



# Real-Time Water Quality Deployment Report

## Outflow of the Steady below FireFly Metals Ltd.'s Nugget Pond Facility

July 23 to  
September 03, 2025



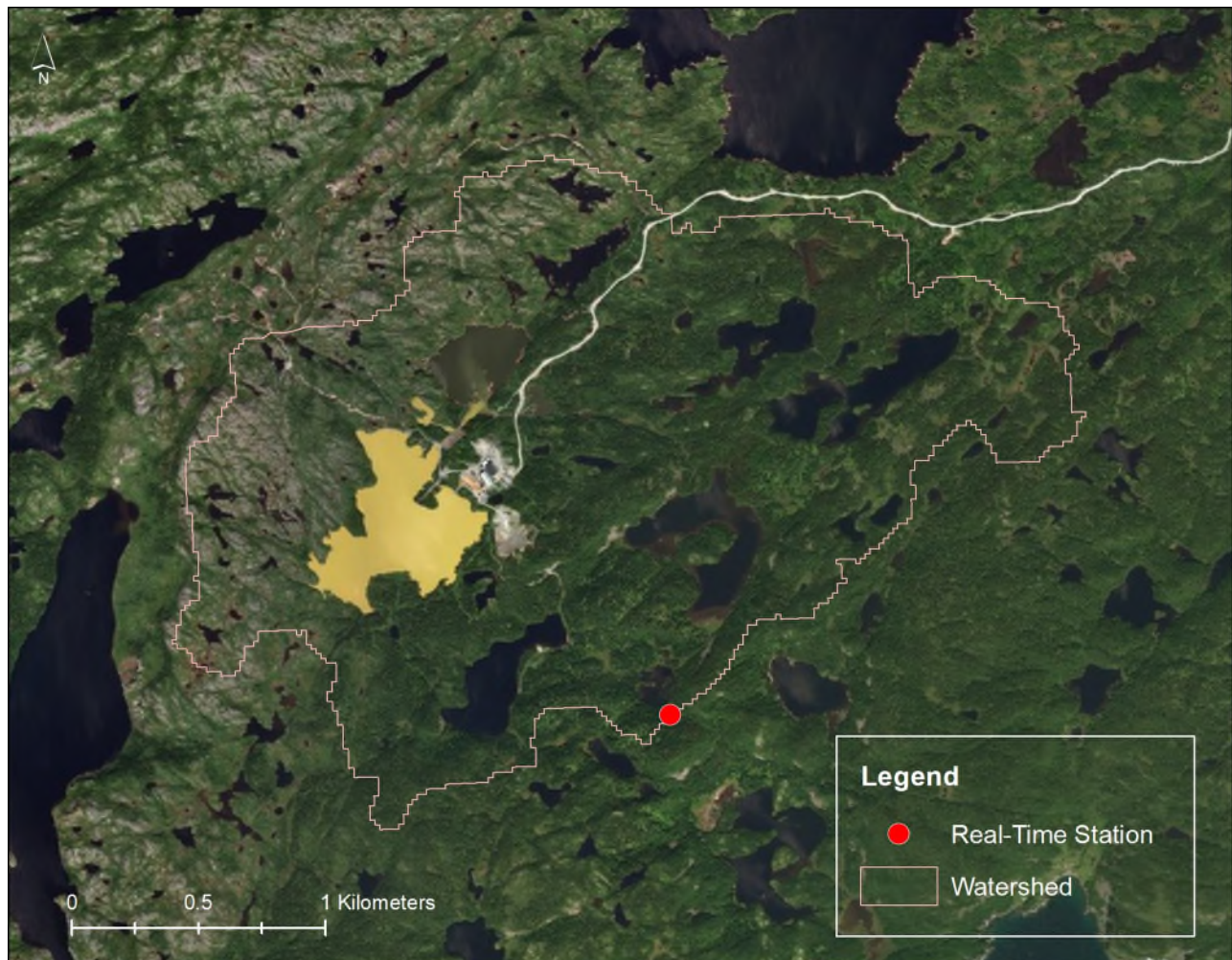
Government of Newfoundland & Labrador  
Department of Environment, Conservation &  
Climate Change  
Water Resources Management Division

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## General

- The Water Resources Management Division, in partnership with Firefly Metals Ltd., formerly Rambler Metals and Mining Canada Ltd., maintain one real-time water quality and water quantity station at the Outflow of the Steady.
- This station is situated downstream of the Nugget Pond Mill tailings management facility (Figure 1).
- On July 23, 2025, a real-time water quality monitoring instrument was deployed at the station Outflow of the Steady. The instrument was deployed for a period of 48 days. This was the second deployment for this station in 2025.
- Water Resources Management Division staff monitor the real-time web pages regularly.



