

Waterford River @ Kilbride

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March 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 March 2012

<u>General</u>

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

• The instrument used for the deployment period from March 2nd until April 11th 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 40 days.

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 Quality Probe Installation and Removal

Date Installed	Date Removed			
March 2, 2012	April 11, 2012			

• Water quality readings were taken with a second freshly cleaned and calibrated water quality instrument at the time of installation and removal for QAQC comparison.

Quality Assurance and Quality Control

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

Date	Action	Comparison Ranking						
		Temp	pН	SpC	DO	Turb		
March 2, 2012	Deployment	Excellent	Excellent	Excellent	Good	Excellent		
	Ranking							
April 11, 2012	Removal	Fair	Excellent	Excellent	Good	Fair		
	Ranking							

Table 2: Comparison rankings for Waterford @ Kilbride station March 2nd to April 11th , 2012

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

• **Removal rankings** of "fair," "excellent," and "good" for water temperature, pH, specific conductivity, dissolved oxygen and turbidity increase confidence that the data collected for these parameters over the duration of this deployment are reliable.

Data Interpretation

• Water temperatures showed an expected seasonal increasing trend in response to increasing air temperatures over the duration of this deployment, ranging from 0.01°C up to 9.14°C. Water temperature data are shown in red in Figure 1 below.

Figure 1: Water Temperature

Water Temperature and Stage Level

• **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels generally decrease as water temperatures increase. DO values are shown in blue and water temperatures are shown in green in **Figure 2**, below. The graph indicates that dissolved oxygen levels ranged between 14.78 and 11.60mg/L during this deployment period, with DO levels dropping off toward the last few days of the deployment, in response to increasing water temperatures.

• **pH** levels were fairly constant for the deployment period, and fell within the CCME recommended minimum and maximum guidelines for the Protection of Aquatic Life, of 6.5 and 9.0 pH units, respectively. pH levels ranged between 6.82 and 7.11 pH units during this deployment.

Specific conductivity (SpC) levels showed significant spikes during this deployment, as shown in green in **Figure 4** below, which is expected this time of year when road salting operations are in effect. A spike in SpC is seen March 4th-5th, corresponding to higher air temperatures and rainfall on those days which resulted in surface run-off containing road salt. Environment Canada daily climate data for the St. John's region from March $1^{st} - 19^{th}$, 2012 is shown in Appendix 1 at the end of this report. (There is no Environment Canada climate data available for March 20th - 31st, so climate data for this period was extracted from the provincial Pippy Park weather station, and is provided in Appendix 1). Another spike in SpC is seen in on March 16th-17th, when SpC levels reached the maximum for this deployment, of 2832µS/cm. Again this spike is in response to increased surface run-off as 13mm of rain fell in the area on March 16^{th} . A third significant spike in SpC is seen in the graph below on April $1^{\text{st}} - 2^{\text{nd}}$. There is currently no Environment Canada climate data available for these dates, and the Department of Environment and Conservation weather station at Pippy Park indicates that there was no rapid increase in air temperature or rainfall, suggesting that anthropogenic activities upstream from the monitoring station may have contributed to the increase in SpC. Daily climate data from the Department of Environment and Conservation weather station at Pippy Park is included in **Appendix 1**.

• **Turbidity** concentrations were at background levels during most of this deployment period, with the exception of a significant spike that occurred during April 3rd and 4th. Turbidity concentrations are shown in green in **Figure 5** below, and the spike is circled in red. Climate data extracted from the Department of Environment and Conservation weather station at Pippy Park indicates that approximately 19.66mm of rain fell during this two day period. The rainfall resulted in increased surface run-off, river flows and turbidity. The increased river flow is also seen in **Figure 5** below, in blue. Daily climate data from the Department of Environment and Conservation weather station at Pippy Park is found in **Appendix 1** at the end of this report.

Figure 5: Turbidity and Flow

Report prepared by: Joanne Sweeney Environmental Scientist Water Resources Management Division Department of Environment and Conservation Confederation Building West Block 4th Floor St. John's NL A1B 4J6 Ph. (709) 729-0351

Appendix 1

Environment Canada Daily Climate Data for St. John's, NL: March 2012 Daily Data Report for March 2012

