Section V: Current Deployment and Performance

The City of Boulder Fire Rescue department is a medium-sized, all-career fire department that provides all-risk emergency services, including a dedicated wildland fire division. The goals of the mission statement is to make Boulder a safe place to live and work, and to reduce the human suffering caused by fires, accidents, sudden illnesses, hazardous material releases, or other disasters.

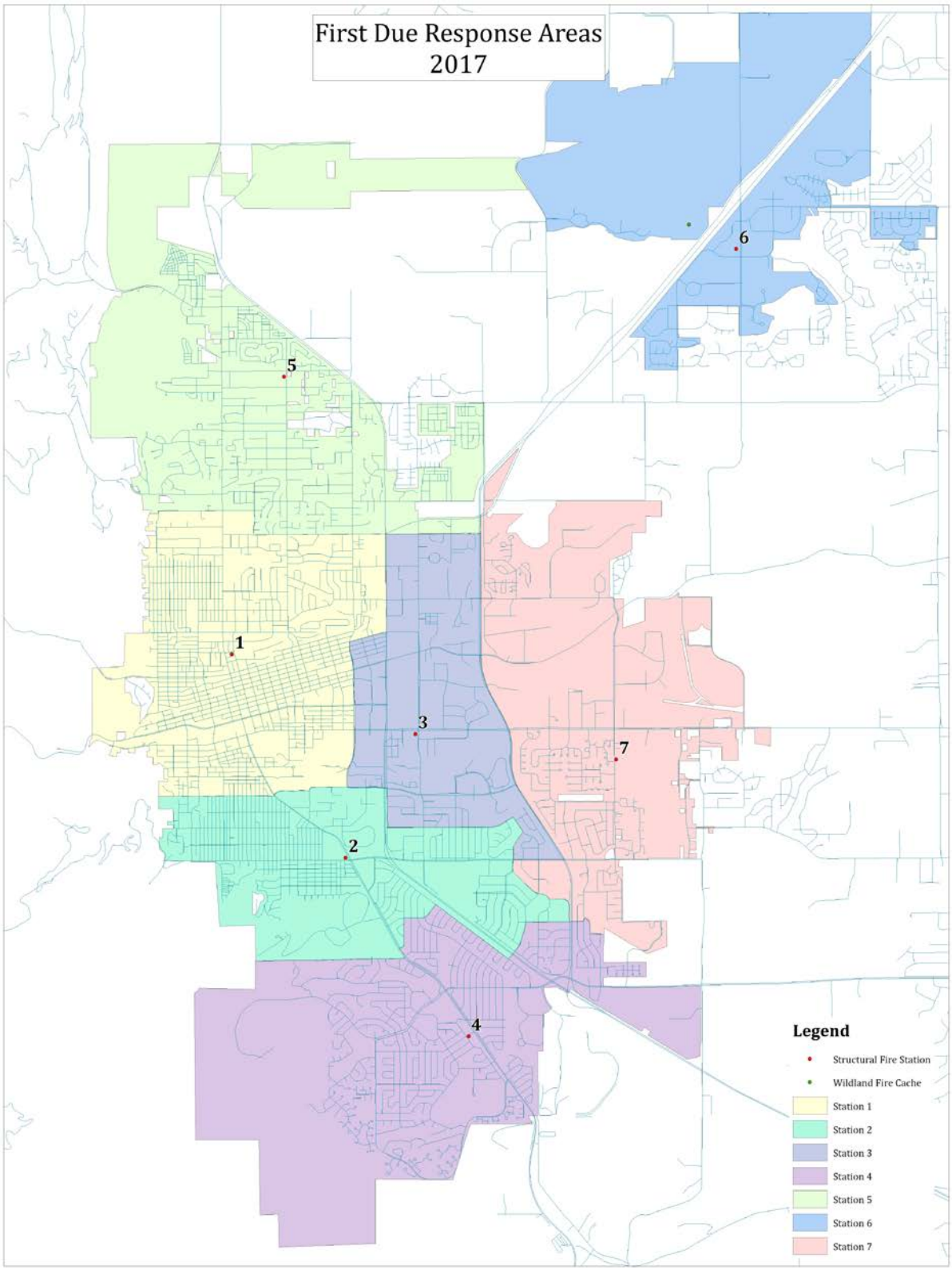
BFR has eight stations that are located strategically around the city to provide a timely response to all incidents. All addresses in the City of Boulder limits are within two miles of a fire station. The department operates 1 ladder truck and 7 engines with designated staffing of 3 firefighters per company Emergency responders are housed at 7 fire stations located throughout the incorporated areas of the city. The on-shift Battalion Chief is housed at Station 1 on 13th St.

BFR provides wildland mitigation, suppression, and education (public and in-house) out of Station 8. The station is located at the Boulder County Regional Fire Training Center and is solely utilized for the Wildland Division. The wildland division does not play a role in first-due (distribution) responses.

The department provides cross-staffing of 1 water rescue vehicle with boat, 2 Type 6 brush engines, and 2 Type 3 brush engines. The Hazardous Materials unit is located at Station 7 and cross-staffed by the personnel at that station.

BFR has established a dispatch configuration for each incident type. The incident type is based on the type of risk. Through evaluation of incident types and critical task analysis, it has been determined that the dispatch codes, and deployment array needs to be further evaluated to better match the needs of the community. A description of each dispatch configuration can be found in the Appendix.

The department attempts to provide consistent service levels based on the number of resources available within the county and the distance between these resources.



Map 23. First Due Response Areas

Data Collection and Analysis

BFR uses a variety of analysis tools to evaluate historical incidents. Each 911 call generates two data sets, what the caller perceives is happening (CAD data) and what Fire personnel report (FIREHOUSE RMS data). Both data sets share an incident number and all times; therefore, they can be cross-referenced. Below is a list of some of the analysis tools used:

- West Net – First In
- SQL Server Management Studio
- Excel Business Services (analysis)
- Firehouse RMS – storage of records
- Tritech CAD – storage of records
- ESRI ArcGIS - ArcGIS is a collection of GIS software products that provides a standards-based platform for spatial analysis, data management, and mapping.

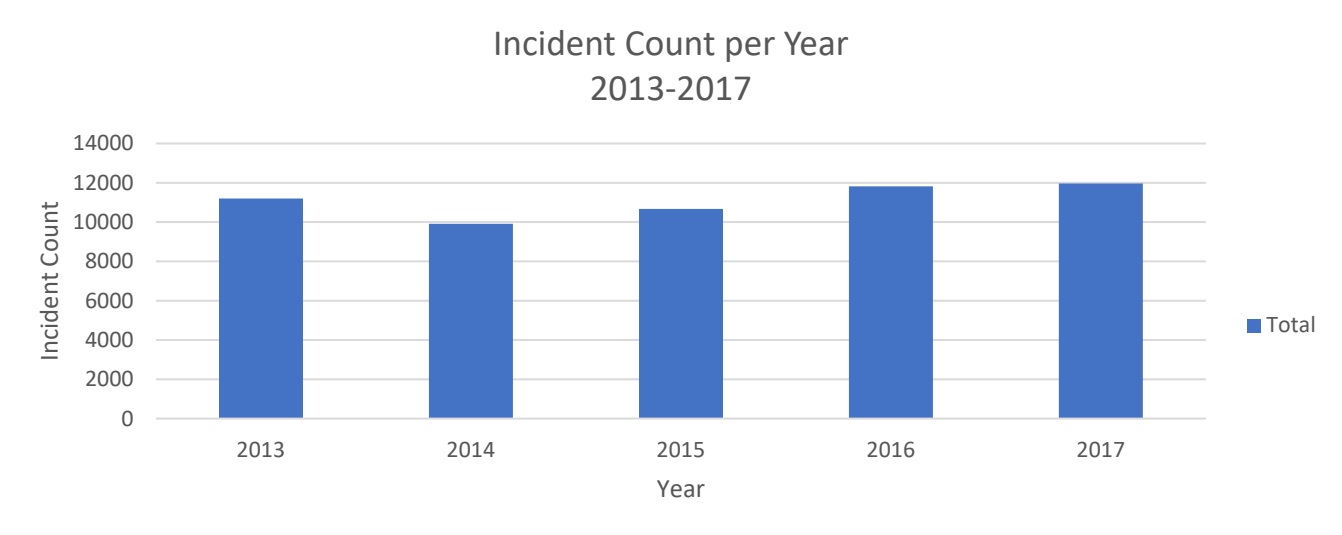
In 2003, the Department began using FIREHOUSE Records Management Software ("Firehouse" or FHRMS). FIREHOUSE is a National Fire Incident Reporting System 5.0 (NFIRS 5.0) incident reporting software package. FIREHOUSE provides BFR with the ability to record, store, archive, and recall incident, hydrant, occupancy, training, and personnel information, and retrieve reports regarding the same.

The incident module within FHRMS is used to record all fires, and includes information pertaining to fire loss, injury and life loss, property loss, and other associated losses. The incident module complies with the National Fire Incident Reporting System (NFIRS) requirements. Company officers are responsible for the completion of all FHRMS reports. They are later quality checked by the on-shift Battalion Chief on duty[i]. The city also has an administrative policy on Information and Technology.

In early 2018, BFR began using First In, a product created by West Net. First In is a fire station alerting system that utilizes a series of remote units placed strategically throughout the fire station to notify fire personnel of an emergency call. The system is alerted by the CAD system and features pre-alert tones and Automated Voice Dispatch, selective alerting by company assignment, dorm remotes for individual dorm room alerting, heart-friendly ramping tones, video messengers for displaying call information on station monitors, back-up alerting as well as red safety lighting to ensure safety throughout the firehouse[38].

[38] http://www.firstinalerting.com

Overall Incident Information



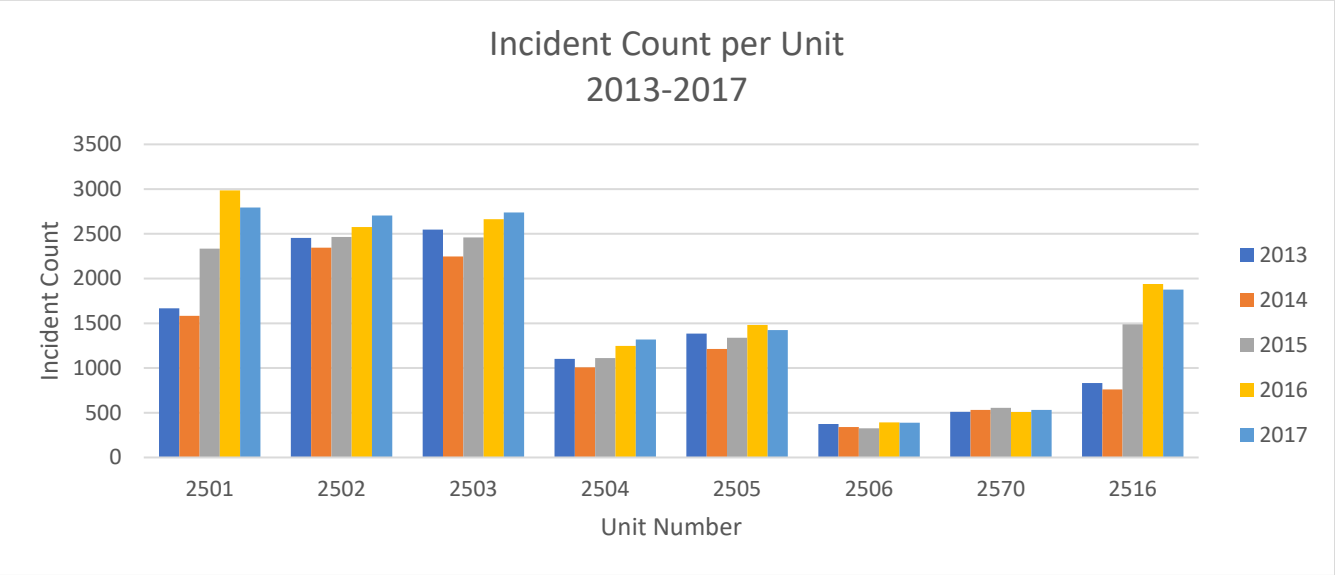
Percent Change By Year	2014	2015	2016	2017
	-13%	7%	10%	1%

Incident volume by 911 call type[39]

Incident Type	Percent of Call Volume
EMS	80.72%
FIALAF-Fire Alarm	9.57%
Odor of Gas	3.39%
FINONF - Non Struct Fire	2.53%
FISTRF-Struct Fire/Smoke insi	2.06%
Auto Aid	0.77%
Hazmat	0.48%
MUAIDF- BFD mutual aid	0.22%
FIWILF-Wildland/Grass fire	0.18%
RESCUEF-Special Rescue	0.05%
AMNONF-Blood draw/noncode amb	0.02%
AIACCF-Motorized Air Accident	0.01%
BOMBF-Bomb Threat	0.01%

[39] Incident types were combined by like items

Emergency Unit Responses[40]

