Real-Time Water Quality Deployment Report

Rattling Brook Network

July 21, 2011 to August 11, 2011

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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2011-07-21 to 2011-08-11

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Habitat compensation work began on a stretch of Rattling Brook between Bridge and Discharge stations. It is anticipated that this work may cause turbidity to be registered at Discharge station. All possible efforts were made to minimize siltation.
- Habitat compensation upstream of Bridge station is anticipated to begin in mid-August.

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.

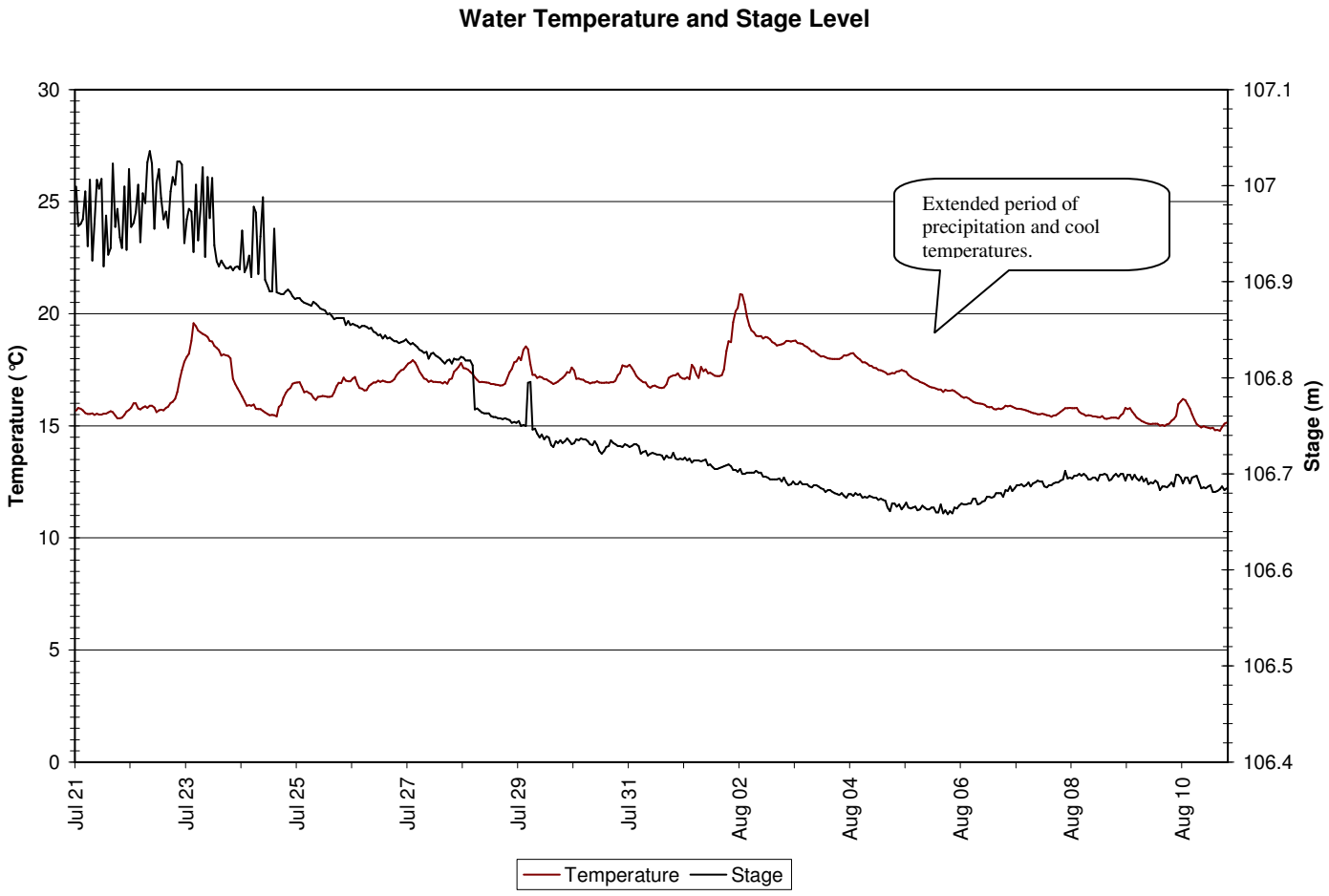
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	July 21, 2011	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	August 11, 2011	Removal	Fair	Excellent	Excellent	Excellent	Good
Rattling Brook below Bridge	July 21, 2011	Deployment	Good	Good	Good	Excellent	Excellent
	August 11, 2011	Removal	Good	Fair	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	July 21, 2011	Deployment	Excellent	Good	Good	Excellent	Excellent
	August 11, 2011	Removal	Fair	Marginal	Excellent	Excellent	Good

Data Interpretation

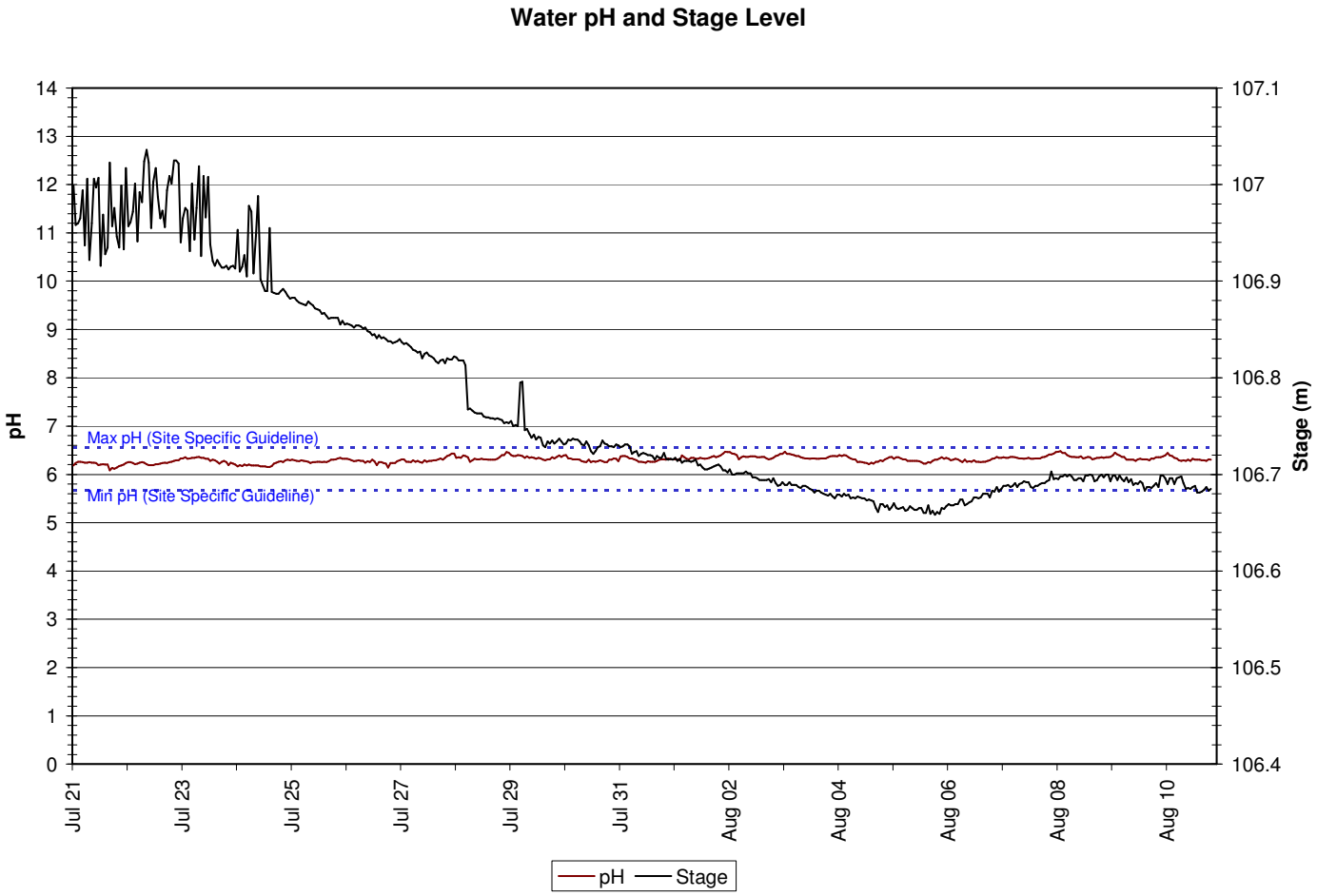
Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond from July 21st to August 11th, 2011



