

Memo

Date: July 7, 2016
To: Kevin Stewart
From: Markus Ritsch
Subject: June 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 June 1 through June 30, 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							1,391,476
Concentrator	194,948	418,430	407,965	435,747	416,968	423,152							2,297,210
ALERT2	136,144	399,530	505,195	540,654	508,036	509,129							2,598,688
TOTAL	449,611	1,082,335	1,154,677	1,242,866	1,170,860	1,187,025	0	0	0	0	0	0	6,287,374
Conc/Leg	1.64	1.58	1.69	1.64	1.70	1.66	1.00	1.00	1.00	1.00	1.00	1.00	1.65
DataChron	645,913	662,847	674,426	742,749	732,116	776,223							4,234,274

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							1,391,476
Concentrator	194,948	418,430	407,965	435,747	416,968	423,152							2,297,210
ALERT2	136,144	399,530	505,195	540,654	508,036	509,129							2,598,688
NS5B (Greenhouse)													
Legacy	118,610	264,516	263,959	266,509	264,138	258,435							1,436,167
Concentrator	194,968	418,532	446,510	435,558	447,154	428,264							2,370,986
ALERT2	136,330	399,841	552,747	540,161	544,926	515,425							2,689,430
Diff (NS5a-NS5b)													
Legacy (Digi One)	-91	-141	-22,442	-44	-18,282	-3,691	0	0	0	0	0	0	-44,691
Concentrator (B2010)	-20	-102	-38,545	189	-30,186	-5,112	0	0	0	0	0	0	-73,776
ALERT2 (B2010)	-186	-311	-47,552	493	-36,890	-6,296	0	0	0	0	0	0	-90,742
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								

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.

The daily ratio of concentrator reports is shown.

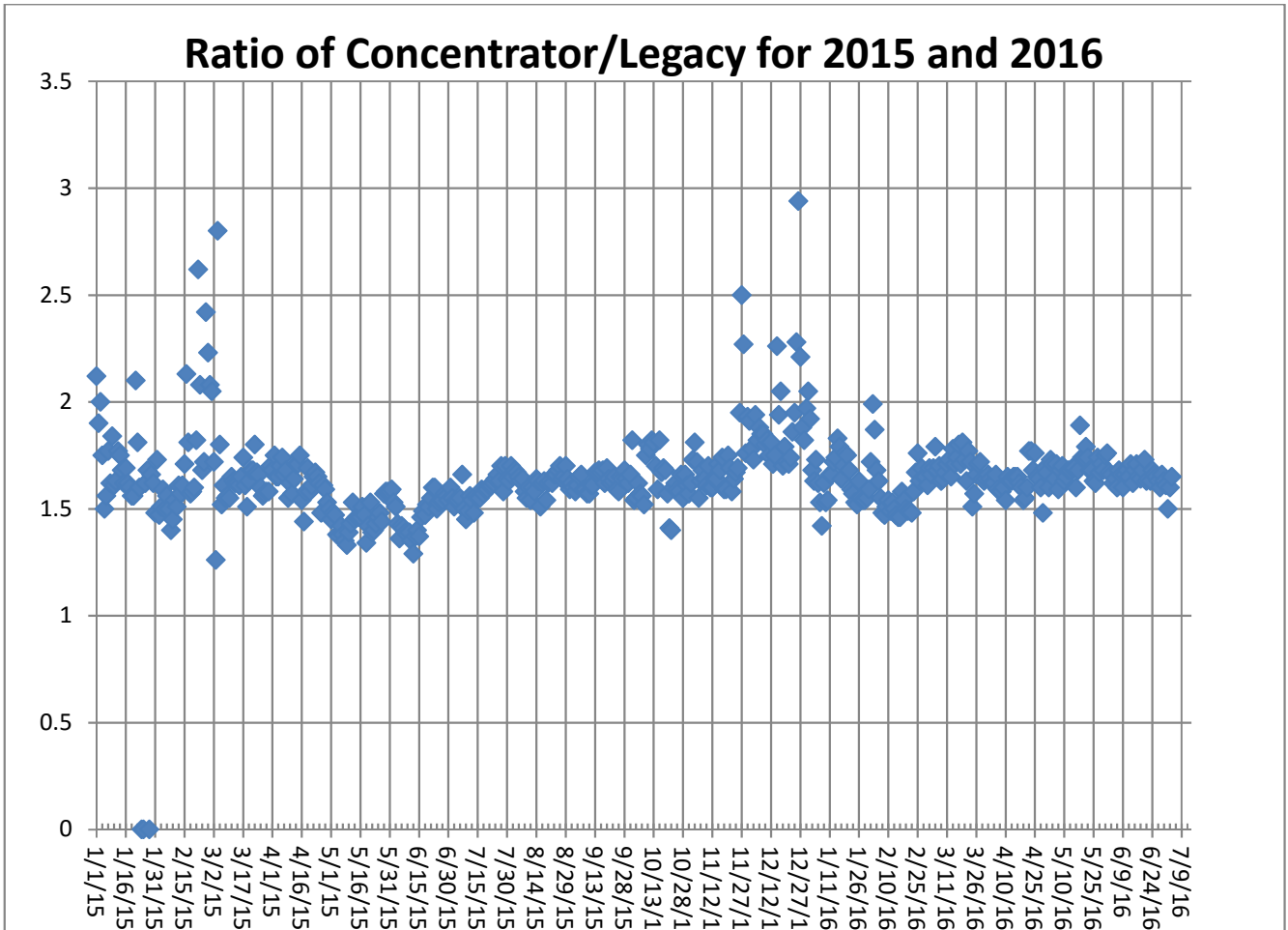


Figure 1. Daily Ratio of Concentrator Reports to Legacy Reports

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 720 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
4270	Cannon Mt	Poor performance
1620	Slaughterhouse Gulch	Poor performance
4330	Hansen Rain	Poor performance
2330	Morrison	Poor performance
6601	Wx-Magnolia	Station died on or about June 27 th
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	

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		0.982	0.996	0.986	0.988
Heritage Regional Park	3090		0.980	0.976	0.711	0.975
Magnolia	6601		0.989	0.981	0.993	0.993
Blackstone	10010		0.971	0.967	0.953	0.966
ETG @ Hampden	10011		0.998	0.993	0.987	0.989
Carr Street (100)	10012		0.902	0.997	0.959	0.950
Maple Grove (1000)	10013		0.976	0.998	0.997	0.972
Upper Sellers	10014	n/a				
Haystack Road	10015	n/a				
Sand Cr at Colfax	10016		0.99	0.94	0.993	0.993
James Creek	10017		0.630	--	0.994	0.966
Lower Left Hand (4453)	10018		0.990	--	0.979	0.25
Murphy Creek (870)	10019		0.998	0.990	0.997	0.995
OneRain Weather	10020		0.883	0.998	0.958	0.989
S. St. Vrain at Berry Ridge	10021		--	--	0.978	0.388
Arvada/Blunn Reservoir	10022		0.994	0.994	0.989	0.987
Havana Pond	10023		0.997	1.00	1.00	0.999
Westerly Creek Dam	10024		0.992	0.992	0.992	0.993
Lena @ Nolte Pond (1023)	10025		0.857	0.997	0.986	0.939
Trumbull (Hayman)	10026	0.785				
West Creek (Hayman)	10027	0.983				
Diamond Hill (1420)	10028		0.999	0.999	0.996	0.999
Plum Creek at Sedalia	10029	0.982				
Coal Creek at McCaslin	10030		0.994	0.996	0.991	0.992
Boulder Cr. Broadway (4583)	10031		0.963	0.513	0.901	0.997
Weir Gulch	10032		0.605	0.911	0.856	0.765
Side Creek Park	10033		--	--	--	--
Not Used	10034		--	--	--	--
Sanderson Gulch (1340)	10035		0.956	0.999	0.994	0.996
Porphyry Mtn	10036		--	--	--	--

