# Real Time Water Quality Report
# Teck Duck Pond Operations
# Deployment Period 2009-05-05 to 2009-06-24

## 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 Teck 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.
- The graphs below may sometimes 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) from May 12, 2009 to May 19, 2009 and June 1, 2009 to June 10, 2009.
- Raw (uncorrected) data has been used in the preparation of the graphs and subsequent discussion below.

## Maintenance and Calibration of Instrumentation

- The regular **DataSondes®** usually deployed in Tributary to Gills Pond Brook and East Pond Brook were both returned to vendor for regular Performance and Evaluation Testing during this deployment period. Two alternate instruments having the same technical specifications were deployed on May 5, 2009 after being cleaned, maintained and freshly calibrated. These instruments remained deployed until June 24, 2009; a 50 day period.
- The **Quanta G®** probe was removed from Monitoring Well After Tailings Dam Station (MW1) on May 5, 2009 for regular cleaning, maintenance and calibration and was deployed on May 7, 2009 through the end of the deployment period; a 48 day period. It is anticipated that this probe will remain deployed for up to six months at a time.
- *In-situ* measurements of ambient water quality were undertaken with a freshly calibrated **MiniSonde®** each time a **DataSonde®** was removed or deployed. 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.

| Tributary to Gills Pond Brook Station (NF02YO0190) | | | | |
|---|---|---|---|---|
| **Date** (yyyy-mm-dd) | **Parameter** | **MiniSonde® Data** | **DataSonde® Data** | **Rating** |
| 2009-05-05 Installation | Temp (°C) | 12.37 | 12.47 | Excellent |
| | pH (units) | 6.71 | 6.11 | Fair |
| | Sp. Conductivity (uS/cm) | 32.1 | 33.3 | Excellent |
| | Dissolved Oxygen (mg/L) | 10.53 | 10.53 | Excellent |
| | Turbidity (NTU) | 0.0 | 0.0 | Excellent |
| 2009-06-24 Removal | Temp (°C) | 15.74 | 15.55 | Excellent |
| | pH (units) | 6.98 | 6.50 | Good |
| | Sp. Conductivity (uS/cm) | 56.4 | 57.0 | Excellent |
| | Dissolved Oxygen (mg/L) | 9.44 | 9.38 | Excellent |
| | Turbidity (NTU) | 0.05 | 0.07 | Excellent |

**Table 1**

| East Pond Brook Station (NF02YO0192) | | | | |
|---|---|---|---|---|
| **Date** (yyyy-mm-dd) | **Parameter** | **MiniSonde® Data** | **DataSonde® Data** | **Rating** |
| 2009-05-05 Installation | Temp (°C) | 14.18 | 14.31 | Excellent |
| | pH (units) | 6.56 | 6.21 | Good |
| | Sp. Conductivity (uS/cm) | 17.40 | 18.00 | Excellent |
| | Dissolved Oxygen (mg/L) | 9.99 | 9.98 | Excellent |
| | Turbidity (NTU) | 0.0 | 0.0 | Excellent |
| 2009-06-24 Removal | Temp (°C) | 16.49 | 16.45 | Excellent |
| | pH (units) | 7.05 | 6.95 | Excellent |
| | Sp. Conductivity (uS/cm) | 24.60 | 26.40 | Excellent |
| | Dissolved Oxygen (mg/L) | 9.70 | 9.67 | Excellent |
| | Turbidity (NTU) | 0.0 | 5.5 | Fair |

**Table 2**

## Data Interpretation

### TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) increased throughout the deployment period. Temperature values ranged from a minimum of 1.27 ˚C to a maximum of 24.92 ˚C.

