

# Waterford River @ Kilbride

# NF02ZM0009

April-May 2012



Government of Newfoundland & Labrador Department of Environment and Conservation Water Resources Management Division St. John's, NL, A1B 4J6 Canada

## Real Time Water Quality Monthly Report Waterford River - St. John's NL April 11–June 7, 2012

## <u>General</u>

• Data from the Waterford River real-time station is regularly monitored by the Water Resources Management Division (WRMD) staff.

• The instrument used for the deployment period from April 11 until June 7 was a YSI 6600 series multi-probe, which continuously measured water temperature, pH, specific conductivity, dissolved oxygen and turbidity. The duration of the deployment was 57 days.

• Stage height data was available from April 11 to May 5, and no stage height data was transmitted after that date due to a communications failure. Consequently, all water quality graphs in this report include a partial line representing stage height.

## Maintenance and Calibration of Instrumentation

• **Table 1** displays the dates when routine cleaning, maintenance and calibration was performed on the water quality probe during this deployment.

Table 1:	Table of Water	r Ouality Probe	Installation a	nd Removal
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Date Installed	Date Removed
April 11, 2012	June 7, 2012

• Water quality readings were taken with a second freshly cleaned and calibrated water quality instrument at the time of installation and removal in compliance with WRMD quality assurance and quality control protocol.

## **Quality Assurance and Quality Control (QAQC)**

• Deployment comparison rankings between the field instrument and the QAQC instrument are summarized in **Table 2**.

 Table 2: Comparison rankings for deployment of RTWQ instrument on April 11, 2012

## Deployment

Field Sonde to QAQC Sonde Comparisons

·	Field	QAQC	Difference / %	
Parameter	Sonde	Sonde	Difference	Ranking
Temperature ('C)	8.85	8.82	0.03	Excellent
рН	6.94	6.93	0.01	Excellent
Specific Conductivity (µS/cm)	436.0	436.0	0.0	Excellent
Total Dissolved Solids (g/l)	0.2830	0.2840	0.0010	
Dissolved Oxygen (%-Sat)	100.5	103.6	3.1	
Dissolved Oxygen (mg/l)	11.65	12.05	0.40	Good
Turbidity (NTU)	2.9	2.5	0.4	Excellent

• **Deployment rankings** of "excellent" and "good" for water temperature, pH, specific conductivity, dissolved oxygen and turbidity indicate successful cleaning and calibration, which enable these sensors to produce reliable data during the subsequent deployment period.

• Removal comparison rankings between the field instrument and the QAQC instrument are summarized in **Table 3**.

Table 3: Comparison rankings for removal of RTWQ instrument on June 7, 2012

Removal Field Sonde to QAQC Sonde Comparisons						
	Field	QAQC	Difference / %			
Parameter	Sonde	Sonde	Difference	Ranking		
Temperature ('C)	9.49	9.50	0.01	Excellent		
рН	6.93	7.62	0.69	Fair		
Specific Conductivity (µS/cm)	381.0	392.0	2.9	Excellent		
Total Dissolved Solids (g/l)	0.2480	0.2550	0.0070			
Dissolved Oxygen (%-Sat)	100.9	100.5	0.4			
Dissolved Oxygen (mg/l)	11.52	11.46	0.06	Excellent		
Turbidity (NTU)	5.7	6.0	0.3	Excellent		

• **Removal rankings** of "excellent" for water temperature, SpC, DO and turbidity increase confidence that the data collected for these parameters over the duration of this deployment are reliable. A removal ranking of "fair" for pH indicates that a limited degree of fouling or impairment of the pH sensor may have occurred during the deployment period, but the results are still considered to be acceptable and representative of pH in the river throughout this deployment period.

## **Data Interpretation**

• Water temperatures fluctuated between 3.41 and 17.15°C during this deployment period, showing diurnal variation and an overall seasonally increasing trend. Water temperature data are shown in brown ink in **Figure 1** below.

### Figure 1: Water Temperature

### Water Temperature and Stage Level



• **Dissolved Oxygen (DO)** values were within the range of 9.58 and 13.56 mg/L during this deployment period. DO levels are shown in brown ink in Figure 2 below. All DO levels during this period were above the minimum guidelines recommended by the CCME for the protection of aquatic life. Dissolved oxygen levels are showing an overall decreasing trend, in response to seasonally increasing water temperatures. The solubility of oxygen is greater in colder water than in warm water.

### Figure 2: Dissolved Oxygen



#### Dissolved Oxygen Concentration and Saturation

• **pH** levels were fairly constant throughout the deployment period ranging from 6.77 to 7.23 pH units. pH levels are shown in brown ink in **Figure 3**, below. pH levels remained above the CCME recommended minimum guideline of 6.5 units for the duration of this deployment. An increase in pH can be expected at this time of year, as photosynthetic activity increases in response to the seasonal increase in daylight hours. Carbon dioxide, which readily forms carbonic acid in water, is removed from water during the photosynthetic process. The increased rate of removal of carbonic acid results in a seasonal increase in pH.

