

# FRESNO FIRE DEPARTMENT STANDARDS OF COVER



Fresno Fire Department  
911 H Street  
Fresno, Ca 93721

2022



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## **Executive Summary**

One of the most significant issues the fire service struggles with is defining service levels for the community. As part of the Commission on Fire Accreditation International (CFAI) process, a Community Risk Assessment: Standards of Cover (SOC) document must be developed and adopted by the agency having jurisdiction. The SOC is a comprehensive study that analyzes the risks facing the City of Fresno (City or COF) and the services provided by the Fresno Fire Department (FFD or Department). This document also provides stakeholders with information on fire service operations and department integrated risk management planning. This is not intended to be stand-alone; it is a living document that will be utilized in conjunction with the FFD Strategic Plan.

The fire service must adequately define the levels of service for the community it protects based on the unique characteristics of the community and availability of fiscal resources. As part of the CFAI process, an adopted SOC document sets the foundation for service level goals. In the development of those goals, FFD utilized industry best practice standards, National Fire Protection Association (NFPA) 1710, Center for Public Safety Excellence (CPSE) and CFAI accreditation model, and the Insurance Services Office (ISO) – Fire Suppression Rating Schedule.

## **Organizational History**

Established in 1877, FFD enjoys the distinction of being one of the oldest fire departments in the nation. The Department's mission, core values, and vision are reflective of the desire to create a culture of excellence in fire/emergency medical service delivery. The Department strives to be an innovative and progressive organization in order to meet the changing demands of the rapidly expanding City's population spread out over 116 square miles.

The FFD is a paid career fire department that serves the City of Fresno and contract areas, providing all-risk emergency response services which includes fire suppression, fire prevention, emergency medical services, hazardous materials response, urban search and rescue, water and dive rescue, fire investigation services, Aircraft Rescue and Firefighting (ARFF), as well as emergency preparedness planning and public education coordination. The Department has over 300 firefighting members, responding to over 45,000 calls for service annually, utilizing 88 firefighting members each day located in the City of Fresno and Fig Garden Fire Protection District (FGFPD). There are 20 fire stations strategically located throughout the City and the FGFPD, as well as an airport station providing services at Fresno Yosemite International Airport totaling 21 stations. Each of these stations provide service twenty-four (24) hours a day and 365 days a year.



## **Mission, Vision, and Core Values**

The Fresno Fire Department is comprised of the Operations Division, Prevention & Support Services Division, Training Division, Personnel & Investigations Division, Business & Fiscal Services Division, and the Office of the Fire Chief. All divisions of the organization are critical and essential for the Department to fulfill its Mission daily, utilizing its Core Values and integrating its Vision of being recognized as a standard of excellence in the fire service.

**Our Mission:** To protect and put service above all else.

**Our Core Values:** Teamwork, Trust, Commitment

### **Teamwork**

- Train for excellence
- Leave it better than you found it
- Everyone goes home safe

### **Trust**

- Treat others the way we want to be treated
- Do the right thing
- Walk the talk

### **Commitment**

- United in our mission
- Everyone plays an important role
- Our work represents us

**Our Vision:** Fresno Fire – Recognized as a Standard of Excellence in the Fire Service.



## **Description of Community Served**

The City of Fresno is located in the southern portion of the San Joaquin Valley and is the 34th most populous city in the nation, fifth most populous in the State of California. The City of Fresno and its Sphere of Influence (SOI) encompass a 100,400-acre (157 square miles) area in central Fresno County, of which 28,000 acres (44 square miles) are unincorporated. Over the past decade, the City has expanded into the northern, northwestern, and eastern reaches of its Sphere of Influence. Fresno is a Charter City with a Strong Mayor (Mayor-Council) form of government. The Fresno Fire Department provides service to not only the City of Fresno (116 square miles and a population of 540,000), but also the Fig Garden Fire Protection District (FGFPD) and maintains service aid agreements with Fresno County Fire Protection District. Fresno was incorporated in 1885 and continues to be an economic hub predominantly tied to large scale agricultural production.

Except for the deep channel of the San Joaquin River at the northern boundary of the City, Fresno's topography is generally level and slopes gently to the southwest at an elevation of 308 feet. Fresno has a Mediterranean climate, averaging over 262 sunny days per year and little or no measurable precipitation from June through September. Annual rainfall typically totals 12-14 inches in episodic events lasting up to a few days at most. Fresno's prevailing winds are typically light and from the northwest. While the average temperature is relatively mild, summer and winter months can bring extreme weather patterns to the region.

## **Community Boundaries**

Fresno is located in Fresno County, the 10th largest county in California. Fresno County covers an area of over 6,000 square miles. The County's topography is characterized by broad, flat valley floors that generally slope from southeast to northwest; foothills and moderately high mountains (Coast Ranges) in the west; and foothills and high mountains (Sierra Nevada) in the east. Approximately 55% of the County is mountainous and 45% is valley land. Elevations range from 100 to 400 feet on the valley floor to 4,000 feet in the Coast Ranges to more than 14,000 feet in the Sierra Nevada. There are two major rivers in Fresno County, the San Joaquin and Kings Rivers which originate in the Sierra Nevada. There is little precipitation in the County during the summer and most of the seasonal precipitation occurs between October and April.



### Governance

The City of Fresno blends elements of a council-manager form of government with a strong mayor system. In this form of municipal government, the City Council serves as the City’s primary legislative body and the Mayor serves as the City’s chief executive. The Mayor appoints a city manager to oversee the City’s day to day operations and implementation of city policies.

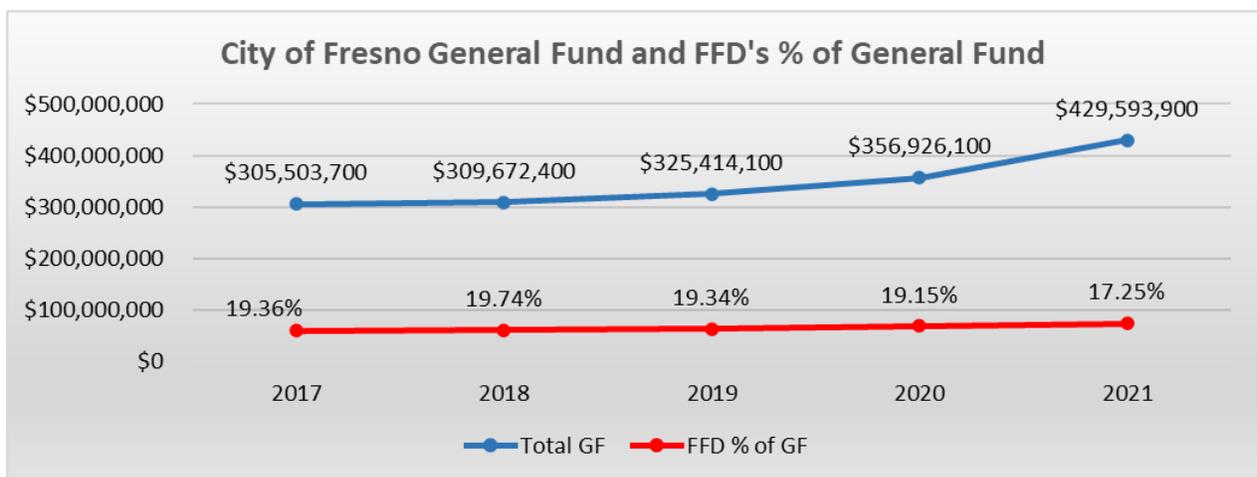
The Fresno City Council is the City’s primary legislative body. It is responsible for approving and adopting the city budget, levying taxes, and making or amending city laws, policies, and ordinances. The Fresno City Council has seven members who are responsible for representing the seven council districts.

### Budget

The Fresno City Council is responsible for approving and adopting the annual budget. The City Manager is the City’s chief administrative officer and is responsible for planning and implementing the City’s budget. Through delegation, the Fire Chief has the responsibility and authority to plan for and budget the necessary funds to provide fire protection and other emergency services to the City of Fresno and contract service areas.

The financial resources that are used to fund fire department operations come from the City’s general fund. The current operating budget for the City of Fresno general fund is \$429,593,900. In fiscal year 2021, the Fresno Fire Department was allocated \$74,121,500, accounting for approximately 17.25% of the City’s general fund.

The figures below show the Fire Department’s general fund allocation as well as the Department’s total operating budget from 2017 to 2021:





Fresno Fire Department Operating Budget						
		Fresno Fire	Fig Garden	North Central	ARFF	Total Budget
Actuals	2017	\$59,147,800	\$1,229,000	\$6,399,500	\$1,030,200	\$67,806,500
	2018	\$61,118,200	\$1,253,600	\$6,986,100	\$1,154,500	\$70,512,400
	2019	\$62,935,900	\$1,278,700	\$7,159,200	\$1,172,600	\$72,546,400
	2020	\$68,354,500	\$1,304,300	\$1,003,000	\$1,345,300	\$72,007,100
	2021	\$74,121,500	\$1,330,400	\$1,033,000	\$1,405,200	\$77,890,100
	2021 General Fund	\$429,593,900	-	-	-	-
	2021 % of GF to FFD	17.25%	-	-	-	-

### Projected Growth

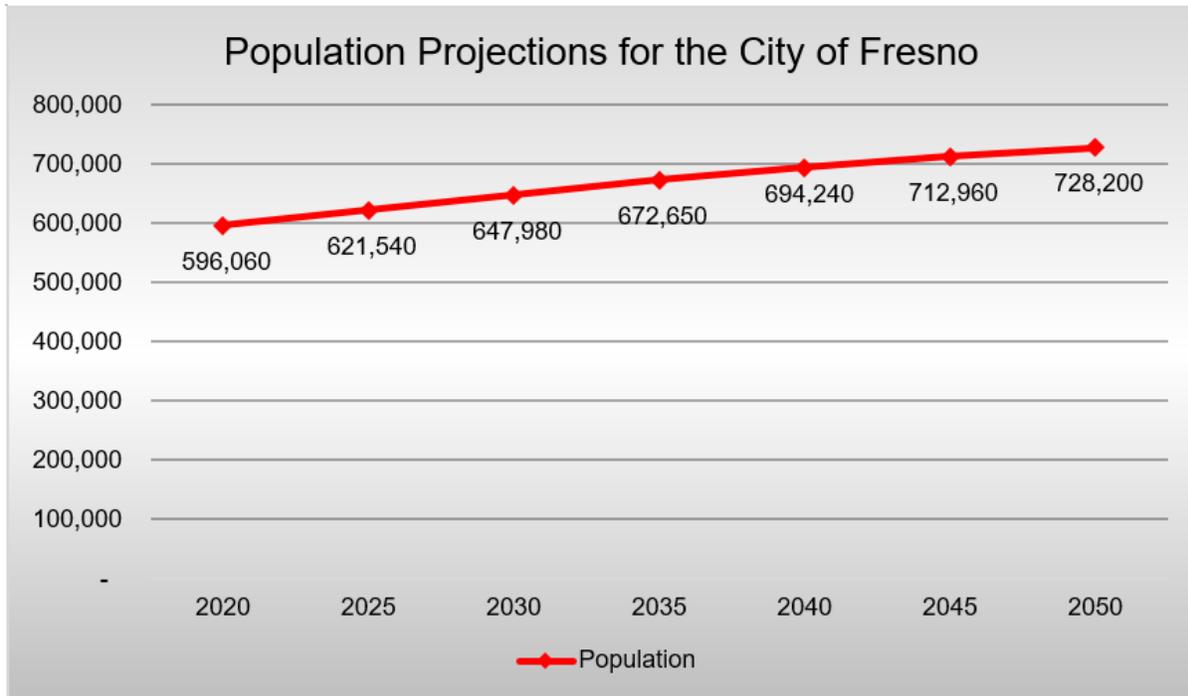
The City of Fresno is projected to experience modest growth. Growth rates from 2020 to 2050, show 5-year increases ranging from 2% - 5% based on the City’s sphere of influence (SOI). Projected growth through 2050 will occur in the City’s SOI comprised of all land within the City Limits, as well as County Islands (unincorporated land surrounded by the city) and land beyond the outer City Limits on all sides, County Islands and unincorporated areas located beyond the City limits but within the SOI. It is estimated that by 2050 City of Fresno’s SOI will see an increase of 41,300 new housing units to meet the population’s market demand. Of the new units 25,300 are expected to be single family units and 16,000 will be multifamily units. As increases in population density occur the Department will require a greater concentration and distribution of resources to meet the demand.

Below is a SOI population table reported by the Fresno County Council of Governments:

JURISDICTION	2019	2020	2025	2030	2035	2040	2045	2050
<b>Total Population</b>								
County	1,018,240	1,023,360	1,069,800	1,112,010	1,151,390	1,185,850	1,215,740	1,240,090
Clovis SOI	134,210	134,780	141,700	147,760	153,420	158,370	162,660	166,160
Coalinga SOI	13,530	13,690	14,570	15,210	15,800	16,320	16,770	17,140
Firebaugh SOI	7,720	7,720	8,790	9,200	9,580	9,920	10,210	10,450
Fowler SOI	6,380	6,580	6,930	7,200	7,460	7,680	7,870	8,030
Fresno SOI	592,350	596,060	621,540	647,980	672,650	694,240	712,960	728,200



Below is a chart depicting the projected changes in City's SOI:



For historical growth within the City of Fresno's SOI, refer to the appendix for Historical Growth Patterns Map located in the appendix



## Insurance Service Office (ISO) Grading Schedule



For a broad spectrum of personal and commercial insurance lines, the Insurance Service Office (ISO) provides a wide array of services. These services include statistical, actuarial, underwriting, claims analyses, consulting and technical assistance, policy language, information about specific locations and communities, fraud identification tools, and data processing. Worldwide, ISO serves insurers, reinsurers, agents, brokers, self-insurers, risk managers, insurance regulators, and other government agencies.

The Public Protection Classification (PPC) rating by the ISO is important to a community. A community's investment in fire mitigation is a proven and reliable predictor of future fire losses. Insurance companies use PPC information for marketing, underwriting, and to help establish fair premiums for homeowners and commercial fire insurance. In general, the price of fire insurance in a community with a good PPC grade is substantially lower than in a community with a poor PPC grade, assuming all other factors are equal. ISO uses a numbering system of 1 – 10 to grade communities. Class 1 (1) represents an exemplary fire suppression program, and a Class 10 (10) indicates that the area's fire suppression program does not meet ISO's minimum criteria.

The ISO evaluates communities according to a uniform set of criteria. It incorporates nationally recognized standards developed by the National Fire Protection Association and the American Water Works Association. A community's PPC class rating depends on the following:

- **Needed Fire Flows** – consists of representative building locations used to determine the theoretical amount of water necessary for fire suppression purposes.
- **Emergency Communications** – consists of emergency reporting, dispatching systems, and telecommunicators.
- **Fire Department** – consists of equipment, staffing, training, fire companies' geographic distribution, operational considerations, and community risk reduction.
- **Water Supply** – consists of inspection and flow testing of hydrants, alternative water supply operations, and a careful evaluation of the ration between the amount of water needed to suppress fires requiring up to 3,500 gallons per minute (gpm) and the available water.



The City of Fresno was last evaluated in 2018 and was assigned a Class 2 rating. The COF and FFD continue to make investments in the Department in pursuit of a Class 1 rating. Below is the most recent FFD ISO survey completed October 1, 2018:

ISO Criteria	Earned Credit	Available Credit
Emergency Communications	8.58	10
Fire Department	37.59	50
Water Supply	38.74	40
Divergence	-4.33	N/A
Community Risk Reduction	4.60	5.50
Total Credit	85.18	105.50

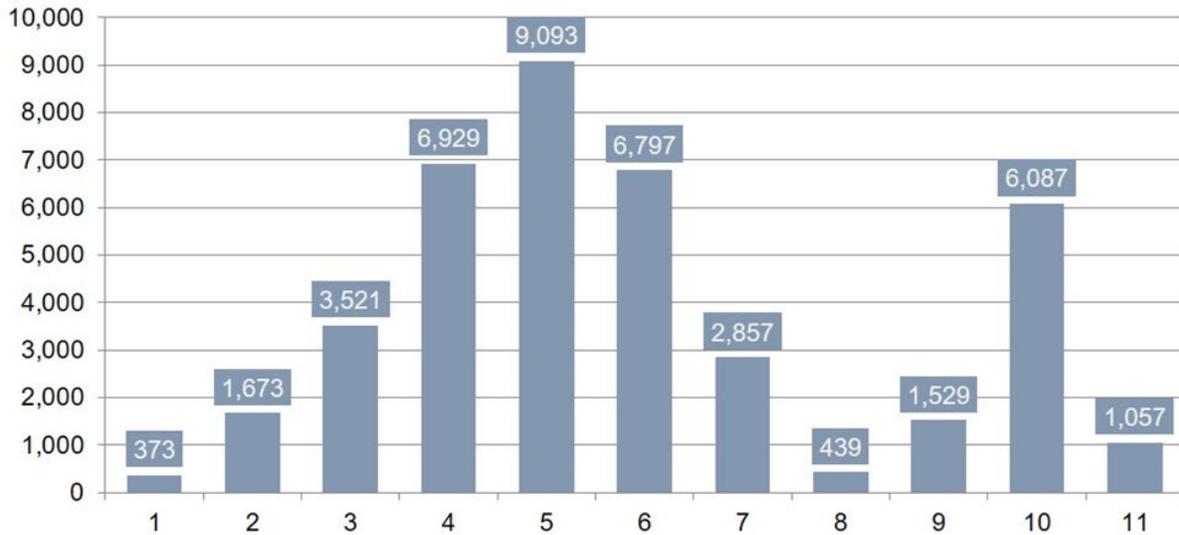
Of a community's overall score, 50% is based upon the fire department's structure fire suppression system. This section reviews fire apparatus, equipment carried, response to fires, deployment analysis, available staffing, and training. With additional staffing, the FFD can increase the score in this category and potentially become a Class 1 fire department. The following table is a detailed breakdown of the classification assigned to FFD from the October 2018 survey:

Fire Department	Earned Credit	Available Credit
Credit for:		
Engine Companies	6.00	6.00
Reserve Pumpers	0.50	0.50
Pumper Capacity	3.00	3.00
Ladder Service	2.36	4.00
Reserve Ladder and Service Trucks	0.34	0.50
Deployment Analysis	7.79	10.00
Company Personnel	8.02	15.00
Training	7.58	9.00
Operational Considerations	2.00	2.00
Total Credit	37.59	50.00

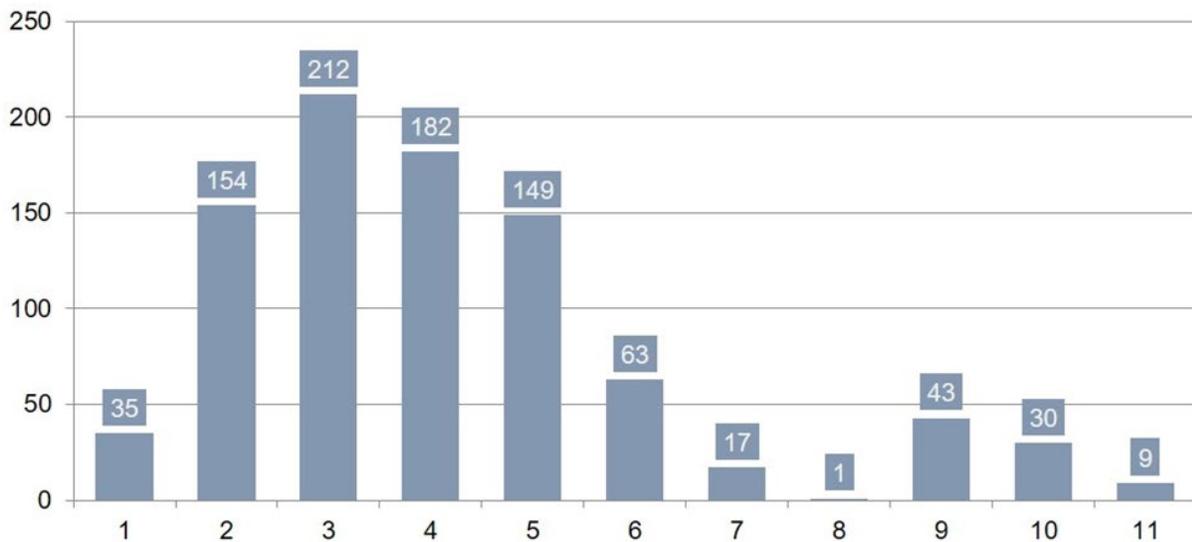


Nationwide, out of over 40,000 fire departments, only 5% of all departments obtain an ISO Class 2 rating or better. Approximately 20% of 895 fire departments in California achieve an ISO Class 2 rating or better, as displayed below:

**Nationwide**



**California**





### **Commission on Fire Accreditation International (CFAI) Risk Assessment**

In 1986, the International Association of Fire Chiefs (IAFC) and the International City/County Management Association (ICMA) developed a continuous fire and emergency service improvement framework. By 1996, this led to the Commission on Fire Accreditation International (CFAI) formation to award accreditation to fire and emergency service agencies. In 2000, the Commission on Chief Fire Officer Designation was established to credential fire and emergency service officers. In 2006, the Commission on Chief Fire Officer Designation changed its name to the Center for Public Safety Excellence, with CFAI and the now-titled Commission on Professional Credentialing became entities under CPSE. The Center for Public Safety Excellence (CPSE) helps high-performing fire departments and emergency services professionals in their efforts to improve continuously. The CPSE does this in the following three ways:

1. Fire department accreditation, a process in which departments undergo a thorough self-assessment focused on identifying strengths and areas for improvement.
2. Credentialing fire and emergency services professionals instills life-long learning and self-accountability principles while helping them grow and plan for a successful career.
3. Education programs offering individuals and departments the information they need to expand their knowledge and capabilities and stay at the forefront of the profession.

