Real-Time Water Quality Monitoring
2007 Annual Report
NF02ZK0009 - Come by Chance

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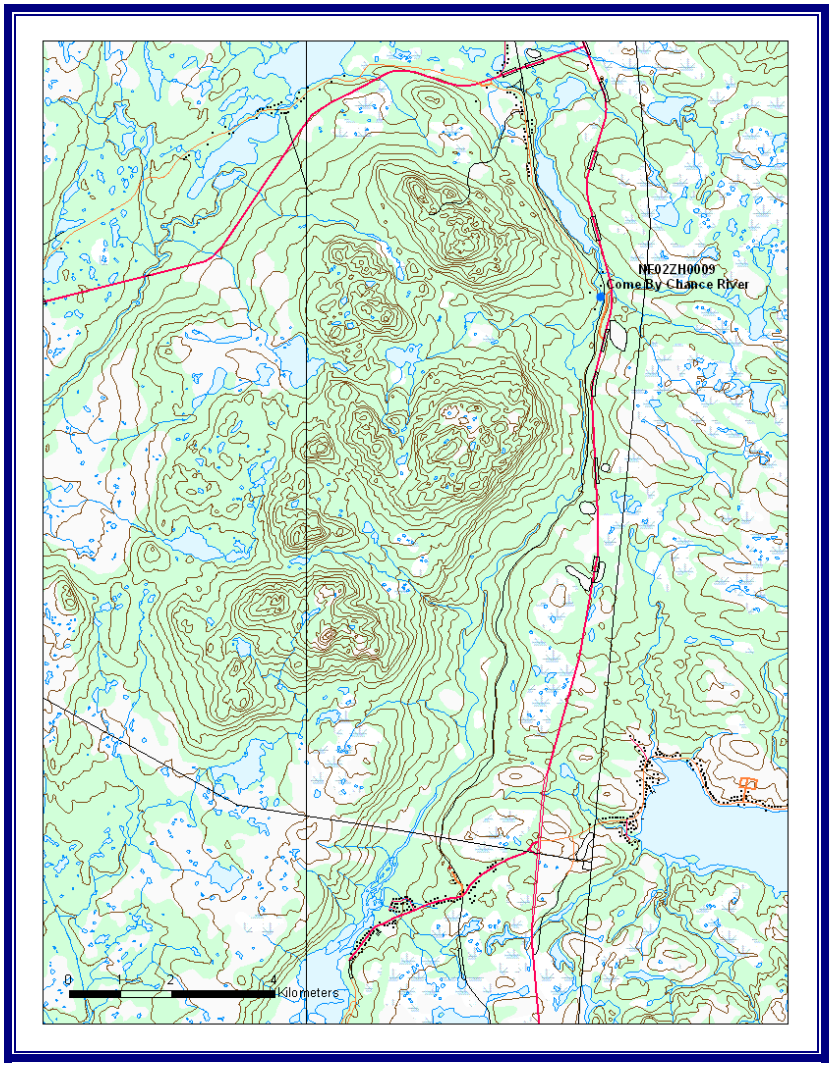
Section 1.0 Introduction

Real-Time Water Quality Monitoring began in Come by Chance in the summer of 2007 with the establishment of a surface water station which was operational for the remainder of the calendar year. The real-time station has provided invaluable baseline water quality information since installation. This real-time water quality station can be seen in **Figure 1**. This report will cover data collected since the initial installation on June 11, 2007 to December 31, 2007 referred to as the reporting period.

Despite the site being installed on June 11, online communication was not established until June 18 for most parameters, as a result most graphs will have a June 18 start date except for temperature and stage which were communicating on installation. During the reporting period, the site experienced two periods of data unavailability, referred to as data gaps. The first data gap was over the period of August 2 to August 21 and was due to transmission problems and the second data gap occurred over the period of October 11 to October 29 while a new hut was installed on site. Throughout the year, regular maintenance/calibration activities occurred approximately every 30 days resulting in short data gaps.

Figure 1: Site Location



Section 2.0 Maintenance/Calibration

It is recommended by the Department of Environment and Conservation (DOEC) that regular maintenance/calibration take place on a monthly basis in order to ensure accuracy of the data from the real-time water quality monitoring station. **Table 1** identifies the dates that the instrument was removed/reinstalled for regular maintenance and calibration in 2007. It is important to note that some deployment periods were longer than thirty days due to such issues as staff availability.

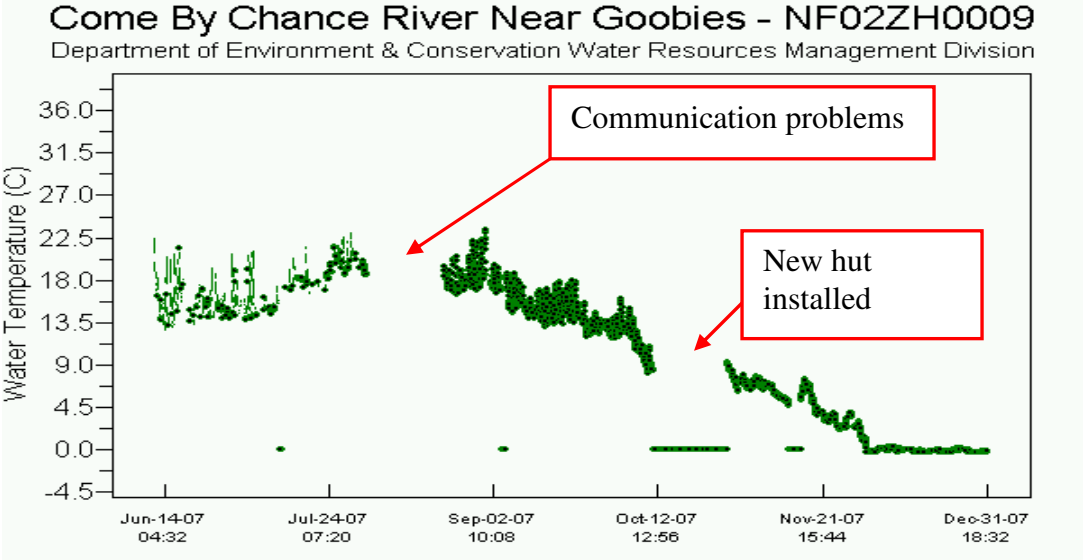
Table 1: Dates of Maintenance/Calibration of Instruments

