

Real Time Water Quality Report Duck Pond Operations (Teck Cominco Limited)

Deployment Period 2008-11-14 to 2008-12-15

General

- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated, with site visits being carried out as warranted.
- Management at Duck Pond Operations are informed of any significant water quality events or instrumentation problems by WRMD.
- Tributary to Gills Pond Brook Station is located 1700 m downstream of the final discharge point for the mine's Polishing Pond. This station is located such that any impacts from the mine discharge on receiving waters can be measured.
- East Pond Brook Station is located several kilometres downstream of the Tailings Management Area. This station is located such that any surface water impacts from the Tailing Management Area via seepage through Dam A may be measured.
- Monitoring Well After Tailings Dam Station is located near Tailings Dam A. This station is located such that any ground water impacts from the Tailing Management Area via seepage through Dam A may be measured.
- The two DataSondes (Tributary to Gills Pond Brook Station and East Pond Brook Station) are set up to measure Ammonium and Nitrate however, technical problems with the instrumentation render readings of these parameters unreliable. Therefore, these parameters will not be discussed or interpreted until the technical problems have been overcome and the data are reliable.
- Many of the graphs below show vertical lines from the data string to zero or the bottom of the graph. These lines indicate when a probe was off-line or removed from service.
- There was effluent from Polishing Pond into the receiving waters (Tributary to Gills Pond Brook) throughout the deployment period.
- Raw (uncorrected) data has been used in the preparation of the graphs and subsequent discussion below.

Maintenance and Calibration of Instrumentation

- The regular DataSondes were deployed in Tributary to Gills Pond Brook and East Pond Brook on November 14, 2008, after being cleaned, serviced and freshly calibrated. The Tributary to Gills Pond Brook instrument was deployed until December 15, 2008 (31 day period). The East Pond Brook instrument was removed following loss of data communication on November 26, 2008 (12 day period).
- The Quanta G probe was deployed in Monitoring Well After Tailings Dam Station (MW1) on November 14, 2008 after being cleaned, serviced and freshly calibrated. Due to this well freezing at surface, this probe will remain deployed beyond this deployment period, throughout the winter.
- *In-situ* measurements of ambient water quality were undertaken with a freshly calibrated MiniSonde each time a DataSonde was installed or removed. No *in situ* measurements can be taken in the Monitoring Well.
- The comparative results between the MiniSonde and DataSonde values at the beginning and end of the deployment period are shown in **Table 1** for Tributary to Gill's Pond Brook and **Table 2** for East Pond Brook. Comparative results could not be obtained for the November 26, 2008 removal of the DataSonde from East Pond Brook.

Table 1: QA/QC Data Comparison Ranking During Deployment Period

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
Tributary to Gill's Pond Brook	2008-11-14	Installation	Excellent	Good	Good	Good
	2008-12-15	Removal	Excellent	Good	Excellent	Poor

Table 2: QA/QC Data Comparison Ranking During Deployment Period

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
East Pond Brook	2008-11-14	Installation	Excellent	Excellent	Excellent	Good
	2008-11-26	Removal	NA	NA	NA	NA

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) fluctuated between a minimum of -0.29 °C to a maximum of 9.35 °C over the deployment period with a decreasing trend.

