

Memo



Date: August 3, 2016
To: Kevin Stewart
From: Markus Ritsch
Subject: July 2016 ALERT Data Analysis

I. ALERT Data Source

Raw ALERT data records extracted from the Urban Drainage and Flood Control District's NovaStar 5 base station were analyzed for the period July 1 through July 31, 2016.

II. General System Analysis Summary

The District receives data through both the legacy ALERT channel and through the ALERT2 (concentrator plus A2 self-reports) channel. The following (Table 1) quantifies the data reports received by each channel.

Table 1. Reception of Data at Diamond Hill (Legacy, ALERT2 and Concentrator Reports from Recdatalog)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
Legacy	118,519	264,375	241,517	266,465	245,856	254,744	262,732						1,654,208
Concentrator	194,948	418,430	407,965	435,747	416,968	423,152	423,762						2,720,972
ALERT2	136,144	399,530	505,195	540,654	508,036	509,129	473,766						3,072,454
TOTAL	449,611	1,082,335	1,154,677	1,242,866	1,170,860	1,187,025	1,160,260	0	0	0	0	0	7,447,634
Conc/Leg	1.64	1.58	1.69	1.64	1.70	1.66	1.61	1.00	1.00	1.00	1.00	1.00	1.64
DataChron	645,913	662,847	674,426	742,749	732,116	776,223	757,956						4,992,230

The District operates two NovaStar5 base stations: the primary (ns5a) at Diamond Hill and a redundant base (ns5b) at Greenhouse Data. Additional analyses are conducted on the data received by these two base stations (Table 2). The data received by both base stations for the month are shown below.

Table 2. Comparison of Data Reception by ns5a and ns5b

NS5A (Diamond Hill)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
Legacy	118,519	264,375	241,517	266,465	245,856	254,744	262,732						1,654,208
Concentrator	194,948	418,430	407,965	435,747	416,968	423,152	423,762						2,720,972
ALERT2	136,144	399,530	505,195	540,654	508,036	509,129	473,766						3,072,454
NS5B (Greenhouse)													
Legacy	118,610	264,516	263,959	266,509	264,138	258,435	262,307						1,698,474
Concentrator	194,968	418,532	446,510	435,558	447,154	428,264	422,702						2,793,688
ALERT2	136,330	399,841	552,747	540,161	544,926	515,425	472,516						3,161,946
Diff (NS5a-NS5b)													
Legacy (Digi One)	-91	-141	-22,442	-44	-18,282	-3,691	425	0	0	0	0	0	-44,266
Concentrator (B2010)	-20	-102	-38,545	189	-30,186	-5,112	1,060	0	0	0	0	0	-72,716
ALERT2 (B2010)	-186	-311	-47,552	493	-36,890	-6,296	1,250	0	0	0	0	0	-89,492
Comments	Recdatalog format changed...missing 1/3 of the month		DH base was down for a period		DH server was down at the end of May		First month that DH has better reception than GH						

The reception rates between Diamond Hill and Greenhouse are consistent this month. The Greenhouse server seems to consistently receive a few more reports each month relative to Diamond Hill, except for this month.

The daily ratio of concentrator to legacy reports is shown.

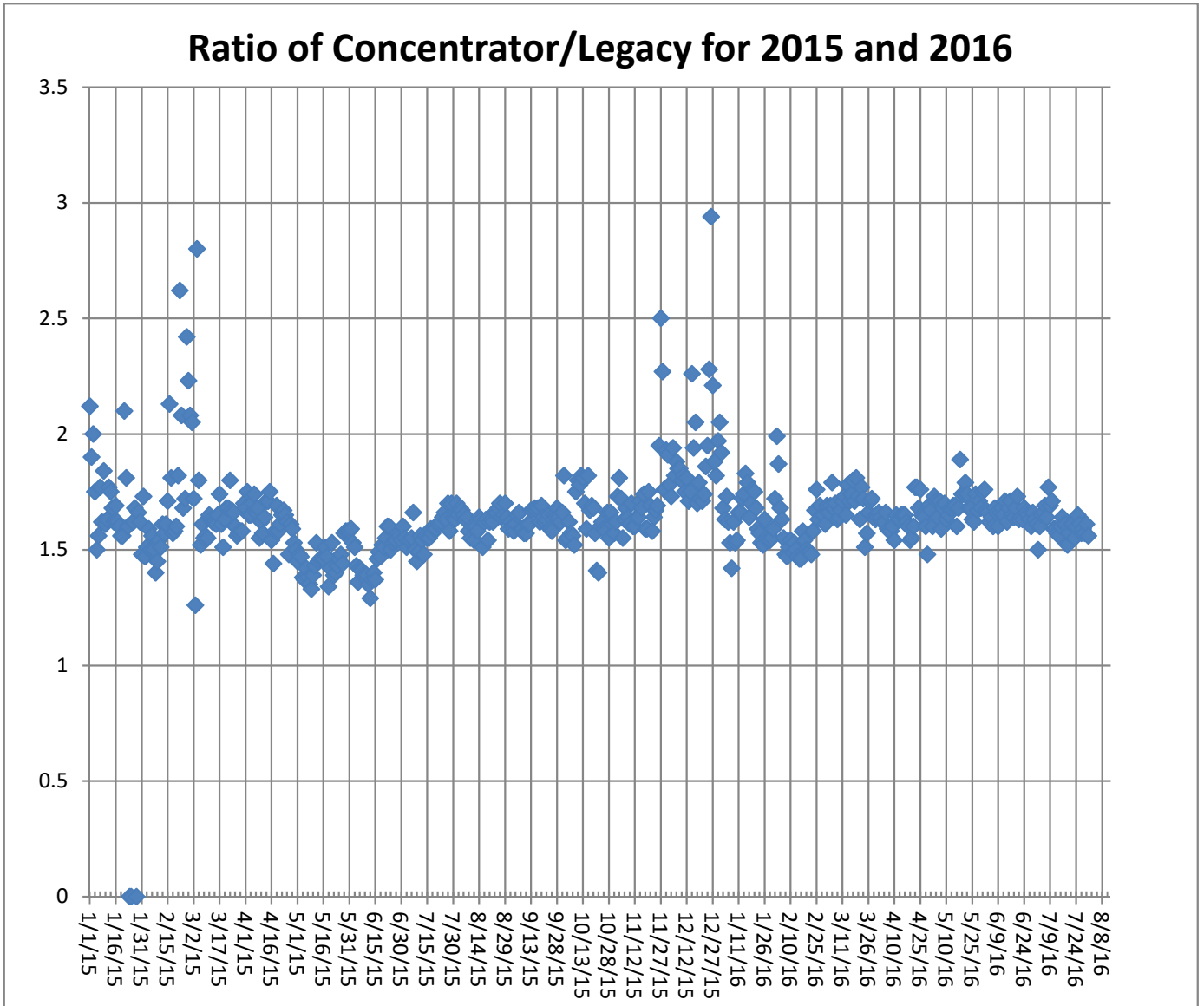


Figure 1. Daily Ratio of Concentrator Reports to Legacy Reports

The ratio becomes more volatile in the cold months as the Blue Mountain repeater has problems with legacy ALERT reporting when the temperature drops.

A. Continuous Operation of Base Receiver/Decoder

The base station was in continuous operation for the entire month. Data was collected on a continuous basis for every hour of every day for a total of 744 hours of operation. Outages of less than one hour are not identified.

B. Specific Issues Identified

Performance of the following sensors (Table 3) was questionable this month.

Table 3. Sensors with Poor Performance Characteristics

Sensor ID	Description	Comments
2790	Wx-W. Cherry Creek	Poor performance
2360	Indian Hills	Poor performance
4470	Little Narrows	Poor performance
2980	Dakan Road	Poor Performance
430	Utah Park	Poor performance
1710	Shop Creek	Poor performance
4330	Hansen Rain	Poor performance
2330	Morrison	Poor performance
6601	Wx-Magnolia	Station died on or about June 27 and started again on July 12
2271, 2272, 2274	Unknown IDs	Possibly coming from Cub Creek below Blue (2270)
623	Unknown ID with a large number of reports	
2283	Unknown ID with a large number of reports	
443	Unknown ID with a large number of reports	

C. Performance of New A2 Sites

This section of the report will look at specific reporting characteristics of the new A2 sites by analyzing their APDUID (Application PDU Identifier). The APDUID is a cyclical, incrementing counter from 0 to 6. Tracking skipped values and restarts of the application control byte counter provides useful insight into site performance and general network health. The performance of the cyclical counter is quantified for each A2 self-reporting site and repeater path (Table 4).