**Figure 1: Location of the real-time station downstream of FireFly's Nugget Pond Mill tailings management facility**

## 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.
  - At deployment and removal, a QA/QC Sonde is temporarily deployed adjacent to the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

**Table 1: Ranking classifications for deployment and removal**

Parameter	Rank				
	Excellent	Good	Fair	Marginal	Poor
Temperature (°C)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L) (% Sat)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

- It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be broken down into three groups: temperature dependant, temperature compensated and temperature independent. Because the temperature sensor is not isolated from the rest of the sonde the entire sonde must be at the same temperature before the sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

Deployment and removal comparison rankings for the station Outflow of the Steady deployed between July 23 and September 03, 2025, are summarized in Table 2.

**Table 2: Comparison rankings for Outflow of the Steady station July 23 – September 03, 2025.**

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Outflow of the Steady	July 23, 2025	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	September 03, 2025	Removal	Excellent	Good	Excellent	Good	Excellent

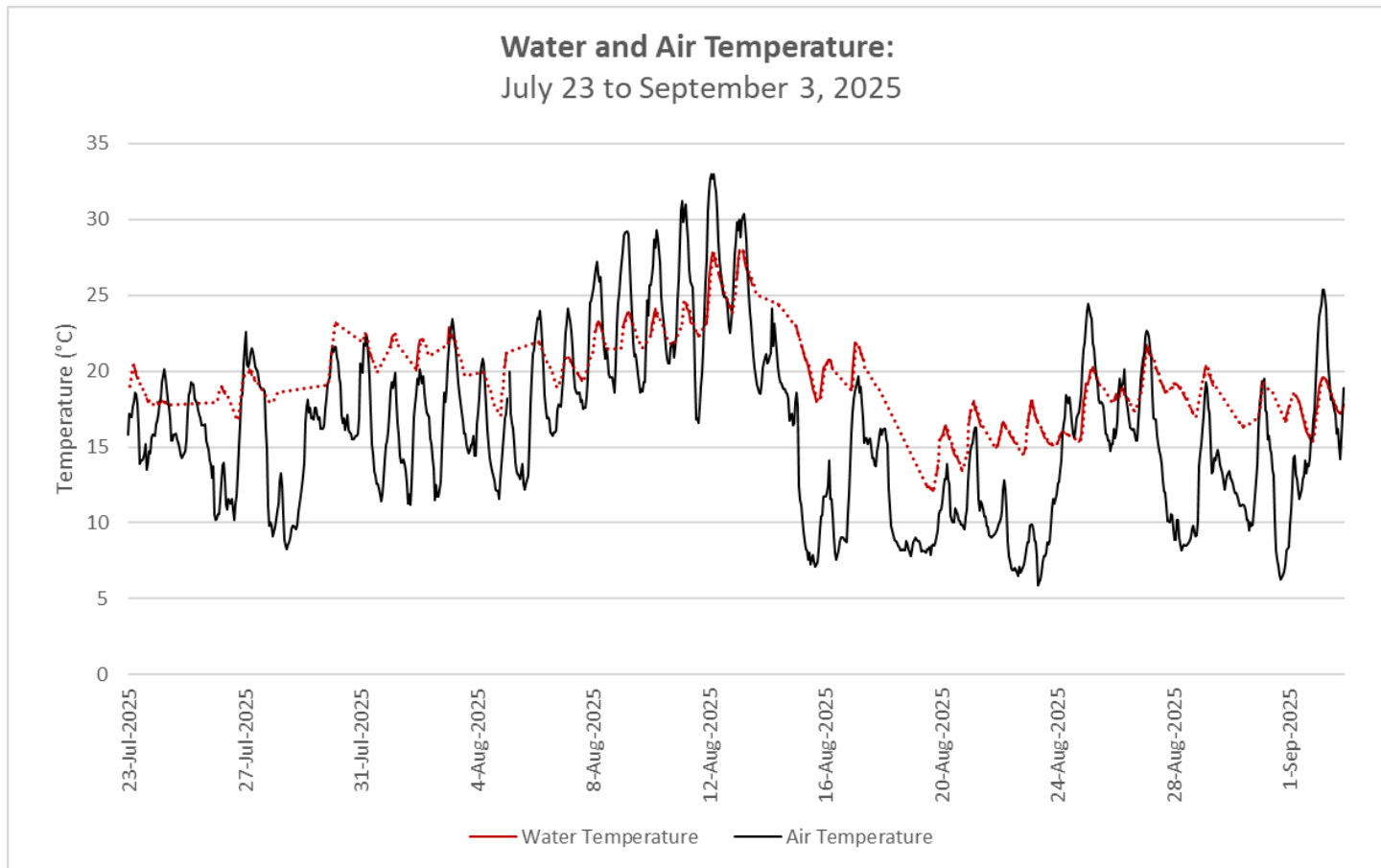
- Deployment rankings were all 'excellent'.
- At removal, all parameters ranked 'excellent' or 'good'.
- There are a few circumstances which may cause less than ideal QA/QC rankings to be obtained. These include: the placement of the QA/QC sonde in relation to the field sonde; the amount of time each sonde was given to stabilize before readings were recorded; and deteriorating performance of one of the sensors.