D a y	<u>Max</u> <u>Temp</u> ℃ ₩	<u>Min</u> <u>Temp</u> ℃ ₩	<u>Mean</u> <u>Temp</u> ℃ ☑	<u>Heat</u> Deg Days	<u>Cool</u> Deg Days ₩	<u>Total</u> <u>Rain</u> mm ₩	<u>Total</u> <u>Snow</u> cm ₩	<u>Total</u> Precip mm ₩	<u>Snow</u> on Grnd cm ₩	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's deg	<u>Spd of</u> Max Gust km/h ₩
<u>01</u> †	-8.4	-13.1	-10.8	28.8	0.0	0.0	0.2	Т	2	33	48
<u>02</u> †	-3.6	-8.6	-6.1	24.1	0.0	0.0	0.2	Т	2	4	33
<u>03</u> †	<mark>0.7</mark>	-3.6	-1.5	19.5	0.0	0.2	0.6	0.8	2	16	74
<u>04</u> †	<mark>5.2</mark>	-0.8	2.2	15.8	0.0	<mark>3.4</mark>	2.2	5.4	2	17	96
<u>05</u> †	<mark>3.5</mark>	-4.1	-0.3	18.3	0.0	<mark>9.8</mark>	0.4	10.2	2	30	72
<u>06</u> †	0.0	-4.1	-2.1	20.1	0.0	0.0	8.4	6.8	1	5	70
<u>07</u> †	-1.5	-7.6	-4.6	22.6	0.0	0.2	16.2	15.2	25	36	95
<u>08</u> †	<mark>4.7</mark>	-7.6	-1.5	19.5	0.0	0.0	Т	Т	22	25	69
<u>09</u> †	<mark>12.2</mark>	-1.2	5.5	12.5	0.0	0.0	0.2	0.2	4	24	98

D a y	<u>Max</u> <u>Temp</u> ℃ ₩	<u>Min</u> <u>Temp</u> ℃ ₩	<u>Mean</u> <u>Temp</u> ℃ ਔ	<u>Heat</u> Deg Days	<u>Cool</u> Deg Days ₩	<u>Total</u> <u>Rain</u> mm <mark>⋈</mark>	<u>Total</u> <u>Snow</u> cm ₩	<u>Total</u> Precip mm ₩	<u>Snow</u> <u>on Grnd</u> cm ☑	Dir of Max Gust 10's deg	Spd of Max Gust km/h
<u>10</u> †	-1.1	-6.3	-3.7	21.7	0.0	0.0	4.4	4.0	1	35	41
<u>11</u> †	-3.2	-9.2	-6.2	24.2	0.0	0.0	Т	Т	5	31	69
<u>12</u> †	0.6	-6.1	-2.8	20.8	0.0	0.0	1.6	1.2	3	22	48
<u>13</u> †	-2.8	-8.6	-5.7	23.7	0.0	0.0	Т	Т	3	32	65
<u>14</u> †	-3.2	-9.4	-6.3	24.3	0.0	0.0	0.0	0.0	2	33	33
<u>15</u> †	-2.8	-8.3	-5.6	23.6	0.0	0.0	0.0	0.0	2	10	44
<u>16</u> †	0.1	-3.1	-1.5	19.5	0.0	<mark>13.0</mark>	0.0	13.0	Т	6	44
<u>17</u> †	<mark>3.3</mark>	-1.5	0.9	17.1	0.0	Т	0.0	Т	Т	28	39
<u>18</u> †	<mark>6.0</mark>	-4.0	1.0	17.0	0.0	0.0	0.0	0.0	Т	25	72
<u>19</u> †	<mark>2.2</mark>	-4.7	-1.3	19.3	0.0	0.0	0.4	0.2	Т	34	74
20											
21											
22											
23											
24											

Daily climate data from the provincial **Department of Environment and Conservation Climate Station at Pippy Park**, March 18 – April 11, 2012

YMD	AIR_TEMP_AVG	AIR_TEMP_MIN	AIR_TEMP_MAX	PRECIP_TOT	RAIN_TOT
	(C)	(C)	(C)	(mm)	
3/20/2012	-0.74	-4.15	3.42	0	0
3/21/2012	-4.8	-7.05	-2.96	0	
3/22/2012	-0.76	-4.34	1.66	0	0
3/23/2012	0.51	-1.98	3.71	3.81	0
3/24/2012	-2.64	-5.89	0.23	0	0
3/25/2012	-4.96	-7.35	-0.71	0	
3/26/2012	-1.14	-7.35	4.48	6.84	3.54
3/27/2012	5.14	0.75	8.57	6.08	6.08
3/28/2012	0.63	-1.66	3.7	0	0
3/29/2012	0.82	-1.63	5.46	3.56	3.56
3/30/2012	-0.34	-2.58	3.52	0	0
3/31/2012	-2.36	-2.65	-1.5	28.18	
4/1/2012	-1.62	-3.42	1.87	0	0
4/2/2012	-1.91	-4.52	3.42	0	0
4/3/2012	-1.19	-3.67	1.43	7.55	7.55
4/4/2012	2.42	0.81	4.31	12.11	12.11
4/5/2012	2.57	0.3	6.47	1.27	1.27
4/6/2012	3.36	-1.37	7.52	0	0
4/7/2012	1.66	-1.71	5.67	7.87	7.87
4/8/2012	6.42	1.59	10.51	1.26	1.26
4/9/2012	4.88	-1.08	10.2	0.76	0.76
4/10/2012	9.05	3.62	15.35	3.8	3.8
4/11/2012	8.84	3.58	15.6	0	0