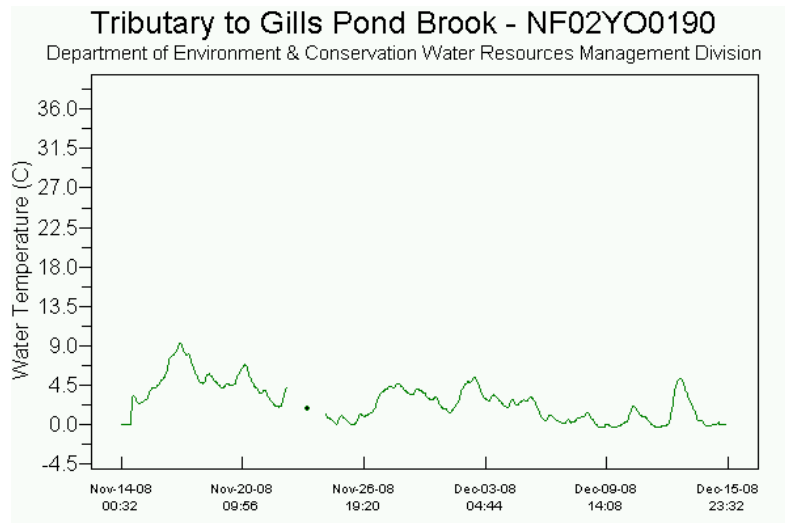


Figure 1

- Throughout the deployment period, pH values (**Figure 2**) ranged from a minimum of 6.14 to a maximum of 7.15 with most of the values falling within the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. The background pH of this stream is normally around the lower limit of the recommended range. The dips in pH correspond with increase in stream stage (**Figure 6**), which are likely the result of precipitation events.

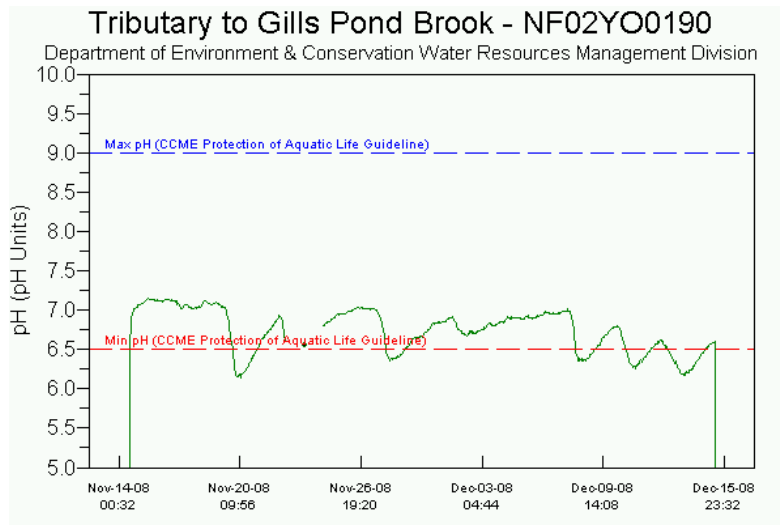


Figure 2

- The specific conductance (**Figure 3**) ranged from a minimum of 103.7 $\mu\text{S}/\text{cm}$ to a maximum of 583 $\mu\text{S}/\text{cm}$ over the deployment period. The dramatic changes in conductivity correspond to similar responses in pH (Figure 2) and an inverse Stage response (Figure 6). Therefore, it is apparent that during periods of discharge from the Polishing Pond, specific conductance is reduced significantly through the input of precipitation.

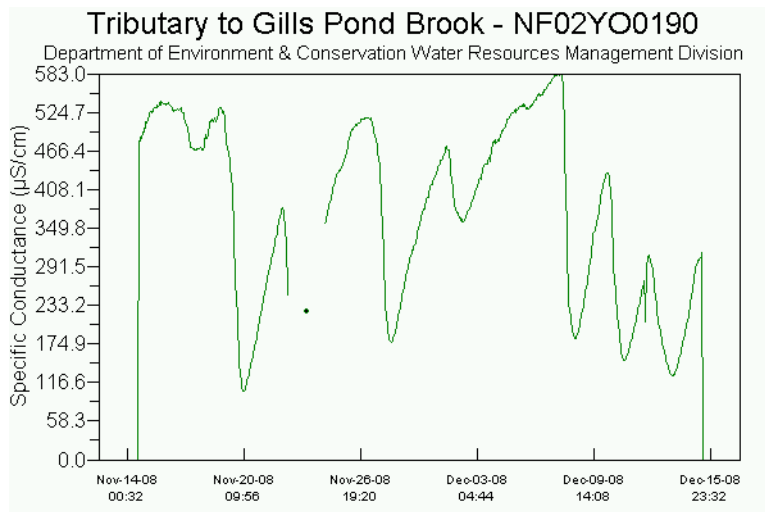


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 10.17 mg/L to a maximum of 13.40 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. All dissolved oxygen values fall within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for dissolved oxygen (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).

