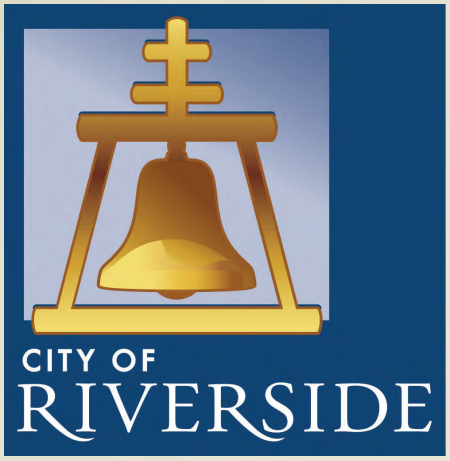
March 2021

Final Summary Report



Riverside Fire Department

Riverside, CA

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CONSULTANT REPORT

City of Riverside Fire Department
Final Summary Report

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EXECUTIVE SUMMARY

This comprehensive summary report includes an executive summary, a presentation slide deck, a quantitative data report, and a geographic information system report. Overall, the firm's strategy is to provide administration and fire department administration with sufficient objective data from which to establish policy. Therefore, all alternatives and recommendations are grounded in the data analysis and best practices, insulating the process from potential biases.

Overall, the Riverside Fire Department (RFD) is an excellent fire department and has considerable external validation. RFD is an accredited agency by the Center for Public Safety Excellence's (CPSE) Commission on Fire Accreditation International (CFAI). Currently, (November 2020) there are 281 internationally accredited agencies in the world. Additionally, RFD was rated as an Insurance Service Organization (ISO) Public Protection Classification 1. In the United States, there are 393 fire departments that have achieved the best ISO rating of 1, which equates to the top 1% of all rated fire departments. Finally, there are only 102 fire departments that are both an ISO 1 and internationally accredited.

The performance audit identified several alternatives that provide operational efficiencies and long-term sustainability. A high-level summary is provided below:

- Recommended move-up policy that will maximize operational deployment
- Creation of an EMS overlay to handle at least 70% of the EMS activity on smaller, less expensive vehicles and with less recurring personnel costs
- Reallocate personnel to the EMS mission to better align resource and cost allocation
- Provide for a more enhanced organizational agility to meet growth in EMS with the best return on investment
- Opportunity to expand the department's quint concept
- Reduce the reliance on large fire apparatus to respond to lower-acuity EMS incidents
- Reduce large fire apparatus incident responses and employee workload by 48% or 19,682 calls
- Introduce fire suppression capacity and readiness back into the system providing cost avoidance for future growth
- Provide for consideration for adopting a continuous staffing strategy that is fiscally beneficial and reduces workload on employees

As presented, all of the observations, recommendations, and alternatives are offered for policy consideration and are not intended to be overly prescriptive. The fire department is well resourced and high performing, and the audit concurs with the excellence that outside agencies such as ISO and CFAI have posited. The alternatives are offered to provide incremental improvement, efficiencies, and long-term sustainability, as desired.

Community Demands for Service

Commensurate with most communities that provide integrated fire and emergency medical services (EMS), requests for EMS are the vast majority of community-driven incident activity. EMS accounted for 74.1% of the incident activity and 63% of all time on task. Fire related incidents accounted for 24.7% of the incidents but only 34% of the overall time on task.

Of the fire related activity, reports of outside fires (1.8%), vehicle fires (0.4%), and structure fires (0.6%) accounted for 2.8% of the total community requests for service.

Table 1: Number of Incidents by Call Category

Call Category	Number of Calls	Average Calls per Day	Call Percentage
EMS	26,310	72.1	69.4
MVA	1,807	5.0	4.8
EMS Total	**28,117**	**77.0**	**74.1**
Cancelled/Wrong Location/No Incident	4,171	11.4	11.0
False Call/Alarm	94	0.3	0.2
Fire Alarm	1,010	2.8	2.7
Fire Other	1,175	3.2	3.1
Outside Fire	680	1.9	1.8
Public Service	1,860	5.1	4.9
Severe Weather or Natural Disaster	7	0.0	0.0
Structure Fire	212	0.6	0.6
Vehicle Fire	161	0.4	0.4
Fire Total	**9,370**	**25.7**	**24.7**
Hazmat	202	0.6	0.5
Hazmat Total	**202**	**0.6**	**0.5**
Rescue	130	0.4	0.3
Rescue Total	**130**	**0.4**	**0.3**
Unknown	107	0.3	0.3
Unknown Total	**107**	**0.3**	**0.3**
Total	**37,926**	**103.9**	**100.0**

Observation:
In 2019, RFD received 37,926 unique requests for service, averaging nearly 104 calls per day.

Observation:
Consistent with most modern fire departments, EMS accounted for the majority of the incidents at 74%.

Observation:
Cancelled calls, wrong locations, and no incident calls occurred 4,171 times in 2019, accounting for 11% of the total reported demand.

Recommendation:
The department is encouraged to evaluate cancelled calls, wrong locations, and no incident calls in conjunction with a robust QA/QI process on incident reporting.

In 2019, RFD answered 37,676 unique requests for service that resulted in 46,828 vehicle movements. The average number of responses per day was 128.3.

Table 2: Number of Calls, Number of Responses, and Total Busy Time by Program

Program	Number of Calls[1]	Number of Responses[2]	Average Responses per Call	Total Busy Hours	Average Busy Minutes per Response	Average Calls per Day	Average Responses per Day
EMS	27,870	31,578	1.1	10,535.9	20.0	76.4	86.5
Fire	9,367	14,521	1.6	5,717.0	23.7	25.7	39.8
Hazmat	202	328	1.6	290.9	53.2	0.6	0.9
Rescue	130	263	2.0	196.2	44.9	0.4	0.7
Unknown	107	138	1.3	40.5	17.6	0.3	0.4
Total	**37,676**	**46,828**	**1.2**	**16,780.6**	**21.5**	**103.2**	**128.3**

[1]"Number of Calls" reflects an adjusted number of calls following any exclusion activity to align with responses made by units assigned to RFD (see Appendix of Data Report).
[2]"Number of Responses" reflects the total number of records in the data file associated with responses made by units assigned to RFD, regardless of calculated busy time.

Observation:
On average, the department is sending 1.2 units to each unique call. This would be considered an efficient utilization of the quantity of resources per incident.

Observation:
The average duration per incident is 21.5 minutes. This is a consistent finding with departments that provide first response medical services but do not provide patient transportation.

Historical Performance

RFD currently operates from 14 fixed-facility fire stations and has a 90th percentile travel time of 6.5 minutes overall. EMS related incidents have a 6.1-minute travel time or less and fire related incidents have a 7.4-minute travel time or less for 90%of the incidents. In other words, 9 out of 10 times, the department will provide this level of service or better.

Dispatch Time

The dispatch time, or call processing time, is intended to measure the time from when the 911 center receives the call or request for service until the dispatch center then dispatches the appropriate closest unit. This is an important segment of time for the department to measure and understand as

it contributes to the overall time of the citizen's experience. Generally, investment in improving dispatch time has a greater return on investment than resource investments on the response side of the continuum.

Table 3: 90th Percentile Turnout, Travel, and Response Times by Program – First Arriving Units

Program	Turnout Time (Minutes)	Travel Time (Minutes)	Response Time (Minutes)	Sample Size[1]
EMS	2.0	6.1	7.6	27,757
Fire	2.1	7.4	8.8	8,095
Hazmat	2.3	7.7	9.3	202
Rescue	1.8	7.3	8.3	130
Unknown	2.1	6.6	7.8	98
Total	**2.0**	**6.5**	**7.9**	**36,282**

[1]Sample sizes reflect the number of responses made by first arriving primary front-line units assigned to RFD; due to missing or excluded time data, sample sizes corresponding to individual table metrics may be smaller.

Observation:
Within the 2019 RMS file provided, 42,248 or 90.2% of the typical dispatch measures were equal to 0 minutes. Therefore, the dispatch interval is not provided here. More granular examination of response times that excluded the 90.2% of zero values resulted in long dispatch time of 4.6 minutes, which are assumed to be outliers, but the sample size is too small to be credible.

Recommendation:
It is recommended that the department evaluate which data sources will have the highest integrity and accuracy, and develop processes and procedures to have timely access to all desired performance measures.

Turnout Time

Turnout time is defined as the time from when the units are notified of an incident by the dispatch center until the unit identifies that it is enroute to the call. It is highly recommended to minimize turnout time as it is largely a no-cost option under management control to realize improved total response time and efficiency.

National recommendations provide differentiation between EMS and fire/special operations incidents. For example, the best practice for an EMS incident is a turnout time of 60 seconds or less 90% of the time. Due to the necessity to don personal protective equipment prior to responding to fire related incidents, best practices provide either 80 seconds (National Fire Protection Association; NFPA) or 90 seconds (CFAI) or less at the 90th percentile for turnout times associated with fire calls. Therefore, turnout and travel times were reported by the major program areas.

Observation:
The turnout time is not well aligned with national best practices of 1 minute for EMS incidents and is reasonably aligned at 1.5 minutes for fire related incidents.

Observation:
Turnout time can have a significant impact on the overall response time for the customer and is generally considered under management's control.

Recommendation:
It is recommended that the department work to align turnout time with best practices.

Travel Time

Travel time, defined as the period from when the units are actually responding until arrival at the incident, is a factor of the number of fire stations, the ability to travel unimpeded on the road network, the existing road network's ability to navigate the community, and the availability of the units. Largely, travel time is the most stable variable to utilize in system design regarding response time performance.

Observation:
Travel time is within the national experience for most metropolitan agencies. It is common for urban/suburban areas to perform between 5 and 8 minutes at the 90th percentile.

Internal Performance Objectives

As an internationally accredited fire department, RFD has adopted a series of benchmark and baseline performance objectives based on severity of risk and call type. As defined in the current Standards of Cover (2017), the travel time is 5:48 seconds, or 5.8 minutes, for first due units to core calls 90% of the time. An overall benchmark (goal) of 5.0 minutes is desirable.[1]

The 2019 data suggest a moderate increase in travel time from the 2017 SOC of 5.8 minutes. In 2019, the travel time is reported as 6.1 minutes for EMS incidents and an overall 6.5 minutes for all incidents at the 90th percentile. In other words, this is a variation between 12 seconds and 42 seconds.[2]

Comparison to National References

There are two notable references for travel time available to the fire service in NFPA 1710[3] and CFAI.[4] NFPA 1710 suggests a 4-minute travel time at the 90th percentile for first due arrival of Basic Life Support (BLS) and fire incidents, and the recommends a 5 minute and 12 seconds travel time for first due arrival in an urban/suburban population density. The arrival of an Advanced Life Support (ALS)

[1] Riverside Fire Department. (2017). 2017 Standards of Cover, p. 74. Riverside, California: Author.

[2] Of course, it is understood that some variance could be attributed to the data audit, treatment of outliers, and statistical analysis.

[3] National Fire Protection Association. (2010). NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. Boston, MA: National Fire Protection Association.

[4] CFAI. (2009). Fire & emergency service self-assessment manual, (8th ed.). Chantilly, Virginia: Author. (page 71)

unit is recommended at 8 minutes travel time by NFPA 1710. It is important to note that the latest edition (9th edition) of the CFAI guidelines have de-emphasized response time and only reference the legacy standards with a separately provided companion document.[5]

System Resiliency

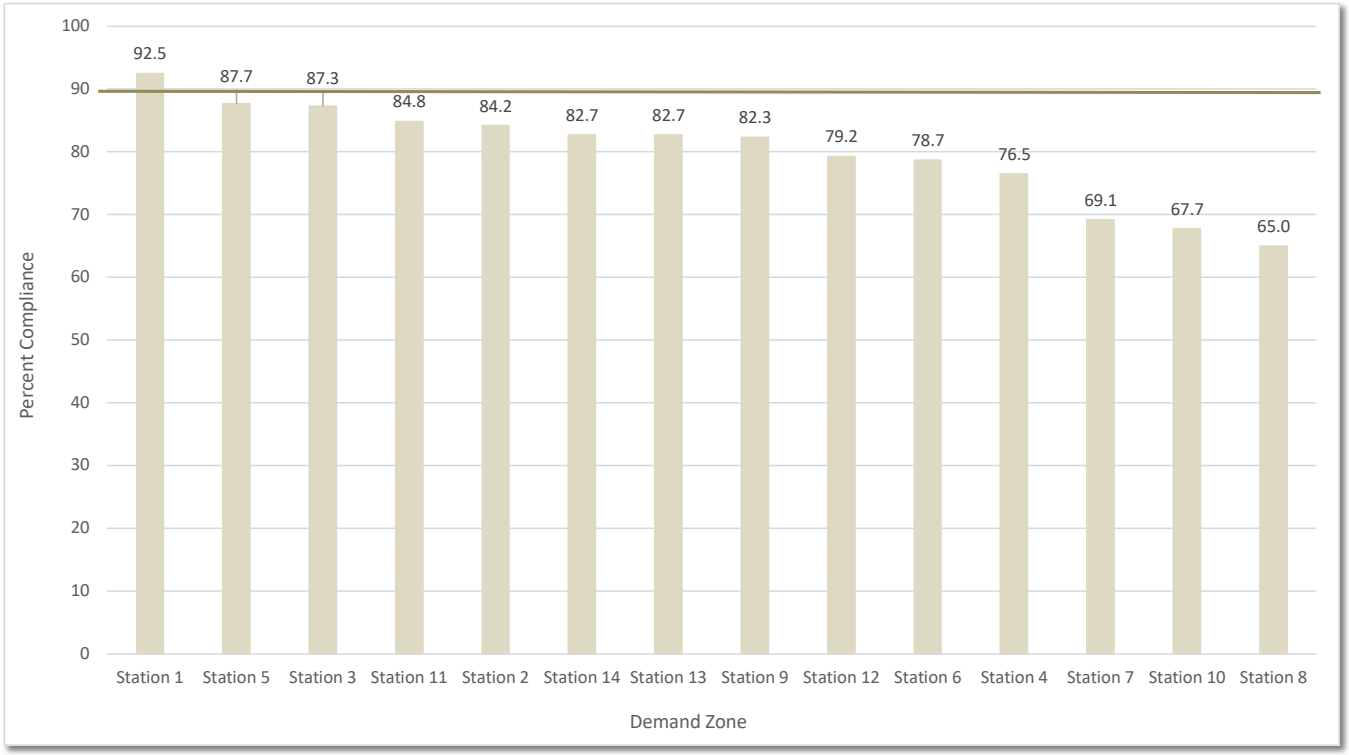
The system design was evaluated to determine if any efficiencies or service gaps existed. Overall, the system is very robust and has very high station reliability, low call concurrency, high resiliency, and quality response times. Response times were evaluated and discussed previously.

Reliability

The reliability of the distribution model is a factor of how often the response model is available and able to respond to a call within the assigned demand zone. This analysis utilized all dispatched calls within RFD's demand zones, and performance included responses from any unit in RFD's department. Units assigned to all stations responded to calls within their respective demand zones between 65% and 92.5% of the time. Units assigned to Station 8 achieved the lowest percent compliance at 65%, and Station 1 had the highest degree of reliability at 92.5%. Three stations were below 70% reliability—Stations 7, 8, and 10.

[5] CFAI. (2016). Fire & emergency service self-assessment manual, (9th ed.). Chantilly, Virginia: Author.

Figure 1: Percentage of First Due Compliance by Demand Zone



Observation:
All stations had 75% or greater station reliability with the exceptions of Stations 7, 8, and 10.

Overlapped or Simultaneous Call Analysis

Overlapped or simultaneous calls are defined as another call being received in a demand zone (or first due station's area) while one or more calls are already ongoing for the same demand zone (or first due station's area). For example, if there is an ongoing call in Station 1's demand zone wherein all RFD units have not yet been cleared, and another request for service occurs in Station 1's demand zone, those two calls would be captured as overlapped calls. Understanding the percentage of overlapped calls may help to determine the number of units to staff for each station. In general, the larger the call volume for a demand zone, the greater the likelihood of overlapped calls occurring. The distribution of the demand throughout the day will impact the chance of having overlapped calls. Additionally, the duration of a call plays a significant role; the longer it takes to clear a request, the greater the likelihood of having an overlapping request.

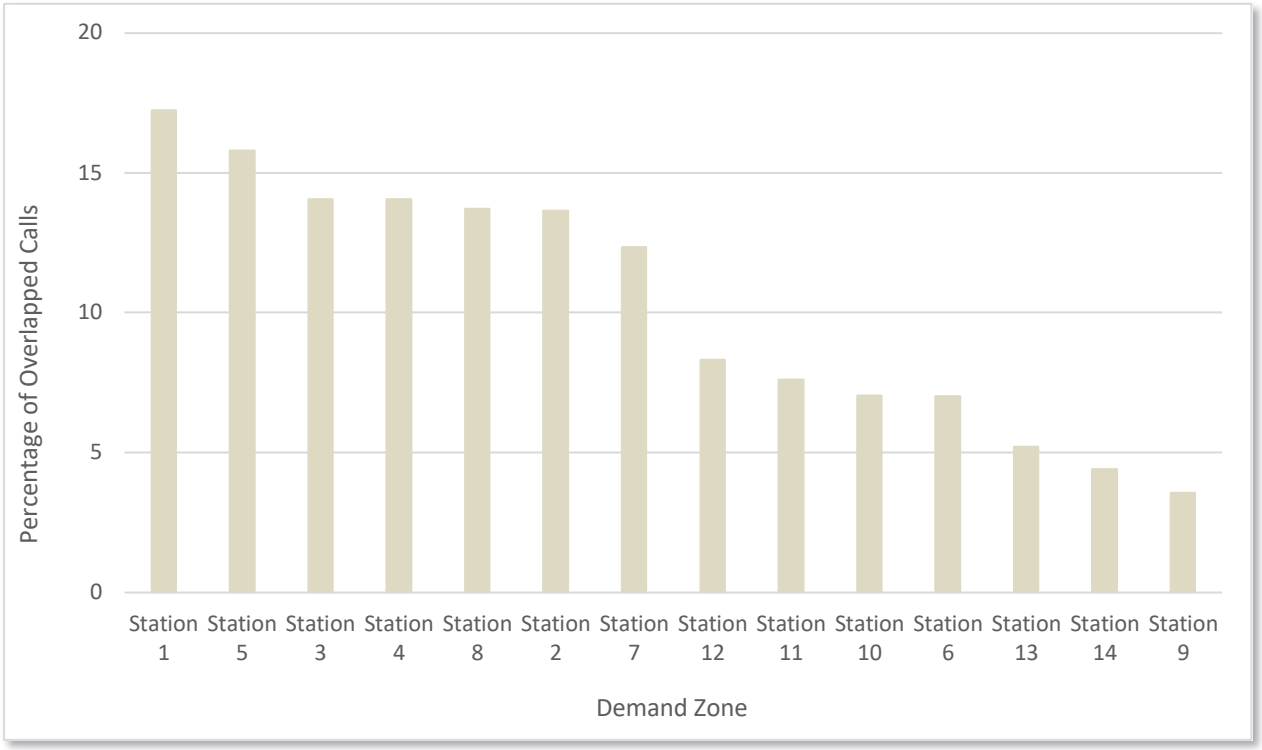
Results for these analyses are reported for all calls and by EMS and fire calls. Note that for EMS and fire calls, overlapped calls represent any call classified in its respective program area, but that overlapped with one or more calls from *any* program area. For example, Station 1's demand zone observed 877 calls during 2019 that overlapped with one or more calls within its jurisdiction—677 were classified as EMS calls, 187 were classified as fire calls, five were classified as hazmat calls, six were classified as rescue calls, and two were classified as unknown calls. The 677 calls that were classified as EMS calls could have overlapped with one or more calls from EMS, fire, or other program areas.

Station 1's demand zone had the highest percentage of overlapped calls during 2019 for overall calls (17.2%), for EMS calls (13.3%), and for fire calls (3.7%).

Observation:
Across all stations, there is approximately an 83% chance that the first call can be dispatched, handled, and the unit return to service prior to a second or greater call occurring.

Observation:
Across all stations, there is greater than a 96% chance that the first fire related call can be dispatched, handled, and the unit return to service prior to a second or greater call occurring.

Figure 2: Percentage of Overlapped Calls by Demand Zone



Considering the Juxtaposition of Station Reliability and Call Concurrency

The measure of call concurrency is directly influenced by the frequency, duration, and distribution of calls throughout the day. In other words, the impact of "busyness" has influence over the call concurrency events and nothing other than community demand would drive simultaneous occurrences. In contrast, the previous analysis of station reliability can be influenced by several non-call related variables such as management decisions. For example, if the department takes units out of service, relocates them to cover other assignments, or sends them to training or other administrative activities, then when calls occur in the "home" station, it would be captured as a missed call. Additionally, for agencies that dispatch with closest unit Automatic Vehicle Location (AVL) systems, the legacy CAD data structure may erroneously report reliability when closer or more appropriate units were sent to the call by design.

There is a case to be made that measures of station reliability are becoming antiquated with the performance measures available today. The measure of station reliability was well intended to be utilized as a surrogate measure for the assumption that the closest unit to a call was the station that was pre-determined to respond to that call. The unintended consequence of overreliance on this measure is that RFD would attempt to create 14 individual fire departments that were 90% responsible for all activity within their respective response areas. This may eliminate efficiencies and potentially duplicate coverage resulting in excess capacity in the system.

Moving towards a system of measures may be a more desirable and valid approach to answer the performance validation of the system. For example, if the goal is to respond to all calls within 8 minutes (current performance) total response time, and that goal is met greater than 90% of the time, then the station reliability measure would be unnecessary as it is intended to be a surrogate of sending the closest unit with the assumption of meeting the desired performance goal, which has already been met. A system of measures such as workload (unit hour utilization; UHU), call concurrency, and response time performance would ensure desired performance more eloquently than station reliability, especially in an urban environment.

Observation:
Understanding the relatively low call concurrency rates of less than 18%, it is unlikely that call volume alone is contributing to the challenges in station reliability.

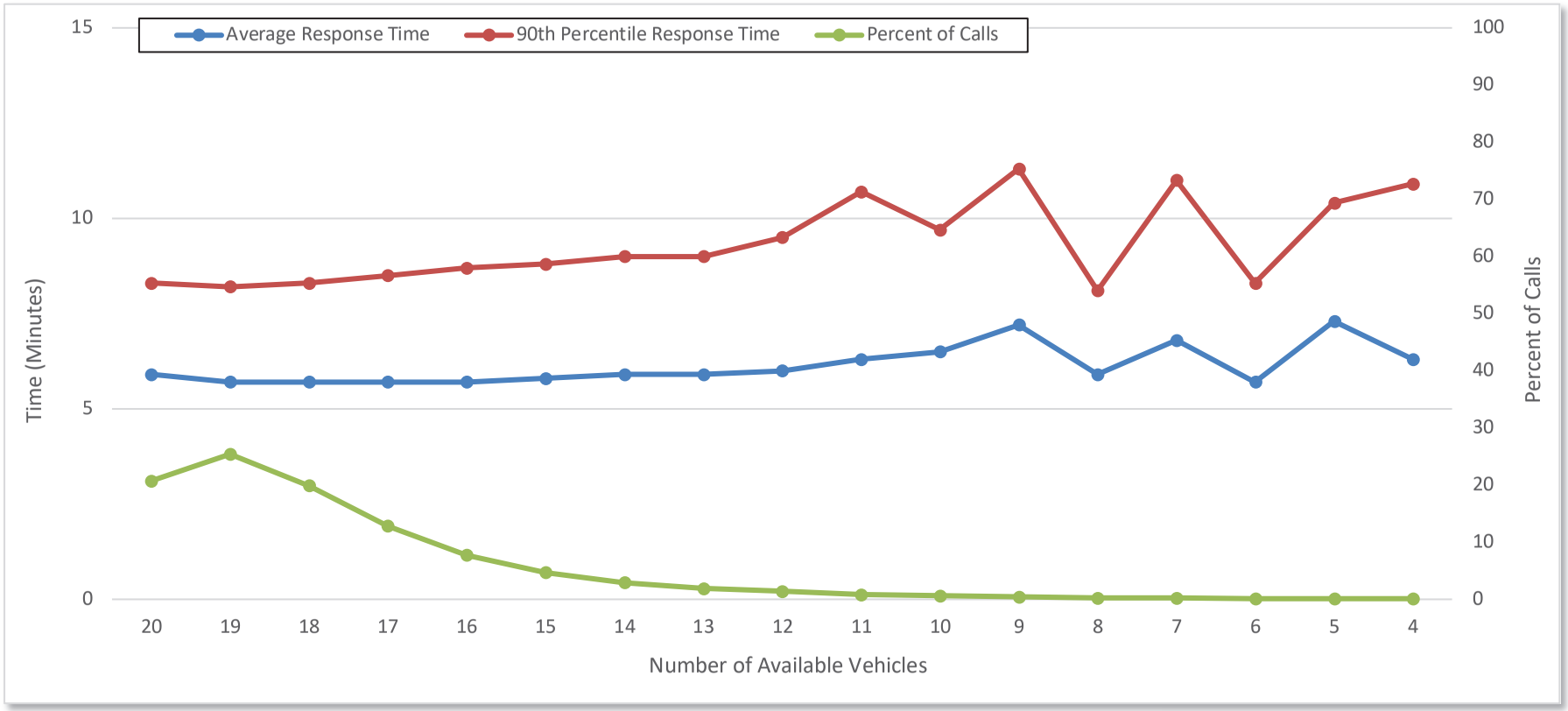
Recommendation:
It is recommended that the department further investigate potential contributors to the station reliability findings, if desired.

Recommendation:
Conversely, the department is encouraged to consider discontinuing measuring station reliability, or at least desensitizing it, as a system of measures can provide a more robust outcome-based approach to performance management.

Impact to Response Time by the Number of Available Vehicles

Analyses were completed to measure the relative impact to response time in relation to the number of available units. The green line represents the percent of calls by number of available units' category. The blue line represents the average response time, and the red line represents the 90th percentile response time. Total response time varied by less than 3 minutes between 20 units and 4 units available at the 90th percentile and average total response times. In total, 91.2% of all calls were handled with 15 or more available vehicles in the system.

Figure 3: Average and 90th Percentile Response Times by Number of Available Vehicles



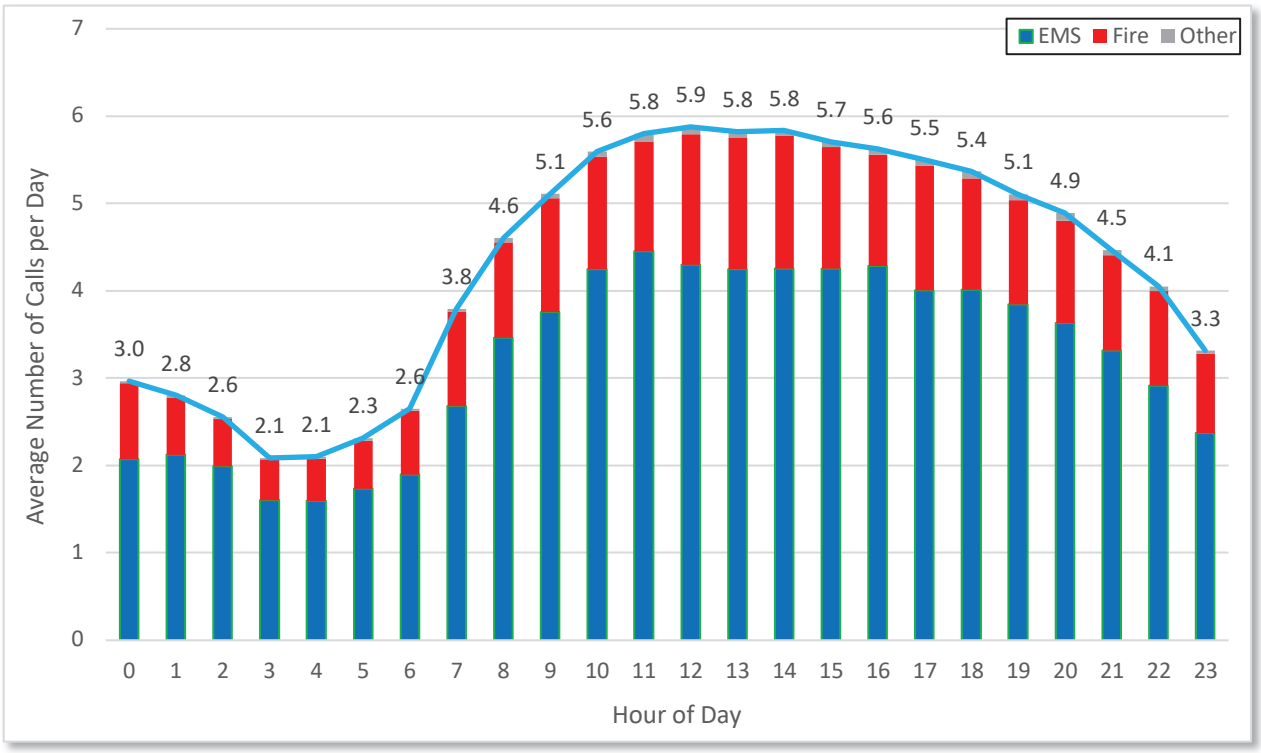
Observation:
The model is robust and has considerable resiliency in the system as response times are minimally impacted at the system level.

Observation:
Overall, 91.2% of the time when a call occurs, 16 units or more were available.

Temporal Distributions

Temporal analysis enables examination and modeling of behavior of a variable in a data set over time (e.g., to determine whether and how concentrations are changing over time). Analysis indicated no significant change in demand by month of year or day of week. However, there is significant variability by hour of the day. Throughout the peak of the day, the department averages 6 calls for service per hour with a considerable difference between the peak of the day and non-peak hours. The rate of fire related incidents would not indicate a strong community demand for fire suppression activity. The fire suppression program could absorb more work if needed or desired.

Figure 4: Average Calls per Day by Hour



Observation:
Significant variability in demand occurs by hour of day. The peak demand between 10 am and 6 pm averages 6 calls per hour.

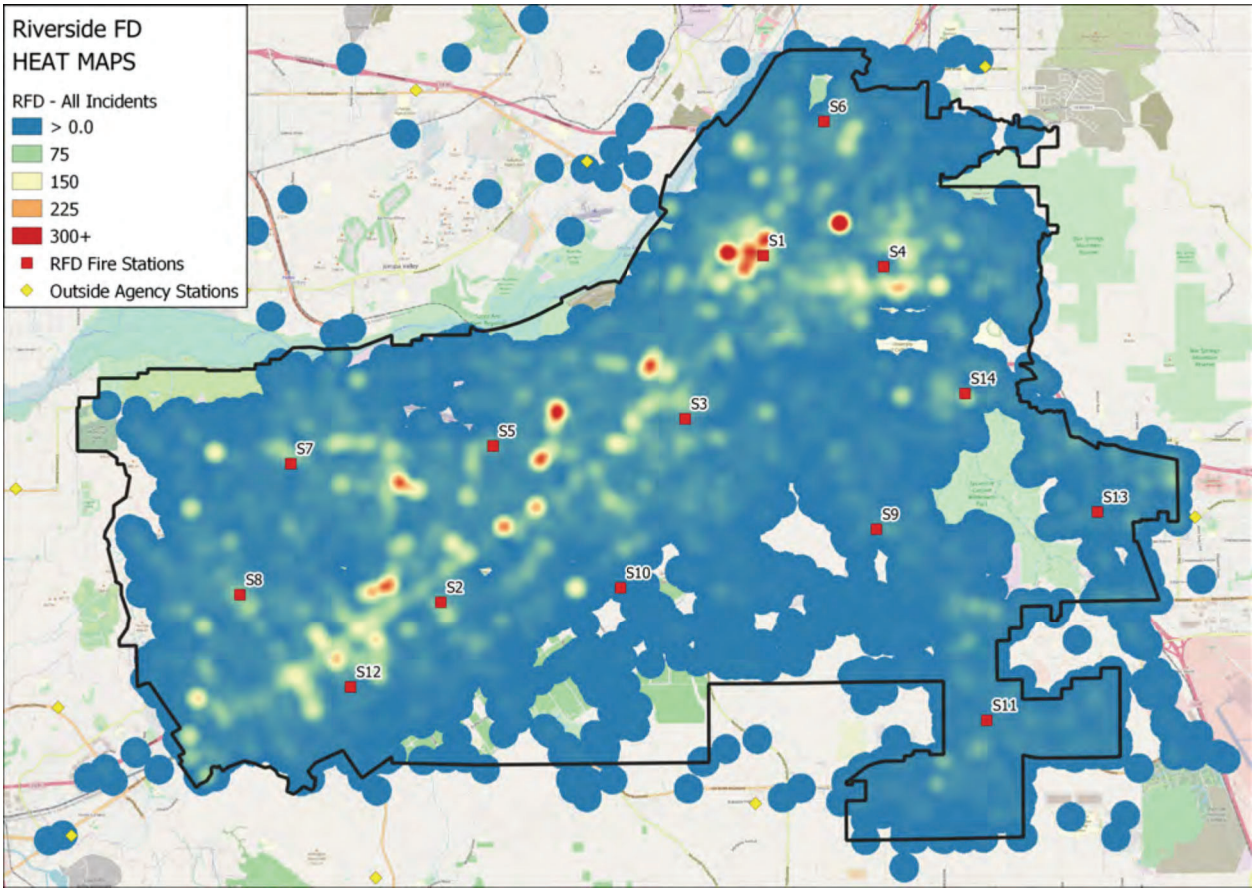
Community Risk Assessment

Distribution of Risk / Demand Overall and by Program Areas

Heat maps were created to identify the concentration of the historic demand for services overall and by program area (i.e., EMS, fire, hazmat, and rescue). The blue areas have the lowest concentration of demand and the dark red areas have the highest concentration of demand.

