Real-Time Water Quality Deployment Report

Rattling Brook Network

February 28, 2013 to April 3, 2013

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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2013-02-28 to 2013-04-03

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- During this deployment interval, monitoring was temporarily suspended at Big Pond station due to ice conditions. Redeployment is expected in the spring once shifting ice pans no longer pose a threat to instrumentation.
- A prolonged communication dropout was experienced from March 9th to March 21st at Plant Discharge station resulting in a loss of stage and flow data. Water quality data was filled in using data logged internally within the Hydrolab. For pH and Conductivity data, there is some error between transmitted and internally logged data. Differences are illustrated as necessary.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), 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.
  - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
  - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

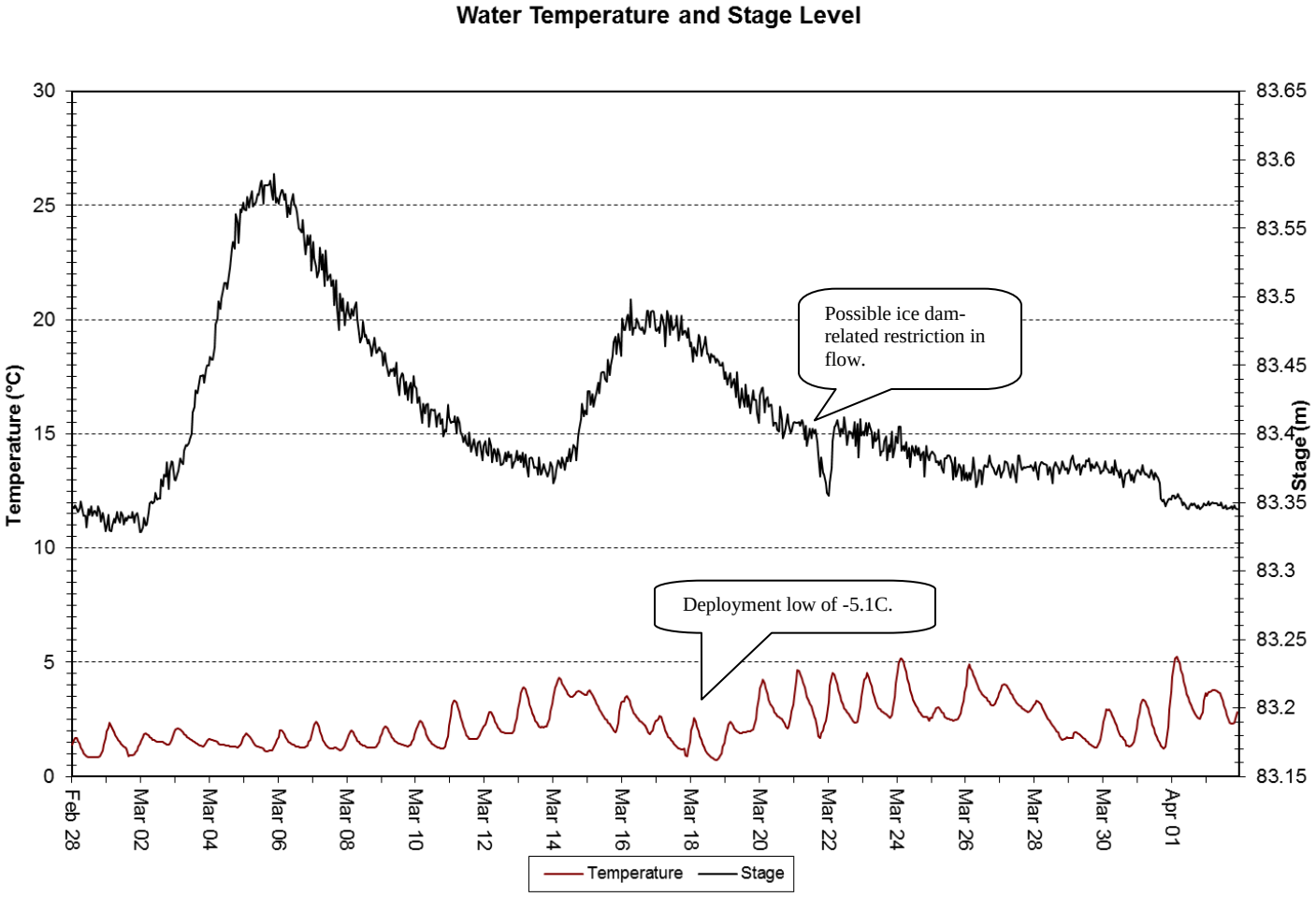
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	Instrument removed due to ice conditions						
Rattling Brook below Bridge	2013-02-28	Deployment	Excellent	Good	Good	Excellent	Excellent
	2013-04-03	Removal	Marginal	Good	Excellent	Marginal	Excellent
Rattling Brook below Plant Discharge	2013-02-28	Deployment	Excellent	Good	Good	Excellent	Excellent
	2013-04-03	Removal	Marginal	Excellent	Excellent	Poor	Good

