Real-Time Water Quality Deployment Report

Rattling Brook Network

September 28, 2011 to November 3, 2011

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

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2011-09-28 to 2011-11-03

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.

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

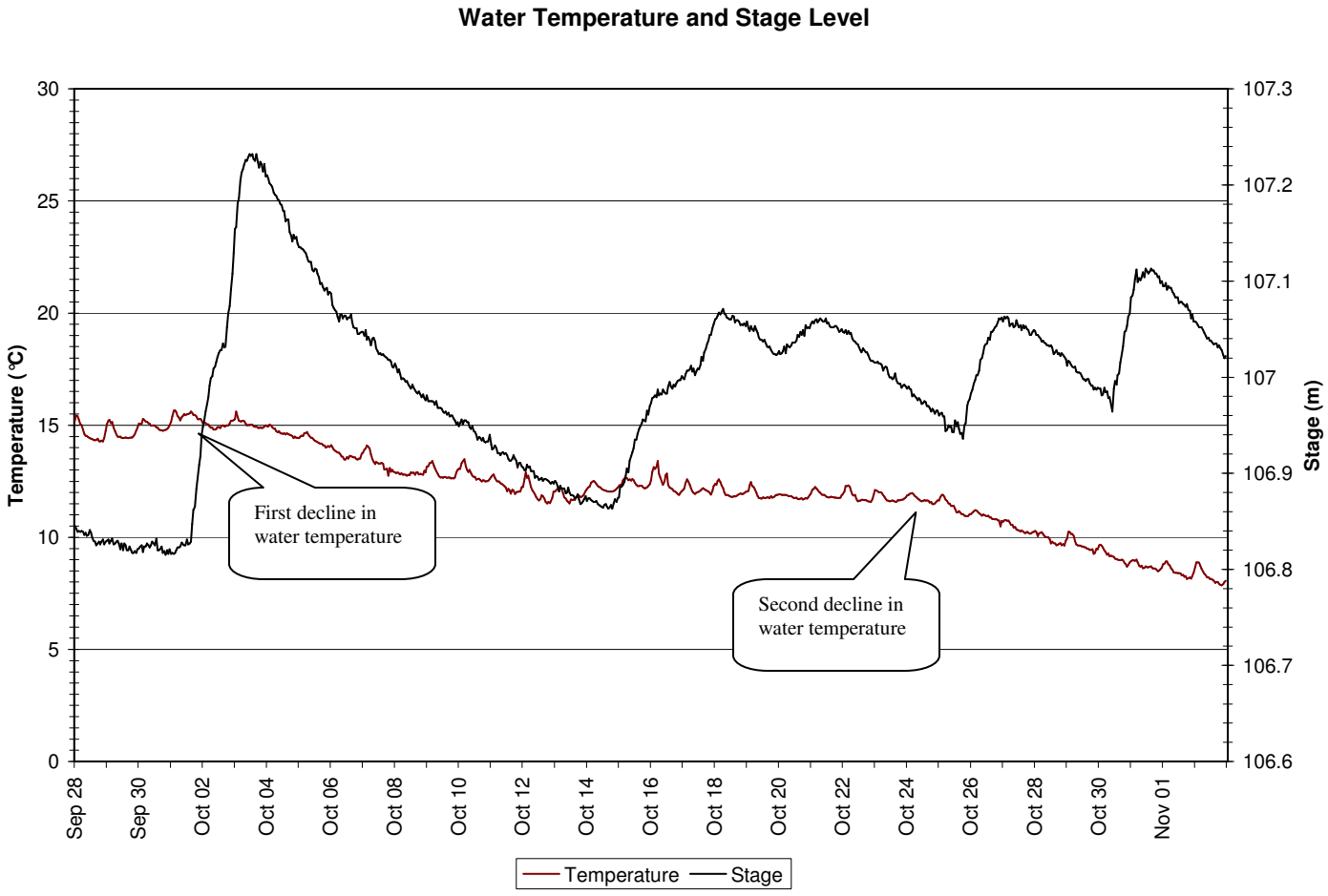
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2011-09-28	Deployment	Good	Excellent	Excellent	Good	Excellent
	2011-11-03	Removal	Excellent	Good	Excellent	NA[†]	Excellent
Rattling Brook below Bridge	2011-09-28	Deployment	Good	Good	Good	Good	Excellent
	2011-11-03	Removal	Good	Excellent	Good	NA[†]	Excellent
Rattling Brook below Plant Discharge	2011-09-28	Deployment	Excellent	Good	Fair	Fair	Excellent
	2011-11-03	Removal	Excellent	Good	Poor[*]	NA[†]	Excellent

[*] A Field sonde reading of 50.1 and a QAQC sonde reading of 60.7 resulted in a 21.2% difference, leading to a "Poor" ranking.
[†] Dissolved Oxygen could not be ranked due to an issue with the QAQC sonde's DO sensor

Data Interpretation

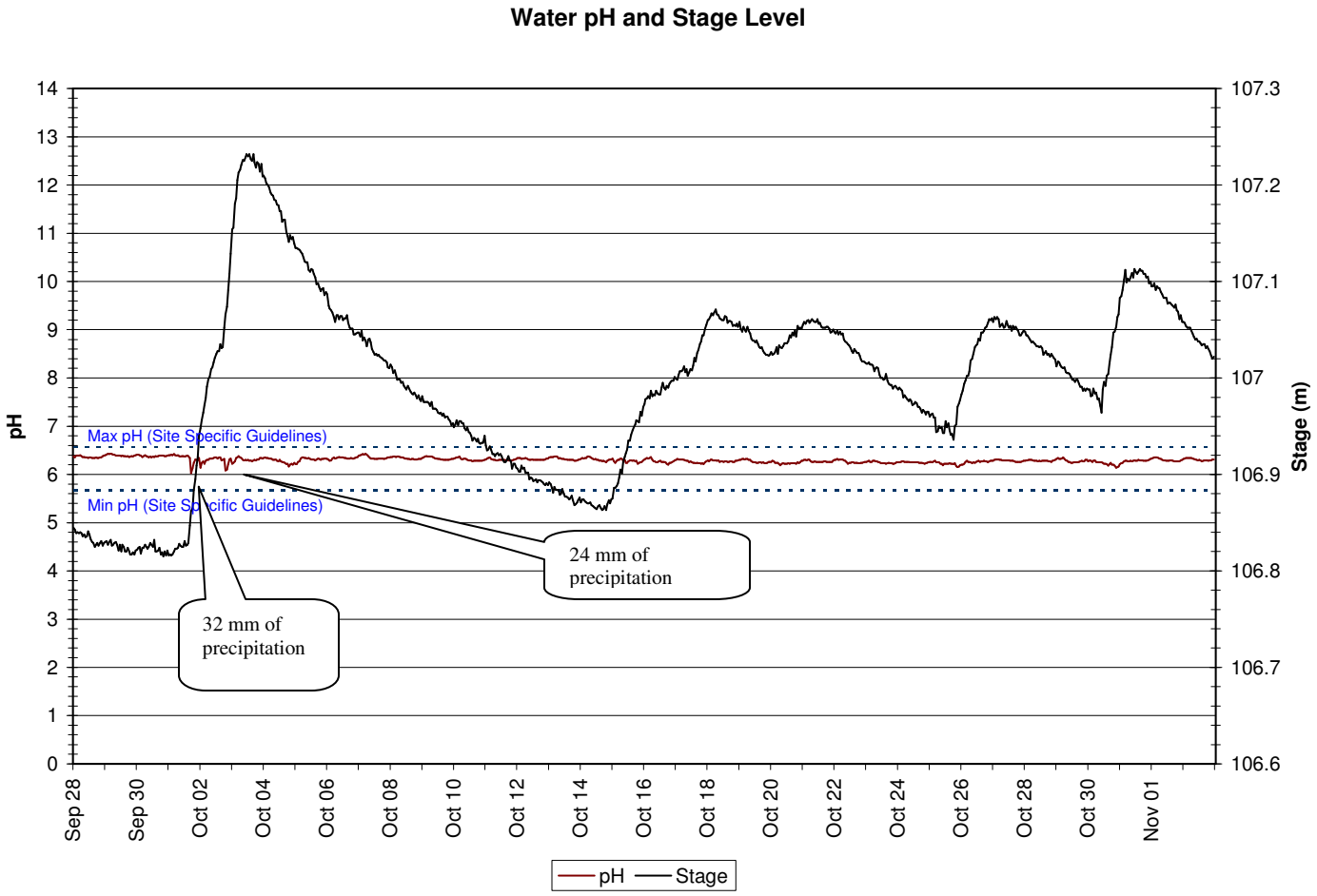
Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond station from September 28 to November 3, 2011



