

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

Deployment Period 2008-05-21 to 2008-06-24

General

- The Water Resources Management Division's (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.
- There is a period of missing data for East Pond Brook from May 28, 2008 to June 2, 2008 due to a data logger / transmission error.
- 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 taken off-line or removed from service.
- The Quanta G monitoring probe has been reinstalled in Monitoring Well After Tailings Dam Station (MW1) now that the well is no longer frozen at surface.
- There was effluent from Polishing Pond into the receiving waters (Tributary to Gills Pond Brook) from June 18, 2008 until the end of 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 DataSonde was deployed in Tributary to Gills Pond Brook on May 21, 2008, after being cleaned, serviced and freshly calibrated. A spare DataSonde was installed in East Pond Brook on May 21, 2008, however, it failed to work properly. Thus the regular DataSonde was deployed on May 23, 2008 after being cleaned, serviced and freshly calibrated. Both instruments were deployed until June 24, 2008 (34 day period for Tributary to Gills Pond Brook and 32 day period for East Pond Brook).
- After being serviced and freshly calibrated following winter storage, the Quanta G Probe was deployed in Monitoring Well After Tailings Dam from May 21, 2008 to June 24, 2008 (34 day period).
- *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	2008-05-21	Installation	Excellent	Excellent	Good	Excellent
	2008-06-24	Removal	Excellent	Excellent	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	2008-05-23	Installation	Excellent	Excellent	Excellent	Fair
	2008-06-24	Removal	Excellent	Good	Excellent	Good

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) increased gradually during deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 5.45 °C to 21.22 °C over the deployment period.

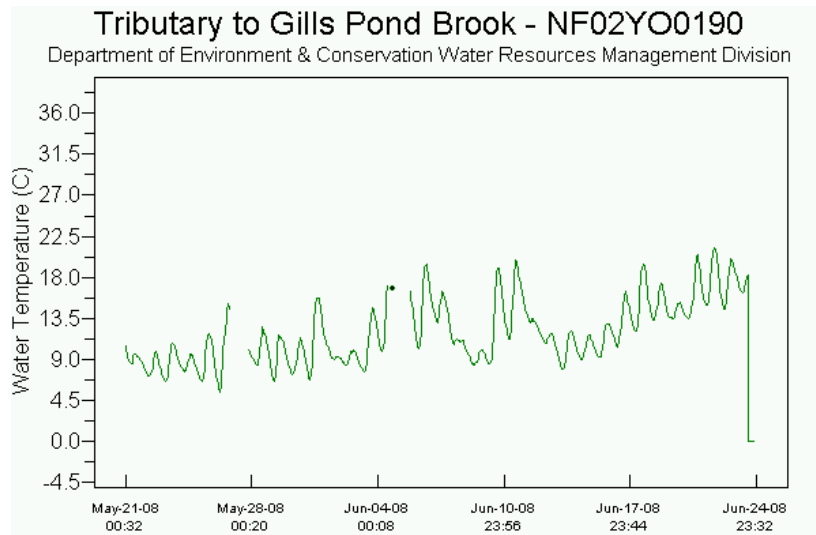


Figure 1

- pH values (**Figure 2**) generally increased slightly over the deployment period. The pH values ranged from a minimum of 6.27 to a maximum of 7.04 with some of the values falling 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 lower than the recommended range. It is interesting to note, that there is no obvious change in pH corresponding to the beginning of the discharge period from Polishing Pond on June 18, 2008.

