

**Real Time Water Quality Report
Duck Pond Operations
(Teck Cominco Limited)
Deployment Period 2008-09-17 to 2008-10-14**

General

- 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 entire deployment period.
- There were four minor periods of data loss from Monitoring Well After Tailings Dam Station (MW1) during this 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 September 17, 2008, after being cleaned, serviced and freshly calibrated. Both instruments were deployed until October 14, 2008 (27 day period).
- After being returned from servicing, the Quanta G was deployed in Monitoring Well After Tailings Dam Station (MW1) during this period after being freshly calibrated. This probe will remain deployed for several months.
- *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.

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	2008-09-17	Installation	Excellent	Good	Fair	Excellent
	2008-10-14	Removal	Poor	Good	Excellent	Fair

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	2008-09-17	Installation	Fair	Good	Good	Excellent
	2008-10-14	Removal	Excellent	Good	Excellent	Excellent

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperatures (**Figure 1**) decreased gradually during deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 5.47 °C to 16.71 °C over the deployment period.

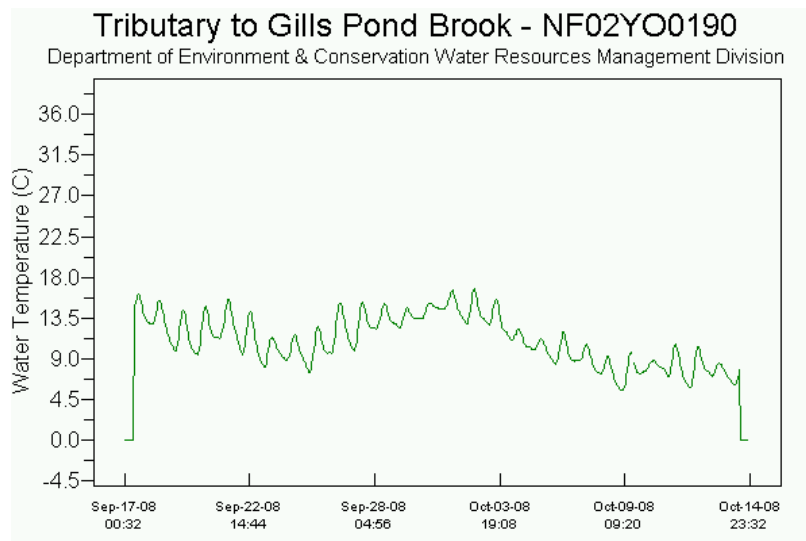


Figure 1

- pH values (**Figure 2**) remained fairly constant throughout the deployment period. The pH values ranged from a minimum of 6.69 to a maximum of 7.44 with all 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.

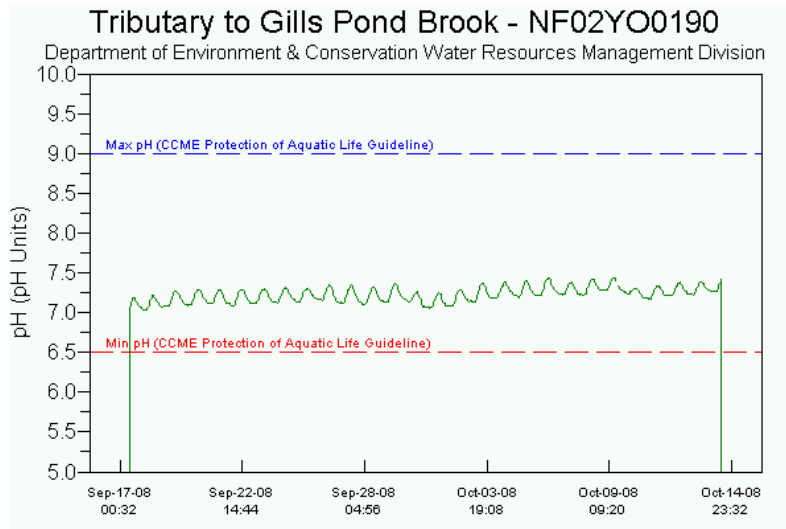


Figure 2

- The specific conductance (**Figure 3**) remained fairly constant, ranging from a minimum of 557 $\mu\text{S}/\text{cm}$ to a maximum of 695 $\mu\text{S}/\text{cm}$ over the deployment period. The obvious dips cannot be related to any of the other measured parameters.