Item Number	Date and time instrument was removed (mm/dd/yy)		Date and time Instrument was reinstalled (mm/dd/yy)		Reason	Remarks
1			06/11/07	10:00	Initial Installation	
2	07/12/07	11:15	07/13/07	11:45	Maintenance/Calibration	
3	09/04/07	11:10	09/05/07	11:20	Maintenance/Calibration	Limited staff availability
4	10/11/07	10:30	10/18/07	12:15	Maintenance/Calibration	
5	11/13/07	12:08	11/16/07	09:17	Maintenance/Calibration	
6	12/11/07	11:20	12/13/07	13:45	Maintenance/Calibration	

Section 3.0 Data Interpretation

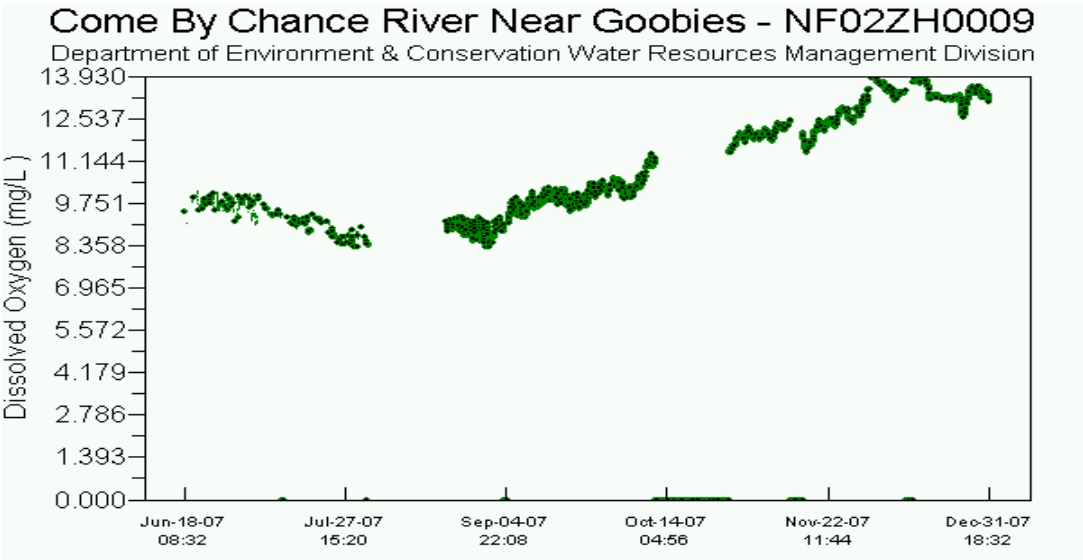
Seasonal variation in the water temperature (**Figure 2**) is clear, with a temperature range of -0.32 to 23.35ºC during the reporting period. Maximum temperature readings occurred soon after the initial installation during the summer months while minimum temperature values were recorded in December.

Figure 2: Temperature



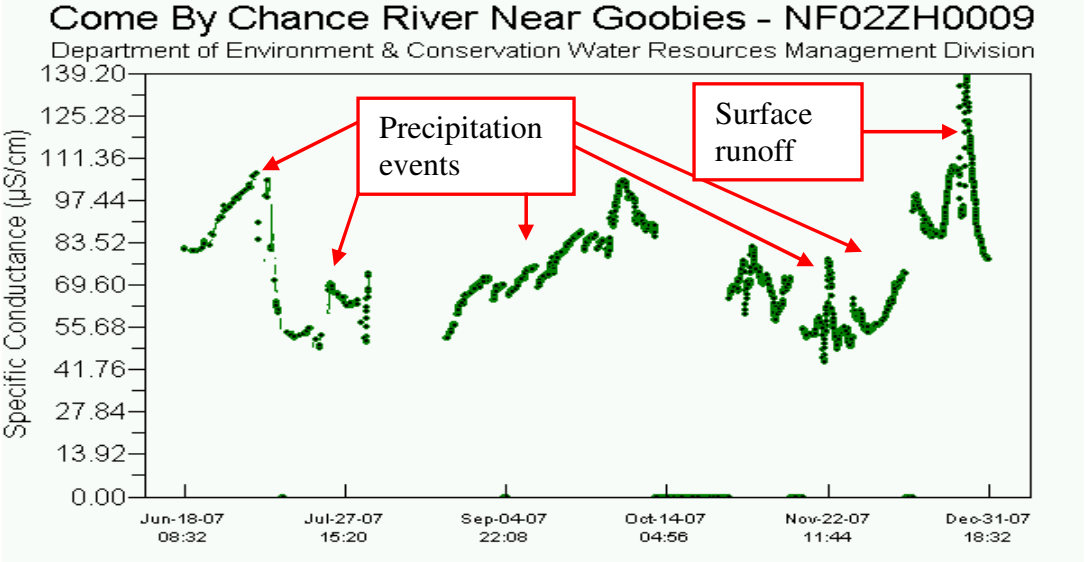
Dissolved oxygen (DO) (**Figure 3**) generally correspond inversely with temperature values. DO had a range of 8.25 to 13.93 mg/L. The majority of DO values were above the most conservative concentration of 9.5 mg/L recommended by the Canadian Council of Ministers of the Environment (CCME) Protection of Freshwater Aquatic Life Guidelines.