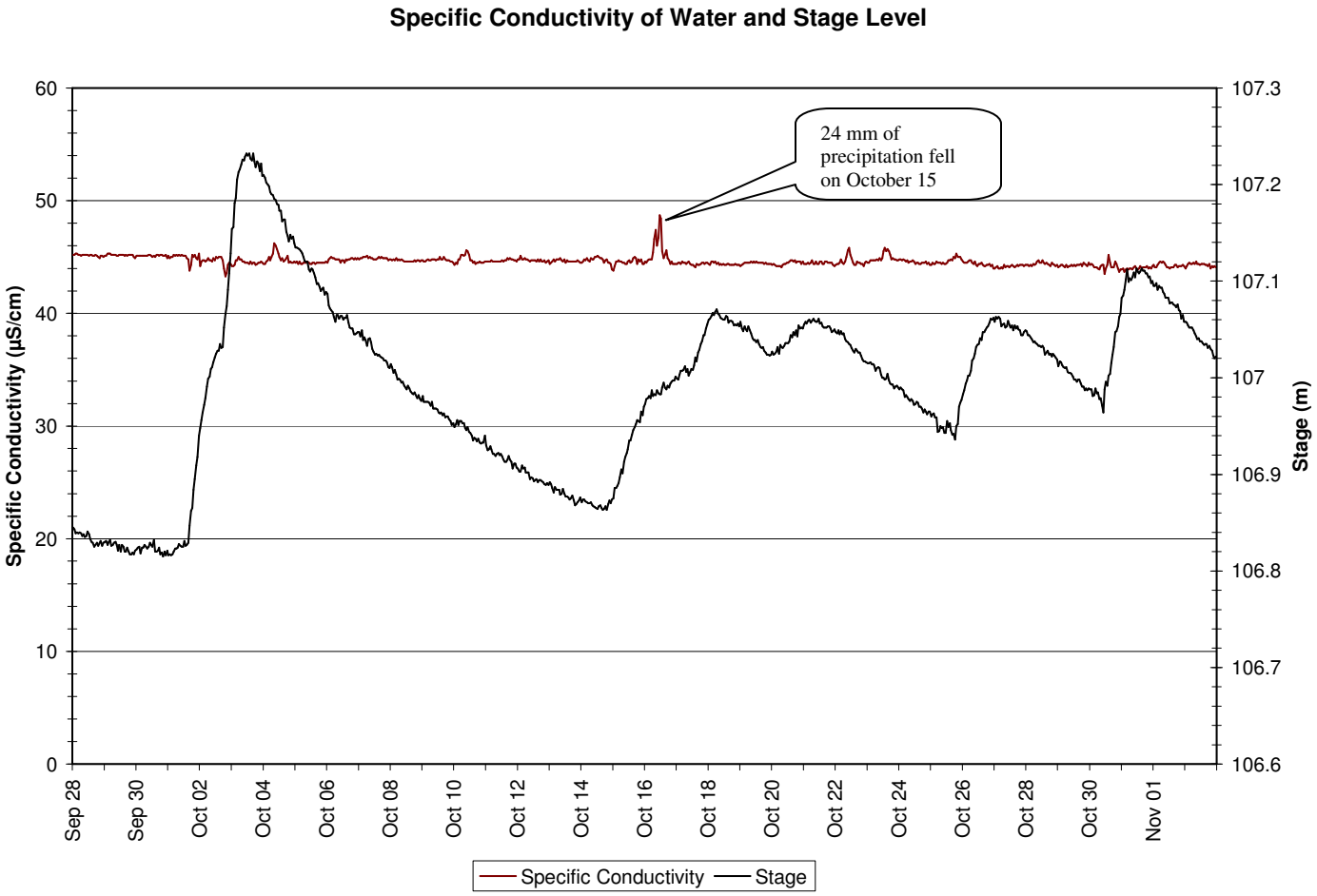
- In late September, water temperature is constant just before a noticeable cooling trend starting on October 2nd. By October 10th, water temperature stabilizes once more for a period of time before decreasing once more into November.
- Water temperature ranged from 15.67°C to 7.86°C.

Figure 2: pH at Rattling Brook Big Pond station from September 28 to November 3, 2011



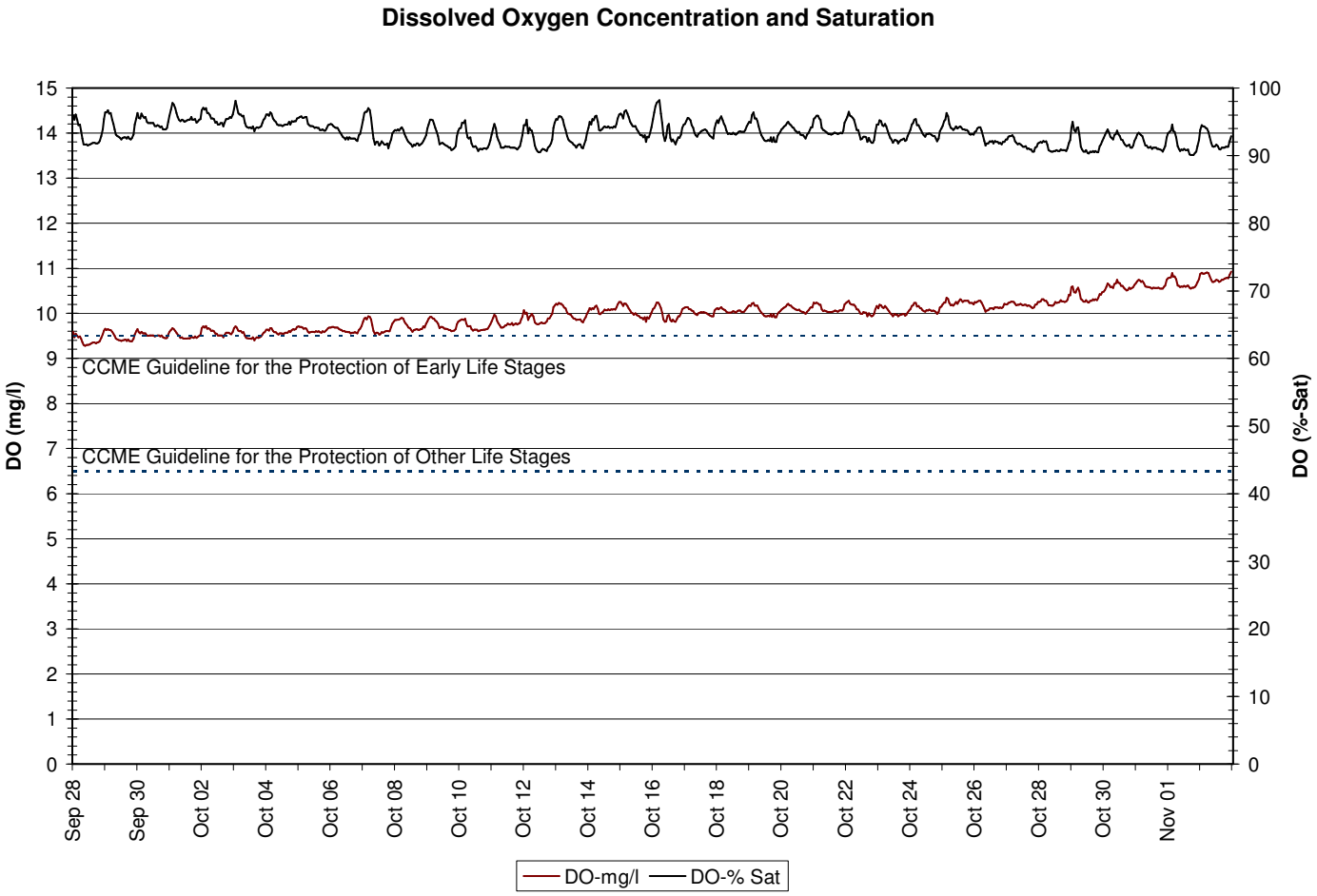
- pH is stable throughout the deployment period with only two periods of variation. Values fell between 6.03 and 6.43 – all within the Site Specific Guidelines for the Rattling Brook Network.