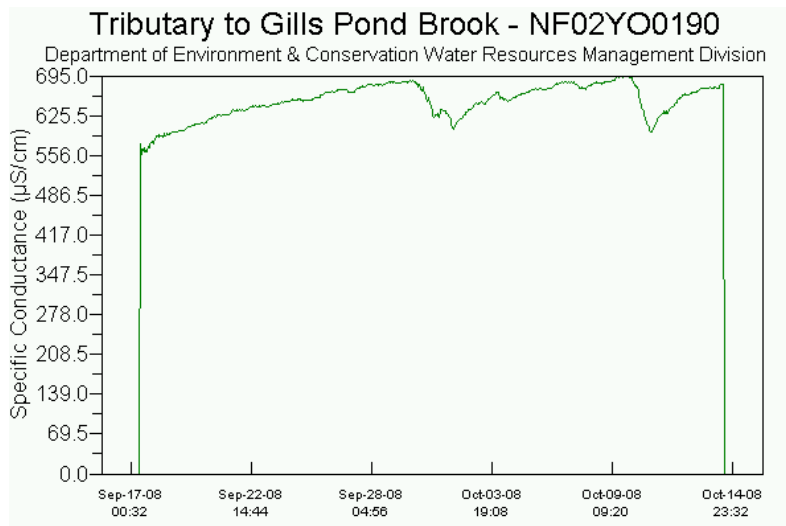


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.89 mg/L to a maximum of 11.41 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. Some of the dissolved oxygen values fall outside 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) however, this is a natural occurrence resultant from the warmer temperatures. A similar profile occurs in East Pond Brook (**Figure 10**).

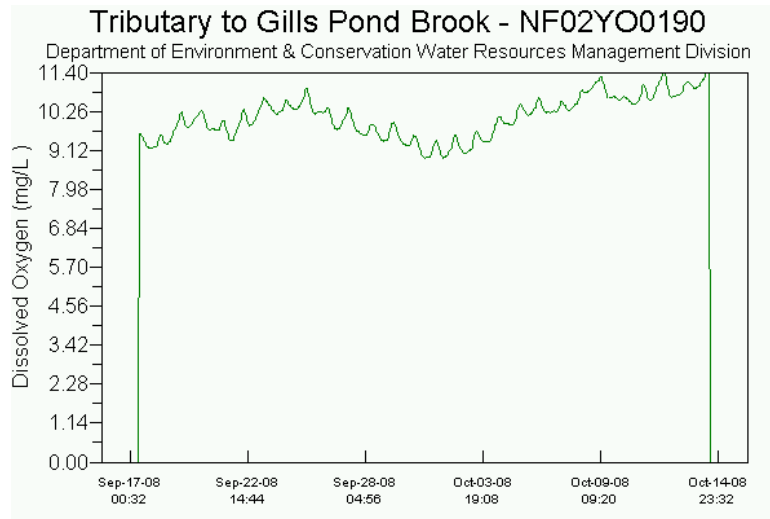


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 92.4 NTU throughout the deployment period. Turbidity values from grab samples and *in situ* measurements collected by staff of Department of Environment and Conservation and Duck Pond Mine returned results less than 1.0 NTU. Turbidity at this location will continue to be investigated.

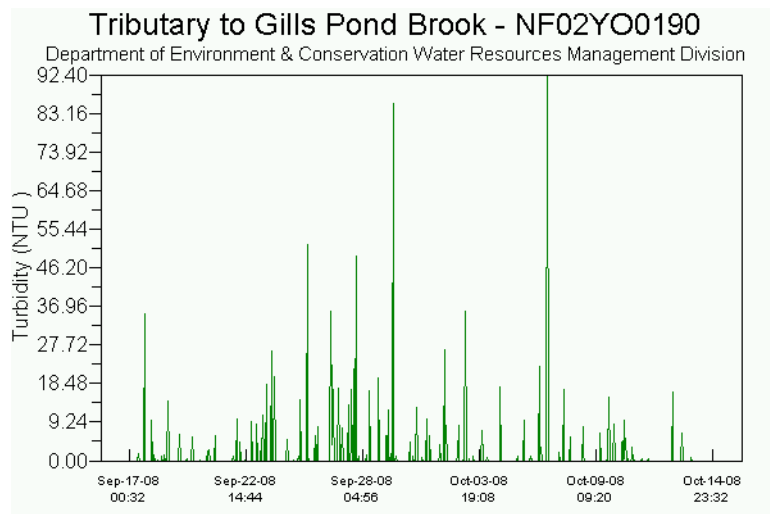


Figure 5

- The stage (**Figure 6**) or water level varied very little over the deployment period, ranging from a minimum of 1.36 m to a maximum of 1.38 m.

