Memo

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Water Resources and Environmental Consulting

Date: March 4, 2008

To: Kevin Stewart and Chad Kudym

From: Markus Ritsch

Subject: **February 2008 ALERT Data Analysis**

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's Nova Star 4.0 base station (ALERT 2) were analyzed for the period February 1 through February 29, 2008.

II. General System Analysis Summary

A total of 214,477 individual data records with valid ALERT IDs were analyzed from the ALERT 2 base station. Meteorological sensors account for 88 percent, water level sensors 4 percent, and rain sensors 3 percent of the total monthly transmissions.

Ninety-nine percent of the received data reports were flagged as "good" by the Nova Star validation process. Roughly 2,434 reports were flagged as "bad". Of these "bad" reports, 851 originated from Quincy Reservoir (ID 757-Wind Gust) and 358 from Aurora Reservoir (ID 908-Solar Radiation).

The system-wide radio traffic loading this month was 7,396 reports per day with an average hourly loading of 308 reports. The peak hourly traffic loading was 421 reports, which occurred on February 11th between 3:00 PM and 4:00 PM. A plot of monthly average and peak hourly traffic loading is provided.

A total of 110 reports were received from the Hayman gages this month. The Hayman gages are winterized and won't return to operation until April 1, 2008.

The sensors reporting most frequently this month are mostly wind sensors and include:

1. Quincy Reservoir (ID 749 - Wind Gust) with 5,505 reports,
2. Ward C-1 (ID 4707 - ALERT wind) with 4,705 reports,
3. Marston Lake North (ID 1522 - Temperature) with 4,082 reports
4. Castle Rock (ID 2747 - ALERT wind) with 3,570 reports, and
5. Salisbury Park (ID 2727 - ALERT wind) with 3,282 reports.

The reports from the above sensors are distributed evenly throughout the month.

The sensors reporting infrequently this month include:

1. Fourmile at Salina (ID 4415) with 1 report,
2. Niver Detention (ID 1900, 1903, and 1905) with 2 reports,
3. LDC at 64th (ID 1310, 1313, and 1315) with 2 reports,
4. Sports Complex (ID 320, 323, and 325) with 2 reports, and
5. West Woods (ID 120 and 123) with 2 reports.

Note that many stations are shut-down over the winter and the reporting for these stations is minimal or non-existent.

III. Rain Sensor Timer Reporting Summary

The following analysis assumes that each rain sensor has a 12-hour timer reporting interval. System-wide the ALERT 2 base station received approximately 74 percent of the non-incrementing timer reports. The worst performing rain sensors for the month are summarized (Table 1).

Table 1. Monthly Summary of Sensors with Poor Timer Performance (Sensor ID)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2190	1660										
140	2190										
4150	140										
4060	4170										
4470	4150										
4530	4530										

Note that many stations are put back into service in February and March which influences the timer reporting performance because only a partial month of data is available for analysis.

Sensors identified as having poor timer performance in multiple months are shaded with unique colors. A developing trend can thus be identified from the color shading as the year progresses.

Sensor ID 1460 has a 24-hour timer reporting interval and is not included in the timer reporting analysis.

Sensor ID 1810 has an 18-hour timer reporting interval and is not included in the timer reporting analysis.

IV. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors (excluding Hayman sensors) are analyzed to quantify the District-wide statistical total monthly tip summary (Table 2).

Table 2. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	7.38	Only the 1-mm rain sensors were included in the analysis
Median	7	Only the 1-mm rain sensors were included in the analysis
Standard deviation	4.69	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	21.44	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Many sensors
Maximum total count	24	Morrison Precipitation

The highest reporting rain sensors were Morrison (ID 2330) and Tomah Road in Douglas County (ID 2990). These were the only sensors that reported more than the system-wide mean plus 3 standard deviations. The data from these sensors was manually inspected. Their data series looks good, nothing suspicious was identified.

A monthly summary of the District-wide mean total tip/count is presented (Table 3).

Table 3. Monthly Summary of District-Wide Mean Total 1-mm Tip/Count

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
2006	4.62	5.92	18.39	20.47	19.44	13.75	74.03	46.89	24.17	41.13	5.04	16.45	24.19
2007	11.56	5.40	29.75	65.03	68.30	15.87	36.20	46.38	22.13	29.50	6.54	11.29	29.00
2008	4.05	7.38											

B. Sensors with a Jump of Six or More in the Sequential Count

The tip count series for sensors with a jump in sequential count of more than six are manually inspected and summarized below. No sensors were identified with a jump in their sequential count of more than six.

C. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 96 percent. A total of 757 incrementing reports were received and a total of 790 were expected. The total loss of incrementing reports for the month was approximately 4 percent. Those sensors with the worst rain event transmission performance characteristics are summarized (Table 4).

Table 4. Monthly Summary of Sensors with the Most Missed Tips

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1640	4520										
2190	4820										
750	4530										
4570	4470										
2990	4810										
--	700										

Sensors identified as having poor event performance in multiple months are shaded with unique colors. A developing trend can thus be identified from the color shading as the year progresses.

The incrementing data series for the worst performing sensors is manually inspected.

a. Eagle Ridge (ID 4520)

This sensor has a continuous series for the entire month. A total of 8 tips were expected and only 6 tips were received. Two single increment transmissions (one on 2/5/08 and a one on 2/15/08) were not received at the base.

b. Dowdy Draw (ID 4820)

This sensor has a continuous series for the entire month. A total of 12 tips were expected and only 9 tips were received. Three single increment transmissions (one on 2/5/08 and two on 2/26/08) were not received at the base.

c. Winiger Ridge (ID 4530)

This sensor has a continuous series for the entire month. A total of 17 tips were expected and only 14 tips were received. Three single increment transmissions (one on 2/10/08, one on 2/15/08, and one on 2/26/08) were not received at the base.

d. Little Narrows (ID 4470)

This sensor has a continuous series for the entire month. A total of 12 tips were expected and only 10 tips were received. Two single increment transmissions (one on 2/26/08 and a one on 2/26/08) were not received at the base

V. Heavy Radio Traffic Analysis

For each month, periods exceeding 600 messages per hour are analyzed independently in an attempt to identify rain tip sequences where 3 or more, sequential messages are lost. These heavy traffic periods are analyzed in the subsequent paragraphs.

A. The Heaviest Traffic Hours This Month

The hourly periods of highest radio traffic for the month include:

- 2/11/08 from 3:00 pm to 4:00 pm (421 reports)
- 2/8/2008 from 12:00 pm to 1:00 pm (419 reports)
- 2/26/2008 from 10:00 am to 11:00 am (414 reports)
- 2/11/2008 from 2:00 pm to 3:00 pm (412 reports)

B. February 26, 2008

The distribution of hourly traffic around the peak hour on February 26 is summarized:

- 8:00 am to 9:00 am – 333 reports
- 9:00 am to 10:00 am – 378 reports
- 10:00 am to 11:00 am – 414 reports
- 11:00 am to 12:00 pm – 367 reports
- 12:00 pm to 1:00 pm – 343 reports
- 1:00 pm to 2:00 pm – 324 reports

Incrementing rain records from the 1-mm gages for the heavy radio traffic period were examined to characterize the loss of sequential incrementing tip transmissions (Table 5). Overall, approximately 5% of the incrementing tip reports were lost during this period.

Table 5. Peak Traffic Analysis - Loss of Incrementing Tip Reports

	Occurrences of lost sequential tip reports during period			
Heavy Traffic Period (Feb 26, 2008)	**Loss of 2 sequential tips**	**Loss of 3 sequential tips**	**Loss of 4 sequential tips**	**Loss of 5 sequential tips**
8:00 am to 2:00 pm	2	0	0	0

VI. Unknown Device Analysis – Received Data Log

The ALERT IDs present in the audio signal received by the decoder are compared against a list of "active" device IDs that are defined within NovaStar. Those IDs received by the decoder that are not defined within NovaStar are considered to be "unknown" and may be the result of radio noise or problems with the telemetry system. The reception of "unknown" device reports for the month is summarized (Table 6).

Table 6. Summary of Unknown IDs

Description	**Quantity**
Total number of unknown IDs (IDs without a device definition)	155
Total reports from unknown IDs	372
Unknown IDs with only a single received report (potential noise)	107
Total reports from all IDs – RecData Log entire month	219,061
Unknown reports as a fraction of total reports	0.17%

The total number of reports from unknown sensors is small relative to the total reports received for the month.

A number of "unknown" sensors had multiple reports which may indicate the existence of a transmitter that is sending information on an ID that is not currently defined within NovaStar. The unknown IDs with multiple reports including the number of reports received by each are quantified (Table 7).

Table 7. Reports Received by Unknown IDs

Unknown Sensor	Reports
4561	39
4562	37
4564	28
205	23
505	21
2204	8
4636	6
4831	5
4047	5
4031	4
4765	4
4760	4
4759	3
4766	3
4748	3
4739	3
4756	3
4091	3
4775	3
1663	3
4828	3

The "unknown" device reports are analyzed temporally to understand when they are received during the day (Table 8). The goal of this analysis is to determine a pattern of occurrence that may correspond to a source of noise in the system, such as the use of a wireless microphone nearby.

