Real Time Water Quality Report
Teck Duck Pond Operations
Deployment Period 2009-09-01 to 2009-11-24

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 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 September 8, 2009 to September 11, 2009, September 19, 2009 to September 21, 2009, September 30, 2009 to October 1, 2009, October 23, 2009 to October 29, 2009, and November 16, 2009 to 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

- Communication issues with the regular **DataSonde®** for Tributary to Gills Pond Brook were resolved. Accordingly after being cleaned and freshly calibrated this instrument went back into service from September 1, 2009 to November 24, 2009; an 84 day period. The regular instrument for East Pond Brook was removed on September 1, 2009, brought to Grand Falls – Windsor for servicing and after being cleaned and freshly calibrated was deployed from September 9, 2009 to November 24, 2009; a 75 day period.
- The **Quanta G®** probe remained deployed continuously in Monitoring Well After Tailings Dam Station (MW1) since May 5, 2009. There was a communications problem originating on October 25, 2009. The probe was removed on October 30, 2009 prior to winter freeze-up to be sent to the vendor for its bi-annual service. This Deployment Report covers a 79 day period. After being deployed for a total of 178 days, the accuracy of this instrument was checked against a grab sample collected from the well and analysed at a certified laboratory. pH had a drift of 0.80 which is considered fair, while Specific Conductance had a drift of 0.013 mS/cm (2.7%) which is considered excellent.
- *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**
2009-09-01 Installation	Temp (°C)	13.35	13.36	Excellent
	pH (units)	6.36	6.42	Excellent
	Sp. Conductivity (uS/cm)	31.3	31.4	Excellent
	Dissolved Oxygen (mg/L)	9.77	9.74	Excellent
	Turbidity (NTU)	0.6	0.3	Excellent
2009-11-24 Removal	Temp (°C)	0.70	0.71	Good
	pH (units)	6.44	6.90	Marginal
	Sp. Conductivity (uS/cm)	662.2	671.7	Excellent
	Dissolved Oxygen (mg/L)	13.27	13.31	Fair
	Turbidity (NTU)	0.0	0.0	Excellent

Table 1

East Pond Brook Station (NF02YO0192)				
Date (yyyy-mm-dd)	**Parameter**	**MiniSonde® Data**	**DataSonde® Data**	**Rating**
2009-09-09 Installation	Temp (°C)	14.14	14.09	Excellent
	pH (units)	6.65	6.75	Excellent
	Sp. Conductivity (uS/cm)	22.7	24.1	Excellent
	Dissolved Oxygen (mg/L)	9.95	9.97	Excellent
	Turbidity (NTU)	0.0	0.0	Excellent
2009-11-24 Removal	Temp (°C)	0.10	-0.07	Excellent
	pH (units)	5.78	6.40	Fair
	Sp. Conductivity (uS/cm)	21.2	22.1	Excellent
	Dissolved Oxygen (mg/L)	13.77	14.41	Fair
	Turbidity (NTU)	0.0	0.0	Excellent

Table 2

Data Interpretation

TRIBUTARY TO GILLS POND BROOK

- The water temperature (**Figure 1**) decreased over the deployment period. Temperature values ranged from a minimum of -0.36 ˚C to a maximum of 19.57 ˚C.

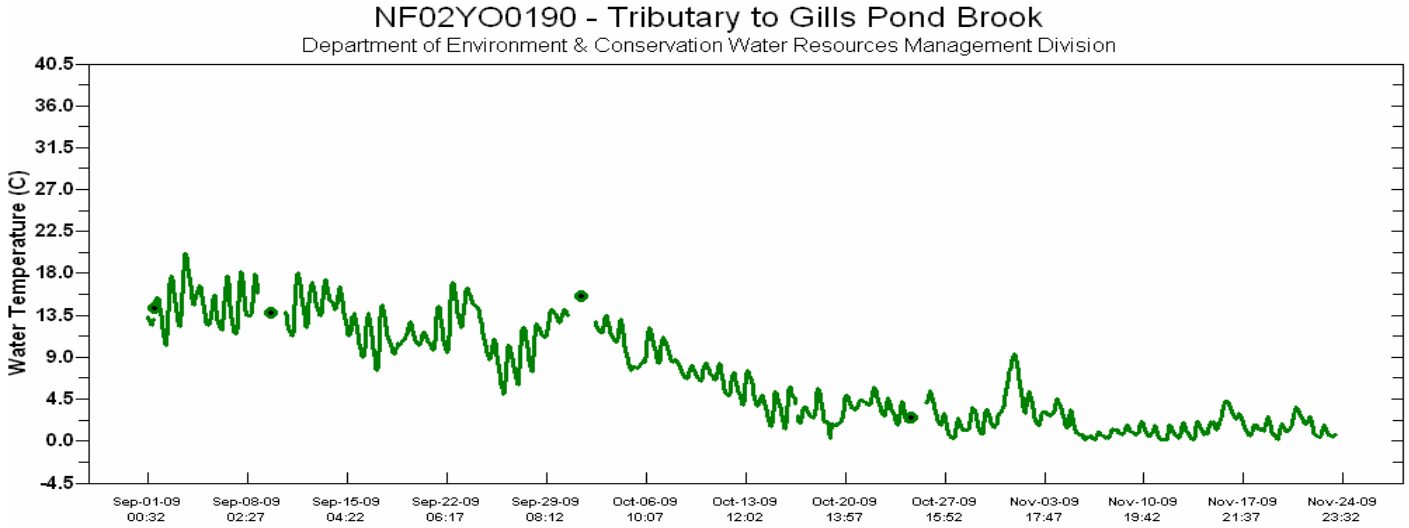

Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 6.18 to a maximum of 7.27 with a few 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. pH varies with periods of discharge from Polishing Pond, as discharge water has a slightly higher pH than the background water quality.

