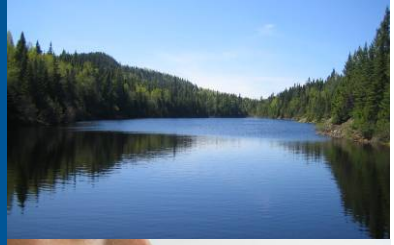
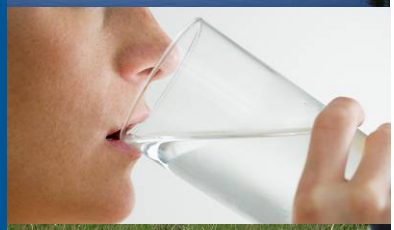



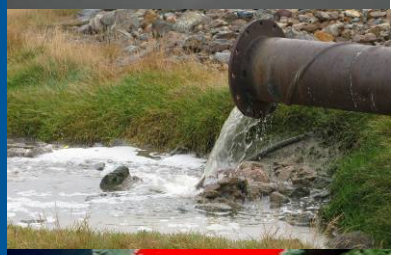


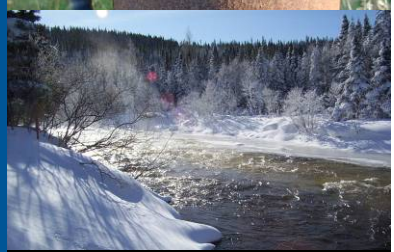

Real Time Water Quality Report
Main River at Paradise Pool

Deployment Period 2010-05-19 to 2010-06-29

2010-07-08

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division

General

- This station is operated cooperatively with Environment Canada.
- This station is operated seasonally from early spring as soon as the site is free of ice up until the late fall before ice forms along the river.
- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated.
- This is a remote site accessible by helicopter only and site visits for QA/QC purposes and the installation of freshly calibrated instruments are conducted by WRMD approximately five or six times per field season.

Maintenance and Calibration of Instrumentation

- After being freshly calibrated the **DataSonde®** for Main River at Paradise Pool was installed for the first time in the 2010 field season on May 19, 2010, and remained deployed continuously until June 29, 2010. At this time the instrument was removed and replaced with a freshly calibrated one.

Quality Assurance / Quality Control (QA/QC) Measures

- As part of the QA/QC protocol, an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. See **Table 1**.

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L) (% Sat)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

Table 1

- Upon deployment, a QA/QC **DataSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field **DataSonde®** for specific conductivity, pH and turbidity parameters. Based on the difference between parameters recorded by the Field **DataSonde®** and QAQC **DataSonde®** and grab sample a qualitative statement is made on the data quality upon deployment. In this incident, a grab sample was not collected during deployment, thus a qualitative statement for these parameters cannot be made.

- At the end of a deployment period, readings are taken in the water body from the Field **DataSonde®** before and after a thorough cleaning in order to assess the degree of biofouling. During calibration in the laboratory, an assessment of calibration drift is made and the two error values are combined to give Total Error (T_e). If T_e exceeds a predetermined data correction criterion, a correction based on T_e is applied to the dataset using linear interpolation. Based on the value for T_e, a qualitative statement is also made on the data quality upon removal.
- The ranking at the beginning and end of the deployment period are shown in **Table 2**.
- With the exception of water quantity data (Stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent Quality Assurance and Quality Control (QA/QC) protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Main River at Paradise Pool (NF02YG0009)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2010-05-19 Deployment	Temp (°C)	Excellent
	pH (units)	NA
	Sp. Conductivity (uS/cm)	NA
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	NA
2010-06-29 Removal	Temp (°C)	Excellent
	pH (units)	Poor*
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Good
	Turbidity (NTU)	Excellent

Table 2

***** It should be note that this poor ranking is due to a malfunctioning pH probe which gave erratic readings well outside the normal range of pH for this site.

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of 5.5 ˚C to a maximum of 20.6 ˚C, with temperature increasing throughout the deployment period.
- As stage decreases, temperature increases, and a sharp rise in stage around mid-June corresponds with a drop in temperature.
- There is a clear diurnal trend with temperature with warming during the day and cooling at night.

