wells. This setup is beneficial as it provides a more comprehensive understanding of vertical groundwater conditions, enables earlier detection of potential contamination in the shallow zones, and helps evaluate the effectiveness of mitigation measures at different depths.

Northwest of Leprechaun Pit, South of Leprechaun Waste Rock Pile, and Southeast of TMF (deep and shallow) were all installed in 2023. South of Marathon Waste Rock Pile (East) and Southwest of Marathon Pit were installed in June 2024. Berry Pit (deep and shallow) was installed November 2024. Please refer to Appendix I for full site descriptions.

Station #	Station Name	Latitude	Longitude
NLGWMG01	South of Leprechaun Waste Rock Pile Monitoring Well	48.347240	-57.166490
NLGWMG02	Northwest of Leprechaun Pit Monitoring Well	48.359530	-57.186130
NLGWMG03	Southeast of TMF Monitoring Well (Deep)	48.373520	-57.109760
NLGWMG04	Southeast of TMF Monitoring Well (Shallow)	48.373520	-57.109760
NLGWMG05	South of Marathon Waste Rock Pile (East)	48.393358	-57.092236
NLGWMG06	Southwest of Marathon Pit - Monitoring Well	48.392156	-57.118278
NLGWMG07	Berry Pit Monitoring Well (Shallow)	48.376972	-57.155272
NLGWMG08	Berry Pit Monitoring Well (Deep)	48.376972	-57.155272

Groundwater - Temperature

Annual Groundwater Temperature Statistics (°C)

Station Name	Minimum	Maximum	Average	Median
Berry Pit Monitoring Well (Deep)*	5.30	5.34	5.32	5.32
Berry Pit Monitoring Well (Shallow)*	5.92	7.30	6.57	6.61
Northwest of Leprechaun Pit Monitoring Well	4.00	8.65	5.84	5.84
South of Leprechaun Waste Rock Pile Monitoring Well	5.08	8.13	6.25	6.18
South of Marathon Waste Rock Pile (East)	5.36	6.40	5.59	5.53
Southeast of TMF Monitoring Well (Deep)	5.23	5.86	5.34	5.35
Southeast of TMF Monitoring Well (Shallow)	4.52	8.56	6.19	6.04
Southwest of Marathon Pit - Monitoring Well	5.42	8.67	6.55	6.73

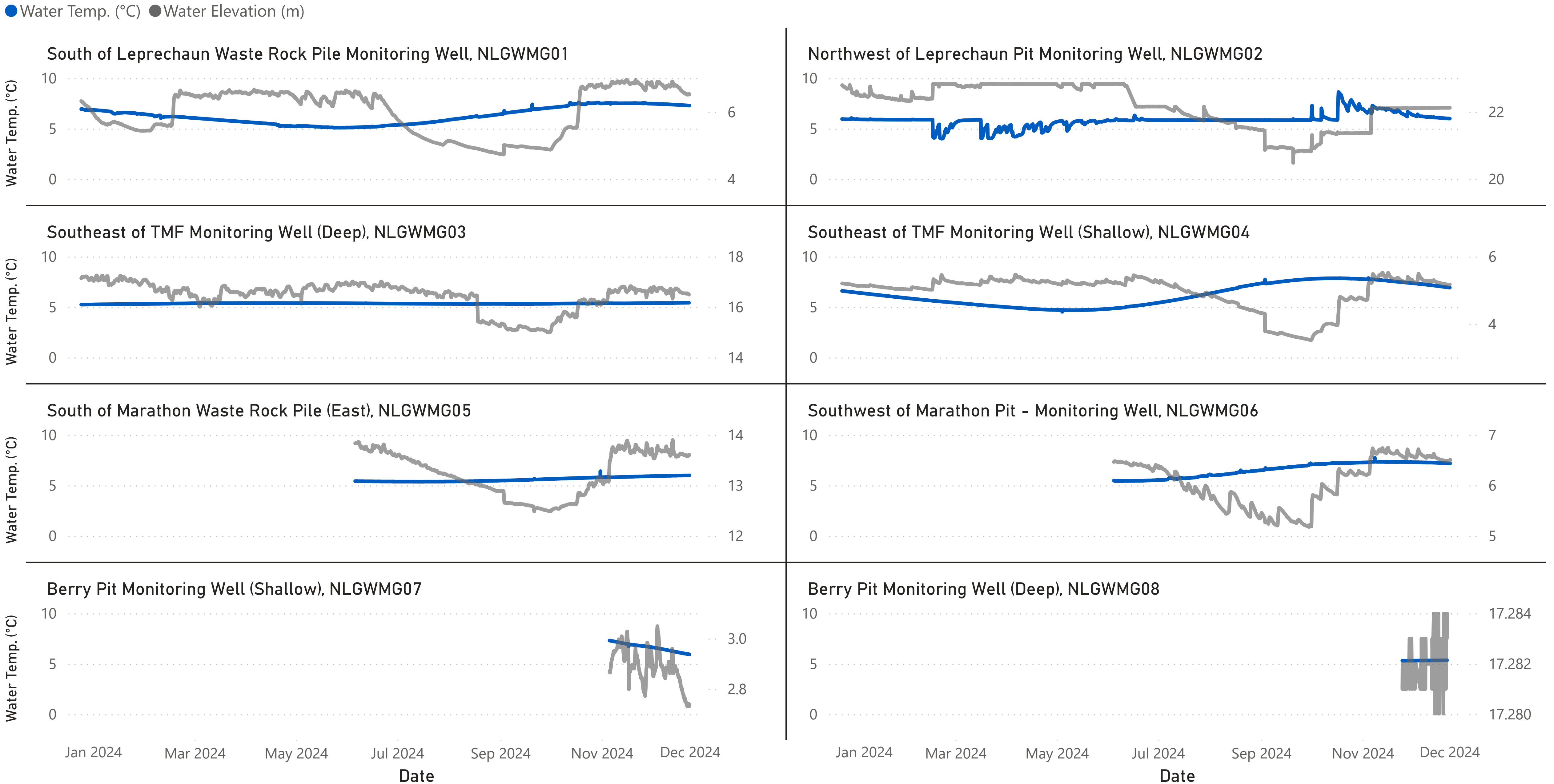
* Limited data (Nov-Dec)

Groundwater temperature is typically stable and consistent, as it is generally unaffected by external environmental factors. However, monitoring groundwater temperature is important, as even small variations can have significant impacts on biological, chemical, and physical processes.

At most of the groundwater monitoring wells, temperatures remained stable throughout the year. Generally, the lowest temperatures were observed during late-spring, with a slight increase noted in the late-summer to fall. This is because groundwater temperature typically lags behind surface air temperature, as soil and rock act as natural insulators, slowing the transfer of heat. These seasonal variations were more noticeable at shallow wells, such as South of Leprechaun Waste Rock Pile and Southeast of TMF (shallow), where groundwater flow is more dynamic and more easily influenced by surface conditions. In contrast, deeper wells, such as Southeast of TMF (deep), demonstrated more consistent temperatures. Northwest of Leprechaun Pit monitoring well did experience some increased fluctuation in the Spring and Fall but was still generally stable.

Groundwater - Water Temperature Graphs

Temperature (°C) and Water Elevation (m)



Groundwater -pH

Annual pH Statistics (pH Units)

Station Name	Minimum	Maximum	Average	Median
Berry Pit Monitoring Well (Deep) *	7.79	7.86	7.83	7.83
Berry Pit Monitoring Well (Shallow) *	7.64	7.92	7.88	7.88
Northwest of Leprechaun Pit Monitoring Well	5.31	7.24	6.20	6.16
South of Leprechaun Waste Rock Pile Monitoring Well	5.16	8.19	6.26	5.96
South of Marathon Waste Rock Pile (East)	7.33	7.72	7.65	7.65
Southeast of TMF Monitoring Well (Deep)	7.33	7.72	7.61	7.64
Southeast of TMF Monitoring Well (Shallow)	6.13	7.66	7.38	7.48
Southwest of Marathon Pit - Monitoring Well	6.72	8.13	7.50	7.41

* Limited data (Nov-Dec)

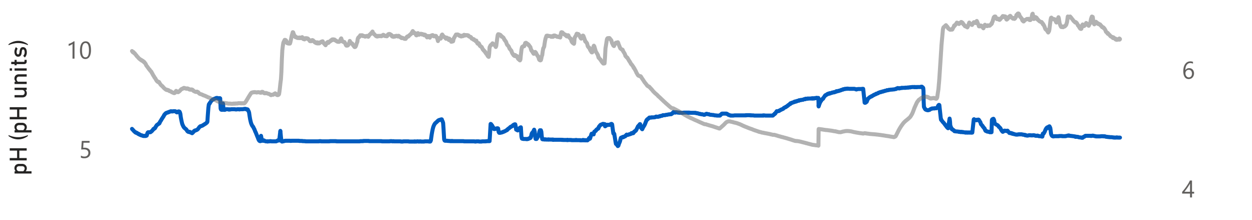
pH is a measure of acidity that reflects the concentration of free hydrogen ions in water. It plays a key role in determining the mobility of heavy metals and other contaminants in groundwater. When pH levels become too acidic or too alkaline, harmful substances can dissolve more easily and migrate through groundwater channels, potentially impacting nearby ecosystems. Regular monitoring of pH in groundwater wells is important for detecting early signs of contamination or geochemical shifts, and for maintaining compliance with environmental regulations.

Throughout the annual deployment, pH levels in most groundwater wells remained stable and consistent. pH levels showed greater variability and are naturally more acidic at South of Leprechaun Waste Rock Pile and Northwest of Leprechaun Pit. At these two locations, pH levels slightly increased during the summer when water levels dropped—likely due to reduced groundwater recharge—and began decreasing again in the fall as groundwater levels recovered. At Southeast of TMF (shallow) station, small pH dips were occasionally observed. These dips often aligned with changes in water elevation and were likely caused by well purging during sample collection, which can stir up sediment and introduce fresh recharge water with different chemical properties.

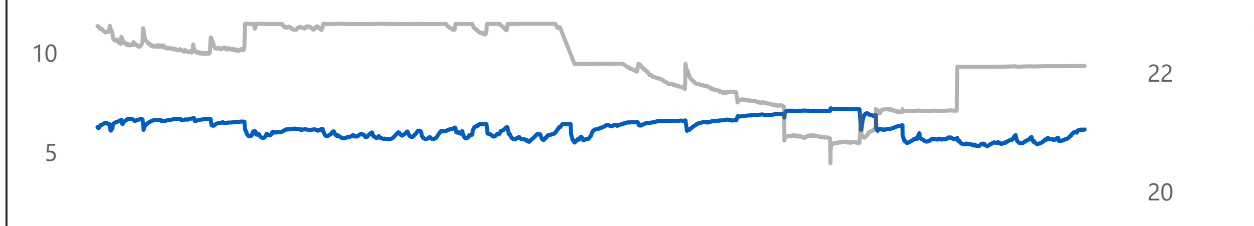
Groundwater - pH Station Graphs

● pH (pH units) ● Water Elevation (m)

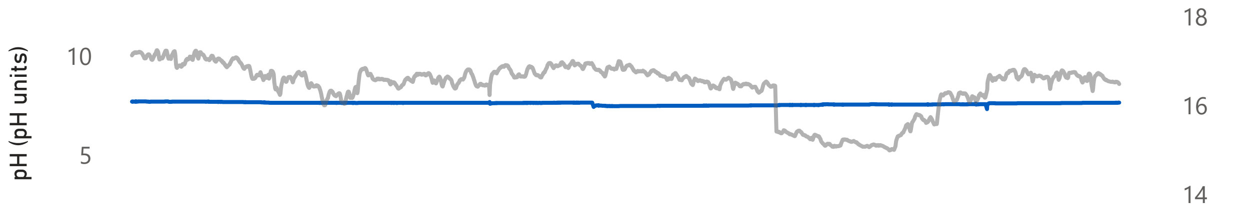
NLGWMG01, South of Leprechaun Waste Rock Pile Monitoring Well



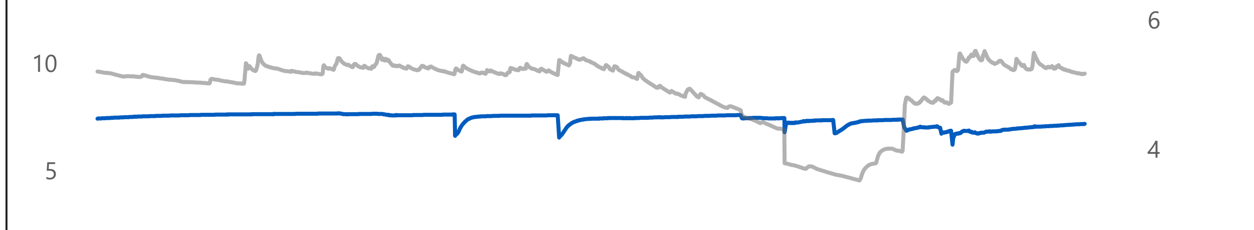
NLGWMG02, Northwest of Leprechaun Pit Monitoring Well



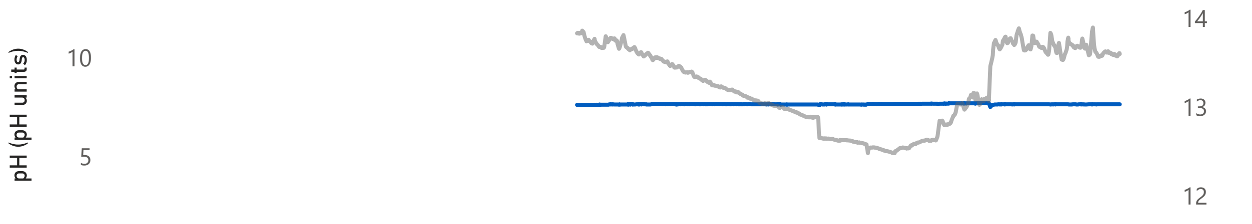
NLGWMG03, Southeast of TMF Monitoring Well (Deep)



