

## Real Time Water Quality Deployment Report for Vale Inco Newfoundland and Labrador Ltd. July/August 2008

### General

- The Water Resources Management Division staff monitors the real-time web page on a daily basis.
- Vale Inco Newfoundland and Labrador Ltd. will continue to be informed of any significant water quality events in the future in the form of a monthly deployment report.
- Environment Canada (EC) staff and Department of Environment and Conservation (DOEC) staff were on-site July 7-8, 2008 to visit the real-time water quality/quantity stations.

### Maintenance and Calibration of Instrumentation

- DOEC staff removed instruments from Camp Pond Brook, Tributary to Lower Reid Brook, Lower Reid Brook and Upper Reid Brook for cleaning and calibration on July 7<sup>th</sup> (after 31 day deployment period). Vale Inco and DOEC staff cleaned and calibrated the instruments and returned them to all four stations on July 8<sup>th</sup>.
- As was mentioned in the previous deployment report, the instrument at Camp Pond Brook (which is actually the instrument listed as “Tributary to Reid Brook”) during the month of June was having problems with the conductivity readings (even though the instrument calibrated correctly). Since the sampling window is so short for Voisey’s Bay, it was decided in July to redeploy this particular instrument at the Upper Reid Brook station and not send it away for servicing. The Upper Reid Brook station is a site with very minimal impact on the water body, thus the lack of conductivity data is not a significant problem. The issue with the conductivity sensor will need to be addressed in the upcoming winter months.
- Minisonde readings which are usually taken for QA/QC purposes were not taken in July due to a malfunction with the charging cable for the Surveyor. Vale Inco staff ordered a new charging cable to ensure the Minisonde was available for use in August.
- Vale Inco staff visited the four stations on August 17<sup>th</sup> and removed all instruments for cleaning and calibration (after 41 day deployment period). The instruments were returned to the water on August 20<sup>th</sup>.
- Upon removal and redeployment at all stations in August, Minisonde readings were taken for QA/QC purposes. The results from comparing the Minisonde values to the Datasonde values can be seen in **Table 1**. As was expected due to the extended deployment period from July 8<sup>th</sup> – August 17<sup>th</sup>, the dissolved oxygen values drifted at the Lower Reid Brook station and Upper Reid Brook station resulting in “poor” rankings upon removal. The temperature and pH rankings at all four stations remained in the “good” and “excellent” rankings upon removal. It appears as though the conductivity probe on the Minisonde was not functioning properly leading to “poor” rankings upon both removal and reinstallation. Additionally, it appears as though the Minisonde readings taken during reinstallation at the Lower Reid Brook station were not stable with the temperature having a “marginal” ranking and the dissolved oxygen having a “poor” ranking. In all likelihood, the Minisonde could not establish accurate readings due to the silty bottom.

**Table 1: QA/QC Data Comparison Rankings upon removal and reinstallation in August 2008**

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
<b>Upper Reid Brook</b>	Aug. 17 <sup>th</sup> , 2008	Removal	Excellent	Excellent	NA*	Poor
	Aug. 20 <sup>th</sup> , 2008	Installation	Good	Good	NA*	Good
<b>Lower Reid Brook</b>	Aug. 17 <sup>th</sup> , 2008	Removal	Excellent	Excellent	NA*	Poor
	Aug. 20 <sup>th</sup> , 2008	Installation	Marginal	Good	NA*	Poor
<b>Tributary to Lower Reid Bk</b>	Aug. 17 <sup>th</sup> , 2008	Removal	Excellent	Excellent	NA*	Excellent
	Aug. 20 <sup>th</sup> , 2008	Installation	Excellent	Excellent	NA*	Excellent
<b>Camp Pond Brook</b>	Aug. 17 <sup>th</sup> , 2008	Removal	Excellent	Good	NA*	Excellent
	Aug. 20 <sup>th</sup> , 2008	Installation	Good	Excellent	NA*	Excellent

\* Conductivity probe on Minisonde was not working properly.

## Data Interpretation

### REID BROOK AT OUTLET OF REID POND (UPPER REID BROOK)

- The water temperature and dissolved oxygen (**Figures 1 & 2** respectively) remained relatively consistent throughout the deployment period without any significant water quality events captured. As expected for this time of the year there was an increase in water temperature and corresponding decrease in dissolved oxygen. All dissolved oxygen values remained above the minimum CCME Water Quality Guideline for the Protection of Aquatic Life.

