Memo

Water & Earth Technologies, Inc.
Water Resources and Environmental Consulting

Date: January 4, 2007

To: Kevin Stewart, Chad Kudym

From: Markus Ritsch

Subject: **December 2006 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, 2006.

II. General System Analysis Summary

A total of 161,131 individual data records were analyzed. Meteorological sensors account for 84 percent, water level sensors 6 percent, and rain sensors 4 percent of the total monthly transmissions.

Ninety-seven percent of the received data reports were flagged as "good" by the Nova Star validation process. Roughly 4,161 reports were flagged as "bad". Of these "bad" reports, 3,599 originated from the wind sensor (ID 2189 and 2187) at Squaw Mountain. The reception of "bad" data reports from the Squaw Mountain sensor ID's 2189 and 2187 has been a consistent theme throughout the entire year.

The system-wide radio traffic loading this month was 5,198 reports per day with an average hourly loading of 217 reports. The peak hourly traffic loading was 349 reports, which occurred on December 24th between 12:00 PM and 1:00 PM. A plot of monthly average and peak hourly traffic loading is provided.

A new radio repeater was installed by Douglas County to relay the Hayman Burn precipitation gages on the District's primary base receiving frequency of 171.875 MHz. The new Douglas County repeater was activated on July 21, 2006 and configured to re-broadcast only those gages with IDs between 5700 through 6000. A total of zero (0) rain reports were received from the Hayman gages this month. The Hayman gages were winterized toward the end of October which explains why no reports were received from these sensors this month.

The sensors reporting most frequently this month include:

1. Salisbury Park (ID 2727) with 3,973 reports,
2. Ward C-1 (ID 4707) with 3,735 reports,
3. Urban Farm (IDs 1464, 1465, and 1466) with 2,908, 2,807, and 2,879 reports respectively.

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

III. Rain Sensor Timer Reporting Summary

The District completed winterization activities at a number of stations during the month of October and November. Roughly 75 rain sensors reported continuously throughout the month of December. The following analysis assumes that all rain sensors have a 12-hour timer reporting interval. System-wide the ALERT 2 base station received approximately 92 percent of the non-incrementing timer reports. Those rain sensors with the worst timer reporting statistics for the month are summarized (Table 1).

Table 1. Monthly Summary of Sensors with Poor Timer Performance

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1010	1460	1460	2340	1460	1460	1460	1440	1540/320	330	1460	1460
1460	1660	4820	1460	1330	4820	1440	1460	1460	1720	4080	750
1640	4240	4570	1330	540	4830	110	2340	4820	430	4830	4730
--	--	--	1610	1600	1600	4820	4820	1440	2270	4240	4850
			1600	4820	2350	4220		110	2340	4560	4750

Urban Farm (1460), Quincy Res (750), Sugarloaf (4730), Porphory Mtn (4850), and Louisville Lake (4750)

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. For example, sensor 4820 consistently exhibits a poor timer performance value.

Sensor 1460 has a 24-hour timer reporting interval so its timer performance value is actually better than reported here (see data analysis report for May, 2006).

1. Urban Farm (ID 1460)

This sensor has a valid count series extending from December 1 through December 30. Sensor 1460 has a 24-hour timer reporting interval so its timer performance value is actually near 100 percent because a total of 30 non-incrementing reports were received for the month.

2. Quincy Reservoir (ID 750)

This sensor is missing 3 days of timer reports from 12/25/2006 through 12/27/2006. The timer reports begin again on the 28th and look good for the remainder of the month.

3. Sugarloaf (ID 4730)

This sensor is missing 3 days of timer reports between 12/5/2006 through 12/8/2006. The timer reports begin again on the 9th. This sensor tends to miss single timer reports sporadically throughout the month.

4. Porphory Mountain (ID 4850)

This sensor is missing 2 days of timer reports from 12/2/2006 through 12/3/2006. The timer reports begin again on the 4th and look good for the remainder of the month.

5. Louisville Lake (ID 4750)

This sensor is missing single timer reports sporadically throughout the month.

IV. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors that reported for the entire month were analyzed to quantify the District-wide statistical total monthly tip summary (Table 2).

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

Statistical Parameter	Value	Comments
Mean	16.45	Only the 1-mm rain sensors were included in the analysis
Median	15	Only the 1-mm rain sensors were included in the analysis
Standard deviation	12.09	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	52.74	Several sensors for the month are outside the Mean +/- 3 Std Dev
Minimum total count	1	St. Antons (ID 4570)
Maximum total count	61	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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
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

The average precipitation (likely snowmelt) experienced district-wide increased from November. One sensor experienced a tip count value that exceeded the system-wide mean plus three standard deviations for the month. This sensor was the Justice Center. This was also the highest reporting rain sensor in November. The data record for this sensor is further inspected.

1. Justice Center (ID 4360)

Overall the series looks reasonable as several periods of rainfall/snowmelt are evident (Figure 1). The majority of bucket tips occurred on December 21 and 22 and then again from December 28 through December 30th.

