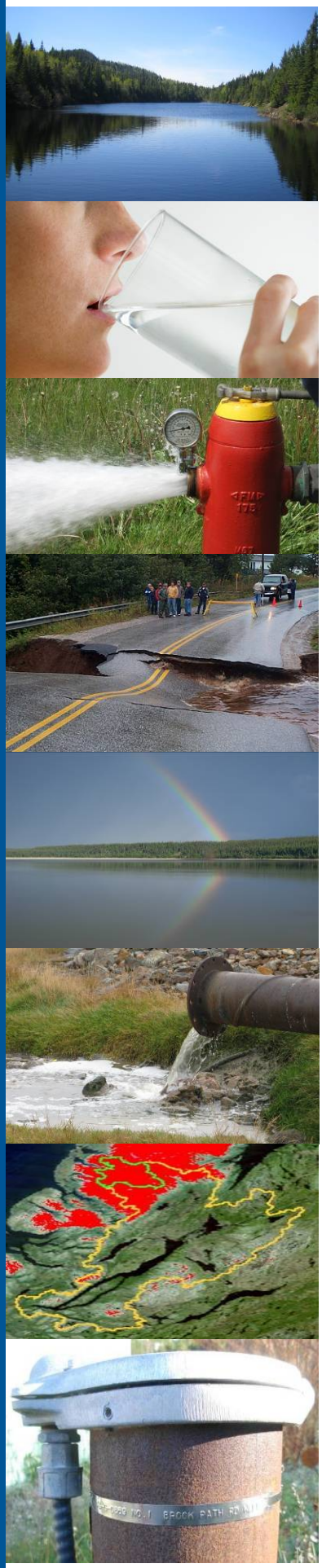


Waterford River @ Kilbride

NF02ZM0009

May to June 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
May - June 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 (May 3rd – June 15th) 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**
May 3rd, 2011	June 15th, 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.

Quality Assurance and Quality Control

- Deployment and removal comparison rankings for the Waterford River deployment from May 3rd to June 15th are summarized in **Table 2**.
- Field Sonde to grab samples comparison rankings for the Waterford River deployment from May 3rd to June 15th are summarized in **Table 3**.
- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

Table 2: Comparison rankings for Waterford @ Kilbride station, May 3rd – June 15th, 2011

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Waterford @ Kilbride	May 3rd, 2011	Deployment	Excellent	Excellent	Poor	Excellent	N/A
	Jun 15th, 2011	Removal	Good	Good	Poor	Marginal	N/A

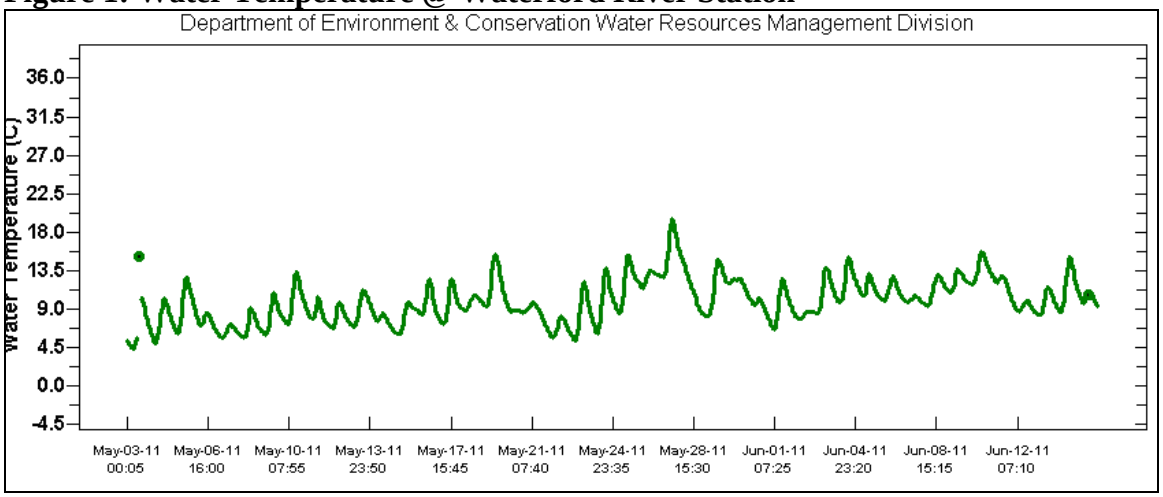
Table 3: Field Sonde to Grab Sample Comparisons for Waterford @ Kilbride station, May 3rd – June 15th, 2011