Figure 3: Specific Conductivity at Rattling Brook Big Pond station from September 28 to November 3, 2011



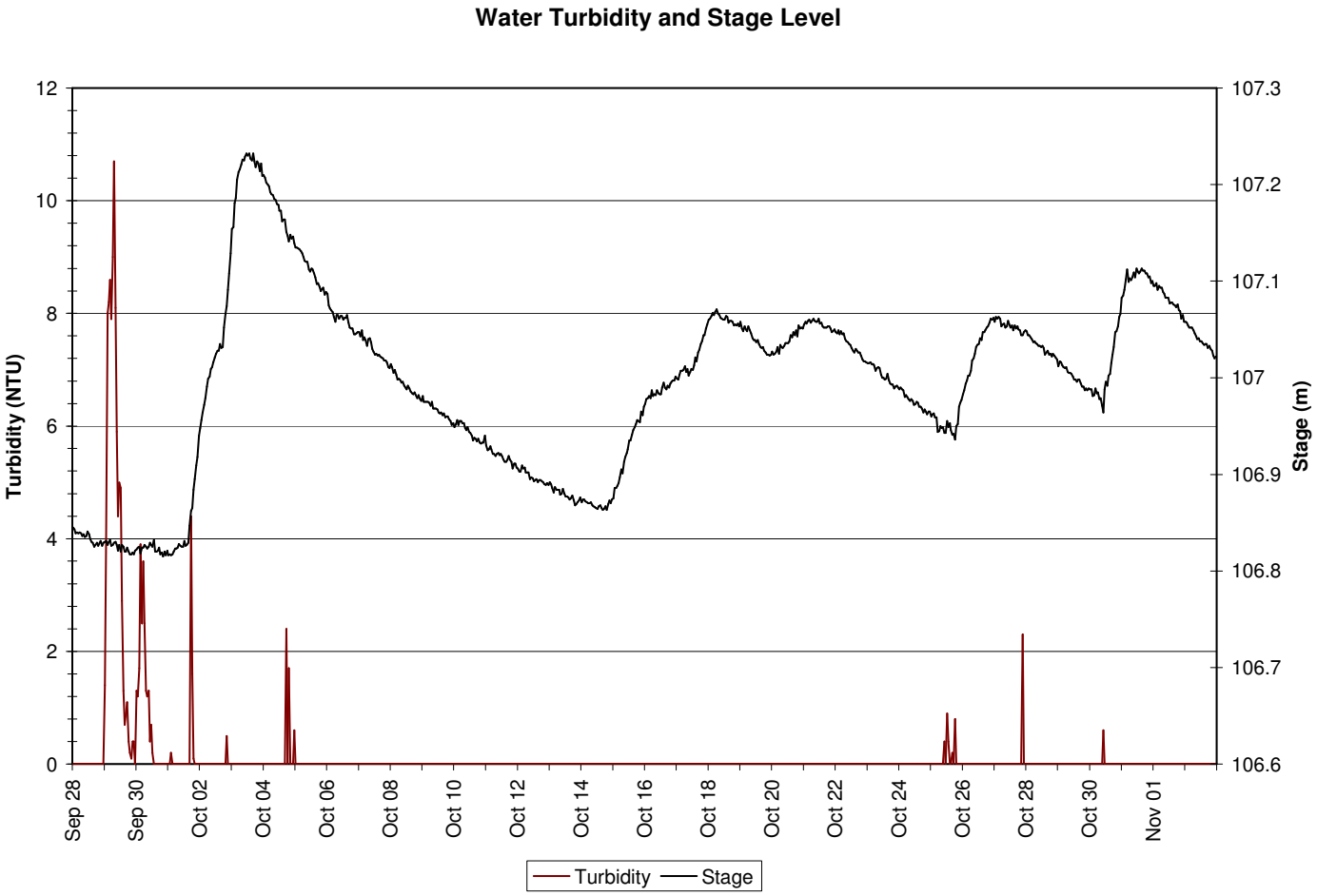
- A verly slight downward trend is seen in specific conductivity from September 28th to November 3rd. Only one fluctuation in conductivity on October 15th is of note. On this day, approximately 24 mm of precipitation fell resulting in a temporary 6% increase from 44.8 to 47.7 µS/cm.
- Values ranged from 48.7 to 43.3 µS/cm with a median value of 44.6 µS/cm.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond station from September 28 to November 3, 2011



- As water temperature declines, a natural increase in the concentration of dissolved oxygen is expected. Dissolved oxygen increased from a low of 9.28 to 10.93 mg/l during this deployment period with a median value of 9.99 mg/l. All values after October 4th were found to be above the CCME Guidelines for the Protection of Early Life Stage Cold Water Biota.

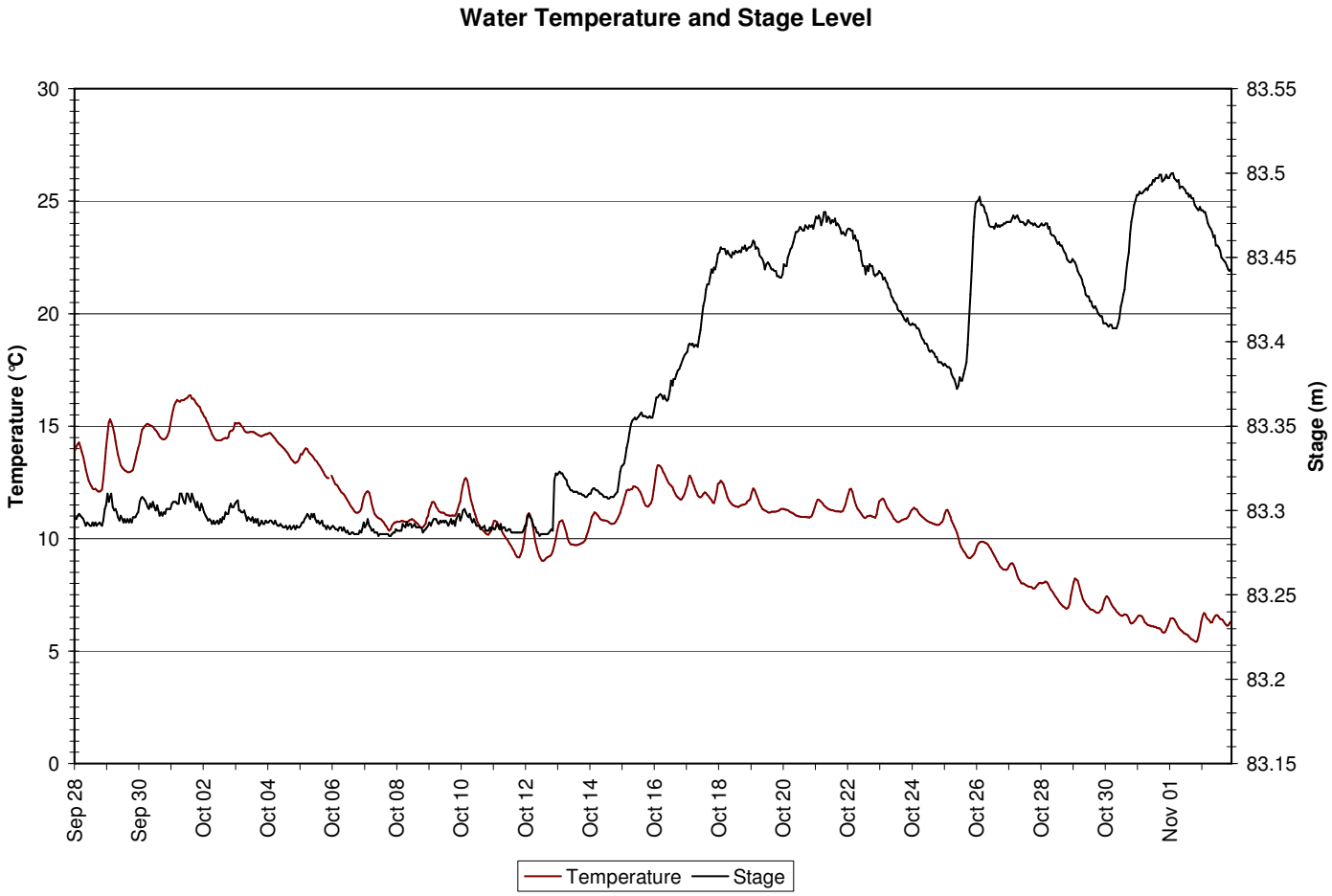
Figure 5: Turbidity at Rattling Brook Big Pond station from September 28 to November 3, 2011



- Low turbidity values were highlighted during this deployment period. Values ranged from 0.0 to 10.7 NTU with a median value of 0.0 NTU for the month.