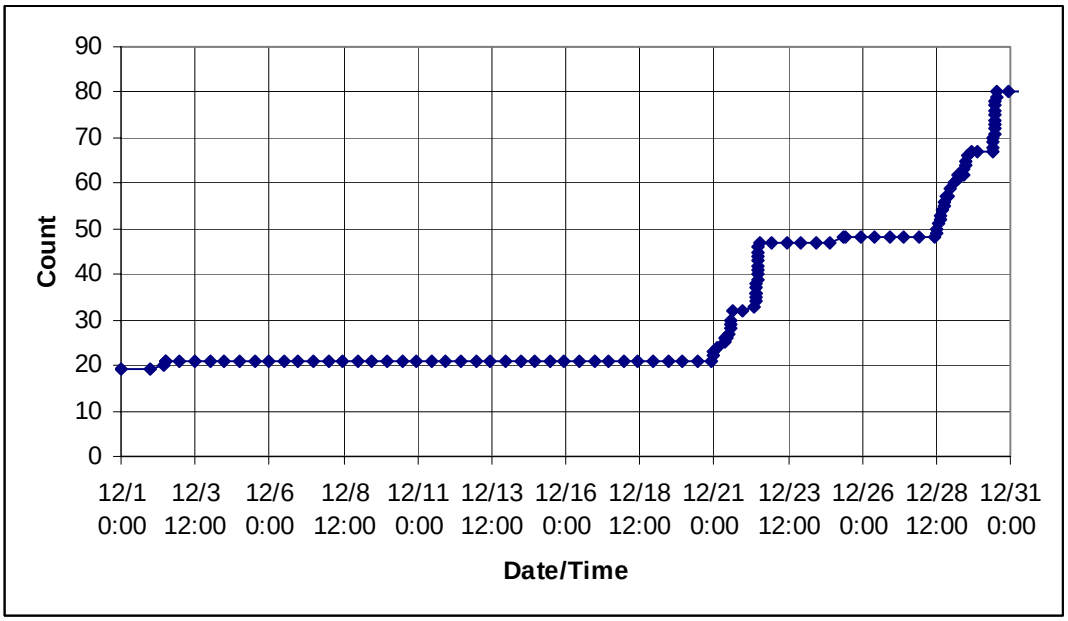


Figure 1. Rain Count Accumulation for Justice Center (ID 4360)

Out of curiosity, the rain tip series for the Justice Center was co-plotted with the tip count series from several rain gages that are in close proximity to the Justice Center (Figure 2). These gages include Filter Plant (ID 4100) and Shanahan Ridge (ID 4810).

The Justice Center recorded 61 tips (mm) for the month of December, the Filter Plant recorded 17 tips, and Shanahan Ridge recorded 24 tips. The Justice Center recorded more than twice the number of tips than were recorded at the nearby stations.

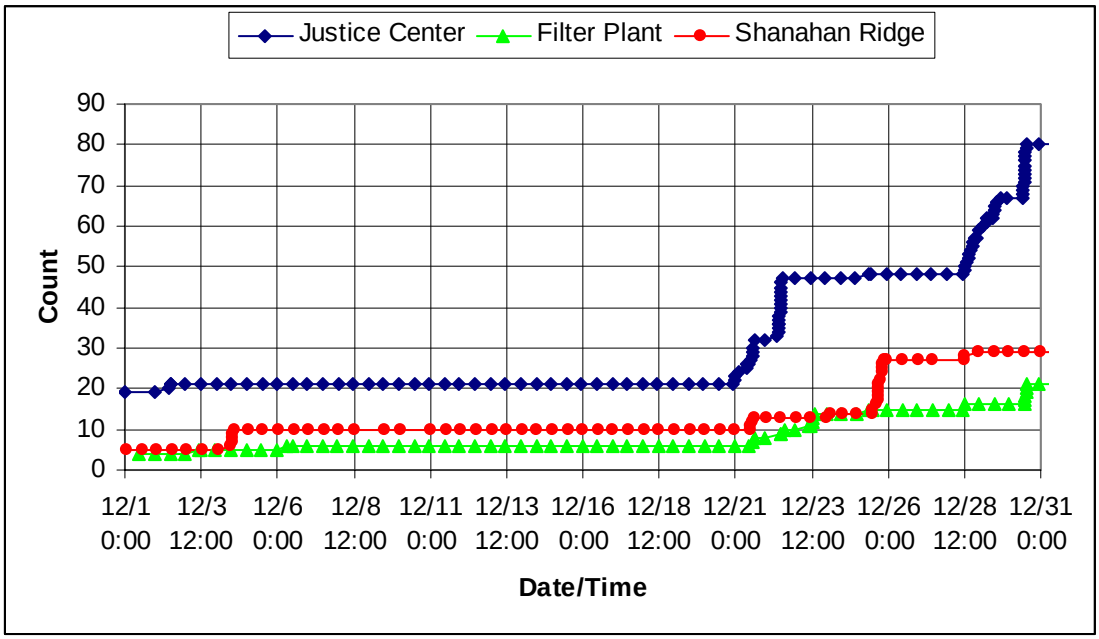


Figure 2. Rain Tip Plot from Justice Center, Filter Plant, and Shanahan Ridge

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

There were no rain sensors that experienced a jump in their sequential tip count of more than 6. If there were, the tip count series for these sensors would be explored in the following paragraphs.

C. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing tip reports for the month was approximately 97 percent. A total of 1,186 incrementing reports were received and a total of 1,225 were expected. The total loss of incrementing reports for the month was approximately 3.18 percent. Those sensors with the worst rain event transmission 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
640	4010	4530	2190	540	4820	4820	2370	1200	1720	1440	4490
1640	4080	4170	310	1400	1350	2350	2310	4820	330	2750	4530
4490	4170	4820	4820	1100	4790	2310	220	2340	2340	4810	4790
-----	-----	-----	-----	4820	2340	750	4060	1530	4820	1640	4710
-----	-----	-----	-----	1420	2350	150	4180	110	4270	2730	4130

*Apple Valley (4490), Winiger Ridge (4530), Button Rock (4790), Ward C-1 (4710), and Swiss Peaks (4130)

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. Poor performing sensors are explored further in the following paragraphs.

1. Apple Valley (ID 4490)

A total of 17 incrementing data transmissions were sent from this station and only 12 incrementing reports were received. A total of 5 incrementing reports are missing which yields an incrementing report reception success rate of only 70.5 percent.