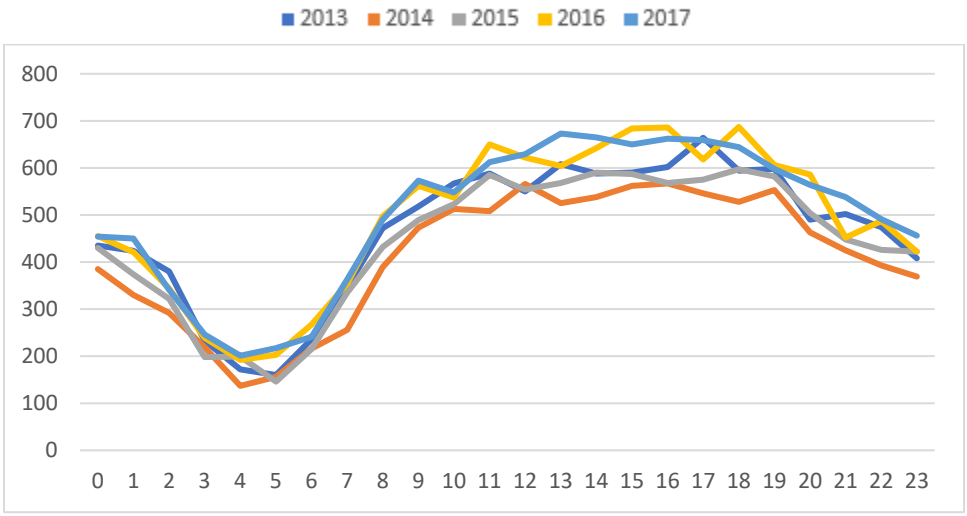


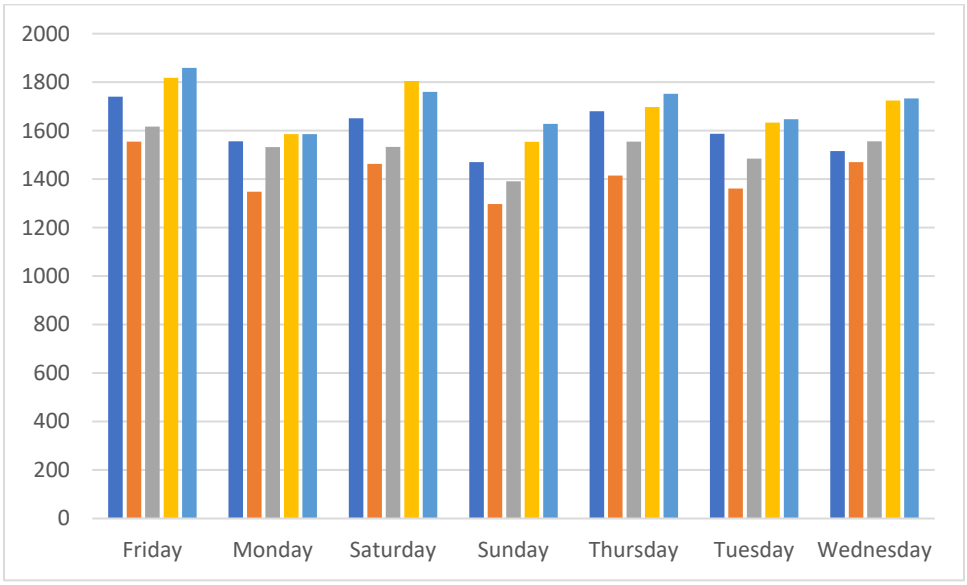
Unit Changes Year over Year: 2015-2017[41]

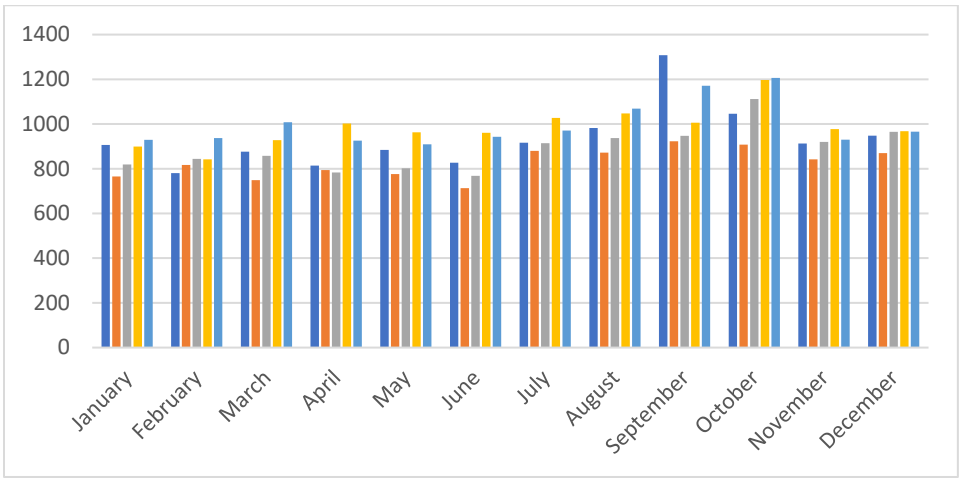
Unit	2015	2016	2017	% Increase
2501	2335	2987	2795	16.46%
2502	2465	2576	2709	9.01%
2503	2460	2663	2738	10.15%
2504	1111	1247	1319	15.77%
2505	1338	1481	1425	6.11%
2506	326	392	391	16.62%
2507	1248	1318	1387	10.02%

[40] Includes emergent and non-emergent responses.
[41] FHRMS

Call Distribution by hour of day, weekday, month:





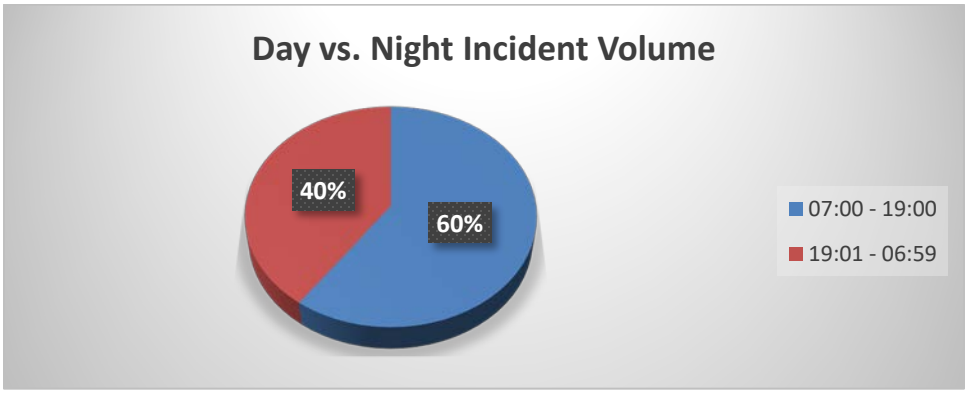


Property and Content Loss

Year	Total Content Loss	Total Property Loss
2015	$ 408,449.00	$ 872,774.00
2016	$ 273,770.00	$ 1,525,668.00
2017	$ 217,711.00	$ 934,299.00
2018	$ 36,015.00	$ 307,100.00
Total	**$ 1,970,885.00**	**$ 7,195,373.00**

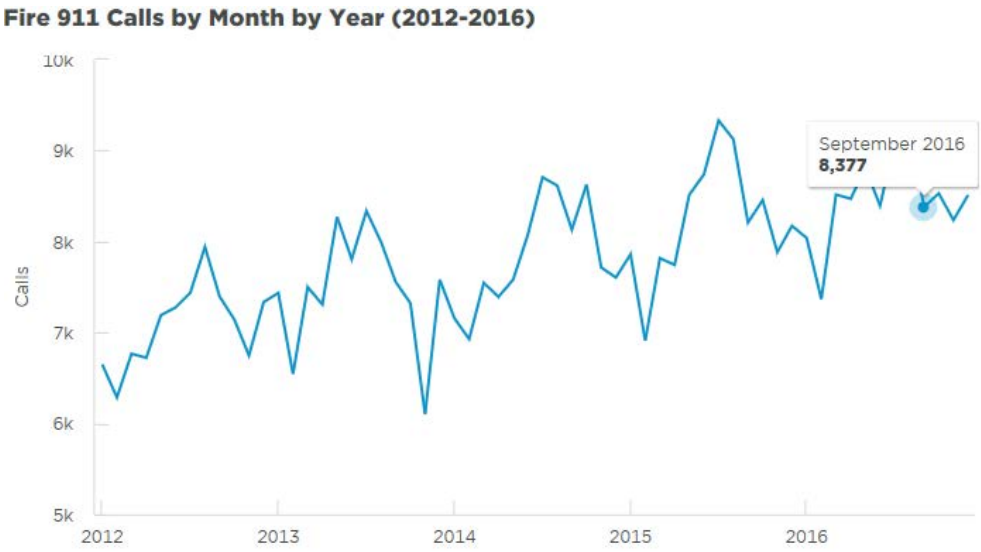
Incidents Day vs. Night

In the City of Boulder 60% of the incidents occur between the hours of 7am and 7pm.



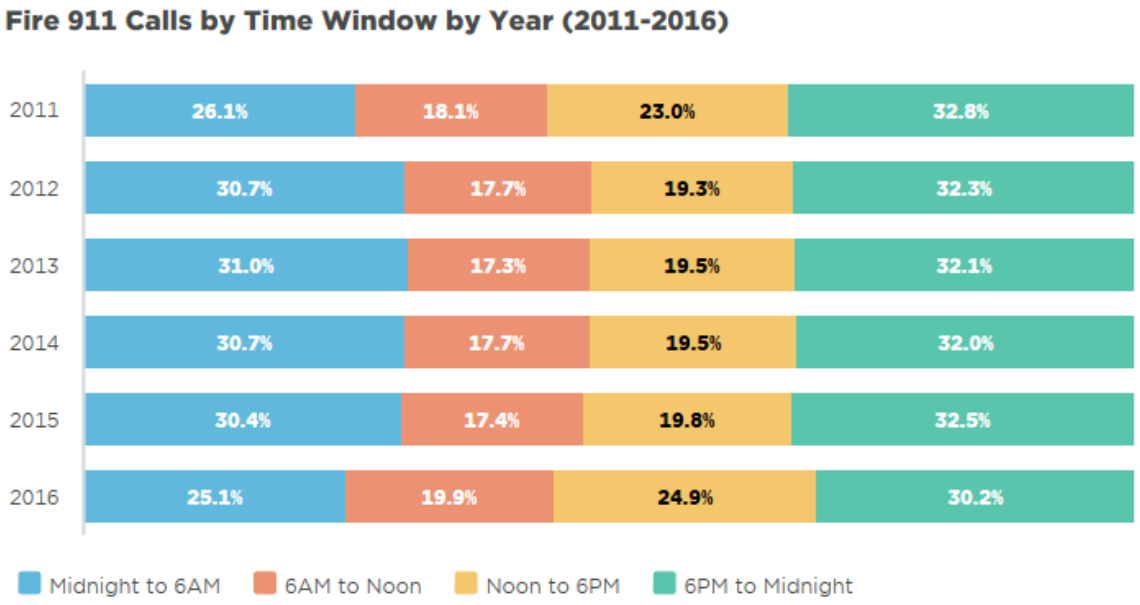
911 Calls

The volume of 911 calls processed by the City of Boulder has increased by 17% since 2012. 911 calls tend to be highest in the summer months of July and August while lowest in the winter months of January and February.



Call Processing by Time of Day

Between 2011-2016, Boulder Fire-Rescue processed the highest number of 911 calls in the evening and early morning hours. However, 2016 saw a spike in daytime responses and a drop in both morning and evening responses relative to previous years.



42

[42] FHRMS

Staffing

BFR has a traditional organizational structure for a department its size. The department has two major divisions, and within those two divisions, are four primary sub-divisions, which comprise the operational structure of the department. The department has a staff of 124[43] full-time equivalent (FTE) personnel. A portion of those FTE positions include 8 full time personnel in the Wildland Division. The four divisions within the department under Support Services and Operations respectively are the community risk reduction and training divisions, and the fire operations and wildland divisions.

Fire personnel are represented by the International Association of Firefighters Local # 900. The current two-year collective bargaining agreement went into effect on January 1, 2017 and expires December 31, 2018.
Wildland Division personnel are not currently represented by Local 900, however the department and the Local are currently engaged in collaborative efforts to incorporate them into the bargaining unit. Chief officers are selected based on city-supported promotional processes. The Fire Chief is selected by the City Manager.

The table below represents the daily minimum staffing on fire apparatus.

Station	Apparatus	Personnel	Type
Station 1	2516 2501 2570	3 3 1	Type I Type I Pick-Up
Station 2	2502 2538	3 0	Type I Type III
Station 3	2503 2521	3 0	Type I Dive Van
Station 4	2504	3	Type I
Station 5	2505 2532	3 0	Type I Type VI
Station 6	2506	3	Type I
Station 7	2507 2523	3 0	Type I Hazmat Van
Station 8 (Wild Land)	2531 2535 2539 2551 2552	0 0 0 0 0	Type VI Type VI Type III Pick-Up Pick-Up
Total Apparatus Minimum Staffing		**25**	

[43] Will be 129 after may.

Community Baselines

Response time is the most common performance measure used for fire services because it is understood by residents, easy to compute, and useful in the evaluation of end results. The 2015 BVCP calls for BFR to: “have response times to location of emergency that is normally six minutes or less.” This goal is supported by the National Fire Protection Association (NFPA) standards, which establishes a six-minute response 90 percent of the time.

Defining System Performance

The measurement of system performance falls into four categories: distribution, concentration, reliability, and comparability.

An adequate distribution of resources is necessary to respond to incidents throughout the jurisdiction, regardless of significance. Distribution of fire companies assures a specific response time performance for a percentage of the calls for service. Ideally, 100% of the community would have a fire company on the scene within the allotted response time. Distribution of fire companies is considered adequate if fire companies can respond to at least 90% of the incidents within the stated travel response-time goal.