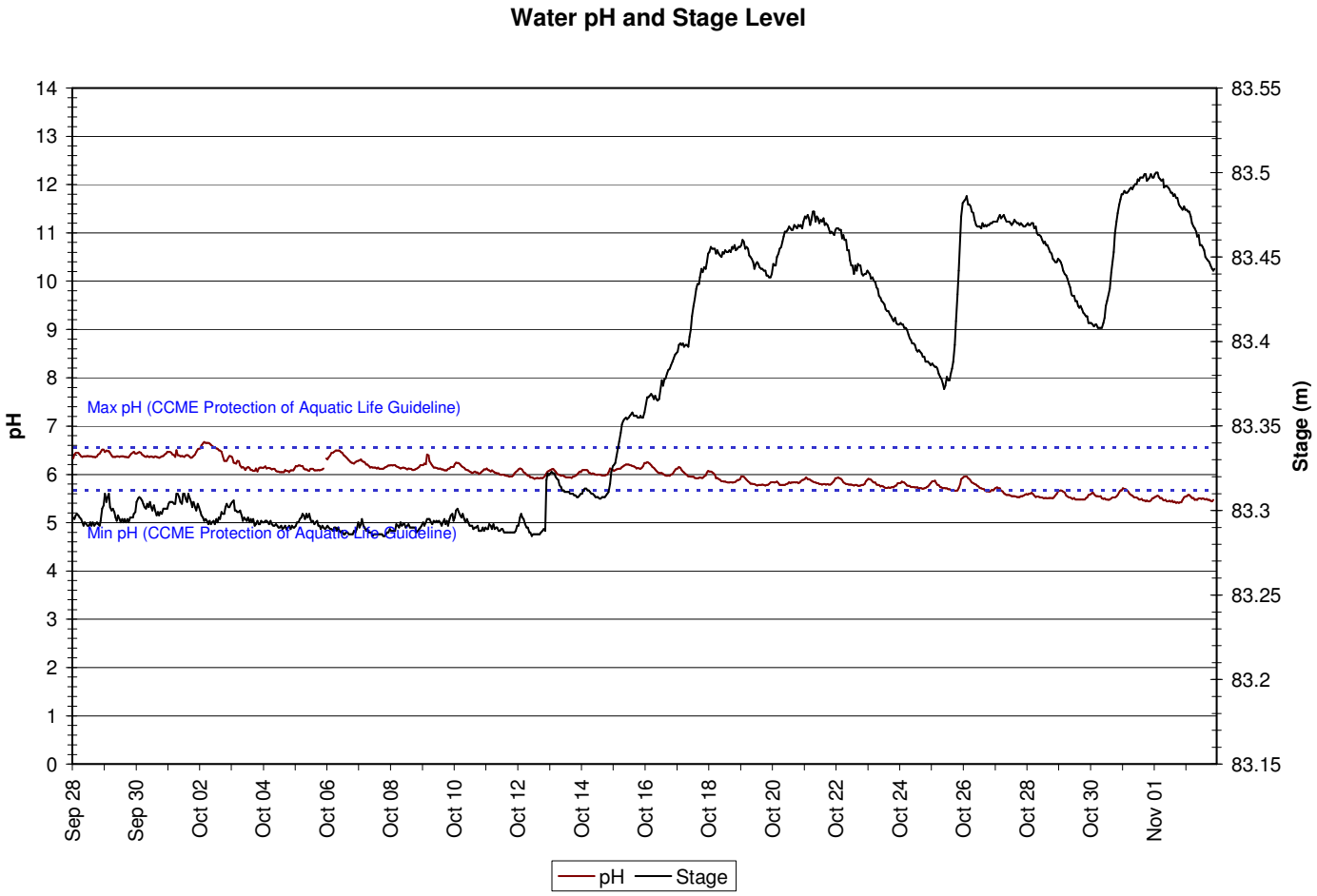
Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge station from September 28 to November 3, 2011



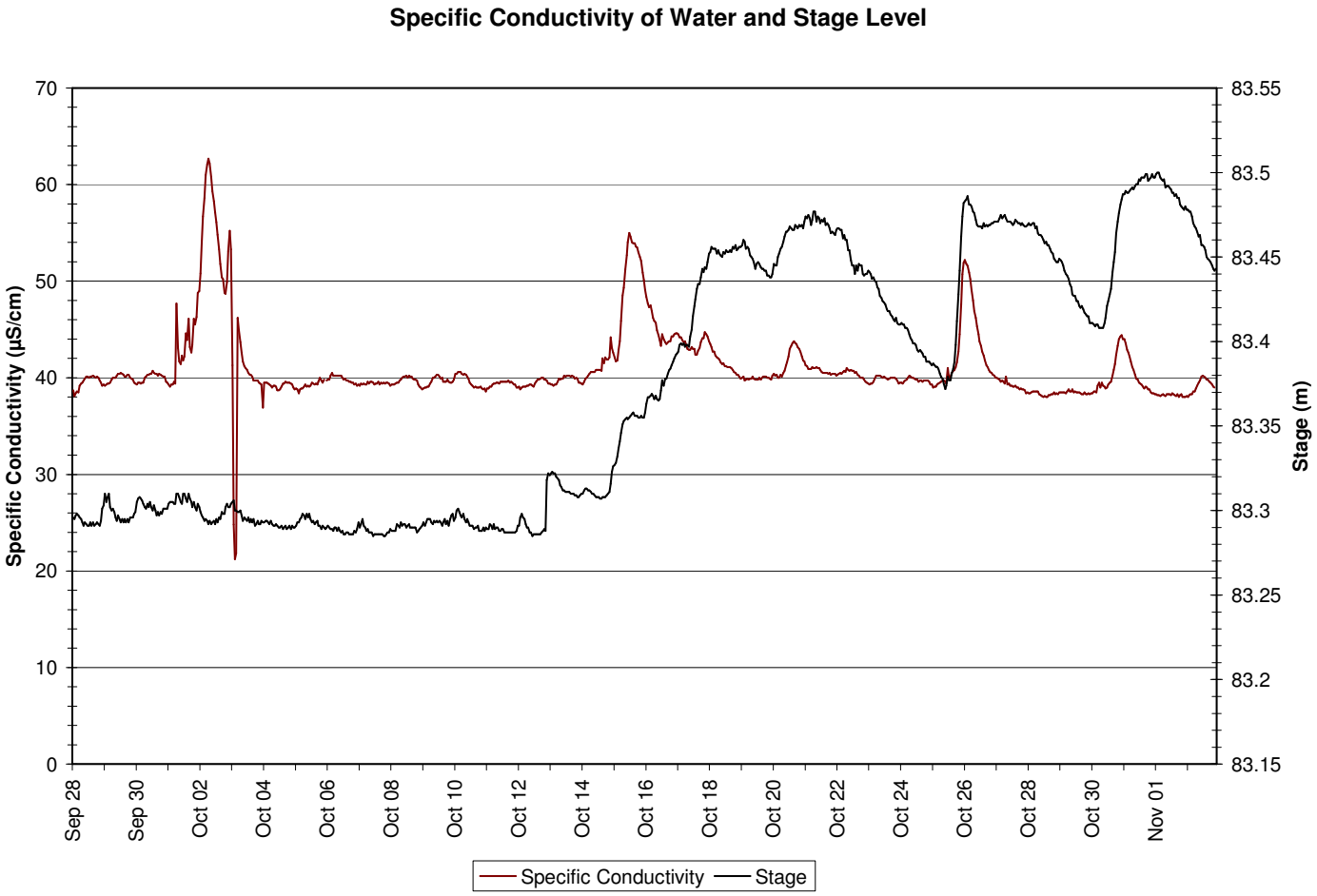
- Water temperature trends at below Bridge station are much more embellished compared to those at Big Pond. A brief warming period precedes a falling trend in temperature followed by a levelling off period and another decline towards November.
- Water temperature ranged from 16.37 to 5.40°C with a median value of 12.09°C.

