

**Real Time Water Quality Report
Duck Pond Operations
(Teck Cominco Limited)
Deployment Period 2008-07-31 to 2008-09-15**

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) from August 9, 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 DataSondes were deployed in Tributary to Gills Pond Brook and East Pond Brook on July 31, 2008, after being cleaned, serviced and freshly calibrated. Both instruments were deployed until September 15, 2008 (45 day period). It should be noted that there was considerable fouling of both probes at the end of the deployment period.
- Due to a calibration failure, the Quanta G was not deployed in Monitoring Well After Tailings Dam Station (MW1) during this period. It was returned to the vendor for servicing.
- *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	2008-07-31	Installation	Excellent	Excellent	Fair	Excellent
	2008-09-15	Removal	Poor	Excellent	Poor	Excellent

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	2008-07-31	Installation	Poor	Excellent	Good	Excellent
	2008-09-15	Removal	Excellent	Good	Excellent	Excellent

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) remained fairly constant throughout the deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 12.24 °C to 25.07 °C over the deployment period.

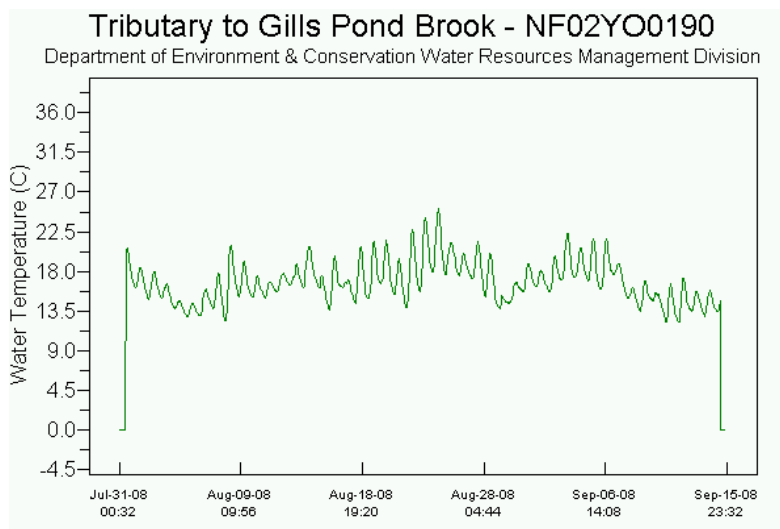


Figure 1

- pH values (**Figure 2**) ranged from a minimum of 6.11 to a maximum of 7.26 over the deployment period. Most of the values fall 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 the pH which bring the values below 6.5 correspond to changes in stage (**Figure 6**) and precipitation events.

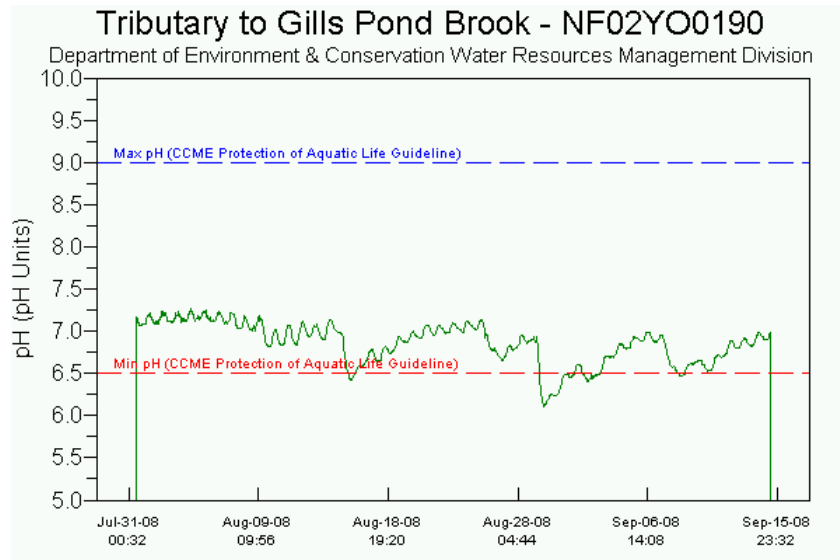


Figure 2

- The specific conductance (**Figure 3**) ranged from a minimum of 51.9 $\mu\text{S}/\text{cm}$ to a maximum of 562 $\mu\text{S}/\text{cm}$ over the deployment period. The initial dramatic change in conductivity corresponds to the discharge from the Polishing Pond beginning on August 9, 2008. Effluent from the Polishing Pond has a higher specific conductance than the stream's background levels. The fluctuations (dips) in conductivity after this date are the result of precipitation events. Similar changes are indicated in pH (**Figure 2**) and Stage (**Figure 6**).