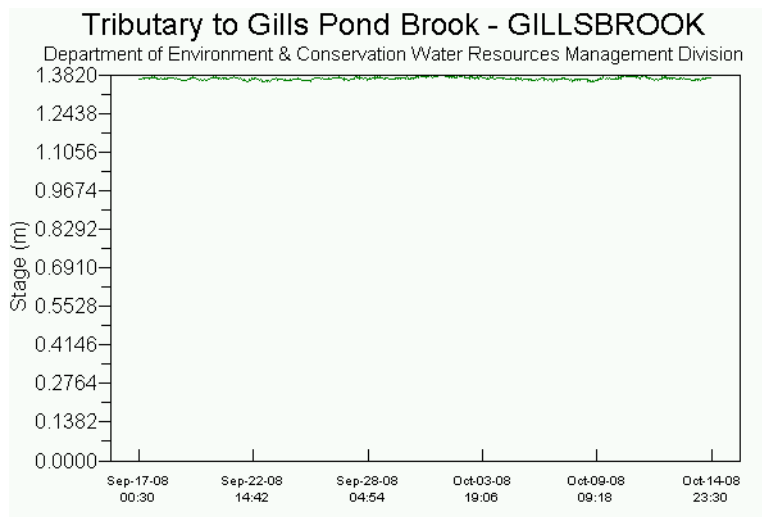


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) generally decreased during the deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 3.52 °C to 17.52 °C over the deployment period.

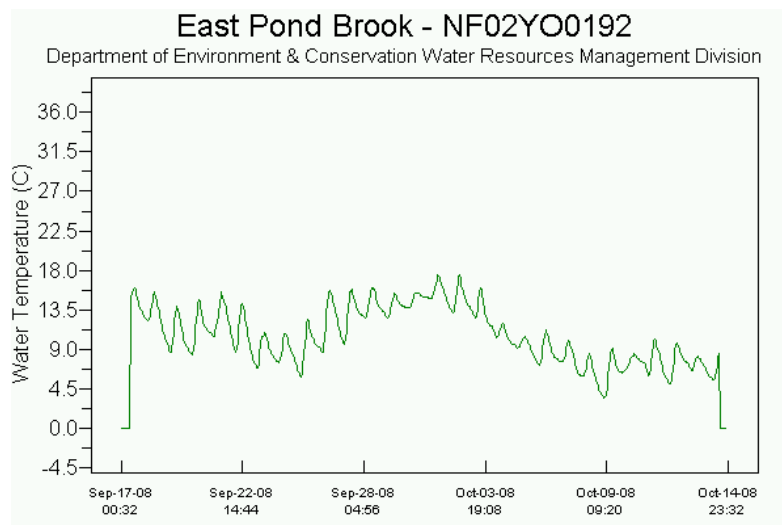


Figure 7

- pH values (**Figure 8**) increased slightly throughout the deployment period, ranging between 6.69 and 7.03. All pH values fell 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 near the lower limit of the recommended range.

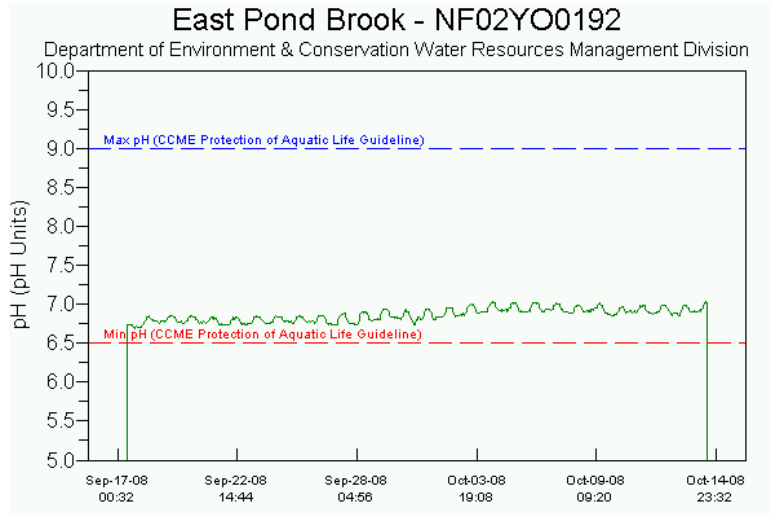


Figure 8

- The specific conductance (**Figure 9**) ranged from a minimum of 25.6 $\mu\text{S}/\text{cm}$ to a maximum of 36.4 $\mu\text{S}/\text{cm}$, generally increasing over the deployment period. This normal variation is inversely proportional to the stage or water level. See Figure 12.

