

Memo



Date: January 03, 2008
To: Kevin Stewart and Chad Kudym
From: Markus Ritsch
Subject: December 2007 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 December 1 through December 31, 2007.

II. General System Analysis Summary

A total of 244,824 individual data records were analyzed from the ALERT 2 base station. Meteorological sensors account for 70 percent, water level sensors 6 percent, and rain sensors 2 percent of the total monthly transmissions.

Ninety-nine point seven percent of the received data reports were flagged as "good" by the Nova Star validation process. Roughly 766 reports were flagged as "bad". Of these "bad" reports, 350 originated from Squaw Mountain. The barometric pressure sensor at Cal-Wood Ranch (ID 4774) reported 46 "bad" reports.

The system-wide radio traffic loading this month was 7,898 reports per day with an average hourly loading of 329 reports. The peak hourly traffic loading was 479 reports, which occurred on December 30th between 11:00 AM and noon. A plot of monthly average and peak hourly traffic loading is provided.

A total of 83 reports were received from the Hayman gages this month. These gages were winterized by OneRain in October.

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

1. Castle Rock (ID 2747 - ALERT wind) with 3,966 reports,
2. Salisbury Park (ID 2727 - ALERT wind) with 3,910 reports, and
3. Ward C-1 (ID 4707 - ALERT wind) with 4,737 reports,

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

The water level sensor at Lyons Diversion NSV (ID 4563) reported 5,124 times this month.

The sensors reporting infrequently this month include:

1. Fourmile at Salina (ID 4415) with 1 report,
2. Stapleton (ID 1469) with 1 report,
3. Gunbarrel (ID 1113) with 1 report,
4. Mission Viejo Park (ID 760) with 1 report,
5. Louisville Rec Ctr (ID 1100) with 1 report,
6. Simms Street (ID 130) with 1 report, and
7. Blue Mountain (ID 143) with 2 reports.

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

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 82 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
750	1330	2310	1810	1810	1810	1810	1600	1330	2340	1500	410
4470	1460	1710	540	310	1710	4560	410	1340	2250	1530	2190
4560	2330	2350	310	540	4470	2350	1350	1360	2230	1620	4470
4240	4170	2240	850	850	1500	2250	2190	1370	2240	600	4560
4510	4470	2250	1710	1710	4290	4200	4820	2310	2310	610	140
				900	540	4240	4830	1030	2360	1320	4510

* - Many District stations are taken out-of-service for the winter beginning in October which influences timer performance.

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 after the month of July.

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) that reported for the entire month were 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	11.29	Only the 1-mm rain sensors were included in the analysis
Median	9	Only the 1-mm rain sensors were included in the analysis
Standard deviation	8.27	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	36.11	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Many sensors
Maximum total count	41	Justice Center (ID 4360)

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

The average precipitation experienced district-wide in December was increased from the previous month of November. The District-wide precipitation experienced in December of 2007 was decreased slightly from that experienced in the same month in 2006.

A number of rain sensors (IDs 2190, 4180, and 4730) experienced only 1 tip for the month.

The rain sensor with the highest tip count total for the month was Justice Center (ID 4360). This sensor was also the only sensor reporting more than the system-wide mean plus 3 standard deviations. This sensor recorded 12 more tips than the next highest reporting sensor which was Betasso (ID 4110).

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

One rain sensor experienced a jump in the sequential tip count of more than six. The tip count series for each sensor was manually inspected and summarized below.

a. Little Narrows (ID 4470)

The Little Narrows rain sensor also had a poor timer reporting percentage this month.

This sensor is missing data reports between December 14th and December 18th. A large jump of 8 counts occurs during this period.

Table 4. Little Narrows (ID 4470) - Large Jump in Count

Date/Time	Sensor ID	Count
12/12/2007 8:35:05 PM	4470	6
12/13/2007 8:33:10 AM	4470	6
12/14/2007 8:29:24 AM	4470	6
12/18/2007 8:12:25 PM	4470	14
12/19/2007 8:10:30 AM	4470	14
12/19/2007 10:18:53 AM	4470	15

b. Button Rock (ID 4790)

Although this sensor does not experience a jump of more than 6 counts, it does have a data gap.