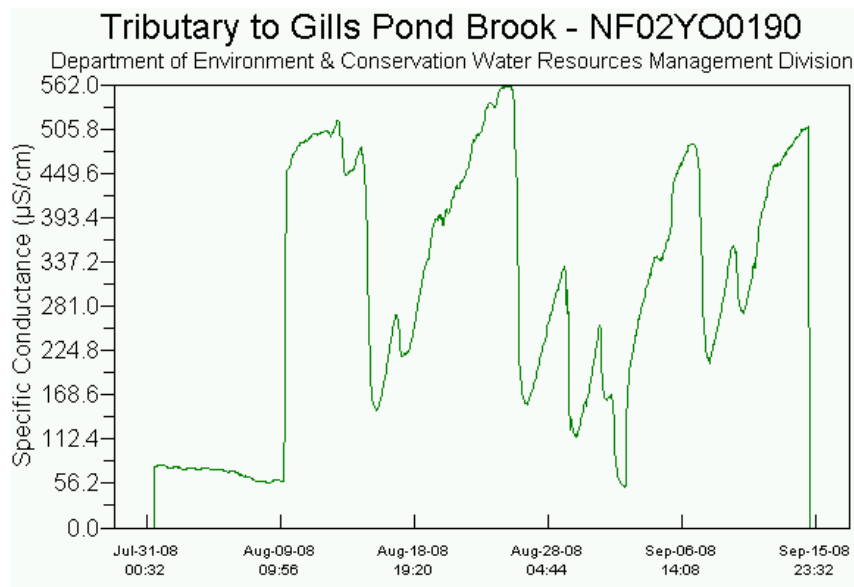


Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 7.82 mg/L to a maximum of 9.71 mg/L over the deployment period. Dissolved oxygen variation is inversely proportional to water temperature. Nearly all 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 higher water temperatures. A similar profile occurs in East Pond Brook (**Figure 10**).

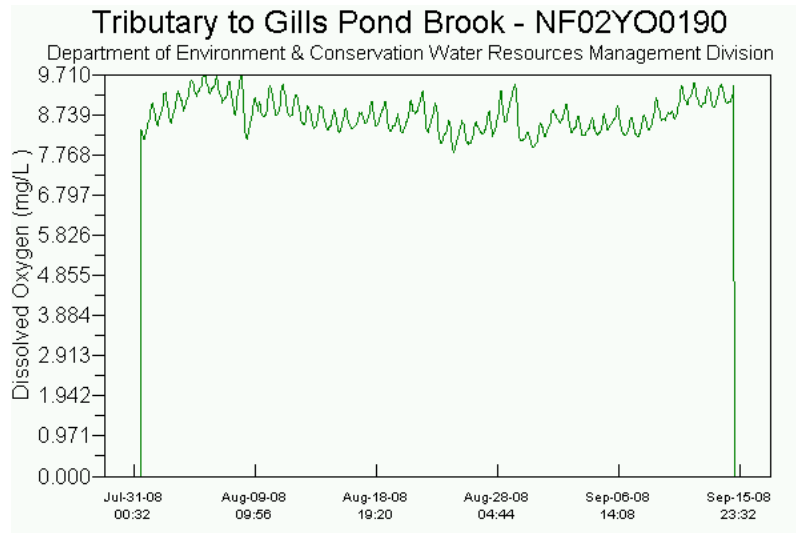


Figure 4

- The turbidity values (**Figure 5**) ranged from a minimum of 0.0 NTU to a maximum of 2696 NTU. While turbidity spiked throughout the deployment period, the frequency and intensity of spikes was greater during the period of discharge from the Polishing Pond. Turbidity values from grab samples and *in situ* measurement collected by staff of Department of Environment and Conservation and Duck Pond Mine returned results less than 2.2 NTU. The greatest spikes in turbidity towards the end of the deployment period are likely the result of fouling of the sensor, as there was no evidence of water quality impairment. Turbidity at this location will continue to be investigated.