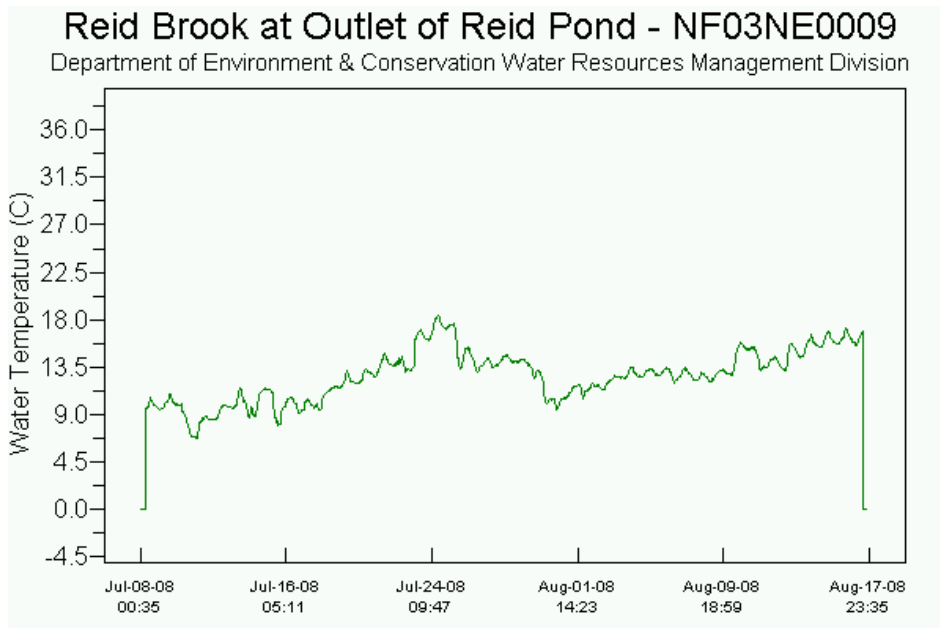


Figure 1

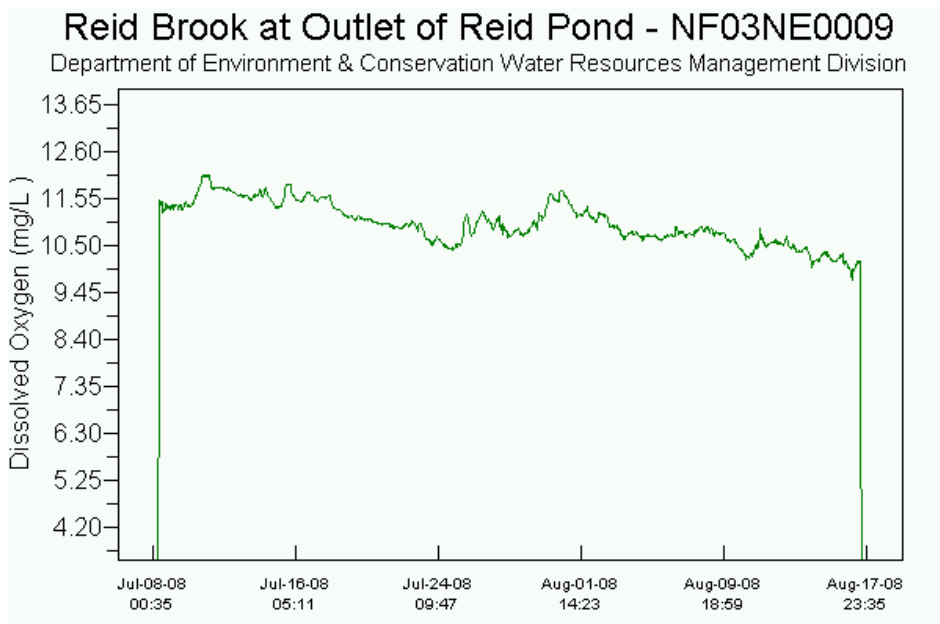
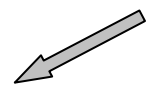
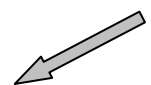
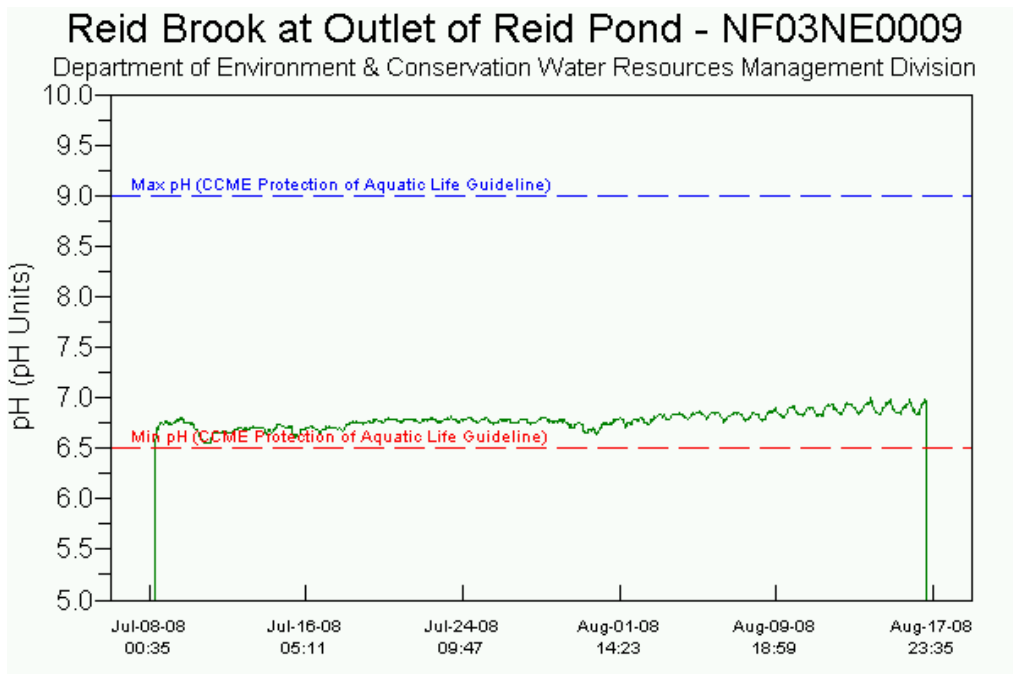


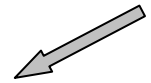
Figure 2



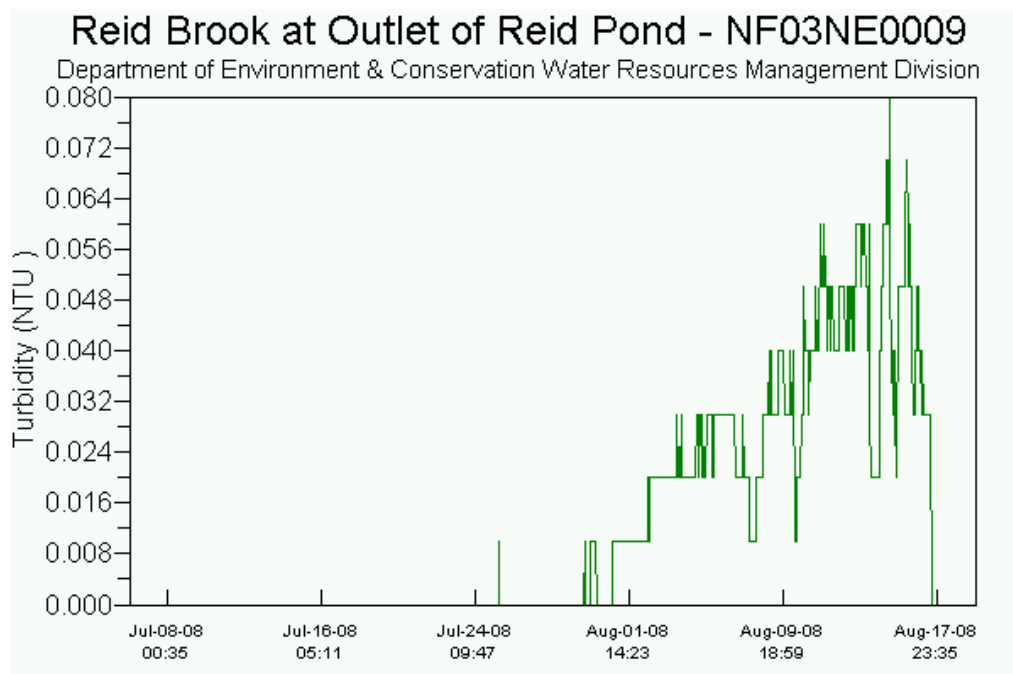
- As mentioned in the previous section, there was a problem with the conductivity sensor on the instrument placed in the Upper Reid Brook site.
- The pH (**Figure 3**) values remained consistent throughout the deployment period and remained within CCME Water Quality Guidelines for Aquatic Life.



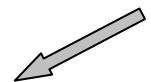
**Figure 3**



- Turbidity values (**Figure 4**) remained at a very low level throughout the deployment period ranging from 0- 0.08NTU.



**Figure 4**



## CAMP POND BROOK BELOW CAMP POND

- The water temperature and dissolved oxygen values (**Figures 5 & 6** respectively) were somewhat variable throughout the deployment period with temperatures ranging from 9.8 – 23.12°C. As the water temperatures increased there was a corresponding decrease in dissolved oxygen. The minimum dissolved oxygen value was 7.68mg/L over the deployment period.