The saturation areas (red) are relative to show where demand is highest in relation to other areas in the community. It is noted that there is relatively balanced dispersion across the jurisdiction for concentration of EMS and fire incidents in relation to the remaining coverage area.

Figure 5: Heat Map for All Incidents



Observation:
A relatively uniform distribution of risk occurs across the community with the higher concentrations through the center of the community.

Figure 6: Heat Map for EMS Related Incidents

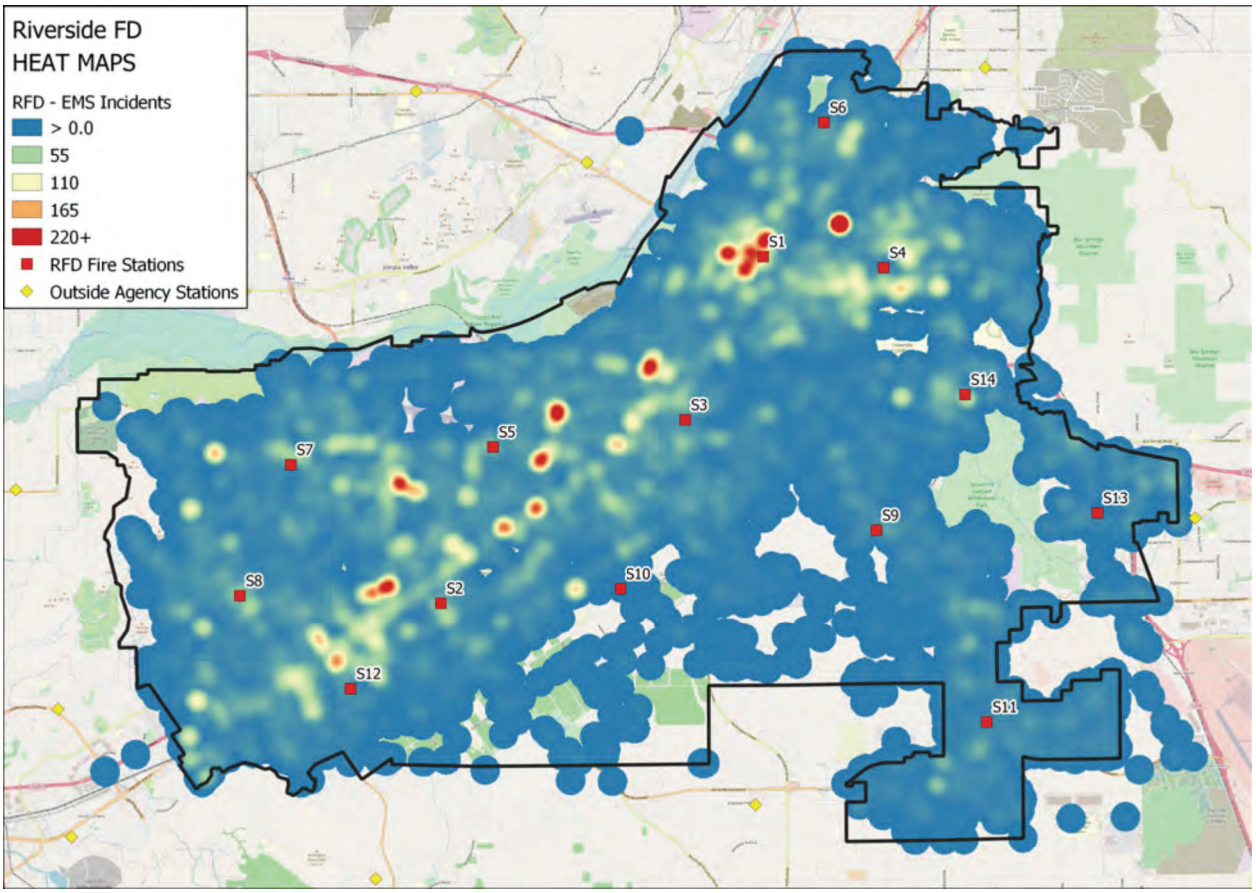
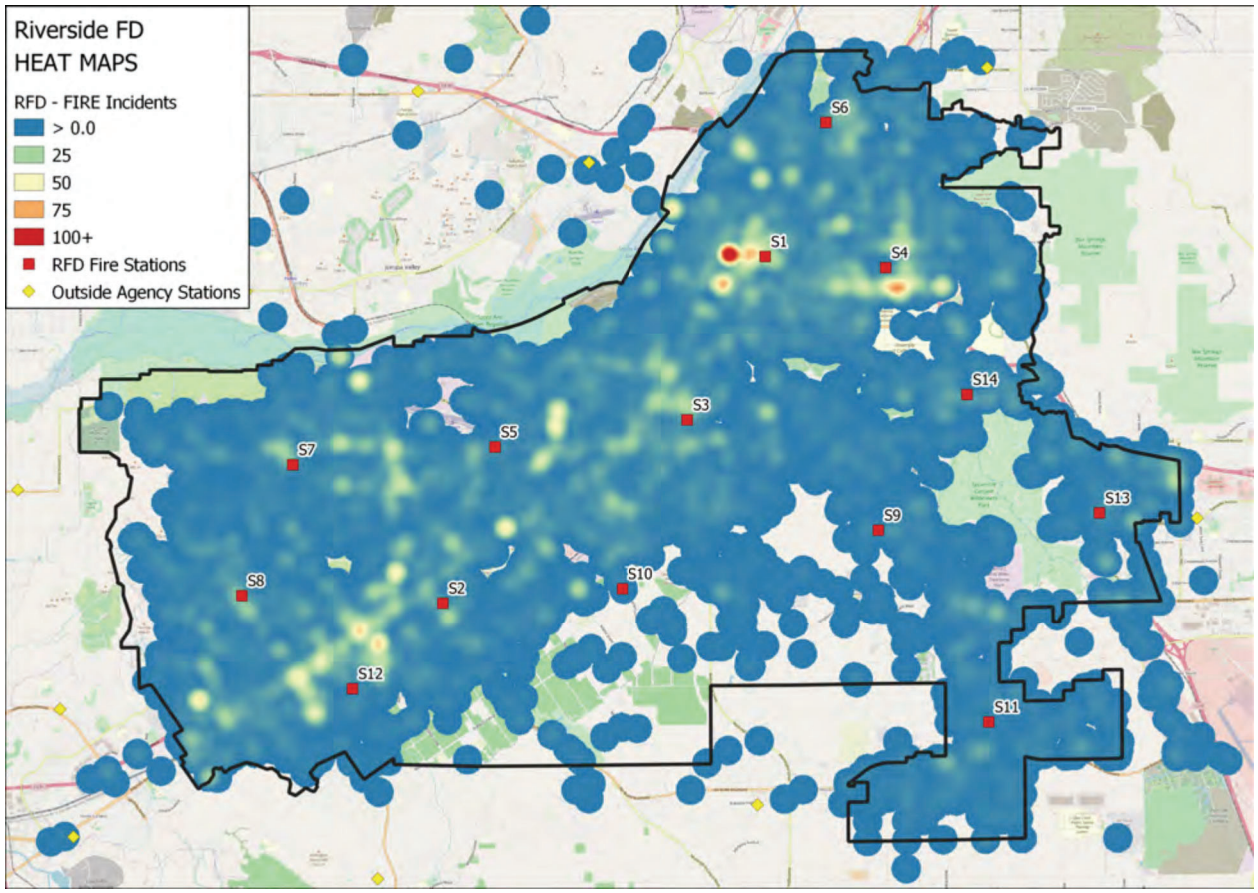


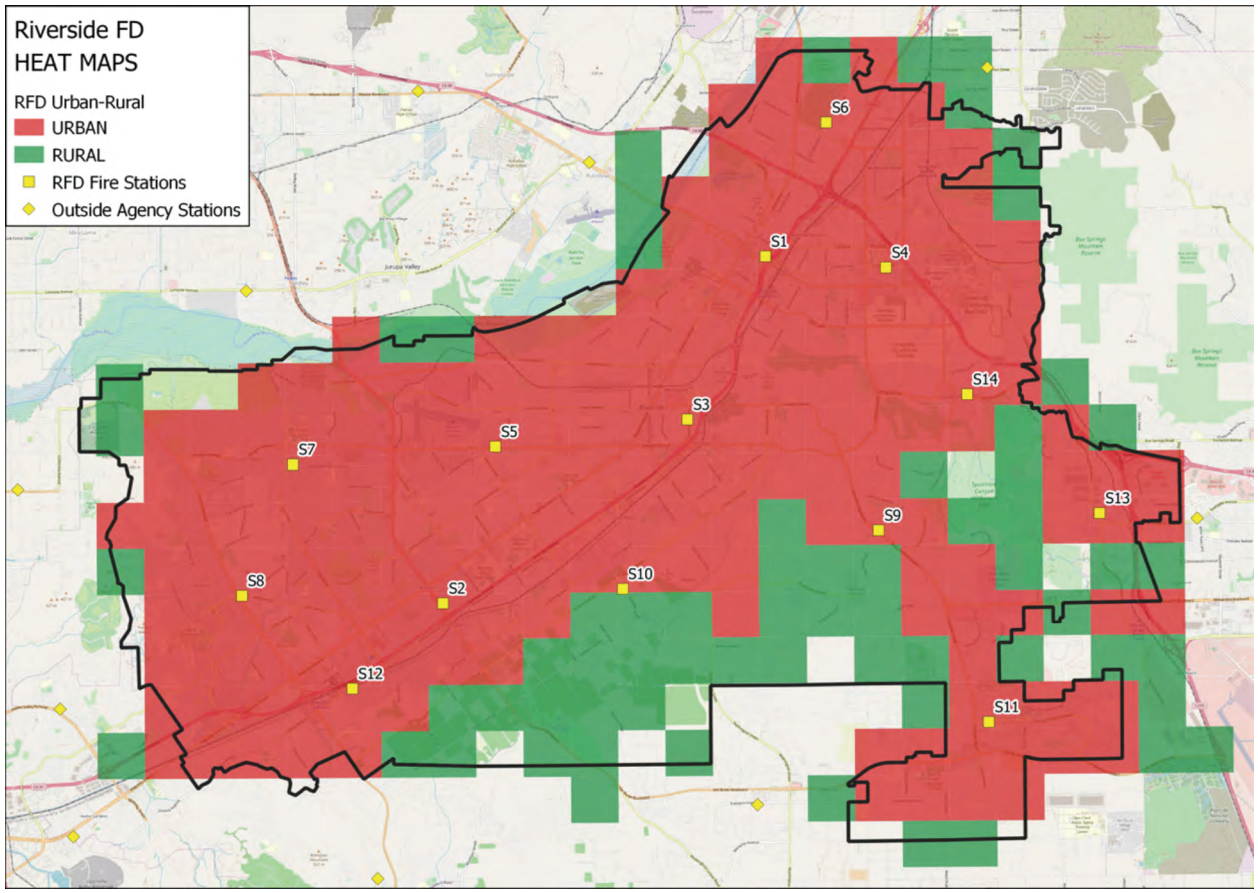
Figure 7: Heat Map for Fire Related Incidents



Observation:
The relative geographic distribution between fire and EMS incidents is consistent across the two program areas.

Finally, we calculated call density based on the relative concentration of incidents over approximately 0.5-mile geographic areas as well as half of the adjacent 0.5-mile areas. The results demonstrate an urban and rural designation based on call density for services and not based on population. The red areas are designated as urban service areas and the green areas are designated as rural service areas. Any area that is not colored has less than one call every six months in the 0.5-mile area and half of the adjacent areas.

Figure 4: Urban and Rural Call Density Map with Current Stations



Observation:
The call density analysis validates the station location planning processes utilized by the city and department.

Occupancy-Level Risk

Occupancy risk was evaluated across the jurisdiction utilizing the internal risk matrix designed by RFD and adopted in the 2017 SOC. The total scores of the matrices provided on pages 35 and 36 of the 2017 SOC were included in the overall risk matrices developed here.

The risk matrices utilized by the department included the number of occupancies that require greater than 3,500 gallons per minute (GPM) Needed Fire Flow (NFF), hazmat occupancies, life safety inspectable properties, high-rise properties, and those with economic, historical, and/or cultural significance. The risk matrix is reproduced below.[6]

[6] Ibid. Page 35-36.

Table 4: RFD Risk Matrix from 2017 SOC

Station	NFF	Hazmat	Life Safety	High Rise	Economic	Historical, Cultural-Other	Total
1	14	105	400	185	150	92	946
2	0	5	648	103	342	1	1099
3	73	0	26	0	0	1	100
4	167	18	21	3	0	13	222
5	57	6	63	0	0	9	135
6	867	68	39	89	6	0	1069
7	24	72	9	0	38	3	146
8	209	3	56	34	35	3	340
9	0	5	4	0	0	3	12
10	312	178	233	25	151	13	912
11	49	1	11	0	0	1	62
12	75	5	26	15	16	10	147
13	176	17	0	0	9	2	204
14	122	1	7	0	0	1	131

Due to the relatively higher demands for personnel and apparatus required for fire events that have occupancy classifications deemed high-risk, these risks garnished the highest ratings by numerical presence.

Concentration of Risks by Station Demand Zone

Analyses were conducted to describe and measure the relative concentration of risks in each of the fire station demand zones. Therefore, a station demand zone risk matrix was developed to quantitatively evaluate the relative risk by including the high-risk occupancies previously identified by RFD in each fire demand zone that are directly correlated to the necessity of higher concentrations of resources. In addition, several measures were used that both serve the distribution aspect of the risk evaluation, and also contribute to the need for higher concentrations of resources. For example, a higher call volume may serve to drive the need for additional resources to cover the community's demand.

The variables included in the risk matrix are the demand for services for each station demand zone, the number of high- and moderate-risk occupancies, and the impact of simultaneous events in each station demand zone. All measures were weighted equally; however, two variables have surrogate relationships with historical community demands and one variable is dedicated to prospective occupancy risk. Community demands were rated more heavily in an effort to provide a realistic balance between the potential risk and historical experience. The risk tool and the scoring template are provided below.

Table 5: Station Demand Zone Risk Concentration Matrix

Station Demand Zone	Community Demand	Call Concurrency	High-Risk Occupancies	Total Risk Score	Risk Rating
1	9	5	10	79.45	Maximum
2	7	4	10	60.35	High
3	6	5	2	23.92	Moderate
4	7	5	3	30.75	Moderate
5	8	5	2	31.27	Moderate
6	3	3	10	30.67	Moderate
7	5	4	2	16.79	Moderate
8	6	4	5	30.63	Moderate
9	2	2	1	3.46	Low
10	4	3	10	36.36	Moderate
11	3	3	1	7.04	Low
12	4	3	2	11.05	Low
13	2	2	3	6.63	Low
14	2	2	2	4.90	Low

Overall, the risk assessment identified that the majority of station demand zones are of moderate risk (Stations 3-8, 10), with five low-risk stations (stations 9, 11-14). Stations 1 and 2 were calculated as high-/maximum-risk station demand zones.

Observation:
Overall, the risk assessment identified that the majority of station demand zones are of low to moderate risk, with two high-/maximum-risk station demand zones (Stations 1 and 2).

Currently, Station 3 is staffed for the Technical Rescue operations; Station 2 is the Hazardous Materials station, and Station 12 has members of the existing crew trained as fire investigators.

Establishing Desired Performance

The fire department's current performance is defined as a travel time of 4.8 minutes or less to 90% of the incidents. This is well aligned with the NFPA 1710 recommendations of 4 minutes, or the Commission on Fire Accreditation International's CFAI recommendation of 5 minutes and 12 seconds.

Conversely, the evidenced-based research in EMS and fire behavior suggests that if the agency cannot respond to the most critical of incidents within 5 minutes or less from onset, the outcome is not strictly correlated with the response time. Therefore, the department has considerable latitude in establishing the desired service levels.

This study recognizes that the travel time of approximately 5 minutes is well aligned with other larger urban/metropolitan fire department agencies and remains a local policy choice. Therefore, analyses focused on optimizing efficiencies within the context of maintaining the quality performance currently provided.

Observation:
While desired performance is largely a local policy decision, the current performance is well aligned with national references and experience.

Workload

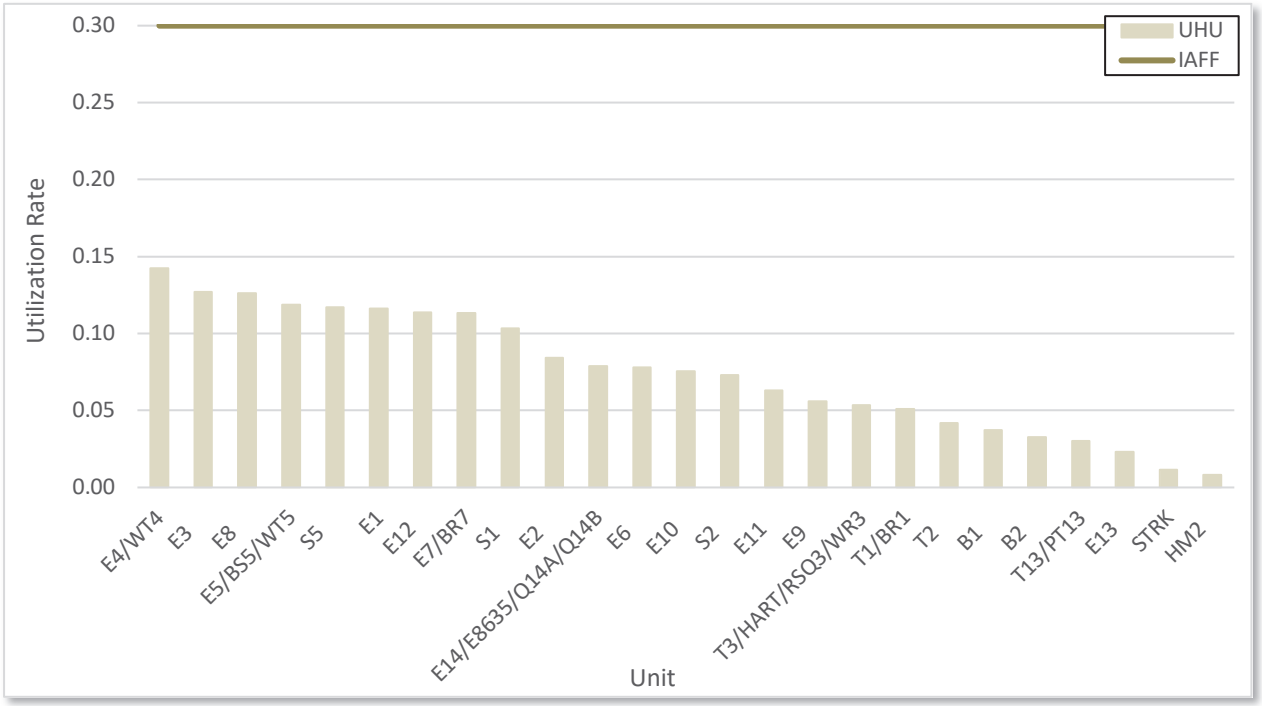
A measure of time on task is necessary to evaluate best practices in efficient system delivery and consider the impact workload has on personnel. UHU values represent the proportion of the work period (24 hours) that is utilized responding to requests for service.

Historically, the International Association of Fire Fighters (IAFF) has recommended that 24-hour units utilize 0.30, or 30% workload as an upper threshold.[7] In other words, this recommendation would have personnel spend no more than 7.2 hours per day on emergency incidents. These thresholds take into consideration the necessity to accomplish non-emergency activities such as training, health and wellness, public education, and fire inspections. The 4th edition of the IAFF EMS Guidebook no longer specifically identifies an upper threshold. However, *FITCH* recommends that an upper unit utilization threshold of approximately 0.30, or 30%, would be considered best practice. In other words, units and personnel should not exceed 30%, or 7.2 hours, of their workday responding to calls. These recommendations are also validated in the literature. For example, in their review of the City of Rolling Meadows, the Illinois Fire Chiefs Association utilized a UHU threshold of 0.30 as an indication to add additional resources.[8] Similarly, in a standards of cover study facilitated by the Center for Public Safety Excellence, the Castle Rock Fire and Rescue Department utilizes a UHU of 0.30 as the upper limit in their standards of cover due to the necessity to accomplish other non-emergency activities.[9]

All units had UHU values below 0.15, or approximately 3.6 hours or less per day on 911 related activity. Therefore, considerable capacity exists within the system.

[7] International Association of Firefighters. (1995). Emergency *Medical Services: A Guidebook for Fire-Based Systems.* Washington, DC: Author. (p. 11)
[8] Illinois Fire Chiefs Association. (2012). An *Assessment of Deployment and Station Location: Rolling Meadows Fire Department.* Rolling Meadows, Illinois: Author. (pp. 54-55)
[9] Castle Rock Fire and Rescue Department. (2011). Community *Risk Analysis and Standards of Cover.* Castle Rock, Colorado: Author. (p. 58)

Figure 8: Unit Hour Utilization



Observation:
All units had UHU values below 0.15, or approximately 3.6 hours or less per day on 911 related activity.

Observation:
Therefore, capacity exists to absorb more work prior to any reinvestment in resources due to workload.

Recommendation:
The department is encouraged to continue to monitor workload and UHUs to not exceed the upper threshold and ensure the other system measures are still meeting desired outcomes.

Workload by Station

The station-level demand is more reflective for deployment decisions, and the unit-level workload will help evaluate the utilization of physical apparatus and assist with apparatus procurement or maintenance decisions.

Station 1 was the busiest station during 2019 based on number of responses made by units assigned to the station (8,471 responses) and based on total busy hours (2,783.0 hours; 16.6% of departmental busy hours). Station 2 and Station 5 were the second and third busiest stations, respectively.

Table 6: Overall Workload by Station

Station	Number of Responses Made by Units Assigned to Station[1]	Responses with Time Data[2]	Total Busy Hours	Average Busy Minutes per Response	Percentage of Total Busy Hours
1	8,471	8,470	2,783.0	19.7	16.6
2	6,375	6,371	2,191.7	20.6	13.1
3	4,558	4,556	1,672.2	22.0	10.0
4	3,774	3,771	1,256.4	20.0	7.5
5	5,663	5,661	2,080.7	22.1	12.4
6	2,045	2,045	706.7	20.7	4.2
7	2,569	2,566	1,010.5	23.6	6.0
8	3,127	3,126	1,111.4	21.3	6.6
9	1,198	1,198	489.0	24.5	2.9
10	1,789	1,789	660.6	22.2	3.9
11	1,426	1,426	552.7	23.3	3.3
12	3,097	3,097	993.8	19.3	5.9
13	1,023	1,023	465.4	27.3	2.8
14	1,684	1,682	688.6	24.6	4.1
Prevention[3]	14	14	19.2	82.4	0.1
Strike Team[4]	15	6	98.7	986.8	0.6
Total	**46,828**	**46,801**	**16,780.6**	**21.5**	**100.0**

[1]"Number of Responses" reflects the total number of records in the data file associated with responses made by units assigned to RFD, regardless of calculated busy time.
[2]"Responses with Time Data" reflects the number of records in the data file associated with responses made by units assigned to RFD with calculated busy time not otherwise excluded.
[3]"Prevention" included seven prevention officer units, PREV31 through PREV37.
[4]"Strike Team" included the unit ID "STRK," not otherwise specified; all other strike team units in previous years were assigned to an RFD station.

Workload by Demand Zone

Another method for assessing the effectiveness of the distribution model is to analyze the demand for services across the department, wherein workload is assessed at the demand zone (first due RFD station) level. The highest volume of incoming calls occurred for Station 1's demand zone (5,088 calls). Station 1's demand zone also had the highest volume of responses made by departmental units to the area (6,807 responses), requiring 14.5% of RFD's total responses.

Table 7: Department Workload by Demand Zone

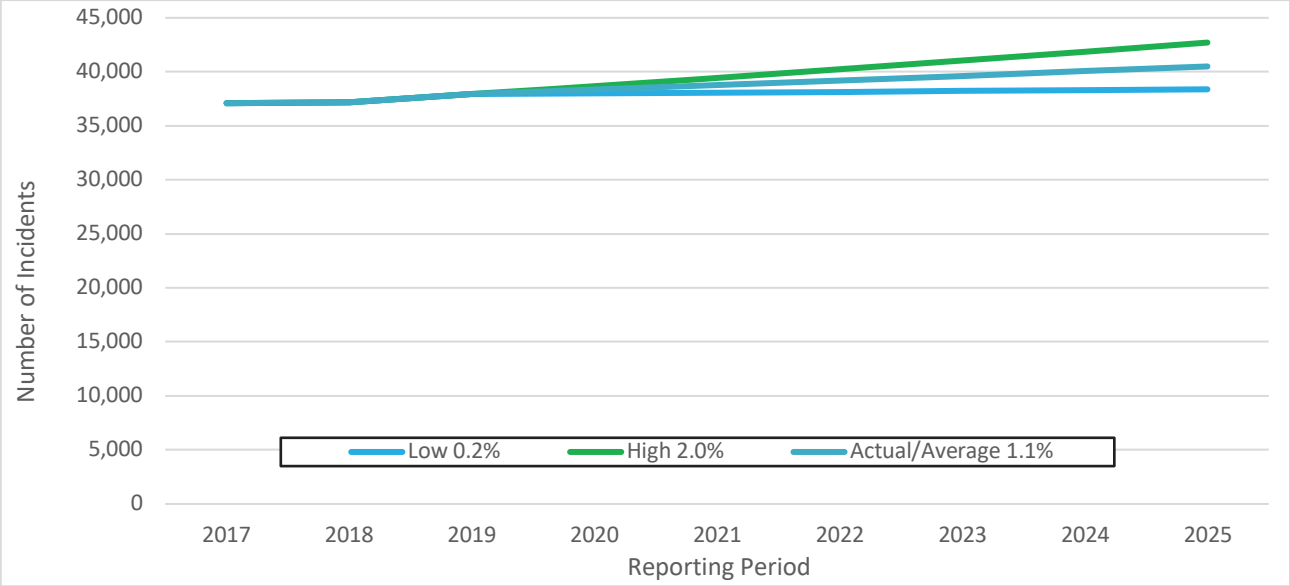
Demand Zone	Number of Calls Incoming to Demand Zone[1]	Number of Responses Made by Department in Demand Zone[2]	Percent of Department Workload[3]
Station 1	5,088	6,807	14.5
Station 2	3,766	4,634	9.9
Station 3	3,506	4,224	9.0
Station 4	3,843	4,726	10.1
Station 5	4,188	5,019	10.7
Station 6	1,769	2,430	5.2
Station 7	2,861	3,610	7.7
Station 8	3,426	4,128	8.8
Station 9	872	972	2.1
Station 10	1,893	2,276	4.9
Station 11	1,562	1,825	3.9
Station 12	2,212	2,768	5.9
Station 13	924	1,273	2.7
Station 14	1,043	1,336	2.9
Unknown	723	800	1.7
Total	**37,676**	**46,828**	**100.0**

[1]"Number of Calls" reflects an adjusted number of calls following any exclusion activity to align with responses made by units assigned to RFD (see Appendix of Data Report).
[2]"Number of Responses" reflects the total number of records in the data file associated with responses made by units assigned to RFD, regardless of calculated busy time.
[3]"Percent of Department Workload" is based on "Number of Responses Made by Department in Demand Zone."

Projected Growth

The available data set included three reporting periods of data, representing calendar years 2017, 2018, and 2019. During that time, calls increased from 37,098 to 37,926, with an average growth rate of 1.1% per year. The figure below depicts observed call volume during the last three years and various hypothetical growth scenarios over the next six years. These projections should be used with caution due to the variability in growth that may have been observed across calendar years prior to 2017. In all cases, data should be reviewed annually to ensure timely updates to projections.

Figure 9: Observed and Hypothetical Growth in Call Volume



Assuming that future demands may not be reasonably distributed across the various stations in the system, the system may ultimately require a redistribution of workload and ultimately reinvestment in resources to meet the growing demand. While the system should be evaluated continuously for performance and desired outcomes, the department should specifically re-evaluate workload and performance indicators for every 1,000-call increase to ensure system stability.

Observation:
If the measured growth for requests for services of 1.1% per year remains stable, the system should remain sustainable for the foreseeable future.

Observation:
The national experience is a growth between 3% and 7% for EMS related incidents.

Recommendation:
The department should specifically re-evaluate workload and performance indicators for every 1,000-call increase to ensure system stability.

Staffing Analyses

Currently, the department operates from 14 fixed-facility fire stations where each fire station operates at least one fire suppression engine or truck. All engines and ladders have a minimum of four-person staffing and each squad has a minimum of two-person staffing. The exception is for the engines that are assigned to a multi-company station that have a minimum staffing of three. The minimum daily staffing is currently 72 personnel prior to hiring back on overtime other than specific qualification needs. The breakout of primary apparatus and personnel is provided below.

Table 8: Current Staffing Strategy

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4	2	1	10
Station 3	3	4			7
Station 4	4				4
Station 5	3		2		5
Station 6	4				4
Station 7	4				4
Station 8	4				4
Station 9	4				4
Station 10	4				4
Station 11	4				4
Station 12	4				4
Station 13		4			4
Station 14	4				4
Total	**48**	**16**	**6**	**2**	**72**

Observation:
The department staffs four personnel on all engines and trucks with the exception of the engine companies that are assigned to a station with a four-person truck company or squad.

Recommendation:
It is recommended that the department continue the three-person staffing strategy for the units at multi-company stations.

Considerations for Constant versus Continuous Staffing Models

The department has a total of 216 personnel assigned to the three-platoon schedule, or 72 firefighters per shift. The three-platoon schedule maintains a 56-hour average work week.

The **Constant Staffing** strategy is utilized when the department only has the exact number of personnel required to meet minimum daily staffing across the three shifts. The most notable item in a Constant Staffing model is that all daily vacancies are replaced with personnel on overtime, as there is no relief staffing. RFD utilizes a constant staffing strategy of 72 personnel per shift.

Observation:
The department staffs 72 personnel per shift in an effort to maintain a minimum daily staffing of 72.

A **Continuous Staffing** strategy is utilized when the department hires additional personnel to cover the average leave experienced on shift. In this manner, the additional personnel are available as "extra" personnel who are utilized to cover vacancies at the straight time more frequently and thus reducing the overtime liability.

An optimized staffing analysis was conducted utilizing mathematical formulae to determine the most efficient allocation of personnel to maintain the desired staffing. Analyses found that RFD was staffing in a responsible manner. However, the overall staffing strategy is requiring a greater potential reliance on overtime to maintain minimum daily staffing.

Optimal staffing is defined as sufficient staffing to cover all scheduled work hours, shift schedules, and the average employee leave experience. Maintaining the 72 minimum daily staffing, it would require a staffing multiplier of 3.49 to optimally staff the department. In other words, it would take 3.49 Full Time Equivalents (FTEs) for each of the 72 minimum staffed positions for a total of 252 personnel assigned to shift, as opposed to the current allocation of 216 personnel. This equates to an additional 36 personnel department-wide, or 12 per shift.

Observation:
Continuous Staffing would require 3.49 Full Time Equivalents (FTEs) for each of the 72 minimum staffed positions for a total of 252 personnel assigned to shift, as opposed to the current allocation of 216 personnel. This equates to an additional 36 personnel department-wide, or 12 per shift.

Observation:
In other words, utilizing a Continuous Staffing strategy, the current FTE allocation of 216 would appropriately support a minimum daily staffing of 62.

Largely, staffing is a local policy choice based on competing demands between operational and fiscal desires as well as the community's sensitivity to specific expenditures such as overtime or fringe benefits. There are both pros and cons to each staffing strategy; however, in all strategies, as long as the minimum daily staffing is sustainable, the citizen's services are insulated and preserved.

- Pros
    - Additional personnel for greater concentration of staffing when less-than-average leave
    - Reduces political sensitivity to high overtime utilization
    - Provides greater depth of residual personnel during wildfire season
    - Providers greater depth of personnel during major events
    - Reduces overtime expenditures
    - Reduces opportunity to work extended work periods
- Cons
    - Maintains benefit and pension rates for the additional personnel
    - Reduction in overtime earnings of personnel

Observation:
Largely, staffing is a local policy choice based on competing demands between operational and fiscal desires as well as the community's sensitivity to specific expenditures such as overtime or fringe benefits.

Recommendation:
It is recommended that the department consider the pros and cons of utilizing the Constant Staffing, Continuous Staffing, or a hybrid model as sensitivities to employee burnout, overtime utilization, and increasing wildland firefighting responsibilities may arise.

Costs Comparison between Constant and Continuous Staffing Models

An analysis was completed to test the breakover point for the policy option of hiring FTEs for relief (Continuous) or covering the vast majority of vacancies with overtime (Constant). The average hourly overtime rate of $56.05 and the average annual compensation for a new hire of $99,936 were provided by the department.[10] Personnel calculations were established utilizing the minimum daily staffing of 72 and a total shift assigned personnel of 216.

Within the budget documents, it is clear that only a very small portion of the overtime is calculated at the straight rate, therefore utilizing the 1.5 factor for hourly premium overtime rate is reasonable.

[10] Excel spreadsheet titled "FY 2020/21 Estimated Scheduled Overtime Cost."

