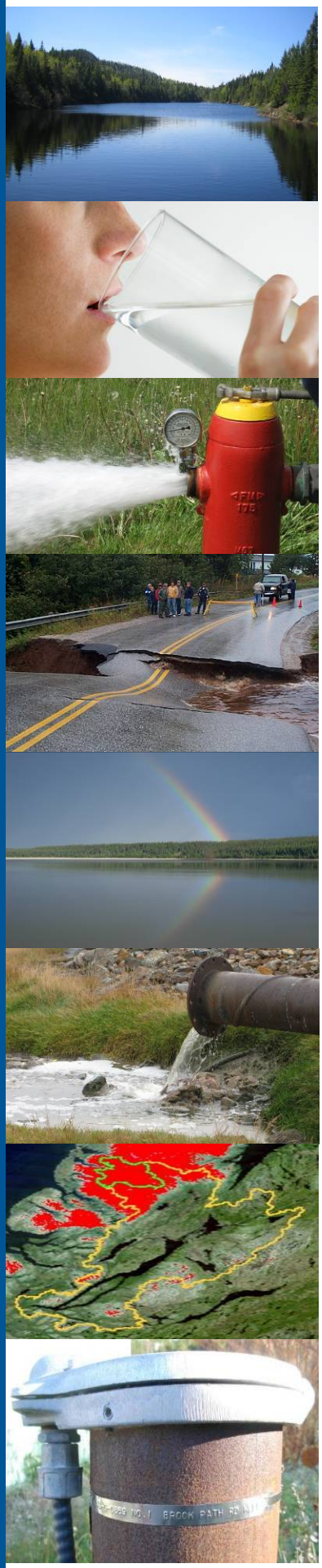


Waterford River @ Kilbride

NF02ZM0009

April 2011

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 2011

General

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

- The instrument used for this deployment period (March 29th – May 3rd) was a Minisonde which continuously monitors water temperature; pH; specific conductivity; and dissolved oxygen. This particular instrument is not capable of monitoring turbidity, hence the lack of turbidity data/graphs in this deployment report.

Maintenance and Calibration of Instrumentation

- The following table displays the dates when the Waterford River water quality probe was installed and removed during this deployment period for routine cleaning, maintenance and calibration.

Table 1: Table of Water Quality Probe Installation and Removal

Date Installed	**Date Removed**
March 29th, 2011	May 3rd, 2011

- 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. The QAQC instrument was calibrated prior to each use.

Quality Assurance and Quality Control

- Deployment and removal comparison rankings for the Waterford River deployment from March 29th to May 3rd are summarized in **Table 2**.
- Field Sonde to grab samples comparison rankings for the Waterford River deployment from March 29th to May 3rd are summarized in **Table 3**.
- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

- The poor pH rankings can be attributed to an instrumental error in the field sonde pH sensor during deployment. The pH sensor required time to stabilize, which directly resulted in the pH to read slightly higher then both the QA/QC and the grab sample. The grab sample and QA/QC sonde pH values are more representative of the pH during this deployment period. The marginal ranking during the removal reflects the field sondes pH sensor stabilization and gradual return to baseline values.

Table 2: Comparison rankings for Waterford @ Kilbride station, March 29th – May 3rd, 2011

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Waterford @ Kilbride	March 29th, 2011	Deployment	Excellent	Poor	Good	Fair	N/A
	May 3rd, 2011	Removal	Good	Marginal	Poor	Fair	N/A

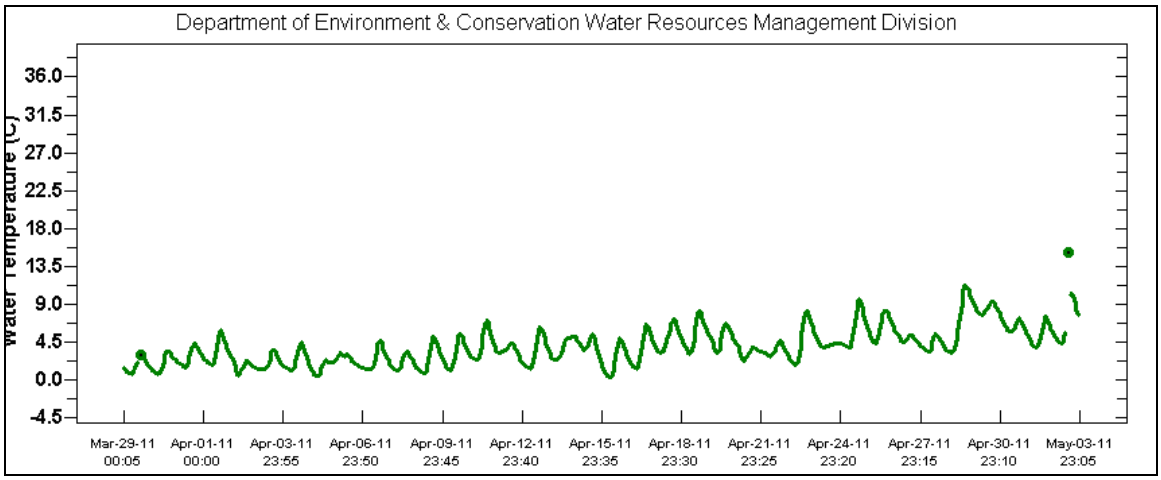
Table 3: Field Sonde to Grab Sample Comparisons for Waterford @ Kilbride station, March 29th – May 3rd, 2011