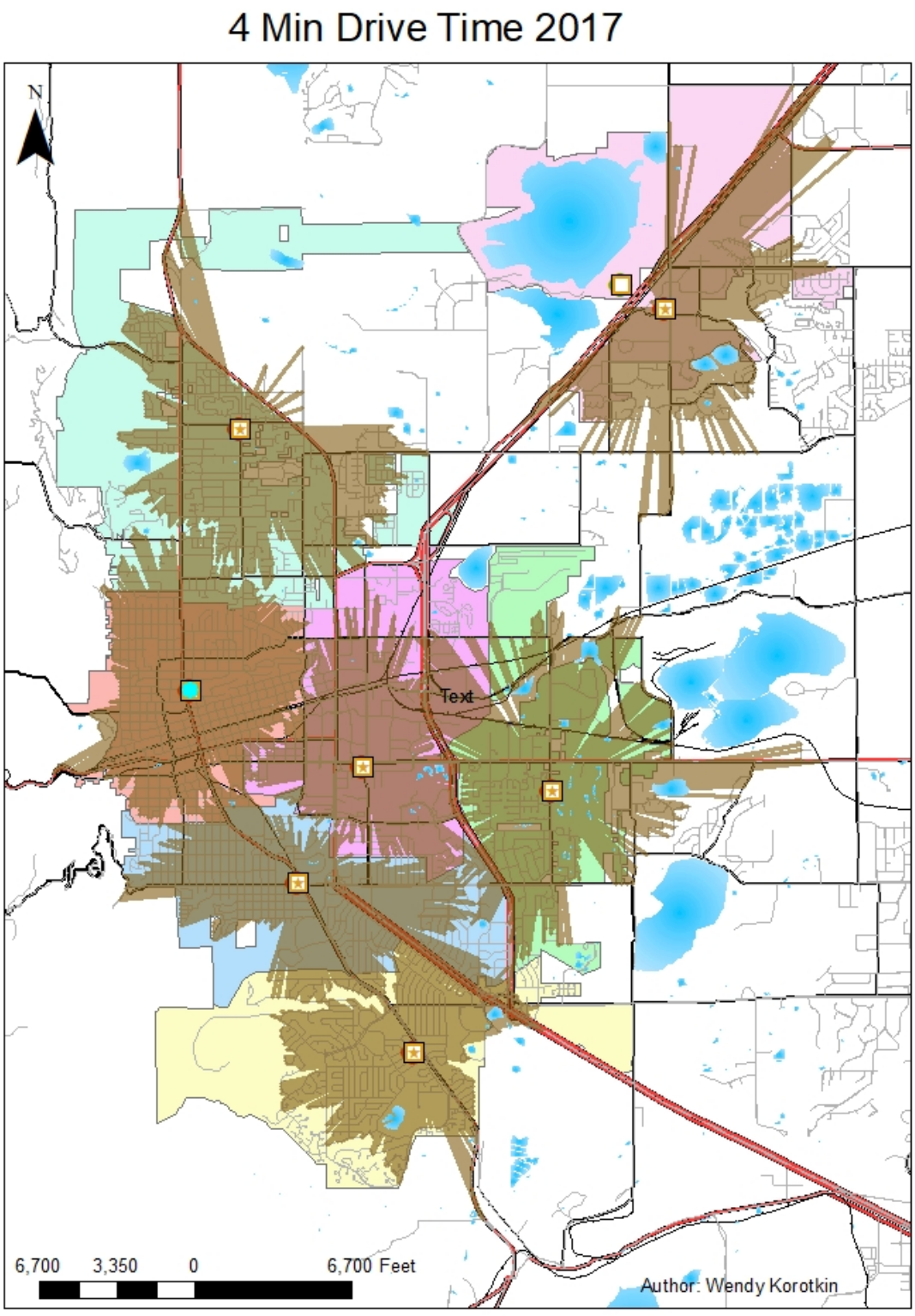
Concentration is the spacing of multiple resources arranged close enough so an initial effective response force (ERF) can be assembled on the scene within the Department’s established response time goals. An initial ERF will most likely stop the escalation of the emergency for a specific risk type.

Fire stations and apparatus must be equally distributed in the community to provide a timely initial attack for all calls. Additionally, the fire station locations and staffing patterns must concentrate resources to respond to a major event within the desired response time goals. BFR apparatus have historically been placed based on distribution, while much of the equipment carried had been based on concentration (e.g.: high-rise pack in high-rise district). The City of Boulder is considered an urban population density.

Distribution

These measures are comparative measurements relative to the distribution of BFR resources. An example is locating first-due resources throughout the jurisdiction to provide all citizens with a quick response for initial intervention. The City of Boulder spans 25.8 square miles. BFR Vehicles are dispatched using Automatic Vehicle Location (AVL), therefore the closest unit is dispatched to most incidents.

BFR fire stations are located to ensure rapid deployment of first-due resources (primarily pumpers) for minimizing and terminating routine emergencies. The methodology for station location predates most of the modern planning tools in use now. Four out of the seven stations were built prior to 1970 and therefore, ISO standards were either not in place or in prior versions. Due to this, the department is currently evaluating the present locations for relocation or provision of alternative response models. The Department strives for an equitable level of outcome, meaning that everyone has a fire station approximately within the same distance in the community. Units are dispatched using AVL, therefore the closest unit will respond to most emergencies.



Map 24. 4 minute drive time of fire apparatus

Square Mileage in each of the Stations Default Territory

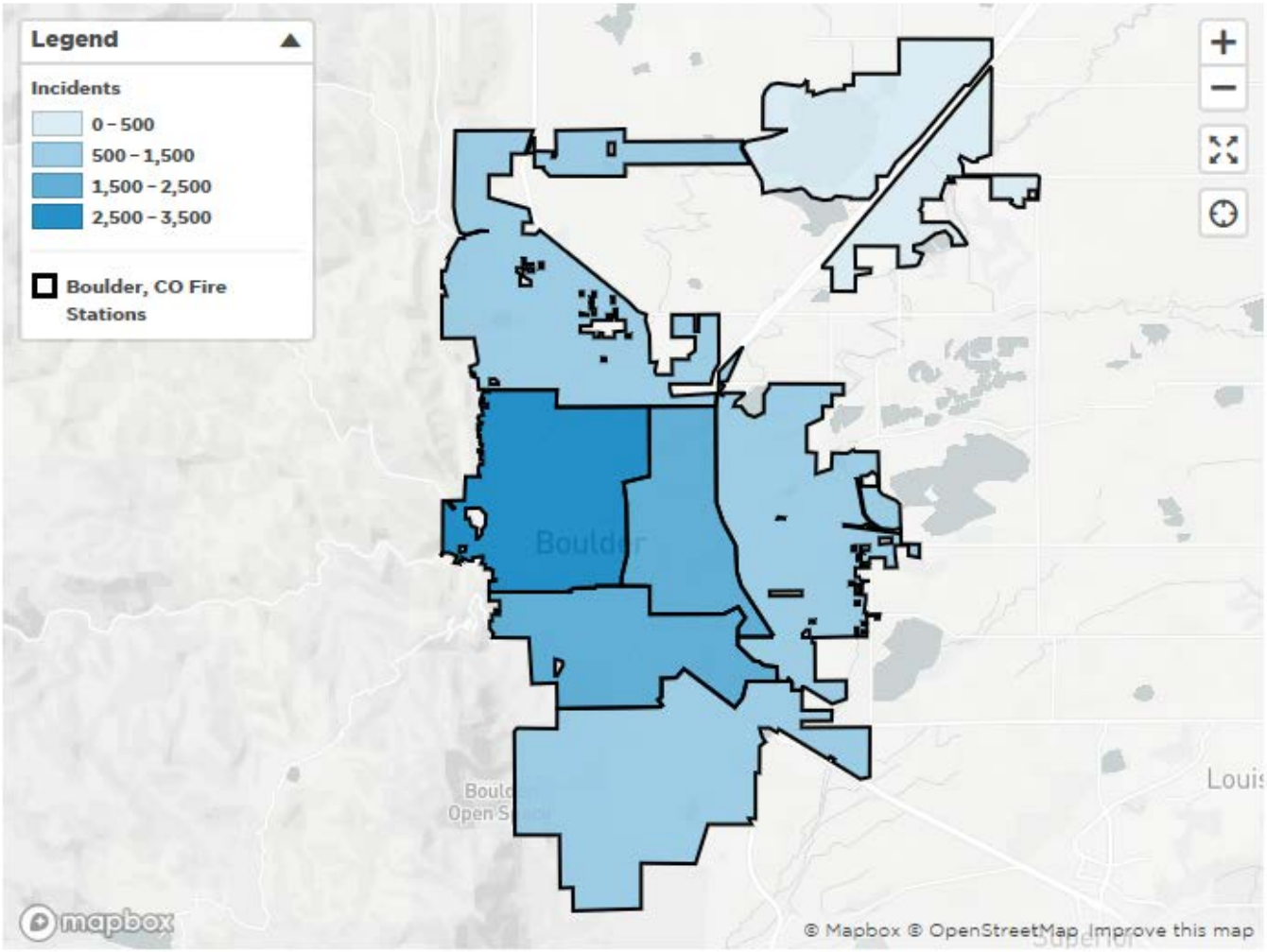
Station	Sq. Miles	Station	Sq. Miles
1	3.44	**5**	4.39
2	3.11	**6**	4.01
3	3.0	**7**	4.18
4	5.14		

Area not covered by the four-minute drive time at 80% speed

Station Area	Full area	Area Not Covered	Amount of Area Covered	% Covered
1	95,945,893.77	8,893,101.76	87,052,792.01	90.73%
2	86,833,934.67	14,074,604.54	72,759,330.12	83.79%
3	83,670,468.25	19,992,914.17	63,677,554.08	76.11%
4	143,385,020.70	66,675,831.39	76,709,189.31	53.50%
5	122,621,451.67	59,694,305.55	62,927,146.13	51.32%
6	111,988,125.99	72,863,134.54	39,124,991.45	34.94%
7	116,620,965.20	34,558,193.07	82,062,772.13	70.37%

Location of Incidents

The map below shows the number of emergency incidents by fire district. Hover over each district to get a total count. Most incidents in 2017 year-to-date occurred within Station 1, which has had nearly as many incidents as Stations 4, 5, 6, and 7 combined.

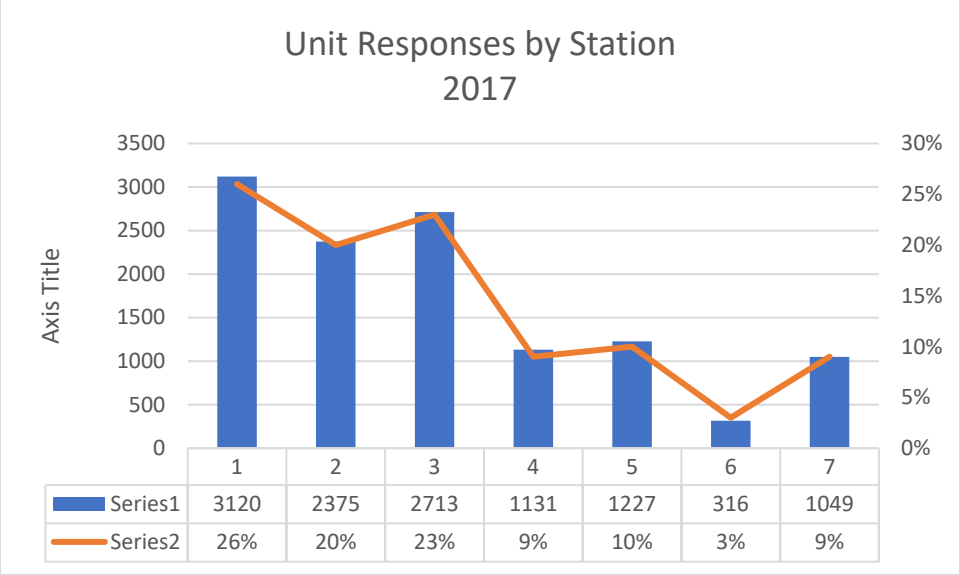


Map 25. Location of Incidents

INCIDENTS: UNIT & STATION/YEAR

Station	2013	2014	2015	2016	2017
1	3114	2703	2905	3245	3120
2	2215	2103	2178	2254	2375
3	2532	2281	2545	2759	2713
4	904	753	878	1029	1131
5	1200	1044	1127	1265	1227
6	262	260	269	303	316
7	936	742	757	912	1049

Two vehicles respond out of Station 1. Engine 1 and Truck 1.



2017			
Station	**Unit Responses/Year**	**Responses/Day**	**Percent of Workload**
1	3120	8.5	26%
2	2375	6.5	20%
3	2713	7.4	23%
4	1131	3.1	9%
5	1227	3.4	10%
6	316	0.9	3%
7	1049	2.9	9%
Total	11931	32.7	100%

Incident Evaluation by Time of day

Below is a stacked bar chart depicting the time of day the BFRD responds to emergencies. These emergencies are most frequent during the hours 12:00PM to 6:00PM. In stations 1, 2, and 3, the second most frequent timeframe is 6:00PM to 12:00AM. However, in stations 4, 5, 6, and 7, the second most frequent timeframe is 6:00AM to 12:00PM.