Figure 7: pH at Rattling Brook below Bridge station from September 28 to November 3, 2011



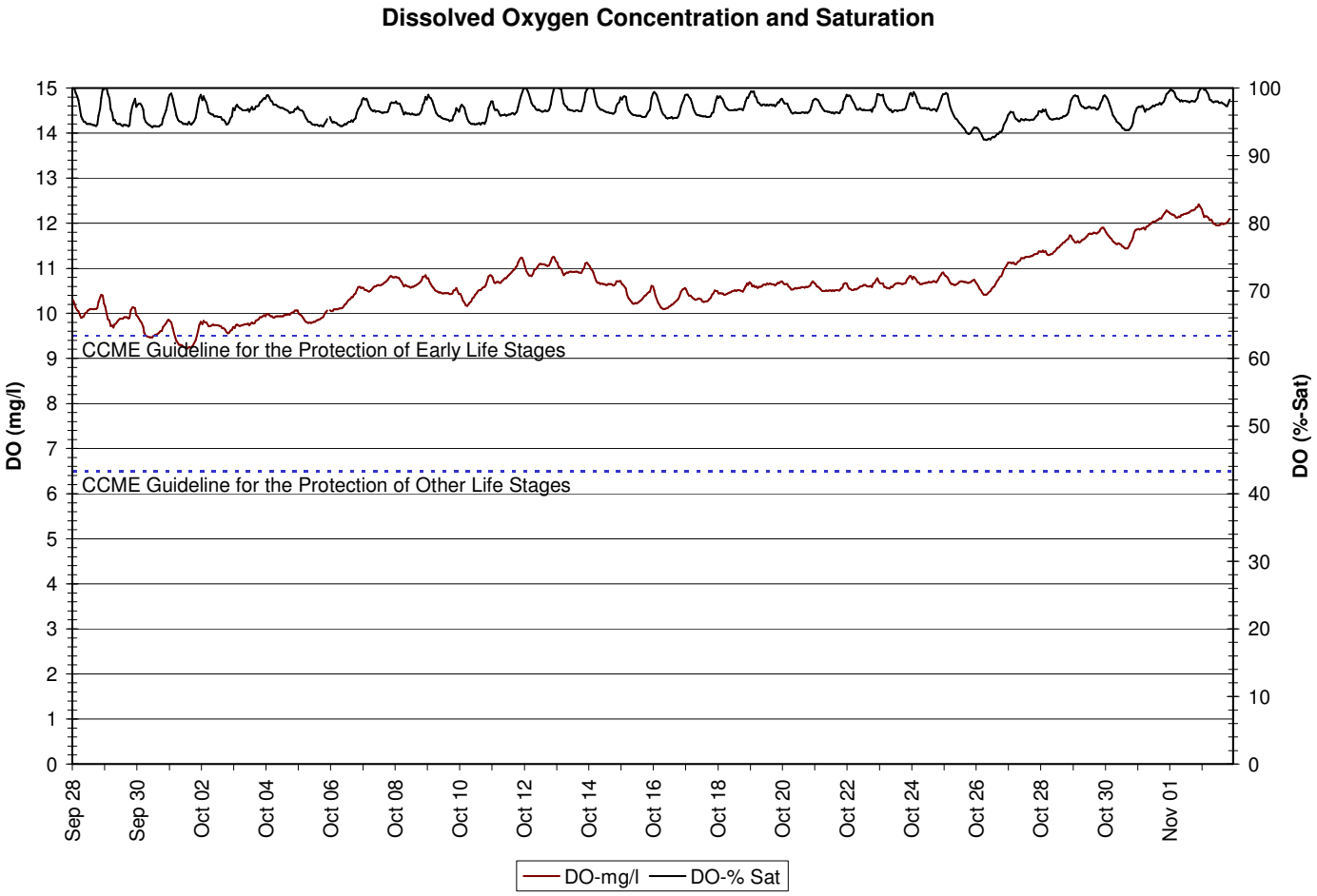
- pH spanned the entire Site Specific Guideline range during the deployment period. pH values ranged from a high of 6.67 to 5.41 (median value: 5.99).

Figure 8: Specific Conductivity at Rattling Brook below Bridge station from September 28 to November 3, 2011



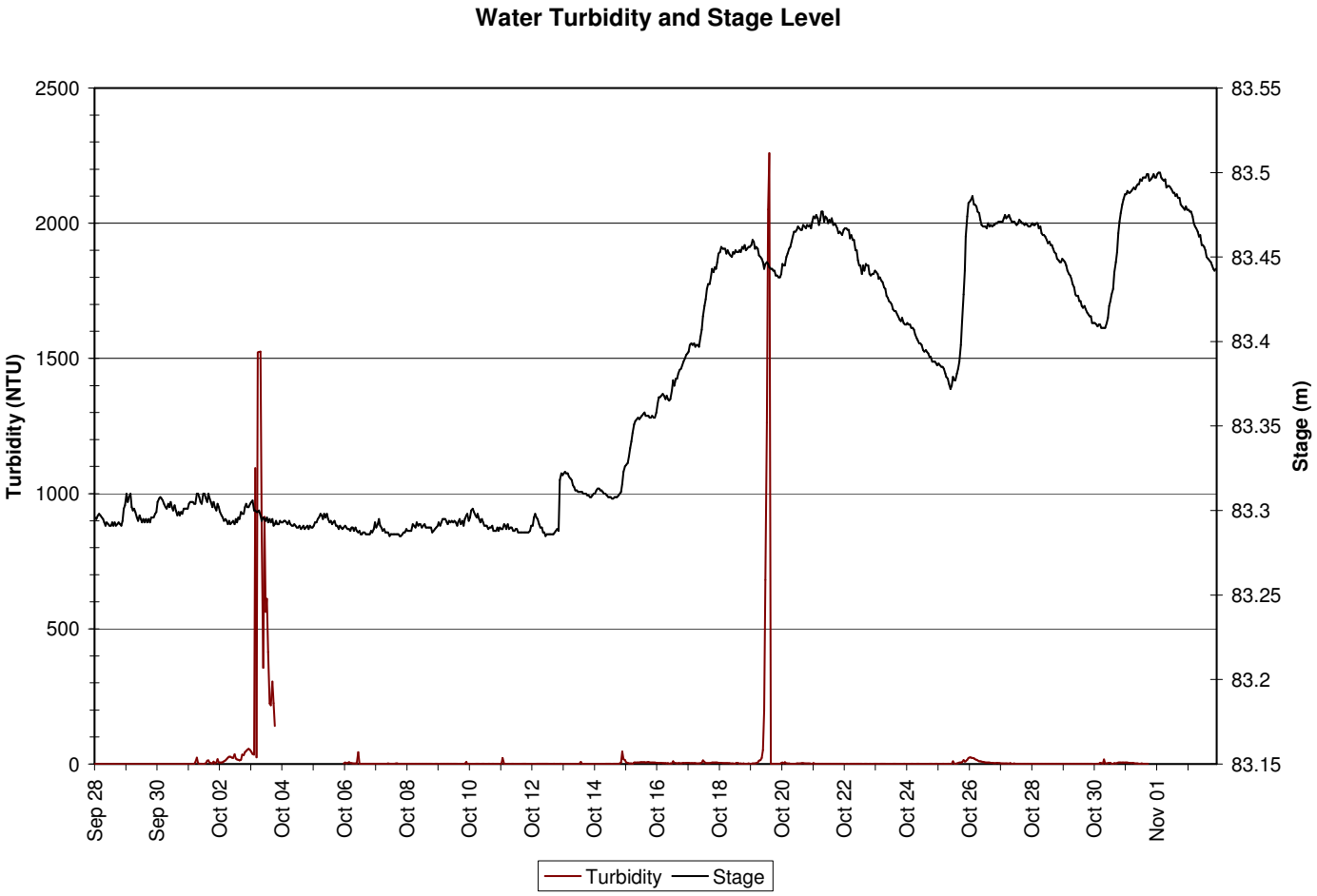
- A series of large spikes punctuate the graph of specific conductivity at Bridge station. Background conductivity during the month resides between 38 – 40 µS/cm while spikes peak to 62.7 µS/cm.
- Values were found to be as low as 21.2 µS/cm with a median value of 39.9 µS/cm.

Figure 9: Dissolved Oxygen at Rattling Brook below Bridge station from September 28 to November 3, 2011



- Dissolved oxygen values increased steadily over the deployment period from September 28th to November 3rd. Most values were found to be above the CCME Guideline for the Protection of Aquatic Life.
- Values fell between 9.22 – 12.42 mg/l with a median of 10.60 mg/l. These values are marginally higher than those at Big Pond station due to air tending to dissolve easier in the water column due to the agitation caused by flowing water.