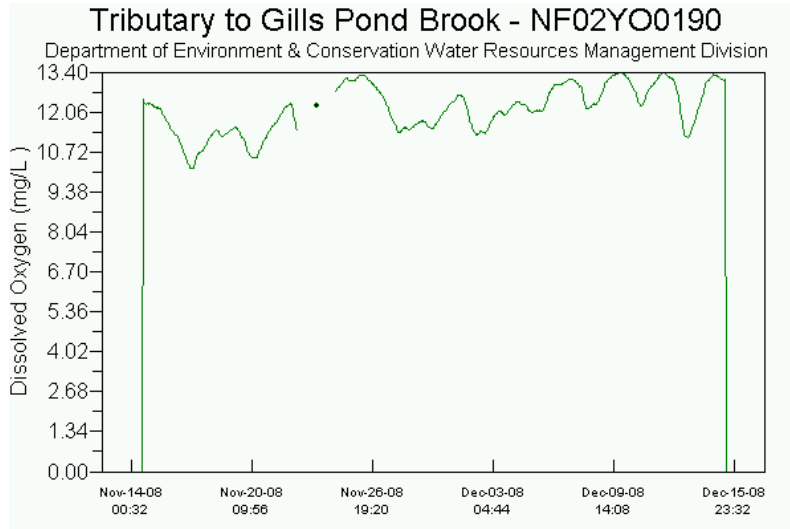


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 370.7 NTU. Turbidity values from *in situ* measurement collected by staff of Duck Pond Mine returned results less than 1.7 NTU. There is a notable change in turbidity following November 20, 2008. It was noted when the probe was removed on December 15, 2008, that the probe had been moved (presumably by the current) out of the pool in which it was placed, downstream to the limit of the safety tether. The fact that it was sitting in shallow water with less turbulent flow than where it had been placed confirms that air entrainment from turbulent flow exaggerates the measured turbidity. It is important to note as well, that the probe cannot be replaced in shallow water as it will become partially submerged during periods of low flow and will be subject to freezing during winter months.

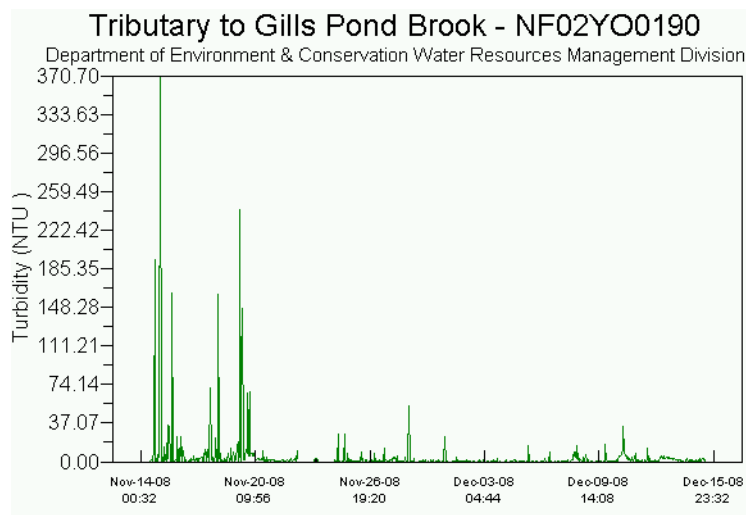


Figure 5

- The stage (**Figure 6**) or water level ranged from a minimum of 1.36 m to a maximum of 1.64 m. Although discharge data has not been provided by Duck Pond Mine, it is presumed that discharge rates remained constant. The peaks in stage would correspond to rainfall events. Similar peaks are obvious from East Pond Brook stage data as well (**Figure 12**).