After determining community hazards and calculating the risks, the department can deploy resources appropriately. Through activities such as providing smoke detectors, conducting public education, disaster planning, and creating building/fire code amendments, the department can manage the known risks and respond immediately to mitigate any adverse risk events. Adverse risk events include fires, medical emergencies, and natural or other disasters.

Department leaders must provide sufficient information to the elected officials to determine:

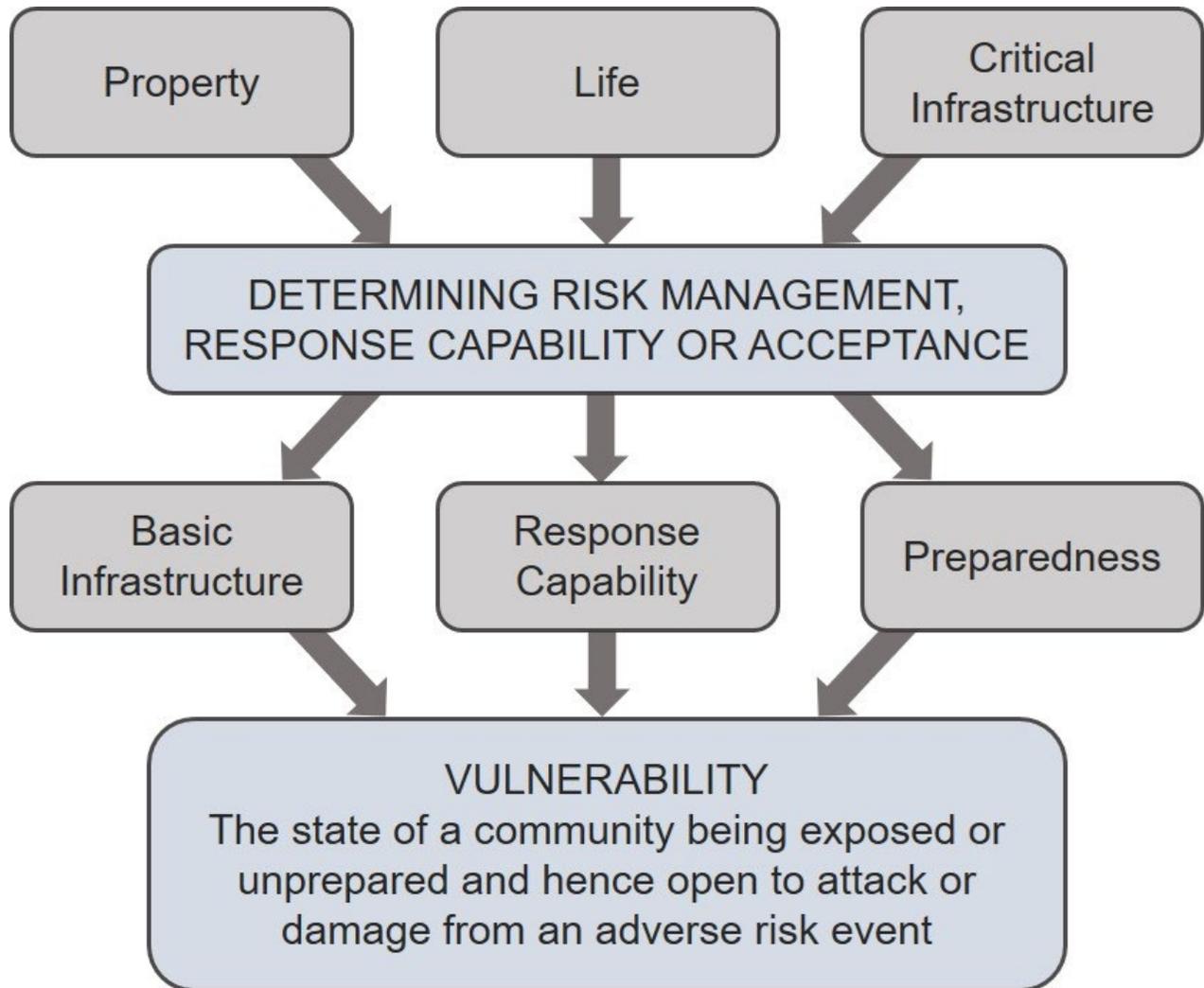
1. What resources to commit to risk management (prevention, pre-planning, and preparation).
2. What resources to commit to response/mitigation.
3. What level of risk to accept.

These concepts build upon the basic infrastructure that already exists, the response capability, and the current community preparedness level.



The information gathered is analyzed, and an overall community "vulnerability score" is calculated. The community risk and hazard factors are found below:

**Community Risk and Hazard Factors**





## **Community Risk Assessment**

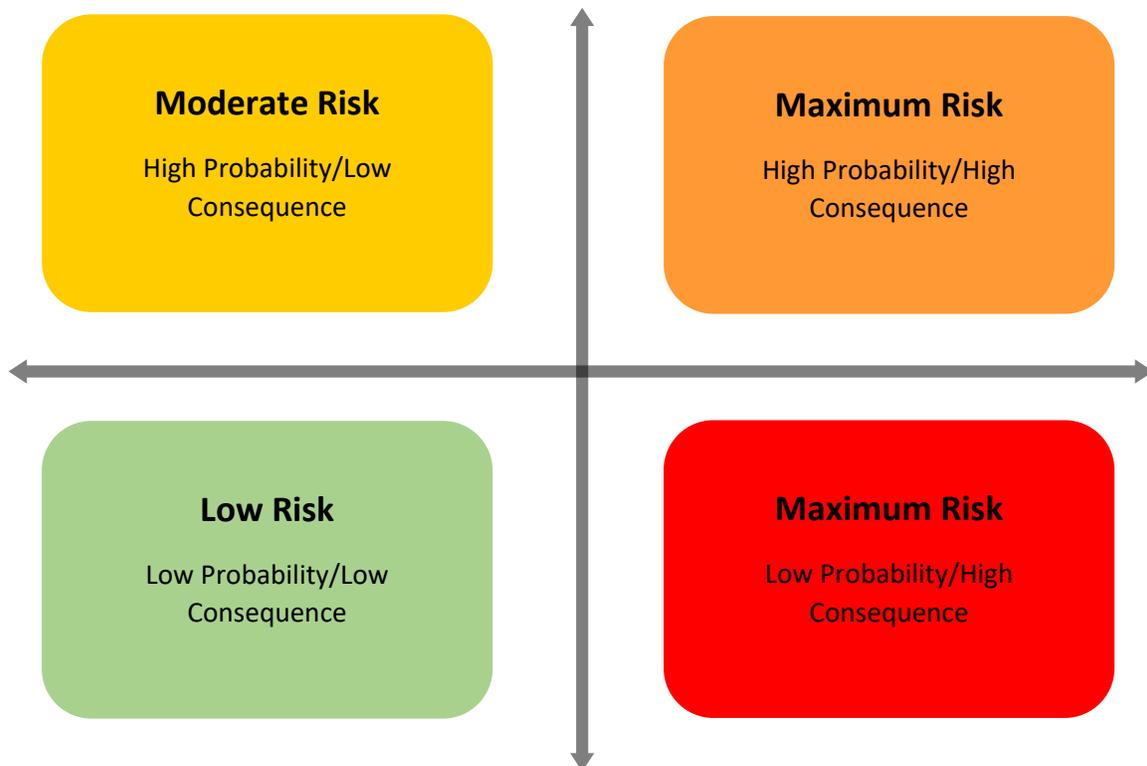
The City of Fresno must assess risks based upon the potential frequency (probability of occurring) and the potential severity (probability of damage) should an event occur. A Community Risk Assessment involves the analysis of risk for fire and non-fire emergencies. The impacts to life safety, assets, and the environment area measured along with an incident's relative probability. The City must assess risks by analyzing probability and consequence. Probability is the likelihood that a particular event will occur in a given time period. Emergency medical events are an example of high probability incidents. Consequences measure the impact of an event to an individual, the community and the agency. There are three areas of concern when evaluating consequences: life safety (danger to occupants), economic impacts (loss of property, income, historic or irreplaceable assets) and environmental impacts (irreplaceable or long-term damage to the environment).

A hazard is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. Risk is broadly defined as the probability of hazard occurrence in combination with the likely severity of these impacts to people, property, and the community as a whole. Organizations must analyze the potential probability and consequences of events occurring in their community to establish the risk that is associated with each hazardous event.



The matrix below can be utilized to show the risk associated with each identified hazard:

### Probability Matrix



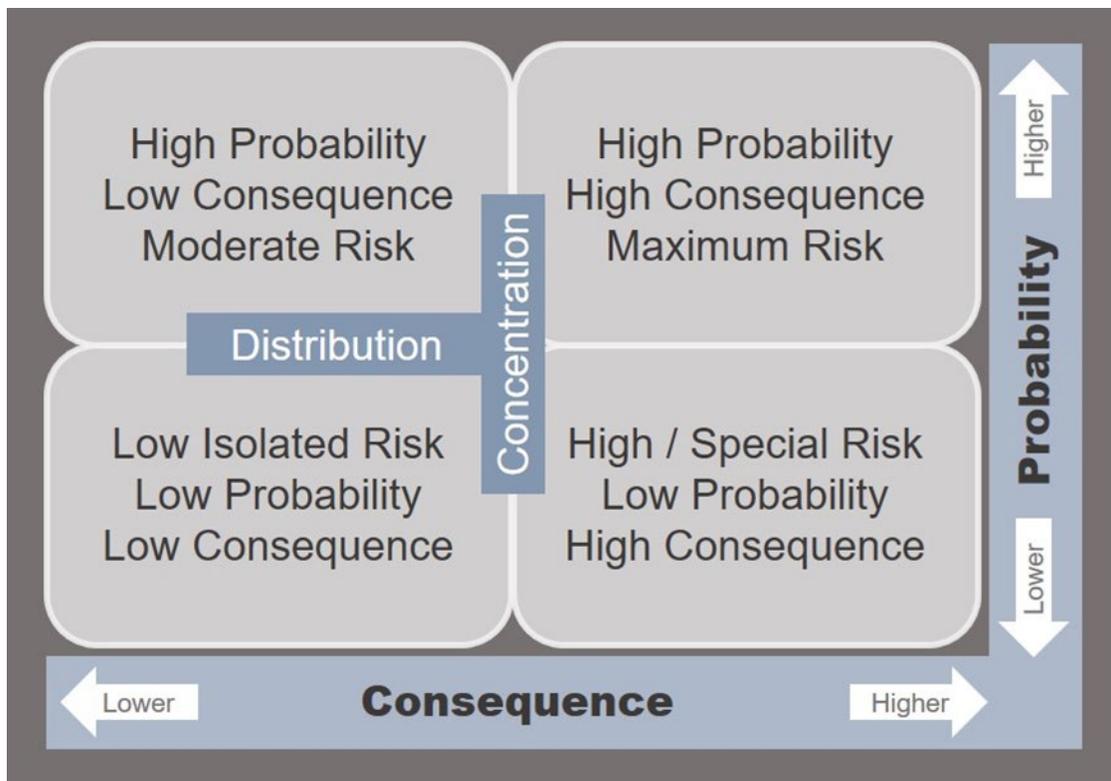
Hazard examples include relatively infrequent structure fires compared to more frequent emergency medical incidents. However, the subsequent loss of revenue, property, business, and jobs all make the consequences associated with a fire event high. A complex hazardous materials incident is also a low probability event but presents a sizeable potential loss to life and property as consequences. Similarly, a dumpster fire may have a high probability of occurring but would have minimal impacts outside of the dumpster container. Understanding the different levels of risk associated with probability and consequences allows agencies to properly address strategic planning associated with risk management and address current resource deployment.



Risk is identified through an analysis of both current and historical data. Additionally, risk is evaluated by providing the necessary structure to appropriately allocate personnel, apparatus, and fire stations that afford sufficient distribution and concentration of resources to mitigate those risks. Allocating enough resources to reach a very large number of events, regardless of their significance, over most of the jurisdiction being protected is defined as distribution. Concentration addresses the agency’s ability to place adequate resources on any specific risk to keep the event from becoming a major incident.

The relationship between probability, consequence, and the community’s adopted service level objectives determines the required distribution and concentration of resources. The optimal balance varies across many factors, including the number of events (calls for service), the area’s risk factors, the availability, reliability, and the arrival of additional emergency response units. The City of Fresno leadership continues to invest resources into supporting the FFD in achieving service level objectives. An example of the overall probability and consequence matrix with concentration and distribution is provided below:

**Probability and Consequence Matrix**





This evaluation considers both structural and non-structural risks. Non-structural risks include emergency medical, hazardous materials, technical rescue, water rescue, wildland/urban interface, and natural disasters. Structural risks evaluated included all structures, highways and roadways, water, power, communications, and other critical infrastructure. In assessing risk, the Department analyzed the demographics in the area protected, the building stock, historical call volume, and the existing deployment of resources.

### **Fire Department Services**

The FFD is comprised of twenty-one fire stations strategically located throughout the City of Fresno. Each fire station is staffed with a minimum of one 3-4 person engine or truck company and provides all risk emergency response services, including fire suppression, emergency medical care, hydrant flow maintenance, fire inspections, public education outreach, and other operations in line with the Department's service level objectives. FFD operates 19 front line fire engine companies, five (5) front line ladder truck companies, and one (1) ARFF unit. There are four Battalion Chiefs assigned to command a geographical area of the City and provide command and control activities at significant incidents. Additionally, the Department provides response capabilities and personnel for wildland fire risks through the California Office of Emergency Services and participates in the statewide master mutual aid system.



**Service Demands**

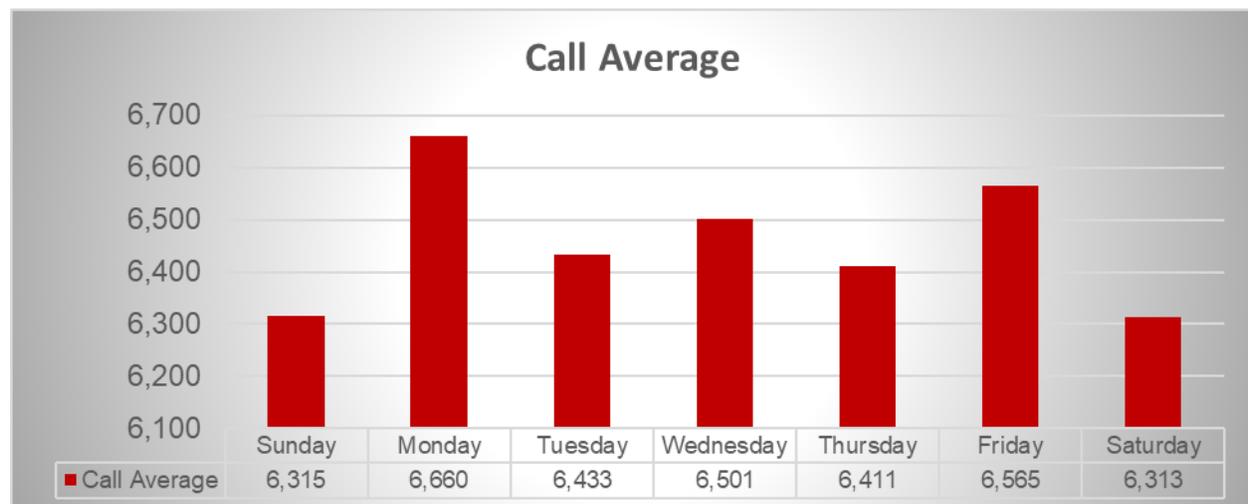
Over the two-year period of 2020-2021, the Department responded to a total of 90,508 calls for service. The number of fire related calls were 12,987, which accounted for 14% of the dispatched incidents. The number of rescue and emergency medical service-related incidents were 47,928, which accounted for 53% of the dispatched incidents.

The table below summarizes the Department's responses:

**TOTAL CALLS FOR 2020 AND 2021**

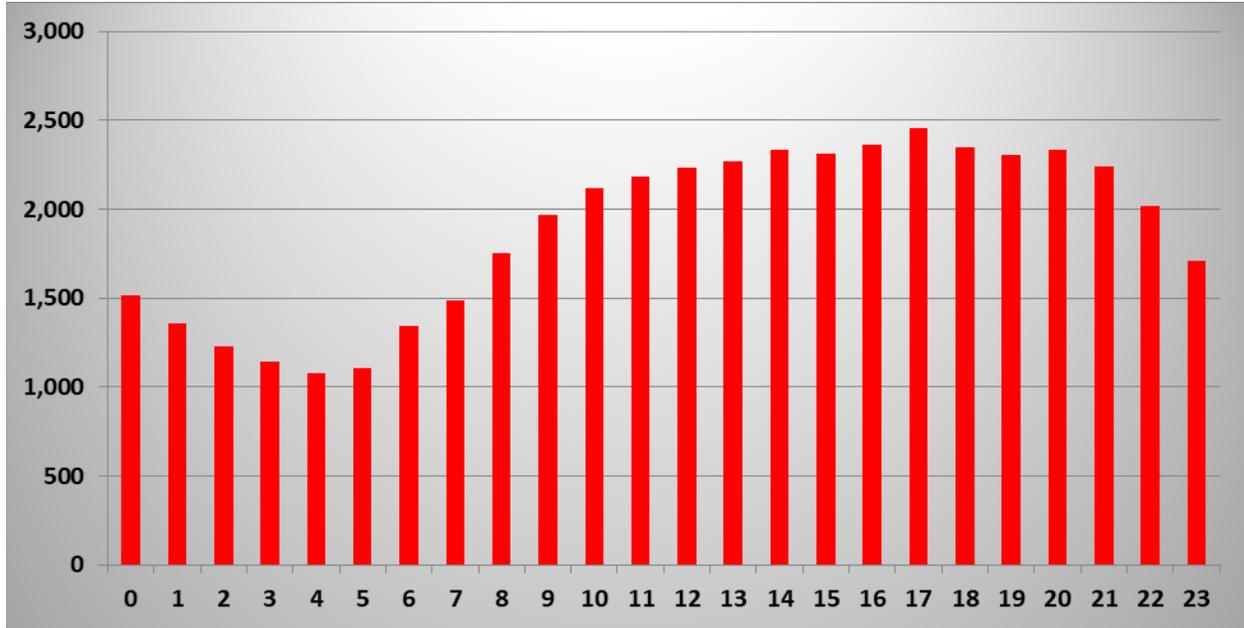
INCIDENT TYPE	Number of Incidents	Percentages
Fire	12,987	14%
Overpressure, Rupture, Explosion, Overheat (No Fire)	198	0.2%
Rescue & Emergency Medical Service Incident	47,928	53%
Hazardous Condition (No Fire)	1,913	2%
Service Call	3,377	4%
Good Intent Call	18,811	21%
False Alarm & False Call	5,213	6%
Severe Weather & Natural Disaster	7	0.008%
Special Incident Type	74	0.08%
<b>TOTALS</b>	<b>90,508</b>	<b>100%</b>

The figure below shows the average responses to emergency incidents per day in the City of Fresno (2020-2021):