This sensor is missing data reports between December 15th and December 18th. A small jump of 3 counts occurs during this period.

Table 5. Button Rock (ID 4790) – Large Jump in Count

Date/Time	Sensor ID	Count
12/14/2007 8:46:47 AM	4790	306
12/14/2007 8:46:49 PM	4790	306
12/15/2007 8:46:49 AM	4790	306
12/18/2007 8:46:53 PM	4790	309
12/19/2007 8:46:52 AM	4790	309
12/19/2007 8:46:54 PM	4790	309

The reason for these data gaps is not known. Both sensors have a complete data record for the entire month. The monthly sequential count series looks good for both sensors.

C. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 97 percent. A total of 831 incrementing reports were received and a total of 858 were expected. The total loss of incrementing reports for the month was approximately 3 percent. Those sensors with the worst rain event transmission performance characteristics are summarized (Table 6).

Table 6. Monthly Summary of Sensors with the Most Missed Tips

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug*	Sep	Oct	Nov	Dec
2320	1330	540	1350	860	1710	2370	1350	1810	1710	1920	4470
2190	4080	310	310	4710	1350	150	2310	520	860	4790	4790
4710	1640	4470	1100	1810	310	1700	540	1360	540	1700	4230
4090	4050	850	860	1350	1700	1350	1300	1700	850	4180	4270
4820	4180	4570	540	400	210	850	1920	1710	900	4770	4010
				4570	110	2340	840	1350	1100	1810	4520

* Note that the outage of the Blue Mountain repeater caused a large data gap in the sequential count series for many sensors and thus the incrementing tip report performance statistics are skewed this month.

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 poorly performing sensors is manually inspected to identify periods of missing data. Nothing abnormal was identified in the tables below.

Sensors 4470 and 4790 are discussed in the previous section.

a. Golden Age (ID 4230)

This sensor has a continuous data series for the entire month. This sensor missed a single tip on December 10th.

Date/Time	Sensor ID	Count
12/9/2007 11:28:13 PM	4230	11
12/10/2007 11:26:12 AM	4230	11
12/10/2007 1:07:14 PM	4230	13
12/10/2007 1:20:42 PM	4230	14
12/10/2007 1:47:00 PM	4230	15

b. Cannon Mountain (ID 4270)

This sensor has a continuous data series for the entire month. This sensor missed one tip on December 10th.

Date/Time	Sensor ID	Count
12/10/2007 9:32:37 AM	4270	37
12/10/2007 12:32:28 PM	4270	38
12/10/2007 1:25:01 PM	4270	40
12/10/2007 2:28:38 PM	4270	41
12/10/2007 9:30:38 PM	4270	41

c. Crescent (ID 4010)

This sensor has a continuous data series for the entire month. This sensor missed a single tip on December 6th.

Date/Time	Sensor ID	Count
12/6/2007 8:47:11 AM	4010	9
12/6/2007 12:32:35 PM	4010	10
12/6/2007 12:48:32 PM	4010	12
12/6/2007 1:21:23 PM	4010	13
12/7/2007 8:43:21 AM	4010	13

V. Heavy Radio Traffic Analysis

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.

A. December 30, 2007

The hour of peak radio traffic for the month occurred on December 30 between 11:00 AM and 12:00 PM. A total of 479 reports were processed during this hour.

The hourly periods of highest traffic for the month include:

- 12/30/07 from 11:00 am to 12:00 pm (479 reports)
- 12/31/07 from 1:00 pm to 2:00 pm (466 reports)
- 12/28/07 from 8:00 am to 9:00 am (464 reports)
- 12/31/07 from 3:00 pm to 4:00 pm (458 reports)
- 12/30/07 from 7:00 am to 8:00 am (457 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 7). Overall, approximately 0.00% of the incrementing tip reports were lost for this period.