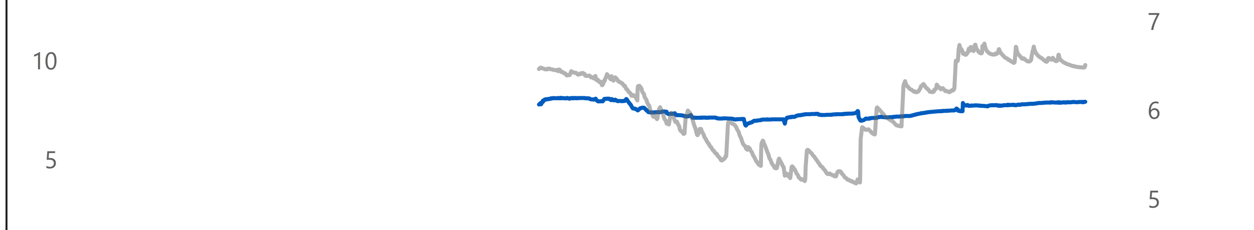
NLGWMG04, Southeast of TMF Monitoring Well (Shallow)



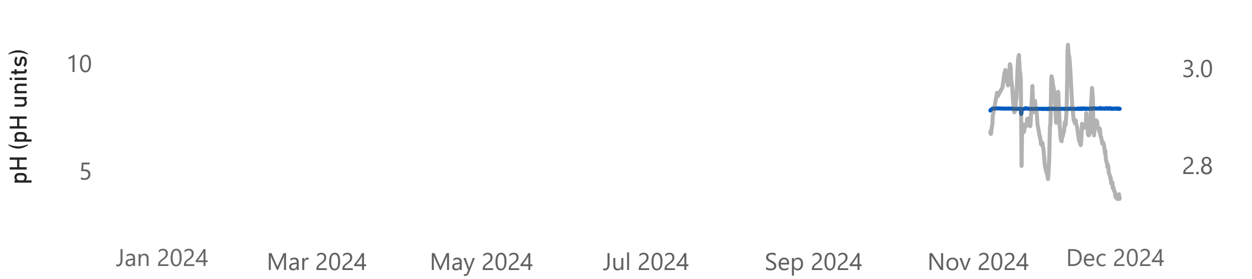
NLGWMG05, South of Marathon Waste Rock Pile (East)



NLGWMG06, Southwest of Marathon Pit - Monitoring Well



NLGWMG07, Berry Pit Monitoring Well (Shallow)



NLGWMG08, Berry Pit Monitoring Well (Deep)

Groundwater - Specific Conductivity

Newfoundland Labrador

Annual Specific Conductivity Statistics (µS/cm)

Station Name	Minimum	Maximum	Average	Median
Berry Pit Monitoring Well (Deep) *	229.07	231.18	230.20	230.30
Berry Pit Monitoring Well (Shallow)*	228.73	253.75	233.69	233.37
Northwest of Leprechaun Pit Monitoring Well	12.54	281.78	95.63	60.62
South of Leprechaun Waste Rock Pile Monitoring Well	32.25	217.37	104.30	77.92
South of Marathon Waste Rock Pile (East)	289.25	318.23	306.41	305.96
Southeast of TMF Monitoring Well (Deep)	255.02	288.81	268.28	264.70
Southeast of TMF Monitoring Well (Shallow)	132.09	314.10	256.07	261.87
Southwest of Marathon Pit - Monitoring Well	157.49	655.13	332.73	314.54

* Limited data (Nov-Dec)

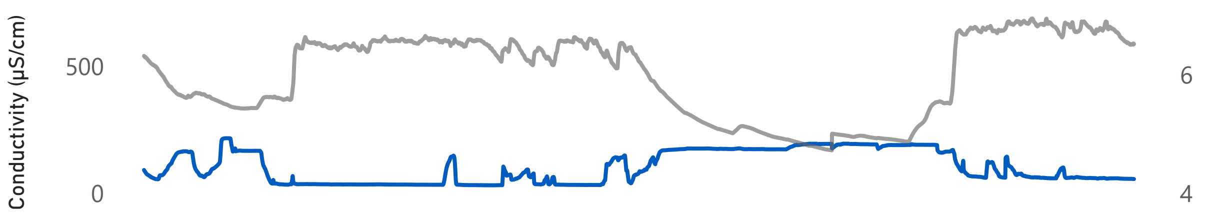
Specific conductivity is a common indicator of the concentration of dissolved ions in water, such as salts, acids, and bases. Higher concentrations of dissolved ions result in higher specific conductivity, while pure water exhibits low conductivity. An increase in specific conductivity could indicate the mobilization of metals or other dissolved solids from mining activities into the groundwater system. Monitoring conductivity, especially through real-time data collection, enables quick detection of these changes, allowing for timely investigation and early mitigation to protect surrounding ecosystems and water resources.

Specific conductivity at Southeast of TMF (shallow and deep) and South of Marathon Waste Rock Pile remained stable and consistent throughout 2024. Minor dips at Southeast of TMF (shallow) often coincide with water level changes and are likely associated with well purging activities to collect grab samples and switch-out the instrument. Conductivity at South of Leprechaun Waste Rock Pile, Northwest of Leprechaun Pit and Southwest of Marathon Pit showed more variability and experienced more frequent fluctuations, though values generally remained low to moderate. Fluctuations can be attributed to changes in water level in the monitoring well. Northwest of Leprechaun Pit and South of Leprechaun Waste Rock Pile conductivity values exhibited a gradual increase over the summer, corresponding with steadily declining water levels due to reduced groundwater recharge. This trend reflects higher dissolved ion concentrations as aquifer water levels decreased and became less diluted. At Southwest of Marathon Pit, conductivity spiked sharply before gradually declining through the summer and fall. The Berry Pit wells (both shallow and deep) showed steady and consistent conductivity throughout their shorter 2024 deployment period. Medians at all stations are comparable except for Northwest of Leprechaun Pit and South of Leprechaun Waste Rock Pile where conductivity is lower.

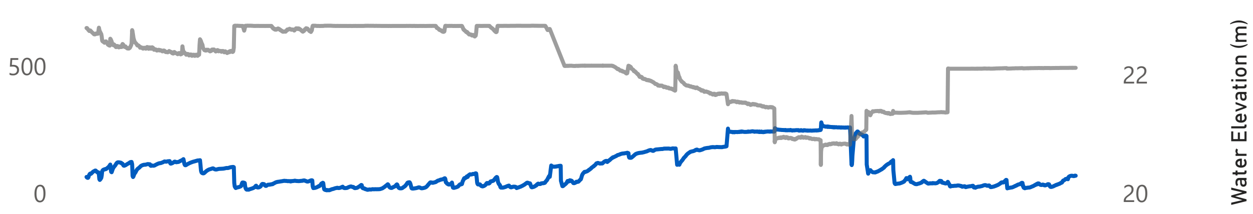
Groundwater - Specific Conductivity Station Graphs

Conductivity (µS/cm) Water Elevation (m)

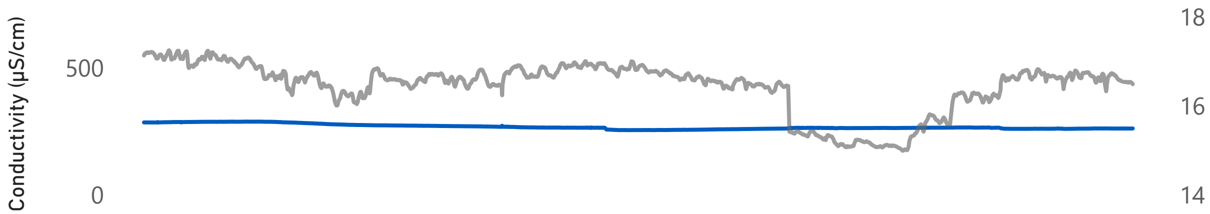
NLGWMG01, South of Leprechaun Waste Rock Pile Monitoring Well



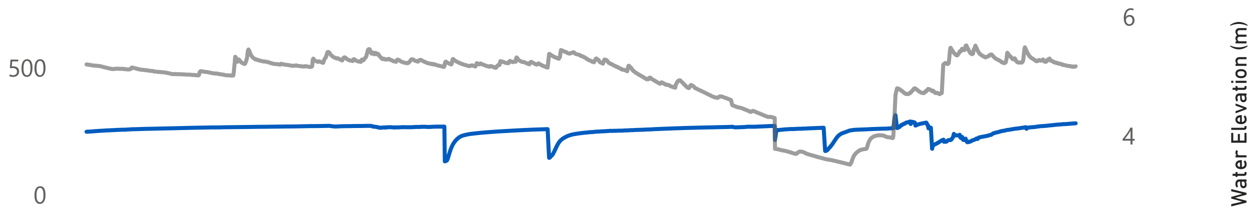
NLGWMG02, Northwest of Leprechaun Pit Monitoring Well



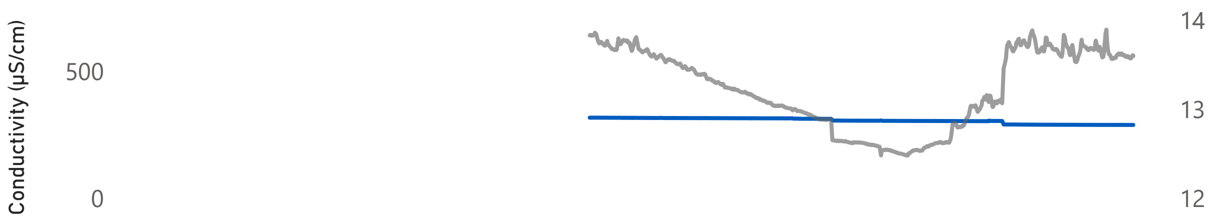
NLGWMG03, Southeast of TMF Monitoring Well (Deep)



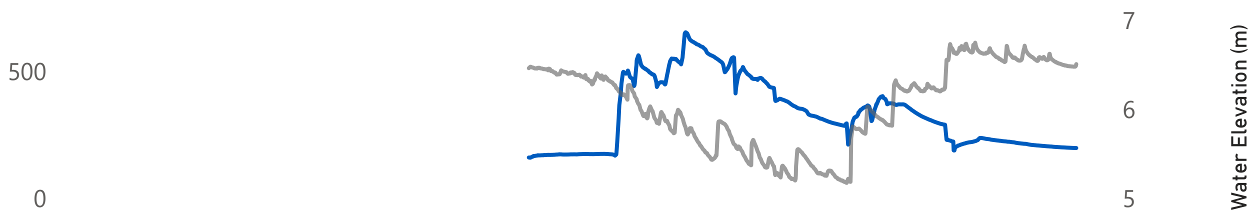
NLGWMG04, Southeast of TMF Monitoring Well (Shallow)



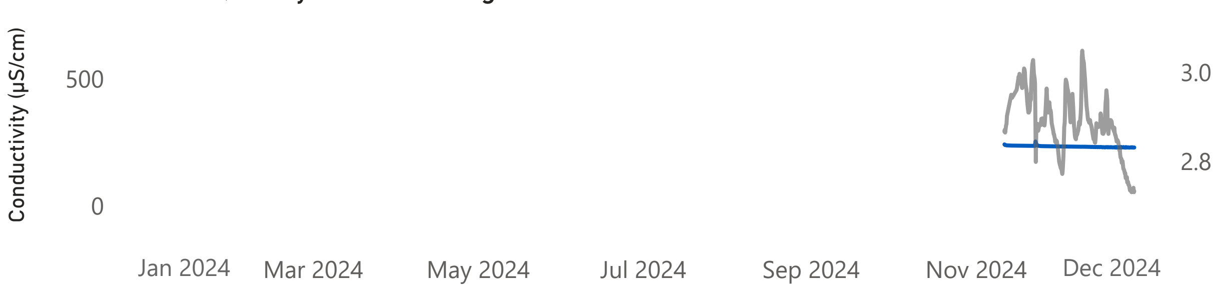
NLGWMG05, South of Marathon Waste Rock Pile (East)



NLGWMG06, Southwest of Marathon Pit - Monitoring Well



NLGWMG07, Berry Pit Monitoring Well (Shallow)



NLGWMG08, Berry Pit Monitoring Well (Deep)

Groundwater - Oxidation-Reduction Potential (ORP)

Newfoundland Labrador

Annual ORP Statistics (mV)

Station Name	Minimum	Maximum	Average	Median
Berry Pit Monitoring Well (Deep)*	204.90	247.20	225.30	222.90
Berry Pit Monitoring Well (Shallow)*	-53.30	262.90	60.83	62.25
Northwest of Leprechaun Pit Monitoring Well	-105.60	991.60	294.90	341.30
South of Leprechaun Waste Rock Pile Monitoring Well	-478.90	441.50	25.59	73.40
South of Marathon Waste Rock Pile (East)	-252.96	130.43	-70.00	-87.70
Southeast of TMF Monitoring Well (Deep)	-438.90	81.40	-182.11	-182.10
Southeast of TMF Monitoring Well (Shallow)	-447.60	489.80	-89.00	-216.70
Southwest of Marathon Pit - Monitoring Well	-515.53	63.70	-338.89	-412.88