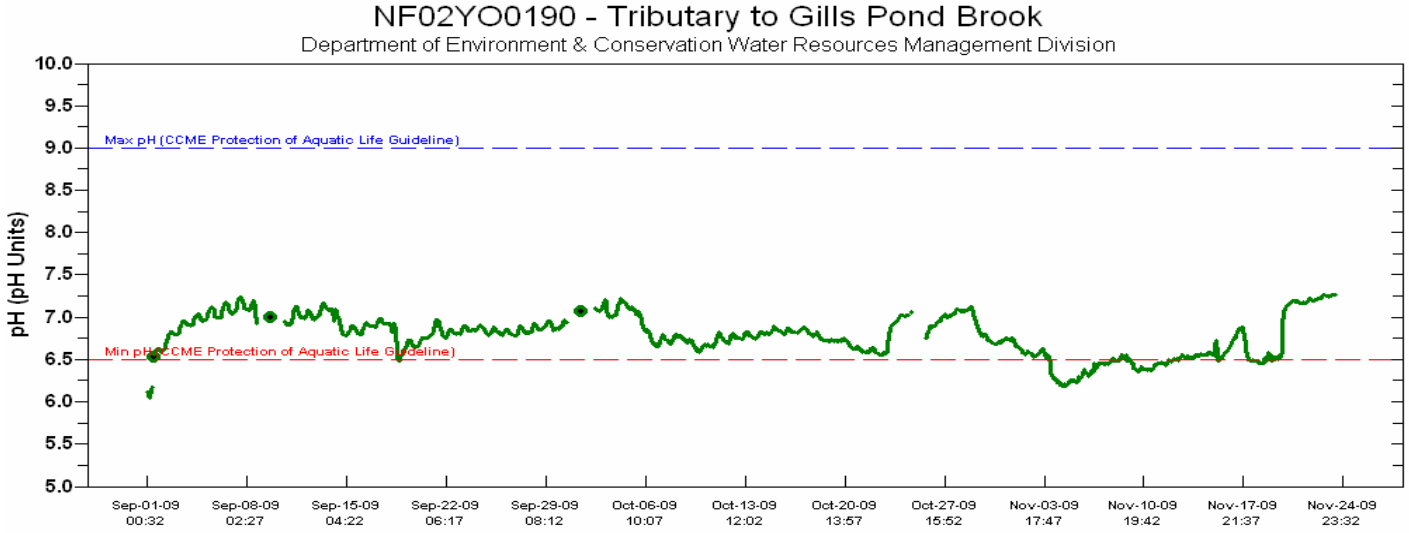

Figure 2

- The specific conductance **(Figure 3)** ranged from a minimum of 31.1 µS/cm to a maximum of 772.0 µS/cm over the deployment period. During the multiple discharge periods from Polishing Pond there are marked increases in conductivity. The 'V' shaped dips during some of the higher periods of conductivity are the result of dilution caused by precipitation events.

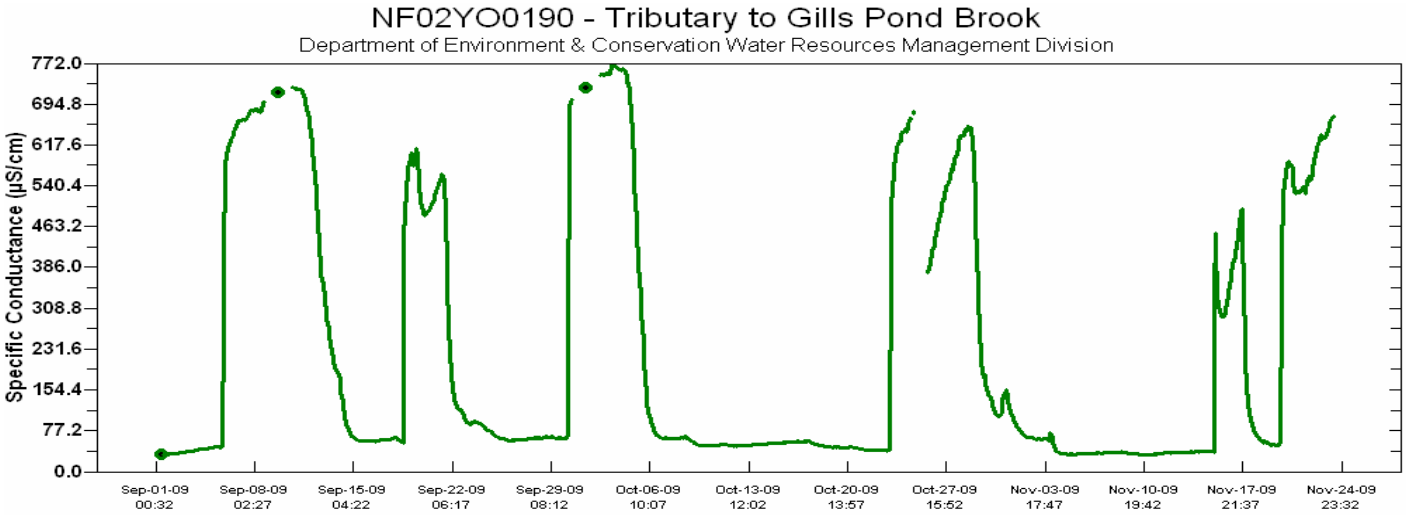

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.61 mg/L to a maximum of 14.28 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).