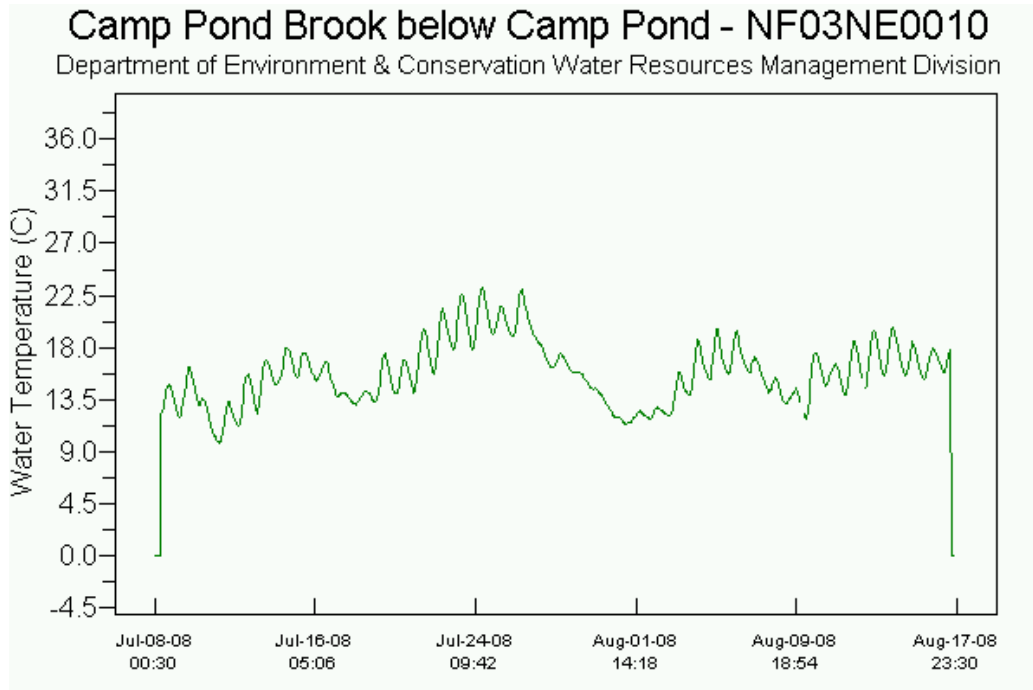


Figure 5

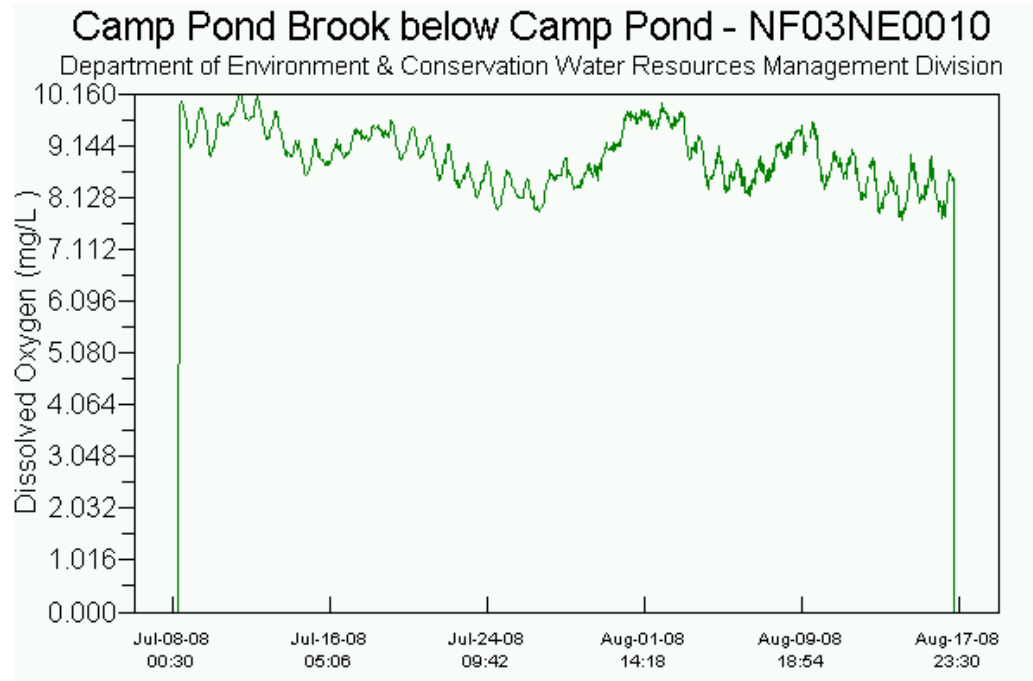
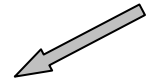
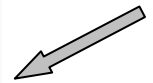
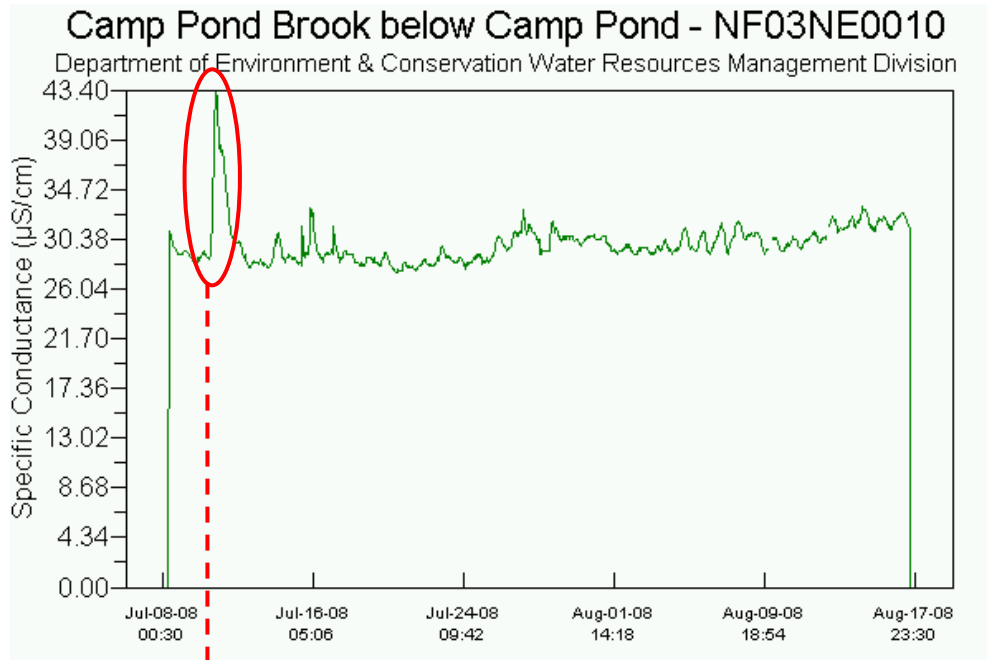


