Real-Time Water Quality Deployment Report
NF02ZK0023 – Rattling Brook below Bridge
July 3, 2009 to August 10, 2009

General

- The Water Resources Management Division staff monitors the real-time web page on a daily basis.
- Vale Inco will be informed of any significant water quality events in the form of a monthly deployment report.
- This monthly deployment report interprets the data from the Rattling Brook River real-time water quality station for the period of July 3rd to August 10th, 2009, a period of 37 days.
- Rattling Brook station operational status was nominal over the deployment period; no communications dropouts or malfunctions were detected. Hydrolab Datasonde 5X s/n 44604 was in place for this time period.
- An increasing trend in Specific Conductivity may have been identified as July 2009 has seen the highest level of conductivity since initiation of the Rattling Brook below Bridge real-time station in 2007. See the section on Specific Conductivity in the Data Interpretation section for more information.

Maintenance and Calibration of Instrument

- As part of the removal and reinstallation process, parameters are recorded from both the field sonde (in situ) and a similar, newly-calibrated QA sonde (placed side by side). The parameters from both instruments are compared and their variability is ranked as part of the QA/QC protocol (see Table 1).
- Upon installation of Datasonde 5X s/n 44604 on July 3rd, 2009, all parameters were ranked as "Excellent." During the removal on August 10th, 2009 Temperature, pH and Conductivity ranked as "Good", "Fair", and "Good", respectively. Dissolved Oxygen and Turbidity ranked as "Excellent".

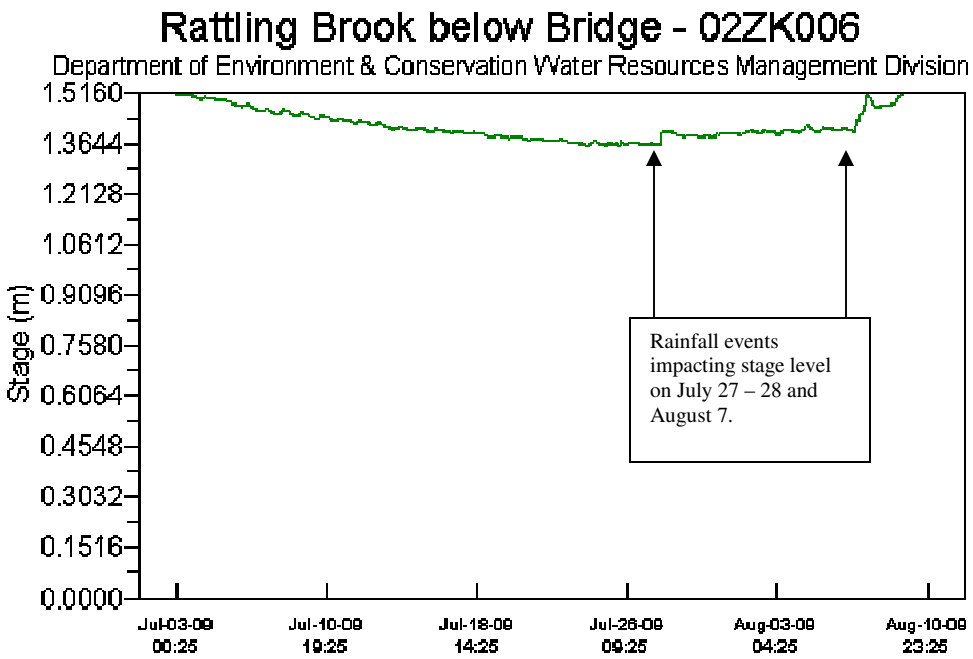
Table 1: QA/QC Data Comparison Rankings upon installation on July 3rd, 2009 to August 10th, 2009.

Station	Date	Action	Instrument Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook (Long Harbour)	July 3rd, 2009	Installation	Excellent	Excellent	Excellent	Excellent	Excellent
	Aug 10th, 2009	Removal	Good	Fair	Good	Excellent	Excellent