Table 4. APDUID Performance of A2 Sites by Source Address

Description	ID	W. Creek (6001)	Smoky Hill (6502)	Blue Mt. (6503)	Lee Hill (6505)	Gold Hill (6506)
Newlin Gulch	3070		0.95	0.97	0.97	0.95
Heritage Regional Park	3090		0.99	0.98	0.92	0.93
Magnolia	6601		0.83	0.77	0.82	0.83
Blackstone	10010		1.00	1.00	0.80	0.98
ETG @ Hampden	10011		0.95	0.95	0.94	0.95
Carr Street (100)	10012		0.79	0.99	0.93	0.91
Maple Grove (1000)	10013		0.97	0.98	0.98	0.97
Upper Sellers	10014	--				
Haystack Road	10015	--				
Sand Cr at Colfax	10016		0.95	0.88	0.96	0.96
James Creek	10017		0.41	--	1.00	0.93
Lower Left Hand (4453)	10018		0.99	--	0.97	1.00
Murphy Creek (870)	10019		0.97	0.97	0.97	0.96
OneRain Weather	10020		0.50	0.98	0.78	0.87
S. St. Vrain at Berry Ridge	10021		--	--	0.96	--
Arvada/Blunn Reservoir	10022		1.00	1.00	.99	1.00
Havana Pond	10023		0.99	0.99	0.99	0.99
Westerly Creek Dam	10024		0.99	0.99	0.99	0.98
Lena @ Nolte Pond (1023)	10025		0.76	1.00	0.98	0.63
Trumbull (Hayman)	10026	0.91				
West Creek (Hayman)	10027	0.94				
Diamond Hill (1420)	10028		0.91	0.91	0.88	0.91
Plum Creek at Sedalia	10029	0.98				
Coal Creek at McCaslin	10030		0.99	1.00	0.99	0.92
Boulder Cr. Broadway (4583)	10031		0.95	0.15	0.87	0.99
Weir Gulch	10032		0.61	0.95	0.93	0.16
Side Creek Park (830)	10033		--	--	--	--
Not Used	10034		--	--	--	--
Sanderson Gulch (1340)	10035		0.97	0.98	0.96	0.95
Porphyry Mtn (4850)	10036		0.94	--	0.94	0.88
West Creek WX (3020)	10037	0.89				
Little Dry Creek at 64 th (1310)	10038		0.98	0.98	0.97	0.97

D. ALERT2 Repeater Loading

The District's ALERT2 architecture utilizes 5 repeaters with a single transmit frequency (170.300 MHz) to Diamond Hill. The repeaters utilize a 20 second frame where each repeater is allocated a slot of specific size and an offset within the frame. The slot allocated to each repeater is sized appropriately to accommodate the total number of existing and future remote sites routed through that repeater. Each repeater is shown along with its designated slot (Table 5). Currently there is no pass-listing for the ALERT2 repeaters. Any remote ALERT2 site can be received by all repeaters and re-broadcast to the base except for West Creek which has an input frequency unique to Douglas County.

Table 5. ALERT2 Repeater Architecture

Repeater	Slot Size (sec)	Slot Offset (sec)	Source Address	ALERT2 Input Frequency (MHz)	ALERT2 Output Frequency (MHz) – received at Diamond Hill
West Creek	2	0	6001	169.425	170.300
Smoky	3	2	6502	169.525	170.300
Blue Mt.	4	5	6503	169.525	170.300
Lee Hill	3	9	6505	169.525	170.300
Gold Hill	3	12	6506	169.525	170.300
Magnolia	5	15	6507		170.300
Frame Size	20				

The following tables summarize the total number of reports received through each repeater (Table 6). This helps to quantify repeater loading for the ALERT2 backbone.

Table 6. ALERT2 Reports Received through Each Repeater (Only A2 Self Reports)

Month-Yr	West Creek (6001)	Smoky (6502)	Blue Mt. (6503)	Lee Hill (6505)	Gold Hill (6506)	TOTAL
Jan-15	0	44,501	44,636	44,783	39,007	172,927
Feb-15	0	58,543	56,150	61,160	57,764	233,617
Mar-15	346	73,198	69,604	77,968	65,323	286,439
Apr-15	595	73,711	69,568	79,215	72,310	295,399
May-15	5,259	78,694	72,340	86,297	77,174	319,764
June-15	11,987	72,449	65,742	82,998	69,570	302,746
July-15	28,595	75,379	71,394	79,026	74,041	328,435
Aug-15	28,409	92,299	84,057	84,363	87,211	376,339
Sep-15	26,809	84,143	84,776	84,289	85,123	365,140
Oct-15	19,775	82,683	83,390	63,475**	84,825	334,148
Nov-15	6,438	62,615	61,477	50,888	58,004	239,422
Dec-15	9,835	72,886	72,465	73,431	47,996	276,613
Jan-16	4,034	38,348	36,826	37,168	19,768	138,160
Feb-16	11,732	93,120	99,206	96,284	99,188	399,530
Mar-16	12,533	126,123	134,329	140,226	139,536	552,747
Apr-16	13,262	128,473	130,223	135,499	133,197	540,654
May-16	27,002	125,098	124,280	138,033	130,513	544,926
Jun-16	30,405	117,877	111,309	133,036	122,798	515,425
Jul-16	37,492	108,334	102,335	115,028	110,577	473,766

** - The number of reports coming through Lee Hill declined in October

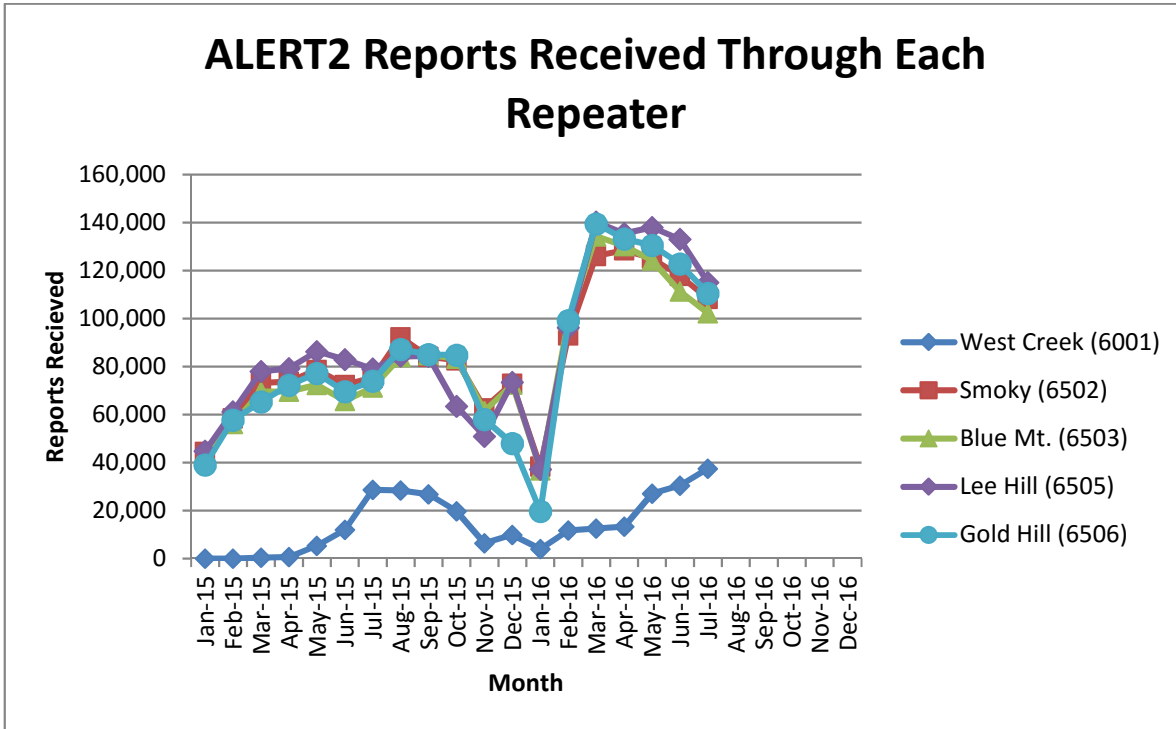


Figure 2. Reports received through each repeater (ALERT2 Only)

A convenient mechanism to track repeater performance throughout the year is to monitor total ALERT2 reports passed by each repeater. In general, each of the primary repeaters in the District process an equivalent number of ALERT2 reports because pass/block filtering is not being used. Several months are evident where the throughput of one repeater is not consistent with the other three.