None of the lost data reports were sequential, they were only single increment reports randomly distributed throughout the series.

D. Peak Traffic Hour Analysis

The peak hour of radio traffic occurred on 12/24/2006 between 12:00 PM and 1:00 PM. The data for this period was examined more closely to characterize the distribution of sensor transmissions during times of heavy loading (Table 5). During this hour the radio traffic was dominated by wind reports.

Table 5. Peak Traffic Hour Sensor Report Distribution

Sensor Group	Reports	Percent
Wind Speed Average & Azimuth	74	21.20%
Wind Gust	55	15.76%
Relative Humidity	53	15.19%
Temperature	50	14.33%
Wind Speed Average	23	6.59%
Wind Direction	23	6.59%
Precipitation	16	4.58%
Battery Voltage Digital	15	4.30%
Water Level PT-HSE	13	3.72%
Solar Radiation	8	2.29%
Barometric Pressure	6	1.72%
Battery Voltage HSE	5	1.43%
Fuel Temperature	2	0.57%
Fuel Moisture	2	0.57%
Water Level Float	2	0.57%
Precipitation - Mean	1	0.29%
Soil Moisture	1	0.29%
Total	**349**	99.99%

A summary of the hours of peak radio traffic hours is presented (Table 6) for the District's 1-mm rain sensors. The peak hour for December was analyzed and is shown. No single incrementing tip reports were lost during this peak hour. The rainfall accumulation totals as tracked by NovaStar for the peak hour were accurate. There were no sensors that under-reported rainfall due to the loss of sequential tip counts.

Table 6. Peak Traffic Hour Rain Reporting Summary – Annual Reporting

Heavy Traffic Period	Traffic Msgs/hr	Rain reports expected	Rain reports received	Loss of reports	Accurate rain totals
12/24/06 12:00 PM – 1:00 PM	394	16	16	0.0%	Yes
11/14/06 1:00 PM – 2:00 PM	374	12	12	0.0%	Yes
10/29/06 1:00 AM – 2:00 AM	567	19	19	0.00%	Yes
9/21/06 3:00 AM – 4:00 AM	620	117	114	2.56%	Yes
8/13/06 9:00 PM – 10:00 PM	1,107	346	286	17.34%	Yes

The table above will be used to track the peak hour summary for each month so that over a period of time a correlation can be developed between peak hour loading and loss of single increment reports.

V. Issues Continued from Previous Month

The following issues were identified last month.

1. On November 3rd at 11:00 AM several rain sensors experienced a large jump in their sequential tip count series. These sensors include Elbert (ID 1440) and Castle Rock (ID 2750). Additional quality control should be performed on the historic/archival data series for these sensors to ensure accurate rain totals are available for future analyses.
2. The reception of "bad" data reports from the Squaw Mountain sensor ID's 2189 and 2187 has been a consistent theme throughout the entire year.
3. Doudy Draw (ID 4820) and El Rancho (ID 2340) exhibit poor timer and event transmission performance.

VI. Issues Identified this Month

Further investigation into the following issues is recommended:

1. Quincy Reservoir, (ID 750): This sensor is missing 3 days of timer reports from 12/25/2006 through 12/27/2006. The timer reports begin again on the 28th and look good for the remainder of the month.
2. Sugarloaf (ID 4730): This sensor is missing 3 days of timer reports between 12/5/2006 through 12/8/2006. The timer reports begin again on the 9th.
3. Porphory Mountain (ID 4850): This sensor is missing 2 days of timer reports from 12/2/2006 through 12/3/2006. The timer reports begin again on the 4th and look good for the remainder of the month.
4. Justice Center (ID 4360): This sensor reported the highest tip count accumulation for the month. This was the second month in a row that this sensor experienced the highest tip count. The series for this sensor should continue to be watched in upcoming months.

General System Analysis

Database Name	P:\A207-UDFCD-Data-Analysis\2006_Dec\Novastar_extract_2006Dec.mdb

First Date in Database	12/1/06 12:00 AM	**Total Days**	31.0
Last Date in Database	12/31/06 11:59 PM	**Total Hours**	744.0

Total Records Analyzed 161131

Records by Group

Wind Gust	31310	19%
Relative Humidity	25836	16%
Temperature	24370	15%
Wind Speed Average & Azimuth	19685	12%
Wind Direction	16862	10%
Wind Speed Average	11658	7%
Water Level PT-HSE	6538	4%
Precipitation	5649	4%
Solar Radiation	3771	2%
Battery Voltage HSE	2871	2%
Battery Voltage Digital	2778	2%
Barometric Pressure	2401	1%
Water Level Float	1999	1%
Fuel Moisture	1479	1%
Fuel Temperature	1476	1%
Repeater Pass List	616	0%
Precipitation - Mean	475	0%
Battery Voltage Analog	471	0%
Precipitation - Test	246	0%
Water Level PT	178	0%
Longmont Flow Gage	115	0%
12Hr Status Report	114	0%
Soil Moisture	63	0%
Battery	59	0%
Longmont Water Level PT	57	0%
Handar 585 ALARM Status	53	0%
Solar Power	1	0%
Total	161131	

Records by Major Group

Meteorologic Sensors	135893	84%
Water Level Sensors	8887	6%
Sensor Status Transmissions	6904	4%
Rain Sensors	5649	4%
Soil and Fuel Sensors	3018	2%
Total	160351	

Records by Validation Type

Good	0	156970	97%
Questionable	1	4161	3%
	Total	161131	

Sensors With Most Invalid Data

Description	**Sensor**	**Reports**
Squaw Mountain	2189	2614
Squaw Mountain	2187	985
Elbert	1439	114
Cal-Wood Ranch	4774	41
Elbert	1437	36