Data Interpretation

Water Temperature

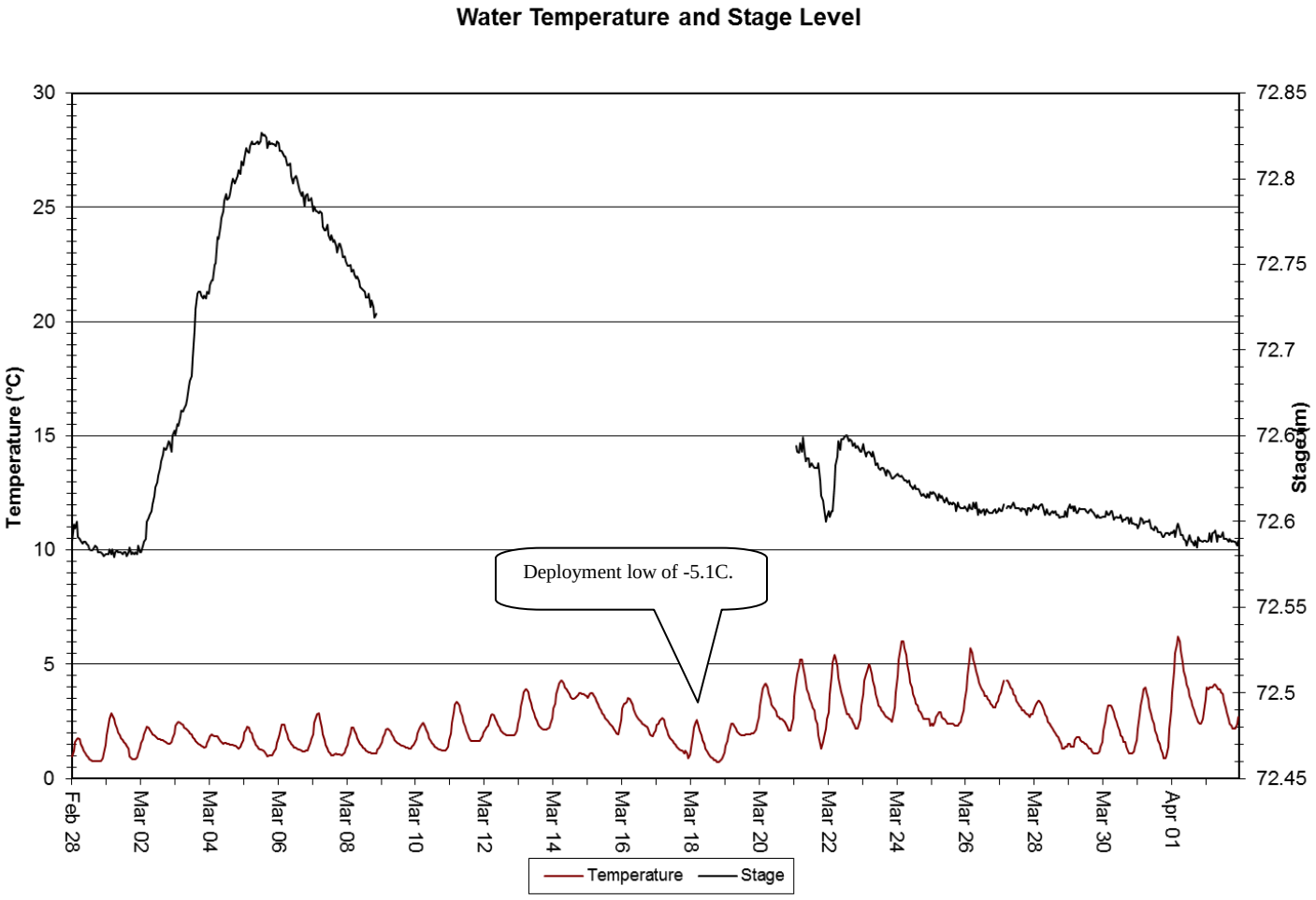
Figure 1: Water Temperature at Rattling Brook below Bridge from February 28, 2013 to April 3, 2013



Parameter	Max	Min	Median
Temperature('C)	5.25	0.72	2.17

- A clear rising trend in water temperature signals the end of the annual winter low temperatures rising from 0.72°C to a high of 5.25°C.
- On March 22nd, there was a rapid water level drop and subsequent rise during a period of warm air temperatures and high precipitation. This flux in temperature and flow may have created an upstream ice dam that restricted flow followed by a release.

Figure 2: Water Temperature at Rattling Brook below Plant Discharge from February 28, 2013 to April 3, 2013