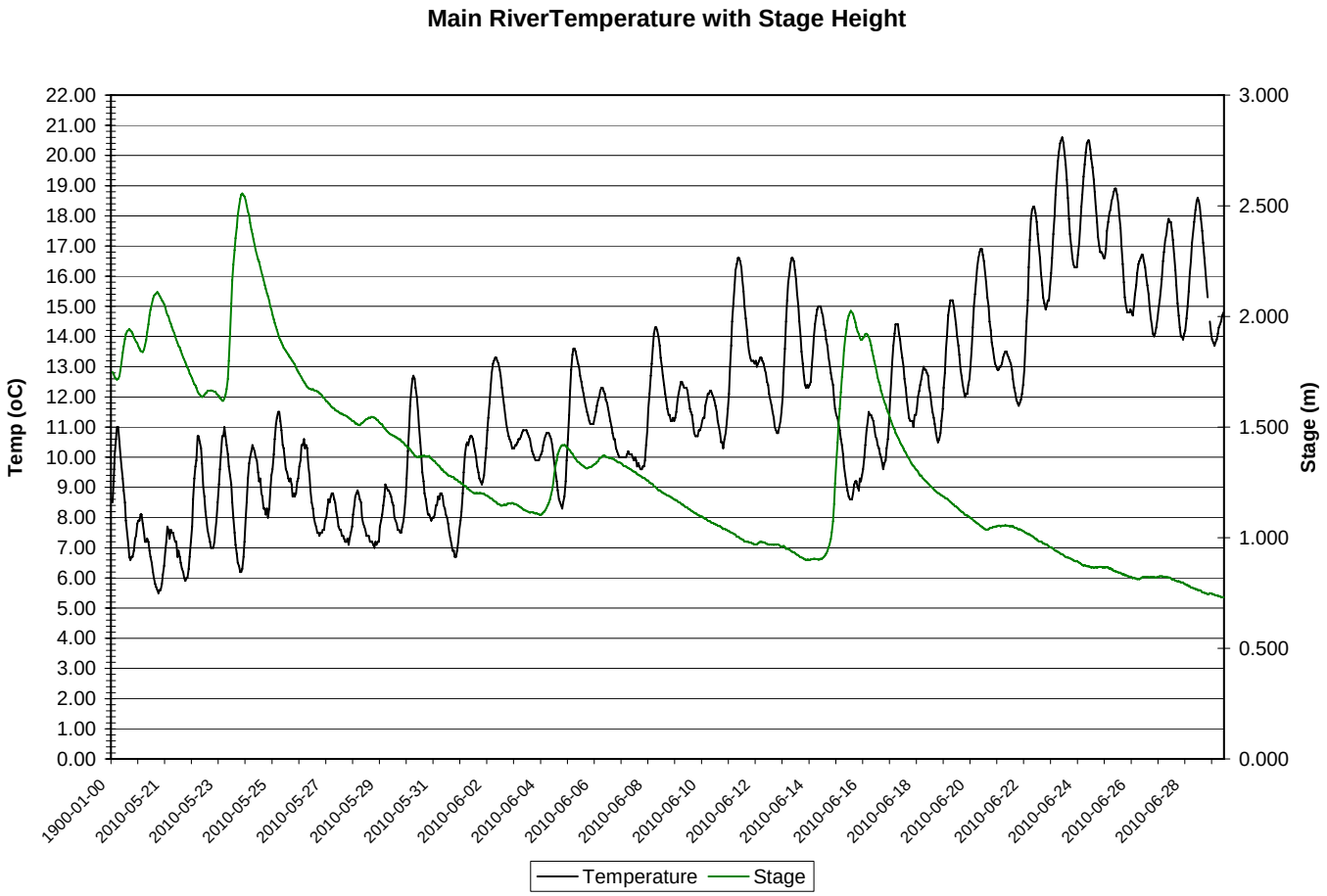

Figure 1

- It appears that after a sharp rise in stage early in the deployment (May 24) that there was a malfunction with the pH probe and readings are not accurate for the remainder of the deployment period (**Figure 2**). Therefore it is impossible to comment on pH for this deployment period.