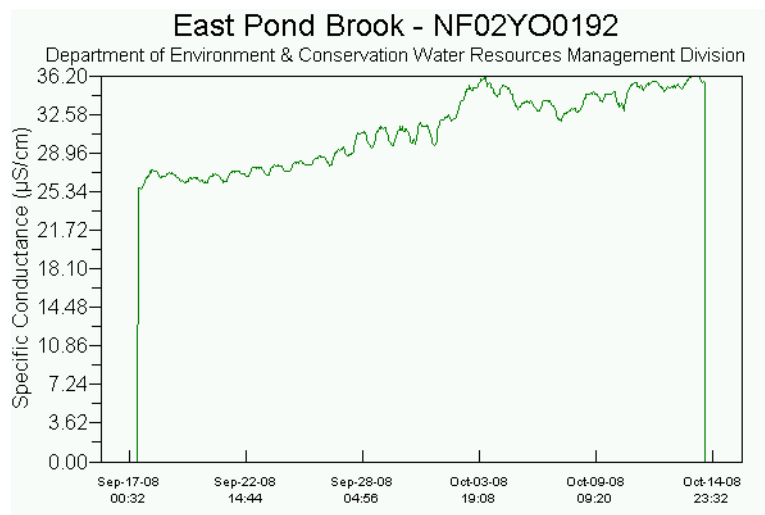


Figure 9

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 8.88 mg/L to a maximum of 12.39 mg/L over the deployment period. Dissolved oxygen levels are generally inversely proportional to water temperature. Some dissolved oxygen values fall below 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), when the water temperatures are warmer.

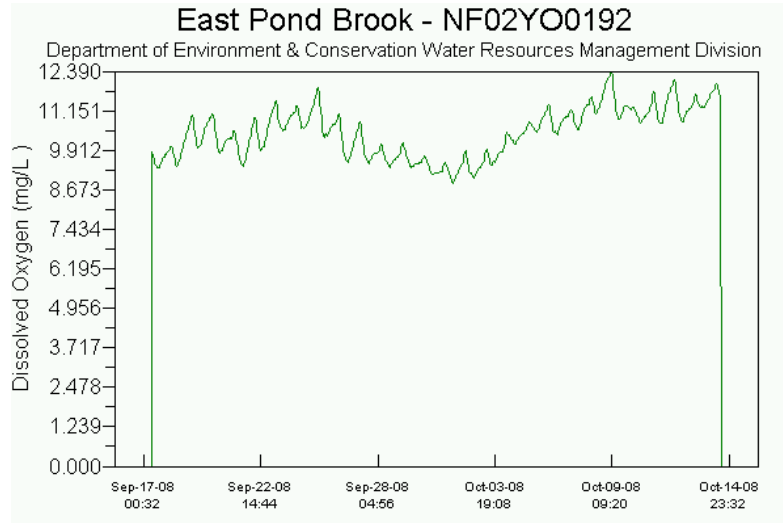


Figure 10

- The turbidity values (**Figure 11**) were 0 NTU throughout the deployment period with one exception. On October 10, 2008 there was one spike to 10.2 NTU. As this turbidity measurement was not sustained, there is no water quality impairment. Higher values can be attributed to natural sediment and debris in the stream.