Table 7. Peak Traffic Analysis - Loss of Incrementing Tip Reports

Heavy Traffic Period (Dec 30, 2007)	Occurrences of loss of sequential tip reports during period			
	Loss of 2 tips	Loss of 3 tips	Loss of 4 tips	Loss of 5 tips
11:00 am to 12:00 pm	0	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 8).

Table 8. Summary of Unknown IDs

Description	Quantity
Total number of unknown IDs (IDs without a device definition)	108
Total reports from unknown IDs	182
Unknown IDs with only a single received report (potential noise)	82
Total reports from all IDs – RecData Log entire month	206,153
Unknown reports as a fraction of total reports	0.09%

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 9).

Table 9. Reports Received by Unknown IDs

Unknown Sensor ID	Total Reports for Month
2204	25
4091	6
4606	6
2205	5
4092	5
4093	5
764	4
4775	4
4087	3
4748	3
4062	3
4094	3
4740	2
4636	2

Unknown Sensor ID	Total Reports for Month
4760	2
4081	2
4084	2
4061	2
2828	2
2365	2
1454	2
4083	2
4831	2
4847	2
4766	2
4828	2

The “unknown” sensor with the largest number of reports is 2204. This sensor begins to report on December 9th and continues to report through December 31. Could this sensor as well as 2205 be reporting from Hiwan Golf?

The “unknown” device reports are analyzed temporally to understand when they are received during the day (Table 10). 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 10. Temporal Distribution of Unknown Reports

Hour (AM)	Reports	Hour (PM)	Reports
0:00-00:59	5	12:00-12:59	16
1:00-1:59	8	1:00-1:59	13
2:00-2:59	3	2:00-2:59	2
3:00-3:59	6	3:00-3:59	5
4:00-4:59	6	4:00-4:59	6
5:00-5:59	7	5:00-5:59	11
6:00-6:59	7	6:00-6:59	13
7:00-7:59	7	7:00-7:59	14
8:00-8:59	7	8:00-8:59	8
9:00-9:59	4	9:00-9:59	12
10:00-10:59	5	10:00-10:59	4
11:00-11:59	6	11:00-11:59	7

Reports from unknown sensors occur each hour of the day. The hour from 12:00 pm to 1:00 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. Cal-Wood Ranch (ID 4774 – Barometric Pressure) with 46 reports,
2. Squaw Mountain (ID 2192 – Temperature) with 190 reports,
3. Squaw Mountain (ID 2191 – Relative Humidity) with 89 reports,
4. Boulder Creek at Broadway (ID 4583 – Water Level) with 6 reports, and
5. Kelly Dam (ID 413 – Water Level) with 6 reports.

Sensors reporting frequently:

6. Lyons Diversion NSV (ID 4563) with 5,124 reports,
7. Castle Rock (ID 2747 - ALERT wind) with 3,966 reports,
8. Salisbury Park (ID 2727 – ALERT wind) with 3,910 reports, and
9. Ward C-1 (ID 4707 – ALERT wind) with 4,734 reports.

Sensors reporting infrequently (under reporting):

10. Fourmile at Salina (ID 4415) with 1 report,
11. Stapleton (ID 1469) with 1 report,
12. Gunbarrel (ID 1113) with 1 report,
13. Louisville Rec Center (ID 1100) with 1 report,
14. Mission Viejo Park (ID 760) with 1 report,
15. Simms Street (ID 130) with 1 report.

Poor timer reporting:

It is difficult to evaluate the timer performance of sensors in December because many stations are winterized during this month which impacts the analysis.

16. **Kelly Dam (ID 410)** – Only reports through December 6th so it looks like this sensor was winterized.
17. **Squaw Mountain (ID 2190)** – Reports received for the entire month.
18. **Little Narrows (ID 4470)** – Reports received for the entire month.

Low rain total:

19. **Squaw Mountain (ID 2190)** – This sensor recorded only 1 tip for the entire month. Nothing suspicious in the data series. Surrounding stations also had low monthly totals.