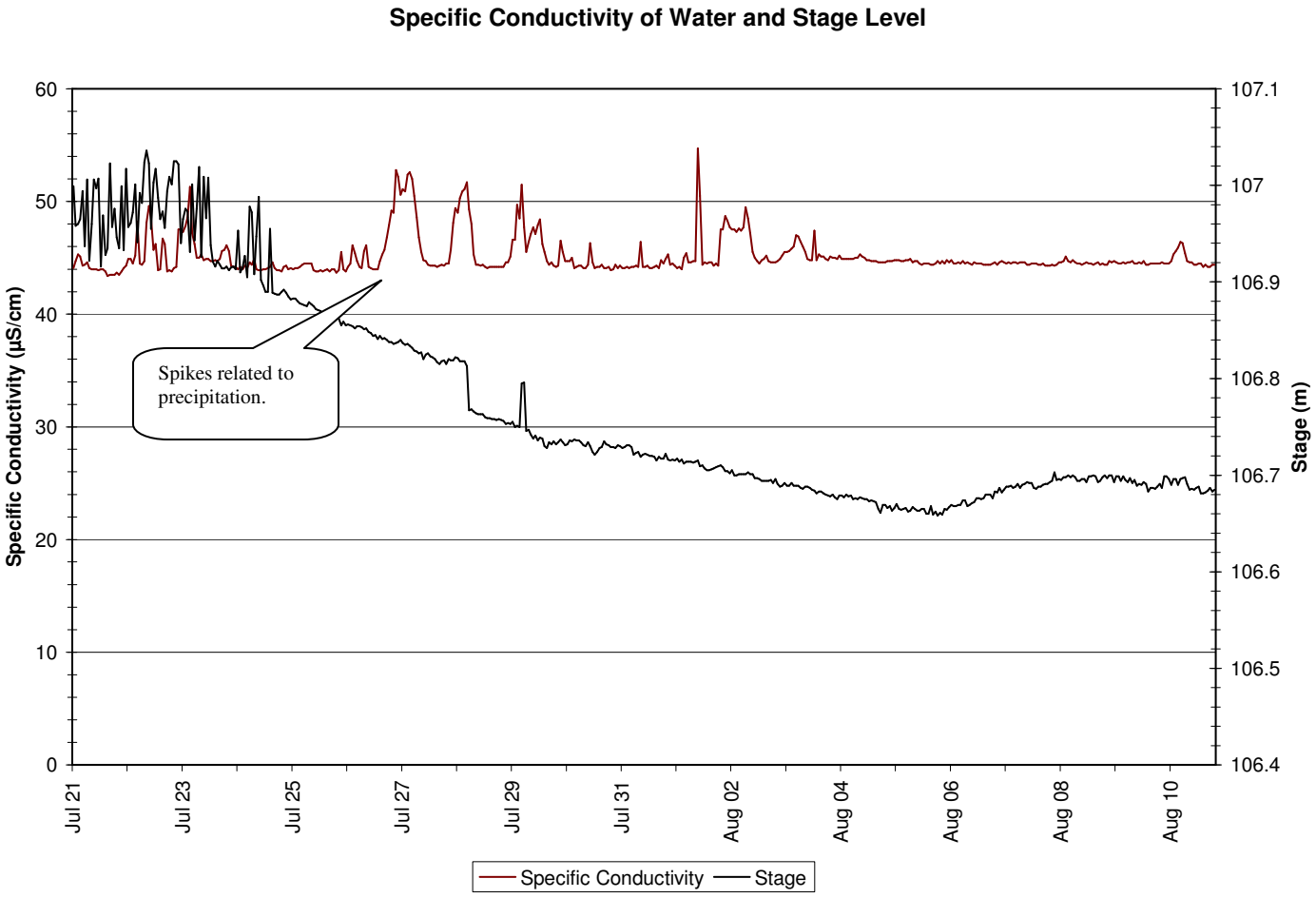
- As testament to the poor weather experienced in July, the normal daily temperature fluctuations were noticeably subdued and almost absent in some cases. An examination of the Mean Daily Temperature and Total Precipitation graph in the Appendix shows the frequent precipitation events and low daily temperatures responsible for the unusual water temperature trend.
- Temperatures ranged from 20.88 to 14.77°C (Median value: 16.92°C). During the same time period in 2010, the median water temperature was found to be 19.07°C, a difference of 11.9%.

Figure 2: pH at Rattling Brook Big Pond from July 21st to August 11th, 2011



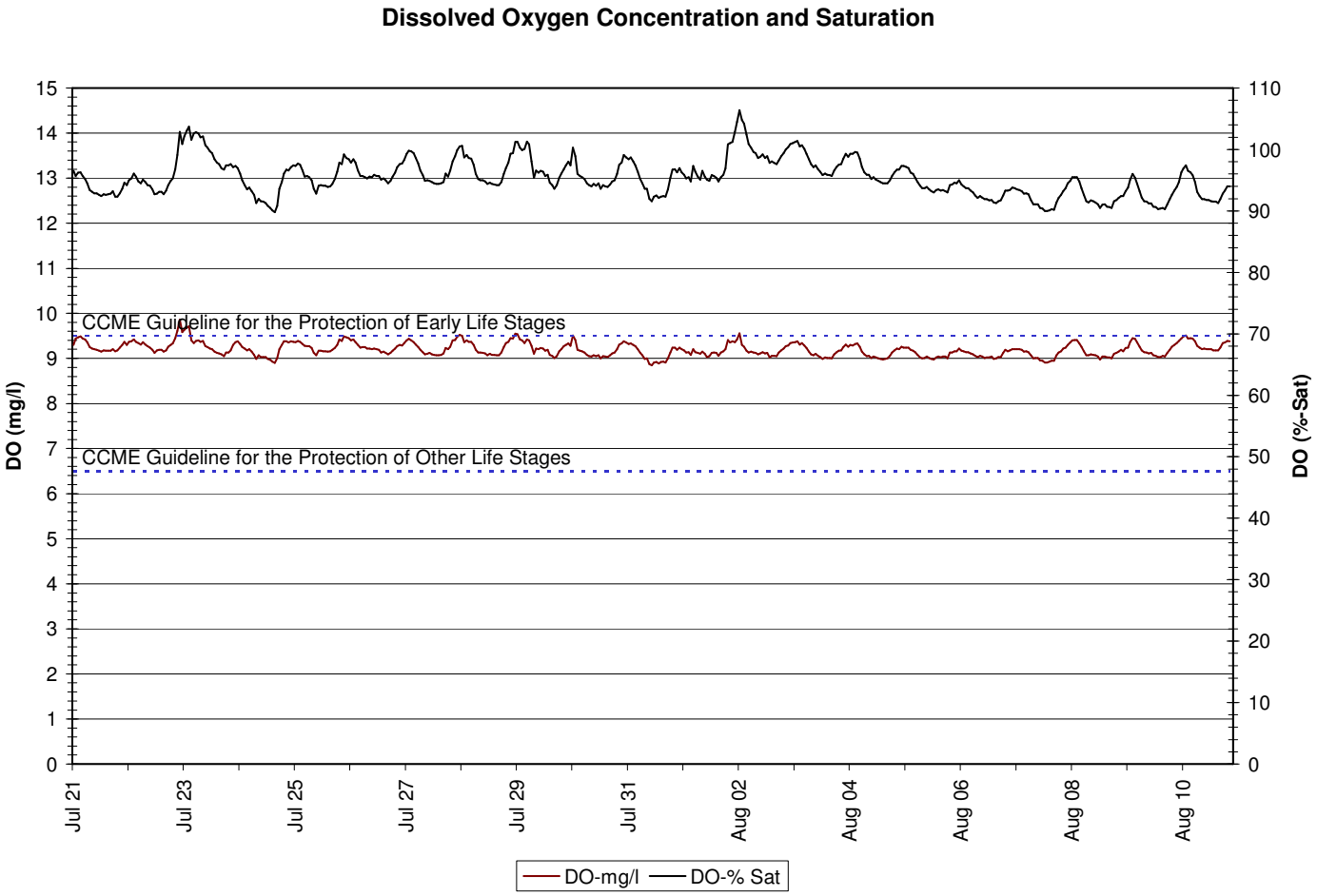
- All pH values were found to fall within the Site Specific Guidelines for the Rattling Brook system (5.67 – 6.56 units) and were stable through the deployment period. Values fell between 6.08 to 6.48 with a median of 6.31.