Data Interpretation

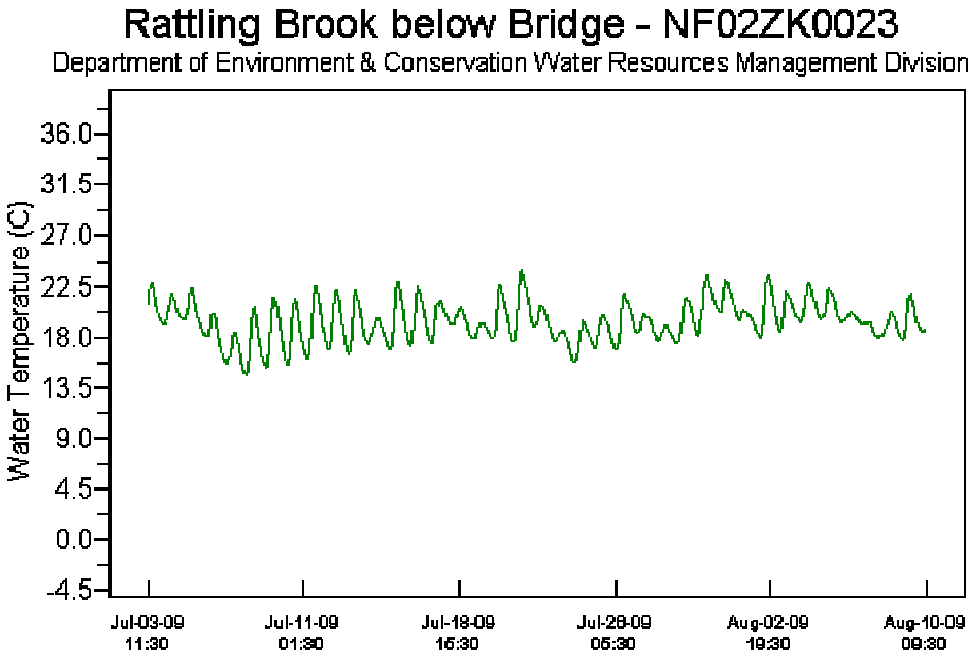
- The deployment period spanning July 3rd to August 10th was marked by few rainfall events. Two significant events occurred: one from July 27 to 28 resulted in 28.6mm of rainfall in the Argentia area (see Appendix for weather data). Another rainfall event on August 7 resulted in 24.2 mm of rain in a short time span. Rainfall events are frequently the impetus for water quality impacts to occur.
- The impact of rainfall events on stream water level is shown in Figure 1. In the first half of the deployment period, water levels are seen to decline gradually until rainfall on July 27th and 28th. At this point, runoff and groundwater flow halt the gradual decline causing water levels to level off. Another event on August 7 imparted a rise to stage level, returning the water levels to pre-deployment heights.

Figure 1: Stage level at Rattling Brook from July 3 to August 10, 2009.



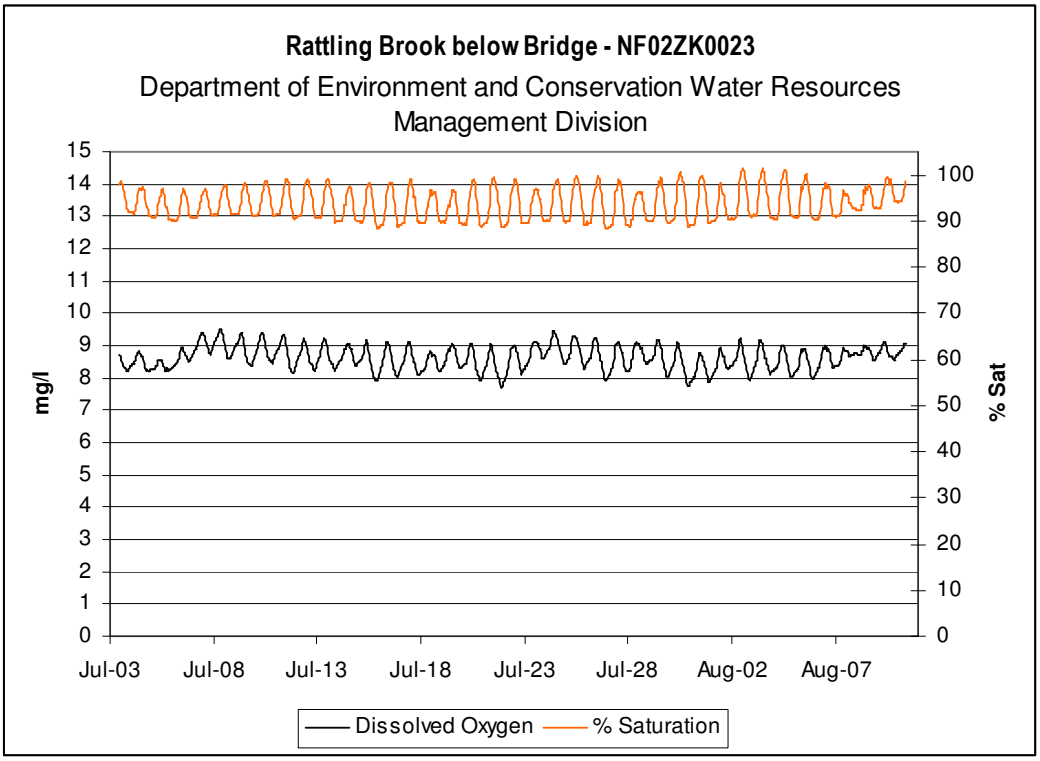
- Water temperature at Rattling Brook did not show any major increase or decrease over the deployment period. Typical diurnal cycles are observed with high temperature occurring in the day and low temperature over night. Rainfall events and overcast days impart a moderating effect on diurnal cycles. Temperature ranged from 14.64°C to 23.97°C.

