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 May 20th, 2009 to July 2nd, 2009, a period of 42 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.
- Over the course of this deployment brush clearing began in this area of the Vale Inco property. No trends have been identified in relation to clearing.
- An incident occurring on June 29th, 2009 at approximately 1300 hrs saw a truck crash partly through the bridge just upstream of the Rattling Brook station. Following the collapse, a large tarp was placed under the bridge by Vale Inco staff in order to prevent excessive debris from falling into the river. No significant impact was detected in the water quality data at the stated time of collapse.

Maintenance and Calibration of Instrumentation

- 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 May 20th, 2009, all parameters were ranked as "Excellent." During the removal on July 2nd, 2009 all parameters were ranked as "Excellent" except for pH which was ranked as "Good."

Table 1: QA/QC Data Comparison Rankings upon installation on May 20th, 2009 and removal on July 2nd, 2009

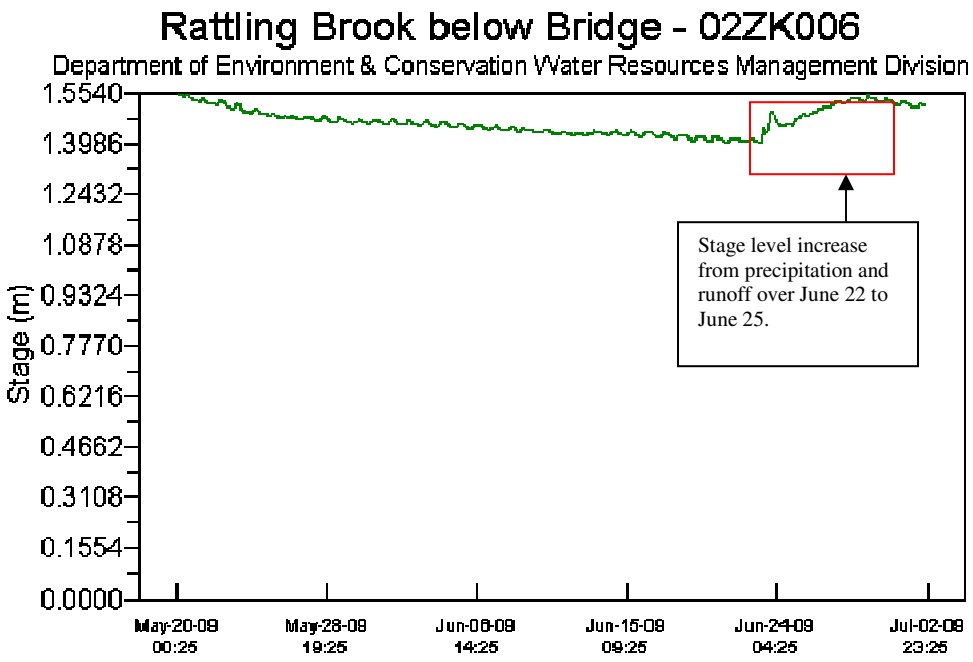
Station	Date	Action	Instrument Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook (Long Harbour)	May 20th, 2009	Installation	Excellent	Excellent	Excellent	Excellent	Excellent
	July 2nd, 2009	Removal	Excellent	Good	Excellent	Excellent	Excellent

Data Interpretation

- Initial inspection of data indicates that water quality at Rattling Brook below Bridge was not impacted and represented seasonal characteristics throughout the deployment. A single, large rainfall event occurred from June 22 to June 25, peaking on June 23rd with 40.9 mm of rain (see Appendix for rainfall quantity).

