Real-Time Water Quality Deployment Report
NF02ZM0178 – Leary Brook at Prince Philip Drive
June 2, 2009 – July 17, 2009

General

- Data from Leary's Brook monitoring station is monitored by the Water Resources Management Division staff.
- Hydrolab Datasonde 5X s/n 43679 was in place between May 22, 2009 and June 2, 2009. However, a problem with the turbidity sensor caused continuous reporting of 3000 ntu – an 'error' reading. Due to this malfunction, the deployment was interrupted.
- This monthly deployment report interprets the data from the Leary Brook real-time water quality station for the period of June 2 to July 17, a period of 45 days.
- Leary Brook station operational status was nominal over the deployment period; no communications dropouts or malfunctions were detected. Hydrolab Datasonde 5X s/n 44975 was in place for this time period.

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).

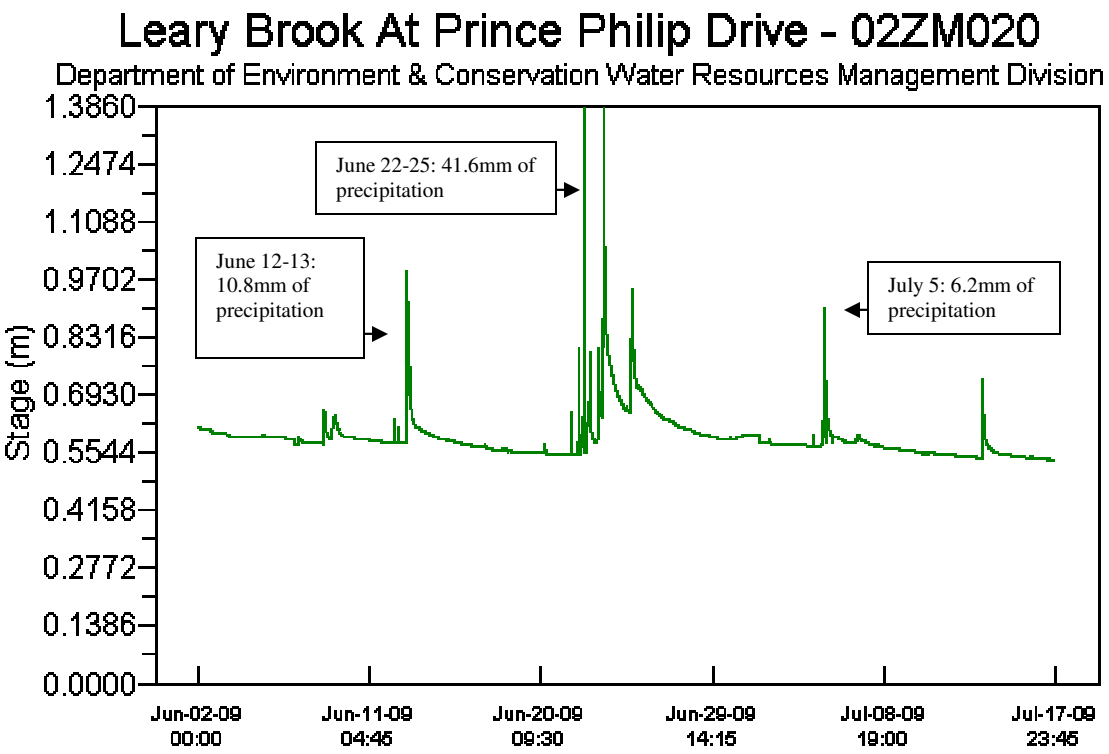
Station	Date	Action	Instrument Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Leary Brook at Prince Philip Drive	June 2, 2009	Installation	Excellent	Excellent	Fair	Poor	Excellent
	July 17, 2009	Removal	Excellent	Excellent	Fair	Good	Poor

- At installation on June 2nd, 2009 all parameters ranked as excellent except for specific conductivity and dissolved oxygen. A flaw in the DO probe resulted in a poor reading on the QAQC probe leading to the 'Poor' designation. The field probe was deemed to be in working order, however, as the reading was in the expected range. It is uncertain as to why there was a significant discrepancy between the QAQC and field probes, possible reasons may be calibration error or fouling remaining after the maintenance check. A problem with the field probe's turbidity sensor caused an inflated reading that led to a 'Poor' rating at the end of deployment. This may have been due to excessive fouling of the self-cleaning turbidity wiper.