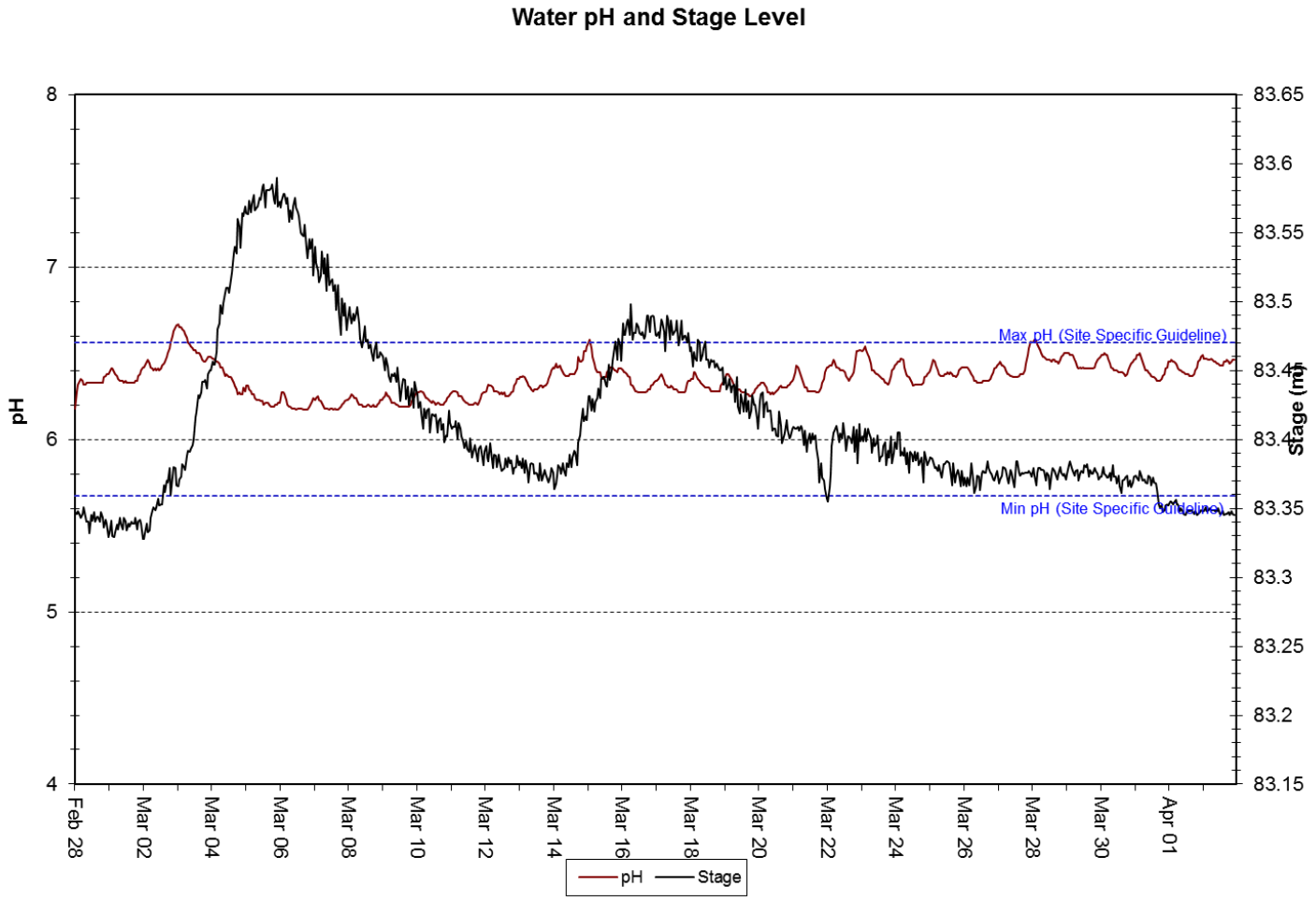


Parameter	Max	Min	Median
Temperature('C)	6.20	0.73	2.22

- Water temperatures were slightly warmer downstream, likely due to a longer period of time for the water to absorb heat from the air.

pH

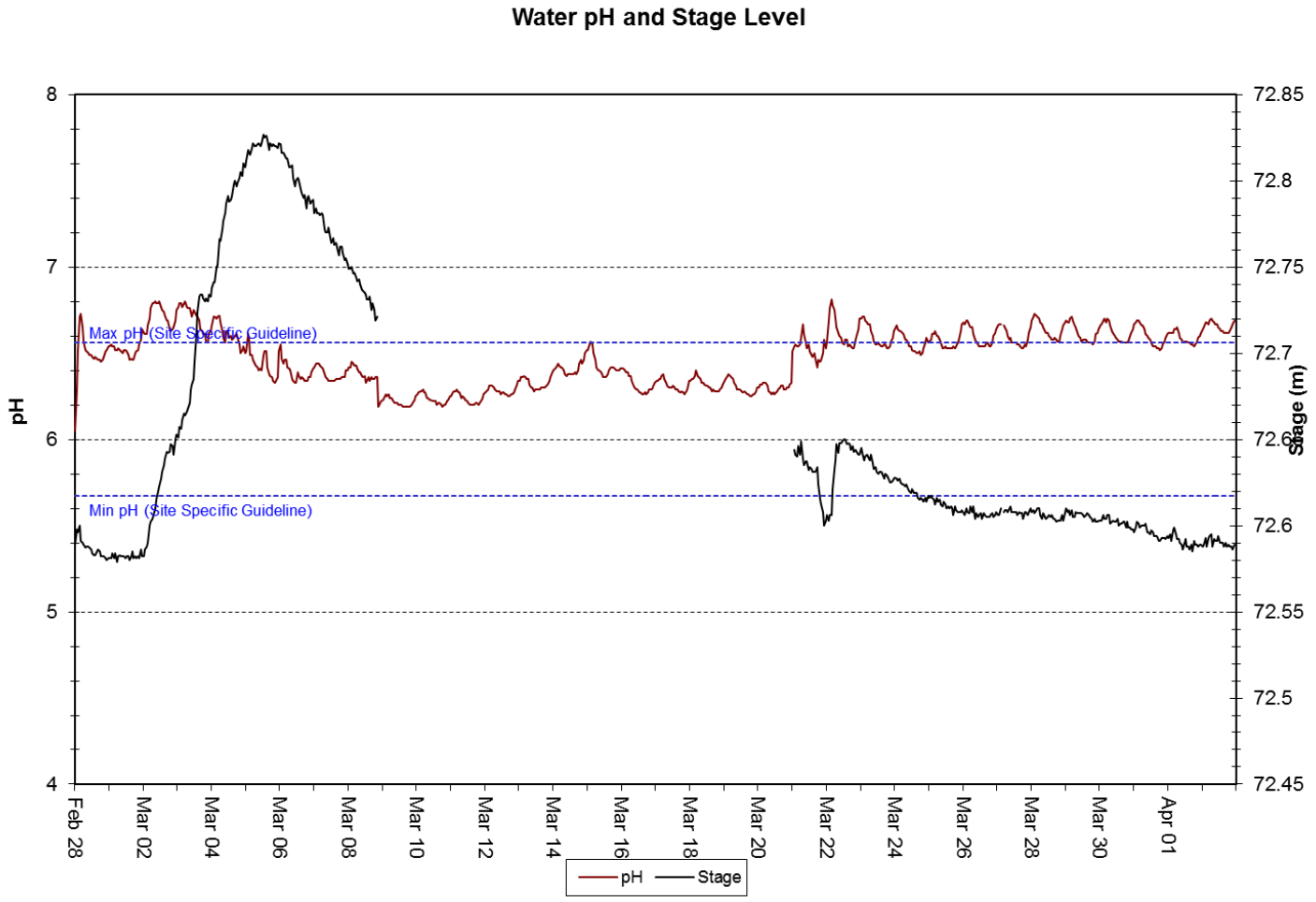
Figure 3: pH at Rattling Brook below Bridge from February 28, 2013 to April 3, 2013



Parameter	Max	Min	Median
pH	6.67	6.17	6.35

- pH values were mostly within the Site Specific Guidelines of 5.67 to 6.56 for Rattling Brook. A slightly upward trend is apparent.