Parameter	Field Sonde	Grab Sample	Difference / % Difference	Ranking
pH	7.16	7.18	0.02	Excellent
Specific Conductivity (µS/cm)	282.10	521.00	84.69	Poor

Data Interpretation

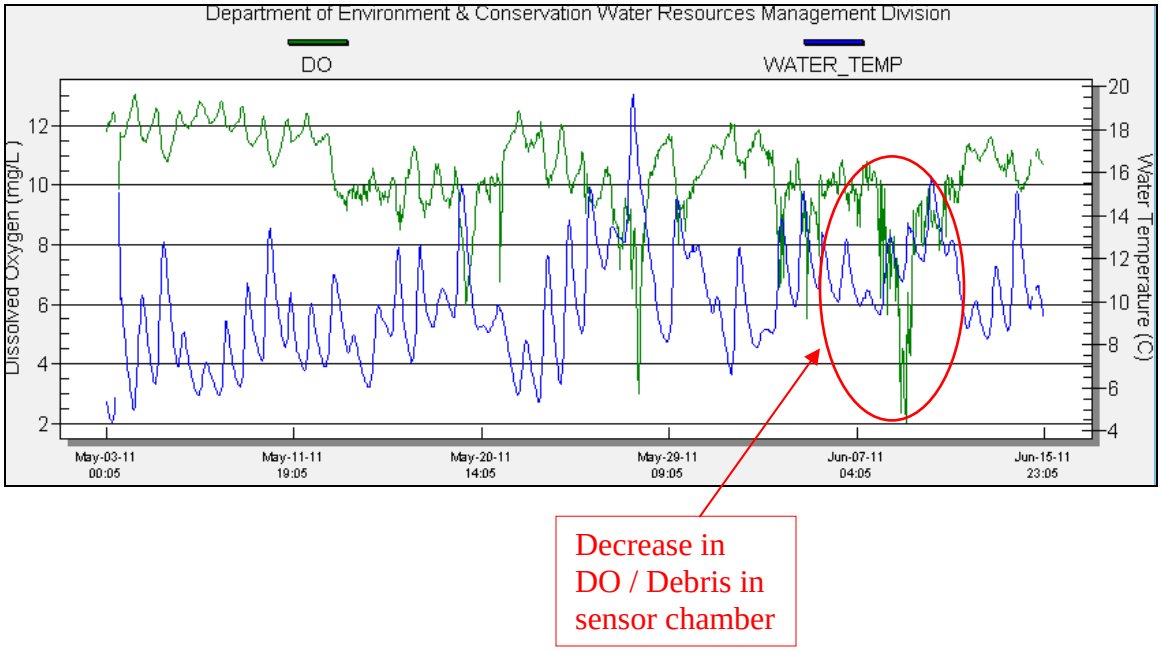
- **Water temperatures** were moderately constant during this deployment, ranging between 5.34 and 19.59 ^{o}C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

Figure 1: Water Temperature @ Waterford River Station



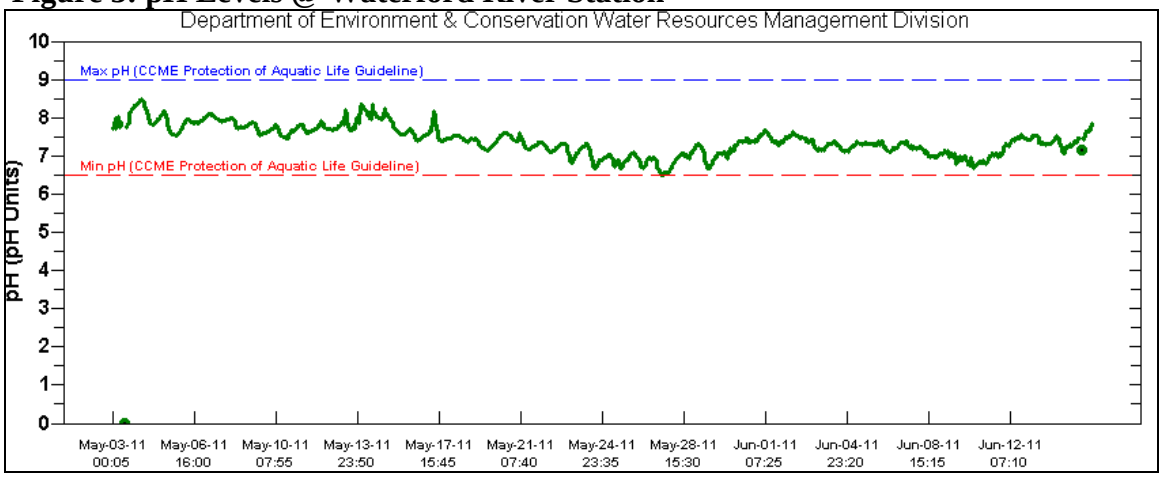
- **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels decrease as water temperature increases. Dissolved oxygen is shown in green and water temperature is shown in blue in **Figure 2**, below. The graph indicates that dissolved oxygen levels peaked at 12.38 mg/L on May 4, the same day that water temperature reached its lowest level of 0.60^{o}C. DO plummeted to its lowest level of 1.95 mg/L on June 9, but this appears to be an error. May through June 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, significant 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