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

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

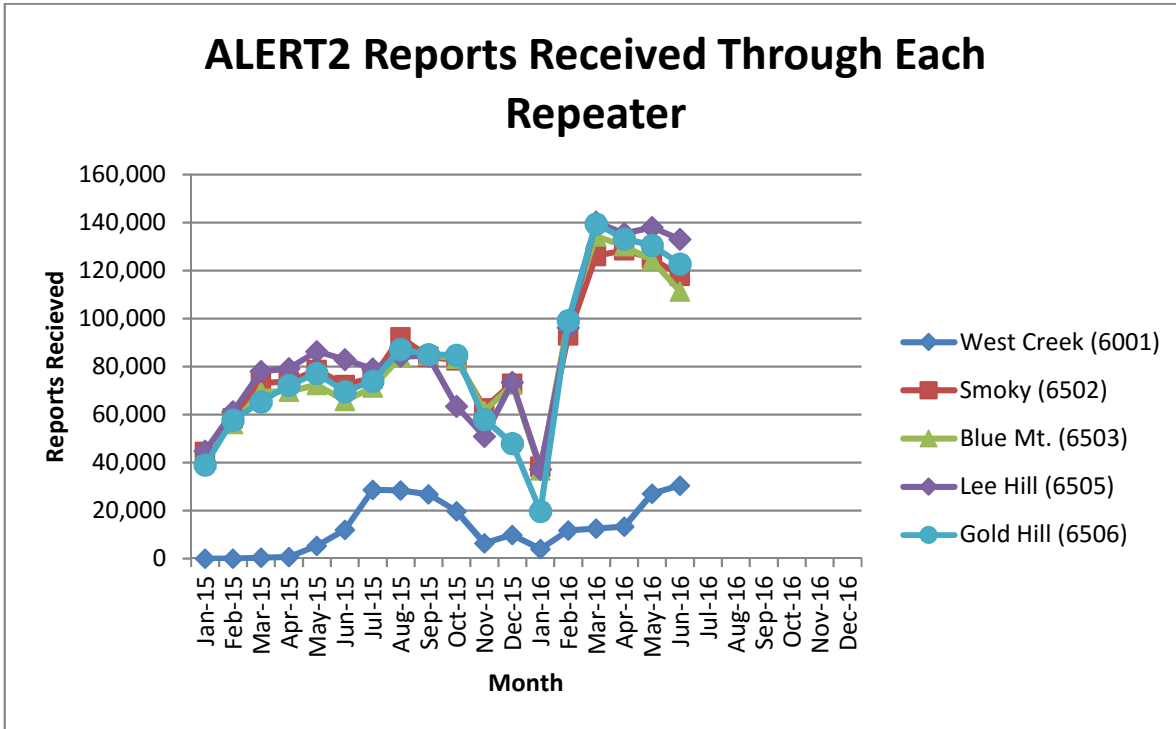


Figure 2. Reports received through each repeater (ALERT2 Only)

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. A reduction in the number of ALERT2 reports through Blue, Smoky and Gold Hill is evident over the past month (Figure 2). The following plot shows the decrease in throughput over the last couple of days in June. On or about June 27th the throughput decreases for all repeaters except West Creek (Magnolia WX died on the 27th).

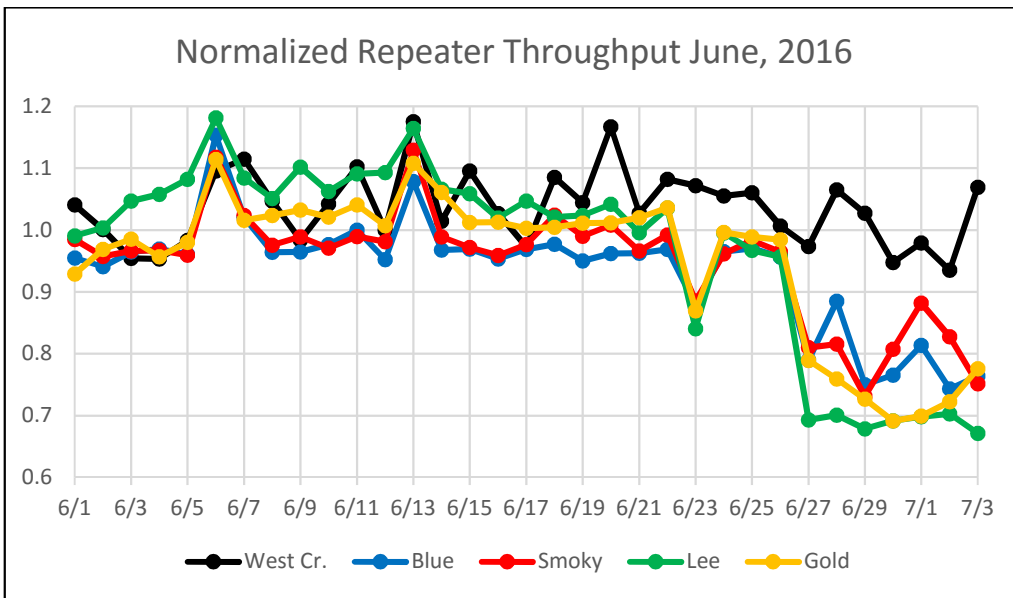


Figure 3. Normalized Repeater Throughput (ALERT2 and Concentrator)

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	57.42	The average time it took a report from the field to reach the base
Minimum	2	The minimum time it took for a report to go from the field to the base
Maximum	226	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						
Minimum	3	2	1	3	2	2						
Maximum	300	261	521	745	262	226						
Station with Max Latency	Magnolia WX (6602)	Magnolia WX (6607)	Sand Cr (10016)	Magnolia WX (6601)	Magnolia WX (6605)	Westerly Cr Dam (10024)						

The large latency of 226 seconds from Westerly Creek Dam (10024) occurred on June 28th. Below are the readings taken from OneRain’s Contrail system for the battery reading for the date/time in question. One can see that the readings taken in the field were received at the base station approximately 3.5 minutes after they were read in the field.

Field Reading Date/Time = 2016-06-18 14:20:06
 Base Receive Date/Time = 2016-06-18 14:23:42
 Value = 13.8 volts
 Unit = V
 Quality = A

This large delay was observed through each repeater and it was observed at all three base stations (Contrail, Diamond Hill and Greenhouse).

Another large delay of 12 minutes was observed on OneRain’s Contrail system for a rain report from Murphy Creek (10019) on June 7th.

Field Reading Date/Time = 2016-06-07 14:24:33
 Base Receive Date/Time = 2016-06-07 14:36:36
 Value = 5.08
 Unit = in.
 Quality = A

This large delay was observed only on the Contrail system. The same data packet was logged on the NovaStar5 system with only a 60 second delay. This delay was likely introduced by the network data connection between OneRain and the District ALERT2 decoder.