Parameter	Difference / % Difference	Ranking
pH	1.67	Poor
Specific Conductivity (µS/cm)	7.47	Poor

Data Interpretation

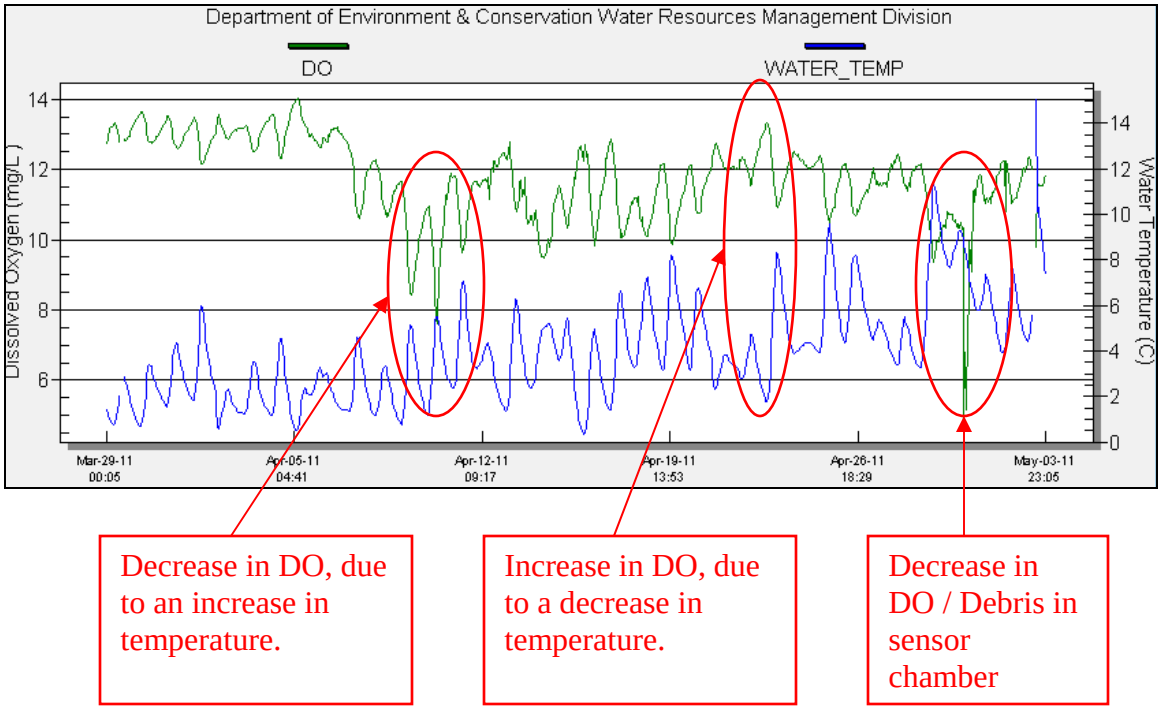
- **Water temperatures** were fairly constant during this deployment, ranging between 0.33 and 11.31^{o}C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