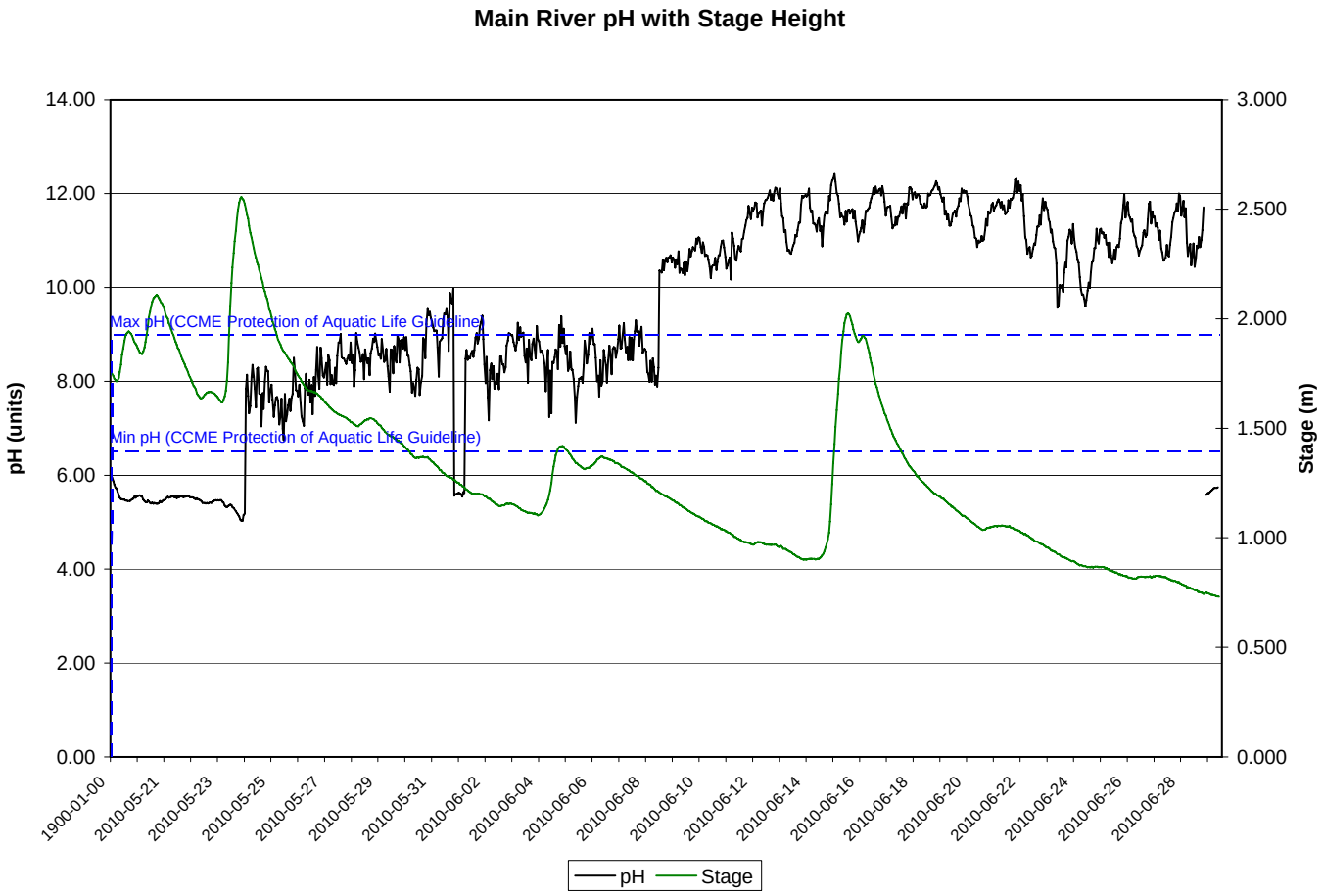

Figure 2

- The specific conductivity **(Figure 3)** ranged from a minimum of 11.7 µS/cm to a maximum of 19.0 µS/cm over the deployment period.
- It appears that as stage height and flow decreased conductivity increased.