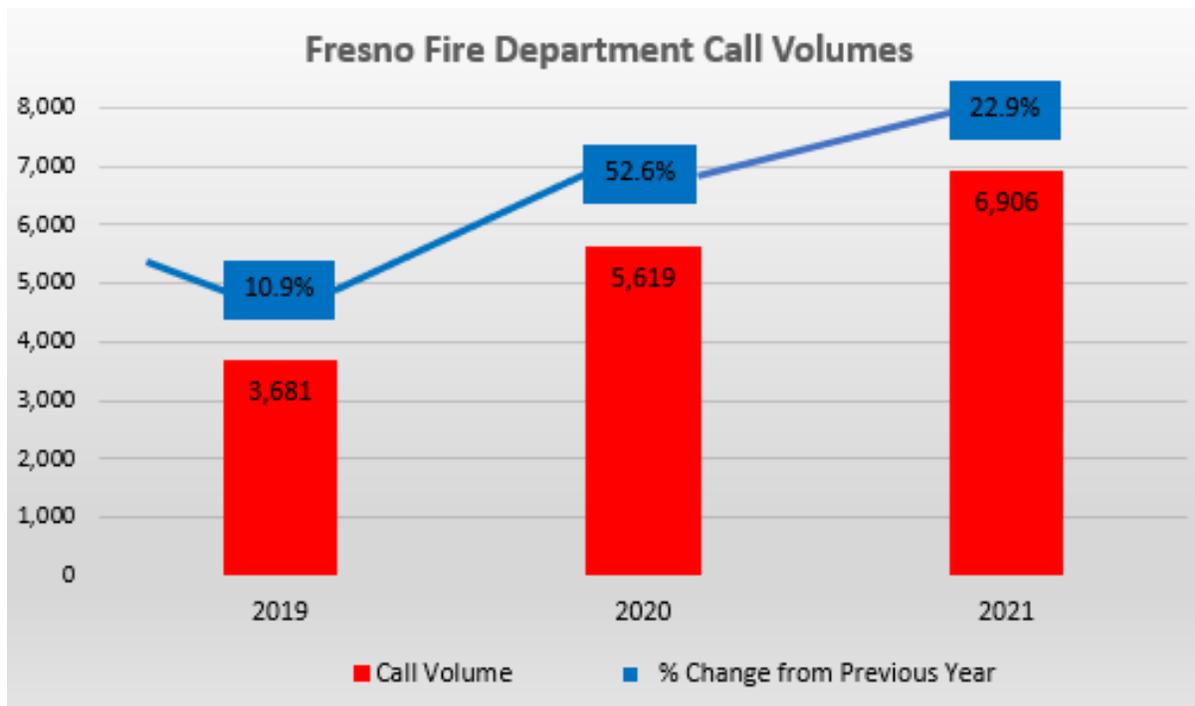
The figure below shows the average responses to emergency incidents by hour per day in the City of Fresno (2020-2021):





Fire departments across the Nation are continuing to deal with increased call volumes as the service demand for EMS calls continues to increase. Fresno has also seen an increase in EMS calls, along with significant increases in fire related incidents each year. In 2020, there was a 53% increase in fire related incidents or an increase of approximately 1,938 fire related incidents. In 2021, FFD experienced a 23% increase from the previous year after seeing an increase of 1,287 fire related incidents.

The chart below reflects these annual increases:



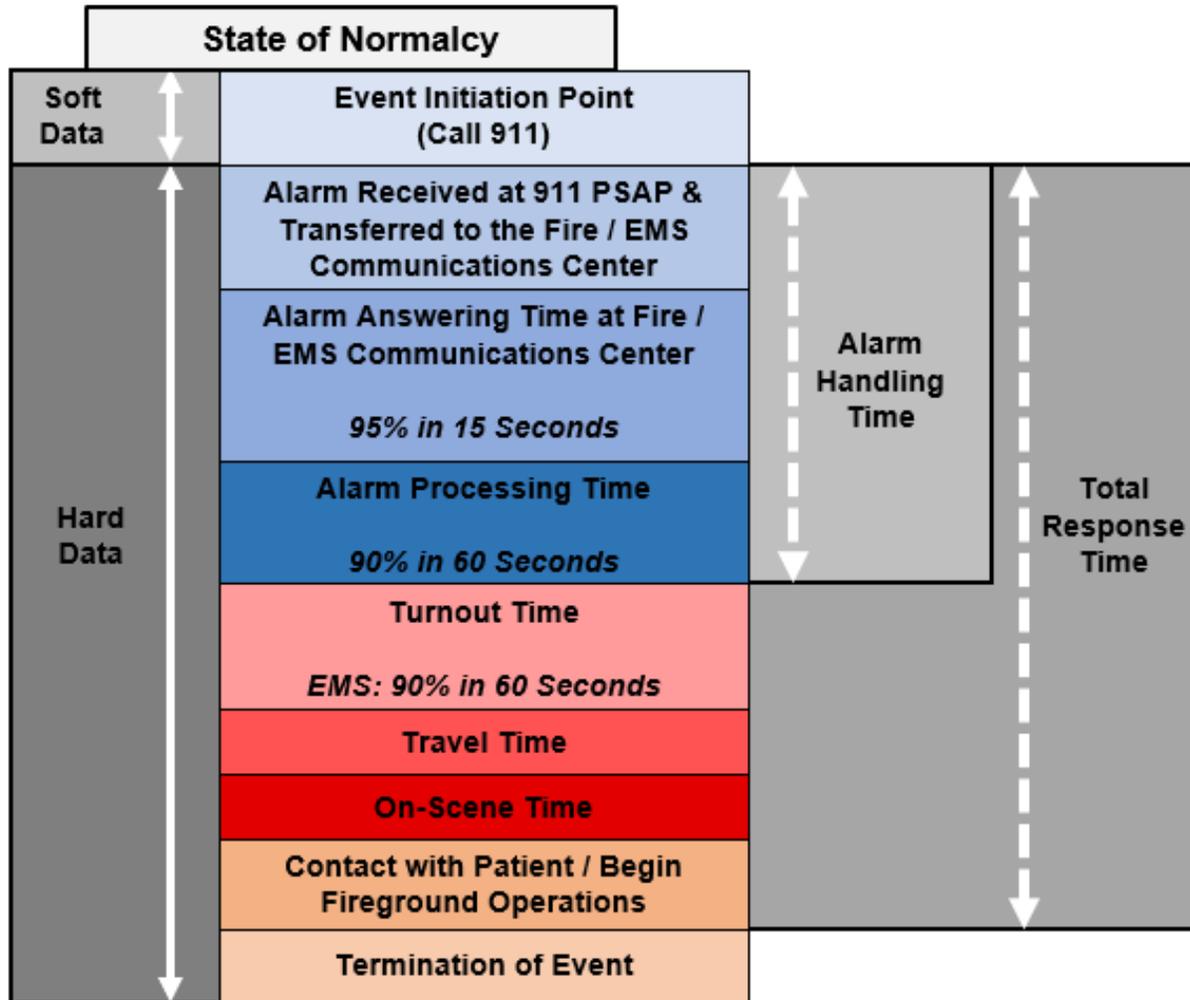
### Review of System Performance

The first step in determining the current state of the Fresno Fire Department's deployment model is to establish baseline measures of performance. This analysis is vital in looking at current practices and identifying opportunities for improvement. System performance analyzes the elements of response time and the cascade of events that lead to timely response in mitigating an event. Response time goals should be analyzed in terms of total response time, which includes dispatch or alarm processing time, turnout time, and travel time.



### Cascade of Events

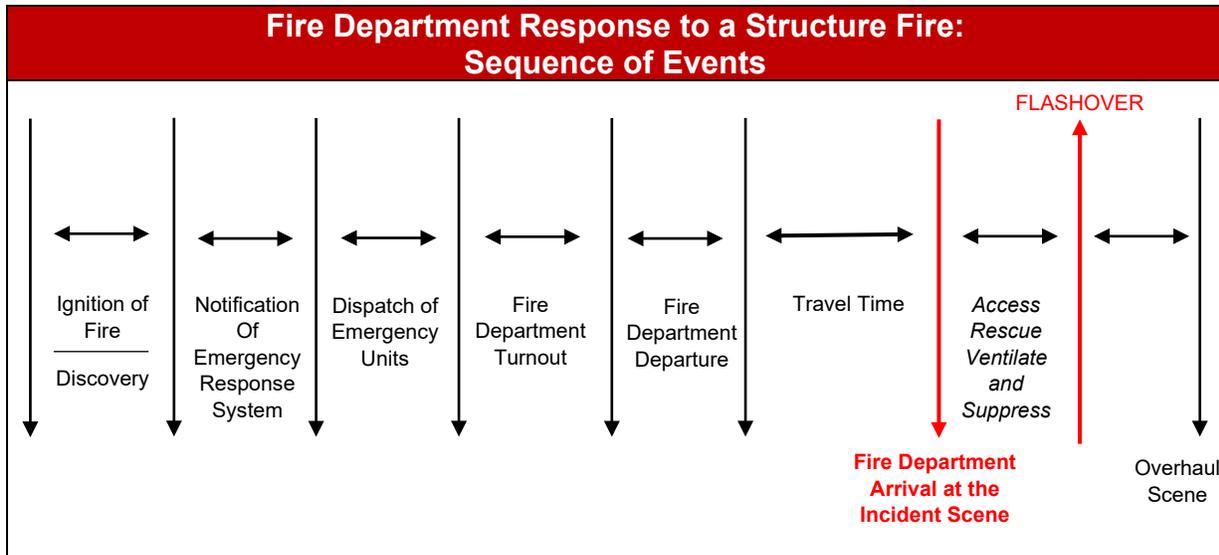
Each incident consists of a sequence of events that form critical elements of emergency operations concerning time and evaluation of the response system. The elements of time that are important to the ultimate outcome of a structure fire or emergency medical incident begin with the initiation of the event. It is important to consider specific industry research to target times for the various levels of risk for situations such as fire department arrival prior to flashover during a fire incident; successfully intervening in a cardiac arrest during an EMS incident; or providing timely rescue services at the scene of a complex and technical incident. These elements include call processing time, turnout time, travel time, and the time spent on-scene. This sequence of events is known as the “cascade of events” and can be found in the figure below:



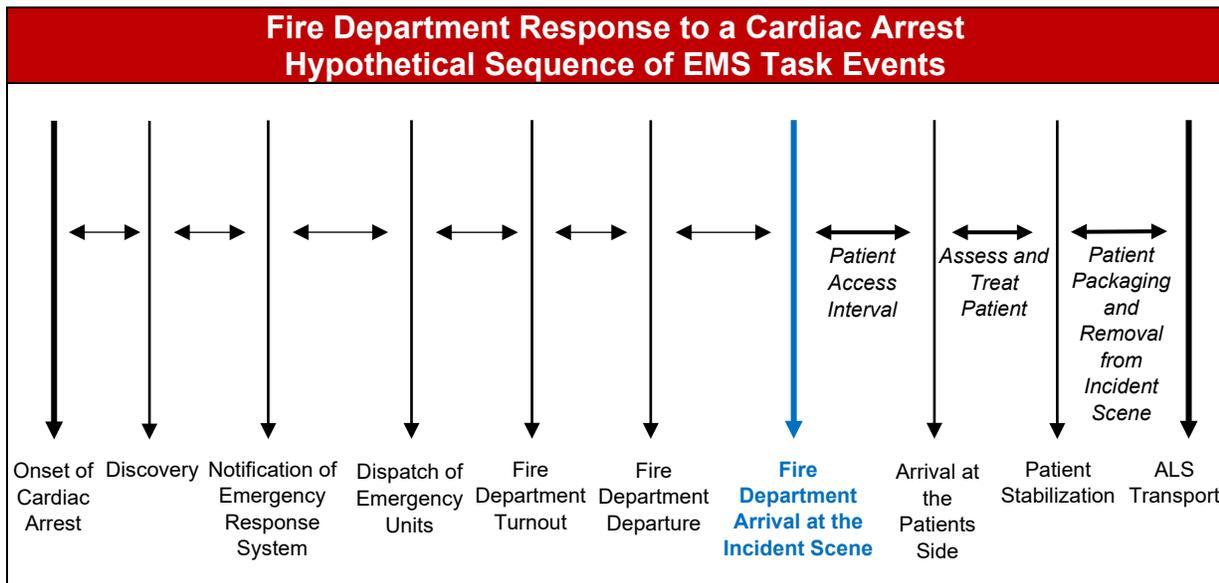
Response Service Level Objectives will be based on risk factors, which translate into distribution and concentration of resources.



The figure below demonstrates the sequence of events for a fire department response to a Structure Fire:



The figure below demonstrates the sequence of events for a fire department response to a Cardiac Arrest Event:





The response performance continuum is composed of the following:

**Event Initiation Point** - The point at which a human being or technologic sentinel (e.g., smoke alarm, infrared heat detector, accelerometer, gyroscope) becomes aware that conditions require activating the emergency response system. Precipitating factors can also occur, resulting in the activation of the emergency response system. Precipitating factors may occur seconds, minutes, hours, or even days before assistance is requested. An example is a patient who ignores chest discomfort for days until it reaches a critical point, at which time the individual seeks help.

**Alarm Received and Transmitted** - The point at which a call is received and answered at the 9-1-1 public-safety answering point (PSAP). The call is then transmitted to the communications dispatch center if the center is not co-located with the PSAP.

**Alarm Answering Time** - The point at which the alarm is transmitted from PSAP and answered at the Fire/EMS communications dispatch center.

**Alarm Processing Time** - A process by which an answered alarm at the communications center is broadcast to emergency response facilities (ERFs) or emergency response units (ERUs) in the field. This period begins with the initial reception of the alarm. This period ends with the dispatch of the responding personnel.

**Turnout Time** - Begins with the responding company's activation. It ends when the responding company designates en route (wheels moving), as noted by the mobile data terminal (MDT) or voice notification to dispatch.

**Travel Time** - Begins when the responding company signals the dispatch center that the apparatus is en route. It ends when the responding company arrives, as noted by the mobile data terminal or voice notification to dispatch.

**On-Scene Time** - Begins when the responding company arrives at a scene, as noted by the mobile data terminal or voice notification to dispatch. It ends when the responding company departs the scene, as noted by the mobile data terminal or voice notification to dispatch.

**Initiation of Action** - It begins when the responding company arrives at a scene and starts taking action to mitigate the event. These actions may include but are not limited to 360-degree size up, water supply, investigation, resource deployment, patient contact, patient intervention, or any combination of these actions.

**Termination of Incident** - It begins when the responding company signals the dispatch center that they have cleared from the incident and are available for another service request.



**Total Response Time** – The total time required to arrive on-scene beginning with the arrival of the alarm at the 9-1-1 PSAP to the time that the first to last units arrive on-scene.

### Fire Suppression Capabilities

Conditions vary widely at each fire. Some fires will be at an early (incipient) stage upon arrival, while others may have spread throughout an entire building. The variation in conditions complicates attempts to compare fire department capability accurately. A standard reference point is essential to make meaningful comparisons across similar conditions. Regarding fire suppression, service level objectives are intended to prevent the flashover point. Flashover is the point of a fire's growth when the fire begins to significantly impact life and property.

Fire suppression tasks required at a typical fire scene can vary significantly. Fire companies must arrive with adequate resources, in a short period of time, to save lives and limit property damage. Ensuring the arrival of resources within a specified time frame is the goal of developing a comprehensive Standards of Cover document. The figure below shows the temperature over time for fire and emergency medical service calls:

With the addition of 63 firefighters and the implementation of two person squads over the last year, the City of Fresno has demonstrated their commitment to increasing our fire suppression capabilities while improving the overall service delivery to the citizens of Fresno.





## The Stages of Fire Growth

Nearly all structure fires progress through a series of identifiable stages if they have the resources they need to burn.

**Stage 1: The Ignition (Incipient) Stage** – The incipient stage is when it is crucial to fight a fire because it is easiest to suppress during this stage, and it will cause the least amount of damage. The first stage begins when heat, oxygen, and a fuel source combine and have a chemical reaction that results in a fire.

**Stage 2: The Growth Stage** – With the initial flame as a heat source, additional fuel ignites. Convection and radiation ignite more surfaces. The size of the fire increases, and the plume reaches the ceiling. Hot gases collecting at the ceiling transfer heat, allowing all fuels in a room to come closer to their ignition temperature at the same time. Once a fire reaches this stage, it becomes harder to control. It is during this stage when a deadly “flashover” can occur potentially trapping, injuring, or killing firefighters or civilians.

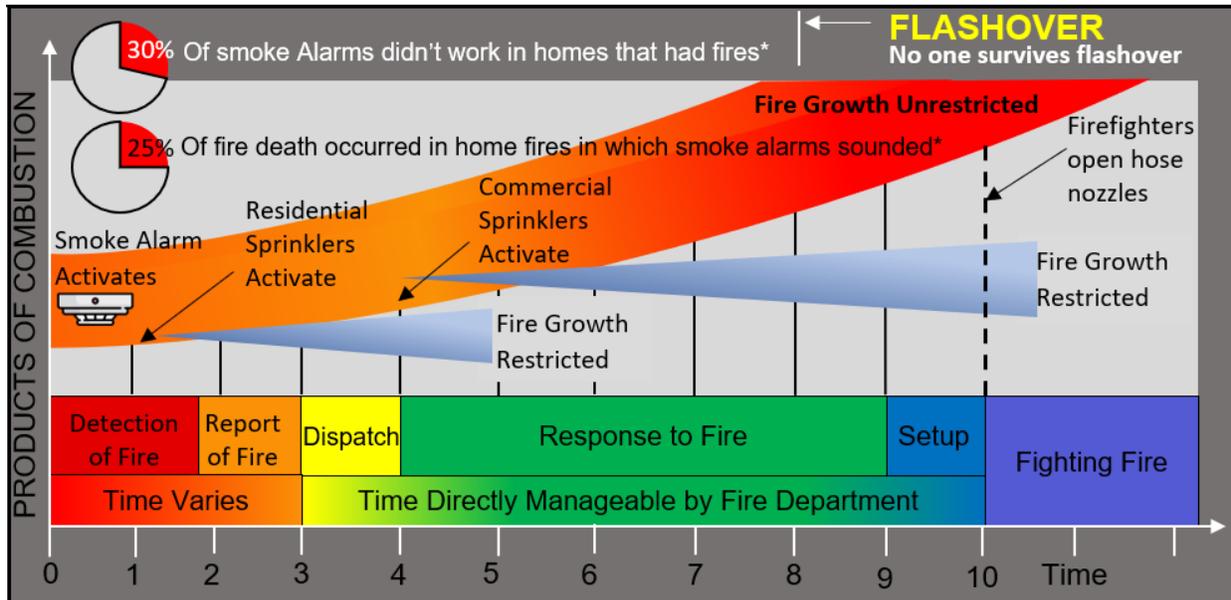
- Flashover is defined as the sudden, simultaneous ignition of everything in a room. When flashover occurs, it significantly impacts responders’ ability to suppress the fire and likely will require additional resources to control the fire. Human survival after this point is highly improbable without specialized protective equipment.

**Stage 3: The Fully Developed Stage** – During this phase, the fire has spread over most if not all of the available fuel. Temperatures reach their peak and oxygen is consumed rapidly. This is the hottest phase of a fire and the most dangerous for anyone trapped inside.

**Stage 4: Decay (Burnout) Stage** – This stage occurs after the fully developed flame starts to run out of fuel or oxygen. After all of the available fuel is consumed, temperatures will decrease, and the fire gets less intense.



The figure below demonstrates the time in minutes vs. products of combustion leading to flashover:



The number of times that fires are prevented from flashover is dependent upon the overall fire protection system and not solely upon emergency responders. Built-in fire protection, public education, extinguishment by civilians, and the type of fuel involved are all factors that determine if a fire will reach flashover.

Flashover is a critical stage of fire growth. It creates a tremendous increase in the rate of combustion, requiring a significant increase in the amount of water needed to reduce the burning material below its ignition temperature. Unfortunately, a fire that has reached the flashover stage often indicates that it is too late to save anyone in the room of origin. These incidents also require a greater number of firefighters to manage the increased number of hose streams needed for extinguishment. Post flashover fires burn hotter and move faster. These conditions compound the search and rescue problems in the remainder of the structure.