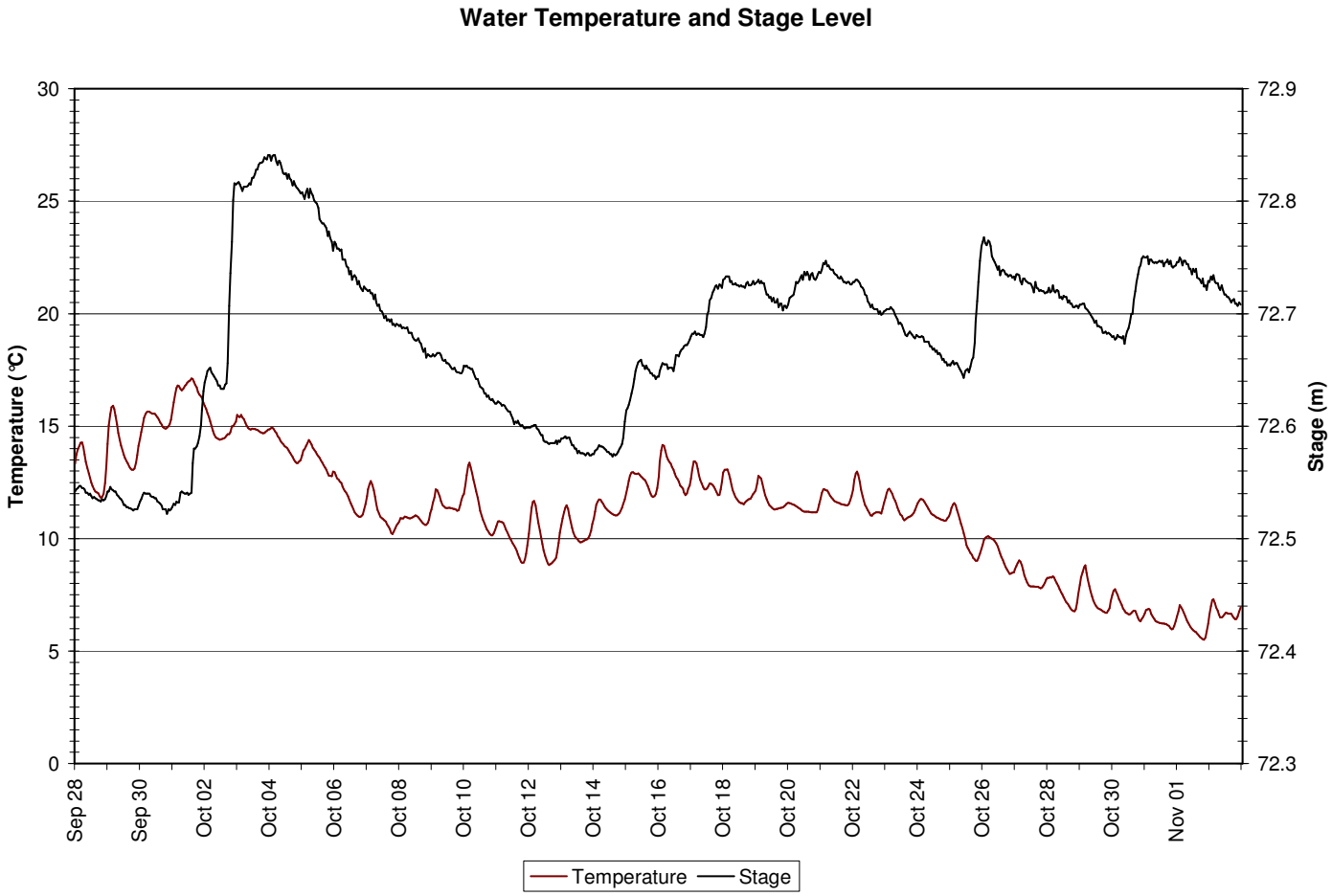
Figure 10: Turbidity at Rattling Brook below Bridge station from September 28 to November 3, 2011



- Two periods of precipitation appear to be responsible for large peaks in turbidity during this deployment period. Since turbidity returned to normal levels within a short period of time, no concern is warranted.
- Through the deployment period, turbidity ranged from 0.0 to 2259.0 NTU with a median value of 1.4 NTU.

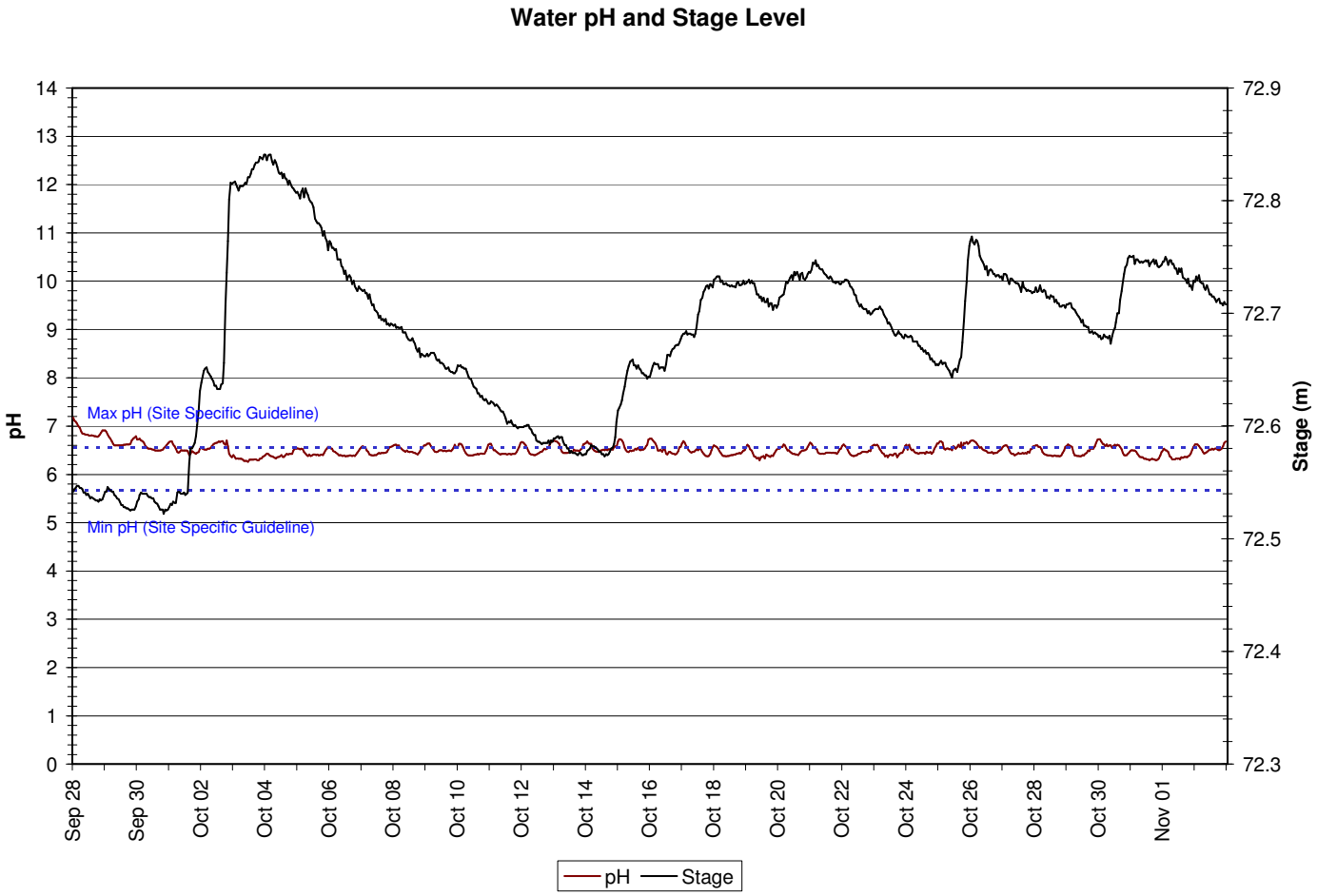
Rattling Brook below Plant Discharge

Figure 11: Water Temperature at Rattling Brook below Plant Discharge station from September 28 to November 3, 2011