The Magnolia Weather station was down from June 27 through July 12. This weather station reports on a frequency of 5 minutes and it reports up to ten total parameters. On a typical day it may send 2,500 total reports. It was not reporting for at least eleven days in July which resulted in a total loss of up to 25,000 reports. This likely explains the drop in total throughput for the months of June and July.

The following tables summarize the system-wide latency of ALERT2 self-reports (Table 7 and Table 8).

Table 7. System-Wide Latency of ALERT2 Self-Reports (seconds)

Statistical Parameter	Value (sec)	Comments
Mean	55.99	The average time it took a report from the field to reach the base
Minimum	3	The minimum time it took for a report to go from the field to the base
Maximum	280	The maximum time it took for a report to go from the field to the base

Table 8. Summary of ALERT2 System-Wide Latency (seconds)

Statistical Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	66.17	72.6	75.36	67.48	53.36	57.42	55.99					
Minimum	3	2	1	3	2	2	3					
Maximum	300	261	521	745	262	226	280					
Station with Max Latency	Magnolia WX (6602)	Magnolia WX (6607)	Sand Cr (10016)	Magnolia WX (6601)	Magnolia WX (6605)	Westerly Cr Dam (10024)	West Cr WX (3019)					

The large latency of 280 seconds from West Creek WX (3019) occurred on July 31st. A report was received on 7/31/2016 at 3:09:40 PM with a report time of 3:05:00 PM.

E. TDMA Time Slot Size

ALERT2 networks will have problems with missing timed station reports when they have transmit times at some stations that exceeded the TDMA slot size. For example, a test transmission from a site may be received when it's sent manually from the site but the timed transmissions are not received. This is a problem with the station preceding the missing station exceeding its slot size in the TDMA assignment.

A program is written for the UDFCD that checks the receive data log files looking for station reports that are too long. For example, the MANT TS=... the Length=# or the data packet size should not be more than 45 bytes. The only stations found to exceed the 45 byte limit were repeaters.....which is acceptable since their slot size is much larger than 0.5 seconds. No stations were found with a slot length exceeding 45 bytes.

F. Inefficient ALERT2 Packets

An inefficient ALERT2 packet contains multiple (MANT) data packets per air link packet. ALERT2 supports the composition of air link packets containing multiple data values in a single MANT packet. Using a single MANT packet for each data packet is an efficient use of the ALERT2 protocol and should be avoided. The following sites were identified as possibly being configured inefficiently:

-) Newlin Gulch (3070) – Campbell Scientific – this transmitter was updated with a new EPROM that allows for MSR reporting
-) OneRain Weather (10020) – Campbell Scientific
-) Diamond Hill (10028) – not sure what transmitter is being used here.
-) Plum Creek at Sedalia (10029) – Campbell Scientific

G. Rain Sensor Timer Reporting Summary

The following analysis assumes that each legacy rain sensor has a 12-hour timer-reporting interval and each A2 rain sensor has a 1-hour timer-reporting interval. The worst performing rain sensors for the month are summarized (Table 9).

Table 9. Monthly Summary of Sensors with Poor Timer Performance (Sensor ID)

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
10026	3020	4470	4850	2790	2790	2790					
4550	4520	2790	2790	1620	430	1530					
2330	2790	4850	2360	2750	4330	430					
4270	4850	5940	1420	2330	2330	4270					
1660	10026	10023	4270	5860	10026	1710					
4330	10020	10026	4520	2360	2360	4330					

*- Only sensors that operate year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

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.

III. Rain Sensor Event Reporting Summary

A. District-Wide Total Tip/Count Statistics

The incrementing reports from all 1-mm rain sensors were analyzed to quantify the District-wide statistical total monthly tip summary (Table 10). For the months of January, February, March, October, November and December only the stations that operate year-round are included in the rain event analysis. These stations include all weather stations and the stations in Boulder County.

Table 10. District-Wide Total Tip/Count Statistical Summary

Statistical Parameter	Value	Comments
Mean	24.2	Only the 1-mm rain sensors were included in the analysis
Median	22	Only the 1-mm rain sensors were included in the analysis
Standard deviation	16.4	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	73.4	Only the 1-mm rain sensors were included in the analysis
Mean minus two standard deviations	--	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Sunshine (4160)
Maximum total count	121	Powers Park (1500) – irrigation influence
Sensors showing NO rain for the month		W. Cherry Creek – WX (2790), Red Hill (4290), Sellers Gulch at Haystack (10015)
Sensors greater than 3 SD (over reporting)		Powers Park (1500), Temple Pond at DTC (630), Harvard Gulch (600) – all influenced by irrigation

B. Monthly Average Tip/Count Summary

A monthly summary of the District-wide mean total tip/count is presented (Table 11).

Table 11. 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	12.26	20.57	54.82	26.06	16.43	90.20	37.54	19.59	2.82	9.24	25.08
2009	6.33	3.11	11.37	59.26	63.45	68.00	65.00	20.00	27.29	30.24	11.00	5.60	30.89
2010	5.97	11.90	32.54	70.57	39.63	56.04	50.23	31.01	4.18	18.31	8.30	3.31	27.67
2011	6.78	7.45	7.54	33.94	92.68	39.42	90.87	18.25	37.67	25.73	10.41	13.59	32.03
2012	4.89	13.57	2.35	30.17	38.97	19.35	73.03	11.31	48.81	22.32	2.98	4.18	22.66
2013	2.96	14.31	21.86	35.96	45.87	16.39	52.33	50.63	229.74	29.64	5.86	4.00	42.46
2014	6.88	11.86	25.91	29.30	77.30	29.16	99.73	43.59	50.96	29.26	13.36	8.11	35.45
2015	9.88	24.42	20.78	69.75	143.07	86.93	54.59	29.95	7.16	53.28	22.08	10.80	44.39
2016	4.68	9.91	32.30	52.10	49.40	40.50	24.20						
Ave	6.24	10.48	19.55	44.28	62.99	37.41	55.68	35.29	44.51	27.18	8.04	7.87	28.53

*- Only sensors that operate year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

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

Several sensors experienced a large jump in the sequential tip count (Table 12).

Table 12. Sensors with a Jump of 6 or More in Sequential Count

Sensor Description	Sensor ID	Comment
Dakan Road	2980	Several large jumps in count were identified this month

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 94 percent. A total of 4,322 incrementing reports were received and a total of 4,591 reports were expected. The total loss of incrementing reports for the month was approximately 6 percent. Those sensors with the worst event transmission performance are summarized (Table 13).

Table 13. Monthly Summary of Sensors with the Worst Performance

Jan*	Feb*	Mar*	Apr	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*
1530	4270	2790	2790	2790	2790	2980					
4550	10026	10026	5900	4330	4270	2360					
1640	2790	5940	4260	1620	1620	4470					
4180	4240	4790	950	4470	4330	2970					
1660	5940	4510	2330	2230	2330	4330					
4840	4510	4870	1480	2980	10026	1620					

*-Only sensors that are operational year-round (weather stations and stations in Boulder County) are included for the analysis in these months.

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.

IV. 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 14).

Table 14. Summary of Unknown IDs

Description	Concentrator	Legacy	A2
Total number of unknown IDs (IDs without a device definition)	207	211	0
Total reports from unknown IDs	1,408	1,360	0
Unknown IDs with only a single received report (potential noise)	141	163	0
Total reports from all IDs – RecData Log entire month	423,762	262,732	473,766
Unknown reports as a fraction of total reports	0.33%	0.52%	0%

The total number of reports from unknown sensors is very small relative to the total reports received for the month. Shown below (Table 15) are the total reports received from unknown sensor IDs for each month of the year.

Table 15. Monthly Summary of Total Reports from Unknown IDs (Concentrator)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	1,220	1,474	1,276	1,174	721	5,707	610	1,738	442	533	2,857	6,396
2011	1,231	2,165	3,065	1,254	2,051	439	489	456	191	683	747	861
2012	692	750	1,575	977	5,469	11,016	453	683	774	2,657	3,854	5,466
2013	4,265	994	1,100	2,589	3,623	6,973	5,230	1,070	4,429	781	13,459	1,213
2014	870	4,284	2,399	2,104	25,746	1,832	3,983	268	369	448	470	1,099
2015	542	9,137	1,524	1,007	946	699	1,179	1,860	1,153	1,063	600	619
2016	323	1,241	3,085	3,586	1,268	945	1,408					

The fraction of reports from unknown sensors relative to the total number of reports is shown below (Table 16).

