Anna Fire Rescue

STANDARD OF COVER

Critical Tasking, Benchmarks Statements, and Performance Gaps for Levels of Risk

Anna Fire Rescue publishes a standard of response cover to outline the contract for services with the community. The document outlines varying levels of risk for emergency medical services, fire suppression, hazardous materials response, technical rescue, and swift water. For each community risk reduction program, the document identifies the critical tasks with each benchmark statement, the resources needed, the output of a three-axis risk scoring methodology, and the response time goals and performance gaps.

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STANDARDS OF COVER AND RESPONSE PERFORMANCE

For any service organization, one of the most important and visible elements to the public is their ability to deliver services in a timely fashion. The study of service delivery and performance allows a department to identify multiple facets of their organization, such as when and where incidents are most likely to occur, how often incidents will occur in a given location, and areas where resources cannot reach that location within a given period. In this section, data obtained from the department was utilized to conduct an in-depth analysis of how multiple variables throughout the service delivery system affected the ability to deploy emergency resources and provide baseline performance metrics for the delivery of these services. The Service Delivery and Performance section is broken into several subsections, each exploring a specific topic related to the delivery of emergency services.

The citizens and visitors of Anna expect to receive quality emergency services promptly whenever an incident occurs. A system-wide analysis must be completed for department leadership and community leaders to understand current service delivery and performance and plan for future service delivery. With a thorough understanding achieved through this analysis, leaders are more knowledgeable and able to set goals for current and future service delivery. The analysis of service delivery and performance will include:

- Service demand
- Resource distribution
- Resource concentration
- Resource reliability
- Response performance

Service Demand Analysis

The first element of service delivery to be analyzed is service demand. This element has several components, which include the types of incidents, when incidents occur, and where incidents occur.

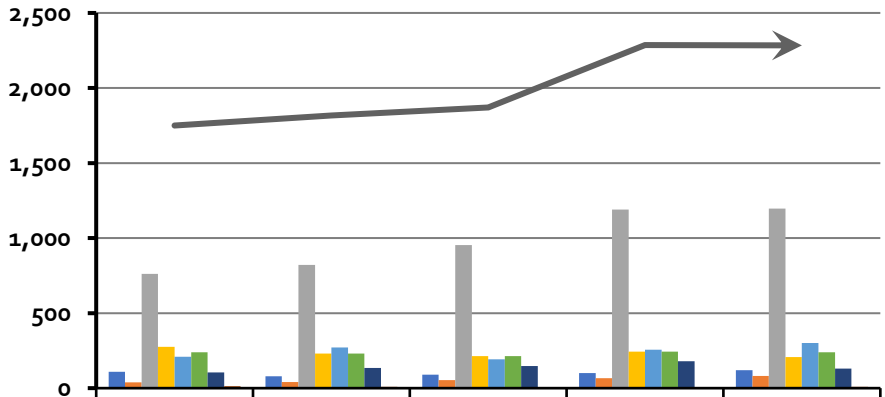
Incident Type Analysis

As an all-hazards fire department, AFR responds to a wide variety of incidents. The National Fire Incident Reporting System (NFIRS) was developed to assist fire departments in documentation of incident response in quantitative and qualitative ways. Within this system, each incident type (currently 178) is assigned a three-digit code. These individual incident-type codes are then grouped into series based on the first digit of each code, as illustrated in the following figure.

Incident Series	Incident Heading
100-Series	Fires
200-Series	Overpressure Rupture, Explosion, Overheating (No Fire)
300-Series	Rescue and Emergency Medical Service (EMS) Incidents
400-Series	Hazardous Condition (No Fire)
500-Series	Service Call
600-Series	Canceled, Good Intent
700-Series	False Alarm, False Call
800-Series	Severe Weather, Natural Disaster
900-Series	Special Incident Type

When firefighters complete their emergency tasks, they return to the station and complete an incident report within the records management system. This report includes many different data points, one of which is the incident type from the NFIRS code list. As illustrated in the following figure, AFR experienced an overall increase of 30.5% in calls for service from 2018 to 2022. This included an increase of 3.8% from 2018 to 2019, an increase of 3% from 2019 to 2020, an increase of 22.2% from 2020 to 2021, and a decrease of 0.1% from 2021 to 2022.

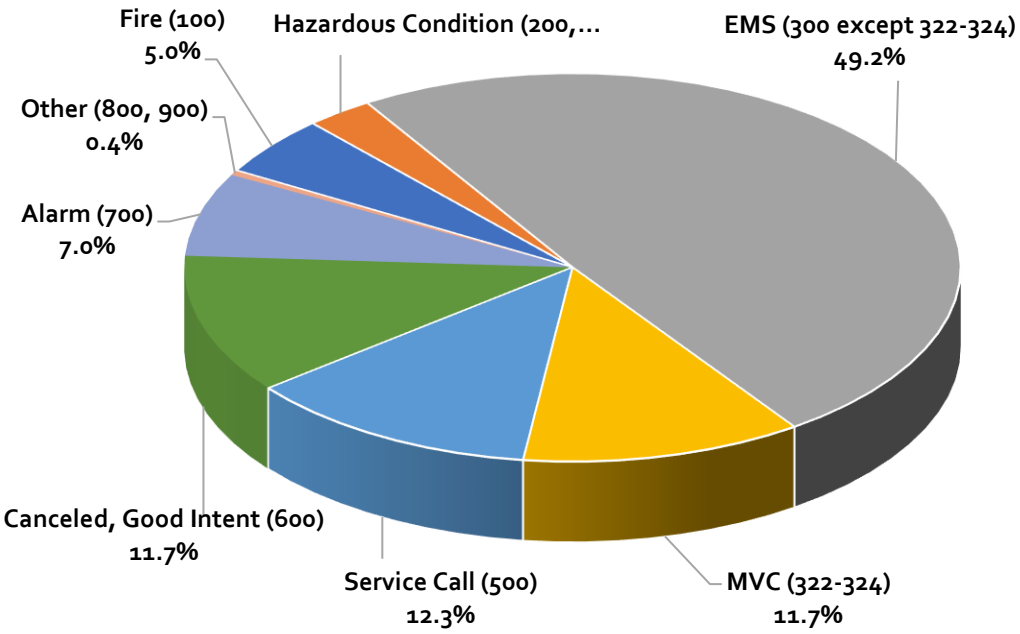
Figure 1 AFR Service Demand by NFIRS Incident Type, 2018–2022



	2018	2019	2020	2021	2022
Fire (100)	109	80	89	100	120
Hazardous Condition (200, 400)	39	40	54	67	81
EMS (300 except 322-324)	761	822	954	1,191	1,197
MVC (322-324)	275	231	214	244	207
Service Call (500)	209	270	192	257	301
Canceled, Good Intent (600)	239	231	214	243	239
Alarm (700)	104	135	148	179	130
Other (800, 900)	14	8	6	5	9
Total	1,750	1,817	1,871	2,286	2,284

The preceding figure provides AFR leadership with the view of the year-to-year progression of overall incident volume, as well as the year-to-year change within each NFIRS series. There is also value for leadership to view the same set of data from the perspective of how each NFIRS series compares to the whole, expressed as a percentage. As illustrated in the following figure, the greatest percentage of calls for service is for Emergency Medical Service (EMS) incidents at 49.2%. The lowest percentage of calls for service is for other incidents at 0.4%.

Figure 2 AFR Service Demand by NFIRS Incident Type, 2018–2022

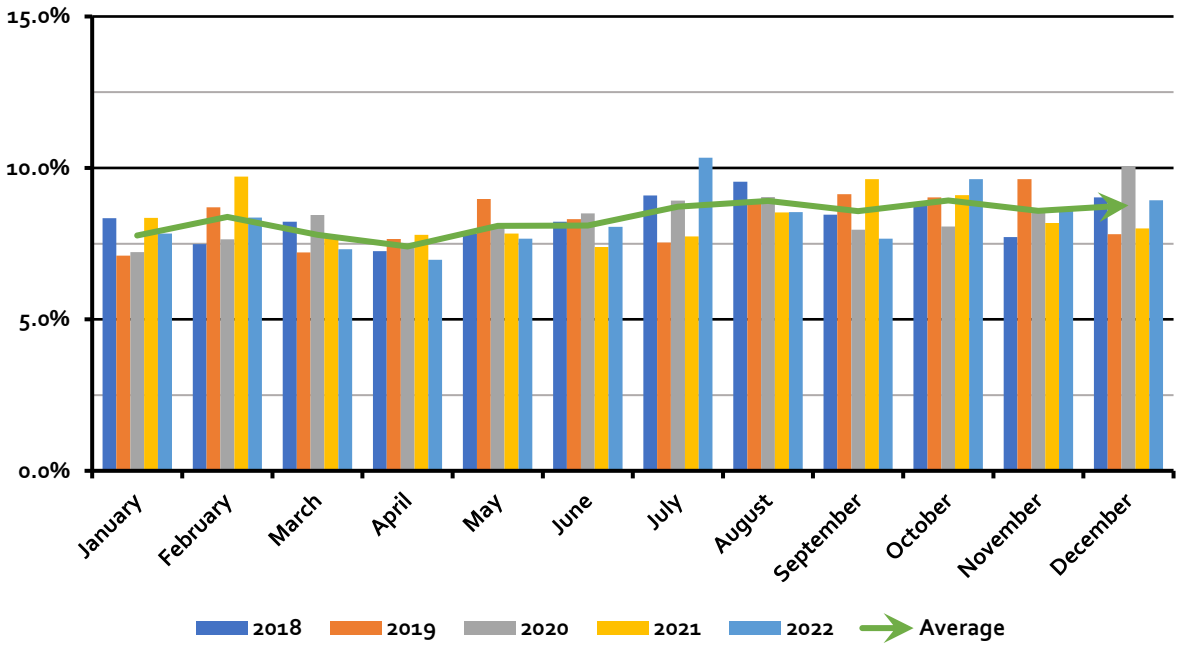


Temporal Analysis

An understanding of the temporal nature of calls for service—when incidents occur—is important when department leaders are considering the number of staffing, the schedule that personnel work, as well as scheduling of non-incident activities such as apparatus maintenance, training, hydrant testing, hose testing, pre-incident planning, public education, and more.

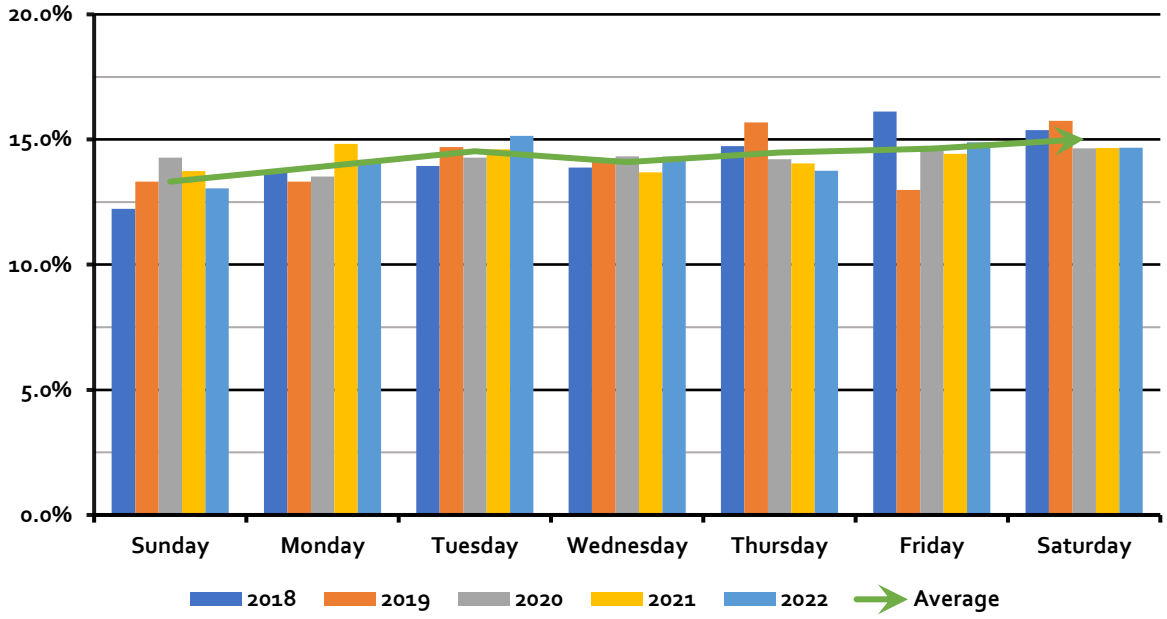
Service demand by month is the first portion of the temporal analysis. As illustrated in the following figure, the lowest demand for services occurs in April. Demand then increases over the following months, until reaching its highest level in August and October. Demand then fluctuates over the next several months until decreasing in March.

Figure 3 AFR Service Demand by Month, 2018–2022

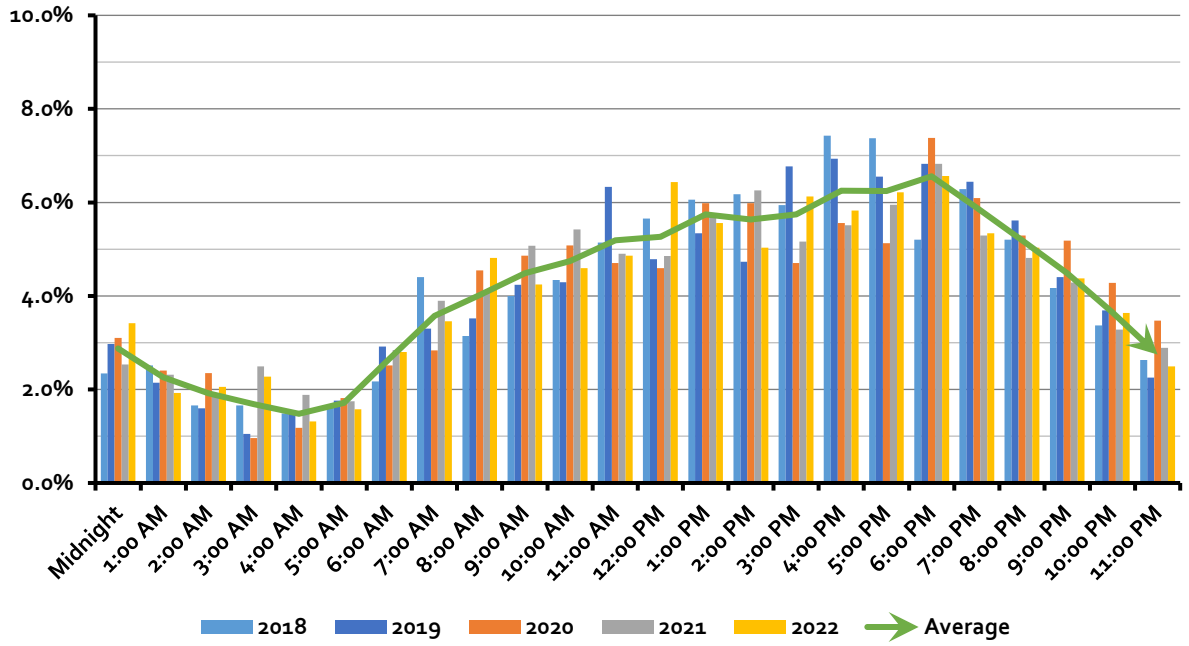


Service demand by day is the second part of the temporal analysis. As illustrated in the following figure, the lowest demand for service occurs on Sunday. With minor fluctuations, there is an overall increase throughout the week until reaching the highest demand on Saturday.

Figure 4 AFR Service Demand by Day, 2018–2022



Service demand by hour is the final part of the temporal analysis. As illustrated in the following figure, the lowest demand for service occurs at 4 AM. This is followed by increases throughout the morning as the population prepares for the day, leaves their home, and participates in their daily activities. This increase continues throughout the day, reaching the point of greatest service demand at 6 PM. There is then a steep decline in calls for service throughout the evening, coinciding with the movement of the population back to their homes and settling in for the night.



While service demand is lowest during those early morning hours, it should be noted that most fatal residential fires occur most frequently late at night or early in the morning. Based on findings from a national study, from 2014 to 2016, residential fatal fires were highest between 1 AM to 2 AM and 4 AM to 5 AM. The 8-hour peak period (11 PM to 7 AM) accounted for 48 percent of residential fatal fires.[1]

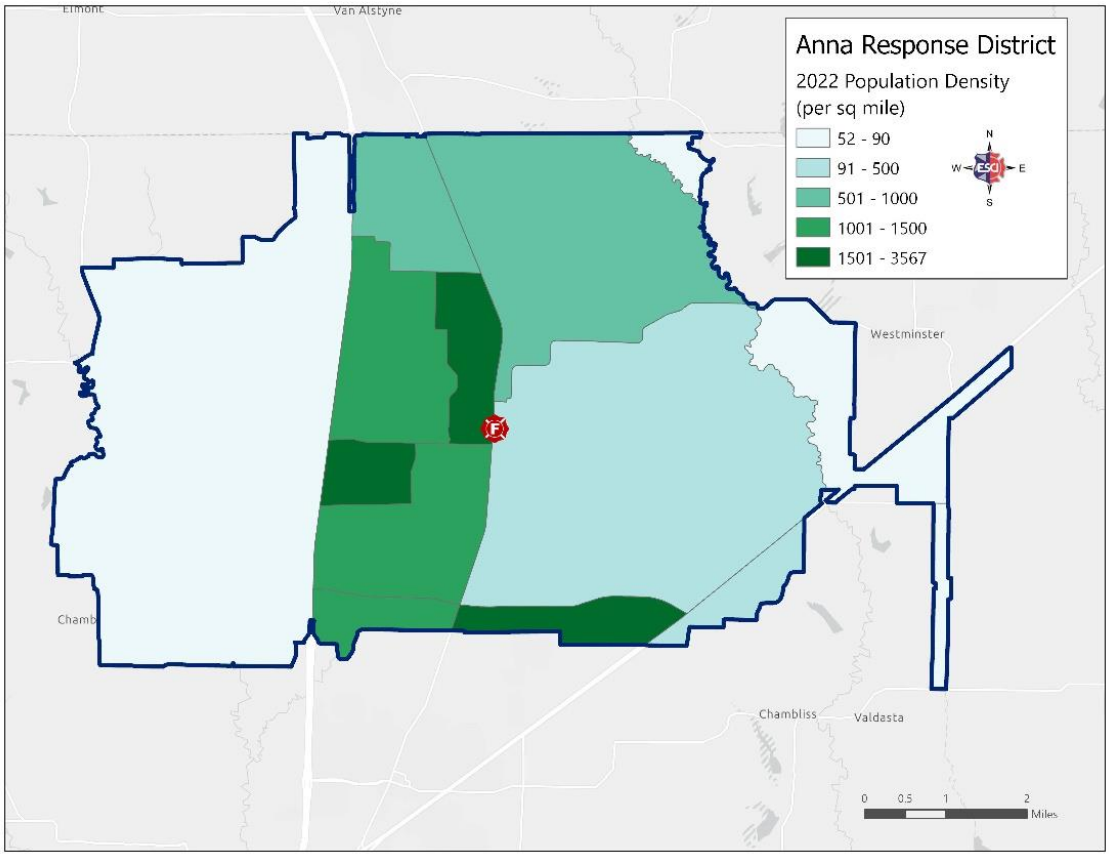
[1] Fatal Fires in Residential Buildings (2014-2016), Topical Fire Report Series Volume 19, Issue 1 /June 18, U.S. Department of Homeland Security, U.S. Fire Administration, National Fire Data Center.

Geographic Analysis

As leadership assesses the appropriate distribution of resources (existing and future), they should first have a thorough understanding of where incidents occur within the community. A geographical analysis is achieved through the use of Geographical Information System (GIS) software which plots the location of each individual incident. The software is then used to calculate the mathematical density of incidents within each square mile and then illustrates this information through use of a "heat map".