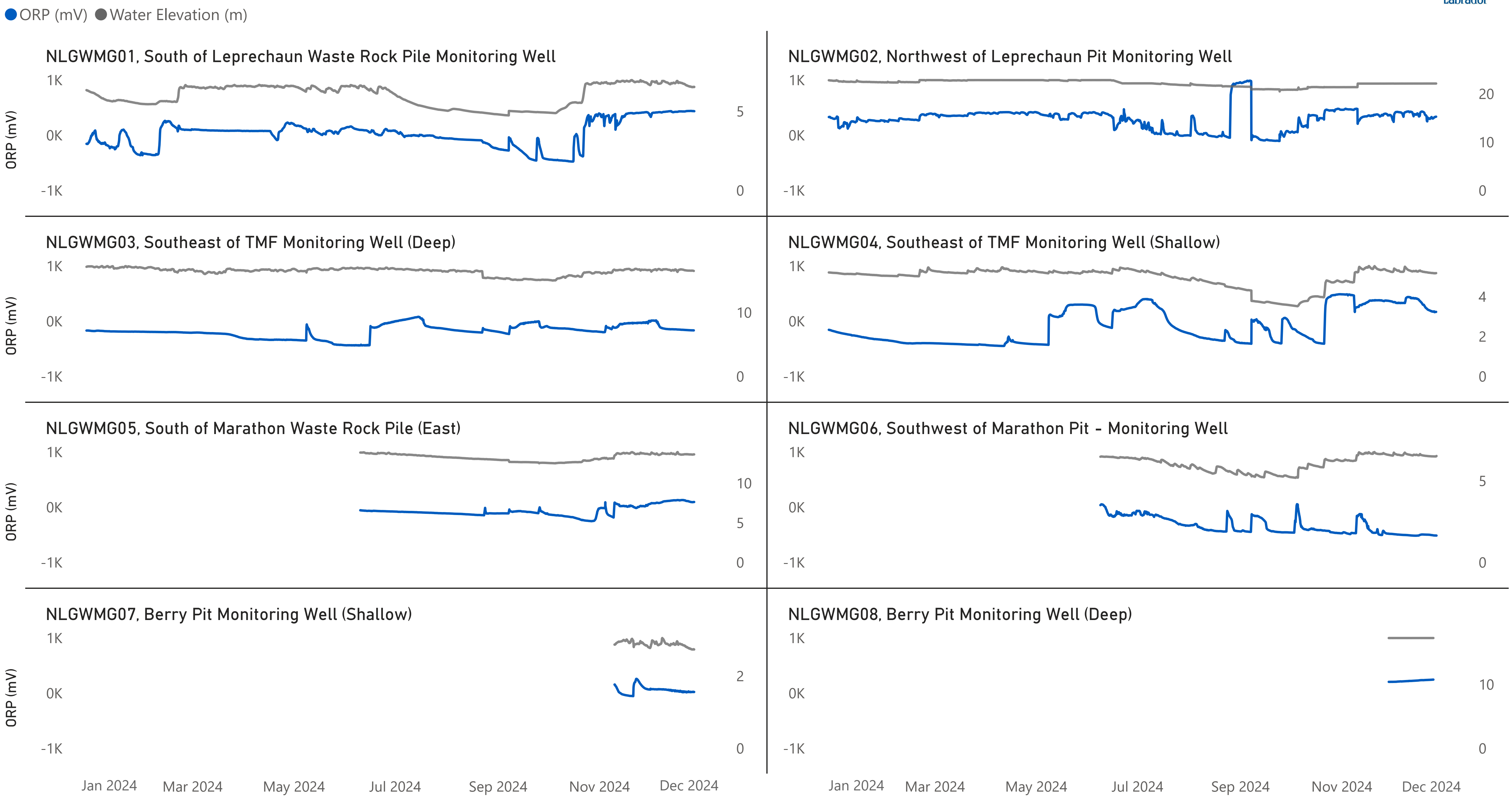
*Limited Data: Nov - Dec

Oxidation-reduction potential (ORP) measures how readily a solution can gain (reduction) or lose (oxidation) electrons. In groundwater systems, ORP is directly linked to the mobility of potential contaminants, as redox conditions control the chemical form, solubility, and behavior of many chemical constituents, including metals. Tracking ORP trends provides valuable insight into shifts in groundwater chemistry and helps detect early signs of environmental changes.

ORP trends across the groundwater monitoring wells show notable variability between locations. The deeper monitoring wells exhibited generally stable and near neutral conditions, like Southeast of TMF (deep), South of Marathon Waste Rock Pile, and Berry Pit (deep). More shallow wells, like Southeast of TMF (shallow) and South of Leprechaun Waste Rock Pile display greater fluctuations. The greater variability in the shallow wells is due to shallow groundwater systems being more directly influenced by surface processes like recharge events. Recharge events - such as heavy rainfall, snowmelt, or seasonal groundwater inputs - introduce oxygen-rich water into groundwater systems. This influx of dissolved oxygen can shift local redox conditions toward a more oxidizing environment, resulting in elevated ORP values. Often ORP shifts can also be related to purging the well which disturbs the water column, and introduces fresh water into the well. ORP can takes days to weeks for values to stabilize.

Groundwater - ORP Station Graphs

Newfoundland Labrador



Groundwater Elevation

Newfoundland Labrador

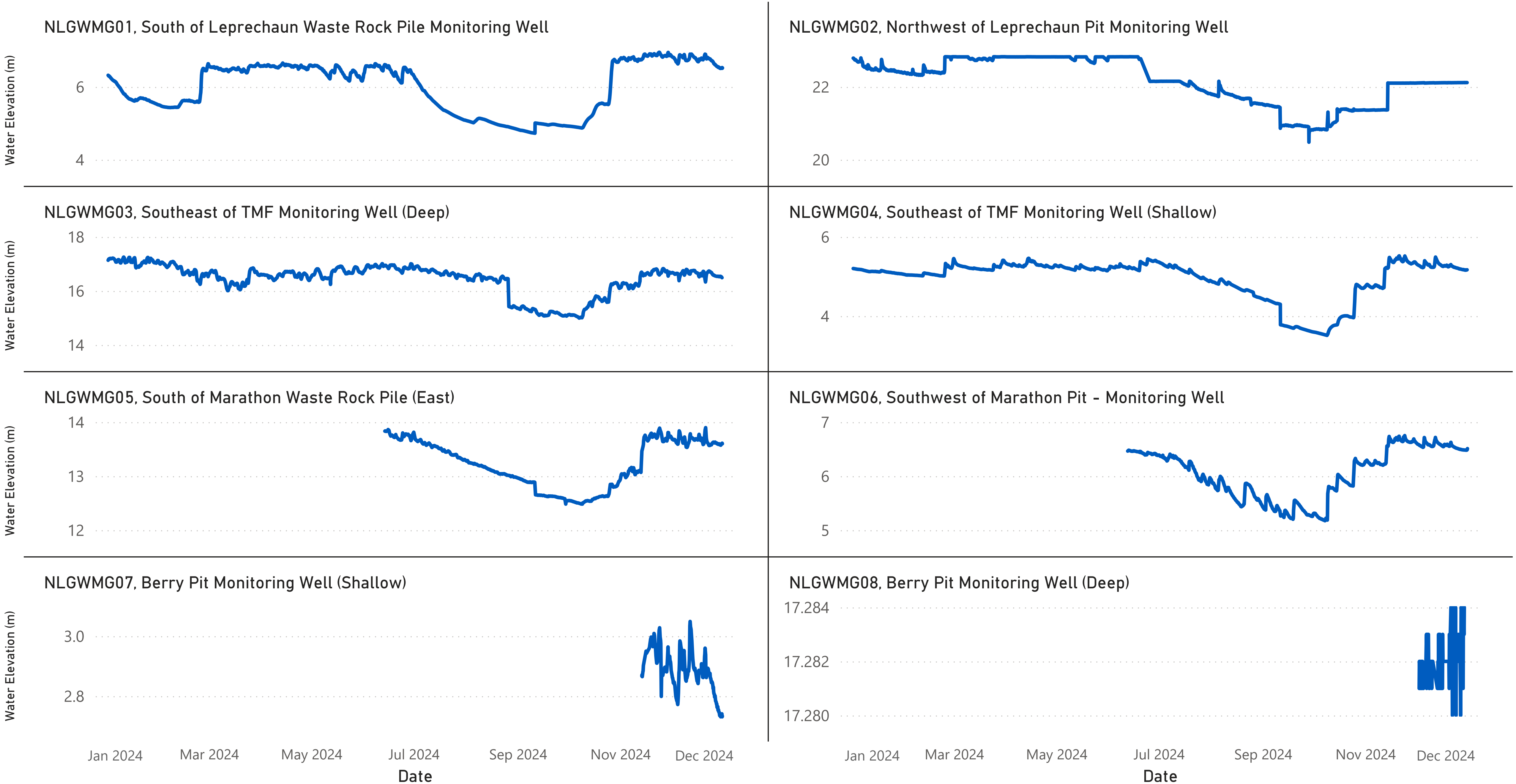
Groundwater Level - Deployment Period Statistics (m)					
Station Name	**Minimum**	**Maximum**	**Range**	**Average**	**Median**
Berry Pit Monitoring Well (Deep)	**17.28**	**17.28**	**0.00**	**17.28**	**17.28**
Berry Pit Monitoring Well (Shallow)	**2.63**	**3.06**	**0.43**	**2.88**	**2.88**
Northwest of Leprechaun Pit Monitoring Well	**20.48**	**22.83**	**2.35**	**22.16**	**22.15**
South of Leprechaun Waste Rock Pile Monitoring Well	**4.73**	**6.95**	**2.22**	**5.99**	**6.28**
South of Marathon Waste Rock Pile (East)	**12.48**	**13.91**	**1.42**	**13.23**	**13.23**
Southeast of TMF Monitoring Well (Deep)	**14.19**	**17.27**	**3.08**	**16.44**	**16.62**
Southeast of TMF Monitoring Well (Shallow)	**3.51**	**5.52**	**2.01**	**4.95**	**5.17**
Southwest of Marathon Pit - Monitoring Well	**5.17**	**6.76**	**1.59**	**6.05**	**6.21**

Monitoring groundwater elevation, or water level, in wells at a gold mine site is crucial for protecting the environment and managing water resources effectively. Fluctuations in groundwater levels can reveal changes in natural flow patterns caused by mining activities such as pit dewatering, blasting, or waste rock placement, which may affect surrounding ecosystems and surface water bodies.

Throughout 2024, groundwater levels across the site remained relatively stable overall, with minor, frequent fluctuations. A notable decline occurred during the summer months, with the lowest levels recorded in late September to early October. This drop is likely the result of an unusually hot and dry summer, which reduced groundwater recharge from precipitation and contributed to regional declines in aquifer levels. In contrast, higher water levels were observed in the spring and fall, driven by increased recharge from rainfall and seasonal cycles. Sudden short-term drops in water level are likely linked to purging activities during groundwater sampling, which temporarily lowers the water level.

Groundwater Elevation Station Graphs

Water Elevation (m)



2024 Conclusions and 2025 Path Forward

Conclusions

- In 2024, water quality instruments were successfully deployed at all groundwater monitoring stations for the full calendar year, and at surface water stations from June through November.
- The RTWQ network was further expanded with the installation of six new monitoring stations: Frozen Ears Lake Outlet, Victoria River at Beothuk Lake, South of Marathon Pit (West) monitoring well, Southwest of Marathon Waste Rock Pile monitoring well and Berry Pit monitoring wells (deep and shallow).
- Groundwater monitoring was successful across all stations, with no major interruptions in data transmission. The data remained relatively stable and consistent across all parameters, with minor fluctuations attributed to routine well purging and seasonal hydrological variations.
- The station graphs for specific conductivity, pH, and ORP illustrate the value of having both shallow and deep wells at the same site. The deep well consistently displays stable readings with minimal fluctuations, indicating limited influence from surface conditions. In contrast, the shallow well exhibits greater variability, reflecting its increased sensitivity to external factors. This setup is beneficial for monitoring potential contaminants and assessing their mobility, as changes are likely to appear in the shallow well first. Early detection in the shallow zone enables quicker response and more effective management of potential water quality issues.
- Surface water temperatures followed expected seasonal patterns, increasing during the spring and summer and cooling in the fall. pH values remained within the CCME guidelines for the protection of aquatic life for most of the deployment period, with only brief and minor deviations. Turbidity levels remained low throughout the season, indicating clear water conditions. Natural fluctuations in water quality parameters were generally linked to weather-related events such as rainfall and evaporation.
- The RTWQ network experienced minimal disruptions overall. Roebucks Brook encountered a pH sensor failure during one deployment and power issues during another, resulting in temporary data loss.
- Hydrometric data was lost at several stations during the 2024 season due to exceptionally low water levels that exposed the hydrometric plates. This issue was resolved at Victoria River at Beothuk Lake in 2024. If similar conditions arise in 2025, plates at affected stations will be repositioned to deeper sections of the river to ensure continued data collection.

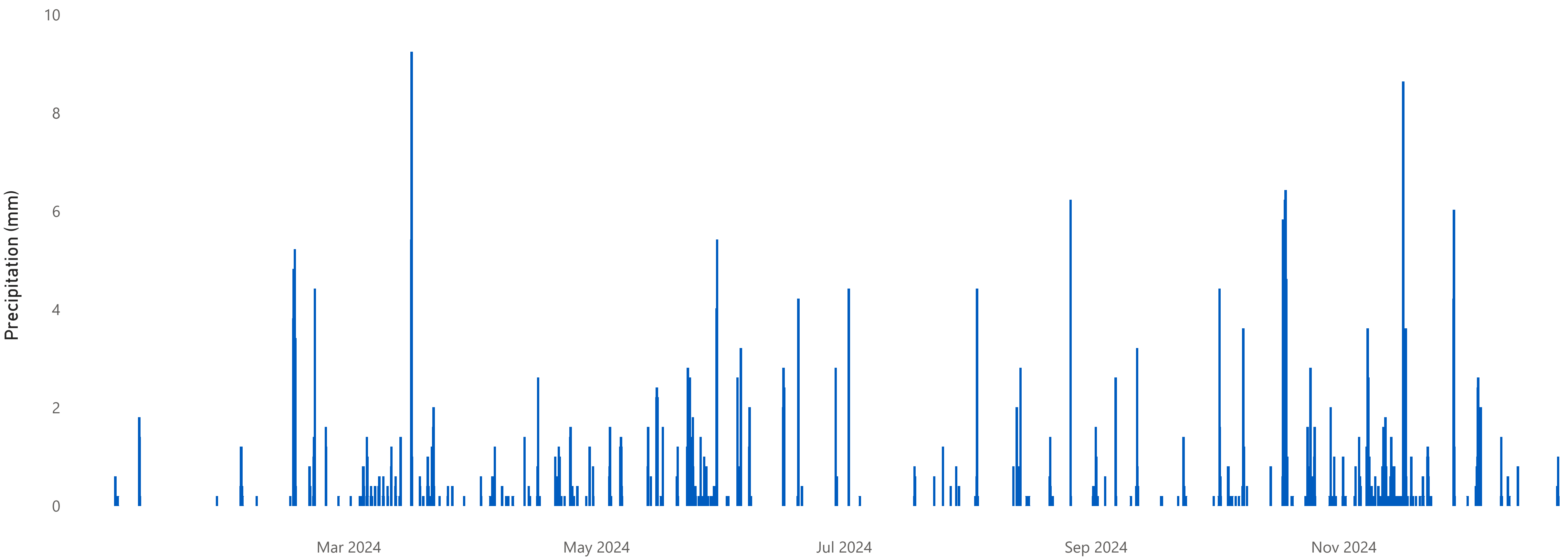
Path Forward

- The Water Resources Management Division (WRMD), in collaboration with Calibre Mining, will continue to operate and maintain the Real-Time Water Quality (RTWQ) network at the Valentine Gold Project. Routine instrument calibrations and regular maintenance will be conducted to ensure reliable operation and effective environmental monitoring. Site visits will occur every 4–6 weeks for surface water stations and every 10–12 weeks for groundwater stations.
- WRMD will investigate the cause of negative turbidity values experienced throughout 2024. New calibration practices will be adapted to try and mitigate negative values prior to and throughout the 2025 season.
- Frozen Ears Lake Outlet will be monitored in 2025 for high pH and dissolved oxygen fluctuations, which could potentially be linked to significant biological activity
- New QAQC procedures will be introduced for groundwater stations to improve comparison rankings upon deployment and removal.
- WRMD extends sincere thanks to the environmental team at Calibre Mining – Valentine Gold Mine for their continued support and collaboration in maintaining the RTWQ network and ensuring the success of this ongoing monitoring initiative.