Traffic Loading Summary

Alert Reports	161131	
Average Daily Traffic	5198	
Average Hourly Traffic	217	
Median Hourly Traffic	219	hour beginning
Peak Hourly Traffic	349	12/24/06 12:00 PM

Rain Timer Performance

Analyze Rain Sensors

systemwide average (days)
0.5185

Systemwide Average
92%

Rain Sensors	Description	mber of Received Timer Repo	Average Timer Interval	mber of expected Timer Repo	Performance
140	Blue Mountain	59	12:26	62.00	95%
700	Toll Gate @ 6th	61	12:00	62.00	98%
740	Smoky Hill	60	12:12	62.00	97%
750	Quincy Reservoir	48	14:08	62.00	77%
900	Aurora Reservoir	60	12:12	62.00	97%
1000	Maple Grove Resv.	53	13:06	62.00	85%
1420	Diamond Hill	59	12:15	62.00	95%
1440	Elbert	59	12:24	62.00	95%
1460	Urban Farm	30	23:59	62.00	48%
1480	Third Creek at DIA	61	12:00	62.00	98%
1520	Marston Lake North	58	12:29	62.00	94%
1540	Sanderson at Xavie	59	12:38	62.00	95%
1640	SPR at Union Ave.	59	12:15	62.00	95%
1660	SPR at Henderson	59	12:13	62.00	95%
1700	Cherry Cr @ Champ	57	12:43	62.00	92%
1810	Sand Creek at mout	61	11:55	62.00	98%
1920	Brighton	59	12:26	62.00	95%
2190	Squaw Mountain	57	12:41	62.00	92%
2210	Hiwan G.C.	60	12:00	62.00	97%
2220	Evergreen Lake	60	12:10	62.00	97%
2330	Morrison	57	12:28	62.00	92%
2710	ighlands Ranch WT	61	12:00	62.00	98%
2730	Salisbury Park	61	12:00	62.00	98%
2750	Castle Rock	60	12:00	62.00	97%
2820	Haskins Gulch Con	55	13:16	62.00	89%
4010	Cresent	50	14:49	62.00	81%
4020	Rio Grande	59	12:11	62.00	95%
4030	Red Garden	59	12:15	62.00	95%
4040	Martin Gulch	58	12:30	62.00	94%
4050	Walker Ranch	62	11:58	62.00	100%
4060	Lakeshore	56	12:26	62.00	90%
4070	Bear Peak	61	11:58	62.00	98%
4080	Twin Sisters	52	13:47	62.00	84%
4090	Magnolia	53	13:15	62.00	85%
4100	Filter Plant	61	11:59	62.00	98%
4110	Betasso	57	12:47	62.00	92%
4130	Swiss Peaks	58	12:41	62.00	94%
4140	Logan Mill	55	12:30	62.00	89%
4150	Gold Hill	55	12:44	62.00	89%
4160	Sunshine	61	11:58	62.00	98%
4170	Pine Brook	53	13:16	62.00	85%
4180	Gold Lake	56	13:03	62.00	90%
4190	Slaughterhouse	60	12:12	62.00	97%
4200	Lazy Acres	60	12:14	62.00	97%
4220	Fling's	55	13:14	62.00	89%
4230	Golden Age	60	12:11	62.00	97%
4240	Sunset	53	13:11	62.00	85%
4250	Geer Canyon	59	12:26	62.00	95%
4260	Taylor Mountain	59	12:12	62.00	95%
4270	Cannon Mountain	57	12:41	62.00	92%
4290	Red Hill	57	13:01	62.00	92%
4300	Big Elk Park	61	11:57	62.00	98%
4310	Johnny Park	59	12:30	62.00	95%
4330	Indian Ruins	60	11:57	62.00	97%
4340	Riverside	59	12:11	62.00	95%
4350	Conifer Hill	59	12:24	62.00	95%
4360	Justice Center	60	11:57	62.00	97%
4470	Little Narrows	58	12:26	62.00	94%
4490	Apple Valley	59	12:25	62.00	95%
4510	Pinewood Springs	57	11:58	62.00	92%
4520	Eagle Ridge	61	12:00	62.00	98%
4530	Winiger Ridge	54	13:12	62.00	87%
4560	.yons Diversion NS	51	14:23	62.00	82%
4570	St. Antons	56	13:06	62.00	90%
4710	Ward C-1	55	13:02	62.00	89%
4730	Sugarloaf	48	14:24	62.00	77%
4750	Louisville Lake	49	14:30	62.00	79%
4770	Cal-Wood Ranch	60	12:13	62.00	97%
4790	Button Rock	58	12:00	62.00	94%
4810	Shanahan Ridge	57	12:40	62.00	92%
4820	Doudy Draw	53	13:33	62.00	85%
4830	SBC @ San Souci	57	13:00	62.00	92%
4840	BC@S Boulder Dit	53	13:48	62.00	85%
4850	Porphory Mtn	48	13:23	62.00	77%
4860	Fairview Peak	60	12:00	62.00	97%