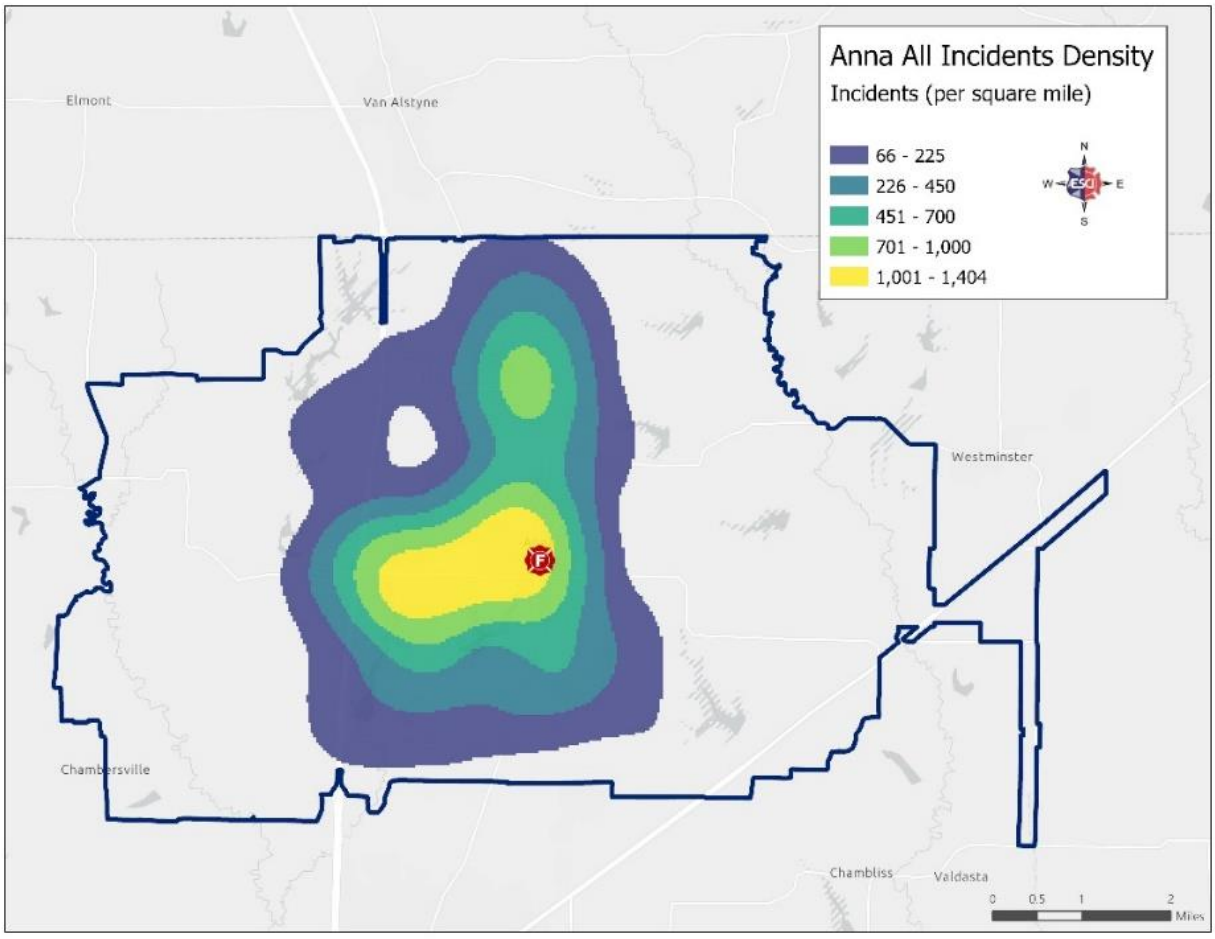
To fully understand the geographical relationship of service demand, it is first important to understand the population density within the community. This is of particular importance because for most communities, areas of greater incident density are found in areas of greater population density. With a larger portion of service demand resulting from calls for emergency medical services, the density of incidents is directly related to the people, rather than the properties. As illustrated in the following figure, the greatest density of population is closest to Central Fire Station, along with another area of higher density at the southern edge of the service area.

Figure 5 AFR Population Density



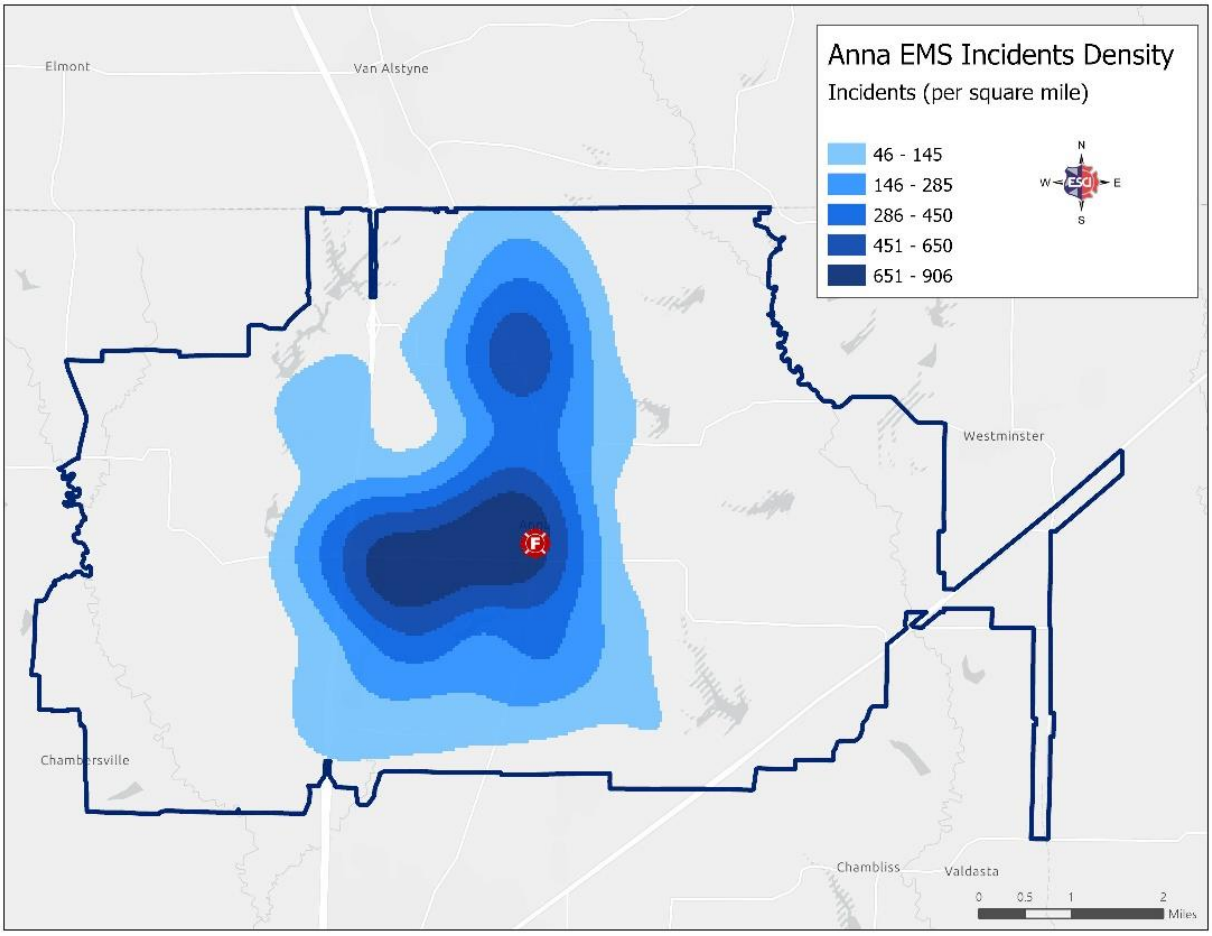
Overall service demand includes incidents of all NFIRS types. As illustrated in the following figure, the greatest demand for service occurs directly near Central Fire Station, near the areas of higher population density.

Figure 6 AFR Incident Density (All), 2018–2022



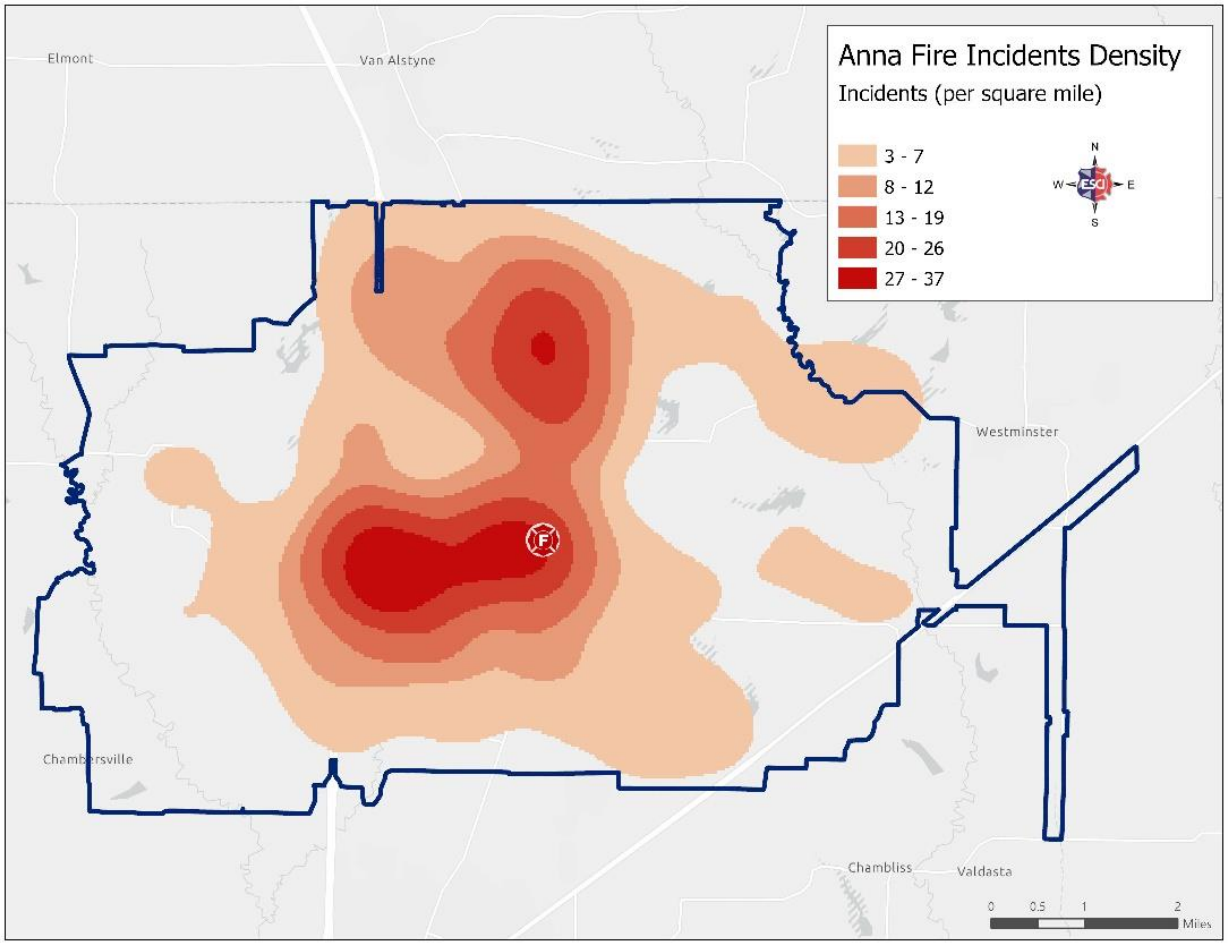
With EMS incidents comprising the greatest percentage of service demand, there is value in viewing the incident density specific to those incidents (NFIRS 300 Series). As illustrated in the following figure, the density of emergency medical service incidents follows a pattern similar to that of the entire data set.

Figure 7 AFR Incident Density (EMS), 2018–2022



Response to fire incidents often requires multiple units and a greater number of personnel. For this reason, understanding the density of fire incidents (NFIRS 100 Series) provides important information to AFR leadership. As illustrated in the following figure, fire incident density also follows a pattern similar to that of all incidents.

Figure 8 AFR Incident Density (Fire), 2018–2022



Resource Distribution Analysis

The second element of service delivery to be analyzed is resource distribution. With an understanding of where incidents occur, it is important to compare those locations to the locations of stations and resources within the community. Location of resources may also be compared to industry standards and best practices such as the Insurance Services Office (ISO) and the National Fire Protection Association (NFPA).

ISO Distribution

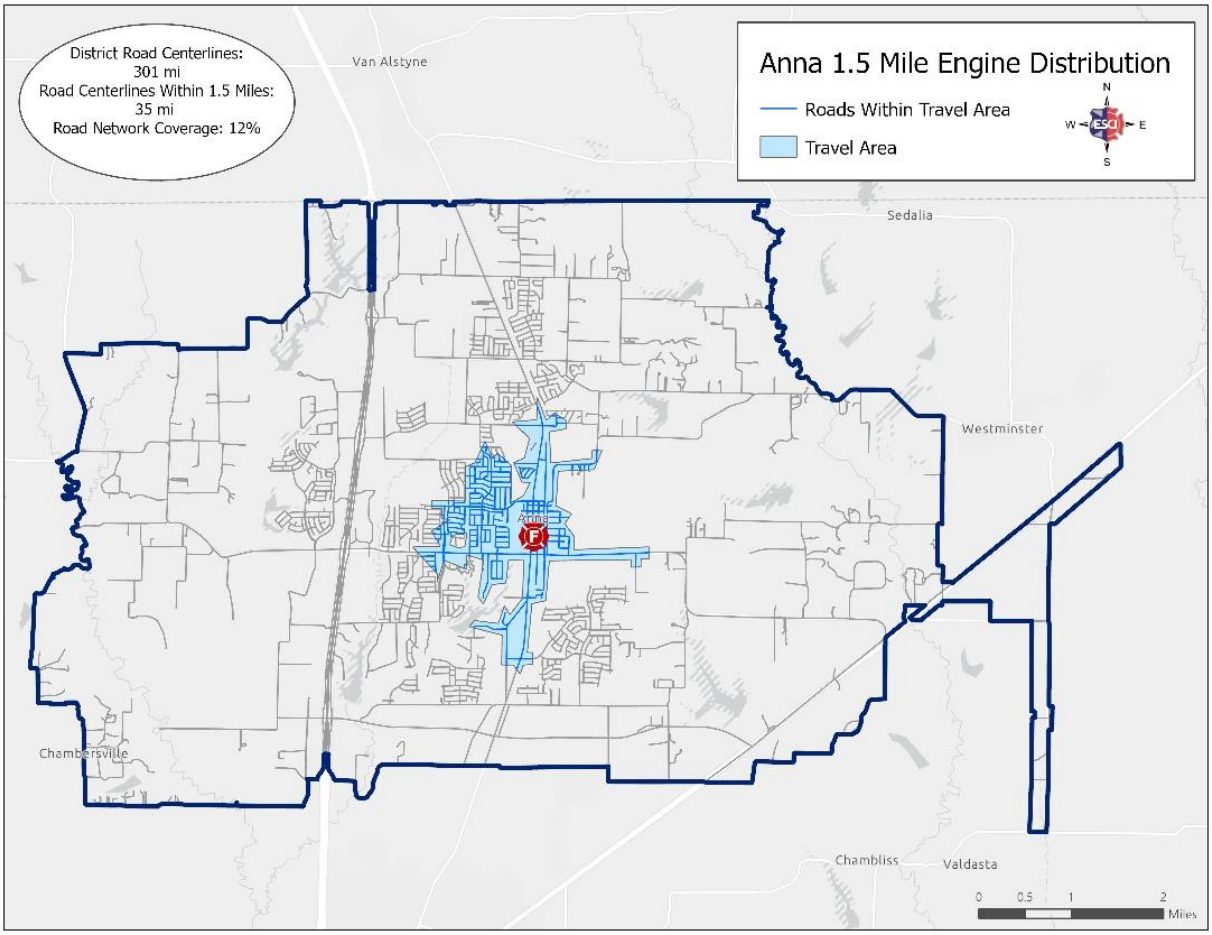
ISO is a national insurance industry organization that evaluates fire protection for communities across the country. ISO assesses all areas of fire protection as broken down into four major categories including emergency communications, fire department, water supply, and community risk reduction. Following an on-site evaluation, an ISO rating, or specifically, a Public Protection Classification (PPC®) number is assigned to the community ranging from 1 (best protection) to 10 (no protection). The PPC® score is developed using the Fire Suppression Rating Schedule (FSRS), which outlines sub-categories of each of the major four, detailing the specific requirements for each area of evaluation.

A community's ISO rating is an important factor when considering fire station and apparatus concentration, distribution, and deployment due to its effect on the cost of fire insurance for the residents and businesses. To receive maximum credit for station and apparatus distribution, ISO evaluates the percentage of the community (contiguously built upon area) that is within specific distances of fire stations, central water supply access (fire hydrants), engine/pumper companies and aerial/ladder apparatus.

Engine Distribution

The evaluation of a department the PPC® score includes an evaluation of the number of structures that fall within a 1.5-mile travel distance of a staffed fire station. This 1.5-mile travel distance is equivalent to the 4-minute travel distance recommended by NFPA 1710 for arrival of the first unit. As illustrated in the following figure, only 12% of the AFR service area is within the 1.5-mile travel distance. This is often a hard measure to meet unless the department is primarily urban/suburban and service demand justifies the expense of additional stations and resources.

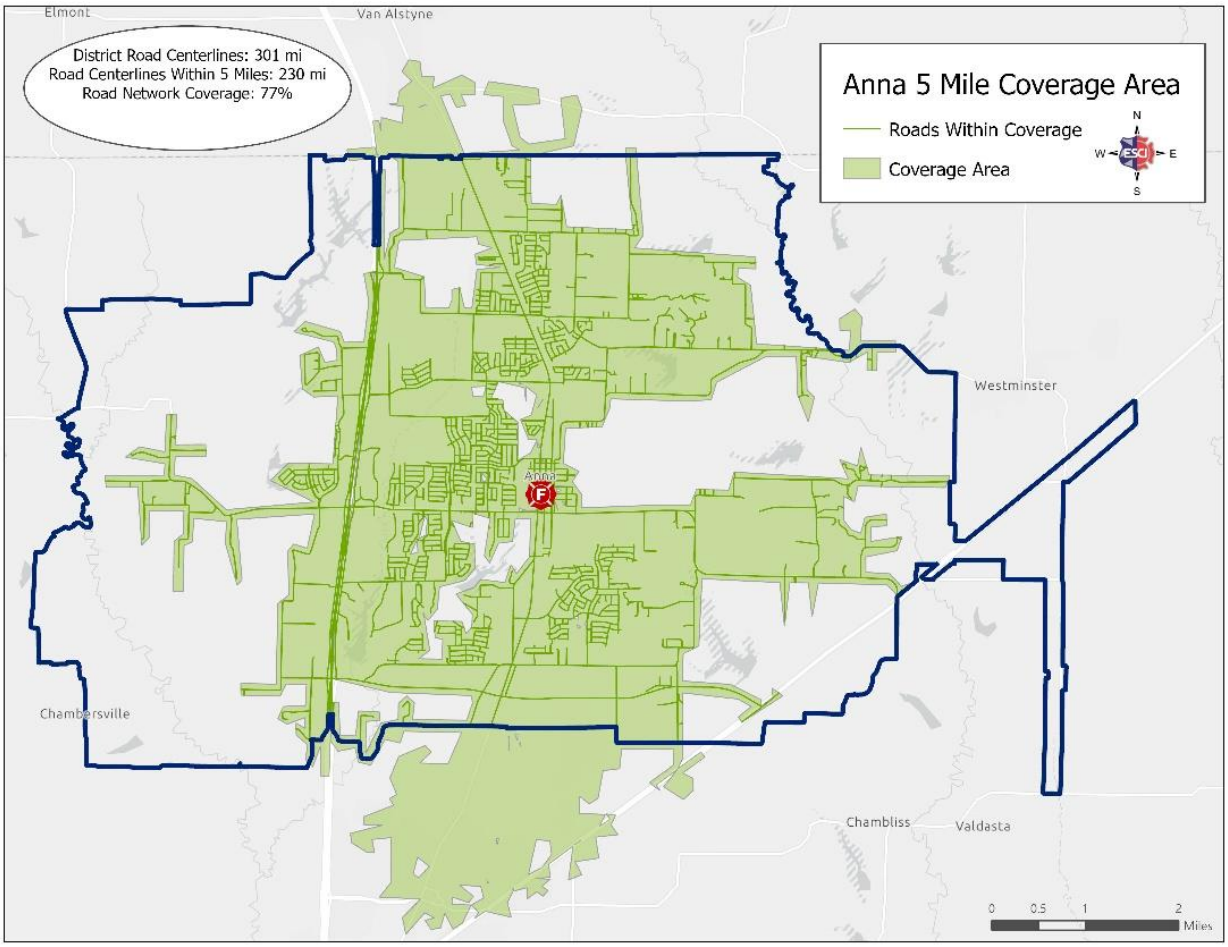
Figure 9 AFR Engine Distribution per ISO Criteria



Fire Station Distribution

The evaluation of a department the PPC® score includes an evaluation of the number of structures that fall within a 5-mile travel distance of a fire station. Areas outside of 5-miles are subject to receiving a PPC® rating of 10 (no fire department protection available). As illustrated in the following figure, 77% of the AFR service area is within the 5-mile travel distance.