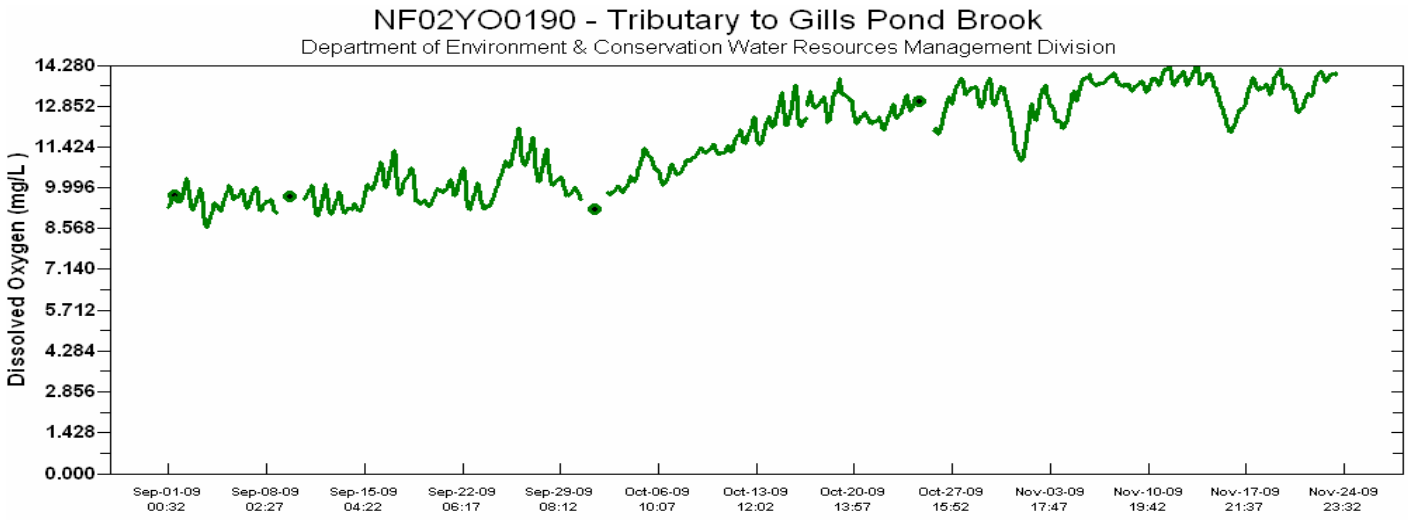

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 623.0 NTU. One measurement of 3000 NTU on November 20, 2009 is invalid as this number represents a system error. 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)"*. It is important to note though, that several *in situ* and grab sample measurements taken by staff of Department of Environment and Conservation and Teck Duck Pond Operations, recorded turbidity was no greater than 1.12NTU.

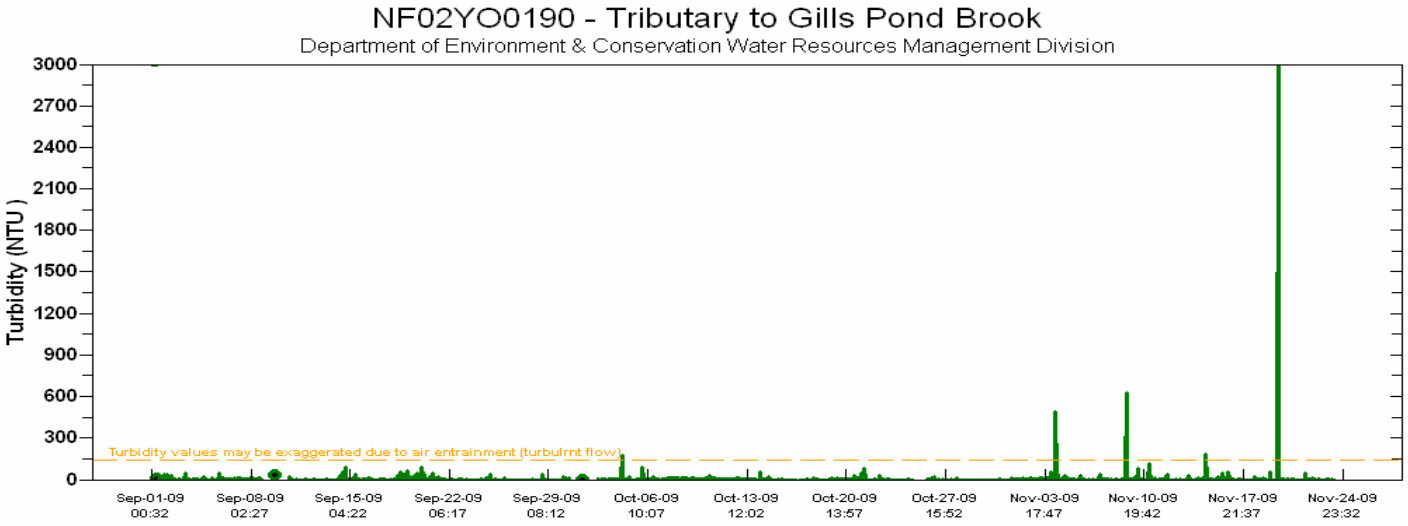

Figure 5

- The stage (**Figure 6)** or water level ranged from a minimum of 1.24 m to a maximum of 1.62 m with the highest peaks corresponding to discharge from Polishing Pond and precipitation events.