Table 9: Comparison of Continuous and Constant Staffing Costs

Category	Hours	Rate	Cost
Scheduled Hours per Employee	2,912		
Average Leave per Employee	405		
Actual Average Hours Worked per Employee	2,507		
Hours of Coverage Needed for Relief (216)	87,480	$56.05	$4,903,254.00
Scheduled Overtime (216) (Avg 3 per week)	33,696	$56.05	$1,888,660.80
Sub-total of Overtime Costs for Min Staff 216	121,176		$6,791,914.80
Cost of 36 Relief Personnel (252-216=36)	90,252	$99,936/year[11]	$3,597,696.00
Cost of Schedule Overtime for Relief (36)	5,616	$56.05	$314,776.80
Subtotal of Costs of Relief Personnel	95,868		$3,912,472.80
Value Proposition of Continuous Staffing			$990,781.20

If the assumptions are accurate, then the city and department may have a fiscal benefit of hiring the additional personnel as well as have a benefit to the employees' workload and potentially a reduction in injuries, worker's compensation claims, and sick leave utilization. Utilizing this strategy would require 3.49 personnel for each seat of the minimum daily staffing of 72, requiring a total of 252 personnel. The city would need to hire the required 36 additional staff.

Observation:
The Continuous Staffing strategy could yield between $990,781 utilizing entry level compensation.

Observation:
The adoption of a Continuous Staffing strategy can be applied independently of any other recommendations.

[11] Calculations are provided on the 2020 estimated personnel costs and do not include any potential adjustments in 2021.

Evaluation of Relationship of Additional Hours Worked, Leave, and WC Costs

An evaluation of the hours worked from FY 2010-2020 (YTD) was completed. Overtime utilization was used as a surrogate measure for hours worked beyond the scheduled hours. The overtime (OT) expenditures were actuals from the Fire Operations general fund budget provided by the department. The Mutual Aid overtime was only available from FY 16 – FY 20, so the mutual aid overtime was not included in the 10-year analysis. The leaves and associated costs were completed utilizing the Worker's Compensation expenditures, Worker's Compensation insurance costs, Sick Leave (SL), Family Medical Leave (FMLA), and Industrial Accidents (IA).

Correlation and regression analyses was completed for using the overtime expenses, sick leave, IA, and FMLA as the independent variables, and total Worker's Compensation costs (WC) as the dependent variable. In other words, this analysis tests the relationship between OT, SL, IA, and total WC expenditures (WC Insurance costs + WC expenditures).

Results found that there is a moderate correlation (r=0.55) between OT and WC and a strong positive correlation (r=0.749) between OT and total leave (SL, FMLA, WC, and IA). These correlation values were statistically significant with 95% confidence. In other words, the amount of total overtime expenditures has a positive relationship with total leave and the subset specifically associated with WC costs. The relationship to total leave is expected as overtime is utilized to cover vacancies. The relationship between OT and WC expenses indicates a positive correlation between hours worked and costs associated with WC.

Figure 10: Analysis of Overtime vs WC Expenditures 2010-2020 YTD

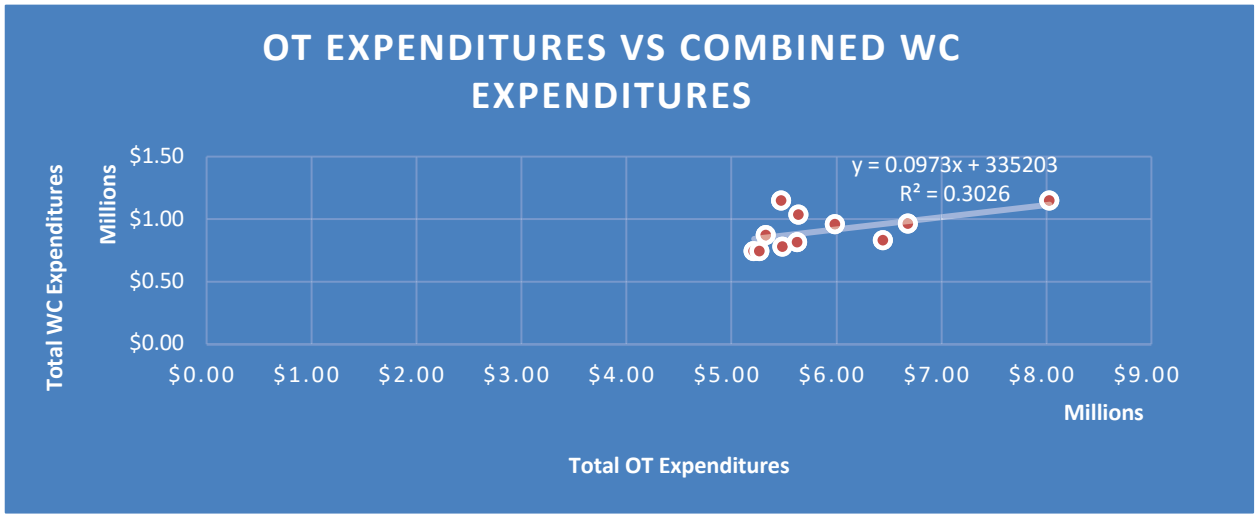
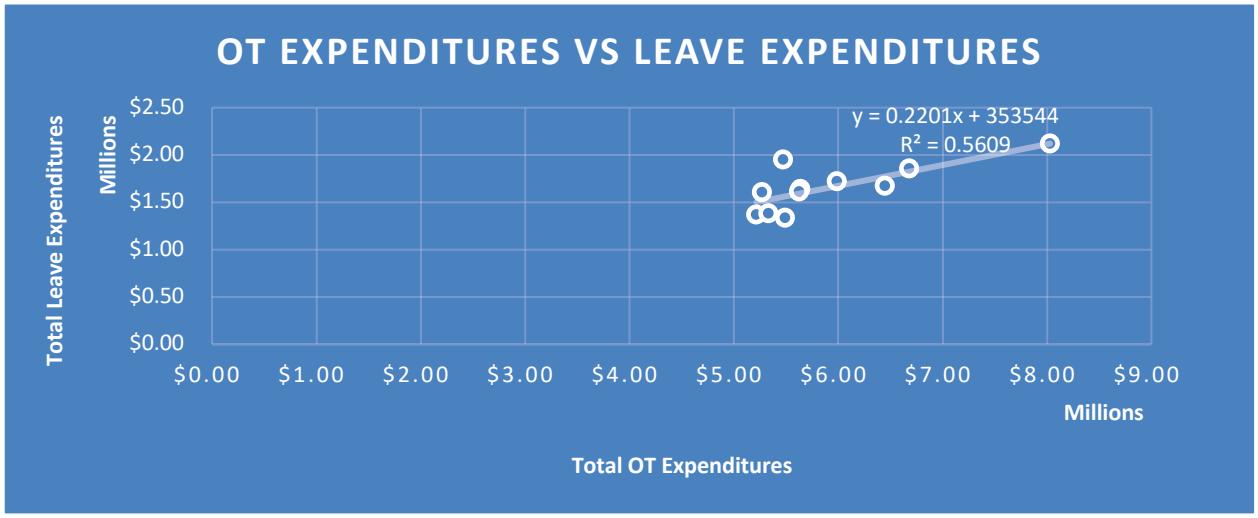


Figure 11: Analysis of Overtime vs Leave Expenditures 2010-2020 YTD



Finally, a regression model was developed to explore the two independent variables (OT and IA) that were statistically significant in predicting WC costs. The model is able to explain 61% (R^2=0.61) of the variability in WC expenses with adjusted R^2 value that explains about 51% of the relationship (R^2=0.512) and was statistically significant with 95% confidence (p=.023).

Intuitively, the regression analyses pass the common-sense test that the more employees work, the greater the opportunity for injury and/or utilization of sick leave, and potentially a subsequent impact on WC premium experience and total leave expenditures. The fact that the model can explain 50% of the expected WC value is significant, as market factors may influence the premium experience beyond what the loss history may influence.

Observation:
The fact that the model can explain 50% of the expected WC value is significant, as market factors may influence the premium experience beyond what the loss history may influence.

Recommendation:
It is recommended that the department consider the pros and cons of utilizing a Continuous Staffing model as excessive hours worked may contribute to the overall WC expense history.

Desired Performance and Station Location Analyses

The overall travel time performance through quantitative analyses resides between 6.1 minutes (EMS) and 7.4 minutes (fire) at the 90th percentile. This includes all units from the five fixed fire station facilities. In contrast, the GIS analyses suggested that only three of the fire stations were needed to achieve greater than 90% coverage within an 8-minute travel time. This demonstrates the relative positive benefit of the department utilizing a programmatic move-up plan following the analyses.

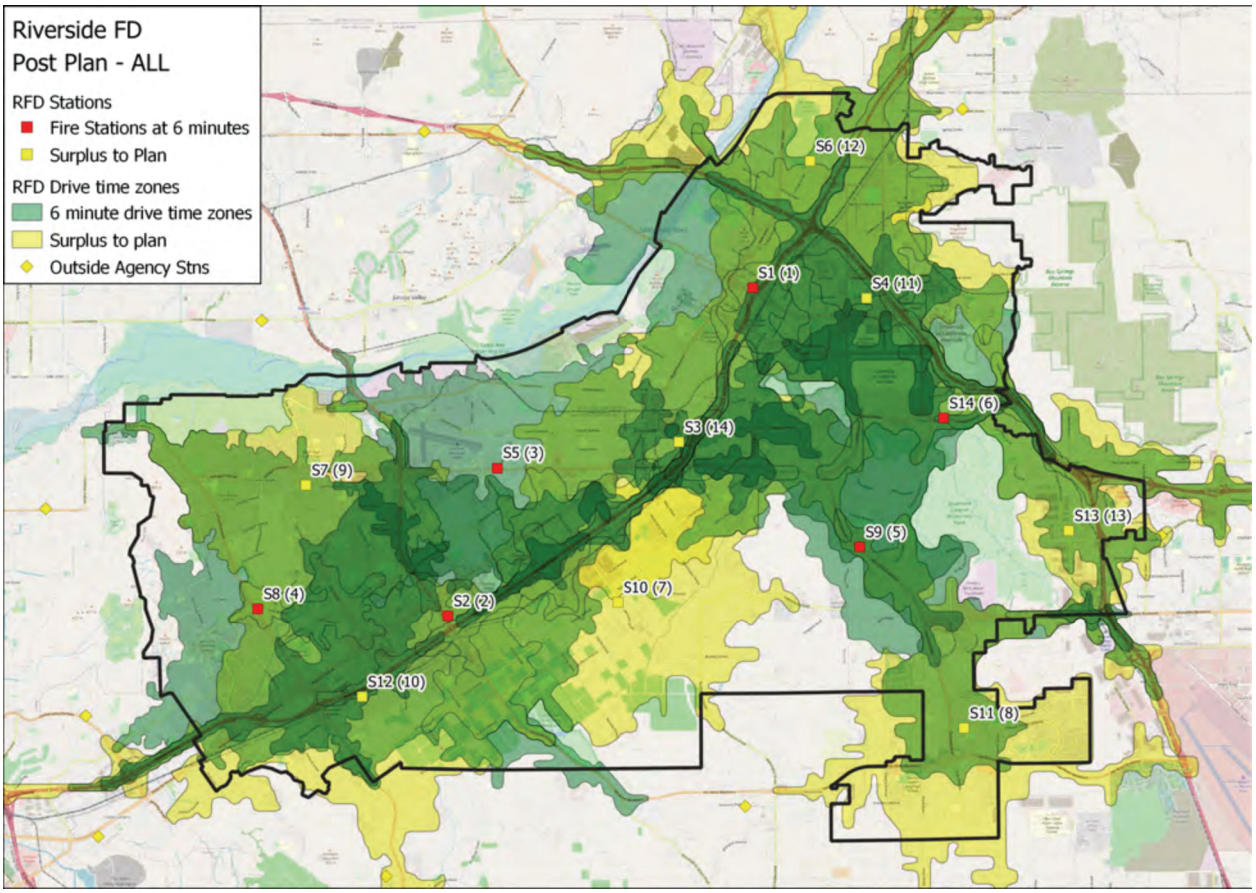
When referring to the marginal utility analysis provided, ascending rank order is the station's capability to cover risk (incidents) for all calls (i.e., EMS, fire, hazmat, rescue, and unknown) in relation to the total historical call volume of the sample period (2019). Station is the identifier for the current RFD station; station capture is the number of calls the station would capture within the specified travel time parameter; total capture is the cumulative number of calls captured with the addition of each fire station; and percent capture is the cumulative percentage of risk covered with the addition of each fire station. The goal would be to achieve at least 90% capture.

Understanding that the department's best measured performance was 6.1 minutes for EMS incidents, a 6-minute travel time was evaluated to validate current performance and ensure that the GIS analyses were aligned. Similar to the urban/rural call density analyses, this analysis demonstrates that the department has done well in station placement planning efforts. This analysis suggests that the 14 stations can cover nearly 99% of all calls within 6 minutes.

Table 10: Marginal Fire Station Contribution for 6-Minute Travel Time

Rank	Station	Station Capture	Total Capture	Percent Capture
1	S1	14,150	14,150	37.44%
2	S2	10,219	24,369	64.49%
3	S5	3,627	27,996	74.08%
4	S8	3,374	31,370	83.01%
5	S9	2,636	34,006	89.99%
6	S14	967	34,973	92.55%
7	S10	718	35,691	94.45%
8	S11	691	36,382	96.27%
9	S7	387	36,769	97.30%
10	S12	266	37,035	98.00%
11	S4	105	37,140	98.28%
12	S6	86	37,226	98.51%
13	S13	81	37,307	98.72%
14	S3	52	37,359	98.86%

Figure 12: Current Fire Station Bleed Map for 6-Minute Travel Time – All 14 Stations



Observation:
Similar to the urban/rural call density analyses, this analysis demonstrates that the department has done well in station placement planning efforts.

Observation:
The current 14-sation deployment can cover nearly 99% of all calls within a 6-minute travel time.

Geographic Coverage without Consideration for Call Distribution

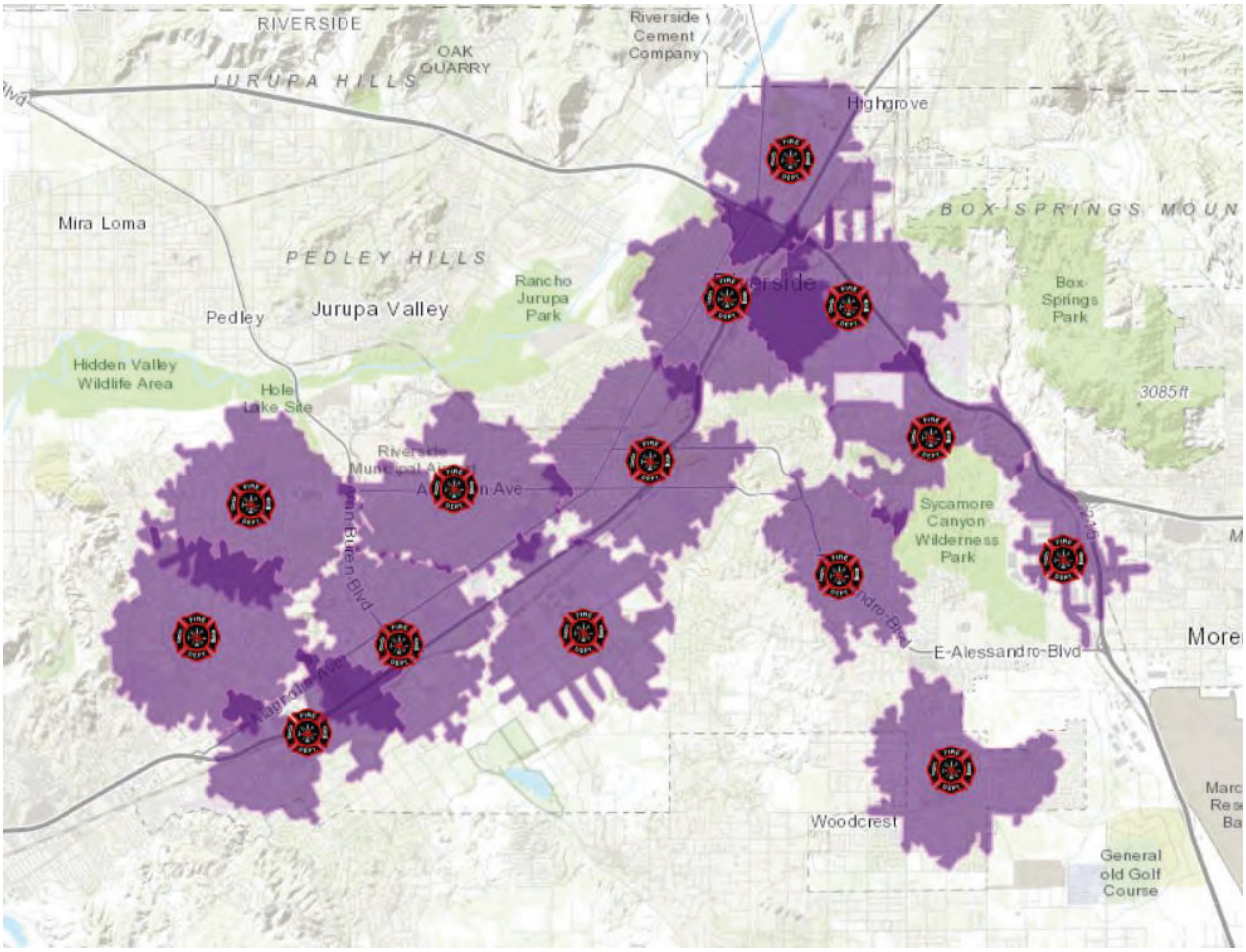
While there are multiple deployment strategies that may be adopted, two clear policy positions emerge in communities. First, position stations that are best prepared to meet the community's historical distribution of calls or demand for services. The advantage to this approach is that it is a more efficient model to address meeting 90% of the risk within the desired performance. This is a very stable outlook for communities that are established and are growing in density or in-fill rather than through significant annexations or urban growth.

A second strategy is to provide station response coverage purely based on a geographic lens without any consideration for how calls are distributed throughout the community. The following analyses

utilized distance without consideration of the relative impedance and/or the robustness of the road network. For example, when time is the unit of measure, a station's units could travel a farther distance on a highway than through a school zone, but this approach caps the coverage area at 1.5 miles (i.e., for engines) regardless of available travel speeds. This strategy more closely follows the recommendations of insurance rating services. Therefore, these analyses examined current coverage areas by utilizing a 1.5-mile engine polygon and a 2.5-mile ladder truck polygon.

Engine Coverage

Figure 13: 1.5-Mile Engine Polygons – Current Locations



Ladder Truck Coverage

Figure 14: 2.5-Mile Ladder Truck Polygons – Current Locations

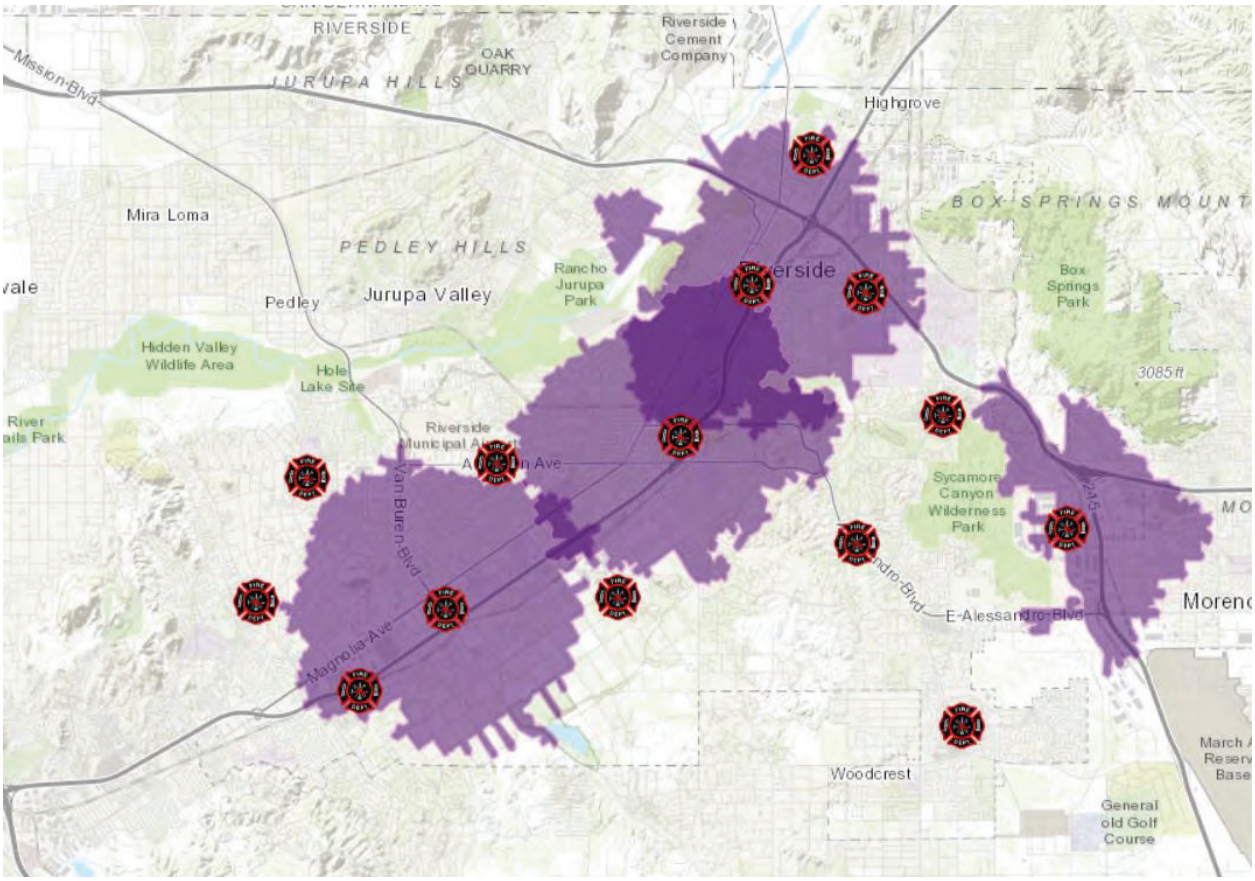
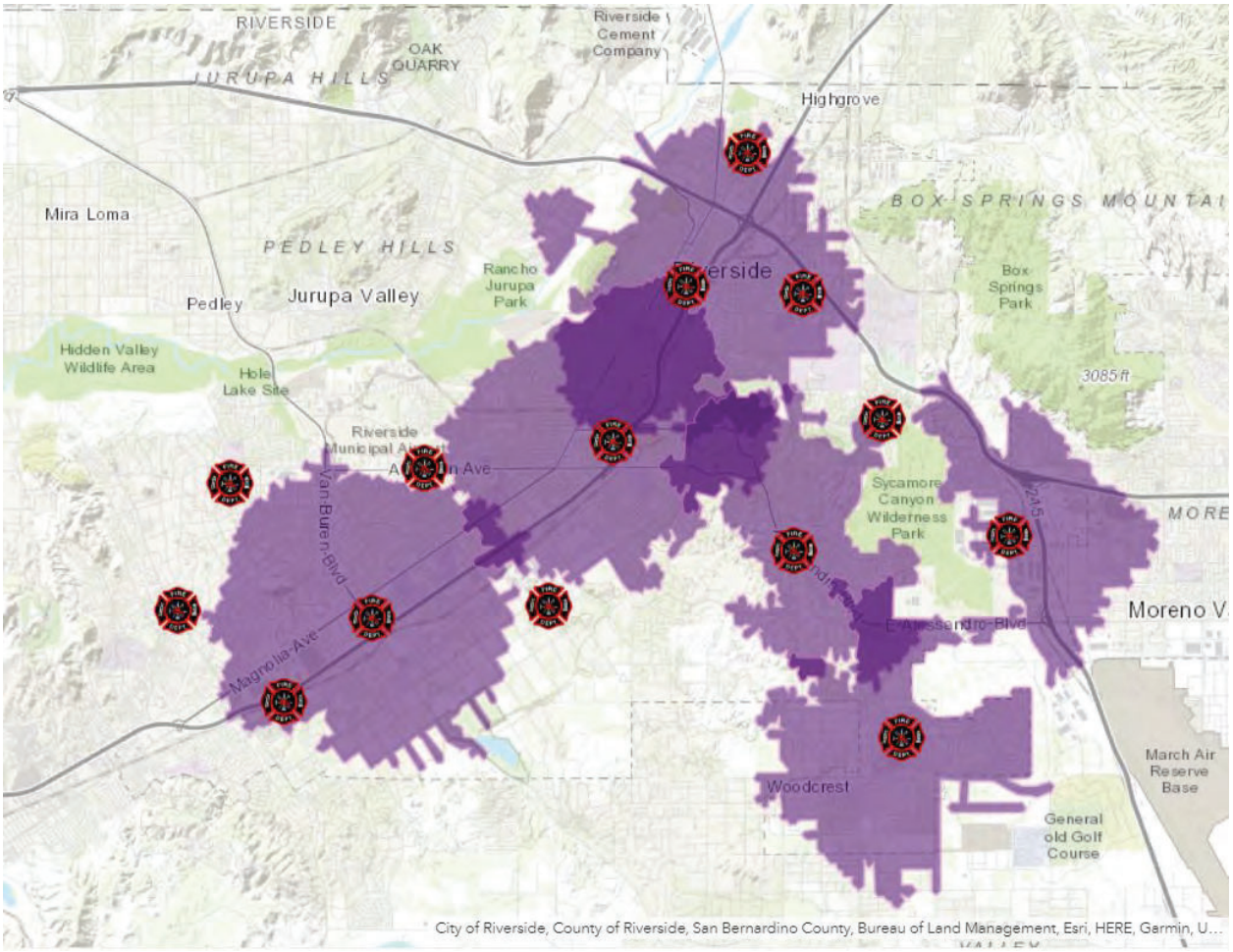


Figure 15: 2.5-Mile Ladder Truck Polygons – Current Locations and Hypothetical Locations at Stations 9 and 11



Observation:
The addition of quint apparatus may provide an opportunity for improved aerial coverage for ISO.

Consideration for a Move-up Policy

The 6-minute marginal utility analysis validated that the current 14-station configuration can deliver a 6-minute travel time to nearly 98% of all incidents. However, dynamically deployed systems are afforded the greatest efficiency in the utilization of their resources. A traditional fire department model is a *static* system, where each of the resources is assigned a "home" station and, after each call, the unit attempts to get back to its home station. Through the lens of direct "home" station area, it passes the common-sense test as the assigned units are assumed to be the closest.

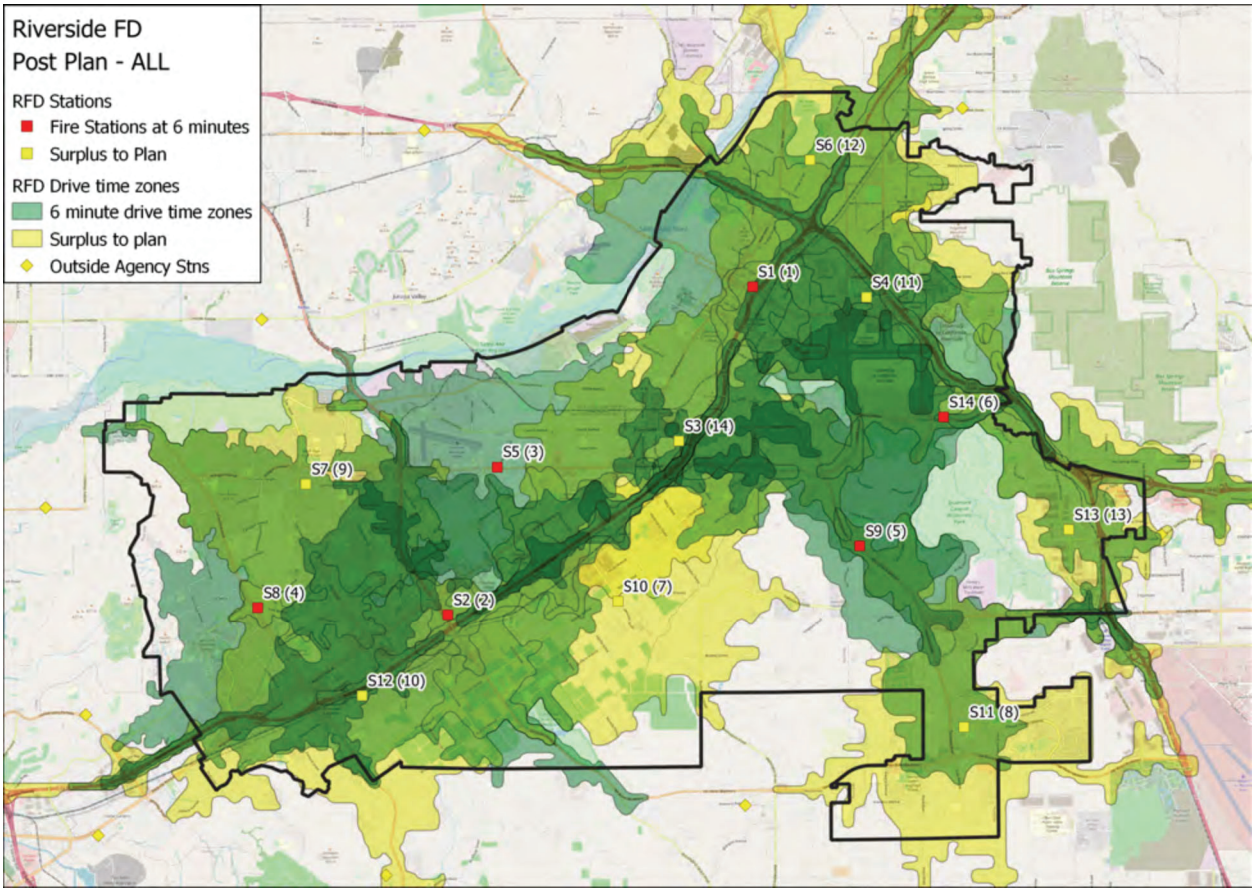
However, from a system or city perspective, efficiencies are lost, as these vehicle movements are not engineered and are not as flexible as they could be during busy periods. The quantitative performance balanced against the GIS analyses may offer some insight into the benefit of a more

flexible dynamic system design. In other words, the department is performing at 6.5 minutes and should be able to provide a 6-minute response within the current deployment capacity.

Assuming a 14-station deployment, the department should have a minimum of 20 resources in the system each day to meet both the geographic demand for services and the average hourly demand of six calls per hour (14 stations + 6 average demand/hour = 20). Therefore, the department is efficiently resourced for the deployment plan. However, an opportunity for improvement may be available by utilizing a more aggressive move-up strategy as units are drawn down.

Reconsidering the marginal utility analysis provided in Table 10, a 6-station solution can achieve 92% of the call capture within 6 minutes. Therefore, following the findings of the marginal utility analysis, when the department is resource constrained down to the last six units, they should be temporarily moved up or placed in Stations 1, 2, 5, 8, 9, and 14, respectively. This progressive move-up policy will provide a more efficient capture and success in a commensurate delivery approach across the city. The mapping below demonstrates the 6-minute coverage of the six stations only. The difference between this 6-station move-up model and the 14-station delivery is less than 8% call capture.

Figure 16: Current Fire Station Bleed Map for 6-Minute Travel Time – Move-Up Stations



This analysis is also helpful in guiding the department in resource allocation decisions during periods where management decisions influence the number of resources that are allowed to be taken out of service each day for non-emergency related activities such as training. For example, department policy allows up to five resources at a time to be out of service or delayed for administrative assignments such as training.

Recommendation:
It is recommended that the department utilize this analysis to establish a move-up policy that moves units in the order identified that covers the greatest number of incidents in the desired performance.

Effective Response Force Assembly

There are two prevailing recommendations for the time to assemble an effective response force (ERF) for structure fires. First, NFPA 1710 suggests that the ERF should arrive in 8 minutes travel time or less. Second, CFAI provides a baseline travel time performance objective of 10 minutes and 24 seconds 90% of the time or less as well as a 13-minute travel time ERF for suburban areas. RFD's internal benchmark for ERF arrival with 15 personnel is 17.4 minutes.[12]

The following analyses evaluated each scenario within the city boundaries. These analyses utilized the current deployment configuration, units, and staffing.