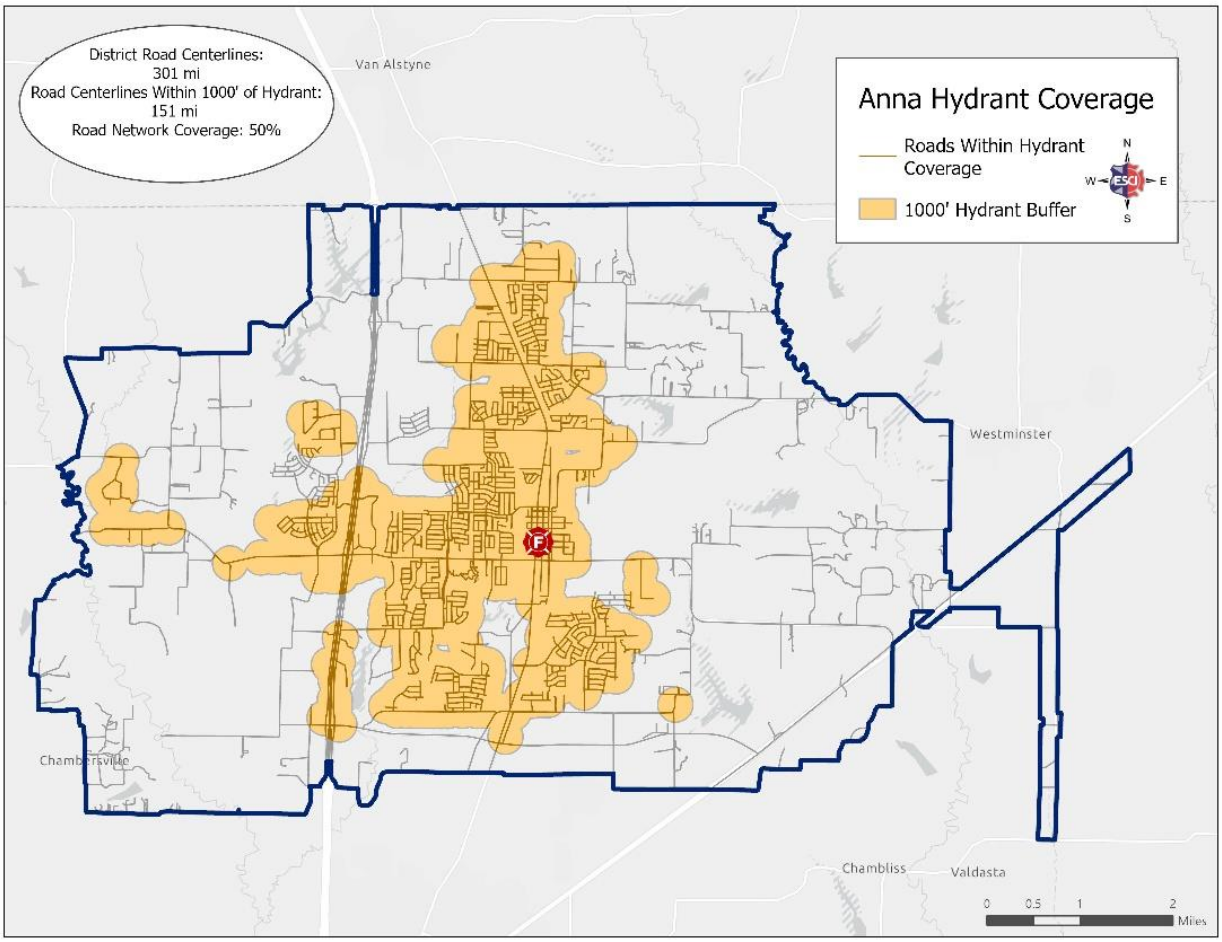
Figure 10 AFR Fire Station Distribution per ISO Criteria



Water Supply

The evaluation of a department the PPC® score includes an evaluation as to the availability of a sufficient water supply, which is critical for the extinguishment of fires. Included in this evaluation is the geographic location and distribution of fire hydrants. Structures outside a 1,000-foot radius of a fire hydrant are subject to a lower Public Protection Classification® rating than areas with adequate hydrant coverage, thus signifying limited fire protection. Exceptions are made when a fire department can show that either a dry hydrant or a suitable water tanker operation is possible to provide the needed volume of water for fire suppression activities for a specific period. As illustrated in the following figure, 50% of the AFR service area is within 1,000 feet of a fire hydrant.

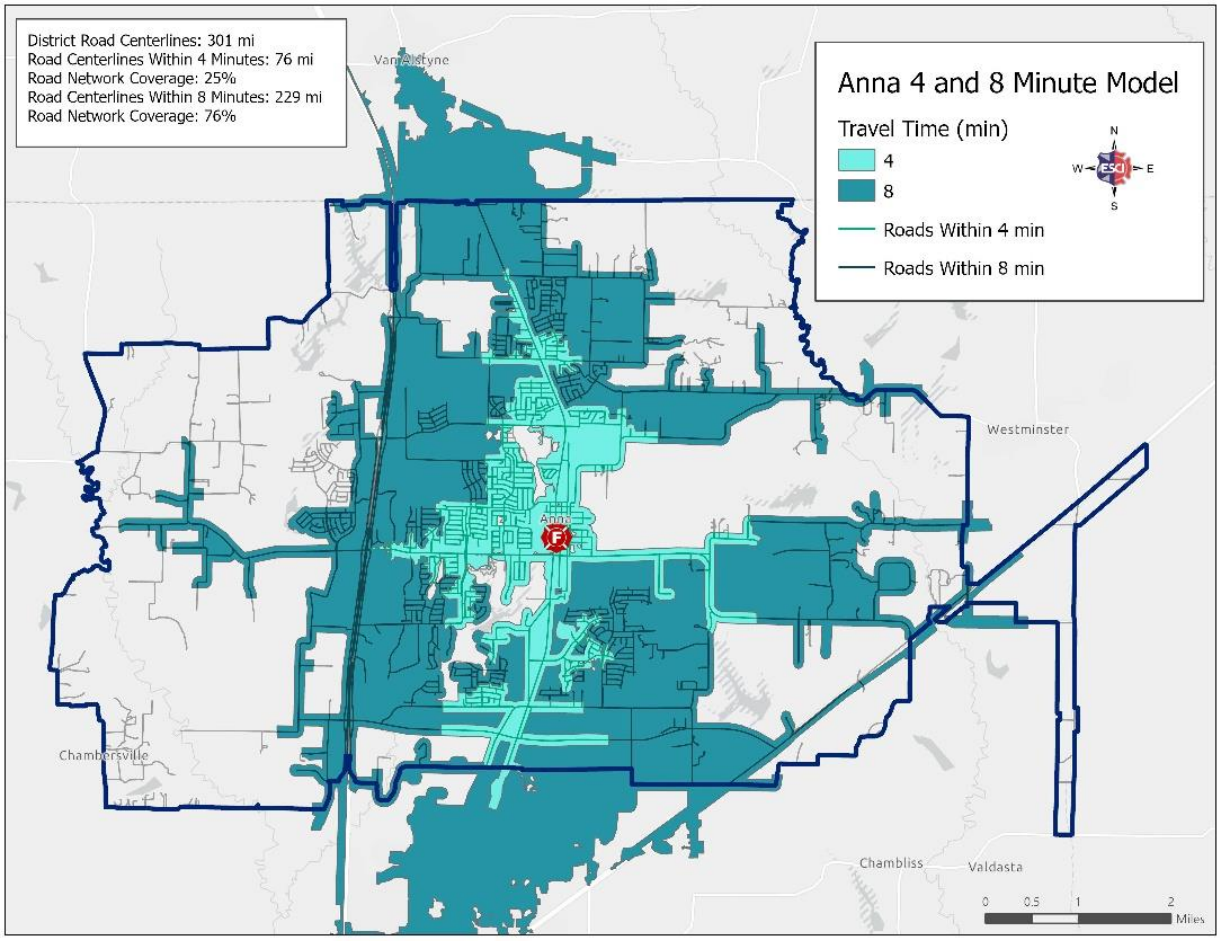
Figure 11 AFR Hydrant Distribution per ISO Criteria



NFPA Distribution

NFPA standards and the Center for Public Safety Excellence (CPSE) both evaluate travel time criteria for the purpose of evaluating resource distribution. Within these recommendations, the first unit should arrive within a 4-minute travel time and the full assignment of resources needed to mitigate the incident should arrive within an 8-minute travel time. Travel time is calculated using the existing road network provided by the department, which includes speed limits, one-way streets, and other permanent factors. As illustrated in the following figure, only 25% of the AFR service area is within a 4-minute travel time and 76% is within an 8-minute travel time.

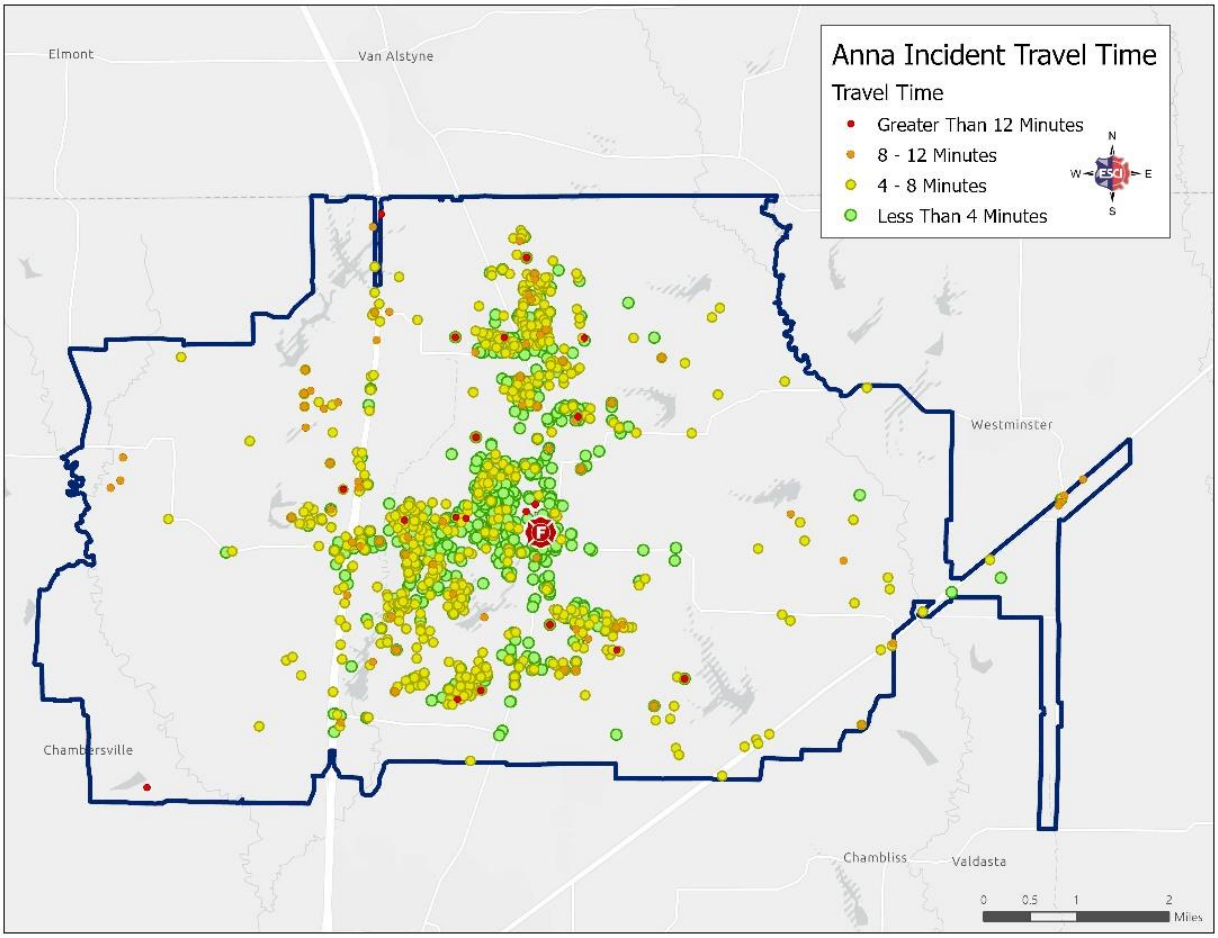
Figure 12 AFR 4/8-Minute Travel per NFPA Criteria



The preceding figure is theoretical in that it is based on no additional impedance factors such as weather, time of day, traffic, etc. and assumes that all units are in station at the time of dispatch. To assist leadership in obtaining a complete picture of travel time within the community, ESCI (Emergency Services Consulting International) evaluated actual travel time to incidents for 2022. This evaluation only included those incidents to which units were

responding emergency (lights and sirens). As illustrated in the following figure, AFR had a travel time of less than 4 minutes to 44.59% of incidents, 4–8 minutes to 45.11% of incidents, 8–12 minutes to 8.47% of incidents, and greater than 12 minutes to 1.83% of incidents.

Figure 13 AFR Actual Travel Time, 2022



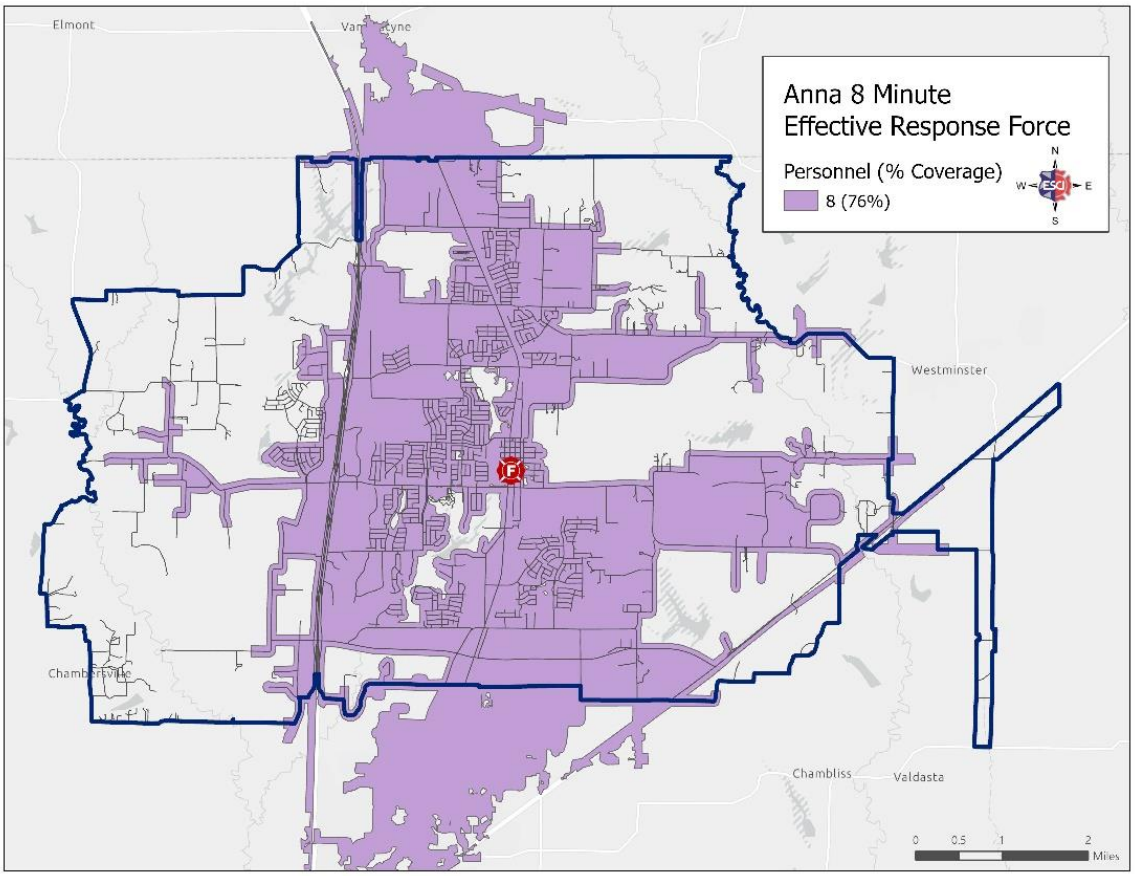
Resource Concentration Analysis

The third element of service delivery to be analyzed is resource concentration. While getting the first unit to the scene in a timely manner is a key component of quality service delivery, when responding to structure fires, multiple units and personnel are needed to safely handle all aspects of the emergency. The ability to assemble sufficient units and staffing is referred to as effective response force (ERF). As recommended by 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*, the following chart illustrates the ERF that should arrive within an 8-minute travel time.

Function/Task	Single-Family Residence (2,000 ft²)	Open Air Strip Shopping Center (13,000–196,000 ft²)	3-Story Garden Apartment (1,200 ft²)
Command	1	2	2
Apparatus Operator	1	2	2
Handlines (2 members each)	4	6	6
Support Members	2	3	3
Victim Search and Rescue team	2	4	4
Ground Ladders/Ventilation	2	4	4
Aerial Device Operator (if ladder used)	(1)	(1)	(1)
Initial Rapid Intervention Team	4	4	4
Initial Medical Care Component	N/A	2	2
Total	**16 (17)**	**27 (28)**	**27 (28)**

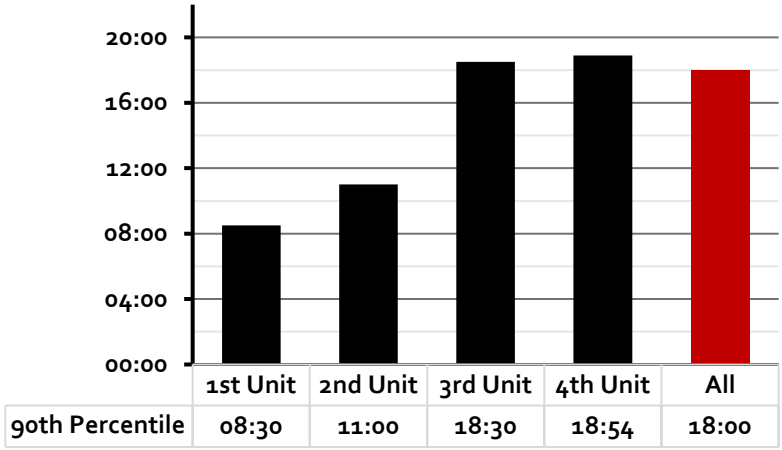
As illustrated in the following figure, AFR is only able to assemble 8 firefighters for a given incident (76% of the service area) without relying on automatic aid and mutual aid resources. The commander of an incident must weigh available resources with incident tasks and determine the tactics to accomplish mitigating the incident while maintaining firefighter safety. As a result, some tasks may be delayed until the arrival of additional resources.

Figure 14 AFR Effective Response Force per NFPA Criteria



The preceding illustration is based on all units at the station at the time of dispatch. To assist AFR leadership in evaluation of ERF to actual incidents, it is valuable to compare the order in which units arrive at structure fires (NFIRS Incident Types 111–112). The following figure illustrates the timing of units to these incidents.

Figure 15 AFR Structure Fire Order of Arrival, 2018–2022



	1st Unit	2nd Unit	3rd Unit	4th Unit	All
90th Percentile	08:30	11:00	18:30	18:54	18:00

Resource Reliability Analysis

The fourth element of service delivery to be analyzed is resource reliability. The reliability of a fire department to respond to incidents may be impacted by how busy that fire department is. Two specific measures for this include incident concurrency and workload. When either measure increases, the number of available resources to respond to additional calls for service decreases—which may result in extended response times as units respond from further distant stations or departments.

Incident Concurrency

Incident concurrency, also called "overlap", refers to when more than one incident occurs at the same time within a jurisdiction. To analyze incident concurrency, a count of incidents occurring simultaneously is calculated and then displayed as a percentage. As illustrated in the following figure, the increase of call volumes that result in two or more callouts has significantly increased since 2019. This increase in calls shows the need for updated response ERF and future planning for stations and apparatus.

Figure 16 AFR Incident Concurrency, 2018–2022

Concurrent Incidents	2018	2019	2020	2021	2022	Change Over Study Period
Single Incident	89.10%	92.09%	92.12%	86.65%	87.59%	-1.51%
Two Incidents	10.32%	7.67%	7.71%	12.78%	11.52%	1.20%
Three Incidents	0.58%	0.18%	0.18%	0.52%	0.89%	0.31%
Four Incidents	0.00%	0.06%	0.00%	0.05%	0.00%	0.00%

Workload

Workload refers to the amount of work performed by each unit within the department. From a simplistic view, this could be expressed as the total number of incidents for each unit over a year's timeframe. However, as incident duration can vary widely from minutes to hours, this is a less realistic measure of workload. A more realistic measure of workload is to consider the total number of hours each unit is assigned to incidents as compared to the total number of hours the unit was in service. This method of workload measurement is referred to as unit hour utilization. While it is more realistic than just an incident count, it still does not capture additional hours spent performing non-incident activities such as apparatus maintenance, station duties, training, pre-incident planning, public education, hydrant testing, hose testing, etc.

While there are limited formal performance measures to use as a target measure, in May 2016, Henrico County (VA) Division of Fire published an article after studying their department's EMS workload.[2] As a result of the study, Henrico County Division of Fire developed a general commitment factor scale for their department. The next figure is a summary of the findings as it relates to commitment factors. ESCI presents this analysis and comparison as a starting point for department leadership to consider and develop workload measures that best serve their department and their community.

Figure 17 Commitment Factors as Developed by Henrico County (VA) Division, 2016

Factor	Indication	Description
16%-24%	Ideal Commitment Range	Personnel can maintain training requirements and physical fitness and can consistently achieve response time benchmarks. Units are available to the community more than 75 percent of the day.
25%	System Stress	Community availability and unit sustainability are not questioned. First-due units are responding to their assigned community 75 percent of the time, and response benchmarks are rarely missed.
26%-29%	Evaluation Range	The community served will experience delayed incident responses. Just under 30 percent of the day, first-due ambulances are unavailable; thus, neighboring responders will likely exceed goals.
30%	"Line in the Sand"	Not Sustainable: Commitment Threshold—community has less than a 70 percent chance of timely emergency service and immediate relief is vital. Personnel assigned to units at or exceeding 0.3 may show signs of fatigue and burnout and may be at increased risk of errors. Required training and physical fitness sessions are not consistently completed.

[2] How Busy Is Busy?; Retrieved from https://www.fireengineering.com/articles/print/volume-169/issue-5/departments/fireems/how-busy-is-busy.html

For the purposes of this workload analysis, each unit was assumed to be in service every day of each year. As illustrated in the following figure, no AFR units are at a concerning level of workload.