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						
4550	4520	2790	2790	1620	430						
2330	2790	4850	2360	2750	4330						
4270	4850	5940	1420	2330	2330						
1660	10026	10023	4270	5860	10026						
4330	10020	10026	4520	2360	2360						

*- 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	40.5	Only the 1-mm rain sensors were included in the analysis
Median	36	Only the 1-mm rain sensors were included in the analysis
Standard deviation	23.1	Only the 1-mm rain sensors were included in the analysis
Mean plus three standard deviations	110	Only the 1-mm rain sensors were included in the analysis
Mean minus two standard deviations	0	Only the 1-mm rain sensors were included in the analysis
Minimum total count	1	Red Hill (4290)
Maximum total count	125	Powers Park (1500) – irrigation influence
Sensors showing NO rain for the month		None
Sensors greater than 3 SD (over reporting)		Powers Park (1500), Temple Pond at DTC (630), Bingham Lake Park (3030) – 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							
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
Wx-West Cherry Creek	2790	Several large jumpsproblem at this site.....WET to investigate
Flying J	850	One jump
Wx-Castle Rock	2750	One jump
Highland Heritage Regional Park	3090	Two jumps.....the site was flooded in early June and relocated later in the month
Cannon Mountain	4270	One jump

D. Sensor-by-Sensor Incrementing Count Summary

The system-wide reception rate of incrementing, 1-mm tip reports for the month was approximately 93 percent. A total of 7,196 incrementing reports were received and a total of 7,736 reports were expected. The total loss of incrementing reports for the month was approximately 7 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						
4550	10026	10026	5900	4330	4270						
1640	2790	5940	4260	1620	1620						
4180	4240	4790	950	4470	4330						
1660	5940	4510	2330	2230	2330						
4840	4510	4870	1480	2980	10026						

*-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)	230	256	0
Total reports from unknown IDs	945	1,006	0
Unknown IDs with only a single received report (potential noise)	152	192	0
Total reports from all IDs – RecData Log entire month	428,264	258,435	515,425
Unknown reports as a fraction of total reports	0.22%	0.39%	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						

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%						

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	
2283	160	2283	156	
623	119	2	148	
443	59	623	117	
2274	51	443	59	
2271	47	2274	51	From Cub Creek below Blue (2270)
2272	46	2271	46	From Cub Creek below Blue (2270)

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						
1530-Bear Cr. At Lowell	8	5	10	3	1	0						
2810-Pine Cliff Rd.	--	18	11	8	9	6						
2750-Wx-Castle Rock	10	24	0	0	1	3						
2790-Wx-W. Cherry Creek	--	--	--	--	8	4						
2980-Dakan Road	--	--	--	8	9	6						
2990-Tomah Rd.	--	12	2	2	2	2						
3010-Wx-EPC @ 105	--	--	8	10	11	11						
3020-Wx-West Creek	9	103	96	111	149	178						
3050-E/W Trailhead	--	--	8	7	7	8						
3070-Newlin Gulch	10	52	5	0	0	1						
3090-Heritage Reg.	--	--	--	--	--	38						
4030-Red Garden	23	41	3	4	2	2						
4330-Hansen Rain	--	--	--	--	5	2						
5730-West Creek	--	--	--	--	22	0						

The antenna system at the West Creek repeater is experiencing radio interference and will require a filter as soon as WET can travel up to the repeater with the new equipment. The likely cause of the poor performance of many Douglas County sites is the local radio interference at the West Creek repeater. The new cavity filter will be installed in the first week of July.

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						
633-Temple Pond at DTC	--	--	--	--	--	13						
653-GG at Iliff Pond	--	--	--	15	1	1						
713-Horseshoe Park Drop	--	--	--	12	0	0						
853-Flying J	--	36	57	58	58	59						
1323-SPR at 3rd Ave	--	--	--	78	1	0						
1383-Ferril Lake	747	703	686	714	683	721						
1623-Slaughterhouse Gulch	--	--	--	--	13	10						
1663-SPR at Henderson	--	--	--	--	9	8						
2813-Pine Cliff Road	--	--	--	--	1,172*	26						
2873-Cottonwood	--	--	85	2,807*	2,764*	0						
3013-EPC@Hwy 105	7	19	11	4	2	17						
3043-CC@Russelville	--	--	22	5	0	0						
3093-Heritage Reg. Park	--	--	--	--	--	54						
4563-Lyons Diversion	--	13	13	10	3	3						

*These stations are out-of-service for the month

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 Type	Date/Time
3090	Big Dry Creek at Heritage Regional Park Precipitation-DG	Douglas County 10 minute rainfall	6/6/16 17:02
3090	Big Dry Creek at Heritage Regional Park Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/6/16 17:04
1400	Upper Sloan Detention Precipitation-JF	Jefferson County 10 minute rainfall	6/6/16 17:13
630	Temple Pond at DTC Precipitation-DN	Plains 10 minute rainfall	6/6/16 17:20
1320	SPR at 3rd Avenue Precipitation-DN	Plains 10 minute rainfall	6/6/16 17:20
1600	Englewood Dam Precipitation-AR	Plains 10 minute rainfall	6/6/16 17:21
630	Temple Pond at DTC Precipitation-DN	Plains 1 hour rainfall	6/6/16 17:33
3030	Bingham Lake Park Precipitation-DG	Douglas County 10 minute rainfall	6/6/16 17:38
3070	Newlin Gulch at Jordan Road Precip-DG	Douglas County 10 minute rainfall	6/6/16 17:38
1600	Englewood Dam Precipitation-AR	Plains 1 hour rainfall	6/6/16 17:39
3030	Bingham Lake Park Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/6/16 18:01
3070	Newlin Gulch at Jordan Road Precip-DG	Douglas County 1 hour-1 Inch rainfall	6/6/16 18:06
3090	Big Dry Creek at Heritage Regional Park Precipitation-DG	Douglas County 10 minute rainfall	6/6/16 23:40
3090	Big Dry Creek at Heritage Regional Park Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/6/16 23:58
4850	Porphyry Mountain Precipitation-BO	Boulder County 10 minute rainfall	6/9/16 19:35
4850	Porphyry Mountain Precipitation-BO	FMC-BA 0.50" in 30 Min Rainfall	6/9/16 19:35
5860	Cedar Mountain Precipitation-TL	Hayman 30 minute rainfall	6/12/16 16:05
5740	Trail Creek Precipitation-TL	Hayman 30 minute rainfall	6/12/16 16:17
1550	Lakewood CC Precipitation-JF	Jefferson County 10 minute rainfall	6/13/16 15:44
3030	Bingham Lake Park Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:04
2950	DC Public Works Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:09
2750	Castle Rock Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/13/16 17:21
2750	Castle Rock Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:21
3080	Tallman Gulch at Tallman Park Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:27
2850	CC blw Bayou Gulch Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/13/16 17:29
2850	CC blw Bayou Gulch Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:29
3030	Bingham Lake Park Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/13/16 17:32
3080	Tallman Gulch at Tallman Park Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/13/16 17:33
3030	Bingham Lake Park Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:33
2990	Tomah Road Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/13/16 17:37
3030	Bingham Lake Park Precipitation-DG	Douglas County 10 minute rainfall	6/13/16 17:44
2970	Rampart Range Road Precipitation-DG	2970 Rampart Range Road 0.2" in 30 Minutes Rainfall	6/13/16 19:45
2330	Bear Creek at Morrison Precipitation-JF	Jefferson County 10 minute rainfall	6/13/16 20:01
1050	Jeffco Fairgrounds Precipitation-JF	Jefferson County 10 minute rainfall	6/13/16 20:16
2910	East Cherry Creek Road Precipitation-DG	Douglas County 10 minute rainfall	6/19/16 22:46
2910	East Cherry Creek Road Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/19/16 23:11
2820	East Plum Creek at Haskins Gulch Precipitation-DG	Douglas County 10 minute rainfall	6/20/16 18:05
2820	East Plum Creek at Haskins Gulch Precipitation-DG	Douglas County 1 hour-1 Inch rainfall	6/20/16 18:09
2950	DC Public Works Precipitation-DG	Douglas County 10 minute rainfall	6/20/16 18:18
5810	Stump Bump Precipitation-TL	Hayman 30 minute rainfall	6/23/16 15:47
5810	Stump Bump Precipitation-TL	Hayman 1 hour rainfall	6/23/16 15:53
5900	Horse Creek Precipitation-DG	Hayman 30 minute rainfall	6/25/16 14:30
210	Leyden Confluence Precipitation-JF-Arvada	Jefferson County 10 minute rainfall	6/28/16 18:17
300	Van Bibber Park Precipitation-JF-Arvada	Jefferson County 10 minute rainfall	6/28/16 18:23
210	Leyden Confluence Precipitation-JF-Arvada	Jefferson County 1 hour rainfall	6/28/16 18:24
210	Leyden Confluence Precipitation-JF-Arvada	Jefferson County 10 minute rainfall	6/28/16 18:28
1320	SPR at 3rd Avenue Precipitation-DN	Plains 10 minute rainfall	6/28/16 18:35
1420	Diamond Hill Precipitation	Plains 10 minute rainfall	6/28/16 18:37
1700	Cherry Creek at Champa Precipitation-DN	Plains 10 minute rainfall	6/28/16 18:40
1700	Cherry Creek at Champa Precipitation-DN	Plains 1 hour rainfall	6/28/16 18:45
1420	Diamond Hill Precipitation	Plains 1 hour rainfall	6/28/16 18:47
1320	SPR at 3rd Avenue Precipitation-DN	Plains 1 hour rainfall	6/28/16 18:48
1420	Diamond Hill Precipitation	Plains 10 minute rainfall	6/28/16 18:49
1320	SPR at 3rd Avenue Precipitation-DN	Plains 10 minute rainfall	6/28/16 18:49
1700	Cherry Creek at Champa Precipitation-DN	Plains 10 minute rainfall	6/28/16 18:52
1720	Cherry Creek @ Steele Precipitation-DN	Plains 10 minute rainfall	6/28/16 19:03
630	Temple Pond at DTC Precipitation-DN	Plains 10 minute rainfall	6/28/16 19:10
2870	Cherry Creek at Cottonwood Park Precipitation-DG	Douglas County 10 minute rainfall	6/28/16 19:13
2970	Rampart Range Road Precipitation-DG	2970 Rampart Range Road 0.2" in 30 Minutes Rainfall	6/29/16 16:15