## **Data Interpretation**

- The following graphs and discussion illustrate water quality related events from July 23 to September 03, 2025 at the station Outflow of the Steady.
- Moving average trendlines have been utilized on all graphs to fill in data gaps resulting from data transmission issues ongoing at the station. Mitigating measures are being planned to improve data transmissions at the station.
- With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.

### Outflow of the Steady

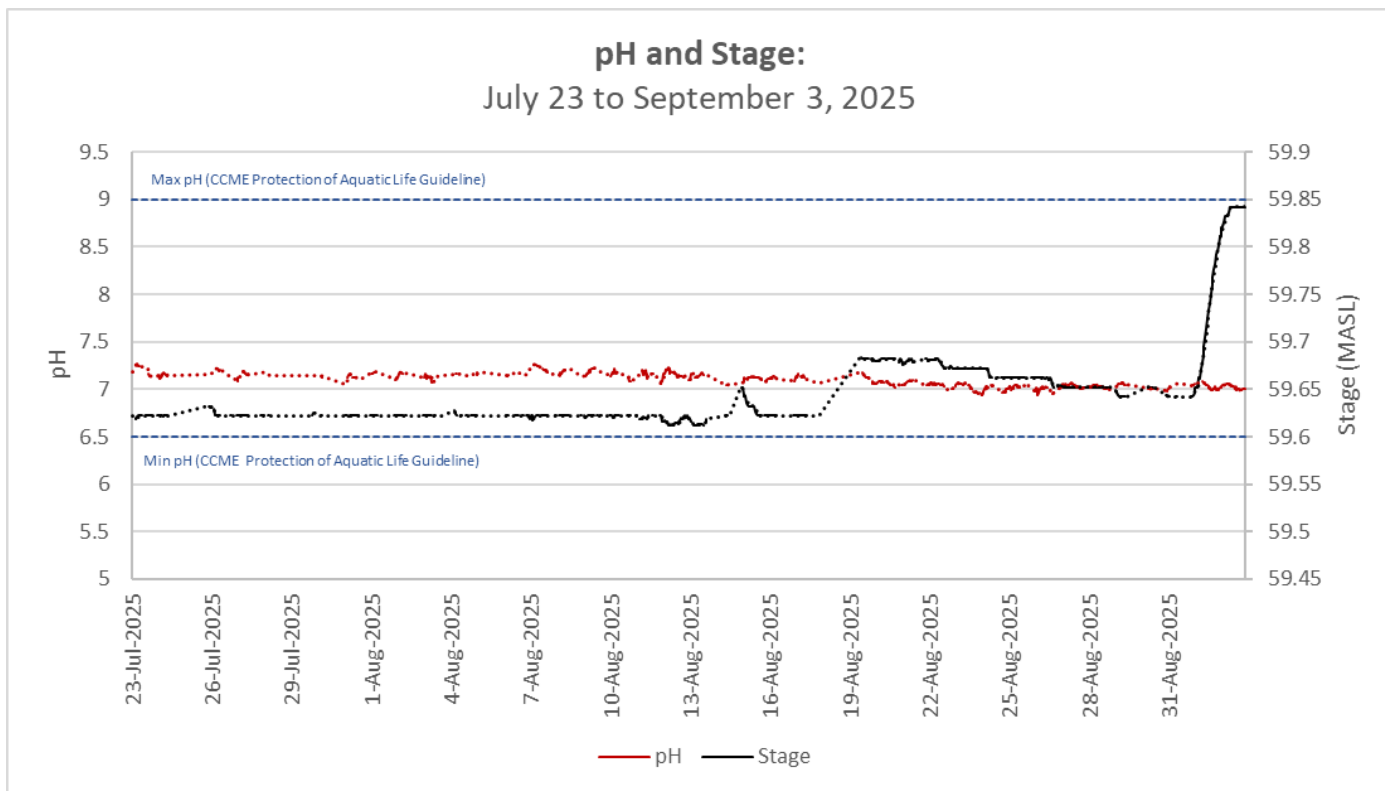
- Water temperature ranged from 12.10 to 27.98°C during this deployment period (Figure 2).
- Water temperature gradually increased until mid August at which point it began to decrease as summer transitioned to fall. The fluctuations in water temperature correspond with ambient air temperatures (Figure 2).