2024 Precipitation Data

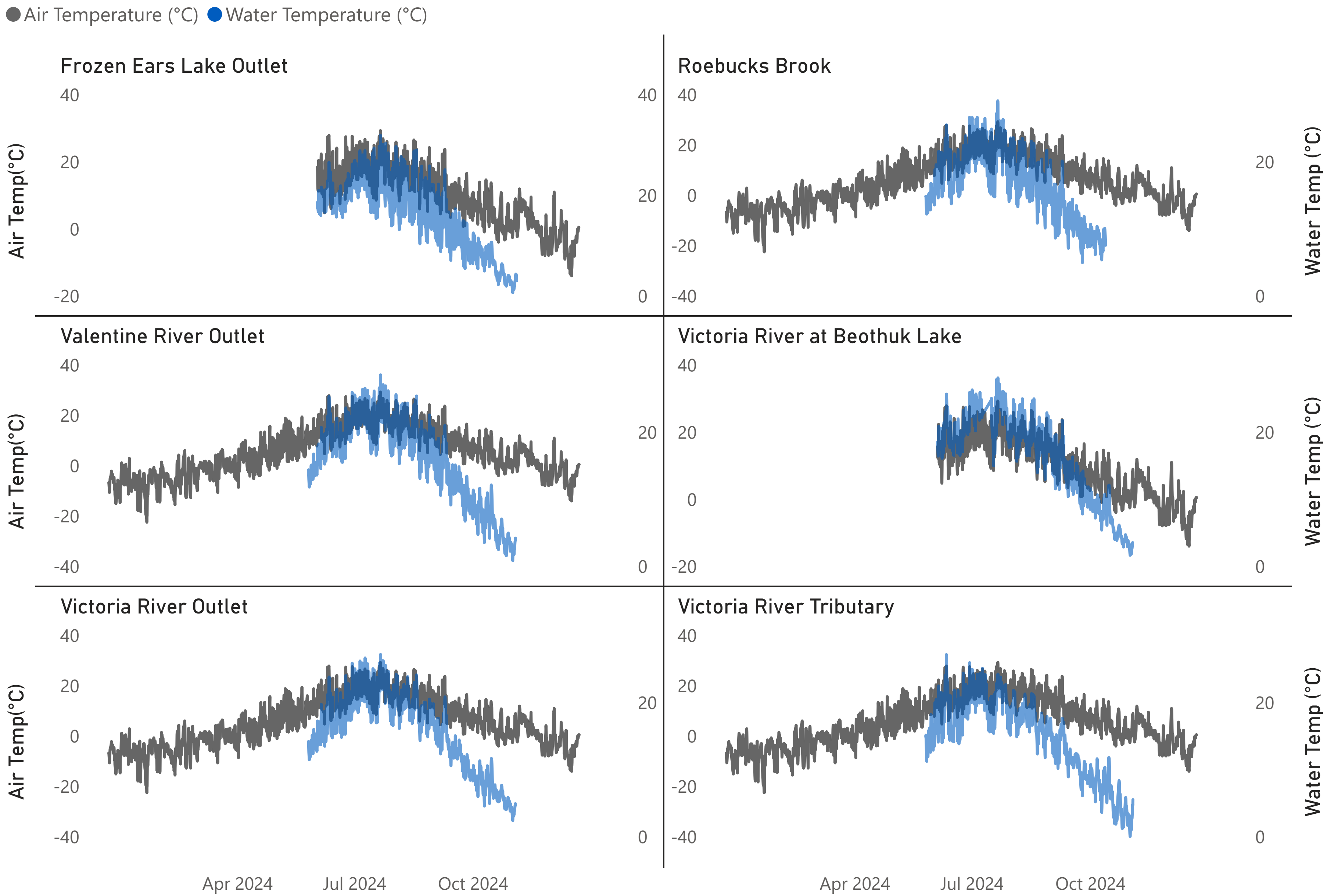
Retrieved from the Calibre Mining (Marathon Gold) MET Station

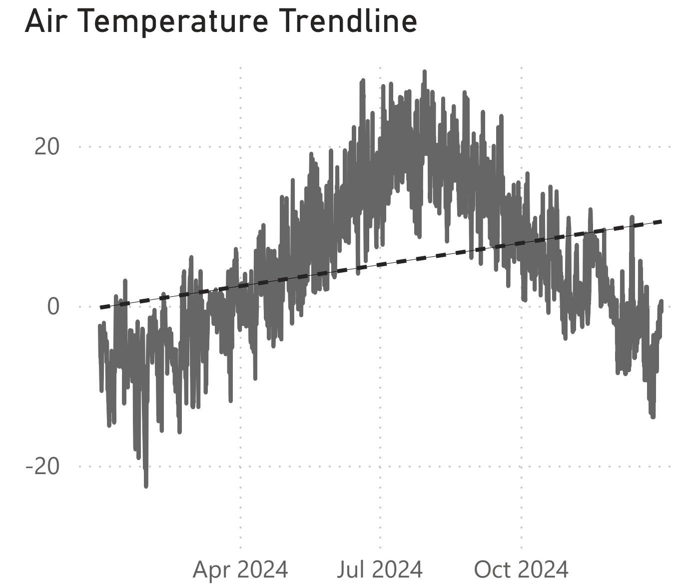
0.11	0.00	0.00	14.27	965.81
Average (mm/hr)	Minimum (mm/hr)	Median (mm/hr)	Maximum (mm/hr)	Total Precip. (mm)



2024 Air Temperature Data

Retrieved from the Calibre Mining (Marathon Gold) MET Station





5.90

Average (°C)

5.48

Median (°C)

-22.64

Minimum (°C)

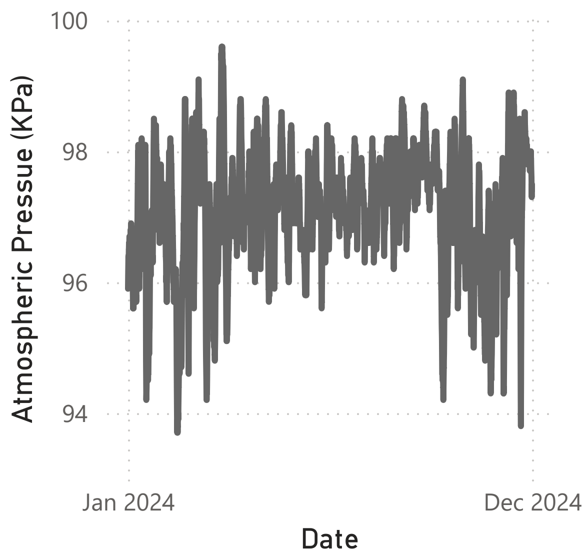
29.32

Maximum (°C)