General System Analysis

Database Name P:\A207-UDFCD-Data-Analysis\2016\06-2016\Novastar_extract_2016Jun.mdb

First Date in Database	5/31/16 11:59 PM
Last Date in Database	6/30/16 11:59 PM

Total Days	30.0
Total Hours	720.0

Summarize

Total Records Analyzed 428,264

Records by Group	Concentrator	Percent	Legacy	Percent	ALERT2	Percent
Wind Data	158,461	37.0%	87,582	33.9%	152,276	29.5%
Temperature	71,914	16.8%	35,861	13.9%	77,130	15.0%
Relative Humidity	63,791	14.9%	35,886	13.9%	74,985	14.5%
Barometric Pressure	33,852	7.9%	20,288	7.9%	1,210	0.2%
Battery Voltage	25,750	6.0%	13,277	5.1%	60,152	11.7%
Water Level	25,718	6.0%	22,685	8.8%	68,009	13.2%
Precipitation	17,843	4.2%	12,762	4.9%	37,711	7.3%
Solar Radiation	10,718	2.5%	10,371	4.0%	0	0.0%
Fuel Temperature	5,770	1.3%	5,747	2.2%	0	0.0%
Fuel Moisture	5,756	1.3%	5,707	2.2%	0	0.0%
Soil Moisture	2,854	0.7%	2,821	1.1%	0	0.0%
Repeater Status Report	1,968	0.5%	2,387	0.9%	0	0.0%
Unknown	945	0.2%	1,006	0.4%	0	0.0%
ET-Hourly	712	0.2%	678	0.3%	0	0.0%
Hayman Battery	663	0.2%	0	0.0%	0	0.0%
Wind Direction	500	0.1%	1	0.0%	1,376	0.3%
12Hr Status Report	319	0.1%	300	0.1%	2,647	0.5%
Not Used	284	0.1%	262	0.1%	714	0.1%
GPS Lock	178	0.0%	115	0.0%	24,412	4.7%
Water Temp	118	0.0%	74	0.0%	0	0.0%
Repeater Pass List	60	0.0%	536	0.2%	0	0.0%
Handar 585 ALARM Status	59	0.0%	58	0.0%	0	0.0%
ET-Daily	30	0.0%	30	0.0%	0	0.0%
ALERT/A2 Testing	1	0.0%	1	0.0%	0	0.0%
Dew Point Temperature	0	0.0%	0	0.0%	7,419	1.4%
Flasher Status	0	0.0%	0	0.0%	7,384	1.4%
Total	428,264	100.0%	258,435	100.0%	515,425	100.0%

Traffic Loading Summary	Concentrator		Legacy		ALERT2	
Alert Reports	428,264		258,435		515,425	
Average Daily Traffic	13,815		8,614		16,627	
Average Hourly Traffic	576		359		693	
Median Hourly Traffic	579	hour beginning	352	hour beginning	746	hour beginning
Peak Hourly Traffic	1,258	Jun 6, 5:00 PM	798	Jun 6, 5:00 PM	1,378	Jun 6, 5:00 PM
2nd Max	1,079	Jun 28, 7:00 PM	737	Jun 23, 5:00 PM	1,044	Jun 6, 11:00 PM
3rd Max	1,061		727	Jun 28, 6:00 PM	969	Jun 9, 7:00 PM
4th Max	1,058	Jun 6, 6:00 PM	706	Jun 13, 7:00 PM	952	Jun 6, 6:00 PM
5th Max	1,019	Jun 28, 6:00 PM	672	Jun 28, 7:00 PM	937	Jun 13, 7:00 PM

Rain Timer Performance

Analyze Rain Sensors

Rain Sensors	Description	Rcv	Timer	Exp	Performance
2790	Wx-W. Cherry Creek	5	1:02	62	8%
430	Utah Park	37	19:04	62	60%
4330	Hansen Rain	41	16:55	62	66%
2330	Morrison	42	15:33	62	68%
100260	Wx-A2-Trumbull (Hayman) - Precip	491		720	68%
2360	Indian Hills	43	14:42	62	69%
1710	Shop Creek	43	15:00	62	69%
2230	Bear Cr below Cub	43	16:27	62	69%
1660	SPR at Henderson	44	14:40	62	71%
1620	Slaughterhouse Glch	45	14:39	62	73%
2270	Cub Cr below Blue	45	14:01	62	73%
2980	Dakan Rd	46	13:42	62	74%
4270	Cannon Mountain	46	13:13	62	74%
4470	Little Narrows	46	13:11	62	74%
4510	Pinewood Springs	47	13:20	62	76%
4870	SBC @ SB Road	47	14:40	62	76%
2350	Idledale	48	13:11	62	77%
4490	Apple Valley	50	13:33	62	81%
310	Guy Hill Ranch	51	12:45	62	82%
2320	Choke Cherry Resvr	51	13:05	62	82%
5720	Four Mile Creek	52	13:13	62	84%
5940	Log Jumper	52	12:36	62	84%
940	Aurora Regional Pond	53	12:48	62	85%
2280	Kinney Peak	53	13:02	62	85%
6601	Wx-A2-Magnolia WX-Precip	77	8:00	90	86%
540	Parker/Mississippi	54	12:43	62	87%
2880	Happy Canyon at N Surrey Dr	54	12:49	62	87%
4290	Red Hill	54	13:06	62	87%
4790	Wx-Button Rock	54	12:32	62	87%
620	Quincy/Highline	55	13:11	62	89%
1640	SPR at Union Ave.	55	12:37	62	89%
2240	Cold Sprg Glch conf	55	12:44	62	89%
2960	Indian Creek	55	12:29	62	89%
5740	Trail Creek	55	12:33	62	89%
3090	A2-Highland Heritage Park	428		480	89%
1010	Denver West	56	12:38	62	90%
1200	Broomfield 3207	56	12:40	62	90%
1400	Upper Sloan Det.	56	12:40	62	90%
1800	Sand Creek Park	56	12:26	62	90%
2810	Pine Cliff Road	56	12:00	62	90%
2820	Haskins Gulch Conf	56	12:30	62	90%
2900	Russelville Gulch-Douglas	56	12:16	62	90%
3010	WX-EPC at Hwy 105	56	11:51	62	90%
4040	Martin Gulch	56	12:25	62	90%
4530	Winiger Ridge	56	12:26	62	90%
4570	St. Antons	56	11:59	62	90%
5730	West Creek	56	12:00	62	90%
210	Leyden Confluence	57	12:11	62	92%
410	Kelly Dam	57	12:13	62	92%
510	Virginia Court	57	12:15	62	92%
520	Jewell Detention	57	12:28	62	92%
650	Iloff Pond	57	12:27	62	92%
810	Granby Ditch @ 6th	57	12:12	62	92%
1370	West Metro FS13	57	12:12	62	92%