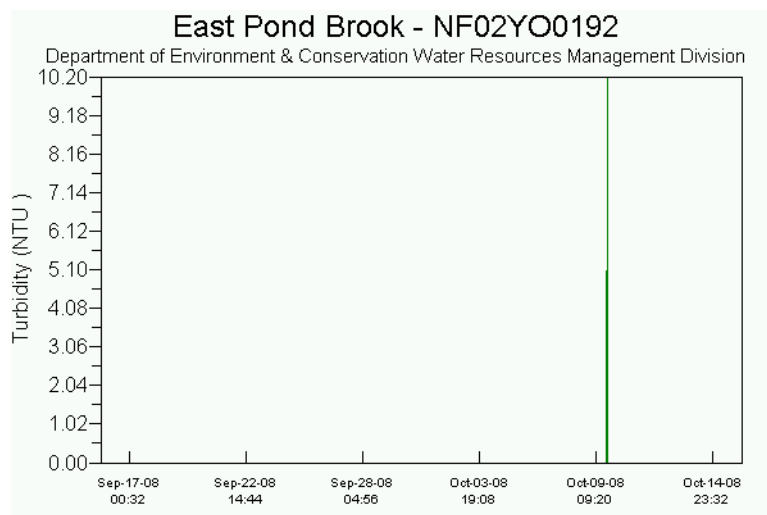


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 0.94 m to a maximum of 1.03 m. This range is normal for this stream and would simply represent runoff. There are no significant peaks which would be indicative of major precipitation events.

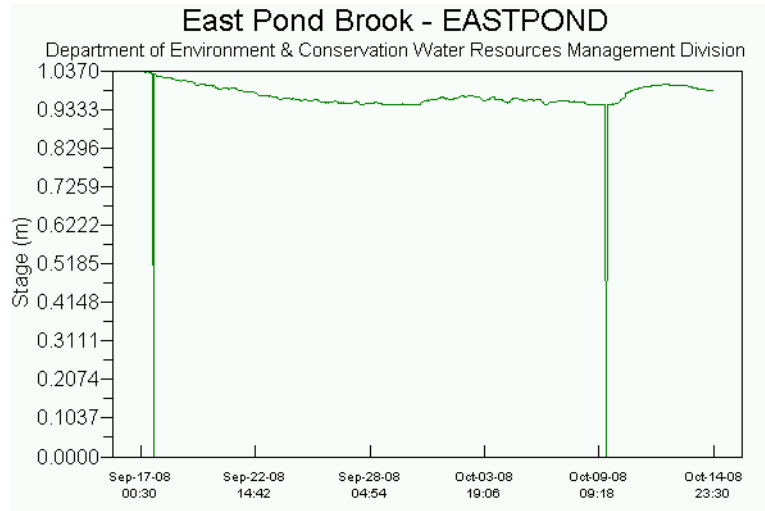


Figure 12

WELL AFTER TAILING DAM A

- The water temperature (**Figure 13**) remained constant between 4.97 °C and 5.23 °C, typical values for this monitoring well.

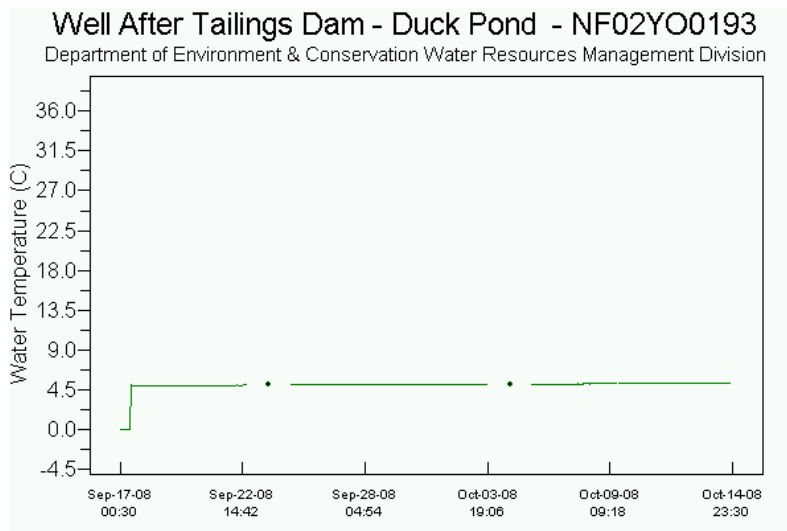


Figure 13

- The pH (**Figure 14**) ranged from a low of 7.82 to a high of 8.99 over deployment period. The initial pH is consistent with results of a grab sample (pH =7.8) collected prior to installation of the Quanta G Probe. pH increases initially after being deployed, and then remains constant near 8.5 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.