Figure 1: Water Temperature @ Waterford River Station



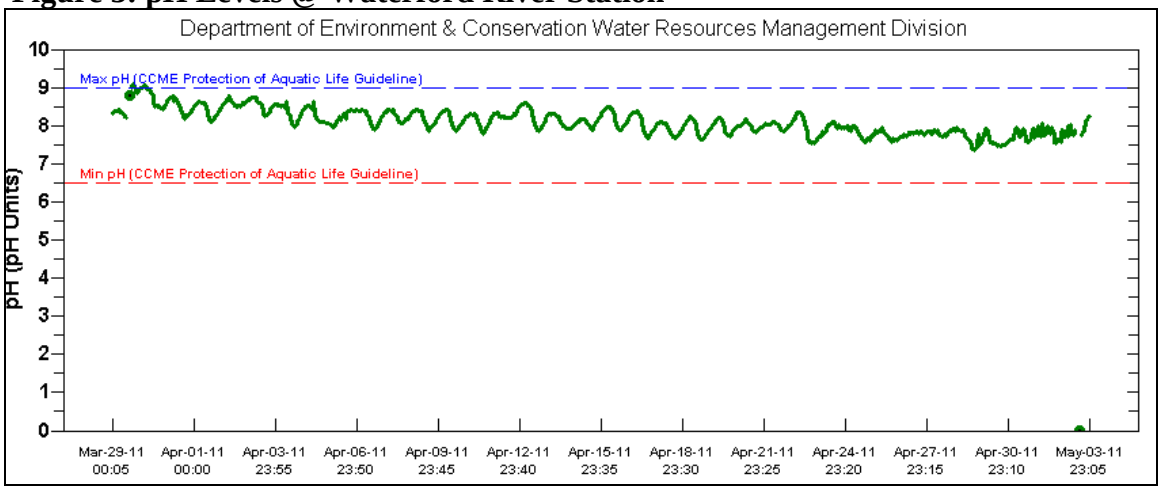
- **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels decrease as water temperature increases. Dissolved oxygen is shown in green and water temperature is shown in blue in **Figure 2**, below. The graph indicates that dissolved oxygen levels peaked at 14.01 mg/L on April 5, the same day that water temperature reached its lowest level of 0.60^{o}C. DO plummeted to its lowest level of 4.71mg/L on April 30, but this appears to be an error. This error can be attributed to a combination of factors. April is representative of a typical spring run-off period during which debris (sand, silt, branches, snow, slush, ice etc) sometimes cause a temporary clogging of the DO sensor chamber, which is then usually flushed out. The decrease in DO is more then likely caused by this clogging effect as opposed to a sensor issue, because the DO values appear to return to background levels within a 24 hour period (approximately). The combination of high temperatures, slight precipitation, and increased runoff lead to this temporary clogging effect of the DO sensor chamber. It looks like water temp also changed significantly when DO plummeted, although not to the same magnitude. The rebound of DO values reflect that this is not a sensor issue, but more likely the clogging effect described above.

Figure 2: Dissolved Oxygen and Water Temperature @ Waterford River Station



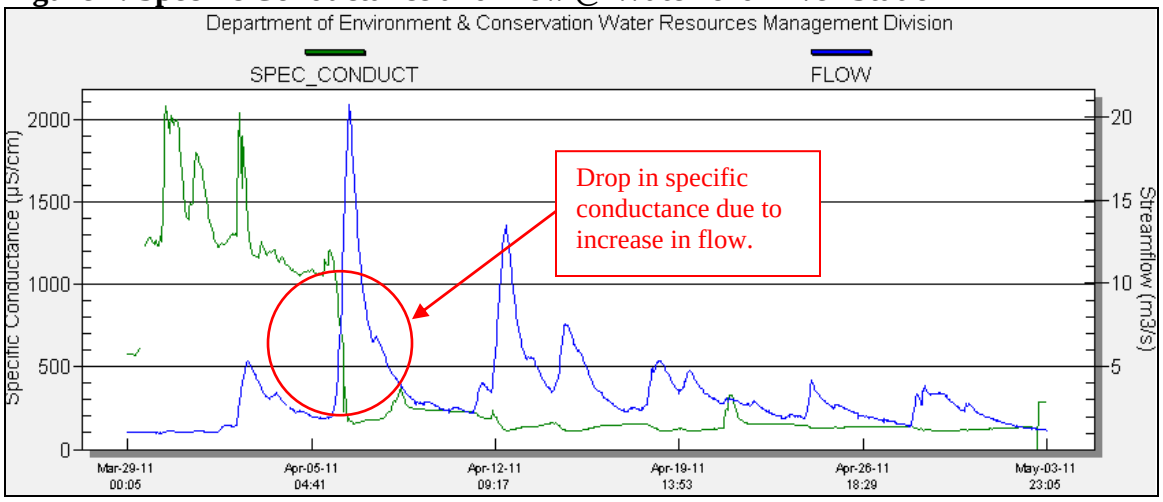
- **pH** levels were fairly constant and within the expected range for this station, with pH values ranging from of 7.35 – 9.08. There was no sudden surges or drops in pH during the specified time frame. There appeared to be a subtle trend in that pH was in a state of continuous decline, gradually throughout the month of April. The majority of the pH values fell within the CCME guidelines for the protection of aquatic life, but as can be seen in **Figure 3,** on March 30 the pH went above the maximum CCME guideline.