**Figure 2: Water and Air Temperature – Outflow of the Steady**  
(Weather data collected at La Scie)

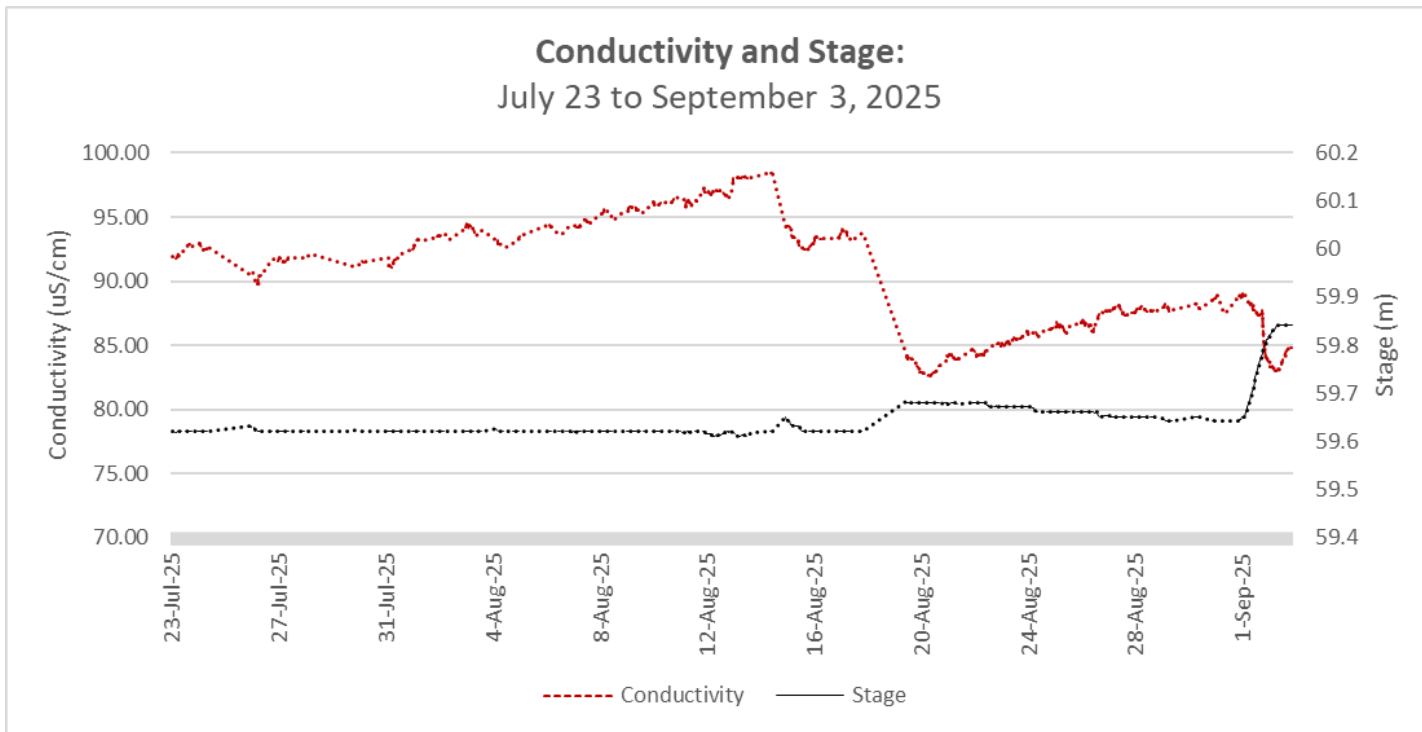
Outflow of the Steady, Nugget Pond facility, FireFly Metals Ltd.