Rain Event Performance

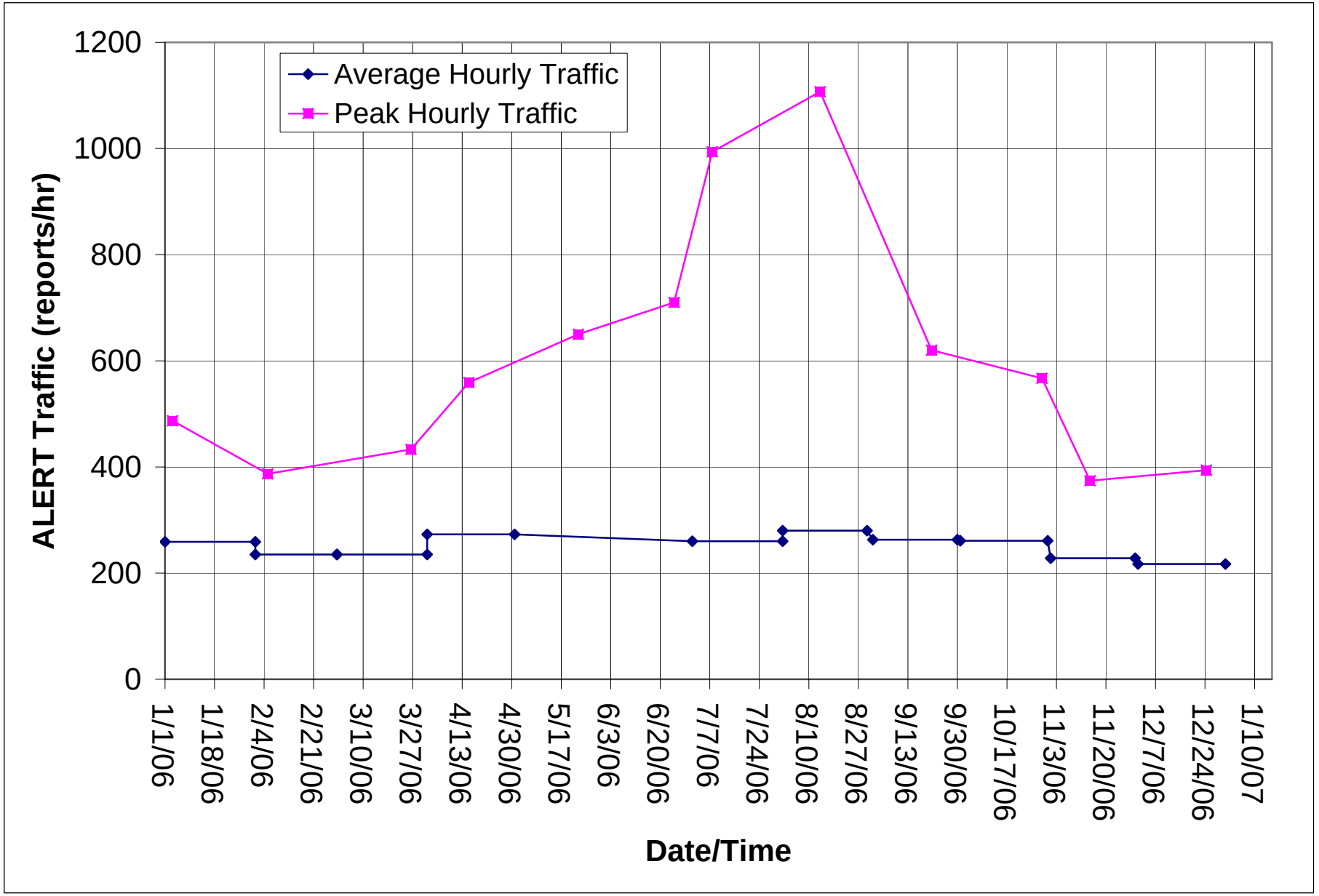
Analyze Rain Sensors

		Reports Received	1186									
	Systemwide Avg	Total Tips	1225									
	97%	Data Loss	3.18%									
Sensor	**Performance**	**1-tips**	**2-tips**	**3-tips**	**4-tips**	**5-tips**	**6-tips**	**>6-tips**	**Rcvd Tips**	**Expected**	**Missed**	**Hold-off**
140	100%	5	0	0	0	0	0	0	5	5	0	0
700	100%	16	0	0	0	0	0	0	16	16	0	0
740	100%	3	0	0	0	0	0	0	3	3	0	0
750	100%	3	0	0	0	0	0	0	3	3	0	0
900	100%	4	0	0	0	0	0	0	4	4	0	0
1000	97%	36	1	0	0	0	0	0	37	38	1	0
1420	100%	36	0	0	0	0	0	0	36	36	0	0
1460	100%	19	0	0	0	0	0	0	19	19	0	0
1480	100%	3	0	0	0	0	0	0	3	3	0	0
1520	100%	24	0	0	0	0	0	0	24	24	0	0
1540	100%	12	0	0	0	0	0	0	12	12	0	0
1545	100%	2	0	0	0	0	0	0	2	2	0	0
1640	100%	21	0	0	0	0	0	0	21	21	0	0
1660	100%	7	0	0	0	0	0	0	7	7	0	0
1700	100%	19	0	0	0	0	0	0	19	19	0	0
1810	100%	20	0	0	0	0	0	0	20	20	0	0
1920	100%	10	0	0	0	0	0	0	10	10	0	0
2190	100%	4	0	0	0	0	0	0	4	4	0	0
2210	100%	12	0	0	0	0	0	0	12	12	0	0
2320	100%	10	0	0	0	0	0	0	10	10	0	0
2330	100%	23	0	0	0	0	0	0	23	23	0	0
2710	100%	10	0	0	0	0	0	0	10	10	0	0
2730	100%	5	0	0	0	0	0	0	5	5	0	0
2750	100%	4	0	0	0	0	0	0	4	4	0	0
2820	96%	23	1	0	0	0	0	0	24	25	1	0
4010	89%	7	1	0	0	0	0	0	8	9	1	0
4020	100%	7	0	0	0	0	0	0	7	7	0	0
4030	97%	32	1	0	0	0	0	0	33	34	1	0
4040	98%	43	1	0	0	0	0	0	44	45	1	0
4050	100%	13	0	0	0	0	0	0	13	13	0	0
4060	100%	5	0	0	0	0	0	0	5	5	0	0
4070	100%	14	0	0	0	0	0	0	14	14	0	0
4080	92%	10	1	0	0	0	0	0	11	12	1	0
4090	93%	12	1	0	0	0	0	0	13	14	1	0
4100	100%	17	0	0	0	0	0	0	17	17	0	0
4110	100%	46	0	0	0	0	0	0	46	46	0	0
4130	88%	6	1	0	0	0	0	0	7	8	1	0
4140	94%	29	2	0	0	0	0	0	31	33	2	0
4150	90%	16	2	0	0	0	0	0	18	20	2	0
4160	100%	7	0	0	0	0	0	0	7	7	0	0
4170	89%	7	1	0	0	0	0	0	8	9	1	0
4190	100%	16	0	0	0	0	0	0	16	16	0	0
4200	100%	29	0	0	0	0	0	0	29	29	0	0
4220	100%	23	0	0	0	0	0	0	23	23	0	0
4230	100%	9	0	0	0	0	0	0	9	9	0	0
4240	91%	9	1	0	0	0	0	0	10	11	1	0
4250	96%	21	1	0	0	0	0	0	22	23	1	0
4260	97%	30	1	0	0	0	0	0	31	32	1	0
4270	100%	15	0	0	0	0	0	0	15	15	0	0
4290	94%	29	2	0	0	0	0	0	31	33	2	0
4300	100%	6	0	0	0	0	0	0	6	6	0	0