High rain total:

20. **Justice Center (ID 4360)** – This sensor recorded a total of 41 tips for the month. This sensor transmitted 12 more tips than the next highest reporting rain sensor which was Betasso (ID 4110).

Large Jump in Sequential Count Value:

21. **Button Rock (ID 4790)** - This sensor is missing data reports between December 15th and December 18th. A small jump of 3 counts occurs during this period. Nothing in the sequential count series suggests the jump is erroneous.
22. **Little Narrows (ID 4470)** - This sensor is missing data reports between December 14th and December 18th. A large jump of 8 counts occurs during this period. Nothing in the sequential count series suggests the jump is erroneous.

Reports from “Unknown Sensors”:

- 23. **2204 and 2205** – The “unknown” sensor with the largest number of reports is 2204. This sensor begins to report on December 9th and continues to report through December 31. Could this sensor, as well as 2205, be reporting from Hiwan Golf?
- 24. **4091, 4092, and 4093** - These sensor IDs each reported 5 or more times during the month. Is it possible they are from the same transmitter?
- 25. 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 ID	Total Reports for Month
2204	25
4091	6
4606	6
2205	5
4092	5
4093	5
764	4
4775	4
4087	3
4748	3
4062	3
4094	3
4740	2
4636	2
4760	2
4081	2
4084	2
4061	2
2828	2
2365	2
1454	2
4083	2
4831	2
4847	2
4766	2
4828	2

General System Analysis

Database Name

P:\A207-UDFCD-Data-Analysis\2007_Dec\Novastar_extract_2007Dec.mdb

First Date in Database

12/1/07 12:00 AM

Total Days

31.0

Last Date in Database

12/31/07 11:59 PM

Total Hours

744.0

Total Records Analyzed

244824

Records by Group

None-ALERT-ID	43149	18%
Wind Gust	37140	15%
Relative Humidity	33705	14%
Temperature	32074	13%
Wind Speed Average & Azimuth	25340	10%
Wind Direction	19092	8%
Wind Speed Average	15208	6%
Water Level PT-HSE	13166	5%
Precipitation	5579	2%
Solar Radiation	4437	2%
Barometric Pressure	3884	2%
Battery Voltage HSE	3634	1%
Battery Voltage Digital	2596	1%
Water Level Float	1385	1%
Water Level PT	910	0%
Fuel Moisture	739	0%
Fuel Temperature	736	0%
Repeater Pass List	597	0%
Battery Voltage Analog	472	0%
Repeater Status Report	469	0%
Precipitation - Mean	366	0%
Precipitation - Test	247	0%
Battery	181	0%
12Hr Status Report	105	0%
Longmont Flow Gage	92	0%
Hayman Precipitation	83	0%
Handar 585 ALARM Status	63	0%
Soil Moisture	63	0%
Longmont Water Level PT	44	0%
Solar Power	1	0%
Total	245557	

Records by Major Group

Meteorologic Sensors	170880	70%
Water Level Sensors	15597	6%
Sensor Status Transmissions	7937	3%
Rain Sensors	5579	2%
Soil and Fuel Sensors	1538	1%
Total	201531	

Records by Validation Type

Good	0	244058	99.69%
Questionable	1	766	0.31%
Total		244824	

Sensors With Most Invalid Data

Description	Sensor	Reports	
Squaw Mountain	2192	190	410
Squaw Mountain	2191	89	
Squaw Mountain	2187	54	
Cal-Wood Ranch	4774	46	
Squaw Mountain	2189	31	

General System Analysis

Traffic Loading Summary

Alert Reports	244824	
Average Daily Traffic	7898	
Average Hourly Traffic	329	
Median Hourly Traffic	339	hour beginning
Peak Hourly Traffic	479	12/30/07 11:00 AM
2nd Max	466	12/31/07 1:00 PM
3rd Max	464	12/28/07 8:00 AM
4th Max	458	12/31/07 3:00 PM
5th Max	457	12/30/07 7:00 AM

