Real-Time Water Quality Deployment Report
Rattling Brook Network
November 18th, 2009 to December 15th, 2009

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- This monthly deployment report interprets the data from Rattling Brook Big Pond, Rattling Brook below Bridge and Rattling Brook below Plant Discharge stations for the period of November 18, 2009 to December 15, 2009.
- Vale Inco will be informed of any significant water quality events in the form of a monthly deployment report and automated alerts as they occur.
- Voluntary short-term work stoppages occur on site occasionally in order to allow deteriorating ground conditions to return to normal before work proceeds.
- From October 2009 to November 2009, high precipitation amounts, coupled with insufficient runoff storage and settling capacity, allowed silt-laden water to pass into the Rattling Brook system. This is evident in the turbidity graphs at Rattling Brook below Bridge and below Pond Discharge stations. Work has been undertaken to increase the ability to settle silt-laden water before discharge into Rattling Brook.
- From November 2009 to December 2009 waterlogged unsuitable material such as peat and overburden removed from the construction site was found to be spilling from trucks hauling the material to Unsuitable Materials Site (USM) #1. Once deposited in USM #1, the material continued to drain silt-laden water into the Rattling Brook system due to insufficient drainage structures.

Maintenance and Calibration of Instrument

- As part of the removal and reinstallation process, parameters are recorded from both the field sonde (in situ) and a similar, newly-calibrated QA sonde (placed side by side). The parameters from both instruments are compared and their variability is ranked as part of the QA/QC protocol (see Table 1).

Table 1: QA/QC Data Comparison Rankings upon Deployment on November 18th, 2009 to December 15th, 2009.

Station	Date	Action	Instrument Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Big Pond	November 18, 2009	Deployment	Excellent	Excellent	Excellent	Excellent	NA
	December 15, 2009	Removal	Excellent	Good	Good	Fair	Excellent
Below Bridge	November 18, 2009	Deployment	Good	Excellent	Good	Good	NA
	December 15, 2009	Removal	Excellent	Marginal	Good	Excellent	Excellent
Below Plant Discharge	November 18, 2009	Deployment	Excellent	Excellent	Good	Good	NA
	December 15, 2009	Removal	Good	Fair	Good	Good	Excellent

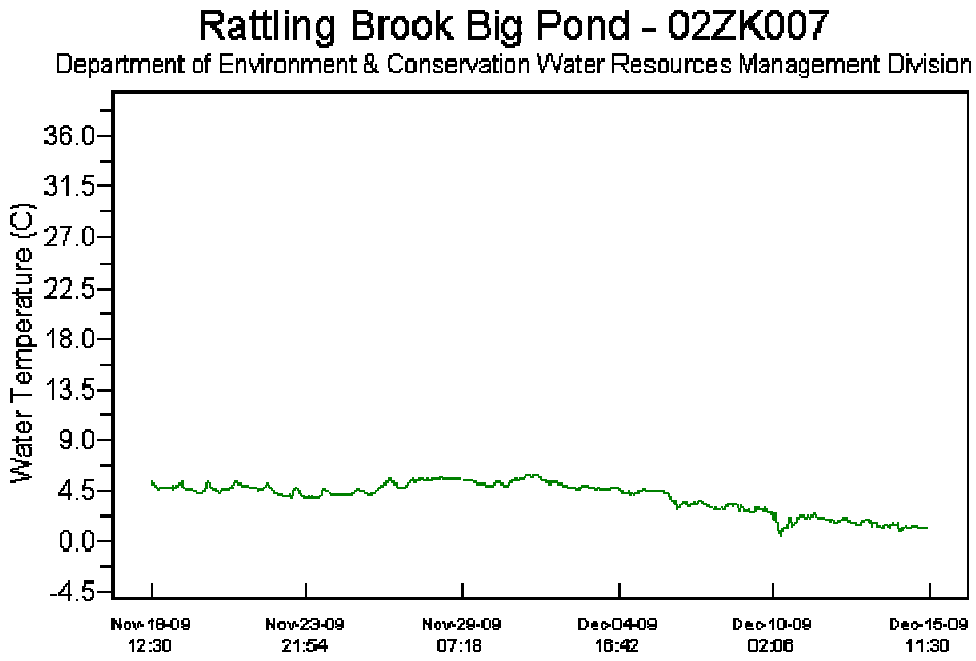
- Rankings for turbidity upon deployment on November 18th, 2009 were not calculated due to a problem with the QA sonde.

Data Interpretation

- The following sections provide details regarding the deployment intervals at Rattling Brook Big Pond (Big Pond), Rattling Brook below Bridge (Below Bridge) and Rattling Brook below Plant Discharge (Plant Discharge).