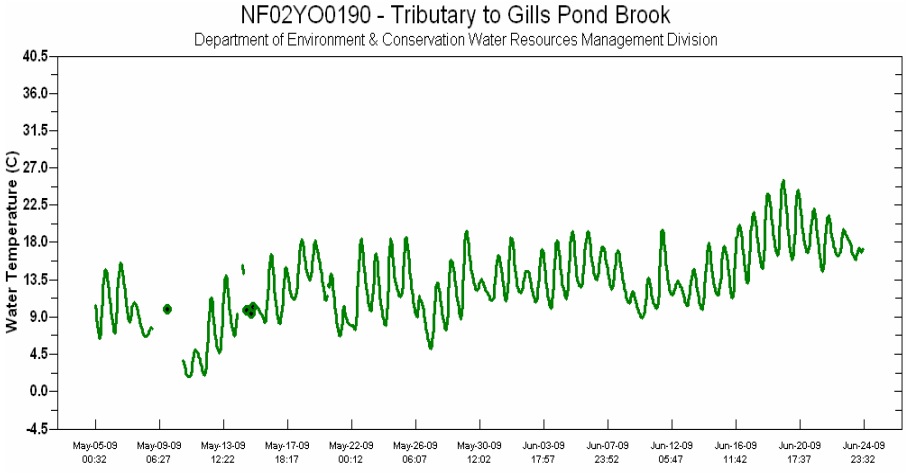


**Figure 1**

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 5.54 to a maximum of 7.12 with many 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 around the lower limit of the recommended range.

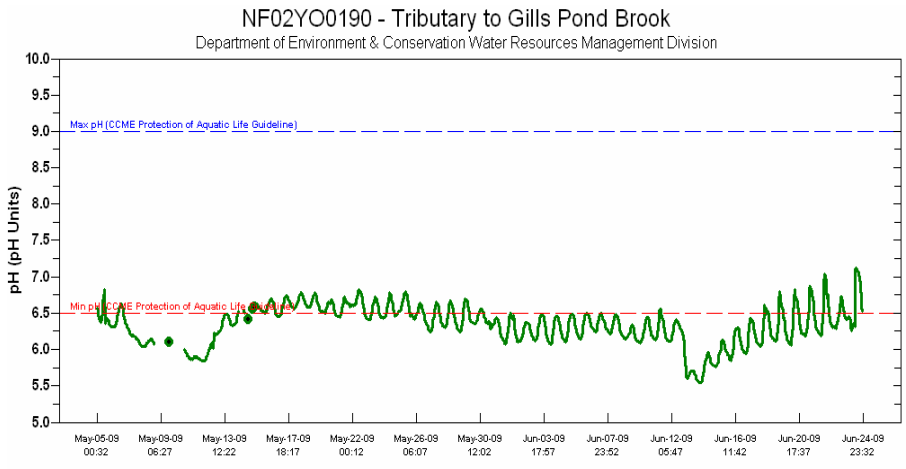


**Figure 2**

- The specific conductance **(Figure 3)** ranged from a minimum of 22.82 µS/cm to a maximum of 647.0 µS/cm over the deployment period. During the discharge periods from Polishing Pond (May 12, 2009 to May 19, 2009 and June 1, 2009 to June 10, 2009) there are marked increases in conductivity. Discharge was initiated again at the very end of the deployment period, as is evidenced by the last day on the graph.

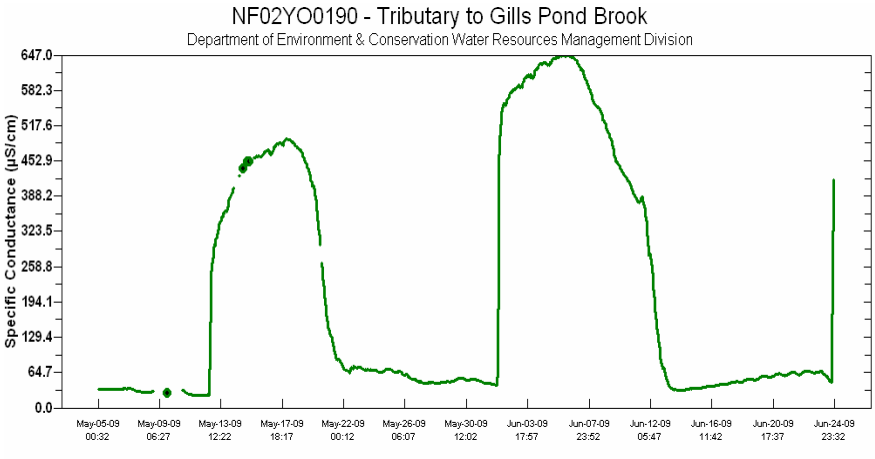


**Figure 3**

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 7.67 mg/L to a maximum of 13.01 mg/L over the deployment period. Dissolved oxygen is inversely proportional to water temperature. Throughout the deployment period, all dissolved oxygen values fell above the lower limit recommended by 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).