#### Figure 3: pH

Water pH and Stage Level



• **Specific conductivity (SpC)** levels were within the expected seasonal range, with values between 213 and 1645 $\mu$ S/cm as shown in brown ink in **Figure 4** below. The two conductivity spikes seen on April 30 and May 2 could be climate related as minimum air temperatures decreased to below 0°C from April 29 to May 3, after several days of warmer temperatures, which may have prompted City officials to use road salt during that period. Rainfall on April 30 and May 2 may have caused the salty surface run-off to enter Waterford River, resulting in spikes in specific conductivity. Provincial Department of Environment and Conservation climate data recorded at Pippy Park in St. John's from April 11 to June 6, 2012 is shown below in Appendix 1 at the end of this report.

#### Figure 4: Specific Conductance and Stage

Specific Conductivity of Water and Stage Level



• **Turbidity** fluctuated near background concentrations throughout most of the deployment period, between 0 - 50NTU, in response to rainfall events. An instantaneous spike of 637 NTU occurred on June 6. Spikes that rapidly increase and recede often indicate the passage of suspended debris in front of the turbidity sensor. The water remained fairly turbid for a couple of hours after the initial spike, near the 100NTU range, in response to moderate precipitation in the form of 33.73mm of rainfall on June 6. Turbidity concentrations are shown in brown ink in **Figure 5** below. Precipitation data is shown below in Appendix 1, as recorded from the Provincial Department of Environment and Conservation weather station at Pippy Park in St. John's.



Water Turbidity and Stage Level



YMD	AIR_TEMP_MIN	AIR_TEMP_MAX	PRECIP_TOT	RAIN_TOT	SNOW_TOT
2012/04/11	3.58	15.6	0	0	
2012/04/12	2.17	11.56	7.04	7.04	
2012/04/13	2.25	13.16	4.06	4.06	
2012/04/14	-0.42	6.72	0.5	0.5	0
2012/04/15	-2.2	9.66	0.25	0.25	0
2012/04/16	0.92	14.91	2.79	2.79	
2012/04/17	2.96	20.87	0	0	
2012/04/18	8.03	20.89	0	0	
2012/04/19	0.91	8.01	0	0	
2012/04/20	1.05	10.07	16.22	16.22	
2012/04/21	2.07	19.01	0.25	0.25	
2012/04/22	5.49	17.41	3.55	3.55	
2012/04/23	1.04	9.84	0	0	
2012/04/24	1.04	7.35	0	0	
2012/04/25	5.62	11.28	0	0	
2012/04/26	6.44	16.45	3.01	3.01	
2012/04/27	4.11	17.28	0	0	
2012/04/28	2.32	10.89	8.88	8.88	
2012/04/29	0.14	8.1	0.25	0.25	
2012/04/30	0.09	6.75	6.34	6.34	
2012/05/01	-1.19	6.33	0	0	0
2012/05/02	-1.15	1.89	12.64	12.64	0
2012/05/03	-0.19	3.04	0	0	0
2012/05/04	1.44	4.93	10.39	10.39	
2012/05/05	2.49	6.51	0	0	
2012/05/06	2.33	6.25	0	0	
2012/05/07	4.09	11.28	0	0	
2012/05/08	3.46	11.62	0	0	
2012/05/09	3.25	13.72	0	0	
2012/05/10	5.69	16.47	0	0	
2012/05/11	6.58	21.02	2.53	2.53	
2012/05/12	9.13	17.94	1.01	1.01	
2012/05/13	7.42	9.56	9.57	9.57	
2012/05/14	1.87	11.05	0.76	0.76	
2012/05/15	5.03	20.47	0	0	
2012/05/16	11.18	23.32	1.52	1.52	
2012/05/17	11.87	22.5	3.05	3.05	
2012/05/18	5.66	17.08	11.15	11.15	
2012/05/19	5.94	18.01	2.02	2.02	
2012/05/20	2.2	10.96	0	0	
2012/05/21	1.65	13.02	0	0	
2012/05/22	6.89	25.82	0	0	
2012/05/23	11.72	22.18	0.25	0.25	
2012/05/24	1.03	9.43	6.34	6.34	
2012/05/25	1	18.31	2.02	2.02	
2012/05/26	8.15	20.9	0	0	
2012/05/27	1.33	15	0	0	
2012/05/28	0.77	9.16	0	0	

Appendix1: Provincial Environment and Conservation Climate Data, April 11-June 6, 202	12
ENVC Pippy Park Weather Station, St. John's NL	

2012/05/29	0.17	6.61	4.32	4.32
2012/05/30	3.28	6.67	0	0
2012/05/31	3.5	10.97	0	0
2012/06/01	5.15	11.4	0	0
2012/06/02	3.92	6.97	0.51	0.51
2012/06/03	3.87	7.94	0.51	0.51
2012/06/04	3.84	7.14	0	0
2012/06/05	3.63	7.26	0	0
2012/06/06	4.65	13.01	33.73	33.73
2012/06/07	3.77	10.48	2.79	2.79

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