Total Number of Sensors Defined	Total Number of Sensors Reporting
881	333

Reports per Sensor

Description	Sensor	Reports	Fraction of Total
Lyons Diversion NSV	4563	5124	2%
Ward C-1	4707	4737	2%
None-ALERT-ID	9233	4461	2%
Castle Rock	2747	3966	2%
Salisbury Park	2727	3910	2%
None-ALERT-ID	9353	3099	1%
Stapleton	1465	2971	1%
Stapleton	1464	2969	1%
Stapleton	1467	2962	1%
Stapleton	1466	2944	1%
None-ALERT-ID	9232	2882	1%
Elbert	1439	2870	1%
Marston Lake North	1526	2859	1%
Elbert	1438	2855	1%
Elbert	1441	2855	1%
Elbert	1437	2853	1%
None-ALERT-ID	9241	2849	1%
Elbert	1442	2846	1%
Stapleton	1461	2826	1%
Marston Lake North	1521	2809	1%
Salisbury Park	2724	2745	1%
Castle Rock	2744	2743	1%
None-ALERT-ID	9272	2606	1%
Hiwan G.C.	2208	2601	1%
None-ALERT-ID	9211	2515	1%
Louisville Lake	4747	2471	1%
Blue Mountain	139	2427	1%
None-ALERT-ID	9261	2412	1%
Blue Mountain	138	2407	1%
Squaw Mountain	2188	2381	1%
Blue Mountain	137	2374	1%
Quincy Reservoir	751	2365	1%
None-ALERT-ID	9231	2362	1%
Blue Mountain	141	2358	1%
None-ALERT-ID	9201	2351	1%
Blue Mountain	142	2279	1%
Salisbury Park	2732	2273	1%
Sugarloaf	4727	2270	1%
Diamond Hill	1414	2251	1%
None-ALERT-ID	9271	2231	1%
Ward C-1	4704	2219	1%
Louisville Lake	4744	2219	1%
Highlands Ranch WTP	2704	2172	1%
None-ALERT-ID	9273	2159	1%
Squaw Mountain	2192	2156	1%
None-ALERT-ID	9251	2145	1%
None-ALERT-ID	9354	2101	1%
None-ALERT-ID	9351	2060	1%
Stapleton	1462	2038	1%
Cal-Wood Ranch	4764	2029	1%

Rain Timer Performance

Analyze Rain Sensors

systemwide average (days)