Figure 2: Temperature at Rattling Brook from July 3 to August 10, 2009.



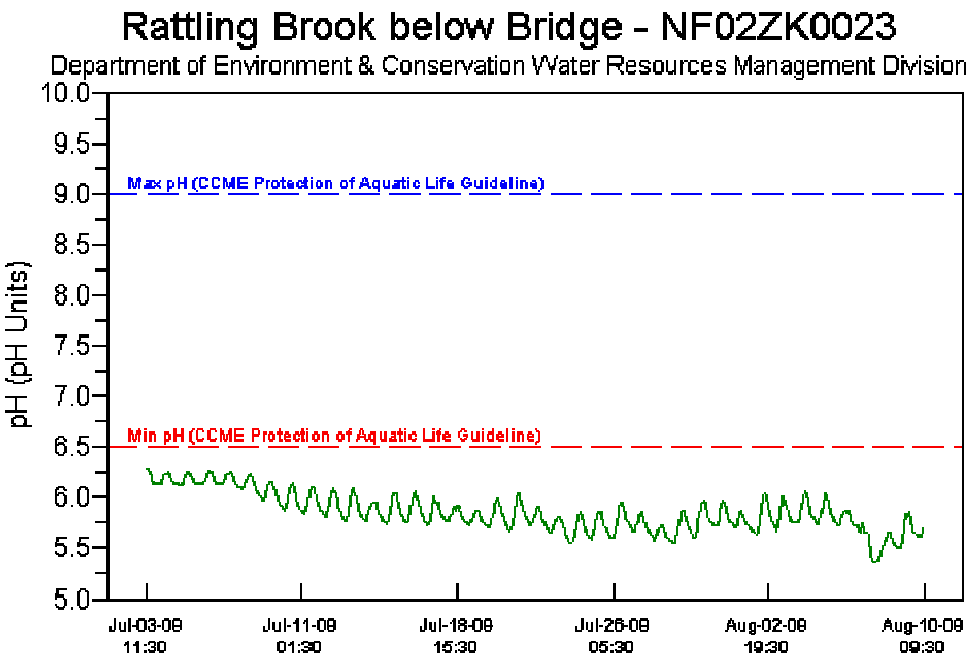
- Dissolved oxygen content ranged from 7.72mg/l to 9.52mg/l in Rattling Brook over the deployment period. This range of dissolved oxygen lies within the upper limits of CCME Guidelines for the Protection of Aquatic Life.
- Levels of dissolved oxygen resulted in percent saturation values ranging from 88.3% to 101.4%. Values above 100% may occur during vigorous flow (such as during a rainfall event) inducing supersaturation conditions.

Figure 3: Dissolved Oxygen at Rattling Brook from July 3 to August 10, 2009.