- pH ranged between 6.94 and 7.27 pH units throughout the deployment period, with a median value of 7.09 units (Figure 3).
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly during the day and night.
- Significant rainfall (evident as a rise in stage levels) can cause a slight dip in pH levels. This is a common occurrence in freshwater as the slightly acidic rain influences the overall pH of the river for a short period of time (Figure 3).
- Overall, pH was generally stable for most of the deployment, with a slight decreasing trend after a precipitation event on August 19<sup>th</sup>.



**Figure 3: Water pH– Outflow of the Steady**

- Specific conductivity ranged from 82.59 to 98.45  $\mu\text{S}/\text{cm}$  (Figure 4).
- Specific conductivity displayed some minimal fluctuations. The fluctuations correspond to increases/decreases in precipitation/stage observed throughout the deployment.
- With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.



**Figure 4: Specific Conductivity of Water - Outflow of the Steady**

- The saturation of dissolved oxygen ranged from 91.64% to 109.68% and a range of 7.78 to 10.49 mg/l was recorded for the concentration of dissolved oxygen with a median value of 9.35 mg/l (Figure 5).
- All values were above the minimum CCME Guideline for the Protection of Other Life Stages of Cold Water Biota of 6.5 mg/l. Approximately a quarter of the values were above the minimum CCME Guideline for the Protection of Early Life Stages of Cold Water Biota value of 9.5 mg/l. The guidelines are indicated in dark blue on Figure 5.
- Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature. Dissolved oxygen decreased until mid-August when water temperatures were warmest, then increased when water temperature dropped into the late summer.

