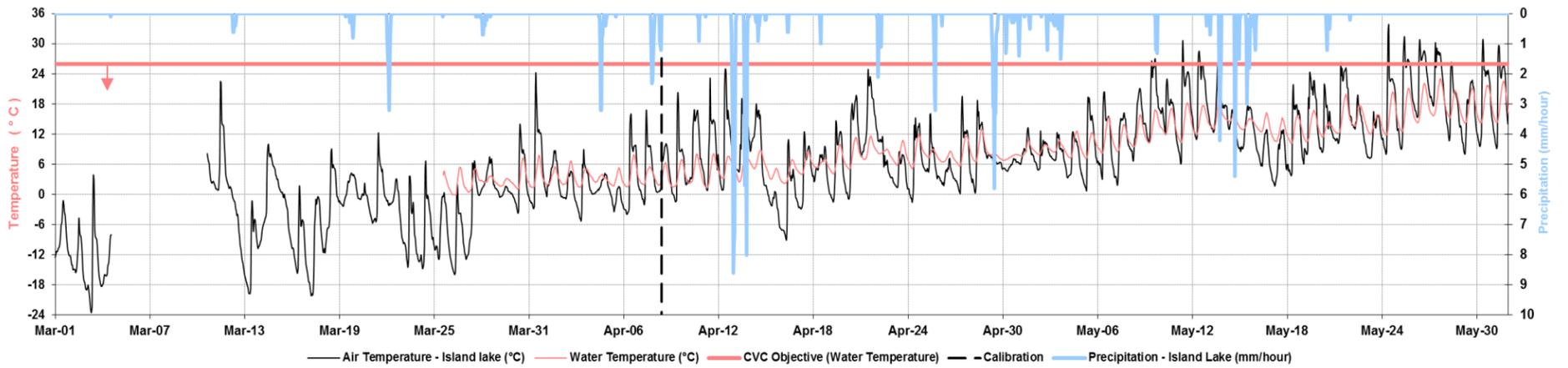
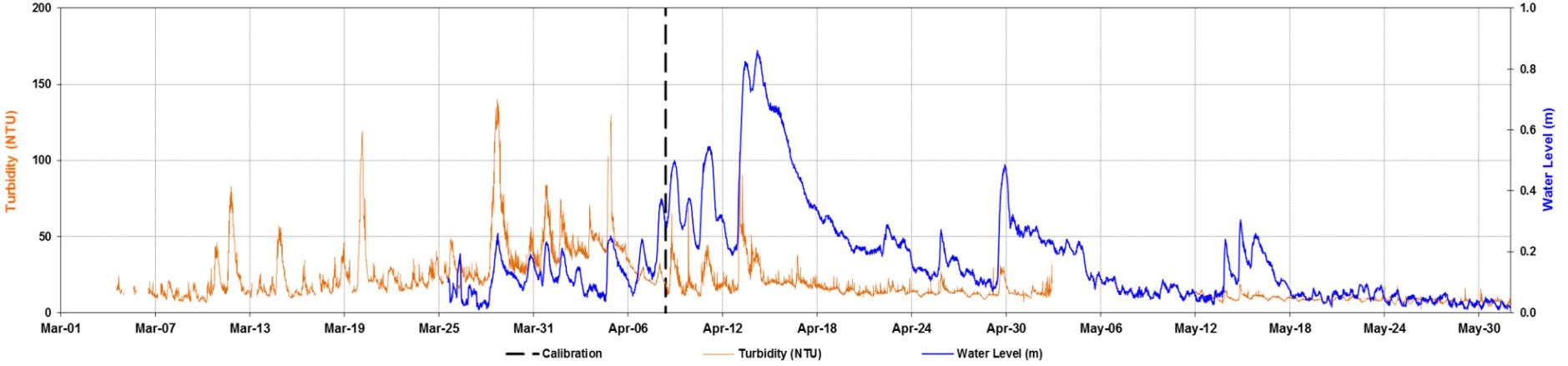