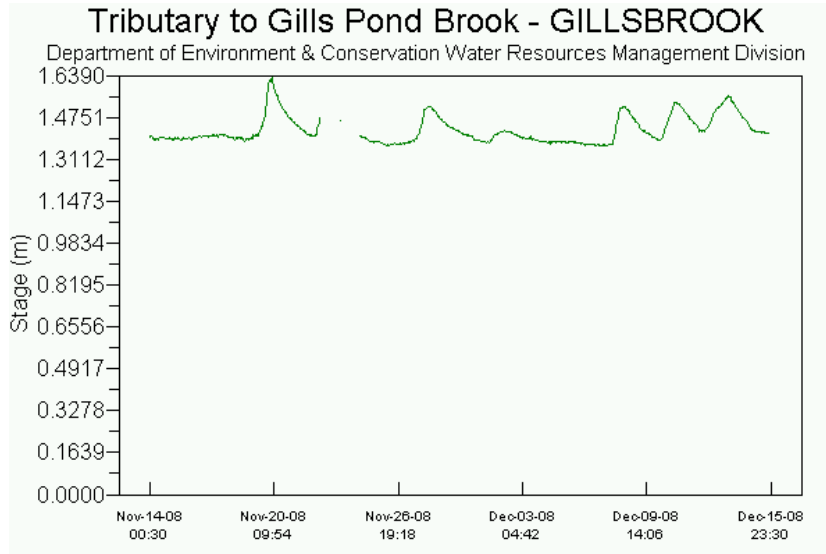


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) peaked on November 16, 2008 then showed a gradual decrease until loss of data transmission on November 26, 2008. Temperature values ranged from a minimum of -0.13 °C to a maximum of 9.63 °C over the period for which there is data.

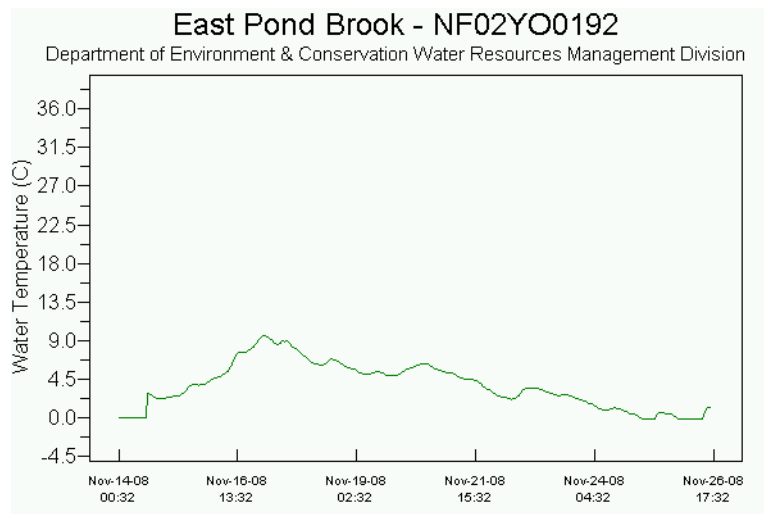


Figure 7

- pH values (**Figure 8**) remained fairly constant throughout the data collection period, ranging between 5.79 and 6.37. All pH values fell below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. The background pH of this stream is normally quite low.

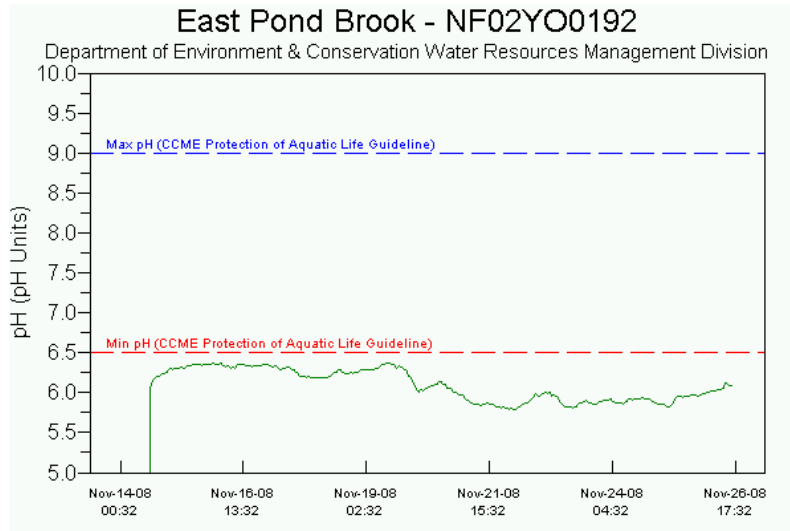


Figure 8

- The specific conductance (**Figure 9**) ranged from a minimum of 16.2 $\mu\text{S}/\text{cm}$ to a maximum of 21.7 $\mu\text{S}/\text{cm}$ over the data collection period. This normal variation is inversely proportional to the stage or water level. See Figure 12.