Table 8. Temporal Distribution of Unknown Reports

Hour (AM)	Reports	Hour (PM)	Reports
0:00-00:59	11	12:00-12:59	47
1:00-1:59	5	1:00-1:59	49
2:00-2:59	3	2:00-2:59	20
3:00-3:59	4	3:00-3:59	8
4:00-4:59	2	4:00-4:59	11
5:00-5:59	5	5:00-5:59	14
6:00-6:59	10	6:00-6:59	19
7:00-7:59	6	7:00-7:59	9
8:00-8:59	13	8:00-8:59	15
9:00-9:59	20	9:00-9:59	16
10:00-10:59	33	10:00-10:59	12
11:00-11:59	35	11:00-11:59	5

Reports from unknown sensors occur each hour of the day. The period from 10:00 am to 2:00 pm received the highest number of unknown reports.

VII. Issues Identified this Month

Sensors with a large number of invalid reports (other than Wind sensors):

1. Aurora Reservoir (ID 908) - Solar Radiation with 358 invalid reports,
2. Squaw Mountain (ID 2192) - Temperature with 172 reports,
3. Quincy Reservoir (ID 753) - Solar Radiation with 118 reports,
4. Quincy Reservoir (ID 755) - Battery Voltage with 92 reports,
5. Lyons Diversion NSV (ID 4563) - Water Level PT with 43 reports,
6. Cal-Wood Ranch (ID 4774) - Barometric Pressure with 33 reports.

Sensors reporting frequently:

7. Quincy Reservoir (ID 749) - Wind Gust with 5,505 reports,
8. Ward C-1 (ID 4707) - ALERT Wind with 4,705 reports,
9. Marston Lake North (ID 1522) - Temperature with 4,082 reports,
10. Castle Rock (ID 2747) - ALERT Wind with 3,570 reports, and
11. Salisbury Park (ID 2727) - ALERT Wind with 3,282 reports.

Sensors reporting infrequently (under reporting):

12. Fourmile at Salina (ID 4415) with 1 report,
13. Niver Detention (ID 1900, 1903, and 1905) with 2 reports,
14. LDC at 64th (ID 1310, 1313, and 1315) with 2 reports,
15. Sports Complex (ID 320, 323, and 325) with 2 reports, and
16. West Woods (ID 120 and 123) with 2 reports.

Poor timer reporting:

The following sensors reported for the entire month and showed poor timer performance.

17. **SPR at Henderson (ID 1660) -** Only 81% of the timer reports received for the entire month.
18. **Squaw Mountain (ID 2190)** - Only 74 % of the timer reports were received from this sensor.
19. **Blue Mountain (ID 140)** - Only 78% of the timer reports were received from this sensor.
20. **Pine Brook (ID 4170)** - Only 79% of the timer reports were received from this sensor
21. **Gold Hill (ID 4150)** - Only 86% of the timer reports were received from this sensor.
22. **Winiger Ridge (ID 4530)** - Only 86% of the timer reports were received from this sensor.

Poor event reporting:

The following sensors reported for the entire month and showed poor event performance.

23. **Eagle Ridge (ID 4520)** – Only 75% of the event reports were received.
24. **Doudy Draw (ID 4820)** – Only 75% of the event reports were received.
25. **Winiger Ridge (ID 4530)** – Only 82% of the event reports were received.
26. **Little Narrows (ID 4470)** – Only 82% of the event reports were received.

Low rain total:

27. **Squaw Mountain (ID 2190) –** This sensor recorded only 2 tips for the entire month. Nothing suspicious in the data series. Surrounding stations also had low monthly totals.

High rain total:

28. **Morrison (ID 2330)** – This was the highest recording sensor for the month with a total of 24 tips. Nothing suspicious was identified in the incrementing series.

Large Jump in Sequential Count Value:

29. **Squaw Mountain (ID 2190)** - This sensor experienced several large jumps in count that are possibly due to transmission errors (see data series below).