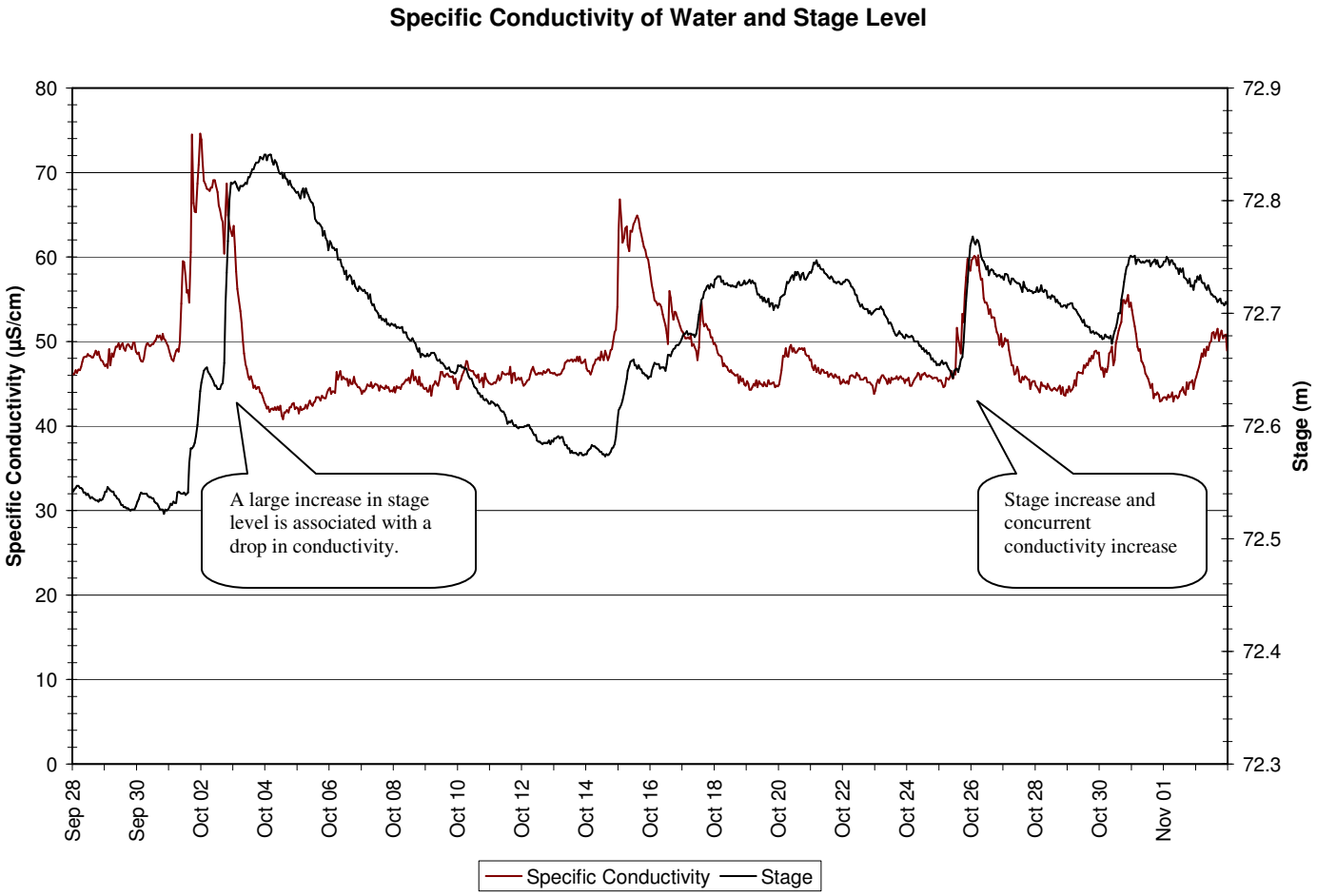
- Water temperature gradually fell over the course of the deployment period from a high of 17.12 to 5.50°C. These temperatures tend to be somewhat higher than those seen upstream at Bridge and Big Pond stations.

Figure 12: pH at Rattling Brook below Plant Discharge station from September 28 to November 3, 2011



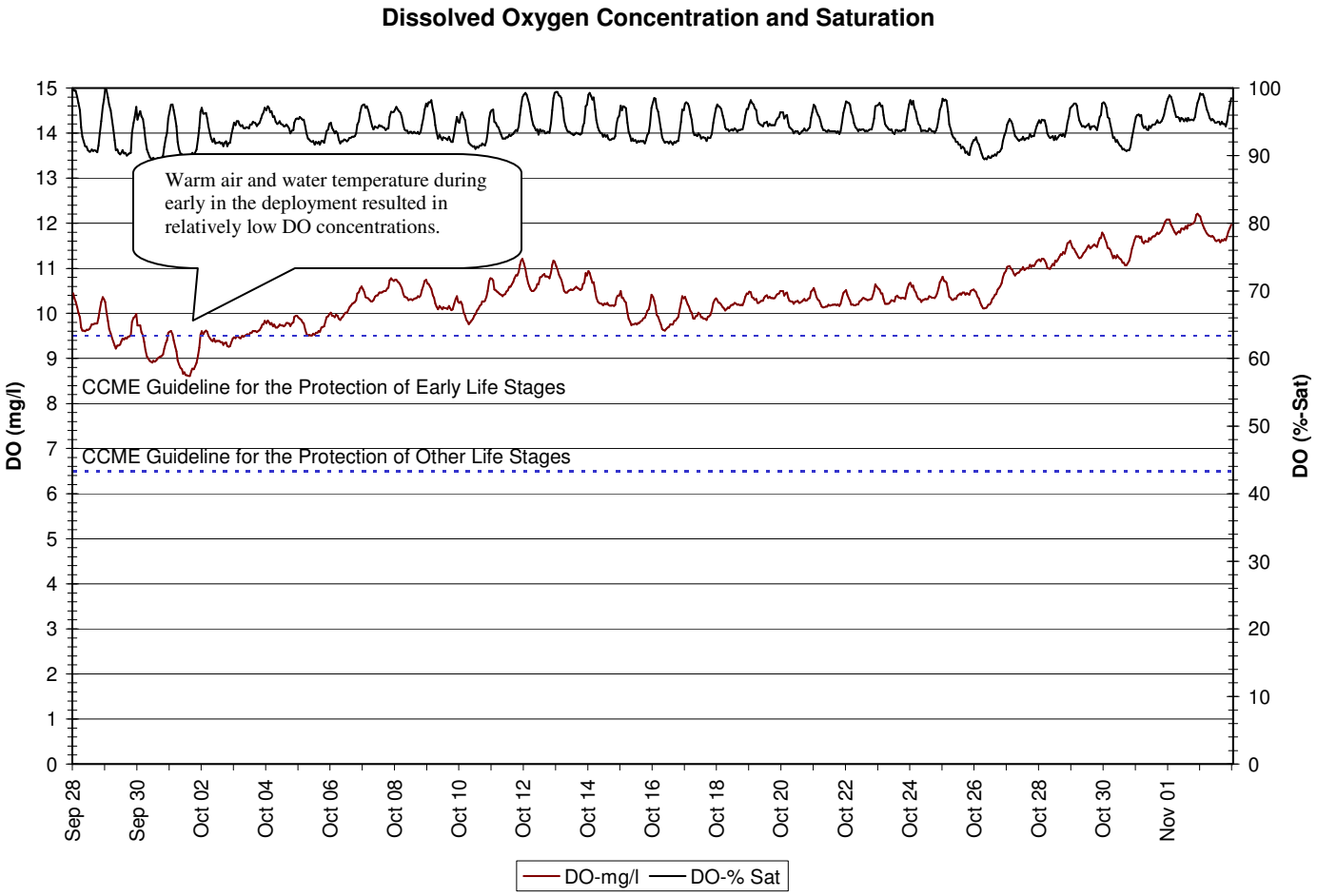
- pH values tended to reside near the upper Site Specific Guideline for the duration of the deployment period; this is not uncommon for Plant Discharge station.
- A range of 0.91 pH units was found with the maximum value of 7.17 and a minimum of 6.26 (the median value during this time was 6.49).