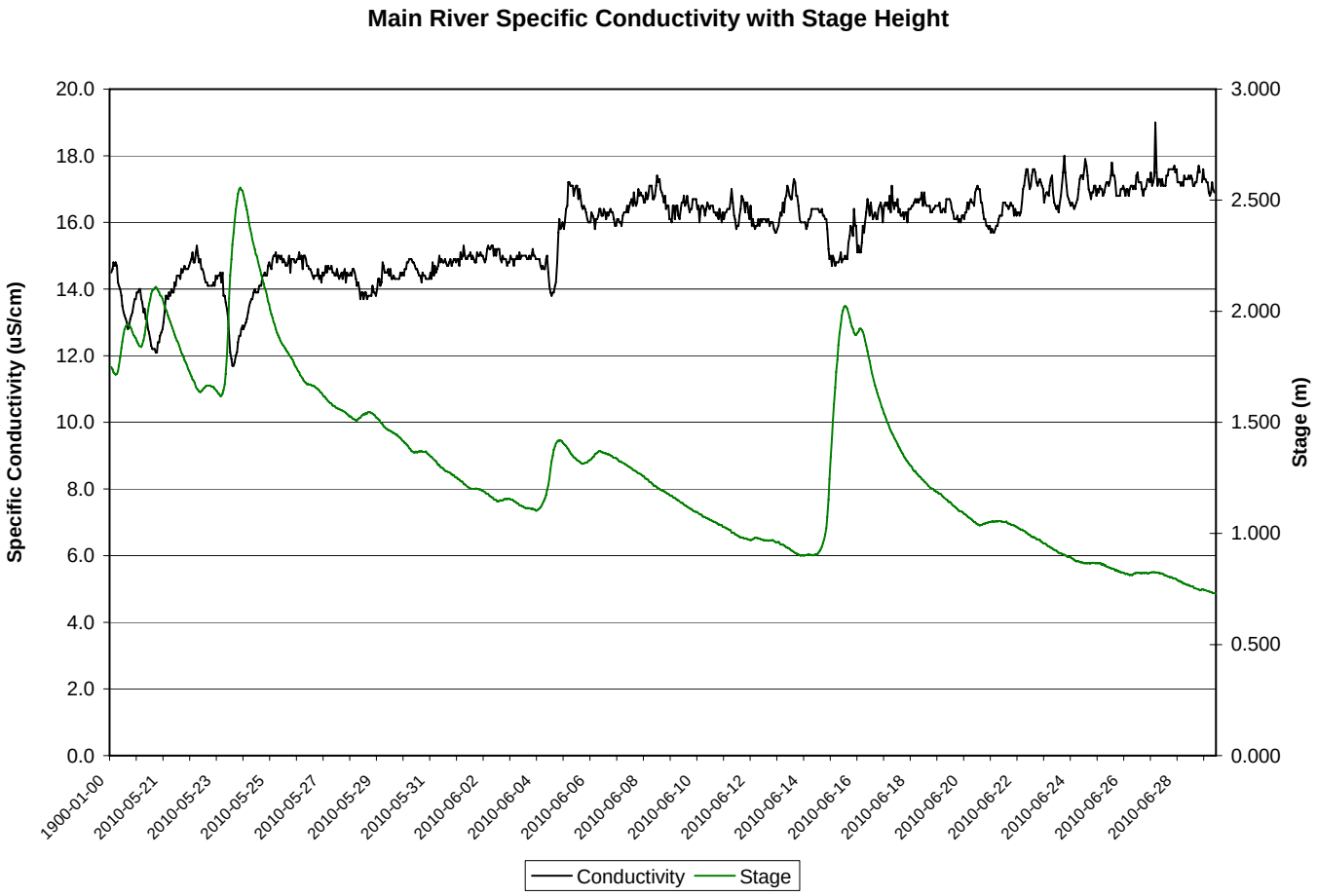

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.1 mg/L to a maximum of 11.59 mg/L over the deployment period. With the percent saturation ranging between 84.1% and 101.0%.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature and a gentle declining trend over the deployment period is related to increasing temperature.
- Throughout the deployment period most of the dissolved oxygen values were above the limits recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. It should be noted that for the latter half of the deployment period some dissolved oxygen values dropped below the 9.5 mg/l CCME Guideline for the Protection of Cold Water Early Life Stages.
- A clear diurnal trend is visible for dissolved oxygen which is related to the diurnal temperature trend.