Figure 4: pH at Rattling Brook below Plant Discharge from February 28, 2013 to April 3, 2013

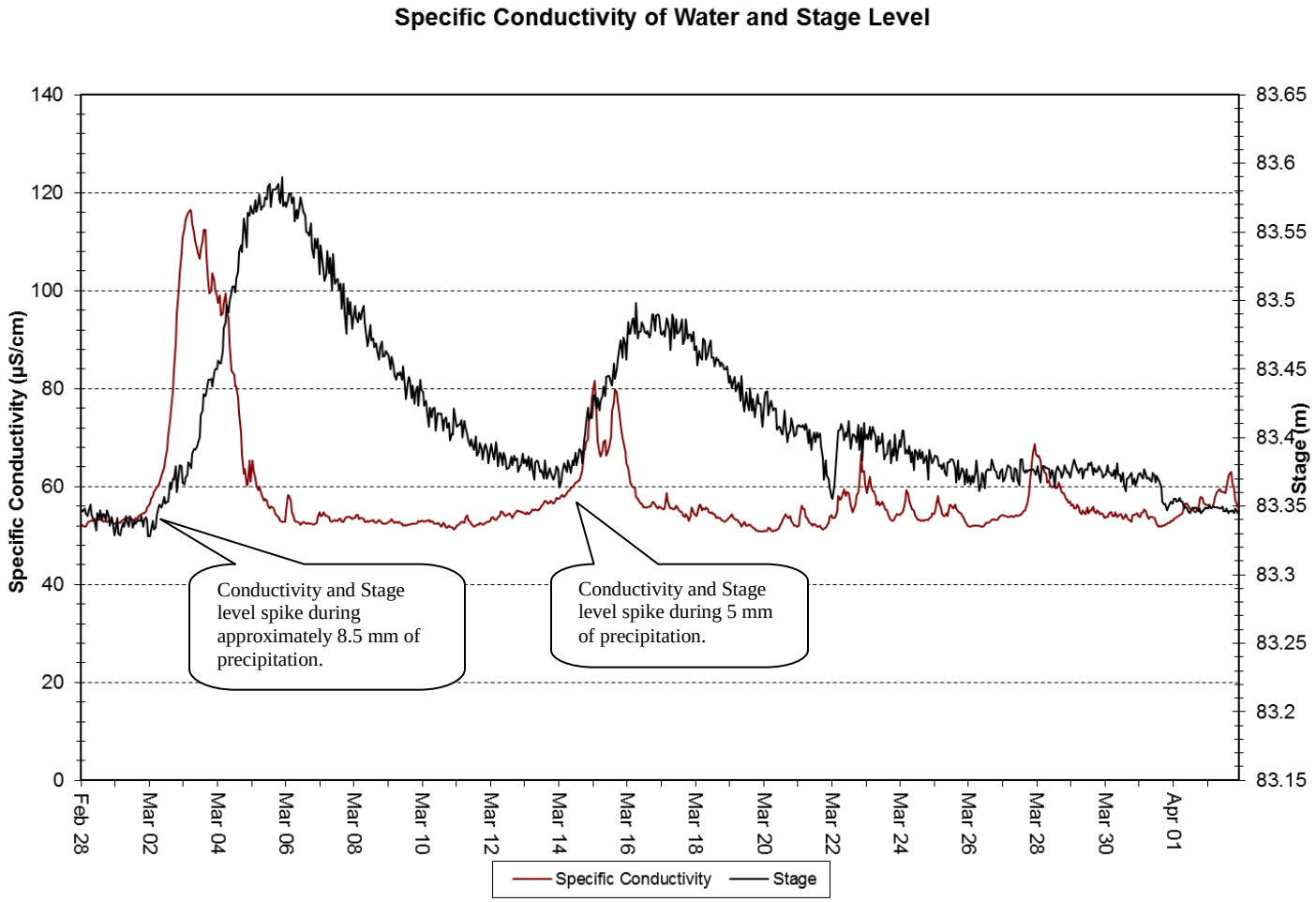


Parameter	Max	Min	Median
pH	6.81	6.05	6.50

- pH levels at Plant Discharge station are marginally more neutral than those upstream at Bridge station.
- The communication dropout from March 9th to March 21st was filled with internally logged pH data. It is clear that pH values recorded in this fashion are somewhat lower than those logged by the datalogger. Regardless, the pH at this station tended to be somewhat more alkaline than upstream at Bridge station.

Specific Conductivity

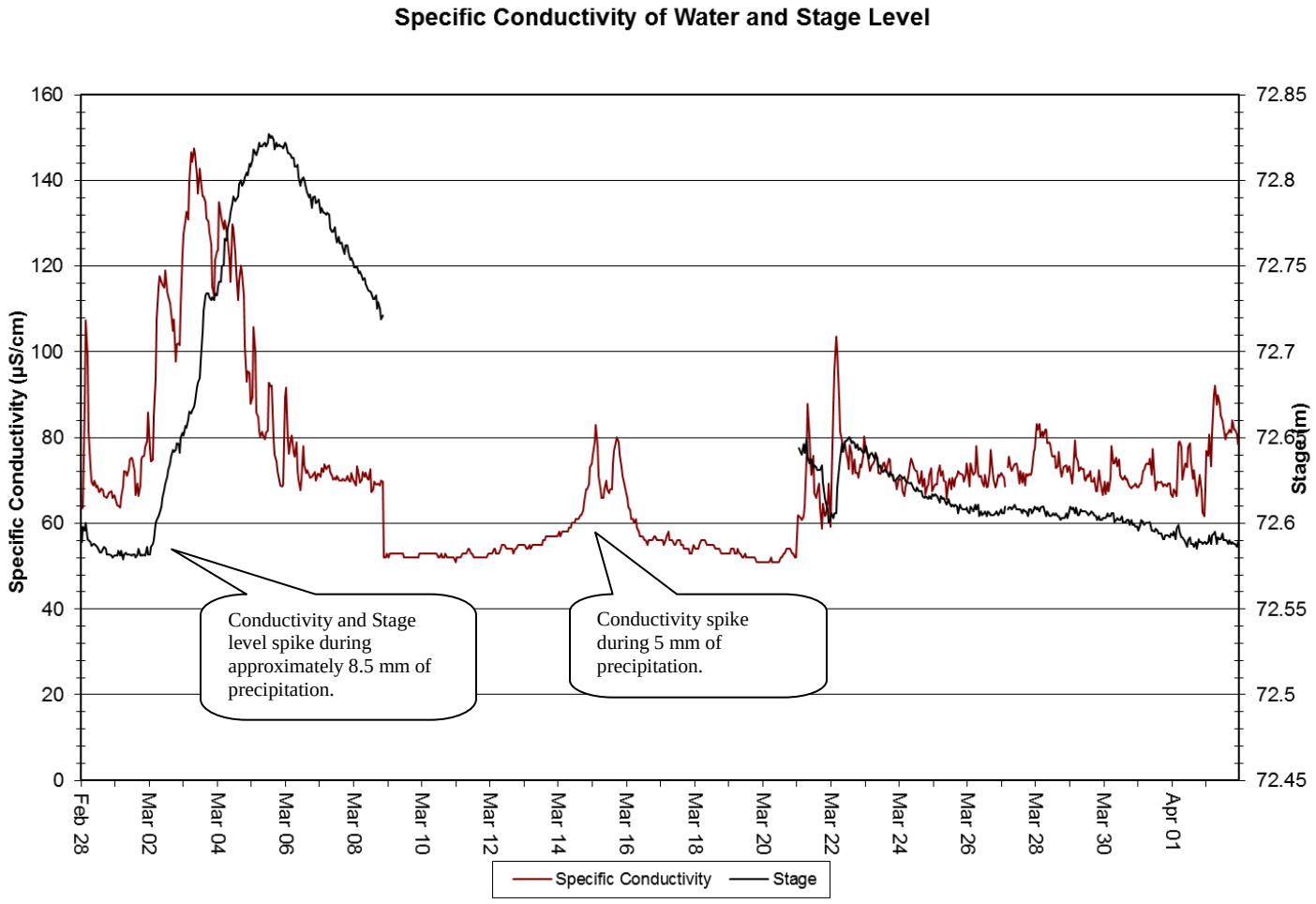
Figure 5: Specific Conductivity at Rattling Brook below Bridge from February 28, 2013 to April 3, 2013