1440	Wx-Elbert	57	12:30	62	92%
1460	Wx-Urban Farm	57	12:28	62	92%
1480	Third Creek at DIA	57	12:29	62	92%
1550	Lakewood CC	57	12:26	62	92%
1700	Cherry Cr @ Champa	57	12:27	62	92%
2310	Genesee Village	57	11:58	62	92%
2340	El Rancho	57	12:41	62	92%
2750	Wx-Castle Rock	57	11:59	62	92%
2860	CC at Stroh Rd	57	12:25	62	92%
2890	Spruce Mt - Douglas	57	12:30	62	92%
2950	DC Public Works	57	12:15	62	92%
3040	CC @ Russelville Road Precip	57	12:43	62	92%
4060	Lakeshore	57	12:21	62	92%
4190	Slaughterhouse	57	11:57	62	92%
4220	Fling's	57	12:13	62	92%
5880	Hackett Mountain	57	12:15	62	92%
1310	LDC at 64th	58	11:58	62	94%
110	Ralston Reservoir	58	12:11	62	94%
200	Leyden Reservoir	58	12:10	62	94%
220	Upper Leyden	58	12:28	62	94%
330	Van Bibber @ Hwy 93	58	12:26	62	94%
440	Fire Station #7	58	12:12	62	94%
530	Fire Station #19	58	12:12	62	94%
610	Harvard @ Jackson	58	12:11	62	94%
630	Temple Pond at DTC	58	11:57	62	94%
640	Goldsmith @ Eastman	58	11:58	62	94%
700	Toll Gate @ 6th	58	12:27	62	94%
760	Mission Viejo Park	58	12:12	62	94%
840	Fire Station 12	58	12:14	62	94%
850	Flying J	58	12:00	62	94%
900	Wx-Aurora Reservoir	58	12:29	62	94%
970	Pump Sta 3	58	12:14	62	94%
1040	Lena @ U.S. Hwy 6	58	11:44	62	94%
1050	Jeffco Fairgrounds	58	11:57	62	94%
1110	Gunbarrel	58	11:58	62	94%
1520	Wx-Marston Lake North	58	12:35	62	94%
2250	Rosedale	58	11:57	62	94%
2710	Wx-Highlands Ranch WTP	58	11:24	62	94%
2730	Wx-Salisbury Park	58	12:28	62	94%
2840	Sulphur Gulch	58	12:15	62	94%
2920	West Cherry Head-Douglas Cnty	58	12:00	62	94%
2940	Willow Creek - DougCnty	58	12:16	62	94%
3060	Fire Sta 47	58	12:30	62	94%
3080	Tallman Gulch	58	11:27	62	94%
4010	Crescent	58	12:12	62	94%
4020	Rio Grande	58	12:11	62	94%
4050	Walker Ranch	58	12:12	62	94%
4070	Bear Peak	58	12:12	62	94%
4260	Taylor Mountain	58	12:08	62	94%
4300	Big Elk Park	58	12:14	62	94%
4310	Johnny Park	58	11:57	62	94%
4350	Conifer Hill	58	12:36	62	94%
4770	Wx-Cal-Wood Ranch	58	12:15	62	94%
5810	Stump Bump	58	12:00	62	94%
120	West Woods	59	11:58	62	95%
500	Havana Park	59	11:57	62	95%
600	Harvard Gulch Park	59	11:58	62	95%
720	Confluence Pond	59	12:11	62	95%
730	No Name @ Quincy	59	12:13	62	95%

1030	NREL/S. Table Mtn.	59	12:11	62	95%
1060	Heritage Square	59	12:12	62	95%
1900	Niver Detention	59	12:10	62	95%
1920	Wx-Brighton	59	12:13	62	95%
2210	Wx-Hiwan G.C.	59	12:00	62	95%
2850	Cherry Cr bl Bayou Glch	59	11:47	62	95%
2910	East Cherry Cr-Douglas	59	12:00	62	95%
4080	Twin Sisters	59	12:11	62	95%
4110	Betasso	59	11:59	62	95%
4160	Sunshine	59	11:58	62	95%
4170	Pine Brook	59	12:10	62	95%
4250	Geer Canyon	59	11:57	62	95%
4360	Justice Center	59	11:57	62	95%
4550	Boulder Jail	59	12:11	62	95%
5860	Cedar Mountain	59	12:00	62	95%
100100	A2-Blackstone Precip	59	12:00	62	95%
100110	A2-ETG @ Hampden Precip	59	12:00	62	95%
140	Wx-Blue Mountain	60	12:00	62	97%
150	Nott Creek	60	11:57	62	97%
320	Sports Complex	60	11:58	62	97%
420	Expo Park	60	11:57	62	97%
710	Horseshoe Park Drop	60	11:58	62	97%
750	Wx-Quincy Reservoir	60	11:56	62	97%
800	Sable Ditch @ 18th	60	11:57	62	97%
820	ETG @ Buckley	60	11:57	62	97%
920	Wx-Aurora Town Hall	60	12:00	62	97%
950	Piney at Liverpool	60	11:57	62	97%
1100	Louisville Rec Ctr	60	11:59	62	97%
1300	Hidden Lake	60	11:58	62	97%
1420	Wx-A2-Diamond Hill	60	12:00	62	97%
1500	Powers Park	60	11:57	62	97%
1530	Bear Creek @ Lowell	60	11:57	62	97%
1570	Wx-Brighton Ditch	60	12:00	62	97%
1600	Englewood Dam	60	12:06	62	97%
1720	Cherry Cr @ Steele	60	11:57	62	97%
2260	Brook Forest	60	11:58	62	97%
2370	Red Rocks Park	60	12:11	62	97%
3030	WX-Bingham Lake Park	60	11:30	62	97%
3050	East/West Trailhead	60	12:00	62	97%
4030	Red Garden	60	12:06	62	97%
4090	Magnolia	60	11:58	62	97%
4100	Filter Plant	60	12:08	62	97%
4140	Logan Mill	60	11:58	62	97%
4180	Gold Lake	60	11:52	62	97%
4200	Lazy Acres	60	11:59	62	97%
4230	Golden Age	60	11:57	62	97%
4240	Sunset	60	12:07	62	97%
4320	Lee Hill Rain 2012	60	11:58	62	97%
4340	Riverside	60	12:07	62	97%
4520	Eagle Ridge	60	11:55	62	97%
4730	Wx-Sugarloaf	60	12:00	62	97%
4750	Wx-Louisville Lake	60	12:00	62	97%
4810	Shanahan Ridge	60	11:57	62	97%
4830	SBC @ San Souci	60	11:58	62	97%
4840	SBC@S Boulder Ditch	60	11:57	62	97%
4880	Whispering Pines	60	11:57	62	97%
100200	Wx-A2-OneRain Weather - Precipitation	60	12:00	62	97%
100270	Wx-A2-WestCreek (Hayman) - Precip	708		720	98%
300	Van Bibber Park	61	11:58	62	98%