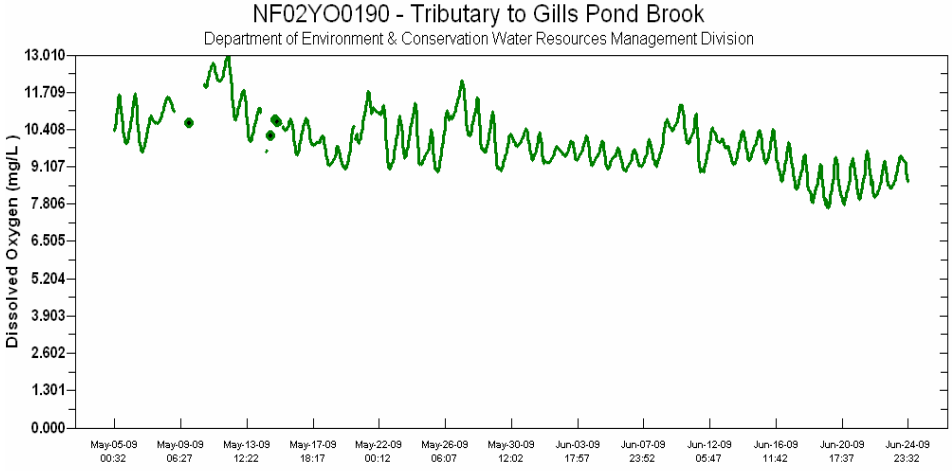


**Figure 4**

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 317.1 NTU. Higher turbidity values correspond to periods of discharge from the Polishing Pond, precipitation events and high stage. Based upon previous investigation, it has been determined that turbidity values may be artificially increased due to air entrainment during high flows. Accordingly, the on-line real time turbidity graph for this station now contains the following comment *"Turbidity values may be exaggerated due to air entrainment (turbulent flow)". In situ* turbidity measurements throughout this period were all less than 1.05 NTU which is considered normal for this type of stream.

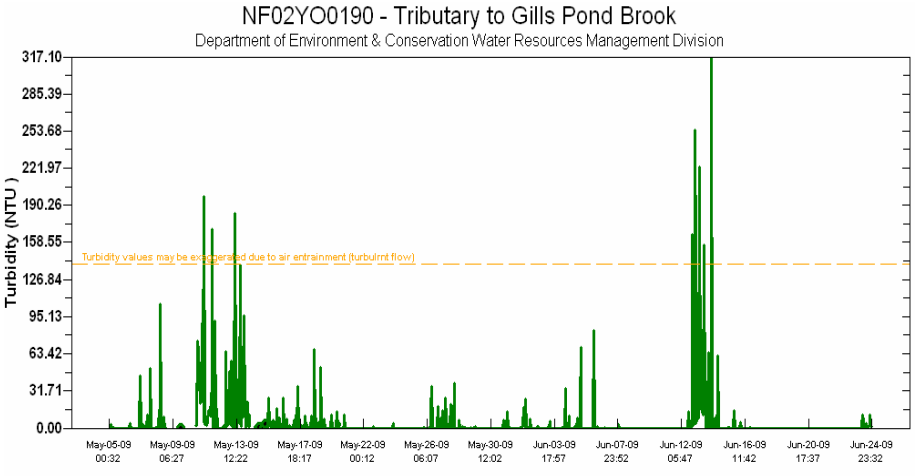


**Figure 5**

- The stage (**Figure 6)** or water level ranged from a minimum of 1.21 m to a maximum of 1.51 m with the highest peaks corresponding to discharge from Polishing Pond and precipitation events.