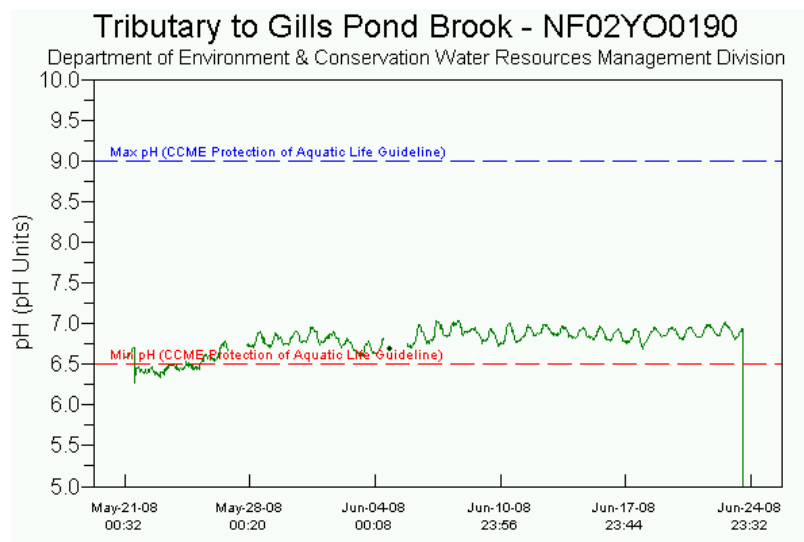


Figure 2

- The specific conductance (**Figure 3**) ranged from a minimum of 20.6 $\mu\text{S}/\text{cm}$ to a maximum of 335 $\mu\text{S}/\text{cm}$ over the deployment period. The most dramatic change in conductivity corresponds to the beginning of discharge from the Polishing Pond on June 18, 2008. The small dip in conductivity around June 20, 2008 is likely the result of a minor precipitation event.

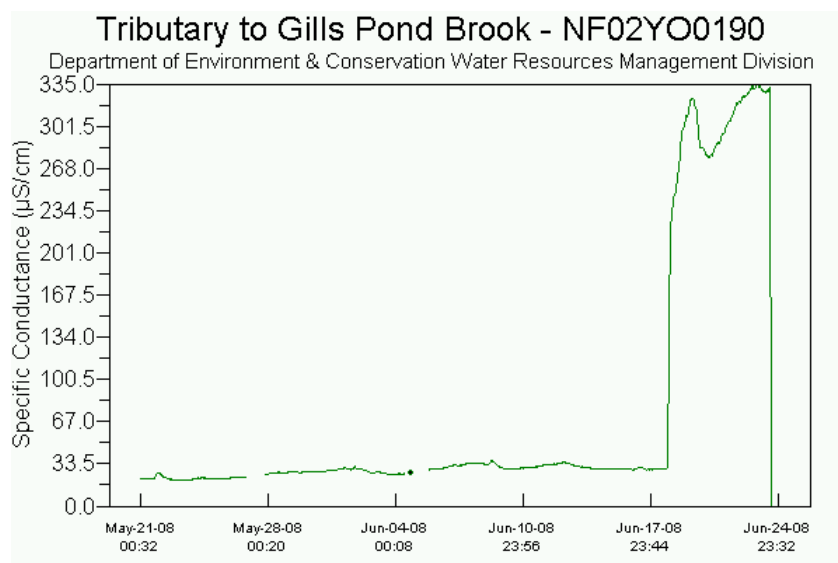


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 9.48 mg/L to a maximum of 13.98 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. Dissolved oxygen values generally 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).

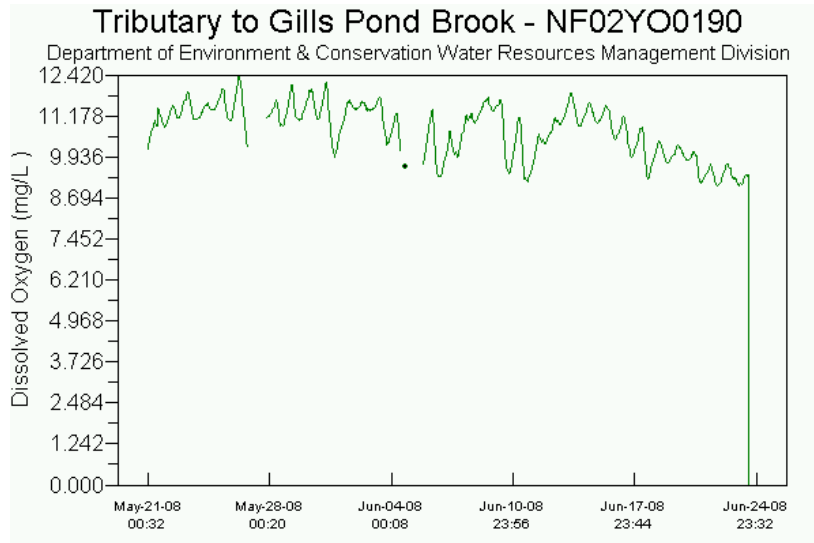


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 108.0 NTU. The regular DataSonde was again deployed during this period, confirming that turbidity variation is not related to an instrument error. While the magnitude of the variability was not much different, the frequency of spikes was greater during the period of discharge from the Polishing Pond. Turbidity values from grab samples collected by staff of Department of Environment returned results less than 1.0 NTU. Turbidity at this location will continue to be investigated.