Parameter	Max	Min	Median
Specific Conductivity (µS/cm)	116.6	50.8	54.4

- A slightly upward trend in conductivity is apparent during this deployment period with some large peaks in values corresponding to stage level increases.

Figure 6: Specific Conductivity at Rattling Brook below Plant Discharge from February 28, 2013 to April 3, 2013

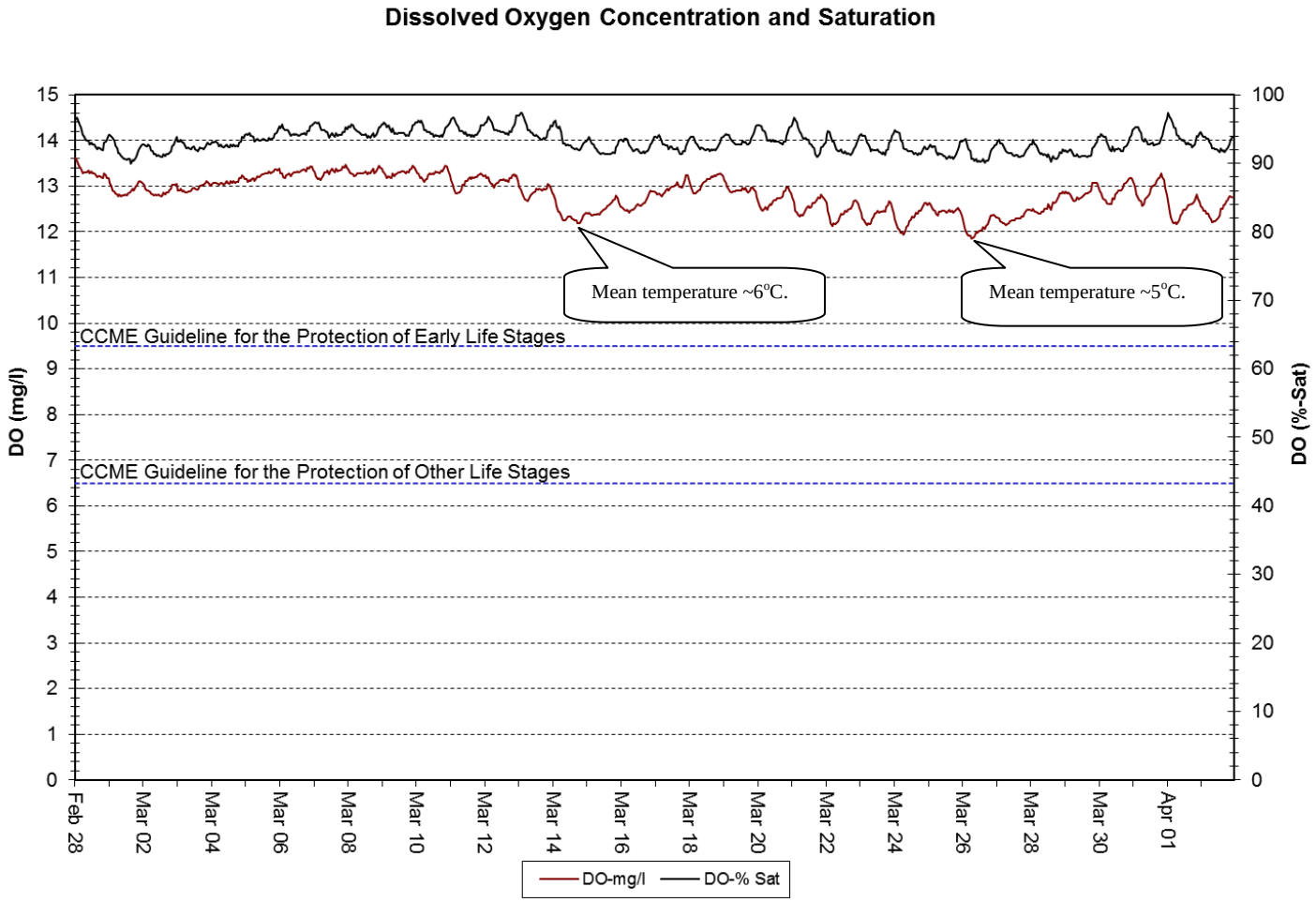


Parameter	Max	Min	Median
Specific Conductivity (µS/cm)	147.4	51.0	69.8

- A slight increase in conductivity is observed over this deployment period.
- The communication drop from early to late March was filled with internally logged data. This data appears to be substantially lower than transmitted values. Despite this, max, min, and median conductivity values were found to be higher than those upstream at Bridge station.