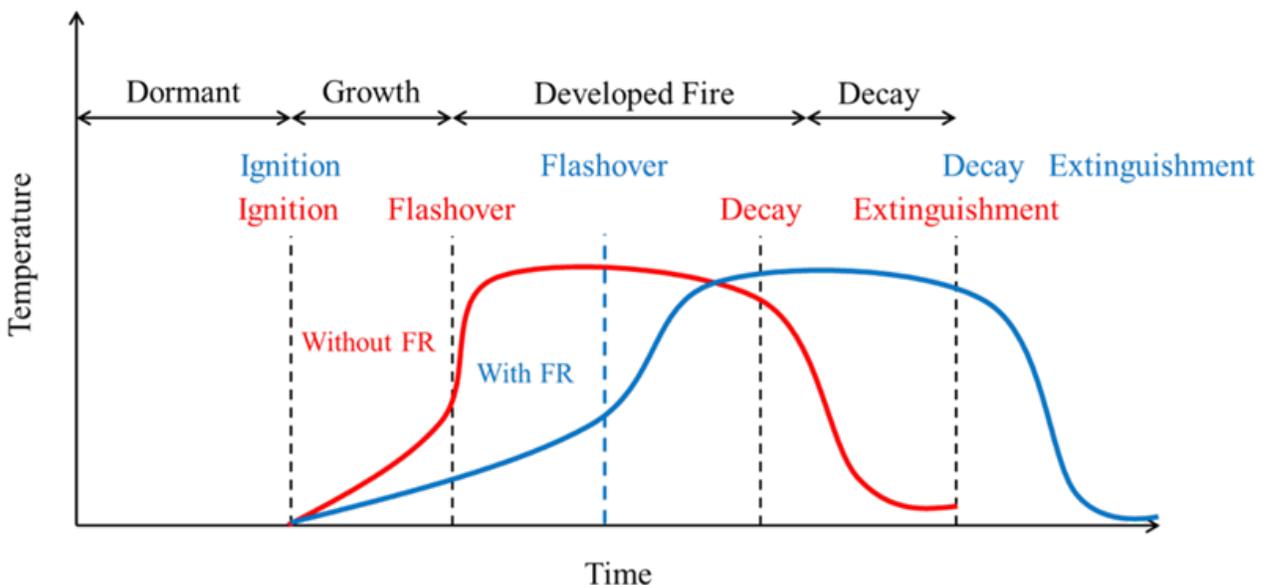


The image below demonstrates the significance of an incident both pre and post flashover:

Pre-Flashover	Post-Flashover
Limited to one room	May spread beyond one room
Requires smaller attack line	Requires larger, more attack lines
Search and rescue is easier	Compounds search and rescue
Initial assignment can handle	Requires additional companies

Fire resistance is also a critical component of the overall fire protection system. Fire resistance can be defined as the ability of building components and systems to perform their intended fire separating and/or loadbearing functions under fire exposure. These components have specified fire resistance ratings based on fire resistance tests. The image below demonstrates the stages of fire with and without fire resistance:

## STAGES OF A FIRE

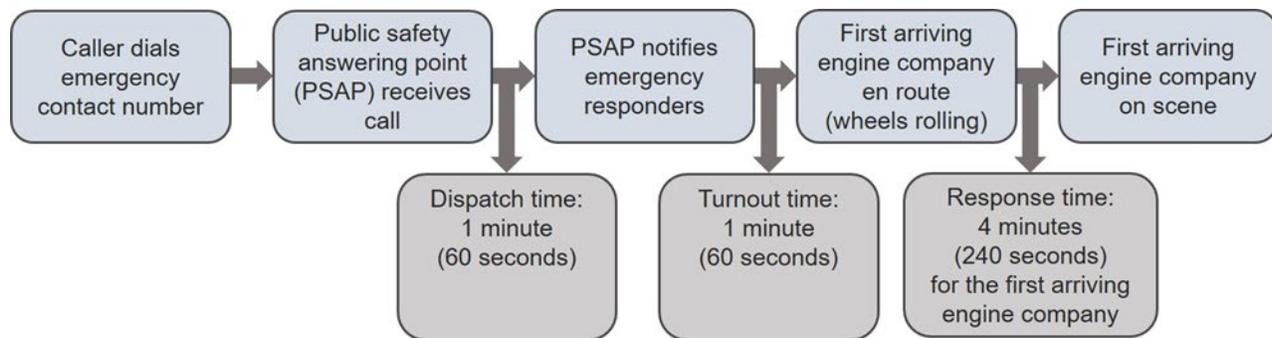




### The Origin and Development of the National Fire Protection Association (NFPA) Standard 1710

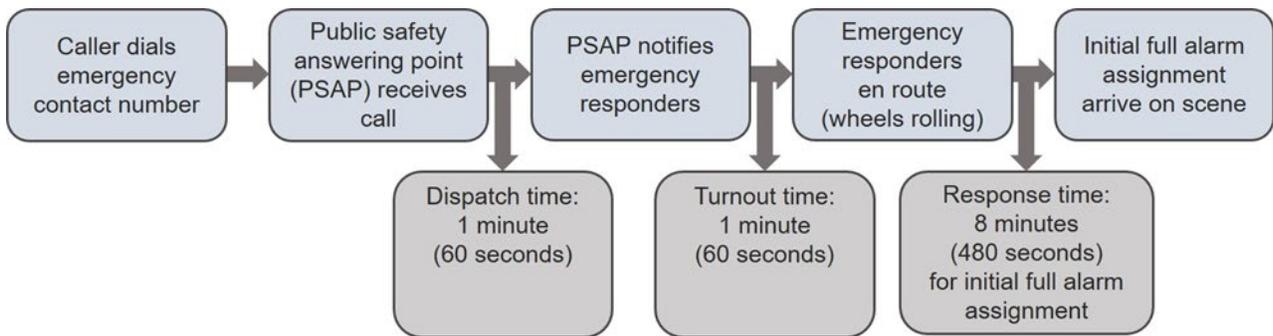
NFPA 1710 originated to specify the minimum criteria addressing the effectiveness and efficiency of the career public fire suppression operations, emergency medical service, and special operations delivery in protecting the citizens of the jurisdiction and fire department employees' occupational safety and health. The standard was released in 2001 with four revisions in 2004, 2010, 2016, and 2020. It resulted from a considerable amount of work over several years by the technical committee members appointed by NFPA, representing multiple fire departments and other governmental organizations. This effort was the first organized approach to developing a standard defining level of service, deployment capabilities, and staffing levels for those "substantially" career fire departments.

The committee used research work and empirical studies in North America as a basis for developing response times and resource capabilities for provided services, as identified by the fire service. NFPA 1710 provides the user with a template for creating an implementation plan incorporating the standard. The NFPA 1710 standard sets forth the recommended resource requirements for fires, emergencies, and other incidents in concise terms. The figure below shows the response time sequence of the first arriving engine company:

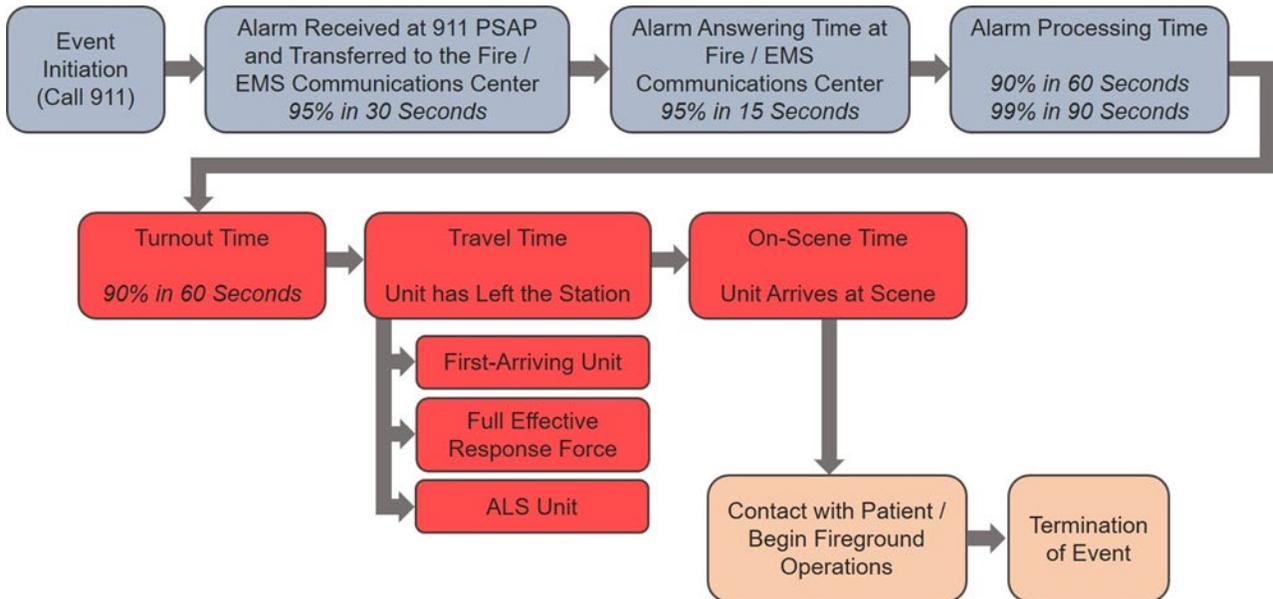




The figure below shows the response time sequence of the initial full alarm assignment:

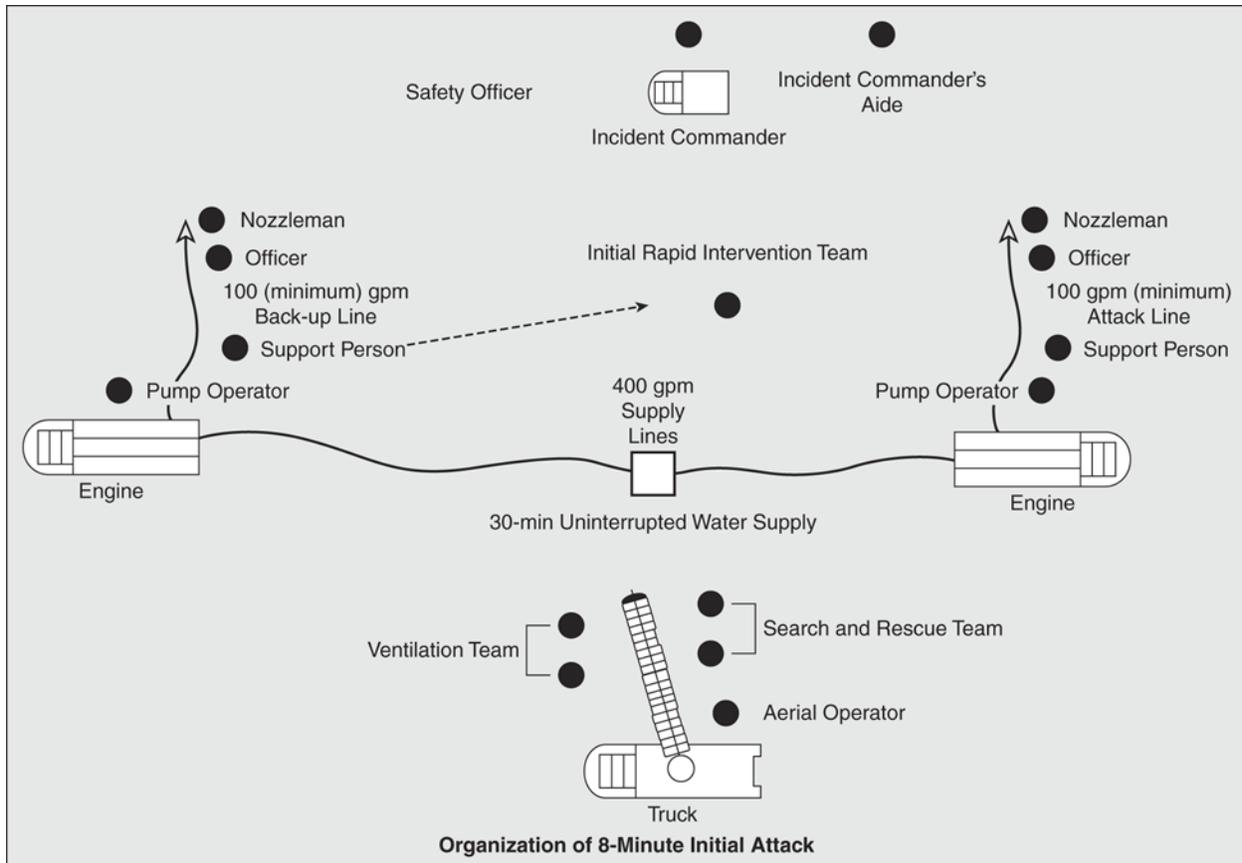


The figure below shows the response time sequence of the total response:





The figure below shows the organization of an 8-minute initial fire attack:





**Fresno Fire Department Service Level Goals**

The following service level objectives relate to the travel times of the initial response to an emergency. The objectives are aspirational and represent the benchmark the department is trying to achieve in each category. The figure below describes the fire service level goals:

<b>Fresno Fire Department Travel Time Service Level Benchmarks</b>		
	<b>First-Arriving Unit</b>	<b>Balance of First-Alarm Assignment or Specialized Units= Effective Firefighting Force (EFF)</b>
<b>Suppression</b>	<b>4 Minutes/90 Percent</b> Travel time of the first unit to an emergency once notified of the event to arrival at the incident.	<b>8 Minutes/90 Percent</b> Travel time of the balance of a first-alarm assignment (typically 3 engines, 2 trucks, and 1 Battalion Chief) to an emergency once notified of the event to arrival at the incident.
<b>EMS</b>	<b>4 Minutes/90 Percent</b> Travel time of the first unit to an emergency once notified of the event to arrival at the incident.	<b>8 Minutes/90 Percent</b> Travel time of the balance of a first-alarm assignment (typically a truck response in cases of patient extrication) to an emergency once notified of the event to arrival at the incident.
<b>Specialized Services</b>		
<b>Hazardous Materials</b>	<b>4 Minutes/90 Percent</b> Travel time of the first unit to an emergency once notified of the event to arrival at the incident. Initial companies provide first-responder operations and personnel are Level B qualified.	<b>12 Minutes/90 Percent</b> Travel time of the HazMat Team, which includes a fully equipped hazmat response vehicle and 7 qualified hazmat specialists.
<b>Urban Search and Rescue</b>	<b>4 Minutes/90 Percent</b> Travel time of the first unit to an emergency once notified of the event to arrival at the incident. Initial companies provide to USAR incidents and are qualified to the RS1 level.	<b>12 Minutes/90 Percent</b> Travel time of the USAR Team to arrive with 6 personnel trained to the technician level in high angle, structural collapse and search disciplines with the appropriate equipment and apparatus.
<b>Water Rescue</b>	<b>4 Minutes/90 Percent</b> Travel time of the first unit to an emergency once notified of the event to arrival at the incident. Initial response companies provide response to Water Rescue incidents and are qualified to the Swift Water First Responder Operational level.	<b>12 Minutes/90 Percent</b> Travel time of the Water Rescue Team to arrive with 4 personnel trained to the technician level for both surface and sub-surface rescue operations with the appropriate equipment and apparatus.
<b>Aircraft Rescue Firefighting (ARFF)</b>	<b>3 Minutes/100 Percent</b> Within 3 minutes from the time of the alarm, at least 1 required aircraft rescue and firefighting vehicle must reach the midpoint of the furthest runway serving air carrier aircraft from its assigned post or reach any other specified point of comparable distance on the movement area that is available to air carriers and begin application of extinguishing agent.	<b>4 Minutes/90 Percent</b> Within 4 minutes from the time of alarm, all other required vehicles must reach the point from their assigned posts and begin application of an extinguishing agent.  <b>8 Minutes/90 Percent</b> Travel time to an in-flight emergency for off-site resources is 2 engines, 1 truck, and 1 Battalion Chief.



Additionally, the Department tracks performance measures identified in both the CFAI process and NFPA 1710.

### **Alarm Processing Time**

The alarm processing time begins with the first ring of the 9-1-1 telephone at the dispatch center, and the computer-aided (CAD) operator activates station or company alerting devices. The process ends with the appropriate dispatch of apparatus and personnel. The department benchmark is 60 seconds.

### **Turnout Time**

Turnout time begins with the activation of station or company alerting devices and the point the apparatus is starting to roll toward the call with all personnel. Time stamps from the mobile data terminal or verbal notification to dispatch that the company responded document this measure's endpoint. During the reflex interval, measured as the time between pre-alarm and actual alarm, crews cease all other activities, don the appropriate protective clothing, determine the call's location, and board to start the fire apparatus in motion. The benchmark is 60 seconds between 0700-2159 and 90 seconds between 2200-0659.

### **Travel Time**

Travel time begins when the responding apparatus signals verbally or through the mobile data terminal to the dispatch center that they are responding to the alarm. It ends when the responding unit notifies either the dispatcher verbally or through the mobile data terminal that it has arrived on-scene.

### **Total Response Time**

The total time required to arrive on-scene beginning with the arrival of the alarm at the 9-1-1 PSAP to the time that the first to last units arrive on-scene.



The targeted service level benchmarks are based on industry standards and best practices. The following charts show the departments turnout, travel, and total response time over a 6-year period:

Turnout Standard - Fire 80 Seconds	90th Percentile (In Seconds)
2017	102
2018	101
2019	105
2020	105
2021	104
2022	95

Travel Standard - Fire 240 Seconds	90th Percentile (In Seconds)
2017	369
2018	353
2019	351
2020	342
2021	343
2022	318

Total Response Time Standard – Fire 320 Seconds	90th Percentile (In Seconds)
2017	440
2018	420
2019	423
2020	414
2021	412
2022	383

**Effective Response Force Capabilities**

The definition of an effective response force (ERF) is the minimum amount of staffing and equipment that must reach a specific emergency zone location within a maximum prescribed total response time and is capable of initial fire suppression, EMS and/or mitigation. The capability of an ERF to assemble in a timely manner with the appropriate personnel, apparatus, and equipment is important to the success of a significant fire event.



Several factors affect the capabilities of assembling an ERF such as the number of fire stations, number of apparatus and number of personnel on each apparatus. While each jurisdiction experiences different hazards and associated risks, the ERF is the result of the critical tasking analysis conducted as part of a community risk assessment.

### Critical Firefighting Tasks

Critical task time measures what must be done over what time frame to achieve a desired outcome. The combination of property and life risk determines the tasks that must be accomplished during an emergency to minimize loss. These interrelated factors can be factored into two distinct types: fire and life safety. Fire tasks are related to fire suppression operations while life safety tasks are related to locating injured/ill persons and providing definitive emergency medical care or finding trapped victims and removing them from the building. Fire flow is defined as the minimum flow of water required for fighting a fire at a specific building, development, or within a specific area. Fire flow is important for emergency response as it is the total capacity of the system that the fire department has available for use in response to a fire. The required fire flow is based on the following building components:

- Size
- Structural material
- Distance from other buildings
- Horizontal and vertical openness
- Contents
- Type
- Density
- Potential energy

Life-safety tasks are based upon the number of patients found at an emergency medical incident or those involved during a fire situation. The key to the fire department's success at an emergency incident is coordinated teamwork, regardless of the critical tasks to be performed. The variety of fireground factors, including the building and occupancy type as well as the size and intensity of the fire and life hazards, determine the tasks required to deal with the incident and the level of risk that will be taken in completing those tasks.

The FFD's risk management policy has established the following guidelines to provide direction to responding personnel when evaluating on-scene conditions and how to respond to those conditions. The FFD expects all members to make operational decisions consistent with the following FFD Risk Management Principles:

- **RISK A LOT TO SAVE A LIFE:** Firefighters may accept significant risk of injury or death ONLY when protecting savable human life.



- **RISK A LITTLE TO SAVE PROPERTY:** Reduced levels of risk to firefighters are acceptable when protecting savable property, ONLY after a balanced evaluation of hazards, AND appropriate control measures are established.
- **RISK NOTHING WHEN NOTHING CAN BE SAVED:** No risk to the safety of firefighters will be acceptable if no reasonable probability exists to save lives or property.

Critical tasks are those tasks that must be conducted in a timely manner by firefighters to effectively manage an emergency incident. NFPA 1710 outlines critical tasks that must be completed by an initial response to a structure fire. The goal of any fire agency is to control the fire before it reaches the flashover stage. Critical tasks that must be accomplished by the ERF at a structure fire can be found on the following pages. While these tasks may be performed sequentially or concurrently, the key to success is a rapid response, efficient fire scene deployment, as well as adequate staffing and coordinated efforts at the event.

When identifying critical tasks, we are assuming interior firefighting operations are necessary and require the use of protective equipment, which includes personal protective clothing, self-contained breathing apparatus (SCBA), and a minimum of a 1¾" hose line. There are several other tasks that must be performed prior to termination of the incident such as salvage, overhaul, and fire investigation. Additional personnel may be requested to achieve these tasks, thus increasing the number of personnel at scene.