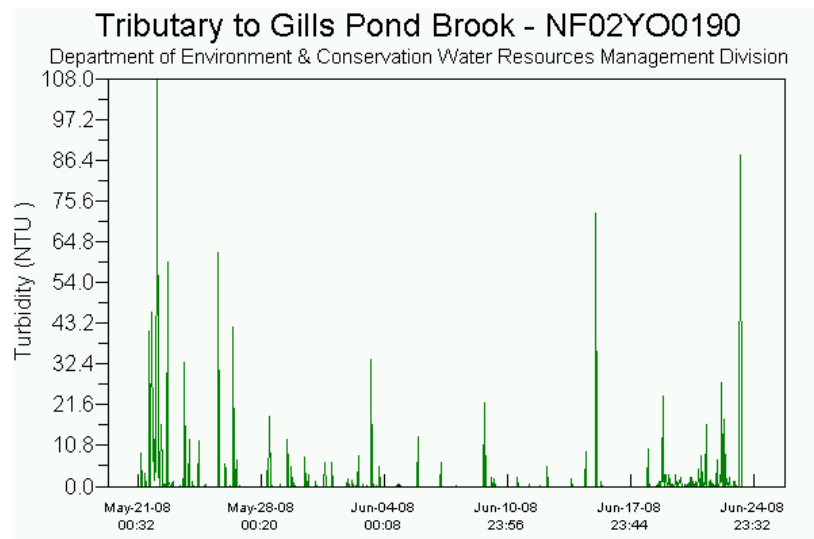


Figure 5

- The stage (**Figure 6**) or water level ranged from a minimum of 1.23 m to a maximum of 1.47 m. The beginning of the discharge period from Polishing Pond is obvious starting on June 18, 2008, but is no more significant than changes in stage resulting from precipitation events throughout the deployment period.

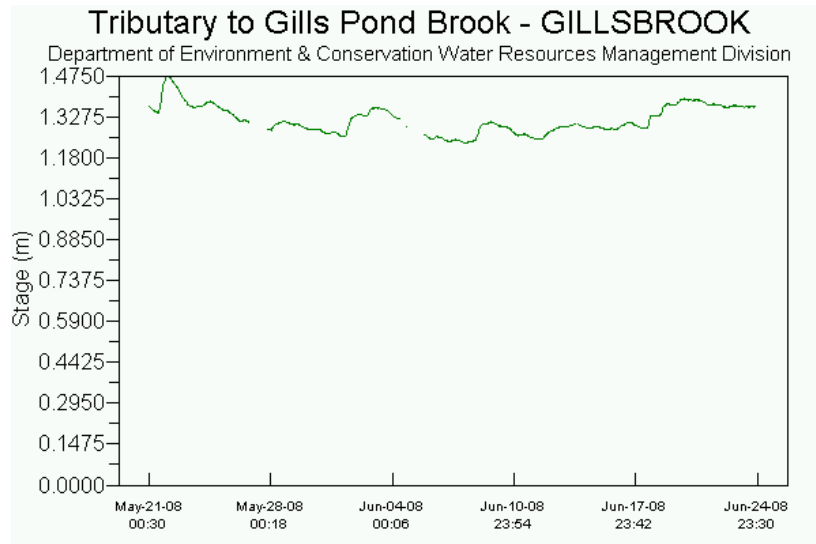


Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) increased gradually during deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 8.11 °C to 21.4 °C over the deployment period.