Data Interpretation

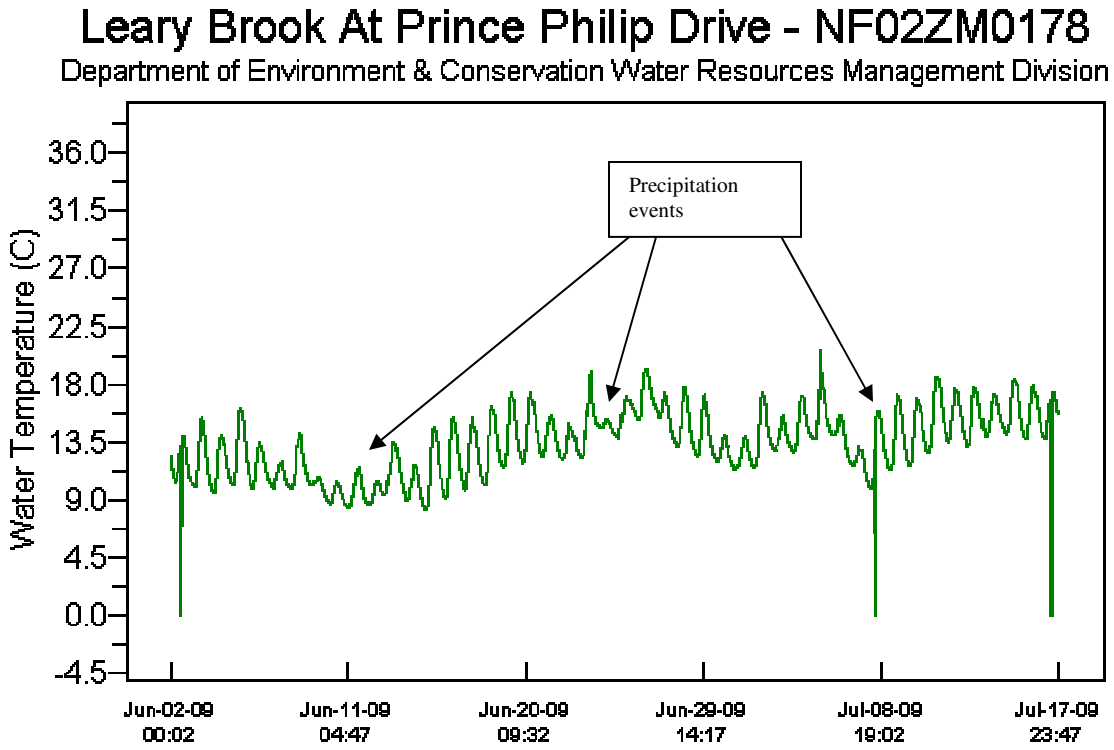
- Figure 1 illustrates the stage level of Leary's Brook throughout the deployment period from June 2 to July 17. Several peaks are seen throughout the deployment. The peaks, caused by an increase in water volume, are linked to precipitation events. Extended flat portions of the graph in between large peaks indicate baseline flow of the river after precipitation events have run their course.