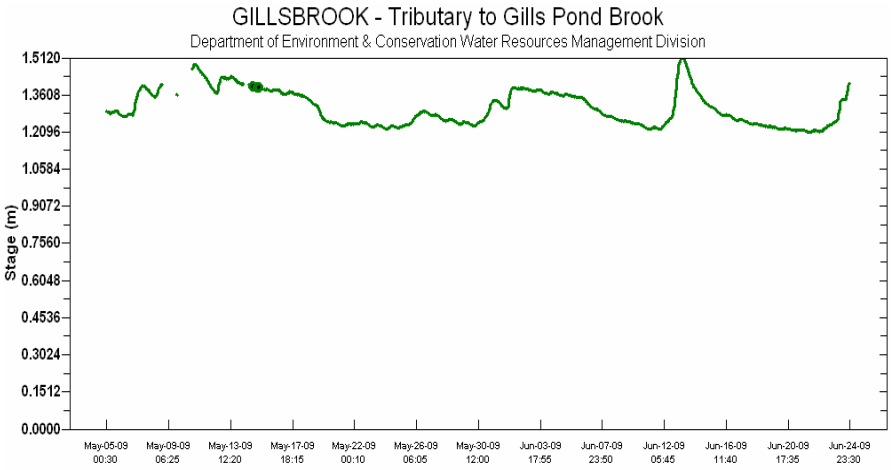


**Figure 6**

## EAST POND BROOK

- The water temperature (**Figure 7**) increased throughout the deployment period, ranging from a minimum of 2.98 ˚C to a maximum of 25.35 ˚C.

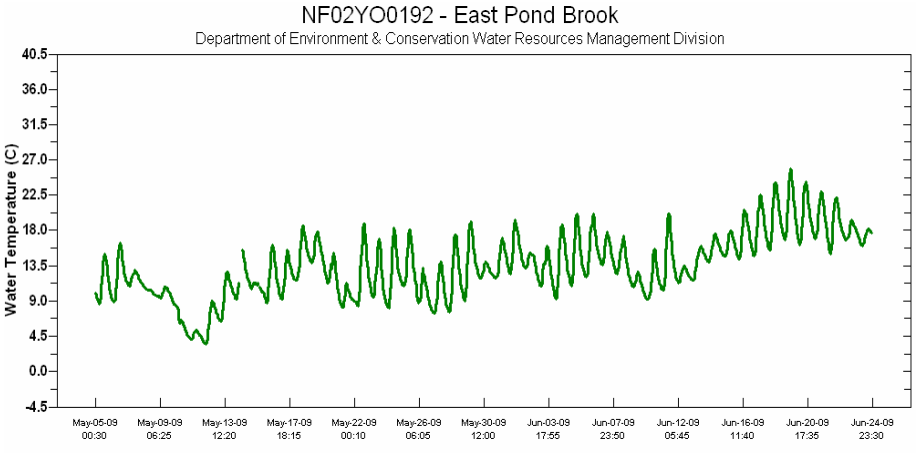


**Figure 7**

- pH values (**Figure 8**) ranged between a minimum of 6.37 and maximum of 7.13, generally increasing over the deployment period. For most of the deployment period, pH values were above the lower limit of 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.

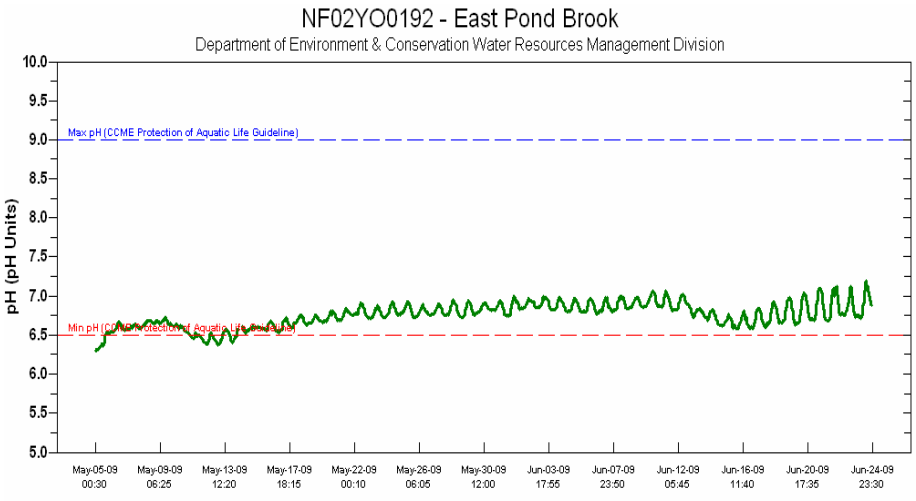


**Figure 8**

- The specific conductance **(Figure 9)** ranged from a minimum of 14.8 µS/cm to a maximum of 28.3 µS/cm. Lowest conductivity values correspond to periods of precipitation and high runoff