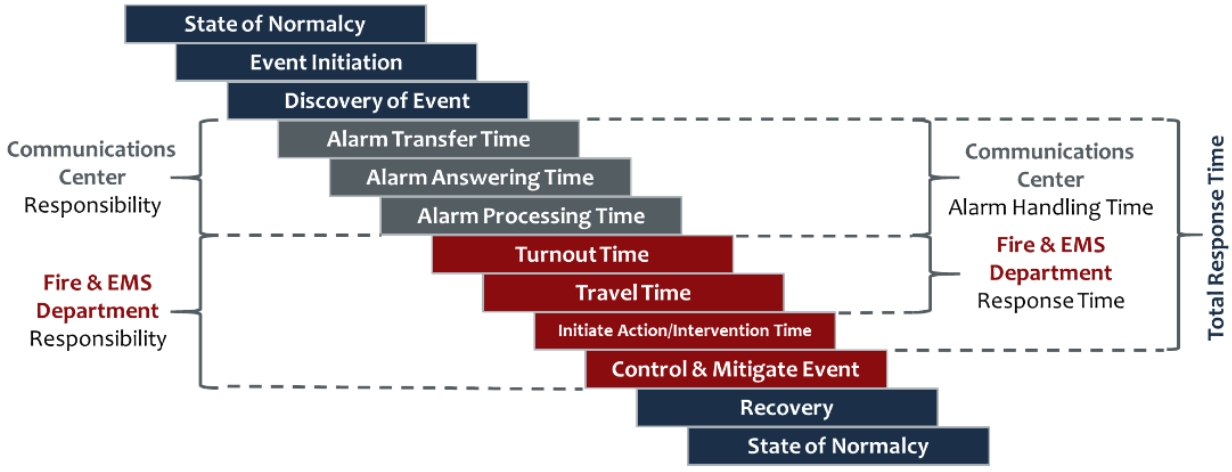
Unit	2018	2019	2020	2021	2022	Change Over Study Period
BC1	0.00%	0.77%	0.31%	3.73%	3.82%	3.82%
E1	7.05%	6.23%	6.91%	6.87%	8.64%	1.60%
MEDIC 1	0.00%	0.00%	0.06%	0.09%	4.13%	4.13%

Response Performance Analysis

The final element of service delivery to be analyzed is response performance. With a primary mission of responding to calls for service, AFR leadership should understand how quickly units arrive at the scene. This overall measure between the public activating 911 and arrival of the first unit at the scene is known as total response time performance. However, this greater measure is comprised of several smaller measures which comprise the response time continuum. These smaller measures of the response time continuum include:

- Alarm Handling – a measure between activation of 911 and dispatch of the first unit.
- Turnout – a measure between dispatch and the unit responding to the incident.
- Travel – a measure between the unit responding to the incident and arrival at the incident.
- Response time – a measure between dispatch and arrival at the incident.
- Total response time – a measure between activation of 911 and arrival at the incident.

The response time continuum may also be illustrated as shown in the following figure.



In analyzing response performance, ESCI generates percentile measurements of response time performance. The use of percentile measurement using the components of response time follows the recommendations of industry best practices. Best practices are derived by the Commission on Fire Accreditation International (CFAI), CPSE, Standard of Cover document, and 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*.

The "average" measure is a commonly used descriptive statistic also called the mean of a data set. The most important reason for not using the average for performance standards is that it may not accurately reflect the performance for the entire data set and may be skewed by outliers, especially in small data sets. One extremely good or bad value can skew the average for the entire data set.

The "median" measure is another acceptable method of analyzing performance. This method identifies the value at the middle of a data set and thus tends to not be as strongly influenced by data outliers.

Percentile measurements are a better measure of performance because they show that most of the data set has achieved a particular level of performance. The 90th percentile means that 10 percent of the values are greater than the value stated, and all other data are at or below this level. This can be compared to the desired performance objective to determine the degree of success in achieving the goal.

As this report progresses through the performance analysis, it is important to keep in mind that each component of response performance is not cumulative. Each is analyzed as an individual component, and the point at which the fractile percentile is calculated exists in a set of data unto itself.

For the purposes of this analysis, only those incidents coded by firefighters as an emergency response (lights and sirens) were included. It should also be noted that the data provided by AFR and the Collin County Sheriff's Office included only hour and minute for each timestamp, so this analysis is unable to accurately calculate down to the second. ESCI recommends that AFR leadership work with Collin County to ensure documentation of time stamps down to the second and regularly track and report time performance measures.

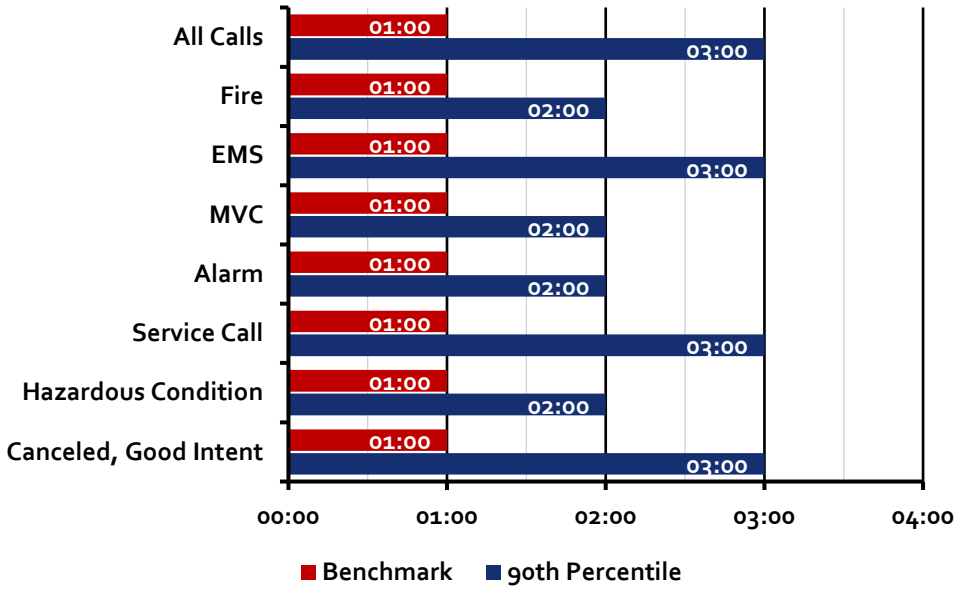
Alarm Handling

Alarm handling is a measure of the time between activation of 911 and dispatch of the first unit and the applicable standard is illustrated in the following figure.

Standard	Performance
NFPA 1225: *Standard for Emergency Services Communications* (2022 Edition)	60 seconds at the 90th percentile

As illustrated in the following figure, AFR overall alarm handling performance is 3 minutes, well above the expected standard of 1 minute. This significant deficiency should be identified as an immediate action item. While alarm handling is not a function under direct control of the fire department, AFR leadership should work with the Collin County communications center leadership to monitor and improve performance on this measure.

Figure 18 AFR Alarm Handling Performance, 2018–2022



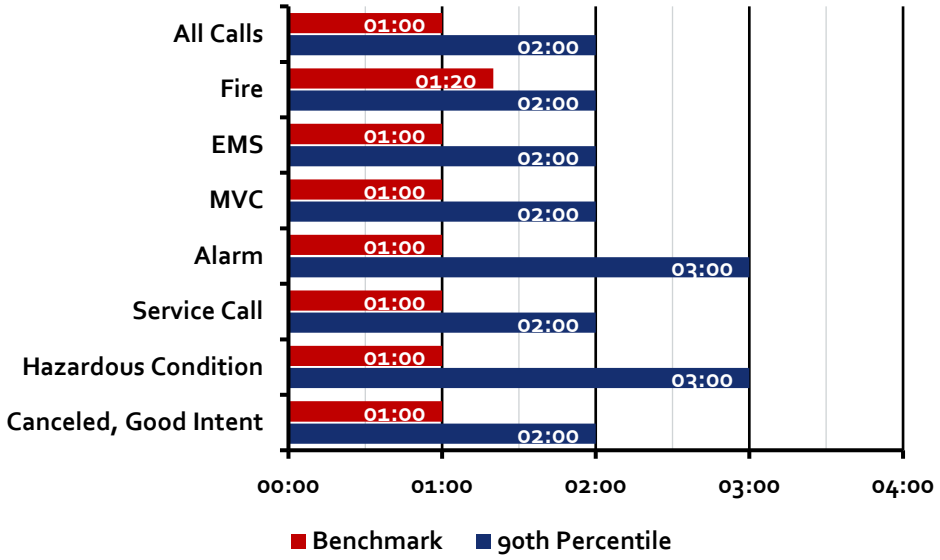
Turnout

Turnout is a measure of the time between dispatch and the unit responding to the incident; unit advises dispatch it is responding, and the apparatus is moving down the road. The applicable standard is illustrated in the following figure.

Standard	Performance
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* recommends	Fire and Special Operations Incidents 80 seconds at the 90th percentile All Other Incidents 60 seconds at the 90th percentile

As illustrated in the following figure, AFR overall turnout performance is 2 minutes, double the expected performance of 1 minute.

Figure 19 AFR Turnout Performance, 2018–2022



As this is the first measure under direct control of the fire department, AFR leadership should consider the various actions that occur within this measure and determine if there are areas where process changes could improve performance. These factors include:

- Systems used to notify personnel of an incident.
- Station design as it relates to the movement of personnel from living quarters to the apparatus bay.
- Personnel adherence to department policies and acting with appropriate speed towards the apparatus.

- Time required to don protective equipment prior to responding.
- Moving equipment between apparatus when units are cross staffed.
- Time from starting apparatus until radio system is capable of transmitting.

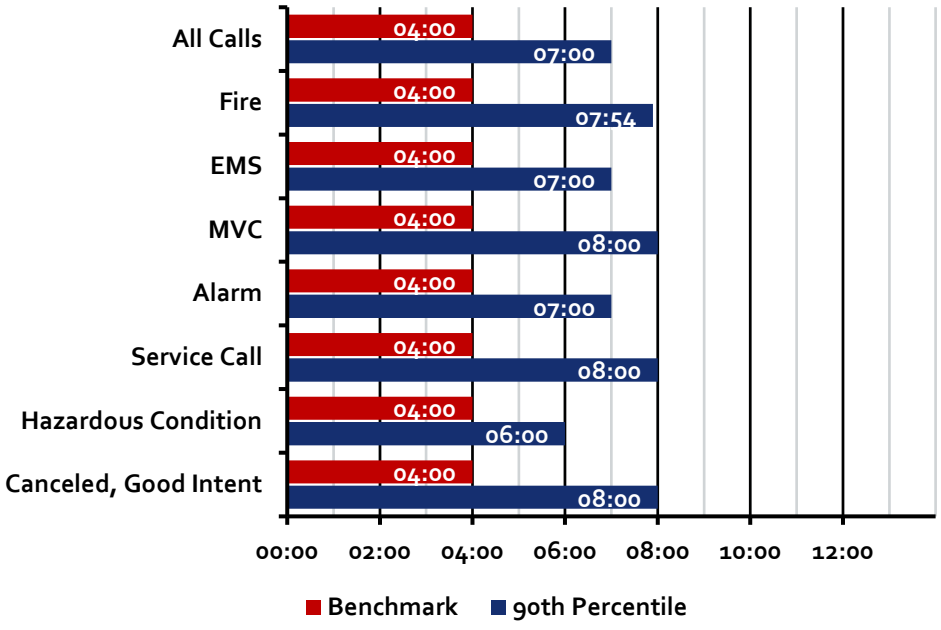
Travel

Travel is a measure of time between the unit responding to the incident and arrival at the incident. The applicable standard is illustrated in the following figure.

Standard	Performance
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* recommends	First Unit 4 minutes at the 90th percentile Full Compliment 8 minutes at the 90th percentile

As illustrated in the following figure, AFR overall travel performance is 7 minutes, which is 3 minutes greater than the expected performance. For this measure, it is key that fire department leadership work closely with elected officials and the community to balance between meeting this standard and costs of adding sufficient resources to accomplish it.

Figure 20 AFR Travel Performance, 2018–2022



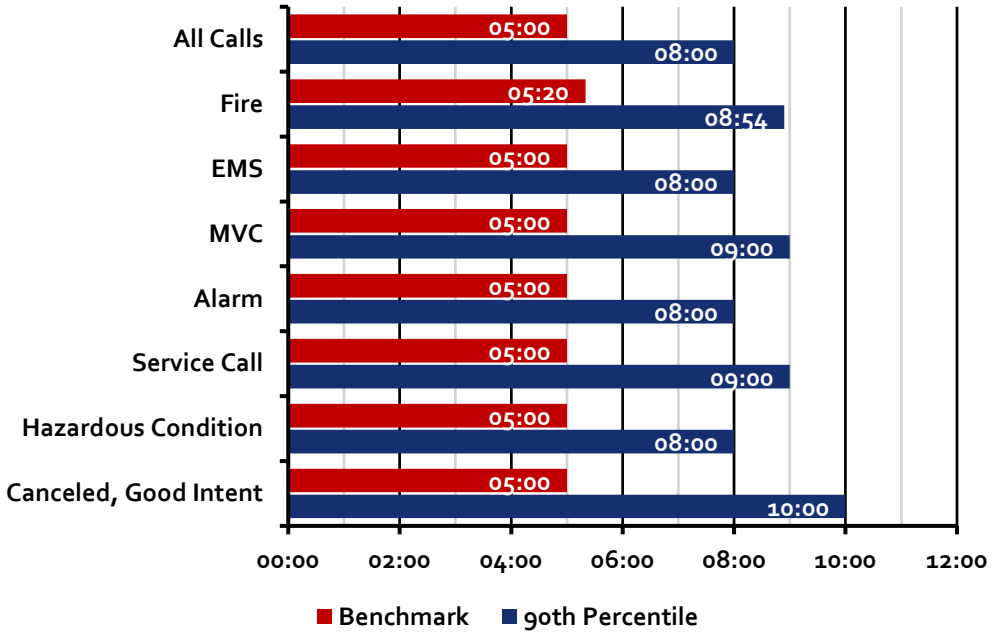
Response Time

Response time is a measure of the time between dispatch and arrival at the incident. For this measure, there is not a specific applicable standard. However, by combining the individual component standards, the following figure may illustrate expected performance.

Component	Performance
Turnout Time	Fire and Special Operations Incidents 80 seconds at the 90th percentile All Other Incidents 60 seconds at the 90th percentile
Travel Time	4 minutes at the 90th percentile
Combined	Fire and Special Operations Incidents 5 minutes, 20 seconds at the 90th percentile All Other Incidents 5 Minutes at the 90th percentile

As illustrated in the following figure, AFR overall response time performance is 8 minutes, which is 3 minutes greater than the expected performance.

Figure 21 AFR Response Time Performance, 2018–2022



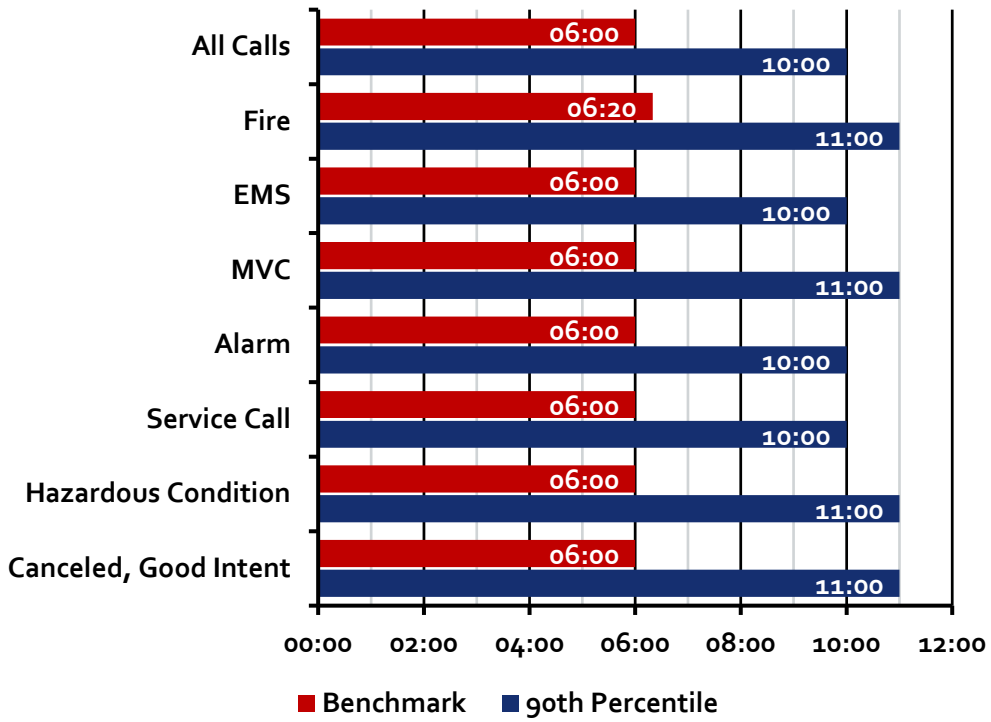
Total Response Time

Total response time is a measure of the time between activation of 911 and arrival at the incident. For this measure, there is not a specific applicable standard. However, by combining the individual component standards, the following figure illustrates expected performance.

Component	Performance
Call Processing Time	60 seconds at the 90th percentile
Turnout Time	Fire and Special Operations Incidents 80 seconds at the 90th percentile All Other Incidents 60 seconds at the 90th percentile
Travel Time	4 minutes at the 90th percentile
Combined	Fire and Special Operations Incidents 6 minutes, 20 seconds at the 90th percentile All Other Incidents 6 Minutes at the 90th percentile

As illustrated in the following figure, AFR overall total response time performance is 10 minutes, which is 4 minutes greater than the expected performance.

Figure 22 AFR Total Response Time Performance, 2018–2022



Mutual and Automatic Aid

As society continues to change and communities continue to grow, there are ongoing efforts to streamline services and provide cost-effective responses to incidents. Towards this goal, many departments sign aid agreements that enable the sharing of resources, thus decreasing the need for the department to supply all needed resources as a sole entity. With mutual aid agreements, each department agrees to respond resources to the other agency's jurisdiction, when requested by the responding officer or on-scene incident commander. With automatic aid agreements, each department agrees to respond resources to the other agency's jurisdiction when dispatched as part of the initial dispatch of units—within a formal matrix or process which specifies which units are dispatched to what types of incidents. AFR is a part of several aid agreements as illustrated in the following figure. While the City of Melissa is an automatic aid agreement, the department has identified that often, the dispatch center is not automatically dispatching aid resources but rather it is done by request—thus operating mostly as a mutual aid process. ESCI recommends that AFR leadership work with Collin County Sheriff's Office leadership to resolve this so that the automatic aid process is more effectively utilized.

Figure 23 AFR Aid Agreements

Agency	Agreement Type
City of Melissa	Automatic
City of Van Alstyne Fire Protection Department	Mutual
Collin County Texas (AMR)	Mutual
McKinney Fire Department	Mutual
Blue Ridge Fire Department	Mutual
Princeton Fire Department	Mutual
Westminster Fire Department	Mutual

AFR makes use of the aid agreements for all types of responses, not just responses to fires. The following figure illustrates the number of incidents involving aid between agencies.

Description	2018	2019	2020	2021	2022	Total
Automatic aid given	165	137	106	63	23	494
Automatic aid received	66	56	41	26	12	201
Mutual aid given	132	123	123	127	136	641
Mutual aid received	194	138	112	128	156	728
Total	**557**	**454**	**382**	**344**	**327**	**2,064**

RISK SCORE METHODOLOGY & DEFINITIONS

Anna Fire Rescue plays a critical role in ensuring the safety and well-being of the Anna community. With the increasing complexity and diversity of risks faced by fire departments, it is crucial to have a systematic and data-driven approach to assess and prioritize these risks. This report highlights the importance of implementing a risk score methodology for Anna Fire Rescue.

- **Enhanced Risk Assessment:**
  A risk score methodology enables Anna Fire Rescue to conduct a comprehensive and standardized risk assessment. By considering various factors such as historical incident data, population density, infrastructure vulnerabilities, and response times, the methodology provides a holistic view of the risks faced by the department. This allows for a more accurate and informed decision-making process regarding resource allocation, training priorities, and preventive measures.
- **Efficient Resource Allocation:**
  With limited resources, it is essential to allocate them effectively where they are most needed. A risk score methodology provides a systematic approach to identifying areas or situations with higher risk levels. By quantifying and comparing the risks associated with different areas, Anna Fire Rescue can prioritize resource allocation based on the severity and likelihood of potential incidents. This ensures that resources are directed to areas that require immediate attention, leading to improved emergency response and reduced response times.
- **Targeted Prevention and Mitigation Strategies:**
  By understanding the specific risk factors contributing to higher risk scores, Anna Fire Rescue can develop targeted prevention and mitigation strategies. For example, if a particular area has a high-risk score due to a high incidence of wildfires, the department can focus on community education programs, enforcement of fire safety regulations, and proactive measures such as vegetation management and firebreaks. This proactive approach reduces the likelihood and impact of incidents, enhancing overall community safety.
- **Improved Operational Preparedness**:
  A risk score methodology assists Anna Fire Rescue in identifying and addressing operational gaps and vulnerabilities. By analyzing risk factors such as response times, equipment availability, and training requirements, the department can identify areas that require improvement. This allows for targeted investments in infrastructure, equipment upgrades, and training programs, ensuring that the department is adequately prepared to respond to emergencies efficiently and effectively.
- **Enhanced Data-Driven Decision-Making:**
  Implementing a risk score methodology promotes a data-driven culture within Anna Fire Rescue. By relying on empirical evidence and objective assessments, decision-making becomes more transparent, consistent, and accountable. The risk score methodology

provides a common language and framework for discussions and resource allocation, reducing subjective biases and ensuring that decisions are based on the best available information.