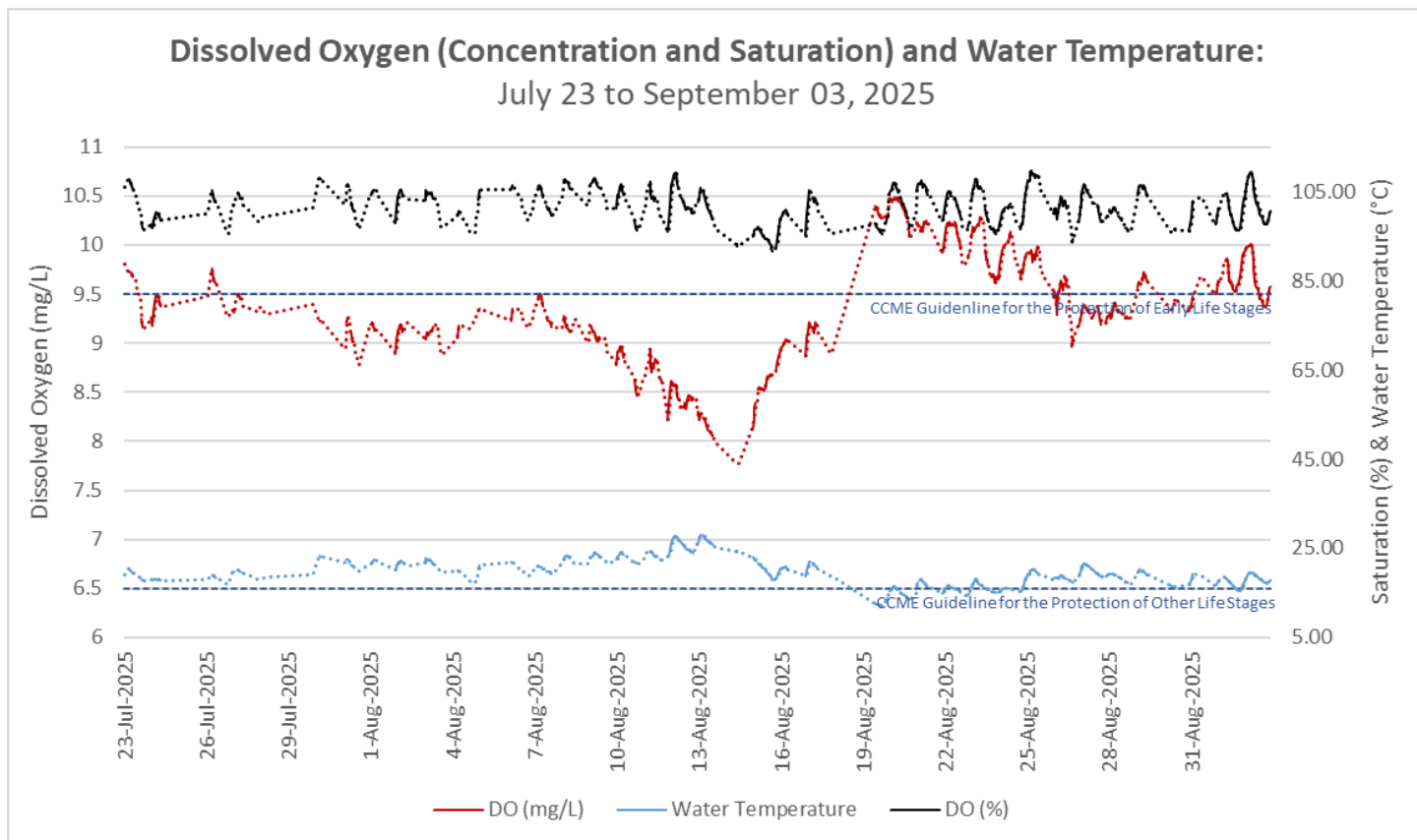
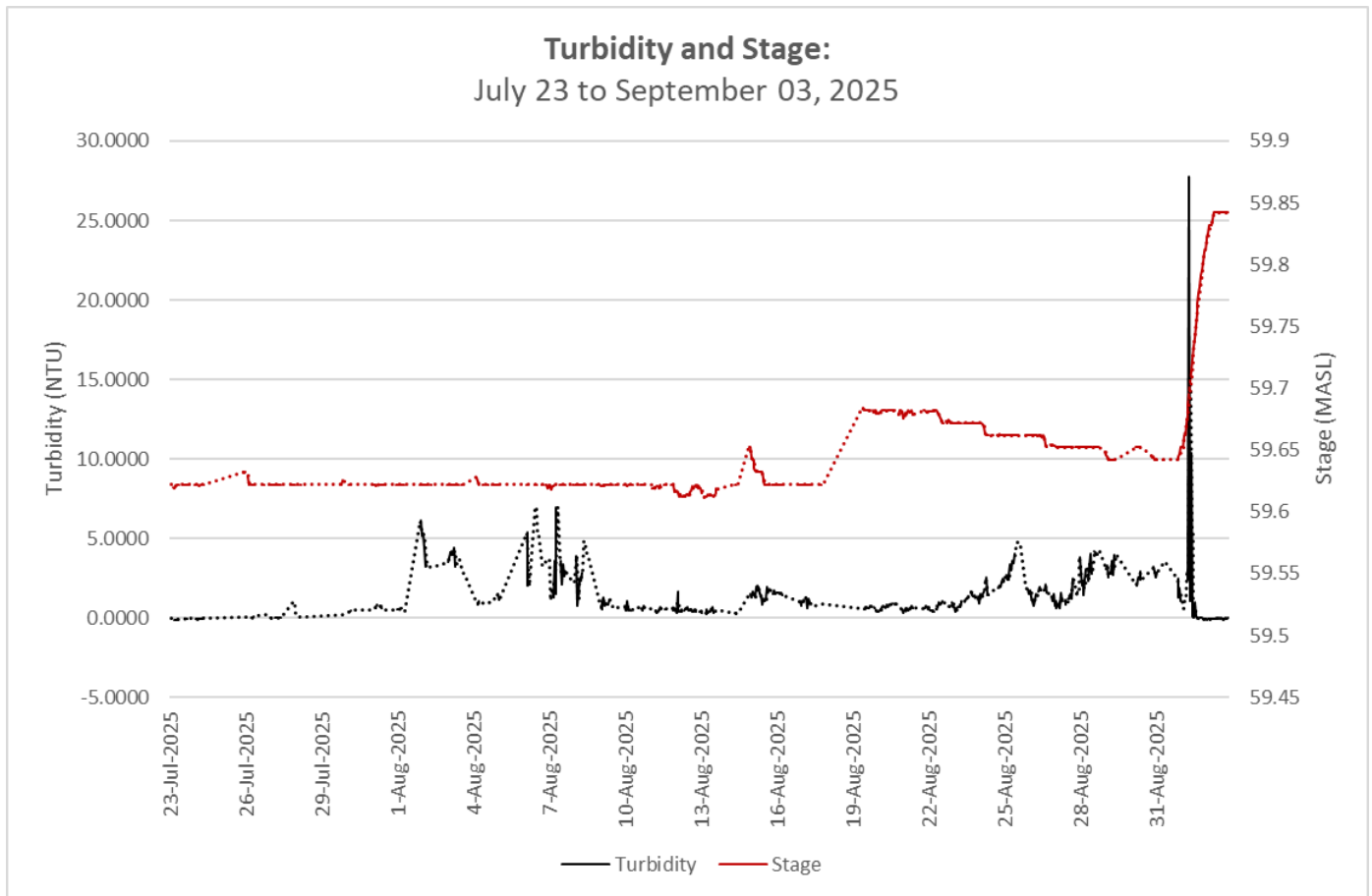