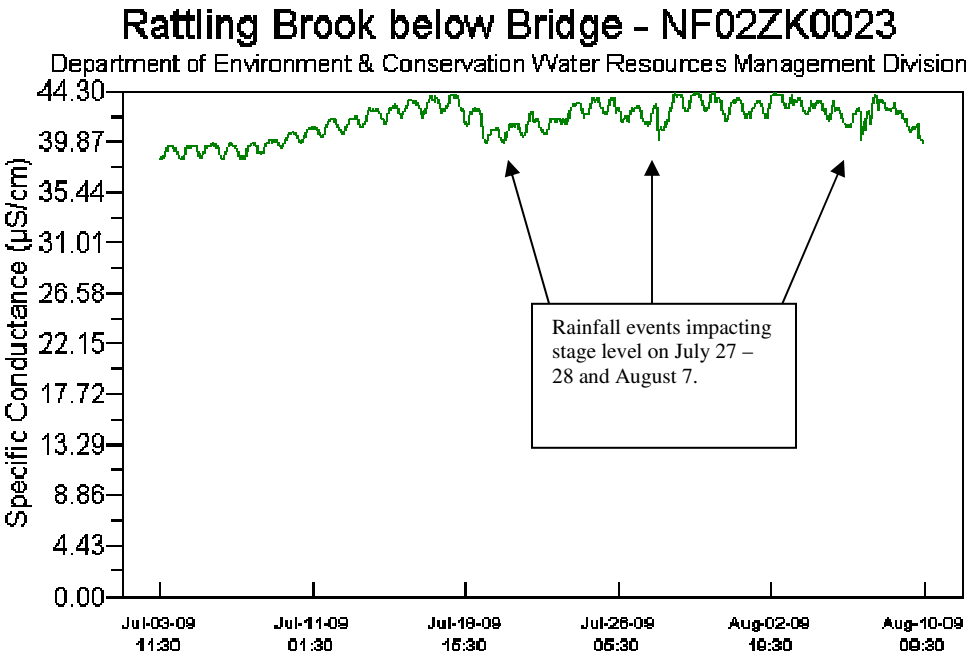
- pH values commonly fall below the CCME Guidelines at Rattling Brook. During the deployment period, pH ranged from 5.35 to 6.29, all below the Guidelines for the Protection for Aquatic Life range (6.5 to 9.0). A general decreasing trend is seen. This downward trend may be due to fouling and/or drift of the sensor as the total error calculated following deployment was 0.45 units.

Figure 4: pH at Rattling Brook from July 3 to August 10, 2009.



- Specific Conductivity at Rattling Brook ranged from 38.3µS/cm to 44.3µS/cm from July 3rd to August 10th. Recorded Conductivity values tend to fluctuate during precipitation events as indicated in Figure 5.

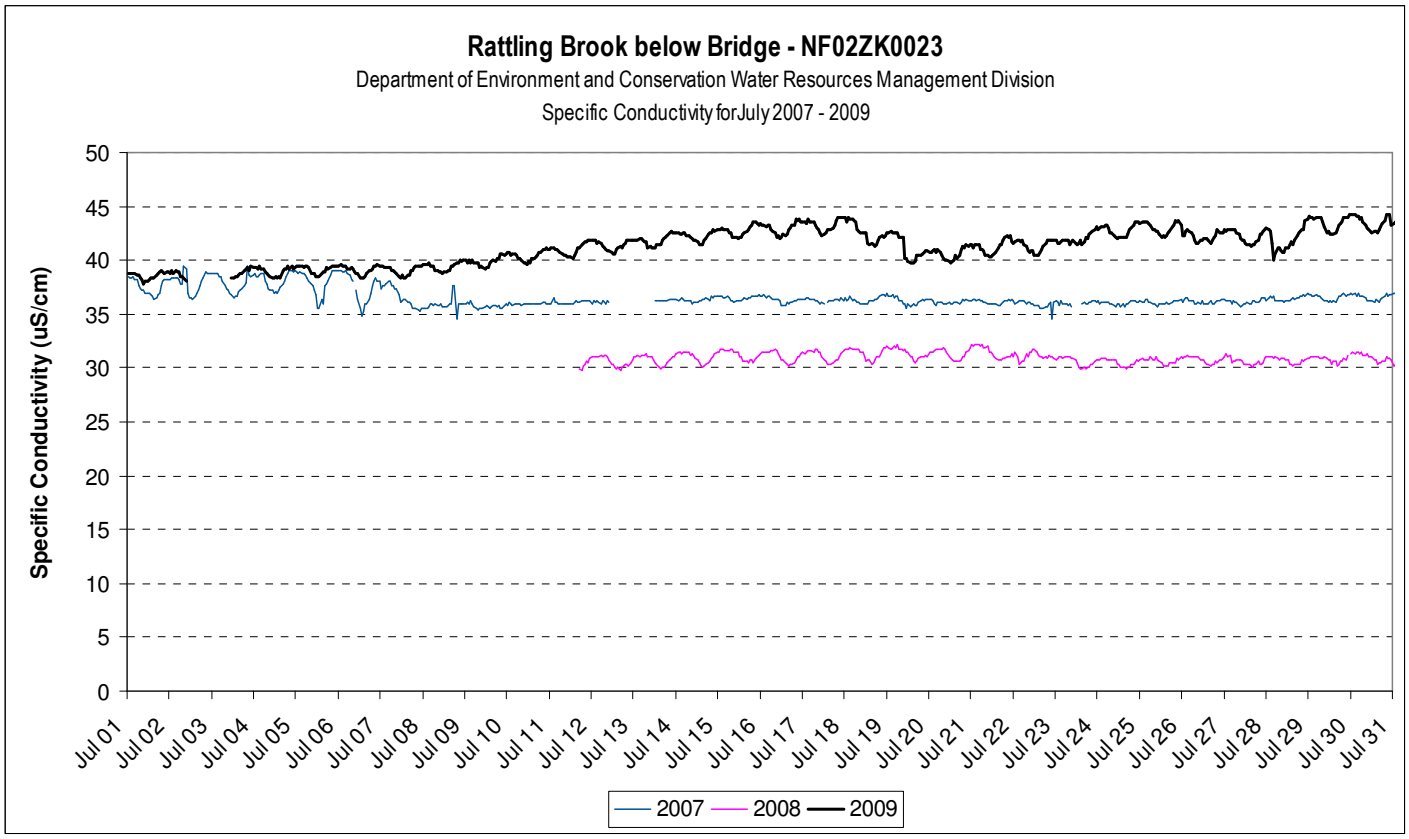
Figure 5: Specific Conductivity at Rattling Brook from July 3 to August 10, 2009.