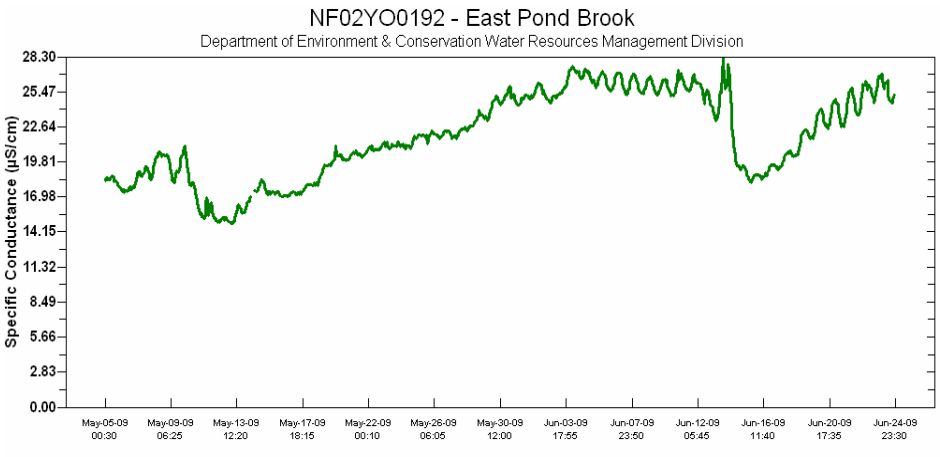


**Figure 9**

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 8.17 mg/L to a maximum of 12.76 mg/L over the deployment period. Dissolved oxygen is inversely proportional to water temperature. Throughout the deployment period, all dissolved oxygen values fell above the lower limit recommended by 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).

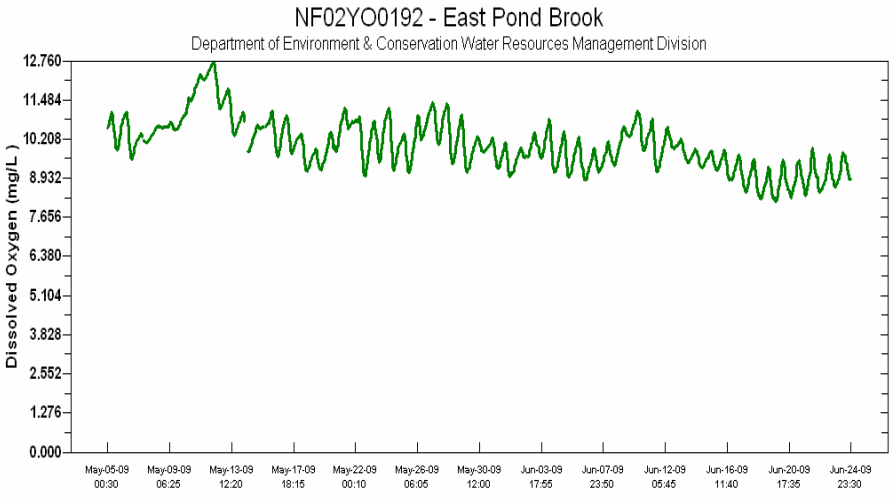


**Figure 10**

- The turbidity values **(Figure 11)** were all reported to be 3000.0 NTU. Values of 3000 NTU are system errors and are considered to be incorrect. Accordingly, all real-time turbidity values for this parameter for this deployment period must be ignored.

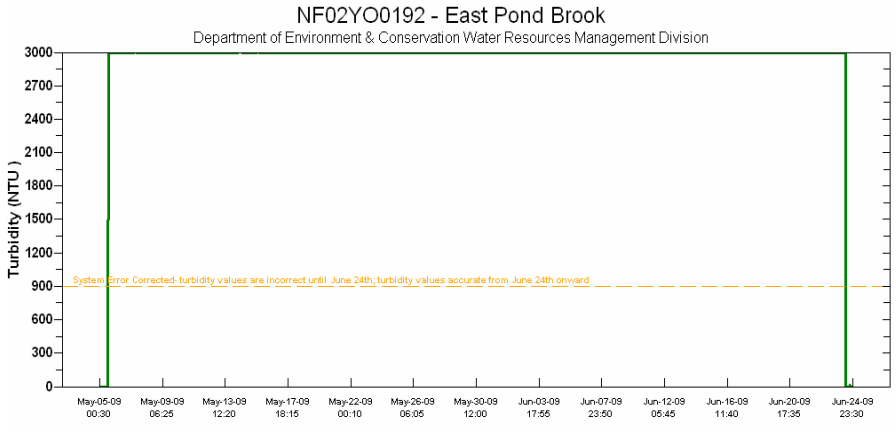


**Figure 11**

- The stage **(Figure 12)** or water level ranged from a minimum of 0.95 m to a maximum of 1.47 m. The highest peaks are the result of precipitation.