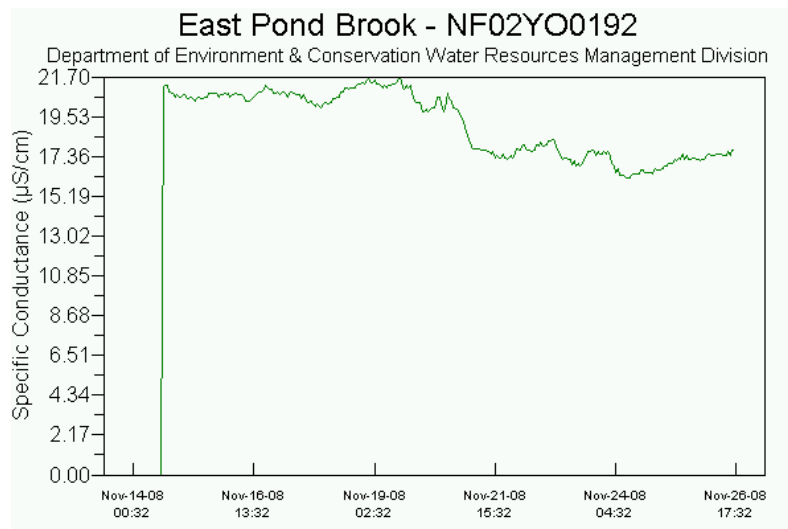


Figure 9

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 10.54 mg/L to a maximum of 14.26 mg/L over the data collection period. Dissolved oxygen levels are generally inversely proportional to water temperature. All dissolved oxygen values fell within the recommended CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).

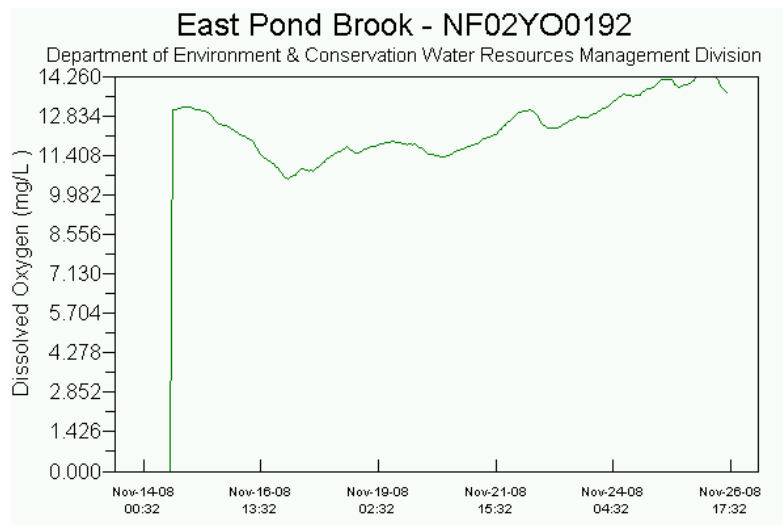


Figure 10

- The turbidity values (**Figure 11**) ranged from 0 NTU to 3000 NTU throughout the data collection period. It was noted that when the probe was removed from the stream, there were accumulations of leaves around the probe tips; this was likely what caused the increased turbidity values. There was no evidence of water quality impairment.

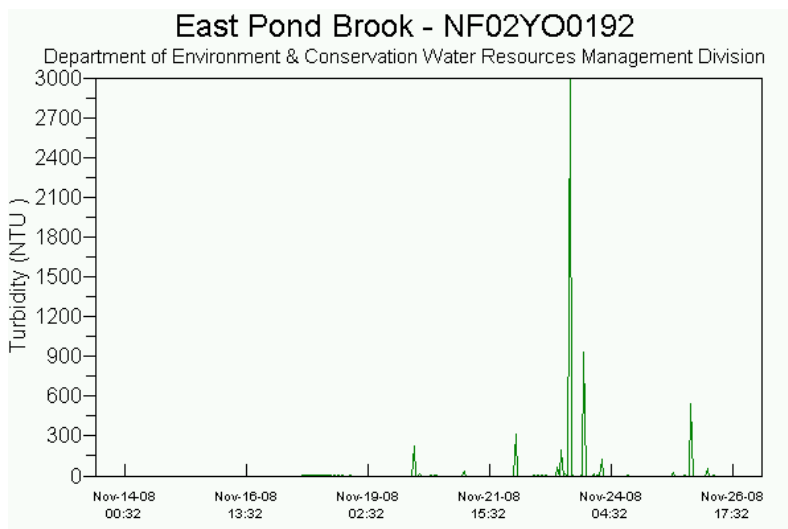


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 1.15 m to a maximum of 1.70 m. There was a period of missing data from November 26, 2008 to December 3, 2008. The peaks represent runoff from precipitation.