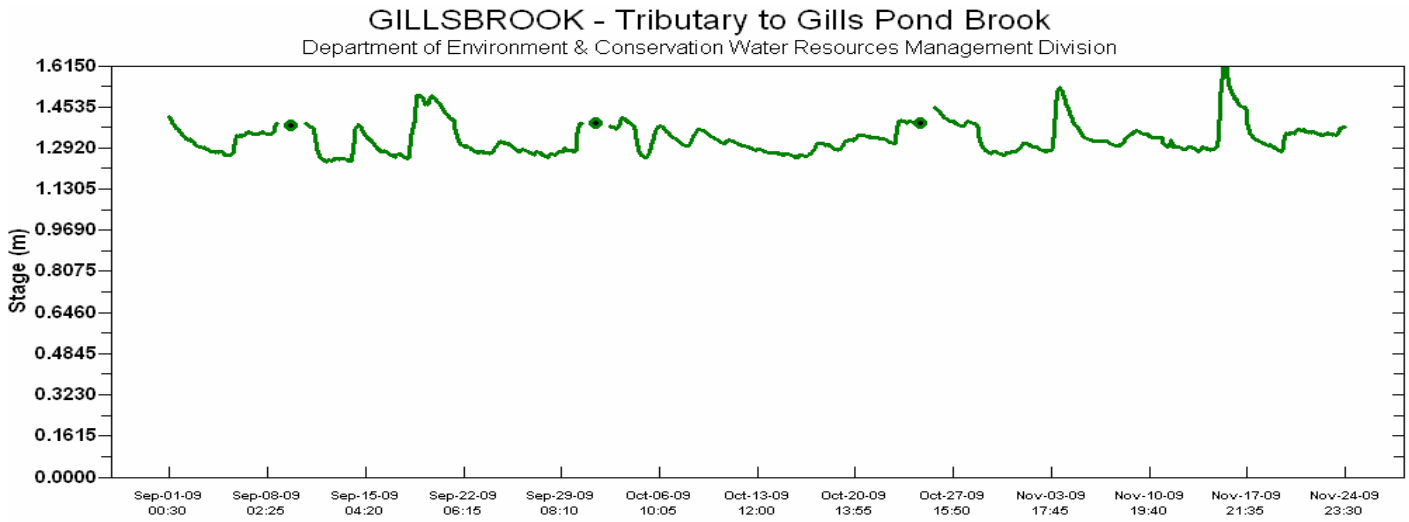

Figure 6

EAST POND BROOK

- The water temperature (**Figure 7**) decreased over the deployment period, ranging from a minimum of -0.14 ˚C to a maximum of 17.16 ˚C.

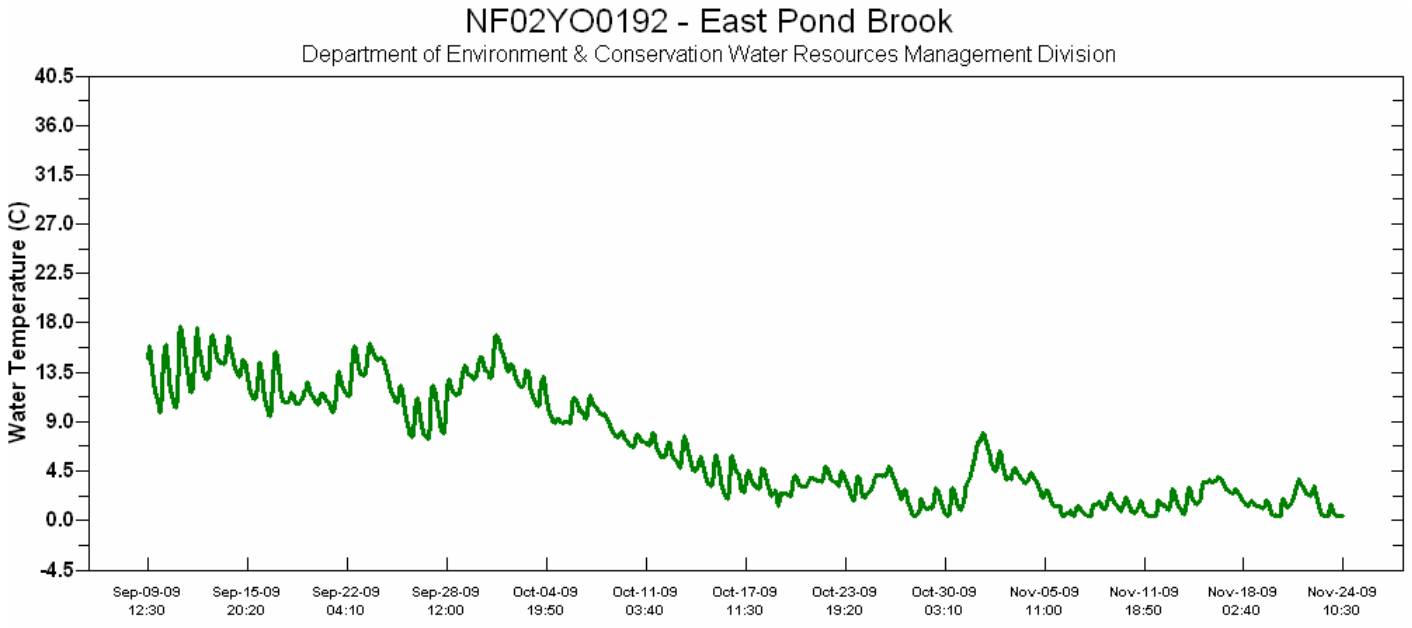

Figure 7

- pH values (**Figure 8**) generally decreased over the deployment period ranging between a minimum of 6.08 and maximum of 6.98. 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, and values below the limit are not unusual.