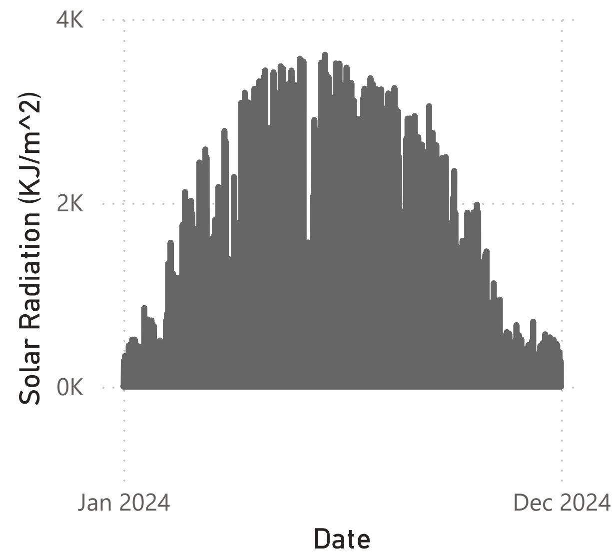
2024 Additional MET Data

Retrieved from the Calibre Mining (Marathon Gold) MET Station

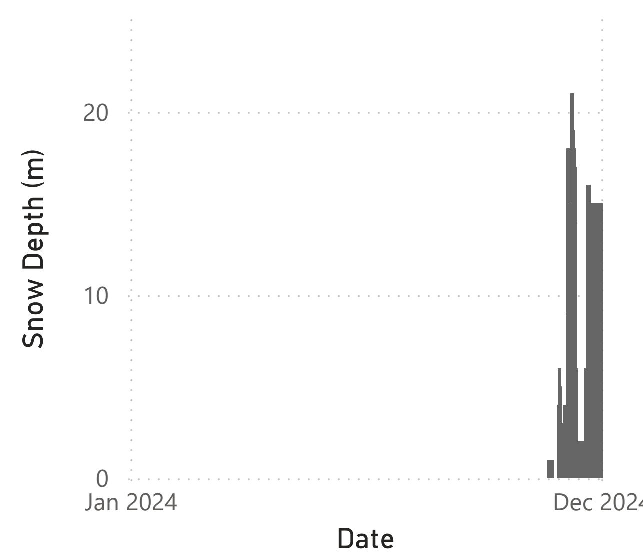
Atmospheric Pressue (KPa) by Date



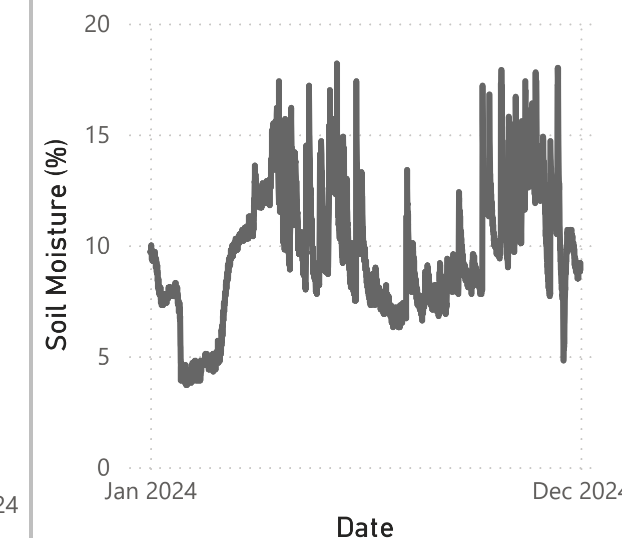
Solar Radiation (KJ/m^2) by Date



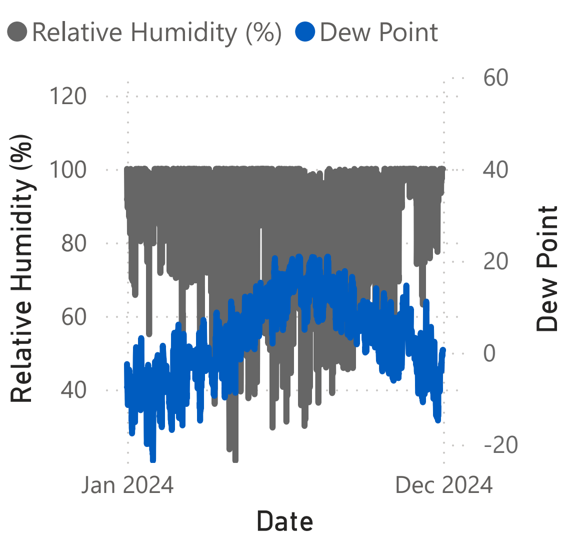
Snow Depth (m) by Date



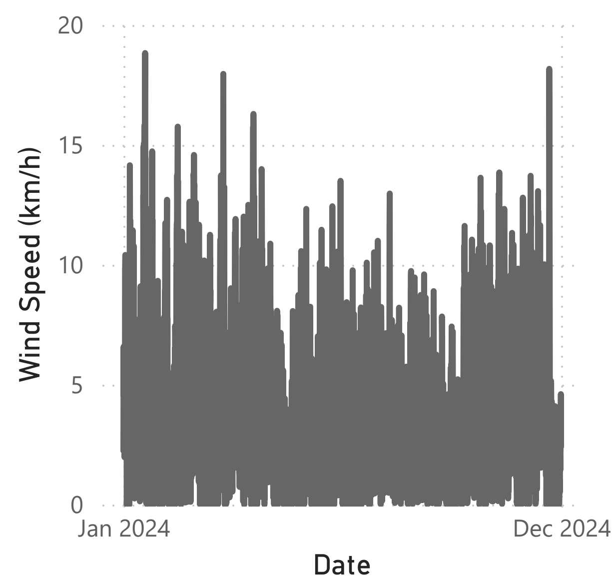
Soil Moisture (%) by Date



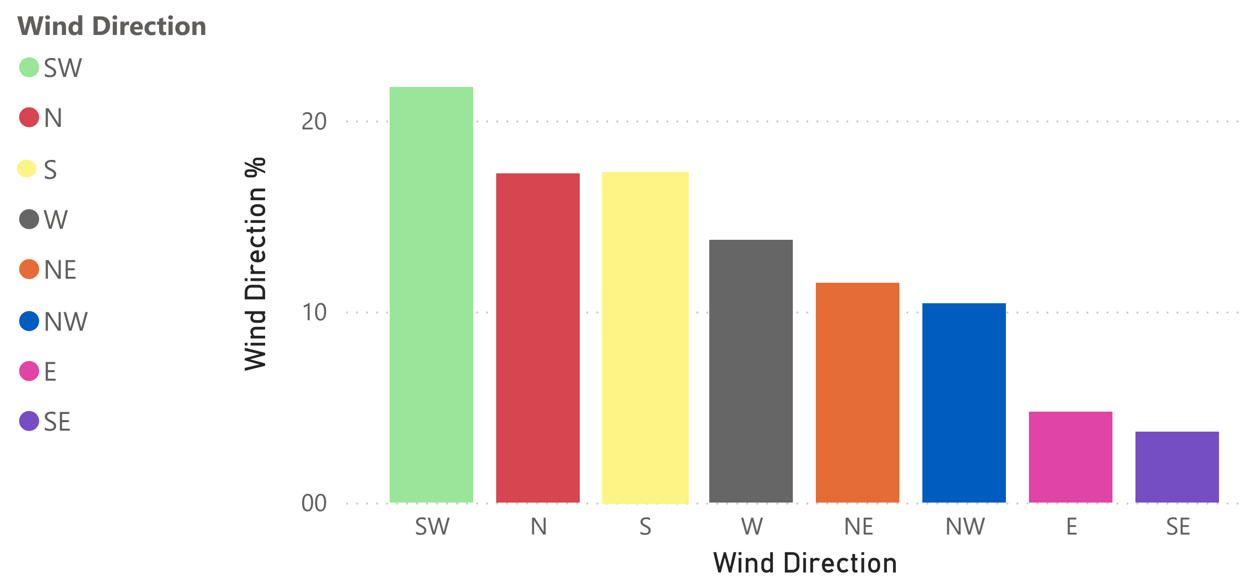
Relative Humidity (%) and Dew Point by Date



Wind Speed (km/h) by Date



2024 Wind Direction %



Appendix I
Site Descriptions

Victoria River Outlet Station

NF02YN0047

Station Location

Victoria River, 6.3 km downstream of Victoria Dam and situated below the quarry pit. The monitoring station is positioned on the western shoreline, accessible via an ATV trail leading down from the quarry. A large embankment lies adjacent to the station. The riverbed substrate consists mainly of soft mud and decaying organic matter. The sonde is deployed at an approximate depth of 0.75 meters, typically 3 to 5 meters from the shoreline

Valentine River Outlet Station
NF02YN0048

Station Location
Valentine River, 1.9 km downstream of the Valentine Lake outlet. The monitoring station is situated approximately 15 meters upstream of the access road crossing bridge, on the southern shoreline. The riverbed consists of bedrock, boulders, and gravel. The sonde is deployed at a depth of 0.10 to 0.25 meters, typically 1 to 5 meters from the shore.



Roebucks Brook Station

NF02YN0049

Station Location

Roebucks Brook, 1.6 km downstream of the Roebucks Lake outlet, with the monitoring station positioned 30 meters downstream of the access road bridge crossing on the western shoreline. The riverbed substrate is composed of boulders, pebbles, and gravel. The sonde is deployed at an approximate depth of 0.25 to 0.50 meters, typically 1 to 2 meters from the shoreline.

Victoria River Tributary
NF02YN0050

Station Location
Victoria River Tributary, located approximately 0.60 km downstream of an unnamed pond and about 0.90 km upstream of the Victoria River. The monitoring station is positioned roughly 10 meters upstream of the access road bridge crossing, on the northern shoreline. The sonde is deployed at a depth of approximately 0.10 to 0.30 meters, around 0.5-1 meter from the shoreline.



Victoria River at Beothuk Lake

NF02YN0051

Station Location

Station is located approximately 55 kilometers from Calibre Mining's Valentine Gold Mine, at the outlet of Victoria River into Beothuk Lake. It is situated on the eastern side of the river, roughly 20 to 30 meters downstream of a bridge along the access road. The riverbed at this location is primarily composed of bedrock and large boulders. The sonde is typically deployed at a depth of 0.5 to 1.0 meters, approximately 3 to 5 meters from the shoreline.

Frozen Ears Lake Outlet

NF02YN0052

Station Location

Located at the beginning of the outlet of Frozen Ear Lake into Valentine Lake. The monitoring station is positioned on the southern edge. The riverbed substrate is primarily composed of boulders, soft mud, and silt. The sonde is deployed at an approximate depth of 0.5 meters, typically 5 to 8 meters from the shoreline.

South of Leprechaun Waste Rock Pile Monitoring Well
NLGWMG01

Station
Monitoring well located approximately 1.2 km southeast of the Leprechaun Pit, directly south of the Leprechaun waste rock pile. The well is 9 meters deep and is primarily designed to monitor shallow seepage, while also capturing potential seepage from fractured bedrock.

Northwest of Leprechaun Pit Monitoring Well

NLGWMG02

Station

Monitoring well located approximately 0.60 km north of Leprechaun Pit. This 50-meter-deep well is primarily intended to monitor groundwater drawdown adjacent to the pit resulting from dewatering activities.

Southeast of TMF Monitoring Well - Deep and Shallow

NLGWMG03 (deep) and NLGWMG04 (shallow)

Station

Co-located monitoring wells situated approximately 0.75 km southeast of the Tailings Management Facility (TMF). The shallow well is 7.5 meters deep, and the deep well is 19 meters deep, with approximately 2.5 meters of horizontal separation. These wells are designed to monitor both shallow and deep seepage from the TMF. Having both a shallow and deep well at the same location allows for a better understanding of vertical groundwater conditions and supports early detection of potential contamination in the shallow zone.

South of Marathon Waste Rock Pile (East) Monitoring Well

NLGWMG05

Station

Located approximately 0.50 kilometers Southeast from Marathon waste rock pile. This well is 20.12m deep and is intended to monitor seepage from the waste rock pile.

Southwest of Marathon Pit Monitoring Well

NLGWMG06

Station

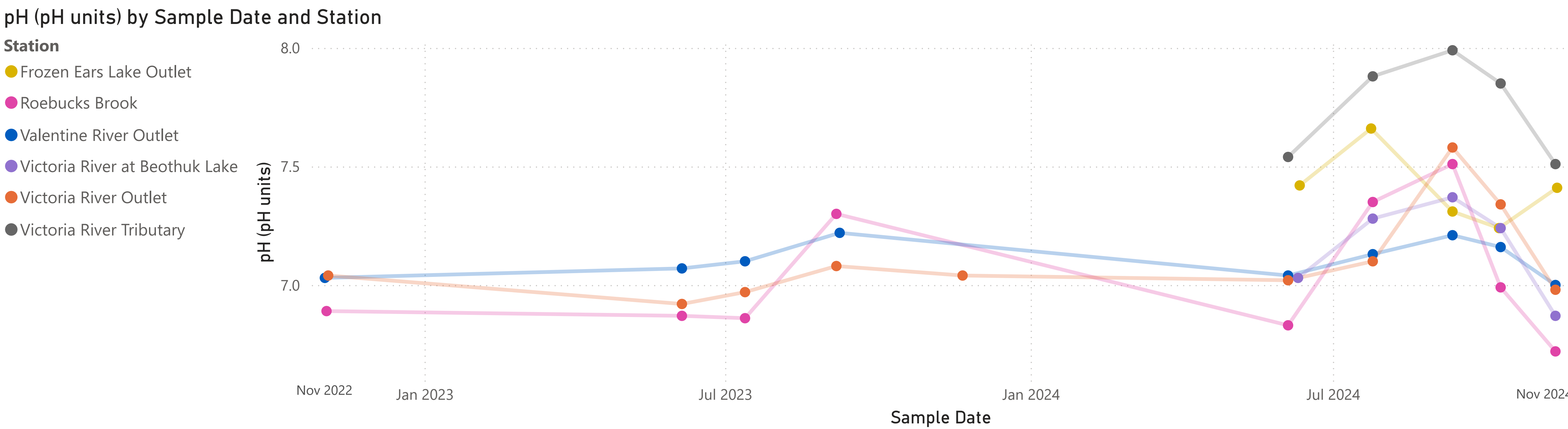
Located approximately 0.75 kilometers southwest from Marathon Pit. This well is 9.14 meters deep and is intended to monitor groundwater drawdown adjacent to the pit resulting from dewatering activities.

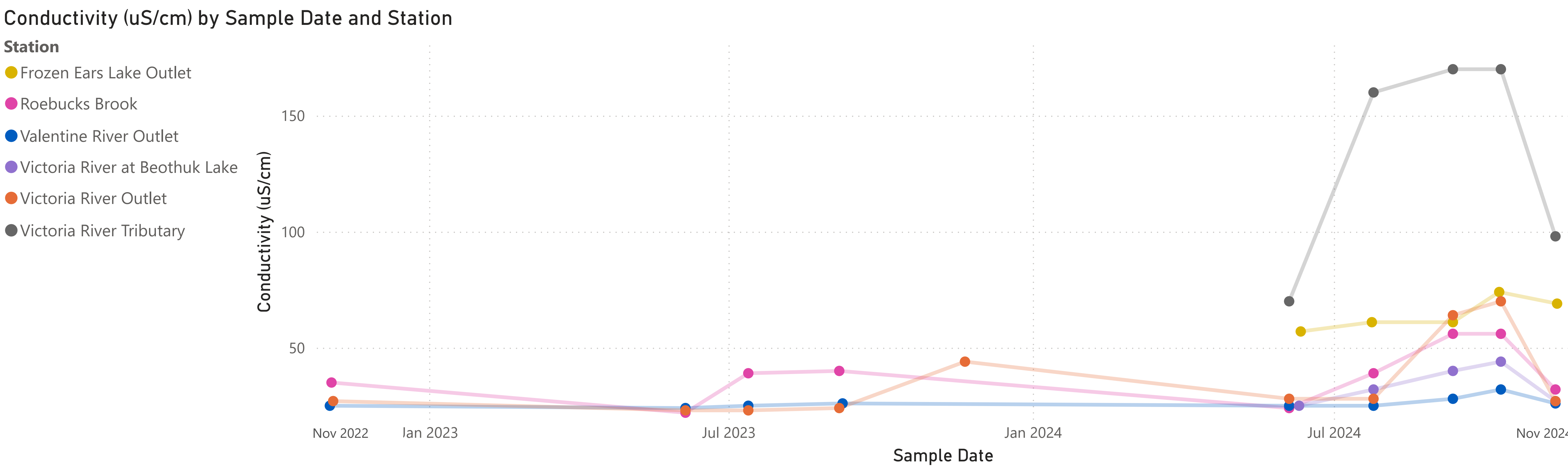
Berry Pit Monitoring Well - Deep and Shallow
NLGWMG07 (shallow) and NLGWMG08 (deep)

Station

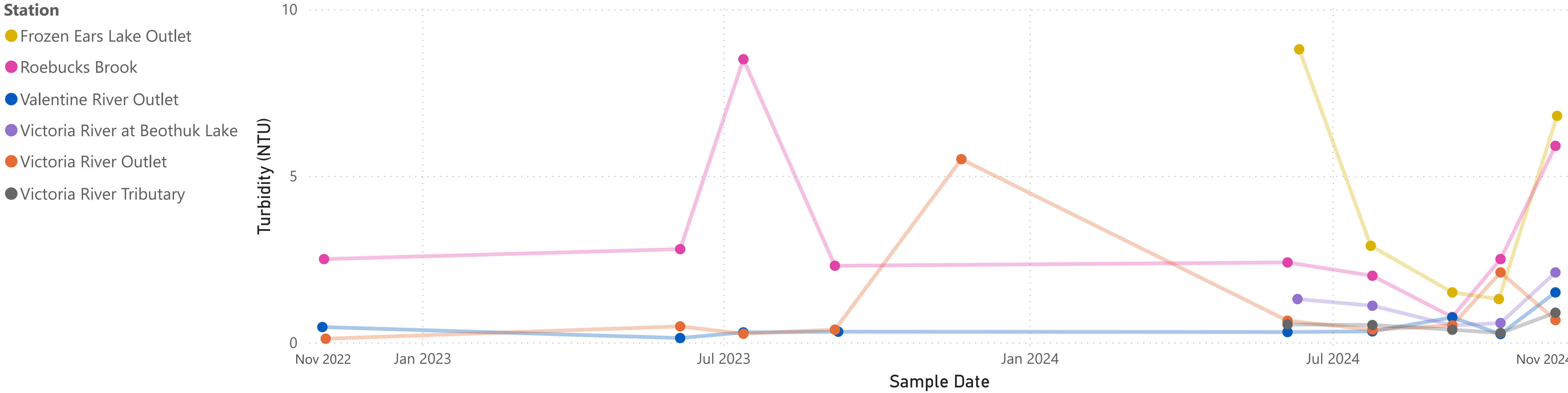
Co-located monitoring wells situated approximately 1.0 km northwest of Berry Pit. The shallow well is 6.01 meters deep, and the deep well is 17.98 meters deep, with approximately 4-5 meters of horizontal separation. These wells are designed to monitor drawdown adjacent to the pit resulting from dewatering activities, as well as potential seepage from the waste rock pile.