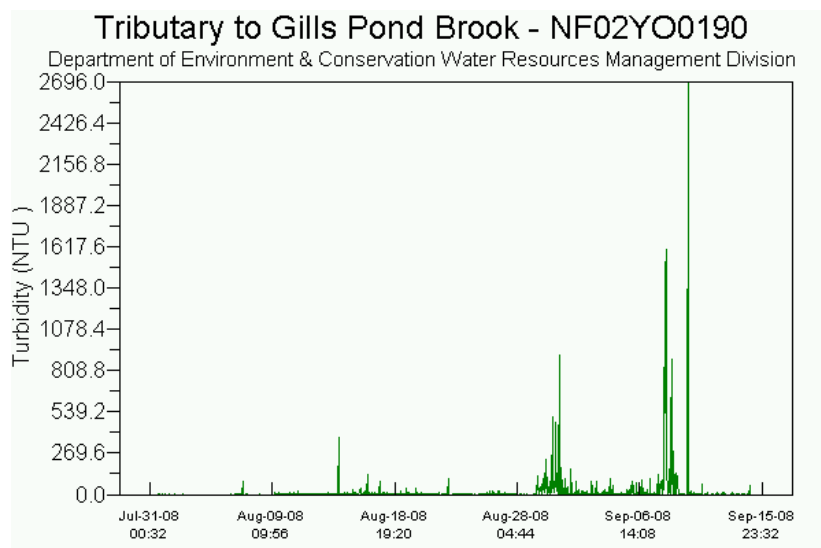


Figure 5

- The stage (**Figure 6**) or water level ranged from a minimum of 1.21 m to a maximum of 1.51 m. The beginning of the discharge period on August 9, 2008 is obvious. Other peaks are the result of precipitation events. A similar profile is obvious from East Pond Brook stage data as well (**Figure 12**).

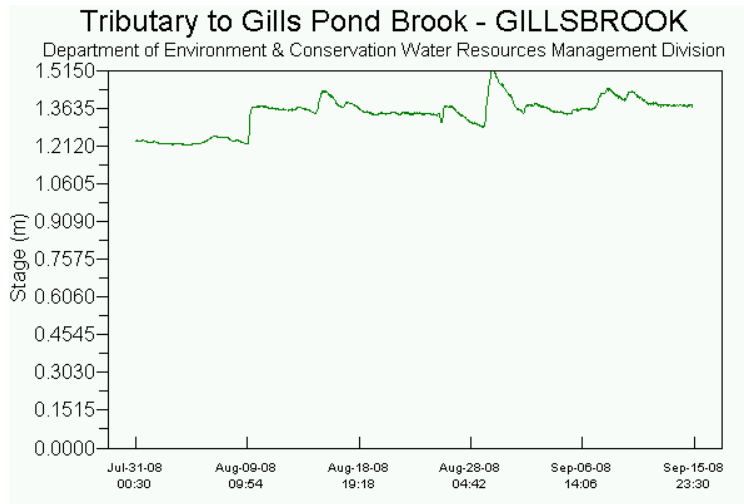


Figure 6

EAST POND BROOK

- The water temperatures (**Figure 7**) remained fairly constant over the deployment period, with an obvious diurnal pattern. Temperature values ranged from a minimum of 12.30 °C to 25.48 °C over the deployment period.