Table 16. Monthly Percent of Unknown Sensor Reports (Concentrator)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	0.42%	0.56%	0.38%	0.32%	0.20%	1.61%	0.17%	0.49%	0.13%	0.16%	0.93%	1.88%
2011	0.39%	0.73%	0.90%	0.37%	0.58%	0.12%	0.12%	0.05%	0.12%	0.18%	0.22%	0.26%
2012	0.30%	0.25%	0.43%	0.26%	1.37%	2.74%	0.11%	0.18%	0.20%	0.72%	1.15%	1.62%
2013	1.40%	0.31%	0.29%	0.60%	0.37%	0.61%	0.82%	0.21%	0.96%	0.31%	5.37%	0.23%
2014	0.14%	0.94%	0.40%	0.34%	3.95%	0.34%	0.66%	0.03%	0.03%	0.07%	0.11%	0.26%
2015	0.15%	2.25%	0.34%	0.22%	0.19%	0.14%	0.26%	0.42%	0.29%	0.24%	0.15%	0.15%
2016	0.10%	0.30%	0.69%	0.82%	0.28%	0.22%	0.33%					

Any month shaded in yellow has an excessive number of reports from unknown sensors.

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 shown (Table 17).

Table 17. Reports Received by Unknown IDs

Concentrator		Legacy ALERT		Comment
Unknown ID	Reports	Unknown ID	Reports	
623	699	623	667	
2283	68	2283	64	
443	62	443	60	
2274	51	2274	50	From Cub Creek below Blue (2270)
2272	50	2272	49	From Cub Creek below Blue (2270)
2271	49	2	116	

V. Sensors with Invalid Reports

The sensors below (Table 18 and Table 19) have the largest number of invalid decodes as determined by the validation process defined at the District NovaStar5 base station. These invalid reports may indicate poor radio paths (bit flip/contention errors/random decode) or validation criteria that do not match the physical installation at the site.

Table 18. Rain Sensors with the Most Invalid Reports

Sensor ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1310-LDC at 64th	--	--	--	--	--	49	264					
1530-Bear Cr. At Lowell	8	5	10	3	1	0	0					
2810-Pine Cliff Rd.	--	18	11	8	9	6	0					
2750-Wx-Castle Rock	10	24	0	0	1	3	1					
2790-Wx-W. Cherry Creek	--	--	--	--	8	4	0					
2980-Dakan Road	--	--	--	8	9	6	2					
2990-Tomah Rd.	--	12	2	2	2	2	1					
3010-Wx-EPC @ 105	--	--	8	10	11	11	6					
3020-Wx-West Creek	9	103	96	111	149	178	50					
3050-E/W Trailhead	--	--	8	7	7	8	1					
3070-Newlin Gulch	10	52	5	0	0	1	0					
3090-Heritage Reg.	--	--	--	--	--	38	0					
4030-Red Garden	23	41	3	4	2	2	0					
4330-Hansen Rain	--	--	--	--	5	2	4					
5730-West Creek	--	--	--	--	22	0	0					

Little Dry Creek at 64th (1310) was out of service for the entire month of July and thus it has a lot of invalid reports. It was placed back into service on August 2, 2016. West Creek WX (3020) was also out of service for most of the month. It was upgraded to a full ALERT2 station on July 19.

Table 19. Level Sensors with the Most Invalid Reports

Sensor ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
203-Leyden Res	11	22	37	15	1	0	0					
633-Temple Pond at DTC	--	--	--	--	--	13	0					
653-GG at Iliff Pond	--	--	--	15	1	1	0					
713-Horseshoe Park Drop	--	--	--	12	0	0	0					
853-Flying J	--	36	57	58	58	59	61					
1323-SPR at 3rd Ave	--	--	--	78	1	0	5					
1383-Ferril Lake	747	703	686	714	683	721	225					
1623-Slaughterhouse Gulch	--	--	--	--	13	10	4					
1663-SPR at Henderson	--	--	--	--	9	8	5					
2813-Pine Cliff Road	--	--	--	--	1,172*	26	42					
2873-Cottonwood	--	--	85	2,807*	2,764*	0	0					
3013-EPC@Hwy 105	7	19	11	4	2	17	6					
3043-CC@Russelville	--	--	22	5	0	0	1					
3093-Heritage Reg. Park	--	--	--	--	--	54	1					
4433-Rowena	--	--	--	--	--	--	23					
4563-Lyons Diversion	--	13	13	10	3	3	4					
*These stations are out-of-service for the month												
Ferril Lake and Flying J were placed back into service on the NovaStar base station on August 2, 2016.												

VI. Rainfall Alarms and Intensity Analysis

The following rainfall rate alarms from the Urban Drainage and Flood Control District NovaStar 5.0 Web Server were identified this month.

ID	Description	Alarm	Date/Time
2810	Pine Cliff Road Precipitation-DG	Douglas County 10 minute rainfall	7/1/2016 14:06
2900	Russellville Gulch Precipitation-DG	Douglas County 10 minute rainfall	7/1/2016 14:37
2900	Russellville Gulch Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	7/1/2016 14:50
4230	Golden Age Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/15/2016 15:58
4850	Porphyry Mountain Precipitation-BO	Boulder County 10 minute rainfall	7/15/2016 15:59
4850	Porphyry Mountain Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/15/2016 15:59
2980	Dakan Road Precipitation-DG	Douglas County 10 minute rainfall	7/18/2016 11:55
5810	Stump Bump Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 16:46
5810	Stump Bump Precipitation-TL	Hayman 1 hour rainfall	7/18/2016 16:52
5810	Stump Bump Precipitation-TL	Hayman 90 minute rainfall	7/18/2016 16:55
5810	Stump Bump Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 16:56
5740	Trail Creek Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 16:57
5880	Hackett Mountain Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 16:58
5720	Four Mile Creek Precipitation-DG	Hayman 30 minute rainfall	7/18/2016 17:00
5740	Trail Creek Precipitation-TL	Hayman 1 hour rainfall	7/18/2016 17:00
5810	Stump Bump Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 17:07
5740	Trail Creek Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 17:10
5720	Four Mile Creek Precipitation-DG	Hayman 1 hour rainfall	7/18/2016 17:12
5720	Four Mile Creek Precipitation-DG	Hayman 30 minute rainfall	7/18/2016 17:12
5810	Stump Bump Precipitation-TL	Hayman 30 minute rainfall	7/18/2016 17:22
4730	Sugarloaf Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/18/2016 17:37
4730	Sugarloaf Precipitation-BO	Boulder County 10 minute rainfall	7/18/2016 17:38
4140	Logan Mill Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	7/18/2016 17:42
4140	Logan Mill Precipitation-BO	Boulder County 10 minute rainfall	7/18/2016 17:47
4140	Logan Mill Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/18/2016 17:47
4110	Betasso Precipitation-BO	Boulder County 10 minute rainfall	7/18/2016 17:49
4110	Betasso Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/18/2016 17:49
4860	Fairview Peak Precipitation-BO	Boulder County 10 minute rainfall	7/18/2016 18:00
4140	Logan Mill Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	7/19/2016 18:20
4140	Logan Mill Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/19/2016 18:24
4880	Whispering Pines Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	7/19/2016 18:25
4880	Whispering Pines Precipitation-BO	Boulder County 10 minute rainfall	7/19/2016 18:29
4880	Whispering Pines Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	7/19/2016 18:29
4320	Lee Hill Rain Precipitation-BO	FMC-BA 0.25" in 10 Min Rainfall	7/19/2016 18:32
1500	Powers Park Precipitation-AR	Plains 10 minute rainfall	7/19/2016 18:39
1640	SPR at Union Avenue Precipitation	Plains 10 minute rainfall	7/19/2016 18:42
1530	Bear Creek at Lowell Precipitation-AR	Plains 10 minute rainfall	7/19/2016 18:47
600	Harvard Gulch Park Precipitation-DN	Plains 10 minute rainfall	7/19/2016 18:49
1640	SPR at Union Avenue Precipitation	Plains 1 hour rainfall	7/19/2016 18:49
1340	Sanderson at Xavier Precipitation-DN	Plains 10 minute rainfall	7/19/2016 18:49
600	Harvard Gulch Park Precipitation-DN	Plains 1 hour rainfall	7/19/2016 18:52

1640	SPR at Union Avenue Precipitation	Plains 10 minute rainfall	7/19/2016 18:53
1340	Sanderson at Xavier Precipitation-DN	Plains 1 hour rainfall	7/19/2016 18:57
1530	Bear Creek at Lowell Precipitation-AR	Plains 1 hour rainfall	7/19/2016 18:58
1530	Bear Creek at Lowell Precipitation-AR	Plains 10 minute rainfall	7/19/2016 18:58
1340	Sanderson at Xavier Precipitation-DN	Plains 10 minute rainfall	7/19/2016 19:01
530	Fire Station #19 Precipitation-DN	Plains 10 minute rainfall	7/19/2016 19:05
2820	East Plum Creek at Haskins Gulch Precipitation-DG	Douglas County 10 minute rainfall	7/22/2016 15:01
3030	Bingham Lake Park Precipitation-DG	Douglas County 10 minute rainfall	7/22/2016 15:28