Dissolved Oxygen

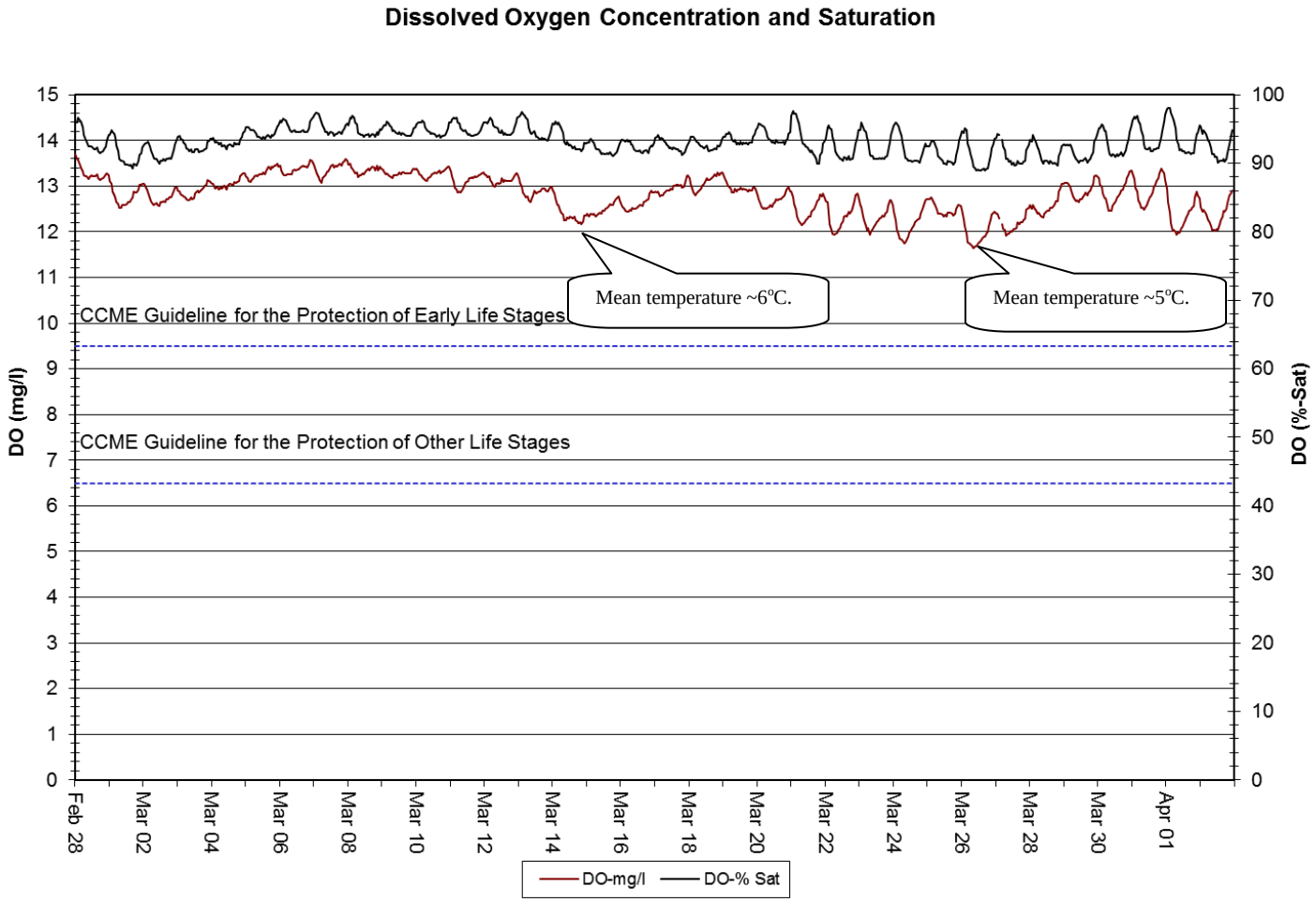
Figure 7: Dissolved Oxygen at Rattling Brook below Bridge from February 28, 2013 to April 3, 2013



Parameter	Max	Min	Median
Dissolved Oxygen (%-Sat)	97.4	90.0	93.0
Dissolved Oxygen (mg/l)	13.61	11.86	12.86

- Dissolved oxygen concentration declined slightly over the course of this deployment period as water temperatures increased from the annual winter low. Two periods of slightly low concentrations were observed when mean daily temperature was high on March 14th and 26th.

Figure 8: Dissolved Oxygen at Rattling Brook below Plant Discharge from February 28, 2013 to April 3, 2013