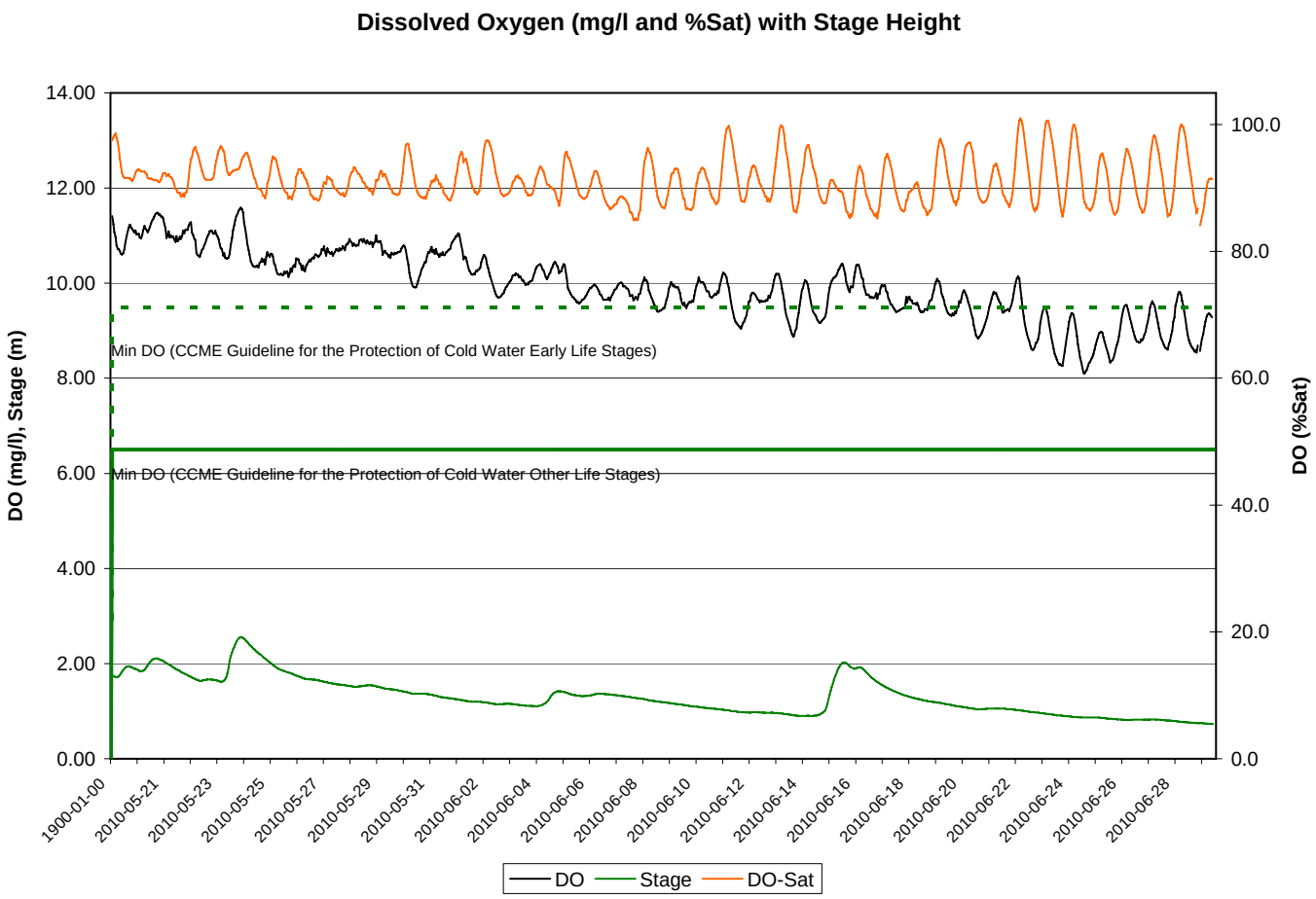

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 0.8 NTU.
- There does not appear to be any clear correlation between turbidity and flow.