- Given the substantial amount of background data possessed by the Water Resources Management Division, an increase in Specific Conductivity may have been identified at the Rattling Brook below Bridge station. Using data for the months of July 2007, 2008 and 2009, Figure 6 has been constructed. This figure suggests that conductivity for July 2009 is higher than normal. While there is no definitive proof that implicates

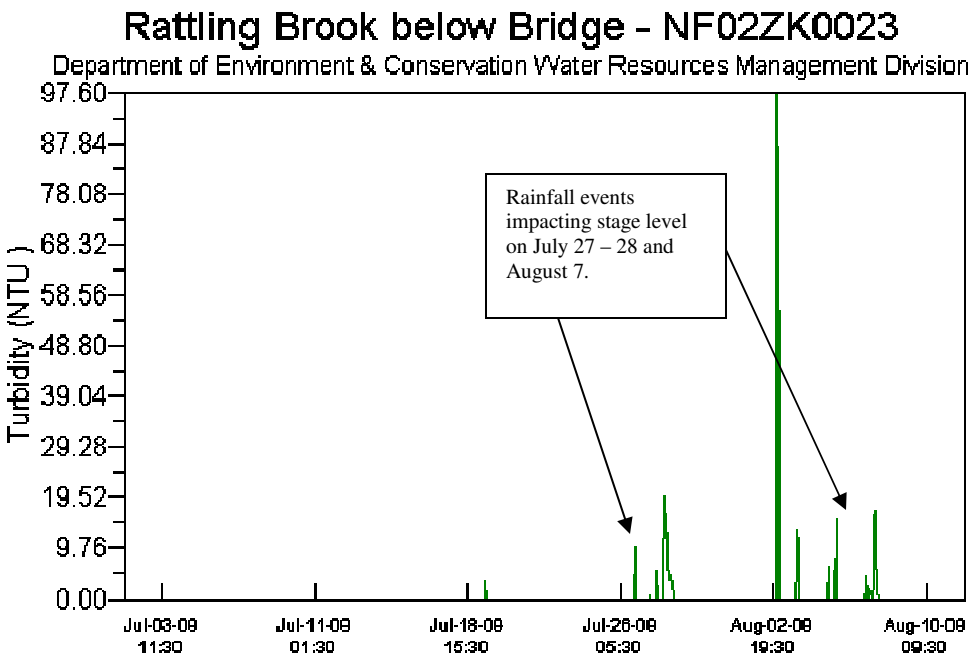
ongoing work in the area as the source of higher-than-normal conductivity values, it remains possible and will be monitored closely by the Division.

Figure 6: Specific Conductivity for the months of July 2007, 2008 and 2009 at Rattling Brook Below Bridge



- Rattling Brook generally remains clear and free of turbidity. During precipitation events, however, silt is washed off of stream banks, sediment is stirred up from the bottom, and air may become entrained within the water column if flow is especially vigorous. Over the deployment period, turbidity ranged from 0ntu to 97.6ntu.

Figure 7: Turbidity at Rattling Brook from July 3 to August 10, 2009.



Appendix

- Dates outlined in red are those identified as imparting a noticeable change on stage level and other parameters.