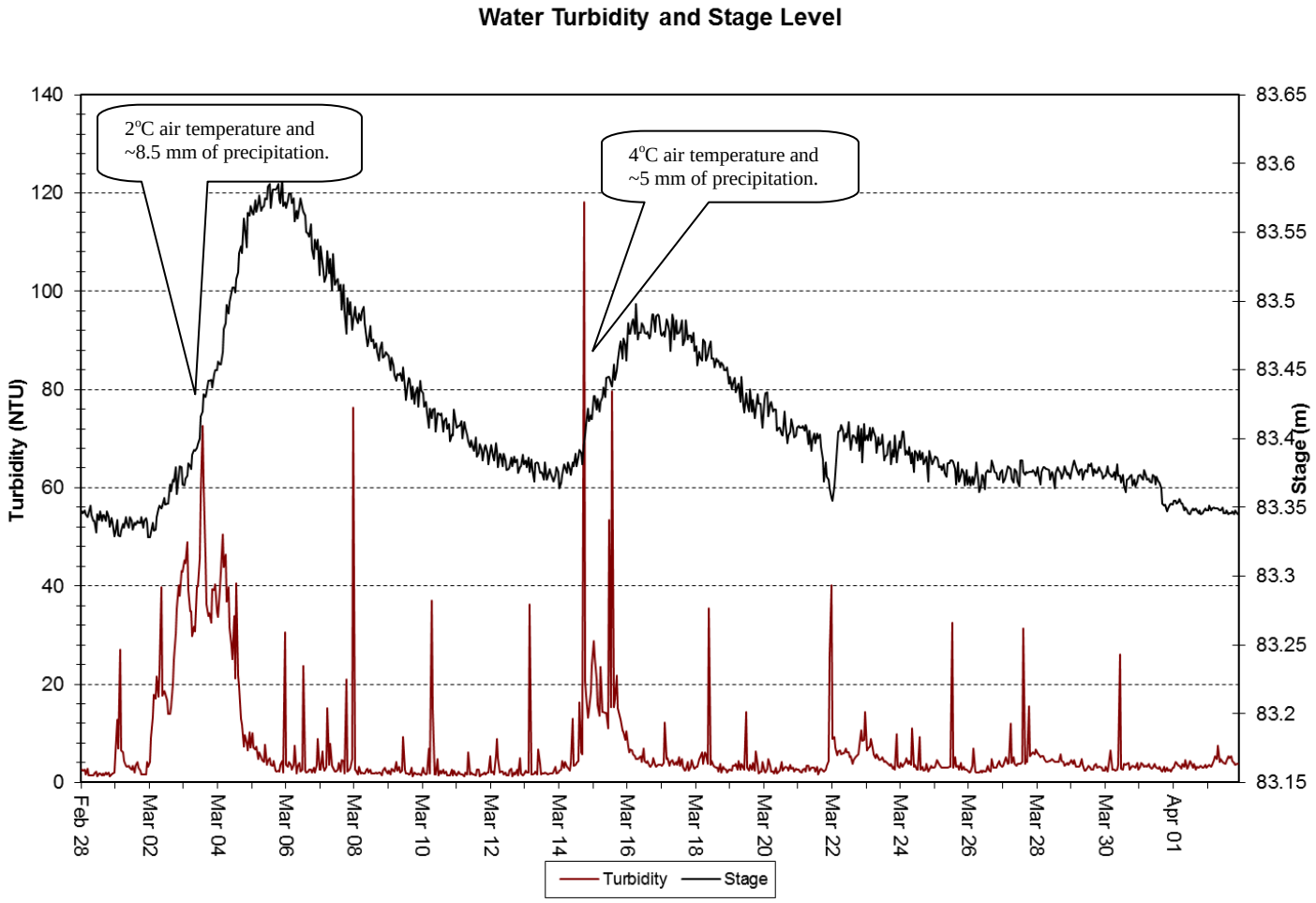


Parameter	Max	Min	Median
Dissolved Oxygen (%-Sat)	98.1	88.9	93.1
Dissolved Oxygen (mg/l)	13.71	11.64	12.85

- Oxygen concentrations at Plant Discharge station were shown to be slightly more elevated on the extreme ends of the spectrum with marginally higher and lower values. Median values between the two stations, however, are essentially the same.
- Identical declines in DO were observed on March 14th and 26th due to warm air temperatures on those days.

Turbidity

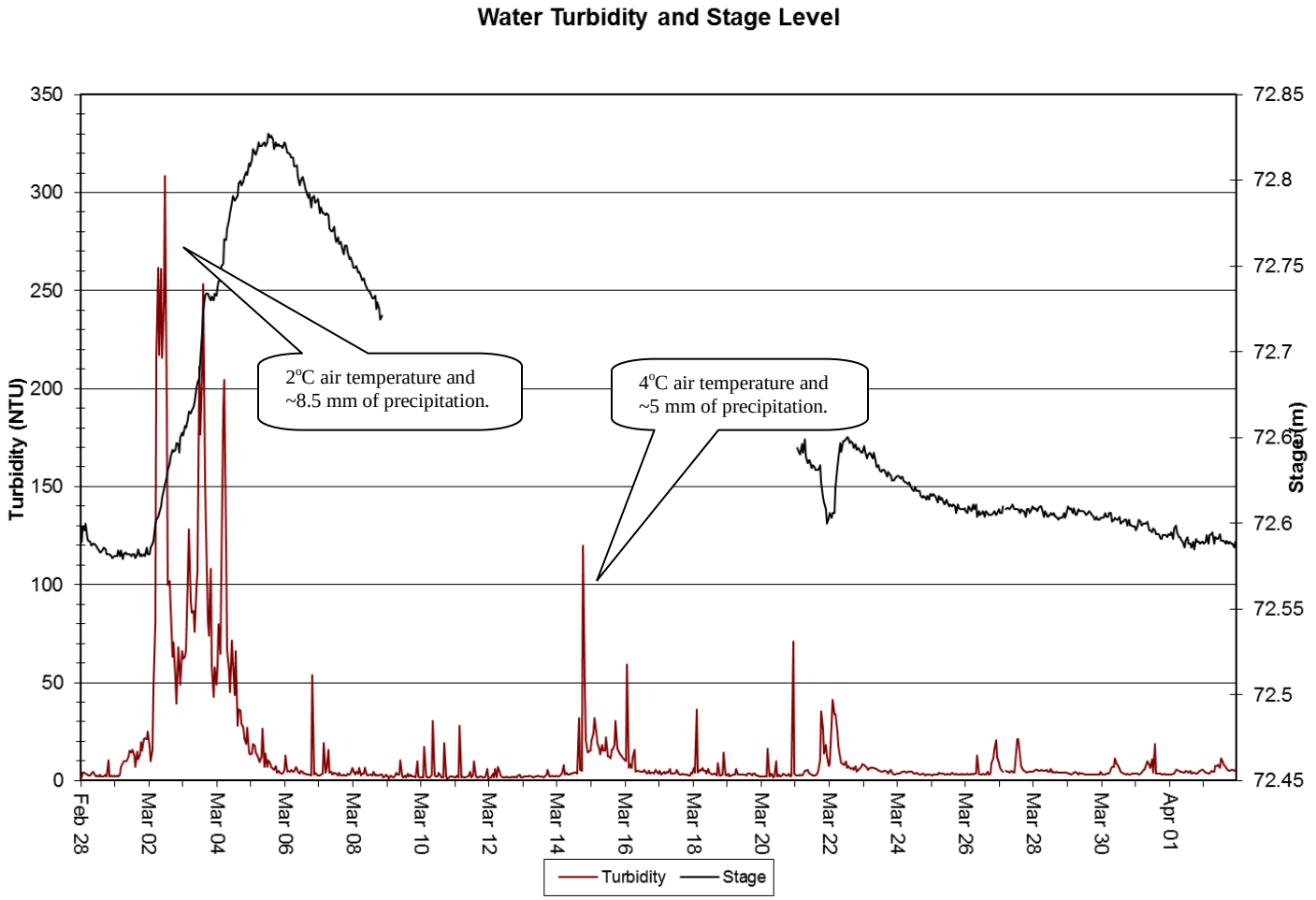
Figure 9: Turbidity at Rattling Brook below Bridge from February 28, 2013 to April 3, 2013