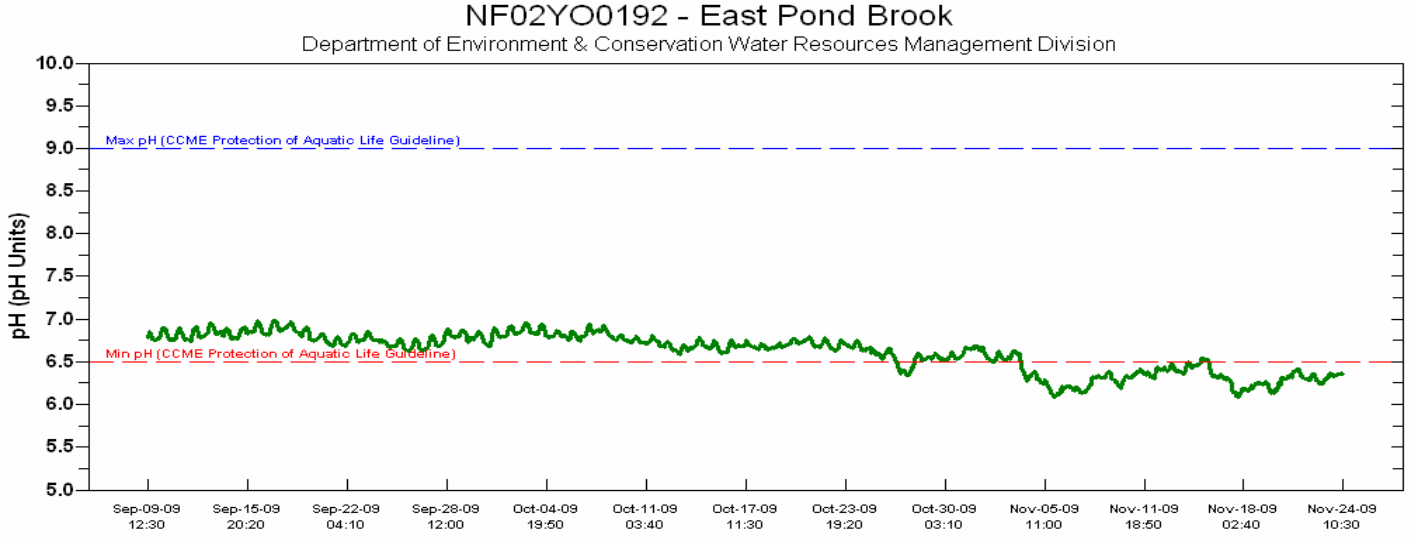

Figure 8

- The specific conductance **(Figure 9)** ranged from a minimum of 16.6 µS/cm to a maximum of 35.0 µS/cm. Lowest conductivity values correspond to periods of precipitation and high runoff.

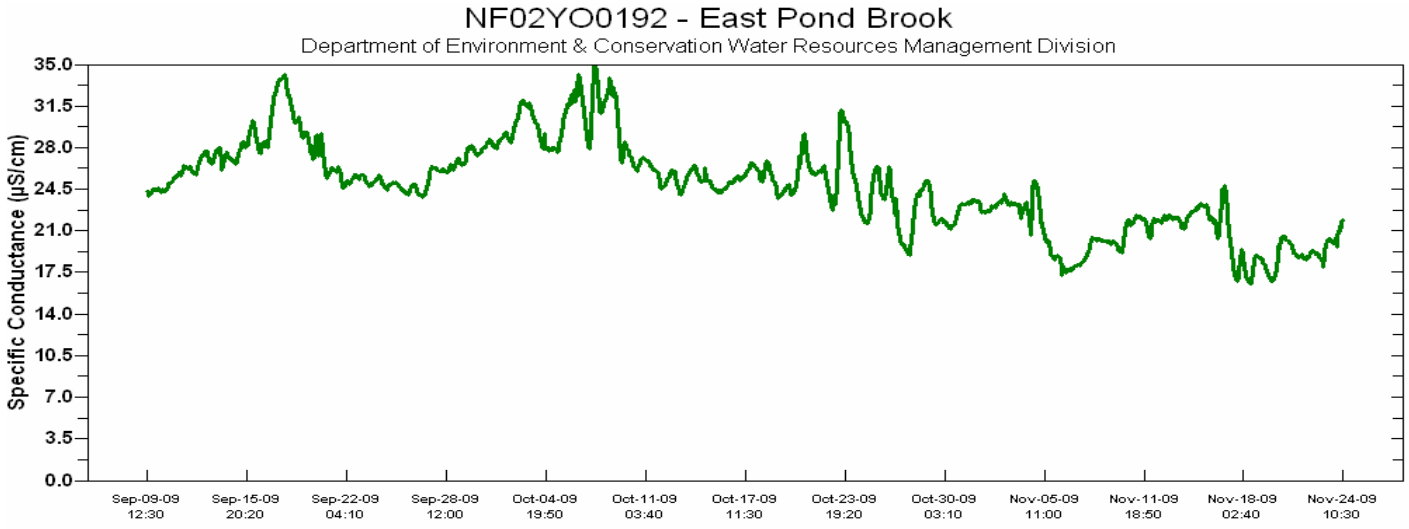

Figure 9

- The dissolved oxygen (**Figure 10**) values ranged from a minimum of 9.29 mg/L to a maximum of 14.56 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).