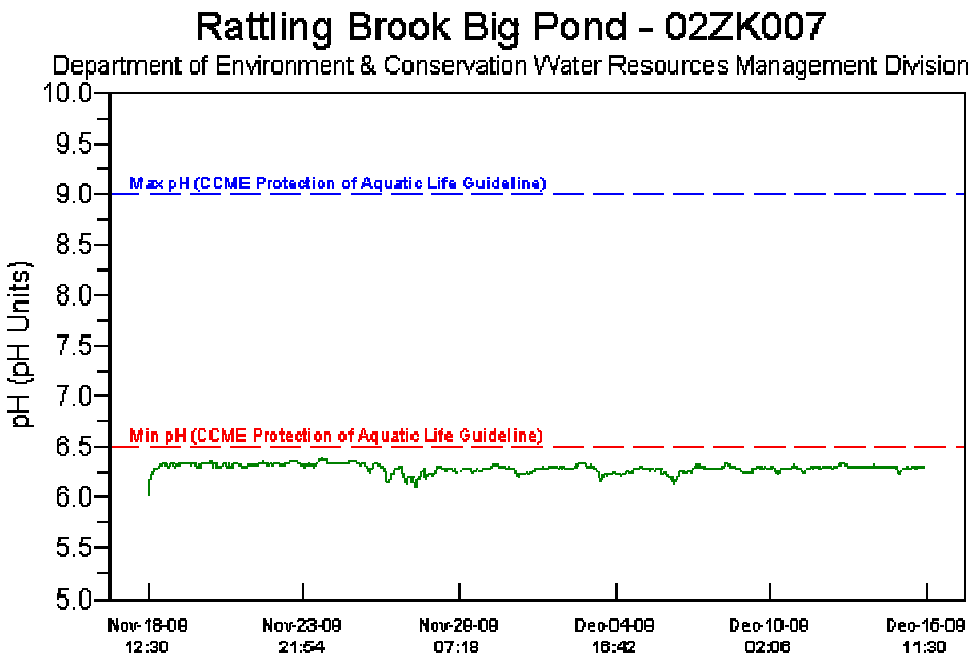
RATTLING BROOK BIG POND

Figure 1: Water Temperature at Rattling Brook Big Pond



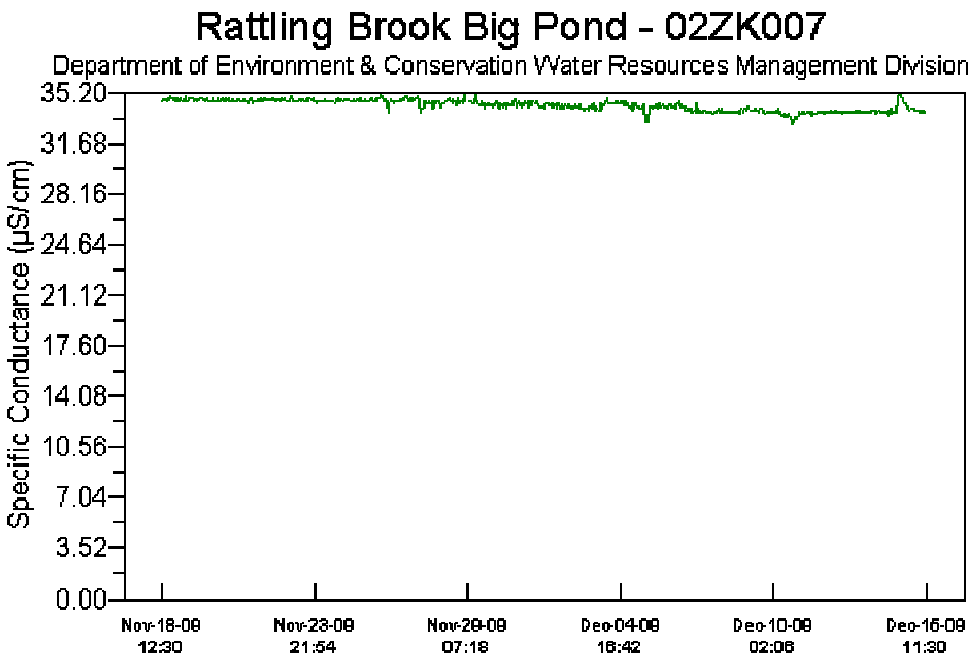
- Water temperature at Rattling Brook Big Pond followed expected trends and declined to a low of 0.48°C. The maximum temperature was 5.87°C.

Figure 2: pH at Rattling Brook Big Pond



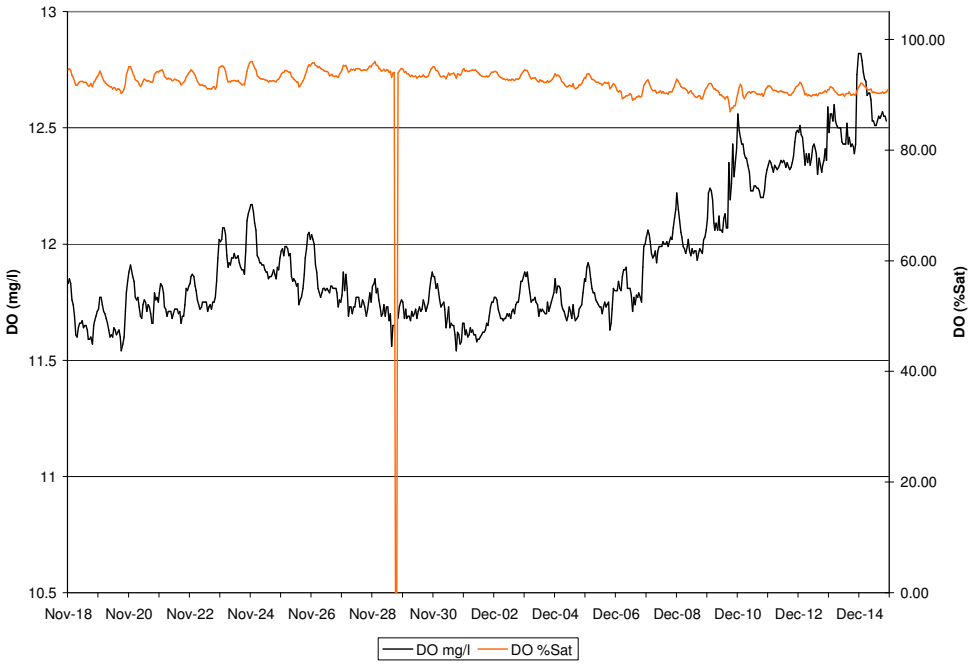
- pH was stable with no noticeable trend upwards or down from November 18th to December 15th. The maximum pH occurred on November 24th (6.38) and the minimum occurred on November 27th (6.10). Despite the fact that the pH values were below the minimum pH for the protection of aquatic life as stated by the CCME, no concern is warranted as this is likely the natural condition of pH in this river system.

Figure 3: Specific Conductivity at Rattling Brook Big Pond



- Specific Conductivity ranged from 33.0 to 35.2 µS/cm. A slight downward trend is seen in the figure over the course of the deployment period. This is likely due to calibration and/or fouling of the sensor. No concern is warranted.

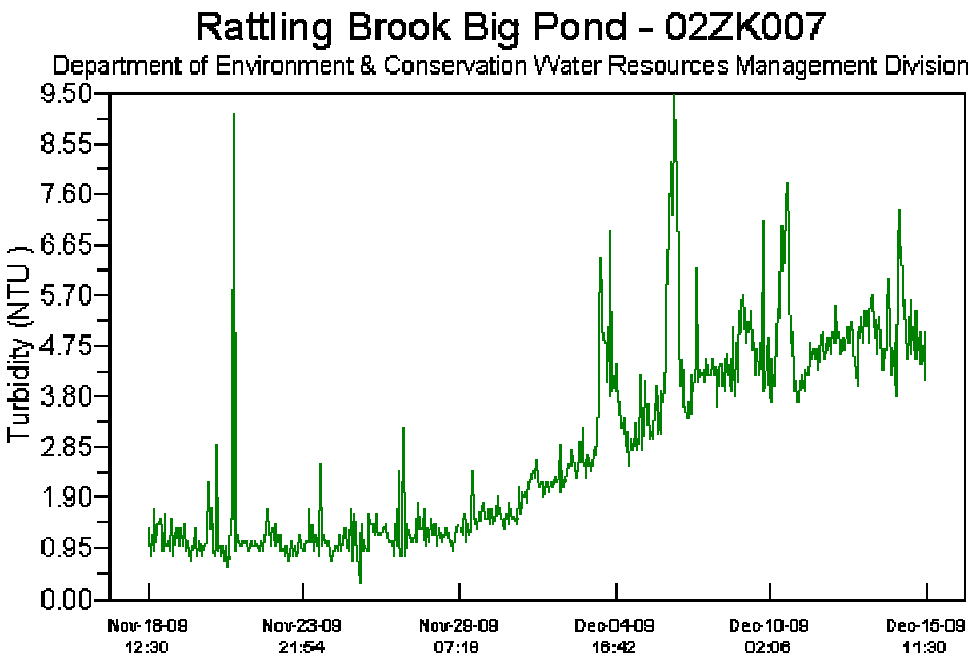
Figure 4: Dissolved Oxygen at Rattling Brook Big Pond