Table 11: Comparisons of Effective Response Force Performance – 15 Personnel

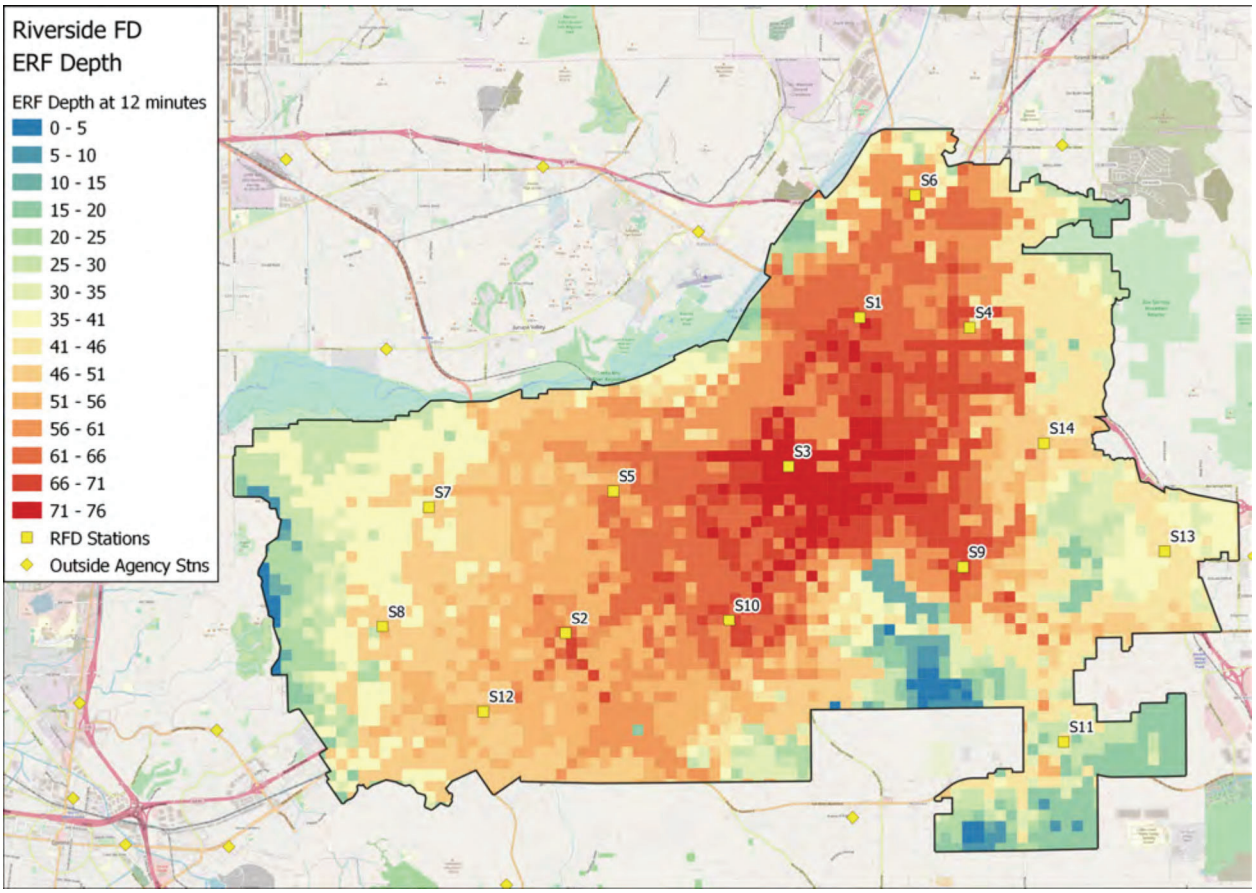
Travel Time Objective	Current
8-Minute	66.05%
10-Minute	88.88%
12-Minute	98.30%
13-Minute	99.24%
15-Minute	99.91%

The quantitative analyses for ERF are problematic due to the limited sample sizes of actual arrival of ERF of 15 personnel. For example, the sample size over 3 years was 121 events out of nearly 120,000 responses. This is a typical result in fire departments across the nation and is not unique or specific to the RFD experience. Therefore, GIS simulation for assembling personnel is a more robust assessment of the conditions, rather than the actual percentage of time that an ERF is, in fact, assembled. The GIS simulation suggests that a 15-person ERF can be assembled to 98% of the city's jurisdiction within 12 minutes, and nearly 100% at 15 minutes.

Overall, the ERF coverage is more robust in the center of the jurisdiction where the greatest historical demand exists. The areas of the city that are more challenged are areas that do not benefit from concentric response zones.

[12] Riverside Fire Department. (2017). *Standards of Response Coverage.*

Figure 17: 12-Minute ERF



These analyses only contemplated RFD stations, units, and staffing. It is understood that outside agencies may contribute to improvement in actual performance.

Observation:
Like most agencies, the department is challenged to assemble a 15-person ERF within the more restrictive national consensus standard of 8 minutes.

Observation:
The department is nearly meeting an acceptable ERF for urban/metropolitan environments as defined by the CFAI at 88% at 10 minutes.

Observation:
The department is reasonably meeting an acceptable ERF for suburban environments as defined by the CFAI at 99% at 13 minutes.

Observation:
Irrespective of any national guidelines, RFD is providing an excellent ERF that meets or exceeds most urban fire departments.

Recommendation:
It is recommended that the department consider utilizing GIS analyses to establish ERF performance objectives due to the lack of validity of small sample sizes for 90th percentile calculations.

Considering the Participation in Providing EMS

It is not uncommon in a tiered system to question whether the department should be providing EMS. Through this lens, the contracted provider has performance-based standards that must be met, with opportunities to progress towards outcome measures. Under the current public-private partnership, the provider (currently AMR) provides first response, patient care, and patient transport in the 911 environment. The fire department provides first response, patient care, and assists in patient transport when clinically necessary or requested.

The argument could be made that some duplication of services exists within the system. However, the transport provider, as a demand model, may incur additional costs or lost efficiencies in providing first response at a compressed timeline that may be passed on contractually in the form of public subsidy. Additionally, the fire department, as a readiness model, has a robust distribution of resources, excellent response time, and excess capacity above the non-EMS incident demand to provide first response services for EMS. In other words, the elimination of EMS workload would not allow the department to realize 74% in efficiencies as the inherent risk-based deployment strategy would remain largely in place.

Financially, the contractual relationship provides $1.6 million for first response services, $94,071 for 911 and priority/emergency medical dispatching, and an additional $30,000 in medical supplies, annually. The provider benefits from a relaxed response time from 9:59 to 11:59, eliminating the public subsidy. Therefore, the overall assessment is that the city/department should continue to provide first response EMS, but consider more efficient resource allocation and deployment strategies as presented below, while maximizing opportunities for cost avoidance and increase cost recovery in the future.

Observation:
The city/department benefits by approximately $2m per year for dispatch and first response services within the current public-private partnership.

Observation:
The provider benefits from a relaxed response time from 9:59 to 11:59, eliminating the public subsidy.

Observation:
As a readiness model, the fire department has a robust distribution of resources, excellent response time, and excess capacity above the non-EMS incident demand to provide first response services for EMS.

Recommendation:
The city/department should continue to provide first response EMS, but consider more efficient resource allocation and deployment strategies as presented below while maximizing opportunities for cost avoidance and increase cost recovery in the future.

Considerations for Maximizing the EMS Response and the Contractual First Response Services

Although the station placement is serving the delivery model well, an incremental efficiency may be available in aligning resources to the greatest probability of the occurrence of a call.

Specifically, with the consideration of the First Responder article and remuneration in the contract with AMR, the city/department could consider a more efficient and dynamic EMS deployment strategy. The contract with AMR provides for cost recovery for providing EMS first response services within 9:59 or less for 90% of the incidents inclusive of turnout and travel time. Meeting this standard provides a contractual value, less any per call assessments for lack of performance, of $129,997.27 per month. The 2019 performance was calculated at 7:42 at the 90th percentile for EMS incidents. The current provider (AMR) is responsible to meet 11:59 or less for 90% of all incidents.

Depending on the policy lens, there may be benefits to partitioning the EMS and fire services for all EMS calls other than the highest severity. In this manner, the EMS incidents with higher clinical severity would always receive the closest available units consistent with current practices, but calls of lesser clinical severity and response time urgency could receive a response that is more aligned with the contractual objectives. The required resource allocation is considerably modified to accommodate this strategy while maintaining all currently available resources.

Observation:
All 911-call triage protocols must be approved by the system Medical Director.

Recommendation:
Any considerations to the adjustment of the 911-call triage system and/or responding resource allocation and capabilities should be completed in concert with the system Medical Director.

Recommendation:
It is recommended that the city/department consider prioritizing EMS incidents that should receive the closest available resource versus incidents that could be responded to by EMS-specific resources within the contractually obligated performance for first response ALS service.

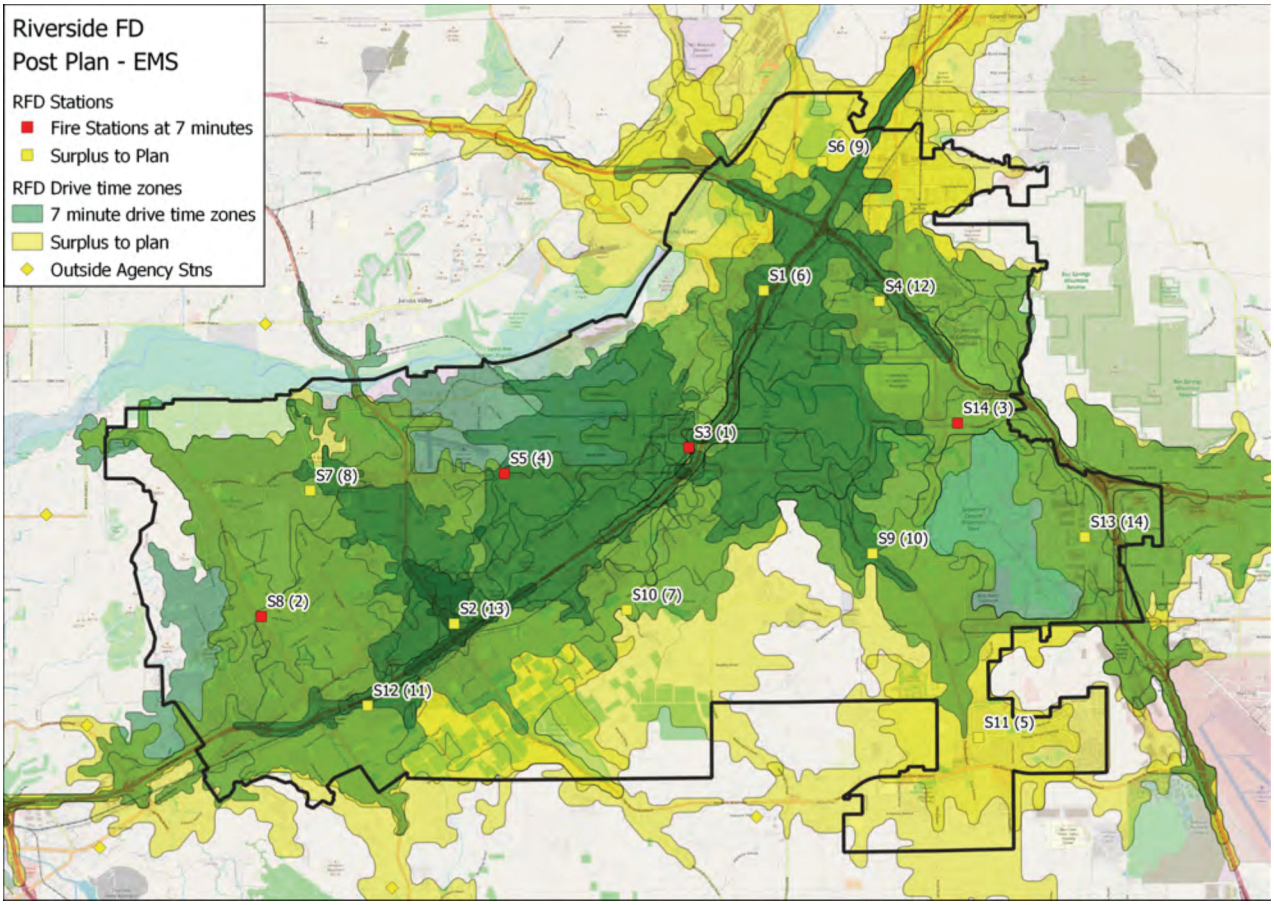
7-Minute Travel Time – EMS Calls

Results suggest that with four of the current 14 stations, 92.79% of EMS calls could be responded to within 7 minutes or less travel time for a total of up to 28,029 incidents.

Table 12: Marginal Fire Station Contribution for 7-Minute Travel Time – EMS Calls

Rank	Station	Station Capture	Total Capture	Percent Capture
1	S3	14,240	14,240	50.73%
2	S8	6,651	20,891	74.42%
3	S14	4,120	25,011	89.10%
4	S5	1,036	26,047	92.79%
5	S11	913	26,960	96.05%
6	S1	739	27,699	98.68%
7	S10	219	27,918	99.46%
8	S7	42	27,960	99.61%
9	S6	23	27,983	99.69%
10	S9	19	28,002	99.76%
11	S12	14	28,016	99.81%
12	S4	10	28,026	99.84%
13	S2	3	28,029	99.85%
14	S13	0	28,029	99.85%

Figure 18: Current Fire Station Bleed Map for 7-Minute Travel Time – EMS Calls



In other words, staffing EMS first response specific units at Stations 3, 8, and 14 would achieve 89% of the necessary contractual response time of 7 minutes travel and the current 2-minute turnout time. This highlights the no-cost return on investment for aligning turnout time with best practices. For example, improving turnout time to 1.0 to 1.5 minutes would afford this model ample room for maintaining contractual compliance. It is important to understand that the citizen's experience is the same with a 6-minute travel time and a 2-minute turnout time, as with a 7-minute travel time and a 1-minute turnout time.

Observation:
It is important to understand that the citizen's experience is the same with a 6-minute travel time and a 2-minute turnout time, as with a 7-minute travel time and a 1-minute turnout time.

Recommendation:
The department is encouraged to better align turnout time with national recommendations and best practices.

Alternative 1 – Relocate Squads to Stations 3, 8, and 14

If the department wants to continue with the current resource allocation, an incremental improvement in the deployment strategy would be to relocate the squads from Stations 1, 2, and 5 to Stations 3, 8, and 14, respectively. The current utilization of the squads reveals that the squads arrived first on scene 7,410 times in 2019, or approximately 20% of the EMS incidents. Utilizing this alternative would provide a greater system-wide benefit to the squad program by increasing workload on the prioritized EMS units and reducing workload on the fire suppression units for calls that were relieved.

Several structural components will be required to best implement this alternative. First, lower-acuity incidents (such as Alphas, Bravos, and Charlies) could be dispatched to the squad units within a 7-minute travel time. Second, when the squad units are not available, and/or the incident is categorized as a higher-acuity incident (Deltas and Echoes), then the closest available unit would be dispatched maintaining current practice and performance. Third, programming for the 7-minute travel times should be accomplished in either an EMS layer run-card or utilizing the AVL dispatching, accommodating the tiered strategy.

This alternative will provide incremental improvement and efficiency within the current human and capital resource allocation.

Alternative 2 – Relocate Squads to Stations 3, 8, and 14 and Add Four Additional Squads 12/7

This alternative is an incremental improvement over Alternative 1. Where Alternative 1 is significantly resource constrained to assume the majority of EMS incidents with only three units, this alternative recommends a total of seven resources (three 24/7 and four 12/7). In this alternative a total of seven squad units would be required to cover at least 70% of all EMS incidents within a 7-minute travel time during the peak 12-hour period between 9 am and 9 pm. This strategy would continue to meet the contractual first response requirements but provide an efficient EMS overlay that will provide high-quality services and reduce the reliance on heavy fire suppression apparatus for lower-acuity EMS incidents during the peak periods.

The four additional squads could be stationed at 5, 11, 1, and 10 as well as at any adjacent stations that have the facility space. Ideally, the secondary stations would be Stations 5, 11, 1, and 10 and then resources could be moved up to 3, 8, 14, and 5 as needed.

This deployment strategy would reduce the reliance on fire suppression apparatus to respond to EMS incidents. All structural components identified in Alternative 1 would continue to apply to Alternative 2. This alternative would require an additional eight personnel per day for 12 hours per day. The staffing multiplier for a 12-hour shift would be approximately 2.5 requiring a total of 20 additional personnel.

Alternative 3 – Relocate Squads to Stations 3, 8, and 14 and Add Four Additional Squads 24/7

In this alternative, a total of seven squad units would be required to cover at least 70% of all EMS incidents within a 7-minute travel time. This strategy would continue to meet the contractual first response requirements but provide an efficient EMS overlay that will provide high-quality services and reduce the reliance on heavy fire suppression apparatus for lower-acuity EMS incidents.

Overall, if 70% of the EMS incidents were handled in this manner, it would require six EMS-specific units stationed at these locations (or actively moving up) to meet or exceed this standard while maintaining 0.25 UHU threshold or less. The four additional squads could be stationed at 5, 11, 1, and 10 as well as at any adjacent stations that have the facility space. Ideally, the secondary stations would be Stations 5, 11, 1, and 10 and then resources could be moved up to 3, 8, 14, and 5 as needed.

This deployment strategy would reduce the reliance on fire suppression apparatus to respond to EMS incidents by 48%, or 19,682 incidents per year. All structural components identified in Alternative 1 would continue to apply to Alternative 3. This could be accomplished by adding eight personnel per day or 28 additional FTEs or by reallocating existing personnel.

Observation:
Seven dedicated EMS-specific units stationed at 3, 8, 14, and 5 could provide for responding to 70% of EMS incidents within 7 minutes or less. This would equate to a 50% improvement in EMS coverage by the squad program.

Observation:
This deployment would continue to meet or exceed the AMR contractual obligation for first response services.

Observation:
All current station areas and demand zones will continue to have first due response capacity consistent with current practices.

Observation:
This deployment strategy will significantly reduce fire suppression workload associated with EMS and provide opportunities to better align budget expenditures to service demands and/or program areas.

Observation:
Alternative 3 would reduce the engine and truck responses by 48% or 19,682 incidents.

Risk-Based Staffing Strategies for Alternative 3

Several staffing strategies were developed to explore efficiencies in reallocation of personnel towards the EMS mission. These alternatives either maintain or increase current staffing of dual-certified personnel.

In the table below, the staffing strategy utilizes the existing staffing strategy of four-person staffing on all units with the exception of engine companies that are in stations with another resource (truck/squad). The redistribution of squads to the recommended stations provides for adjustments within the current staffing strategy but would require a daily minimum staffing of 76. This would require four additional FTEs per day for a total of 14 additional FTEs (Continuous) and 8 additional FTEs (Constant).

Table 13: Alternative 3 - Current Staffing Strategy Engines with Squads to Three-Person Staffing

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4		1	8
Station 3	3	4	2		9
Station 4	4				4
Station 5	3		2		5
Station 6	4				4
Station 7	4				4
Station 8	3		2		5
Station 9	4				4
Station 10	3		2		5
Station 11	3		2		5
Station 12	4				4
Station 13		4			4
Station 14	3		2		5
Total	**44**	**16**	**14**	**2**	**76**

The station-level risk ratings were reevaluated through the lens of the 70% reduction in EMS activity. Both call concurrency and the number of high-risk occupancies were not changed. However, the reduction in community demand that would be handled by a lighter and less expensive vehicle resulted in adjustments to the risk profiles of each station. Overall, the risk assessment identified that the majority of station demand zones are of low risk (Stations 3, 4, 7, 9, and 11-14), with five

moderate-risk stations (Stations 2, 5, 6, 8, and 10). Station 1 was calculated as a high-risk station demand zone.

Table 14: Station Demand Zone Risk Concentration Matrix – Alternative 3

Station Demand Zone	Community Demand	Call Concurrency	High-Risk Occupancies	Total Risk Score	Risk Rating
1	5	5	10	53.03	High
2	3	4	10	36.36	Moderate
3	3	5	2	13.44	Low
4	3	5	3	16.29	Low
5	4	5	2	16.79	Moderate
6	2	3	10	25.85	Moderate
7	3	4	2	11.05	Low
8	3	4	5	19.61	Moderate
9	1	2	1	2.12	Low
10	2	3	10	25.85	Moderate
11	2	3	1	4.95	Low
12	2	3	2	6.63	Low
13	1	2	3	4.95	Low
14	1	2	2	3.46	Low

Observation:

Considering full implementation of Alternative 3, the risk assessment identified that the majority of station demand zones are of low risk (Stations 3, 4, 7, 9, and 11-14), with five moderate-risk stations (Stations 2, 5, 6, 8, and 10). Station 1 was calculated as a high-risk station demand zone.

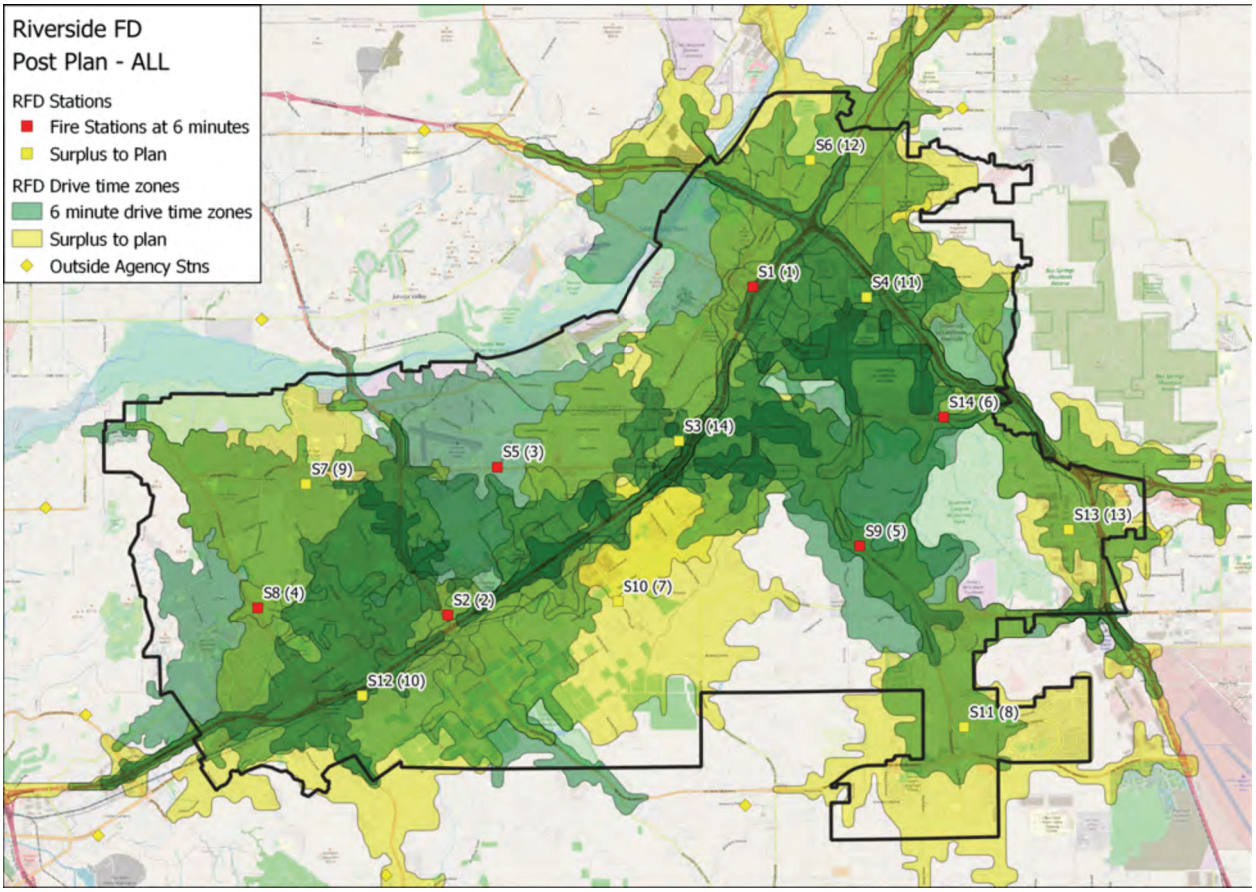
In addition to the risk aligned to the full contemplation of Alternative 3, the marginal utility analyses for all calls within a 6-minute travel time provide context to the consideration of the relative contribution of each station as previously presented. The evaluation is presented below for the reader's convenience.

The key takeaway is that Stations 3, 4, 7, 12, and 13 are not specifically required to meet the desired performance and collectively contribute less than 3% additional coverage between 96.27% and 98.86%. A very similar outcome is observed at the 7-minute response time as well at the 99% threshold.

Table 15: Marginal Fire Station Contribution for 6-Minute Travel Time

Rank	Station	Station Capture	Total Capture	Percent Capture
1	S1	14,150	14,150	37.44%
2	S2	10,219	24,369	64.49%
3	S5	3,627	27,996	74.08%
4	S8	3,374	31,370	83.01%
5	S9	2,636	34,006	89.99%
6	S14	967	34,973	92.55%
7	S10	718	35,691	94.45%
8	S11	691	36,382	96.27%
9	S7	387	36,769	97.30%
10	S12	266	37,035	98.00%
11	S4	105	37,140	98.28%
12	S6	86	37,226	98.51%
13	S13	81	37,307	98.72%
14	S3	52	37,359	98.86%

Figure 19: Current Fire Station Bleed Map for 6-Minute Travel Time



Observation:
Stations 3, 4, 7, 12, and 13 are not specifically required to meet the desired performance and collectively contribute less than 3% additional coverage between 96.27% and 98.86%. A very similar outcome is observed at the 7-minute response time as well at the 99% threshold.

In the table below, the staffing strategy utilizes the existing staffing strategy of four-person staffing on all units with the exception of engine companies. The redistribution of squads to the recommended stations provides for adjustments within the current staffing strategy. In addition, engines 4, 6, 7, 9, and 12 would be adjusted to a minimum of three-person staffing due to a reasonableness test of both the risk rating presented above and the relatively low marginal utility of the station to the overall system performance. This strategy would reallocate the needed personnel for full implementation of Alternative 3 and reduce the engine/truck workload by 19,682 EMS incidents.

This strategy would provide for a savings between $299,808 and $348,777.

Table 16: Alternative 3 - Current Staffing Strategy with Engines with Squad and Engines 4, 6, 7, 9, and 12 Converted to Three-Person Staffing.

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4		1	8
Station 3	3	4	2		9
Station 4	3				3
Station 5	3		2		5
Station 6	3				3
Station 7	3				3
Station 8	3		2		5
Station 9	3				3
Station 10	3		2		5
Station 11	3		2		5
Station 12	3				3
Station 13		4			4
Station 14	3		2		5
Total	**39**	**16**	**14**	**2**	**71**

Observation:
Utilizing this staffing strategy, the department could fully implement Alternative 3 while maintaining the daily minimum staffing of 71.

Observation:
This staffing strategy affords future immediate savings between $299,808 and $348,777, future cost avoidance, and allows the Quint concept.

Alternative 4 – Consider Creation of EMS Overlay with Single-Certified Personnel

While not a specific alternative, any of the operational benefits from Alternatives 2 and 3 could be accomplished through the creation of a single-certification employee group to complement the dual-certified resource allocation and deployment strategies. At the time of this writing, we did not have any market research values to consider, but in our experience with other municipalities, the single-certification strategy is typically 30% to 50% of the dual certified firefighter costs.

Therefore, at a high level, a civilian program could provide the same benefits as Alternative 3, the expanded quint program, and 3-person minimum staffing at a total savings of approximately $1,259,194 and $1,469,059. This is calculated at a 70% base value with residual savings after civilian reinvestment.

Organizational Structure and Consolidation of Administrative Functions

A review of the organizational structure was completed to benchmark against the national experience and best practices. The Riverside Fire Department's organizational structure is appropriate to address the scale and complexity of a modern-metro sized fire department that does not provide patient transportation services. During onsite structured interviews, there was no evidence that the management structure itself was an impediment to completion of the administrative duties.

It is understood that a myriad of organizational structural designs may be equally effective as there is considerable variety across the national with proven experience. Often, the efficacy is found within the personnel assigned, and their commitment to their individual roles and the overall organization's mission, vision, and values. The current organizational chart is provided below.

However, there are some incremental alternatives for consideration. First, the administrative oversight of the grant programs for UASI, USAR, etc. could be consolidated under the Deputy Chief of Administration. Some consideration for the allocation of management analysts, accountants, and coordination under the Office of Emergency Management could be explored to determine where the greatest value and demand for time is focused between OEM and UASI to inform program migration options. Second, the department could consolidate the Administrative Services Manager (and staff) under the Division Chief of Administration as well. Finally, the Fire Prevention functions (Fire Marshal, staff, and fire investigations) could be elevated to a Division on par with the Deputy Chief of Administration, Office of Emergency Management, and Deputy Chief of Operations. In this manner, there would be four direct reports (divisions) to the Fire Chief. An example of the organizational divisions if provided below.

Figure 20: Current Organizational Structural Chart

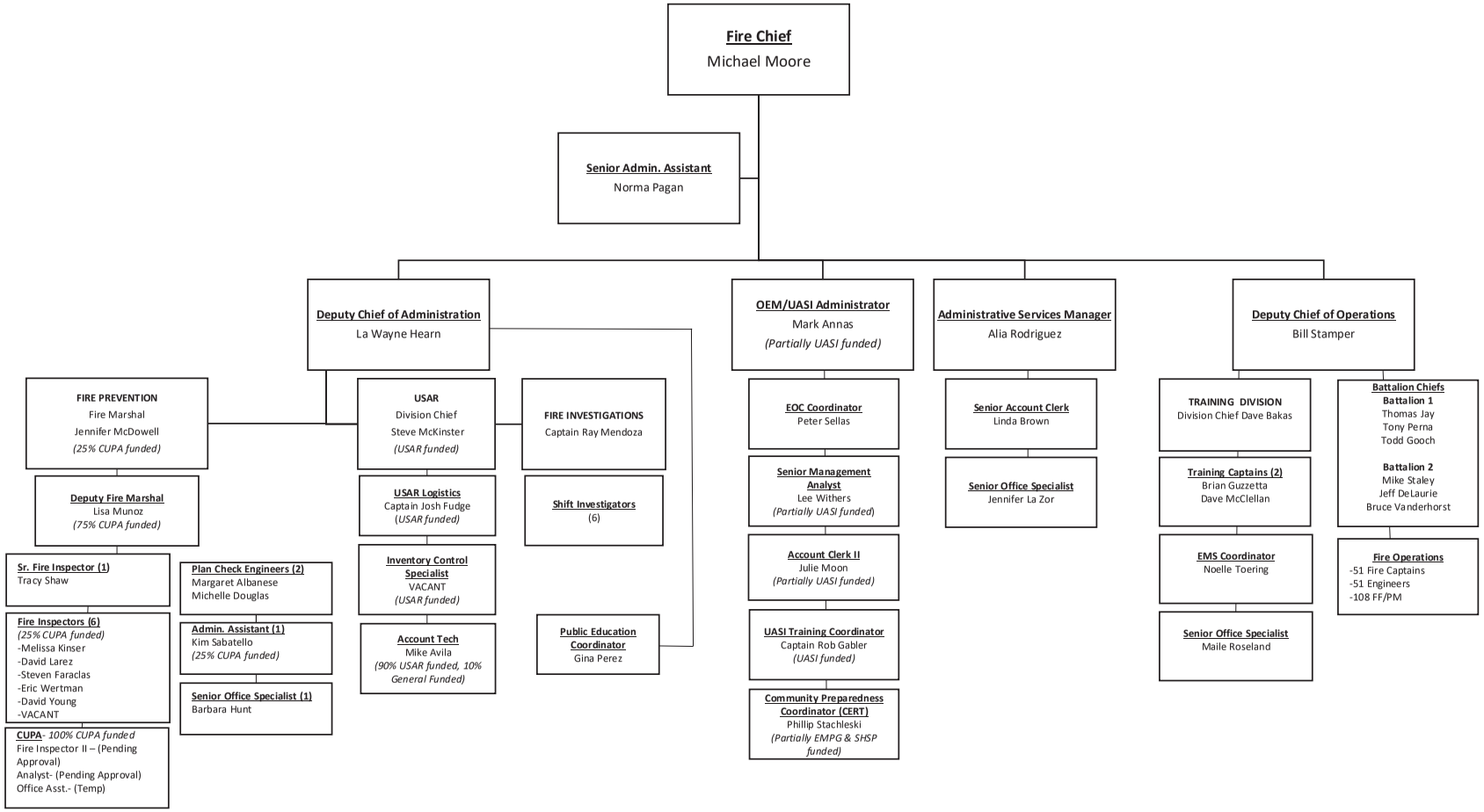
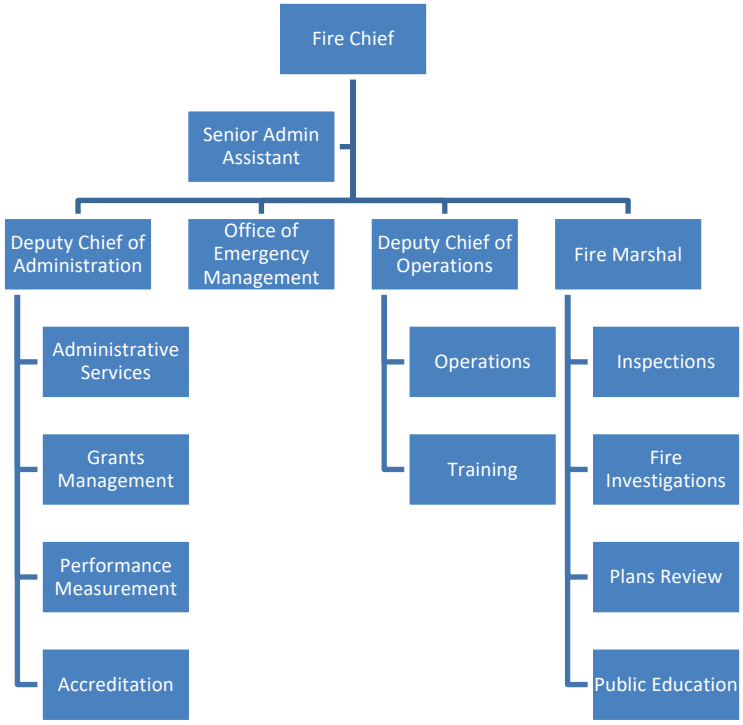


Figure 21: Alternative Organizational Structure by Function



As proposed, this alternative may assist in providing a more congruent organizational workflow and reporting relationships. However, it is understood that the current organizational structure is well-functioning and there are no observable signs that any specific immediate action is imperative. Therefore, the department is encouraged to consider any elements that resonate.

Management Systems

The management systems in place for the department are working effectively. There are no observable signs of any difficulties within the management systems. In fact, the development of depth and breadth of the staffing, time-off, and overtime within the TeleStaff system are superior. Policies and procedures are appropriate between the city and department and provide for an appropriate framework for management.

If additional funding were available, the department may benefit from greater capacity for performance management, data analytics, accreditation management, and in-time analyses assigned to the Deputy Chief of Administration. However, no recommendation is made at this time, until the department fully contemplates the capacity from existing management analyst positions that may be reallocated.