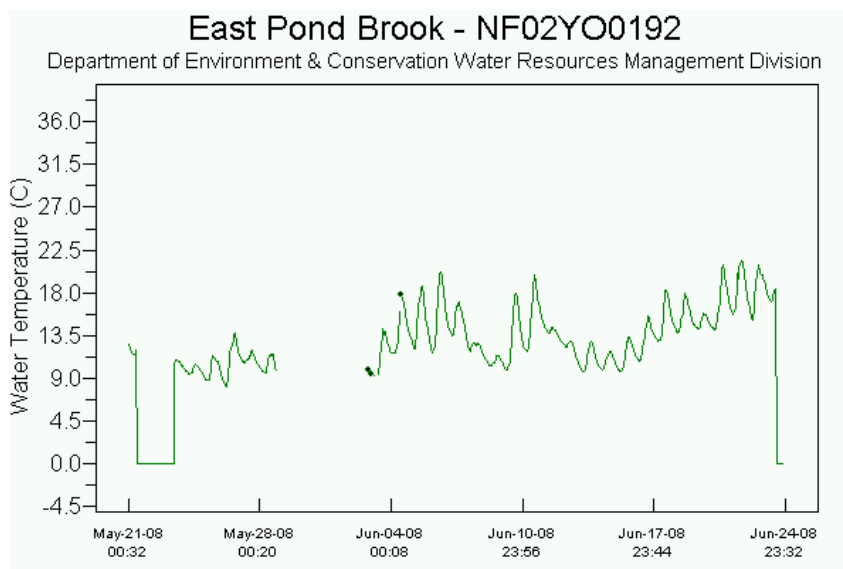


Figure 7

- pH values (**Figure 8**) increased slightly throughout the deployment period, ranging between 6.23 and 6.99. During the initial part of the deployment period, 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.

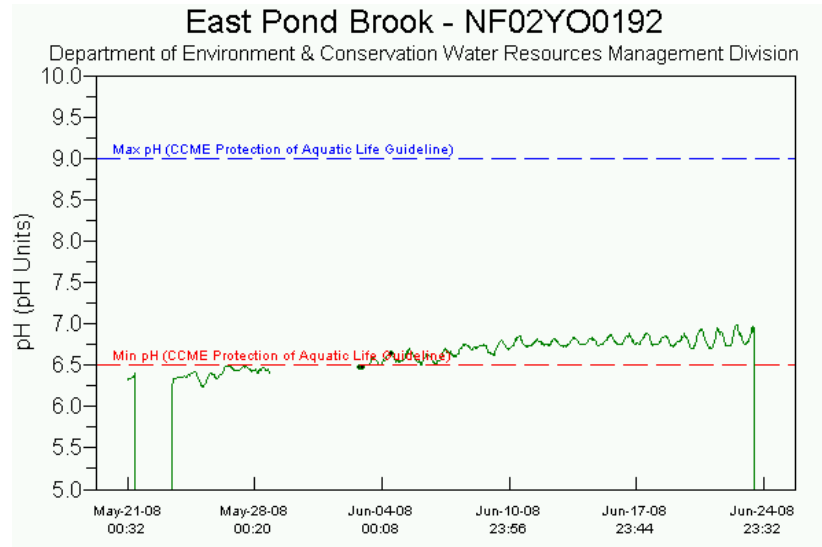


Figure 8

- The specific conductance (**Figure 9**) ranged from a minimum of 14.1 $\mu\text{S}/\text{cm}$ to a maximum of 24.7 $\mu\text{S}/\text{cm}$ over the deployment period. This normal variation is inversely proportional to the stage or water level. See Figure 12.