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2016\07-2016\Novastar_extract_2016Jul.mdb

First Date in Database	6/30/16 11:59 PM	Total Days	31.0
Last Date in Database	7/31/16 11:59 PM	Total Hours	744.0

Summarize

Total Records Analyzed 423,762

Records by Group	Concentrator	Percent	Legacy	Percent	ALERT2	Percent
Wind Data	162,847	38%	91,058	35%	120,021	25%
Temperature	70,608	17%	37,914	14%	71,880	15%
Relative Humidity	62,094	15%	36,884	14%	69,062	15%
Barometric Pressure	32,782	8%	21,451	8%	1,258	0%
Battery Voltage	26,200	6%	13,566	5%	62,538	13%
Water Level	20,734	5%	18,466	7%	55,510	12%
Precipitation	15,339	4%	11,656	4%	39,296	8%
Solar Radiation	11,124	3%	11,001	4%	0	0%
Fuel Temperature	5,955	1%	5,923	2%	0	0%
Fuel Moisture	5,946	1%	5,889	2%	0	0%
Soil Moisture	2,962	1%	2,939	1%	0	0%
Repeater Status Report	1,976	0%	2,405	1%	0	0%
Hayman Battery	1,604	0%	0	0%	0	0%
Unknown	1,408	0%	1,360	1%	730	0%
ET-Hourly	734	0%	708	0%	0	0%
12Hr Status Report	337	0%	326	0%	2,509	1%
Not Used	327	0%	299	0%	0	0%
Wind Direction	326	0%	0	0%	13,155	3%
GPS Lock	181	0%	122	0%	26,436	6%
Water Temp	119	0%	119	0%	0	0%
Handar 585 ALARM Status	62	0%	61	0%	0	0%
Repeater Pass List	62	0%	552	0%	0	0%
ET-Daily	31	0%	28	0%	0	0%
Solar Power	3	0%	4	0%	0	0%
ALERT/A2 Testing	1	0%	1	0%	0	0%
Flasher Status	0	0%	0	0%	5,850	1%
Dew Point Temperature	0	0%	0	0%	5,521	1%
Total	423,762	100%	262,732	100%	473,766	100%

Traffic Loading Summary	Concentrator		Legacy		ALERT2	
Alert Reports	423,762		262,732		473,766	
Average Daily Traffic	13,243		8,475		14,805	
Average Hourly Traffic	552		353		617	
Median Hourly Traffic	558	hour beginning	346	hour beginning	722	hour beginning
Peak Hourly Traffic	1,165	Jul 19, 7:00 PM	885	Jul 19, 7:00 PM	973	Jul 19, 7:00 PM
2nd Max	1,027	Jul 19, 6:00 PM	755	Jul 19, 6:00 PM	956	Jul 19, 6:00 PM
3rd Max	965		631		873	
4th Max	930	Jul 18, 5:00 PM	603	Jul 2, 12:00 AM	854	Jul 15, 3:00 PM
5th Max	817	Jul 15, 3:00 PM	589	Jul 18, 5:00 PM	821	Jul 18, 6:00 PM

Rain Timer Performance

Analyze Rain Sensors

Rain Sensors	Description	Rcv	Timer	Exp	Performance	Comment
100150	A2-Sellers Gulch at Haystack Precip	20.00	11:59	744.00	3%	Still trouble-shooting
2790	Wx-W. Cherry Creek	4.00	16:00	64.00	6%	
3020	Wx-West Creek WX	297.00		744.00	40%	Partial month of data
1530	Bear Creek @ Lowell	35.00	20:48	64.00	55%	
430	Utah Park	41.00	14:57	64.00	64%	
4270	Cannon Mountain	43.00	15:51	64.00	67%	
1710	Shop Creek	43.00	16:55	64.00	67%	
4330	Hansen Rain	44.00	15:56	64.00	69%	
1660	SPR at Henderson	45.00	16:34	64.00	70%	
100260	Wx-A2-Trumbull (Hayman) - Precip	525.00		744.00	71%	
2360	Indian Hills	46.00	14:43	64.00	72%	
2330	Morrison	46.00	14:37	64.00	72%	
2230	Bear Cr below Cub	47.00	15:23	64.00	73%	
1620	Slaughterhouse Glch	48.00	14:24	64.00	75%	
2280	Kinney Peak	49.00	14:25	64.00	77%	
4870	SBC @ SB Road	50.00	14:52	64.00	78%	
700	Toll Gate @ 6th	52.00	14:20	64.00	81%	
2980	Dakan Rd	53.00	13:28	64.00	83%	
4040	Martin Gulch	53.00	13:13	64.00	83%	
940	Aurora Regional Pond	54.00	12:57	64.00	84%	
2320	Choke Cherry Resvr	54.00	12:45	64.00	84%	
5720	Four Mile Creek	54.00	13:15	64.00	84%	
540	Parker/Mississippi	54.00	13:40	64.00	84%	
4510	Pinewood Springs	55.00	12:41	64.00	86%	
2900	Russelville Gulch-Douglas	55.00	13:28	64.00	86%	
1920	Wx-Brighton	55.00	14:01	64.00	86%	
4490	Apple Valley	56.00	12:39	64.00	88%	
2350	Idledale	56.00	12:12	64.00	88%	
4470	Little Narrows	56.00	12:54	64.00	88%	
6601	Wx-A2-Magnolia WX-Precip	56.00	8:00	64.00	88%	
310	Guy Hill Ranch	57.00	12:51	64.00	89%	
5940	Log Jumper	57.00	12:15	64.00	89%	
2840	Sulphur Gulch	57.00	12:43	64.00	89%	
4790	Wx-Button Rock	57.00	13:07	64.00	89%	
1700	Cherry Cr @ Champa	58.00	12:13	64.00	91%	
720	Confluence Pond	58.00	12:39	64.00	91%	
2270	Cub Cr below Blue	58.00	12:13	64.00	91%	
4180	Gold Lake	58.00	12:37	64.00	91%	
4290	Red Hill	58.00	12:22	64.00	91%	
4260	Taylor Mountain	58.00	12:37	64.00	91%	
1480	Third Creek at DIA	58.00	12:41	64.00	91%	
2940	Willow Creek - DougCnty	58.00	12:40	64.00	91%	
2710	Wx-Highlands Ranch WTP	58.00	12:15	64.00	91%	
4070	Bear Peak	59.00	11:57	64.00	92%	
4550	Boulder Jail	59.00	12:24	64.00	92%	
2860	CC at Stroh Rd	59.00	12:40	64.00	92%	
2870	Cottonwood (Apache)	59.00	12:13	64.00	92%	
4220	Fling's	59.00	12:38	64.00	92%	
650	Iliff Pond	59.00	12:41	64.00	92%	
2960	Indian Creek	59.00	12:27	64.00	92%	
4310	Johnny Park	59.00	12:10	64.00	92%	
4360	Justice Center	59.00	12:37	64.00	92%	
210	Leyden Confluence	59.00	12:23	64.00	92%	
620	Quincy/Highline	59.00	12:11	64.00	92%	
2370	Red Rocks Park	59.00	12:25	64.00	92%	
4190	Slaughterhouse	59.00	12:10	64.00	92%	
2890	Spruce Mt - Douglas	59.00	12:14	64.00	92%	
4080	Twin Sisters	59.00	12:11	64.00	92%	
2920	West Cherry Head-Douglas Cnty	59.00	12:15	64.00	92%	
1370	West Metro FS13	59.00	12:25	64.00	92%	
3010	WX-EPC at Hwy 105	59.00	12:14	64.00	92%	
3090	A2-Highland Heritage Park	686.00		744.00	92%	
100110	A2-ETG @ Hampden Precip	60.00	12:00	64.00	94%	
3040	CC @ Russelville Road Precip	60.00	12:27	64.00	94%	
2850	Cherry Cr bl Bayou Glch	60.00	12:28	64.00	94%	
4010	Cresent	60.00	12:11	64.00	94%	
2950	DC Public Works	60.00	12:14	64.00	94%	
1010	Denver West	60.00	11:57	64.00	94%	
4820	Doudy Draw	60.00	12:12	64.00	94%	
3060	Fire Sta 47	60.00	12:00	64.00	94%	
840	Fire Station 12	60.00	12:00	64.00	94%	