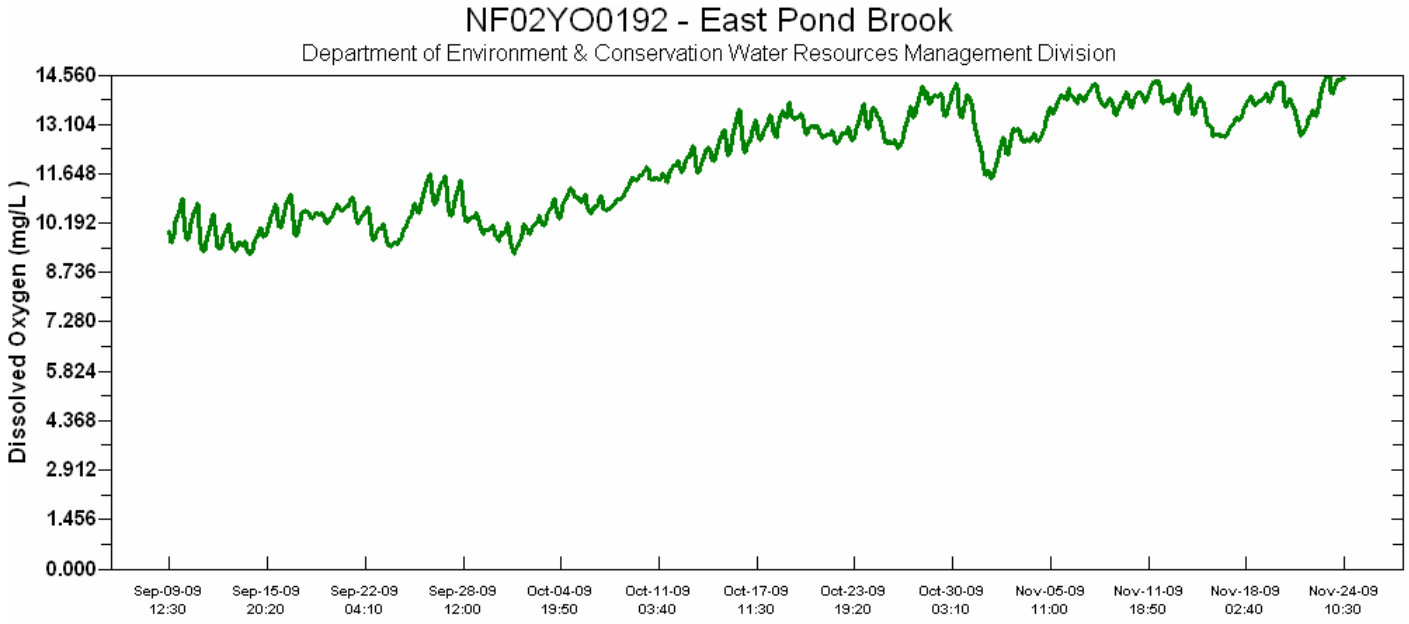

Figure 10

- The turbidity values **(Figure 11)** ranged from a minimum of 0.0 NTU to a maximum of 71.9 NTU. The high turbidity values between October 5, 2009and October 10, 2009 are likely the result of leafy debris caught in the sensor, which cleared abruptly. There were no unusually high *in situ* measurements, and no evidence of water quality impairment.

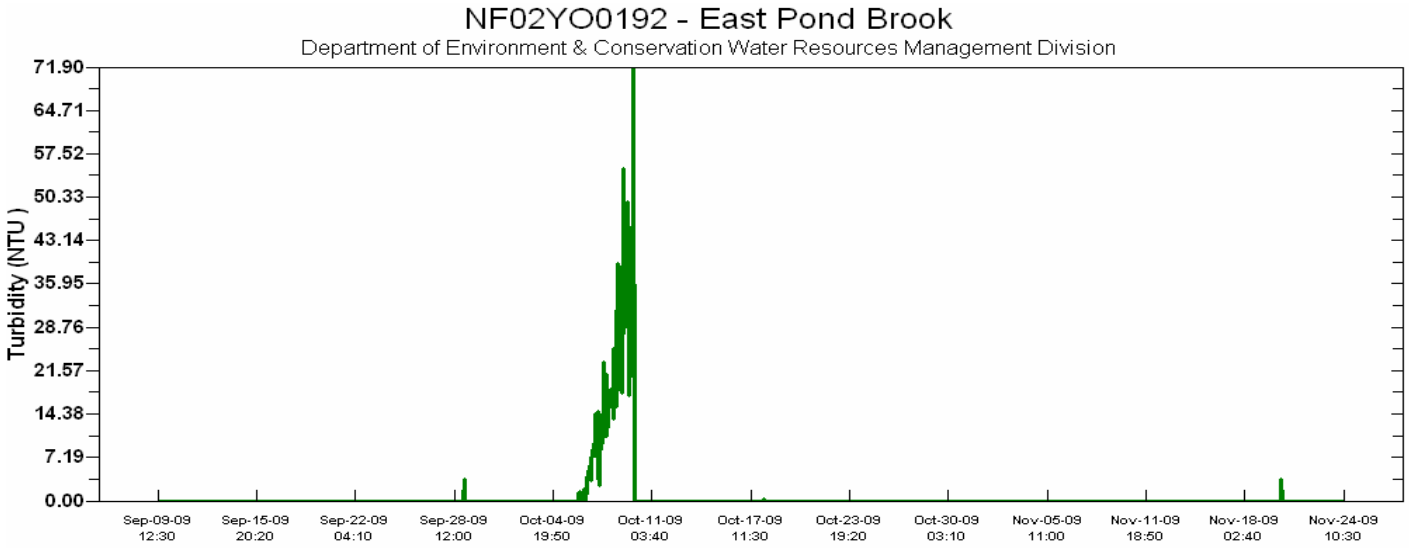

Figure 11

- The stage **(Figure 12)** or water level ranged from a minimum of 0.94 m to a maximum of 1.50 m. The highest peaks are the result of precipitation events.