Communications

The within department communications were observed to be adequate and sufficient to coordinate and accomplish the completion of desired tasks. During structured interviews, some feedback would suggest an opportunity for improvement for communications between the administration and the field. However, this is a common element to be identified, but it is unclear whether it is functionally correct or an issue of perception. Either way, the department could benefit from a renewed emphasis on communications between administration and the field and back to administration.

The interdepartmental communication is largely an observed value and is not predicated on any specific feedback or individual source. The high-level observation is that there should be a greater emphasis on detailed, data-driven, and objective policy driven communications to ensure a mutual understanding between the fire department and other city departments. Understanding that public safety occupies such a large portion of the general funds within municipal government, often an unintended and naturally occurring interdepartmental competition emerges for limited resources. Further complicating the issue, is many times the fire department's operations are unique and unknown outside of the specific industry and foreign to most of the typical general purpose government operations. Therefore, an open, candid, and transparent data driven dialogue is imperative to established and maintained trust.

Financial Expenditures Review

An expenditure review was conducted covering the past three fiscal years (FY 17, FY18, and FY19). This review consisted of analysis and comparisons of professional service and maintenance contracts, as well as non-personnel expenditure transactions. The department maintains these agreements to support the administrative and operational requirements necessary to run a metropolitan-sized fire and EMS first response agency, as well as to ensure compliance with industry standards and external regulatory requirements. Review consisted of year-over-year cost analysis and comparisons, as well as a check for anomalous spending. The review validated transparent and accountable practices. Professional service and maintenance contracts are consistent with the operational bandwidth of the department. Expenses along this line are also consistent for a metropolitan-sized full-service fire and EMS agency. Non-personnel spending is in line and controlled within the allocated budget.

Observation:
The review validated transparent and accountable financial practices.

Observation:
Professional service and maintenance contracts are consistent with the operational bandwidth of the department.

Observation:
Non-personnel spending is in line and controlled within the allocated budget.

Observation:
The policy-driven approval process for purchases provides sufficient security to flag unusual or irregular purchases.

Observation:
Overall, the potential for purchasing and/or procurement abuse is minimal.

Timekeeping Procedures, Overtime, and Internal Controls

Fire management continuously monitors overtime and other categories of time usage as a priority. The city utilizes Workforce TeleStaff for Public Safety, a product of Kronos, a US company that specializes in human capital and workforce management. TeleStaff automates firefighter scheduling and time tracking. It is designed to optimize the communications and deployment of public safety personnel. The company website claims that it services more than 2,000 government agencies.[13]

The level of time tracking detail in the city's TeleStaff version is impressive. Overtime is currently tracked in the system under a wide array of TeleStaff codes that can differentiate the underlying drivers of overtime utilization. Examples include sick leave, strike team, training, FLSA, mandatory, and vacation and holiday distinctions. The framework provides the department with robust data to continuously monitor overtime utilization and, in particular, the underlying causes of any deviations.

Observation:
The level of time tracking detail in the city's TeleStaff version is impressive.

Recommendation:
The department is encouraged to continue with the level of detail in accounting for employee expenditures.

Miscellaneous and Other Considerations

Technology and Dispatch

Through the course of evaluating the fire department operations, it was expressed that the dispatch center did not repeat, transmit, and record mayday alerts. This is an important element for firefighter safety and for any after-action reporting, opportunities for improvement, and/or litigation. The dispatch center is an integral partner in the on-scene activities for these rare, but sentinel events.

This may be related to the lack of a command channel provided for RFD. The department utilizes a simplex radio channel for running larger and more complex operations that are not monitored and recorded by the dispatch center. In addition, this requires the incident command to monitor multiple radio channels, increasing any likelihood of missing emergency traffic that isn't repeated by dispatch.

[13] Workforce TeleStaff for Public Safety, www.Kronos.com, accessed August 2019.

If the cursory review is accurate, the department is encouraged to work with the 911 center to establish a monitored command channel to switch to during larger events with multiple unit responses that can be monitored and recorded by dispatch.

Recommendation:
The department is encouraged to work with the 911 center to establish a monitored tactical channel to utilize on larger events with multiple unit responses that can be monitored and recorded by dispatch.

Additionally, there are no CAD-to-CAD capabilities with AMR as exists with the city-to-county operations. Efficiencies may exist for both dispatch centers (city and AMR) with a CAD-to-CAD interface for transferring calls.

Recommendation:
The department is encouraged to work with the 911 center to establish a CAD-to-CAD interface with AMR.

Considering move-up plans, the city may be desirous of automated software that suggests move-up timing and locations as the city system dynamically changes throughout the day with unit availability, surges in demand, traffic impedance, and call concurrency. There are several software vendors available that can provide such services.

Recommendation:
If desired, the department is encouraged to explore software options that can be integrated with CAD to make automated move-up recommendations.

Other Fiscal Considerations

During the structured interviews on the budget processes, it was identified that the department did not specifically budget for retirement payouts. It is understood that this is a policy choice by the city and department as to whether to encumber funds for anticipated retirements and/or the average annual experience. For example, it is not uncommon for municipalities to absorb these expenditures from the overall general fund as they may be highly variable. However, if the budget impact is born solely by the fire department, it is recommended that the department begin to develop a specific line-item reserve to cover anticipated or historically annualized expenses associated with retirement payouts.

Recommendation:
It is recommended that the department begin to develop a specific line-item reserve to cover anticipated or historically annualized expenses associated with retirement payouts.

The department indicated that they were in the process of adopting a policy that would allow the four-person staffing to continue to deploy with three personnel for up to four hours per day. This is evidence of a collaborative approach to staffing that maintains the intent of the staffing strategy but acknowledges the functional efficiency of small time periods that doesn't negatively impact

employees' ability to take time off, impact employees required to report in to work for short periods, and reduces the department's fiscal liability for overtime.

Recommendation:
It is recommended that the department continue with the staffing modifications that accommodates flexibility in short periods.

Other Operational Considerations

If the city and department adopt Alternative 3, then the ongoing performance management should identify other opportunities for realigning resource allocations based on risk and demand. The EMS deployment strategy could be requested to respond to a greater number of EMS incidents in the future as the system becomes comfortable with the new strategies.

Within the Alternative 3 design posited here, the residual workloads at each station were evaluated to determine the optimal alignment of resource allocation to demand. In particular, Stations 2 and 3 are both low-/moderate-risk stations and respond to an average of 0.3 calls per hour in each of the stations. This is similar to Stations 4, 5, and 8 that are all performing well with a single fire suppresion unit. With the exception of Station 1 as a high-risk station and an engine and truck combination, all other stations could function for the forseeable future with a single fire suppression resource. Therefore, Stations 2 and 3 could function at some point in the future with a quint apparatus similar to Station 13.

As previously noted, Station 2 is currently provisioned as the Hazardous Materials location and Station 3 is provisioned as the Technical Rescue station. Employing this alternative, the department would need to evaluate how best to address the low frequency needs of the specialty teams and the best staffing scenario for sufficient readiness. Utilizing the marginal utility analyses may provide some insight into which stations would serve a geographic needs and not materially impact response perofrmance when on specialty incidents.

The expansion of the quint concept to Stations 2 and 3, will afford a current staffing reduction of 6 personnel (3 on each Engine) per day for a total of 18 FTEs over the 3 shifts with the current constant staffing strategy. This equates to a value of $1,798,848. Utilizing the recommended continuous staffing strategy, this would a total FTE reduction of 21 personnel for a total savings of $2,092,660.

The station hourly demands for service for Stations 2 and 3 are provided below.

Figure 22: Overall: Average Calls per Day by Hour of Day – Demand Zone Station 2 – Alternative 3

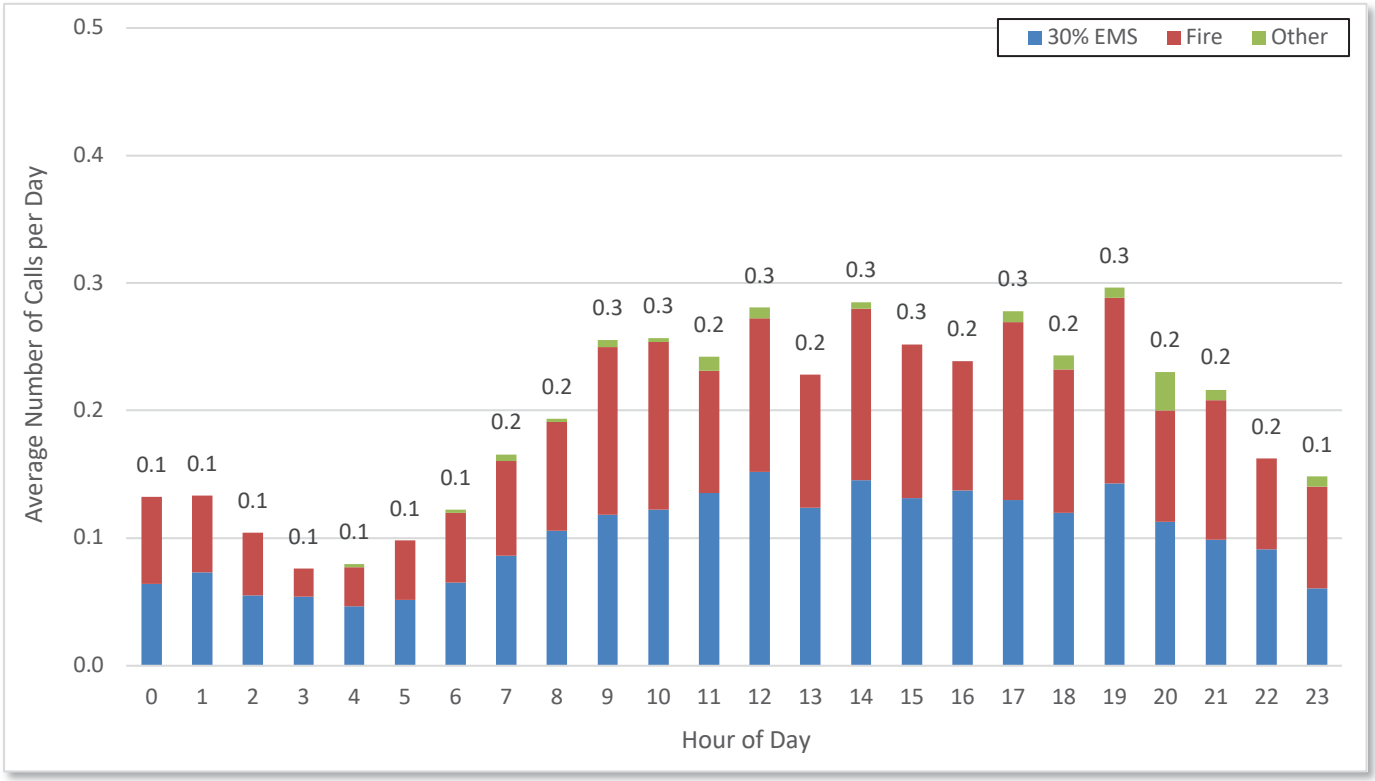


Figure 23: Overall: Average Calls per Day by Hour of Day – Demand Zone Station 3 – Alternative 3

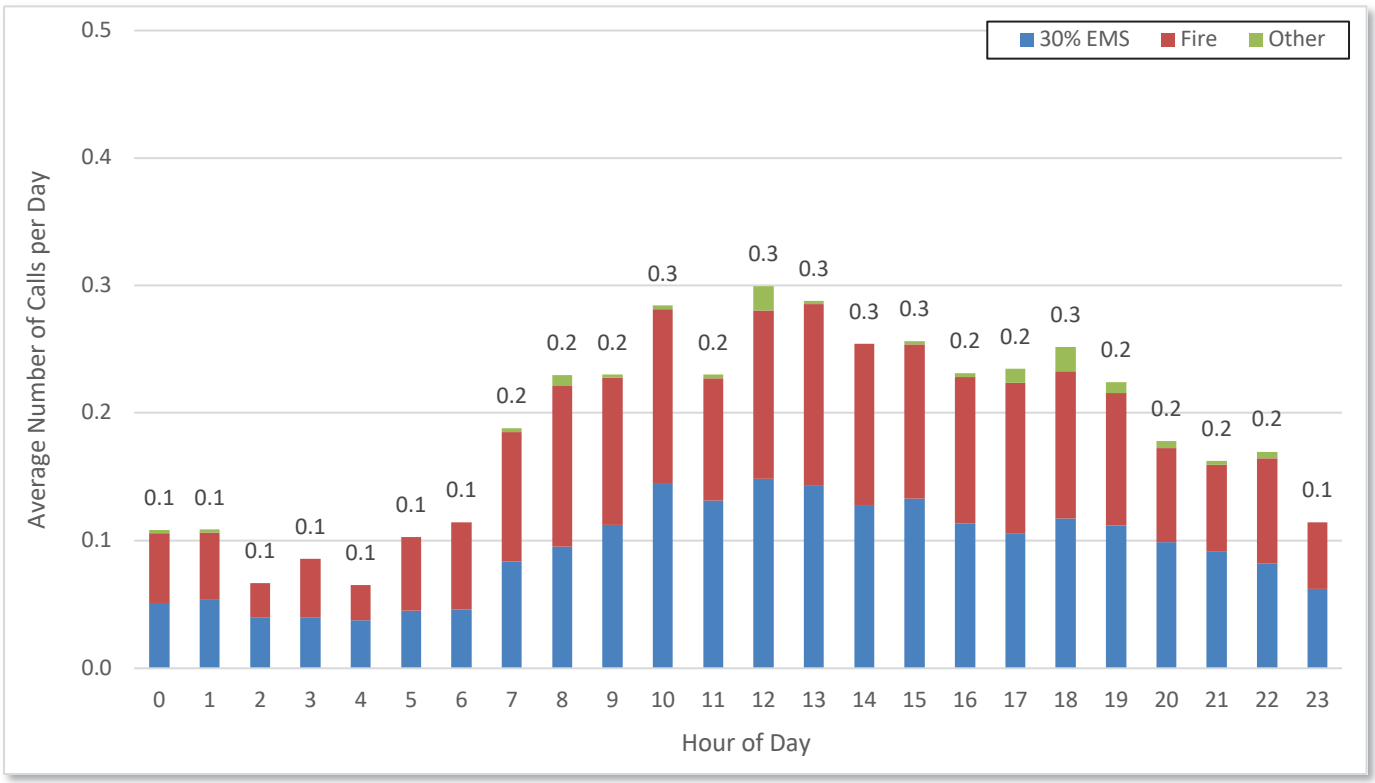


Table 17: Alternative 3 - Current Staffing Strategy with Engines with Squad and Engines 4, 6, 7, 9, and 12 Converted to Three-Person Staffing and the Creation of Quint 2 and Quint 3

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2		4		1	5
Station 3		4	2		6
Station 4	3				3
Station 5	3		2		5
Station 6	3				3
Station 7	3				3
Station 8	3		2		5
Station 9	3				3
Station 10	3		2		5
Station 11	3		2		5
Station 12	3				3
Station 13		4			4
Station 14	3		2		5
Total	**33**	**16**	**14**	**2**	**65**

Observation:

If desired, with the exception of Station 1 as a high-risk station and an engine and truck combination, all other stations could function for the forseeable future with a single fire suppression resource in combination with Alternative 3 of the EMS Redeployment.

Observation:

The expansion of the quint concept to Stations 2 and 3, will afford a current staffing reduction of 6 personnel (3 on each Engine) per day for a total of 18 to 21 FTEs over the 3 shifts. This equates to a value of $1,798,848 to $2,092,660.

Summary of Recommendations

1. The department is encouraged to evaluate cancelled calls, wrong locations, and no incident calls in conjunction with a robust QA/QI process on incident reporting.

2. It is recommended that the department evaluate which data sources will have the highest integrity and accuracy, and develop processes and procedures to have timely access to all desired performance measures.

3. It is recommended that the department work to align turnout time with best practices.

4. It is recommended that the department further investigate potential contributors to the station reliability findings, if desired.

5. Conversely, the department is encouraged to consider discontinuing measuring station reliability, or at least desensitizing it, as a system of measures can provide a more robust outcome-based approach to performance management.

6. The department is encouraged to continue to monitor workload and UHUs to not exceed the upper threshold and ensure the other system measures are still meeting desired outcomes.

7. The department should specifically re-evaluate workload and performance indicators for every 1,000-call increase to ensure system stability.

8. It is recommended that the department continue the three-person staffing strategy for the units at multi-company stations.

9. It is recommended that the department consider the pros and cons of utilizing the Constant Staffing, Continuous Staffing, or a hybrid model as sensitivities to employee burnout, overtime utilization, and increasing wildland firefighting responsibilities may arise.

10. It is recommended that the department consider the pros and cons of utilizing a Continuous Staffing model as excessive hours worked may contribute to the overall WC expense history.

11. It is recommended that the department utilize this analysis to establish a move-up policy that moves units in the order identified that covers the greatest number of incidents in the desired performance.

12. It is recommended that the department consider utilizing GIS analyses to establish ERF performance objectives due to the lack of validity of small sample sizes for 90th percentile calculations.

13. The city/department should continue to provide first response EMS, but consider more efficient resource allocation and deployment strategies as presented below while maximizing opportunities for cost avoidance and increase cost recovery in the future.

14. Any considerations to the adjustment of the 911-call triage system and/or responding resource allocation and capabilities should be completed in concert with the system Medical Director.

15. It is recommended that the city/department consider prioritizing EMS incidents that should receive the closest available resource versus incidents that could be responded to by EMS-specific resources within the contractually obligated performance for first response ALS service.

16. The department is encouraged to better align turnout time with national recommendations and best practices.

17. The department is encouraged to continue with the level of detail in accounting for employee expenditures.

18. The department is encouraged to work with the 911 center to establish a monitored tactical channel to utilize on larger events with multiple unit responses that can be monitored and recorded by dispatch.

19. The department is encouraged to work with the 911 center to establish a CAD-to-CAD interface with AMR.

20. If desired, the department is encouraged to explore software options that can be integrated with CAD to make automated move-up recommendations.

21. It is recommended that the department begin to develop a specific line-item reserve to cover anticipated or historically annualized expenses associated with retirement payouts.

22. It is recommended that the department continue with the staffing modifications that accommodates flexibility in short periods.

Summary of Observations

1. In 2019, RFD received 37,926 unique requests for service, averaging nearly 104 calls per day.

2. Consistent with most modern fire departments, EMS accounted for the majority of the incidents at 74%.

3. Cancelled calls, wrong locations, and no incident calls occurred 4,171 times in 2019, accounting for 11% of the total reported demand.

4. On average, the department is sending 1.2 units to each unique call. This would be considered an efficient utilization of the quantity of resources per incident.

5. The average duration per incident is 21.5 minutes. This is a consistent finding with departments that provide first response medical services but do not provide patient transportation.

6. Within the 2019 RMS file provided, 42,248 or 90.2% of the typical dispatch measures were equal to 0 minutes. Therefore, the dispatch interval is not provided here. More granular examination of response times that excluded the 90.2% of zero values resulted in long dispatch time of 4.6 minutes, which are assumed to be outliers, but the sample size is too small to be credible.

7. The turnout time is not well aligned with national best practices of 1 minute for EMS incidents and is reasonably aligned at 1.5 minutes for fire related incidents.

8. Turnout time can have a significant impact on the overall response time for the customer and is generally considered under management's control.

9. Travel time is within the national experience for most metropolitan agencies. It is common for urban/suburban areas to perform between 5 and 8 minutes at the 90th percentile.

10. All stations had 75% or greater station reliability with the exceptions of Stations 7, 8, and 10.

11. Across all stations, there is approximately an 83% chance that the first call can be dispatched, handled, and the unit return to service prior to a second or greater call occurring.

12. Across all stations, there is greater than a 96% chance that the first fire related call can be dispatched, handled, and the unit return to service prior to a second or greater call occurring.

13. Understanding the relatively low call concurrency rates of less than 18%, it is unlikely that call volume alone is contributing to the challenges in station reliability.

14. The model is robust and has considerable resiliency in the system as response times are minimally impacted at the system level.

15. Overall, 91.2% of the time when a call occurs, 16 units or more were available.

16. Significant variability in demand occurs by hour of day. The peak demand between 10 am and 6 pm averages 6 calls per hour.

17. A relatively uniform distribution of risk occurs across the community with the higher concentrations through the center of the community.

18. The relative geographic distribution between fire and EMS incidents is consistent across the two program areas.

19. The call density analysis validates the station location planning processes utilized by the city and department.

20. Overall, the risk assessment identified that the majority of station demand zones are of low to moderate risk, with two high-/maximum-risk station demand zones (Stations 1 and 2).

21. While desired performance is largely a local policy decision, the current performance is well aligned with national references and experience.

22. All units had UHU values below 0.15, or approximately 3.6 hours or less per day on 911 related activity.

23. Therefore, capacity exists to absorb more work prior to any reinvestment in resources due to workload.

24. If the measured growth for requests for services of 1.1% per year remains stable, the system should remain sustainable for the foreseeable future.

25. The national experience is a growth between 3% and 7% for EMS related incidents.

26. The department staffs four personnel on all engines and trucks with the exception of the engine companies that are assigned to a station with a four-person truck company or squad.

27. The department staffs 72 personnel per shift in an effort to maintain a minimum daily staffing of 72.

28. Continuous Staffing would require 3.49 Full Time Equivalents (FTEs) for each of the 72 minimum staffed positions for a total of 252 personnel assigned to shift, as opposed to the current allocation of 216 personnel. This equates to an additional 36 personnel department-wide, or 12 per shift.

29. In other words, utilizing a Continuous Staffing strategy, the current FTE allocation of 216 would appropriately support a minimum daily staffing of 62.

30. Largely, staffing is a local policy choice based on competing demands between operational and fiscal desires as well as the community's sensitivity to specific expenditures such as overtime or fringe benefits.

31. The Continuous Staffing strategy could yield between $990,781 utilizing entry level compensation.

32. The adoption of a Continuous Staffing strategy can be applied independently of any other recommendations.

33. The fact that the model can explain 50% of the expected WC value is significant, as market factors may influence the premium experience beyond what the loss history may influence.

34. Similar to the urban/rural call density analyses, this analysis demonstrates that the department has done well in station placement planning efforts.

35. The current 14-sation deployment can cover nearly 98% of all calls within a 6-minute travel time.

36. The addition of quint apparatus may provide an opportunity for improved aerial coverage for ISO.

37. Like most agencies, the department is challenged to assemble a 15-person ERF within the more restrictive national consensus standard of 8 minutes.

38. The department is nearly meeting an acceptable ERF for urban/metropolitan environments as defined by the CFAI at 88% at 10 minutes.

39. The department is reasonably meeting an acceptable ERF for suburban environments as defined by the CFAI at 99% at 13 minutes.

40. Irrespective of any national guidelines, RFD is providing an excellent ERF that meets or exceeds most urban fire departments.

41. The city/department benefits by approximately $2m per year for dispatch and first response services within the current public-private partnership.

42. The provider benefits from a relaxed response time from 9:59 to 11:59, eliminating the public subsidy.

43. As a readiness model, the fire department has a robust distribution of resources, excellent response time, and excess capacity above the non-EMS incident demand to provide first response services for EMS.

44. All 911-call triage protocols must be approved by the system Medical Director.

45. It is important to understand that the citizen's experience is the same with a 6-minute travel time and a 2-minute turnout time, as with a 7-minute travel time and a 1-minute turnout time.

46. Seven dedicated EMS-specific units stationed at 3, 8, and 14 could provide for responding to 70% of EMS incidents within 7 minutes or less. This would equate to a 50% improvement in EMS coverage by the squad program.

47. This deployment would continue to meet or exceed the AMR contractual obligation for first response services.

48. All current station areas and demand zones will continue to have first due response capacity consistent with current practices.

49. This deployment strategy will significantly reduce fire suppression workload associated with EMS and provide opportunities to better align budget expenditures to service demands and/or program areas.

50. Alternative 3 would reduce the engine and truck responses by 48% or 19,682 incidents.

51. Considering full implementation of Alternative 3, the risk assessment identified that the majority of station demand zones are of low risk (Stations 3, 4, 7, 9, and 11-14), with five moderate-risk stations (Stations 2, 5, 6, 8, and 10). Station 1 was calculated as a high-risk station demand zone.

52. Stations 6 and 9 are not specifically required to meet the desired performance and collectively contribute less than 1% additional coverage between 97.42% and 97.95%. A very similar outcome is observed at the 7-minute response time as well at the 99% threshold.

53. Utilizing this staffing strategy, the department could fully implement Alternative 3 while maintaining the minimum daily staffing of 72.

54. The review validated transparent and accountable financial practices.

55. Professional service and maintenance contracts are consistent with the operational bandwidth of the department.

56. Non-personnel spending is in line and controlled within the allocated budget.

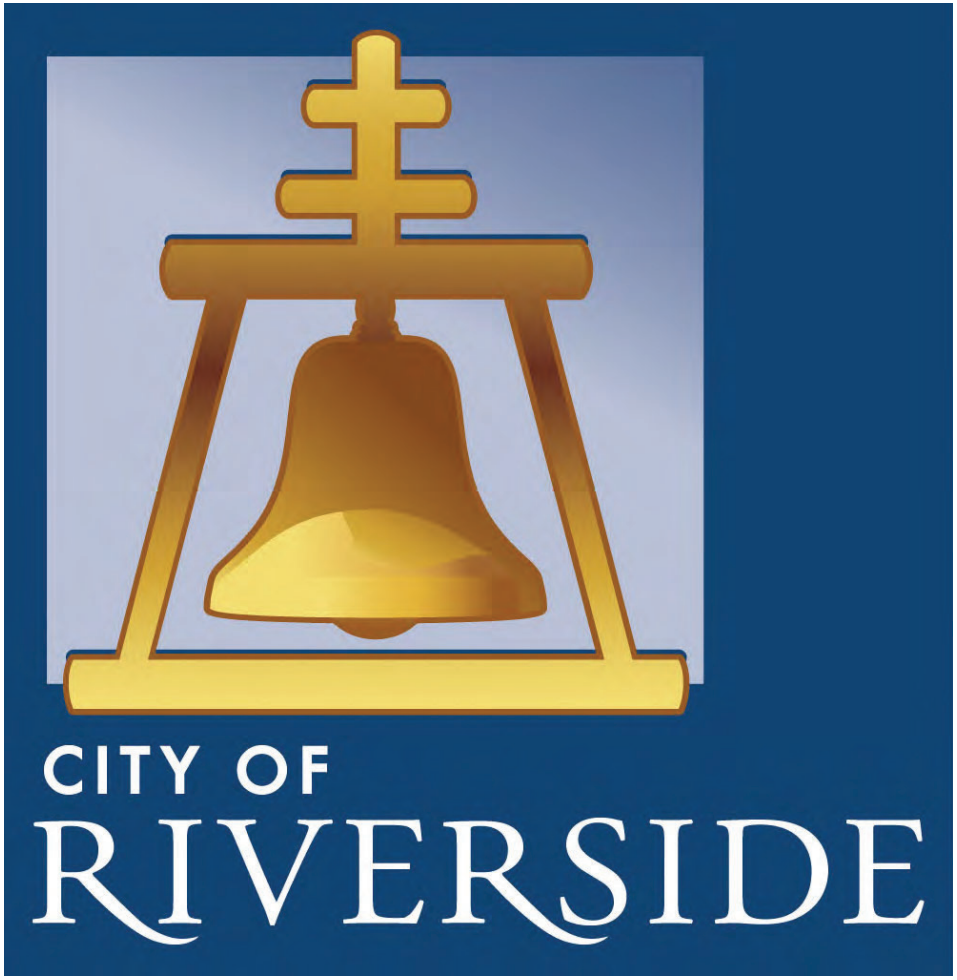
57. The policy-driven approval process for purchases provides sufficient security to flag unusual or irregular purchases.

58. Overall, the potential for purchasing and/or procurement abuse is minimal.

59. The level of time tracking detail in the city's TeleStaff version is impressive.

60. If desired, with the exception of Station 1 as a high-risk station and an engine and truck combination, all other stations could function for the forseeable future with a single fire suppression resource.

REPORT PRESENTATION BODY



City of Riverside, CA

Fire Department
Performance Audit

Community Response History

	Reporting Period		
Call Category	2017	2018	2019
Cardiac and Stroke	2,425	2,651	2,636
Difficulty Breathing	2,587	2,842	2,916
Fall and Injury	9,155	9,149	8,532
Illness and Other	12,145	11,399	12,272
MVA	998	956	930
Overdose and Psychiatric	885	989	935
Possible Death or Death	120	100	135
Seizure and Unconsciousness	4,151	4,571	4,310
Transfer	103	130	86
EMS Total	32,569	32,787	32,752
Aircraft Crash	10	7	9
Fire Alarm	1,784	1,811	2,030
Fire Other	835	895	997
Outside Fire	519	499	613
Public Service	806	790	1,054
Strike Team Request	59	41	33
Structure Fire	490	417	430
Vehicle Fire	356	305	282
Fire Total	4,859	4,765	5,448
Hazmat	255	290	280
Hazmat Total	255	290	280
Rescue	233	236	265
Rescue Total	233	236	265
Total	37,916	38,078	38,745
Average Calls per Day	103.9	104.3	106.2
YoY Growth	N/A	0.4%	1.8%

Community Demand

- EMS accounts for largest share of community requests for service
- Total of 38,745 unique incidents in 2019
- 106.2 calls per day
- Year over year growth in calls varied between 0.4% and 1.8%
- Average year over year growth is approximately 1.1% per year
- National experience is between 3% and 7% in EMS growth

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Community Demand

- EMS accounts for 74.1% of the requests for service
- Fire related incidents accounts for 24.7% of the incidents
- Special risks such as hazmat and technical rescue are combined 0.8% of demand
- Outside, Vehicle, and Structure fires combined account for 2.8% of the demand.
- Validates an EMS centric resource allocation

Call Category	Number of Calls	Average Calls per Day	Call Percentage
EMS	26,310	72.1	69.4
MVA	1,807	5.0	4.8
EMS Total	28,117	77.0	74.1
Cancelled/Wrong Location/No Incident	4,171	11.4	11.0
False Call/Alarm	94	0.3	0.2
Fire Alarm	1,010	2.8	2.7
Fire Other	1,175	3.2	3.1
Outside Fire	680	1.9	1.8
Public Service	1,860	5.1	4.9
Severe Weather or Natural Disaster	7	0.0	0.0
Structure Fire	212	0.6	0.6
Vehicle Fire	161	0.4	0.4
Fire Total	9,370	25.7	24.7
Hazmat	202	0.6	0.5
Hazmat Total	202	0.6	0.5
Rescue	130	0.4	0.3
Rescue Total	130	0.4	0.3
Unknown	107	0.3	0.3
Unknown Total	107	0.3	0.3
Total	37,926	103.9	100.0

System Performance

2019 Historical Performance

- Measured at the 90th percentile
- Considering "Travel Time"
- EMS is at 6.1 minutes
- Fire is at 7.4 minutes
- System performance is at 6.5 minutes overall

Program	Turnout Time (Minutes)	Travel Time (Minutes)	Response Time (Minutes)	Sample Size[1]
EMS	2.0	6.1	7.6	27,757
Fire	2.1	7.4	8.8	8,095
Hazmat	2.3	7.7	9.3	202
Rescue	1.8	7.3	8.3	130
Unknown	2.1	6.6	7.8	98
Total	2.0	6.5	7.9	36,282

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2019 Historical Performance

- Measured at the 90th percentile
- Considering "Travel Time"
- Engines is at 6.6 minutes
- Trucks is at 7.4 minutes
- Squads at 6.5 minutes

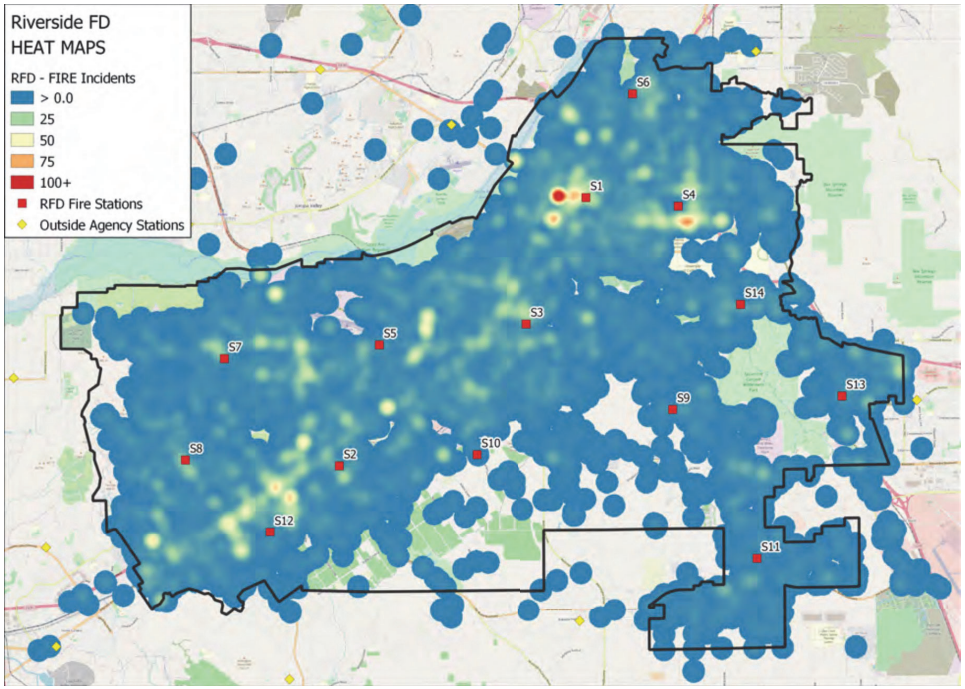
Unit Type	Travel Time (Minutes)	Number of First Arrivals	Number of First Arrivals with Travel Times
Battalion	7.2	237	214
Breathing Support	--	1	1
Brush	23.7	28	21
Engine	6.6	26,191	25,804
Hazmat	--	6	2
Heavy Rescue	7.3	270	266
OES Type 3	--	9	6
Patrol	--	5	3
Reserve Engine	--	3	3
Squad	5.7	7,410	7,295
Truck Company	7.4	2,120	2,056
Water Tender	--	2	2
Total	6.5	36,282	35,673