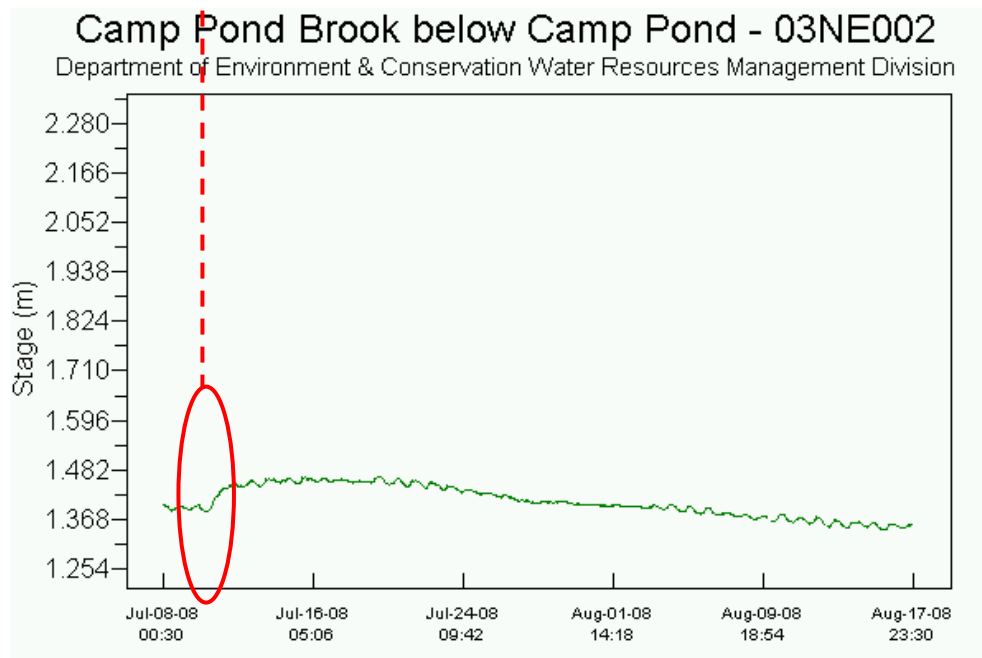
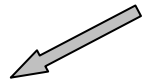
Figure 6



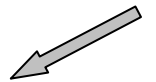
- The conductivity values (**Figure 7**) remained consistent throughout the deployment period with the exception of an increase in values on July 10<sup>th</sup> and 11<sup>th</sup>; when the conductivity reached a maximum value of 43.4  $\mu\text{S}/\text{cm}$  but returned to background levels within a 48 hour time period. This increase in conductivity is reflected in a slight decrease/increase in the stage graph (**Figure 8**) and was likely affected by precipitation in the area.



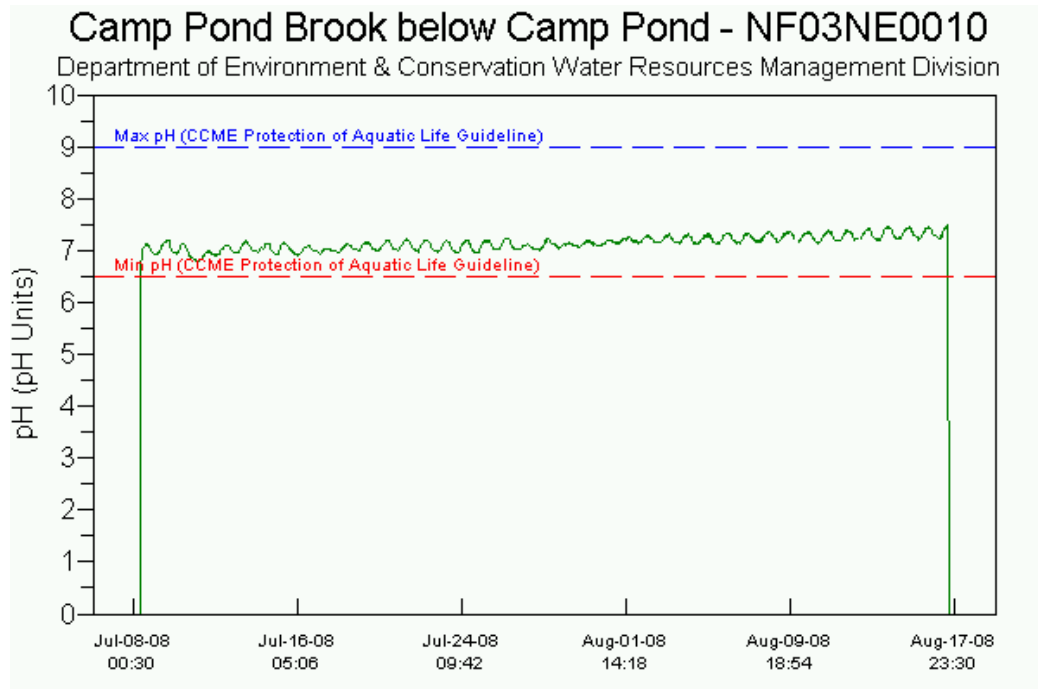
**Figure 7**



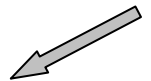
**Figure 8**



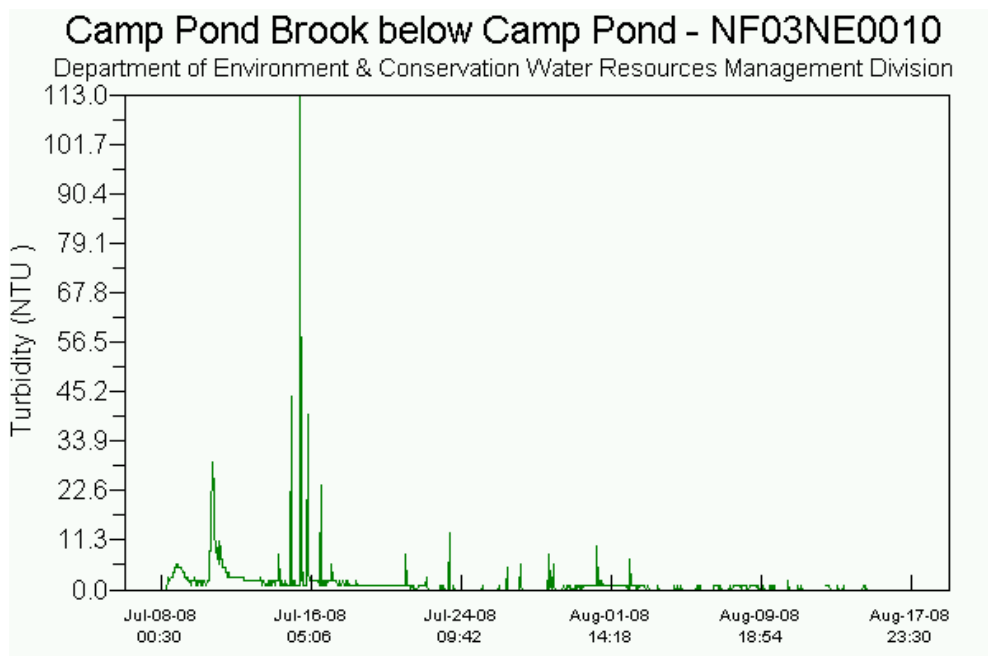
- The pH (**Figure 9**) values remained consistent throughout the deployment period (with only a slight increase) and remained within CCME Water Quality Guidelines for Aquatic Life.



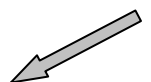
**Figure 9**



- Turbidity values (**Figure 10**) at the Camp Pond Brook station showed slightly fluctuating turbidity values over the deployment period. Most of the values remained below 15 NTU with the exception of spikes occurring on July 10<sup>th</sup> (maximum value of 29 NTU) and July 15<sup>th</sup> (maximum value of 113 NTU). As noted previously, there was a noticeable decrease/increase in the stage graph (**Figure 8**) on July 10<sup>th</sup> thus explaining the likely cause of the turbidity increase. The cause of the second spike is unknown.