Figure 3: Dissolved Oxygen



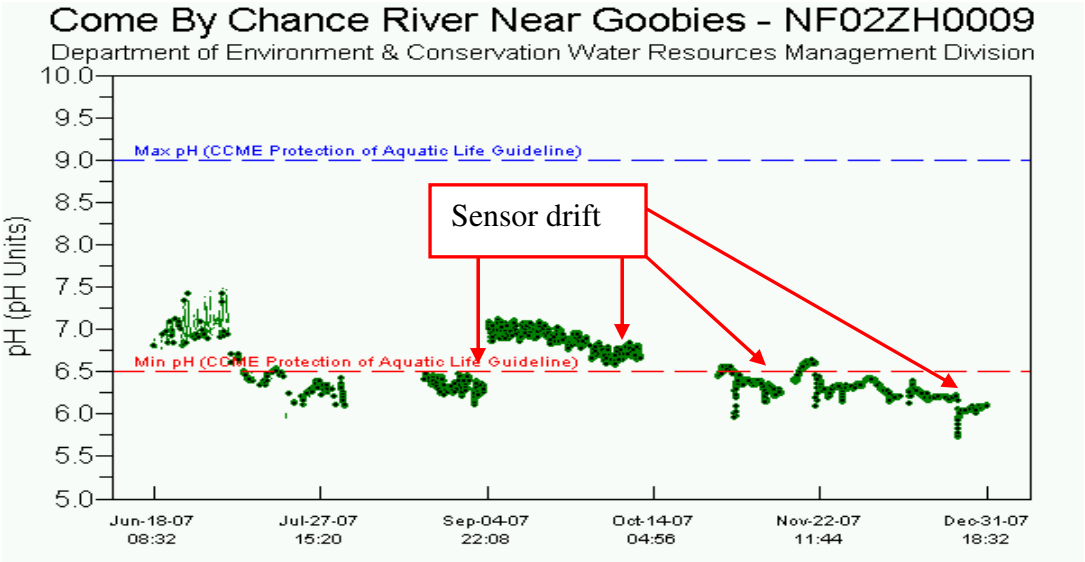
Specific conductivity values (**Figure 4**) had a range of 44.0 to 139.2 µS/cm over the reporting period. This range indicates that some ions (contaminants) are entering the system. Most increases in specific conductivity are attributed to precipitation events (Appendix A for climate data). A spike in December is attributed to a period of mild temperature, influencing snow-melt and surface run-off.

Figure 4: Specific Conductance



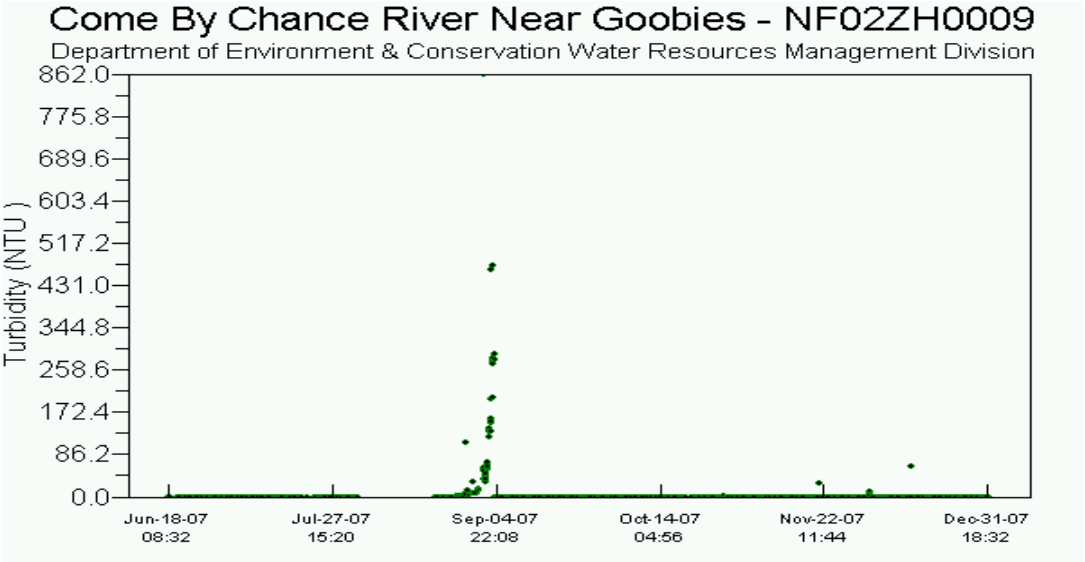
pH values (**Figure 5**) had a range of 5.72 to 7.5 over the reporting period and showed signs of sensor drift towards the end of some of the deployment periods. Many pH values fell below the lower CCME Protection of Aquatic Life guideline (6.5-9.0) due to the naturally acidic nature of NL waters.