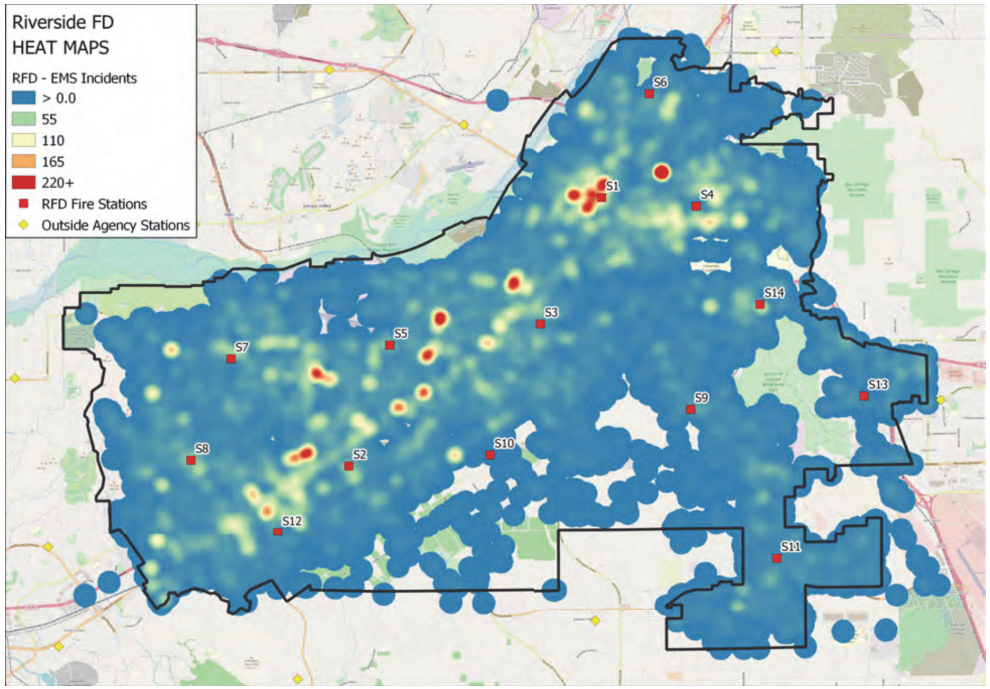
FITCH & ASSOCIATES

Risk Assessment

Fire Incidents

EMS Incidents

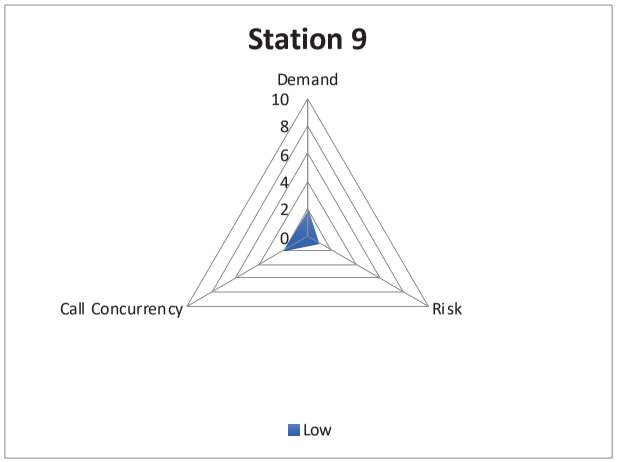


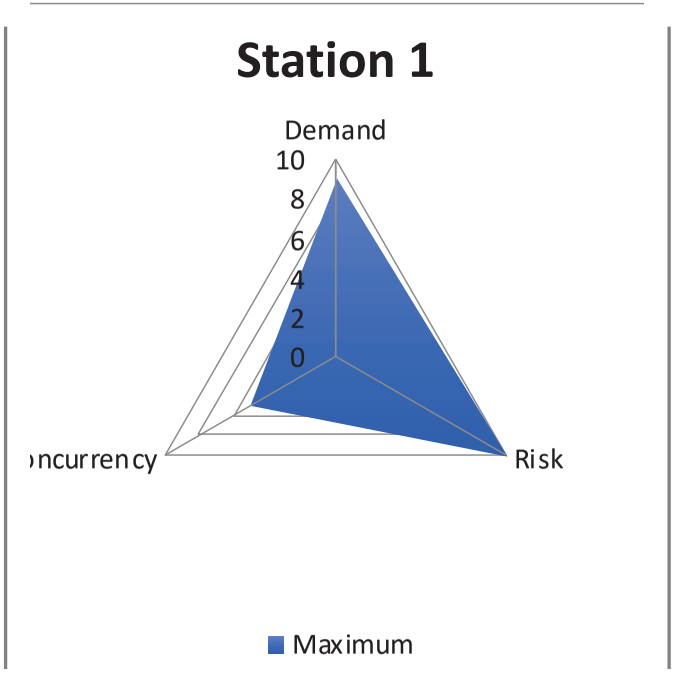


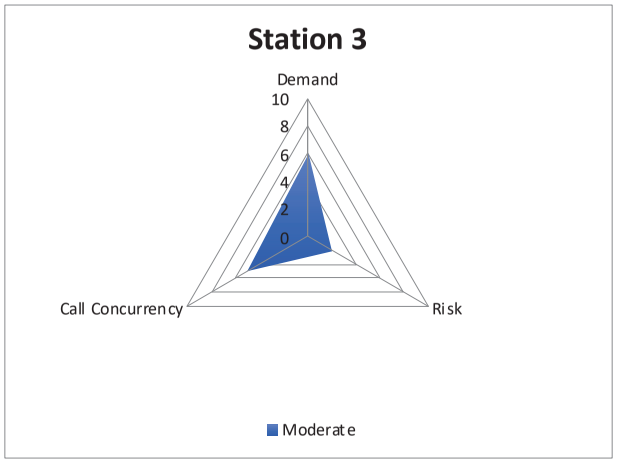
Station Demand Zone Risk Matrix

- Utilized all high-risk occupancies identified by the Riverside Fire Department's occupancy risk assessment.
- Risk matrix incorporates three variables in the formula
  - 2019 station demand
  - 2019 station level call concurrency
  - Number of high-risk occupancies
- Overall, the risk assessment identified that the majority of station demand zones are of low to moderate risk, with two high/maximum-risk station demand zones (Stations 1 and 2).

Station Demand Zone	Community Demand	Call Concurrency	High Risk Occupancies	Total risk Score	Risk Rating
1	9	5	10	79.45	Maximum
2	7	4	10	60.35	High
3	6	5	2	23.92	Moderate
4	7	5	3	30.75	Moderate
5	8	5	2	31.27	Moderate
6	3	3	10	30.67	Moderate
7	5	4	2	16.79	Moderate
8	6	4	5	30.63	Moderate
9	2	2	1	3.46	Low
10	4	3	10	36.36	Moderate
11	3	3	1	7.04	Low
12	4	3	2	11.05	Low
13	2	2	3	6.63	Low
14	2	2	2	4.90	Low


Station 9
Demand
10
8
6
4
2
0
Call Concurrency
Risk
Low

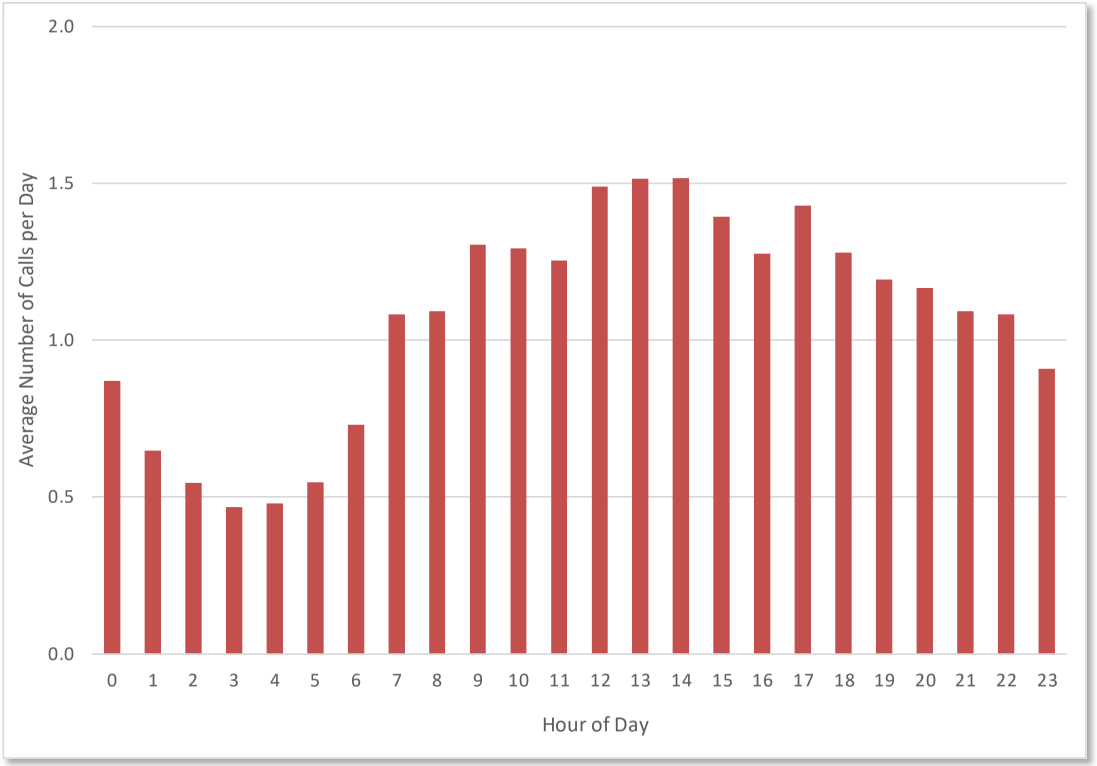

Station 1
Demand
10
8
6
4
2
0
ncurrency
Risk
Maximum

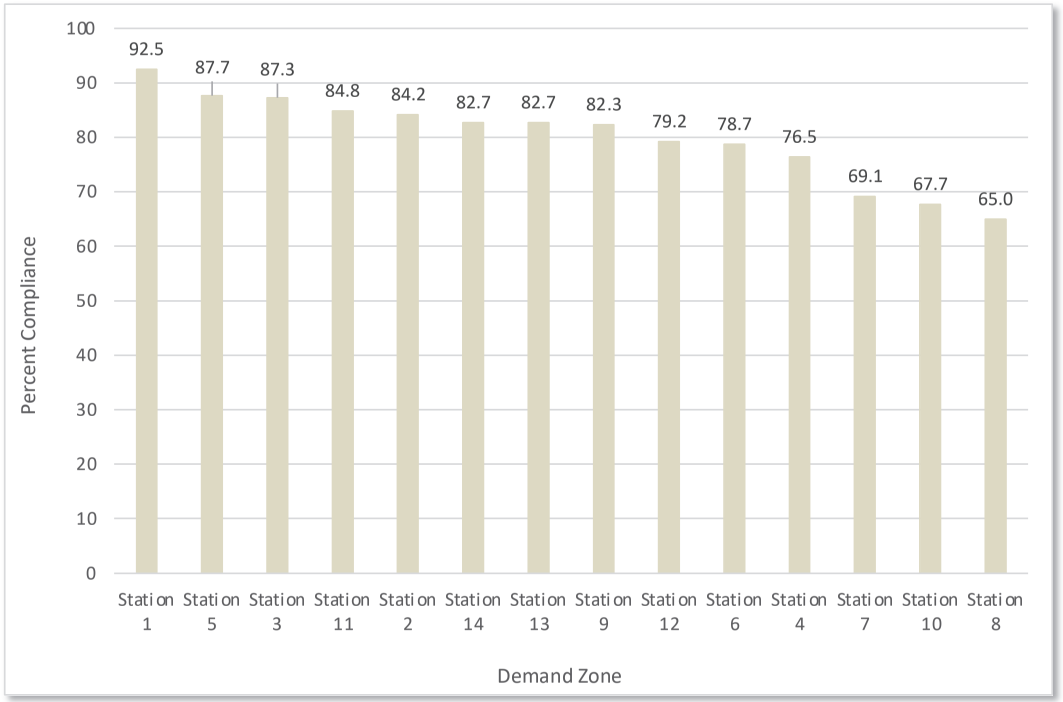

Station 3
Demand
10
8
6
4
2
0
Call Concurrency
Risk
Moderate


System Resiliency

Fire Related Demand

- The rate of fire related incidents would not indicate a strong community demand for fire services
- Average hourly demand 1.5 calls per hour at the peak of the day with 17 primary fire suppression resources
- Reinforces that the overwhelming community demand for services are for EMS





- All stations had 75% or greater station reliability with the exceptions of 7, 8, and 10, respectively.
- In other words, for the majority of the stations 75% to 92.5% of the incidents were handled by the station that was geographically supposed to handle the incident
  - Stations 7, 8, and 10 vary between 65% and 69%
- Antiquated measure due to automatic vehicle location (AVL) dispatching that assigns the closest unit regardless of the prescribed geographic legacy boundary
- AVL dispatching is considered a best practice

Station Reliability

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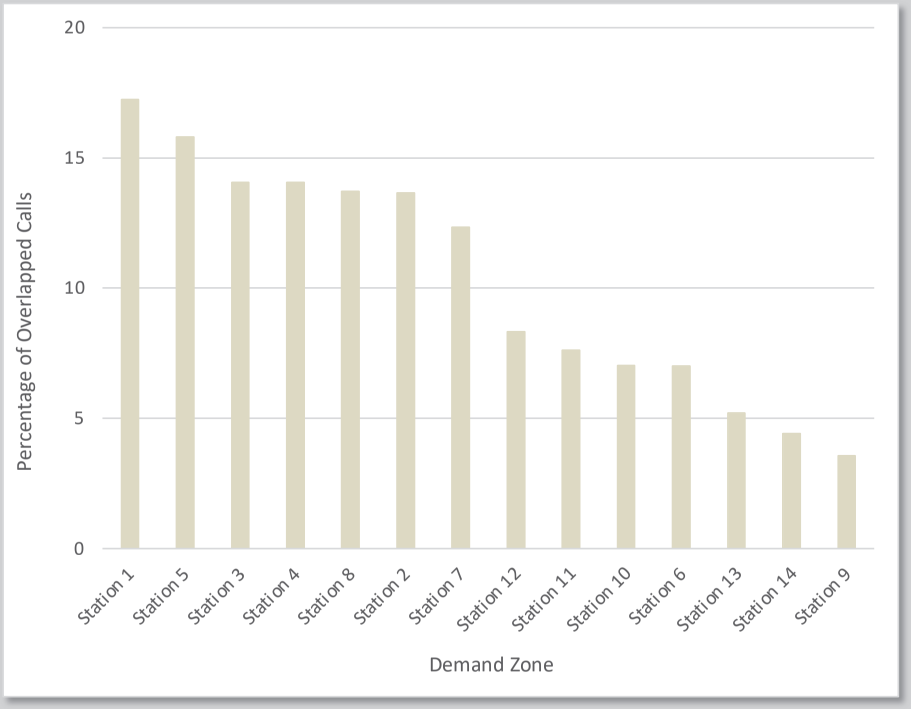
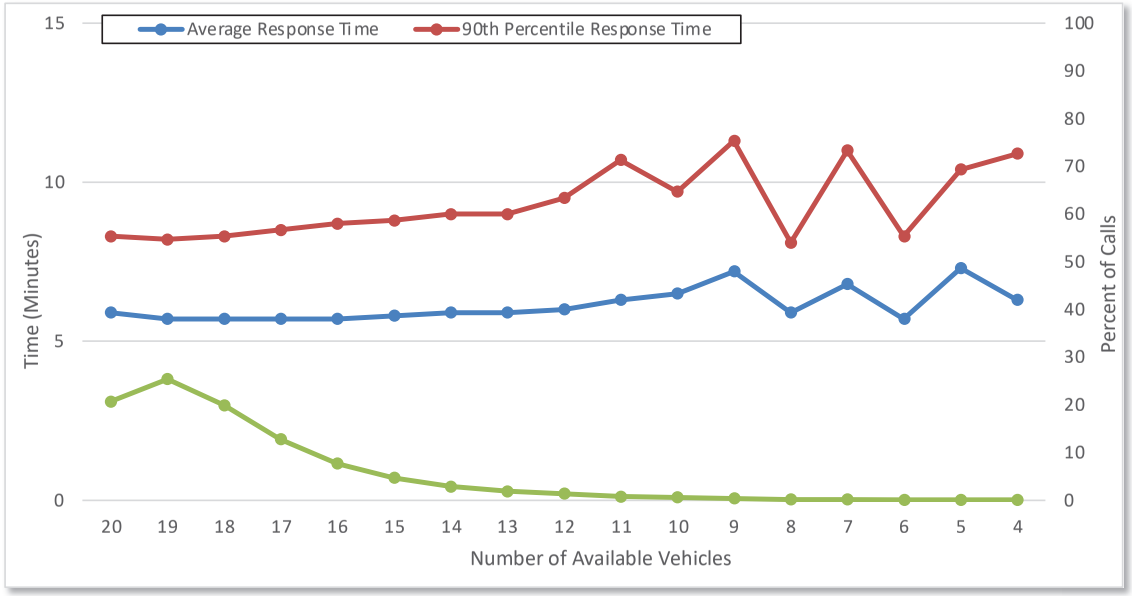
Simultaneous Events

- Station 1 has the highest rate of simultaneous events at 17.2%
  - 13.3% of Station 1's call concurrency is for EMS
- In other words, approximately 83% of the time when an incident occurs the incident can be mitigated, and the units returned to available status prior to another incident occurring
- Fire related activity only has a call concurrency rate of 3.7%
  - In other words, approximately 96% of the time when a fire-related incident occurs the incident can be mitigated, and the units returned to available status prior to another fire-related event occurring





- Overall, 91.2% of the time when a call occurs, 15 units or more were available.
- The total response time varies less than 3 minutes at the 90th percentile between 20 units available and 4 units.
- Any calls occurring at less than 5 remaining units accounted for less than 0.1%

Measures of Resiliency

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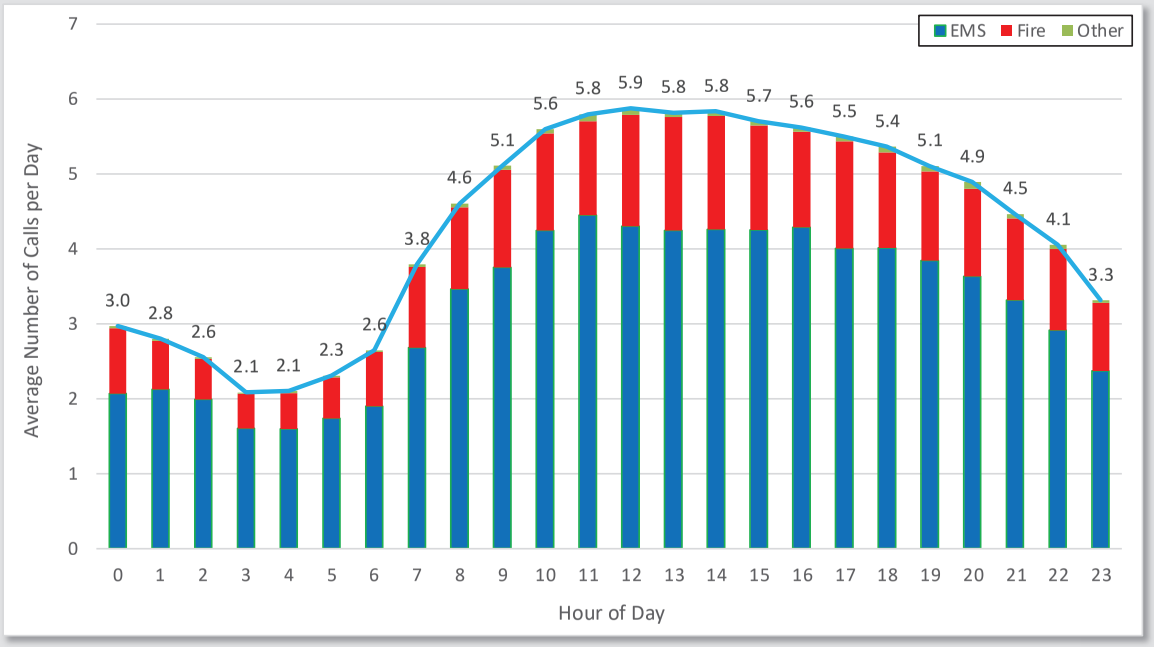
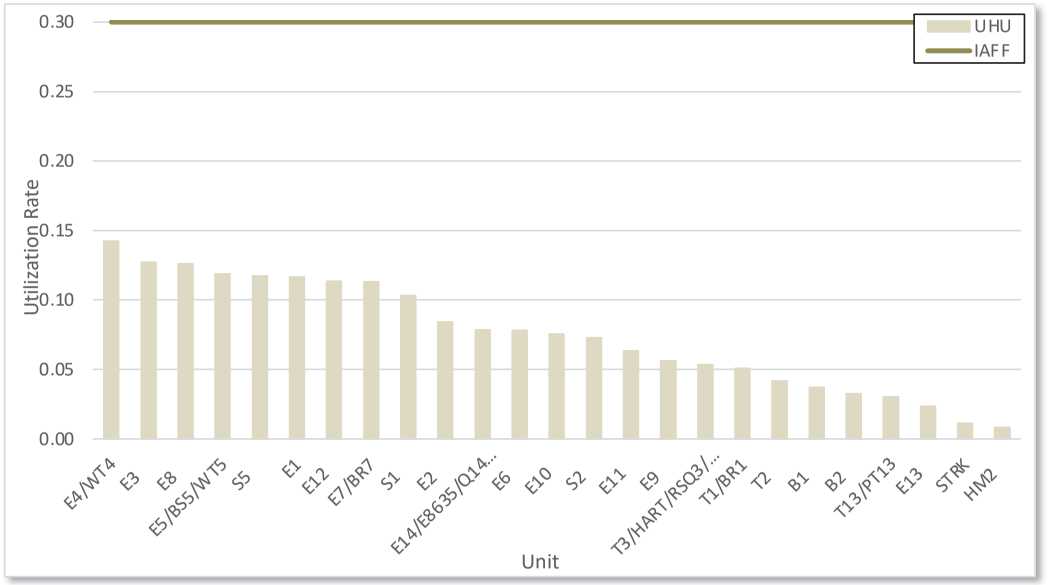


Temporal Distribution

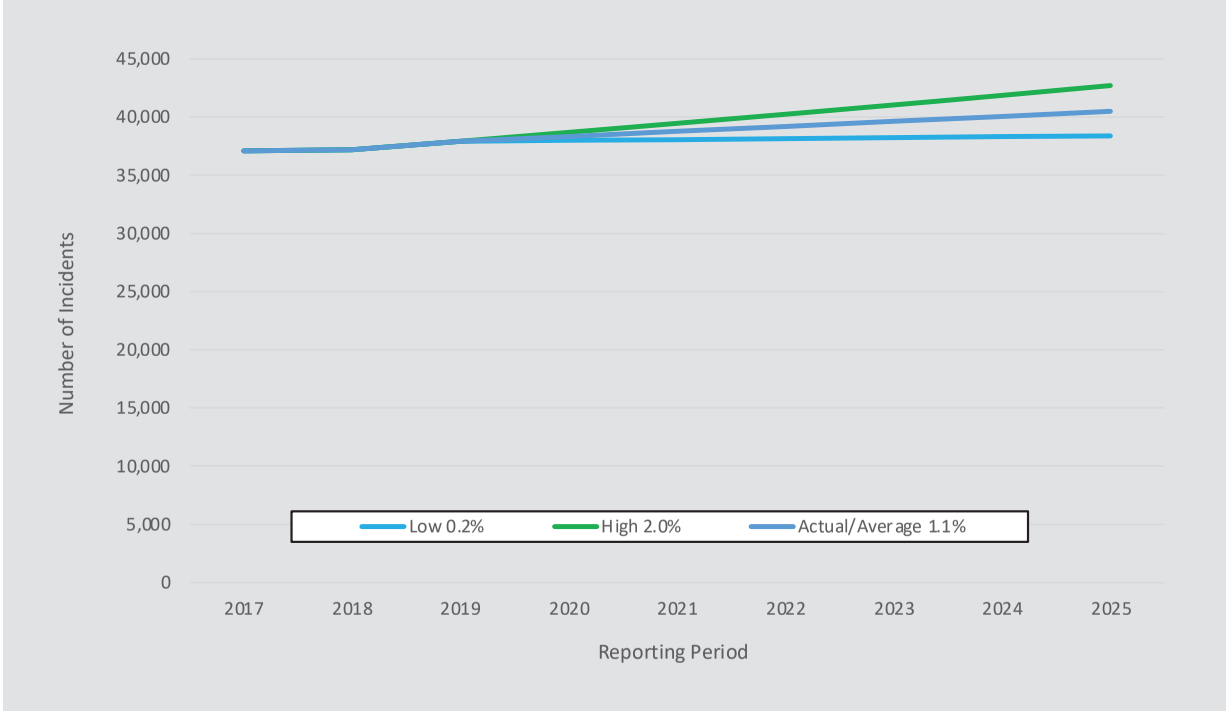
- The community demand is at its peak between 9 am and 9 pm
- Generally, there is an average of 6 call per hour throughout the peak periods
- EMS accounts for greater than 4of the 6 calls per hour

Unit Hour Utilization

- Considering how much work is to much work
- Best practice is not to exceed 0.25 to 0.30-unit hour utilization within a 24-hour shift
- All units are less than 15% UHU
- Overall, the current workload indicates that there is excess capacity in the system and therefore can absorb more work
- The utilization of Squad units to absorb work from the fire suppression resources is under utilized and under performing providing limited system benefits



Projected Growth



- Community requests for services had a year of year growth of 1.1% over the study period
- If the last three years is representative of the future, demand will be relatively stable
- In our experience most of the country is growing by 3% to 7% per year in EMS incidents

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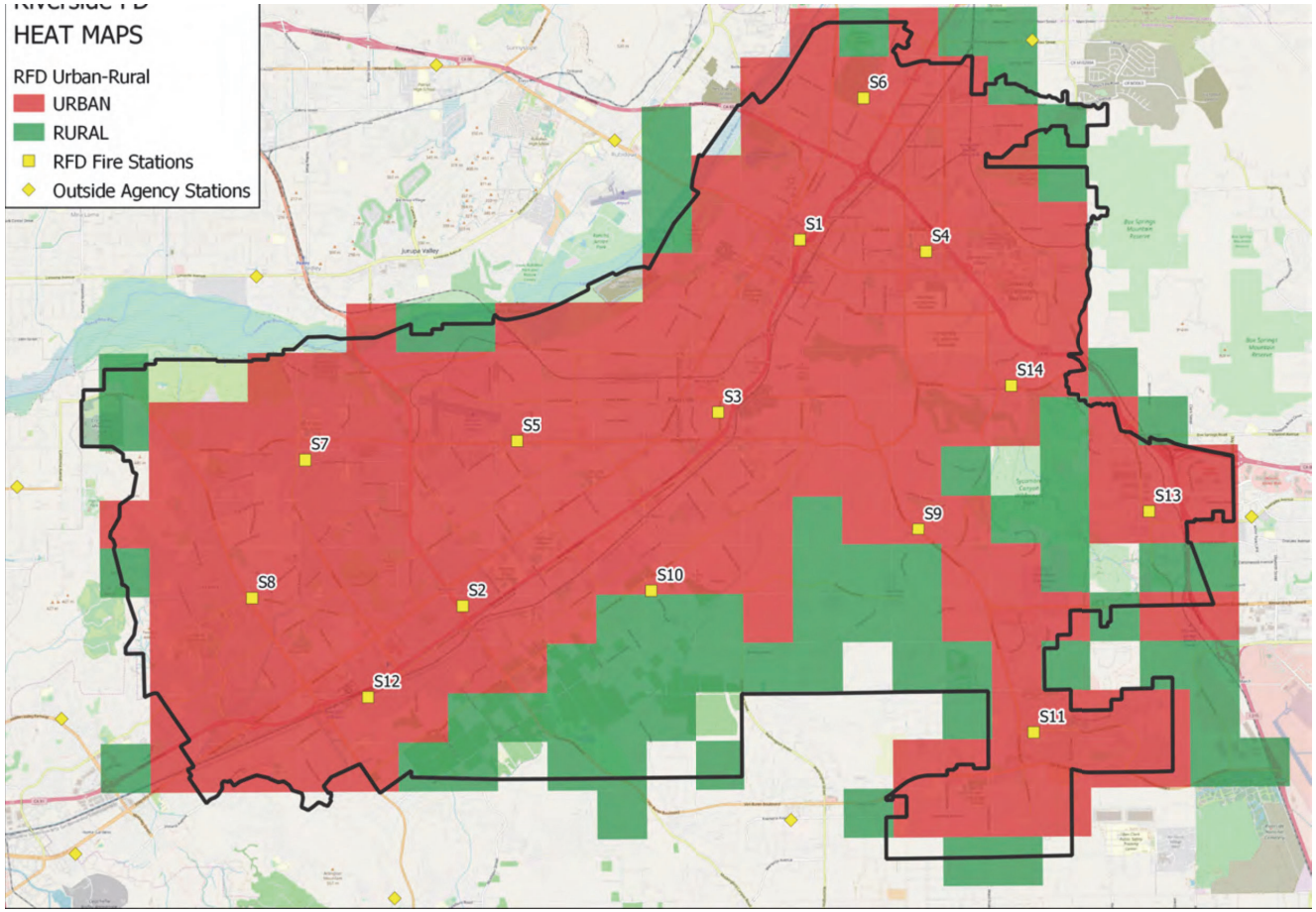
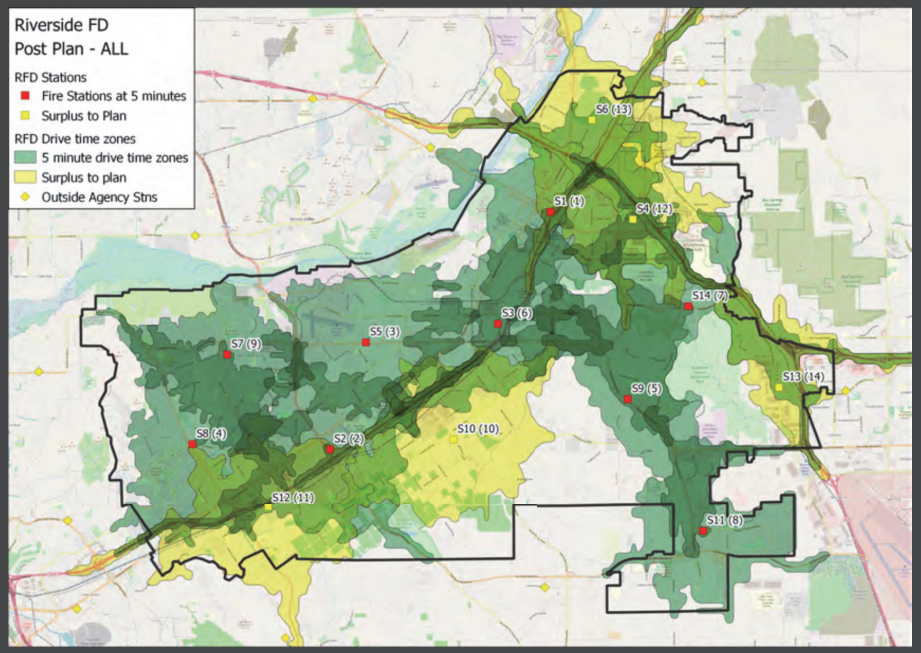
Desired Performance and Station Locations

- All Calls



Call Density Validates Station Locations

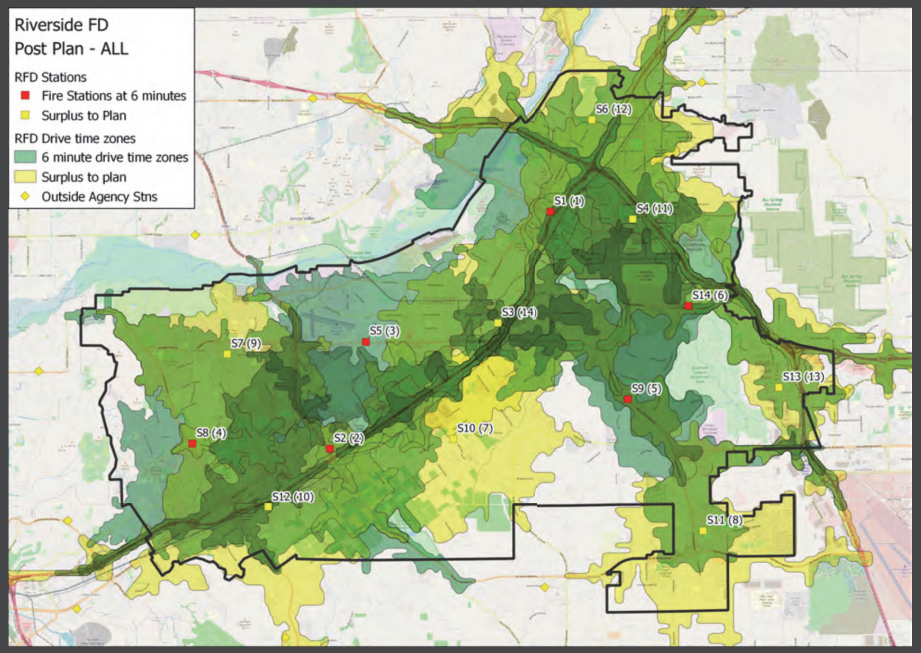
Overall, the station placement is well aligned with the demand for services