Date/Time	Sensor ID	Count
2/1/2008 3:07:44 PM	2190	37
2/2/2008 3:07:47 AM	2190	37
2/2/2008 3:07:53 PM	2190	37
2/3/2008 3:08:01 PM	2190	37
2/4/2008 3:08:03 AM	2190	37
2/5/2008 3:08:18 PM	2190	37
2/6/2008 3:08:27 PM	2190	37
2/7/2008 3:08:37 PM	2190	37
2/8/2008 3:08:40 AM	2190	1541
2/8/2008 3:08:46 PM	2190	37
2/9/2008 3:08:49 AM	2190	37
2/9/2008 3:08:54 PM	2190	37
2/10/2008 3:09:14 AM	2190	37
2/10/2008 3:09:15 PM	2190	37
2/11/2008 3:09:11 AM	2190	37
2/11/2008 3:09:12 PM	2190	37
2/12/2008 3:09:12 AM	2190	37
2/12/2008 3:09:17 PM	2190	37
2/13/2008 3:09:19 AM	2190	37
2/13/2008 3:09:24 PM	2190	37
2/14/2008 3:09:32 PM	2190	37
2/15/2008 3:09:34 AM	2190	37
2/15/2008 3:09:39 PM	2190	37
2/16/2008 3:09:41 AM	2190	37
2/16/2008 3:09:46 PM	2190	37

Date/Time	Sensor ID	Count
2/17/2008 3:09:49 AM	2190	37
2/17/2008 3:09:55 PM	2190	37
2/18/2008 3:09:58 AM	2190	1541
2/18/2008 3:10:04 PM	2190	37
2/19/2008 3:10:07 AM	2190	37
2/19/2008 2:25:43 PM	2190	38
2/19/2008 3:10:12 PM	2190	38
2/20/2008 3:10:18 PM	2190	38
2/21/2008 3:10:20 AM	2190	38
2/21/2008 3:10:25 PM	2190	38
2/22/2008 3:10:28 AM	2190	38
2/22/2008 3:10:33 PM	2190	38
2/23/2008 3:10:36 AM	2190	38
2/23/2008 3:10:41 PM	2190	38
2/24/2008 3:10:47 AM	2190	38
2/25/2008 3:10:56 PM	2190	38
2/26/2008 3:10:59 AM	2190	38
2/26/2008 3:11:05 PM	2190	38
2/27/2008 3:11:07 AM	2190	1542
2/27/2008 3:11:12 PM	2190	38
2/28/2008 1:57:10 AM	2190	39
2/28/2008 3:11:14 AM	2190	39
2/28/2008 3:11:19 PM	2190	39
2/29/2008 3:11:26 PM	2190	39

Reports from "Unknown Sensors":

30. **4561, 4562, and 4564 –** These "unknown" sensor IDs all had a large number of reports. Is this a newly installed station?
31. **205 and 505 -** These sensor IDs each reported more than 20 times during the month.
32. The following table shows the "unknown" sensor IDs and the total number of reports received during the month. These reports indicate the existence of a transmitter that is sending information on an ID that is not currently defined within NovaStar.

Unknown Sensor	Reports
4561	39
4562	37
4564	28
205	23
505	21
2204	8
4636	6
4831	5
4047	5
4031	4
4765	4
4760	4
4759	3
4766	3
4748	3
4739	3
4756	3
4091	3
4775	3
1663	3
4828	3

Duplicate Reports:

33. **Cal-Wood Ranch (IDs 4764, 4767, 4772, 4771, 4774, 4778) –** Approximately 3,184 duplicate reports were received on the ALERT 2 base station from the Cal-Wood Ranch station.
34. Duplicate reports are also received from Diamond Hill, SBC @ San Souci, SBC @ S Boulder Ditch, Sugarloaf, Louisville Lake and Doudy Draw.

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2008_Feb\Novastar_extract_2008Feb.mdb

First Date in Database	2/1/08 12:00 AM	**Total Days**	29.0
Last Date in Database	2/29/08 11:59 PM	**Total Hours**	696.0

Total Records Analyzed 214477

Records by Group

Wind Gust	44838	21%
Temperature	36099	17%
Relative Humidity	34082	16%
Wind Speed Average & Azimuth	22199	10%
Wind Direction	18278	9%
Wind Speed Average	14820	7%
Barometric Pressure	9255	4%
Solar Radiation	8143	4%
Water Level PT-HSE	6624	3%
Precipitation	5956	3%
Battery Voltage HSE	3725	2%
Battery Voltage Analog	3225	2%
Battery Voltage Digital	2599	1%
Water Level Float	1062	0%
Fuel Moisture	671	0%
Fuel Temperature	664	0%
Repeater Pass List	570	0%
Repeater Status Report	447	0%
Precipitation - Test	232	0%
Water Level PT	193	0%
Battery	172	0%
Handar 585 ALARM Status	135	0%
Longmont Flow Gage	116	0%
Hayman Precipitation	110	0%
12Hr Status Report	104	0%
Soil Moisture	58	0%
Longmont Water Level PT	53	0%
Total	214430	

Records by Major Group

Meteorologic Sensors	187714	88%
Sensor Status Transmissions	10805	5%
Water Level Sensors	8048	4%
Rain Sensors	5956	3%
Soil and Fuel Sensors	1393	1%
Total	213916	