Figure 5: pH



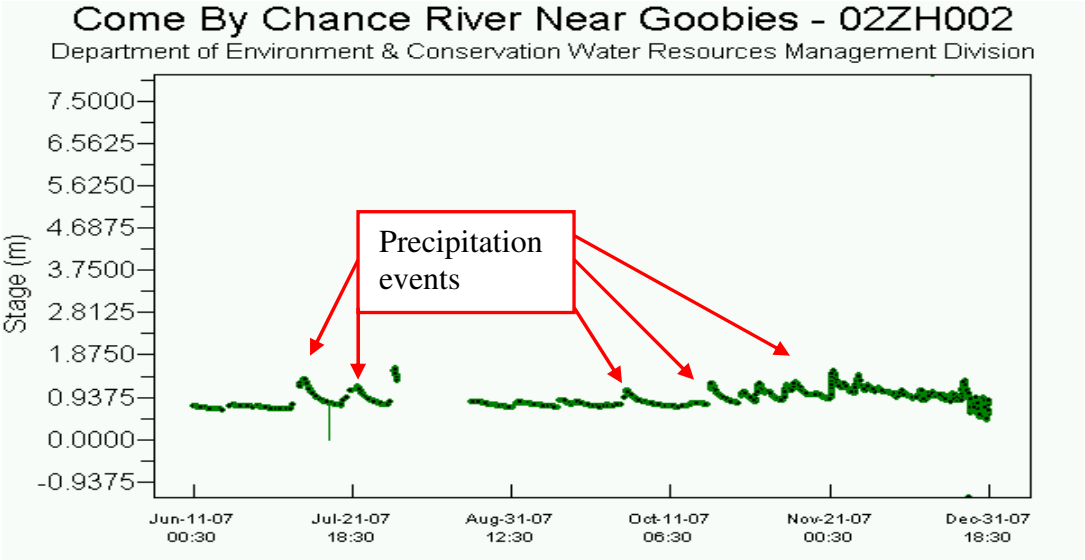
Turbidity values (**Figure 6**) remained relatively stable throughout the year at zero NTU. Towards the end of a longer than normal deployment period, July 13 to September 4, turbidity values rose to a maximum value of 862 NTU, on removal it was noted that the turbidity sensor was fouled.

Figure 6: Turbidity



Stage values (**Figure 7**) ranged from 0.439 to 1.575 meters and correspond to precipitation events (Appendix A for climate data) throughout the reporting period. The most significant precipitation events occurred in early July, mid August, mid October and throughout November.

Figure 7: Stage



Overall, the Come by Chance station displayed consistent values for all measured parameters over the 2007 reporting period. Most variation in parameter values over the year have been attributed to natural conditions including precipitation events and seasonal variation as well as and sensor drift and sensor fouling.

Section 4.0 Quality Assurance/Quality Control (QA/QC) Measures

Quality Assurance/Quality Control (QA/QC) measures are a very important aspect of the Real-Time Water Quality Monitoring Site at Come by Chance. These measures are put in place to ensure that the instruments are reading data accurately. The QA/QC procedures established by DOEC are two-fold:

1) Data from the water quality monitoring instrument in-situ, Datasonde, were compared to data from a portable instrument in-situ, Minisonde, at the time of redeployment after maintenance/calibration procedures have been performed; data must fall within a specified range. **Table 2** summarizes the QA/QC results comparing the field readings against the QA instrument.

2) Grab water samples are taken from each station at the time of redeployment and sent to a laboratory for analysis; the results are then compared to those of the water quality monitoring instrument in-situ (Datasonde); data must fall within a specified range. **Table 3** summarizes the QA/QC results comparing the Datasonde readings against the laboratory results (three parameters were available for comparison– pH; conductivity; turbidity).

As can be seen in **Table 2**, the QA/QC comparison between the field instrument and the QA instrument at the time of redeployment was generally excellent or good. Fair and poor rankings for the initial site installation rankings are below tolerable levels but due to communication problems this was not noticed until the site was online one week later and there was also a time delay in the comparison values that would have negatively influenced the rankings. A very similar problem occurred for the October 18th installation.

As can be seen in **Table 3**, the QA/QC comparison between the field instrument and laboratory data at the time of redeployment was generally good or excellent. There were two instances of poor rankings, one for turbidity and one for conductivity. This has recently been encountered with a variety of the QA/QC samples for a number of other real-time water quality samples and will be looked at in more detail in 2008.

Table 2: QA/QC Results (Datasonde vs. Minisonde)

Reinstallation Date	Parameters	Datasonde Data	Minisonde Data	Rating
	Temp (°C)	20.91	19.78	Poor
	pH (units)	6.83	6.43	Good
	Conductivity (µS/cm)	75.5	59.8	Poor
6/11/2007	Dissolved Oxygen (mg/L)	9.24	8.66	Fair
	Temp (°C)	17.26	17.04	Good
	pH (units)	6.34	6.32	Excellent
	Conductivity (µS/cm)	53.7	52.5	Excellent
7/13/2007	Dissolved Oxygen (mg/L)	9.27	9.37	Excellent
	Temp (°C)	18.07	17.13	Marginal
	pH (units)	7.07	6.69	Good
	Conductivity (µS/cm)	66.2	66.1	Excellent
9/5/2007	Dissolved Oxygen (mg/L)	9.44	9.45	Excellent
	Temp (°C)	9.25	7.2	Poor
	pH (units)	6.43	6.55	Excellent
	Conductivity (µS/cm)	65	81.1	Poor
10/18/2007	Dissolved Oxygen (mg/L)	11.45	11.84	Good
	Temp (°C)	5.28	5.16	Excellent
	pH (units)	6.41	5.95	Good
	Conductivity (µS/cm)	55.1	54.5	Excellent
11/16/2007	Dissolved Oxygen (mg/L)	12.07	12.12	Excellent
	Temp (°C)	0.05	0.16	Excellent
	pH (units)	6.12	6	Excellent
	Conductivity (µS/cm)	93.6	94.1	Excellent
12/13/2007	Dissolved Oxygen (mg/L)	13.73	13.88	Excellent