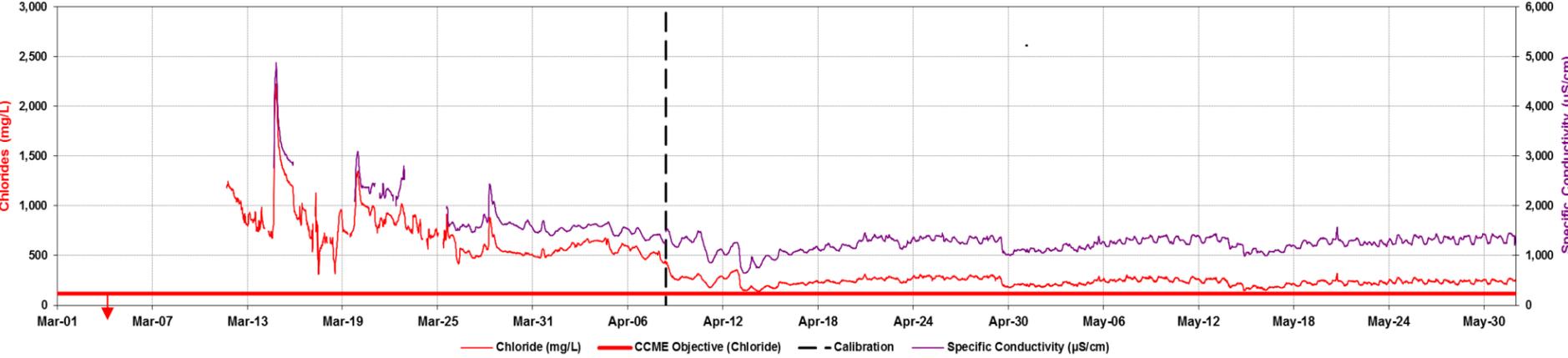
Water Temperature, Air Temperature, and Precipitation



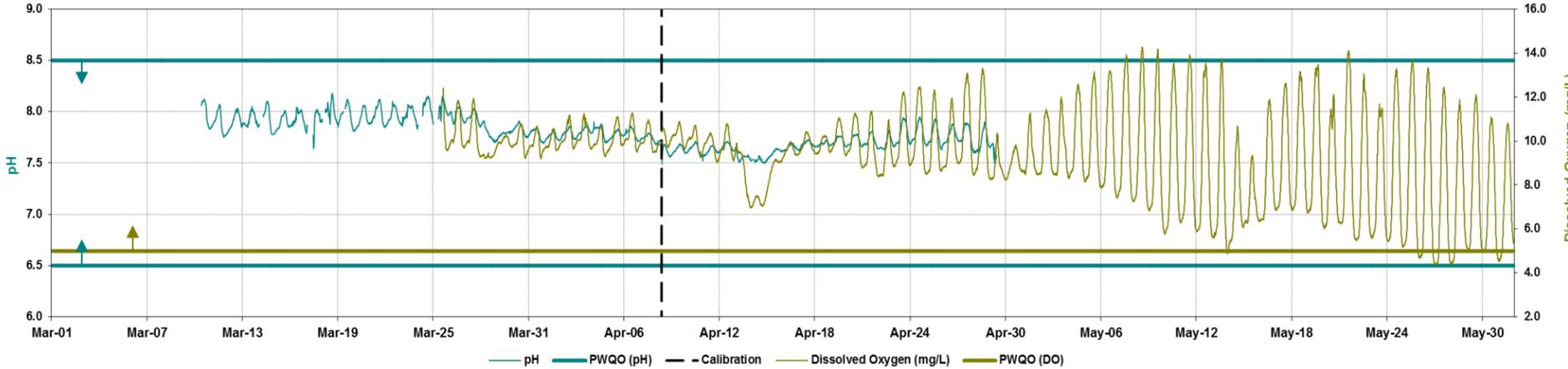
Turbidity and Water Level



Chloride and Specific Conductivity



pH and Dissolved Oxygen



↑ ↓ Coloured arrows indicate whether the given parameter should be above or below the indicated Water Quality Objective. Objective may be off-scale for some graphs.

Seasonal Exceedance of Water Quality Objectives

	Water Temperature			Dissolved Oxygen		pH		Chloride
	Cold	Mixed	Warm	Cold	Warm	Lower limit	Upper limit	Upper limit
Objective/Guideline	26 °C	28 °C	30 °C	5 mg/L	4 mg/L	6.5	8.5	120 mg/L
Number of Days	0	0	0	8	0	0	0	82
Percent of Readings	0.00	0.00	0.00	2.26	0.00	0.00	0.00	100.00

Water Temperature

Aquatic organisms, especially fish, are sensitive to extreme highs in river water temperature. If the water temperature exceeds CVC's maximum objective, fish will suffer. CVC has set an absolute maximum water temperature objective of no greater than 26 °C for cold water streams such as the Credit River in Orangeville.

Water Level

The water level at each site is essential to translate parameter concentrations to loadings. Water level also allows us to determine when a rain event has occurred and how fast the water level increased, and returned to normal during and after a storm, respectively.