Daily Data Report for July 2009

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†	18.0	8.7	13.4	4.6	0.0	M	M	0.0			<31
02†	21.3	9.1	15.2	2.8	0.0	M	M	0.0		16	43
03†	23.3	13.4	18.4	0.0	0.4	M	M	0.0		15	33
04†	20.4	13.0	16.7	1.3	0.0	M	M	0.0			<31
05†	20.1	12.4	16.3	1.7	0.0	M	M	0.0		20	44
06†	15.7	7.3	11.5	6.5	0.0	M	M	0.0		36	39
07†	13.7	6.9	10.3	7.7	0.0	M	M	0.6		1	33
08†	14.8	7.4	11.1	6.9	0.0	M	M	0.0		22	39
09†	15.4	9.7	12.6	5.4	0.0	M	M	0.0		20	35
10†	16.9	7.3	12.1	5.9	0.0	M	M	0.0		20	41
11†	17.4	13.2	15.3	2.7	0.0	M	M	0.0		20	39
12†	18.1	12.1	15.1	2.9	0.0	M	M	0.0		22	32
13†	24.0	11.9	18.0	0.0	0.0	M	M	0.0		14	59
14†	17.7	13.3	15.5	2.5	0.0	M	M	0.0		14	44
15†	18.2	12.1	15.2	2.8	0.0	M	M	0.0		22	35
16†	16.1	12.4	14.3	3.7	0.0	M	M	0.0		22	46
17†	18.2	14.2	16.2	1.8	0.0	M	M	1.5		22	32
18†	20.6	13.6	17.1	0.9	0.0	M	M	1.6			<31
19†	20.1	13.8	17.0	1.0	0.0	M	M	0.8		12	43
20†	18.5	14.6	16.6	1.4	0.0	M	M	0.0		23	46
21†	20.8	14.4	17.6	0.4	0.0	M	M	0.0		20	35
22†	20.4	13.3	16.9	1.1	0.0	M	M	6.4		13	39
23†	16.8	9.8	13.3	4.7	0.0	M	M	0.0		2	33
24†	16.6	9.1	12.9	5.1	0.0	M	M	0.0		21	32
25†	18.5	12.8	15.7	2.3	0.0	M	M	14.1		30	33
26†	18.3	13.5	15.9	2.1	0.0	M	M	0.7			<31
27†	18.2	14.4	16.3	1.7	0.0	M	M	11.7			<31
28†	19.3	14.6	17.0	1.0	0.0	M	M	16.9		21	43
29†	20.2	15.2	17.7	0.3	0.0	M	M	0.0		25	35
30†	21.9	14.4	18.2	0.0	0.2	M	M	5.0		20	41
31†	18.4	15.9	17.2	0.8	0.0	M	M	0.7		21	52
Sum				**82.0**	**0.6**	**M**	**M**	**60.0**			
Avg	**18.6**	**12.1**	**15.35**								
Xtrm	**24.0**	**6.9**								**14**	**59**

Daily Data Report for August 2009

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†	17.9	15.6	16.8	1.2	0.0	M	M	2.2		21	44
02†	22.2	13.8	18.0	0.0	0.0	M	M	0.0		26	43
03†	22.7	13.7	18.2	0.0	0.2	M	M	3.0		13	54
04†	18.6	15.5	17.1	0.9	0.0	M	M	0.0		20	35
05†	21.0	14.8	17.9	0.1	0.0	M	M	0.0		23	39
06†	18.1	16.0	17.1	0.9	0.0	M	M	0.0		20	39
07†	18.3	16.5	17.4	0.6	0.0	M	M	24.2			<31
08†	18.6	15.2	16.9	1.1	0.0	M	M	1.0		24	43
09†	20.3	16.0	18.2	0.0	0.2	M	M	1.2		28	44
10†	19.7	15.5	17.6	0.4	0.0	M	M	0.0		21	41
11†	19.7	15.1	17.4	0.6	0.0	M	M	19.6		15	52
12†	20.6	12.2	16.4	1.6	0.0	M	M	0.0		3	37
13†	19.6	12.6	16.1	1.9	0.0	M	M	0.0		25	35
14†	19.6	15.9	17.8	0.2	0.0	M	M	0.0		21	35
15†	20.3	15.9	18.1	0.0	0.1	M	M	0.0		20	41
16†	22.8	14.7	18.8	0.0	0.8	M	M	0.0		23	41
Sum				**9.5***	**1.3***	**M**	**M**	**51.2***			
Avg	**20***	**14.9***	**17.5***								
Xtrm	**22.8***	**12.2***								**13***	**54***

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