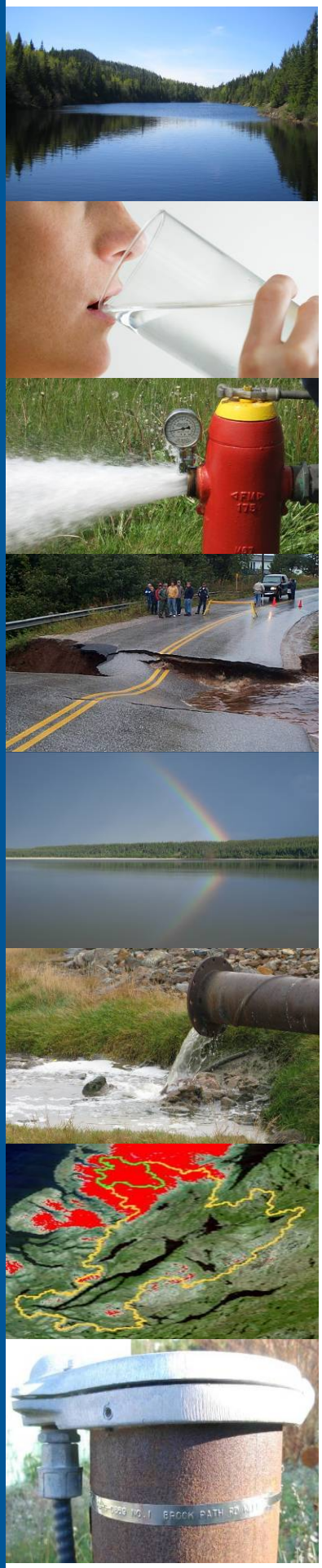


Waterford River @ Kilbride

NF02ZM0009

February to March 2008

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
February - March 2008

General

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

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**
February 15th, 2007	March 27th, 2008

- 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.
- Deployment and removal comparison rankings for the Waterford River deployment from February 15th to March 27th 2008 are summarized in **Table 2**.
- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

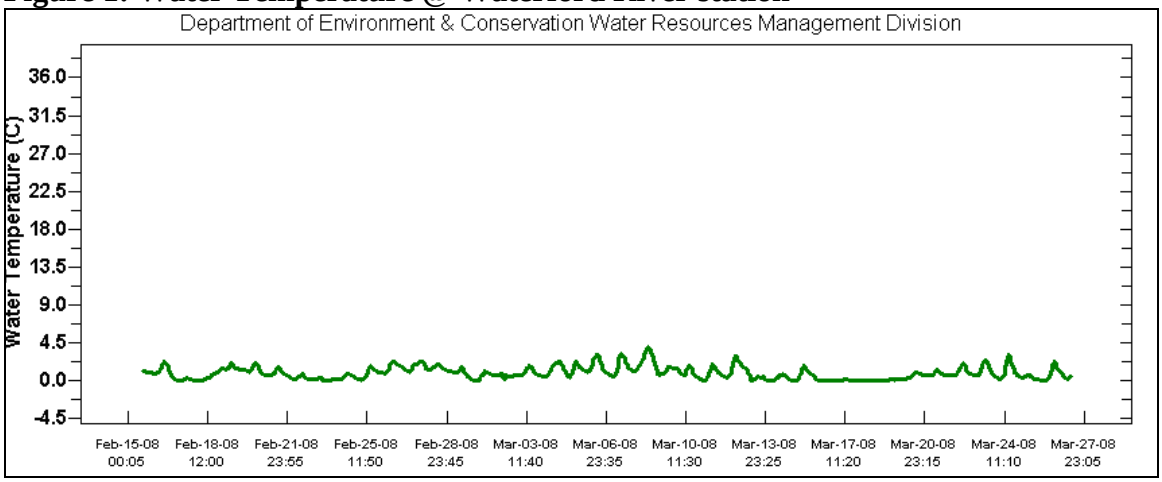
Table 2: Comparison rankings for Waterford @ Kilbride station February 15th – March 27th, 2008

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Waterford @ Kilbride	February 15th, 2008	Deployment	Good	Fair	Excellent	Poor	N/A
	March 27th, 2008	Removal	Fair	Excellent	Good	Poor	N/A