4310	100%	44	0	0	0	0	0	0	44	44	0	0
4330	100%	15	0	0	0	0	0	0	15	15	0	0
4340	94%	15	1	0	0	0	0	0	16	17	1	0
4350	100%	6	0	0	0	0	0	0	6	6	0	0
4360	97%	57	2	0	0	0	0	0	59	61	2	0
4470	90%	17	2	0	0	0	0	0	19	21	2	0
4490	71%	7	5	0	0	0	0	0	12	17	5	0
4510	95%	20	1	0	0	0	0	0	21	22	1	0
4520	100%	10	0	0	0	0	0	0	10	10	0	0
4530	83%	4	1	0	0	0	0	0	5	6	1	0
4570	100%	1	0	0	0	0	0	0	1	1	0	0
4710	87%	11	2	0	0	0	0	0	13	15	2	0
4730	100%	3	0	0	0	0	0	0	3	3	0	0
4750	100%	11	0	0	0	0	0	0	11	11	0	0
4770	100%	15	0	0	0	0	0	0	15	15	0	0
4790	85%	14	3	0	0	0	0	0	17	20	3	0
4810	96%	22	1	0	0	0	0	0	23	24	1	0
4820	100%	17	0	0	0	0	0	0	17	17	0	0
4830	95%	20	1	0	0	0	0	0	21	22	1	0
4840	97%	30	1	0	0	0	0	0	31	32	1	0
4850	90%	8	1	0	0	0	0	0	9	10	1	0
4860	100%	11	0	0	0	0	0	0	11	11	0	0
	Total Tips	1147	39	0	0	0	0	0	1186	1225		

Sensor	Bucket Tips	Outliers Removed
140	15	15
700	5	5
740	4	4
750	6	6
140	5	5
700	16	16
740	3	3
750	3	3
900	4	4
1000	38	38
1420	36	36
1460	19	19
1480	3	3
1520	24	24
1540	12	12
1545	2	2
1640	21	21
1660	7	7
1700	19	19
1810	20	20
1920	10	10
2190	4	4
2210	12	12
2320	10	10
2330	23	23
2710	10	10
2730	5	5
2750	4	4
2820	25	25
4010	9	9
4020	7	7
4030	34	34
4040	45	45
4050	13	13
4060	5	5
4070	14	14
4080	12	12
4090	14	14
4100	17	17
4110	46	46
4130	8	8
4140	33	33
4150	20	20
4160	7	7
4170	9	9
4190	16	16
4200	29	29
4220	23	23
4230	9	9
4240	11	11
4250	23	23
4260	32	32
4270	15	15
4290	33	33
4300	6	6
4310	44	44
4330	15	15
4340	17	17
4350	6	6
4360	61	
4470	21	21
4490	17	17
4510	22	22
4520	10	10
4530	6	6
4570	1	1
4710	15	15
4730	3	3
4750	11	11
4770	15	15
4790	20	20
4810	24	24
4820	17	17
4830	22	22
4840	32	32

Compute Statistics

Bucket Tip Data Analysis	
Mean	16.45333
Median	15
Std Deviation	12.09455
Mean + 3 st dev	52.73699
Mean - 3 st dev	-19.8303
Min	1
Max	61


Average Hourly Traffic
Peak Hourly Traffic
ALERT Traffic (reports/hr)
0
200
400
600
800
1000
1200
1/1/06
1/18/06
2/4/06
2/21/06
3/10/06
3/27/06
4/13/06
4/30/06
5/17/06
6/3/06
6/20/06
7/7/06
7/24/06
8/10/06
8/27/06
9/13/06
9/30/06
10/17/06
11/3/06
11/20/06
12/7/06
12/24/06
1/10/07
Date/Time