Figure 3: Specific Conductivity at Rattling Brook Big Pond from July 21st to August 11th, 2011



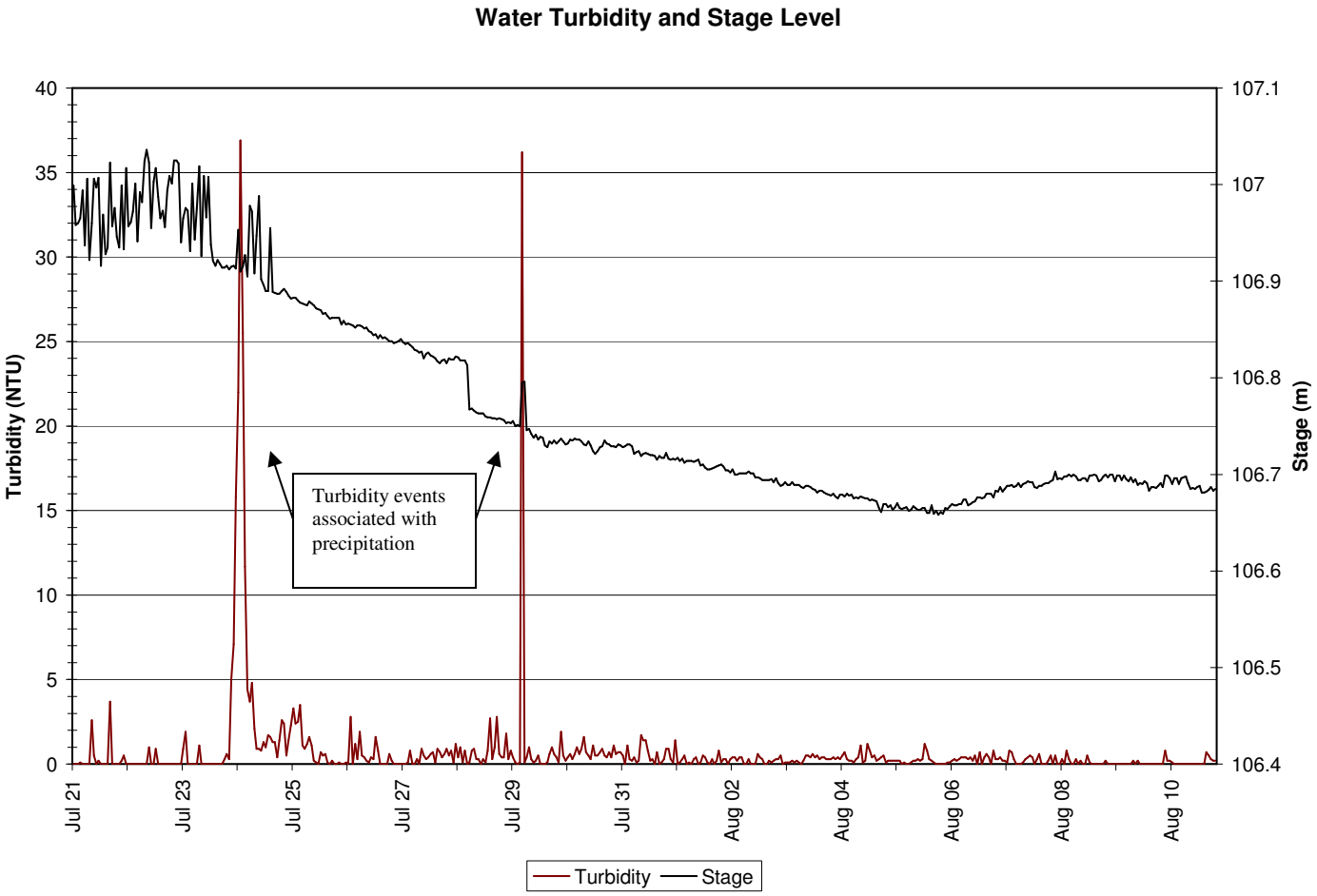
- Specific conductivity was mostly stable through the deployment period with some occasions of spikes seen from July 26th to 30th related to precipitation. No major trend was observed.
- Values range from 43.4 to 54.7 µS/cm (median value: 44.6 µS/cm).

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond from July 21st to August 11th, 2011



- Dissolved oxygen did not have any appreciable trend from July 21st to August 11th which is somewhat unusual for this time of year. Generally, this is time period is prime heating season which sees a decreasing DO concentration into late August. This month, no gains or losses were seen.
- Values ranged from 8.85 to 9.86 mg/l with a median value of 9.18 mg/l.

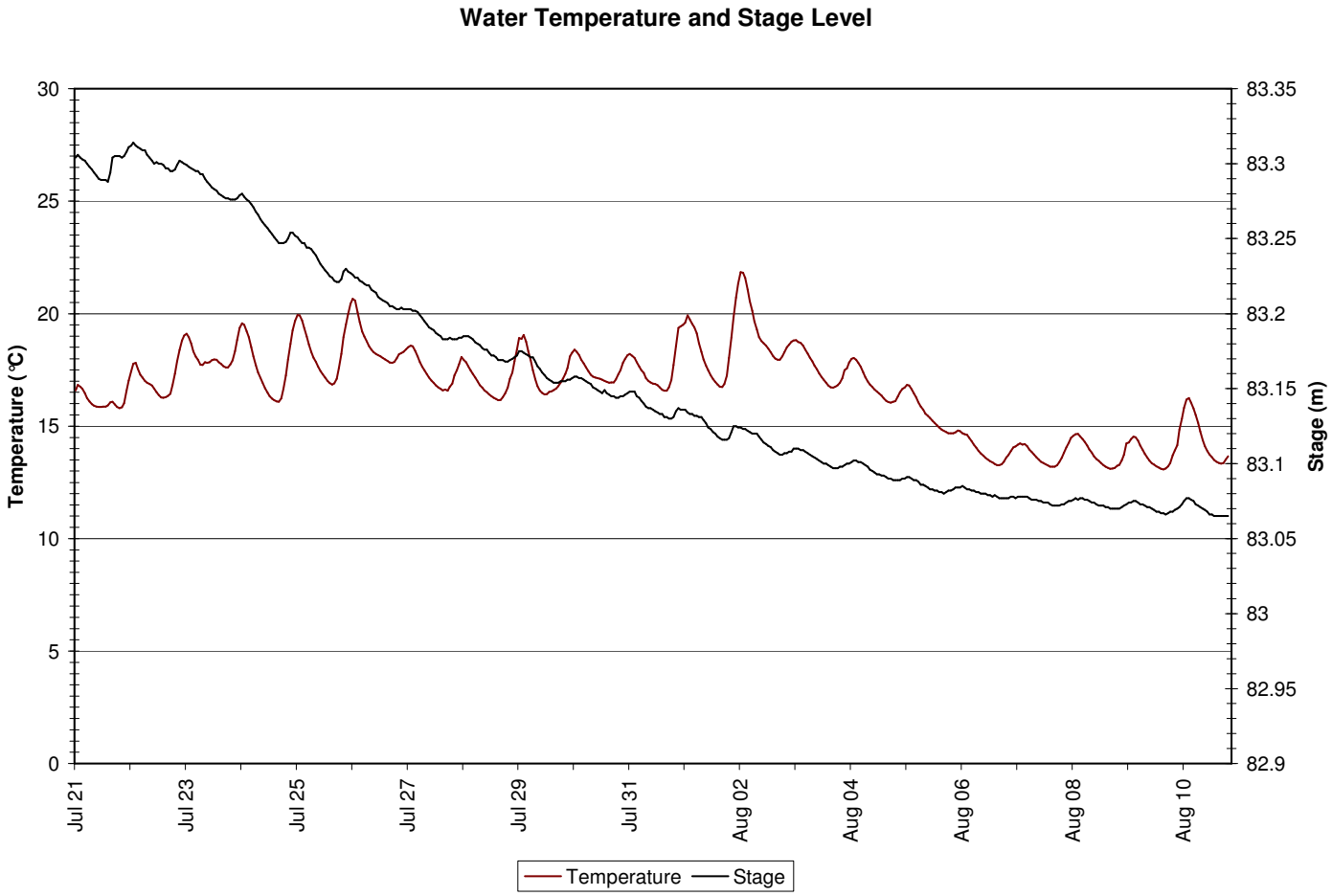
Figure 5: Turbidity at Rattling Brook Big Pond from July 21st to August 11th, 2011



- Very few turbidity events were seen during this deployment period. This fact is highly salient given the ongoing construction of an inlet structure nearby.
- Values ranged from 0.0 to 36.9 NTU with a median value of 0.2 NTU.