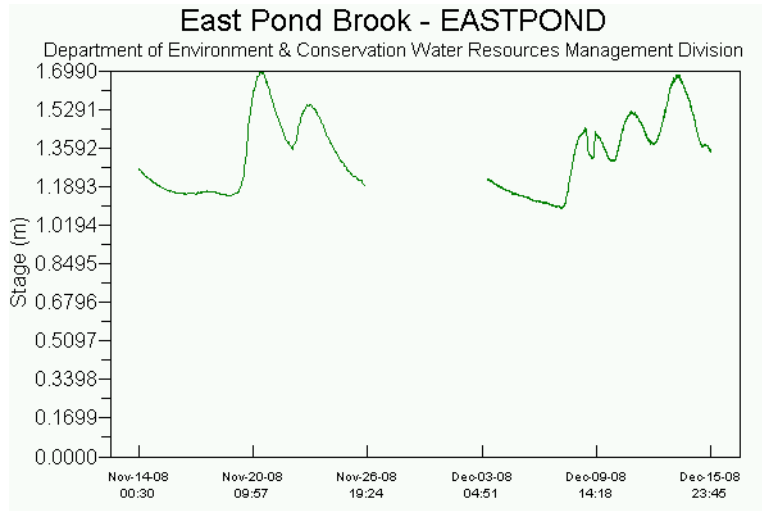


Figure 12

WELL AFTER TAILING DAM A

- Throughout the deployment period, the water temperature (**Figure 13**) remained constant between 5.37 °C and 5.60 °C.

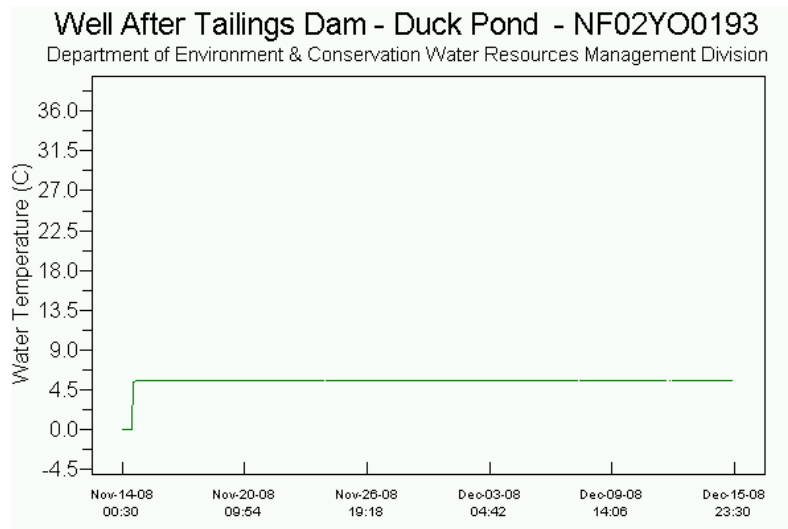


Figure 13

- The pH (**Figure 14**) ranged from a low of 7.93 to a high of 8.88 over deployment period. pH increases initially after being deployed, and then remains fairly constant near 8.8 throughout the remainder of the period. This pattern is consistent with previous deployments. It is presumed that the initial change in pH is the result of the well being purged and sampled prior to the reinstallation of the probe.