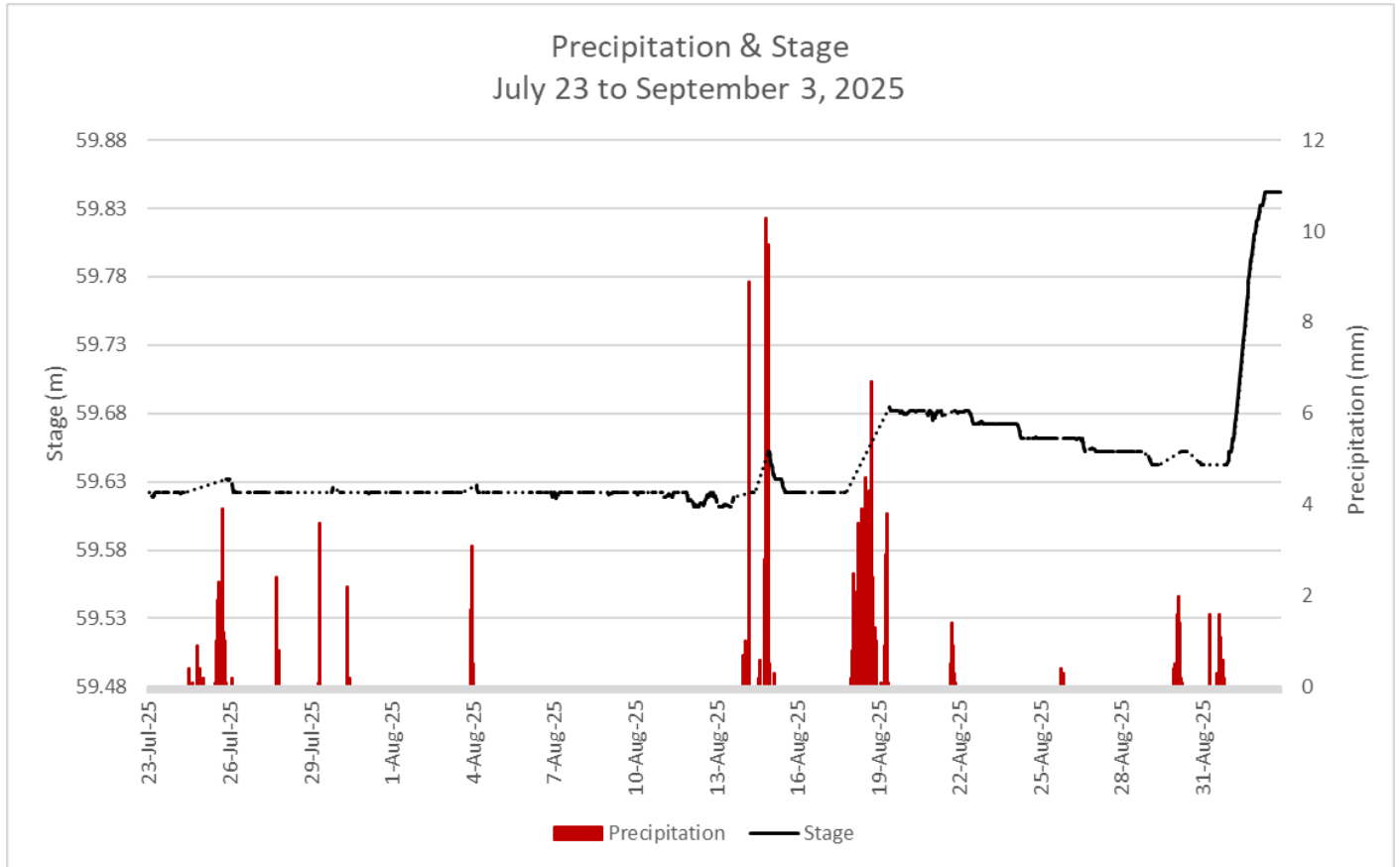
Figure 5: Dissolved Oxygen and Water Temperature – Outflow of the Steady