Figure 1: Stage Level at Leary's Brook from June 2, 2009 to July 17, 2009



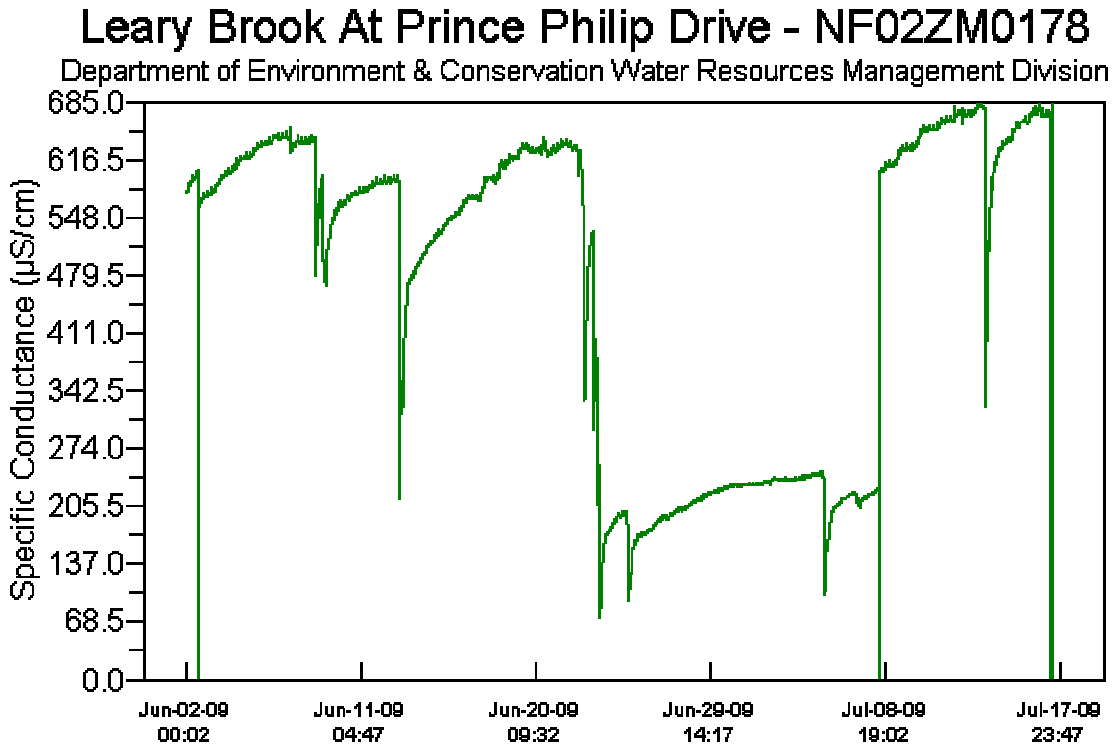
- Water temperature ranged from 8.22 – 20.7°C on June 15 and July 5, respectively, according to Figure 2. These temperatures are within the norm for the season. During precipitation events, a moderating effect is seen in the diurnal temperature cycle. During periods with little precipitation, an obvious warm-cool cycle is seen on a daily basis. Due to heavy cloud cover, precipitation, overland and groundwater flow, water temperature remains much more consistent and even, resulting in a depressed diurnal cycle. Periods of 0°C are erroneous measurements caused by temporary communication drops.