Table 3: QA/QC Results (Datasonde vs. Laboratory)

Reinstallation Date	Parameters	Datasonde Data	Laboratory Data	Rating
6/11/2007	pH (units)	6.83	6.76	Excellent
	Conductivity (µS/cm)	75.5	76	Excellent
	Turbidity (NTU)	0.0	0.4	Good
7/13/2007	pH (units)	6.34	6.54	Excellent
	Conductivity (µS/cm)	53.7	55	Excellent
	Turbidity (NTU)	0.0	0.9	Marginal
9/5/2007	pH (units)	7.07	6.72	Good
	Conductivity (µS/cm)	66.2	66	Excellent
	Turbidity (NTU)	0.0	3	Poor
10/18/2007	pH (units)	6.43	6.98	Fair
	Conductivity (µS/cm)	65	86	Poor
	Turbidity (NTU)	0.0	1.3	Excellent
11/16/2007	pH (units)	6.41	6.43	Excellent
	Conductivity (µS/cm)	55.1	57	Excellent
	Turbidity (NTU)	0.0	0.8	Excellent
12/13/2007	pH (units)	6.12	6.28	Good
	Conductivity (µS/cm)	93.6	89	Excellent
	Turbidity (NTU)	0.0	0.7	Excellent

Note: NA for the Datasonde indicates communication problems between the Datasonde and the datalogger at the time of reinstallation. NA for Laboratory Data indicates that no QA water sampling was performed this was due to a change in laboratories used to analyze the samples at the time of reinstallations in April and May.

Section 5.0 Conclusions

The Come by Chance real-time water quality monitoring site has been very successful in gathering water quality data since installation in June, 2007. The site will continue to operate over the winter, and throughout the 2008 calendar year. The near-real time water quality data allows NL Refining Corporation Ltd. staff to become aware of natural background water quality at this site. To date, the data has clearly shown that the ambient water quality is relatively stable.

Section 6.0 Path Forward

In order for a program to be successful, it is essential to continually evaluate and move forward. The following is a list of planned activities to be carried out in the upcoming year.

- shipment of instrument for servicing work as required
- continued year-round monitoring of water quality with continued data analysis in the form of deployment reports
- communication between DOEC and NLRC staff to respond to emerging issues on a proactive basis
- continued site visitation with monthly maintenance/calibration by DOEC staff
- continued work on Automatic Data Retrieval System to incorporate new capabilities
- continued transfer of data from DOEC to NLRC staff through the departmental web page
- provide on-line statistical analysis of data
- evaluation and upgrading of QA/QC procedures
- work on extrapolation of other water quality parameters using regression analysis
- creation of value added products using the real-time water quality data, remote sensing and water quality indices

Appendix A: Climate Data for Argentia, NL

Daily Data Report for June 2007

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	8.7	3.1	5.9	12.1	0.0			9.2	0		
02	9.1	4.7	6.9	11.1	0.0			0.0	0		
03	7.6	1.2	4.4	13.6	0.0			0.0	0		
04	9.6	1.8	5.7						0		
05	12.6	4.2	8.4						0		
06	16.8	7.9	12.4						0		
07	20.8	8.4	14.6						0		
08	20.6	7.1	13.9	4.1	0.0			0.0	0		
09	16.2	9.9	13.1	4.9	0.0			0.0	0		
10	14.3	9.2	11.8	6.2	0.0			0.0	0		
11	21.7	8.9	15.3	2.7	0.0			0.0	0		
12	11.9	7.0	9.5	8.5	0.0			0.0	0		
13	12.6	6.3	9.5	8.5	0.0			0.0	0		
14	9.7	5.5	7.6	10.4	0.0			0.0	0		
15	7.6	4.6	6.1	11.9	0.0			0.0	0		
16	12.6	5.0	8.8	9.2	0.0			0.6	0		
17	15.6	8.1	11.9	6.1	0.0			0.0	0		
18	17.4	8.5	13.0	5.0	0.0			7.6	0		
19	11.2	9.7	10.5	7.5	0.0			5.2	0		
20	11.2	7.5	9.4	8.6	0.0			0.6	0		
21	17.2	7.9	12.6	5.4	0.0			0.0	0		
22	16.2	8.6	12.4	5.6	0.0			0.0	0		
23	18.0	8.3	13.2	4.8	0.0			1.3	0		
24	14.6	7.9	11.3	6.7	0.0			0.0	0		
25	14.1	10.5	12.3	5.7	0.0			0.0	0		
26	13.7	8.1	10.9	7.1	0.0			0.0	0		
27	12.2	8.5	10.4	7.6	0.0			2.3	0		
28	13.2	8.3	10.8	7.2	0.0			3.2	0		
29	12.6	9.2	10.9	7.1	0.0			4.0	0		
30	11.7	7.6	9.7	8.3	0.0			0.7	0		
Sum				226.8	0.0			39.7			
Avg	13.7	7.1	10.4								
Xtrm	21.7	1.2									