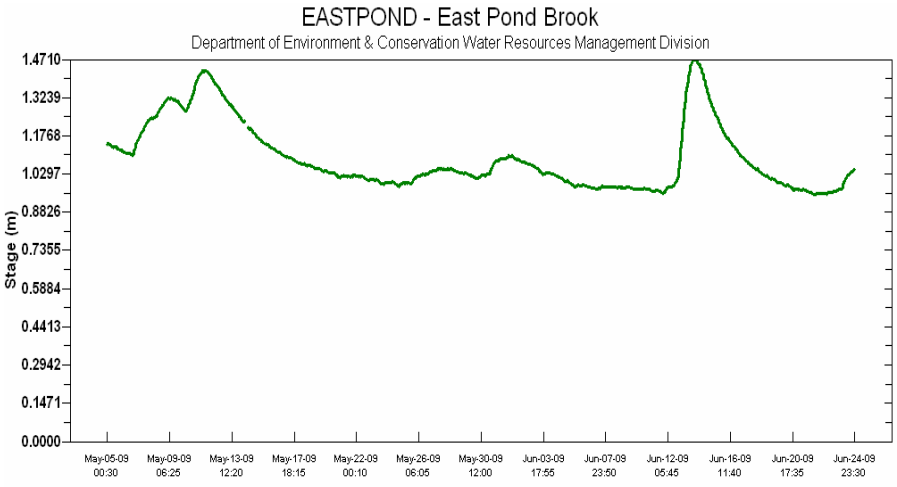


**Figure 12**

## WELL AFTER TAILING DAM A

- Throughout the deployment period, water temperature (**Figure 13**) remained constant ranging between 4.78 $^{o}$C and 5.03 $^{o}$C.

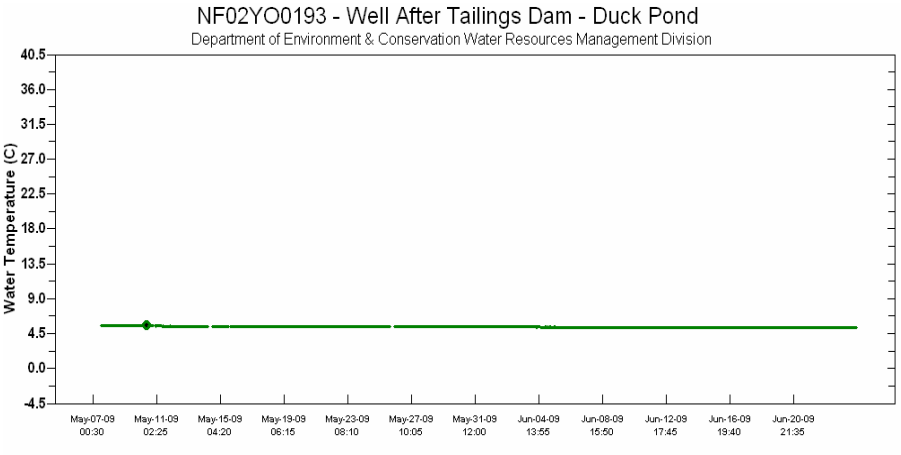


**Figure 13**

- The pH **(Figure 14)** increased from 7.27 at the beginning of the deployment period to a maximum of 8.76 near the end of the period. The initial pH is reasonably consistent with results of a grab sample (pH =7.88) collected prior to installation of the Quanta G Probe. This pattern is consistent with several previous deployment periods in 2007 and 2008. 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.