Below are definitions of critical tasks that are to be performed at the scene of a structure fire:

**Fire Attack** – A medium sized hose that produces 100+ gpm and is handled by a minimum of two firefighters or a larger hose that produces 200+ gpm and is handled by three or more firefighters.

**Rapid Intervention Crew (RIC)** – This task involves the staging of firefighters in a position of readiness should they need to enter the structure and perform a firefighter rescue should something go wrong.

**Search and Rescue** – This task involves assigning personnel to search for living victims and their removal from danger while the fire attack crew moves between the victims and the fire to stop the fire spread. Crew size can vary based upon size of the structure, but more crews are required in multi-story buildings or structures with people who are not capable of self-evacuation.



**Ventilation** – This task involves personnel opening a vertical or horizontal channel when the attack crew is ready to enter the building. Size of the structure and complexity of the incident will determine how many personnel will be required to complete this task effectively. Ventilation removes superheated gases and obscuring smoke, preventing flashover, and increasing visibility for interior fire attack crews.

**Back-Up Line** – This task involves personnel deploying a back-up hose line to protect the fire attack crew should there be an increase in fire intensity, or a problem develops with the initial fire attack hose line.

**Safety Officer** – This is an officer assigned to ensure that fire department personnel on scene are following department policies and procedures while ensuring overall fireground safety.

**Pump Operator** – One firefighter assigned to deliver water under the right pressure to the various hose lines in use (attack, backup, and exposure lines) and monitor the pressure changes caused by the changing flows on each hose line. The pump operator also completes the hose hookups to the correct discharges and completes the water supply hookup to the correct intake. If hydrant location allows, the pump operator may also connect the supply line to the hydrant without assistance. However, more distant hydrant locations will require the use of additional personnel to complete the supply line connection.

**Aerial Operator** – This task involves positioning the aerial ladder for aboveground rescues, roof access, and elevate master streams for firefighting operations. The aerial operator is responsible for operating the ladder within its safety parameters to prevent overloading the device or injuries to firefighters or civilians.

**Water Supply** – This task requires personnel to extend the large diameter hose line from a fire apparatus to the nearest fire hydrant.

**Command Officer** – The successful mitigation of any emergency incident requires the implementation of an effective command structure. This task is an officer assigned to remain outside of the structure to coordinate the fire attack, evaluate results, request additional resources, and monitor fire conditions that might jeopardize firefighter safety.



Evaluating critical tasks that need to be accomplished depending upon the risk involved determines the appropriate level of resources necessary to simultaneously handle the tasks of fire attack, search and rescue, backup lines, pump operation, water supply and command, all within eight minutes after arrival of the first-due unit. If fewer firefighters and equipment are available, or if they have longer travel distances, then the department will not be able to accomplish an objective such as confining a fire near or to the area of origin.

The figure below shows the minimum tasks necessary at a 2,000 square foot residential structure fire:

<b>Minimum Tasks Necessary at a 2,000 Square-Foot Residential Structure Fire</b>		
<b>Task</b>	<b>Number Firefighters</b>	<b>Company Assigned</b>
Attack Line	2	1st Engine
Rapid Intervention Team	2	Truck/Engine
Search and Rescue	2	Truck
Ventilation	2	Truck
Back-up Line	2	2nd Engine
Safety Officer	1	Assigned
Pump Operator	1	1st Engine
Aerial Operator (Optional Depending on the Incident)	1	Assigned
Water Supply	1	2nd Engine/WT
Command Officer	1	Battalion Chief
Command Aid (Optional Depending on the Incident)	1	Assigned
<b>Total Personnel</b>	<b>14 - 16</b>	



Low hazard/risk occupancies are those with a history of low frequency of fires and minimal potential for loss of life or economic loss. The figure below shows the minimum tasks necessary at a low hazard occupancy:

<b>Low-Hazard Occupancies</b>		
<b>One-, two-, or three-family dwellings and scattered small businesses and industrial occupancies</b>		
<b>Task</b>	<b>Number Firefighters</b>	<b>Company Assigned</b>
Attack Line	2	1st Engine
Rapid Intervention Team	2	Truck/Engine
Search and Rescue	2	Truck
Ventilation	2	Truck
Back-up Line	2	2nd Engine
Safety Officer	1	Assigned
Pump Operator	1	1st Engine
Aerial Operator (Optional Depending on the Incident)	1	Assigned
Water Supply	1	2nd Engine/WT
Command Officer	1	Battalion Chief
Command Aid (Optional depending on the incident)	1	Assigned
Investigator	1	
<b>Total Personnel</b>	<b>15 - 17</b>	



Moderate (medium) hazard/risk occupancies are those with a history of moderate frequency of fires and moderate potential for loss of life or economic loss. The figure below shows the minimum tasks necessary at a moderate hazard occupancy:

<b>Medium-Hazard Occupancies</b>		
<b>Apartments, offices, mercantile, and industrial occupancies not normally requiring extensive rescue or firefighting forces</b>		
<b>Task</b>	<b>Number Firefighters</b>	<b>Company Assigned</b>
Attack Line	4	1st Engine
Rapid Intervention Team	2	Truck/Engine
Search and Rescue	2	Truck
Ventilation	2	Truck
Back-up Line	4	2nd/3rd Engine
Safety Officer	1	Assigned
Pump Operator	2	1st/2nd Engine
Aerial Operator (Optional depending on the incident)	1	Assigned
Water Supply	1	4th Engine
Command Officer	1	Battalion Chief
Command Aid (Optional depending on the incident)	1	Assigned
Investigator	1	
<b>Total Personnel</b>	<b>22</b>	



High hazard/risk occupancies are those that have a history of high fire frequency, high potential for loss of life or economic loss, or that has a low or moderate history of fires or loss of life, but the occupants have a high dependency on the built-in fire protection features or staff to assist in evacuation during a fire or other emergency. The figure below shows the high-hazard occupancies:

<b>High-Hazard Occupancies</b>		
<b>Schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings, and other high-life hazard or large fire potential occupancies</b>		
<b>Task</b>	<b>Number Firefighters</b>	<b>Company Assigned</b>
Attack Line	2	1st Engine
Rapid Intervention Team	2	2nd Engine
Search and Rescue	2	Truck
Ventilation	4	Truck
Back-up Line	2	2nd Engine
Safety Officer	1	Assigned
Pump Operator	1	1st Engine
Aerial Operator (Optional depending on the incident)	1	Assigned
Water Supply	1	4th Engine
Command Officer	1	Battalion Chief
Command Aid/PIO Liaison (Optional depending on the incident)	2	Assigned
Staging Officer	1	3rd Engine
Lobby Control	1	3rd Engine
Base	1	5th Engine
Stairwell Support	1	5th Engine
Investigators	1	
<b>Total Personnel</b>	<b>21 - 24</b>	



## **Defining Building Risk**

The fire service delivery model works as a system of fire stations and units. This system is broken down into first in areas of responsibility defined by each station district. The station district is the first-in area of responsibility for each fire station. These districts form multiple-fire demand zones. Those zones are mapped, with the district being further split into smaller response zones. When a service request is received through the 9-1-1 system, the Fire Communication Center (FCC) verifies the call location. The computer-aided dispatch (CAD) system then identifies the required resources to send. The CAD system takes into consideration special hazards, routine risks, and isolated risks.

Once the call type is determined, the correct type of predetermined response is dispatched. For example, a residential structure (low-hazard occupancy) will receive three engines (9-12 personnel), two trucks (6-8 personnel), an investigator (1 personnel), a safety officer (1 personnel) and one battalion chief (1 personnel). An apartment building (medium-hazard occupancy) will receive five engines (15-20 personnel), two trucks (6-8 personnel), an investigator (1 personnel), a safety officer (1 personnel) and two battalion chiefs (2 personnel). The CAD system allows the call taker to dispatch a predetermined fire alarm assignment quickly to the emergency.

The FFD has identified risk hazards for each occupancy type within Fresno, the Fresno County contract area, and Fig Garden Fire Protection District. All operations emergency response units utilize mobile data terminals (MDTs) containing computer-aided dispatch premise information for all identified occupancies. Each fire company is required to produce a pre-fire plan for risks that pose a high life hazard, high property loss, conflagration hazard, contain hazardous materials, or have frequent fire occurrence. Hard copies of pre-fire plan maps for the first-in district are onboard each emergency response apparatus. Risks classifications are defined below:

- High-Hazard Occupancies
- Medium-Hazard Occupancies
- Low-Hazard Occupancies
- Rural-Operation Occupancies



**High-Hazard Occupancies:** Schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings, and other high-life hazard or large fire potential occupancies. They frequently indicate a fire agency's need for multiple alarm capability and the ability to concentrate adequate resources to control loss when a fire occurs.

**Medium-Hazard Occupancies:** Apartments, offices, mercantile, and industrial occupancies not usually requiring extensive rescue or firefighting forces.

**Low-Hazard Occupancies:** One-, two-, or three-family dwellings, scattered small businesses, and industrial occupancies.

It should be noted 72% of all fire deaths occur in residential dwellings. Even though significant property loss is usually low, the potential for life loss is high.

**Remote/Isolated Rural Risks:** Small commercial structures remote from other buildings, such as detached residential garages and outbuildings. Areas may be classified as remote/isolated rural risks if they are separated from any population centers and contain few buildings—for example, rural land with no occupied structures or recreational areas. In addition, topographic and geological conditions may increase a rural area to a risk level that requires more comprehensive management. Those conditions may consist of wildland cover or exposure to the wildland-urban interface.



### Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. The City works with owners and operators of critical facilities to ensure they can provide alternate sources of electricity, water, and sewerage in the event that regular utilities are interrupted in a disaster. An inventory of critical of facilities in the City of Fresno provided through Fresno County GIS can be found below:

Critical Facility Type	Number
Airport	3
Behavioral Health	4
Cal ARP	28
Colleges and Universities	14
Communications	1
County Government	4
Courthouse	1
Daycare	155
Department of Agriculture	2
Department of Public Health	4
Department of Public Works	1
Department of Social Services	9
Detention Center	4
District Attorney	2
Fire Station	21
General Services	3
Health Care	12
Nursing Home	27
Police	10
School	183
Sheriff	3
Supplemental College	4
Urgent Care	4
Total	499



**Natural Hazards Risk Assessment**

The purpose of the natural hazards risk assessment is to as accurately as possible describe the impact of priority natural hazards (mentioned below) on the City of Fresno and it’s SOI. The results of the assessment are intended to be used to identify assets at risk by the related jurisdiction where possible, to further define populations, buildings, and infrastructure at risk to natural hazards.

The below table is the City of Fresno’s natural risk profiles:

Hazard	Geographic Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
<b>Agricultural Hazards</b>	Limited	Highly Likely	Critical	Low
<b>Avalanche</b>	N/A	N/A	N/A	N/A
<b>Dam Failure</b>	Significant	Unlikely	Limited	Medium
<b>Drought</b>	Significant	Likely	Critical	High
<b>Earthquake</b>	Extensive	Occasional	Critical	Medium
<b>Flood/Levee Failure</b>	Significant	Occasional	Critical	High
<b>Hazardous Materials Incident</b>	Significant	Likely	Critical	High
<b>Human Health Hazards</b>				
• Epidemic/Pandemic	Extensive	Occasional	Critical	Medium
• West Nile Virus	Limited	Highly Likely	Negligible	Low
• Landslide	Limited	Unlikely	Negligible	Low
<b>Severe Weather:</b>				
• Extreme Cold/Freeze	Significant	Occasional	Negligible	Low
• Extreme Heat	Extensive	Highly Likely	Limited	Medium
• Fog	Extensive	Likely	Limited	Medium
• Heavy Rain, Thunderstorm, Hail, Lightning	Extensive	Highly Likely	Limited	Low
• Tornado	Extensive	Occasional	Negligible	Low
• Windstorm	Extensive	Highly Likely	Negligible	Medium
• Winter Storm	Extensive	Highly Likely	Negligible	Low
<b>Soil Hazards:</b>				
• Erosion	No Data	Likely	No Data	Low
• Expansive Soils	No Data	Occasional	No Data	Low
• Land Subsidence	Limited	Occasional	No Data	Low
<b>Volcano</b>	Extensive	Unlikely	Negligible	Low
<b>Wildfire</b>	Extensive	Highly Likely	Critical	Medium



### Guidelines for Natural Risk Rankings

For the purposes of assessing natural risks rankings the Department defines in qualitative terms the potential impacts of possible natural risks based on the historical occurrences, geography, damage severity and potential for casualty significance. The table below describes the implications of each factor:

<b>Geographic Extent:</b>	<b>Prob of Occurrence:</b>	<b>Magnitude/Severity:</b>	<b>Significance:</b>
Limited: Less than 10% of planning area	Highly Likely: Near 100% chance of occurrence in next year, happens every year	Catastrophic: More than 50% of property severely damaged; shutdown of facilities for more than 30 days; and/or multiple deaths	Low: Minimal potential impact
Significant: 10-50% of planning area	Likely: Between 10 and 100% chance of occurrence in next year, has a recurrence interval of 10 years or less	Critical: 25-50% of property severely damaged, shutdown of facilities for at least two weeks; and/or injuries/illnesses result in permanent disability	Medium: Moderate potential impact
Extensive: 50-100% of planning area	Occasional: Between 1 and 10% chance of occurrence in next year, has a recurrence interval of 11 to 100 years	Limited: 10-25% of property severely damaged; shutdown of facilities for more than a week; and/or injuries/illnesses treatable do not result in permanent disability	High: Widespread potential impact
	Unlikely: Less than 1% chance of occurrence in next 100 years, has a recurrence interval of greater than every 100 years	Negligible: Less than 10% of property severely damaged; shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid	



## EMS Risk Assessment

NFPA 1710 recognizes three levels of Emergency Medical Service (EMS) delivery within the standard.

1. First Responder with AED
2. Basic Life Support (BLS)
3. Advanced Life Support (ALS)

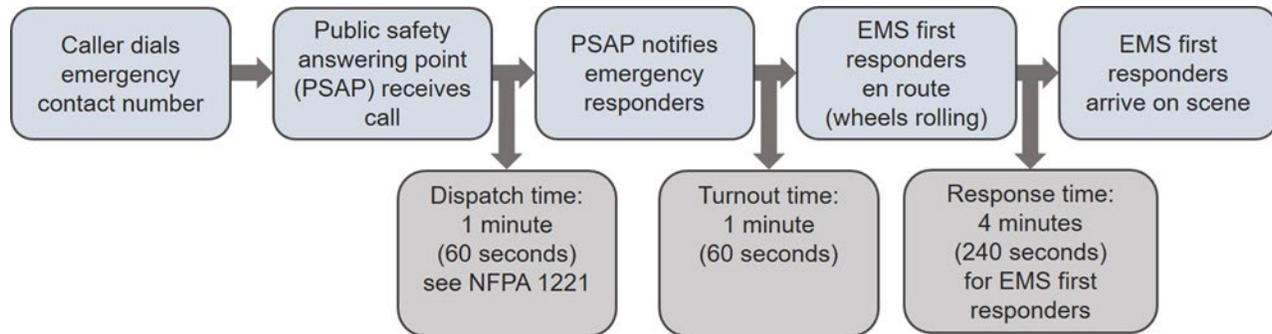
The standard also recognizes EMS transport as a service that the fire department may provide. Therefore, a fire department is not required to deliver other EMS service levels beyond a first responder with AED. However, the standard establishes operational requirements for each level provided by a department. For each level, the operational requirements are:

- a) **First Responder (AED)** — A fire department must appropriately train all response personnel at the first responder level capable of operating an AED. Personnel must arrive within a four-minute travel response timeframe to 90 percent of all emergency medical incidents. The number of personnel must be sufficient to ensure adequate care capability and member safety.
- b) **Basic Life Support** — A fire department providing BLS beyond the first responder level shall adhere to the state or provincial licensing agency's staffing and training requirements. The department must also deploy sufficient mobile resources to arrive within a four-minute travel response timeframe for 90 percent of all incidents.
- c) **Advanced Life Support** — A fire department that provides ALS beyond the first responder and BLS levels shall adhere to state or provincial licensing agency's staffing and training requirements. The department also must deploy sufficient mobile resources to arrive within an eight-minute travel response timeframe for 90 percent of all incidents.

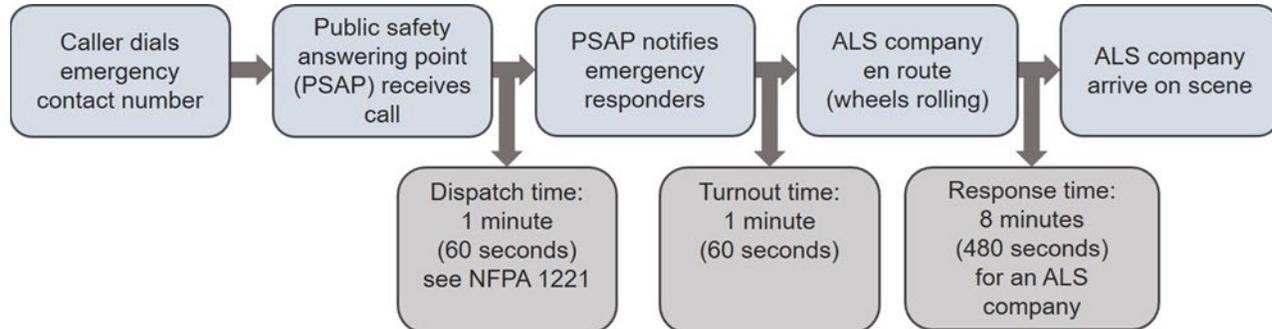


NFPA 1710 standard states explicitly that staffing and training requirements for both BLS and ALS transport units are to be determined by the state or provincial agency responsible for providing EMS licensing.

The figure below shows the response time sequence of an EMS first responder (with an AED):



The figure below shows the response time sequence for an ALS company:



The FFD provides BLS emergency medical services with automated external defibrillator (AED) capabilities. All FFD members are Emergency Medical Technician (EMT) certified providing first responder service from 21 fire stations throughout the City of Fresno. Fresno County Emergency Medical Service Agency provides BLS, Advanced Life Support (ALS), and ambulance transportation services through an exclusive contract with American Ambulance. The City's 9-1-1 primary Public Safety Answering Point obtains basic medical information and routes the call to Fresno County EMS Communications Center for fire response and ambulance dispatching. The FFD responds to nearly all priority one EMS incidents in the City of Fresno.



Over 53% of the FFD's call volume, over a 2-year period (2020-2021) were generated from EMS related incidents. Due to the distribution of our fire stations throughout the City of Fresno, FFD is often the first responder on scene during an EMS incident. FFD's service level goal for an EMS incident is to have the first arriving unit on scene within four minutes of receiving the initial alarm. During a cardiac arrest event, brain damage is highly likely after six minutes without oxygen. Additionally, survivability dramatically decreases beyond four minutes without appropriate intervention.

During cardiac arrest, the heart beats chaotically (fibrillation) and cannot pump blood efficiently. Time is critical. If a normal heart rhythm is not restored within minutes, the chance for survivability is extremely low. For every minute without defibrillation, the odds of survival drop by 7 to 10%. Cardiac arrest victims not defibrillated within 8-10 minutes will have virtually no chance of survival. Some of the most critical links in the chain of survival for a cardiac arrest patient are early CPR and early defibrillation.

The shortest possible response times create the highest probabilities of successful resuscitation. Another consideration that is often overlooked is the time that it takes fire crews to reach the patient. The response time clock will stop when an apparatus arrives at the scene of the dispatched address, but it often takes a little more time to locate the patient before medical intervention takes place. In high-risk occupancies or larger buildings, the amount of time it takes to locate a patient after arriving at scene can be substantial, further delaying medical intervention.