Figure 2: Water temperature at Leary's Brook from June 2, 2009 to July 17, 2009



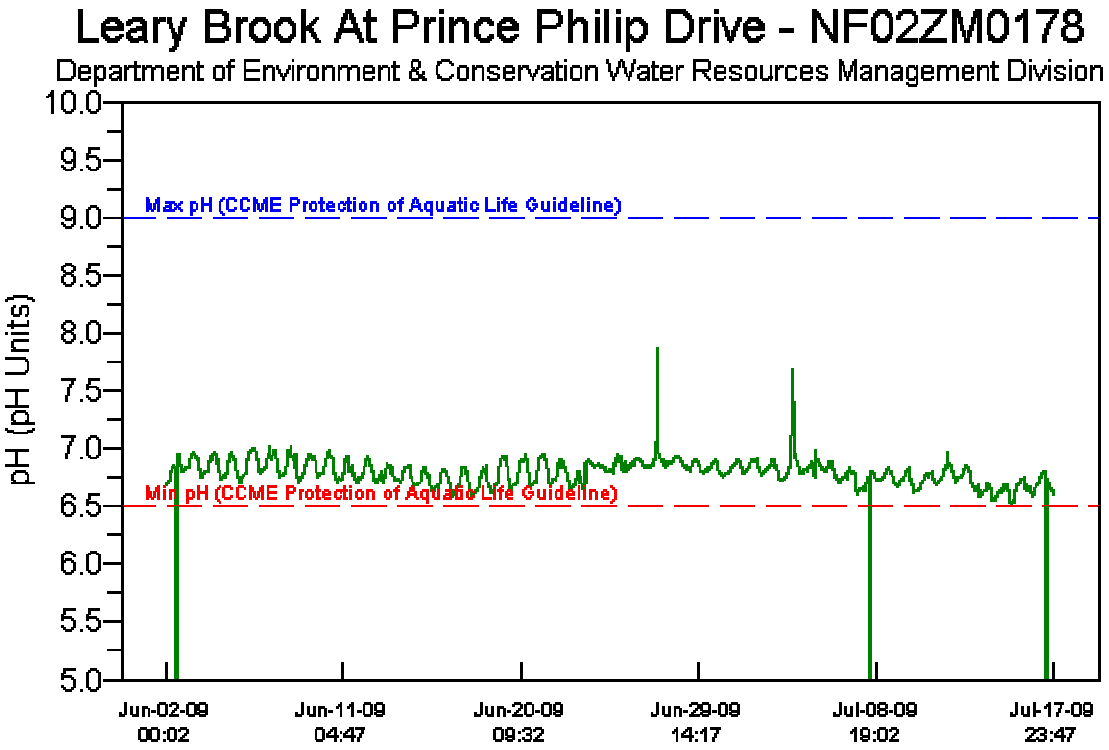
- Specific Conductivity, or water's ability to permit passage of electric current, relates to the total amount of ionic compounds dissolved in the water. As an urban stream impacted by storm runoff on a continual basis, conductivity is generally higher at Leary's Brook compared to ambient, rural waterways. During high-flow, an influx of rainwater dilutes the dissolved compounds, decreasing conductivity. During the precipitation even from June 22-25, conductivity fell sharply and remained until a sharp and sudden increase on the morning of July 8. During the heavy precipitation, sediment may have built up within the conductivity probe and was consequently removed during a field visit on July 8 when the Hydrolab was shifted.

Figure 3: Specific Conductivity at Leary's Brook from June 2, 2009 to July 17, 2009.