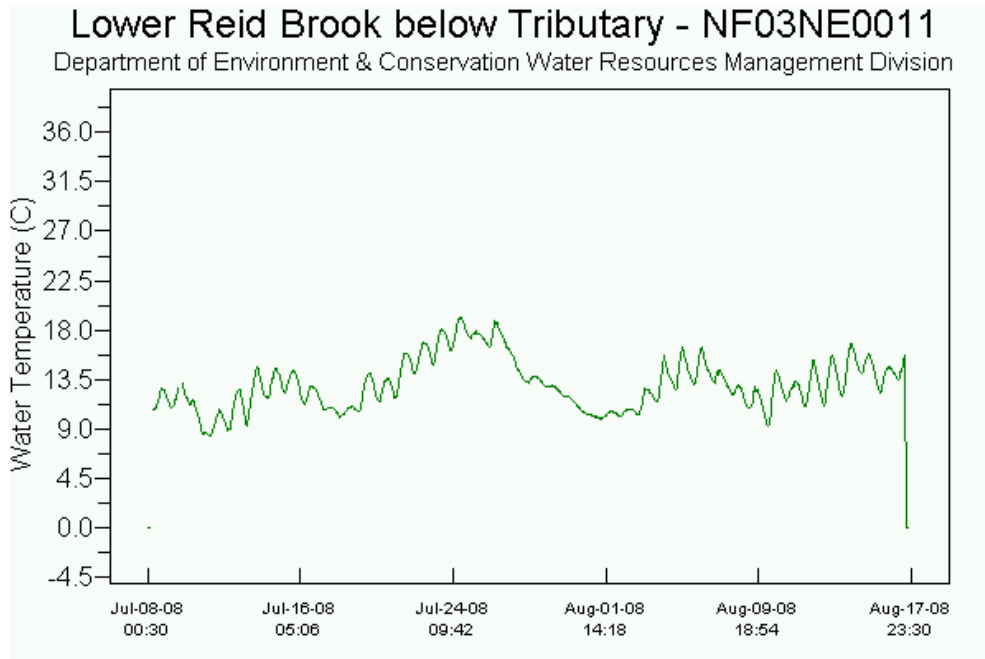


**Figure 10**

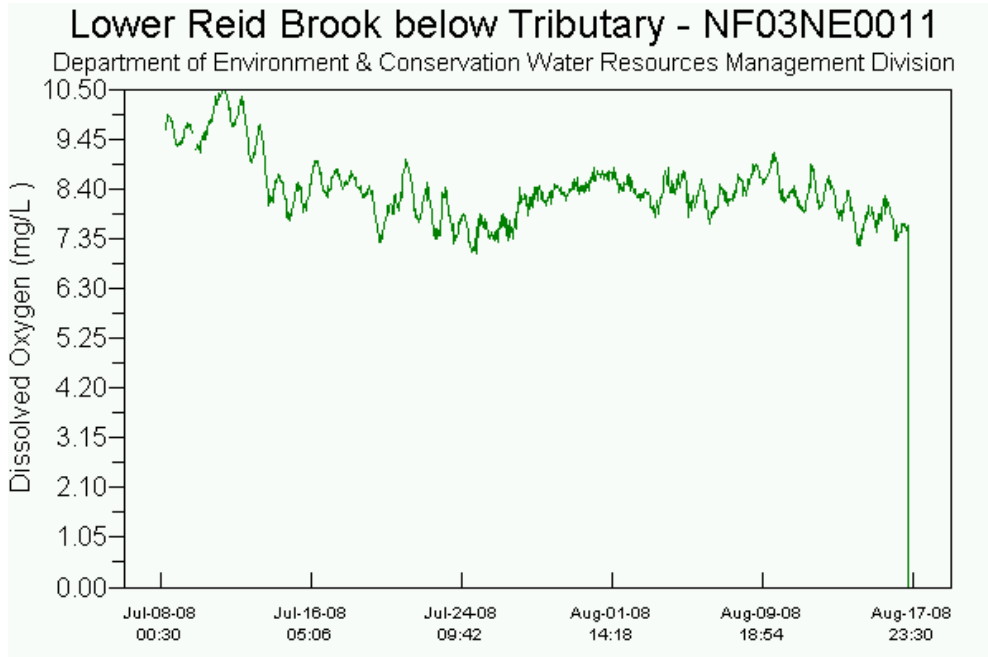
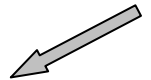


**LOWER REID BROOK BELOW TRIBUTARY**

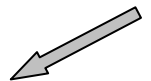
- The water temperature and dissolved oxygen values (**Figures 11 & 12** respectively) were somewhat variable throughout the deployment period with temperatures ranging from 8.38 – 19.09°C. As the water temperatures increased there was a corresponding decrease in dissolved oxygen. The minimum dissolved oxygen value was 7.04mg/L over the deployment period.



**Figure 11**



**Figure 12**





- The pH and specific conductivity (Figures 13 & 14 respectively) remained at fairly constant background levels for this station over the deployment period. All pH values remained within CCME Water Quality Guidelines for Aquatic Life (6.5 – 9.0).