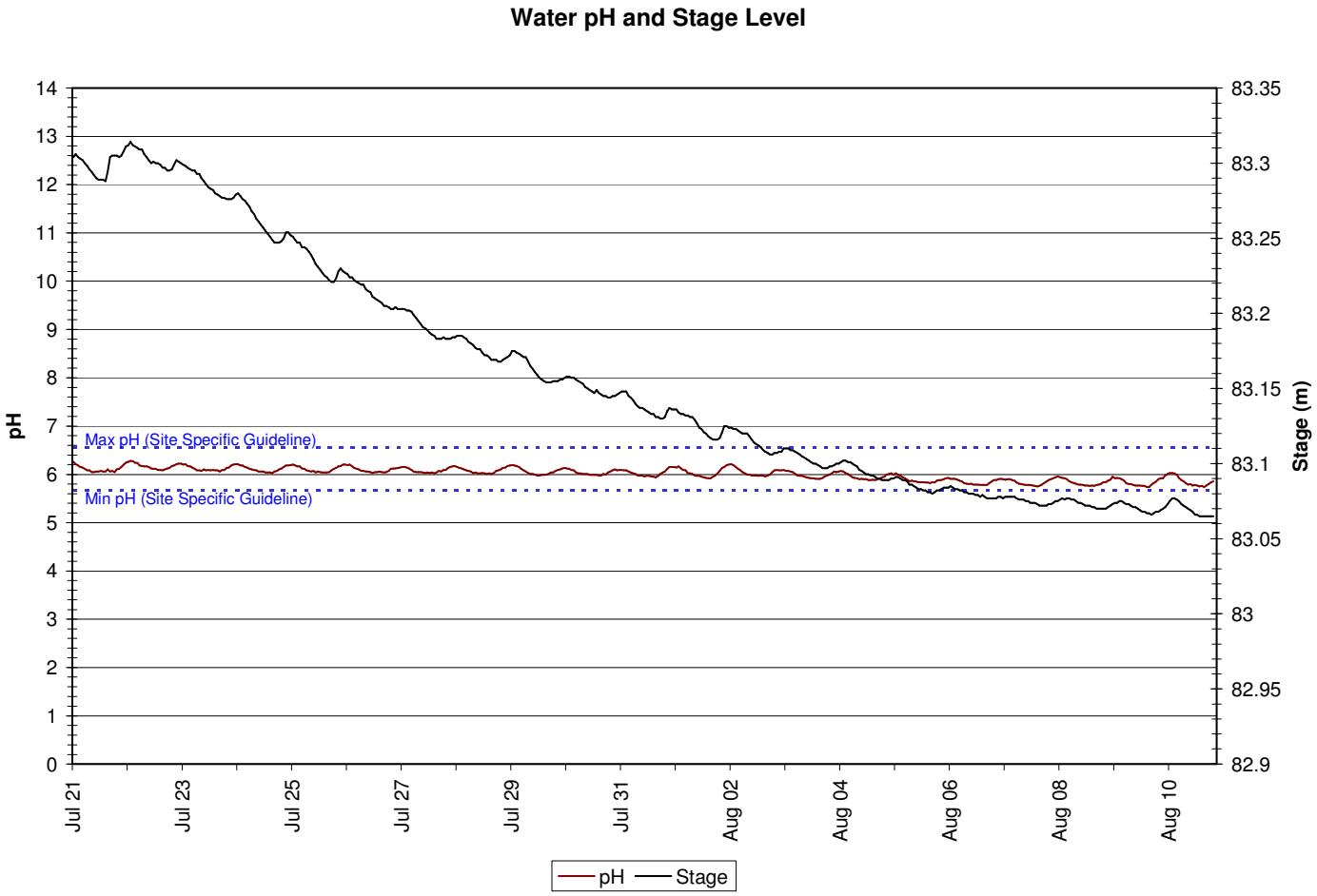
Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge from July 21st to August 11th, 2011



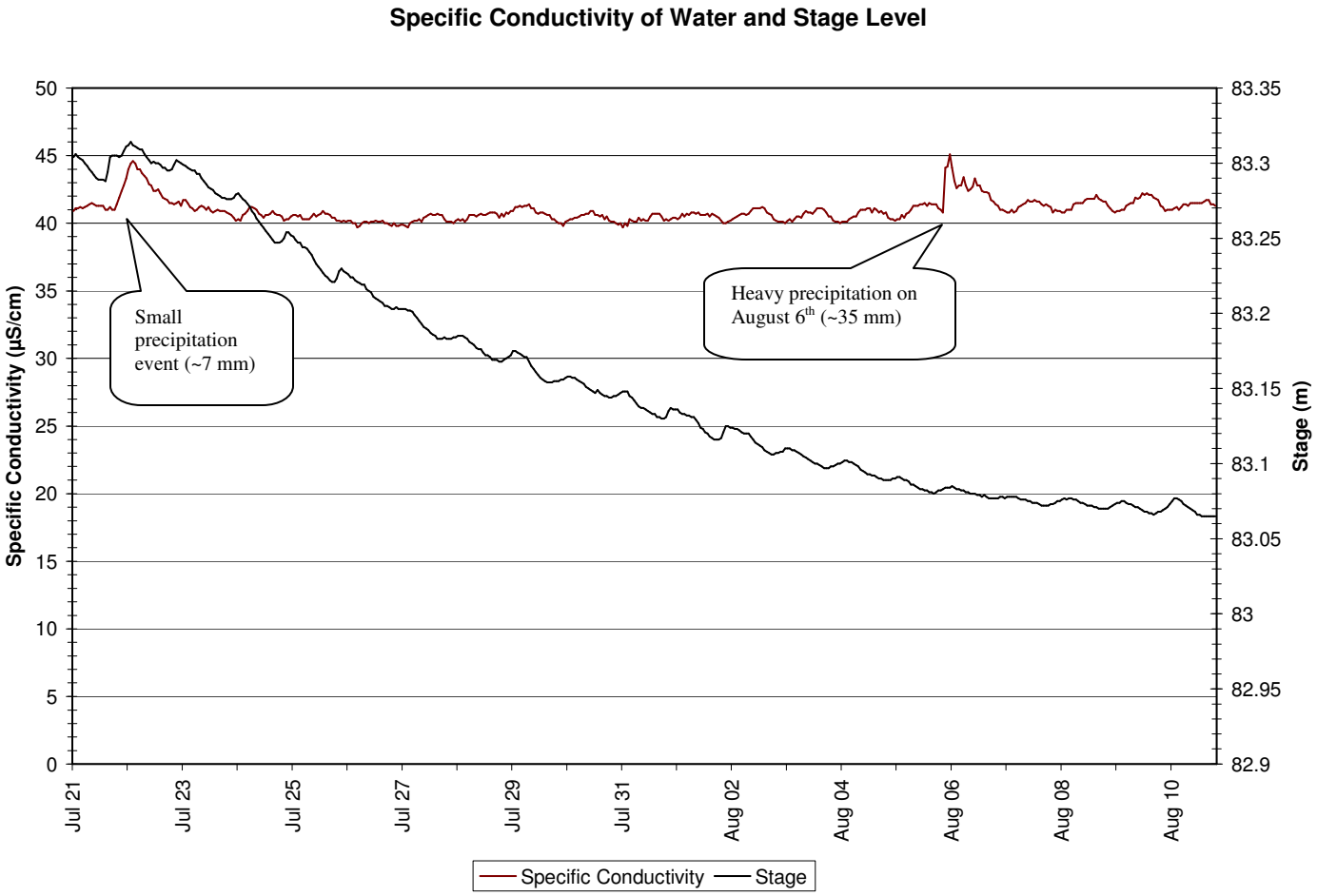
- A range of 13.08 to 21.84°C was observed during the deployment period with a median temperature of 16.92°C. During the same time last year, water temperature ranged from 17.31 to 22.84°C with a median of 19.37°C.