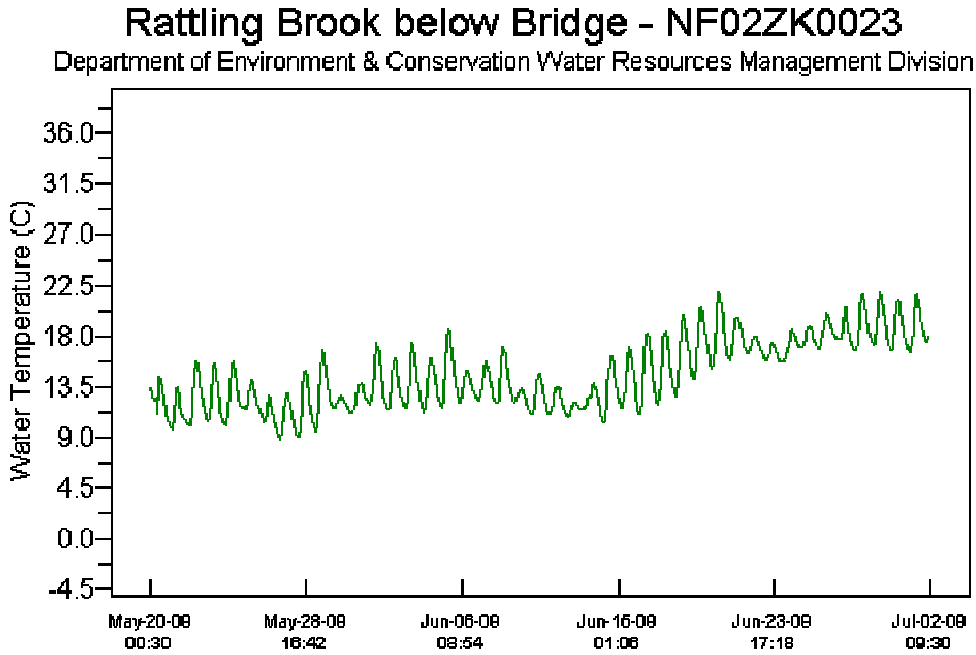
- Figure 1 depicts the stage level of Rattling Brook below Bridge over the course of deployment on May 20th to July 2nd. Stage was seen to be highest at the beginning of deployment on May 20th with 1.554m and lowest on June 23rd with 1.402m. Stage rises following June 23rd due to a three day period of rainfall from June 22nd to June 25th.

Figure 1: Stage Level at Rattling Brook from May 20 to July 2, 2009



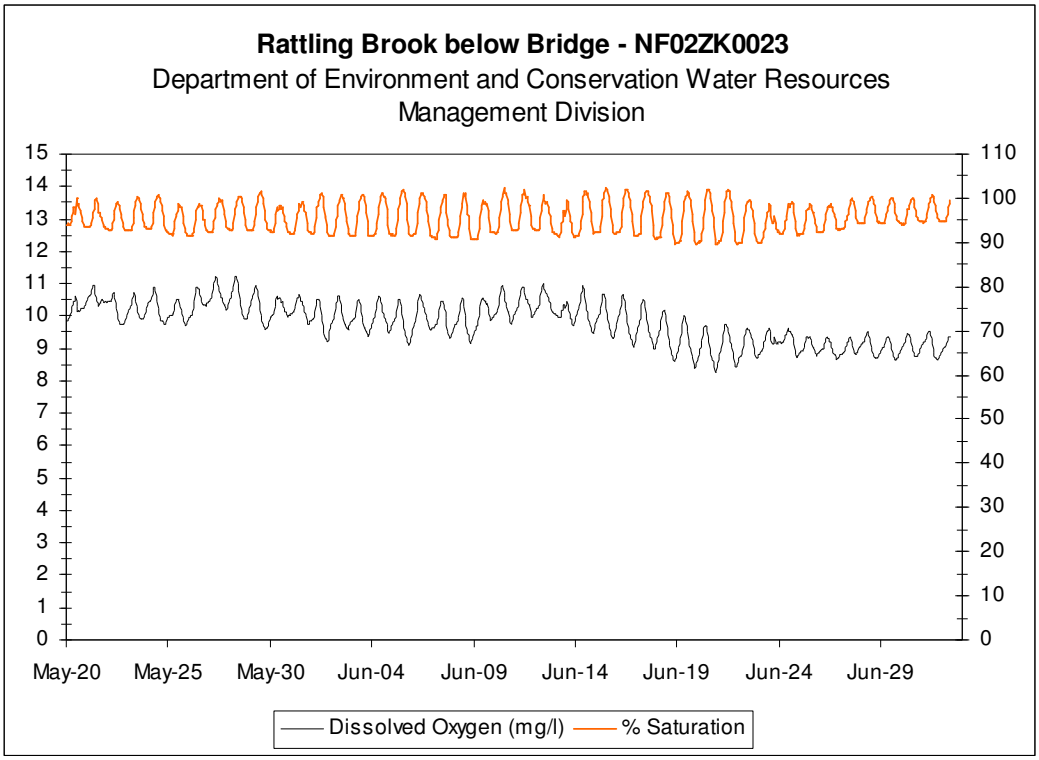
- Water temperature in Figure 2 shows the anticipated summer increase in water temperature as the daily maximum air temperature rises (see Appendix). A clear, diurnal cycle is seen in Figure 2 as the water temperature is heated over the course of the daytime and then falls once again over night. The rainfall period from June 22nd to 25th has a moderating effect on temperature, likely due to cooler groundwater infiltration and precipitation, plus cloud cover preventing direct sunshine on the river