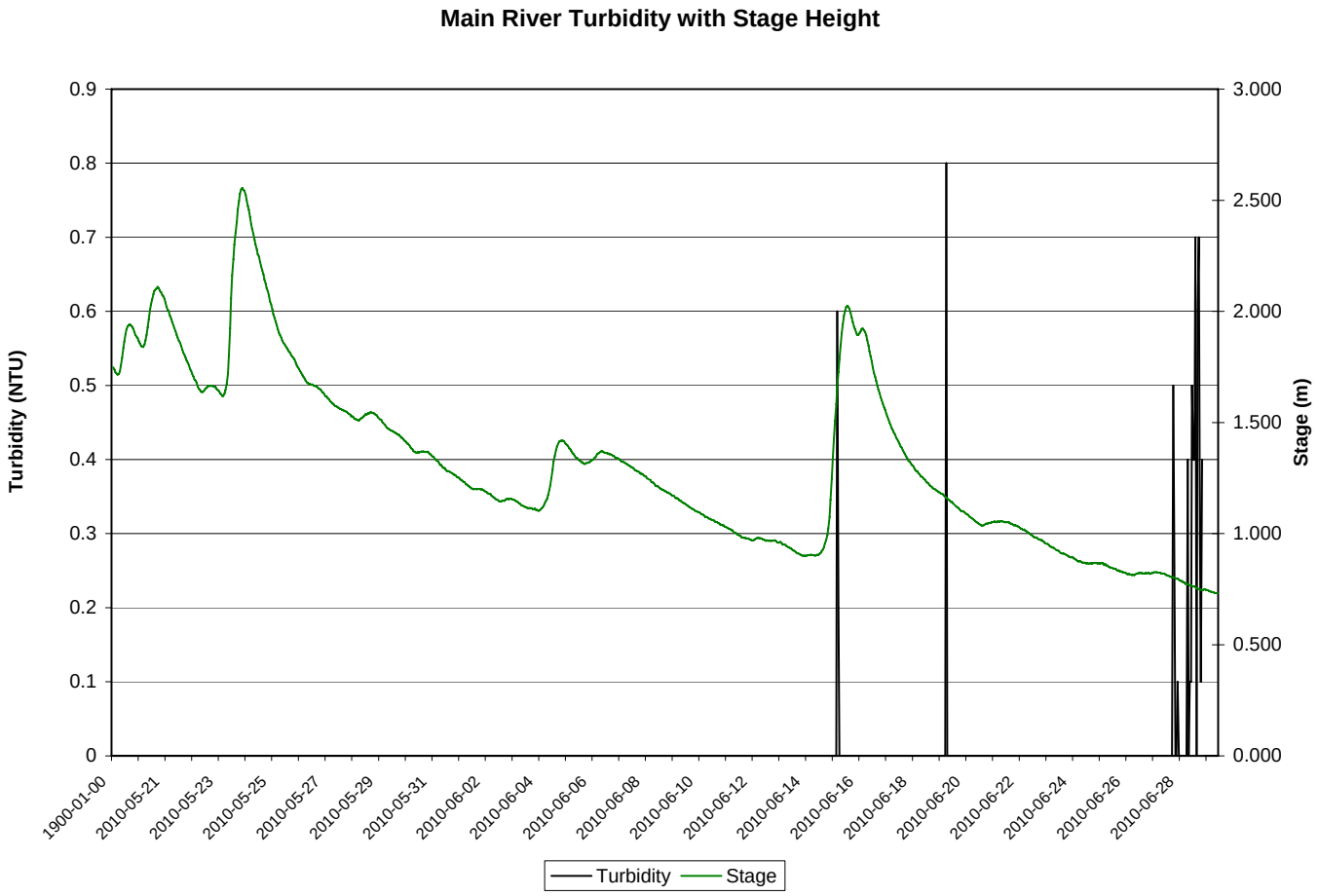

Figure 5

- The stage (**Figure 6)** or water level ranged from a minimum of 0.731 m to a maximum of 2.556 m with the highest peaks presumably resulting from precipitation events.