Records by Validation Type

Good	0	212043	99%
Questionable	1	2434	1%
	Total	214477	

Sensors With Most Invalid Data

Description	**Sensor**	**Reports**
Quincy Reservoir	757	851
Aurora Reservoir	908	358
Squaw Mountain	2192	172
Elbert	1437	132
Elbert	1439	132

Traffic Loading Summary

Alert Reports	214477	
Average Daily Traffic	7396	
Average Hourly Traffic	308	
Median Hourly Traffic	310	hour beginning
Peak Hourly Traffic	421	2/11/08 3:00 PM
2nd Max	419	2/8/08 12:00 PM
3rd Max	414	2/26/08 10:00 AM
4th Max	412	2/11/08 2:00 PM
5th Max	412	2/11/08 2:00 PM

General System Analysis

Reports per Sensor

Description	Sensor	Reports	Fraction of Total
Quincy Reservoir	749	5505	3%
Ward C-1	4707	4705	2%
Marston Lake North	1522	4082	2%
Castle Rock	2747	3570	2%
Salisbury Park	2727	3282	2%
Stapleton	1461	3075	1%
Stapleton	1464	2775	1%
Stapleton	1465	2774	1%
Stapleton	1467	2769	1%
Elbert	1438	2766	1%
Stapleton	1466	2759	1%
Elbert	1437	2758	1%
Elbert	1439	2752	1%
Elbert	1441	2750	1%
Elbert	1442	2750	1%
Aurora Reservoir	908	2747	1%
Quincy Reservoir	751	2692	1%
Aurora Reservoir	903	2692	1%
Quincy Reservoir	752	2689	1%
Marston Lake North	1526	2679	1%
Quincy Reservoir	754	2659	1%
Quincy Reservoir	755	2655	1%
Quincy Reservoir	757	2634	1%
Castle Rock	2744	2487	1%
Squaw Mountain	2188	2441	1%
Hiwan G.C.	2208	2379	1%
Ward C-1	4704	2371	1%
Louisville Lake	4747	2324	1%
Salisbury Park	2724	2289	1%
Squaw Mountain	2192	2268	1%
Blue Mountain	139	2267	1%
Blue Mountain	138	2258	1%
Sugarloaf	4727	2256	1%
Louisville Lake	4744	2248	1%
Blue Mountain	137	2242	1%
Sugarloaf	4724	2230	1%
Blue Mountain	141	2223	1%
Diamond Hill	1414	2193	1%
Blue Mountain	142	2181	1%
Cal-Wood Ranch	4764	2172	1%
Squaw Mountain	2189	2019	1%
Highlands Ranch WTP	2704	1972	1%
Squaw Mountain	2187	1966	1%
Squaw Mountain	2191	1927	1%
Salisbury Park	2732	1921	1%
Highlands Ranch WTP	2711	1825	1%
Brighton	1914	1798	1%
Cal-Wood Ranch	4771	1794	1%
Brighton	1921	1793	1%
Highlands Ranch WTP	2712	1781	1%
Castle Rock	2751	1760	1%
Castle Rock	2752	1758	1%
Louisville Lake	4751	1710	1%
Ward C-1	4711	1686	1%
Hiwan G.C.	2209	1684	1%
Sugarloaf	4731	1676	1%
Brighton	1922	1669	1%
Salisbury Park	2731	1652	1%
Marston Lake North	1527	1642	1%
Stapleton	1462	1632	1%
Highlands Ranch WTP	2707	1626	1%
Aurora Reservoir	906	1620	1%
Cal-Wood Ranch	4772	1615	1%
Button Rock	4791	1564	1%
Diamond Hill	1422	1538	1%
Sugarloaf	4732	1507	1%
Hiwan G.C.	2212	1490	1%
SPR at Union Ave.	1643	1466	1%
Louisville Lake	4752	1452	1%
Button Rock	4784	1452	1%
Button Rock	4792	1448	1%
Diamond Hill	1417	1390	1%
Hiwan G.C.	2207	1384	1%
Ward C-1	4712	1324	1%
Marston Lake North	1521	1283	1%
Cal-Wood Ranch	4767	1244	1%
Quincy Reservoir	753	1238	1%
Aurora Reservoir	901	1200	1%
Aurora Reservoir	905	1196	1%
Hiwan G.C.	2211	1187	1%
Marston Lake North	1525	1151	1%
Brighton	1917	1113	1%
Cal-Wood Ranch	4774	1080	1%