- Dissolved oxygen in Big Pond tends to be slightly lower than at stations further down in the Rattling Brook system (below Bridge and below Plant Discharge). This is likely due to the relatively still waters in Big

Pond as opposed to Rattling Brook, where flowing riffles and rapids increase the content of dissolved oxygen. Regardless of the slightly lower concentration of DO in Big Pond, the concentration of DO at Big Pond ranged from 11.54 mg/l to 12.82 mg/l; all values were above the CCME guideline of 9.5 mg/l for the protection of early life-stage cold-water biota.

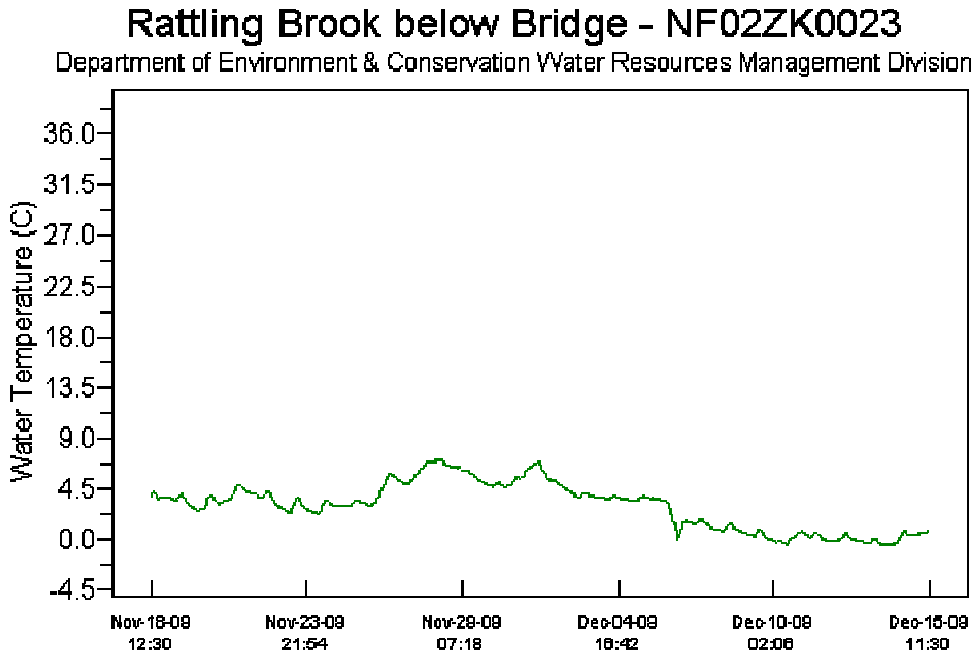
Figure 5: Turbidity at Rattling Brook Big Pond



- Wave action near the shore deployment of the water quality sonde results in increased turbidity readings at this station. Aside from the large spikes, the steady increase in turbidity in the second half of the deployment is not correlated with air temperature, wind, or precipitation. Because of this, it is possible that fouling from silt deposition caused drift in the sensor. The Water Resources Management Division will closely follow the trends at this station in the future to determine if a different deployment method is warranted.

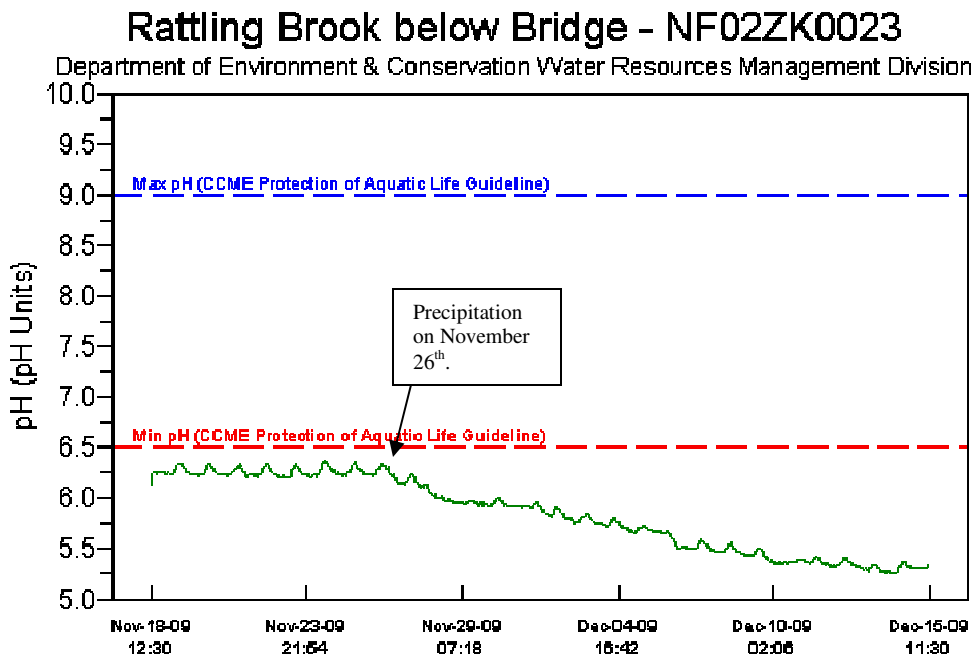
RATTLING BROOK BELOW BRIDGE

Figure 6: Water Temperature at Rattling Brook below Bridge



- Water temperature at Rattling Brook below Bridge (Bridge) declines as expected over the deployment period from a high of 7.01°C to a low of -0.5°C.