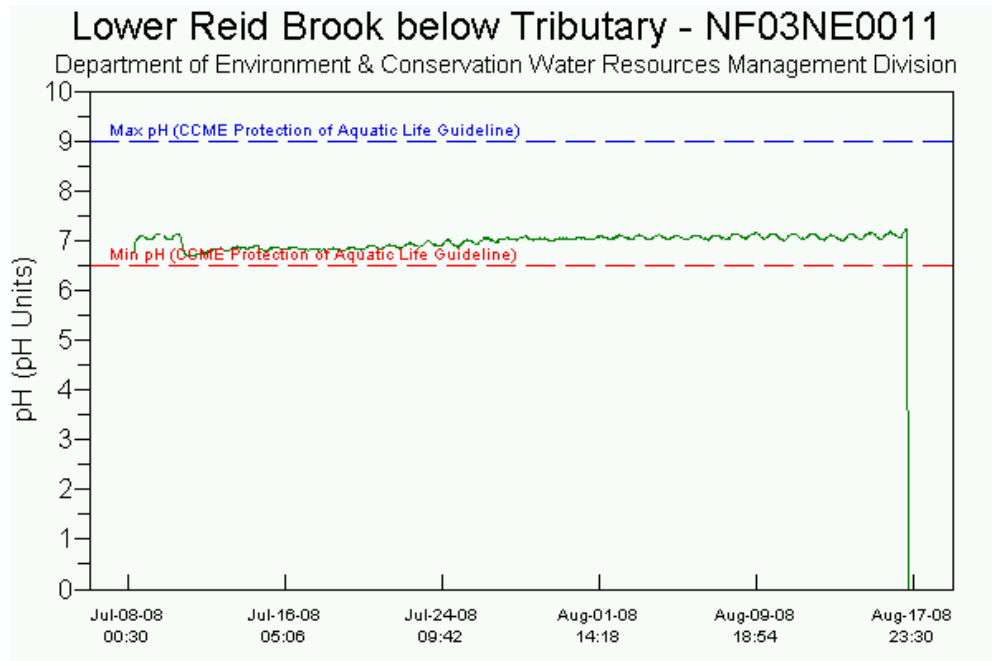


Figure 13

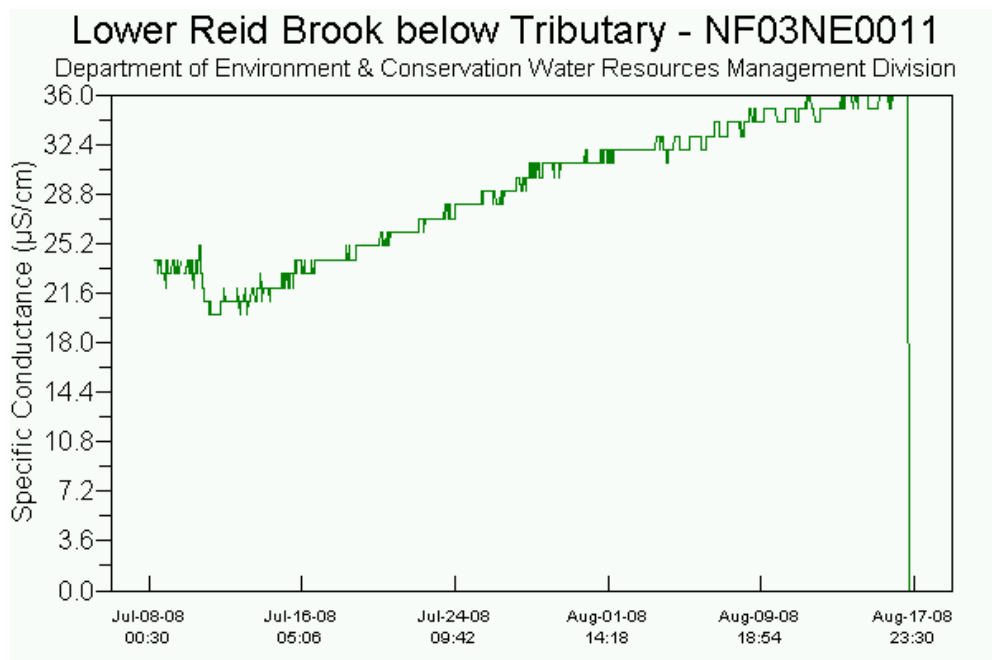
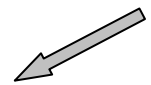
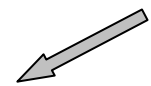
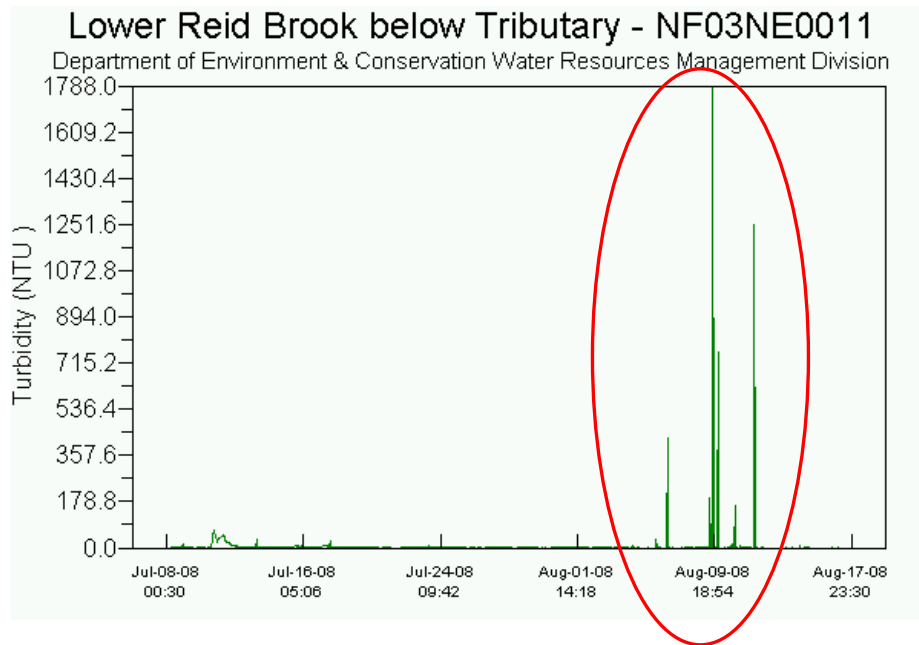


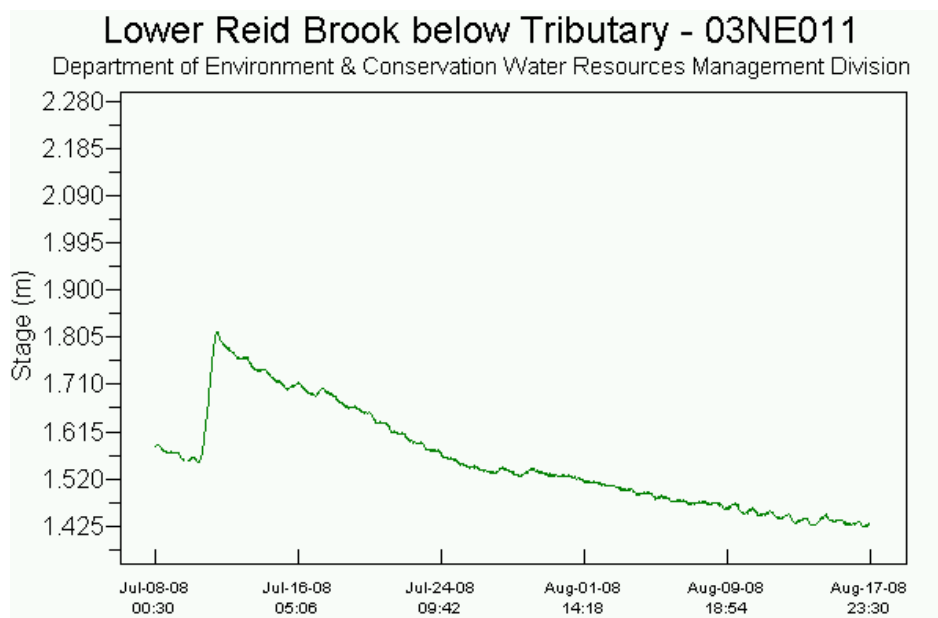
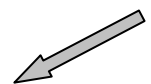
Figure 14



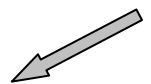
- Turbidity values (**Figure 15**) remained relatively consistent until early August when several spikes are visible. It is unlikely that these increases are due to precipitation events since there are no increases visible on the stage graph (**Figure 16**). The data itself indicates that the spikes are random and instant whereby very low readings are recorded then one high reading is recorded and then back down again to very low levels. The causes of these spikes remain unknown to date but may be due to sensor interference due to the silty nature of this particular site.