In an ever-changing and dynamic environment, the implementation of a risk score methodology is crucial for the City of Anna. By enhancing risk assessment, optimizing resource allocation, developing targeted prevention strategies, improving operational preparedness, and promoting data-driven decision-making, the department can effectively safeguard the community and reduce the impact of emergencies. The adoption of a risk score methodology will strengthen the department's capabilities and contribute to a safer and more resilient community.

PROBABILITY OF OCCURRENCE & CONSEQUENCE TO THE COMMUNITY

Anna Fire Rescue uses the last five years of response data to determine the likelihood of occurrence. The three-axis model uses a numeric score based on the definitions below. Additionally, the department subjectively assigns a consequence score based on the definitions outlined below.

PROBABILITY SCORING	
1	More than Annually
2	Annually
3 4	Quarterly
5 6	Monthly
7 8	Weekly
9	Daily
10	Multiple Times Daily

CONSEQUENCE SCORING	
1	One Person
2	One Household
3	Single Business Interruption - One-Day
4	Single Business Interruption - 2-7 Days
5	Multiple Businesses or Households Impacted
6	Neighborhood-wide Impact
7 8	City-wide Impact
9 10	Region-wide Impact

Impact on Anna Fire Rescue:

The department calculates the impact score by dividing the staff resources assigned by the department's minimum staffing and then multiplying by 10. This method provides a result on a ten-point scale and aligns with the practices of the other two axes.

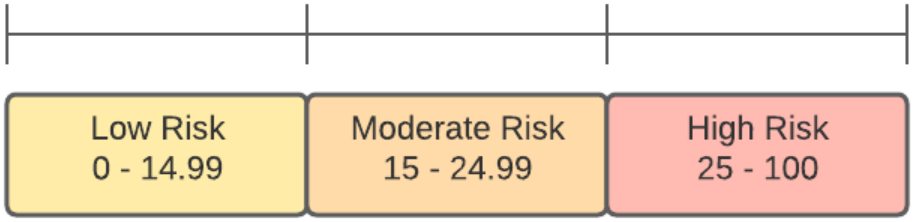
(Staff Assigned to Incident / Minimum Staffing) x 10 = Impact Score

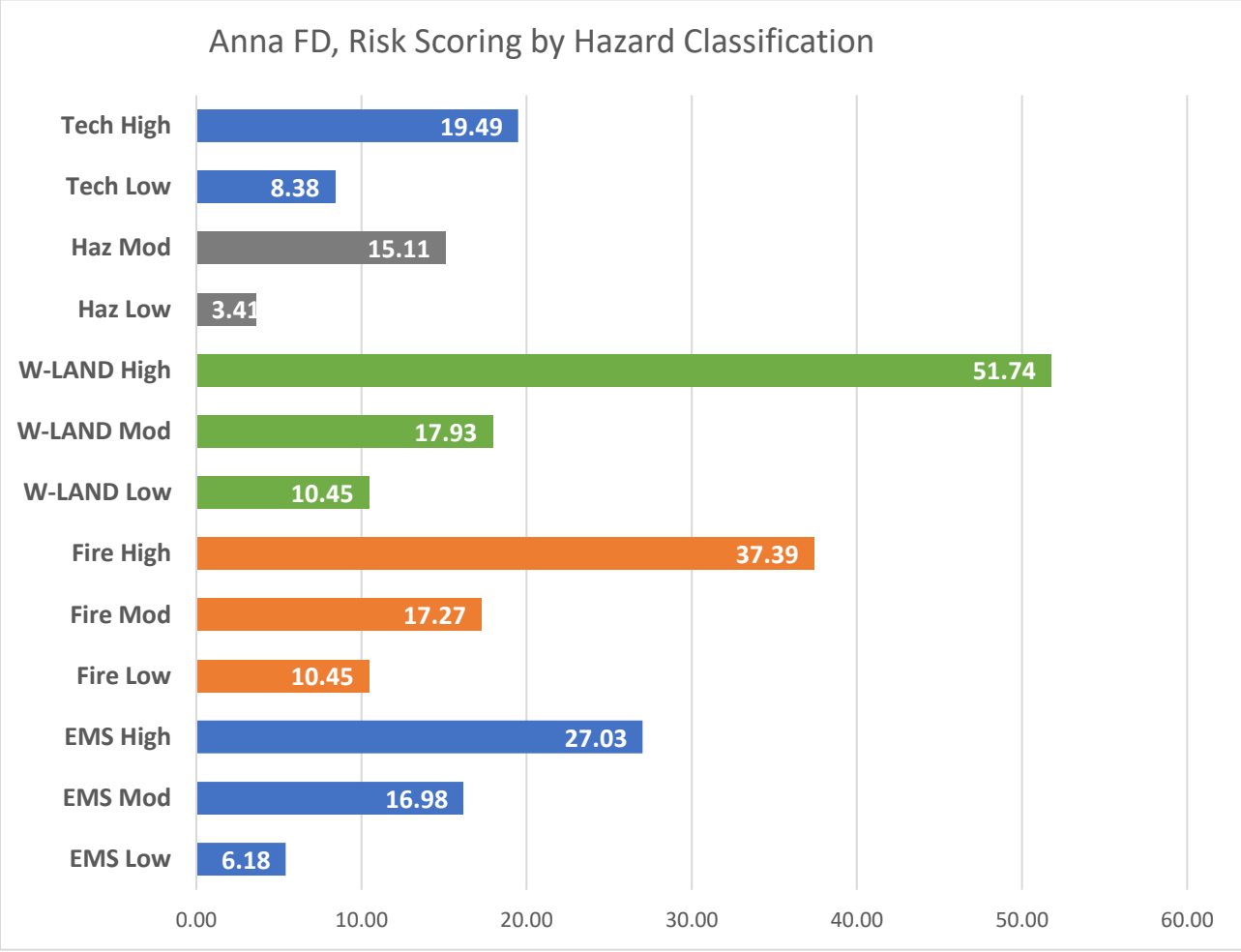
Three-Axis Risk Scoring Model

Anna Fire Rescue uses the three-axis scoring methodology. This method uses the square root of each risk element value to determine the "surface area." The surface area value then becomes the risk's numeric value.

Square Root of ((Prob^2 x Cons^2/2) + (Cons^2 x Imp^2/2) + (Prob^2 x Imp^2/2)) = Risk Score

The scores derived from this method indicate the level of risk associated with certain types of incident responses. The scores are sorted into three different risk classifications: Low, Moderate, and High risk. The figure below shows the score ranges for each type.





Response Performance Goals

This report highlights the significance of response performance goals for Anna Fire Rescue aligned with NFPA standards. It emphasizes the importance of setting specific response performance goals, explores the benefits they bring to the fire department and the community, and discusses how compliance with NFPA standards ensures a high level of operational effectiveness and public safety.

Anna Fire Rescue recognizes the critical role of response performance goals in delivering effective emergency services. By establishing clear objectives and adhering to NFPA standards, the department can continuously improve its operational efficiency, response times, and overall effectiveness in protecting lives and property.

Setting response performance goals provides the department with a framework for measuring and improving its operational capabilities. These goals serve as benchmarks for evaluating the department's performance, identifying areas for improvement, and allocating resources efficiently. Additionally, they enhance accuracy, accountability, and clarity, fostering public trust in the fire department's ability to deliver timely emergency services.

NFPA develops and maintains a set of standards that guide fire departments in various aspects of their operations, including response performance. Compliance with NFPA standards ensures that the department meets recognized best practices and industry benchmarks. By aligning response performance goals with NFPA standards, the department can demonstrate its commitment to excellence and prioritize public safety.

Response time goals are a key component of response performance goals. NFPA standards provide guidelines for acceptable response times based on incident type, severity, and location. By setting specific response time goals, Anna Fire Rescue can strive to meet or exceed these standards, ensuring prompt assistance to those in need and minimizing potential risks and damages.

Response performance goals enhance the operational effectiveness of the department. By continuously monitoring and evaluating response times, resource allocation, and incident management, the department can identify areas for improvement and implement appropriate strategies and training programs. This proactive approach increases the department's ability to handle emergencies efficiently and effectively.

Response performance goals also help optimize resource allocation within Anna Fire Rescue. By analyzing response data and understanding incident patterns, the department can strategically position fire apparatus, staff personnel accordingly and ensure that resources are allocated in areas with the highest call volumes or specific risk factors. This maximizes the department's capacity to respond promptly and deliver appropriate services.

Setting and achieving response performance goals build community confidence in Anna Fire Rescue's capabilities. When residents and businesses are aware of the department's

commitment to meeting industry standards, they feel reassured that emergency services will be provided in a timely manner. This confidence contributes to a sense of safety and enhances public well-being.

Response performance goals provide a framework for continuous improvement within Anna Fire Rescue. By regularly evaluating performance against established goals, the department can identify trends, implement corrective measures, and adapt strategies to evolving community needs and emerging challenges. This commitment to continuous improvement ensures that the department remains proactive and responsive to the changing dynamics of emergency response.

Response performance goals aligned with NFPA standards are essential for the department. By setting specific goals, the department can enhance operational effectiveness, improve response times, and optimize resource allocation. Compliance with NFPA standards demonstrates the department's commitment to industry best practices and ensures the highest level of public safety. Regular monitoring and continuous improvement based on these goals foster community confidence and trust in the department's ability to provide timely and effective emergency services.

Example of Measures: focus performance-based goals

Measure	{Date-Date}	2023 Goal	Sample Risk	Justification
Alarm Handling	{0:00}	1:00	All Risk	NFPA 1710
Turnout Time	{0:00}	1:00	All Risk	NFPA 1710
1st Unit Travel Time	{0:00}	8:00	BLS	NFPA 1710
1st Unit Travel Time	{0:00}	4:00	ALS	NFPA 1710

EMERGENCY MEDICAL SERVICES

Anna Fire Rescue recognizes the crucial role of emergency medical services in protecting the health and well-being of the community. The EMS delivery system encompasses the placement of fire apparatus and the coordination of personnel to respond promptly to medical emergencies. This report explores the key aspects of the EMS delivery system, including apparatus placement, resource allocation, and the integration of EMS services within the fire department's operations.

Utilizing a single fire station with a second coming online, Anna Fire Rescue strategically places fire apparatus throughout its jurisdiction to optimize emergency medical response. The placement of fire stations and apparatus is determined by factors such as population density, response time goals, geographic distribution, and historical incident data. The department aims to minimize response times by locating apparatus in proximity to areas with higher call volumes and vulnerable populations.

Engine companies play a vital role in the EMS delivery system. These apparatuses are equipped with firefighting and medical equipment, including Automated External Defibrillators (AEDs), basic life support supplies, and advanced life support capabilities in some cases. Engine companies are strategically placed at fire stations to provide immediate medical response while waiting for dedicated medical units to arrive.

Anna Fire Rescue allocates resources effectively to support the EMS delivery system. This includes personnel training, equipment maintenance, and the continual evaluation of response data to identify areas for improvement. The department ensures an adequate number of trained EMS personnel and regularly reviews staffing levels to meet community needs.

Anna Fire Rescue leverages technology to enhance the efficiency of its EMS delivery system. Computer-aided dispatch systems and GPS tracking enable real-time monitoring and resource allocation based on incident location and severity. This integration optimizes response times and ensures the closest available apparatus is dispatched to the emergency.

To maintain a high level of performance, the department emphasizes ongoing training and quality improvement initiatives for both EMS and firefighting personnel. Regular training sessions, simulations, and skill assessments enhance medical knowledge, response coordination, and patient care. Additionally, the department conducts reviews of EMS incidents to identify areas for improvement and implement necessary changes.

The EMS delivery system of the department, including the strategic placement of fire apparatuses, demonstrates a commitment to providing efficient and timely emergency medical response. By strategically locating apparatus, integrating EMS services within fire department operations, fostering collaboration, and leveraging technology, the department ensures the performance and efficacy needed.

Emergency Medical Services – Low Risk

Low-risk EMS are those medical calls for service that the emergency medical dispatch process determines are non-emergency. Examples of low-risk EMS incidents may include ground-level falls without injury, general illness, low-acuity abdominal pain, and those incidents classified by ProQA as Alpha and Bravo.

CRITICAL TASK	REQUIRED STAFF
Primary Patient Care & Incident Command	1
Vehicle Operations	1
Effective Response Force:	**2**
RESOURCE DEPLOYMENT	**MINIMUM STAFFING**
Transport Ambulance (or Engine)	2 (4)
Total Personnel:	**2 (4)**

THREE-AXIS RISK SCORE	
Probability of Occurrence	7
Consequence to Community	1
Impact on Fire Department	0
SCORE:	**6.18**

BENCHMARK STATEMENTS

For 90% of low-risk emergency medical responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least two (2) emergency medical technicians, shall be 10 minutes.

The first arriving unit for low-risk emergency medical responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Administering emergency medical patient care
- Deploying automatic external defibrillation (AED)
- Performing cardiopulmonary resuscitation (CPR)
- Providing patient transport to the closest appropriate facility

The response model achieves the effective response force with the first arriving unit.

Performance Measure	Time Goal	2018-2022 Performance	Gap
First Arriving	6:00	7:46	1:46
Effective Response Force	8:00	9:20	1:20

Emergency Medical Services – Moderate Risk

Moderate-risk EMS are those medical calls for service that the emergency medical dispatch process determines are emergent. Examples of moderate-risk EMS incidents may include chest pain, difficulty breathing, stroke, and those incidents classified by ProQA as Bravo and Charlie.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Primary Patient Care Provider	1
Secondary Patient Care Provider	1
Vehicle Operations	2
Effective Response Force:	**5**
RESOURCE	**MINIMUM STAFFING**
ALS Transport Ambulance	2
AFR Suppression Apparatus	4
Total Personnel:	**5**

THREE-AXIS RISK SCORE	
Probability of Occurrence	10
Consequence to Community	2
Impact on Fire Department	1
SCORE:	**16.98**

BENCHMARK STATEMENTS

For 90% of moderate-risk emergency medical responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least two (2) emergency medical technicians, shall be 6 minutes.

The first arriving unit for moderate-risk emergency medical responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system

- Assessing the need for additional resources
- Obtaining vitals and patient medical history
- Administering advanced life support patient care
- Deploying automatic external defibrillation (AED)
- Performing cardiopulmonary resuscitation (CPR)

For 90% of moderate-risk emergency medical responses in the area of responsibility, the total response time for the arrival of all fire and other EMS units and personnel necessary to complete the first-alarm assignment, otherwise referred to as the Effective Response Force (ERF), shall be 8 minutes.

The effective response force for moderate-risk emergency medical response shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Obtaining vitals and patient medical history
- Administering advanced life support patient care
- Deploying automatic external defibrillation (AED)
- Performing cardiopulmonary resuscitation (CPR)
- Assisting transport personnel with packaging the patient
- Providing advanced life support
- Providing patient transport to the closest appropriate facility

Performance Measure	Time Goal	2018-2022 Performance	Gap
First Arriving	6:00	7:46	1:46
Effective Response Force	8:00	9:20	1:20

Emergency Medical Services – High Risk

High-risk EMS are those medical calls for service that the emergency medical dispatch process determines are life-threatening. Examples of high-risk EMS incidents may include cardiac arrest, shootings, stabbings, and those incidents classified by ProQA as Charlie, Delta, and Echo.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Primary Patient Care Provider	1
Secondary Patient Care Provider	1
Medical Equipment Operator	1
Vehicle Operations	2
Effective Response Force:	**6**
RESOURCE	**MINIMUM STAFFING**
ALS Transport Ambulance	2
AFR Suppression Apparatus	4
Supervisor	1
Total Personnel:	**6**

THREE-AXIS RISK SCORE	
Probability of Occurrence	9
Consequence to Community	4
Impact on Fire Department	1
SCORE:	**27.03**

FIRE SUPPRESSION

1. *Fire Station #1 – 305 S Powell Pkwy, Anna Texas. Station 1 serves Anna by housing an engine, an ambulance, brush truck, and battalion chief with eight (8) total personnel. This station is in excellent condition housing the staff prior to building an additional Station 2.*

Fire Suppression – Low Risk

Low-risk fire incidents are those emergent calls for service that are unlikely to cause injury or significant property damage. Examples of low-risk fire incidents may include vehicles, trash, brush, and other non-structural fires.

CRITICAL TASK	REQUIRED STAFF
Attack Hoseline Deployment	2
Vehicle Operations	2
Effective Response Force:	**4**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Total Personnel:	**4**

THREE-AXIS RISK SCORE	
Probability of Occurrence	7
Consequence to Community	2
Impact on Fire Department	1
SCORE:	**10.45**

BENCHMARK STATEMENTS

For 90% of low-risk fire responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be 6 minutes and 20 seconds.

The first arriving unit for low-risk fire responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for and requesting additional resources as needed
- Providing 1,500 GPM water pumping capacity
- Advancing a charged fire suppression attack hose line for fire control or rescue

The response model achieves the effective response force with the first arriving unit.

Performance Measure	Time Goal	2018-2022 Performance	Gap
First Arriving	6:20	7:10	90
Effective Response Force	8:20	9:20	1:20

Fire Suppression – Moderate Risk

Moderate-risk fire incidents are those calls for service that are unlikely to cause injury or significant property damage. Examples of moderate-risk fire incidents may include single-family homes, utility facilities, commercial & business occupancies, and storage facilities.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Attack Hoseline Deployment	2
Secondary Hoseline Deployment	2
Search & Rescue	2
Water Supply	1
Engine Operations	2
Aerial Operations	1
Support Functions – Ventilation – Utility Control – Forced Entry	2
Medical Assistance & Rehab	2
Effective Response Force:	**15**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Suppression Apparatus	4
Aerial Apparatus	4
Aerial Apparatus	4
Transport Ambulance	2
Supervisor	1
Total Personnel:	**19**

THREE-AXIS RISK SCORE	
Probability of Occurrence	4
Consequence to Community	4
Impact on Fire Department	3
SCORE:	**17.27**

BENCHMARK STATEMENTS

For 90% of moderate-risk fire responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be 6 minutes and 20 seconds.

The first arriving unit for moderate-risk fire responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for and requesting additional resources as needed
- Providing 1,500 GPM water pumping capacity
- Advancing a charged fire suppression attack hose line for fire control or rescue

For 90% of all moderate-risk structure fire responses within the area of responsibility, the total response time for the arrival on the scene of all fire units and personnel necessary to complete a full first-alarm assignment, otherwise referred to as the Effective Response Force (ERF) shall be 10 minutes, 20 seconds.

The effective response force for moderate-risk fire responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Establishing an incident command system
- Providing an uninterrupted water supply
- Advancing a charged fire suppression attack hose line and a backup line for fire control
- Complying with the OSHA requirements of two-in and two-out
- Completing forcible entry
- Searching and rescuing at-risk victims
- Ventilating the structure
- Controlling utilities
- Placing elevated master streams into service from aerial apparatus

Fire Suppression – High Risk

High-risk fire incidents are those calls for service that are likely to cause injury or significant property damage. Examples of high-risk fire incidents may include multi-family occupancies, places of assembly, high-rise buildings, academic, athletic, and health buildings, industrial buildings, mixed-use, and railway emergencies.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Attack Hoseline Deployment	4
On-Deck Crew & Rapid Intervention Crew	2
Search & Rescue	4
Water Supply	2
Engine Operations	2
Aerial Operations	2
Support Functions – Ventilation – Utility Control – Forced Entry	2
Medical Assistance & Rehab	2
Effective Response Force:	**21**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Suppression Apparatus	4
Suppression Apparatus	4
Suppression Apparatus	4
Aerial Apparatus	4
Aerial Apparatus	4
Transport Ambulance	2
Supervisor	1
Total Personnel:	**28**

THREE-AXIS RISK SCORE	
Probability of Occurrence	6
Consequence to Community	6
Impact on Fire Department	5
SCORE:	**37.39**

BENCHMARK STATEMENTS

For 90% of high-risk fire responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be 6 minutes and 20 seconds.

The first arriving unit for high-risk fire responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for and requesting additional resources as needed
- Providing 1,500 GPM water pumping capacity
- Advancing a charged fire suppression attack hose line for fire control or rescue
- Initiating other fire ground operations in accordance with department policies and procedures

For 90% of all high-risk structure fire responses within the area of responsibility, the total response time for the arrival on the scene of all fire units and personnel necessary to complete a full first-alarm assignment, otherwise referred to as the Effective Response Force (ERF) shall be 10 minutes and 20 seconds.

The effective response force for high-risk fire responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Establishing an incident command system
- Providing an uninterrupted water supply
- Advancing a charged fire suppression attack hose line and a backup line for fire control
- Complying with the OSHA requirements of two-in and two-out
- Completing forcible entry
- Searching and rescuing at-risk victims
- Ventilating the structure
- Controlling utilities
- Placing elevated master streams into service from aerial apparatus

HAZARDOUS MATERIALS RESPONSE

Hazardous Materials – Low Risk

Low-risk hazardous materials incidents are those calls for service that are unlikely to cause injury or significant property damage. Examples of low-risk hazardous materials incidents may include spills of 10-50 gallons of automotive fluid.