Figure 7: pH at Rattling Brook below Bridge from July 21st to August 11th, 2011



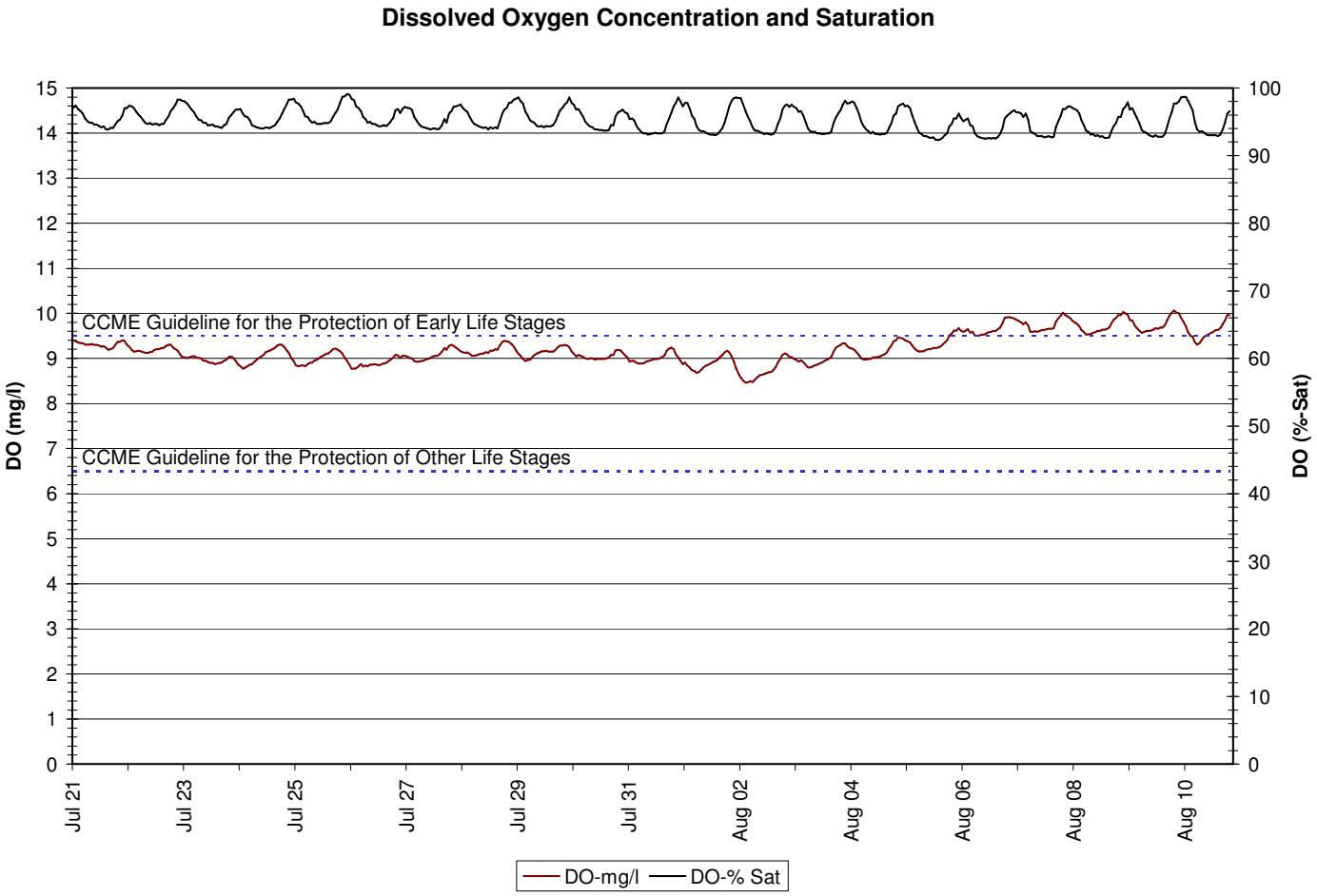
- A marginally downward trend in pH was observed at Bridge station during this deployment. The deployment began with a high value of 6.28 and finished slightly more acidic with a value of 5.74 (median value 6.03 pH units). All pH recordings fell within the Site Specific Guidelines of the Rattling Brook network.

Figure 8: Specific Conductivity at Rattling Brook below Bridge from July 21st to August 11th, 2011



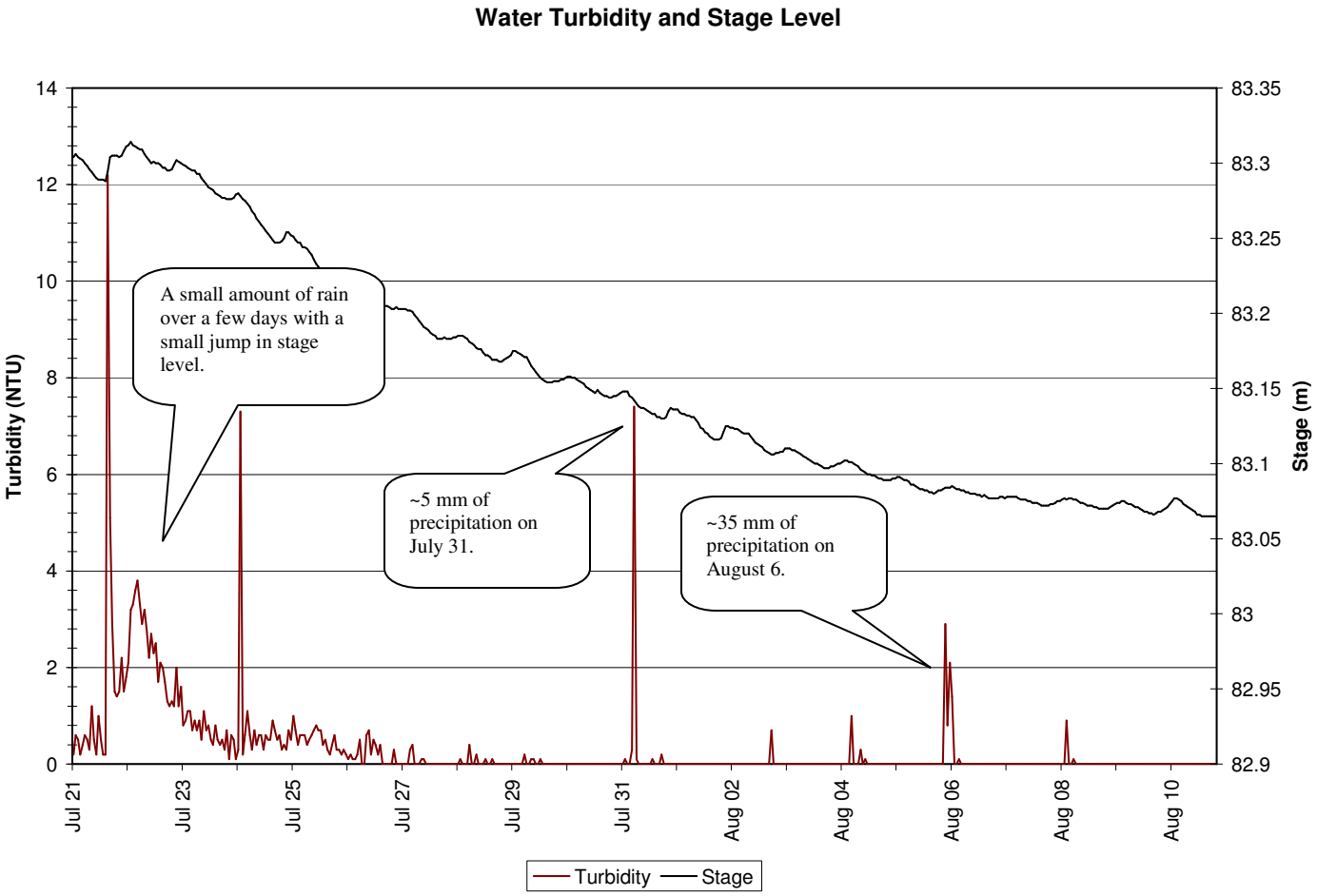
- Converse to the pH trend seen at Bridge station, specific conductivity appeared to increase slightly during the deployment. Conductivity ranged from 39.7 to 45.1 µS/cm (median value of 40.8 µS/cm).
- Despite the gradual rise in conductivity, there were only two small peaks in conductivity throughout the month, as illustrated above.

Figure 9: Dissolved Oxygen at Rattling Brook below Bridge from July 21st to August 11th, 2011



- Dissolved oxygen appears to have increased slightly during this deployment. For much of the month, concentrations remained below the CCME Guideline of 9.5 mg/l for the Protection of Early Life Stage Aquatic Life but far above the critical 6.5 mg/l Guideline for the Protection of Other Life Stages.
- Concentrations fell between 8.46 and 10.06 mg/l for the month (median value 9.15 mg/l).