Figure 2: Water Temperature at Rattling Brook from May 20 to July 2, 2009



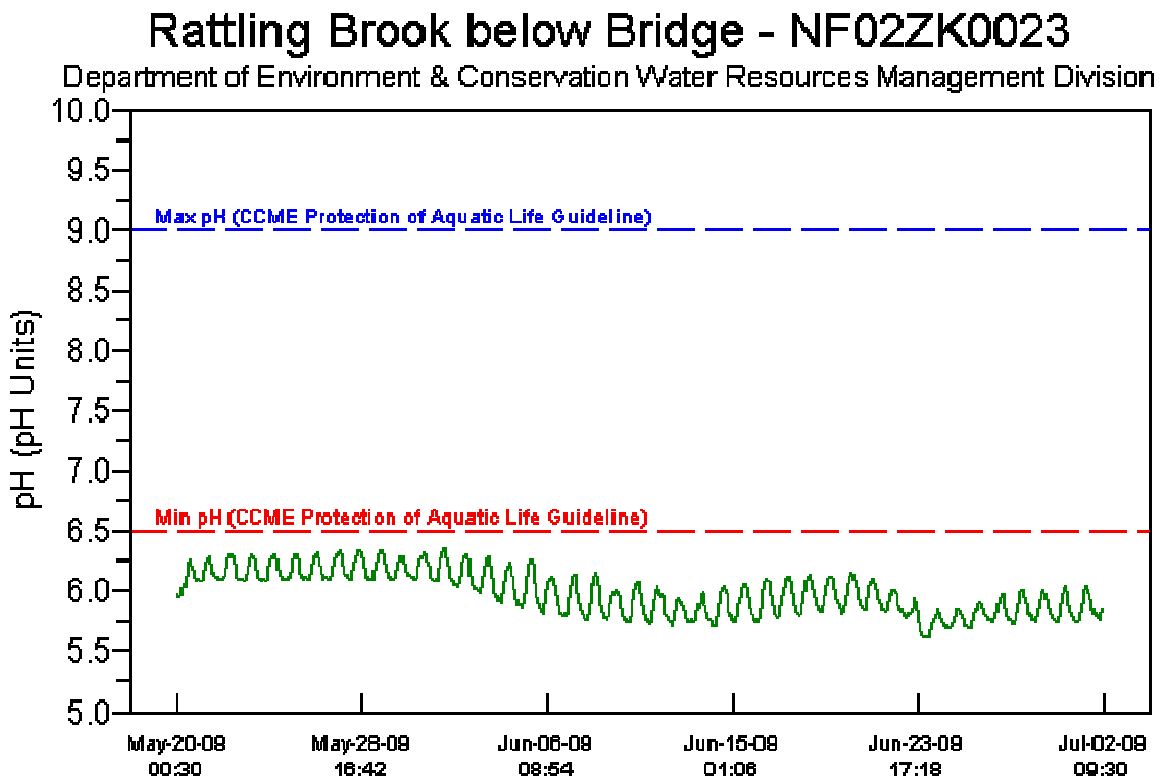
- Two major factors impact dissolved oxygen content in water bodies: water temperature and biota. Dissolved oxygen concentration is inversely proportional to temperature and, as a result, when water temperature increases, dissolved oxygen concentration falls. This leads to dissolved oxygen decreasing throughout the daytime and rising over night as temperature falls. Competing with this process is the production and demand of oxygen by flora and fauna growing in the river. Photosynthesis, driven by the sun, adds oxygen to the river over the daytime. At night when photosynthesis ceases, however, flora and fauna impart a net decrease in oxygen concentration as they require the gas for respiration.
- Dissolved oxygen saturation is a diurnal process as illustrated by the explanation above and Figure 3. Saturation remains relatively level from May 20th to July 2nd. Dissolved oxygen concentration, however, is level for the first half of the deployment and then falls towards the latter half as water temperature rises. Dissolved oxygen in Rattling Brook is seen to be highest during the evening and lowest during the day, implying that temperature is the primary drive for oxygen concentration and photosynthesis does not have the power to maintain 100% oxygen saturation over the daytime.