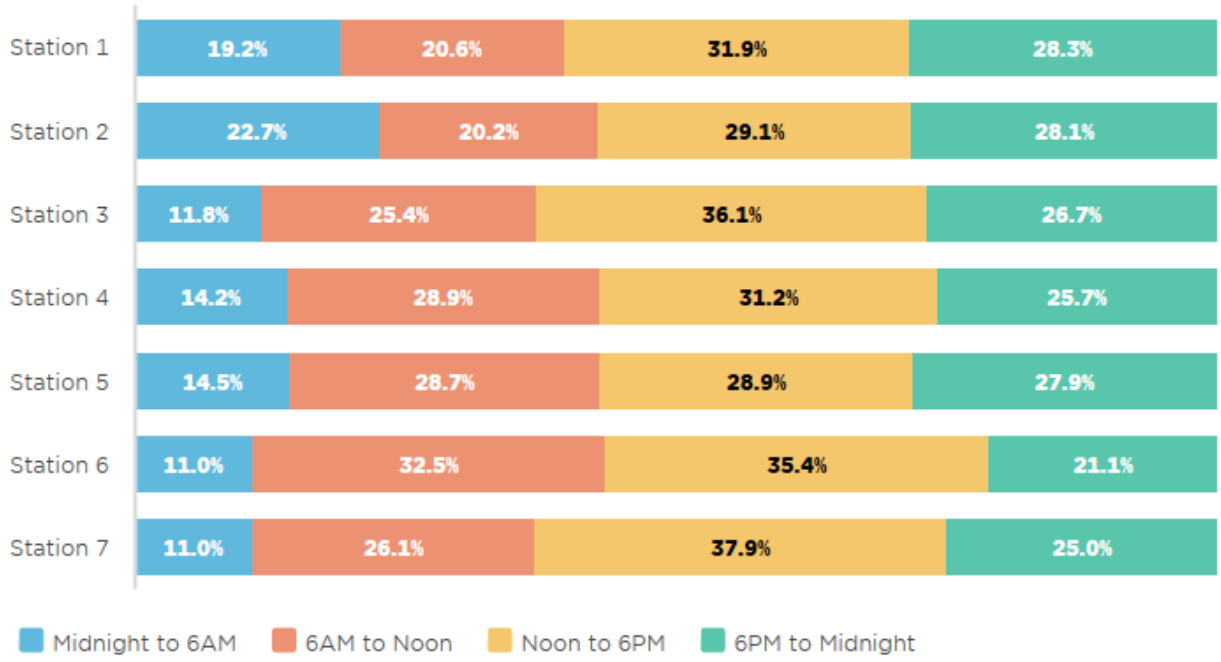
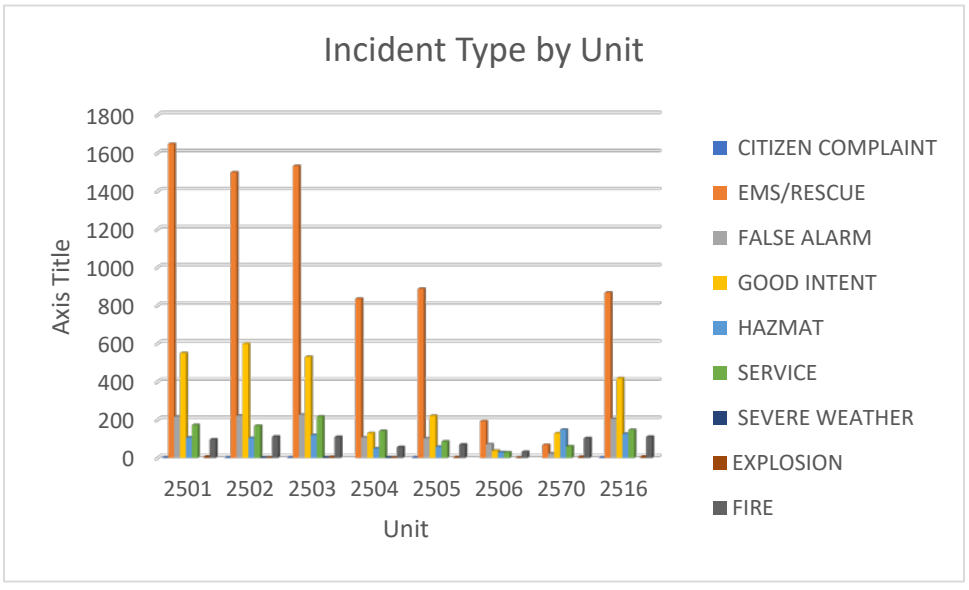


Image 19. Incidents by time of day

Incident Types by Unit

As seen in the chart below, EMS/Rescue incidents are the bulk of the call volume for engines. The on-shift BC, 2570, is not automatically dispatched to these incidents which is reflected on the chart.



Specialty Unit responses

Below is the number of incidents committed to by specialty units.

Row Labels	2013	2014	2015	2016	2017	Grand Total
Wildland	14	13	5	2	7	41
Wildland Brush Truck	23	25	7	21	18	94
Wildland Division Chief				3	6	9
Wildland Truck	1	5	1	6	5	18
Wildland Type 3		1	8	9	11	29
Wildland Type 3 Engine		5	33	38	41	117
Dive Van	31	36	31	20	26	144
Rescue Squad 2523	17	25	35	24	21	122

Reliability

Response reliability addresses the ability of a resource to respond within each area. It is the probability that the unit assigned to a territory will be available to respond in that territory. It is also to determine the ability of the appropriate resource to meet the determined performance measure baseline.

As the number of calls increases, and the demand on crews increase (training, out of service time), the reliability decreases. Response reliability is typically reflected as a percentage. In 2017, 76% of calls were responded to by the first-due company. Data reflecting where units went during the time out of territory is located below

Incident volume by unit per station territory

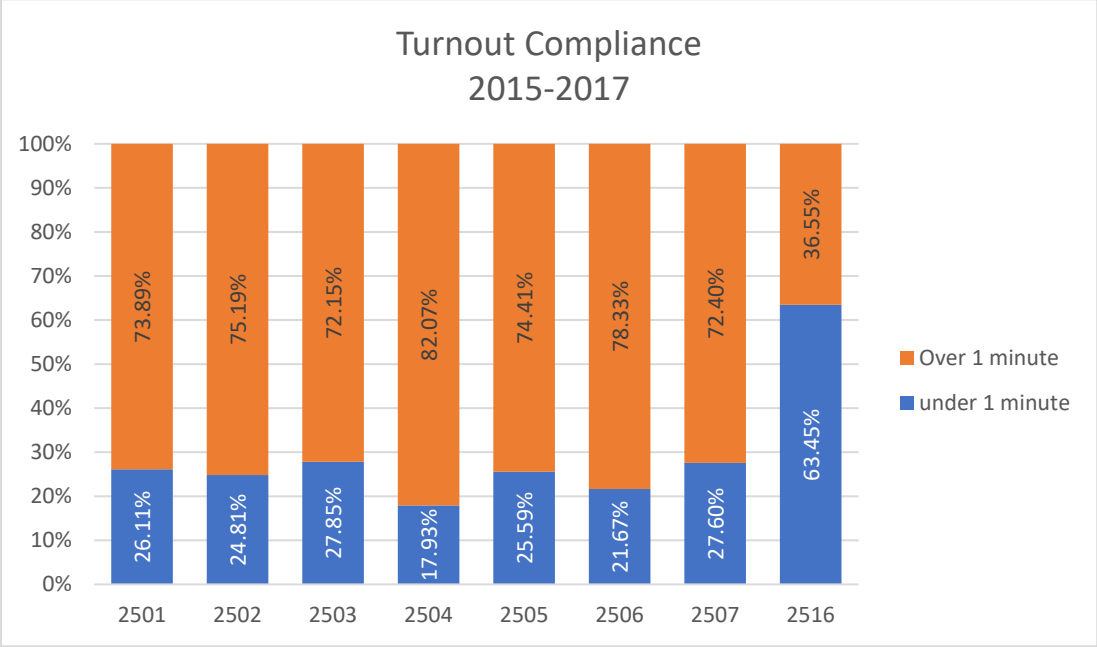
The table below depicts each of the first line units and which station area they respond to most. The highest numbers are in the stations first in territory, and the colors range from green (lowest) to red (highest).

Station 1 – 2501 & 2516
Station 2 – 2502
Station 3 – 2503
Station 4 – 2504
Station 5 – 2505
Station 6 – 2506
Station 7 – 2507

Response Area	ST1	ST2	ST3	ST4	ST5	ST6	ST7
2501	2272	165	191	24	110	7	20
2502	276	1947	258	137	19	3	64
2503	121	220	2163	42	65	14	112
2504	35	158	55	1017	13	3	32
2505	72	16	170	5	1113	34	9
2506	15	16	22	1	28	294	13
2507	44	169	171	35	19	12	934
2516	1398	135	187	30	87	18	24
Total	**4233**	**2826**	**3217**	**1291**	**1454**	**385**	**1208**

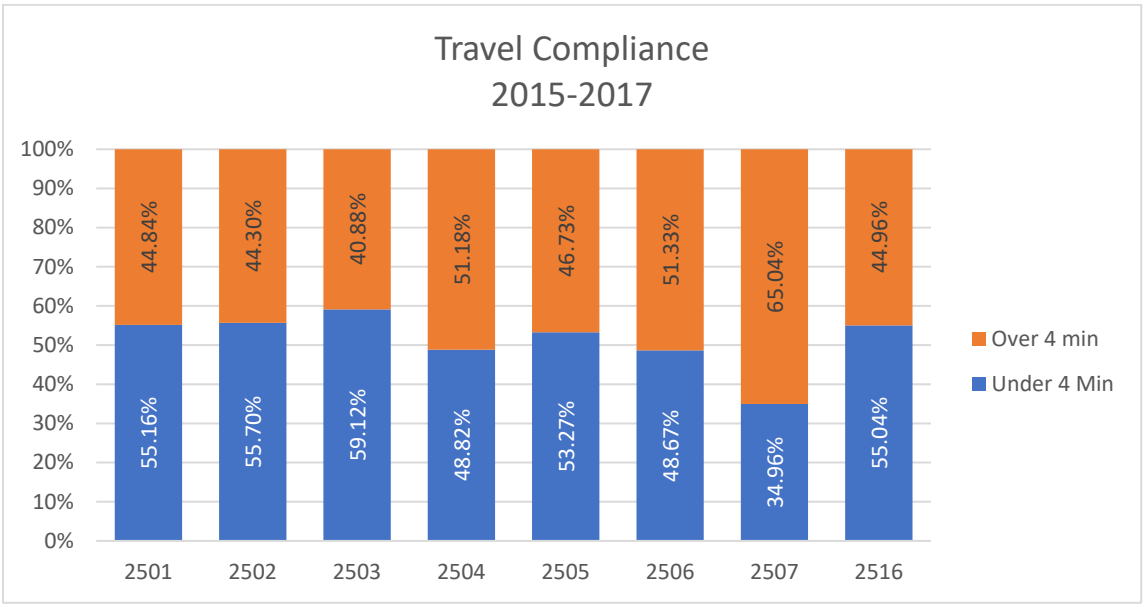
Turnout Compliance

The chart below displays front line apparatus and compliance with turnout times under 1 minute.



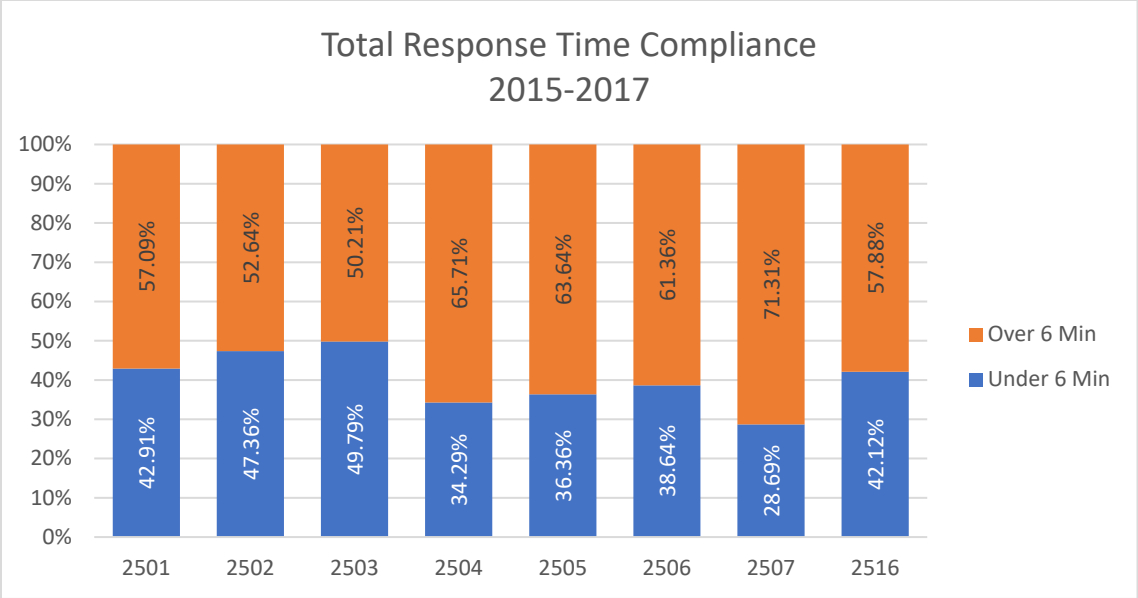
Travel Compliance

The chart below displays front line apparatus and compliance with travel times under 4 minutes.



Total Response Time Compliance

The chart below displays front line apparatus and compliance with total response times under 6 minutes.