Rain Timer Performance

Analyze Rain Sensors

			systemwide average (days) 0.5181		rage 74%
Rain Sensors	**Description**	**Rcvd**	**Average Timer Interval**	**Exp**	**Performance**
320	Sports Complex	2		58.00	3%
1350	Chatfield COE	5	8:00	58.00	9%
1370	West Metro FS13	7	0:00	58.00	12%
110	Ralston Reservoir	12	15:57	58.00	21%
1040	Lena @ U.S. Hwy 6	13	13:11	58.00	22%
540	Parker/Mississippi	14	15:38	58.00	24%
620	Quincy/Highline	14	17:56	58.00	24%
1530	Bear Creek @ Lowell	14	11:57	58.00	24%
1030	NREL/S. Table Mtn.	15	11:57	58.00	26%
530	Fire Station #19	16	12:45	58.00	28%
1060	Heritage Square	16	11:57	58.00	28%
210	Leyden Confluence	17	11:58	58.00	29%
300	Van Bibber Park	17	11:57	58.00	29%
510	Virginia Court	17	13:27	58.00	29%
840	Fire Station 12	17	15:00	58.00	29%
1010	Denver West	17	11:57	58.00	29%
440	Fire Station #7	18	12:40	58.00	31%
520	Jewell Detention	18	12:40	58.00	31%
760	Mission Viejo Park	18	14:04	58.00	31%
1050	Jeffco Fairgrounds	18	11:57	58.00	31%
1360	Denver Zoo	18	12:42	58.00	31%
500	Havana Park	19	12:40	58.00	33%
600	Harvard Gulch Park	19	11:58	58.00	33%
630	Temple Pond at DTC	19	12:37	58.00	33%
820	ETG @ Buckley	19	13:17	58.00	33%
1340	Sanderson at Xavier	19	12:00	58.00	33%
800	Sable Ditch @ 18th	21	11:57	58.00	36%
810	Granby Ditch @ 6th	21	11:57	58.00	36%
830	Side Creek Park	21	11:57	58.00	36%
1330	Roslyn	22	12:00	58.00	38%
1460	Stapleton	27	23:59	58.00	47%
1810	Sand Creek at mouth	37	18:00	58.00	64%
200	Leyden Reservoir	39	0:49	58.00	67%
2190	Squaw Mountain	43	15:54	58.00	74%
140	Blue Mountain	45	14:51	58.00	78%
4170	Pine Brook	46	14:33	58.00	79%
1660	SPR at Henderson	47	14:08	58.00	81%
4140	Logan Mill	47	14:49	58.00	81%
4560	Lyons Diversion NSV	48	14:17	58.00	83%
4860	Fairview Peak	48	13:54	58.00	83%
4090	Magnolia	49	12:48	58.00	84%
4570	St. Antons	49	13:23	58.00	84%
900	Aurora Reservoir	50	13:16	58.00	86%
2730	Salisbury Park	50	13:30	58.00	86%
4130	Swiss Peaks	50	13:19	58.00	86%
4150	Gold Hill	50	13:33	58.00	86%
4240	Sunset	50	13:01	58.00	86%
4530	Winiger Ridge	50	13:35	58.00	86%
4470	Little Narrows	51	13:00	58.00	88%
4490	Apple Valley	51	12:44	58.00	88%
4830	SBC @ San Souci	51	13:14	58.00	88%
4180	Gold Lake	52	13:00	58.00	90%
4510	Pinewood Springs	52	11:58	58.00	90%
4840	SBC@S Boulder Ditch	52	13:12	58.00	90%
4010	Cresent	53	12:43	58.00	91%
4080	Twin Sisters	53	12:27	58.00	91%
4220	Fling's	53	12:13	58.00	91%