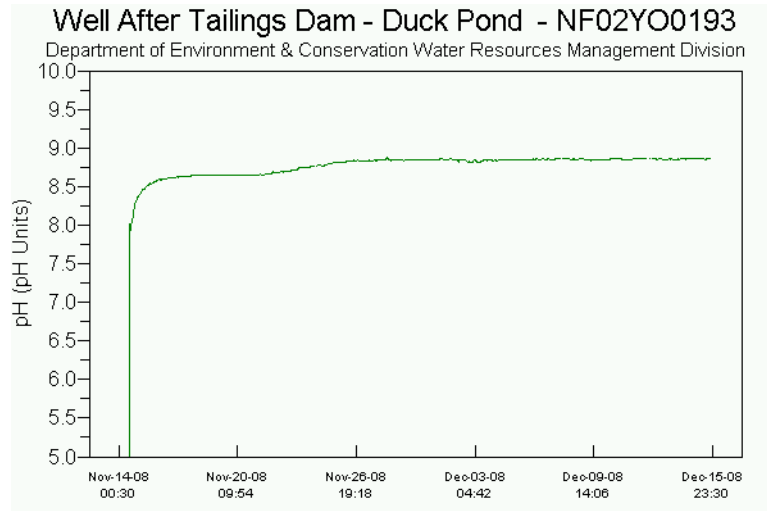


Figure 14

- The specific conductance (**Figure 15**) ranged from a minimum of 0.400 mS/cm to a maximum of 0.422 mS/cm over the deployment period. Similar to pH there was a little variability at the beginning of the deployment period followed by sustained period of stability.

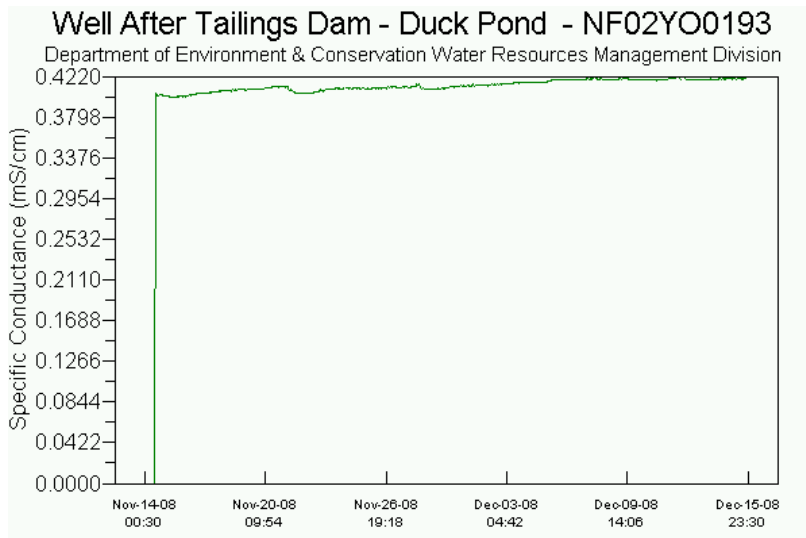


Figure 15

- The water level (**Figure 16**) remained fairly constant throughout the deployment period, ranging from 0.692 m to 0.808 m. The peaks correspond very closely to peaks in stage at Tributary to Gills Pond Brook (**Figure 6**) and are similar to peaks in stage at East Pond Brook (**Figure 12**). This indicates that water level in this well is influenced by precipitation

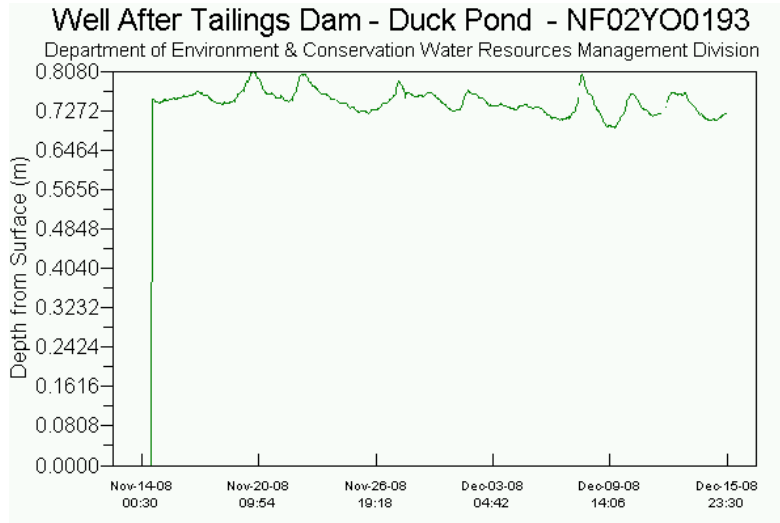


Figure 16

Prepared by:

Robert Wight
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Tel: 709-292-4280
Fax: 709-292-4365
e-mail: robertwight@gov.nl.ca