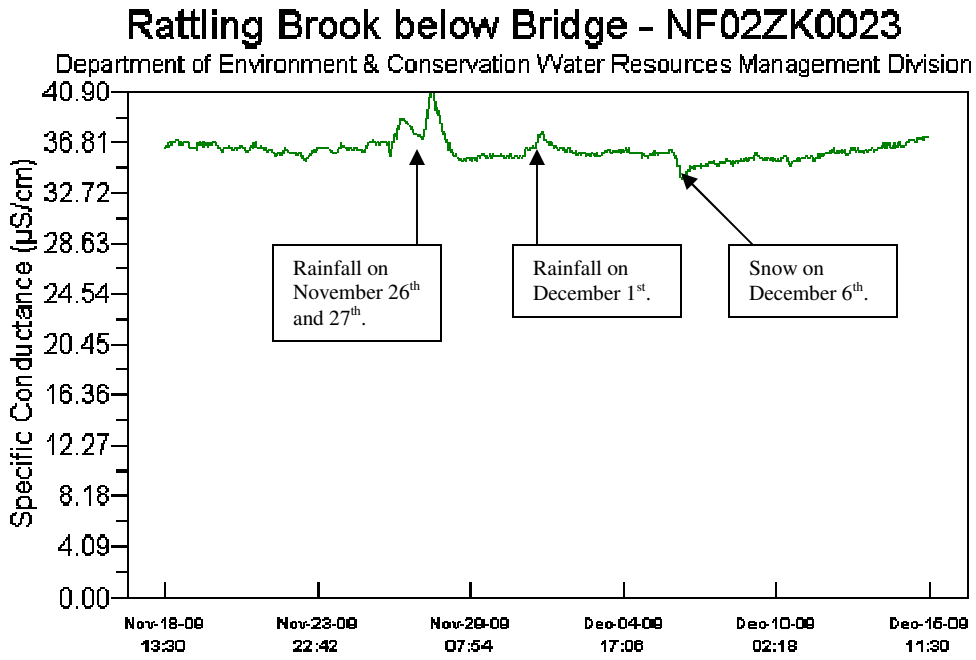
Figure 7: pH at Rattling Brook below Bridge



- The first 1/3 of the deployment period appears stable and level followed by a notable decline. This decline occurs during a period of high flow about 15 mm on November 26th. Interestingly, pH does not recover after

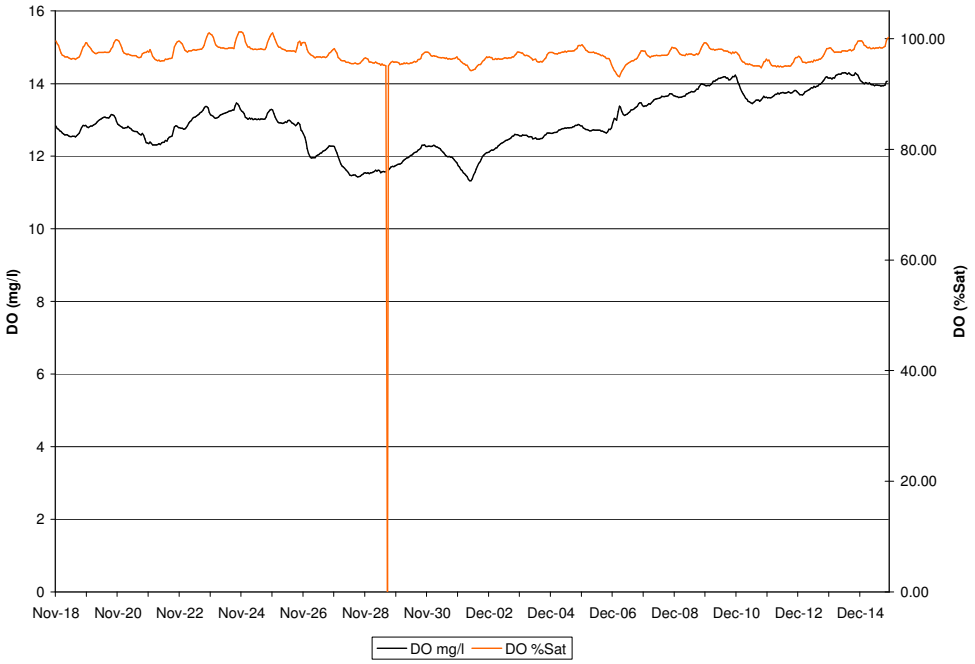
the precipitation. It is possible that some material may have deposited itself on the pH sensor or calibration drift occurred.

Figure 8: Specific Conductivity at Rattling Brook below Bridge



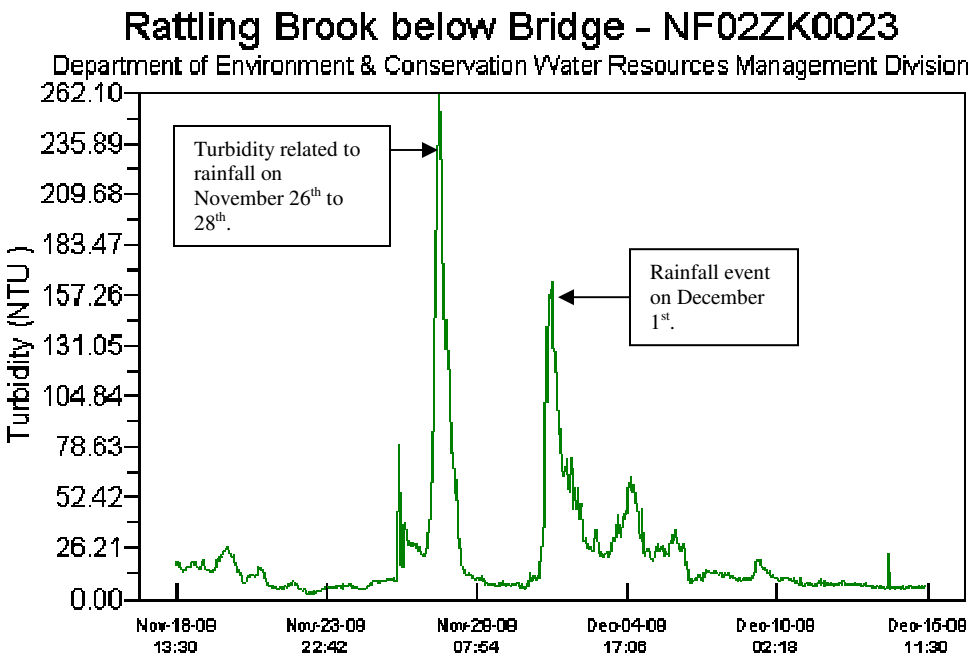
- Conductivity at Rattling Brook below Bridge ranged from 33.9 to 40.9 µS/cm during the deployment period. Two peaks indicated on the graph above are associated with heavy precipitation of about 42 mm on November 26th and 27th, and 26 mm on December 1st resulting in runoff into the river system. Another precipitation event on December 6th caused a decline in conductivity as opposed to a spike due to air temperature at the time. Precipitation between December 5th and 9th fell as snow, causing little to no runoff, leading to a dilution effect in the river.