**Figure 15**

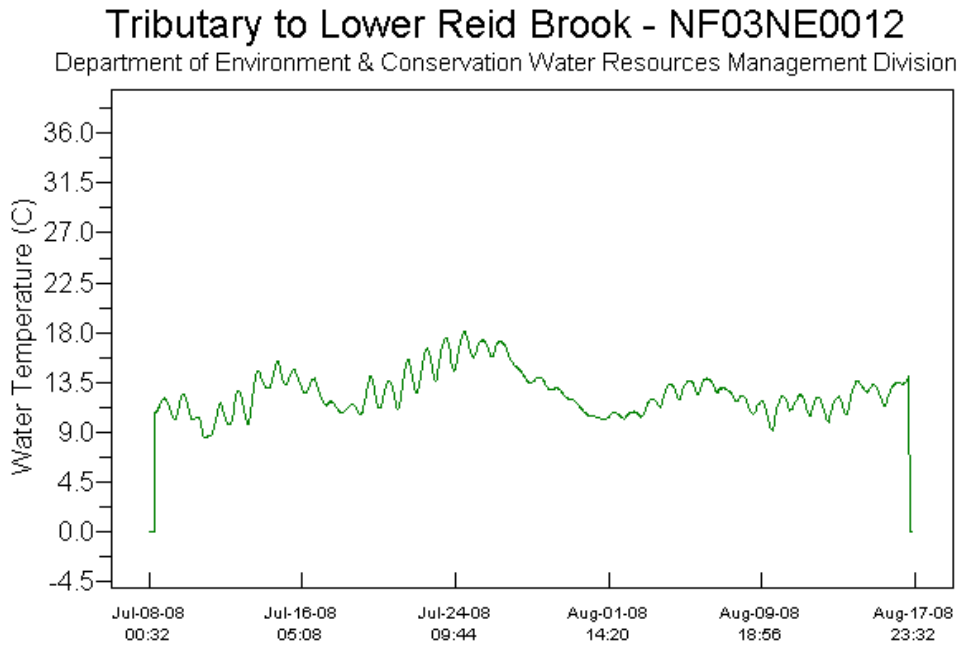


**Figure 16**

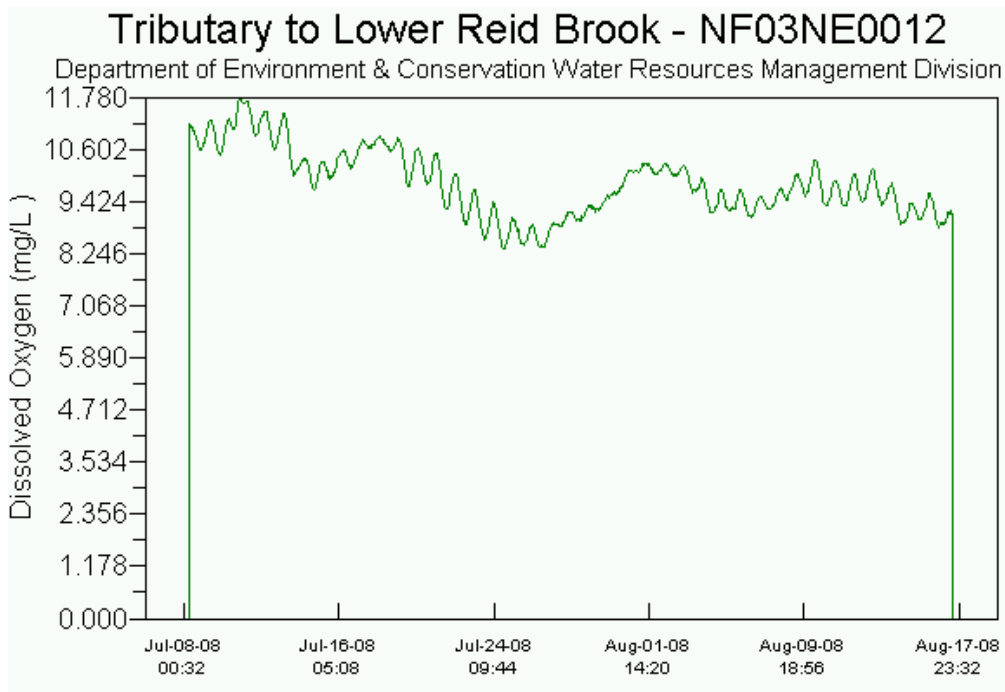
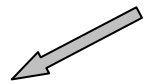


**TRIBUTARY TO REID BROOK**

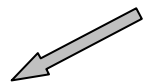
- The water temperature and dissolved oxygen values (**Figures 17 & 18** respectively) were somewhat variable throughout the deployment period with temperatures ranging from 8.47 – 18.15°C. As the water temperatures increased there was a corresponding decrease in dissolved oxygen. The minimum dissolved oxygen value was 8.34mg/L over the deployment period.