Rank	Station	Station Capture	Total Capture	Percent Capture
1	S1	11,568	11,568	30.61%
2	S2	8,006	19,574	51.80%
3	S5	4,297	23,871	63.17%
4	S8	3,785	27,656	73.18%
5	S9	2,313	29,969	79.30%
6	S3	1,469	31,438	83.19%
7	S14	1,006	32,444	85.85%
8	S11	912	33,356	88.27%
9	S7	868	34,224	90.56%
10	S10	660	34,884	92.31%
11	S12	505	35,389	93.65%
12	S4	425	35,814	94.77%
13	S6	338	36,152	95.67%
14	S13	89	36,241	95.90%

5-Minute Travel Time

- Current configuration can meet approximately 96% of the incidents within 5-minutes travel time or less
- The current practice of up to five units out of service per day may contribute to actual performance of 6.5 minutes
- Strategic move-up plan can assist in improving performance



Rank	Station	Station Capture	Total Capture	Percent Capture
1	S1	14,150	14,150	37.44%
2	S2	10,219	24,369	64.49%
3	S5	3,627	27,996	74.08%
4	S8	3,374	31,370	83.01%
5	S9	2,636	34,006	89.99%
6	S14	967	34,973	92.55%
7	S10	718	35,691	94.45%
8	S11	691	36,382	96.27%
9	S7	387	36,769	97.30%
10	S12	266	37,035	98.00%
11	S4	105	37,140	98.28%
12	S6	86	37,226	98.51%
13	S13	81	37,307	98.72%
14	S3	52	37,359	98.86%

6-Minute Travel Time

- Current configuration can meet approximately 99% of the incidents within 6-minutes travel time or less
- Only six continuously staffed stations are required to meet greater than 90% of the incidents
- Strategic move-up strategy can preserve performance as system drawdown occurs

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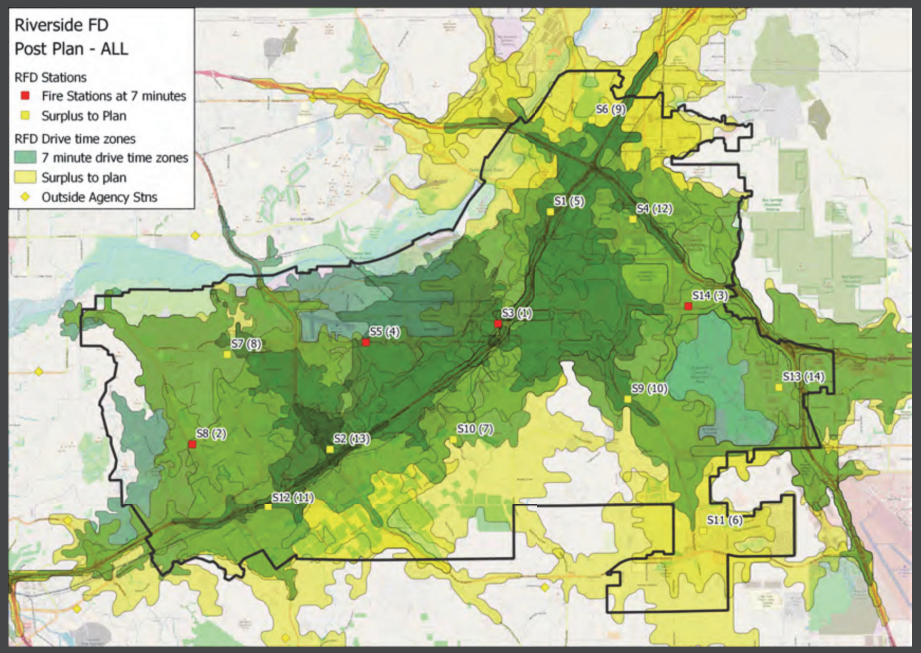

Rank	Station	Station Capture	Total Capture	Percent Capture
1	S3	18,949	18,949	50.14%
2	S8	8,655	27,604	73.05%
3	S14	5,552	33,156	87.74%
4	S5	1,520	34,676	91.76%
5	S1	1,272	35,948	95.13%
6	S11	1,255	37,203	98.45%
7	S10	330	37,533	99.32%
8	S7	55	37,588	99.47%
9	S6	33	37,621	99.55%
10	S9	28	37,649	99.63%
11	S12	20	37,669	99.68%
12	S4	14	37,683	99.72%
13	S2	6	37,689	99.73%
14	S13	0	37,689	99.73%

7-Minute Travel Time

- Current configuration can meet approximately 100% of the incidents within 7-minutes travel time or less
- A four-station configuration can meet approximately 92% of the incidents within 7-minutes travel time
- Basis for a design of an EMS system overlay

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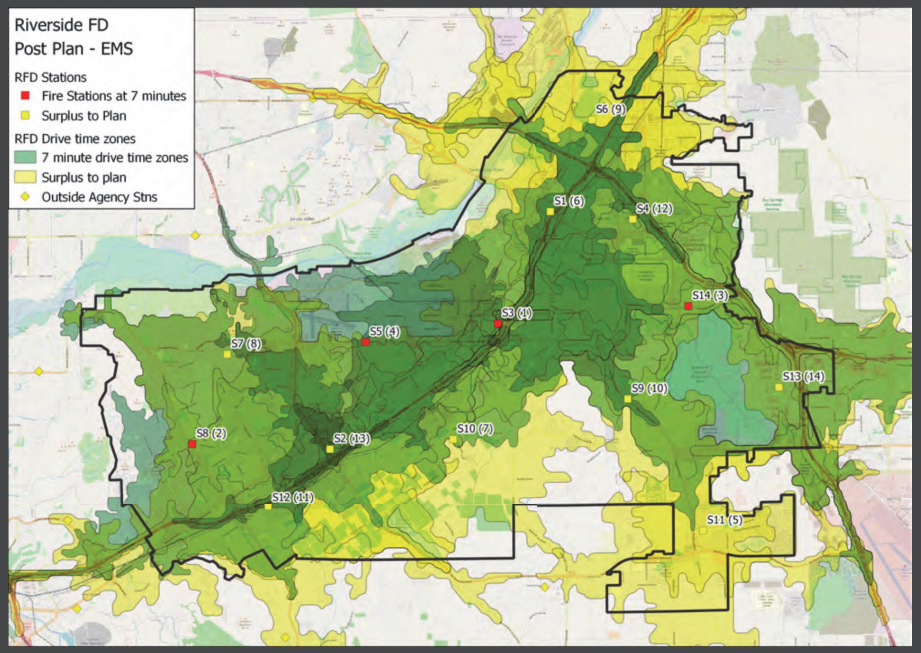
Desired Performance and Station Locations

- EMS Calls



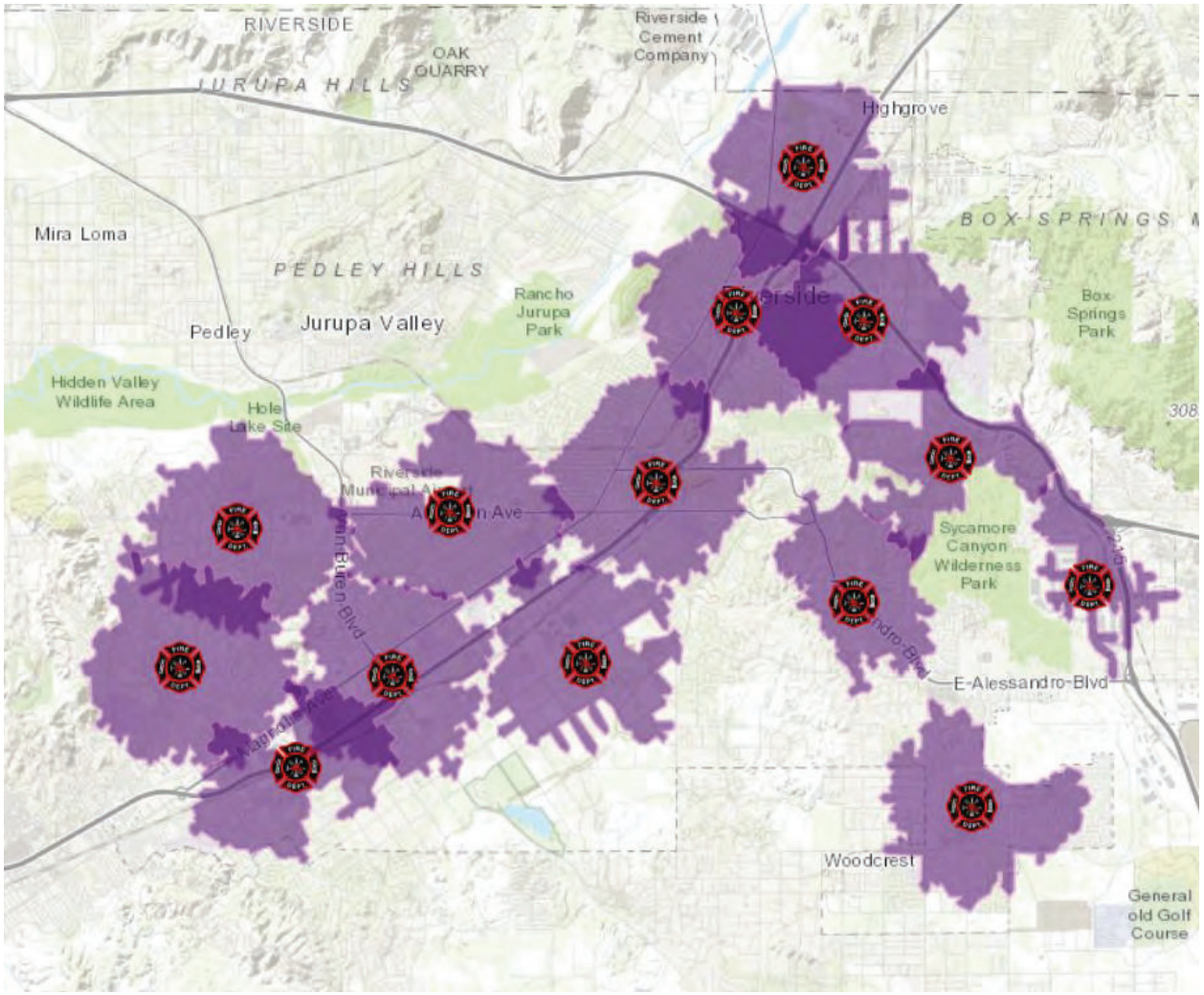
Rank	Station	Station Capture	Total Capture	Percent Capture
1	S3	14,240	14,240	50.73%
2	S8	6,651	20,891	74.42%
3	S14	4,120	25,011	89.10%
4	S5	1,036	26,047	92.79%
5	S11	913	26,960	96.05%
6	S1	739	27,699	98.68%
7	S10	219	27,918	99.46%
8	S7	42	27,960	99.61%
9	S6	23	27,983	99.69%
10	S9	19	28,002	99.76%
11	S12	14	28,016	99.81%
12	S4	10	28,026	99.84%
13	S2	3	28,029	99.85%
14	S13	0	28,029	99.85%

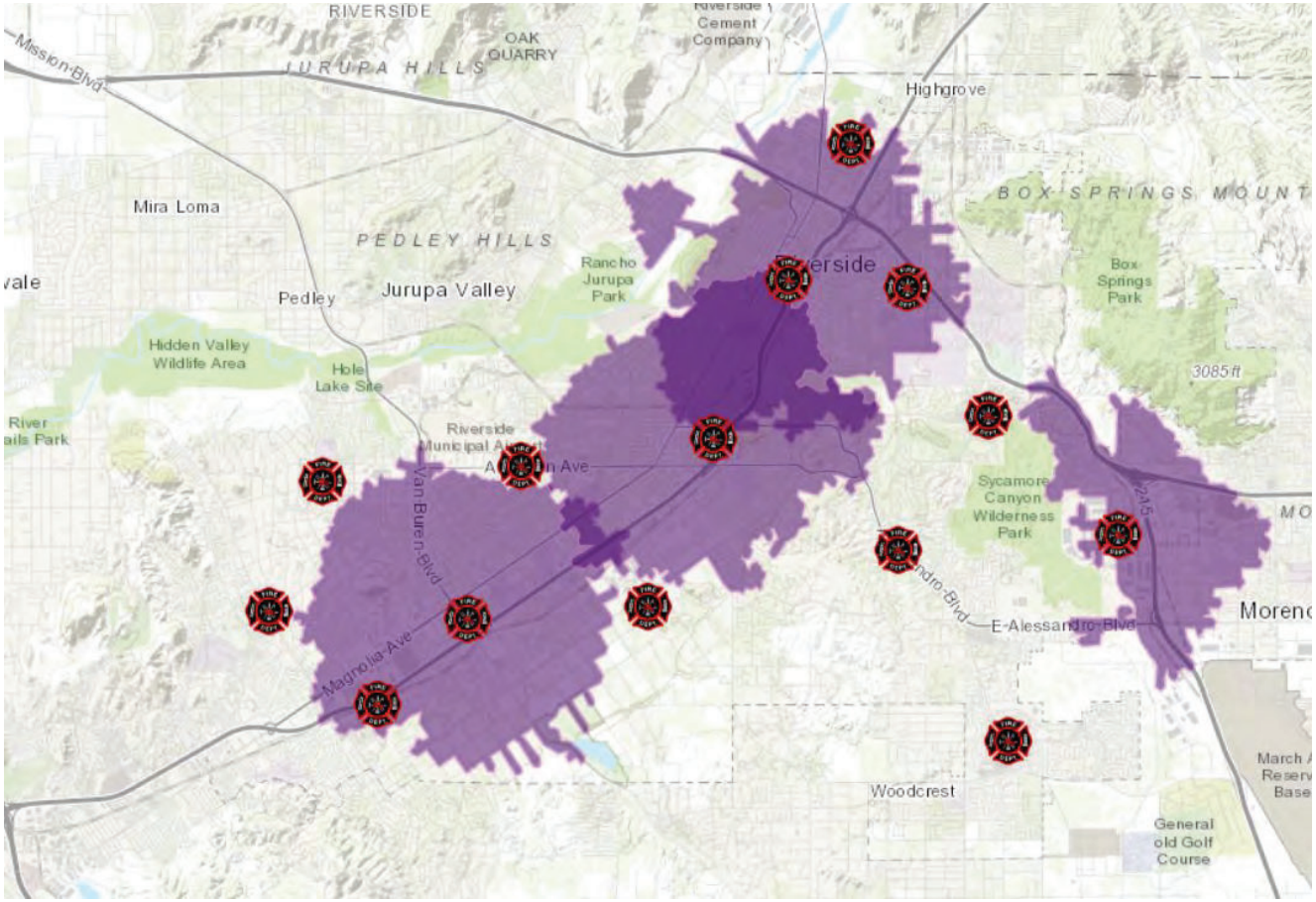
7-Minute Travel Time

- Current configuration can meet approximately 100% of the EMS incidents within 7-minutes travel time or less
- A four-station configuration can meet approximately 91% of the EMS incidents within 7-minutes travel time
- Contractual obligation of combined turnout and travel of 9:59
- Current performance is at 7:42 at the 90th percentile
- This configuration will require 7 EMS units (Squads) to create an EMS overlay and deliver a service of approximately 8:59-minutes

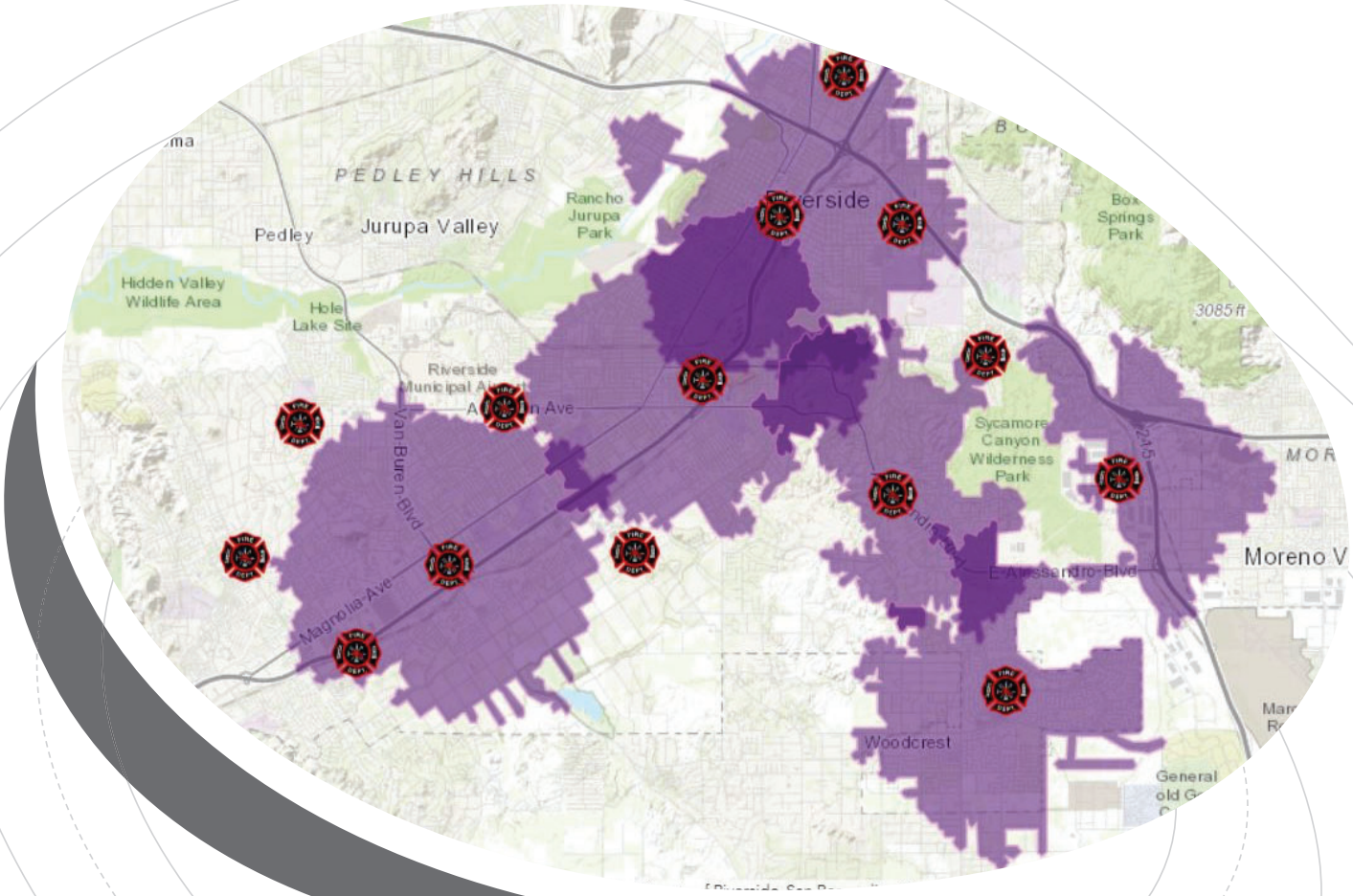
Station Deployment based on Geography - ISO

ISO Engine Coverage at 1.5 Miles





ISO Truck Coverage at 2.5 Miles



ISO Truck Coverage at 2.5 Miles

Staffing Considerations

Program	Number of Calls[1]	Number of Responses[2]	Average Responses per Call	Total Busy Hours	Average Busy Minutes per Response	Average Calls per Day	Average Responses per Day
EMS	27,870	31,578	1.1	10,535.9	20.0	76.4	86.5
Fire	9,367	14,521	1.6	5,717.0	23.7	25.7	39.8
Hazmat	202	328	1.6	290.9	53.2	0.6	0.9
Rescue	130	263	2.0	196.2	44.9	0.4	0.7
Unknown	107	138	1.3	40.5	17.6	0.3	0.4
Total	37,676	46,828	1.2	16,780.6	21.5	103.2	128.3

Calls, Responses, and Busy Time by Program

- On average, the department is sending 1.2 units per incident.
- Nearly all EMS incidents receive a single resource from the fire department.
- While EMS accounts for 74.1% of the calls it contributes to 62.8% of the time on task.
- Fire related activity accounts for 24.7% of the calls and contributes to 34.1% of the overall time on task.
- The average duration of each incident is 21.5 minutes.

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4	2	1	10
Station 3	3	4			7
Station 4	4				4
Station 5	3		2		5
Station 6	4				4
Station 7	4				4
Station 8	4				4
Station 9	4				4
Station 10	4				4
Station 11	4				4
Station 12	4				4
Station 13		4			4
Station 14	4				4
Total	**48**	**16**	**6**	**2**	**72**

Current Deployment Minimum Staffing

- Currently the department staffs a total of 216 personnel on shift or 72 per shift
- The department has a minimum staffing threshold of 72 prior to hiring back on overtime

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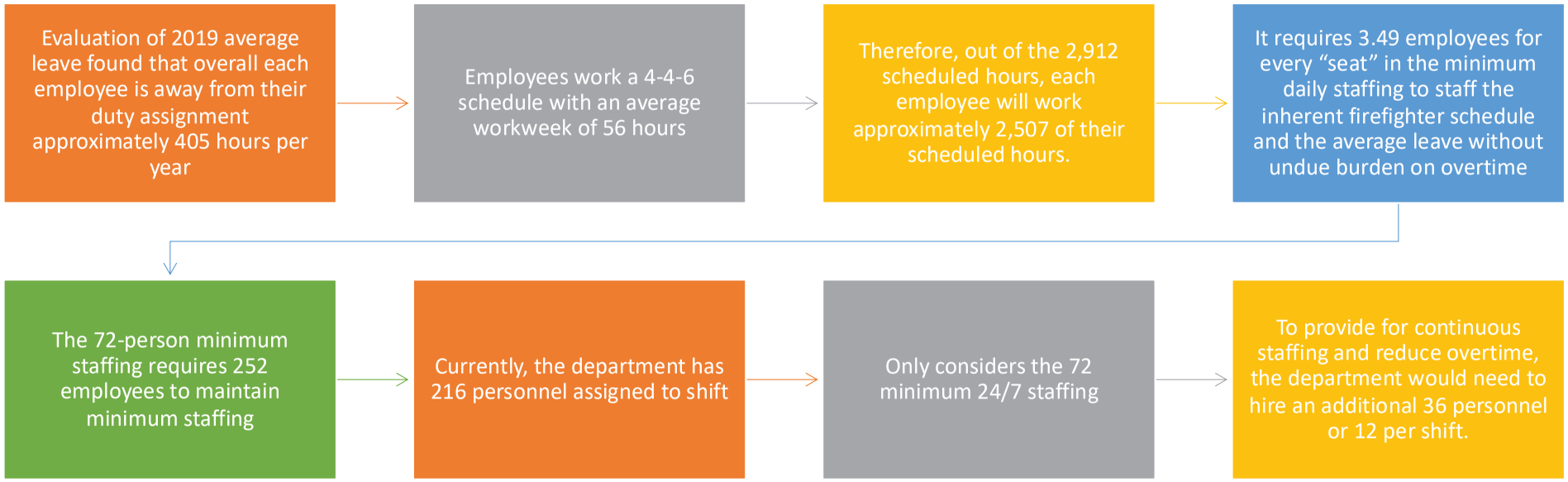
Optimized Staffing



Staffing Considerations

Constant Staffing

- 72 Minimum Daily Staffing
- Total of 216 shift assigned personnel
- Department currently uses a “constant staffing model”
- Allocates 72 personnel per day
- All vacancies to maintain 72 are filled with overtime

Continuous Staffing

- 72 Minimum Daily Staffing
- Total of 216 shift assigned personnel
  - Relief staffing multiplier of 3.49
  - 36 additional personnel
- Would afford a total of 12 personnel per day in relief
- Overtime would be significantly reduced, but will never eliminate overtime liability

Considerations for Continuous Staffing Model

- Pros
  - Additional personnel for greater concentration of staffing when less than average leave
  - Reduces political sensitivity to high overtime utilization
  - Provides greater depth of residual personnel during wildfire season
  - Providers greater depth of personnel during major events
  - Reduces overtime expenditures
  - Reduces opportunity to work extended work periods
- Cons
  - Maintains benefit and pension rates for the additional personnel
  - Reduction in overtime earnings of personnel

Fiscal Proposition of Continuous Staffing

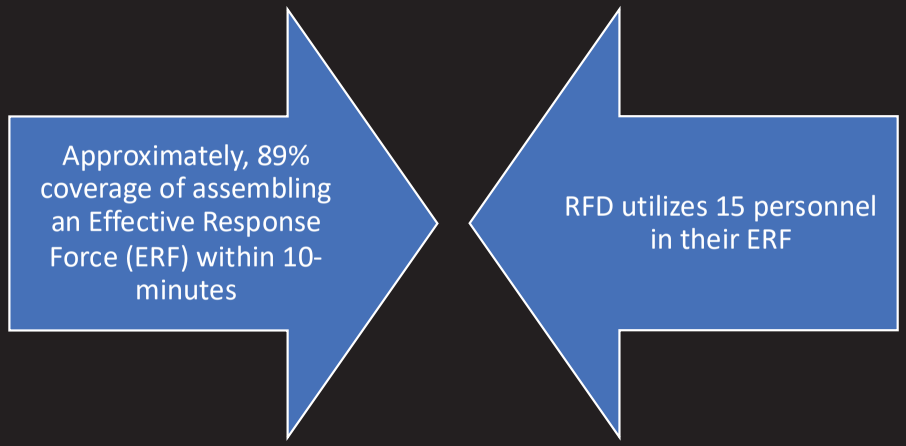
- The average hourly overtime rate of $56.05 and the average annual compensation for a new hire of $99,936 were provided by the department.
- Personnel calculations were established utilizing the minimum daily staffing of 72 and a total shift assigned personnel of 216.

Category	Hours	Rate	Cost
Scheduled Hours per Employee	2,912		
Average Leave per Employee	405		
Actual Average Hours Worked per Employee	2,507		
Hours of Coverage Needed for Relief (216)	87,480	$56.05	$4,903,254.00
Scheduled Overtime (216)(Avg 3 per week)	33,696	$56.05	$1,888,660.80
Sub-total of Overtime Costs for Min Staff 216	121,176		$6,791,914.80
Cost of 36 Relief Personnel (252-216=36)	90,252	$99,936/year	$3,597,696.00
Cost of Schedule Overtime for Relief (36)	5,616	$56.05	$314,776.80
Subtotal of Costs of Relief Personnel	95,868		$3,912,472.80
Value Proposition of Continuous Staffing			$990,781.20

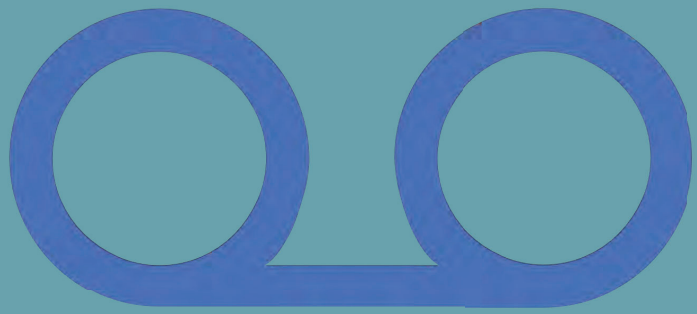
Effective Response Force Evaluations

Effective Response Force Calculations

Travel Time Objective	Current
8-Minute	66.05%
10-Minute	88.88%
12-Minute	98.30%
13-Minute	99.24%
15-Minute	99.91%

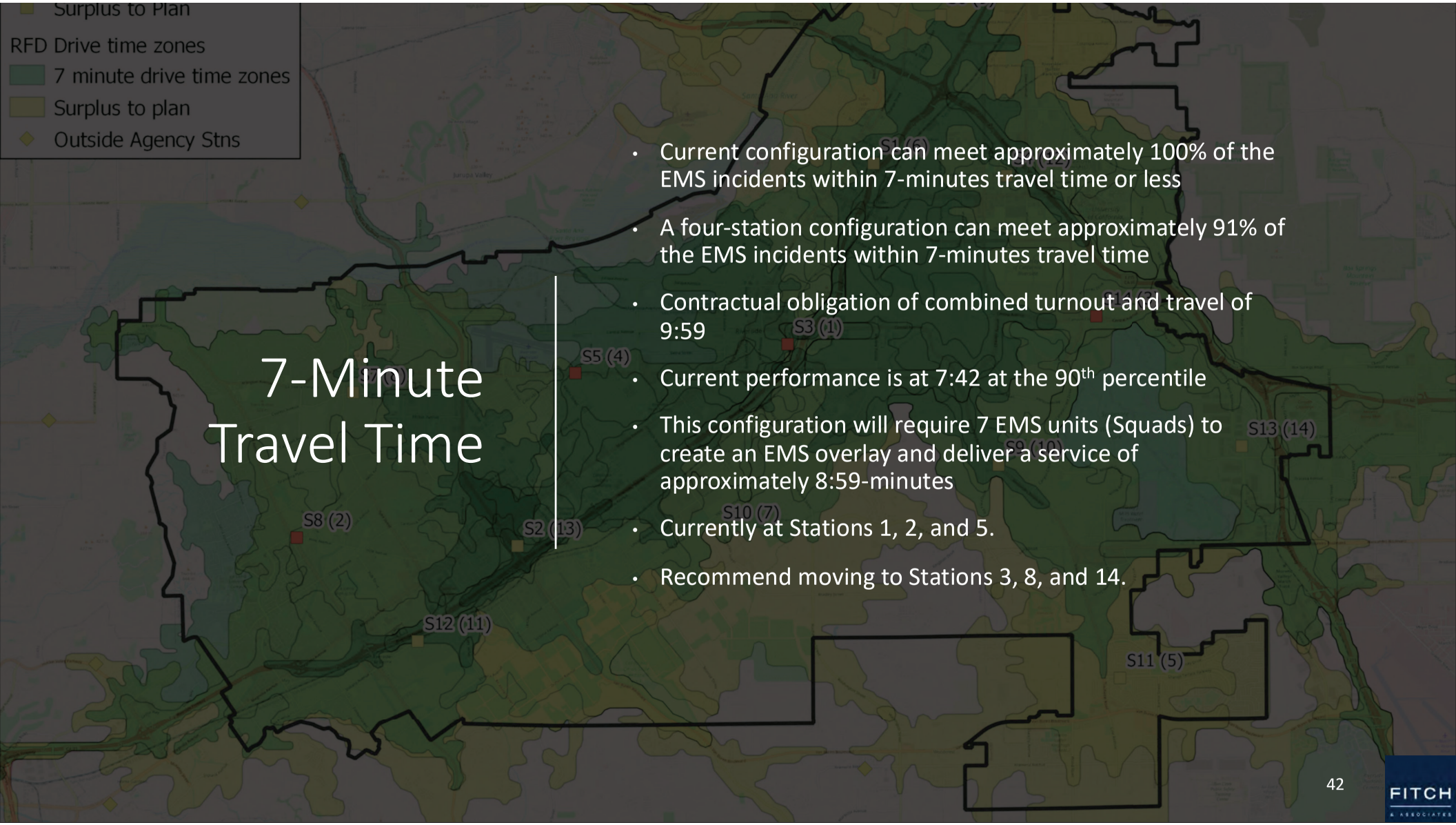


Alternatives for Consideration of an EMS System Overlay



Alternative 1

Relocate Squads to Stations 3, 8, and 14



7-Minute Travel Time

- Current configuration can meet approximately 100% of the EMS incidents within 7-minutes travel time or less
- A four-station configuration can meet approximately 91% of the EMS incidents within 7-minutes travel time
- Contractual obligation of combined turnout and travel of 9:59
- Current performance is at 7:42 at the 90th percentile
- This configuration will require 7 EMS units (Squads) to create an EMS overlay and deliver a service of approximately 8:59-minutes
- Currently at Stations 1, 2, and 5.
- Recommend moving to Stations 3, 8, and 14.