CRITICAL TASK	REQUIRED STAFF
Incident Command & Safety Officer	1
Leak & Spill Control	2
Effective Response Force:	**3**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Total Personnel:	**7**

THREE-AXIS RISK SCORE	
Probability of Occurrence	3
Consequence to Community	1
Impact on Fire Department	1
SCORE:	**3.41**

BENCHMARK STATEMENTS

For 90% of low-risk hazardous materials responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be six minutes and twenty seconds (6:20).

The first arriving unit for low-risk hazardous materials responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Evacuating immediate and adjacent areas
- Isolating and controlling access to high-hazard areas

The response model achieves the effective response force with the first arriving unit.

Hazardous Materials – Moderate Risk

Moderate-risk hazardous materials incidents are those calls for service that are unlikely to cause injury or significant property damage. Examples of moderate-risk hazardous materials incidents may include spills greater than 50 gallons of automotive fluid, an unknown chemical emergency, biological powder, or a facility's HazMat alarm. Natural gas or propane leaks and alarms are not included in this risk.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Safety Officer	1
Research & Referencing	2
Entry Teams - Leak & Spill Control	2
Backup Team	2
Decontamination	2
Medical Support	2
Effective Response Force:	**12**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Suppression Apparatus	4
Transport Ambulance	2
Supervisor	1
Total Personnel:	**12**

THREE-AXIS RISK SCORE	
Probability of Occurrence	3
Consequence to Community	5
Impact on Fire Department	3
SCORE:	**13.11**

BENCHMARK STATEMENTS

For 90% of moderate-risk hazardous materials responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be six minutes and twenty seconds (6:20).

The first arriving unit for moderate-risk hazardous materials responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Evacuating immediate and adjacent areas
- Isolating and controlling access to high-hazard areas

For 90% of all moderate-risk hazardous materials responses within the area of responsibility, the total response time for the arrival on the scene of all fire units and personnel necessary to complete a full first-alarm assignment, otherwise referred to as the Effective Response Force (ERF) shall be 10 minutes, 20 seconds (10:20).

The effective response force for moderate-risk hazardous materials responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Evacuating immediate and adjacent areas
- Isolating and controlling access to high-hazard areas
- Establishing and conducting emergency decontamination procedures as necessary
- Identifying and assessing hazardous materials involved and their potential for harm
- Developing a plan of strategies and tactics to effectively mitigate the incident

Performance Measure	Time Goal	2018-2022 Performance	Gap
First Arriving	6:20	7:49	1:29
Effective Response Force	10:20	N/A	N/A

TECHNICAL RESCUE RESPONSE

Technical Rescue – Low Risk

Low-risk technical rescue incidents are those calls for service that are unlikely to cause injury or significant property damage. Examples of low-risk technical rescue may include vehicle accidents with entrapment.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Safety Officer	1
Extrication Team	2
Equipment Operator	2
Apparatus Operator	1
Primary Patient Care & Incident Command	1
Vehicle Operations	1
Effective Response Force:	**9**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Aerial Apparatus	4
Transport Ambulance	2
Supervisor	1
Total Personnel:	**11**

THREE-AXIS RISK SCORE	
Probability of Occurrence	4
Consequence to Community	2
Impact on Fire Department	2
SCORE:	**8.38**

BENCHMARK STATEMENTS

For 90% of low-risk technical rescue responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be six minutes and twenty seconds (6:20).

The first arriving unit for low-risk technical rescue responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources

- Isolating and controlling access to high-hazard areas

For 90% of all low-risk technical rescue responses within the area of responsibility, the total response time for the arrival on the scene of all fire units and personnel necessary to complete a full first-alarm assignment, otherwise referred to as the Effective Response Force (ERF) shall be 10 minutes, 20 seconds (10:20).

The effective response force for low-risk technical rescue responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Isolating and controlling access to high-hazard areas
- Rescuing and transporting victims to an appropriate medical facility

Technical Rescue – High Risk

High-Risk Incidents can be mitigated by utilizing the expertise and resources of the AFR Suppression group. Specialized gear, tools, equipment, or knowledge is required beyond the scope of a First Responder. Examples of high-risk technical rescue responses include rope rescue, structural collapse, trenches, vehicle extrication with multiple patients or needing multiple extrication points and involving multiple vehicles, and confined space rescues.

CRITICAL TASK	REQUIRED STAFF
Incident Command	1
Safety Officer	1
Technical Rescue Group Lead	1
Extrication Team #1	2
Extrication Team #1	2
Equipment Operator	3
Apparatus Operator	3
Medical Support & Rehab	2
Effective Response Force:	**15**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Aerial Apparatus	4
Transport Ambulance	2
Supervisor	1
Total Personnel:	**11**

THREE-AXIS RISK SCORE	
Probability of Occurrence	2
Consequence to Community	7
Impact on Fire Department	3
SCORE:	**17.49**

BENCHMARK STATEMENTS

For 90% of high-risk technical rescue responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be six minutes and twenty seconds (6:20).

The first arriving unit for high-risk technical rescue responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Isolating and controlling access to high-hazard areas

For 90% of all high-risk technical rescue responses within the area of responsibility, the total response time for the arrival on the scene of all fire units and personnel necessary to complete a full first-alarm assignment, otherwise referred to as the Effective Response Force (ERF) shall be 10 minutes, 20 seconds (10:20).

The effective response force for high-risk technical rescue responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Assessing the need for additional resources
- Isolating and controlling access to high-hazard areas
- Rescuing and transporting victims to an appropriate medical facility

WILDLAND FIRE RESPONSE

Wildland – Low Risk

Low-risk wildland incidents are those emergent calls for service that are unlikely to cause injury or significant property damage. Examples of low-risk wildland incidents may include Grass Fires and Natural Vegetation Fires.

CRITICAL TASK	REQUIRED STAFF
Attack Houseline Deployment	2
Vehicle Operations	1
Effective Response Force:	**3**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Total Personnel:	**4**

THREE-AXIS RISK SCORE	
Probability of Occurrence	7
Consequence to Community	2
Impact on Fire Department	1
SCORE:	**10.45**

BENCHMARK STATEMENTS

For 90% of low-risk wildland responses in the area of responsibility, the total response time for the first arriving fire unit, staffed with at least four (4) firefighters, shall be 6 minutes and 20 seconds.

The first arriving unit for low-risk wildland responses shall be capable of the following:

- Conducting a rapid size-up of the emergency scene
- Initiating an incident command system
- Developing an initial incident action plan
- Providing either mobile attack or progressive hose lays
- Extinguishing fire

The response model achieves the effective response force with the first arriving unit.

Wildland – Moderate Risk

Moderate-risk wildland incidents are those calls for service that are unlikely to cause injury or significant property damage. Examples of moderate-risk wildland incidents may include brush fires or brush/grass mixed fires.

CRITICAL TASK	REQUIRED STAFF
Incident Command, Size up, Initial Safety Officer, Develop IAP	1
Initial Confinement/Extinguishment Actions	2
Continued Confinement & Extinguishment with Mobile Attack	6
Water Supply or Tender Operations	3
Incident Command, Accountability, & IAP Refinement	1
Medical Rehab & Support	2
Effective Response Force:	**15**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Suppression Apparatus	4
Suppression Apparatus (Brush Truck)	3 (2)
Suppression Apparatus (Brush Truck)	3 (2)
Transport Ambulance	2
Supervisor	1
Total Personnel:	**17**

THREE-AXIS RISK SCORE	
Probability of Occurrence	4
Consequence to Community	4
Impact on Fire Department	3
SCORE:	**17.93**

BENCHMARK STATEMENTS

For 90% of all moderate-risk wildland fires, the total response time for the arrival of the first-due unit, staffed with four (4) firefighters, shall be 6 minutes 20 seconds (6:20). The first arriving unit shall be capable of the following:

- Establishing command
- Sizing up the incident
- Developing an initial incident action plan
- Extending an appropriate hose line
- Providing either mobile attack or progressive hose lays
- Extinguishing fire

For 90% of all moderate-risk wildland fires, the total response time for the arrival of the Effective Response Force, staffed with 16 firefighters, shall be 10 minutes and 20 seconds (10:20). The Effective Response Force must be capable of the following:

- Establishing command
- Sizing up the incident
- Developing an initial incident action plan
- Extending appropriate hose lines
- Providing either mobile attack or progressive hose lays
- Extinguishing fire

Wildland – High Risk

High-risk wildland incidents are those calls for service that are likely to cause injury or significant property damage. Examples of high-risk wildland incidents may include brush fires or brush/grass mixed fires over one hundred acres in size.

CRITICAL TASK	REQUIRED STAFF
Incident Command, Size up, Initial Safety Officer, Develop IAP	1
Initial Confinement/Extinguishment Actions	2
Continued Confinement & Extinguishment with Mobile Attack	9
Water Supply or Tender Operations	3
Incident Command, Accountability, & IAP Refinement	2
Medical Rehab & Support	4
Effective Response Force:	**21**
RESOURCE	**MINIMUM STAFFING**
Suppression Apparatus	4
Suppression Apparatus	4
Suppression Apparatus	4
Suppression Apparatus (Brush Truck)	3 (2)
Suppression Apparatus (Brush Truck)	3 (2)
Suppression Apparatus (Brush Truck)	3 (2)
Transport Ambulance	2
Supervisor	1
Total Personnel:	**24**

THREE-AXIS RISK SCORE	
Probability of Occurrence	9
Consequence to Community	6
Impact on Fire Department	5
SCORE:	**51.74**

BENCHMARK STATEMENTS

For 90% of all high-risk wildland fires, the total response time for the arrival of the first-due unit, staffed with four (4) firefighters, shall be 6 minutes and 20 seconds (6:20). The first arriving unit shall be capable of the following:

- Establishing command
- Sizing up the incident
- Developing an initial incident action plan
- Extending an appropriate hose line
- Providing either mobile attack or progressive hose lays
- Extinguishing fire

For 90% of all high-risk wildland fires, the total response time for the arrival of the Effective Response Force, staffed with 21 firefighters, shall be 10 minutes and 20 seconds (10:20). The Effective Response Force must be capable of the following:

- Establishing command
- Sizing up the incident
- Developing an initial incident action plan
- Extending appropriate hose lines
- Providing either mobile attack or progressive hose lays
- Extinguishing fire

SYSTEM PERFORMANCE: PERFORMANCE OVERVIEW

This report provides an overview of the response system performance of the fire department's one and soon to be second station. Each station will play a crucial role in emergency response, covering specific areas within the jurisdiction. The report examines the response times, resource allocation, training programs, and technological advancements at each station, highlighting their individual contributions to the overall system performance.

Station 1

Station 1 serves as the central hub for emergency response. With its strategic location and highly trained team, it plays a critical role in minimizing response times to incidents within its coverage area. The station's prompt response and efficient resource allocation ensure that emergencies are addressed swiftly and effectively.

The one station within the fire department's response system plays a vital role in ensuring public safety and minimizing the impact of emergencies. With the second station coming on-line in the near future, each station's specific coverage area, expertise, and resources will contribute to the overall system performance. By maintaining efficient response times, proper resource allocation, ongoing training programs, and embracing technological advancements, the department maximizes its effectiveness in protecting lives and property within its jurisdiction.

Response

Anna Fire Rescue responds to over 2,284 emergency incidents annually. These calls include EMS, accounting for 49.2% of all responses, followed by OTHER types at 44%, and FIRES at 5%.

Hazardous incidents that occur without fire but present a risk, such as gaseous leaks, electrical hazards, liquid fuel spills, fire alarms, and inaccurate reports of fires, are classified as OTHER. ESCI used a tool in GIS to identify the concentration of calls in various portions of the city.

Temporal Demand

An analysis of temporal variation (when incidents occur) allows leadership to schedule non-incident activities during lower-impact periods, including training, fire prevention activities, and station/vehicle/equipment maintenance. The following demonstrates the variables in service demand.

From 9:00 AM to 9:00 PM is shown to be the peak call activity, which is 70% of the total call demand. Saturday and Sunday are slightly busier but only 1-2% over the average.

Staffing and Deployment

Anna Fire Rescue should work to maintain compliance with NFPA 1710. The fire and EMS department must establish the following performance objectives for the first-due response zones that are identified by the AHJ:

NFPA 1710

Response Interval	NFPA/CFAI Recommendations
Call Processing	60 seconds or less at 90%

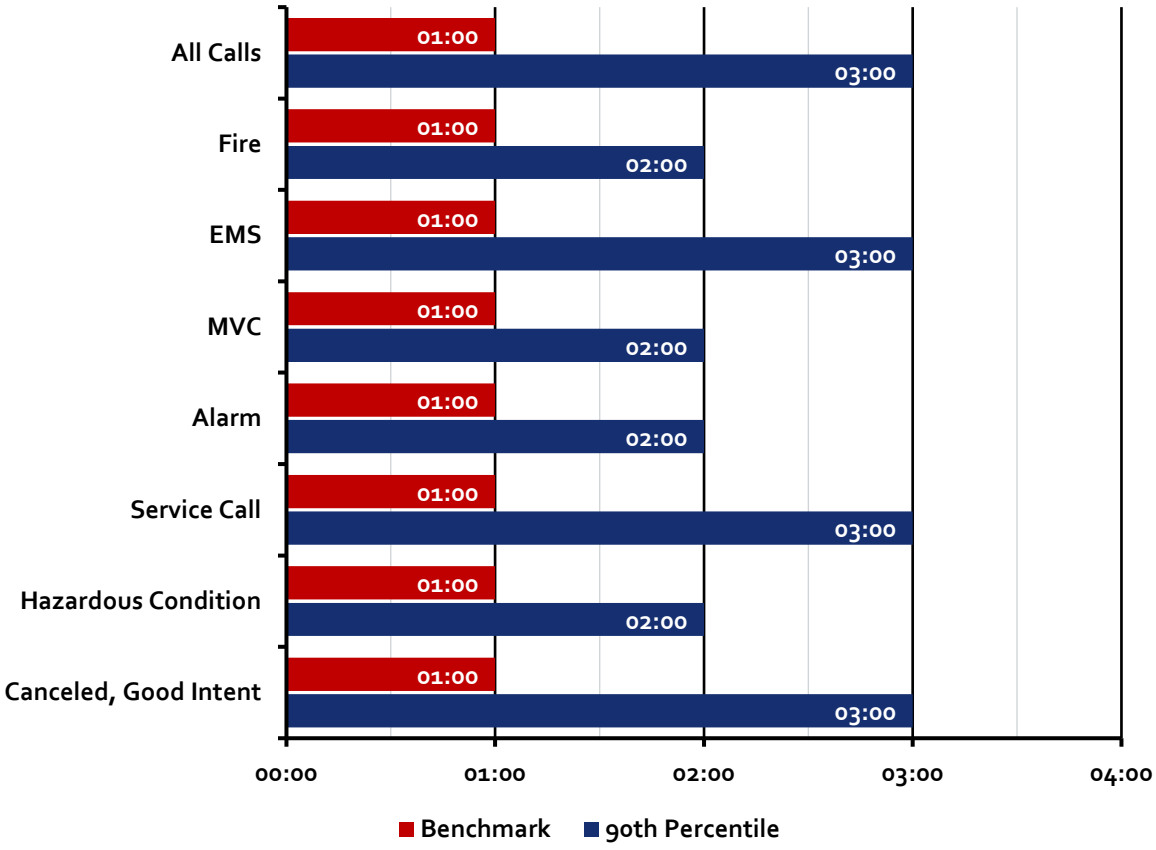
COMPLIANCE WITH NATIONAL STANDARDS

Anna Fire Rescue should work toward compliance with NFPA 1710. National and industry standards form crucial baselines for effective emergency response and provide measurable thresholds for improvement.

Call Processing

The Dispatch Center currently meets the performance standard for call processing. As a result of call processing performance being a dispatch center responsibility and not the fire and EMS department, Anna Fire Rescue leadership must work with dispatch center leadership to monitor and ensure continued quality performance.

Call Processing Performance at the 90th Percentile and Average: FY 2018 – FY 2022

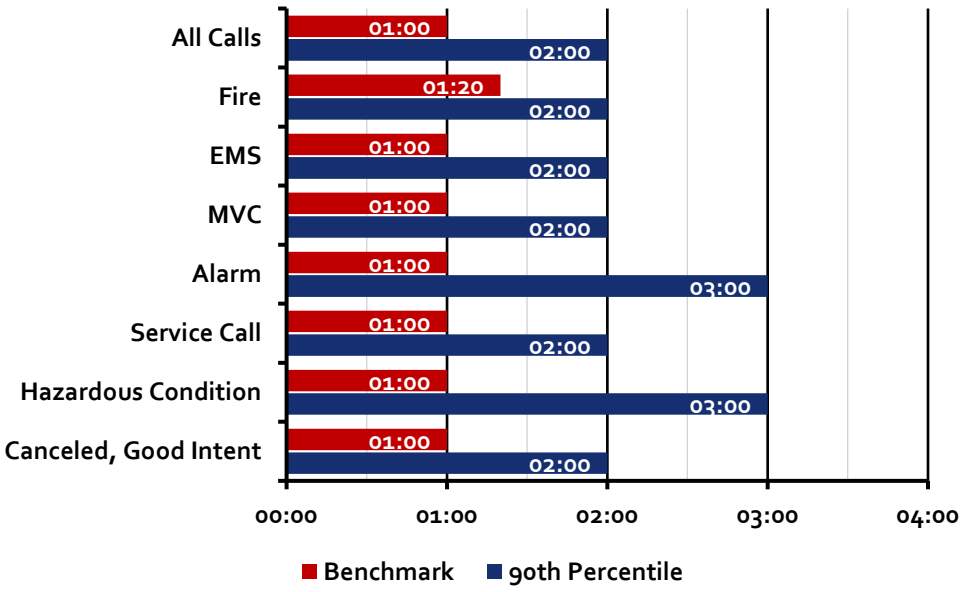


Turnout Time

The ability to quickly react to the notice of an alarm and begin responding to an incident is the first component that is under the direct control of the fire and EMS department personnel. Turnout is the time it takes personnel to receive the dispatch information, move to the appropriate apparatus, and proceed to the incident. NFPA 1710 specifies that turnout time performance should be less than 60 seconds (01:00), measured at the 90th percentile for EMS response and 80 seconds (1 minute, 20 seconds) for fire and special operations. NFPA allows for an additional 20 seconds for firefighters to don their gear at the station and avoid crews attempting to get dressed in a moving vehicle.

Turnout time for fire calls is 1 minute, 4 seconds (64 seconds), which is within the standard for fire calls. Leadership should review any factors that may impact turnout time and determine if there are methods for improving. These factors may include notification processes, the physical layout of the station as it relates to the pathway to donning gear and proceeding to the apparatus, and various personnel activities during on-duty hours.

Turnout Time Performance at the 90th Percentile and Average

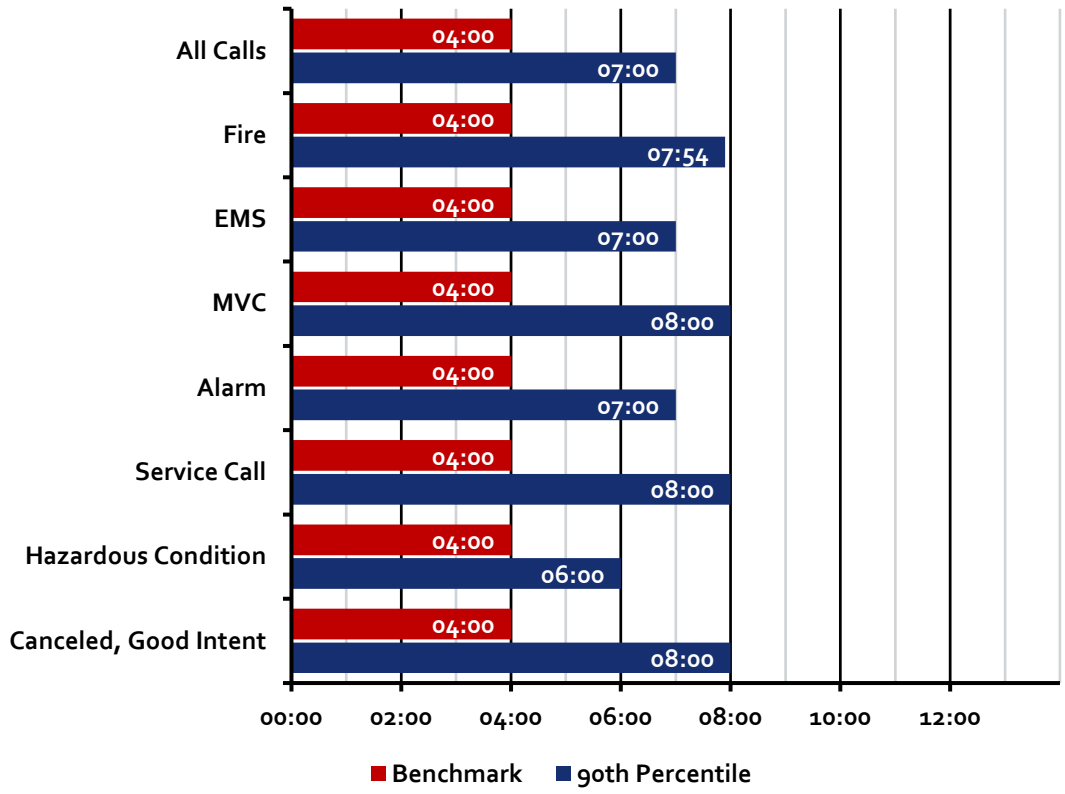


First-Due Travel Time

Anna Fire Rescue should work toward compliance with NFPA 1710 4.2.1. The fire and EMS department must establish the following performance objectives for the first-due response zones that are identified by the AHJ, to include 240 seconds (4 minutes) or less travel time for the arrival of the first engine company at a fire suppression incident, 90% of the time:

The standard for travel time to a fire suppression incident is 240 seconds or 4 minutes. As illustrated in Anna Fire Rescue's performance below, travel time exceeds the recommended travel in all incident types. With geographic location having the greatest impact on travel time, leadership and governing bodies must weigh the factors associated with working to meet that standard. Most often, fire and EMS departments must add additional stations and units to meet the travel time performance. Achieving this standard in sparsely populated rural areas is typically impractical. Recommendations regarding future station locations are included in the Deployment section.