Figure 9: Dissolved Oxygen at Rattling Brook below Bridge



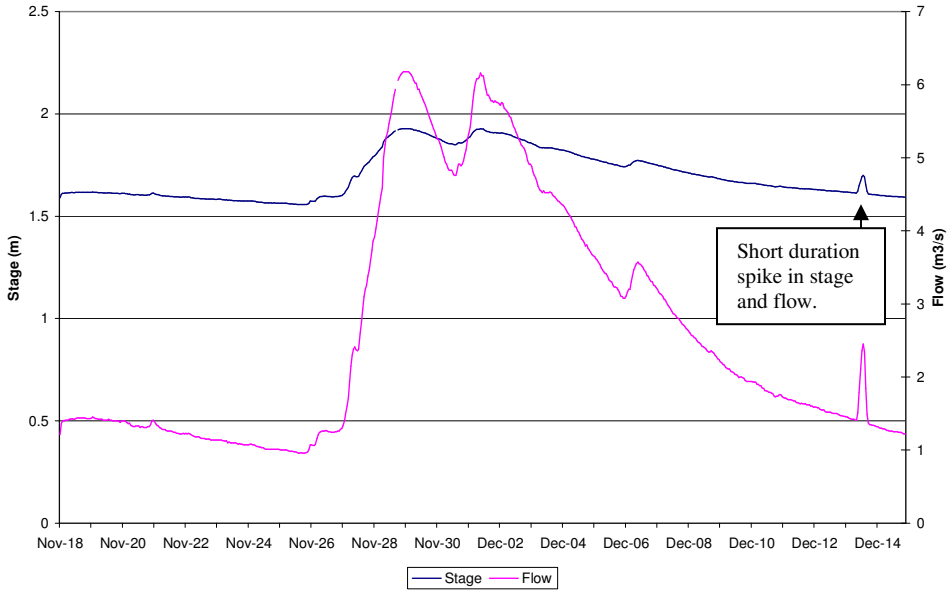
- Dissolved oxygen in Rattling Brook ranged from 11.32 to 14.30 mg/l during the deployment; reaching a minimum on December 1st and a maximum on December 14th. Dissolved oxygen remained above the CCME guideline of 9.5 mg/l for this period of time and continued to rise as water temperature declined into December.

Figure 10: Turbidity at Rattling Brook below Bridge



- Turbidity averaged 22.0 NTU during the deployment period with a low of 2.4 NTU on November 23rd and a high of 262.1 NTU on November 27th.

Figure 11: Stage and Flow at Rattling Brook below Bridge

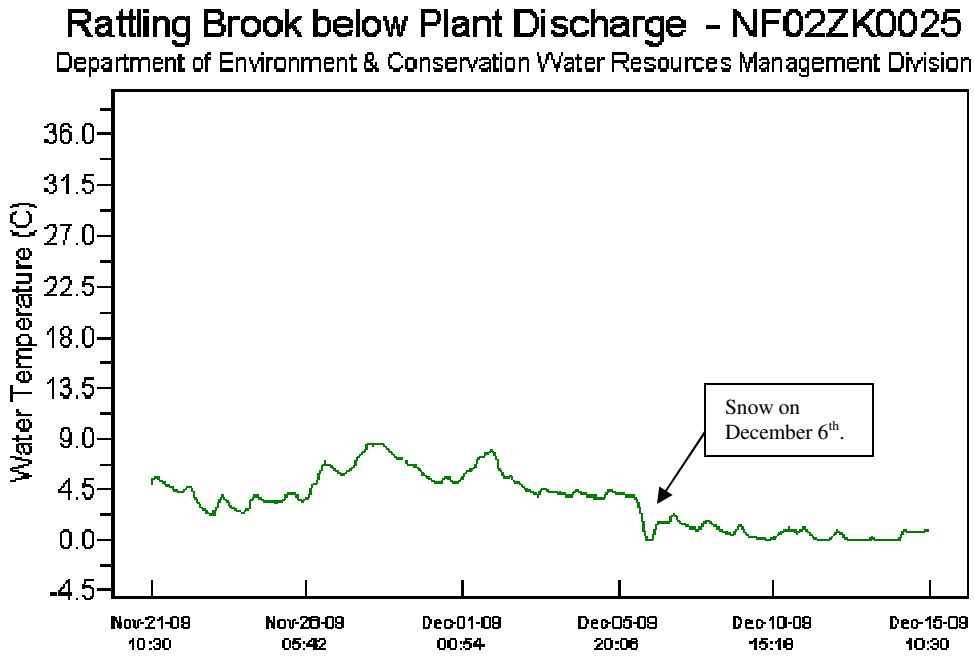


- Flow at Rattling Brook below Bridge ranged from a low of 0.96 m^3/s to 6.18 m^3/s following precipitation. A short surge in stage and flow is identified on December 13th. An associated precipitation or temperature relationship cannot be identified. A declining trend is seen going into late December.