Data Interpretation

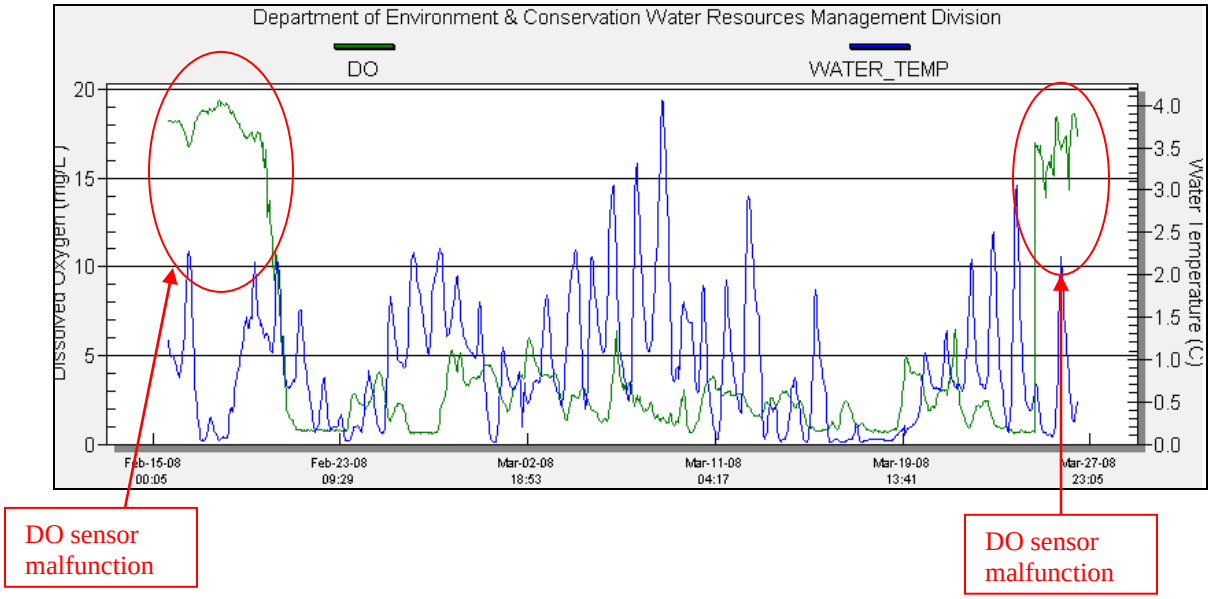
- **Water temperatures** were fairly constant during this deployment, ranging between 0.02 and 4.06°C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

Figure 1: Water Temperature @ Waterford River station



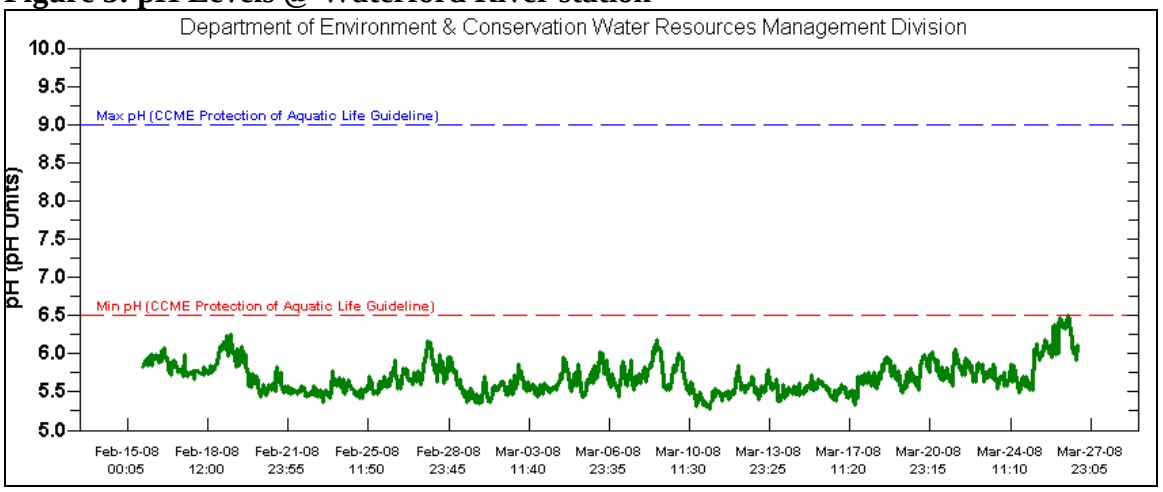
- **Dissolved oxygen (DO)** values were well outside background levels throughout this deployment period, indicating trouble with the functioning of the DO sensor. This can be seen in the "poor" QA/QC ranking in **Table 2**. DO values are therefore not valid for this deployment.