4250	Geer Canyon	60.00	12:23	64.00	94%
810	Granby Ditch @ 6th	60.00	12:39	64.00	94%
600	Harvard Gulch Park	60.00	11:58	64.00	94%
2820	Haskins Gulch Conf	60.00	12:14	64.00	94%
500	Havana Park	60.00	12:11	64.00	94%
710	Horseshoe Park Drop	60.00	12:10	64.00	94%
4060	Lakeshore	60.00	12:10	64.00	94%
4200	Lazy Acres	60.00	12:27	64.00	94%
4320	Lee Hill Rain 2012	60.00	11:57	64.00	94%
1040	Lena @ U.S. Hwy 6	60.00	12:25	64.00	94%
4140	Logan Mill	60.00	12:11	64.00	94%
1100	Louisville Rec Ctr	60.00	12:24	64.00	94%
4090	Magnolia	60.00	11:58	64.00	94%
110	Ralston Reservoir	60.00	12:25	64.00	94%
4340	Riverside	60.00	12:24	64.00	94%
1800	Sand Creek Park	60.00	12:11	64.00	94%
4570	St. Antons	60.00	12:12	64.00	94%
220	Upper Leyden	60.00	12:00	64.00	94%
330	Van Bibber @ Hwy 93	60.00	11:58	64.00	94%
510	Virginia Court	60.00	12:14	64.00	94%
4050	Walker Ranch	60.00	12:11	64.00	94%
120	West Woods	60.00	11:58	64.00	94%
900	Wx-Aurora Reservoir	60.00	12:13	64.00	94%
1570	Wx-Brighton Ditch	60.00	12:00	64.00	94%
2750	Wx-Castle Rock	60.00	12:13	64.00	94%
1520	Wx-Marston Lake North	60.00	12:13	64.00	94%
4300	Big Elk Park	61.00	11:57	64.00	95%
1350	Chatfield COE	61.00	11:59	64.00	95%
2240	Cold Sprg Glch conf	61.00	11:58	64.00	95%
1360	Denver Zoo	61.00	12:12	64.00	95%
4520	Eagle Ridge	61.00	12:00	64.00	95%
2910	East Cherry Cr-Douglas	61.00	12:00	64.00	95%
3050	East/West Trailhead	61.00	12:13	64.00	95%
420	Expo Park	61.00	11:57	64.00	95%
4860	Fairview Peak	61.00	12:00	64.00	95%
850	Flying J	61.00	12:00	64.00	95%
2310	Genesee Village	61.00	11:58	64.00	95%
4150	Gold Hill	61.00	11:58	64.00	95%
640	Goldsmith @ Eastman	61.00	12:11	64.00	95%
1110	Gunbarrel	61.00	11:58	64.00	95%
2880	Happy Canyon at N Surrey Dr	61.00	12:12	64.00	95%
610	Harvard @ Jackson	61.00	12:09	64.00	95%
1050	Jeffco Fairgrounds	61.00	12:11	64.00	95%
520	Jewell Detention	61.00	12:10	64.00	95%
410	Kelly Dam	61.00	11:57	64.00	95%
1550	Lakewood CC	61.00	12:11	64.00	95%
200	Leyden Reservoir	61.00	12:09	64.00	95%
760	Mission Viejo Park	61.00	12:11	64.00	95%
1900	Niver Detention	61.00	11:57	64.00	95%
150	Nott Creek	61.00	11:57	64.00	95%
1030	NREL/S. Table Mtn.	61.00	12:11	64.00	95%
4170	Pine Brook	61.00	11:57	64.00	95%
2810	Pine Cliff Road	61.00	12:13	64.00	95%
950	Piney at Liverpool	61.00	12:11	64.00	95%
1500	Powers Park	61.00	11:56	64.00	95%
4030	Red Garden	61.00	12:10	64.00	95%
4020	Rio Grande	61.00	11:58	64.00	95%
4830	SBC @ San Souci	61.00	12:10	64.00	95%
320	Sports Complex	61.00	12:10	64.00	95%
4240	Sunset	61.00	12:10	64.00	95%
4160	Sunshine	61.00	11:58	64.00	95%
4130	Swiss Peaks	61.00	11:59	64.00	95%
3080	Tallman Gulch	61.00	12:00	64.00	95%
1400	Upper Sloan Det.	61.00	12:10	64.00	95%
300	Van Bibber Park	61.00	11:58	64.00	95%
5730	West Creek	61.00	12:00	64.00	95%
4880	Whispering Pines	61.00	11:57	64.00	95%
100200	Wx-A2-OneRain Weather - Precipitation	61.00	12:00	64.00	95%
920	Wx-Aurora Town Hall	61.00	12:00	64.00	95%
3030	WX-Bingham Lake Park	61.00	12:28	64.00	95%
140	Wx-Blue Mountain	61.00	12:00	64.00	95%
1440	Wx-Elbert	61.00	12:00	64.00	95%
4750	Wx-Louisville Lake	61.00	12:00	64.00	95%
2730	Wx-Salisbury Park	61.00	12:13	64.00	95%
2930	Wx-Spring Valley Rd-DougCnty	61.00	12:00	64.00	95%
4730	Wx-Sugarloaf	61.00	12:13	64.00	95%

2990	Wx-Tomah Rd-DougCnty	61.00	12:12	64.00	95%
4710	Wx-Ward C-1	61.00	12:00	64.00	95%
5900	Horse Creek-Satellite	711.00		744.00	96%
100100	A2-Blackstone Precip	62.00	12:00	64.00	97%
4110	Betasso	62.00	11:59	64.00	97%
2260	Brook Forest	62.00	11:58	64.00	97%
1200	Broomfield 3207	62.00	11:58	64.00	97%
1720	Cherry Cr @ Steele	62.00	11:57	64.00	97%
4350	Conifer Hill	62.00	11:57	64.00	97%
2340	El Rancho	62.00	11:57	64.00	97%
1600	Englewood Dam	62.00	11:57	64.00	97%
820	ETG @ Buckley	62.00	11:57	64.00	97%
4100	Filter Plant	62.00	11:47	64.00	97%
530	Fire Station #19	62.00	11:57	64.00	97%
440	Fire Station #7	62.00	11:57	64.00	97%
4230	Golden Age	62.00	11:57	64.00	97%
1060	Heritage Square	62.00	12:09	64.00	97%
1300	Hidden Lake	62.00	11:58	64.00	97%
730	No Name @ Quincy	62.00	11:58	64.00	97%
970	Pump Sta 3	62.00	12:00	64.00	97%
2250	Rosedale	62.00	11:57	64.00	97%
800	Sable Ditch @ 18th	62.00	11:57	64.00	97%
4840	SBC@S Boulder Ditch	62.00	11:57	64.00	97%
4810	Shanahan Ridge	62.00	11:57	64.00	97%
1320	SPR at 3rd Ave	62.00	11:58	64.00	97%
1640	SPR at Union Ave.	62.00	11:57	64.00	97%
630	Temple Pond at DTC	62.00	11:56	64.00	97%
4530	Winiger Ridge	62.00	11:57	64.00	97%
1420	Wx-A2-Diamond Hill	62.00	12:00	64.00	97%
4770	Wx-Cal-Wood Ranch	62.00	12:00	64.00	97%
2210	Wx-Hiwan G.C.	62.00	12:00	64.00	97%
1460	Wx-Urban Farm	62.00	12:00	64.00	97%
100270	Wx-A2-WestCreek (Hayman) - Precip	730.00		744.00	98%
5860	Cedar Mountain	63.00	11:33	64.00	98%
5880	Hackett Mountain	63.00	11:34	64.00	98%
5740	Trail Creek	63.00	11:34	64.00	98%
750	Wx-Quincy Reservoir	63.00	11:56	64.00	98%
100290	Wx-A2-PlumCr at Sedalia - Precip	733.00		744.00	99%
100160	A2-Sand Creek at Colfax Precip	742.00		744.00	100%
100320	A2-Weir Gulch - Precip	742.00		744.00	100%
100	A2-Carr Street	743.00		744.00	100%
100300	A2-CoalCreek at McCaslin - Precip	743.00		744.00	100%
100230	A2-Havana Pond Precip	743.00		744.00	100%
100240	A2-Westerly Cr Dam Precip	743.00		744.00	100%
4850	Porphory Mtn	743.00		744.00	100%
1340	Sanderson at Xavier	743.00		744.00	100%
1000	A2-Maple Grove Resv.	744.00		744.00	100%
870	A2-Murphy Creek GC	744.00		744.00	100%
3070	A2-Newlin Gulch Precip	744.00		744.00	100%
5810	Stump Bump	64.00	11:34	64.00	100%
2970	Rampart Range Rd-Satellite	206.00		206.00	100%