Travel Time Performance at the 90th Percentile and Average



Community-Wide Risks

Anna is subject to a variety of community-wide risks. The most common of these are:

- Winter Storm
- Tornado
- Hail
- Thunderstorm Winds
- Flood
- Extreme Heat

Each of these, along with all other natural hazards, is discussed in more detail in the following sections.

Biological Incident

A biological incident refers to an accidental or naturally occurring disease outbreak of known or unknown origin that pose a threat to the health of living organisms, primarily that of humans, but also includes biological agents found in the environment, or diagnosed in animals that have the potential for transmission to humans. Examples of biological events include Zika, H1N1, Ebola, and West Nile.

Communications/Infrastructure Failure

Infrastructure is the basic facilities and services needed for a community. The city's infrastructure includes roads, wastewater treatment plants, water and wastewater pipes, power plants, electrical lines, bridges, an airport, railroads, and schools. Infrastructure also includes telecommunications equipment, which, if impacted, may cause a communications failure. A communications failure is the interruption or loss of communications systems including transmission lines, communications satellites, and associated hardware and software necessary for the communications system to function. It can include telecommunications, radio, and information technology failures. A communications failure may be the result of an equipment failure, a human act (deliberate or accidental) or the result of another hazard event.

Nearly every aspect of modern life is dependent on digital infrastructure. Critical infrastructure services, such as emergency services, utility services, water services and infrastructure services, such as emergency services, utility services, water services and telecommunications, can be impacted by a communications or infrastructure failure. Failures can result in a 911 or emergency warning system failure, a delay of response times by emergency service providers, and has the potential to impact the entire community.

Drought

Drought is a period without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic.

Meteorological Drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.

Agricultural Drought occurs when there is inadequate soil moisture to meet the needs of a specific crop during a certain time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought and can affect livestock and other dry land agricultural operations.

Hydrological Drought refers to the deficiencies in surface and subsurface water supplies. It is measured as stream flow, snowpack, and the groundwater levels of lakes reservoirs. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes, and reservoirs. Therefore, hydrological measurement tends to lag behind other drought indicators.

Socioeconomic Drought occurs when physical water shortages begin to affect the health, well-being, and quality of life of people, or when the drought starts to affect the supply and demand of an economic product.

Erosion

Erosion involves the loss of rock and soil found along riverbeds and banks, along with rock and soil particles carried downstream. Erosion can be vertical, which deepens the channel, or lateral, which widens the channel. Both water erosion and wind erosion occur in Collin County. Droughts increase the effects of wind erosion since there is less vegetation to hold land in place. Likewise, sheet flooding and large amounts of storm run-off due to excessive rainfall increase the effects of water-caused erosion.

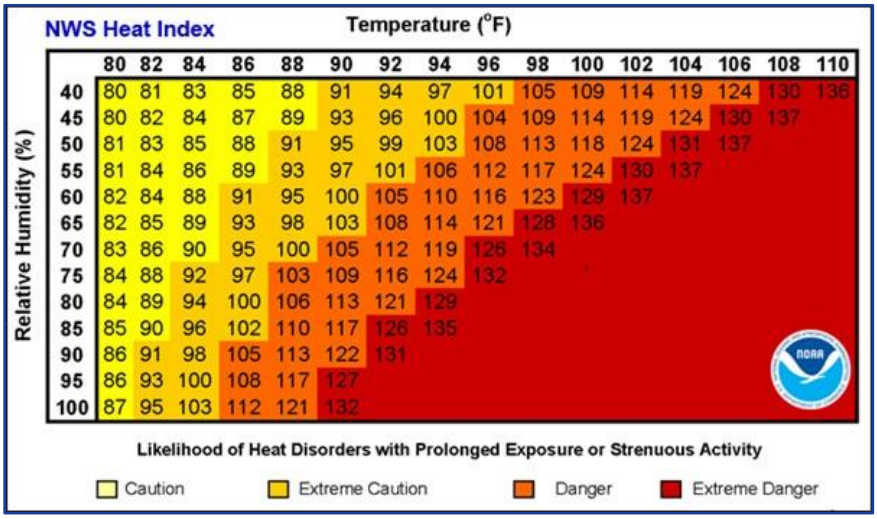
Expansive Soil

Expansive soils contain minerals that are capable of absorbing water. When they absorb water, they increase in volume. This volume change can exert enough force on a building or other structure to cause damage. Expansive soil will also shrink when they dry out. This shrinkage can remove support from buildings or other structures, and result in damaging subsidence.

Extreme Heat

Extreme heat is characterized by a combination of exceptionally high temperatures and humidity. When these conditions persist over a period, they can damage buildings and facilities, but present a more significant threat to the safety and welfare of residents. Extreme heat is a common occurrence in summer months, and residents are prepared and practiced in mitigating risk. The main concern with an extreme heat event is that it could be a precursor for other hazards, such as drought and dust storms.

Figure 24: NWS Heat Index



Fire or Explosion

Fire is "a rapid oxidation process, involving a chemical chain reaction resulting in the evolution of light and heat in varying intensities." An explosion is "the sudden conversion of potential energy (chemical or mechanical) into kinetic energy with the production and release of gas under pressure. These high-pressure gases then do mechanical work such as moving, changing, or shattering nearby materials."[i]

Fires are most likely to occur in residential structures due to careless acts involving cooking or smoking. The frequency of fires or explosions in large or high-risk structures is low due to fire-resistive construction and other fire protection systems; however, the potential impact may be severe. The full involvement of these structures is rare but may require special extinguishment techniques or mutual aid from neighboring communities. An urban conflagration fire is a fire where multiple buildings or structures are involved. The risk of an urban conflagration in Anna is unlikely, but the potential impact could be substantial.

Flood

Floods are the most prevalent hazard in the United States. A flood is defined as "two or more acres of dry land, or two or more properties, that are covered by water temporarily." There are three types of flooding that occur in Collin County: river flood, inland (or sheet) flooding and flash floods.

A *river flood* occurs when water levels rise over the top of riverbanks due to excessive rain or persistent thunderstorms over the same area for extended periods of time.

Inland flooding, or "sheet flooding", occurs when moderate precipitation accumulates over a large area over several days, with periods of intense precipitation over a short period.

Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds and urban streets. A flash flood is caused by heavy or excessive rainfall in a short period of time, generally less than six hours.

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. Each zone reflects the severity of the impact or type of flooding in the area.

Hazardous Materials Release

Hazardous materials are defined as "any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors."[ii]

The release of hazardous materials can occur throughout Collin County, either during transport or while in production, use, packaging, or storage in a fixed facility. Thus, an incident involving hazardous materials could occur at any fixed site, including industrial, commercial, public, or residential locations.

A release could also occur along any transportation route. In Collin County, the most significant potential for a release during over-the-road transportation would be along major roadways. Other areas of concern would be the rail spurs that service industrial customers along the central part of the County. A release of hazardous material could also occur along the route of any gas transmission, distribution, or service lines that lie underground throughout Collin County.

Hurricane/Tropical Storm

Hurricanes and tropical storms are "any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across." The official season for Atlantic storms is from June 1 through November 20 each year, with the peak season being September.

The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Storm surge and wind-driven waves, which are significant concerns in coastal areas, are not expected to be a major problem in Collin County, given its location further inland. However, flooding due to heavy rains and limited draining at the height of and after, the storm can be destructive in the City's area. Most risk of hurricane or tropical storm in the Collin County area is from heavy rainfall and potential flooding, with a lower risk of high wind speed. There is no risk of storm surge this far inland.

Medical Emergency

A medical emergency usually involves an emergency medical services (EMS) response, i.e., prehospital medical care, usually delivered on-site by trained specialists with transport by ground ambulance. Common responses include sick calls, vehicular incidents, difficulty breathing, injuries due to trauma, and heart attacks. The number of patients is usually small,

and symptoms are within the capabilities of first arriving units. Some calls require only first aid; others require basic life support (BLS), advanced life support (ALS), or mobile intensive care (MIC). Overall, EMS responses account for over 50 percent of all Anna Fire Rescue calls for service.

Mass casualty trauma calls involve multiple patients and require additional units. Mass casualty responses are most often associated with commercial bus, aircraft, or passenger train crashes; release of hazardous materials in a congested area (including a deliberate chemical attack); or evacuations of schools, office buildings, shopping centers, hospitals, or other health care facility. A mass casualty incident would cause minor to major impacts to the community; however, that type of incident is rare. On the other hand, medical emergencies are highly likely to occur, with a limited to minor impact on the community.

Power Outage

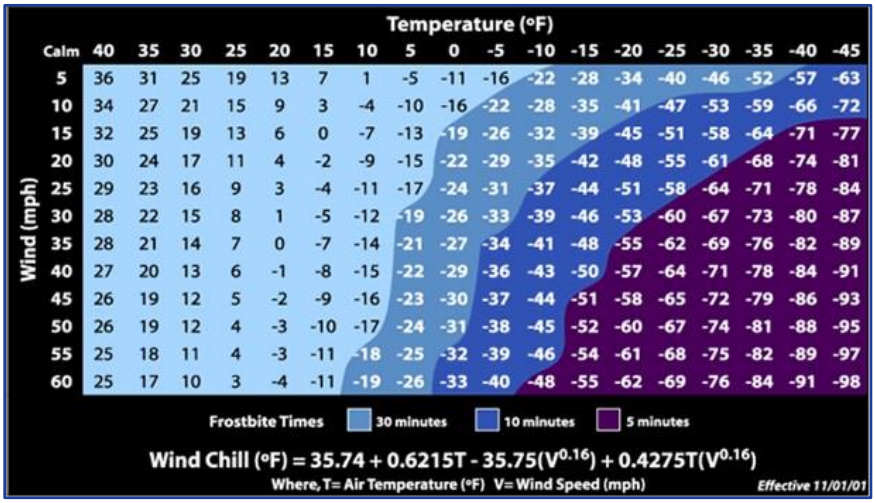
Power outage is defined as any interruption or loss of electrical service caused by disruption of power transmission which may be the result of an accident, sabotage, natural hazards, or equipment failure. A significant power failure is defined as any incident of a long duration, which may require Anna to provide food, water, and/or shelter.

Power outages in Anna are usually localized and are normally the result of a natural hazard involving high winds. As days get warmer in summer months, temperatures rise and demand for energy on the grid will increase, therefore increasing the vulnerability of the power providers in Collin County. An extended power outage could become a cascading event that may cause impacts from extreme heat.

Severe Winter Weather

Severe winter weather can be a variety of precipitation that forms at low temperatures such as heavy snowfall, sleet, or ice. Many winter depressions give rise to exceptionally heavy rain and widespread flooding. Conditions worsen if the precipitation is frozen. The biggest concern for the planning area is maintaining power to structures, as winter weather may cause disruptions. The other concern is the citizen's inexperience in preparing for, and driving in, severe winter weather events. In terms of EMS, there is the risk of low temperatures and wind chill with reduced body temperatures and frostbite.

Figure 25: Wind Chill & Frostbite Risk



Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Structural Collapse/Technical Rescue

Structural collapse hazards are predominantly a problem in mature communities where several large structures predating modern building codes (built before 1970) are still in use by the public, or conversely, abandoned buildings, or buildings under construction, that have not been secured or destroyed. A structural collapse usually occurs when a building or structure collapses due to engineering or construction problems, metal fatigue, changes to the load bearing per the structure, human operating error or intentional act, or other cause such as severe weather. Other types of technical rescue include the specialized rescue of victims from vehicles, elevators, rising water, confined spaces, elevated spaces (high angle), or similar environments.

Terrorism/Cyber Attack

According to the Homeland Security Act of 2002, terrorism is defined as "activity that is dangerous to human life or potentially destructive of critical infrastructure or key resources." There are different types of terrorism defined by the motivation behind attacks. There are also different methods and tactics that terrorists use in their attacks such as assassination, explosives, radiological threat, radicalization, chemical threats, biological threats, active shooters, infrastructure threats, arson, kidnapping, and cyber threats.

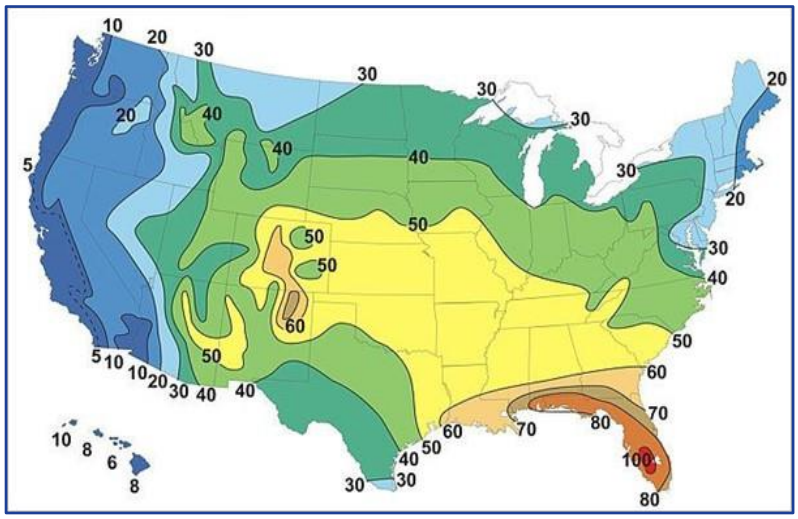
Thunderstorm/Lightning/Hail

The National Weather Service defines a severe thunderstorm as "a storm that has winds of at least 58 mph (50 knots), and/or hail at least 1-inch in diameter." Severe thunderstorms also can be capable of producing a tornado. Straight-line winds are often responsible for wind damage associated with a severe thunderstorm. Downbursts or microbursts are examples of damaging straight-line winds. Wind speeds in some of the stronger downbursts can reach 100 to 150 miles per hour.

Severe thunderstorms produce precipitation in the form of irregular pellets or balls of ice that combine and fall with rain. The size of hailstones is a direct correlation of the severity of impact and size of the storm. High-updraft winds are required to keep hail in suspension in thunderclouds. Generally, the higher the strength of the updraft, the longer the suspension time and hailstone size. Due to the unpredictable nature of hailstorms, it is impossible to determine the exact area of their future occurrences. Thus, the entire Anna area is equally subject to thunderstorms, with accompanying lightning and hail. Large-size hail would cause major impacts to the community, causing severe roof damage and serious risk of injuries.

Figure 26: Average Annual Number of Thunderstorm Days Throughout the U.S. (2017)

Source: National Weather Service



Tornado/Severe Straight-Line Winds

A tornado is defined as a rapidly rotating vortex or funnel of air extending groundward from a cumulonimbus cloud. Most of the time, vortices remain suspended in the atmosphere. Spawned by powerful thunderstorms, tornadoes can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with winds that can reach 300 miles per hour. Anna sits in "Tornado Alley," and has a high vulnerability to tornados, with winds up to 250 mph. The highest risk in the Collin County area occurs in late spring and early summer months. The following figure illustrates this.[iii]

Figure 27: Tornado Activity in the U.S.

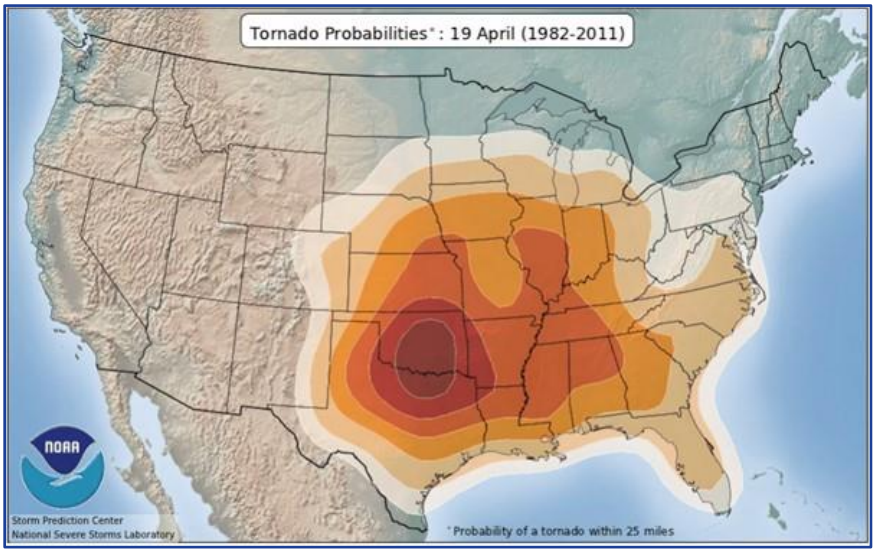


Figure 28: Tornado Wind Speeds in the United States

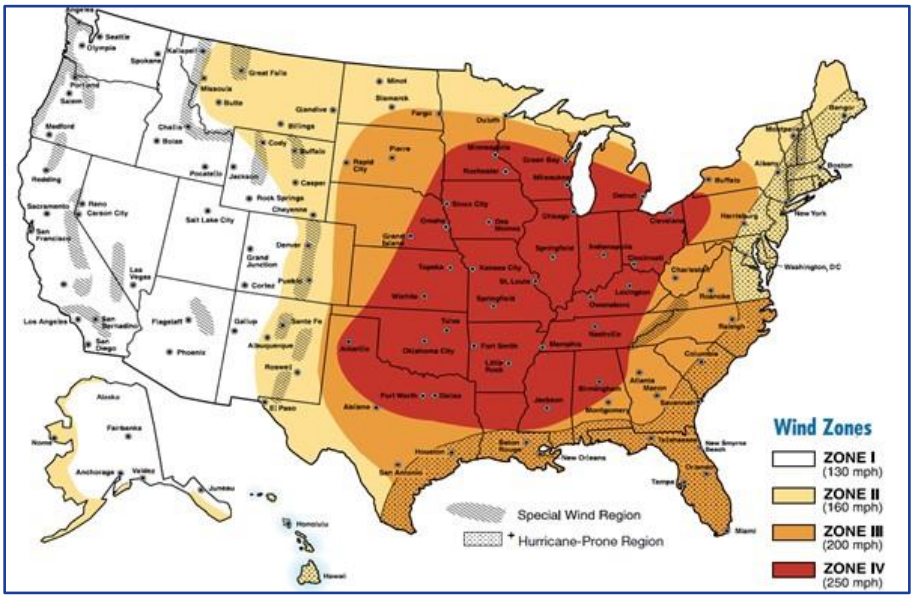


Figure 29: Tornado Intensity—Enhanced Fujita Scale

Source: Compiled from multiple sources

Designation	Wind Speed	Typical Damage
EF-0	65–85 mph	**Minor or no damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF-0.
EF-1	86–110 mph	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	111–135 mph	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	136–165 mph	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.
EF-4	166–200 mph	**Devastating damage.** Well-constructed and whole frame houses completely leveled; cars and other large objects and small missiles thrown.
EF-5	> 200 mph	**Extreme damage**. Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks, and train cars can be thrown approximately 1 mile (1.6 km).

Risk by Geographical Planning Zone

For the purposes of this study, ESCI has used the Collin County limits as the primary planning zone to describe system and unit performance utilizing historical response information provided by the department. Details of service delivery and deployment are described in detail in the following sections of this report.

Fire stations are often located in order to provide an acceptable distribution of resources and response time, or to provide a concentration of resources in areas that require specialized or additional coverage based on risk such as congested downtown commercial centers, industrial areas, areas with large warehouses or logistics centers, and transportation hubs such as airports and marine terminals.

Given current and planned land use, ESCI suggests Anna Fire Rescue formally adopt multiple planning zones that match station first-due territory for primary fire and EMS emergency response. These fire station zones and the equipment assigned to each are based upon the location of the stations and consider the risks of each area. These zone maps may be revised as stations are relocated or added based upon potential risk and community need. Use of station

zones will help encourage risk-based resource deployment, will provide more detailed data analysis regarding performance measures and outcomes, and can be easily linked to political subdivisions and land use.

Manufacturing, Industrial, & Storage

In addition to the presence of potentially hazardous materials, facilities used for manufacturing, storage, or other industrial uses may be the site of physical hazards, or potentially hazardous operations, processes, or combustible fire load. Target hazards of this type include high-pile storage, and manufacturing processes that involve extremely heavy materials, expose workers to extremes of heat or cold, automated, or rotating machinery and equipment, or contain large amounts of plastics or other combustible fire loads.

Nuclear Facilities

There are no nuclear power or waste facilities in Collin County; however, there are other facilities that use small amounts of radioactive materials for specific work or scientific processes. The most common of these in the Collin County service area are nuclear medicine (both diagnostic and therapeutic), non-destructive testing, and food irradiation.