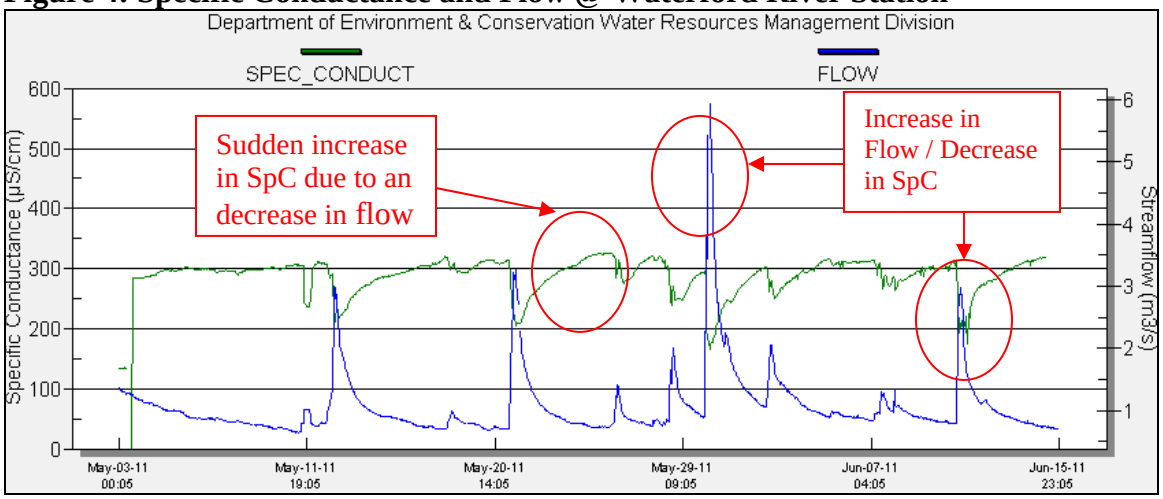
- **pH** levels were fairly constant and within the expected range for this station, with pH values ranging from of 6.48 – 8.34. There was no sudden surges or drops in pH during the specified time frame. The majority of the pH values fell within the CCME guidelines for the protection of aquatic life, but as can be seen in **Figure 3,** on May 27, the pH fell slightly below the CCME guidelines for the protection of aquatic life.

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 165.5 – 572.0 µS/cm and showed sudden increases, generally in response to the after effects of significant precipitation events during May, which resulted in an increased runoff, which in turn caused the specific conductivity to increase.

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 May2011:

Day	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				340.9	0.6	78.8	0.0	78.8			
Avg	11.1	2.9	7.0								
Xtrm	22.1	-2.1								25	61
01†	2.5	-2.1	0.2	17.8	0.0	T	0.0	T		4	46
02†	3.4	-2.1	0.7	17.3	0.0	T	0.0	T		6	39
03†	6.5	-0.1	3.2	14.8	0.0	0.0	0.0	0.0			<31
04†	13.4	0.5	7.0	11.0	0.0	0.0	0.0	0.0		25	54
05†	17.3	1.3	9.3	8.7	0.0	T	0.0	T		26	41
06†	4.3	0.9	2.6	15.4	0.0	0.4	0.0	0.4		12	39
07†	5.7	1.7	3.7	14.3	0.0	0.2	0.0	0.2			<31
08†	6.2	2.0	4.1	13.9	0.0	0.4	0.0	0.4			<31
09†	9.7	2.5	6.1	11.9	0.0	0.0	0.0	0.0			<31
10†	12.0	3.6	7.8	10.2	0.0	0.0	0.0	0.0			<31
11†	8.0	3.4	5.7	12.3	0.0	0.0	0.0	0.0		10	50
12†	7.6	3.7	5.7	12.3	0.0	15.0	0.0	15.0		13	46
13†	14.1	2.8	8.5	9.5	0.0	0.8	0.0	0.8			<31
14†	4.6	2.1	3.4	14.6	0.0	0.4	0.0	0.4		4	32
15†	11.9	2.1	7.0	11.0	0.0	T	0.0	T		27	39
16†	8.1	1.5	4.8	13.2	0.0	0.0	0.0	0.0			<31
17†	10.4	1.8	6.1	11.9	0.0	T	0.0	T			<31
18†	12.2	6.6	9.4	8.6	0.0	2.6	0.0	2.6			<31
19†	18.7	2.4	10.6	7.4	0.0	0.6	0.0	0.6		27	48
20†	12.3	2.3	7.3	10.7	0.0	0.6	0.0	0.6		25	50
21†	12.0	1.0	6.5	11.5	0.0	18.8	0.0	18.8		26	52
22†	4.2	0.9	2.6	15.4	0.0	0.0	0.0	0.0		8	41
23†	6.7	1.4	4.1	13.9	0.0	0.0	0.0	0.0			<31
24†	12.5	1.1	6.8	11.2	0.0	0.0	0.0	0.0		21	39
25†	18.7	5.7	12.2	5.8	0.0	5.4	0.0	5.4		24	54
26†	17.8	10.4	14.1	3.9	0.0	1.6	0.0	1.6		24	46
27†	22.1	15.0	18.6	0.0	0.6	1.0	0.0	1.0		25	61
28†	16.1	3.4	9.8	8.2	0.0	10.2	0.0	10.2		26	37
29†	19.8	4.3	12.1	5.9	0.0	0.4	0.0	0.4		25	54
30†	15.9	8.7	12.3	5.7	0.0	19.0	0.0	19.0		25	59
31†	9.1	1.7	5.4	12.6	0.0	1.4	0.0	1.4		1	52