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Alternative System Designs - #1

Better aligns resource allocation to community demands for EMS

Improves EMS capacity and geographic coverage throughout the city

No changes in staffing or resources

Recommend sending the Squads to all Alpha, Bravo, and Charlie incidents (lower acuity)

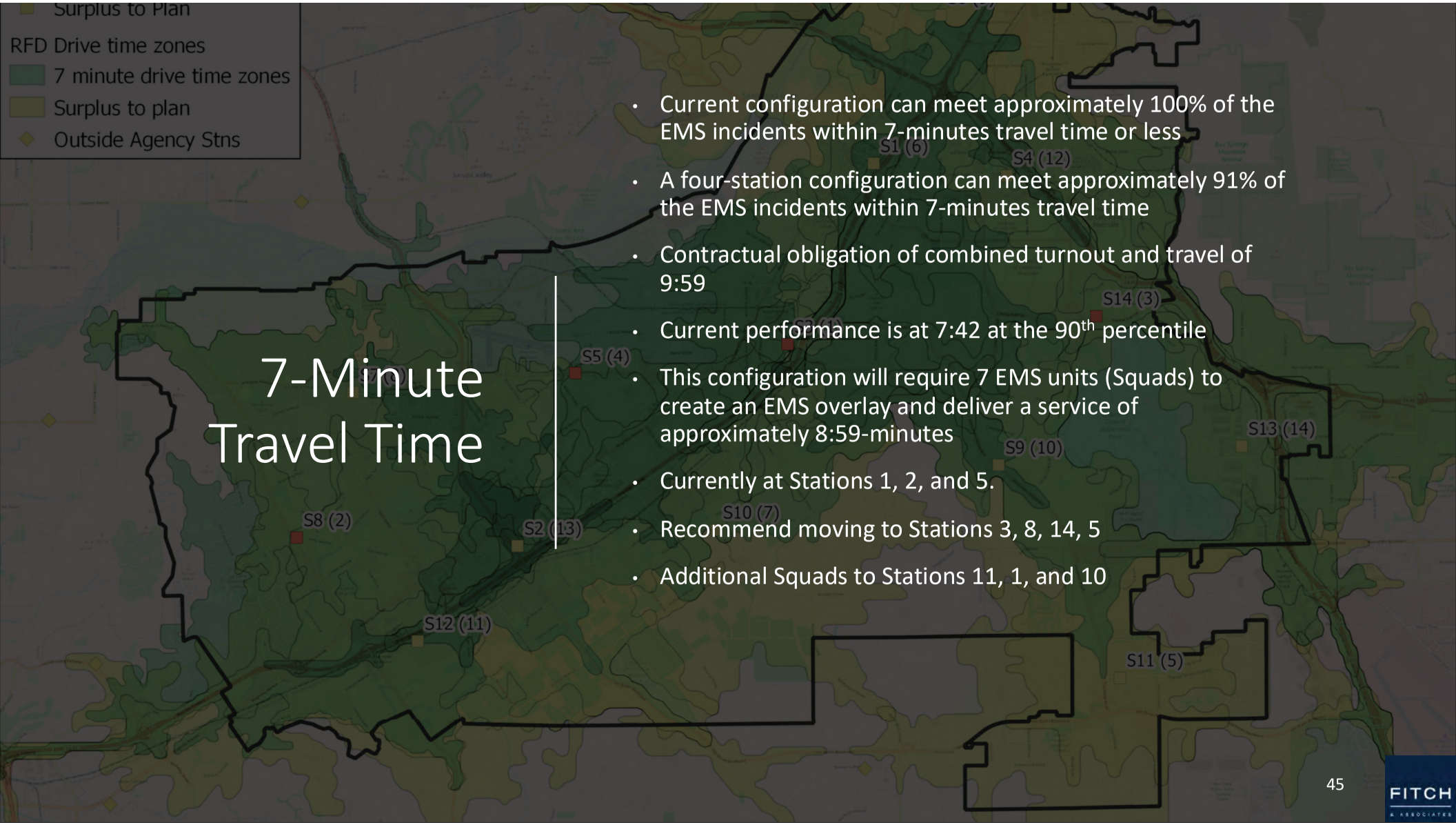
All Delta and Echo incidents (higher acuity) can be handled by the closest available unit consistent with current practice

Design AVL dispatching for 7-minute travel times for Squad incidents

All incidents outside of the acceptable response range for lower-acuity incidents (8-minutes) would result in a dispatch of the closest available unit

Alternative 2

Relocate Squads to Stations 3, 8, and 14 and Add 4 Additional Squads 12/7



7-Minute Travel Time

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- A four-station configuration can meet approximately 91% of the EMS incidents within 7-minutes travel time
- Contractual obligation of combined turnout and travel of 9:59
- Current performance is at 7:42 at the 90th percentile
- This configuration will require 7 EMS units (Squads) to create an EMS overlay and deliver a service of approximately 8:59-minutes
- Currently at Stations 1, 2, and 5.
- Recommend moving to Stations 3, 8, 14, 5
- Additional Squads to Stations 11, 1, and 10

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Alternative System Designs - #2

Better aligns resource allocation to community demands for EMS

Improves EMS capacity and geographic coverage throughout the city

Would require an additional 8 personnel per day for the peak period and a total of 20 additional departmental FTEs

Recommend sending the Squads to all Alpha, Bravo, and Charlie incidents (lower acuity)

All Delta and Echo incidents (higher acuity) can be handled by the closest available unit consistent with current practice

Design AVL dispatching for 7-minute travel times for Squad incidents

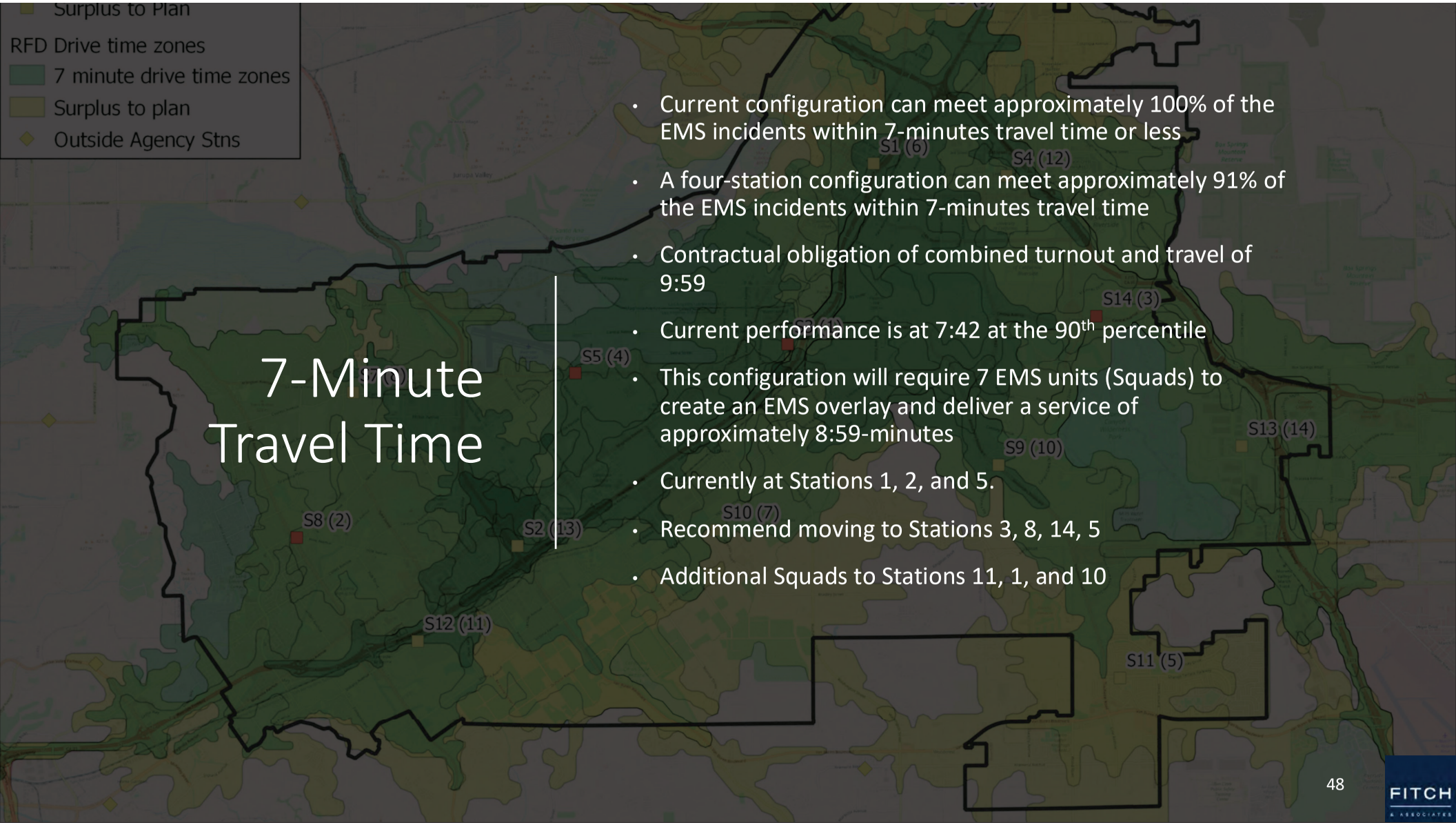
All incidents outside of the acceptable response range for lower-acuity incidents (8-minutes) would result in a dispatch of the closest available unit

Will have a reciprocal reduction in reliance on fire suppression units for EMS incidents

Ideally, the 4th - 7th Squads could be stationed at 5, 11, 1, and 10 and then moved up to 3, 8, and 14 as needed.

Alternative 3

Relocate Squads to Stations 3, 8, and 14 and Add 4 Additional Squads 24/7



7-Minute Travel Time

- Current configuration can meet approximately 100% of the EMS incidents within 7-minutes travel time or less
- A four-station configuration can meet approximately 91% of the EMS incidents within 7-minutes travel time
- Contractual obligation of combined turnout and travel of 9:59
- Current performance is at 7:42 at the 90th percentile
- This configuration will require 7 EMS units (Squads) to create an EMS overlay and deliver a service of approximately 8:59-minutes
- Currently at Stations 1, 2, and 5.
- Recommend moving to Stations 3, 8, 14, 5
- Additional Squads to Stations 11, 1, and 10

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Current Staffing Strategies for Alternative 3

- Consistent with current staffing strategies.
- All stations where an Engine is paired with either a Truck or a Squad the Engine is staffed with a minimum of three personnel
- Would require 4 additional FTEs per day in minimum staffing of 76
- Would require an additional 14 department level FTEs

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4		1	8
Station 3	3	4	2		9
Station 4	4				4
Station 5	3		2		5
Station 6	4				4
Station 7	4				4
Station 8	3		2		5
Station 9	4				4
Station 10	3		2		5
Station 11	3		2		5
Station 12	4				4
Station 13		4			4
Station 14	3		2		5
Total	**44**	**16**	**14**	**2**	**76**

Adjusted Station Level Risk Assessment

- Alternative 3 reduces fire suppression responses to EMS by 48% or 19,682 incidents
- Fire suppression was calculated to handle 30% of the current EMS volume to account for high-acuity incidents and system relief when needed
- Change in demand adjusted risk ratings as the EMS overlay provides a system level benefit to handling EMS incidents
- Considering full implementation of Alternative 3, the risk assessment identified that the majority of station demand zones are of low risk (Stations 3, 4, 7, 9, and 11-14), with five moderate-risk stations (Stations 2, 5, 6, 8, and 10).
- Station 1 was calculated as a high-risk station demand zone.

Station Demand Zone	Community Demand	Call Concurrency	High Risk Occupancies	Total risk Score	Risk Rating
1	5	5	10	53.03	High
2	3	4	10	36.36	Moderate
3	3	5	2	13.44	Low
4	3	5	3	16.29	Low
5	4	5	2	16.79	Moderate
6	2	3	10	25.85	Moderate
7	3	4	2	11.05	Low
8	3	4	5	19.61	Moderate
9	1	2	1	2.12	Low
10	2	3	10	25.85	Moderate
11	2	3	1	4.95	Low
12	2	3	2	6.63	Low
13	1	2	3	4.95	Low
14	1	2	2	3.46	Low

Risk-based Staffing Strategies for Alternative 3

- Consistent with current staffing strategies except for Stations 4, 6, 7, 9, and 12
- All stations where an Engine is paired with either a Truck or a Squad the Engine is staffed with a minimum of three personnel
- Would not require any additional FTEs

Station	Engine	Truck	Squad	Battalion Chief	Minimum Staffing
Station 1	3	4	2	1	10
Station 2	3	4		1	8
Station 3	3	4	2		9
Station 4	3				3
Station 5	3		2		5
Station 6	3				3
Station 7	3				3
Station 8	3		2		5
Station 9	3				3
Station 10	3		2		5
Station 11	3		2		5
Station 12	3				3
Station 13		4			4
Station 14	3		2		5
Total	39	16	14	2	71

Alternative System Designs - #3

Better aligns resource allocation to community demands for EMS and provides for a community level benefit

Improves EMS capacity and geographic coverage throughout the city and reduces the reliance on large fire suppression apparatus for EMS incidents by 48% or 19,682 incidents

Option to reallocate existing personnel within the 71-minimum staffing by reducing the Engines at to three personnel.

Recommend sending the Squads to all Alpha, Bravo, and Charlie incidents (lower acuity)

All Delta and Echo incidents (higher acuity) can be handled by the closest available unit consistent with current practice

Design AVL dispatching for 7-minute travel times for Squad incidents

All incidents outside of the acceptable response range for lower-acuity incidents (8-minutes) would result in a dispatch of the closest available unit

Reduces the reliance on large fire suppression apparatus for EMS incidents by 48% or 19,682 incidents

Ideally, the 4th - 7th Squads could be stationed at 5, 11, 1, and 10 and then moved up to 3, 8, and 14 as needed.

Alternative 4

Alternatives 2 and 3 could be accomplished with single-certification personnel

Alternative System Designs - #4

If desired, Alternatives 2 and 3 could be accomplished with single-certification personnel (EMS only)

All of the same benefits to the system

Benefits would include an EMS dedicated workforce and a potential reduction in personnel costs

Challenges would be a decrease in overall firefighter strength, effective response force, contractual obligations, and potential for adjustments in ISO ratings.

Reducing the Reliance on Large Apparatus for EMS Responses

Consider Reducing Engine and Truck Responses to EMS Incidents

Opportunities to Reduce Large Apparatus EMS Responses

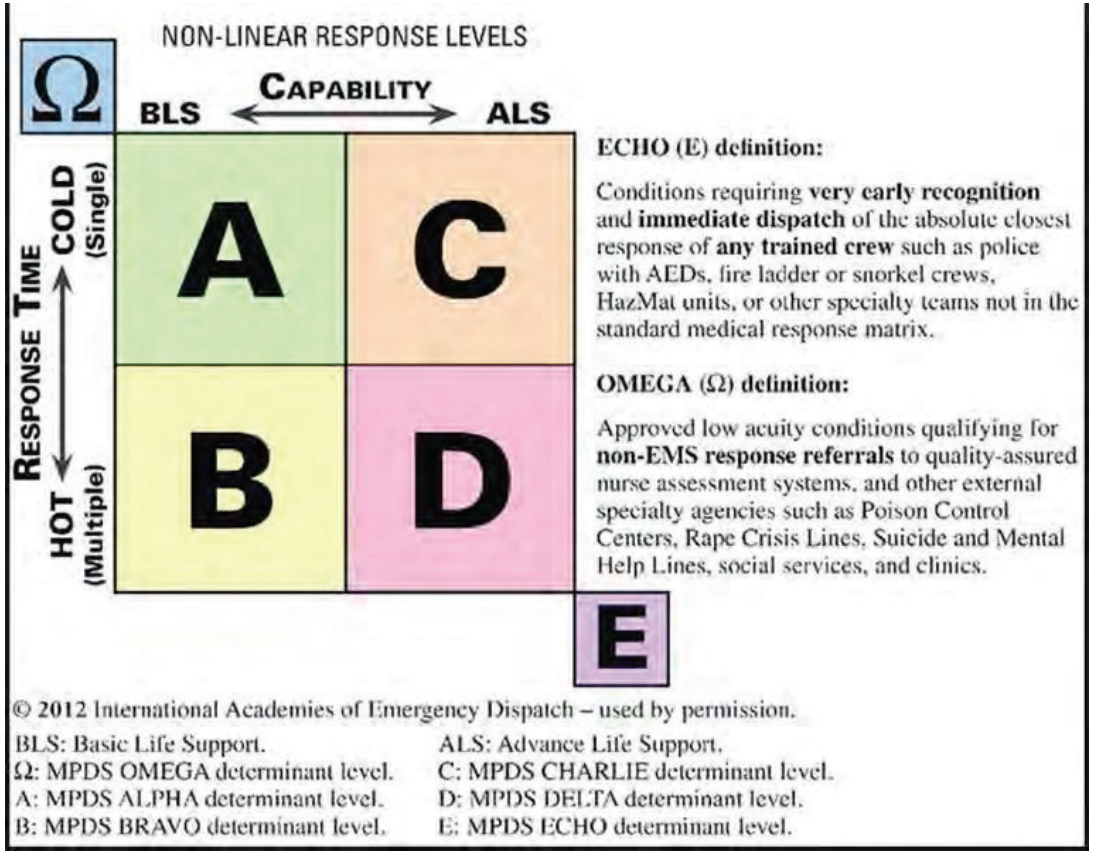
- Department currently sends the closest engine and/or truck to EMS incidents
- Most communities are sensitive to incidents where large and/or multiple apparatus are arriving for an EMS call
- A 7-Squad program will replicate the large fire suppression apparatus efforts, so the need to send an Engine/Truck before the ambulance will be significantly reduced by 70%
- Will reduce overall Engine/Truck incidents by 48% or 19,682
- While contemplating a consolidation of fire apparatus, a reduction in workload on EMS incidents will reintroduce readiness capacity back into the fire suppression system

Medical Priority Dispatch

Emergency Medical Dispatching

Medical Priority Dispatch System

- Currently the department sends an Engine/Truck to a significant portion of EMS incidents
- Increased wear and tear and per mile operating expenses on the larger apparatus
- Opportunity to better align clinical risk/severity to resource allocation
- Could send a Squad only to a large portion of the calls
  - Reintroduces fire suppression capacity back into the system
  - Provides more readiness for the severe clinical incidents as well
- Could respond non-emergency to a significant portion of the calls that are not clinically time sensitive
  - Reduces risk to both responders and the driving public at large



Agency	N	Dispatch priority levels: n (%)					
		OMEGA	ALPHA	BRAVO	CHARLIE	DELTA	ECHO
ATCEMS	354,929	3,992 (1.1)	65,822 (18.6)	77,801 (21.9)	62,724 (17.7)	128,676 (36.3)	15,914 (4.5)
EMSA	1,514,033	78,041 (5.2)	236,153 (15.6)	446,747 (29.5)	310,374 (20.5)	418,080 (27.6)	24,638 (1.6)
LMEMS	472,343	24,061 (5.1)	85,092 (18.0)	81,855 (17.3)	115,739 (24.5)	160,519 (34.0)	5,076 (1.1)
MEDIC	156,063	2,101 (1.4)	23,748 (15.2)	28,959 (18.6)	40,911 (26.2)	57,624 (36.9)	2,720 (1.7)
MedStar	617,396	12,603 (2.0)	135,111 (21.9)	161,815 (26.2)	153,777 (24.9)	146,043 (23.7)	8,047 (1.3)
SLCFD	47,526	530 (1.1)	9,881 (20.8)	8,809 (18.5)	8,628 (18.2)	18,623 (39.2)	1,051 (2.2)
Overall	3,162,290	121,328 (3.8)	555,807 (17.6)	805,986 (25.5)	692,153 (21.9)	929,565 (29.4)	57,446 (1.8)

ATCEMS = Austin-Travis County EMS, Austin, Texas, USA. *EMSA* = Emergency Medical Services Authority, Tulsa, Oklahoma, USA. *LMEMS* = Louisville Metro EMS, Louisville, Kentucky, USA. *MEDIC* = Mecklenburg EMS Agency, Charlotte, North Carolina, USA. *MedStar* = MedStar-Mobile Healthcare, Ft. Worth, Texas, USA. *SLCFD*

Table 1. Distribution of cases by agency and priority level.

Distribution of Medical Priority Dispatch

Fire Suppression Apparatus could limit responses to only 30% of the EMS related incidents

Other Operational Considerations

Expanded Utilization of the Quint Concept

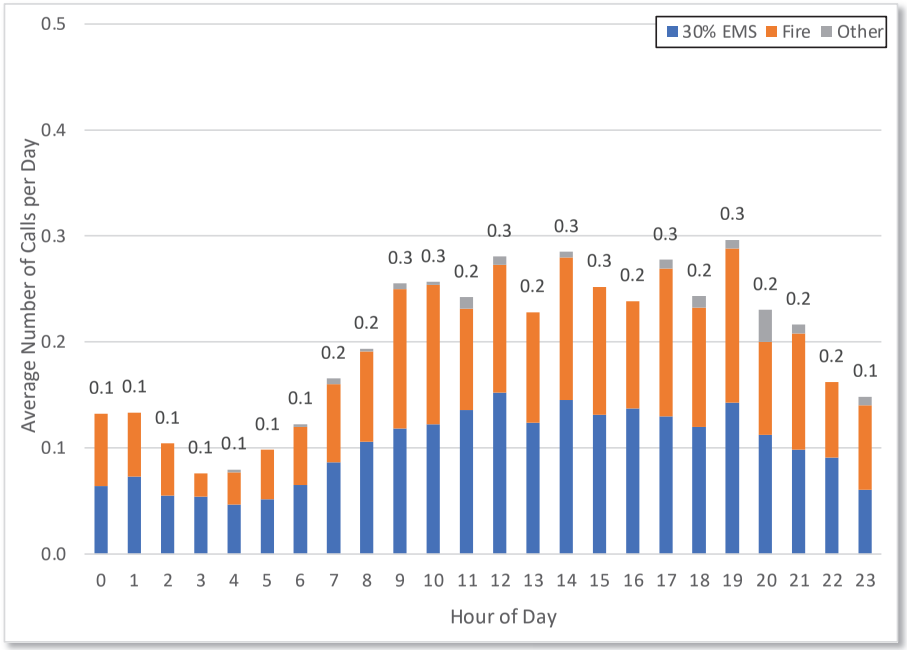
Adjusted Station Level Risk Assessment

- Alternative 3 reduces fire suppression responses to EMS by 48% or 19,682 incidents
- Fire suppression was calculated to handle 30% of the current EMS volume to account for high-acuity incidents and system relief when needed
- Change in demand adjusted risk ratings as the EMS overlay provides a system level benefit to handling EMS incidents

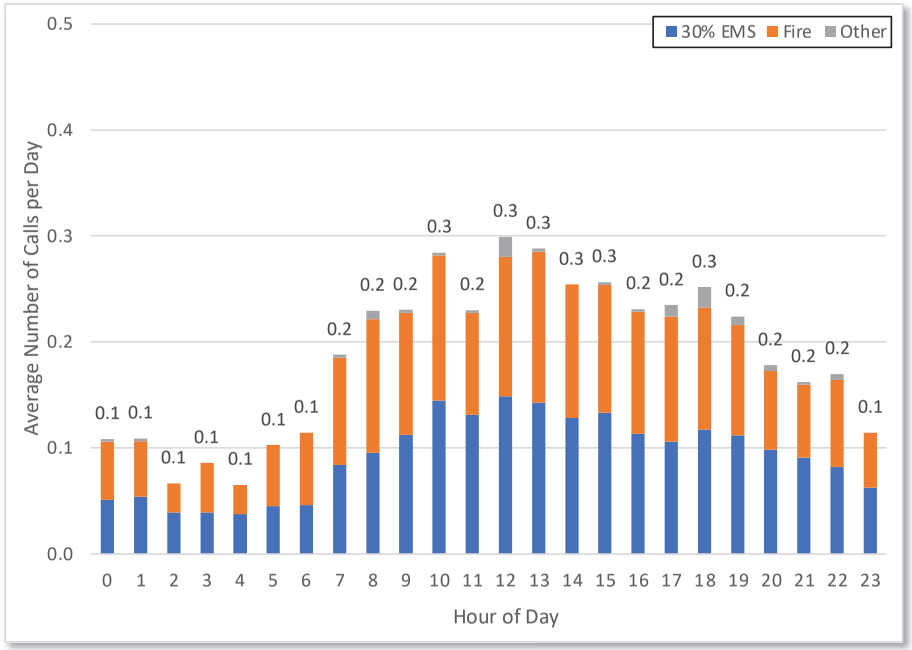
Station Demand Zone	Community Demand	Call Concurrency	High Risk Occupancies	Total risk Score	Risk Rating
1	5	5	10	53.03	High
2	3	4	10	36.36	Moderate
3	3	5	2	13.44	Low
4	3	5	3	16.29	Low
5	4	5	2	16.79	Moderate
6	2	3	10	25.85	Moderate
7	3	4	2	11.05	Low
8	3	4	5	19.61	Moderate
9	1	2	1	2.12	Low
10	2	3	10	25.85	Moderate
11	2	3	1	4.95	Low
12	2	3	2	6.63	Low
13	1	2	3	4.95	Low
14	1	2	2	3.46	Low

Adjusted Hourly Demand

Station 2

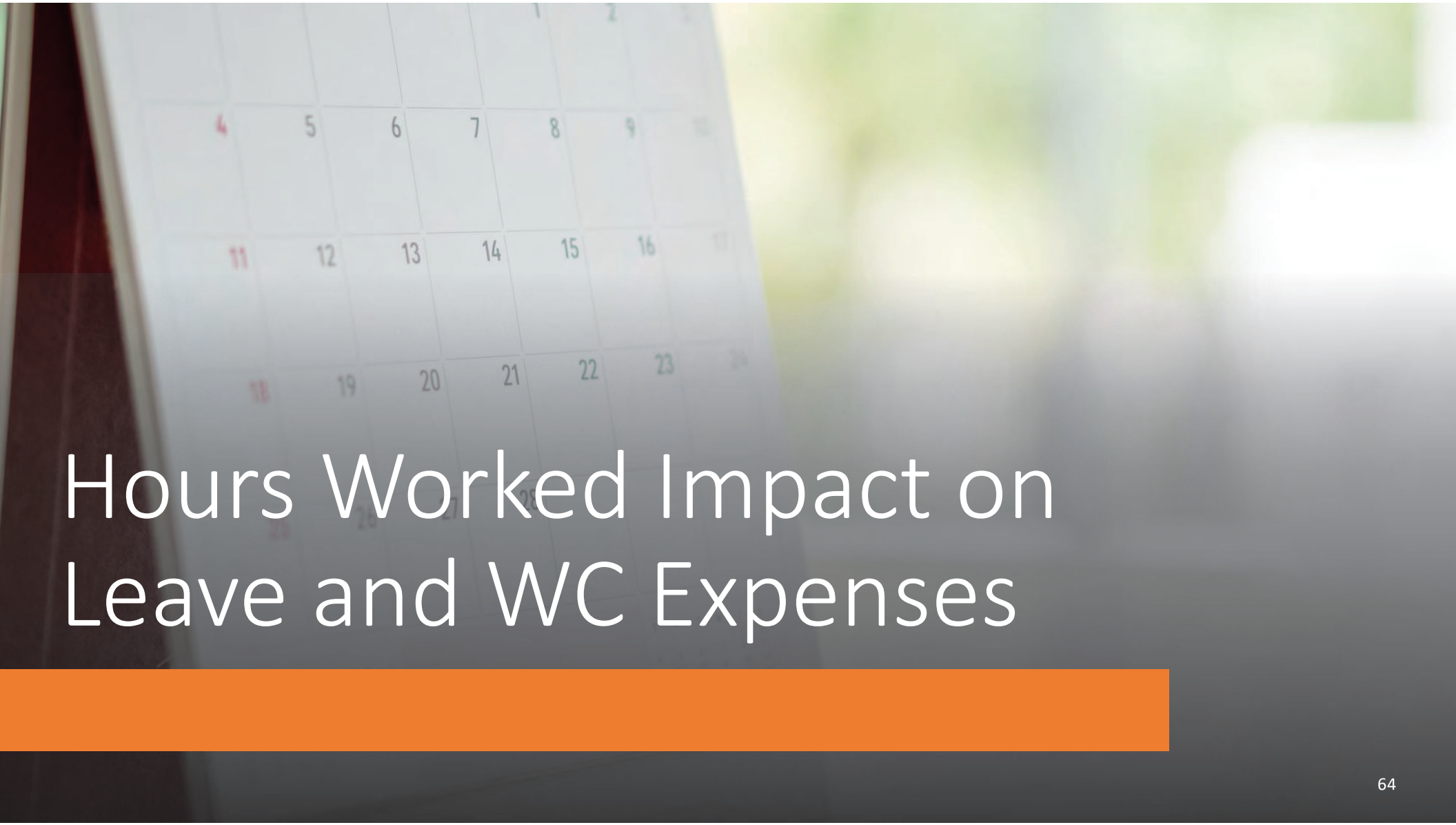


Station 3



Expanding the Quint Concept

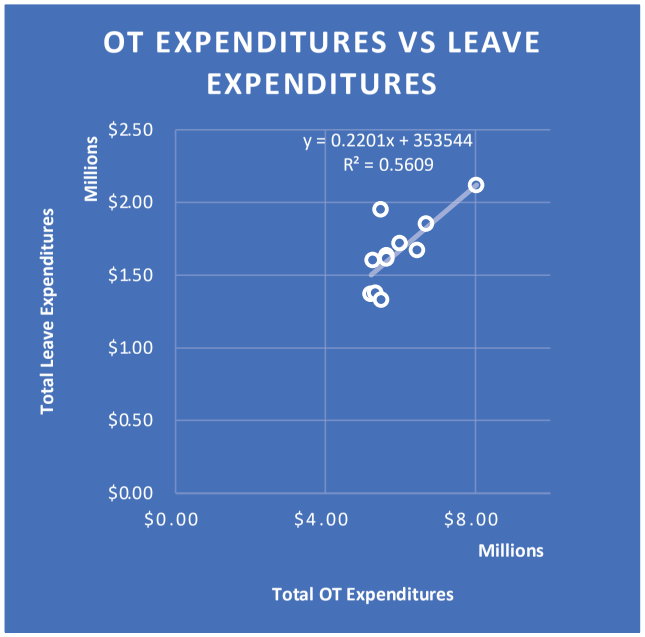
- The department currently is utilizing a Quint concept for the 4 Truck companies (1, 2, 3, and 13). A Quint is a Truck company that also has the water and hose capacity that traditionally is found on an Engine company.
- Truck company maintains 4-person staffing consistent with current practice
- The residual call volume in Stations 2 and 3 are both under 1,800 calls per year or approximately 5 calls per day
- Majority of fire related incidents are not actual working fires, so resources can be returned to available status relatively quickly
- The hourly rate of incidents are less than 0.3 calls per hour at the peak
- In other words, in any one hour, there would be a call about every third day.
- At hourly rates of less than 0.5 per hour, a single resource can reasonably handle the call volume
- Prior to a reduction in 70% of EMS incidents, the call concurrency in each zone is less than 15%. In other words, 85% of the time the unit can run the call and return to available status before another call in the primary zone occurs.
- The fire related call concurrency is less than 3%. Indicating that 97% of the fire related activity can be handled in either Stations 2 or 3 and the units returned to available status prior to a second or greater incident occurring.
- Therefore, Stations 2 and 3 could operate a single Quint resource if desired.
- This would be like the Quint assignment at Station 13 and a similar average hourly call rates at Stations 4, 5, and 8 that function well as a single resource.



Hours Worked Impact on Leave and WC Expenses

Assumptions

- Utilized total overtime expenditures by year 2010 -2020 YTD
  - All overtime expenditures for the year including Fire Operations (actuals) excluding Mutual Aid Personnel Costs due to inconsistent reporting
  - Overtime was used as a surrogate measure for the collective hours worked, primarily in addition to the schedule
- Utilized various leaves associated with sick and injury
  - Workers comp expenditures
  - Workers comp insurance costs
  - Sick leave
  - Family Medical Leave
  - Industrial Accident

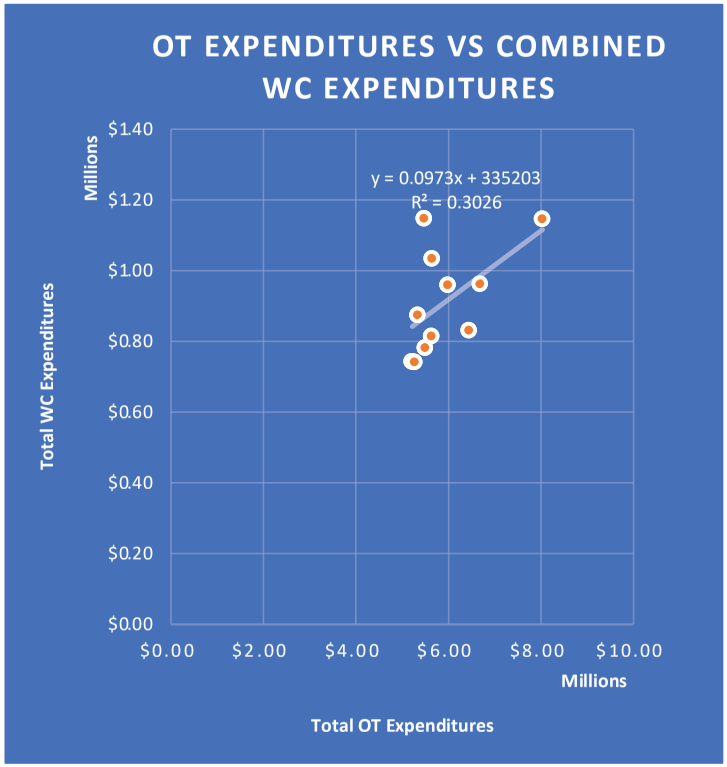


Correlation between OT and Leave Expenditures

- The correlation is strong at 0.75
- Statistically significant with 95% confidence
- Intuitively, the correlation passes the commonsense test that the more employees work the greater the opportunity for injury and/or utilization of sick leave and subsequent impact on total leave expenditures, including Worker's Compensation
- Especially understanding that vacancies are largely covered by overtime

Correlation between OT and Leave Expenditures

- The correlation is is moderate at .55
- Statistically significant with 95% confidence
- Intuitively, the correlation passes the commonsense test that the more employees work the greater the opportunity for injury and a relationship with total WC expenses
- Additionally, a regression model that utilized OT and IA as predictors of the WC expenditures was created that explained greater than 50% of the WC expenditures that was statistically significant with 95% confidence.
- The fact that the model can explain 50% of the expected WC value is significant as market factors may influence the premium experience beyond what the loss history may influence.



Steven Knight, PhD

Questions?

www.fitchassoc.com