Figure 3: pH Levels @ Waterford River Station



- **Specific conductivity** levels peaked fairly high, but within the expected range for Waterford River during this deployment. Specific conductivity levels ranged between 108.3 – 2079 µS/cm and showed sudden increases, generally in response to spring run-off conditions that occurred whenever daily maximum air temperatures rose above 0^{o}C. Specific conductivity data is shown in **Figure 4** below. The Environment Canada Daily Climate Data for April, for the St. John's region, shown below in **Appendix 1**, indicates that maximum daily air temperatures were frequently above 0^{o}C during the month of April, resulting in increased run-off containing significant amounts of road salt entering the river. As well, there were significant precipitation events during the first few days in April, which resulted in an increased runoff, which in turn caused the specific conductivity to spike.

Figure 4: Specific Conductance and Flow @ Waterford River Station



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APPENDIX 1: Weather information for St. John's, NL provided by Environment Canada for April 2011:

	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
Sum				449.7*	0.0*	55.0*	31.8*	86.0*			
Avg	7.0*	-2.0*	2.5*								
Xtrm	15.8*	-8.5*								24*	95*
01†	4.8	-1.3	1.8	16.2	0.0	0.0	T	T	32	16	46
02†	6.4	-0.6	2.9	15.1	0.0	11.8	7.4	19.2	31	26	67
03†	2.6	-1.5	0.6	17.4	0.0	0.0	2.4	2.4	26	25	56
04†	1.2	-7.6	-3.2	21.2	0.0	0.0	T	T	24	34	56
05†	10.0	-6.8	1.6	16.4	0.0	1.2	1.0	2.6	22	18	72
06†	13.2	-0.1	6.6	11.4	0.0	1.6	0.0	1.6	16	24	80
07†	3.6	-2.2	0.7	17.3	0.0	0.0	2.0	2.0	4	36	52
08†	0.3	-6.9	-3.3	21.3	0.0	0.0	2.8	1.6	7	35	46
09†	2.1	-6.6	-2.3	20.3	0.0	0.0	T	T	4	28	37
10†	5.6	-4.2	0.7	17.3	0.0	0.0	0.0	0.0	4	26	39
11†	9.1	-0.2	4.5	13.5	0.0	0.0	0.0	0.0	2	22	78
12†	9.8	-0.7	4.6	13.4	0.0	5.4	T	5.4	T	24	95
13†	6.8	-0.9	3.0	15.0	0.0	0.0	0.0	0.0	T	33	56
14†	11.8	0.9	6.4	11.6	0.0	1.6	0.0	1.6	T	22	69
15†	5.4	-7.4	-1.0	19.0	0.0	0.4	T	0.4	T	1	50
16†	1.1	-8.5	-3.7	21.7	0.0	0.0	T	T	T	27	39
17†	6.4	-2.9	1.8	16.2	0.0	0.8	0.0	0.8	T	19	72
18†	11.4	2.2	6.8	11.2	0.0	5.4	0.0	5.4	T	19	80
19†	12.0	1.0	6.5	11.5	0.0	6.6	0.0	6.6		22	57
20†	5.8	-0.8	2.5	15.5	0.0	0.0	0.0	0.0		29	67
21†	2.7	-2.0	0.4	17.6	0.0	0.6	11.8	12.4	9	29	50
22†	1.6	-4.0	-1.2	19.2	0.0	0.0	1.8	1.8	2	29	57
23†	11.6	-2.8	4.4	13.6	0.0	0.0	0.0	0.0	T	26	41
24†	6.6	1.6	4.1	13.9	0.0	4.8	2.2	7.0	T	19	72
25†	8.6	0.3	4.5	13.5	0.0	T	0.0	T			<31
26†	10.7	3.0	6.9	11.1	0.0	0.0	0.0	0.0		23	44
27											
28†	2.7	-1.1	0.8	17.2	0.0	10.4	0.4	10.8	T	16E	44E
29†	15.8	0.8	8.3	9.7	0.0	T	0.0	T		26	69
30†	12.1	1.1	6.6	11.4	0.0	4.4	0.0	4.4		3	32