Appendix II
Surface Water Grab Sample Results

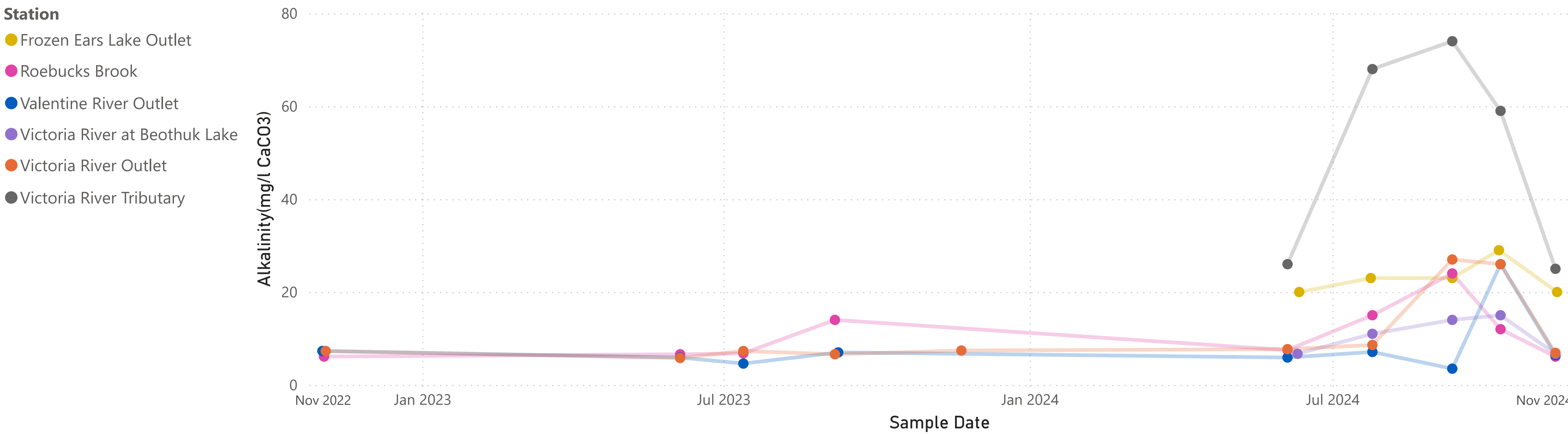

pH (pH units) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
8.0
7.5
7.0
pH (pH units)
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date

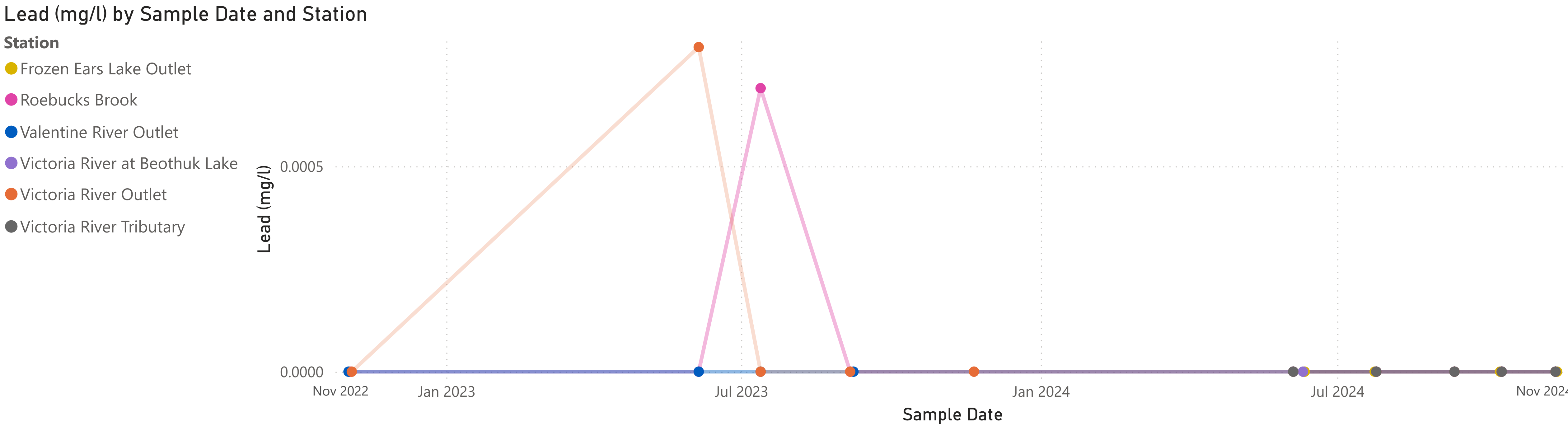

Conductivity (uS/cm) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
150
100
50
Conductivity (uS/cm)
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date

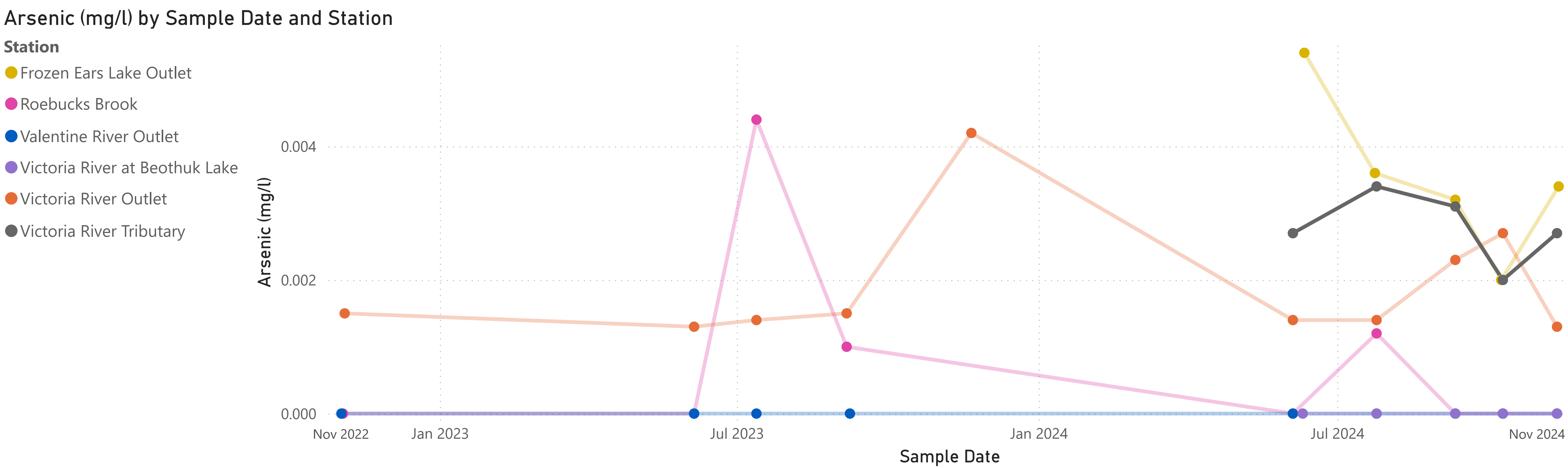
Turbidity (NTU) by Sample Date and Station



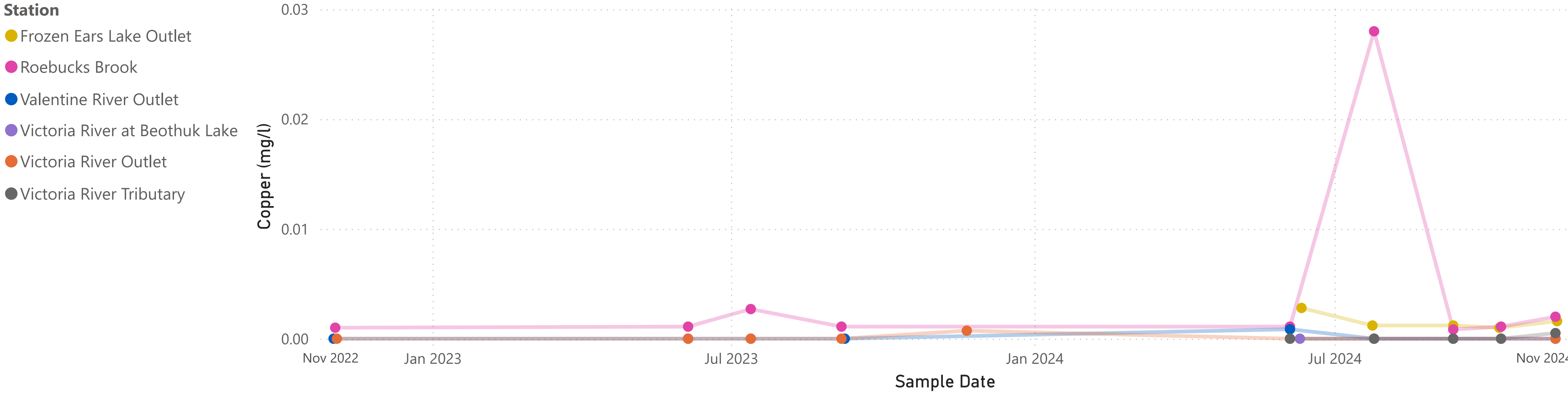
Alkalinity(mg/l CaCO3) by Sample Date and Station



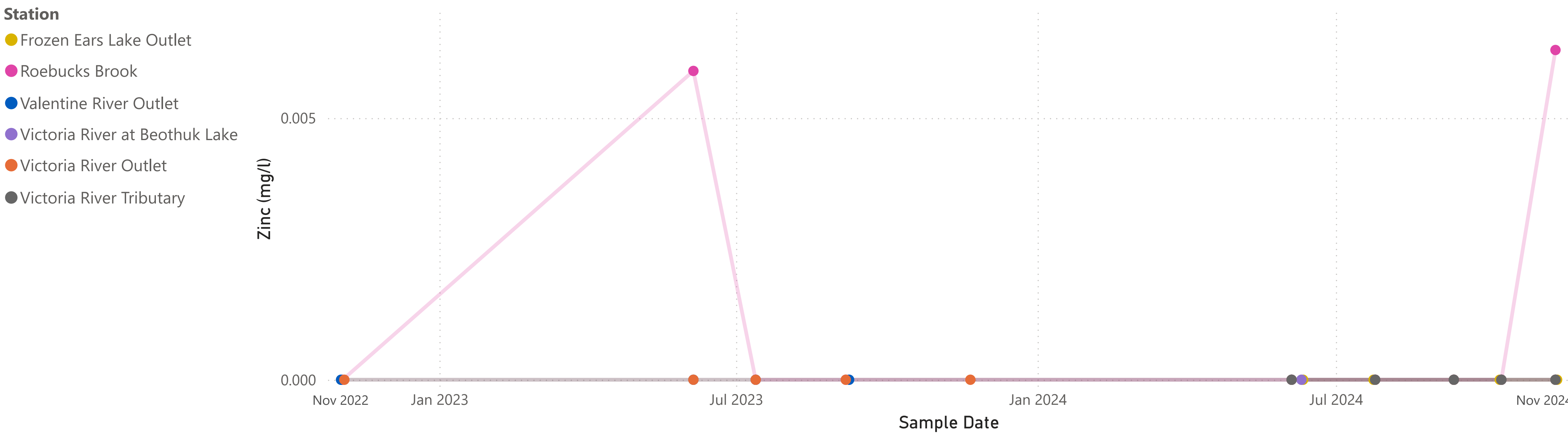

Lead (mg/l) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
Lead (mg/l)
0.0005
0.0000
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date


Arsenic (mg/l) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
Arsenic (mg/l)
0.004
0.002
0.000
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date

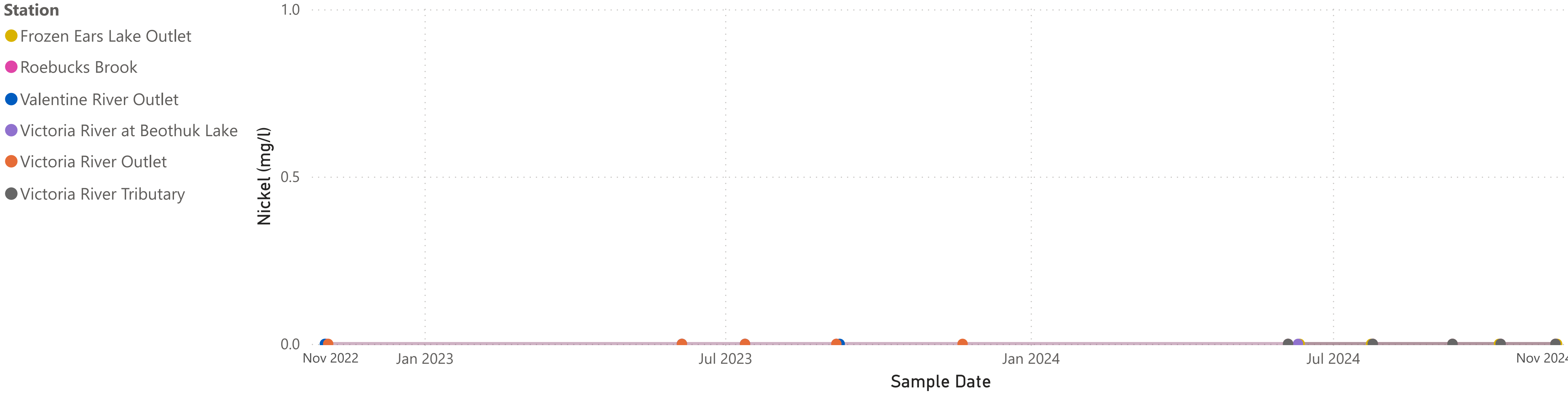
Copper (mg/l) by Sample Date and Station