0.5186

90% Average

Rain Sensors	Description	Rcvd	Average Timer Interval	Exp	Performance
410	Kelly Dam	10	11:58	62.00	16%
1460	Stapleton	31	0:00	62.00	50%
1810	Sand Creek at mouth	39	18:00	62.00	63%
2190	Squaw Mountain	39	16:32	62.00	63%
4470	Little Narrows	39	16:11	62.00	63%
4560	Lyons Diversion NSV	42	17:33	62.00	68%
140	Blue Mountain	48	14:38	62.00	77%
4510	Pinewood Springs	48	13:54	62.00	77%
4080	Twin Sisters	49	13:52	62.00	79%
4790	Button Rock	51	12:30	62.00	82%
2930	Spring Valley Rd - DougCnty	53	13:28	62.00	85%
4150	Gold Hill	53	13:19	62.00	85%
4850	Porphory Mtn	53	13:47	62.00	85%
4860	Fairview Peak	53	13:30	62.00	85%
4490	Apple Valley	54	13:11	62.00	87%
4730	Sugarloaf	54	13:09	62.00	87%
4820	Doudy Draw	54	12:52	62.00	87%
4090	Magnolia	55	12:29	62.00	89%
4130	Swiss Peaks	55	12:44	62.00	89%
4140	Logan Mill	55	13:04	62.00	89%
4190	Slaughterhouse	55	12:57	62.00	89%
4220	Fling's	55	13:25	62.00	89%
4520	Eagle Ridge	55	12:00	62.00	89%
4530	Winiger Ridge	55	12:59	62.00	89%
4750	Louisville Lake	55	13:01	62.00	89%
740	Smoky Hill	56	13:11	62.00	90%
4010	Crescent	56	12:41	62.00	90%
4170	Pine Brook	56	12:55	62.00	90%
4240	Sunset	56	13:04	62.00	90%
4810	Shanahan Ridge	56	12:57	62.00	90%
750	Quincy Reservoir	57	12:42	62.00	92%
2920	West Cherry Head-Douglas Cnty	57	12:13	62.00	92%
2990	Tomah Rd-Douglas Cnty	57	12:31	62.00	92%
4060	Lakeshore	57	12:41	62.00	92%
4290	Red Hill	57	13:00	62.00	92%
4570	St. Antons	57	12:52	62.00	92%
4840	SBC@S Boulder Ditch	57	12:15	62.00	92%
700	Toll Gate @ 6th	58	12:14	62.00	94%
1660	SPR at Henderson	58	12:40	62.00	94%
2330	Morrison	58	12:26	62.00	94%
4100	Filter Plant	58	12:28	62.00	94%
4230	Golden Age	58	12:37	62.00	94%
4260	Taylor Mountain	58	12:37	62.00	94%
4300	Big Elk Park	58	12:24	62.00	94%
4350	Conifer Hill	58	12:36	62.00	94%
4710	Ward C-1	58	12:26	62.00	94%
900	Aurora Reservoir	59	12:25	62.00	95%
2220	Evergreen Lake	59	12:22	62.00	95%
2820	Haskins Gulch Conf	59	12:28	62.00	95%
4020	Rio Grande	59	12:24	62.00	95%
4110	Betasso	59	11:59	62.00	95%
4180	Gold Lake	59	12:23	62.00	95%
4250	Geer Canyon	59	12:27	62.00	95%
4310	Johnny Park	59	11:57	62.00	95%
4340	Riverside	59	12:25	62.00	95%
920	Aurora Town Hall Wx	60	12:12	62.00	97%
1440	Elbert	60	12:12	62.00	97%
1480	Third Creek at DIA	60	12:13	62.00	97%
1520	Marston Lake North	60	12:00	62.00	97%
1570	Brighton Ditch Wx	60	12:12	62.00	97%
1920	Brighton	60	12:13	62.00	97%

2210	Hiwan G.C.	60	12:12	62.00	97%
2710	Highlands Ranch WTP	60	12:00	62.00	97%
2750	Castle Rock	60	12:00	62.00	97%
4030	Red Garden	60	11:59	62.00	97%
4050	Walker Ranch	60	12:12	62.00	97%
4070	Bear Peak	60	11:58	62.00	97%
4270	Cannon Mountain	60	11:58	62.00	97%
4360	Justice Center	60	12:13	62.00	97%
4830	SBC @ San Souci	60	11:58	62.00	97%
5770	Hayman	60	12:15	62.00	97%
1420	Diamond Hill	61	12:00	62.00	98%
1540	Sanderson at Xavier	61	11:57	62.00	98%
1640	SPR at Union Ave.	61	12:00	62.00	98%
1700	Cherry Cr @ Champa	61	12:00	62.00	98%
2730	Salisbury Park	61	12:00	62.00	98%
2940	Willow Creek - DougCnty	61	12:00	62.00	98%
4040	Martin Gulch	61	11:43	62.00	98%
4160	Sunshine	61	12:10	62.00	98%
4200	Lazy Acres	61	11:59	62.00	98%
4330	Indian Ruins	61	11:57	62.00	98%
4770	Cal-Wood Ranch	61	12:00	62.00	98%