Figure 3: Dissolved Oxygen at Rattling Brook from May 20 to July 2, 2009



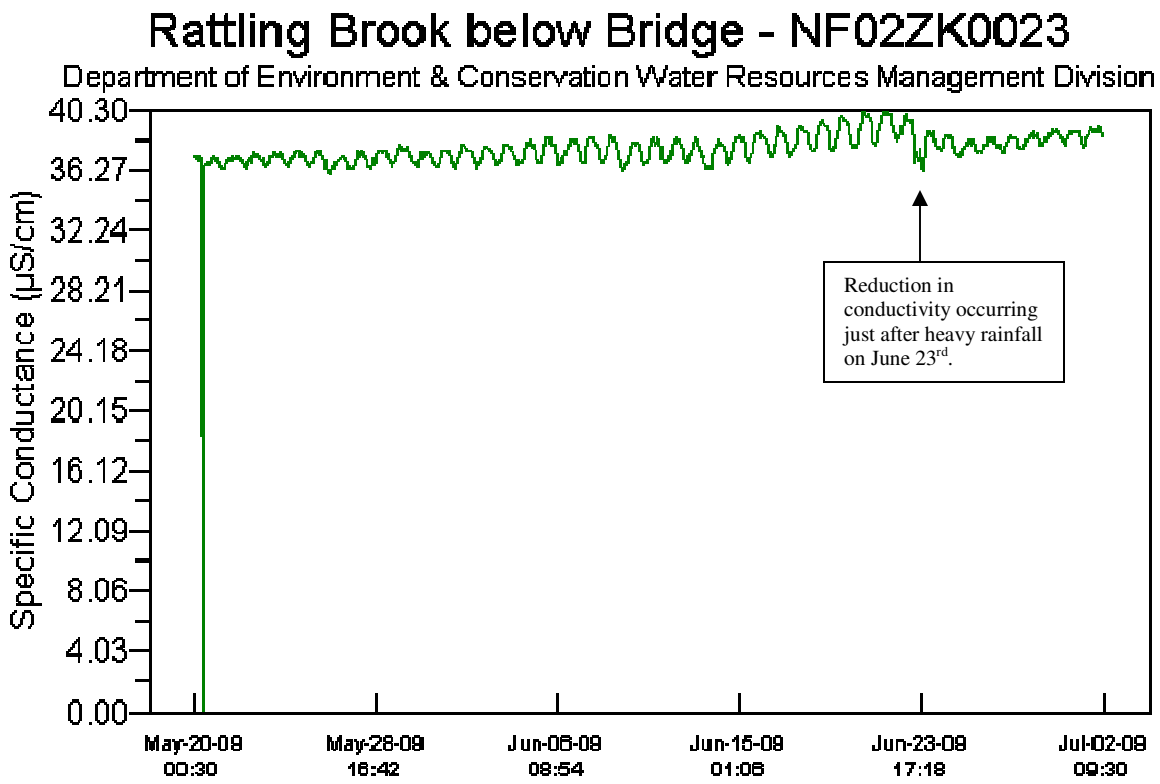
- From May 20th to July 2nd, pH reached a maximum on June 1st (6.35). pH was lowest on June 24th at 5.62 during heavy rainfall. A general downward trend is seen in Figure 4 with three distinct portions: an initial plateau from May 20th to early June resulting from a period of little rainfall and consistent water temperatures. The next period occurs from early June to June 24th as warmer temperatures correlate with a slight decline in pH until it plateaus. The final portion is seen following heavy rainfall on June 22nd to 25th. Groundwater flow and precipitation impart a drop in pH followed by gradual rise thereafter as groundwater flow begins to decline once more.