4290	Red Hill	53	12:28	58.00	91%
4850	Porphory Mtn	53	12:14	58.00	91%
1700	Cherry Cr @ Champa	54	12:44	58.00	93%
2220	Evergreen Lake	54	12:38	58.00	93%
2920	t Cherry Head-Douglas	54	12:28	58.00	93%
2930	ring Valley Rd - DougC	54	12:28	58.00	93%
4060	Lakeshore	54	12:42	58.00	93%
4070	Bear Peak	54	12:27	58.00	93%
4200	Lazy Acres	54	12:14	58.00	93%
4270	Cannon Mountain	54	12:38	58.00	93%
4310	Johnny Park	54	12:12	58.00	93%
4710	Ward C-1	54	12:32	58.00	93%
750	Quincy Reservoir	55	12:26	58.00	95%
1420	Diamond Hill	55	12:14	58.00	95%
2210	Hiwan G.C.	55	12:13	58.00	95%
2990	Tomah Rd-Douglas Cnt	55	12:15	58.00	95%
4190	Slaughterhouse	55	12:26	58.00	95%
4260	Taylor Mountain	55	12:27	58.00	95%
4340	Riverside	55	12:26	58.00	95%
4730	Sugarloaf	55	12:14	58.00	95%
4750	Louisville Lake	55	12:00	58.00	95%
4790	Button Rock	55	12:15	58.00	95%
4810	Shanahan Ridge	55	12:26	58.00	95%
4820	Doudy Draw	55	12:26	58.00	95%
700	Toll Gate @ 6th	56	12:14	58.00	97%
740	Smoky Hill	56	12:13	58.00	97%
920	Aurora Town Hall Wx	56	12:13	58.00	97%
1480	Third Creek at DIA	56	12:13	58.00	97%
1520	Marston Lake North	56	12:14	58.00	97%
1640	SPR at Union Ave.	56	12:14	58.00	97%
2750	Castle Rock	56	12:13	58.00	97%
2820	Haskins Gulch Conf	56	11:59	58.00	97%
2940	Willow Creek - DougCnt	56	12:14	58.00	97%
4020	Rio Grande	56	12:11	58.00	97%
4040	Martin Gulch	56	12:12	58.00	97%
4050	Walker Ranch	56	12:11	58.00	97%
4100	Filter Plant	56	12:27	58.00	97%
4110	Betasso	56	11:59	58.00	97%
4160	Sunshine	56	12:11	58.00	97%
4230	Golden Age	56	12:11	58.00	97%
4250	Geer Canyon	56	11:58	58.00	97%
4300	Big Elk Park	56	11:58	58.00	97%
4330	Indian Ruins	56	12:11	58.00	97%
5770	Hayman	56	12:00	58.00	97%
1440	Elbert	57	12:00	58.00	98%
1540	Sanderson at Xavier	57	11:57	58.00	98%
1570	Brighton Ditch Wx	57	12:00	58.00	98%
1920	Brighton	57	12:00	58.00	98%
2330	Morrison	57	12:13	58.00	98%
2710	Highlands Ranch WTP	57	12:00	58.00	98%
4030	Red Garden	57	11:59	58.00	98%
4350	Conifer Hill	57	11:58	58.00	98%
4360	Justice Center	57	11:57	58.00	98%
4520	Eagle Ridge	57	12:00	58.00	98%
4770	Cal-Wood Ranch	57	12:00	58.00	98%