1350	Chatfield COE	61	11:55	62	98%
1360	Denver Zoo	61	11:54	62	98%
2930	Wx-Spring Valley Rd-DougCnty	61	11:54	62	98%
4130	Swiss Peaks	61	11:55	62	98%
4150	Gold Hill	61	11:53	62	98%
4710	Wx-Ward C-1	61	11:55	62	98%
4820	Doudy Draw	61	11:53	62	98%
100290	Wx-A2-PlumCr at Sedalia - Precip	709		720	98%
100320	A2-Weir Gulch - Precip	713		720	99%
2970	Rampart Range Rd-Satellite	218		220	99%
4850	Porphory Mtn	715		720	99%
100230	A2-Havana Pond Precip	717		720	100%
100	A2-Carr Street	718	0:00	720	100%
870	A2-Murphy Creek GC	718		720	100%
1340	Sanderson at Xavier	719		720	100%
3070	A2-Newlin Gulch Precip	719		720	100%
100160	A2-Sand Creek at Colfax Precip	719		720	100%
100240	A2-Westerly Cr Dam Precip	719		720	100%
100300	A2-CoalCreek at McCaslin - Precip	719		720	100%
1000	A2-Maple Grove Resv.	720		720	100%
1320	SPR at 3rd Ave	62	11:58	62	100%
2870	Cottonwood (Apache)	62	11:34	62	100%
4860	Fairview Peak	62	11:44	62	100%
5900	Horse Creek-Satellite	1770		1770	100%
2990	Wx-Tomah Rd-DougCnty	64	11:04	62	103%

Rain Event Performance																	
	Reports Received	Reports Received	7,196	Analyze Rain Sensors							0	<<show stations with zero rain (1=yes, 0=no)					
	Systemwide Avg	Total Tips	7,736														
	93.02%	Data Loss	6.98%														
Description	Sensor	Performance	1-tips	2-tips	3-tips	4-tips	5-tips	6-tips	>6-tips	Rcv	Exp	Miss	Hold	Bucket			
Wx-W. Cherry Creek	2790	42%	2	1	1	0	1	0	1	5	12	7	0	0.03937			
Cannon Mountain	4270	48%	13	1	0	0	0	0	1	14	29	15	0	0.03937	Mean	40.5	
Slaughterhouse Glch	1620	60%	3	2	1	0	0	0	0	6	10	4	0	0.03937	Median	36	
Hansen Rain	4330	67%	12	2	1	0	1	0	0	16	24	8	0	0.03937	St. Dev	23.1	
Morrison	2330	71%	28	9	4	0	0	0	0	41	58	17	1	0.03937	Mean plus 3 SD	110	
Wx-A2-Trumbull (Hayman) - Precip	100260	73%	36	6	0	1	2	0	0	45	62	17	0	0.03937	Min	1 Red Hill 4290	
Dakan Rd	2980	73%	26	8	1	1	0	0	0	36	49	13	0	0.03937	Max	125 Powers Park 1500	
Lena @ U.S. Hwy 6	1040	76%	19	4	2	0	0	0	0	25	33	8	0	0.03937			
Lakewood CC	1550	78%	35	9	2	0	0	0	0	46	59	13	0	0.03937			
Four Mile Creek	5720	78%	32	5	0	2	0	0	0	39	50	11	0	0.03937			
Rampart Range Rd-Satellite	2970	79%	35	4	2	1	0	0	0	42	53	11	0	0.03937			
Ralston Reservoir	110	80%	6	2	0	0	0	0	0	8	10	2	0	0.03937			
NREL/S. Table Mtn.	1030	80%	16	3	1	0	0	0	0	20	25	5	0	0.03937			
Apple Valley	4490	80%	6	2	0	0	0	0	0	8	10	2	0	0.03937			
Wx-Brighton	1920	81%	17	3	1	0	0	0	0	21	26	5	0	0.03937			
Cherry Cr bl Bayou Glch	2850	81%	69	9	0	2	1	0	0	81	100	19	0	0.03937			
SPR at Henderson	1660	81%	20	6	0	0	0	0	0	26	32	6	0	0.03937			
Denver Zoo	1360	81%	37	5	1	1	0	0	0	44	54	10	0	0.03937			
SBC @ SB Road	4870	82%	28	2	1	1	0	0	0	32	39	7	1	0.03937			
Crescent	4010	83%	18	0	0	0	1	0	0	19	23	4	0	0.03937			
Shop Creek	1710	83%	24	4	1	0	0	0	0	29	35	6	0	0.03937			
Idleedale	2350	83%	21	3	1	0	0	0	0	25	30	5	0	0.03937			
Iliff Pond	650	85%	19	2	1	0	0	0	0	22	26	4	0	0.03937			
Van Bibber @ Hwy 93	330	85%	24	3	1	0	0	0	0	28	33	5	0	0.03937			
Justice Center	4360	85%	25	1	2	0	0	0	0	28	33	5	0	0.03937			
Pinewood Springs	4510	85%	25	3	1	0	0	0	0	29	34	5	0	0.03937			
Martin Gulch	4040	86%	27	5	0	0	0	0	0	32	37	5	0	0.03937			
Little Narrows	4470	88%	6	1	0	0	0	0	0	7	8	1	0	0.03937			
SPR at 3rd Ave	1320	88%	62	8	1	0	0	0	0	71	81	10	0	0.03937			
Cherry Cr @ Champa	1700	88%	60	7	1	0	0	0	0	68	77	9	0	0.03937			
Tallman Gulch	3080	88%	79	2	1	1	1	0	0	84	95	11	0	0.03937			
Haskins Gulch Conf	2820	89%	55	8	0	0	0	0	0	63	71	8	0	0.03937			
Betasso	4110	89%	22	1	1	0	0	0	0	24	27	3	0	0.03937			
Log Jumper	5940	89%	37	2	0	1	0	0	0	40	45	5	0	0.03937			
Lazy Acres	4200	89%	24	0	0	1	0	0	0	25	28	3	0	0.03937			
Third Creek at DIA	1480	89%	52	7	0	0	0	0	0	59	66	7	0	0.03937			
Wx-Button Rock	4790	89%	16	0	1	0	0	0	0	17	19	2	0	0.03937			
Cub Cr below Blue	2270	90%	40	1	2	0	0	0	0	43	48	5	0	0.03937			
Conifer Hill	4350	90%	31	4	0	0	0	0	0	35	39	4	0	0.03937			
Indian Hills	2360	90%	24	3	0	0	0	0	0	27	30	3	0	0.03937			
WX-Bingham Lake Park	3030	90%	99	6	3	0	0	0	0	108	120	12	0	0.03937			
A2-Highland Heritage Park	3090	90%	79	0	1	1	1	0	2	82	91	9	3	0.03937			
A2-CoalCreek at McCaslin - Precip	100300	90%	27	0	0	1	0	0	0	28	31	3	0	0.03937			
Wx-Tomah Rd-DougCnty	2990	90%	59	7	0	0	0	0	0	66	73	7	0	0.03937			
Fire Station #19	530	90%	34	4	0	0	0	0	0	38	42	4	0	0.03937			
Rio Grande	4020	90%	17	2	0	0	0	0	0	19	21	2	0	0.03937			
Wx-Castle Rock	2750	91%	81	7	1	0	0	0	1	89	98	9	0	0.03937			
Jeffco Fairgrounds	1050	91%	37	4	0	0	0	0	0	41	45	4	0	0.03937			
Kelly Dam	410	91%	29	3	0	0	0	0	0	32	35	3	0	0.03937			
Wx-Highlands Ranch WTP	2710	92%	42	2	1	0	0	0	0	45	49	4	0	0.03937			
Wx-A2-WestCreek (Hayman) - Precip	100270	92%	63	6	0	0	0	0	0	69	75	6	1	0.03937			
ETG @ Buckley	820	92%	11	1	0	0	0	0	0	12	13	1	0	0.03937			
Chatfield COE	1350	92%	34	1	1	0	0	0	0	36	39	3	0	0.03937			
Wx-Spring Valley Rd-DougCnty	2930	92%	44	4	0	0	0	0	0	48	52	4	0	0.03937			
Bear Peak	4070	92%	33	3	0	0	0	0	0	36	39	3	0	0.03937			
DC Public Works	2950	92%	68	4	1	0	0	0	0	73	79	6	0	0.03937			