Figure 4: pH at Rattling Brook from May 20 to July 2, 2009

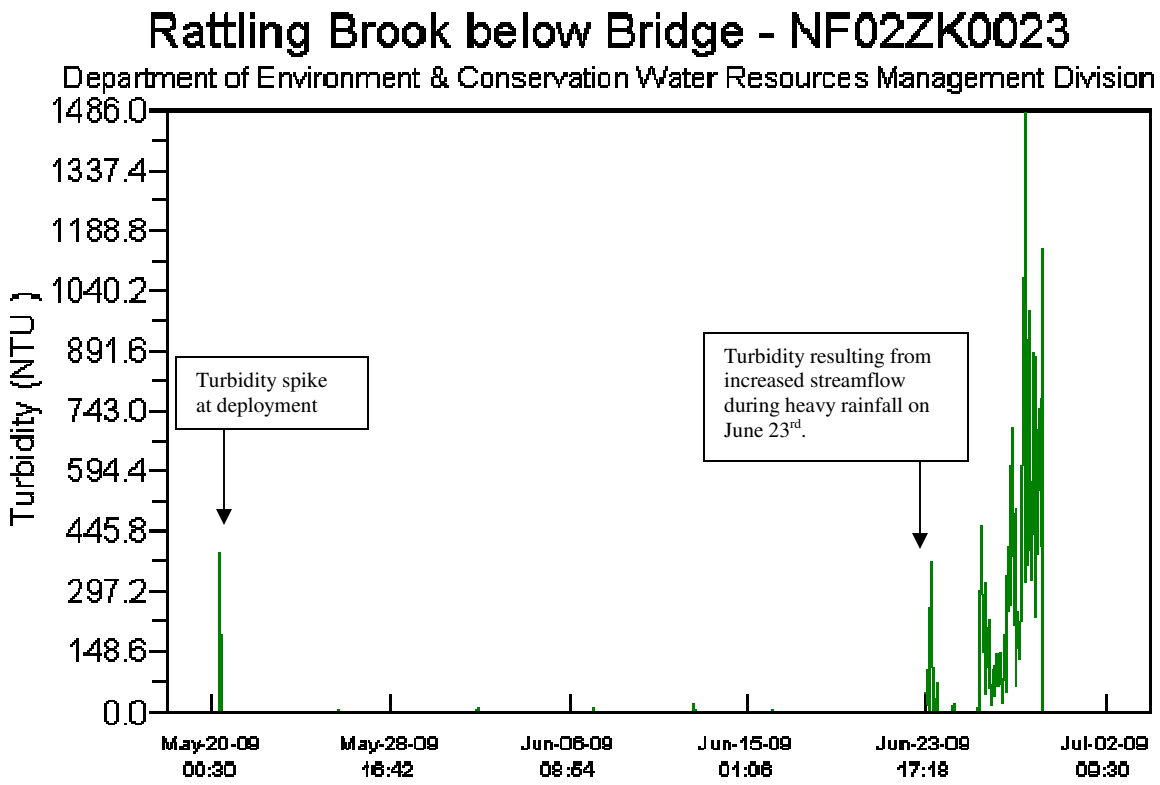


- A general increase in specific conductivity is seen from May 20th to July 2nd. A low of 36.0 occurred on May 26th with a high point occurring on June 20th (40.3 uS/cm) following a rising trend related to decreasing streamflow. A period of heavy rain on June 23rd causes a drop in conductivity and a reduction in diurnal flux through heavy groundwater flow.

Figure 5: Specific Conductivity at Rattling Brook from May 20 to July 2, 2009



- Turbidity at Rattling Brook reached an extreme of 1486 ntu on June 28 at 12pm. Such a high value is unusual and likely represents air entranement or particulate matter blocking the sensor. Despite this, the value occurs during a prolonged episode, implying that a significant turbidity event did occur at this time. Given that the heavy rainfall event occurred a few days prior to this time, it is uncertain whether there is a causal relationship, especially since the rain-induced turbidity spike subsided prior to this secondary spike.



Appendix

- Daily weather data recorded at Argentia Weather Station

Daily Data Report for May 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†	8.3	1.4	4.9	13.1	0.0	M	M	7.6		20	89
02†	6.6	3.6	5.1	12.9	0.0	M	M	9.7		20	74
03†	6.6	3.0	4.8	13.2	0.0	M	M	4.3			<31
04†	8.8	3.9	6.4	11.6	0.0	M	M	2.6		20	39
05†	8.2	2.1	5.2	12.8	0.0	M	M	0.0		20	33
06†	9.9	2.7	6.3	11.7	0.0	M	M	11.9		14	56
07†	7.0	3.3	5.2	12.8	0.0	M	M	3.4		21	50
08†	10.0	4.0	7.0	11.0	0.0	M	M	29.1		19	50
09†	6.4	2.5	4.5	13.5	0.0	M	M	0.0		22	44
10†	7.6	2.4	5.0	13.0	0.0	M	M	9.8		12	57
11†	5.6	1.4	3.5	14.5	0.0	M	M	0.7		34	65
12†	5.5	1.0	3.3	14.7	0.0	M	M	0.0		20	37
13†	7.7	-0.8	3.5	14.5	0.0	M	M	0.0		21	39
14†	14.3	3.9	9.1	8.9	0.0	M	M	0.0		20	37
15†	13.7	4.6	9.2	8.8	0.0	M	M	0.0		21E	46E
16†	7.8	3.3	5.6	12.4	0.0	M	M	0.0		20	41
17†	12.5	3.9	8.2	9.8	0.0	M	M	0.0			<31
18†	15.1	7.7	11.4	6.6	0.0	M	M	2.9			<31
19†	14.5	6.7	10.6	7.4	0.0	M	M	7.1		20	44
20†	7.6	4.2	5.9	12.1	0.0	M	M	0.8		22	50
21†	9.0	3.8	6.4	11.6	0.0	M	M	0.0		20	52
22†	10.2	4.8	7.5	10.5	0.0	M	M	0.0		20	52
23†	10.7	3.2	7.0	11.0	0.0	M	M	0.0		25	46
24†	9.5	2.4	6.0	12.0	0.0	M	M	3.7		15	44
25†	10.2	4.8	7.5	10.5	0.0	M	M	0.8		20	39
26†	6.7	1.8	4.3	13.7	0.0	M	M	10.6		2	56
27†	9.8	3.6	6.7	11.3	0.0	M	M	0.0		32	44
28†	8.7	4.1	6.4	11.6	0.0	M	M	0.0		23	33
29†	11.3	2.9	7.1	10.9	0.0	M	M	0.0		20	33
30†	12.1	7.4	9.8	8.2	0.0	M	M	7.9		14	67
31†	12.7	6.6	9.7	8.3	0.0	M	M	1.5		13	50
Sum				**354.9**	**0.0**	**M**	**M**	**114.4**			
Avg	**9.5**	**3.6**	**6.53**								
Xtrm	**15.1**	**-0.8**								**20**	**89**