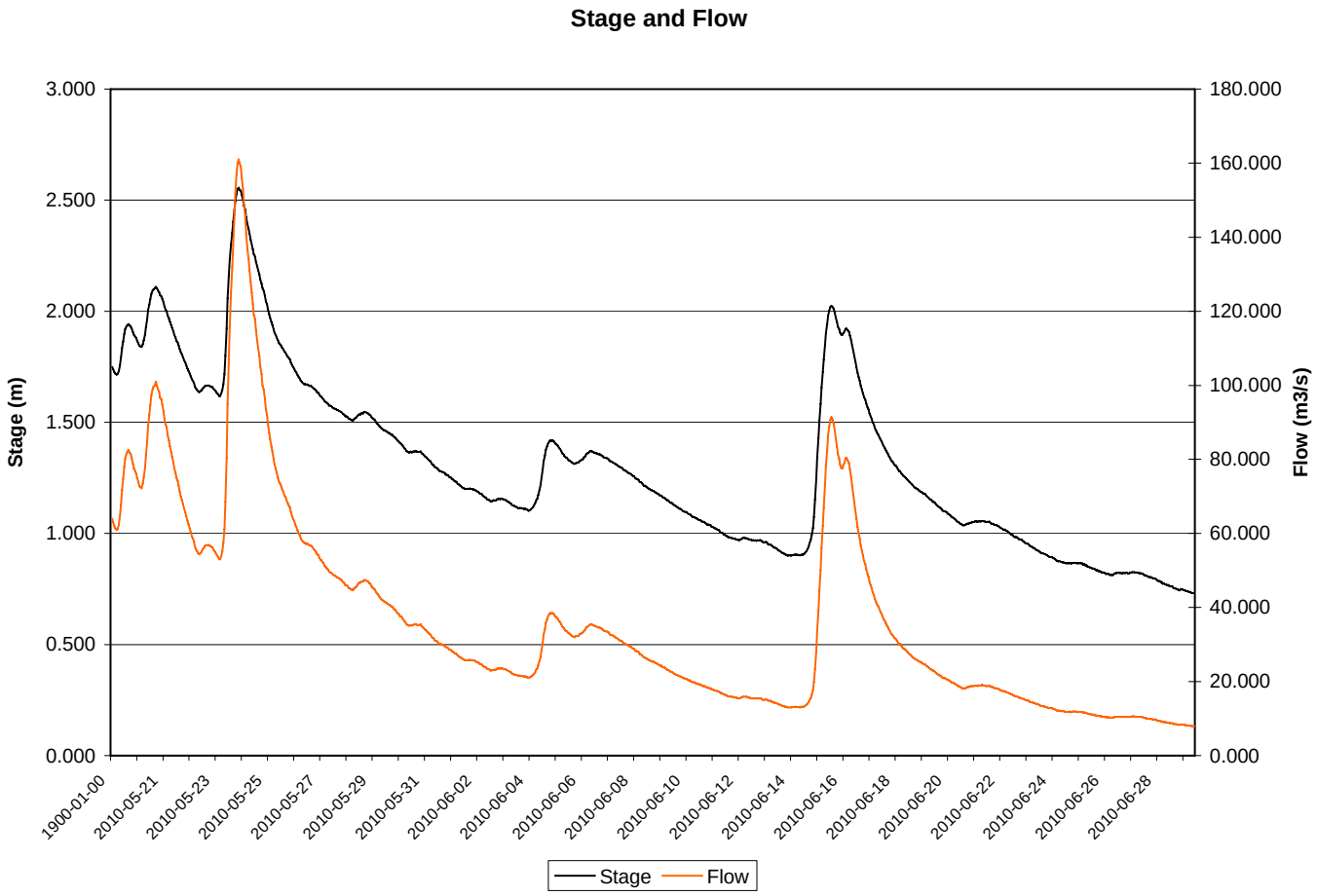

Figure 6

Climate Data

- Climate data for the full deployment period from the nearest station(Daniel's Harbour) is included in Appendix A.