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



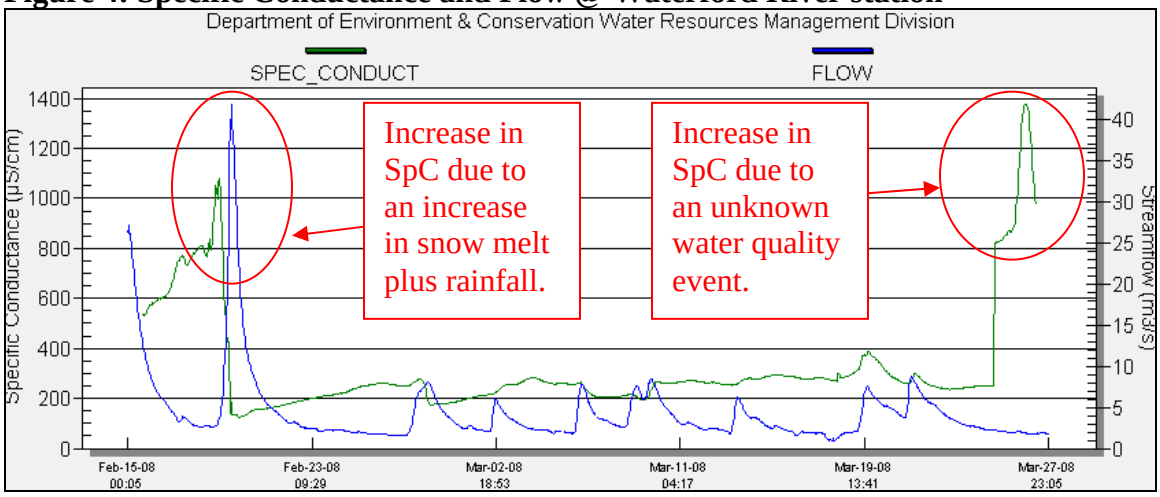
- **pH** levels were fairly constant and were within the expected range for this station, with pH values ranging from of 5.27 – 6.50. It should be noted that during the entire duration of the deployment period, the pH was below the minimum CCME Protection of Aquatic Life Guideline, of 6.5 pH units. This may be indicative of the winter season, when shorter daylight hours result in less photosynthetic activity, and lower pH values.

Figure 3: pH Levels @ Waterford River station



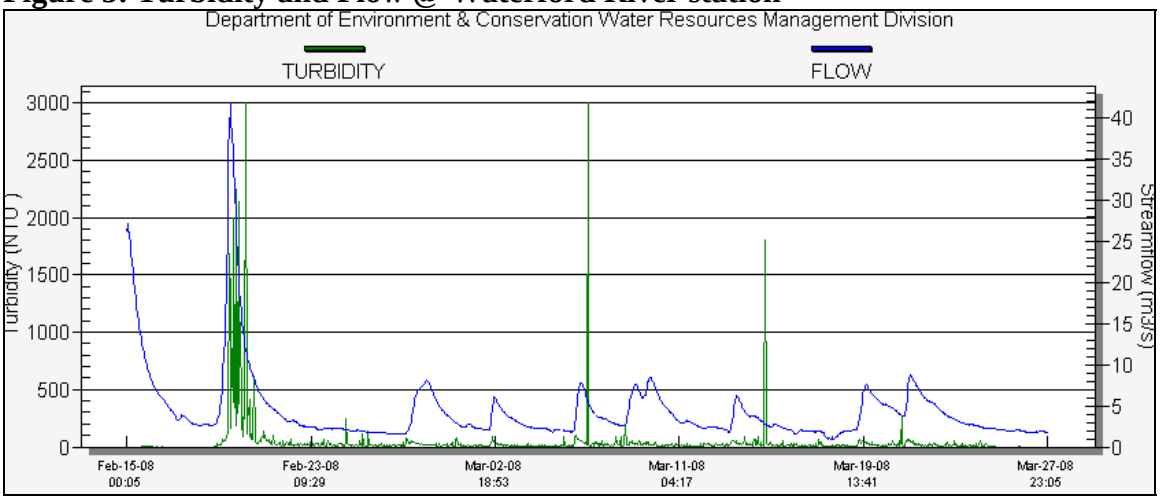
- **Specific conductivity** levels were within the expected range for Waterford River during this deployment. Specific conductivity levels ranged between 122.8.0 - 1376.0 µS/cm and showed sudden increases, generally in response to the aftermath of significant precipitation events. The specific conductivity data for this deployment period is shown in **Figure 4** below. The Environment Canada Daily Climate Data for February and March, for the St. John's region is shown below in **Appendix 1** and **Appendix 2**, and indicates that there were significant precipitation events during these months. The spike seen on February 15th was caused by a combination of snow melt and rainfall. The air temperature and total precipitation shown in **Appendix 1** indicates above zero temperatures with the addition of 35 mm. This is typical for this time of year, as during the winter months, specific conductance generally increases in response to snow melt and precipitation events. This is a direct result of large amounts of road salt washing into the system. The spike seen on March 25th to 26th can be attributed to a water quality event upstream. There was no precipitation and air temperatures were below zero during this period as seen in **Appendix 2**, indicating this spike was caused by a water quality event.