Figure 13: Specific Conductivity at Rattling Brook below Plant Discharge station from September 28 to November 3, 2011



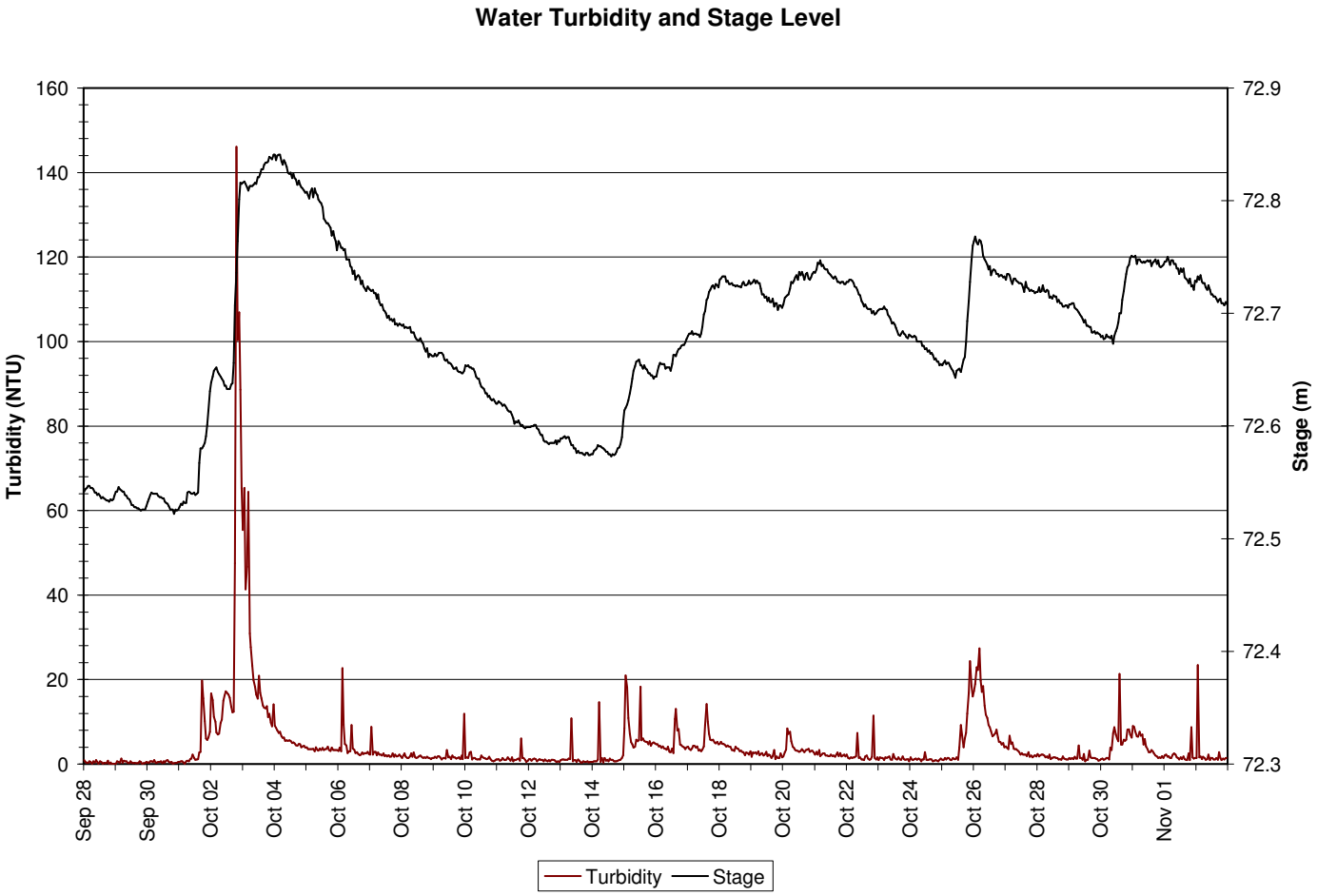
- In the figure above, conductivity is seen to change with stage level. Two processes, however, seem to control whether conductivity increases or decreases with stage level. In the first case, a large and rapid increase in stage is accompanied by a decline in conductivity. In the second case, stage level increases less than the first instance and is accompanied by an increase in conductivity. A possible key difference may be the intensity of precipitation during these two times; however the data is not available at the Argentia weather station. This interesting function merits attention at some point in the future.
- Conductivity ranged from 74.6 to 40.8 µS/cm during the deployment period with a median value of 46.3 µS/cm.

Figure 14: Dissolved Oxygen at Rattling Brook below Plant Discharge station from September 28 to November 3, 2011



- Dissolved oxygen concentration increased steadily over the time frame of the deployment period from a low of 8.61 mg/l to a high of 12.21 mg/l (median: 10.32 mg/l). Most DO values were found to be within acceptable limits for the time period, with only a short duration between September 29th and October 4th falling below the CCME Guideline for Protection of Early Life Stage cold water biota.

Figure 15: Turbidity at Rattling Brook below Plant Discharge station from September 28 to November 3, 2011

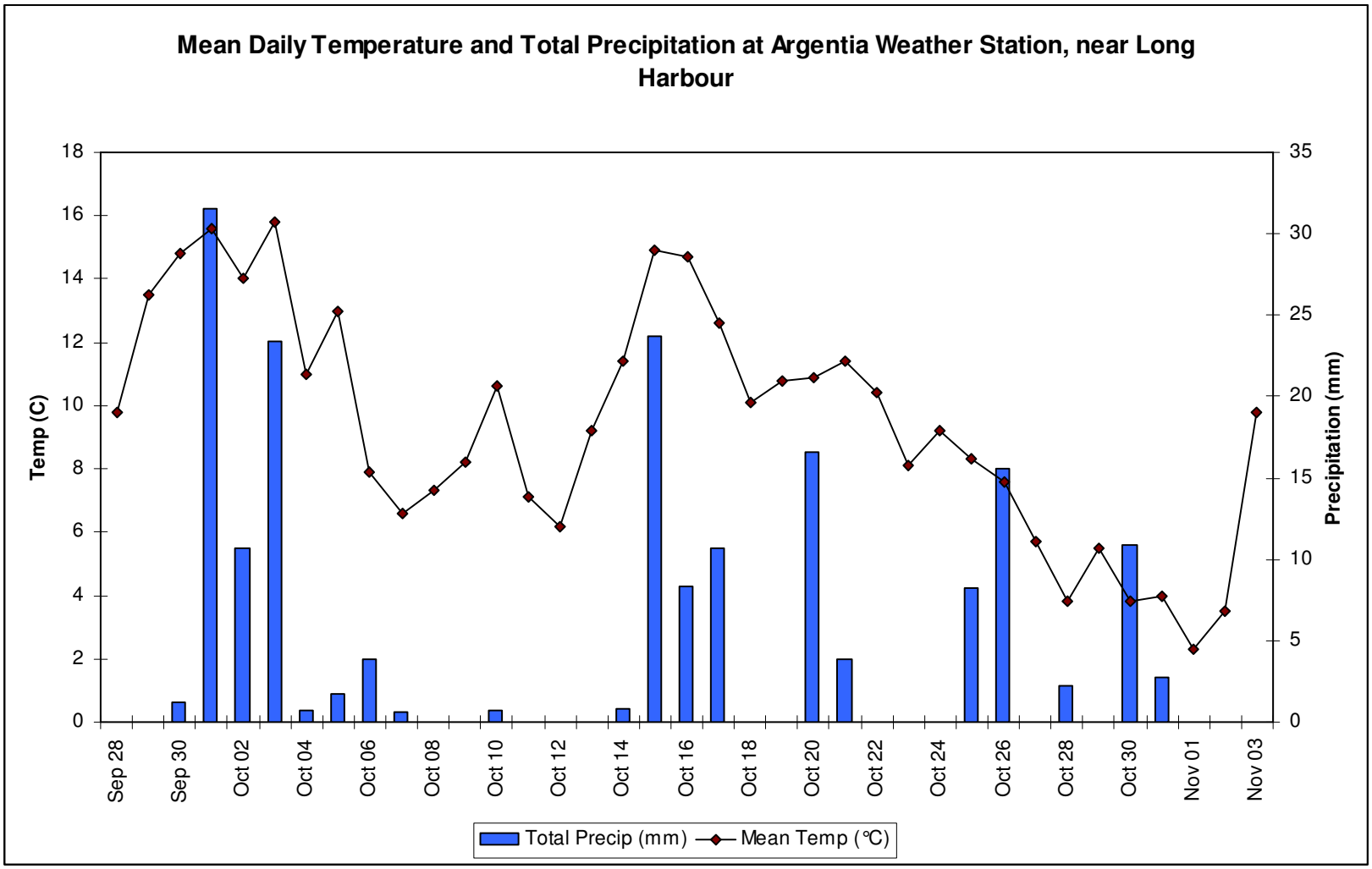


- Heavy precipitation and stage level was associated with the peak in turbidity on October 3rd. Turbidity levels quickly fell shortly after the peak. Overall, a range from 0.0 to 146.1 NTU was found during the deployment with a median value of 1.9 NTU. No concern is warranted at this time regarding chronic excessive turbidity levels.

Conclusions

- Water quality events observed during this deployment period revolve around decreasing air temperatures and a few periods of heavy precipitation – the average air temperature during the 35 days from September 28th to November 3rd was 9.44°C and a total of 178 mm of precipitation fell.
- No major water quality events requiring immediate attention were detected.

Appendix



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