Figure 10: Turbidity at Rattling Brook below Bridge from July 21st to August 11th, 2011

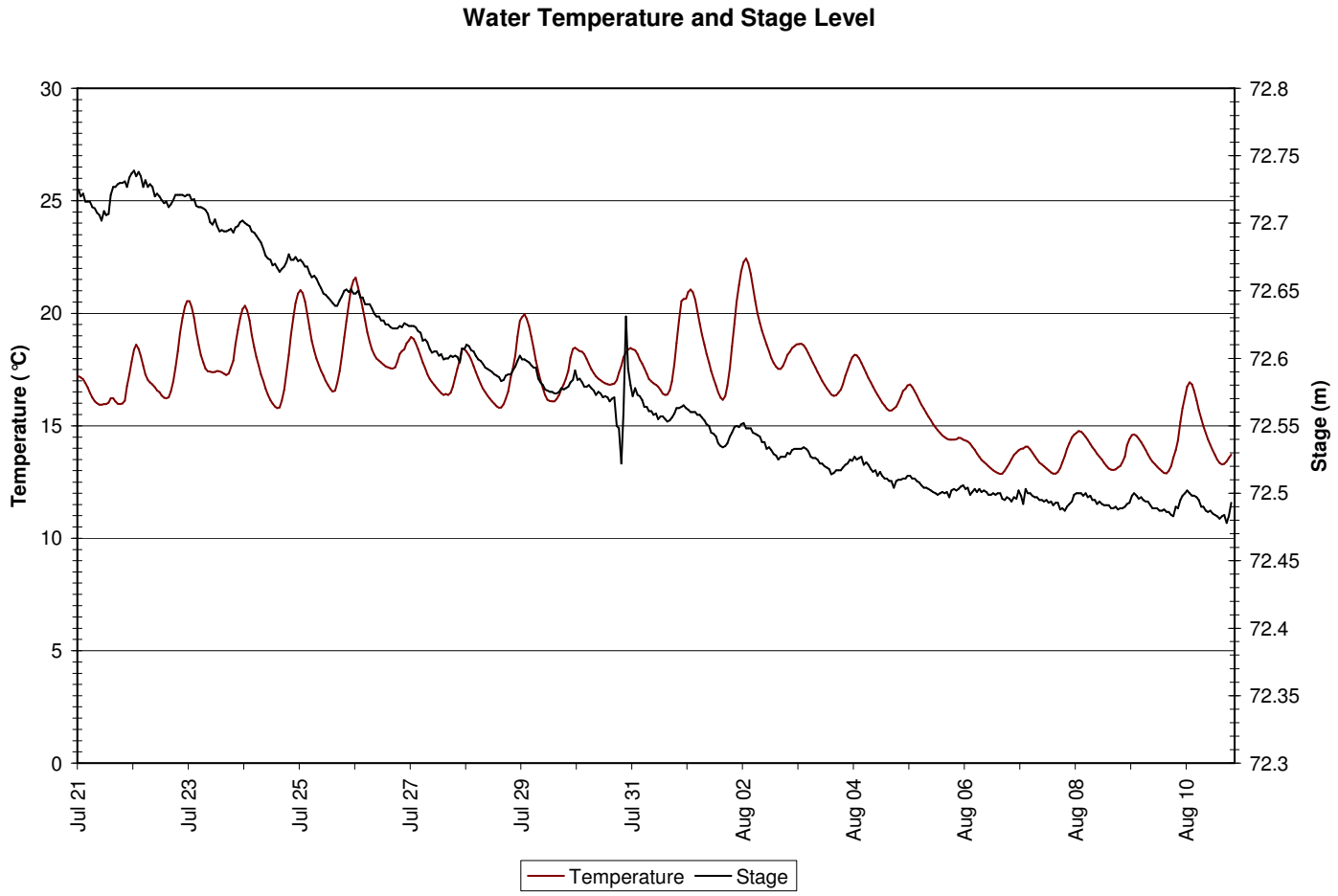


- Turbidity at below Bridge was low for the deployment period with the maximum turbidity recorded at 12.2 NTU. The median value for the month was found to be 0.0 NTU.
- A handful of minor spikes generally occurred with precipitation events.

Rattling Brook below Plant Discharge

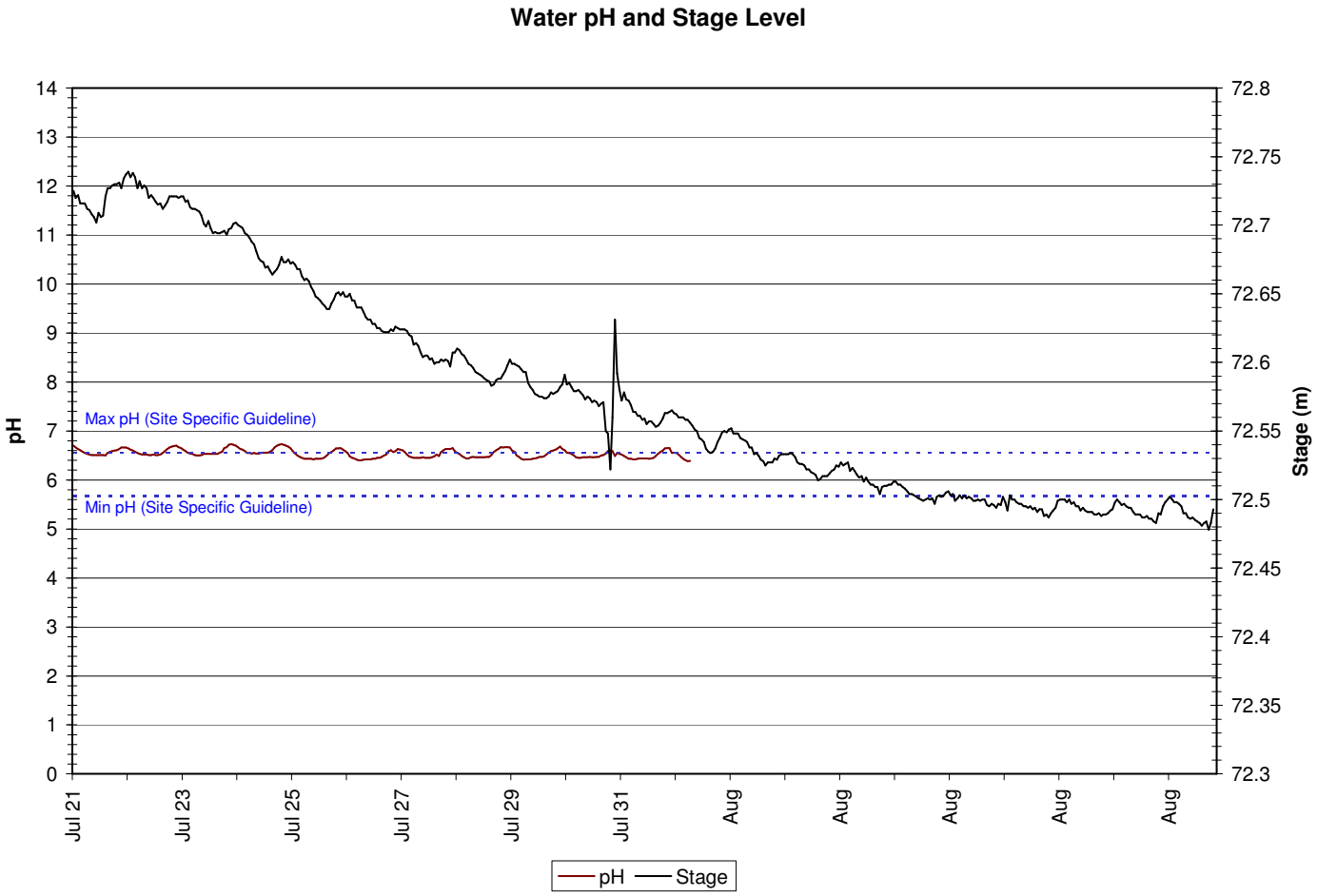
- In each of the following graphs for Plant Discharge station, an unusual change in water level was observed at Rattling Brook below Plant Discharge. On July 31st, the water level began to fall 4.9 cm between 4:30 AM to 10:30 AM and quickly increased 10.9 cm by 12:30 PM. Such rapid changes are very unusual in Rattling Brook and indicate water being withheld upstream and subsequently released.