Nott Creek	150	93%	35	1	1	0	0	0	0	0	37	40	3	0	0.03937			
Sports Complex	320	93%	34	3	0	0	0	0	0	0	37	40	3	0	0.03937			
Confluence Pond	720	93%	34	3	0	0	0	0	0	0	37	40	3	0	0.03937			
Englewood Dam	1600	93%	46	4	0	0	0	0	0	0	50	54	4	0	0.03937			
Cherry Cr @ Steele	1720	93%	47	2	1	0	0	0	0	0	50	54	4	0	0.03937			
Red Garden	4030	93%	23	2	0	0	0	0	0	0	25	27	2	0	0.03937			
Sulphur Gulch	2840	93%	82	5	1	0	0	0	0	0	88	95	7	0	0.03937			
Harvard @ Jackson	610	93%	36	3	0	0	0	0	0	0	39	42	3	0	0.03937			
Kinney Peak	2280	93%	36	3	0	0	0	0	0	0	39	42	3	0	0.03937			
Lakeshore	4060	93%	12	1	0	0	0	0	0	0	13	14	1	0	0.03937			
Aurora Regional Pond	940	93%	49	2	1	0	0	0	0	0	52	56	4	0	0.03937			
A2-Weir Gulch - Precip	100320	93%	65	0	1	1	0	0	0	0	67	72	5	0	0.03937			
Denver West	1010	93%	25	2	0	0	0	0	0	0	27	29	2	0	0.03937			
Cold Sprg Gch conf	2240	93%	25	2	0	0	0	0	0	0	27	29	2	0	0.03937			
Filter Plant	4100	93%	25	2	0	0	0	0	0	0	27	29	2	0	0.03937			
West Woods	120	93%	38	3	0	0	0	0	0	0	41	44	3	0	0.03937			
Bear Creek @ Lowell	1530	93%	26	2	0	0	0	0	0	0	28	30	2	0	0.03937			
Pine Cliff Road	2810	93%	40	1	1	0	0	0	0	0	42	45	3	0	0.03937			
Quincy/Highline	620	94%	27	2	0	0	0	0	0	0	29	31	2	0	0.03937			
Mission Viejo Park	760	94%	27	2	0	0	0	0	0	0	29	31	2	0	0.03937			
East Cherry Cr-Douglas	2910	94%	81	6	0	0	0	0	0	0	87	93	6	0	0.03937			
Leyden Confluence	210	94%	55	4	0	0	0	0	0	0	59	63	4	2	0.03937			
Indian Creek	2960	94%	56	2	1	0	0	0	0	0	59	63	4	0	0.03937			
Granby Ditch @ 6th	810	94%	15	1	0	0	0	0	0	0	16	17	1	0	0.03937			
Wx-Salisbury Park	2730	94%	62	0	2	0	0	0	0	0	64	68	4	0	0.03937			
Russelville Gulch-Douglas	2900	94%	61	4	0	0	0	0	0	0	65	69	4	0	0.03937			
Fire Sta 47	3060	94%	78	3	1	0	0	0	0	0	82	87	5	0	0.03937			
Golden Age	4230	94%	33	0	1	0	0	0	0	0	34	36	2	0	0.03937			
Wx-Quincy Reservoir	750	95%	34	2	0	0	0	0	0	0	36	38	2	0	0.03937			
Hidden Lake	1300	95%	34	2	0	0	0	0	0	0	36	38	2	0	0.03937			
Upper Sloan Det.	1400	95%	51	3	0	0	0	0	0	0	54	57	3	0	0.03937			
Wx-Marston Lake North	1520	95%	17	1	0	0	0	0	0	0	18	19	1	0	0.03937			
Wx-Sugarloaf	4730	95%	17	1	0	0	0	0	0	0	18	19	1	0	0.03937			
Cottonwood (Apache)	2870	95%	53	1	1	0	0	0	0	0	55	58	3	0	0.03937			
Parker/Mississippi	540	95%	35	2	0	0	0	0	0	0	37	39	2	0	0.03937			
Walker Ranch	4050	95%	18	1	0	0	0	0	0	0	19	20	1	0	0.03937			
Stump Bump	5810	95%	57	1	1	0	0	0	0	0	59	62	3	0	0.03937			
West Cherry Head-Douglas Cnty	2920	95%	40	2	0	0	0	0	0	0	42	44	2	0	0.03937			
A2-Havana Pond Precip	100230	96%	42	2	0	0	0	0	0	0	44	46	2	2	0.03937			
Broomfield 3207	1200	96%	22	1	0	0	0	0	0	0	23	24	1	0	0.03937			
Gold Lake	4180	96%	44	2	0	0	0	0	0	0	46	48	2	0	0.03937			
Temple Pond at DTC	630	96%	112	5	0	0	0	0	0	0	117	122	5	0	0.03937			
Brook Forest	2260	96%	68	3	0	0	0	0	0	0	71	74	3	0	0.03937			
Powers Park	1500	96%	115	5	0	0	0	0	0	0	120	125	5	0	0.03937			
SBC @ San Souci	4830	96%	23	1	0	0	0	0	0	0	24	25	1	0	0.03937			
Wx-A2-PlumCr at Sedalia - Precip	100290	96%	23	1	0	0	0	0	0	0	24	25	1	1	0.03937			
Spruce Mt - Douglas	2890	96%	47	2	0	0	0	0	0	0	49	51	2	0	0.03937			
Upper Leyden	220	96%	24	1	0	0	0	0	0	0	25	26	1	1	0.03937			
Heritage Square	1060	96%	24	1	0	0	0	0	0	0	25	26	1	0	0.03937			
Rosedale	2250	96%	49	2	0	0	0	0	0	0	51	53	2	0	0.03937			
SPR at Union Ave.	1640	96%	26	1	0	0	0	0	0	0	27	28	1	0	0.03937			
East/West Trailhead	3050	96%	53	2	0	0	0	0	0	0	55	57	2	0	0.03937			
West Metro FS13	1370	97%	27	1	0	0	0	0	0	0	28	29	1	0	0.03937			
Wx-Urban Farm	1460	97%	27	1	0	0	0	0	0	0	28	29	1	0	0.03937			
Wx-Brighton Ditch	1570	97%	54	2	0	0	0	0	0	0	56	58	2	0	0.03937			
Goldsmith @ Eastman	640	97%	30	1	0	0	0	0	0	0	31	32	1	0	0.03937			
Flying J	850	97%	30	1	0	0	0	0	0	1	31	33	2	0	0.03937			
A2-Westerly Cr Dam Precip	100240	97%	32	1	0	0	0	0	0	0	33	34	1	0	0.03937			
Virginia Court	510	97%	33	1	0	0	0	0	0	0	34	35	1	0	0.03937			
Willow Creek - DougCnty	2940	97%	67	2	0	0	0	0	0	0	69	71	2	0	0.03937			
Fling's	4220	97%	34	1	0	0	0	0	0	0	35	36	1	0	0.03937			