APPENDIX 2: Weather information for St. John's, NL provided by Environment for June 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				270.2	0.0	100.0	0.0	100.0			
Avg	11.7	6.2	9.0								
Xtrm											
01†	9.5	1.6	5.6	12.4	0.0	0.2	0.0	0.2		21	33
02†	9.7	4.0	6.9	11.1	0.0	6.8	0.0	6.8		20	61
03†	16.9	8.1	12.5	5.5	0.0	T	0.0	T		20	69
04†	14.9	6.7	10.8	7.2	0.0	T	0.0	T		17	39
05†	9.8	6.7	8.3	9.7	0.0	4.0	0.0	4.0			<31
06†	10.9	6.9	8.9	9.1	0.0	1.4	0.0	1.4			<31
07†	8.4	6.6	7.5	10.5	0.0	8.4	0.0	8.4			<31
08†	13.9	7.6	10.8	7.2	0.0	1.6	0.0	1.6			<31
09†	14.6	8.3	11.5	6.5	0.0	0.2	0.0	0.2			<31
10†	18.3	12.4	15.4	2.6	0.0	0.2	0.0	0.2			<31
11†	12.8	3.6	8.2	9.8	0.0	11.2	0.0	11.2		31	44
12†	7.6	3.5	5.6	12.4	0.0	1.6	0.0	1.6		35	56
13†	11.4	5.3	8.4	9.6	0.0	T	0.0	T			<31
14†	11.9	5.5	8.7	9.3	0.0	0.0	0.0	0.0			<31
15†	9.1	5.8	7.5	10.5	0.0	1.6	0.0	1.6		10	50
16†	7.4	5.8	6.6	11.4	0.0	13.6	0.0	13.6		12	46
17†	8.5	5.4	7.0	11.0	0.0	3.2	0.0	3.2			<31
18†	9.7	5.2	7.5	10.5	0.0	0.0	0.0	0.0			<31
19†	8.8	5.0	6.9	11.1	0.0	T	0.0	T		16	50
20†	8.5	6.5	7.5	10.5	0.0	24.8	0.0	24.8		15	69
21†	13.7	7.0	10.4	7.6	0.0	4.0	0.0	4.0		28	37
22†	11.1	5.5	8.3	9.7	0.0	3.0	0.0	3.0		34	33
23†	8.2	5.4	6.8	11.2	0.0	4.2	0.0	4.2		35	46
24†	7.3	5.2	6.3	11.7	0.0	1.2	0.0	1.2		36	46
25†	12.5	5.7	9.1	8.9	0.0	0.0	0.0	0.0			<31
26†	11.6	7.2	9.4	8.6	0.0	2.0	0.0	2.0		17	46
27†	19.4	9.8	14.6	3.4	0.0	1.6	0.0	1.6		26	32
28†	15.0	6.9	11.0	7.0	0.0	0.2	0.0	0.2		28	33
29†	12.2	6.7	9.5	8.5	0.0	0.0	0.0	0.0			<31
30†	17.1	7.4	12.3	5.7	0.0	5.0	0.0	5.0		13	35