Rain Event Performance		Reports Received	Reports Received	4,322	Analyze Rain Sensors						0	<<show stations with zero rain (1=yes, 0=no)								
		Systemwide Avg	Total Tips	4,591																
		94.14%	Data Loss	5.86%																
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket						
Dakan Rd	2980	30%	7	5	0	1	0	1	1	14	46	32	0	0.03937						
Indian Hills	2360	67%	22	7	1	1	1	0	0	32	48	16	0	0.03937	Mean		24.2			
Little Narrows	4470	70%	5	1	1	0	0	0	0	7	10	3	0	0.03937	Median		22			
Rampart Range Rd-Satellite	2970	71%	11	2	2	0	0	0	0	15	21	6	0	0.03937	St. Dev		16.4			
Hansen Rain	4330	72%	15	0	2	1	0	0	0	18	25	7	0	0.03937	Mean plus 3 SD		73.4			
Slaughterhouse Glch	1620	73%	13	2	0	0	1	0	0	16	22	6	0	0.03937	Min		1	Sunshine (4160)		
Cannon Mountain	4270	73%	7	4	0	0	0	0	0	11	15	4	0	0.03937	Max		121	Powers Park (1500)		
Bear Creek @ Lowell	1530	78%	23	5	0	1	0	0	0	29	37	8	0	0.03937						
Taylor Mountain	4260	80%	3	1	0	0	0	0	0	4	5	1	0	0.03937						
Russelville Gulch-Douglas	2900	81%	40	5	1	0	1	0	0	47	58	11	0	0.03937						
Choke Cherry Resvr	2320	82%	14	4	0	0	0	0	0	18	22	4	0	0.03937						
Pinewood Springs	4510	82%	7	2	0	0	0	0	0	9	11	2	0	0.03937						
Spruce Mt - Douglas	2890	82%	20	2	0	1	0	0	0	23	28	5	0	0.03937						
Lakeshore	4060	83%	8	2	0	0	0	0	0	10	12	2	0	0.03937						
Wx-Button Rock	4790	85%	9	2	0	0	0	0	0	11	13	2	0	0.03937						
Parker/Mississippi	540	85%	34	3	2	0	0	0	0	39	46	7	0	0.03937						
Cherry Cr @ Champa	1700	85%	15	1	1	0	0	0	0	17	20	3	0	0.03937						
Willow Creek - DougCnty	2940	85%	15	1	1	0	0	0	0	17	20	3	0	0.03937						
Justice Center	4360	86%	10	2	0	0	0	0	0	12	14	2	0	0.03937						
Kinney Peak	2280	86%	22	2	1	0	0	0	0	25	29	4	0	0.03937						
Cherry Cr bl Bayou Glch	2850	86%	22	2	1	0	0	0	0	25	29	4	0	0.03937						
DC Public Works	2950	86%	17	1	1	0	0	0	0	19	22	3	0	0.03937						
Wx-A2-Trumbull (Hayman) - Precip	100260	86%	16	3	0	0	0	0	0	19	22	3	0	0.03937						
Wx-Sugarloaf	4730	87%	22	4	0	0	0	0	0	26	30	4	0	0.03937						
Wx-Urban Farm	1460	87%	11	2	0	0	0	0	0	13	15	2	0	0.03937						
Happy Canyon at N Surrey Dr	2880	87%	11	2	0	0	0	0	0	13	15	2	0	0.03937						
Idledale	2350	87%	24	2	1	0	0	0	0	27	31	4	0	0.03937						
Jeffco Fairgrounds	1050	88%	12	2	0	0	0	0	0	14	16	2	0	0.03937						
Red Rocks Park	2370	88%	13	0	1	0	0	0	0	14	16	2	0	0.03937						
Filter Plant	4100	88%	13	0	1	0	0	0	0	14	16	2	1	0.03937						
Wx-Brighton	1920	88%	6	1	0	0	0	0	0	7	8	1	1	0.03937						
Apple Valley	4490	88%	6	1	0	0	0	0	0	7	8	1	0	0.03937						
SPR at 3rd Ave	1320	88%	13	2	0	0	0	0	0	15	17	2	0	0.03937						
Harvard @ Jackson	610	88%	33	5	0	0	0	0	0	38	43	5	0	0.03937						
Cherry Cr @ Steele	1720	89%	21	3	0	0	0	0	0	24	27	3	0	0.03937						
WX-Bingham Lake Park	3030	89%	36	5	0	0	0	0	0	41	46	5	0	0.03937						
Golden Age	4230	90%	23	3	0	0	0	0	0	26	29	3	0	0.03937						
Denver Zoo	1360	90%	16	2	0	0	0	0	0	18	20	2	0	0.03937						
Morrison	2330	90%	8	1	0	0	0	0	0	9	10	1	0	0.03937						
Sand Creek Park	1800	90%	25	3	0	0	0	0	0	28	31	3	0	0.03937						
Horseshoe Park Drop	710	90%	17	2	0	0	0	0	0	19	21	2	0	0.03937						
Martin Gulch	4040	90%	17	2	0	0	0	0	0	19	21	2	0	0.03937						
East/West Trailhead	3050	91%	9	1	0	0	0	0	0	10	11	1	0	0.03937						
Twin Sisters	4080	91%	9	1	0	0	0	0	0	10	11	1	0	0.03937						
Red Garden	4030	92%	10	1	0	0	0	0	0	11	12	1	0	0.03937						
Gold Lake	4180	92%	10	1	0	0	0	0	0	11	12	1	0	0.03937						
NREL/S. Table Mtn.	1030	92%	11	1	0	0	0	0	0	12	13	1	0	0.03937						
Fire Station #19	530	93%	35	1	1	0	0	0	0	37	40	3	0	0.03937						
Wx-Marston Lake North	1520	93%	23	2	0	0	0	0	0	25	27	2	0	0.03937						
Lakewood CC	1550	93%	25	2	0	0	0	0	0	27	29	2	0	0.03937						
Utah Park	430	93%	66	2	0	1	0	0	0	69	74	5	0	0.03937						
Wx-Brighton Ditch	1570	93%	13	1	0	0	0	0	0	14	15	1	0	0.03937						
Cold Sprg Glch conf	2240	94%	27	2	0	0	0	0	0	29	31	2	0	0.03937						
Walker Ranch	4050	94%	14	1	0	0	0	0	0	15	16	1	0	0.03937						
Lazy Acres	4200	94%	29	2	0	0	0	0	0	31	33	2	0	0.03937						
A2-Sand Creek at Colfax Precip	100160	95%	34	0	1	0	0	0	0	35	37	2	1	0.03937						