Daily Data Report for June 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†	12.1	5.3	8.7	9.3	0.0	M	M	0.0		20	39
02†	10.9	5.6	8.3	9.7	0.0	M	M	0.0		20	52
03†	10.9	5.0	8.0	10.0	0.0	M	M	0.0		22	39
04†	12.6	5.8	9.2	8.8	0.0	M	M	0.0		22	33
05†	12.8	7.5	10.2	7.8	0.0	M	M	0.0		21	35
06†	14.5	7.8	11.2	6.8	0.0	M	M	0.0		20	35
07†	15.7	8.2	12.0	6.0	0.0	M	M	0.0		22	32
08†	10.5	6.3	8.4	9.6	0.0	M	M	2.4		21	37
09†	9.8	6.1	8.0	10.0	0.0	M	M	4.8		1	39
10†	10.7	4.6	7.7	10.3	0.0	M	M	0.0		1	37
11†	10.3	5.5	7.9	10.1	0.0	M	M	0.0			<31
12†	14.2	6.6	10.4	7.6	0.0	M	M	4.0		18	70
13†	15.1	5.5	10.3	7.7	0.0	M	M	3.7		20	67
14†	14.3	4.9	9.6	8.4	0.0	M	M	0.0			<31
15†	11.6	5.1	8.4	9.6	0.0	M	M	M			<31
16†	12.2	5.2	8.7	9.3	0.0	M	M	0.0			<31
17†	14.0	5.1	9.6	8.4	0.0	M	M	0.0			<31
18†	15.6	7.8	11.7	6.3	0.0	M	M	0.0		20	33
19†	16.5	9.2	12.9	5.1	0.0	M	M	0.0		21	37
20†	18.4	9.6	14.0	4.0	0.0	M	M	0.0			<31
21†	20.9	10.4	15.7	2.3	0.0	M	M	0.0			<31
22†	17.5	13.1	15.3	2.7	0.0	M	M	5.2		9	56
23†	17.7	12.5	15.1	2.9	0.0	M	M	40.9		21	33
24†	14.7	11.8	13.3	4.7	0.0	M	M	4.3			<31
25†	16.3	12.2	14.3	3.7	0.0	M	M	6.4			<31
26†	15.1	12.3	13.7	4.3	0.0	M	M	0.0			<31
27†	19.3	11.5	15.4	2.6	0.0	M	M	0.0		2	39
28†	21.7	9.8	15.8	2.2	0.0	M	M	0.0		8	32
29†	20.6	9.2	14.9	3.1	0.0	M	M	0.0		11	32
30†	19.2	8.4	13.8	4.2	0.0	M	M	0.0		10	41
Sum				**197.5**	**0.0**	**M**	**M**	**71.7***			
Avg	**14.9**	**7.9**	**11.39**								
Xtrm	**21.7**	**4.6**								**18**	**70**

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
Sum				**36.9***	**0.4***	**M**	**M**	**0.6***			
Avg	**18.1***	**9.8***	**13.9***								
Xtrm	**23.3***	**6.9***								**20***	**44***

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