Prepared by:

Ian Bell
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Tel: 709-637-2431
Fax: 709-637-2541
e-mail: ianbell@gov.nl.ca

Appendix A

Climate Data for May

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
19†	15.3	-0.4	7.5	10.5	0.0	M	M	0.5		20	50
20†	15.6	4.3	10.0	8.0	0.0	M	M	7.5		16	70
21†	6.0	1.5	3.8	14.2	0.0	M	M	2.0		32	48
22†	8.4	2.2	5.3	12.7	0.0	M	M	0.0			<31
23†	10.3	4.4	7.4	10.6	0.0	M	M	12.0		21	82
24†	7.6	2.1	4.9	13.1	0.0	M	M	0.0		3	32
25†	9.1	3.7	6.4	11.6	0.0	M	M	0.0			<31
26†	7.2	4.3	5.8	12.2	0.0	M	M	2.5		35	57
27†	9.6	3.2	6.4	11.6	0.0	M	M	2.0		36	57
28†	10.4	2.8	6.6	11.4	0.0	M	M	0.5		4E	56E
29†	12.5	2.3	7.4	10.6	0.0	M	M	0.0		36	37
30†	15.7	1.3	8.5	9.5	0.0	M	M	0.0		35E	39E
31†	9.1	3.4	6.3	11.7	0.0	M	M	0.0		3	54
Sum				**393.5**	**0.0**	**M**	**M**	**126.5**			
Avg	**8.5**	**2.1**	**5.28**								
Xtrm	**15.7**	**-2.7**								**21**	**89**

Climate Data for June

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
01†	10.6	2.8	6.7	11.3	0.0	M	M	0.0			<31
02†	10.9	4.6	7.8	10.2	0.0	M	M	0.0			<31
03†	9.7	5.7	7.7	10.3	0.0	M	M	2.5		21E	56E
04†	M	6.1E	M	M	M	M	M	M			<31
05†	13.3	4.2	8.8	9.2	0.0	M	M	3.5		27	46
06†	14.9	7.0	11.0	7.0	0.0	M	M	4.0		7E	35E
07†	12.0	5.7	8.9	9.1	0.0	M	M	5.5		13	56
08†	9.1	5.1	7.1	10.9	0.0	M	M	1.0		20	63
09†	8.7	5.2	7.0	11.0	0.0	M	M	0.0			<31
10†	9.8E	5.3E	7.6E	10.4E	0.0E	M	M	0.5E		20E	57E
11†	18.1	8.4	13.3	4.7	0.0	M	M	0.0		20	70
12†	13.9	5.9	9.9	8.1	0.0	M	M	0.5		21E	32E
13†	16.1	5.7	10.9	7.1	0.0	M	M	0.0		21	56
14†	17.0	7.8	12.4	5.6	0.0	M	M	13.0			<31
15†	8.8	5.5	7.2	10.8	0.0	M	M	23.0		36	91
16†	10.0	4.3	7.2	10.8	0.0	M	M	3.5		34	70
17†	10.7	3.4	7.1	10.9	0.0	M	M	0.0			<31
18†	13.0	4.8	8.9	9.1	0.0	M	M	12.0			<31
19†	16.9	5.3	11.1	6.9	0.0	M	M	0.0		20	39
20†	17.3	10.0	13.7	4.3	0.0	M	M	4.0			<31
21†	17.5E	10.0E	13.8E	4.2E	0.0E	M	M	0.0		M	M
22†	13.3	5.7	9.5	8.5	0.0	M	M	0.0		21	56

23†	17.3	11.2	14.3	3.7	0.0	M	M	0.0	21	63
24†	16.0	10.2	13.1	4.9	0.0	M	M	0.5	14	41
25†	16.9	9.1	13.0	5.0	0.0	M	M	6.0	21E	72E
26†	15.2	8.8	12.0	6.0	0.0	M	M	5.0	20E	46E
27†	12.0	8.6	10.3	7.7	0.0	M	M	0.0	22	54
28†	13.3	6.9	10.1	7.9	0.0	M	M	0.0	20	48
29†	19.1	6.9	13.0	5.0	0.0	M	M	0.0	11E	33E
Sum				**225.4***	**0.0***	**M**	**M**	**85.0***		
Avg	**13.7E**	**6.7E**	**10.19E**							
Xtrm	**19.1E**	**2.8E**							**36***	**91**