CC at Stroh Rd	2860	97%	69	2	0	0	0	0	0	71	73	2	0	0.03937
CC @ Russelville Road Precip	3040	97%	69	2	0	0	0	0	0	71	73	2	0	0.03937
SBC@S Boulder Ditch	4840	97%	35	1	0	0	0	0	0	36	37	1	0	0.03937
Harvard Gulch Park	600	97%	71	2	0	0	0	0	0	73	75	2	0	0.03937
Pump Sta 3	970	97%	36	1	0	0	0	0	0	37	38	1	0	0.03937
West Creek	5730	97%	73	2	0	0	0	0	0	75	77	2	0	0.03937
Wx-Elbert	1440	98%	39	1	0	0	0	0	0	40	41	1	0	0.03937
Wx-Ward C-1	4710	98%	40	1	0	0	0	0	0	41	42	1	0	0.03937
Hackett Mountain	5880	98%	40	1	0	0	0	0	0	41	42	1	0	0.03937
Van Bibber Park	300	98%	42	1	0	0	0	0	0	43	44	1	0	0.03937
A2-Carr Street	100	98%	43	1	0	0	0	0	0	44	45	1	0	0.03937
Expo Park	420	98%	48	1	0	0	0	0	0	49	50	1	0	0.03937
Wx-Cal-Wood Ranch	4770	98%	48	1	0	0	0	0	0	49	50	1	0	0.03937
Johnny Park	4310	98%	52	1	0	0	0	0	0	53	54	1	0	0.03937
Horse Creek-Satellite	5900	98%	58	1	0	0	0	0	0	59	60	1	0	0.03937
Wx-Blue Mountain	140	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937
Leyden Reservoir	200	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937
Guy Hill Ranch	310	100%	8	0	0	0	0	0	0	8	8	0	0	0.03937
Utah Park	430	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Fire Station #7	440	100%	22	0	0	0	0	0	0	22	22	0	0	0.03937
Havana Park	500	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Jewell Detention	520	100%	23	0	0	0	0	0	0	23	23	0	0	0.03937
Toll Gate @ 6th	700	100%	20	0	0	0	0	0	0	20	20	0	0	0.03937
Horseshoe Park Drop	710	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
No Name @ Quincy	730	100%	53	0	0	0	0	0	0	53	53	0	0	0.03937
Sable Ditch @ 18th	800	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Fire Station 12	840	100%	26	0	0	0	0	0	0	26	26	0	0	0.03937
A2-Murphy Creek GC	870	100%	38	0	0	0	0	0	0	38	38	0	0	0.03937
Wx-Aurora Town Hall	920	100%	29	0	0	0	0	0	0	29	29	0	0	0.03937
Piney at Liverpool	950	100%	41	0	0	0	0	0	0	41	41	0	0	0.03937
A2-Maple Grove Resv.	1000	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Louisville Rec Ctr	1100	100%	39	0	0	0	0	0	0	39	39	0	0	0.03937
Gunbarrel	1110	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937
Sanderson at Xavier	1340	100%	28	0	0	0	0	0	0	28	28	0	0	0.03937
Wx-A2-Diamond Hill	1420	100%	65	0	0	0	0	0	0	65	65	0	2	0.03937
Sand Creek Park	1800	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Niver Detention	1900	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Wx-Hiwan G.C.	2210	100%	31	0	0	0	0	0	0	31	31	0	0	0.03937
Bear Cr below Cub	2230	100%	37	0	0	0	0	0	0	37	37	0	0	0.03937
Genesee Village	2310	100%	14	0	0	0	0	0	0	14	14	0	0	0.03937
Choke Cherry Resvr	2320	100%	19	0	0	0	0	0	0	19	19	0	0	0.03937
El Rancho	2340	100%	23	0	0	0	0	0	0	23	23	0	0	0.03937
Red Rocks Park	2370	100%	41	0	0	0	0	0	0	41	41	5	0	0.03937
Happy Canyon at N Surrey Dr	2880	100%	58	0	0	0	0	0	0	58	58	0	0	0.03937
A2-Newlin Gulch Precip	3070	100%	66	0	0	0	0	0	0	66	66	0	0	0.03937
Twin Sisters	4080	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Magnolia	4090	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937
Swiss Peaks	4130	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937
Logan Mill	4140	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937
Gold Hill	4150	100%	21	0	0	0	0	0	0	21	21	0	0	0.03937
Sunshine	4160	100%	5	0	0	0	0	0	0	5	5	0	0	0.03937
Pine Brook	4170	100%	12	0	0	0	0	0	0	12	12	0	0	0.03937
Slaughterhouse	4190	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937
Sunset	4240	100%	30	0	0	0	0	0	0	30	30	0	0	0.03937
Geer Canyon	4250	100%	18	0	0	0	0	0	0	18	18	0	0	0.03937
Taylor Mountain	4260	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Red Hill	4290	100%	1	0	0	0	0	0	0	1	1	0	0	0.03937
Big Elk Park	4300	100%	37	0	0	0	0	0	0	37	37	0	0	0.03937
Lee Hill Rain 2012	4320	100%	16	0	0	0	0	0	0	16	16	0	0	0.03937
Riverside	4340	100%	27	0	0	0	0	0	0	27	27	0	0	0.03937
Eagle Ridge	4520	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937

Winiger Ridge	4530	100%	15	0	0	0	0	0	0	15	15	0	0	0.03937			
Boulder Jail	4550	100%	24	0	0	0	0	0	0	24	24	0	0	0.03937			
St. Antons	4570	100%	11	0	0	0	0	0	0	11	11	0	0	0.03937			
Wx-Louisville Lake	4750	100%	34	0	0	0	0	0	0	34	34	0	0	0.03937			
Shanahan Ridge	4810	100%	33	0	0	0	0	0	0	33	33	0	0	0.03937			
Doudy Draw	4820	100%	25	0	0	0	0	0	0	25	25	0	0	0.03937			
Whispering Pines	4880	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937			
Trail Creek	5740	100%	52	0	0	0	0	0	0	52	52	0	0	0.03937			
Cedar Mountain	5860	100%	42	0	0	0	0	0	0	42	42	0	0	0.03937			
A2-Blackstone Precip	100100	100%	47	0	0	0	0	0	0	47	47	0	0	0.03937			
A2-ETG @ Hampden Precip	100110	100%	54	0	0	0	0	0	0	54	54	0	0	0.03937			
A2-Sand Creek at Colfax Precip	100160	100%	17	0	0	0	0	0	0	17	17	0	0	0.03937			
Wx-Aurora Reservoir	900	100%	41	0	0	0	0	0	0	41	41	0	0	0.03937			
	TOTAL TIPS		6778	342	53	15	8	0	6	7196	7736	545	14				
WX-EPC at Hwy 105	3010	77%	147	20	7	2	1	2	1	179	245	54	0	0.01			
Porphory Mtn	4850	86%	123	20	2	0	0	0	0	145	169	24	28	0.01			
Fairview Peak	4860	90%	242	16	4	0	0	1	0	263	292	29	44	0.01			
Wx-A2-Magnolia WX-Precip	6601	100%	44	0	0	0	0	0	1	44	44	0	0	0.01			
Wx-A2-OneRain Weather - Precipitation	100200	94%	84	2	0	0	1	0	0	87	93	6	0	0.01			

2016 Monthly Peak Hour ALERT Radio Traffic Summary