Station Installed June 11, 2007

Daily Data Report for July 2007

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	11.8	7.6	9.7	8.3	0.0			0.0	0		
02	14.3	7.6	11.0	7.0	0.0			0.0	0		
03	11.0	7.6	9.3	8.7	0.0			0.0	0		
04	12.9	7.3	10.1	7.9	0.0			0.0	0		
05	14.3	8.3	11.3	6.7	0.0			1.8	0		
06	15.8	10.6	13.2	4.8	0.0			62.1	0		
07	16.2	10.4	13.3	4.7	0.0			11.7	0		
08	12.8	9.5	11.2	6.8	0.0			15.1	0		
09	12.8	8.5	10.7	7.3	0.0			0.0	0		
10	13.0	7.9	10.5	7.5	0.0			0.0	0		
11	14.7	9.6	12.2	5.8	0.0			0.0	0		
12	19.0	9.5	14.3	3.7	0.0			1.4	0		
13	17.6	12.7	15.2	2.8	0.0			1.3	0		
14	14.5	11.2	12.9	5.1	0.0			0.0	0		
15	18.6	11.6	15.1	2.9	0.0			0.0	0		
16	19.8	11.6	15.7	2.3	0.0			9.1	0		
17	14.3	12.3	13.3	4.7	0.0			2.1	0		
18	17.4	11.3	14.4	3.6	0.0			2.3	0		
19	18.9	12.9	15.9	2.1	0.0			15.1	0		
20	15.6	13.6	14.6	3.4	0.0			0.6	0		
21	16.3	14.4	15.4	2.6	0.0			0.0	0		
22	15.3	13.6	14.5	3.5	0.0			16.1	0		
23	18.1	11.9	15.0	3.0	0.0			0.0	0		
24	16.4	12.9	14.7	3.3	0.0			0.6	0		
25	16.1	13.9	15.0	3.0	0.0			0.0	0		
26	16.6	13.2	14.9	3.1	0.0			1.6	0		
27	19.7	11.5	15.6	2.4	0.0			0.0	0		
28	18.2	13.6	15.9	2.1	0.0			0.0	0		
29	18.6	15.4	17.0	1.0	0.0			0.6	0		
30	20.0	15.2	17.6	0.4	0.0			3.3	0		
31	19.3	16.0	17.7	0.3	0.0			189.3E	0		
Sum				130.8	0.0			334.1E			
Avg	16.1	11.4	13.8								
Xtrm	20.0	7.3									

Daily Data Report for August 2007

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†	21.1	13.6	17.4	0.6	0.0	M	M	8.2		32	41
02†	17.5	11.8	14.7	3.3	0.0	M	M	0.0			<31
03†	16.7	11.7	14.2	3.8	0.0	M	M	0.0			<31
04†	19.8	11.8	15.8	2.2	0.0	M	M	0.0		18	37
05†	19.4	13.4E	16.4E	1.6E	0.0E	M	M	0.0		M	M
06†	19.2	12.6	15.9	2.1	0.0	M	M	0.0		21	37
07†	19.1	12.6E	15.9E	2.1E	0.0E	M	M	0.7E		M	M
08†	20.4	16.1	18.3	0.0	0.3	M	M	0.0		17	46
09†	20.3	13.2	16.8	1.2	0.0	M	M	18.8		18	67
10†	17.9	12.2	15.1	2.9	0.0	M	M	0.0		32	69
11†	18.4	14.1	16.3	1.7	0.0	M	M	0.0		21	39
12†	17.9	12.2	15.1	2.9	0.0	M	M	0.0		21	32
13†	19.1	11.1	15.1	2.9	0.0	M	M	0.0		18	33
14†	23.1	13.7	18.4	0.0	0.4	M	M	0.0		15	41
15†	21.4	14.0	17.7	0.3	0.0	M	M	0.0		19	32
16†	18.5	15.5	17.0	1.0	0.0	M	M	0.0		21	39
17†	19.3	15.8	17.6	0.4	0.0	M	M	35.0		21	61
18†	21.1	16.3	18.7	0.0	0.7	M	M	16.5		20	72
19†	17.2	13.8	15.5	2.5	0.0	M	M	0.0		23	80
20†	16.6	13.2	14.9	3.1	0.0	M	M	0.0		26	54
21†	17.0	13.1	15.1	2.9	0.0	M	M	0.0		24	33
22†	16.6	10.4	13.5	4.5	0.0	M	M	0.0		25	32
23†	16.5	9.5	13.0	5.0	0.0	M	M	0.0			<31
24†	17.5	11.0	14.3	3.7	0.0	M	M	0.0		22	32
25†	18.8	10.4	14.6	3.4	0.0	M	M	0.0			<31
26†	18.8	12.7	15.8	2.2	0.0	M	M	0.0		15	32
27†	18.6	14.5	16.6	1.4	0.0	M	M	0.0			<31
28†	19.1	14.3	16.7	1.3	0.0	M	M	0.0			<31
29†	19.3	14.1	16.7	1.3	0.0	M	M	0.0		22	33
30†	19.0	14.6	16.8	1.2	0.0	M	M	0.0		21	35
31†	20.3	16.4	18.4	0.0	0.4	M	M	0.0			<31
Sum				61.5E	1.8E	M	M	79.2E			
Avg	18.9	13.2E	16.05E								
Xtrm	23.1	9.5E								23•	80