Public Safety Services

The mission of emergency services is to save lives, protect property and the environment, assist communities impacted by disasters, and aid recovery during and after emergencies. There are four separate and wide-ranging functions and roles commonly associated with emergency services—Law Enforcement, Fire/Rescue Services, Emergency Medical Services, and Emergency Management. Target hazard locations for public safety would include police, fire, and EMS stations, the Emergency Operations Center (EOC), and related structures and properties.

Residential

Some structures used for residential purposes pose higher risks to civilians and firefighters than single-and-two-family residences. These include multi-family dwellings (primarily apartments and condominiums), hotels and motels, dormitories, fraternity and sorority residences, group homes, live/work units, and boarding homes.

The first risk is the potential for large loss of life and property. The second risk is the size and construction of the building. Often, older structures have limited fire department access, and do not meet modern codes for means of egress, fire protection systems like automatic sprinkler systems, or fire separation and compartmentation. Attics and crawl spaces may be open, or have penetrations in firestops caused by maintenance, installation of communications cabling, and damage.

Transportation

Transportation corridors provide necessary access and egress for the public, commercial enterprise, and emergency service providers. For this study, ESCI used GIS data supplied by Collin County and others to understand and display the transportation network throughout the study area.

The configuration of transportation systems can also affect the response capability of emergency services. Limited access freeways and rail lines can interrupt street connectivity, forcing apparatus to negotiate a circuitous route to reach an emergency scene. Pipeline and air routes are usually taken for granted by the public; however, a major incident could occur along any of these routes, often with the potential for hazardous material release, spill, or fire.

Collin County does have several airports, but these fall under the jurisdiction of different entities. The airports within Collin County include:

- McKinney National Airport (TKI): McKinney National Airport is a public airport located in McKinney, Texas, and serves as the primary general aviation airport for Collin County.
- Mesquite Metro Airport (HQZ): While Mesquite Metro Airport is primarily located in Mesquite, Texas, a portion of it extends into Collin County.
- Collin County Regional Airport at McKinney (formerly Aero Country Airport): This airport is located in McKinney, Texas, and primarily serves as a general aviation facility.
- Sherman Municipal Airport (SWI): Sherman Municipal Airport is not directly in Collin County; however, it is relatively close, in Sherman, Grayson County, serving the broader North Texas region.

It is important to note that airports typically have safety measures to manage hazards and ensure the well-being of passengers and aircraft. These safety measures include protocols, emergency response plans, and regular inspections. While ESCI does not have access to real-time data or specific hazard ratings for each airport, it is common for airports to prioritize safety and mitigate potential risks through ongoing safety management programs. If you require detailed hazard ratings for specific airports, it would be best to reach out to the relevant airport authorities or regulatory agencies for the most up-to-date information.

Over-the-Road

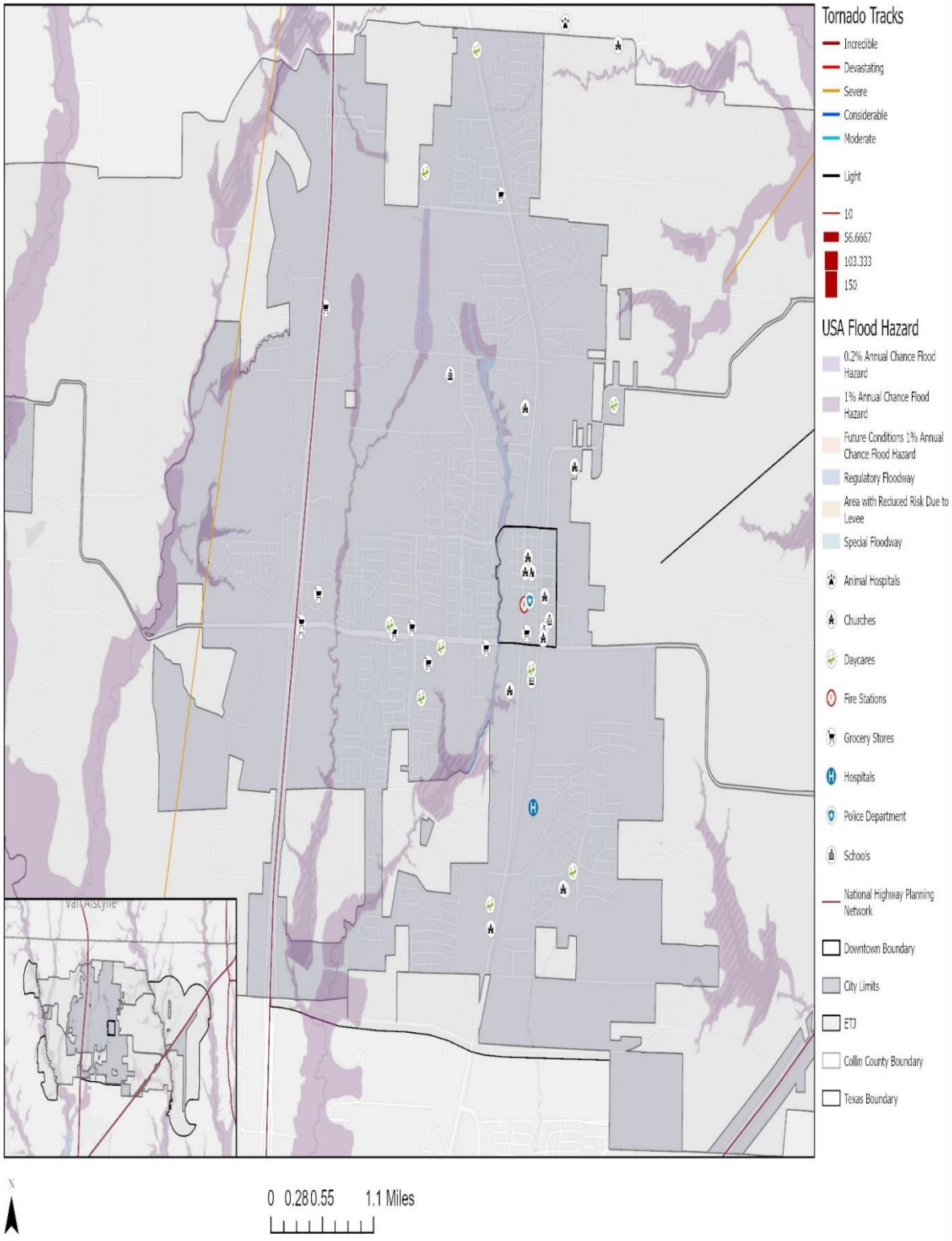
Anna Fire Rescue covers several areas within Collin County. While Collin County primarily focuses on emergency services, including fire protection and medical services, it does not have direct authority over major roadways or transportation infrastructure.

There are several major roadways that traverse Collin County and are managed by relevant transportation authorities. These roadways include:

1. **U.S. Route 75 (US 75)**: U.S. Route 75, also known as Central Expressway, is a major north-south highway that runs through Collin County, providing access to cities like Anna. It is maintained by the Texas Department of Transportation (TxDOT).
2. **State Highway 5 (SH 5)**: State Highway 5 is a north-south highway that runs through Anna, Texas, providing a local route for residents and travelers. It is also maintained by TxDOT.
3. **Farm to Market Road 455 (FM 455)**: FM 455 is an east-west road that passes through Anna and connects the city to other communities in Collin County. It is also managed by TxDOT.
4. **State Highway 121 (SH 121)**: SH 121 runs along the southern border of Collin County, providing access to major cities like Plano and McKinney. It is a vital route for commuters and travelers in the area.
5. **Sam Rayburn Tollway (SH 121)**: Part of SH 121 is operated as a tollway, known as the Sam Rayburn Tollway. It offers a faster route for drivers willing to pay tolls and is managed by the North Texas Tollway Authority (NTTA).
6. **U.S. Route 380 (US 380)**: U.S. Route 380 is an east-west highway that passes just south of Anna. It provides access to cities like McKinney and Denton and is maintained by TxDOT.
7. **Texas State Loop 286 (SL 286)**: Loop 286 is a partial loop road that surrounds the city of Anna and provides.

It is important to note that the relevant transportation authorities, such as TxDOT typically manage safety concerns and hazard mitigation for these major roadways. These agencies implement various measures to enhance safety, including road design improvements, signage, traffic control systems, and regular maintenance and inspections. If you have specific safety concerns or require detailed information about hazard mitigation efforts along these roadways, it would be best to contact TxDOT or the appropriate transportation authorities for the most up-to-date information.

The City of Anna Texas



Recommendations for Standard of Cover

Anna Fire Rescue should attempt to capture benchmarks in order to track the following data and monitor compliance with NFPA 1710. The fire and EMS department shall establish the following performance objectives for the first-due response zones:

> (1) 360 seconds or less travel time for the arrival of the second company with minimum staffing of 4 personnel at the fire suppression incident.
> (2) Other than a high-rise, 480 seconds or less travel time for the deployment of an initial full alarm assignment arrival at a fire suppression incident.
> (3) 240 seconds or less travel time for the arrival of a unit with a first responder with automatic external (AED) or higher-level capability at an emergency medical incident (Fire).

The standard travel time for EMS calls is 240 seconds or 4 minutes. With geographic location having the most significant impact on travel time, leadership and governing bodies must weigh the factors associated with working to meet that standard. Most often, fire and EMS departments must add additional stations and units to meet the travel time performance, but the workload may not balance out the cost of adding resources. Recommendations regarding station locations are included in the Deployment section.

> (4) 480 seconds or less travel time for the arrival of advanced life support (ALS) unit at an emergency medical incident, where this service is provided by the fire department with a first responder with an AED for basic life support (BLS) unit arrived in 240 seconds or less of travel time.

Anna Fire Rescue should maintain annual reports following NFPA 1710 Chapter 4. The current Record Management System (RMS) maintains these requirements and should be monitored and evaluated yearly.

- 4.1.2.5.1 The fire department shall evaluate its level of service and deployment delivery of alarm handling time, turnout time, and travel time performance objectives annually.
- 4.1.2.5.2 The evaluations shall be based on emergency incident data relating to the level of service, deployment, and achievement of each travel time performance objective in each geographic area within the jurisdiction of the fire department.
- 4.1.2.6 The fire department shall provide the AHJ with a written annual report.
- 4.1.2.6.1 The annual report shall define the geographic areas and/or circumstances in which the requirements of this standard are not being met.
- 4.1.2.6.2 The annual report shall explain the predictable consequences of these deficiencies and address the steps that are necessary to achieve compliance.

- 4.1.2.6.3 The annual report shall identify any deficiencies that are anticipated to develop in the next three years and address the steps necessary to continue to achieve compliance with this standard.

Anna Fire Rescue currently collects and evaluates the data identified in this section of NFPA 1710. ESCI suggests that in addition to annually updating its Standards of Cover document, the department should include a concise report with only the dedicated areas of information. This document should serve as an ongoing source of evaluation and discussion between Anna Fire Rescue and City leadership about the resources required to meet the established performance criteria.

ESCI recommends that Anna Fire Rescue establish criteria for safety officers to be automatically deployed for incident management support to manage the department's TCFP-compliance and to assist with the personnel accountability system during emergency incidents. This position may come from the Fire Prevention Division (Fire Marshal's Office). The goal would be to assist the Operations Battalion Chiefs serving as incident commanders. This would relieve the Tactical Safety Officers from incident management support and accountability system management responsibilities to focus on their primary responsibilities of ensuring incident scene safety.

Anna Fire Rescue should work toward compliance with NFPA 1710 5.2.3.1, Engine Companies. Fire Companies whose primary functions are to pump and deliver water and perform basic firefighting at fires, including search and rescue, shall be engine companies.

- 5.2.3.1.1 These companies shall be staffed with at least four (4) on-duty members.
- 5.2.3.1.2 In first-due response zones with a high number of incidents, geographical restrictions, geographical isolation, or urban areas, as identified by the AHJ, these companies shall be staffed with a minimum of five (5) on-duty members.
- 5.2.3.1.2.1 In first-due response zones with tactical hazards, high-hazard occupancies, or dense urban areas as identified by the AHJ, these fire companies shall be staffed with six (6) on-duty members.

ESCI recommends that Anna Fire Rescue work toward future compliance with NFPA 1710 5.2.3.1. In prioritizing needs, fire department leadership has initiated staffing engine companies with four (4) firefighters. While it is difficult for any career fire department to achieve and sustain the minimum staffing requirements outlined in NFPA 1710 5.2.3.1.2 and 5.2.3.1.2.1 (i.e., five or six on-duty members, respectively), minimum staffing of four (4) on-duty members is widely achieved and sustained. Studies have shown that four-member staffing provides safer and more effective tactical operations at the individual company level and reduces the overall number of engine companies that need to be dispatched to the scene as part of the ERF.

Anna Fire Rescue's leadership acknowledges that a fire company staffed with four personnel is much more effective and places less risk on the health and safety of the assigned firefighters; however, funding to achieve and sustain this level of staffing may be a limiting factor as the growth of future stations evolve.

Anna Fire Rescue should work toward compliance with NFPA 1710 5.2.3.2, Ladder/Truck Companies. At time of data collection, the Ladder Truck was not in service. The next set of items focuses on Ladder/Truck recommendations. Fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work, shall be known as ladder or truck companies.

- 5.2.3.2.1 These fire companies shall be staffed with at least four (4) on-duty members.
- 5.2.3.2.2 In first-due response zones with a high number of incidents, geographical restrictions, geographical isolation, or urban areas, as identified by the AHJ, these companies shall be staffed with a minimum of five (5) on-duty members.
- 5.2.3.2.2.1 In first-due response zones with tactical hazards, high-hazard occupancies, or dense urban areas, as identified by the AHJ, these fire companies shall be staffed with six (6) on-duty members.

ESCI recommends that Anna Fire Rescue work toward future compliance with NFPA 1710 5.2.3.2. The Risk Assessment will assist department leadership in prioritizing where and when to begin staffing ladder companies with four (4) firefighters. While it is extremely rare for any career fire department to achieve and sustain the minimum staffing requirements outlined in NFPA 1710 5.2.3.1.2 and 5.2.3.1.2.1 (i.e., five or six on-duty members, respectively), minimum staffing of four on-duty members is widely achieved and sustained by metro-sized fire departments. Studies have shown that four-member staffing provides safer and more effective tactical operations at the individual company level and reduces the overall number of ladder companies that need to be dispatched to the scene as part of the ERF.

Comprehensive Analysis and Forward-Thinking Strategies

Anna Fire Rescue, as the guardian of the city's safety, faces an array of challenges and opportunities. This report focuses on evaluating and addressing the risk factors associated with the current fire station, the addition of a second fire station, the integration of a new ladder truck, and staffing in all divisions. Furthermore, it delves into the importance of forward-thinking strategies that rely on statistical data to encompass all areas within the city limits. While the department should be commended for demonstrating exceptionally forward-thinking initiatives over the past five years, it is imperative to maintain and regularly review these practices to meet the evolving needs of the city. Additionally, a critical aspect requiring attention is Community Outreach and Development, with a specific emphasis on the Fire Marshal's Office (Prevention Division). This division plays a pivotal role in risk mitigation, new construction acceptance, plan review, safety inspections, consultations, and public education. As articulated in the Master Plan document, the increase in plan reviews, field inspections, consulting, permitting, and investigative callouts necessitates additional personnel and staff to manage the increased workload. Simultaneously, the coordination of public education is a crucial focus. All of the items discussed in this document are integral for the overall risk management of Anna Fire Rescue and the community it serves.

Incorporating statistical data analysis and insights from a consultant into the risk management strategy is another illustration of the department's successful approach and mindset. By monitoring trends and risks closely, the department can adapt and refine its methods over time, ensuring that resources are allocated effectively. The insights provided by a consultant offer an objective and informed perspective that guides the department's leadership in making data-driven decisions. This demonstrates a willingness to evolve and adapt to changing circumstances, further reinforcing the department's forward-thinking attitude.

Current Fire Station and Risk Factors

The current fire station, while serving as the backbone of the department, faces several risk factors that require attention. The foremost concern is the issue of response times. The station's current location may result in longer response times in specific areas, potentially endangering lives and property. Furthermore, the station's capacity is not sufficient to absorb the increasing call volume and modern firefighting demands, which is the reason for the focus of Fire Station 2. Finally, the administrative area within the current fire station limits proper expansion of Command Staff, the Prevention Division, and the Emergency Management Division.

Second Fire Station and Ladder Truck

The strategic addition of a second fire station and a new ladder truck promises to enhance the department's capabilities significantly. A second station strategically located should initially lead to reduced response times in underserved areas for a given period, however, further population increases within the city will erode these reductions. The ladder truck will enhance the department's ability to handle incidents in taller structures and protect exposures during fireground operations. Additionally, the presence of multiple stations and equipment ensures resource redundancy, which is crucial for maintaining services in case of maintenance or concurrent incidents.

Administrative and Support Facilities

Effective service delivery requires appropriate accommodation and support facilities. The current station, although newly constructed and modern in its design, lacks proper expansion area for administrative support, emergency management staff, and fire prevention personnel. To meet the growing needs of the department, it is vital to ensure:

- Adequate Administrative and Fire Prevention Capacity: Ensuring that current and future expansion efforts of department leadership and support personnel are possible is essential for efficient service delivery and operations. Timely consideration should be given to the limited area currently provided to department leadership and the fire prevention division. This requires the proper integration of staffing models into current and future facility designs.

- Emergency Management: The current Emergency Operations Center (EOC) meets the basic sheltering and incident command standards required to maintain emergency operations; however, it lacks proper configuration, technology, and communication resources that are industry standard. A well-equipped EOC is crucial in maintaining continuity of operations.

- Support Services, Logistics, and Administrative Services: As the department increases its operations personnel, it continues to require additional logistics and administrative support. Ensuring that current and future expansion efforts are possible is essential for efficient service delivery and operations. Timely consideration should be given to the limited area currently provided. This requires the proper integration of current and future staffing models into facility design.

Staffing and Training

Effective service delivery hinges on appropriate staffing levels and ongoing training. To meet the evolving needs of the city, it is imperative to maintain:

- Adequate Staffing: Ensuring 24/7 minimum coverage at both stations is essential for optimizing response times and efficient service delivery. Significant consideration must also be given to Fire Prevention staffing models due to the level of integration required between the department's divisions. ESCI also recommends dedicating a FTE to coordinate the Emergency Management Division.

- Cross-Training: Cross-training personnel equips them with versatile skills, enhancing readiness for various emergencies.

- Continuous Learning: Regular training and education are vital to keep firefighters updated with the latest firefighting techniques and equipment.

Community Outreach and Development

The Fire Marshal's Office (Prevention Division) plays a pivotal role in risk mitigation, safety inspections, new construction, consulting, permitting, and public education. As mentioned in the Master Plan document, an increase in plan reviews, field inspections, consulting, permitting, and investigative callouts necessitates additional personnel and staff to manage the current volume. Simultaneously, the coordination of public education is a crucial focus. This approach ensures that the department not only responds to emergencies but also actively works to prevent them through education, engineering, enforcement, and safety initiatives.

Findings

In this comprehensive report, ESCI has highlighted the critical elements that form the foundation of an effective risk management strategy for Anna Fire Rescue. The research conducted has played a pivotal role in shaping this strategy and the positive outcomes thus far demonstrate that the current Fire Chief and Command Staff have been undeniably forward-thinking in their approach to enhancing public safety and mitigating hazards.

Addressing the risk factors associated with the current fire station is a primary concern, and the examination conducted by ESCI has shed light on the deficiencies and limitations of the existing facility. By recognizing these issues and taking proactive steps to remedy them, the department demonstrates its commitment to ensuring the safety of the community. The planned expansion, which includes the construction of a second fire station, the acquisition of a new ladder truck, and continued development of the Prevention Division, is a testament to the attentive approach of the department's Chief Officer. These actions not only address immediate concerns but also anticipate the city's future needs, thereby ensuring that the department remains on course in successfully planning these expansions to meet the growing demands of an exploding population.

ESCI's research has further underscored the importance of adequate staffing and training, emphasizing that current staffing levels are insufficient to effectively respond to emergencies and mitigate new construction and development hazards. The department's proactive decision to increase the number of firefighters and paramedics shows foresight and a commitment to enhancing the safety of both the citizens and the department's personnel. By investing in ongoing training and professional development, the department ensures that its team is well-equipped to handle a wide range of emergencies.

Anna Fire Rescue's commitment to a comprehensive and modern risk management strategy is evident in the research findings of ESCI. By addressing the identified risk factors associated with the current fire station, expanding with a second station and a new ladder truck, ensuring adequate staffing and training, and prioritizing community outreach and development with additional staffing, the department’s internal planning and efforts to date have effectively met the city's growing needs. However, to maintain the current level of community safety, a commitment to continuing these efforts must exist so that forward momentum is not lost. Incorporating statistical data analysis and insights from a consultant strengthens the department's ability to make informed decisions and adapt to evolving circumstances. Anna Fire Rescue, under the leadership of the Fire Chief, has demonstrated a clear commitment to enhancing public safety, making the city of Anna a safer and more resilient community for years to come.

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[i] NFPA 921: Guide for Fire and Explosion Investigations, 2017 Edition. National Fire Protection Association, Quincy, MA. 2016.

[ii] Institute of Hazardous Materials Management (IHMM).

[iii] Animated Tornado Probability Map: Visualize Your Risk of Storm Danger with This 365-Day Tornado Map from NOAA, Patrick McCarthy, Off-Grid, 2016.