Unit Hour Utilization

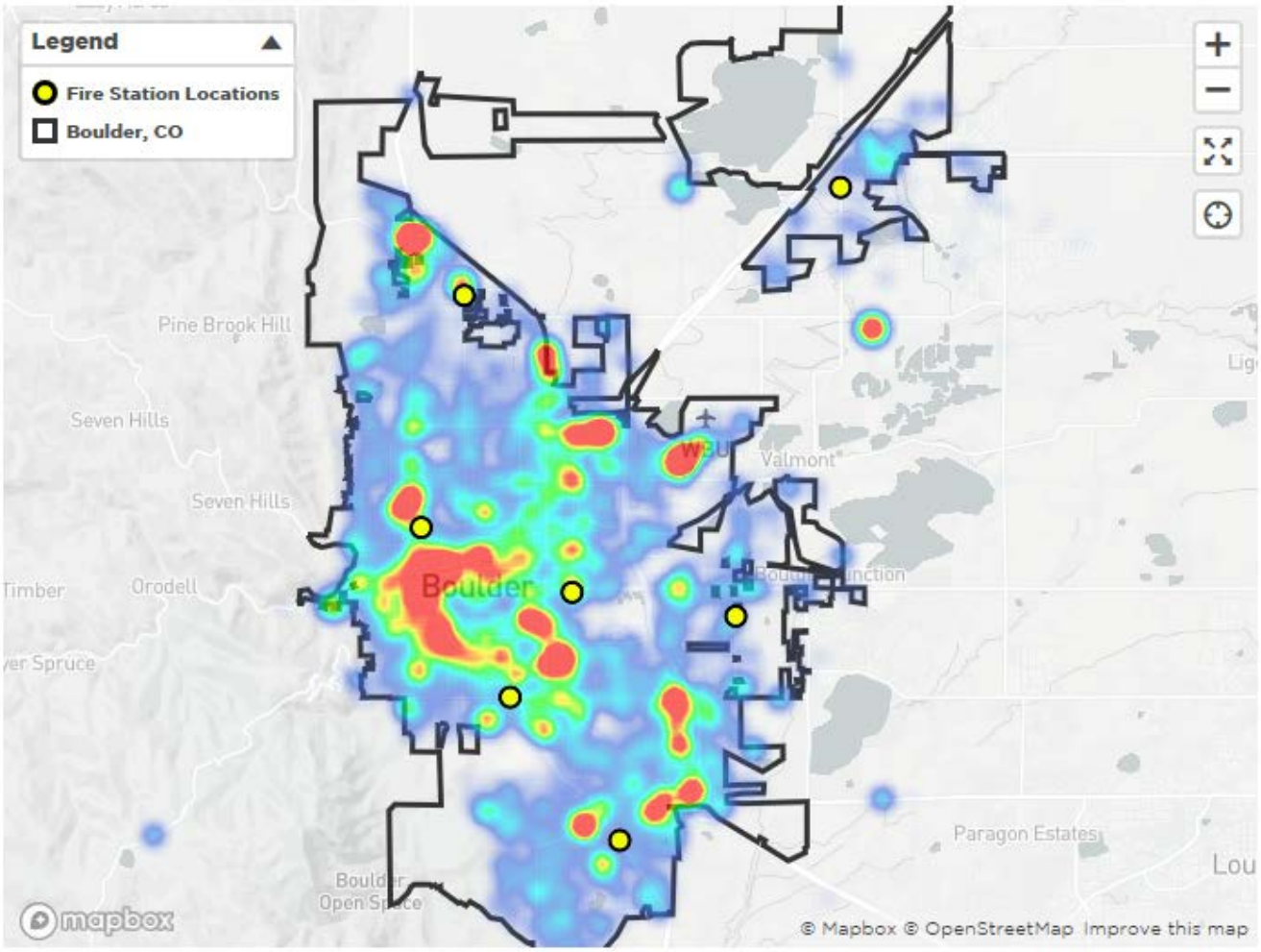
Unit hour utilization is the percent of time during each 24-hour period that a unit is committed to an incident.

Below is a table that reflects first line apparatus and the BC's Unit Hour Utilization (UHU).

Unit Hour Utilization

Unit	Total Commit Time	Number of Incidents	UHU
2501	3720:57:42	5127	42%
2502	4557:01:49	6857	52%
2503	4518:15:26	6912	52%
2505	3128:48:28	3914	36%
2504	2641:46:57	3447	30%
2506	733:54:29	916	8%
2507	2534:47:39	3363	29%
2516	2988:19:53	4474	34%
2570	1032:45:40	1079	12%

Map 26. Response times over 6 minutes and 30 seconds



About This Map: This is a heat map of all responses where the BFRD responded to incidents in greater than 390 seconds. When zoomed in, point data is displayed. Larger dots represent a greater density of incidents, and smaller dots represent less density of incidents where the response time was greater than 390 seconds.

Number of Incidents BFR responds to at the same time

The bar graphs on this page show the total number of concurrent 911 calls by response unit broken down by concurrency. Concurrent calls are those that occur simultaneously. The overwhelming majority of 911 calls occur by themselves. However, between 2012-2016, anywhere from 5% to 15% of calls for a response unit occurred simultaneously.

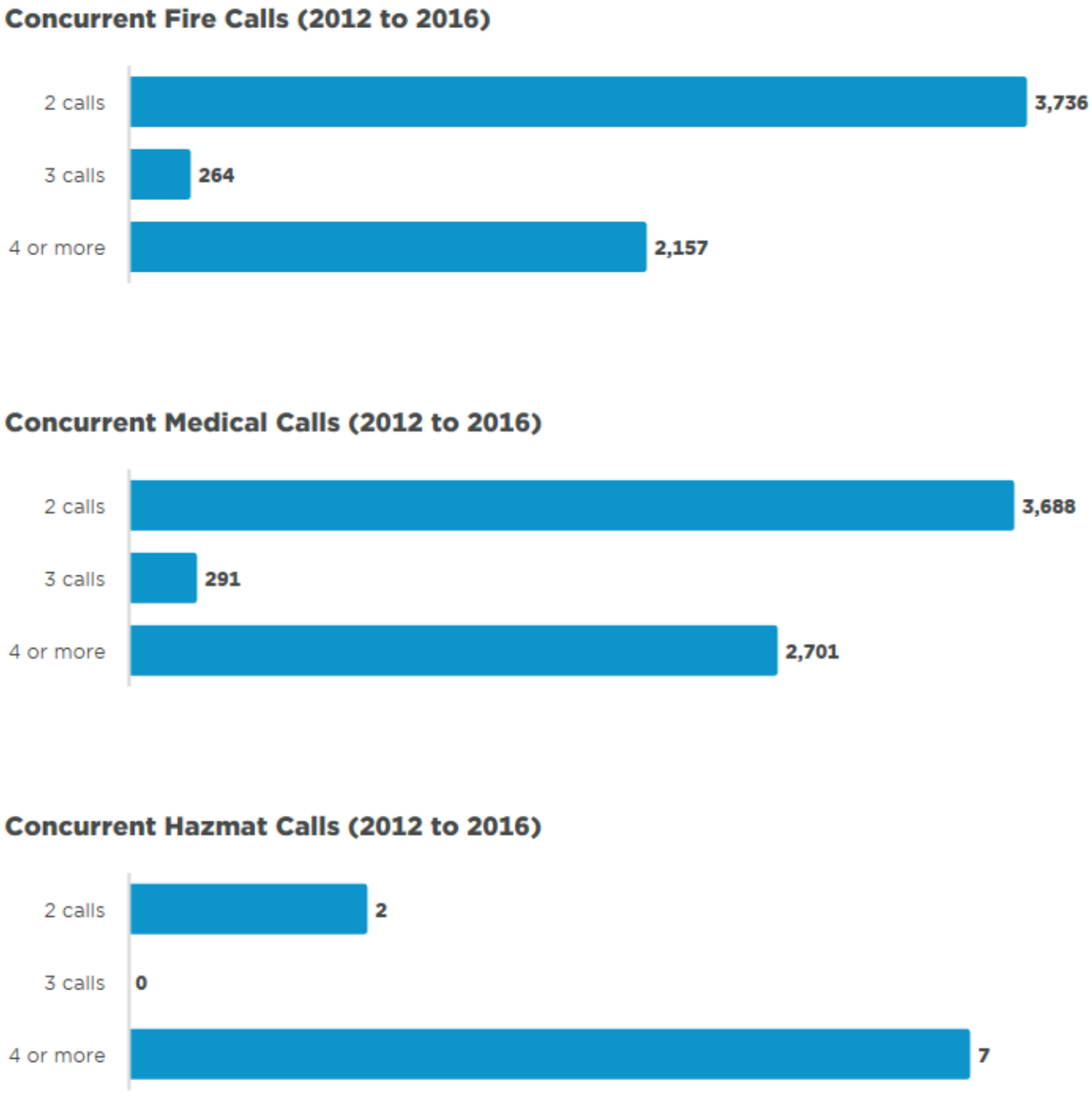


Image 20. Concurrent Incidents by type

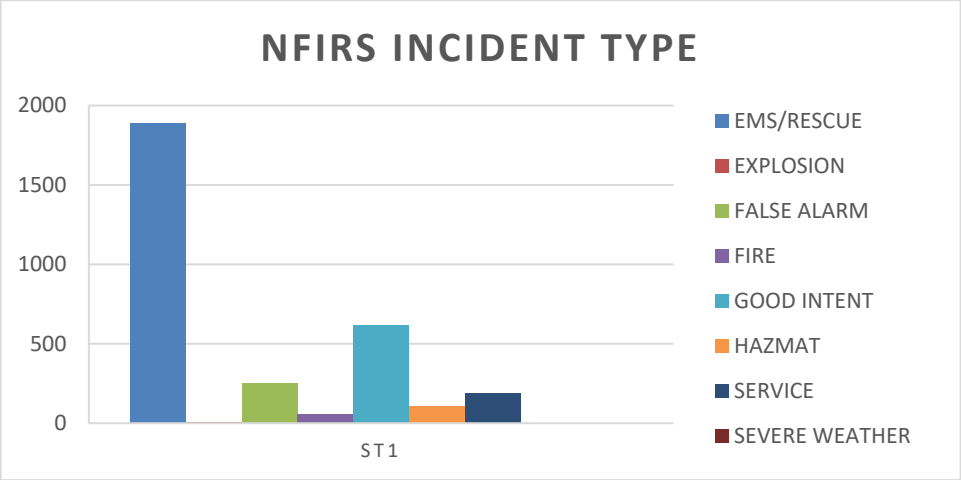
Station Distribution and Reliability Analysis: 2017

Station 1

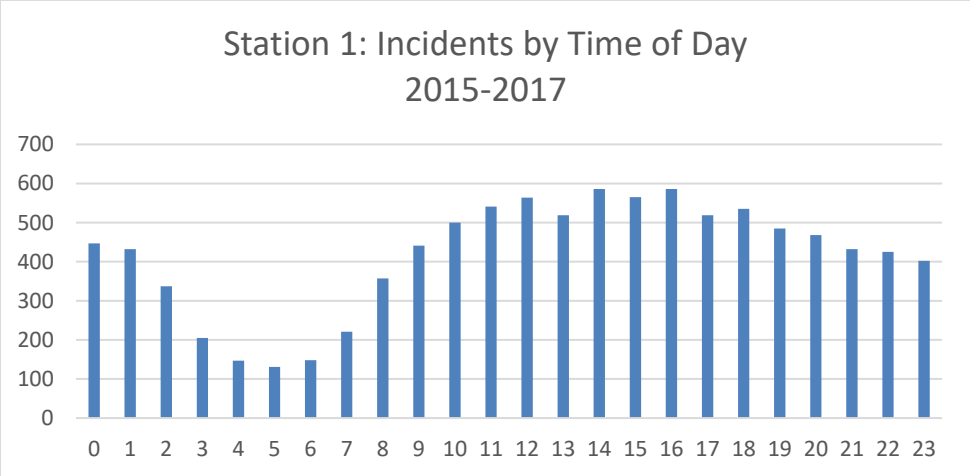
In/Out of Territory Responses (Unit: 2501/2516)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
4,233	3,670	998

Incident Outcome Types



Incidents by Time of Day

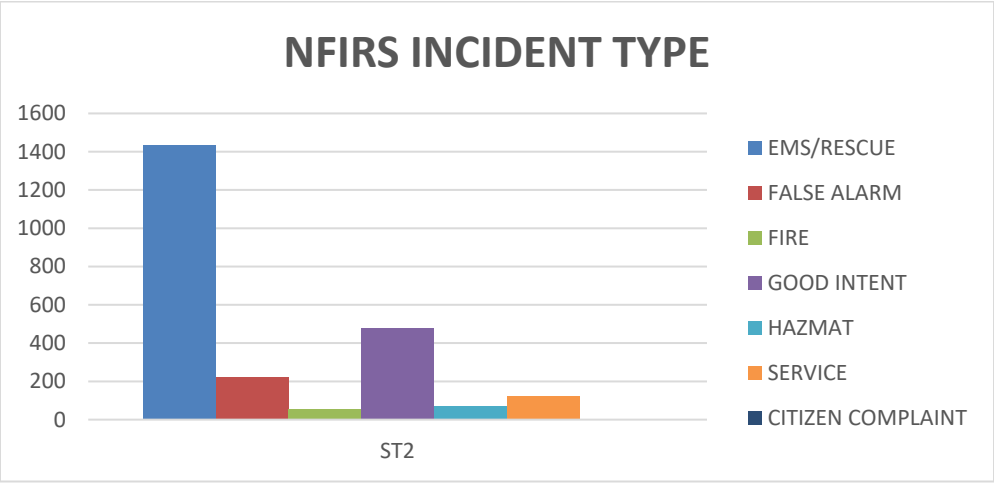


Station 2

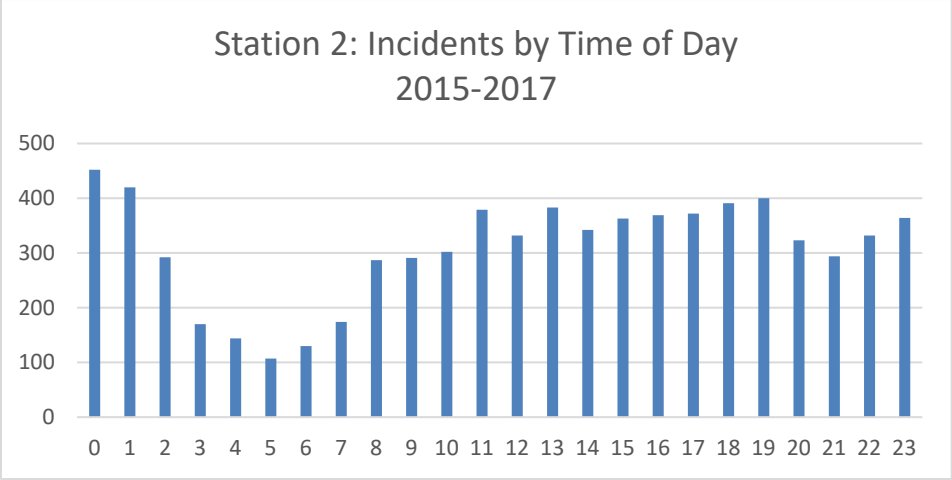
In/Out of Territory Responses (Unit: 2502)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
2826	1947	757