Figure 11: Water Temperature at Rattling Brook below Plant Discharge from July 21st to August 11th, 2011



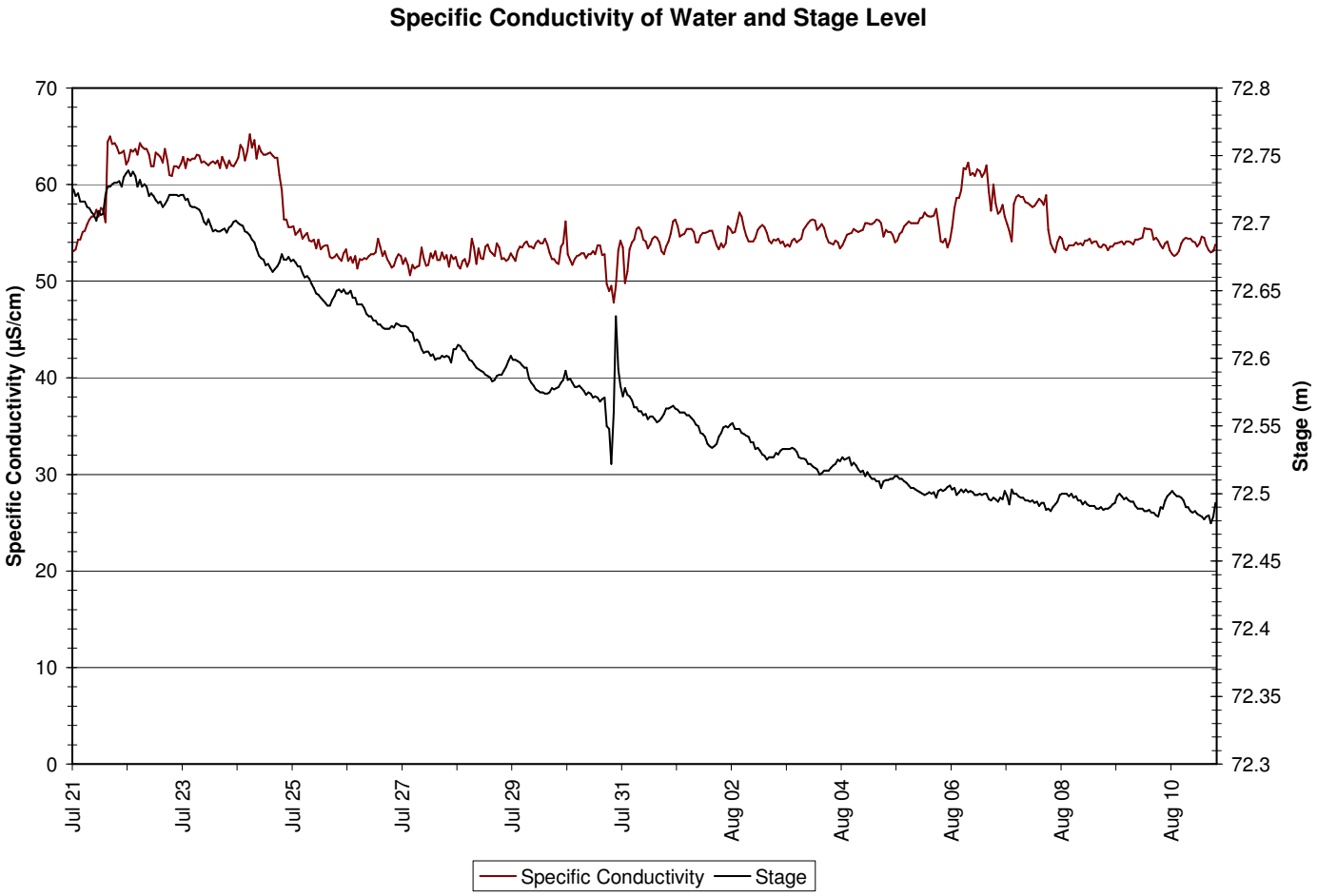
- Diurnal temperature cycles are much more prominent at Discharge station compared to those upstream. A generally downward trend in temperature was observed over the deployment period with values ranging from 22.43 to 12.86°C (median value: 16.85°C). During the same time period in 2010, water temperatures were much warmer and ranged from 23.67 to 17.15°C (median value: 19.60°C).

Figure 12: pH at Rattling Brook below Plant Discharge from July 21st to August 11th, 2011



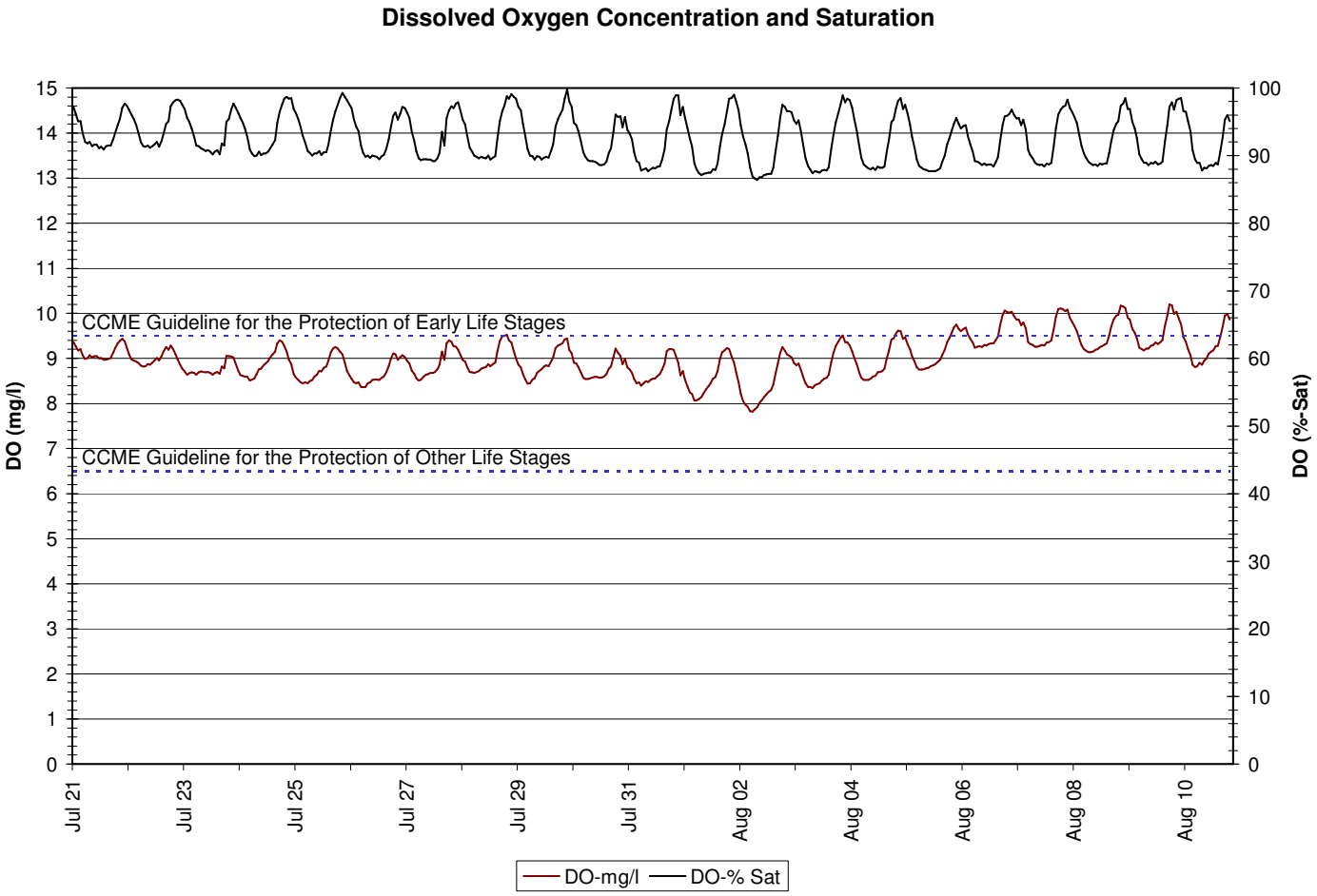
- On August 1st, the pH sensor appears to have encountered an unusual event that resulted in an upward shift in pH measurements. After this date, pH hovers nearly a full pH unit above expected levels. Indeed, at the end of the deployment, the resulting QAQC Ranking is "Marginal" for pH.
- Prior to the incident impacting pH at Discharge station, values tend to persist near the upper Site Specific Guideline levels and ranged from 6.38 to 6.73 (median value: 6.53). Other than the unusual jump in data following August 1st, no other notable events in pH were observed.