Parameter	Max	Min	Median
Turbidity (NTU)	118.1	1.2	3.3

- Turbidity values centered around 3.3 NTU during this deployment period with two major events occurring from March 2nd to 6th and March 14th to 17th. The earlier event coincided with several days of precipitation and warm air temperatures. The latter event coincided with most warm air temperatures. During this time of year, warm air temperatures result in a high influx of snow melt

Figure 10: Turbidity at Rattling Brook below Plant Discharge from February 28, 2013 to April 3, 2013



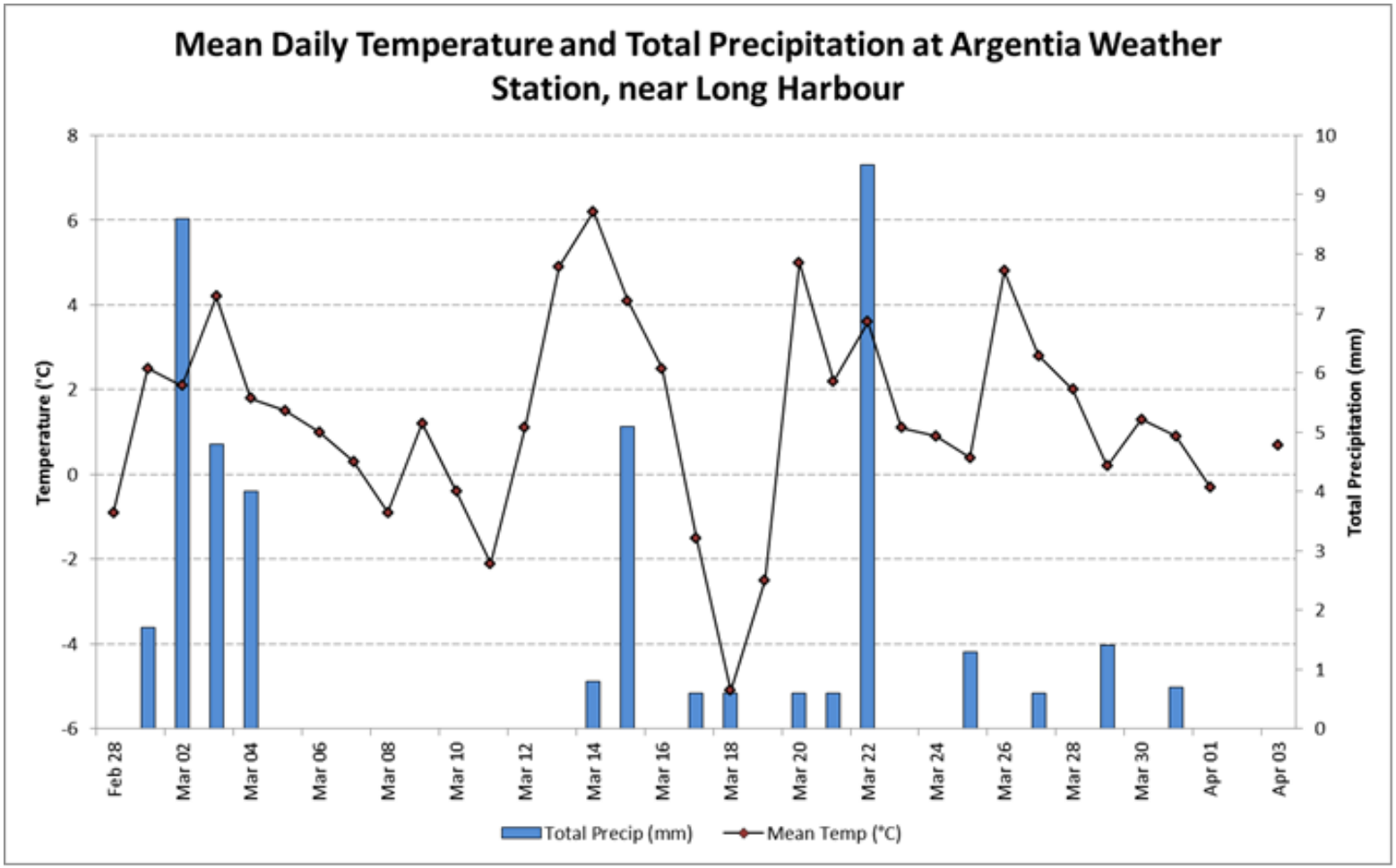
Parameter	Max	Min	Median
Turbidity (NTU)	308.5	1.2	4.0

- Overall, turbidity events downstream at Plant Discharge station were higher than those upstream. In general, however, the same turbidity events are represented at both stations.

Conclusions

- This deployment period marks the early spring season with initial rises in water temperature and declines in dissolved oxygen. Large swings in turbidity levels are also common at this time of year with variable freezing and thawing conditions combined with high volumes of precipitation.
    - 6 turbidity events were observed at Bridge station.
    - 64 turbidity events were observed at Plant Discharge station.
- Discrepancies between transmitted and logged data were found when the transmission gap at Plant Discharge station was filled with internally logged data. Discrepancies were especially notable between pH and conductivity values. A resolution is being sought.

Appendix



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