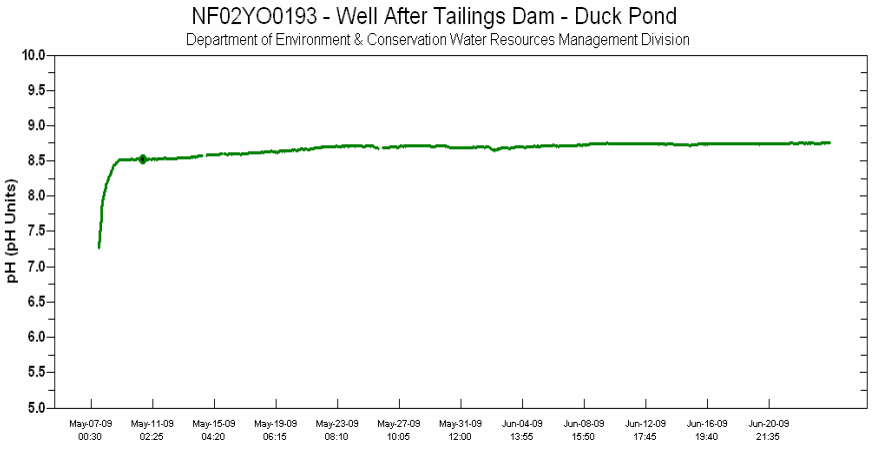


**Figure 14**

- Specific Conductance (**Figure 15**) remained fairly constant over the deployment period ranging from a minimum of 0.425 mS/cm to a maximum of 0.437 mS/cm.

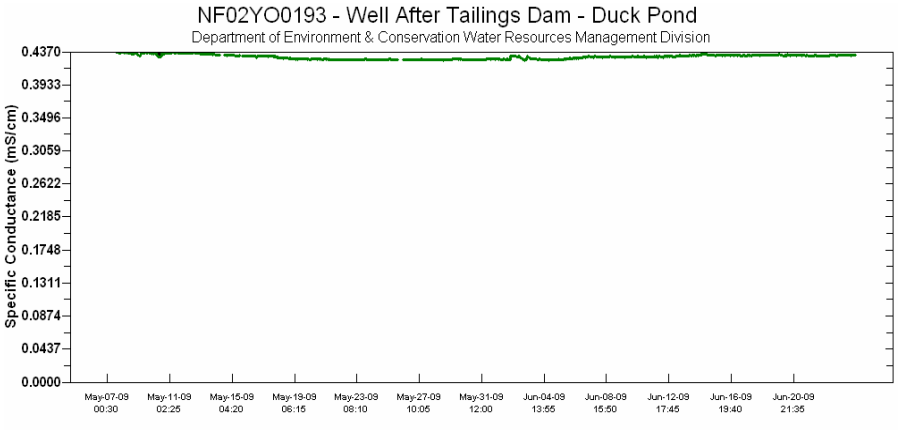


**Figure 15**

- The water level (**Figure 16**) generally increased throughout the deployment period, ranging from a minimum of 270.99 m to a maximum of 271.08 m.

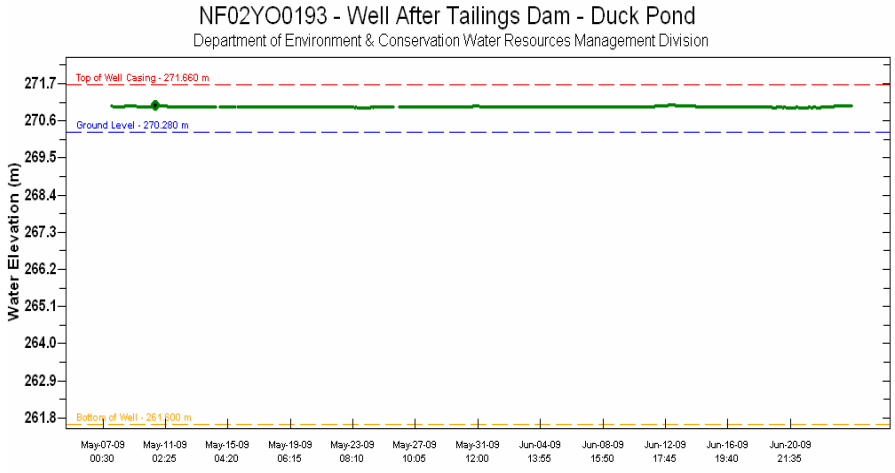


**Figure 16**

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