RATTLING BROOK BELOW PLANT DISCHARGE

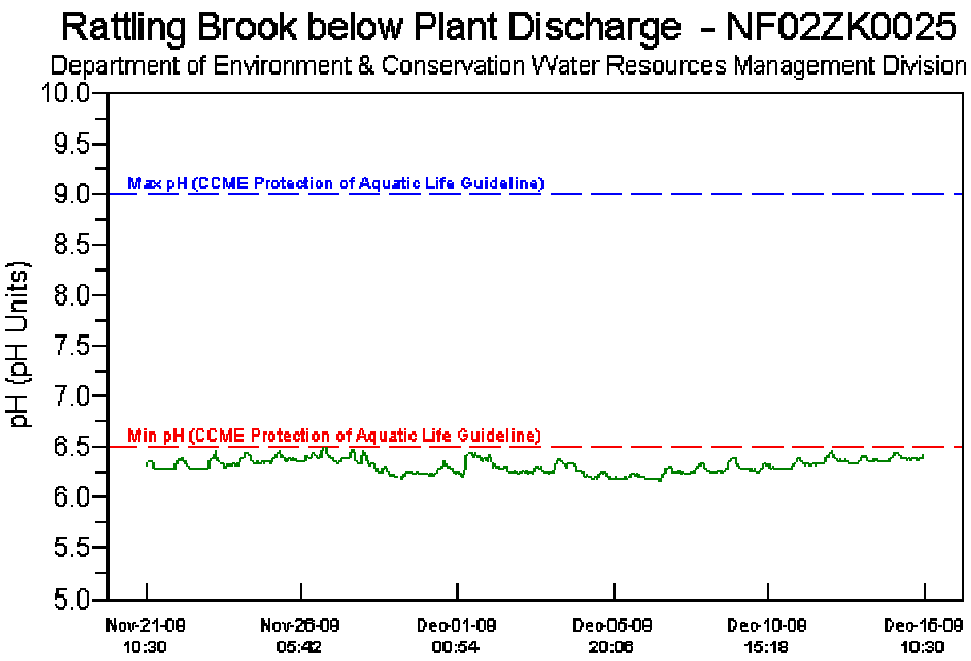
- Upon redeployment at Rattling Brook below Plant Discharge on November 15th, a cable was mistakenly left unconnected. This cable was reconnected on November 21st by Fluor staff. The following graphs represent the effective deployment interval of November 21st to December 15th.

Figure 12: Water Temperature at Rattling Brook below Plant Discharge



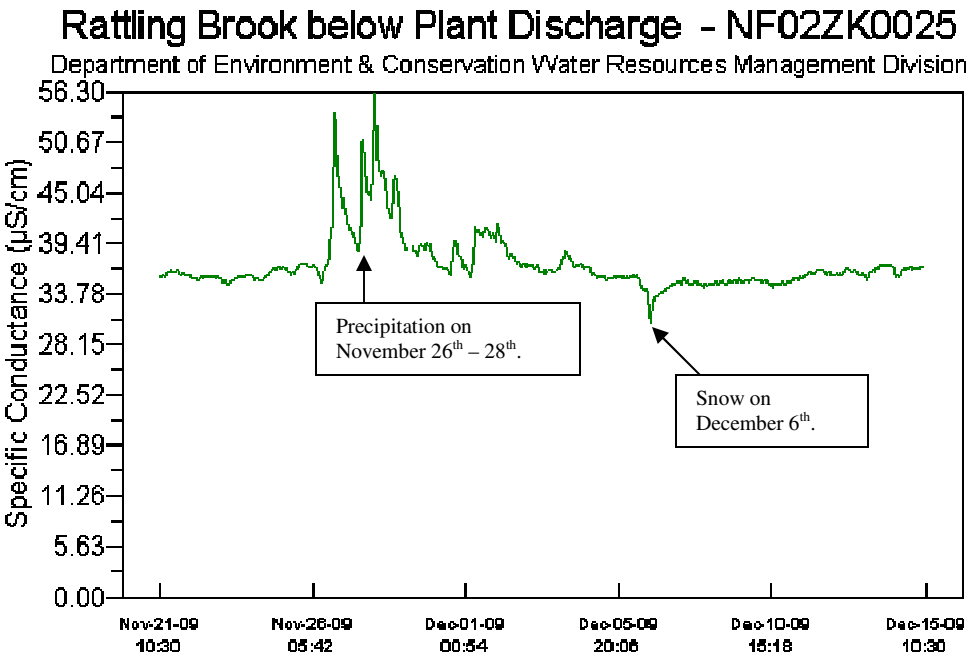
- Temperature at Rattling Brook below Plant Discharge ranged from 0.02°C to 8.58°C during the deployment period. A snowfall on December 6th caused a short term drop in water temperature.

Figure 13: pH at Rattling Brook below Bridge



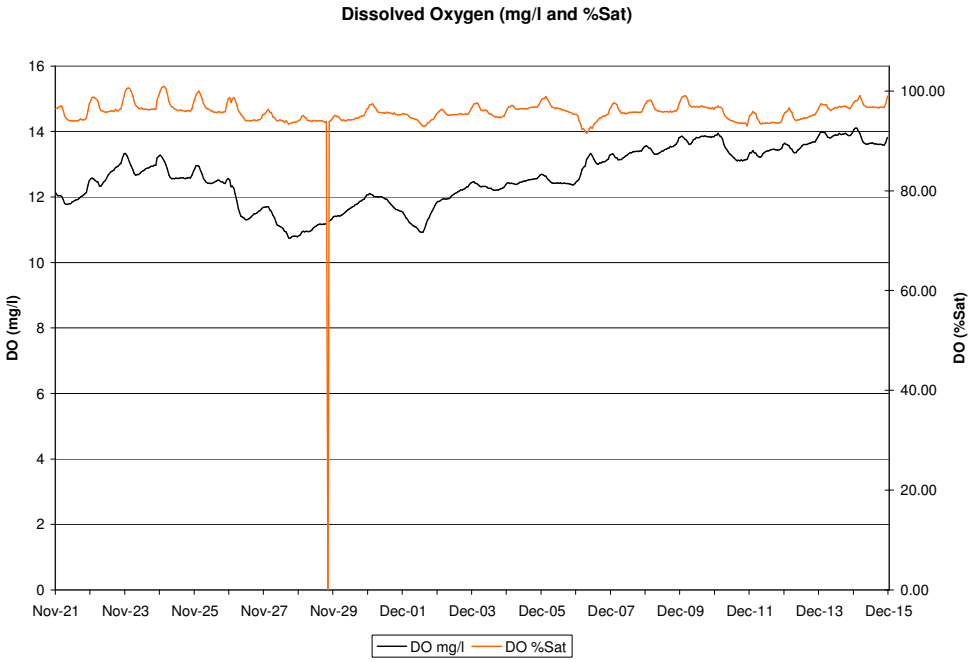
- pH at Rattling Brook below Bridge was below the CCME Guideline of 6.5 for almost the entire month. pH ranged from 6.17 to 6.51. No concern is warranted with regards to pH as this is likely the natural condition of pH in this river system.