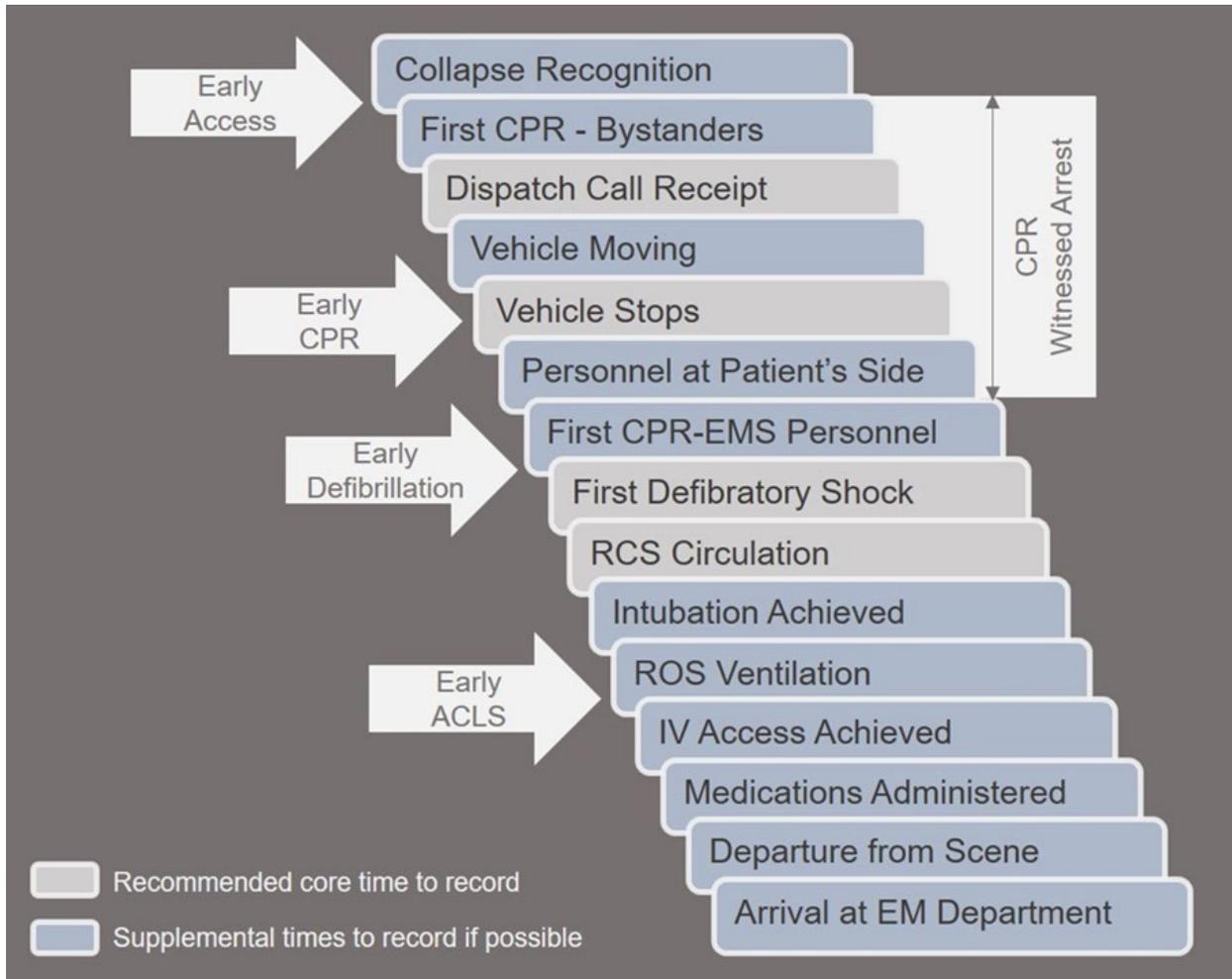


The figure below defines the critical tasks necessary for a cardiac arrest event with 3 personnel and an ALS ambulance:

Critical Task		Personnel Required
1	Chest Compressions	1 - 2
2	Ventilate / Oxygen	1 - 2
3	Airway Control	1 - 2
4	Defibrillate	1 - 2
5	Establish I.V.	1 - 2
6	Control Hemorrhage	1 - 2
7	Splint Fractures	2 - 3
8	Interpret ECG	2
9	Administer Medications	2
10	Spinal Immobilization	2 - 5
11	Extricate Patient	3 - 4
12	Patient Charting	1 - 2
13	Hospital Communication	1 - 2
14	Treatment During Transport	2 - 3



The figure below shows the cardiac chain of survival along with the associated events during a cardiac arrest event:





As previously mentioned, the EMS benchmark for the FFD is for the first arriving unit to be at scene within four minutes of the initial dispatch, 90% of the time. The targeted service level benchmarks are based on industry standards and best practices. The following charts show the departments turnout, travel, and total response time over a 6-year period:

<b>Turnout Standard - EMS 60 Seconds</b>	<b>90th Percentile (In Seconds)</b>
2017	95
2018	94
2019	96
2020	100
2021	102
2022	94

<b>Travel Standard - EMS 240 Seconds</b>	<b>90th Percentile (In Seconds)</b>
2017	337
2018	332
2019	332
2020	351
2021	362
2022	365

<b>Total Response Time Standard - EMS 300 Seconds</b>	<b>90th Percentile (In Seconds)</b>
2017	403
2018	394
2019	398
2020	422
2021	430
2022	423



## Specialized Services

FFD has defined service level objectives for the following disciplines: Hazardous Materials Response (HMRT), Urban Search and Rescue (USAR), Water/Dive Rescue (WRT), and Aircraft Rescue and Firefighting (ARFF). The fire department is mandated to formally define the special operations required or expected in an emergency or other type of incident. These special operations include but are not limited to hazardous materials response, technical rescue, and swift water rescue. Regardless of the fire department's defined special operations capabilities, all firefighters who provide emergency response are required to receive operational level training for hazardous materials response and confined space rescue. Likewise, all fire departments must define their response capability to natural disasters, terrorism incidents, large-scale emergencies, and mass casualty incidents.

Fire departments that establish their level of training is beyond the first responder level for hazardous materials or confined space emergencies, must ensure all members involved in that level of response are trained to the standard. The department must also determine resource availability outside of the fire department through federal, state, provincial, and local assistance or private contractors deployed to emergencies and other incidents. Operational plans that initiate such an outside response must also be established. Additionally, the fire department must limit the size of the response to special operation emergencies to the level for which it has staffed, trained and equipped its personnel.

NFPA 1710 requires airport fire departments to ensure their response capabilities to non-aircraft incidents (non-airframe structural fires and EMS emergencies) within the department's response jurisdiction are identical to non-ARFF fire department capabilities. The NFPA 1710 standard recognizes many, if not most, fire departments must respond to either wildland or wildland/urban interface fires. Accordingly, the fire department must address the service delivery for such occurrences. The standard specifies the minimum wildland staffing for defined wildland engine and truck companies that respond to wildland or urban interface/wildland emergencies. Likewise, deployment requirements for a wildland initial direct attack are specified.

A system is a functionally related group of components. These are areas where a set of needs or requirements work closely together and are interrelated to achieve a key result—the NFPA 1710 standard addresses five of these systems.

- **Safety and Health** — Each organization must have an occupational safety and health program meeting the requirements of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program.
- **Incident Management** — Each organization must have in place an incident management system designed to handle expected incidents. The system must



be in accordance with NFPA 1561, Standard on Emergency Services Incident Management System.

- **Training** — Each organization must ensure members train to execute all responsibilities consistent with its organizational statement. This training must use a programmatic approach that includes a policy.
- **Communications** — Each organization must have a communications system characterized by:
  - Reliability
  - Promptness
  - Standard operating procedures, terminology, and protocols

Departments must also comply with all the requirements outlined in NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.

- **Pre-Incident Planning** — Safe and effective operations are grounded in identifying critical high-hazard targets. The standard requires departments to develop operational requirements to obtain information regarding these locations.

These five systems cohesively help ensure that emergency responders have the essential tools, information, procedures, and safeguards to operate effectively and efficiently.



**Current Deployment**

The Fresno Fire Department responds to well over 120 emergency incidents per day. The type of incident will determine the number of resources assigned to that incident and the number of fire personnel on the initial response. The figure below shows the apparatus deployment for the different types of incidents:

<b>Types of Calls</b>	<b>Responding Units</b>
Structure Fire - Residential	5 Engines, 2 Trucks, 1 Battalion Chief, 1 Investigator, 1 Safety Officer
Structure Fire - Commercial/Residential	3 Engines, 2 Trucks, 1 Battalion Chief, 1 Investigator, 1 Safety Officer or 4 Engines, 1 Truck, 1 Battalion Chief, 1 Investigator, 1 Safety Officer
Box Alarm	2 Engines, 1 Truck, 1 Battalion Chief
Automatic Alarm	1 Engine
Fires - Outside, Vehicle, Grass, Brush, Trash, Dumpster	1 Engine
Hazardous Materials	1 Engine, Hazmat Response Team (1 Engine, 1 Truck, 1 Hazmat Vehicle)
Rescue, Structural Collapse	1 Engine, 1 Truck, 1 Battalion Chief, USAR Team (1 Engine, 1 Truck, 1 Rescue Vehicle)
Medical Aid, Injury or Accident	1 Engine
Water Rescue	1 Engine, 1 Truck, 1 Water Rescue Team (Dive Vehicle and Boat), 1 Battalion Chief
Extrication	1 Engine, 1 Truck
Aircraft Emergency	2 ARFF Vehicles, 2 Engines, 1 Truck
Wildland Tack force	2 Engines, 2 Patrol Trucks, 1 Water Tender, 1 Battalion Chief



## **Findings and Recommendations**

The Fresno Fire Department continues to evaluate performance, measure the effectiveness of the changes that are made in operational response, and has identified gaps in service. The findings and recommendations that are found below will identify gaps in service and provide recommendations for ways in which to address these gaps.

**Finding #1.** The Fresno Fire Department continues to fall short of meeting our service level benchmarks for both fire and EMS response. This consists of the following standards – Turnout, Travel, and Total Response Time.

### **Recommendations:**

- Over the last year, the FFD has produced a data analytics dashboard that can be accessed by all department members. This information shows not only call volume, but the metrics associated with NFPA 1710. Since the implementation of this dashboard, crews are now aware of their times and are continuously working towards improving these times. The Department will continue to inform and educate line staff on performance measures to reduce our times.
- Over the last few years, we have experienced a significant increase in call volume. During this time, we also experienced an increase in travel time. The Department has already started the implementation of two-person EMS squads to address this increased call volume and plans to add additional squads in the high-density areas of the City to address this growing challenge.
- The Fire Impact Fee Study completed in 2018 and updated again in 2022 identifies several new stations that need to be built in order for the department to keep up with population and new construction growth.

**Finding #2.** The Fresno Fire Department fails to meet the Effective Response Force (ERF) travel time performance of 8:00 minutes or less on the periphery of the City.

### **Recommendations:**

- As fiscal resources allow, the City should consider adding one additional staffed aerial apparatus to the northeast portion of the City to provide expanded first-due and ERF service capacity.



- As fiscal resources allow, the City should consider adding a fourth (4<sup>th</sup>) firefighter to all remaining apparatus that are staffed with three (3) personnel to provide expanded first due and ERF service capacity.
- Prepare architectural plans to complete the re-location of Station 10 (land already purchased) to meet the increased development and growth in this portion of the City.
- Identify land for an in-fill station in the downtown area.

Finding #3. Industrial growth has increased in the southern portion of the City and as this continues the fire department will be challenged at meeting the required four minute, first due, travel time. Additionally, the Fresno Municipal Code currently has provisions that would not allow additional growth in certain portions of this area without an additional fire station.

**Recommendations:**

- Identify and purchase land for new fire stations in the Southern part of Fresno to keep pace with development and ensure adequate service delivery to this part of the City.
- Following the land purchase, we would need to prepare architectural plans to complete the station build.

Finding #4. Through our research we identified gaps in our data collection process. Data driven decisions are only effective if the information entered is accurate.

**Recommendations:**

- Work with County EMS and American Ambulance to obtain our call processing data on a regular basis. This will allow us to evaluate, analyze and improve call processing times as necessary.
- Communicate the importance of the timely completion and accuracy of incident reports.



Finding #5. The Fresno Fire Department has identified the need to analyze and review our performance data on a more frequent basis to ensure organizational success.

**Recommendations:**

- Establish a Community Risk Assessment / Standards of Cover committee to review response data and recommend changes as needed.
- Once established, schedule quarterly meetings to ensure frequent reviews.
- Expand the CRA/SOC document to include fire prevention information.

**Station Analysis**

A critical factor in developing a standard of coverage is examining the overall system to determine how often the department meets or exceeds established service-level objectives. It is common for fire and EMS to have distinctive geographic areas built upon the fire stations' first-response areas throughout the City. This approach allows the fire department to analyze each station's workloads and measure its performance based on the identified service level objectives. Doing so helps the department identify any area of weakness, indicating if additional stations or companies need to be placed in service to strengthen response capability.

The following section breaks down each station and provides a detailed analysis for the companies' first-in response area. Performance measures include the service level objectives and other workload indicators such as the total number of calls, inspected occupancies, hydrants, and public educational events.



# Fire Station 1

1264 N Jackson Ave

### Apparatus

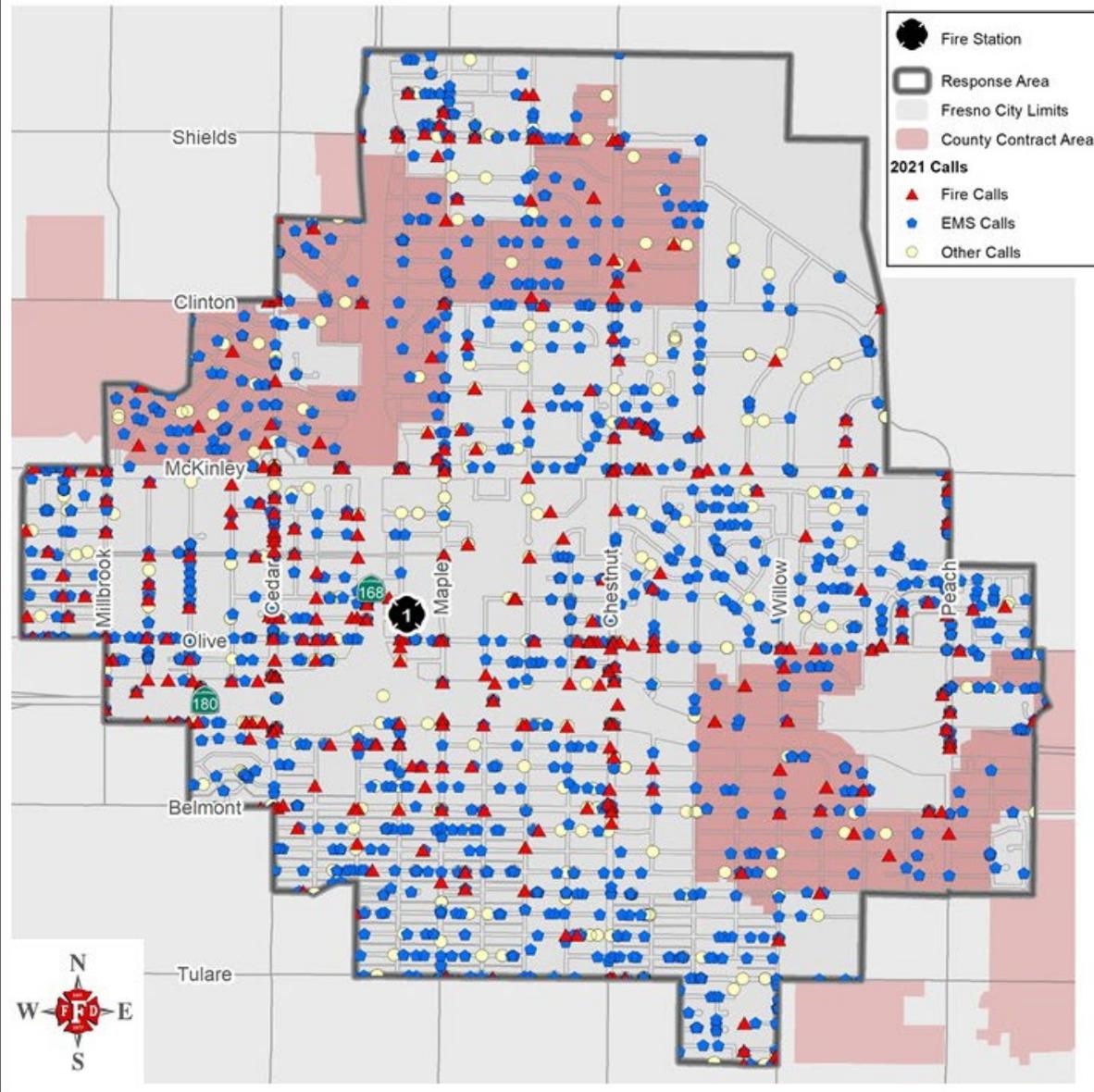
- Engine 01
- Truck 01
- Battalion Chief 01