Daily Data Report for September 2007

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†	20.8	13.5	17.2	0.8	0.0	M	M	9.9		19	78
02†	17.8	10.7	14.3	3.7	0.0	M	M	0.0		36	56
03†	16.6	9.8	13.2	4.8	0.0	M	M	0.0		21	46
04†	16.1	13.4	14.8	3.2	0.0	M	M	3.5		21	48
05†	16.6	10.0	13.3	4.7	0.0	M	M	0.0		25	46
06†	14.4	6.9	10.7	7.3	0.0	M	M	0.0		2	41
07†	16.4	7.2	11.8	6.2	0.0	M	M	0.0			<31
08†	17.5	11.3	14.4	3.6	0.0	M	M	0.0			<31
09†	16.5	10.8	13.7	4.3	0.0	M	M	0.0		4	46
10†	12.3	10.6	11.5	6.5	0.0	M	M	0.6		4	41
11†	15.2	10.9	13.1	4.9	0.0	M	M	0.0		12	46
12†	19.4	11.6	15.5	2.5	0.0	M	M	0.6		15	80
13†	15.9	10.4	13.2	4.8	0.0	M	M	0.0		26	57
14†	14.4	9.2	11.8	6.2	0.0	M	M	0.0		27	46
15†	15.6	8.3	12.0	6.0	0.0	M	M	0.0		17	56
16†	18.1	10.7	14.4	3.6	0.0	M	M	4.2		18	85
17†	14.7	8.1	11.4	6.6	0.0	M	M	0.0			<31
18†	15.7	6.9	11.3	6.7	0.0	M	M	0.0			<31
19†	15.4	8.2	11.8	6.2	0.0	M	M	0.0		24	33
20†	15.6	13.2	14.4	3.6	0.0	M	M	0.0		21	48
21†	18.0	8.7	13.4	4.6	0.0	M	M	0.0		27	37
22†	16.3	9.3	12.8	5.2	0.0	M	M	0.0		17	39
23†	18.4	12.2	15.3	2.7	0.0	M	M	8.1		19	57
24†	12.9	9.1	11.0	7.0	0.0	M	M	0.0		27	59
25†	12.2	9.1	10.7	7.3	0.0	M	M	0.0		32	41
26†	13.3	9.6	11.5	6.5	0.0	M	M	8.1		17	41
27†	15.8	8.1	12.0	6.0	0.0	M	M	0.0		20	46
28†	18.5	7.9	13.2	4.8	0.0	M	M	6.8		21	74
29†	15.6	9.7	12.7	5.3	0.0	M	M	15.4		23	52
30†	12.2	6.5	9.4	8.6	0.0	M	M	0.0		32	41
Sum				154.2	0.0	M	M	57.2			
Avg	15.9	9.7	12.83								
Xtrm	20.8	6.5								18	85

Daily Data Report for October 2007

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†	12.9	6.6	9.8	8.2	0.0	M	M	0.0		24	48
02†	14.2	10.6	12.4	5.6	0.0	M	M	0.0		25	48
03†	15.1	10.3	12.7	5.3	0.0	M	M	0.0			<31
04†	15.2	10.5	12.9	5.1	0.0	M	M	2.9		20	48
05†	14.3	11.1	12.7	5.3	0.0	M	M	0.0		26	59
06†	13.5	8.7	11.1	6.9	0.0	M	M	0.0		33	57
07†	10.2	6.8	8.5	9.5	0.0	M	M	0.7		28	52
08†	11.0	6.7	8.9	9.1	0.0	M	M	4.4		33	61
09†	9.0	5.2	7.1	10.9	0.0	M	M	0.0		35	56
10†	11.1	4.2	7.7	10.3	0.0	M	M	0.0		33	33
11†	11.2	4.2	7.7	10.3	0.0	M	M	0.0		11	37
12†	12.1	3.6	7.9	10.1	0.0	M	M	0.0		7	39
13†	11.9	6.1	9.0	9.0	0.0	M	M	9.0		10	63
14†	9.7	7.3	8.5	9.5	0.0	M	M	0.0			<31
15†	12.0	6.6	9.3	8.7	0.0	M	M	7.8			<31
16†	7.7	3.7	5.7	12.3	0.0	M	M	3.0		34	43
17†	8.0	4.4	6.2	11.8	0.0	M	M	0.0		34	57
18†	8.0	4.1	6.1	11.9	0.0	M	M	0.7		27	54
19†	8.7	2.6	5.7	12.3	0.0	M	M	0.0		31	35
20†	15.3	4.3	9.8	8.2	0.0	M	M	25.6		20	74
21†	14.0	8.7	11.4	6.6	0.0	M	M	23.0		21	65
22†	10.3	4.3	7.3	10.7	0.0	M	M	0.0		26	54
23†	14.6	5.3	10.0	8.0	0.0	M	M	0.0		20	69
24†	11.9	5.9	8.9	9.1	0.0	M	M	0.0		21	59
25†	7.2	4.5	5.9	12.1	0.0	M	M	0.0		29	32
26†	8.8	4.4	6.6	11.4	0.0	M	M	0.0		26	54
27†	10.7	7.7	9.2	8.8	0.0	M	M	0.0		26	44
28†	15.6	9.3	12.5	5.5	0.0	M	M	17.9		19	72
29†	10.6	2.5	6.6	11.4	0.0	M	M	9.7		26	54
30†	6.2	1.9	4.1	13.9	0.0	M	M	0.6			<31
31†	4.9	2.1	3.5	14.5	0.0	M	M	0.6		34	43
Sum				292.3	0.0	M	M	105.9			
Avg	11.2	5.9	8.55								
Xtrm	15.6	1.9								20	74