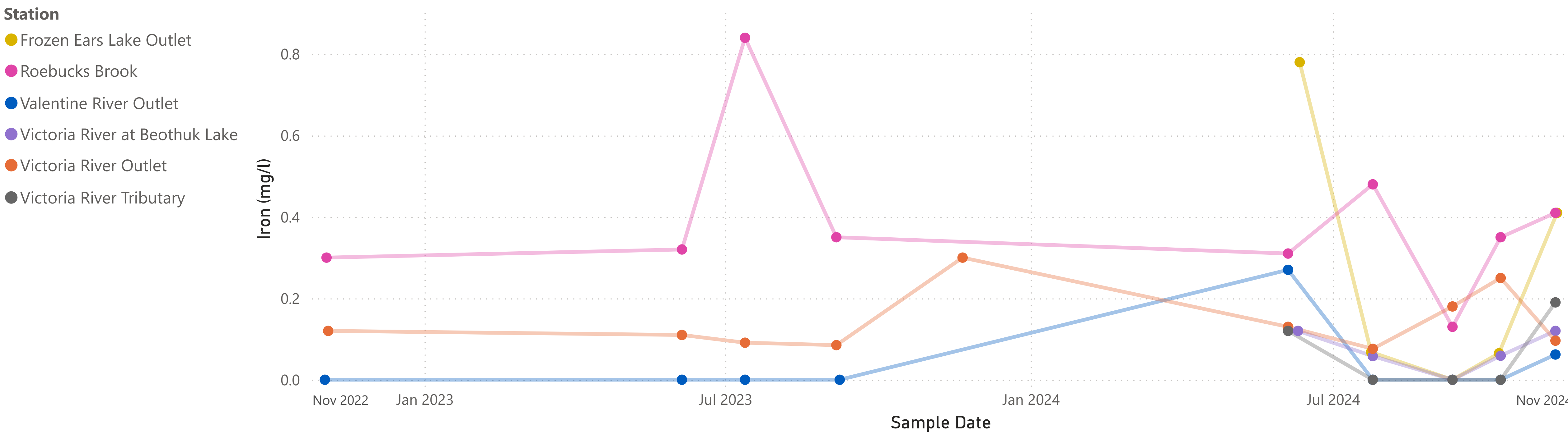
Zinc (mg/l) by Sample Date and Station

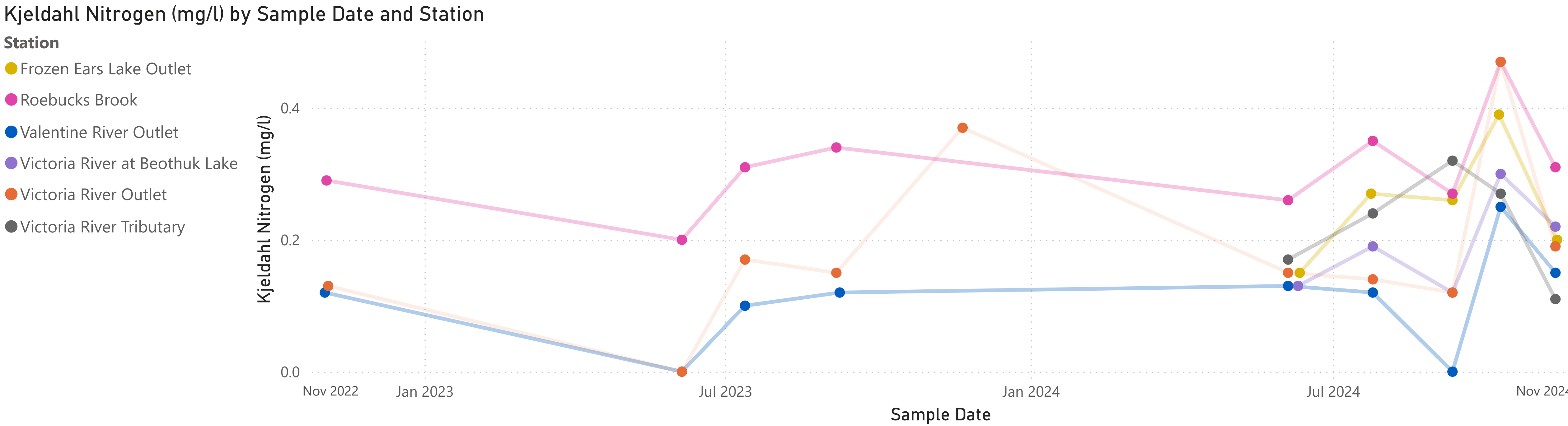


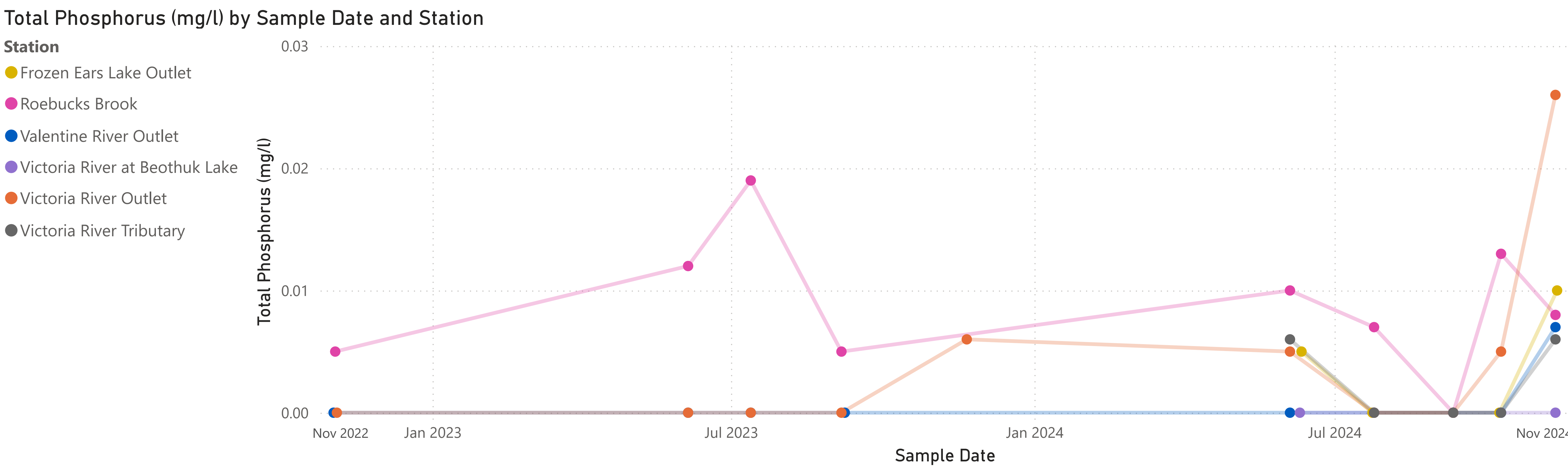
Nickel (mg/l) by Sample Date and Station



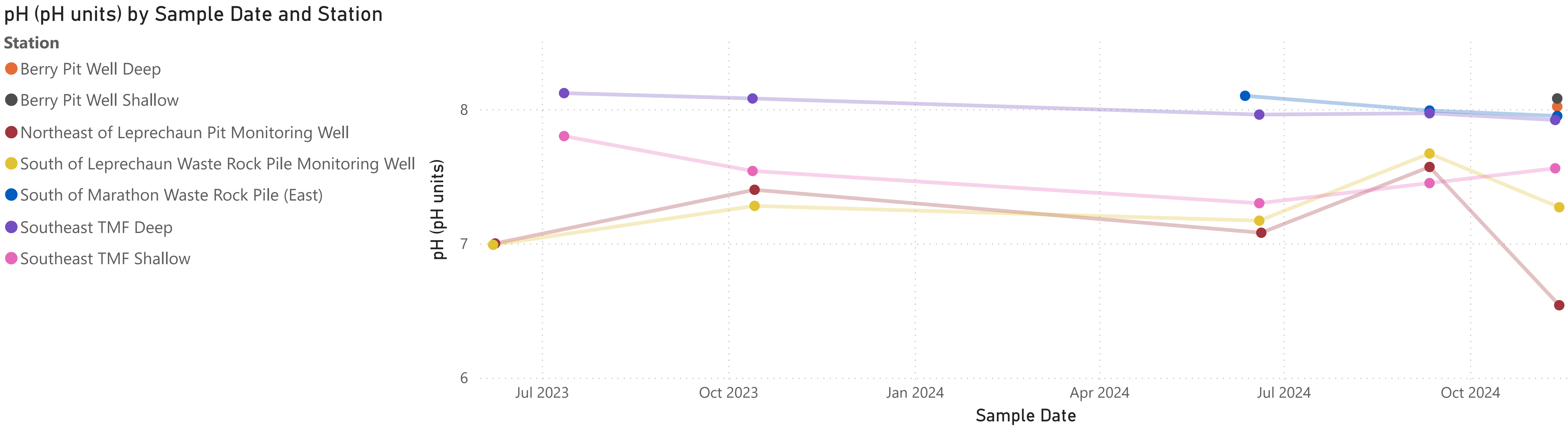
Iron (mg/l) by Sample Date and Station

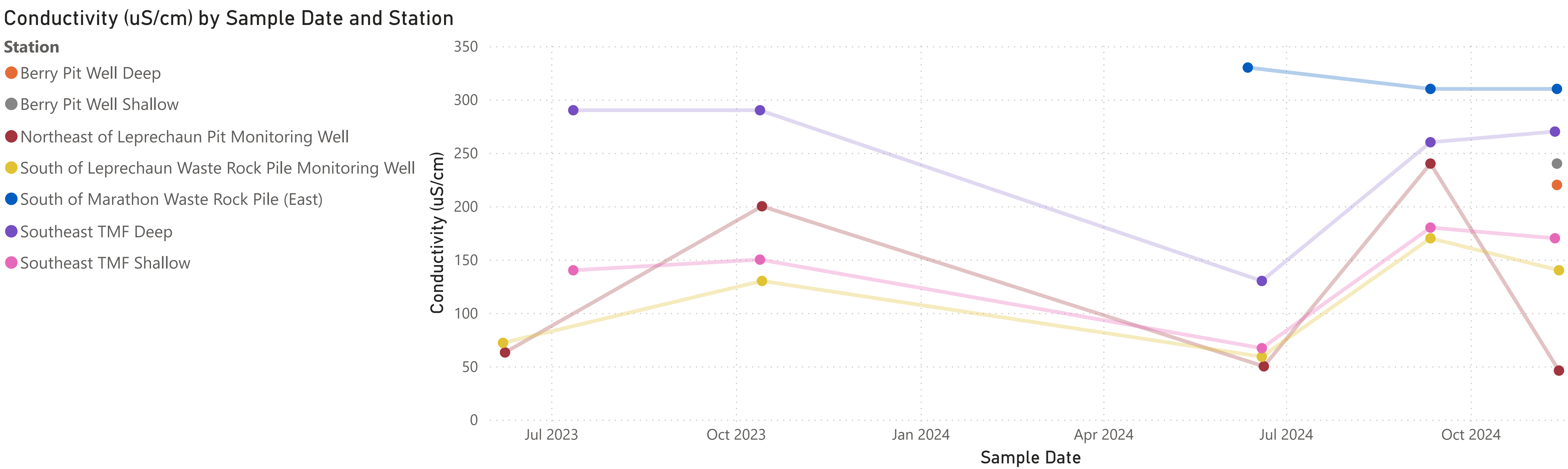



Kjeldahl Nitrogen (mg/l) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
Kjeldahl Nitrogen (mg/l)
0.4
0.2
0.0
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date

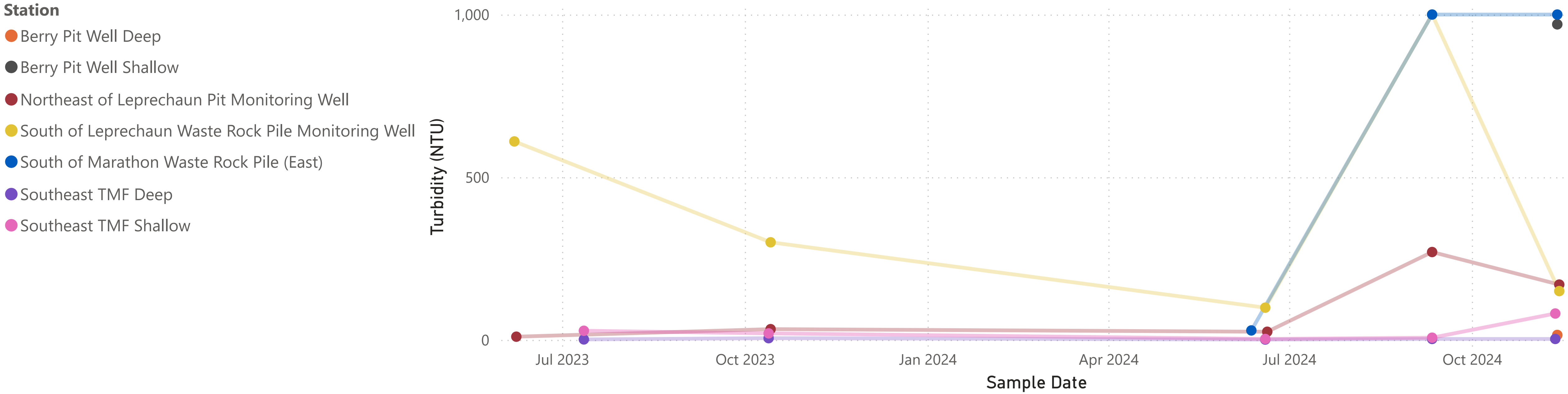

Total Phosphorus (mg/l) by Sample Date and Station
Station
Frozen Ears Lake Outlet
Roebucks Brook
Valentine River Outlet
Victoria River at Beothuk Lake
Victoria River Outlet
Victoria River Tributary
Total Phosphorus (mg/l)
0.03
0.02
0.01
0.00
Nov 2022
Jan 2023
Jul 2023
Jan 2024
Jul 2024
Nov 2024
Sample Date