Figure 14: Specific Conductance at Rattling Brook below Plant Discharge



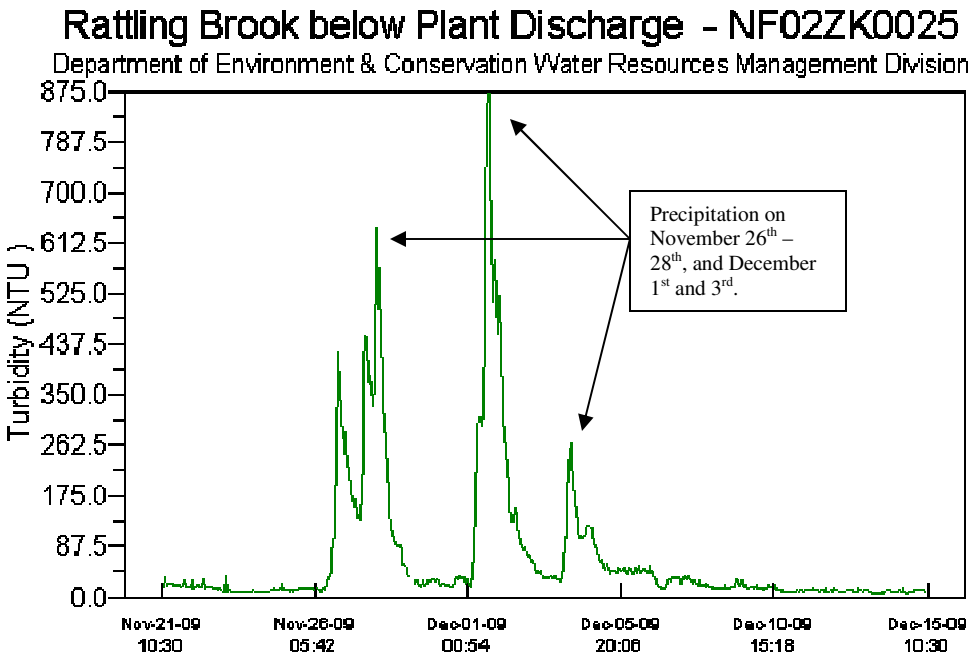
- Specific Conductivity ranged from 30.6 to 56.3 µS/cm from November 21st to December 15th. A set of spikes in conductivity occurred from November 26th to the end of November 28th due to heavy precipitation. A dip in conductivity on December 6th resulted from snow on that day.

Figure 15: Dissolved Oxygen at Rattling Brook below Plant Discharge



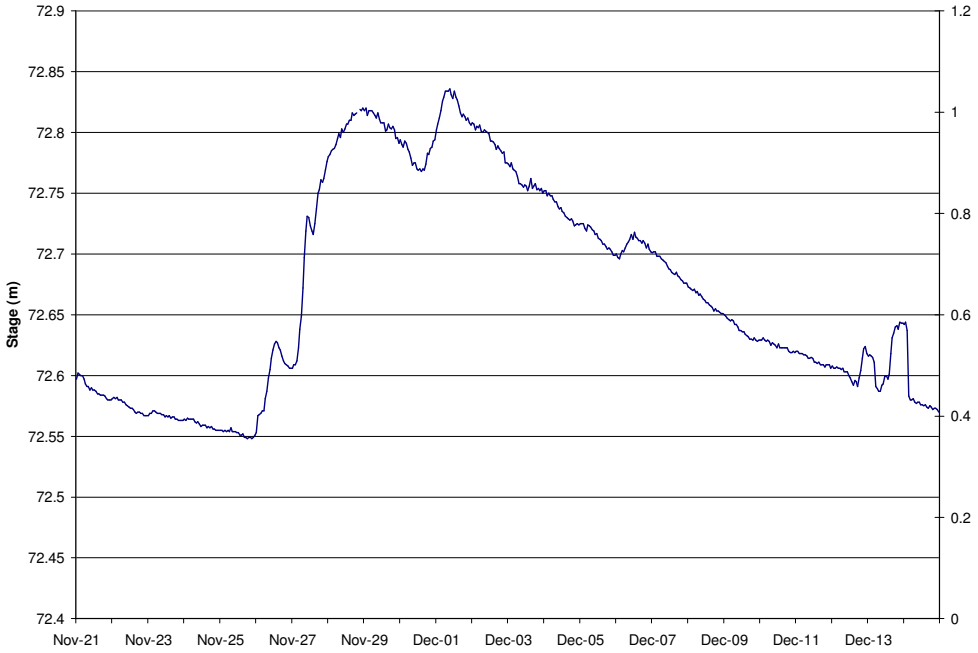
- Dissolved oxygen at Rattling Brook below Plant Discharge remained above the CCME guideline of 9.5 mg/l for the whole deployment since the range was from 10.74 to 14.1 mg/l. A rising trend occurred in the later half of the deployment as water temperature decreased.

Figure 16: Turbidity at Rattling Brook below Plant Discharge



- Three major sets of peaks (875, 649, and 267.8 NTU) were observed in turbidity at Rattling Brook below Bridge. The lowest value recorded over the deployment period was 8 NTU.

Figure 17: Stage at Rattling Brook below Plant Discharge



- Stage at Rattling Brook below Plant Discharge ranged from 72.5 to 72.8 m over the deployment period. Since a flow curve has not been developed for this section of the river, flow rate cannot be estimated.