Dissolved Oxygen

Aquatic habitats need sufficient oxygen in water to survive and thrive. DO fluctuates over a diurnal cycle; high during the day and lower during the night, and with temperature (colder water holds more oxygen). Provincial Water Quality Objective for cold water fish is greater than 5 mg/L, and for warm water fish is greater than 4mg/L. The Credit River in Orangeville represents a cold water fish habitat.

Turbidity

Turbidity is a measurement of water clarity. A high turbidity indicates the presence of solids, sediments, or pollutants. Turbidity is used to estimate total suspended solid concentration.

Specific Conductivity

Conductivity measures the ability of water to pass an electrical current. Higher conductivity indicates a higher concentration of salts and other ions in the water.

Chloride

Chlorides are often elevated in highly urbanized areas as a result of road salt application and the drainage of swimming pools, or water softeners. The CCME guideline for chlorides is 120mg/L.

pH

pH level is a measurement of the acidity or alkalinity of water. The pH scale ranges from 0 to 14. Extreme levels of both alkalinity and acidity can be detrimental to aquatic life. The MOE has set a Provincial Water Quality Objective of in between 6.5 and 8.5 units.

Real-Time Water Quality: Spring 2014

Credit River in Orangeville

Water Temperature, Air Temperature, and Daily Precipitation

- Air temperature ranged from -23.5 °C to 33.75 °C. The maximum temperature was observed on May 24th.
- Water temperature ranged from -0.4 °C to 23.08 °C.
- Air temperature dropped below freezing on 41% of the days measured this spring*.
- Water temperature dropped to or below freezing on 40% of the days measured this spring.
- The river remained thawed from March 26th onwards.
- A total of 171.3 mm of precipitation was recorded* this spring.
- The largest event this spring saw 31.8 mm of rain fall on April 13th over 7 hours. The average precipitation event was 5 mm, and there were 4 events this season of 10 mm or more. An event is defined as any amount of precipitation separated by 6 hours or more.

*Measured at the Island Lake climate station, roughly 2.5km from the water quality station, and within its drainage area.

Water Level and Turbidity

- Water level increased throughout March and early April with melting snow and precipitation, reaching its peak of 0.86 m on April 14th. It then gradually receded back to ambient levels throughout the spring, increasing only in response to rain events, reaching seasonal lows towards the end of the season.
- In March and early April turbidity frequently increased in response to inputs from melting snow and precipitation. It gradually receded back to its ambient levels of 5 NTU to 10 NTU throughout the spring.
- Water level and turbidity follow a diurnal pattern at this station, in response to regular outputs from the upstream waste water treatment plant.

Chloride and Specific Conductivity

- Chloride ranged from 139 mg/L to 2226 mg/L.
- In March, increases in chloride and specific conductivity occurred when road salt was washed into the river after application, and when temperatures increased allowing salt-rich snow to melt and flow into the river.
- Chloride values dropped from their peak in mid-March to ambient levels in mid-April as temperatures rose consistently above the freezing point, and road salt was no longer in use.

pH and Dissolved Oxygen

- Dissolved oxygen ranged from 4.38 mg/L to 14.28 mg/L this spring, dropping below the 5 mg/L Provincial Water Quality Objective (PWQO) 2.26% of the time.
- pH ranged from 7.49 to 8.18 this spring, staying within the 6.5 to 8.5 unit PWQO the entire season.
- In mid-April as plants and algae began to grow, producing oxygen during the day, and consuming it overnight, the range of dissolved oxygen values increased. The growth of plants and algae has a similar impact on pH values.

Quality Control Issues

- Water level data were removed until March 25th; ice formation results in pressure changes which affect readings, and cannot be corrected.
- Air temperature data are missing for a few days in early March due to sensor failure.
- Until March 25th, when water level began to increase with melting snow, water level periodically dropped to levels low enough to cause sensors to rise above the water level. All sensors were affected by this, and sections of affected data until March 25th have been removed.
- A linear drift correction was applied to turbidity values from March 28th to calibration on April 8th to ensure agreement with the more accurate post-calibration values.
- Turbidity data were removed from May 2nd to May 11th, due to interference with the sensor.
- pH data were removed from April 29th onwards due to interference with the sensor.

Deployment Information

- Deployment period 1: November 11th, 2013 to April 8th, 2014 (148 days)
- Deployment period 2: April 8th, 2014 to June 2nd, 2014 (55 days)
- Monitoring equipment used
 - Water quality parameters: Hydrolab DS5X
 - Water level: Hydrolab DS5X
 - Air temperature: Island Lake climate station
 - Precipitation: Island Lake climate station

Figure 1: Credit River, looking downstream, April 8th



Questions or Comments?

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