Rain Event Performance		Reports Received	831	Analyze Rain Sensors										
	Systemwide Avg	Total Tips	858											
	97%	Data Loss	3.15%											
Rain Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcvd	Exp	Miss	Hold	Bucket	
4470	47%	7	0	0	0	0	0	1	7	15	0	0	0.0393701	
4790	71%	4	0	1	0	0	0	0	5	7	2	0	0.0393701	
4230	80%	3	1	0	0	0	0	0	4	5	1	0	0.0393701	
4270	83%	4	1	0	0	0	0	0	5	6	1	0	0.0393701	
4010	88%	6	1	0	0	0	0	0	7	8	1	0	0.0393701	
4520	88%	14	0	1	0	0	0	0	15	17	2	0	0.0393701	
4090	90%	8	1	0	0	0	0	0	9	10	1	0	0.0393701	
4190	92%	10	1	0	0	0	0	0	11	12	1	0	0.0393701	
700	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701	
4150	92%	11	1	0	0	0	0	0	12	13	1	0	0.0393701	
1810	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701	
4050	93%	13	1	0	0	0	0	0	14	15	1	0	0.0393701	
4070	94%	14	1	0	0	0	0	0	15	16	1	0	0.0393701	
2990	95%	20	1	0	0	0	0	0	21	22	1	0	0.0393701	
4830	95%	20	1	0	0	0	0	0	21	22	1	0	0.0393701	
4290	96%	23	1	0	0	0	0	0	24	25	1	1	0.0393701	
4110	97%	27	1	0	0	0	0	0	28	29	1	0	0.0393701	
4360	98%	39	1	0	0	0	0	0	40	41	1	0	0.0393701	
2190	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701	
4180	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701	
4730	100%	1	0	0	0	0	0	0	1	1	0	0	0.0393701	
410	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701	
920	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701	
1440	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701	
4240	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701	
4570	100%	2	0	0	0	0	0	0	2	2	0	0	0.0393701	
900	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393699	
4300	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701	
4350	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701	
4710	100%	3	0	0	0	0	0	0	3	3	0	0	0.0393701	
2750	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701	
2930	100%	4	0	0	0	0	0	0	4	4	0	0	0.0393701	
2730	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
4080	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
4170	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
4260	100%	5	0	0	0	0	0	0	5	5	0	0	0.0393701	
1480	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
1660	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
2320	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
2920	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
4020	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
4060	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
4130	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
4160	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
4330	100%	6	0	0	0	0	0	0	6	6	0	0	0.0393701	
140	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701	
750	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701	
4220	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701	
4340	100%	7	0	0	0	0	0	0	7	7	0	0	0.0393701	
2710	100%	8	0	0	0	0	0	0	8	8	0	0	0.0393701	
740	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
1920	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
2940	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
4750	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
4770	100%	9	0	0	0	0	0	0	9	9	0	0	0.0393701	
1700	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701	
2330	100%	11	0	0	0	0	0	0	11	11	0	0	0.0393701	
1460	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
1540	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
4100	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
4810	100%	12	0	0	0	0	0	0	12	12	0	0	0.0393701	
4530	100%	13	0	0	0	0	0	0	13	13	0	0	0.0393701	
1640	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701	
4510	100%	14	0	0	0	0	0	0	14	14	0	0	0.0393701	
4200	100%	16	0	0	0	0	0	0	16	16	0	0	0.0393701	
4490	100%	17	0	0	0	0	0	0	17	17	0	0	0.0393701	
2820	100%	18	0	0	0	0	0	0	18	18	0	0	0.0393701	
4820	100%	21	0	0	0	0	0	0	21	21	0	0	0.0393701	
4030	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701	
4040	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701	
4250	100%	22	0	0	0	0	0	0	22	22	0	0	0.0393701	
1520	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701	
4310	100%	23	0	0	0	0	0	0	23	23	0	0	0.0393701	
4140	100%	27	0	0	0	0	0	0	27	27	0	0	0.0393701	
1420	100%	28	0	0	0	0	0	0	28	28	0	0	0.0393701	
4840	100%	29	0	0	0	0	0	0	29	29	0	0	0.0393701	
	Total Tips	814	15	2	0	0	0	1	831	858	19	1		