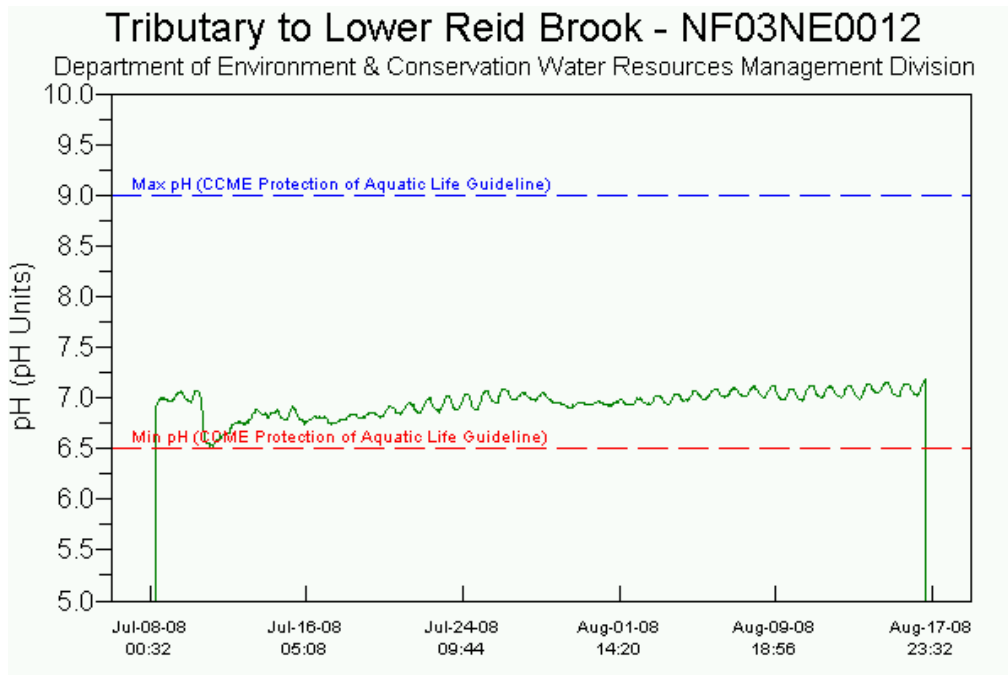
**Figure 17**



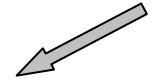
**Figure 18**



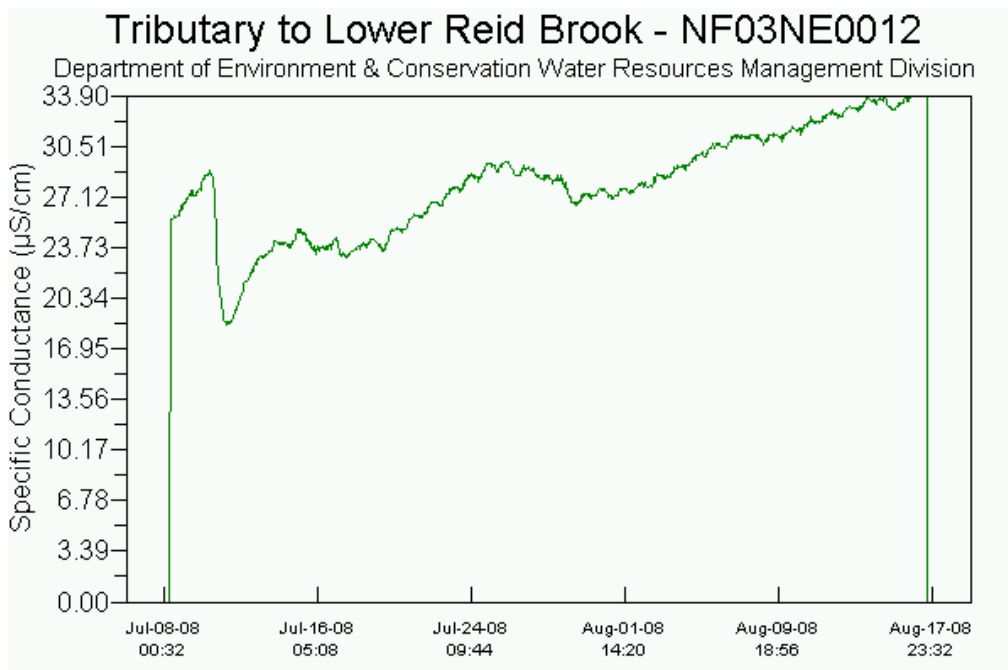
- The pH (**Figure 19**) remained consistent and within CCME Water Quality Guidelines for Aquatic Life (6.5 – 9.0) over the deployment period.



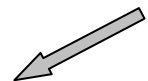
**Figure 19**



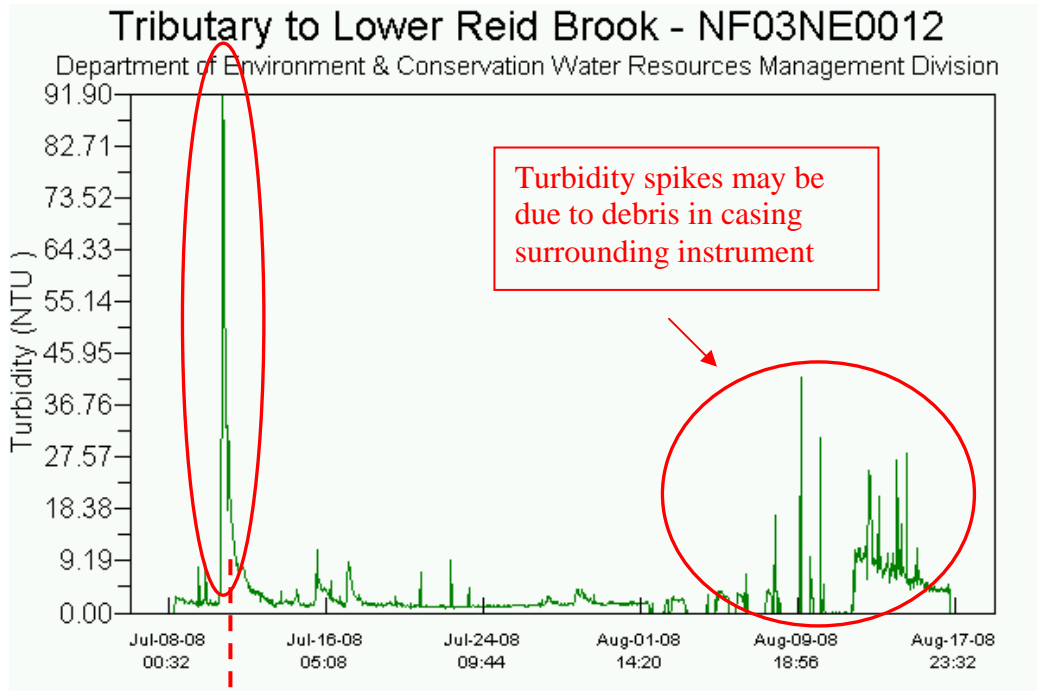
- The specific conductivity (**Figure 20**) showed a general increase in values throughout the deployment period. This may indicate some sensor drift. It is difficult to determine how much of this increase is due to sensor drift since the conductivity sensor on the Minisonde is not reading accurately so there are no accurate comparison values upon removal in August.



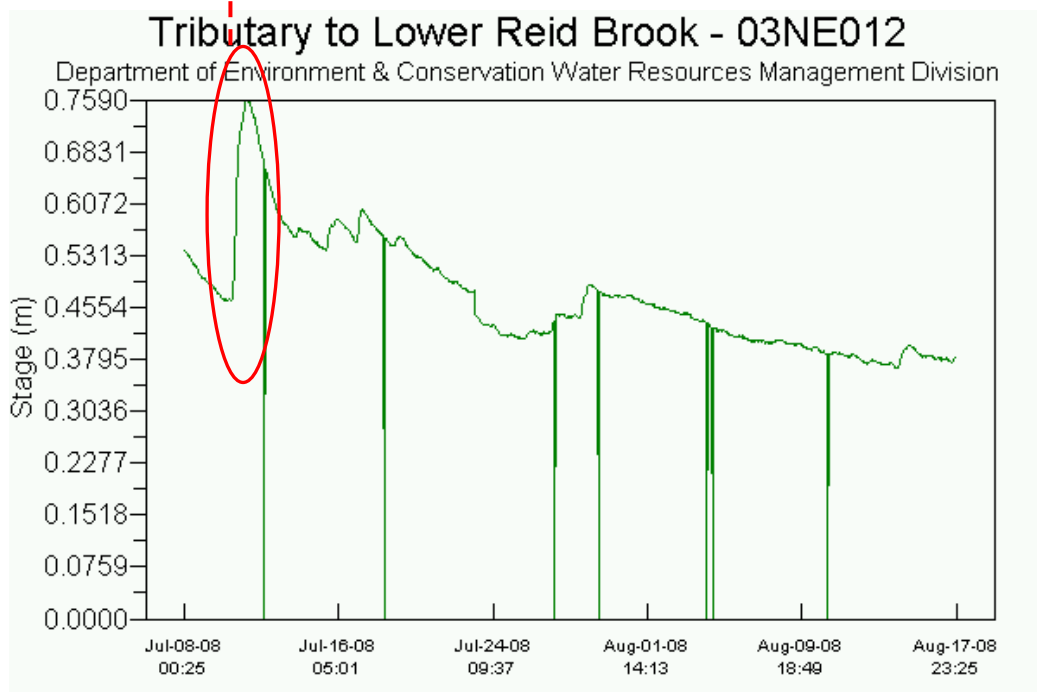
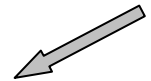
**Figure 20**



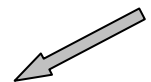
- Turbidity values (**Figure 21**) fluctuated throughout the deployment period, however remained below 91.9 NTU. The turbidity spike in early July definitely looks to be influenced by the precipitation and corresponds with the increase in stage values (**Figure 22**). It was noted by Vale Inco NL staff that there was a significant amount of cobble stone/silt found in the steel casing surrounding this instrument upon removal in August. It is likely that this debris interfered with the turbidity readings at the end of the deployment period.



**Figure 21**



**Figure 22**



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