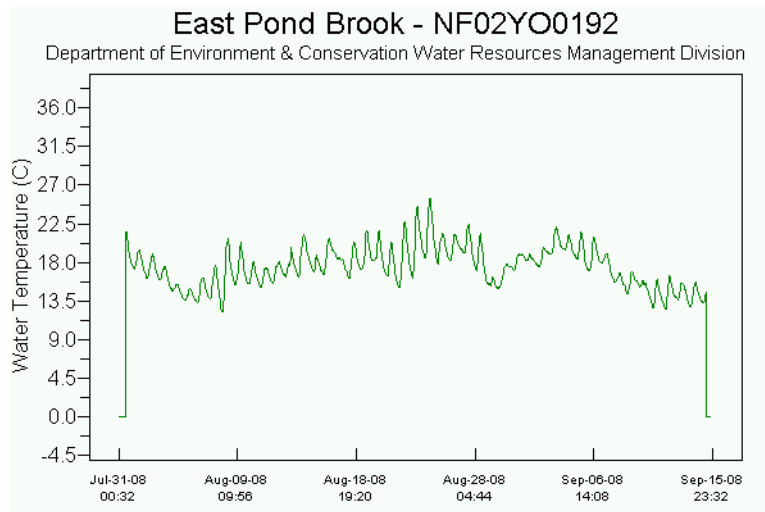
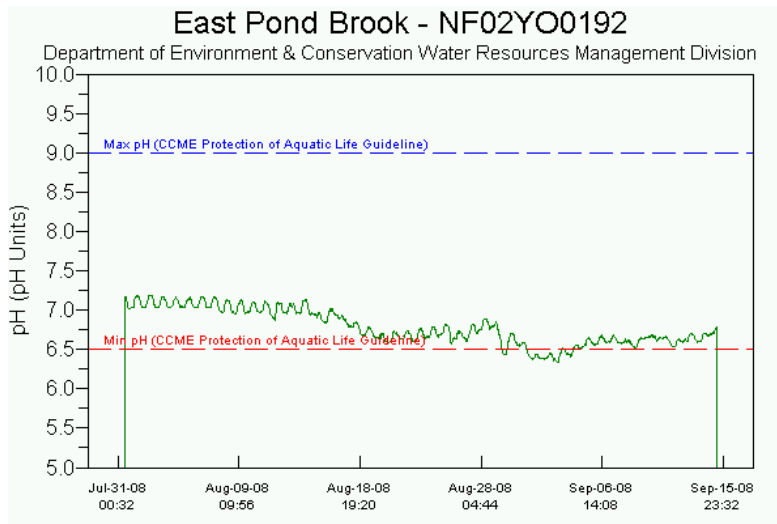
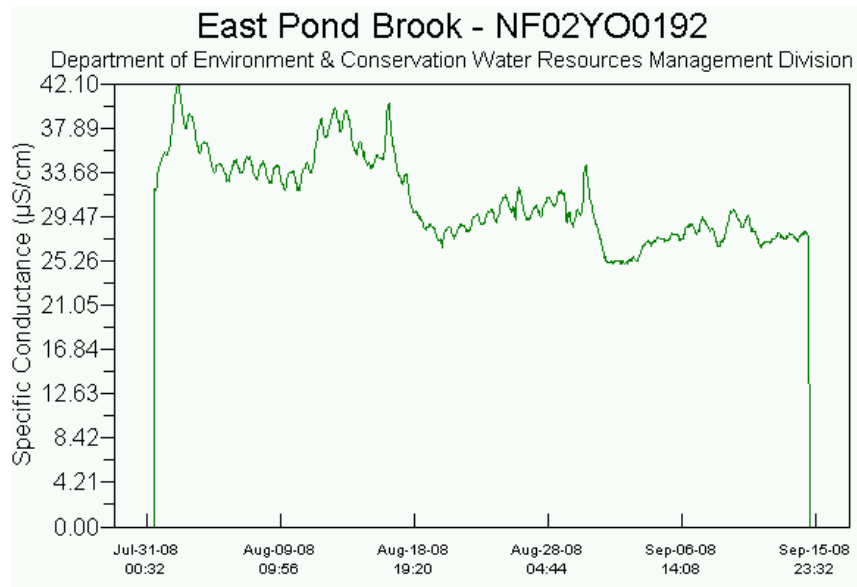


Figure 7

- pH values (**Figure 8**) remained fairly constant throughout the deployment period, ranging between 6.33 and 6.7.19 Most 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 quite low. The dip in pH below 6.5 corresponds to an increase in stage (**Figure 12**) which is the result of a precipitation event.

**Figure 8**

- The specific conductance (**Figure 9**) decreased over the deployment period ranging from a minimum of 24.9 $\mu\text{S}/\text{cm}$ to a maximum of 42.1 $\mu\text{S}/\text{cm}$. This normal variation is inversely proportional to the stage or water level. See Figure 12.

**Figure 9**

- The dissolved oxygen (**Figure 10**) values remained fairly constant throughout the deployment period, ranging from a minimum of 7.93 mg/L to a maximum of 10.20 mg/L. 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.