Incident Outcome Types



Incidents by Time of Day

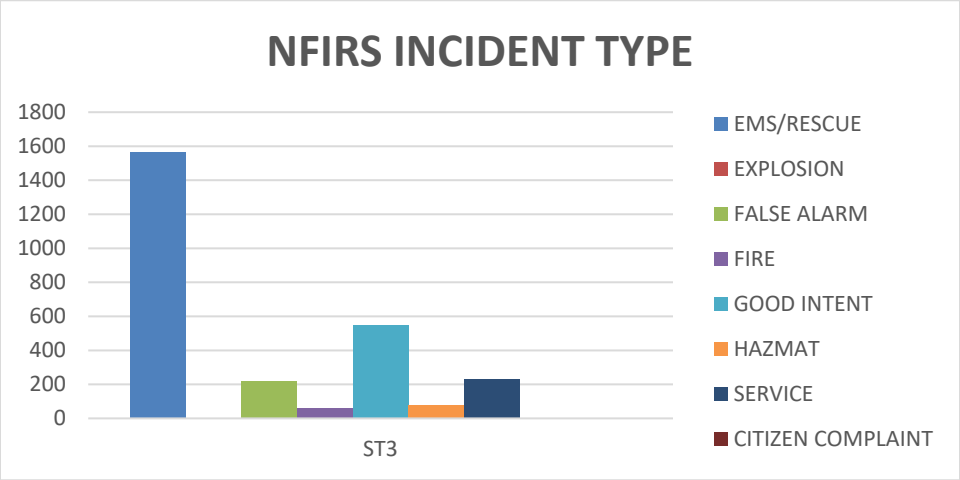


Station 3

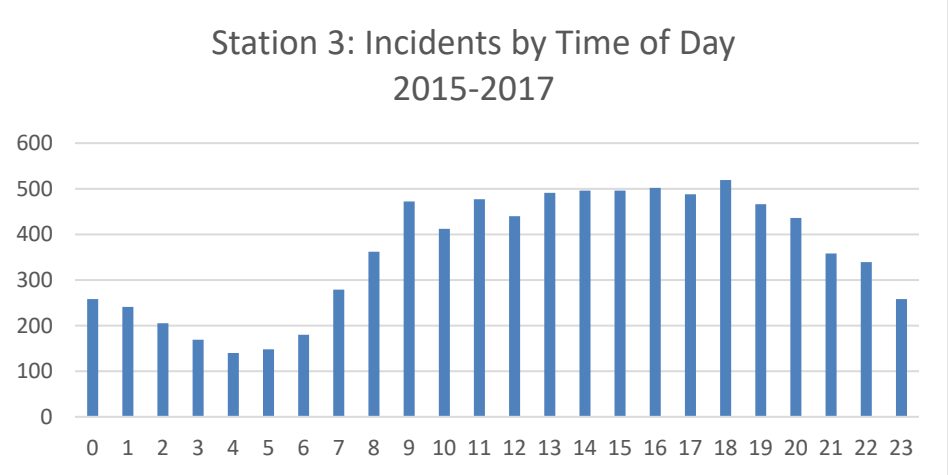
In/Out of Territory Responses (Unit: 2503)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
3217	2163	574

Incident Outcome Types



Incidents by Time of Day

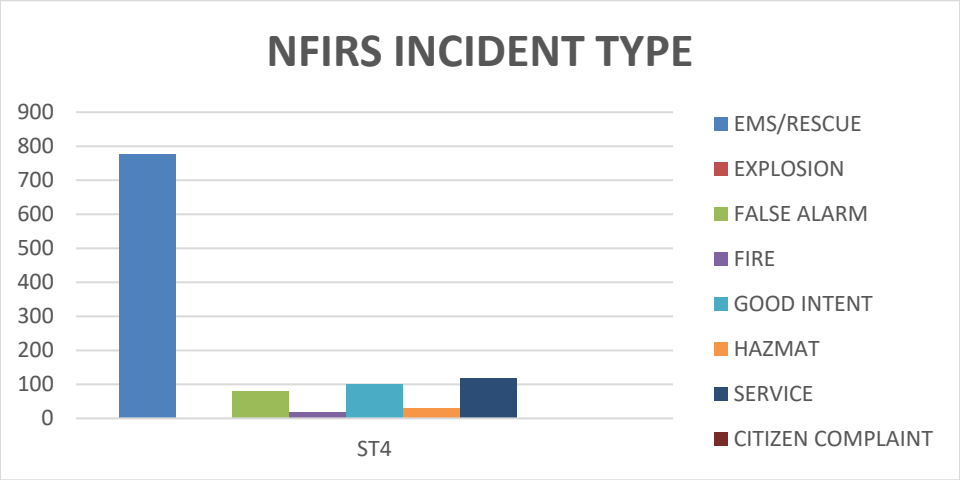


Station 4

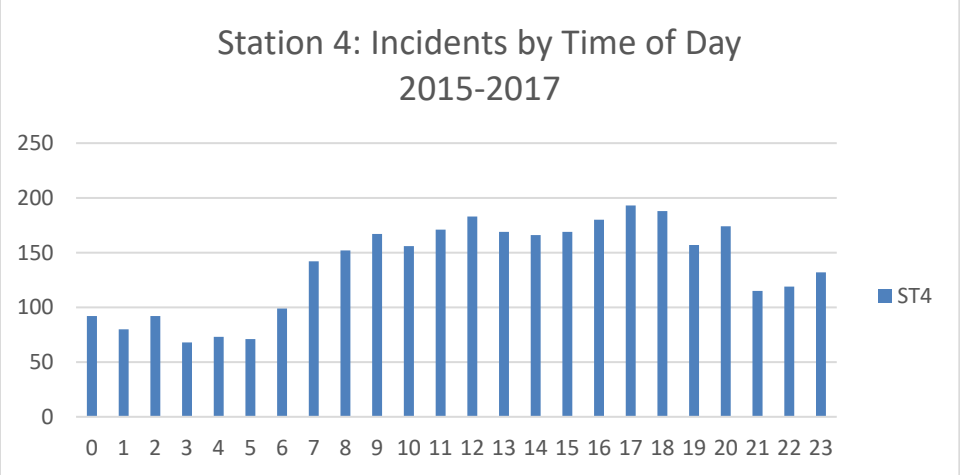
In/Out of Territory Responses (Unit: 2504)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
1291	1017	296

Incident Outcome Types



Incidents by Time of Day

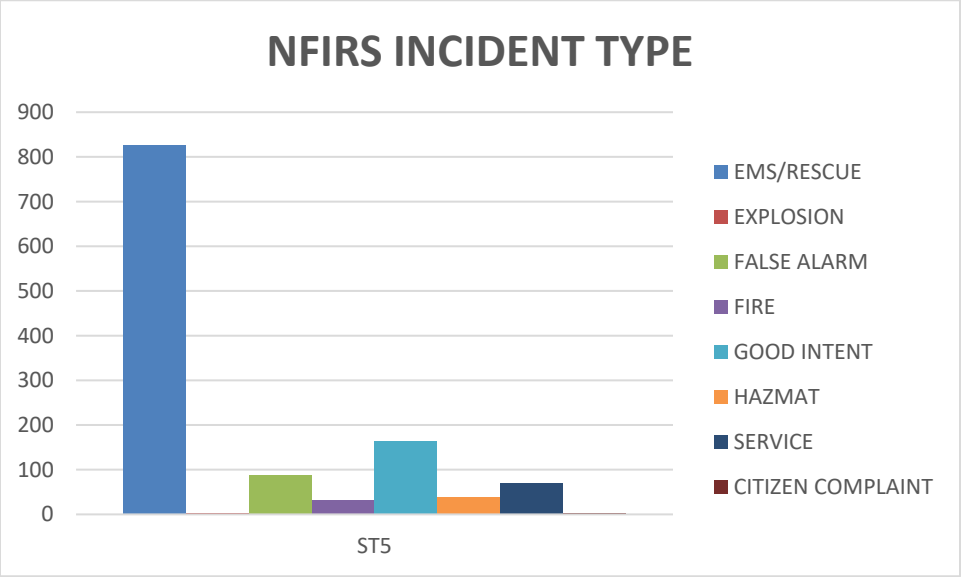


Station 5

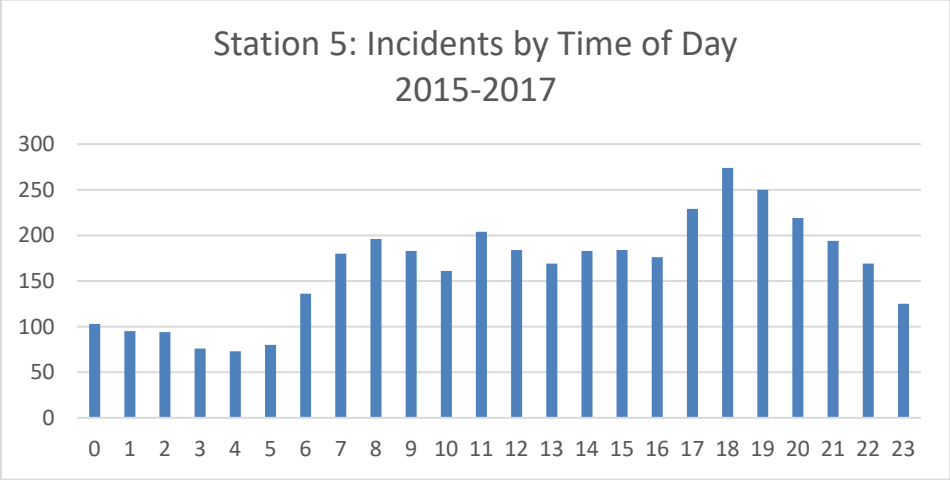
In/Out of Territory Responses (Unit: 2505)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
1454	1113	306

Incident Outcome Types



Incidents by Time of Day

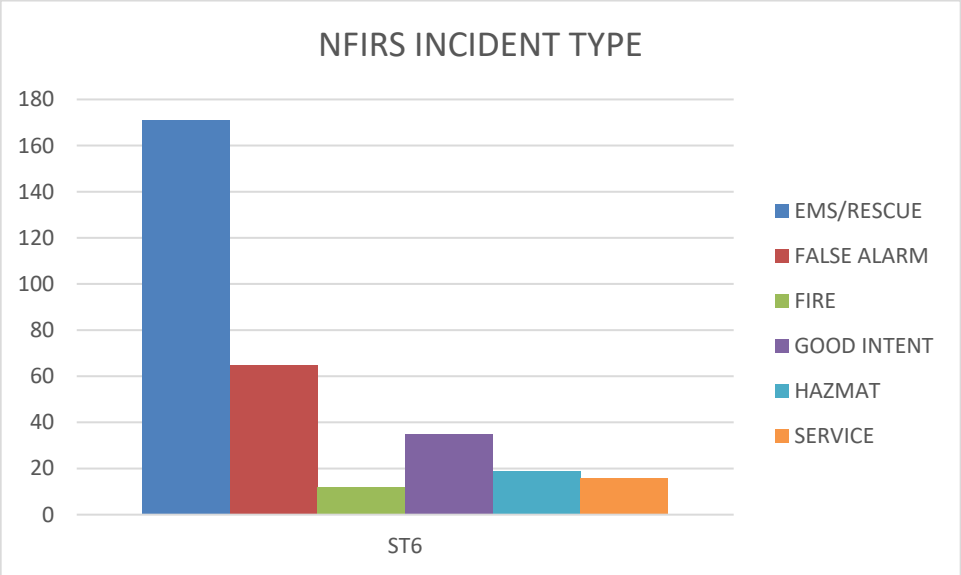


Station 6[44]