### Response Area

- 6.01 Square Miles
- 41,758 Residents

### 2021 Call Volume

- 3,301 Total Calls
  - 556 Fire Calls
  - 2,023 EMS Calls
  - 722 Other Calls





# Fire Station 2

7114 N West Ave

### Apparatus

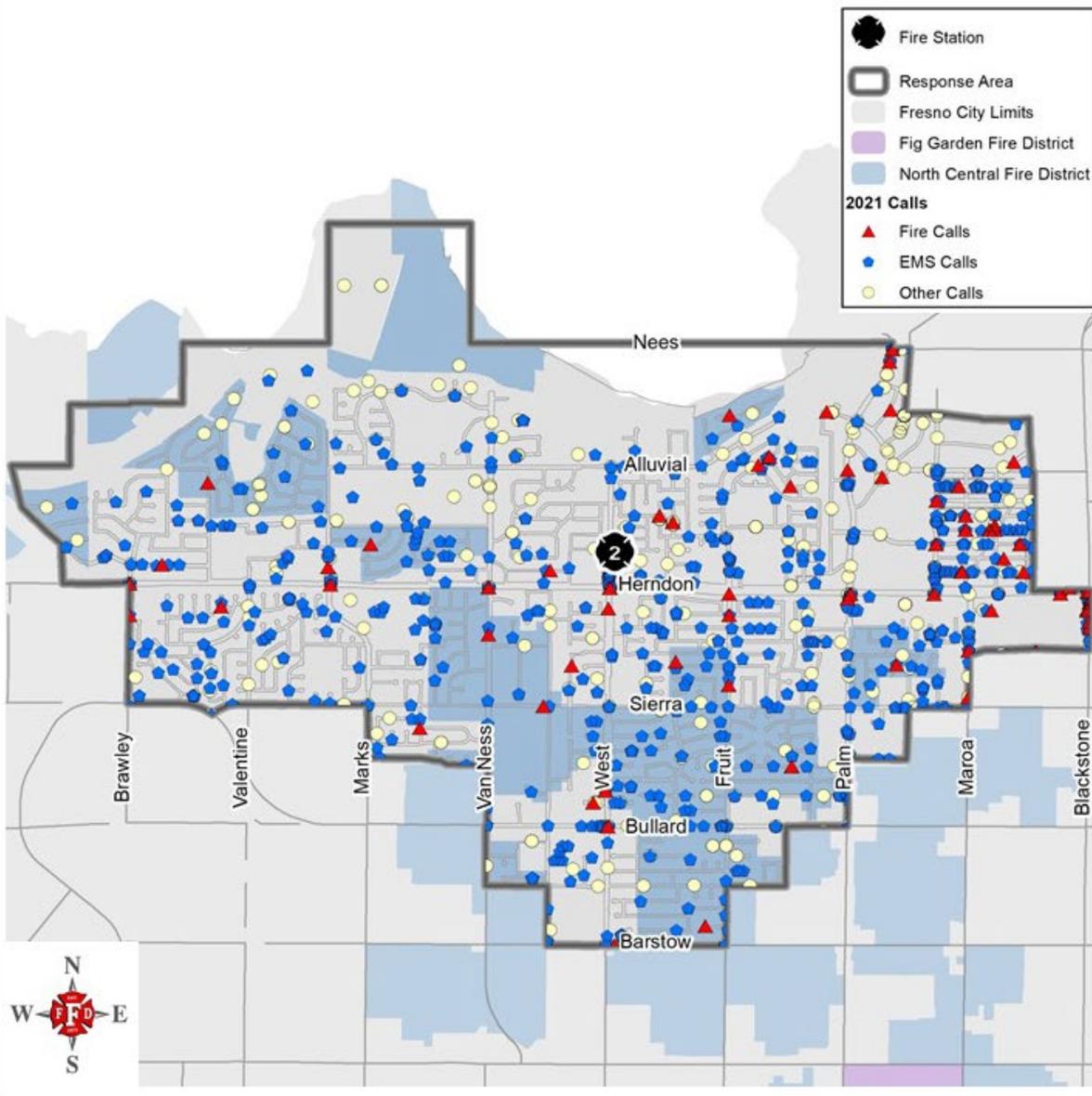
- Engine 02

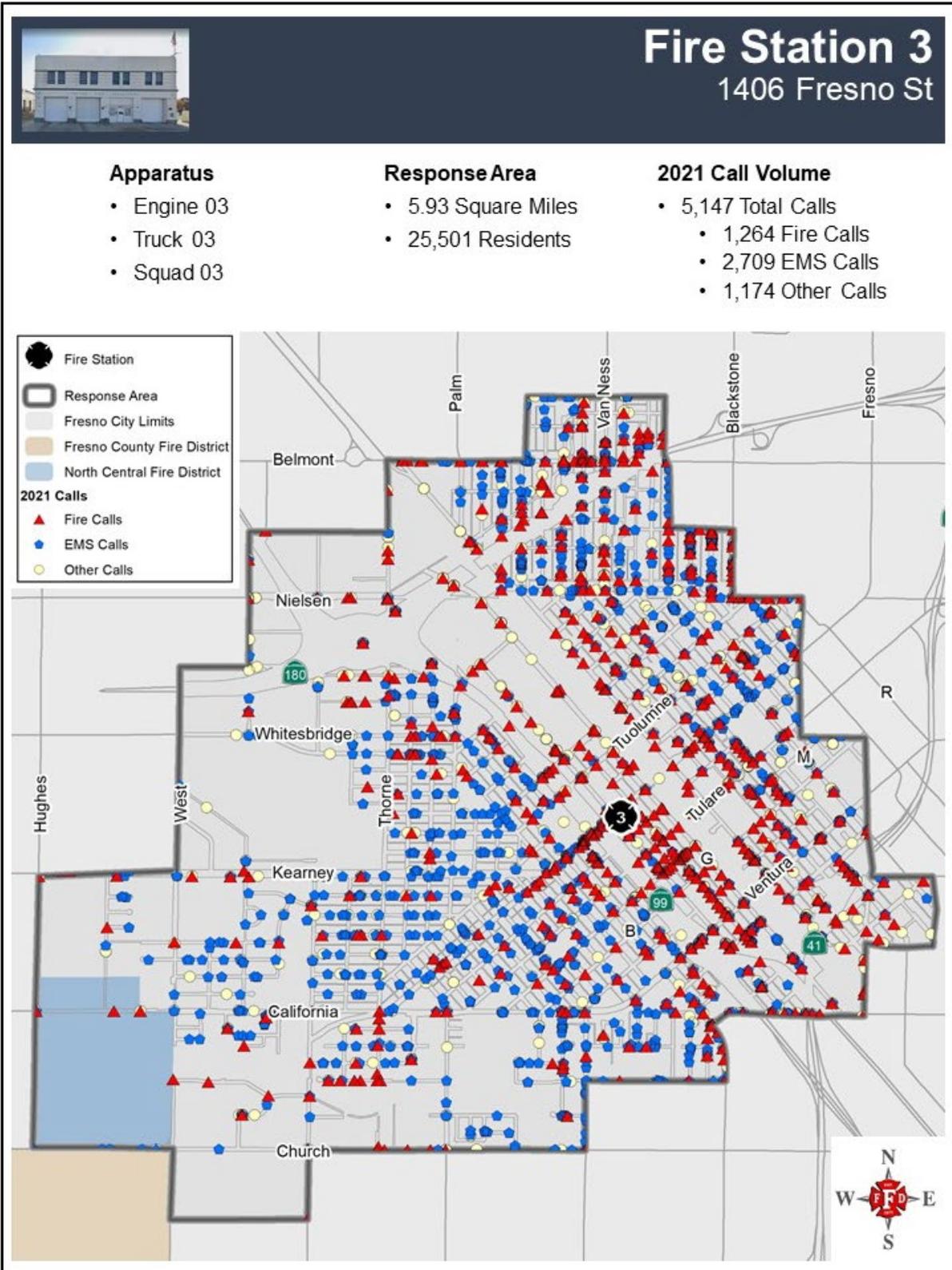
### Response Area

- 7.44 Square Miles
- 22,912 Residents

### 2021 Call Volume

- 1,295 Total Calls
  - 82 Fire Calls
  - 876 EMS Calls
  - 337 Other Calls







# Fire Station 4

3065 E Iowa Ave

### Apparatus

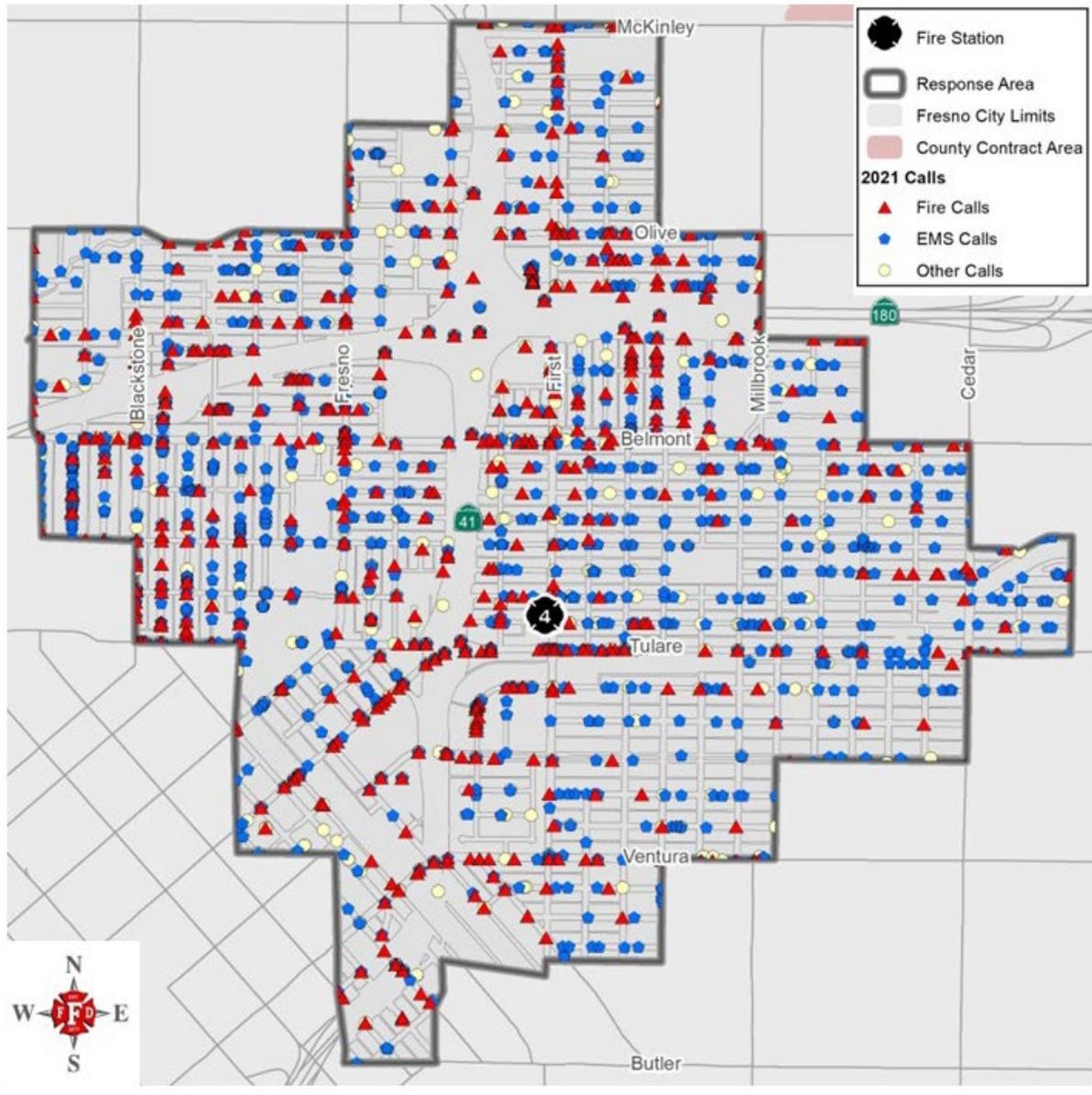
- Engine 04
- Squad 04
- Safety 01

### Response Area

- 3.40 Square Miles
- 27,444 Residents

### 2021 Call Volume

- 3,695 Total Calls
  - 987 Fire Calls
  - 1,981 EMS Calls
  - 727 Other Calls





# Fire Station 5

3131 N Fresno St

### Apparatus

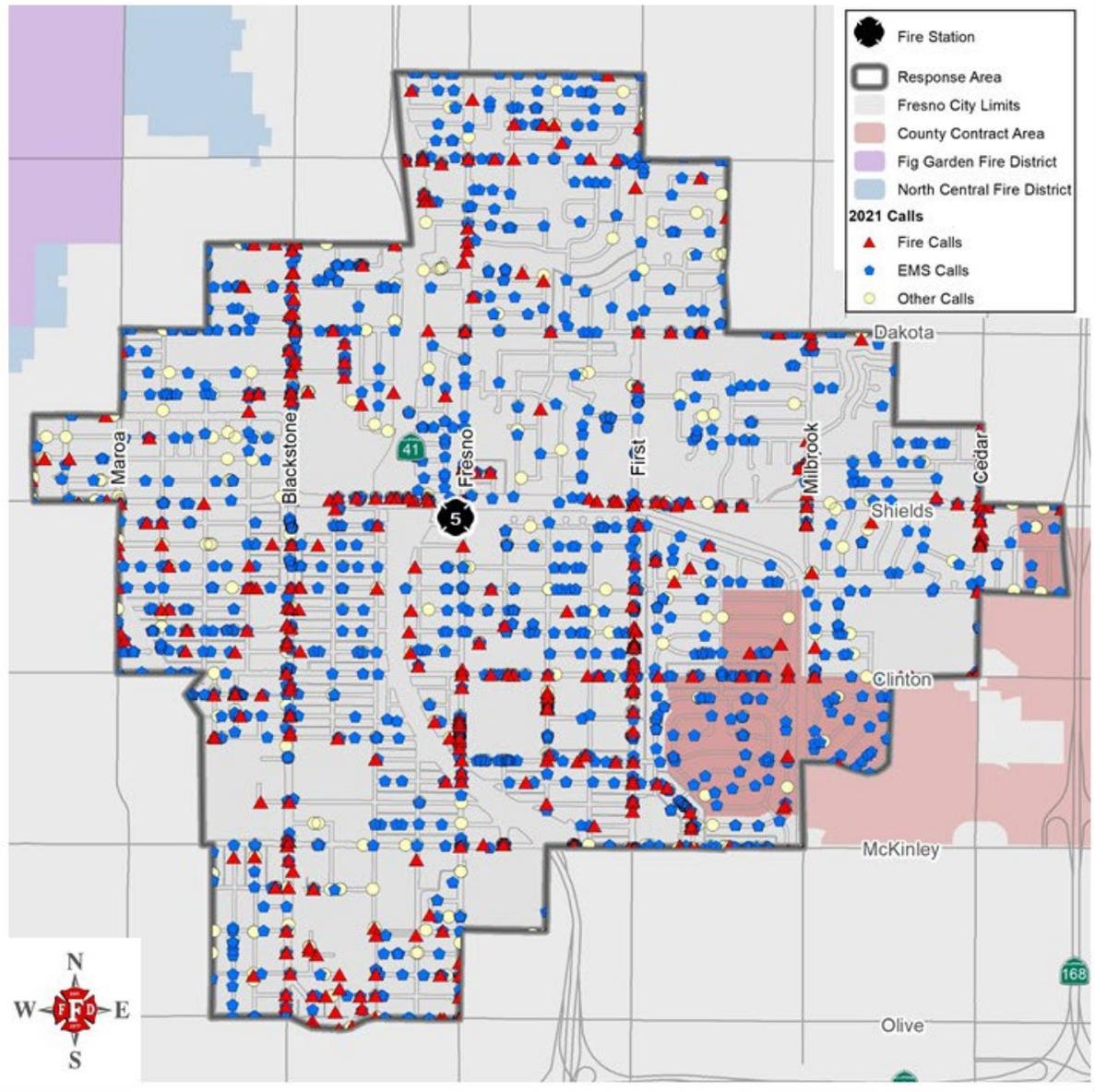
- Engine 05
- Squad 05

### Response Area

- 4.73 Square Miles
- 32,063 Residents

### 2021 Call Volume

- 3,905 Total Calls
  - 592 Fire Calls
  - 2,514 EMS Calls
  - 799 Other Calls





# Fire Station 6

4343 E Gettysburg Ave

### Apparatus

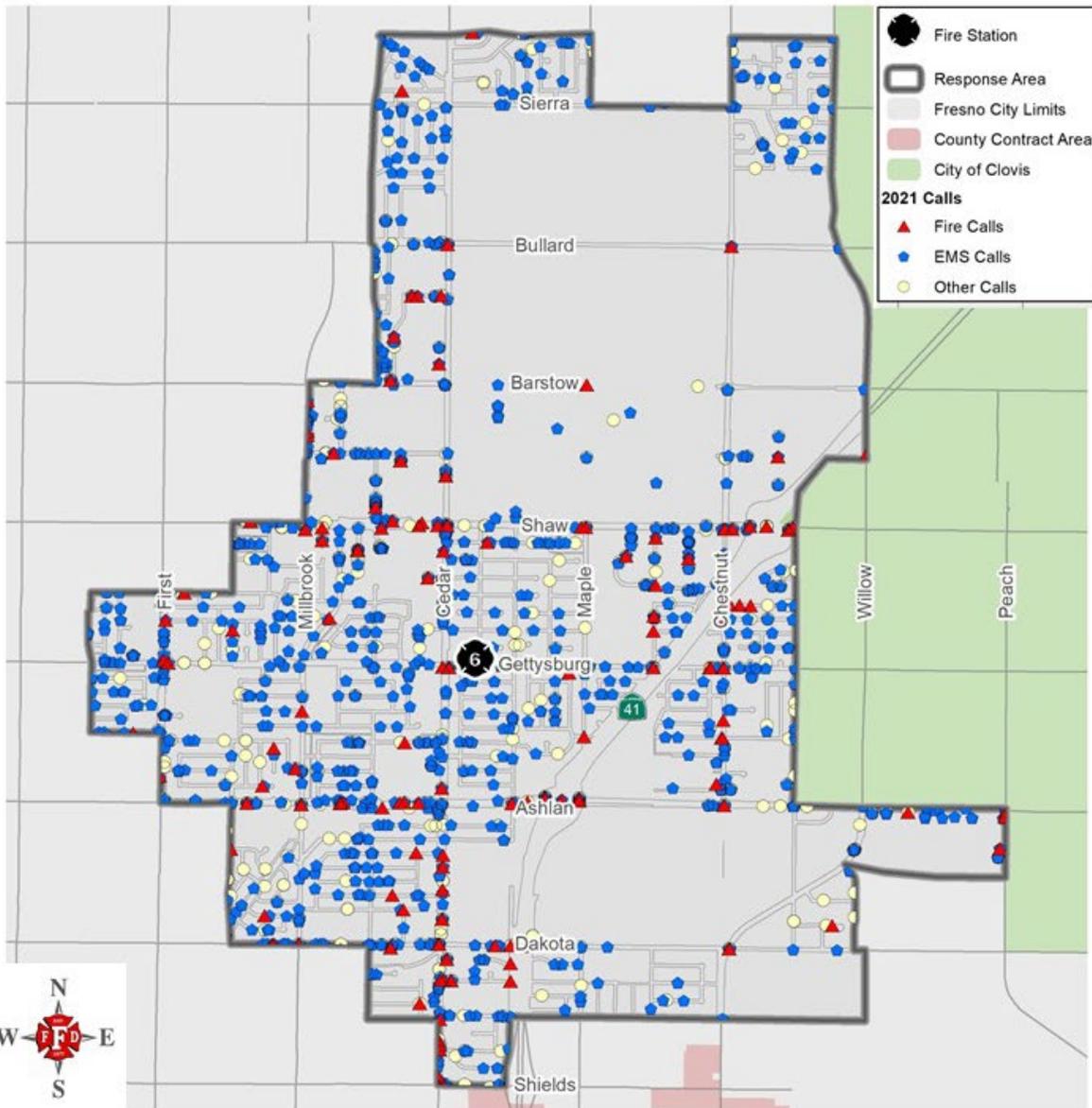
- Engine 06

### Response Area

- 6.96 Square Miles
- 34,395 Residents

### 2021 Call Volume

- 2,260 Total Calls
  - 179 Fire Calls
  - 1,533 EMS Calls
  - 548 Other Calls





# Fire Station 7

2571 S Cherry Ave

### Apparatus

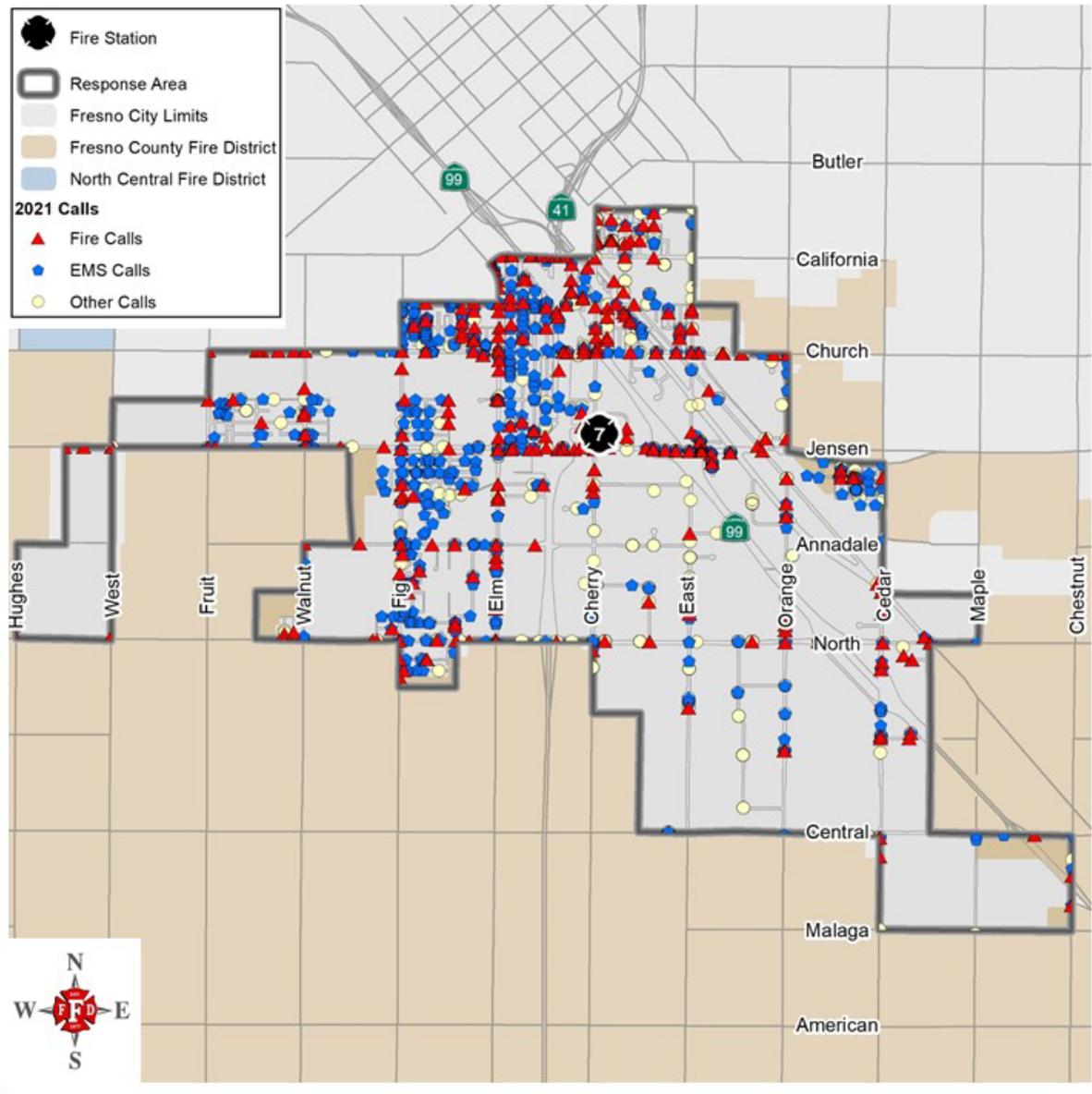