Appendix

Figure 18: Air Temperature at the Argentia Weather Station, near Long Harbour

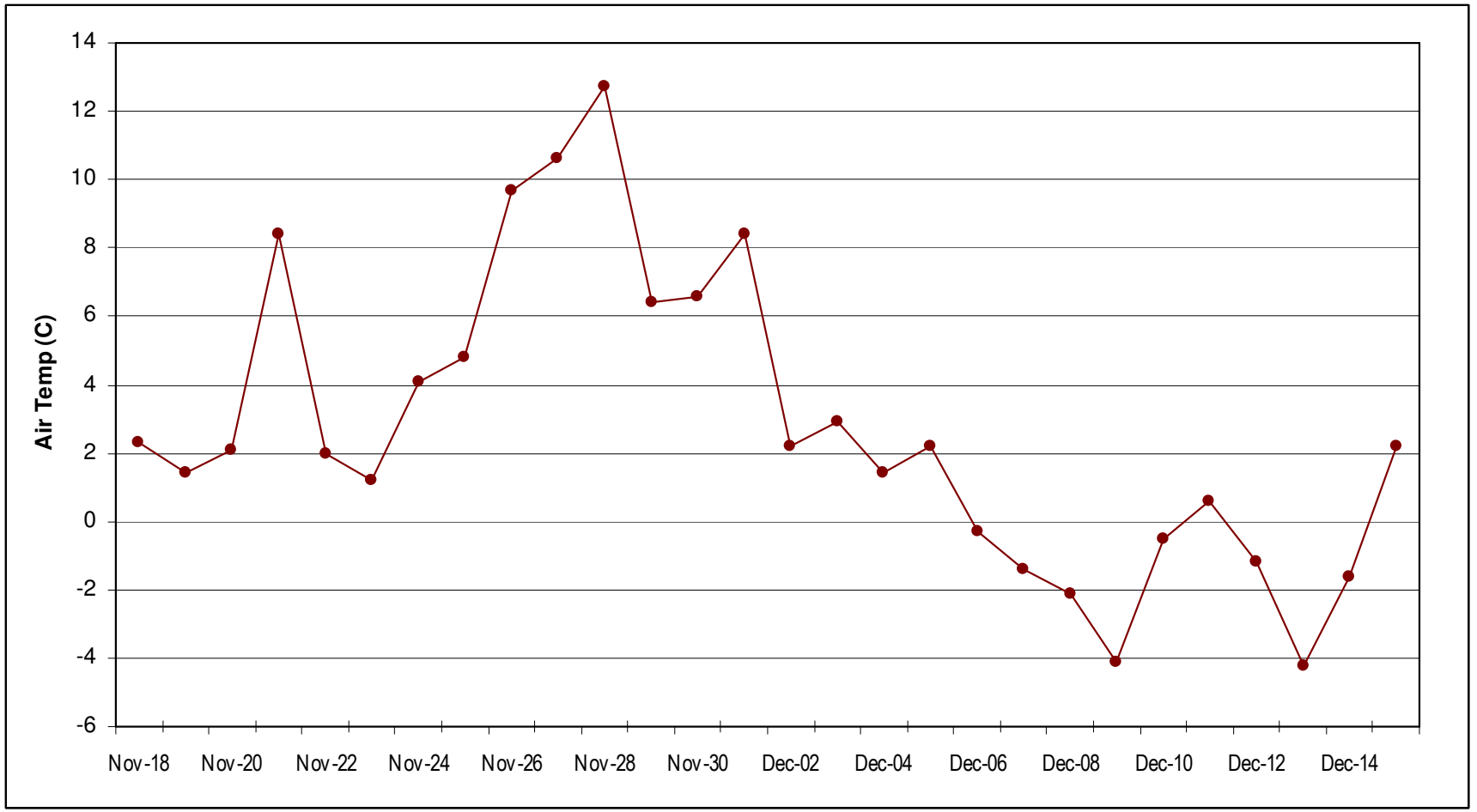
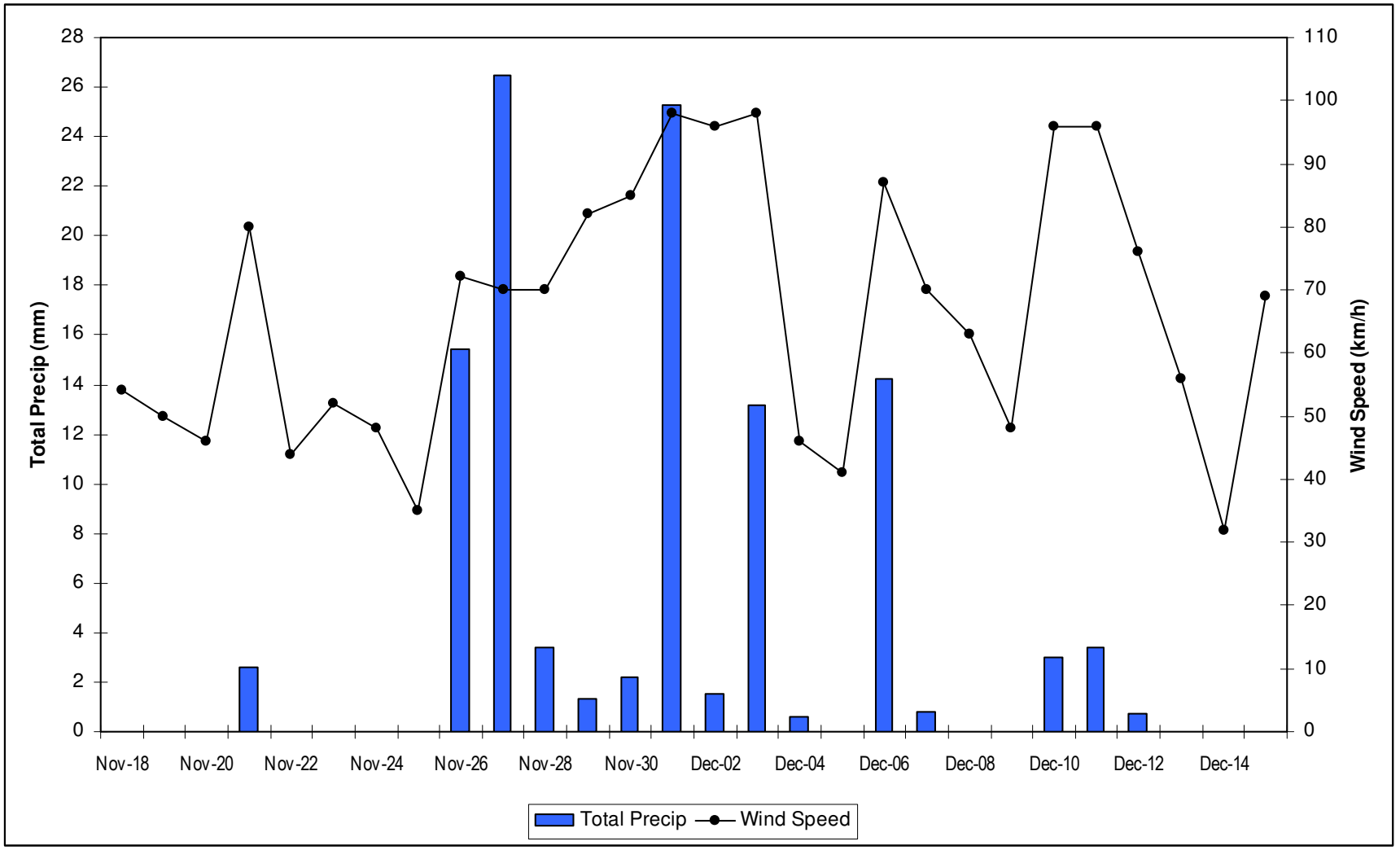


Figure 19: Total Precipitation and Wind Speed at the Argentia Weather Station, new Long Harbour



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