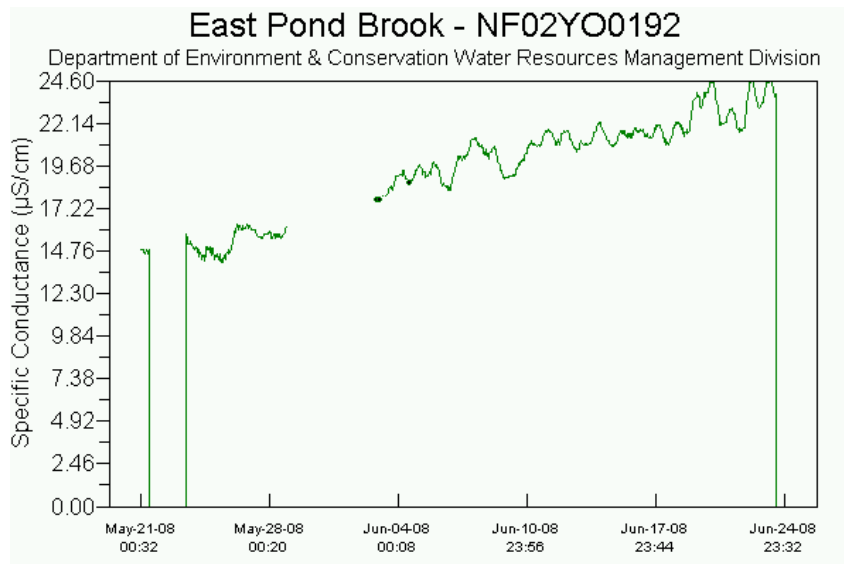


Figure 9

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 8.84 mg/L to a maximum of 11.55 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* 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 normal pattern as water warms up during the summer months.

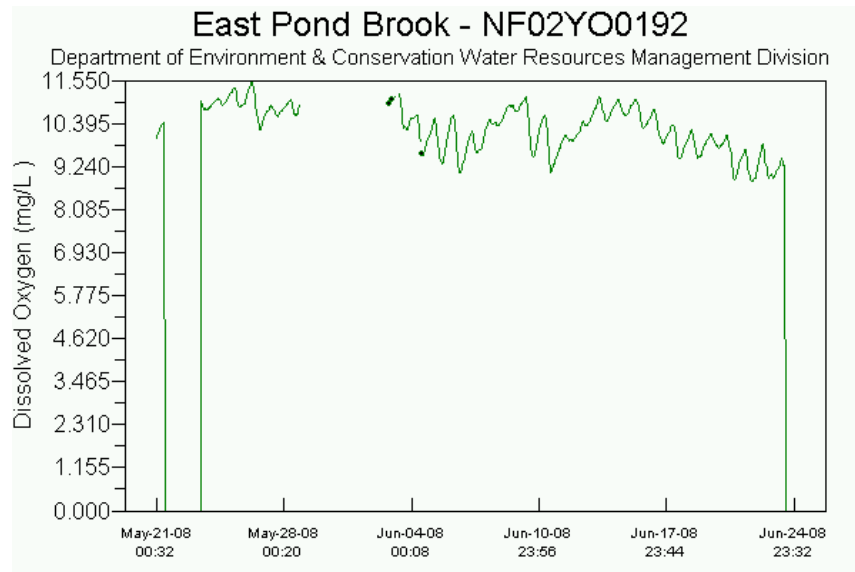


Figure 10

- The turbidity values (**Figure 11**) are constant at 0 NTU throughout most of the deployment period. There were a few minor peaks with the greatest turbidity level being measured at 15.5 NTU. As these turbidity measurements were not sustained, there is no water quality impairment. Higher values can be attributed to natural sediment and debris in the stream.

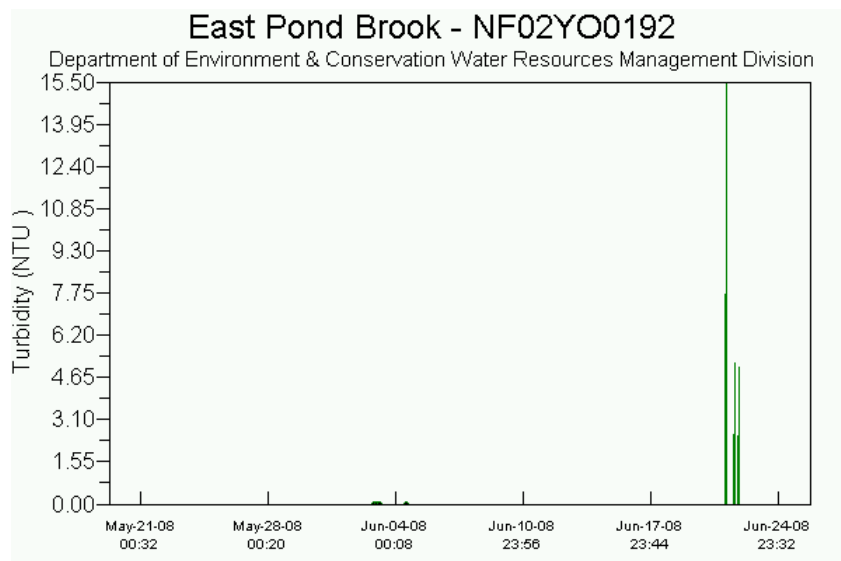


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 1.04 m to a maximum of 1.36 m. This range is normal for this stream and would simply represent runoff from any remaining snowpack and precipitation.