- Turbidity values range from -0.14 NTU to 27.77 NTU with a median of 0.84, indicating very clear background turbidity.
- The minus turbidity measurements were due to a calibration error prior to deployment.
- Turbidity increased during periods of precipitation, indicating either sediment was washed into the river with the precipitation or the increased stage level and turbulence caused sediment in the river to suspend within the water column, increasing turbidity values until the sediment settled out again (Figure 6).



**Figure 6: Turbidity – Outflow of the Steady**

- Precipitation and stage during the deployment period are graphed below (Figure 7).
- With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.



**Figure 7: Precipitation – Outflow of the Steady**

## Conclusions

- An instrument was deployed at the Outflow of the Steady water quality monitoring station on July 23 and removed on September 03, 2025. This was the second deployment of the 2025 season.
- In most cases, weather related events (precipitation and spring ice thaw) explain parameter fluctuations.
- Water temperature increased until mid August and then began to decrease towards the end of the deployment period, ranging from 12.10 to 27.98°C. This is expected due to the influence of the ambient air temperature as summer transitions into fall.
- pH values were all within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 6.94 and 7.27. The brook is influenced by high precipitation events which decrease pH values for a short time.
- Specific conductivity ranged from 82.59 to 98.45  $\mu\text{s}/\text{cm}$ , showing minimal fluctuations during the deployment.
- Dissolved oxygen values were above the minimum CCME Guideline for the Protection of Other Life Stage Cold Water Biota of 6.5 mg/l and approximately a quarter of the values were above the minimum CCME Guideline for the Protection of Early Life Stage Cold Water Biota value of 9.5 mg/l.
- Turbidity values of -0.14 NTU to 27.77 NTU with a median of 0.84 NTU indicated low background turbidity.
- Stage was relatively stable with minor increases related to precipitation.
- All data used in the preparation of the graphs and subsequent discussion adhere to stringent QA/QC protocol. Corrected data can be obtained upon request.

## Appendix 1