liff Pond	650	95%	35	2	0	0	0	0	0	37	39	2	0	0.03937
Powers Park	1500	95%	109	6	0	0	0	0	0	115	121	6	0	0.03937
Jewell Detention	520	95%	38	2	0	0	0	0	0	40	42	2	0	0.03937
Slaughterhouse	4190	95%	19	1	0	0	0	0	0	20	21	1	0	0.03937
Bear Cr below Cub	2230	95%	40	2	0	0	0	0	0	42	44	2	0	0.03937
East Cherry Cr-Douglas	2910	95%	41	0	1	0	0	0	0	42	44	2	0	0.03937
Betasso	4110	95%	20	1	0	0	0	0	0	21	22	1	0	0.03937
ETG @ Buckley	820	96%	22	1	0	0	0	0	0	23	24	1	0	0.03937
Shop Creek	1710	96%	22	1	0	0	0	0	0	23	24	1	0	0.03937
Kelly Dam	410	96%	23	1	0	0	0	0	0	24	25	1	0	0.03937
Fire Station #7	440	96%	23	1	0	0	0	0	0	24	25	1	0	0.03937
Confluence Pond	720	96%	23	1	0	0	0	0	0	24	25	1	0	0.03937
Wx-Salisbury Park	2730	96%	23	1	0	0	0	0	0	24	25	1	0	0.03937
Wx-Cal-Wood Ranch	4770	96%	23	1	0	0	0	0	0	24	25	1	0	0.03937
Harvard Gulch Park	600	96%	74	1	1	0	0	0	0	76	79	3	0	0.03937
SPR at Union Ave.	1640	96%	50	2	0	0	0	0	0	52	54	2	0	0.03937
Genesee Village	2310	96%	25	1	0	0	0	0	0	26	27	1	0	0.03937
Cottonwood (Apache)	2870	96%	25	1	0	0	0	0	0	26	27	1	0	0.03937
CC @ Russelville Road Precip	3040	96%	25	1	0	0	0	0	0	26	27	1	0	0.03937
Tallman Gulch	3080	96%	25	1	0	0	0	0	0	26	27	1	0	0.03937
Log Jumper	5940	96%	25	1	0	0	0	0	0	26	27	1	0	0.03937
Goldsmith @ Eastman	640	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937
Cub Cr below Blue	2270	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937
Winiger Ridge	4530	96%	26	1	0	0	0	0	0	27	28	1	0	0.03937
West Cherry Head-Douglas Cnty	2920	97%	27	1	0	0	0	0	0	28	29	1	0	0.03937
Fire Sta 47	3060	97%	28	1	0	0	0	0	0	29	30	1	0	0.03937
Sable Ditch @ 18th	800	97%	29	1	0	0	0	0	0	30	31	1	0	0.03937
Pine Cliff Road	2810	97%	29	1	0	0	0	0	0	30	31	1	0	0.03937
Stump Bump	5810	97%	59	2	0	0	0	0	0	61	63	2	0	0.03937
Havana Park	500	97%	30	1	0	0	0	0	0	31	32	1	0	0.03937
Logan Mill	4140	97%	32	1	0	0	0	0	0	33	34	1	0	0.03937
Pump Sta 3	970	97%	34	1	0	0	0	0	0	35	36	1	0	0.03937
Crescent	4010	97%	34	1	0	0	0	0	0	35	36	1	0	0.03937
Hackett Mountain	5880	97%	34	1	0	0	0	0	0	35	36	1	0	0.03937
Wx-Elbert	1440	97%	35	1	0	0	0	0	0	36	37	1	2	0.03937
CC at Stroh Rd	2860	97%	36	1	0	0	0	0	0	37	38	1	0	0.03937
Quincy/Highline	620	97%	37	1	0	0	0	0	0	38	39	1	0	0.03937
Wx-A2-WestCreek (Hayman) - Precip	100270	97%	37	1	0	0	0	0	0	38	39	1	0	0.03937
Temple Pond at DTC	630	98%	82	2	0	0	0	0	0	84	86	2	0	0.03937
Wx-Castle Rock	2750	98%	41	1	0	0	0	0	0	42	43	1	0	0.03937
Flying J	850	98%	45	1	0	0	0	0	0	46	47	1	0	0.03937
Virginia Court	510	98%	50	1	0	0	0	0	0	51	52	1	0	0.03937
Wx-Aurora Town Hall	920	98%	56	1	0	0	0	0	0	57	58	1	0	0.03937
Expo Park	420	98%	62	1	0	0	0	0	0	63	64	1	0	0.03937
Sanderson at Xavier	1340	100%	48	0	0	0	0	0	0	48	48	0	0	0.03937
A2-Murphy Creek GC	870	100%	47	0	0	0	0	0	0	47	47	0	0	0.03937
Brook Forest	2260	100%	41	0	0	0	0	0	0	41	41	0	0	0.03937
Cedar Mountain	5860	100%	39	0	0	0	0	0	0	39	39	0	0	0.03937
Trail Creek	5740	100%	36	0	0	0	0	0	0	36	36	0	0	0.03937
Four Mile Creek	5720	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937
Fire Station 12	840	100%	32	0	0	0	0	0	0	32	32	0	0	0.03937
Haskins Gulch Conf	2820	100%	32	0	0	0	0	0	0	32	32	0	0	0.03937
A2-Westerly Cr Dam Precip	100240	100%	32	0	0	0	0	0	0	32	32	0	1	0.03937
Geer Canyon	4250	100%	30	0	0	0	0	0	0	30	30	0	0	0.03937
A2-ETG @ Hampden Precip	100110	100%	30	0	0	0	0	0	0	30	30	0	0	0.03937
Toll Gate @ 6th	700	100%	28	0	0	0	0	0	0	28	28	0	0	0.03937
Wx-Highlands Ranch WTP	2710	100%	28	0	0	0	0	0	0	28	28	0	0	0.03937
Mission Viejo Park	760	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Wx-Hiwan G.C.	2210	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Sulphur Gulch	2840	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
A2-Newlin Gulch Precip	3070	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937

Horse Creek-Satellite	5900	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Nott Creek	150	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Granby Ditch @ 6th	810	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Rosedale	2250	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
El Rancho	2340	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
Wx-Spring Valley Rd-DougCnty	2930	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
West Creek	5730	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937
Rio Grande	4020	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Swiss Peaks	4130	100%	23	0	0	0	0	0	0	23	23	0	0	0.03937
Whispering Pines	4880	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937
Chatfield COE	1350	100%	21	0	0	0	0	0	0	21	21	0	0	0.03937
Wx-Quincy Reservoir	750	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937
No Name @ Quincy	730	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
Hidden Lake	1300	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
Wx-Ward C-1	4710	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
A2-Blackstone Precip	100100	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
Doudy Draw	4820	100%	18	0	0	0	0	0	0	18	18	0	0	0.03937
Wx-A2-PlumCr at Sedalia - Precip	100290	100%	18	0	0	0	0	0	0	18	18	0	0	0.03937
A2-Weir Gulch - Precip	100320	100%	18	0	0	0	0	0	0	18	18	0	1	0.03937
Wx-A2-Diamond Hill	1420	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Indian Creek	2960	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Lee Hill Rain 2012	4320	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Conifer Hill	4350	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Aurora Regional Pond	940	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937
Van Bibber @ Hwy 93	330	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
West Metro FS13	1370	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
Wx-Blue Mountain	140	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Piney at Liverpool	950	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Heritage Square	1060	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Englewood Dam	1600	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Pine Brook	4170	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Riverside	4340	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
St. Antons	4570	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Denver West	1010	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937
Upper Sloan Det.	1400	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937
Wx-West Creek WX	3020	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937
Bear Peak	4070	100%	13	0	0	0	0	0	0	13	13	0	0	0.03937
A2-Carr Street	100	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Lena @ U.S. Hwy 6	1040	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Gold Hill	4150	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Magnolia	4090	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Wx-Aurora Reservoir	900	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Ralston Reservoir	110	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
A2-Maple Grove Resv.	1000	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Third Creek at DIA	1480	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
A2-Highland Heritage Park	3090	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Fling's	4220	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Eagle Ridge	4520	100%	10	0	0	0	0	0	0	10	10	0	0	0.03937
Sports Complex	320	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Louisville Rec Ctr	1100	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Wx-Tomah Rd-DougCnty	2990	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Boulder Jail	4550	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Shanahan Ridge	4810	100%	9	0	0	0	0	0	0	9	9	0	0	0.03937
Upper Leyden	220	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
Van Bibber Park	300	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
Wx-Louisville Lake	4750	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
A2-Havana Pond Precip	100230	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
West Woods	120	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
Sunset	4240	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
SBC @ SB Road	4870	100%	7	0	0	0	0	0	0	7	7	0	0	0.03937
Leyden Reservoir	200	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937

SBC@S Boulder Ditch	4840	100%	6	0	0	0	0	0	0	6	6	0	0	0.03937			
Big Elk Park	4300	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937			
Johnny Park	4310	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937			
A2-CoalCreek at McCaslin - Precip	100300	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937			
Gunbarrel	1110	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937			
Niver Detention	1900	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937			
SBC @ San Souci	4830	100%	4	0	0	0	0	0	0	4	4	0	0	0.03937			
Broomfield 3207	1200	100%	3	0	0	0	0	0	0	3	3	0	0	0.03937			
Leyden Confluence	210	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937			
Guy Hill Ranch	310	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937			
SPR at Henderson	1660	100%	2	0	0	0	0	0	0	2	2	0	0	0.03937			
Sunshine	4160	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937			
		Total Tips	4,118	173	21	6	3	1	1	4,322	4,591	269	7				
WX-EPC at Hwy 105	3010	82%	80	9	2	1	0	1	0	93	114	21	0	0.01			
Porphory Mtn	4850	80%	80	18	1	0	0	1	1	100	125	25	24	0.01			
Fairview Peak	4860	81%	132	28	4	1	0	0	0	165	204	39	79	0.01			
Wx-A2-Magnolia WX-Precip	6601	100%	63	0	0	0	0	0	1	63	63	0	4	0.01			
Wx-A2-OneRain Weather - Precipitation	100200	71%	11	2	2	0	0	0	0	15	21	6	1	0.01			

2016 Monthly Peak Hour ALERT Radio Traffic Summary