Figure 13: Specific Conductivity at Rattling Brook below Plant Discharge from July 21st to August 11th, 2011



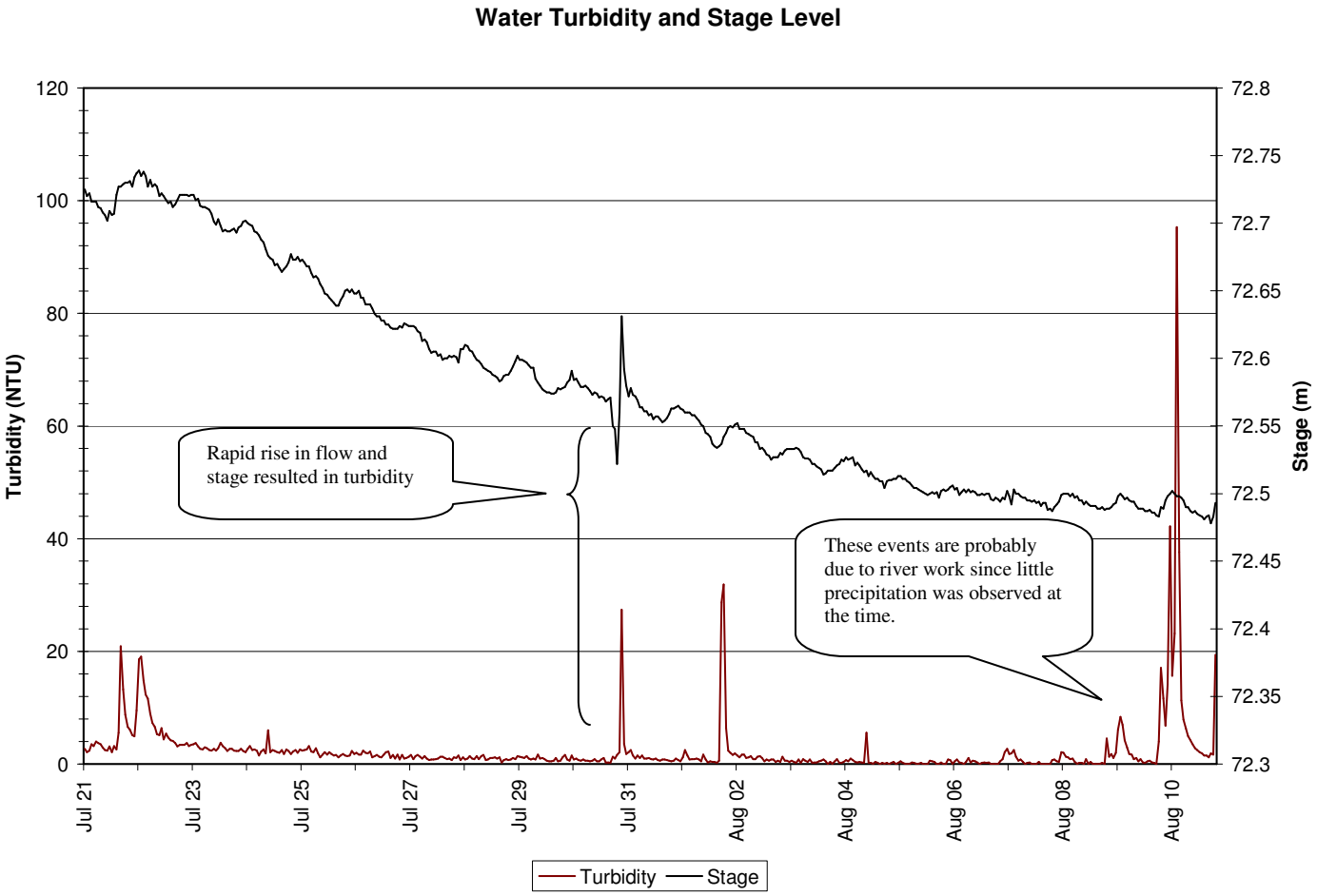
- A slight rise is evident in conductivity over the deployment period. Interestingly, a sustained plateau of conductivity is evident from July 21st to July 25th. The plateau is sustained longer than expected given the amount of precipitation that occurred over the time frame (and since the stage level declines consistently).
- On July 31st, during the drop and rise in stage level, conductivity falls during the "impoundment" stage upstream and returns to normal after the water is released.
- Overall, conductivity fell between 47.8 to 65.2µS/cm (median value: 54.4µS/cm).

Figure 14: Dissolved Oxygen at Rattling Brook below Plant Discharge from July 21st to August 11th, 2011



- Dissolved oxygen concentrations fell between 7.82 and 10.20 mg/l in a slightly upward trend. All values were above the critical 6.5 mg/l CCME Guideline for the Protection of Other Life Stage aquatic species. No particular events related to DO were notable during this deployment period.

Figure 15: Turbidity at Rattling Brook below Plant Discharge from July 21st to August 11th, 2011

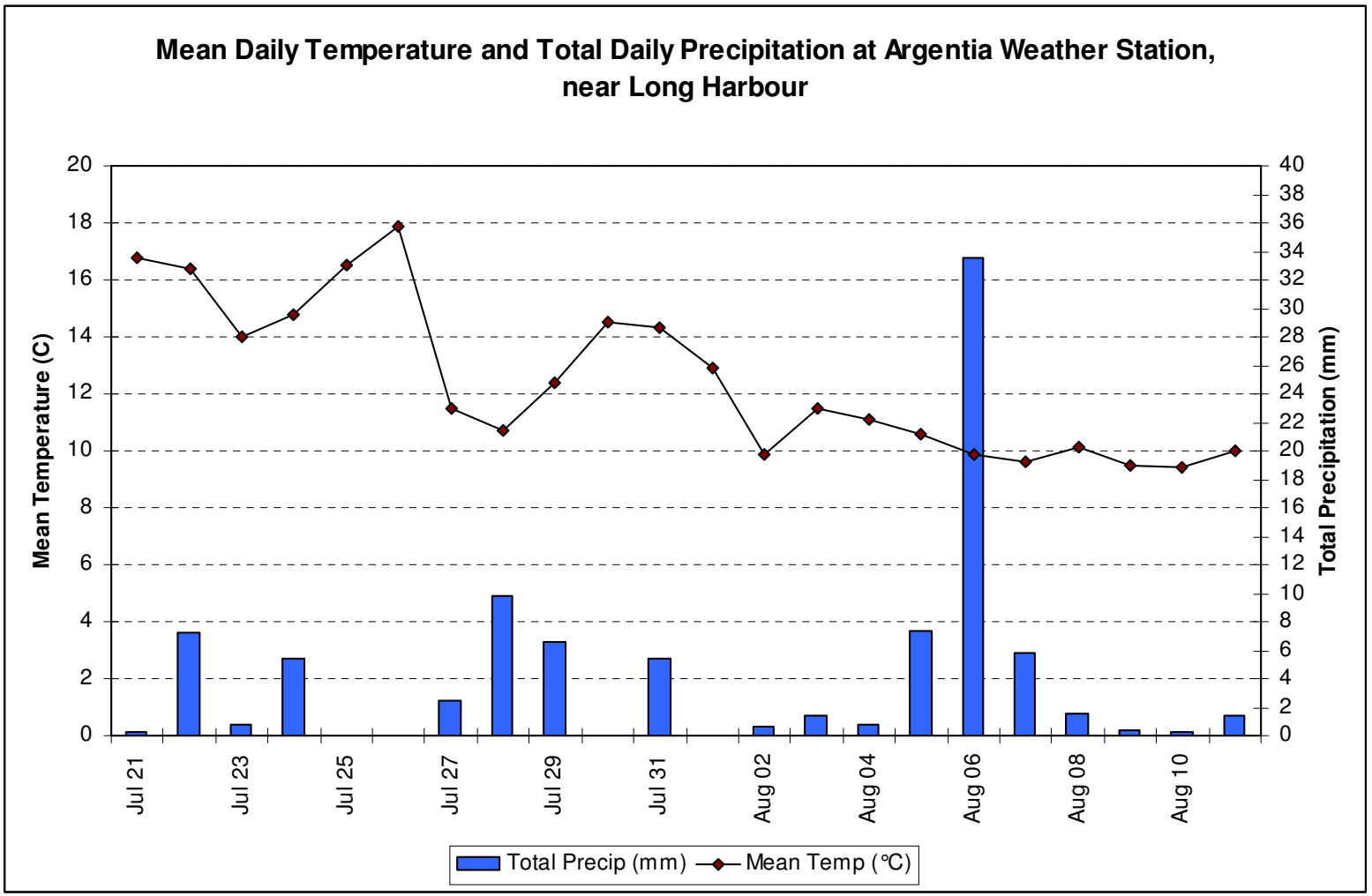


- It is impressive to note that with habitat rehabilitation work under way upstream from Plant Discharge station, no major sustained turbidity releases were observed from July 21st to August 11th. A handful of short-duration spikes were recorded, however, values quickly returned to baseline.
- Turbidity values fell between 0.0 and 95.3 NTU with a median value 1.1 NTU. Turbidity will be watched close during the habitat work in order to observe turbidity releases before they become problematic.

Conclusions

- Habitat rehabilitation work is ongoing between Bridge and Plant Discharge stations and is soon to begin upstream of Bridge station. No concerns are noted regarding river health at this time and water management appears to be effective during the work.
- Unseasonably cool and drizzly weather through July has led to lower water temperatures and higher dissolved oxygen content relative to years previous.

Appendix



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