Figure 4: Specific Conductance and Flow @ Waterford River station



- **Turbidity** levels shown in green in **Figure 5** were within the expected range for Waterford River during this deployment, with the exception of a few notable spikes. As can be seen in **Figure 5**, there was a spike on February 19th. This spike was caused by an increase in flow. As can be seen in **Appendix 1**, air temperatures were above zero and there was significant precipitation during this spike. This combination caused an increase in flow which resulted in an increase in turbidity. The spikes seen on March 6th and 14th are not the result of a sensor malfunction but rather an indication that debris passed directly in front of the sensor when it was taking a turbidity reading. The turbidity values returned to background levels as the debris floated by.

Figure 5: Turbidity and Flow @ Waterford River station



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APPENDIX 1: Weather information for St. John's, NL provided by Environment Canada for February 2008:

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				635.6	0.0	70.6	57.1	118.7			
Avg	-0.0	-7.8	-3.9								
Xtrm	10.9	-14.1								19	106
01	-3.4	-7.1	-5.3	23.3	0.0	0.0	0.0	0.0	16	29E	50E
02	1.6	-8.0	-3.2	21.2	0.0	8.4	2.0	10.4	15	15E	72E
03	-0.1	-6.1	-3.1	21.1	0.0	T	0.2	T	13	28E	70E
04	-5.0	-7.2	-6.1	24.1	0.0	0.0	T	T	13	33E	46E
05	-6.1	-12.7	-9.4	27.4	0.0	0.0	T	T	10	33E	41E
06	-2.2	-12.6	-7.4	25.4	0.0	T	3.2	1.8	10	14E	33E
07	-2.3	-4.9	-3.6	21.6	0.0	T	3.2	2.2	13	35E	44E
08	-2.5	-4.9	-3.7	21.7	0.0	0.0	0.2	T	13	3E	35E

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
09	-0.8	-7.5	-4.2	22.2	0.0	0.0	5.8	5.6	18	33E	41E
10	-1.9	-7.3	-4.6	22.6	0.0	0.0	6.0	4.6	18	11E	54E
11	-0.3	-5.5	-2.9	20.9	0.0	0.0	12.8	10.6	22	23E	70E
12	-1.7	-7.6	-4.7	22.7	0.0	0.0	1.4	0.8	26	29E	83E
13	-2.6	-8.4	-5.5	23.5	0.0	0.0	T	T	24	29E	46E
14	8.5	-4.0	2.3	15.7	0.0	35.6	T	35.6	23	19E	106E
15	4.6	-3.8	0.4	17.6	0.0	0.4	T	0.4	11	25E	33E
16	1.8	-12.6	-5.4	23.4	0.0	T	T	T	11	29E	52E
17	-9.1	-14.1	-11.6	29.6	0.0	0.0	0.0	0.0	10	29E	54E
18	6.2	-12.2	-3.0	21.0	0.0	3.2	2.0	4.6	10	22E	72E
19	10.9	0.9	5.9	12.1	0.0	20.2	0.0	20.2	8	22E	85E
20	2.9	-4.2	-0.7	18.7	0.0	0.0	T	T	6	25E	85E
21	-2.0	-10.3	-6.2	24.2	0.0	0.0	0.2	T	6	27E	54E
22	-5.9	-11.0	-8.5	26.5	0.0	0.0	T	T	6	28E	57E
23	-4.3	-9.6	-7.0	25.0	0.0	T	17.5	17.5	6	7E	54E
24	-4.8	-12.1	-8.5	26.5	0.0	0.0	T	T	21	29E	50E
25	0.1	-7.2	-3.6	21.6	0.0	0.0	0.0	0.0	20	25E	35E
26	1.5	-3.6	-1.1	19.1	0.0	0.0	0.0	0.0	20		<31
27	9.4	-5.8	1.8	16.2	0.0	2.2	0.0	2.2	17	18E	70E
28	8.6	-2.2	3.2	14.8	0.0	0.6	0.0	0.6	12	25E	61E
29	-2.2	-13.6	-7.9	25.9	0.0	T	2.6	1.6	11	35E	37E