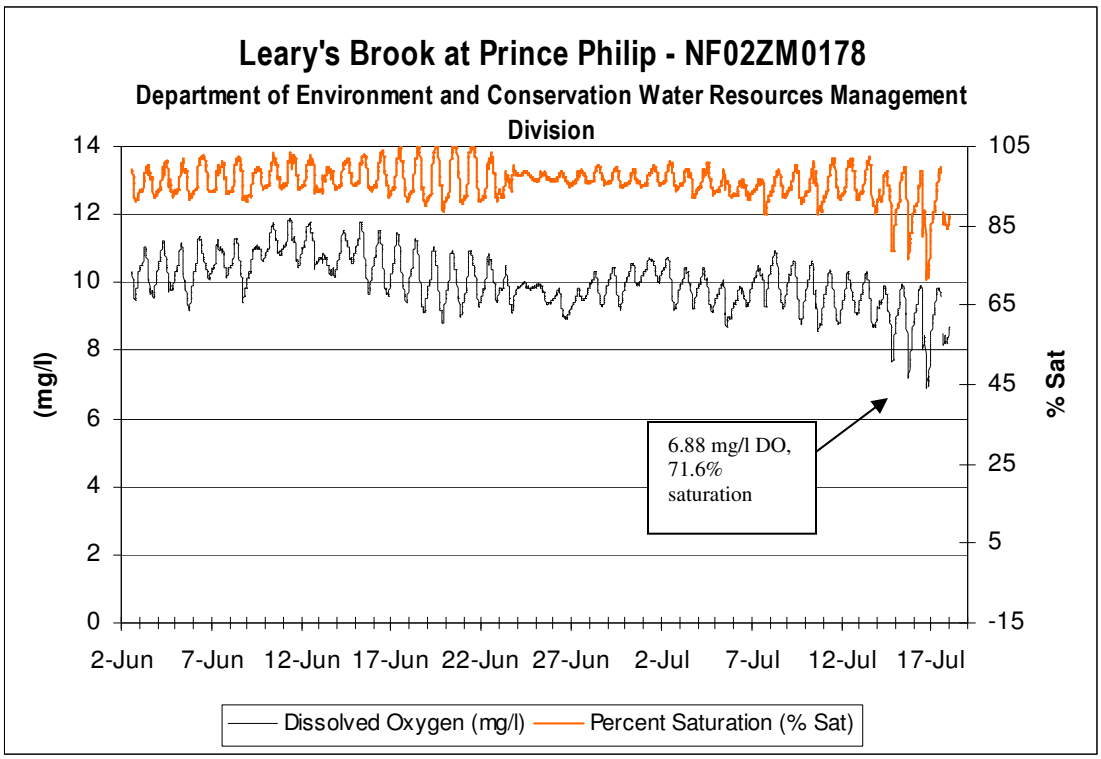
- Over the course of the deployment period at Leary's Brook, the pH ranged from a low of 6.51 to a maximum of 7.86. Figure 4 shows that the pH was sustained between the ideal range of 6.5 – 9.0 as set by the Canadian Council of Ministers of the Environment for the Protection of Aquatic Life. Some instances of pH 0 occurred during communication dropouts as data was lost.

Figure 4: pH at Leary's Brook from June 2, 2009 to July 17, 2009.



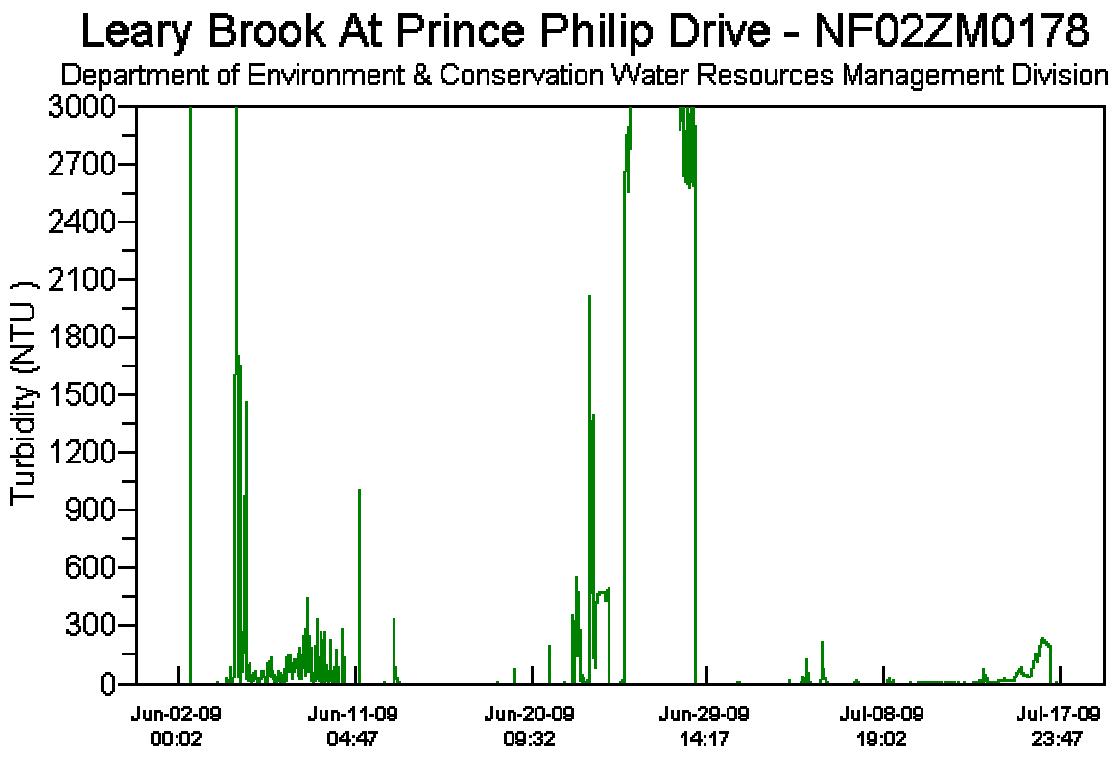
- Dissolved Oxygen in Leary's Brook ranged from 6.88 mg/l to 11.91 mg/l. A general downward trend is expected given the increasing trend in water temperature. Towards the end of the deployment, percent saturation decreases to 71.6% on July 16. This may be an indication of possible eutrophication issues.