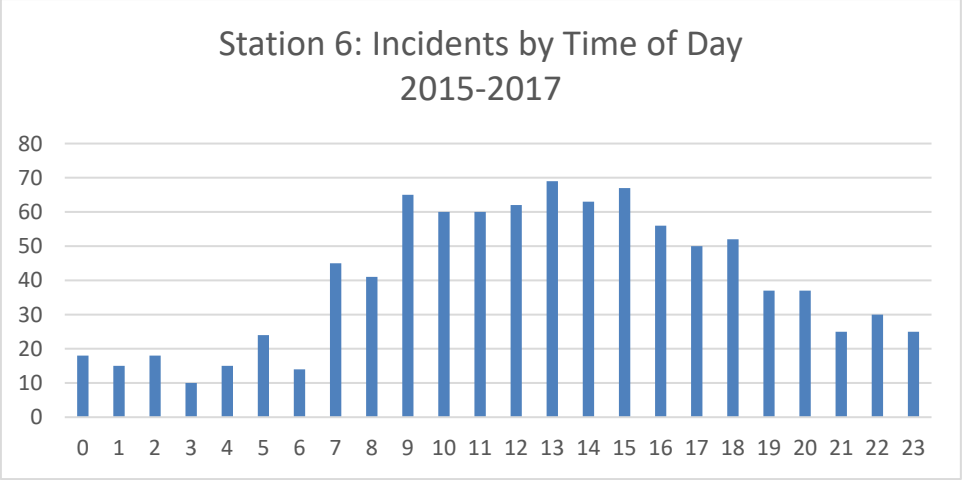
In/Out of Territory Responses (Unit: 2506)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
385	294	95

Incident Outcome Types



Incidents by Time of Day



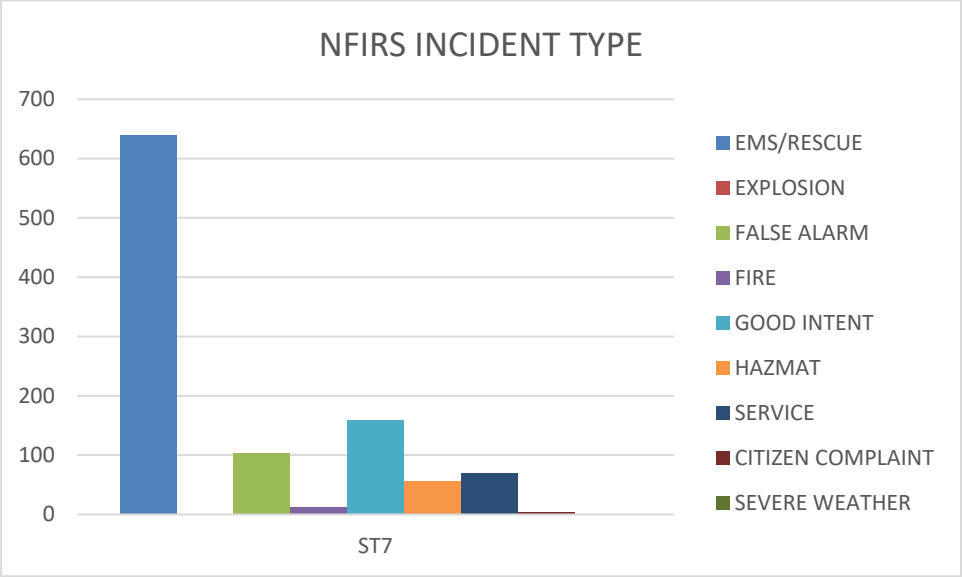
[44] Low volume Engine – without it, we can't get to Gunbarrel

Station 7

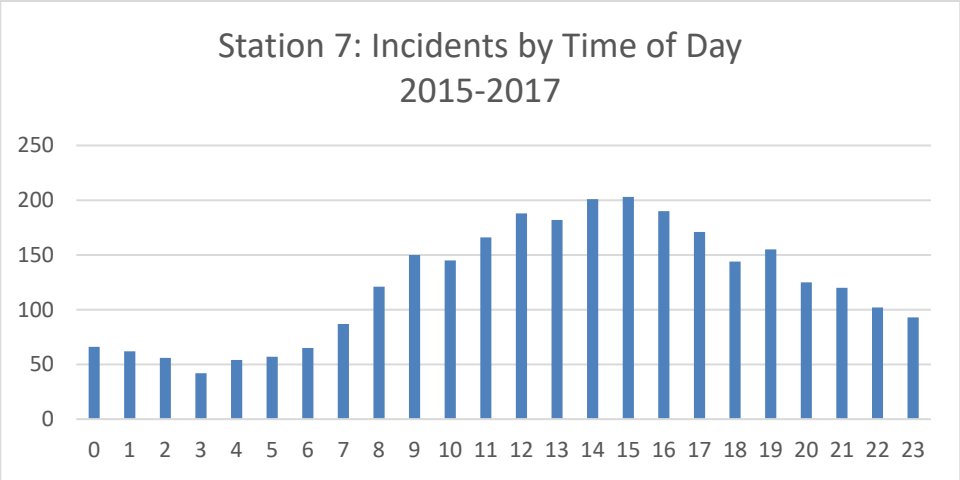
In/Out of Territory Responses (Unit: 2507)

Total Number of Incidents in Territory	Handled by First Due	Handled by Another Unit
1208	934	450

Incident Outcome Types



Incidents by Time of Day



Concentration

Concentration is the arrangement of resources within the jurisdiction. Resources should be spaced near one another to assemble an Effective Response Force (ERF) for the type and magnitude of incident within adopted public policy periods. Historically, stations and equipment have been placed based on the assumption that all areas have the same risk and probability of an event occurring.

Time Components

In the City of Boulder, all calls are dispatched by the Boulder Police Department, who serves as the public safety answering point (PSAP) for BFR.

BFR measures alarm handing (processing), turnout, travel, and total response time (2C.5).

- Alarm handling/processing - begins after the dispatcher has received the call and begins dispatching units.
- Turnout - begins when a unit receives notification of the emergency and ends when the unit is en-route to the emergency incident (the unit's wheels begin to roll). The maximum time for turnout should not exceed one minute.
- Travel - begins when a unit is en-route to the emergency incident (the unit's wheels begin to roll and 911 is notified that the unit is responding) and ends when the unit arrives on the scene.
- Total response - is the sum of each of the time components (Alarm handling +Turnout + Travel). Time begins when 911 receives notification of the emergency and ends when the unit(s) arrive(s) on the scene.

The target service-level objectives in the benchmark statements are based on industry standards and best practices, and the needs of the department. The objectives are included in the BVCP which has been adopted by City Council.

Benchmarking

Establishing a benchmark offers the agency a figurative "target" to aim for. Below are the benchmark response-time objectives for each level of service. BFR considers the area served as an urban community. All response time benchmarks are for an urban population density.

Baseline Performance

Before measuring baseline emergency responses, all non-emergency responses, mutual aid assistance, exposures, and NULL arrival time values were removed. NULL time values are removed because these times represent an incomplete time segment. E.g.: if a unit were cancelled, the arrival time would be equal to NULL because it never happened. Upgrades and downgrades are also not considered because they would have been driving with the flow of traffic for a portion of their response. Measuring mutual-aid units does not assess BFR capabilities in the City of Boulder, therefore these responses are not included. For fire incidents, AMR was excluded because they are not used to create a fire ERF. Statistical outliers were removed when possible. The definition of a statistical outlier is 1.5 times the Interquartile Range *IQR).

The categories and criteria for measuring baseline performance at the 90th percentile is detailed below.

HazMat	EMS	Fire
Low		
CAD**:** HAZMINF-Minor hazmat response First arriving Engine Company (all hazmat ops cert.) (3)		CAD: FINONF - Non Struct Fire 3 personnel.
Moderate		
CAD: HAZMAJF-HAZMAT major response		CAD: FISTRF-Struct Fire/Smoke insi - 13 personnel. NFIRS Property use 419/429
High		
CAD**:** HAZMFULLF-Countywide Hazmat	CAD: Engine or an ambulance on-scene 4 or more personnel with a minimum of 2 EMT's and 2 Paramedics.	CAD: FISTRF-Struct Fire/Smoke insi - 16 personnel (apartment fires and commercial fires). NFIRS Property use not 419/429

Critical Tasking

Evaluating the critical tasks required for on-scene operations is another element of a standard of cover analysis. Understanding the critical tasks that need to be completed to mitigate this incident will assist in determining appropriate staffing levels, number of units needed, deployment strategies, and duties to be performed at an incident. A department must be able to determine what tasks should be completed to have a positive influence on the outcome of the situation and define the number of personnel and apparatus required to complete those tasks in an effective manner. Because each emergency varies, and the order of activities undertaken to achieve objectives may vary depending on the immediate needs. The variables of the scene should be assessed upon arrival to determine where the resources available can be most effectively used to meet our primary objectives, Life Safety (occupants, emergency workers, bystanders, etc.), Incident Stabilization, and Property Conservation (LIP).

A minimum number of personnel must be identified to initiate all tasks required, and an incident commander must be on-scene to assign the specific tasks. BFR critical tasks are not pre-assigned based on unit designation (e.g.: ladder trucks are not always assigned the task of ventilation); however, the incident commander takes into consideration the type of unit and equipment available before assigning a specific task to a crew.

All personnel have the training required to perform the specific tasks assigned. Assigning tasks to crews rather than to individuals maintains crew integrity and thereby increases firefighter safety, efficiency, and accountability. BFR defines critical tasks for low risk fire incidents, residential/commercial structure Fires, EMS, TRT, and HazMat responses.

BFR is unable to record timestamps for critical tasking as there is no field to record them in. At this time, one would have to query the CAD comments to derive certain time stamps if the crews report them. This is an area for improvement within BFR. Currently, BFR dispatches the same compliment to a residential structure fire and a commercial structure fire. Through the Standard of Cover process, BFR identified the need to alter the dispatch array to fire incidents based on the critical task analysis.

System Performance

FIRE

Low Risk Fire

Benchmark: Low Risk Fire

The Department's benchmark service-level objectives are as follows:

For 90 % of all Low Risk structure fires, the total response time for the arrival of the first-due unit, staffed with three personnel, shall be 6 minutes

For 90 % of all Low Risk structure fires, the total response time for the arrival of the effective response force (ERF) of three personnel shall be 6 minutes.

Critical Tasks: Low Risk Fire

For a low-risk fire (ex: dumpster fire), the total personnel needed for an effective response force is 3. A dumpster fire compliment is: 1 engine (3).

Low Risk – Fire Suppression	
Critical Task	**Minimum Personnel**
Incident command	1
Pump operator	1
Fire Attack	1
Total	**3**

Baseline: Low Risk Fire

For 90 % of all Low Risk structure fires, the total response time for the arrival of the first-due unit staffed with three fire personnel is 10 minutes and 31 seconds.

For 90 % of all Low Risk structure fires, the total response time for the arrival of the ERF staffed with three fire personnel is 10 minutes and 31 seconds.

*Low Risk Fire Response Times**

(Fire) (Low) 90th Percentile Times Baseline Performance			2015-2017	2019	2018	2017	2016	2015	Target (Agency Benchmark)
Alarm Handling	Pick-up to Dispatch	Urban	1:16			0:43	0:42	2:17	
						N =259	N=276	N=230	
Turnout Time	Turnout Time 1st Unit	Urban	2:21			2:11	2:32	2:20	
Travel Time	Travel Time 1st Unit **Distribution**	Urban	8:13			8:27	8:41	7:15	
	Travel Time ERF **Concentration**	Urban							
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:31			10:23	10:49	10:32	
	Total Response Time ERF **Concentration**	Urban							

*outliers were not removed from this dataset. This data set was calculated in Tableau with no outliers removed. This was done due to data integrity issues.

Moderate Risk Fire

Benchmark: Moderate Risk Fire

For 90 % of all Moderate Risk structure fires, the total response time for the arrival of the first-due unit, staffed with three to five firefighters, shall be 6 minutes.

For 90 % of all Moderate Risk structure fires, the total response time for the arrival of the ERF, staffed with eighteen personnel shall be 8 minutes.

Critical Tasks: Moderate Risk Fire

A residential structure fire compliment is: 3 engines (E) (9 personnel), 1 ladder (L) (3 personnel), safety officer (SO) (1 person), and battalion chief (BC) (1 person).

For a moderate-risk incident (ex: residential structure fire), the current deployment is 4E,1L,1BC. However, after a critical task analysis it was determined that dispatch procedures should change. The total personnel needed for an effective response force is 14.

Moderate Risk – Fire Suppression (*Single Family Residence < 3,0000 sq. ft.*)	
Critical Task	**Minimum Personnel**
Incident command	1
Pump operator	1
360- IC1 / Initial attack line (min. 1 ¾ line)	2
Water Supply (5” supply lines from permanent water supply)	1
Search and Rescue	2
Ventilation	2
Utilities	1
Safety officer (certified incident safety officer)	1
On-Deck (Rapid Intervention Team (RIT))	3
	14

Baseline: Moderate Risk[45]

For 90 % of all Moderate Risk structure fires, the total response time for the arrival of the first-due unit, staffed with three firefighters, is[46] 6 minutes and 29 seconds.

For 90 % of all Moderate Risk structure fires, the total response time for the arrival of the ERF, staffed with fourteen personnel is[47] 14 minutes and 10 seconds.