APPENDIX 2: Weather information for St. John's, NL provided by Environment Canada for March 2008:

	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				666.1	0.0	103.2	119.7	207.6			
Avg	0.1	-7.1	-3.5								
Xtrm	13.8	-15.6								4*	96*
01	-3.8	-15.6	-9.7	27.7	0.0	0.0	T	T	13	16E	56E
02	2.1	-4.0	-1.0	19.0	0.0	11.4	7.0	18.4	9	16E	70E
03	-0.4	-4.5	-2.5	20.5	0.0	0.2	2.0	2.0	11	22E	48E
04	3.5	-6.1	-1.3	19.3	0.0	T	T	T	11	29E	63E
05	-2.0	-7.0	-4.5	22.5	0.0	T	0.0	T	10	17E	72E
06	9.5	-3.4	3.1	14.9	0.0	5.2	0.0	5.2	7	17E	72E
07	0.9	-5.3	-2.2	20.2	0.0	0.0	0.0	0.0	5		<31
08	13.8	-3.6	5.1	12.9	0.0	4.6	0.0	4.6	5	26E	78E
09	5.3	-5.6	-0.2	18.2	0.0	9.8	1.2	12.8	2	26E	76E
10	0.1	-12.8	-6.4	24.4	0.0	0.0	6.0	3.0	6	34E	48E
11	-2.3	-12.2	-7.3	25.3	0.0	0.0	0.0	0.0	5		<31

	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
12	2.4	-6.4	-2.0	20.0	0.0	0.0	T	T	5	16E	46E
13	1.4	-7.4	-3.0	21.0	0.0	12.2	14.8	26.6	10	30E	76E
14	-3.7	-10.5	-7.1	25.1	0.0	0.0	0.5	0.5	7	29E	80E
15	-2.8	-11.8	-7.3	25.3	0.0	0.0	T	T	7	25E	33E
16	-5.4	-8.4	-6.9	24.9	0.0	0.0	20.4	17.8	18	3E	63E
17	-1.4	-8.7	-5.1	23.1	0.0	0.0	37.4	30.3	25	4E	96E
18	-0.2	-1.6	-0.9	18.9	0.0	16.0	1.2	18.8	53	M	M
19	0.6	-1.7	-0.6	18.6	0.0	32.6	0.0	32.6	40	M	M
20	1.1	-1.7	-0.3	18.3	0.0	T	0.0	T	33	M	M
21	3.0	-2.9	0.1	17.9	0.0	11.2	T	11.2	33	16E	63E
22	2.0	-4.2	-1.1	19.1	0.0	0.0	1.8	1.8	28	23E	35E
23	-0.1	-5.8	-3.0	21.0	0.0	0.0	1.0	1.0	27	26E	63E
24	-1.4	-7.6	-4.5	22.5	0.0	0.0	T	T	27	27E	69E
25	-6.3	-9.6	-8.0	26.0	0.0	0.0	6.4	4.2	26	2E	35E
26	-5.6	-10.7	-8.2	26.2	0.0	0.0	0.4	0.4	32	34E	32E
27	1.6	-7.6	-3.0	21.0	0.0	0.0	2.4	2.4	31	17E	70E
28	2.3	-5.9	-1.8	19.8	0.0	0.0	0.0	0.0	32	28E	54E
29	-1.8	-5.8	-3.8	21.8	0.0	T	10.2	8.8	32	2E	44E
30	-1.8	-7.6	-4.7	22.7	0.0	0.0	7.0	5.2	42	1E	57E
31	-6.6	-13.4	-10.0	28.0	0.0	0.0	T	T	38	M	M