Appendix III
Groundwater Grab Sample Results

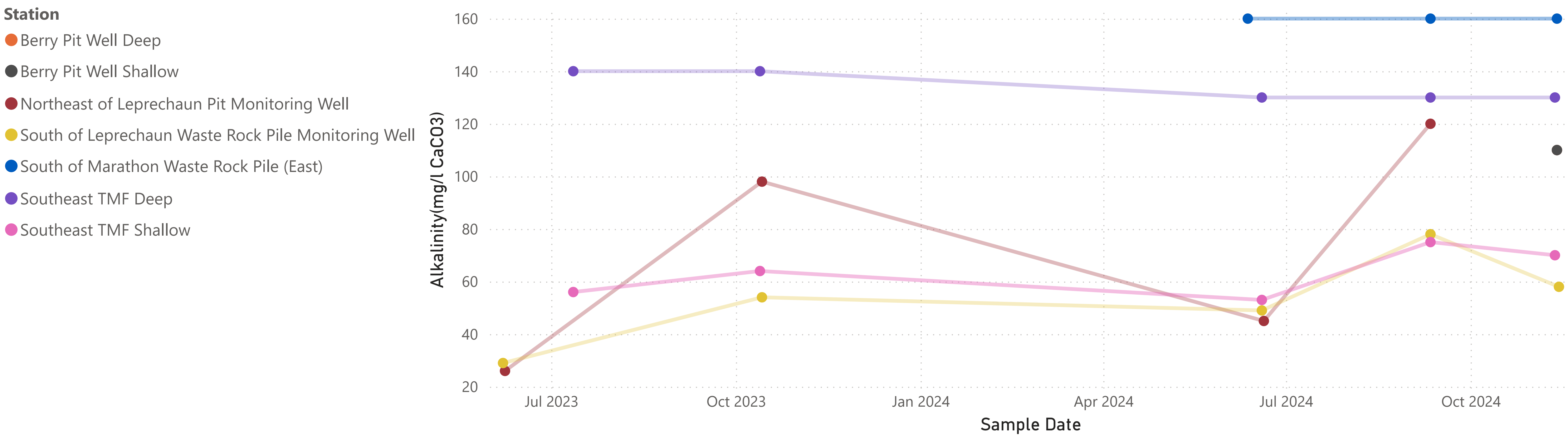

pH (pH units) by Sample Date and Station
Station
Berry Pit Well Deep
Berry Pit Well Shallow
Northeast of Leprechaun Pit Monitoring Well
South of Leprechaun Waste Rock Pile Monitoring Well
South of Marathon Waste Rock Pile (East)
Southeast TMF Deep
Southeast TMF Shallow
pH (pH units)
8
7
6
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Oct 2024
Sample Date

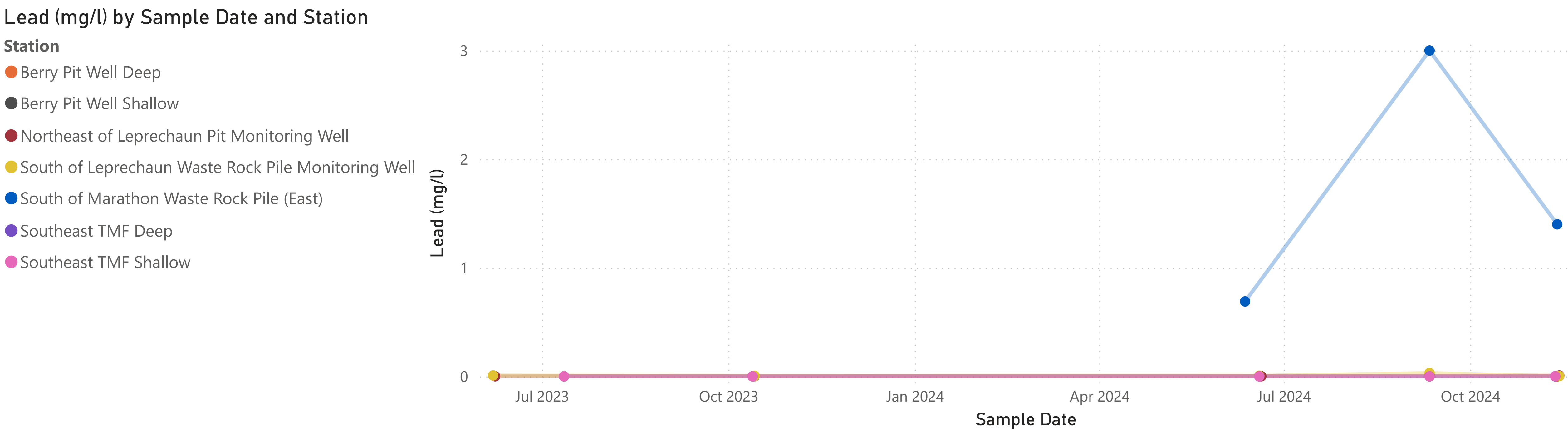

Conductivity (uS/cm) by Sample Date and Station
Station
Berry Pit Well Deep
Berry Pit Well Shallow
Northeast of Leprechaun Pit Monitoring Well
South of Leprechaun Waste Rock Pile Monitoring Well
South of Marathon Waste Rock Pile (East)
Southeast TMF Deep
Southeast TMF Shallow
Conductivity (uS/cm)
350
300
250
200
150
100
50
0
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Oct 2024
Sample Date

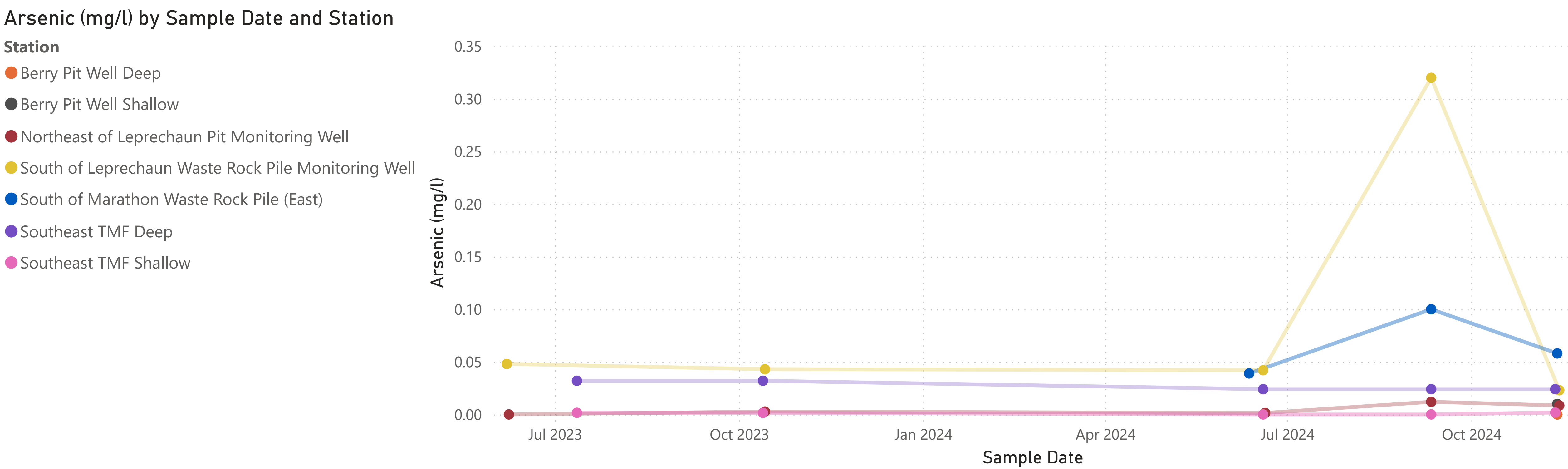
Turbidity (NTU) by Sample Date and Station



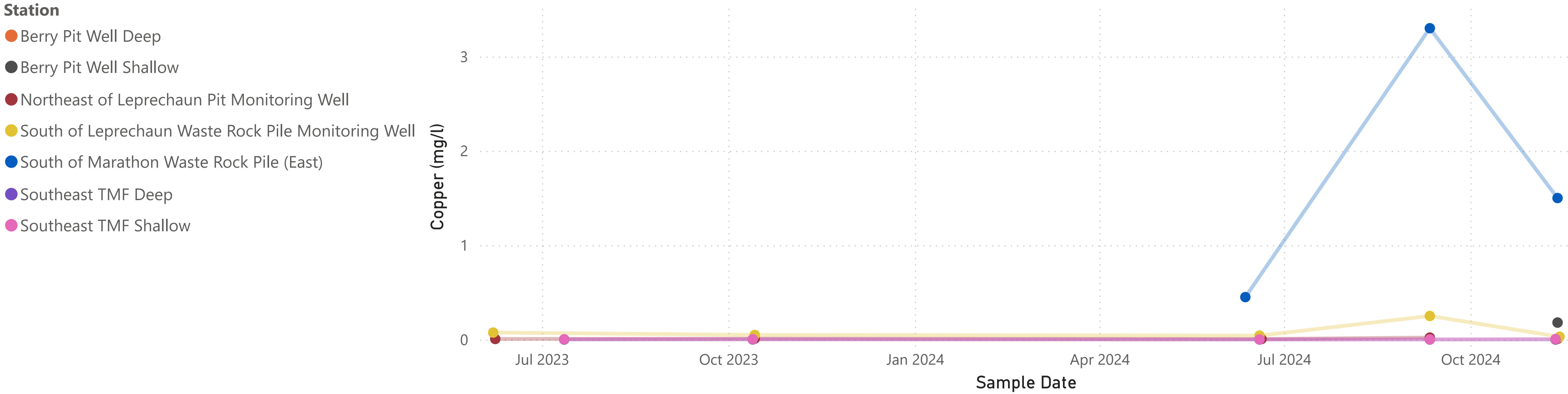
Alkalinity(mg/l CaCO3) by Sample Date and Station



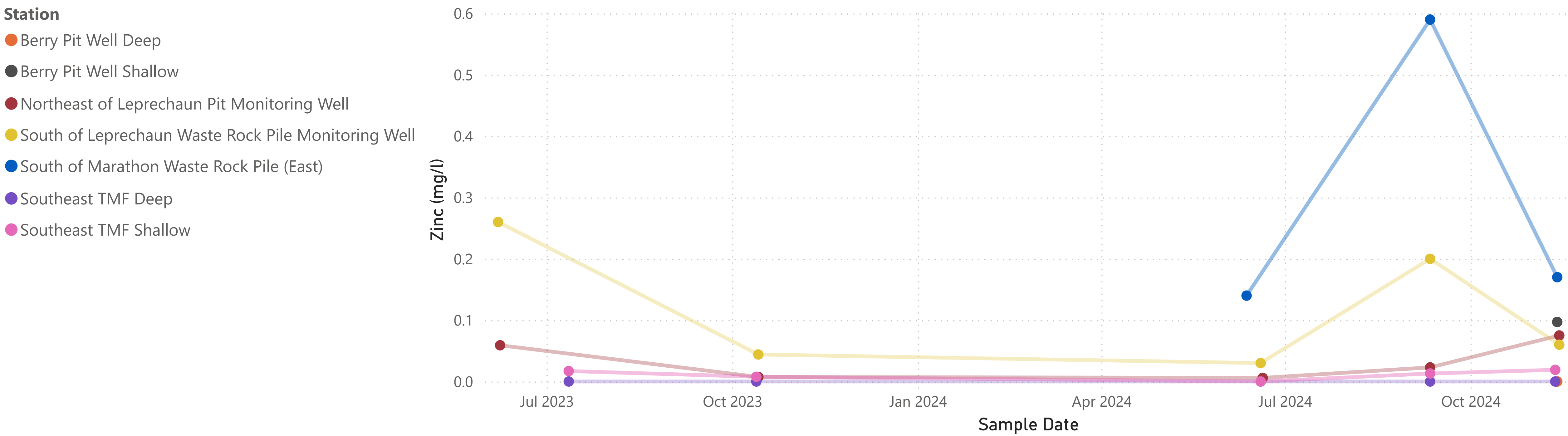

Lead (mg/l) by Sample Date and Station
Station
Berry Pit Well Deep
Berry Pit Well Shallow
Northeast of Leprechaun Pit Monitoring Well
South of Leprechaun Waste Rock Pile Monitoring Well
South of Marathon Waste Rock Pile (East)
Southeast TMF Deep
Southeast TMF Shallow
Lead (mg/l)
3
2
1
0
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Oct 2024
Sample Date


Arsenic (mg/l) by Sample Date and Station
Station
Berry Pit Well Deep
Berry Pit Well Shallow
Northeast of Leprechaun Pit Monitoring Well
South of Leprechaun Waste Rock Pile Monitoring Well
South of Marathon Waste Rock Pile (East)
Southeast TMF Deep
Southeast TMF Shallow
Arsenic (mg/l)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Jul 2023
Oct 2023
Jan 2024
Apr 2024
Jul 2024
Oct 2024
Sample Date

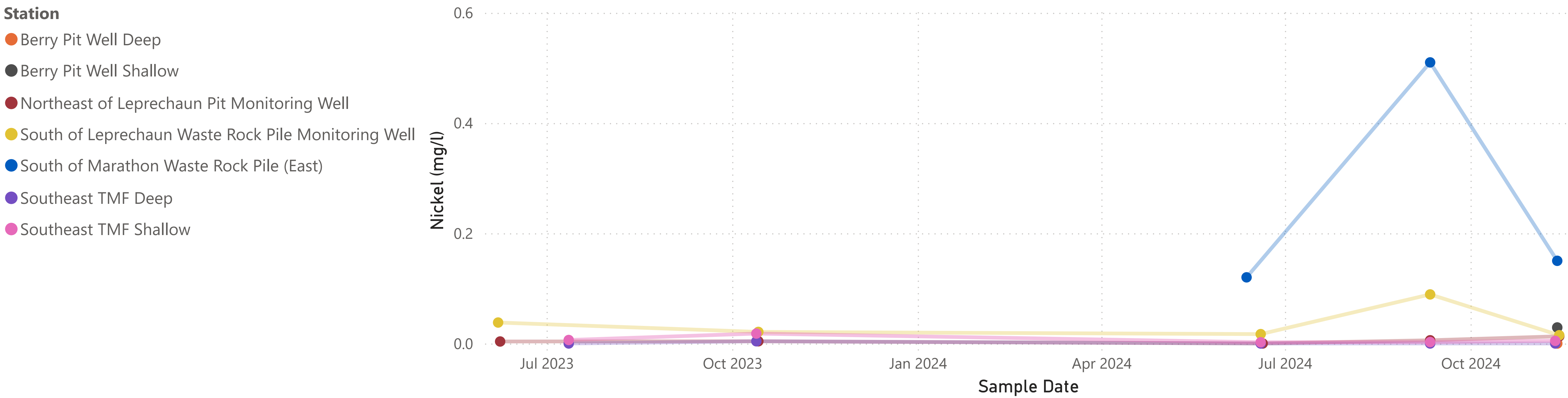
Copper (mg/l) by Sample Date and Station



Zinc (mg/l) by Sample Date and Station



Nickel (mg/l) by Sample Date and Station



Iron (mg/l) by Sample Date and Station