Figure 5: Dissolved Oxygen an Leary's Brook from June 2, 2009 to July 17, 2009



- Turbidity at Leary's Brook can vary very rapidly according to precipitation events. Turbidity spikes in this urban river peak quickly and subside rapidly as runoff is very flashy in this urban stream surrounded by impermeable ground cover. During the precipitation event from June 22-25, turbidity remained high and was even measured at 3000ntu, the error reading of the Hydrolab turbidity sensor. Air entrainment and suspension of heavy particulate matter often results from very fast flowing water in a rainfall event.

Figure 6: Turbidity at Leary's Brook from June 2, 2009 to July 17, 2009



Appendix

- The following data was retrieved from the webpage of Environment Canada's Weather Service.

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†	23.1	5.8	14.5	3.5	0.0	0.2	0.0	0.2		26	41
02†	18.5	5.2	11.9	6.1	0.0	0.0	0.0	0.0		23	56
03†	17.4	7.2	12.3	5.7	0.0	0.0	0.0	0.0		28	57
04†	19.3	5.9	12.6	5.4	0.0	0.0	0.0	0.0		25	39
05†	18.8	8.6	13.7	4.3	0.0	0.0	0.0	0.0		26	39
06†	19.3	6.7	13.0	5.0	0.0	0.0	0.0	0.0		26	52
07†	14.9	5.8	10.4	7.6	0.0	1.4	0.0	1.4			<31
08†	15.4	5.6	10.5	7.5	0.0	2.4	0.0	2.4		25	37
09†	6.5	4.4	5.5	12.5	0.0	3.8	0.0	3.8		1	41
10†	6.2	3.7	5.0	13.0	0.0	0.2	0.0	0.2		36	35
11†	9.7	3.7	6.7	11.3	0.0	T	0.0	T			<31
12†	10.4	5.3	7.9	10.1	0.0	1.6	0.0	1.6		18	63
13†	18.8	3.2	11.0	7.0	0.0	9.2	0.0	9.2		18	65
14†	8.7	1.5	5.1	12.9	0.0	T	0.0	T			<31
15†	12.8	2.0	7.4	10.6	0.0	0.0	0.0	0.0			<31
16†	17.0	5.1	11.1	6.9	0.0	0.0	0.0	0.0			<31
17†	19.1	6.2	12.7	5.3	0.0	0.0	0.0	0.0		14	32
18†	20.2	8.1	14.2	3.8	0.0	0.0	0.0	0.0			<31
19†	26.4	7.2	16.8	1.2	0.0	0.0	0.0	0.0		27	33
20†	22.3	9.4	15.9	2.1	0.0	0.0	0.0	0.0			<31
21†	19.8	10.7	15.3	2.7	0.0	0.0	0.0	0.0			<31
22†	16.5	10.0	13.3	4.7	0.0	5.6	0.0	5.6		13	39
23†	20.9	9.9	15.4	2.6	0.0	23.8	0.0	23.8			<31
24†	18.5	13.2	15.9	2.1	0.0	1.6	0.0	1.6			<31
25†	23.6	14.6	19.1	0.0	1.1	10.6	0.0	10.6		26	35
26†	23.9	15.8	19.9	0.0	1.9	0.2	0.0	0.2		28	32
27†	17.0	9.4	13.2	4.8	0.0	T	0.0	T			<31
28†	16.0	9.5	12.8	5.2	0.0	0.0	0.0	0.0			<31
29†	13.4	8.6	11.0	7.0	0.0	0.0	0.0	0.0		14	33
30†	11.4	7.8	9.6	8.4	0.0	T	0.0	T		13	32
Sum				179.3	3.0	60.6	0.0	60.6			
Avg	16.9	7.3	12.1								
Xtrm	26.4	1.5								18	65