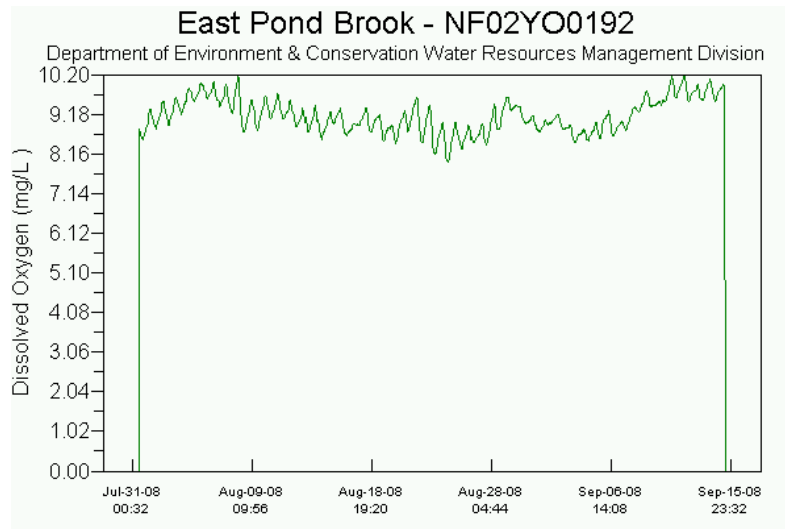


Figure 10

- The turbidity values (**Figure 11**) ranged from 0 NTU to 471 NTU throughout the deployment period. There were a few minor peaks prior to September 1, 2008. 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. Following September 1, 2008, there is a period of sustained turbidity peaks lasting until the instrument was removed from service. It was noted that there was an accumulation of algae and other organic matter on the probe which likely caused the increased turbidity values.

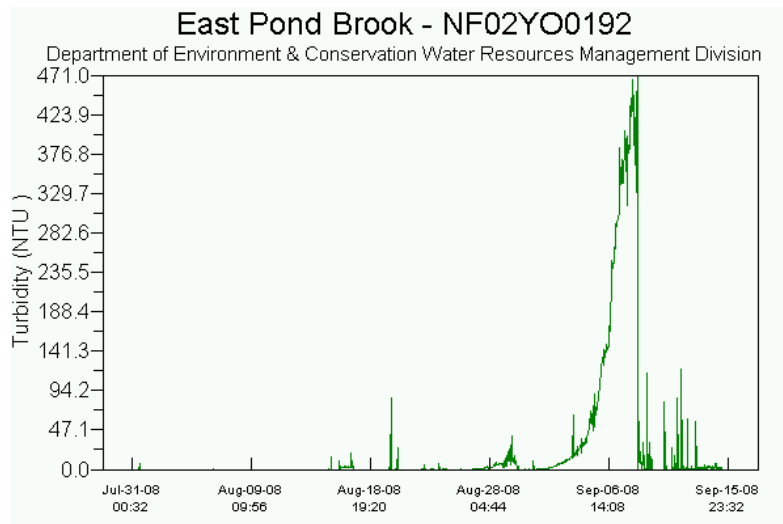


Figure 11

- The stage (**Figure 12**) or water level ranged from a minimum of 0.96 m to a maximum of 1.42 m. This range is normal for this stream and would simply represent baseline runoff and peaks from precipitation events.

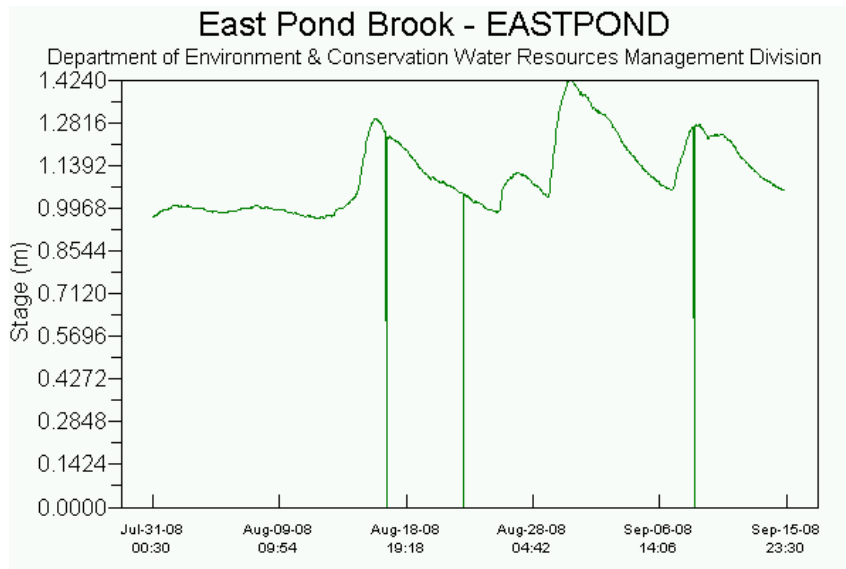


Figure 12

WELL AFTER TAILING DAM A

- Due to a calibration failure, the Quanta G was not deployed during this period. It was returned to the vendor for servicing.

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