Daily Data Report for November 2007

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†	13.7	3.6	8.7	9.3	0.0	M	M	0.0		21	76
02†	16.5	4.9	10.7	7.3	0.0	M	M	22.2		20	93
03†	7.6	1.5	4.6	13.4	0.0	M	M	0.0		12	50
04†	15.4	6.6	11.0	7.0	0.0	M	M	2.6		21	98
05†	11.3	5.0	8.2	9.8	0.0	M	M	0.0		23	32
06†	9.6	2.4	6.0	12.0	0.0	M	M	0.0		2	37
07†	9.0	1.6	5.3	12.7	0.0	M	M	0.0		15	39
08†	11.0	6.1	8.6	9.4	0.0	M	M	10.2		14	70
09†	8.8	2.8	5.8	12.2	0.0	M	M	24.9		2	54
10†	4.1	1.8	3.0	15.0	0.0	M	M	0.0		8	57
11†	12.9	2.4	7.7	10.3	0.0	M	M	20.5		12	76
12†	7.6	3.4	5.5	12.5	0.0	M	M	0.6		23	65
13†	4.6	2.0	3.3	14.7	0.0	M	M	1.4		26	48
14†	6.9	1.9	4.4	13.6	0.0	M	M	0.0		30	43
15†	12.2	4.0	8.1	9.9	0.0	M	M	0.0		21	56
16†	17.0	10.7	13.9	4.1	0.0	M	M	1.3		15	72
17†	14.3	5.4	9.9	8.1	0.0	M	M	5.7		24	96
18†	7.4	0.4	3.9	14.1	0.0	M	M	0.0		2	37
19†	1.6	-1.8	-0.1	18.1	0.0	M	M	0.0		4	41
20†	2.7	-1.5	0.6	17.4	0.0	M	M	3.4		7	48
21†	6.1	1.5	3.8	14.2	0.0	M	M	56.1		9	61
22†	4.0	0.8	2.4	15.6	0.0	M	M	0.0			<31
23†	11.5	1.0	6.3	11.7	0.0	M	M	2.4		18	37
24†	10.6	0.2	5.4	12.6	0.0	M	M	16.0		28	74
25†	4.0	-0.3	1.9	16.1	0.0	M	M	0.0		25	54
26†	6.5	2.6	4.6	13.4	0.0	M	M	1.3		21	59
27†	12.3	4.5	8.4	9.6	0.0	M	M	21.4		21	87
28†	8.7	-0.7	4.0	14.0	0.0	M	M	0.0		26	87
29†	4.4	-2.3	1.1	16.9	0.0	M	M	0.0		13	57
30†	8.9	0.0	4.5	13.5	0.0	M	M	6.3		28	76
Sum				368.5	0.0	M	M	196.3			
Avg	9	2.4	5.69								
Xtrm	17.0	-2.3								21	98

Daily Data Report for December 2007

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†	2.0E	-0.2E	0.9E	17.1E	0.0E	M	M	M		27E	69E
02†	2.0	0.3	1.2	16.8	0.0	M	M	15.1		35	102
03†	3.2	-0.4	1.4	16.6	0.0	M	M	0.7		35	83
04†	3.9	-1.1	1.4	16.6	0.0	M	M	4.5		10	56
05†	4.8	1.5	3.2	14.8	0.0	M	M	0.6		26	54
06†	3.1	0.4	1.8	16.2	0.0	M	M	6.3		24	52
07†	1.0	-3.0	-1.0	19.0	0.0	M	M	0.0		29	46
08†	6.7	-0.9	2.9	15.1	0.0	M	M	2.6		26	74
09†	2.3	-7.3	-2.5	20.5	0.0	M	M	1.2		27	69
10†	-3.0	-6.8	-4.9	22.9	0.0	M	M	0.0		29	67
11†	-2.8	-4.8	-3.8	21.8	0.0	M	M	0.0		28	54
12†	1.6	-5.2	-1.8	19.8	0.0	0.0	M	3.2		34	80
13†	-0.3	-8.6	-4.5	22.5	0.0	M	M	0.0	5	30	67
14†	-6.8	-10.7	-8.8	26.8	0.0	M	M	0.0	3	32	41
15†	-6.1	-9.3	-7.7	25.7	0.0	M	M	0.0	4	36	39
16†	-5.7	-10.4	-8.1	26.1	0.0	M	M	0.0	4	11	54
17†	5.0	-6.5	-0.8	18.8	0.0	M	M	10.5		14	122
18†	0.1	-1.8	-0.9	18.9	0.0	M	M	0.0		26	83
19†	-0.9	-8.7	-4.8	22.8	0.0	M	M	0.0		31	52
20†	-6.2	-9.2	-7.7	25.7	0.0	M	M	0.0		5	43
21†	-2.2	-8.8	-5.5	23.5	0.0	M	M	0.0		3	57
22†	-1.8	-9.1	-5.5	23.5	0.0	M	M	0.0		26	44
23†	1.4	-2.3	-0.5	18.5	0.0	M	M	0.0		24	54
24†	10.5	1.3	5.9	12.1	0.0	0.0	M	5.9		21	106
25†	1.8	-0.7	0.6	17.4	0.0	M	M	0.0		26	89
26†	1.1	-0.3	0.4	17.6	0.0	M	M	0.0		26	57
27†	0.2	-4.2	-2.0	20.0	0.0	M	M	1.4		8	52
28†	-1.3	-4.3	-2.8	20.8	0.0	0.0	M	9.6	5	36	85
29†	-3.2	-6.0	-4.6	22.6	0.0	M	M	0.0	1	12	63
30†	3.3	-3.2	0.1	17.9	0.0	0.0	M	4.9	10	12	76
31†	3.2	-5.7	-1.3	19.3	0.0	M	M	4.3	6	13	95
Sum				617.7E	0.0E	0.0*	M	70.8*			
Avg	0.5E	-4.4E	-1.92E								
Xtrm	10.5E	-10.7E								14	122