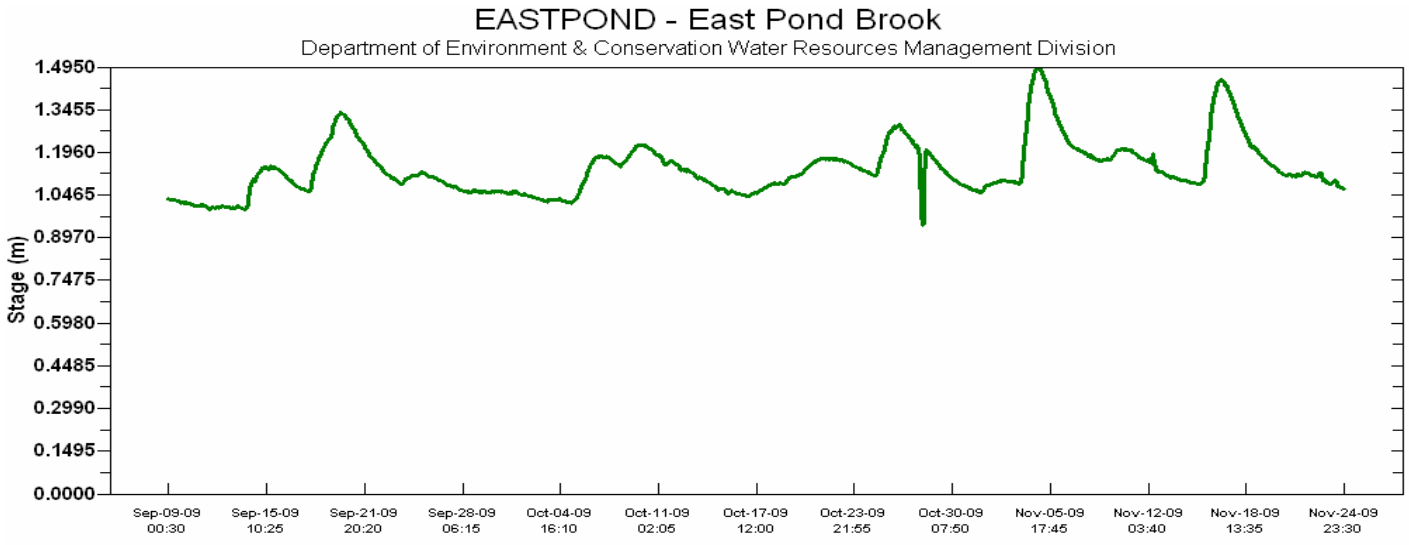

Figure 12

WELL AFTER TAILING DAM A

- Throughout the deployment period, water temperature (**Figure 13**) remained fairly constant ranging between 5.01 ^{o}C and 5.49 ^{o}C.

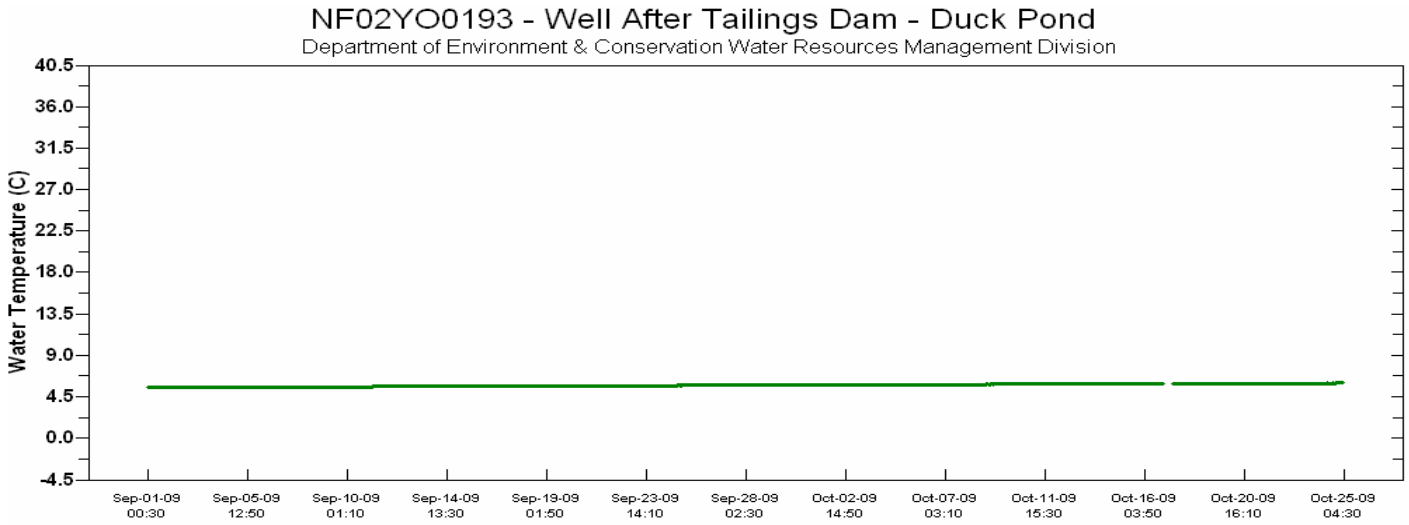

Figure 13

- The pH **(Figure 14)** increased slightly, ranging from a minimum of 8.83 to a maximum of 8.93 over the deployment period.

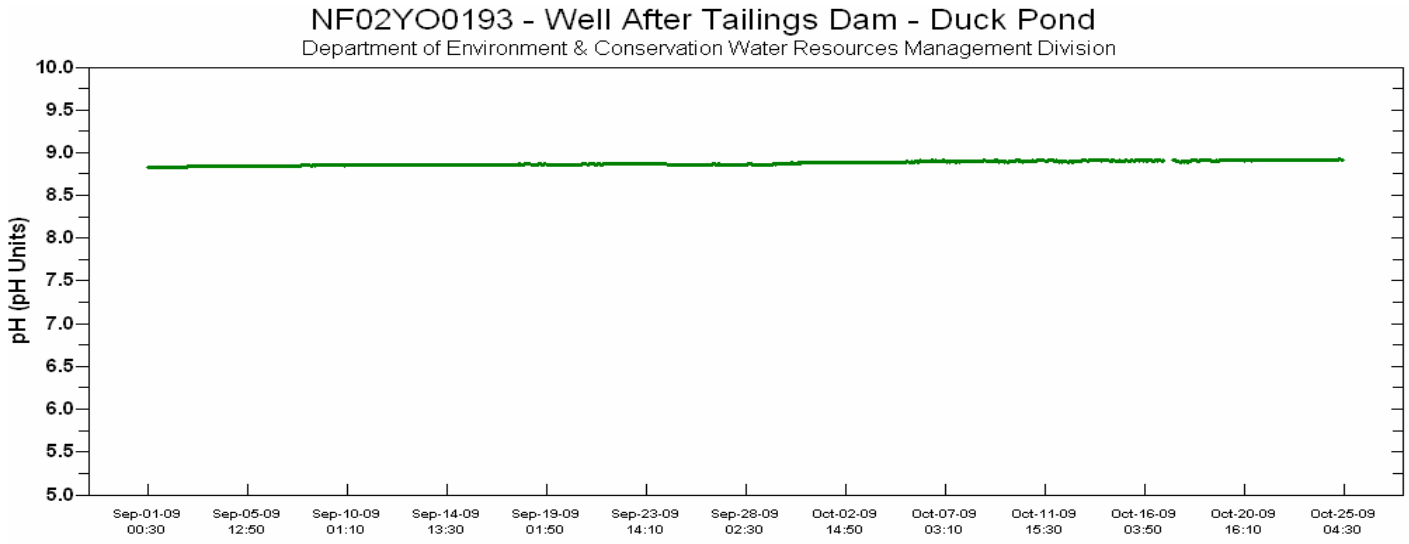

Figure 14

- Specific Conductance (**Figure 15**) increased slightly over the deployment period ranging from a minimum of 0.447 mS/cm to a maximum of 0.463 mS/cm.