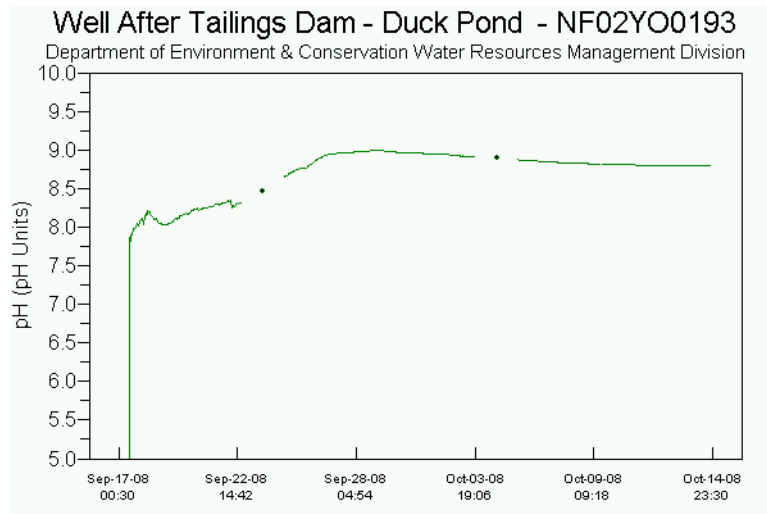


Figure 14

- The specific conductance (**Figure 15**) ranged from a minimum of 0.411 mS/cm to a maximum of 0.431 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.

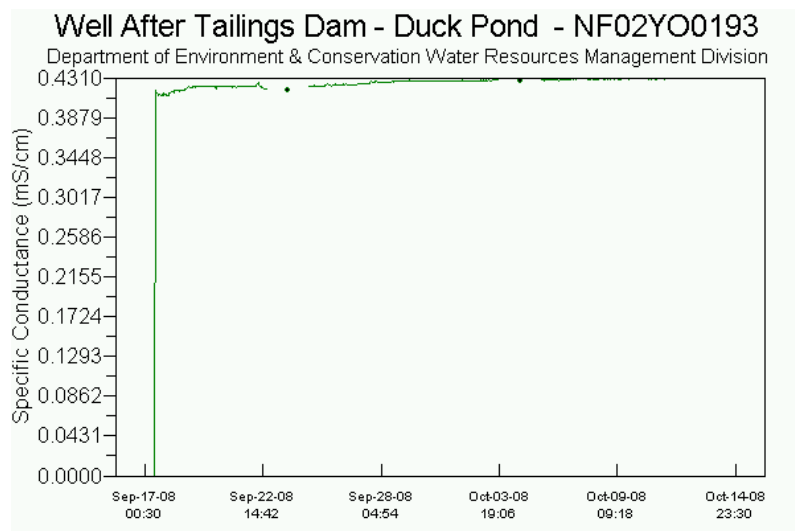


Figure 15

- The water level (**Figure 16**) in this well, showed very little variability over the deployment period. Including the dip on September, 22, 2008 (corresponding to a sampling event by Duck Pond staff) the water level ranged by only 0.40 m. At the beginning of deployment, Static Water Level (SWL) was measured to be 0.630 m down from the top of the PVC casing. As the top of the PVC Casing is 1.380 m above ground, SWL is actually above ground level. It should also be noted that water was flowing from the lower lip of the top of the outer protective casing which is equal to the SWL at 0.630m.

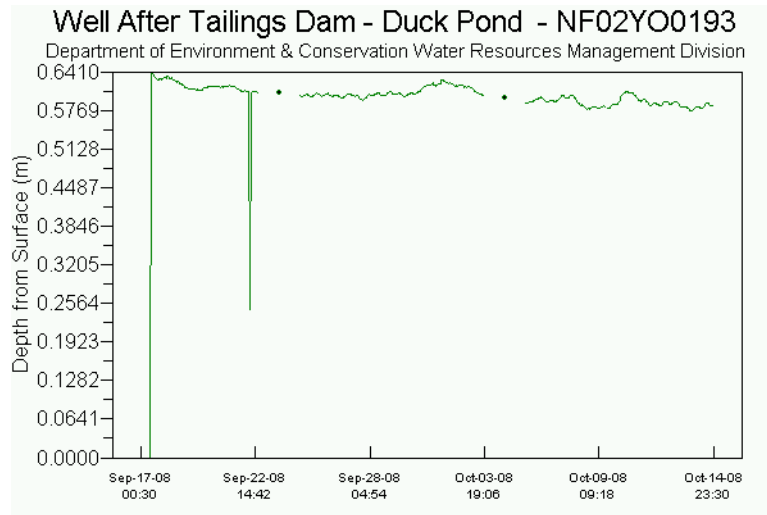


Figure 16

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