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†	12.8	7.4	10.1	7.9	0.0	0.8	0.0	0.8			<31
02†	16.7	7.8	12.3	5.7	0.0	T	0.0	T			<31
03†	16.0	10.5	13.3	4.7	0.0	T	0.0	T			<31
04†	20.4	10.7	15.6	2.4	0.0	T	0.0	T			<31
05†	23.1	12.5	17.8	0.2	0.0	6.2	0.0	6.2		25	44
06†	16.3	6.7	11.5	6.5	0.0	0.4	0.0	0.4		26	39
07†	9.1	3.5	6.3	11.7	0.0	3.0	0.0	3.0			<31
08†	18.6	2.6	10.6	7.4	0.0	0.0	0.0	0.0		28	35
09†	20.6	7.8	14.2	3.8	0.0	0.0	0.0	0.0			<31
10†	23.8	7.3	15.6	2.4	0.0	0.0	0.0	0.0		25	52
11†	26.3	13.3	19.8	0.0	1.8	0.0	0.0	0.0			<31
12†	23.6	12.5	18.1	0.0	0.1	0.0	0.0	0.0		27	33
13†	22.5	10.9	16.7	1.3	0.0	3.4	0.0	3.4		16	56
14†	22.9	12.3	17.6	0.4	0.0	T	0.0	T		15	44
15†	23.6	12.4	18.0	0.0	0.0	0.0	0.0	0.0		28	33
16†	22.9	11.6	17.3	0.7	0.0	0.0	0.0	0.0		25	39
17†	24.0	12.5	18.3	0.0	0.3	0.4	0.0	0.4		25	41
18†	20.1	12.5	16.3	1.7	0.0	3.2	0.0	3.2		19	32
19†	17.6	12.2	14.9	3.1	0.0	2.2	0.0	2.2		27	44
20†	26.1	15.9	21.0	0.0	3.0	T	0.0	T		27	39
21†	21.8	14.2	18.0	0.0	0.0	0.0	0.0	0.0			<31
22†	15.9	11.5	13.7	4.3	0.0	3.2	0.0	3.2			<31
23†	13.5	9.9	11.7	6.3	0.0	2.2	0.0	2.2			<31
24†	16.3	9.8	13.1	4.9	0.0	0.0	0.0	0.0			<31
25†	21.1	12.2	16.7	1.3	0.0	14.6	0.0	14.6		16	41
26†	15.7	12.2	14.0	4.0	0.0	6.8	0.0	6.8			<31
27†	15.0	13.3	14.2	3.8	0.0	2.4	0.0	2.4			<31
28†	22.8	13.7	18.3	0.0	0.3	6.2	0.0	6.2		25	48
29†	21.3	10.4	15.9	2.1	0.0	T	0.0	T			<31
30†	23.7	10.4	17.1	0.9	0.0	0.4	0.0	0.4		20	37
31†	25.5	16.8	21.2	0.0	3.2	T	0.0	T		27	59
Sum				87.5	8.7	55.4	0.0	55.4			
Avg	20	10.9	15.43								
Xtrm	26.3	2.6								27	59

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