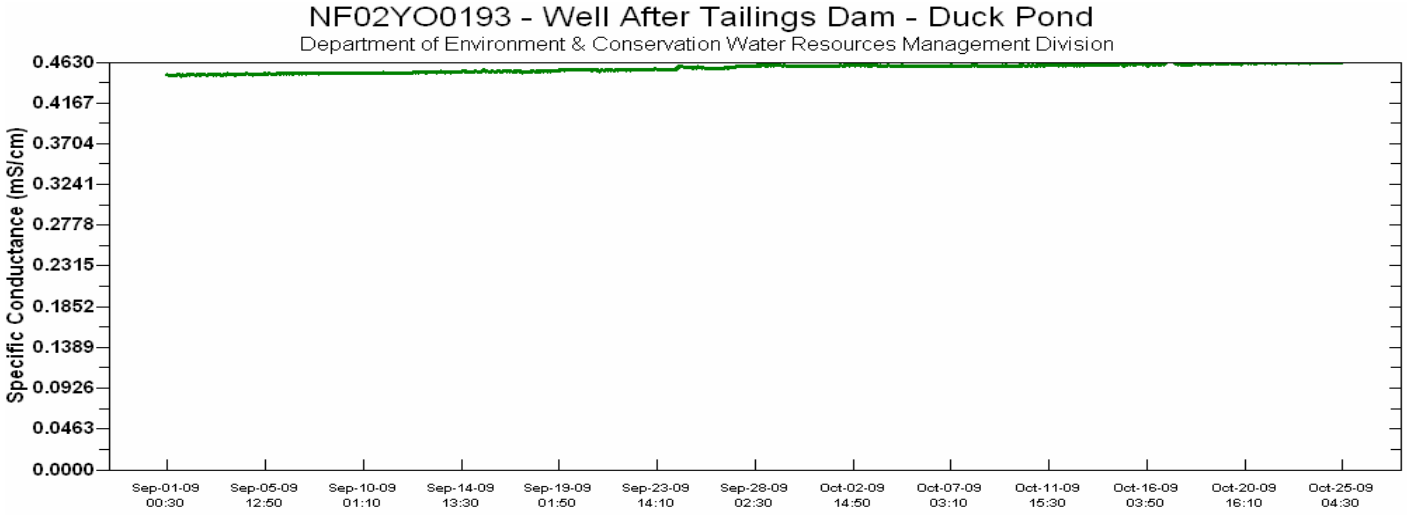

Figure 15

- The water level (**Figure 16**) remained constant throughout the deployment period, ranging from a minimum of 270.78 m to a maximum of 271.21 m.

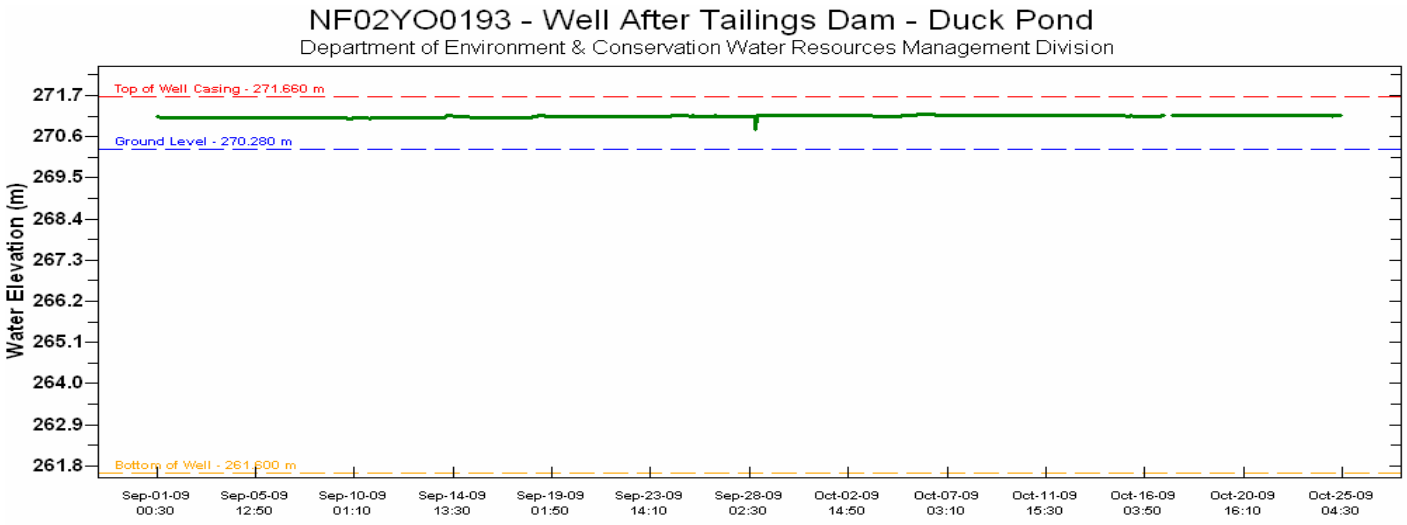

Figure 16

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