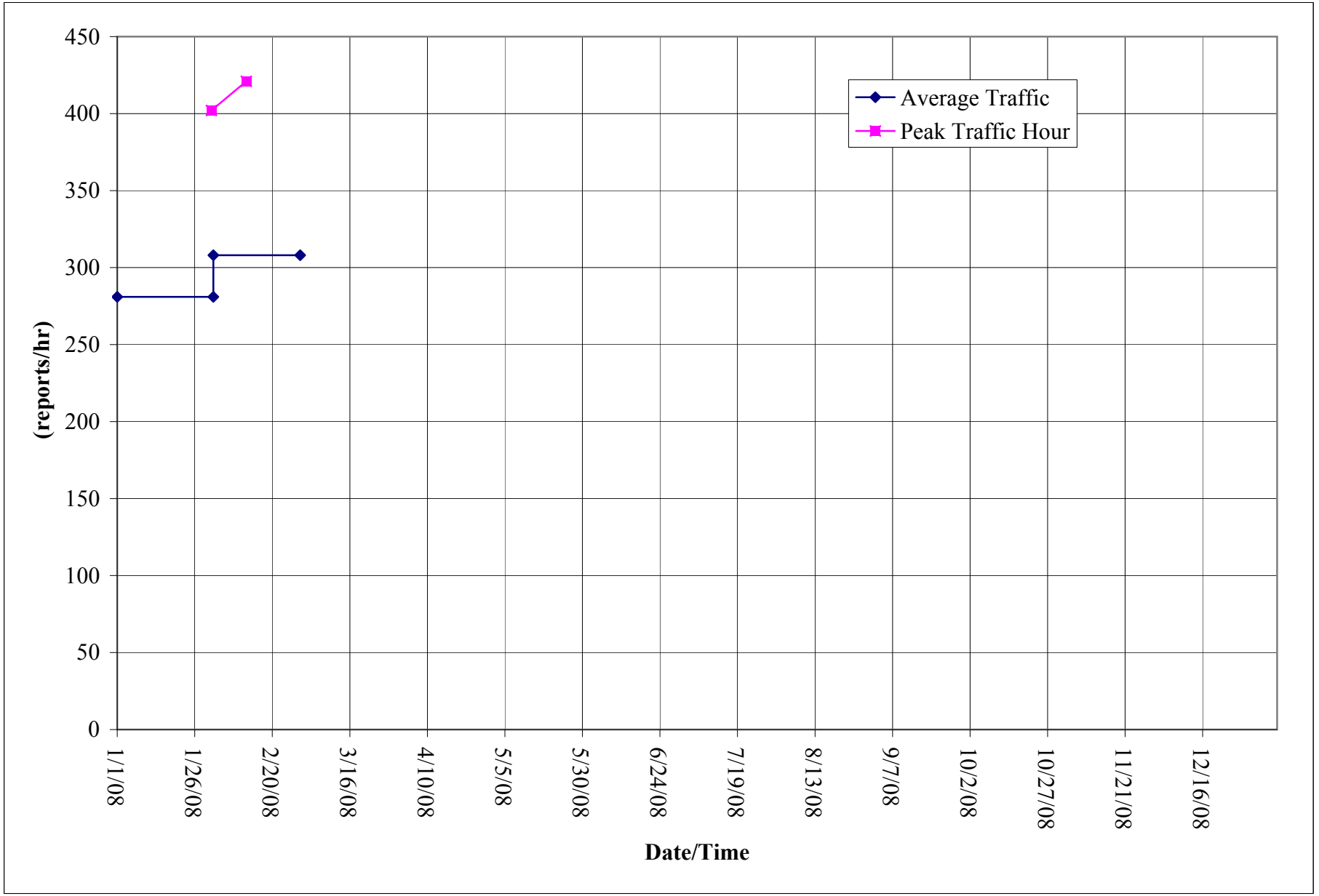
Rain Event Performance

Analyze Rain Sensors

		Reports Received	757
	Systemwide Avg	Total Tips	790
	96%	Data Loss	4.18%

Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcvd	Exp	Miss	Hold-off	Bucket
500	50%	0	1	0	0	0	0	0	1	2	1	0	0.0393701
1330	50%	2	0	0	1	0	0	0	3	6	3	0	0.0393701
1360	50%	3	0	0	0	1	0	0	4	8	4	0	0.0393701
4520	75%	4	2	0	0	0	0	0	6	8	2	0	0.0393701
4820	75%	7	1	1	0	0	0	0	9	12	3	0	0.0393701
4530	82%	11	3	0	0	0	0	0	14	17	3	0	0.0393701
4470	83%	8	2	0	0	0	0	0	10	12	2	0	0.0393701
4810	85%	10	0	1	0	0	0	0	11	13	2	0	0.0393701
700	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701
1370	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
1040	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4010	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4060	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4090	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4160	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4220	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4300	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701
4140	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
4190	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
4330	91%	9	1	0	0	0	0	0	10	11	1	0	0.0393701
4290	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701
1340	100%	5	0	0	0	0	0	0	2	2	0	0	0.0393701
110	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
120	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
140	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
210	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
220	100%	8	0	0	0	0	0	0	8	8	0	2	0.0393701
300	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
320	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
440	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
510	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
520	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
530	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
540	100%	4	0	0	0	0	0	0	4	4	0	1	0.0393701
600	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
620	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
630	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
740	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
750	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
760	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
800	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
810	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
820	100%	1	0	0	0	0	0	0	1	1	0	1	0.0393701
830	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
840	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
900	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393699
920	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
1010	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1030	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1050	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1060	100%	7	0	0	0	0	0	0	7	7	0	1	0.0393701
1310	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
1400	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
1420	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
1460	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701
1480	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701
1520	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
1530	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1540	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1570	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
1640	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
1660	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
1700	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
1810	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
1920	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701

2190	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
2320	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
2330	100%	24	0	0	0	0	0	0	24	24	0	0	0.0393701
2710	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
2730	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
2750	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701
2820	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
2920	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
2930	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701
2940	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
2990	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701
4020	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4030	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4040	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
4050	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
4070	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
4080	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4100	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701
4110	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
4130	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4150	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4170	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701
4180	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
4200	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
4230	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4240	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4250	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
4260	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
4310	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
4340	100%	10	0	0	0	0	0	0	10	10	0	0	0.0393701
4350	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
4360	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
4490	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701
4510	100%	15	0	0	0	0	0	0	15	15	0	0	0.0393701
4570	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
4710	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
4730	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
4750	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701
4770	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701
4790	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701
4830	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701
4840	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701
	Total Tips	734	22	2	1	1	0	0	757	790	33	5	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Average Traffic
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2/20/08
3/16/08
4/10/08
5/5/08
5/30/08
6/24/08
7/19/08
8/13/08
9/7/08
10/2/08
10/27/08
11/21/08
12/16/08
Date/Time