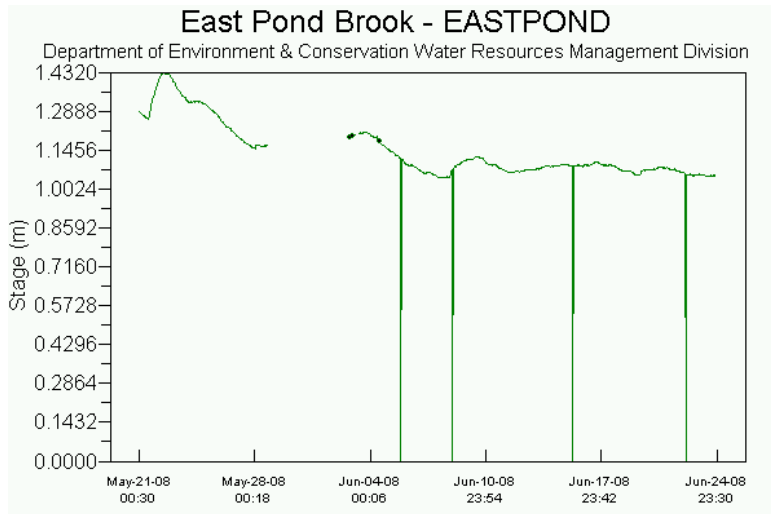


Figure 12

WELL AFTER TAILING DAM A

- The water temperature (**Figure 13**) remained constant between 4.59 °C and 4.72 °C. This is typical for this type of monitoring well.

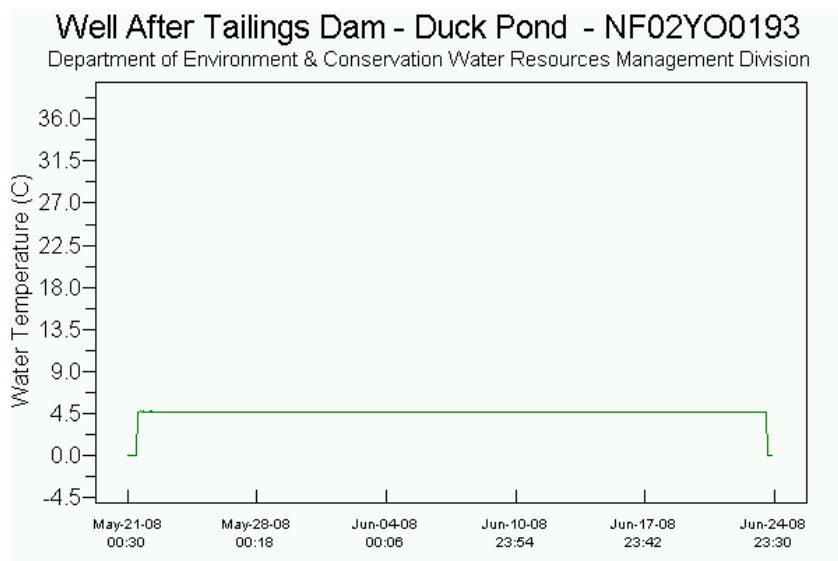


Figure 13

- The pH (**Figure 14**) increased from 7.55 at the beginning of the deployment period to 9.23 at the end of the period, with the maximum pH recorded at 9.32. The initial pH is consistent with results of a grab sample (pH =7.88) collected prior to installation of the Quanta G Probe. Recalibration of the instrument at the end of the deployment period determined that there was very little drift, suggesting that a pH above 9 is also a realistic value. This pattern is consistent with two previous deployment periods in 2007. 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.