General System Analysis

Reports per Sensor

Description	Sensor	Reports	Fraction of Total
Salisbury Park	2727	3973	2%
Ward C-1	4707	3735	2%
Urban Farm	1464	2908	2%
Urban Farm	1466	2879	2%
Urban Farm	1465	2807	2%
Elbert	1439	2772	2%
Urban Farm	1467	2744	2%
Marston Lake North	1526	2717	2%
Squaw Mountain	2187	2695	2%
Marston Lake North	1521	2630	2%
Salisbury Park	2724	2620	2%
Squaw Mountain	2189	2614	2%
Castle Rock	2747	2575	2%
Hiwan G.C.	2208	2554	2%
Blue Mountain	138	2533	2%
Squaw Mountain	2188	2387	1%
Castle Rock	2744	2352	1%
Ward C-1	4704	2293	1%
Blue Mountain	139	2178	1%
Elbert	1438	2129	1%
Louisville Lake	4744	2085	1%
Quincy Reservoir	751	2081	1%
Diamond Hill	1414	2048	1%
Salisbury Park	2732	2028	1%
Louisville Lake	4747	1962	1%
Highlands Ranch WTP	2704	1943	1%
Sugarloaf	4724	1844	1%
Sugarloaf	4727	1840	1%
Highlands Ranch WTP	2707	1769	1%
Cal-Wood Ranch	4771	1762	1%
Highlands Ranch WTP	2711	1759	1%
Highlands Ranch WTP	2712	1750	1%
Brighton	1921	1735	1%
Cal-Wood Ranch	4772	1719	1%
Brighton	1922	1671	1%
Aurora Reservoir	906	1663	1%
Quincy Reservoir	747	1646	1%
Elbert	1442	1640	1%
Ward C-1	4711	1640	1%
Brighton	1914	1634	1%
Marston Lake North	1527	1626	1%
Salisbury Park	2731	1619	1%
Louisville Lake	4751	1610	1%
Louisville Lake	4752	1572	1%
Hiwan G.C.	2212	1555	1%
Hiwan G.C.	2209	1535	1%
Diamond Hill	1422	1504	1%
Ward C-1	4712	1462	1%
Blue Mountain	142	1430	1%
SPR at Union Ave.	1643	1414	1%
Sugarloaf	4731	1391	1%
Sugarloaf	4732	1380	1%
Castle Rock	2751	1379	1%
Blue Mountain	137	1376	1%
Aurora Reservoir	905	1317	1%
Elbert	1437	1254	1%
Quincy Reservoir	752	1238	1%
Elbert	1441	1222	1%
Button Rock	4791	1201	1%
Aurora Reservoir	901	1180	1%
Marston Lake North	1522	1173	1%
Hiwan G.C.	2211	1168	1%
SPR at Henderson	1659	1162	1%
Marston Lake North	1525	1108	1%
Hiwan G.C.	2207	1101	1%
Cal-Wood Ranch	4774	1034	1%
Aurora Reservoir	907	1019	1%
Blue Mountain	141	1018	1%
Maple Grove Resv.	1003	1016	1%
Aurora Reservoir	902	975	1%
Squaw Mountain	2192	953	1%
Diamond Hill	1417	944	1%
Squaw Mountain	2191	880	1%
Diamond Hill	1421	876	1%
Quincy Reservoir	753	863	1%
Brighton	1917	850	1%
Castle Rock	2752	801	0%

General System Analysis

Boulder Cr at Broadway	4583	745	0%
Hiwan G.C.	2213	740	0%
Blue Mountain	143	739	0%
Blue Mountain	144	738	0%
Hiwan G.C.	2214	738	0%
Green Ditch	4593	719	0%
Button Rock	4792	701	0%
Toll Gate @ 6th	703	685	0%
Urban Farm	1461	684	0%
SPR at 19th Street	1649	680	0%
Button Rock Resv	4476	542	0%
Urban Farm	1462	500	0%
Button Rock	4794	428	0%
Button Rock	4787	389	0%
Basin Avg-Bear Creek	9100	384	0%
Morrison	2333	332	0%
Smoky Hill	8007	319	0%
Test	8002	318	0%
Ward C-1	4714	316	0%
Longmont	4798	313	0%
Sugarloaf	4734	276	0%
Castle Rock	2758	259	0%
Blue Mountain	8001	247	0%
Smoky Hill	8006	247	0%
Test	8000	246	0%
Louisville Lake	4754	232	0%
Choke Cherry Resvr	2320	225	0%
Choke Cherry Resvr	2324	211	0%
Marston Lake North	1523	202	0%
Eagle Ridge	4524	199	0%
Third Creek at DIA	1484	188	0%
Third Creek at DIA	1483	162	0%
Eldorado Springs	4383	158	0%
SPR at Dartmouth	1629	157	0%
Sand Creek at mouth	1813	155	0%
Cherry Cr @ Champa	1703	148	0%
SBC @ San Souci	4833	122	0%
Justice Center	4360	120	0%
Highlands Ranch WTP	2718	119	0%
Urban Farm	1463	115	0%
Evergreen Lake	2223	115	0%
Toll Gate @ 6th	705	114	0%
Lafayette	4758	110	0%
Martin Gulch	4040	104	0%
Betasso	4110	104	0%
Johnny Park	4310	104	0%
Cal-Wood Ranch	4778	103	0%
SPR at Henderson	1656	102	0%
Diamond Hill	1420	96	0%
Red Garden	4030	94	0%
Brighton	1928	93	0%
Maple Grove Resv.	1000	91	0%
Taylor Mountain	4260	91	0%
Lena Basin Mean	9101	91	0%
Lazy Acres	4200	90	0%
SBC@S Boulder Ditch	4843	90	0%
Red Hill	4290	89	0%
Logan Mill	4140	87	0%
SBC@S Boulder Ditch	4840	85	0%
Sugarloaf	4738	84	0%
Marston Lake North	1520	83	0%
Sand Creek at mouth	1810	82	0%
Geer Canyon	4250	82	0%
SPR at Union Ave.	1640	81	0%
Morrison	2330	81	0%
Lyons Diversion NSV	4563	81	0%
Shanahan Ridge	4810	81	0%
Haskins Gulch Conf	2820	80	0%
Filter Plant	4100	79	0%
Fling's	4220	79	0%
Pinewood Springs	4510	79	0%
SBC @ San Souci	4830	79	0%
Toll Gate @ 6th	700	78	0%
Little Narrows	4470	78	0%
Cherry Cr @ Champa	1700	77	0%
Slaughterhouse	4190	77	0%
Cal-Wood Ranch	4770	77	0%
Walker Ranch	4050	76	0%
Bear Peak	4070	76	0%