(Residential Structure Fire) (Moderate) 90th Percentile Times Baseline Performance			**2015-2017**	**2019**	**2018**	**2017**	**2016**	**2015**	**Target (Agency Benchmark)**
Alarm Handling	Pick-up to Dispatch	Urban				00:42	00:32	1:21	1:00
Turnout Time	Turnout Time 1st Unit	Urban				02:28	02:22	02:26	1:00
Travel Time	Travel Time 1st Unit **Distribution**	Urban				04:30	05:07	04:45	4:00
	Travel Time ERF **Concentration**	Urban				11:48	12:21	09:30	6:00
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban				06:29	07:53	07:40	6:00
						N= 31	N=34	N=46	
	Total Response Time ERF **Concentration**	Urban				14:10	22:55[48]	12:54	8:00
						N=31	N=34	N=46	

Exclusions – AMR, Inspections Vehicles, Automatic Aid (1)
Inclusions - Prop use = 419 & 429

[45] No outliers in this set
[46] This time standard is not an aggregate, this displays 2017 incident data
[47] This time standard is not an aggregate, this displays 2017 incident data
[48] Need to investigate this further

Wildland Fire Risk

Benchmark: Wildland Fire Benchmarks

> For 90 % of all Wildland fires, the total response time for the arrival of the first-due unit, staffed with three firefighters, shall be 6 minutes.

At this time there is only a response benchmark for the first arriving unit. A slower response standard for the ERF is necessary to account for travel time to distant portions of the city as well as non-emergency responses to some incidents.

Critical Task: Wildland Fire

Critical tasks for wildland incidents are nearly impossible to define because the nature of assets that are needed are not determined until the arrival of the first-arriving wildland unit. Depending on the incident, other assets may be sent non-emergency, requested from other mutual aid partners, or not requested at all. The goal of the Wildland team is to recognize and identify the need for additional personnel and resources.

In the wildland fire environment, four basic safety hazards confront the firefighter -lightning, fire-weakened timber, rolling rocks, entrapment by running fires. Each firefighter must know the interconnection of Lookouts, Communications, Escape Routes, and Safety Zones (LCES). LCES should be established before fighting the fire: select lookouts, set up a communication, choose escape routes, and select safety zones. In the instance of a high/extreme fire, BFR would automatically need to request mutual aid for additional personnel.

Outlined, on the next two pages, are the three types of critical tasking based on risk in the wildland environment.

Low Risk	
Command	1
Size-Up	
IAP/LCES	
Fire Attack/Structure Protection	2
Total	**3**

Moderate Risk	
Command	1
Size-Up	
IAP/LCES	
Fire Attack/Structure Protection	2
Anchor/Flank	3
Water Supply	3

	8

High/Extreme Risk	
Command	IC
Size-Up	IC
IAP/LCES	IC
Fire Attack/Structure Protection	2
Anchor/Flank	3
Water Supply	3
	8

2015-2017 Wildland Incident Response

Incident Type	**Count of Incidents**
AutoAid: Wildland Fire	22
AutoAid: Wildland Task Force	14
FIWILF-Wildland/Grass fire	69
Total	**105**

Due to the low volume and varied wildland response, the incident responses are calculated with an aggregate for total response time.

The average response time for wildland events is 1 hour 45 minutes, while the 90th percentile is 1 hour and 14 minutes. There is a wide variety of reported data, with a minimum response time of 12 seconds and a maximum response time of 30 hours. This leads to the conclusion that there are validity issues with this data.

EMS

BFR responds to a wide variety of EMS calls including falls, motor vehicle accidents, childbirth, difficulty breathing, and cardiac arrests. BFR sends an engine to all BLS incidents. Engine companies respond to all basic life support (BLS) calls; an engine and a private ambulance company respond to advanced life support (ALS) calls, the private ambulance transports patient to the hospital.

Seven Engines and one ladder are basic life support (BLS) first responders. Each piece of apparatus is staffed with three personnel. The department relies upon a third-party provider to provide Advanced Life Support (ALS) and transport to patients. The department utilizes the ambulance service to complete the ERF component of its EMS program.

There are between 2- 10 ALS ambulances in the system at any given time. The ALS ambulances are staffed with a minimum of two personnel, one of whom must be a paramedic. The ambulance providers are required to meet response time criteria of 7 minutes 90% of the time and 11 minutes 98% of the time.

The initial arriving fire department company shall have the capabilities of providing first responder medical aid including automatic external defibrillation, until the third-party provider arrives on scene. If the third-party provider unit arrives on scene first, its personnel shall initiate care and the staff from the initial fire department company shall provide support as needed.

High	ALS	L1	911 typically dispatches 1 fire unit and 1 ambulance to these incidents. Low acuity incidents are “L1” problem codes in CAD, all “EMSF” problem codes are also included in this category due to the unknown nature of the complaint at the University. Calls generated from campus are not EMD’d.

Image 21. CPR Chain of Survival

High Acuity EMS

Benchmark: High Acuity

The Department's benchmarks are as follows:

For 90% of all High Acuity EMS response incidents, the total response time for the arrival of the 1st Unit is 6 minutes.

For 90% of all High Acuity EMS response incidents, the total response time for the arrival of the arrival of the ERF of 4 personnel (1 paramedic) is 7 minutes.

Critical Tasks: High Acuity EMS

The first due BLS unit shall be capable of: providing incident command and producing related documentation; completing patient assessment; providing appropriate treatment; performing automatic external defibrillator (AED); initiating cardio-pulmonary resuscitation (CPR). For moderate acuity incidents, a third-party ambulance is used to accomplish the ERF. During these events there is a high likelihood that the patient will need ALS intervention. The ALS unit shall be capable of: providing appropriate treatment; providing IV access medication administration.

Moderate Risk – EMS	
Critical Task	**Minimum Personnel**
Incident command	1
Airway Management/Patient Assessment/Treatment	
Possible AED/Chest Compressions/Medication	1
Patient Packaging/ Transport	2
Total	**4**

Baseline: High Acuity

For 90 % of all High Acuity EMS incidents, the total response time for the arrival of the first-due unit, staffed with three personnel is, 9 minutes and 11 seconds.

For 90 % of all High Acuity EMS incidents, the total response time for the arrival of the ERF, staffed with five personnel (1 Paramedic) is, 10 minutes and 42 seconds

*High Acuity EMS Response Times**

(EMS) (High Acuity) 90th Percentile Times Baseline Performance			2015-2017	2019	2018	2017	2016	2015	Target (Agency Benchmark)
			N=18072			N=6384	N=6262	N=5426	
Alarm Handling	Pick-up to Dispatch	Urban	3:13			2:56	2:59	4:08	1:00
Turnout Time	Turnout Time 1st Unit	Urban	1:31			1:02	1:04	1:54	1:00
Travel Time	Travel Time 1st Unit **Distribution**	Urban	6:03			5:59	6:09	5:57	4:00
	Travel Time ERF (AMR) **Concentration**	Urban	8:24			8:04	8:27	8:41	5:00
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	9:11			08:26	08:44	11:12	6:00
			N=18072			N=6384	N=6262	N=5426	
	Total Response Time ERF (AMR) **Concentration**	Urban	10:52			10:03	10:24	12:41	7:00
			N=18072			N=6384	N=6262	N=5426	

*Outliers were not removed from this data set. Included in this data set is severity = C,D,E and all un-coded medical calls

Low Volume Incidents

BFR responds to a multitude of incidents other than fires or EMS. These include Hazmat, technical rescue, severe weather, natural disaster, and service calls. While individually these calls do not happen in large numbers, as a total they do represent a substantial amount of calls.

Hazmat

As mentioned earlier, Hazardous materials response is a locally provided service mandated by federal statute. Federal law requires Colorado to develop a hazardous materials response system. The responsibility for the development of this system was delegated to local jurisdictions by statute. The statute requires local governing bodies to appoint a Designated Emergency Response Authority (DERA) for the purpose of responding to hazardous materials emergencies. In order to provide the citizens with the best possible and most cost-effective response, Boulder County has one county Hazardous Materials Team. The team is comprised of City of Boulder, City of Longmont, Boulder Rural Fire Protection District and City of Lafayette.

Response is the portion of incident management in which personnel are involved in controlling a hazardous materials incident defensively or offensively. The activities in the response portion of hazardous materials incident include:

(a) Analyzing the incident
(b) Planning the response
(c) Implementing the planned response
(d) Evaluating the process

A slower response standard is necessary to account for travel time to distant portions of the city as well as non-emergency responses to some incidents. The slower standard also accounts for other municipalities responding to fill the ERF.

Low Risk Hazmat

Benchmark: Low Risk Hazmat

The Department's benchmark service-level objectives are as follows:

For 90 % of responses for Low Risk HazMat incidents, the total response time for the first due unit staffed with a minimum of 3 personnel shall be: 6 minutes.

For 90 % of responses for Low Risk HazMat incidents, the total response time for the ERF unit staffed with a minimum of 3 personnel shall be: 6 minutes.

Critical Tasks: Low Risk Hazmat

One operational level trained response vehicle (either an engine, truck, or rescue). First apparatus (engines, trucks, and rescues) that are equipped with hand-tools and trained to arrive on-scene and take appropriate initial actions to mitigate small isolated incidents or until the HMRT arrives. Initial alarm equipment can be on the scene in a timely manner and begin incident stabilization.

Low Risk – HazMat	
Critical Task	**Minimum Personnel**
Incident command	1
Fire Attack	2
Total	**3**

Baseline: Low Risk HazMat (Hazmat Minor)

(Hazmat) (Low Acuity) 90th Percentile Times Baseline Performance			2015-2017	2019	2018	2017	2016	2015	Target (Agency Benchmark)
Alarm Handling	Pick-up to Dispatch	Urban				00:27	00:39	02:29	
Turnout Time	Turnout Time 1st Unit	Urban				01:21	00:36	02:19	
Travel Time	Travel Time 1st Unit **Distribution**	Urban				05:42	03:16	05:02	
	Travel Time ERF **Concentration**	Urban				05:42	03:16	07:10	
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban				07:30	12:20	09:44	
						N=9	N=9	N=7	
	Total Response Time ERF **Concentration**	Urban				07:30	12:20	09:44	
						N=9	N=9	N=7	

The incidents from 2015-2016 are not statistically significant due to the low incident volume. The 2016 data cannot be verified.

In 2017, there was a total of 44 emergent and non-emergent responses to Hazmat Minor.

HAZMINF-Minor hazmat response	
1E,1BC	44

Moderate Risk Hazmat

Benchmark: Moderate Hazmat

The Department's benchmark service-level objectives are as follows:

For 90 % of responses for Moderate Risk HazMat incidents, the total response time for the first due unit staffed with a minimum of 3 personnel shall be 6 minutes.

The Hazmat Authority benchmark service-level objectives are as follows:

For 90 % of responses to High Risk HazMat incidents, within the vicinity of

- East of Broadway/Hwy 93/U.S. 36
- North of Hwy 128
- South of Hwy 66
- West of East County Line Road

the total response time for the arrival of the effective response force (ERF) minimum of 13 people personnel shall be 90 minutes.

For 90 % of responses to High Risk HazMat incidents, outside of the area defined above, the total response time for the arrival of the effective response force (ERF) minimum of 13 people personnel shall be 120 minutes.

Critical Tasks: Moderate Hazmat

One Hazmat unit is capable of assessing safe entry routes to the incident, identifying a defensive perimeter and an operational area and staging area, directing defensive operations, and initiating a site-specific written action plan. They shall be capable of preparing for and initiating offensive Hazmat operations, decontamination operations, and property conservation operations.

High Risk – HazMat (3E,1BC,1HM, 1AM)	
Critical Task	**Minimum Personnel**
HazMat Group Supervisor	1
Safety Officer	1
Entry Team Lead	1
Entry Team	2
Backup Entry Team	2
Research Lead	1
Research	1
Decontamination Leader	1
Decontamination Team	2
Site Access	1
Total	**13**

Baseline: Moderate Risk Hazmat (Hazmat Major)

- 2017: 2 Incidents in this category
- 2016: 2 Incidents in this category
- 2015: 4 incidents in this category, only 3 of which had all units dispatched at the same time

In 2017, there were a total of 3 hazmat responses, 2 emergent, 1 non-emergent

HAZMAJF-HAZMAT major response	
3E,1BC,1HM, 1AM	3

High Risk Hazmat

Benchmark: High Risk Hazmat

Boulder County level response

The Department's benchmark service-level objectives are as follows:

For 90 % of responses for High Risk HazMat incidents, the total response time for the first due unit staffed with a minimum of 3 personnel shall be 6 minutes

The Hazmat Authority benchmark service-level objectives are as follows:

For 90 % of responses to High Risk HazMat incidents, within the vicinity of

- East of Broadway/Hwy 93/U.S. 36
- North of Hwy 128
- South of Hwy 66
- West of East County Line Road

the total response time for the arrival of the effective response force (ERF) minimum of 13 people personnel shall be 90 minutes.

For 90 % of responses to High Risk HazMat incidents, outside of the area defined above, the total response time for the arrival of the effective response force (ERF) minimum of 13 people personnel shall be 120 minutes.

Critical Tasks: High Risk Hazmat

One Hazmat unit is capable of assessing safety entry routes to the incident, identifying a defensive perimeter and an operational area and staging area, directing defensive operations, and initiating a site-specific written action plan. They shall be capable of preparing for and initiating offensive HazMat operations, decontamination operations, and property conservation operations.

High Risk – HazMat (3E,1BC,1HM, 1AM)	
Critical Task	**Minimum Personnel**
HazMat Group Supervisor	1
Safety Officer	1
Entry Team Lead	1
Entry Team	2
Backup Entry Team	2
Research Lead	1
Research	1
Decontamination Leader	1
Decontamination Team	2
Site Access	1
Total	**13**

Baseline: High Risk Hazmat (Hazmat Full)

2015-2017 There were 0 emergent incidents in the City of Boulder CAD with the problem code: HAZMFULLF. In 2017, there were two incidents with non-emergent response

HAZMFULLF-Countywide Hazmat	
1BC	1
3E,1BC,1HM, 1AM	1