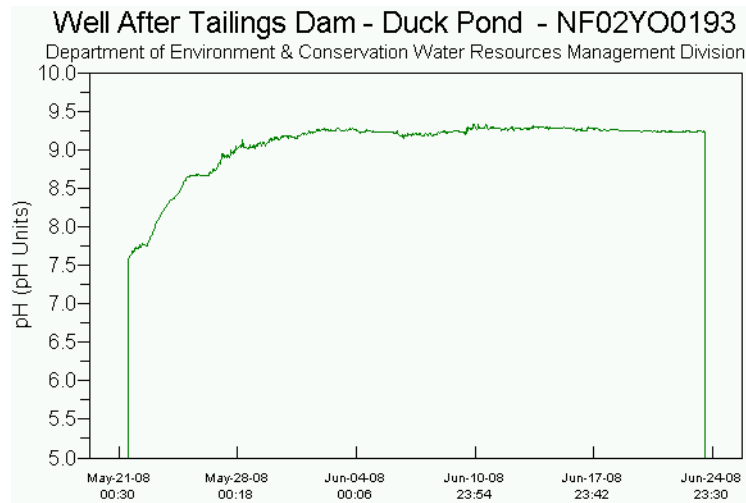


Figure 14

- The specific conductance (**Figure 15**) ranged from a minimum of 0.377 mS/cm to a maximum of 0.408 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.

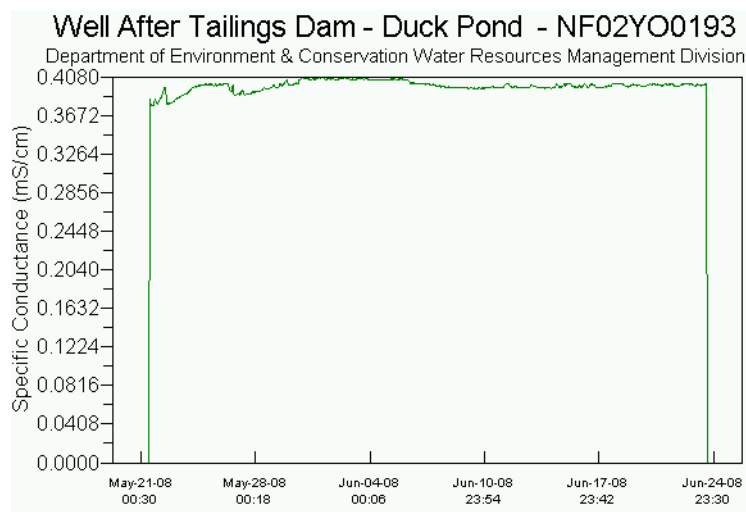


Figure 15

- The water level (**Figure 16**) in this well, displayed below as depth from surface, showed very little variability over the deployment period ranging by merely 0.068 m. At the beginning of deployment, Static Water Level (SWL) was measured to be 0.695 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.

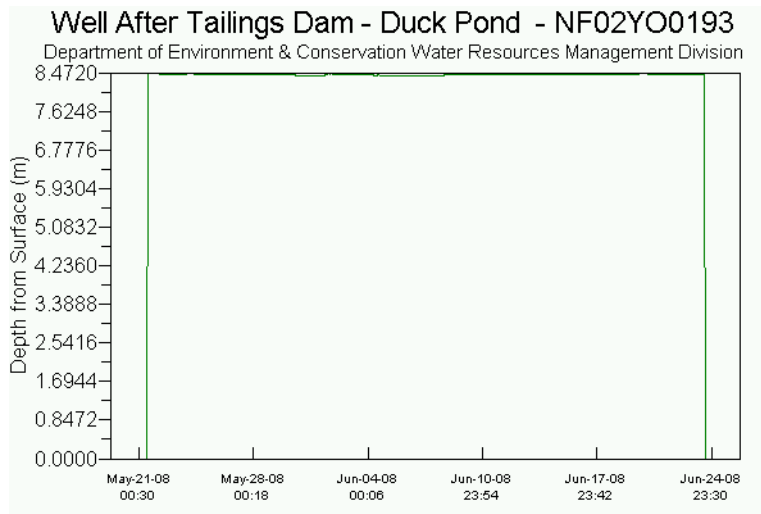


Figure 16

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