Indian Ruins	4330	76	0%
Riverside	4340	76	0%
Gross Reservoir	4373	76	0%
Button Rock	4790	76	0%
Hiwan G.C.	2210	74	0%
Gold Hill	4150	74	0%
Cannon Mountain	4270	73	0%
Apple Valley	4490	73	0%
Sanderson at Xavier	1540	72	0%
Highlands Ranch WTP	2710	72	0%
Eagle Ridge	4520	72	0%
Doudy Draw	4820	72	0%
Fairview Peak	4860	72	0%
Brighton	1920	70	0%
Golden Age	4230	70	0%
Orodell	4403	70	0%
Sunshine	4160	69	0%
Ward C-1	4710	69	0%
Big Elk Park	4300	68	0%
SPR at Henderson	1660	67	0%
Salisbury Park	2730	67	0%
Rio Grande	4020	67	0%
Magnolia	4090	67	0%
Castle Rock	2750	66	0%
Swiss Peaks	4130	66	0%
Conifer Hill	4350	66	0%
Blue Mountain	140	65	0%
Aurora Reservoir	900	65	0%
Third Creek at DIA	1480	65	0%
Smoky Hill	740	64	0%
Squaw Mountain	2190	64	0%
Twin Sisters	4080	64	0%
Sunset	4240	64	0%
Urban Farm	1471	63	0%
Marston Lake North	1524	62	0%
Hiwan G.C.	2206	62	0%
Haskins Gulch Conf	2825	62	0%
Red Garden	4035	62	0%
Lakeshore	4060	62	0%
Betasso	4115	62	0%
Pine Brook	4170	62	0%
Slaughterhouse	4195	62	0%
Orodell	4405	62	0%
Fairview Peak	4864	62	0%
Elbert	1436	61	0%
SPR at 19th Street	1646	61	0%
Evergreen Lake	2220	61	0%
Salisbury Park	2738	61	0%
Rio Grande	4025	61	0%
Lakeshore	4065	61	0%
Bear Peak	4075	61	0%
Filter Plant	4105	61	0%
Sunshine	4165	61	0%
Taylor Mountain	4265	61	0%
Cannon Mountain	4275	61	0%
Red Hill	4295	61	0%
Big Elk Park	4305	61	0%
Indian Ruins	4335	61	0%
Louisville Lake	4750	61	0%
Lee Hill	8011	61	0%
Gold Hill	8016	61	0%
Blue Mountain	136	60	0%
Elbert	1440	60	0%
Morrison	2335	60	0%
Martin Gulch	4045	60	0%
Walker Ranch	4055	60	0%
Lazy Acres	4205	60	0%
Geer Canyon	4255	60	0%
Johnny Park	4315	60	0%
Riverside	4345	60	0%
Conifer Hill	4355	60	0%
Eldorado Springs	4380	60	0%
Tunnel	4400	60	0%
Little Narrows	4473	60	0%
Winiger Ridge	4530	60	0%
SBC@S Boulder Ditch	4845	60	0%
Aurora Reservoir	904	59	0%
Third Creek at DIA	1488	59	0%
Sanderson at Xavier	1545	59	0%

General System Analysis

Cresent	4010	59	0%
Golden Age	4235	59	0%
Winiger Ridge	4535	59	0%
SBC @ San Souci	4835	59	0%
Porphory Mtn	4850	59	0%
Swiss Peaks	4135	58	0%
Gold Hill	4155	58	0%
Gold Lake	4180	58	0%
Gold Lake	4185	58	0%
Fling's	4225	58	0%
Little Narrows	4475	58	0%
Button Rock Outflow	4486	58	0%
St. Antons	4570	58	0%
Doudy Draw	4825	58	0%
Maple Grove Resv.	1005	57	0%
Evergreen Lake	2225	57	0%
Cresent	4015	57	0%
Sunset	4245	57	0%
Eldorado Springs	4385	57	0%
Button Rock Lake	4483	57	0%
Button Rock Inflow	4487	57	0%
St. Antons	4575	57	0%
Diamond Hill	1428	56	0%
Pinewood Springs	4515	56	0%
Shanahan Ridge	4815	56	0%
Squaw Mountain	2186	55	0%
Gross Reservoir	4370	55	0%
Gross Reservoir	4375	55	0%
Apple Valley	4495	55	0%
Twin Sisters	4085	54	0%
Logan Mill	4145	54	0%
Ward C-1	4718	54	0%
Lyons Diversion NSV	4560	53	0%
Quincy Reservoir	750	52	0%
Pine Brook	4175	52	0%
Sugarloaf	4730	52	0%
Urban Farm	1460	50	0%
Porphory Mtn	4854	50	0%
Quincy Reservoir	746	48	0%
Lyons Diversion NSV	4565	48	0%
Urban Farm	1468	31	0%
SPR at Dartmouth	1626	4	0%
Rosedale	2250	3	0%
Horseshoe Park Drop	714	2	0%
Rosedale	2253	2	0%
Cal-Wood Ranch	4767	2	0%
Button Rock	4784	2	0%
Fire Station #7	440	1	0%
Denver Zoo	1360	1	0%
Urban Farm	1469	1	0%
Hiwan/pre94	1511	1	0%
Bear Cr below Cub	2233	1	0%
Brook Forest	2260	1	0%
Indian Hills	2356	1	0%
Cal-Wood Ranch	4764	1	0%
	Total	161131	