- Engine 07

### Response Area

- 8.04 Square Miles
- 13,330 Residents

### 2021 Call Volume

- 2,067 Total Calls
  - 485 Fire Calls
  - 1,008 EMS Calls
  - 574 Other Calls





# Fire Station 8

1428 S Cedar Ave

### Apparatus

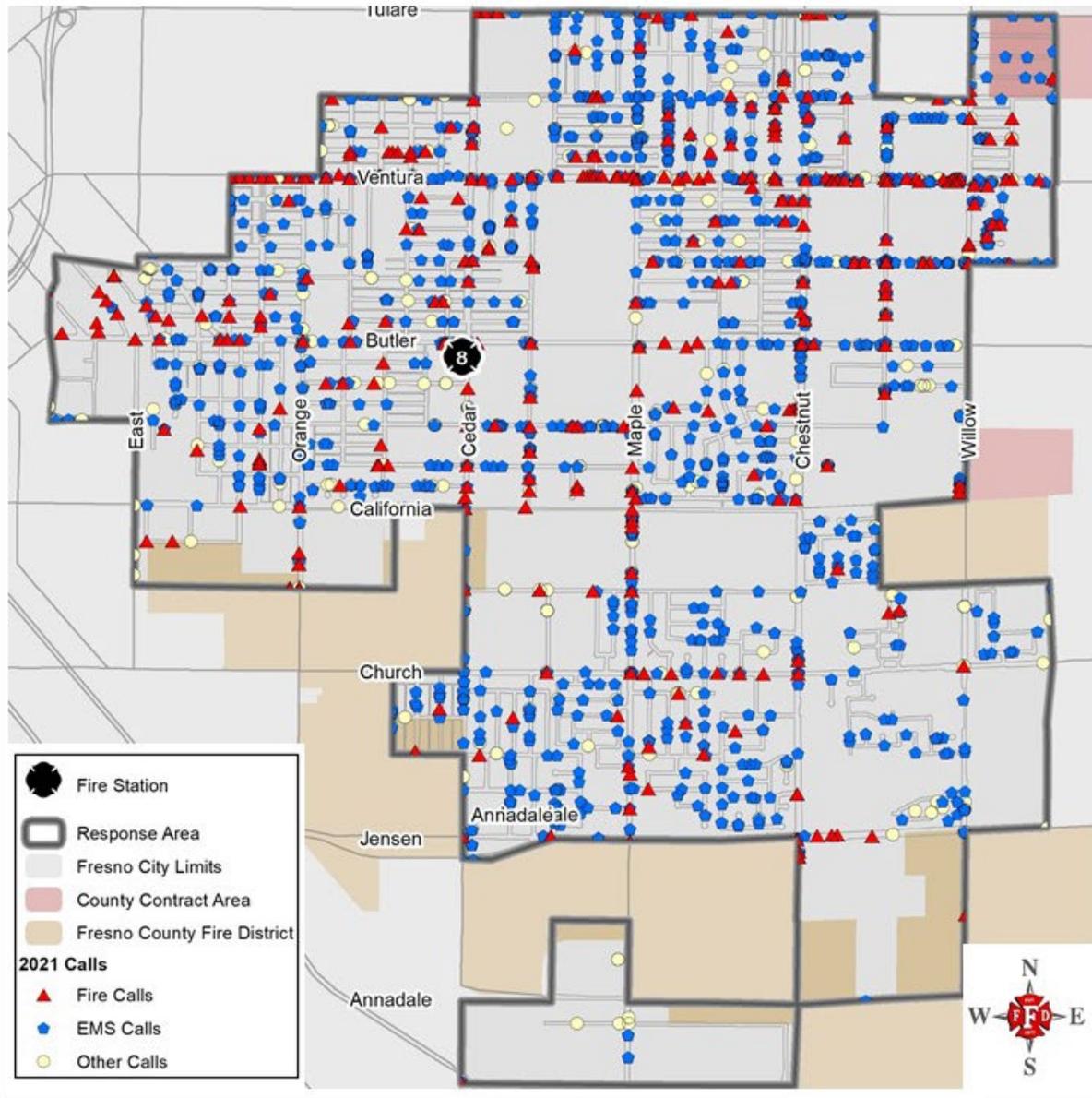
- Engine 08

### Response Area

- 6.00 Square Miles
- 45,316 Residents

### 2021 Call Volume

- 3,117 Total Calls
  - 443 Fire Calls
  - 2,157 EMS Calls
  - 517 Other Calls





# Fire Station 9

2340 N Vagedes Ave

### Apparatus

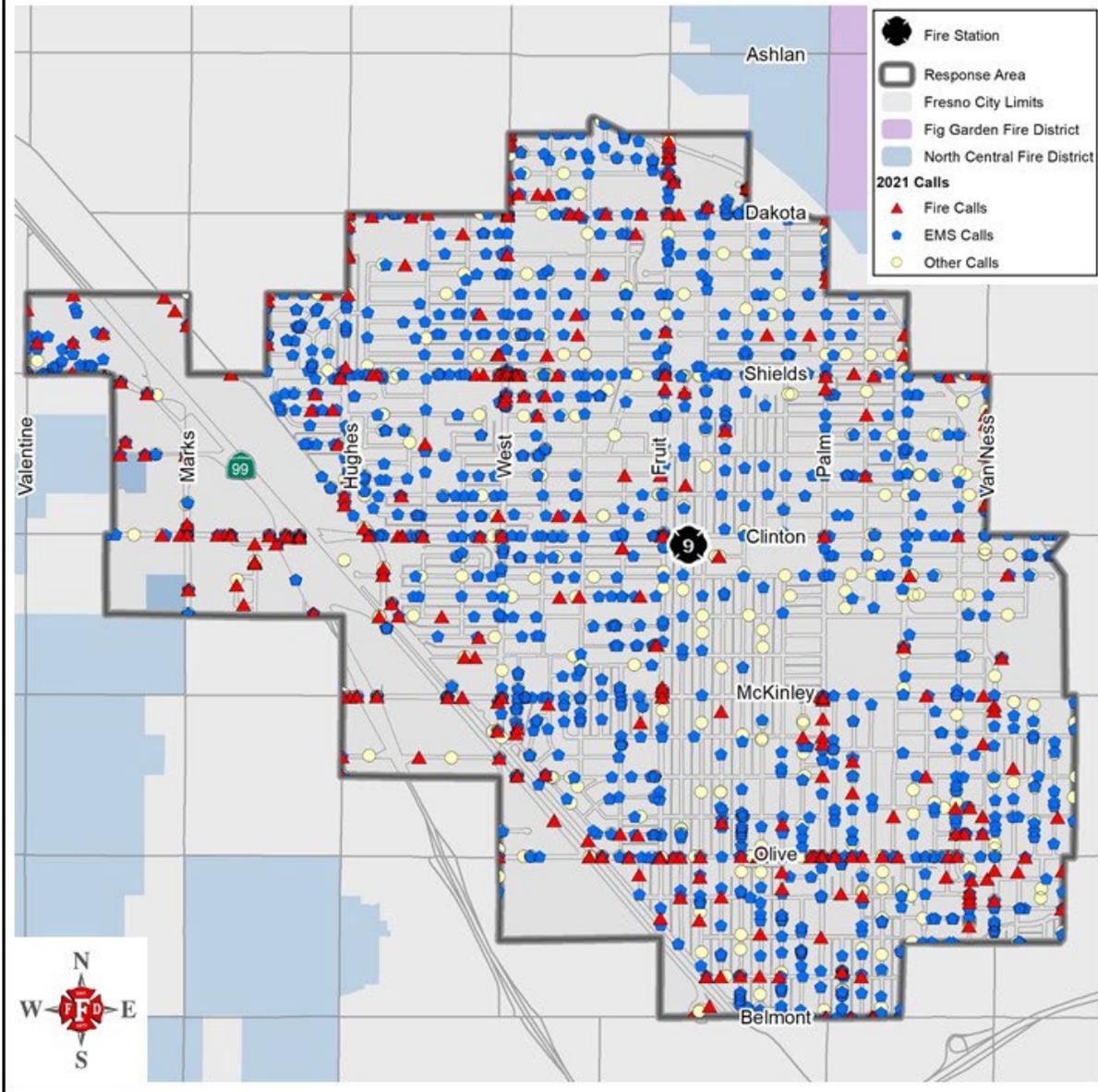
- Engine 09
- Truck 09
- Battalion Chief 04

### Response Area

- 5.50 Square Miles
- 35,631 Residents

### 2021 Call Volume

- 3,257 Total Calls
  - 403 Fire Calls
  - 2,127 EMS Calls
  - 727 Other Calls





# Fire Station 10

5545 E Aircorp Way

### Apparatus

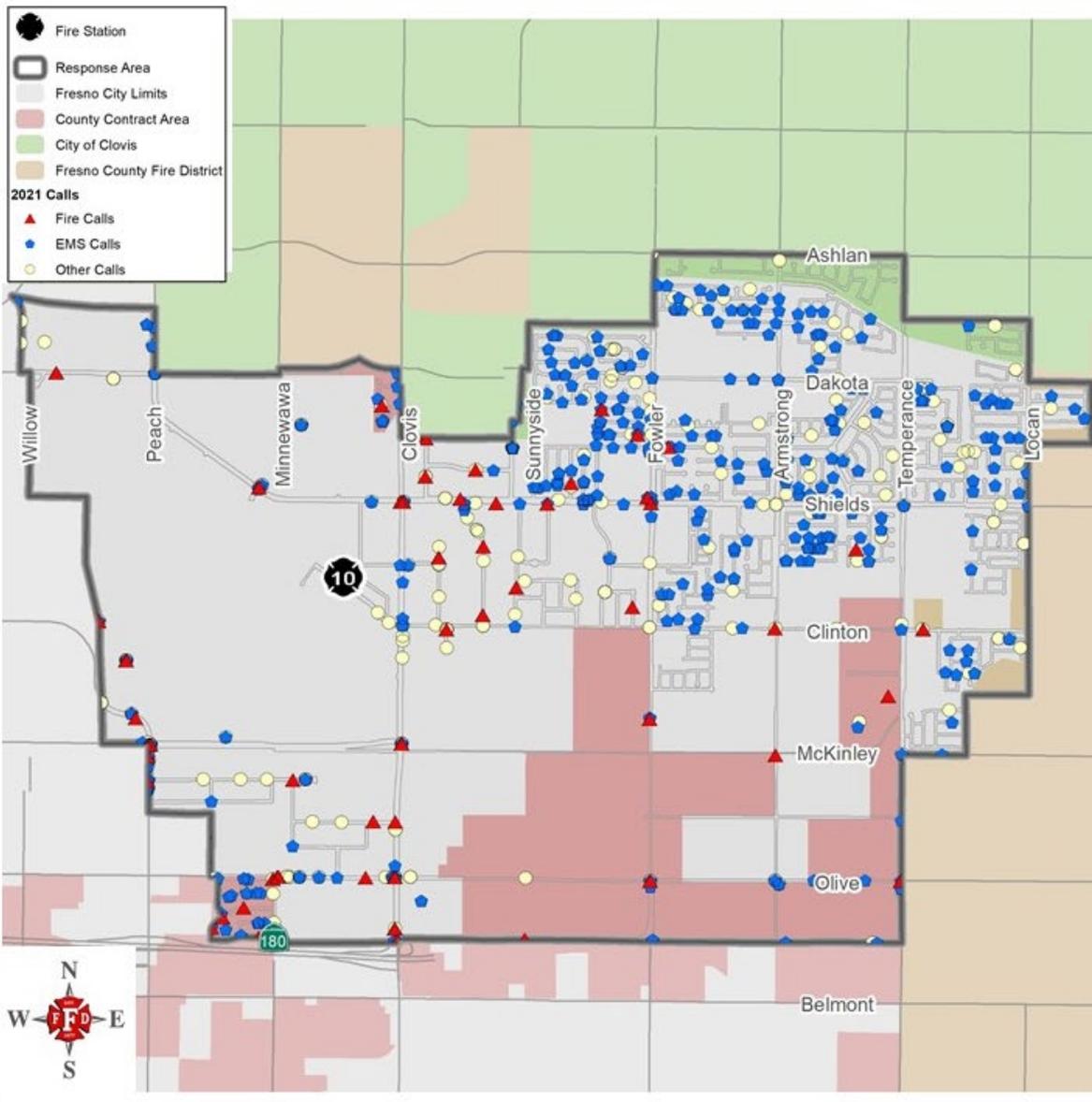
- Engine 10

### Response Area

- 8.69 Square Miles
- 19,861 Residents

### 2021 Call Volume

- 756 Total Calls
  - 74 Fire Calls
  - 457 EMS Calls
  - 225 Other Calls





# Fire Station 11

5544 N Fresno St

### Apparatus

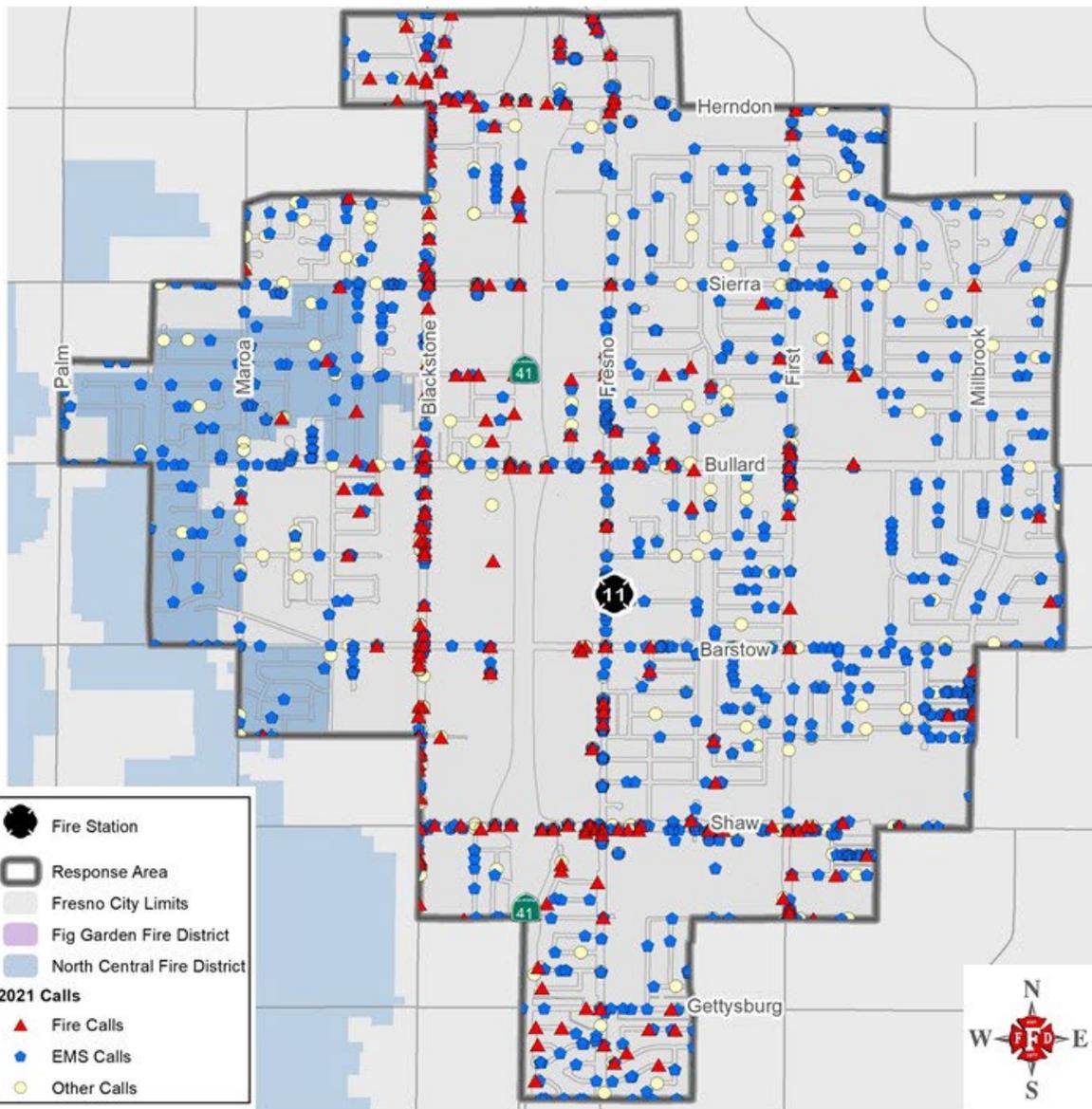
- Engine 11
- Truck 11
- Battalion Chief 03

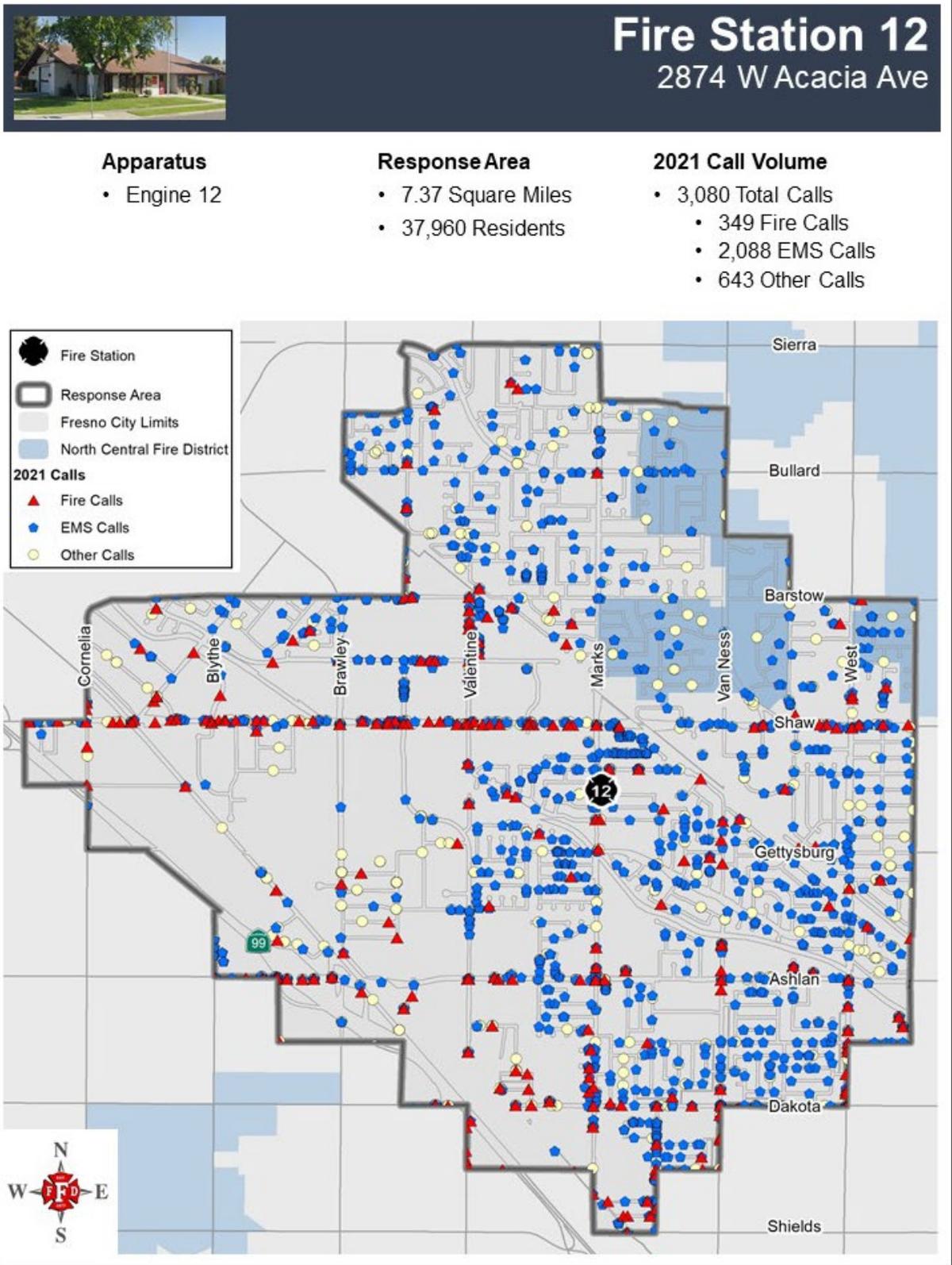
### Response Area

- 5.06 Square Miles
- 25,881 Residents

### 2021 Call Volume

- 2,879 Total Calls
  - 360 Fire Calls
  - 1,804 EMS Calls
  - 715 Other Calls







# Fire Station 13

815 E Nees Ave

### Apparatus

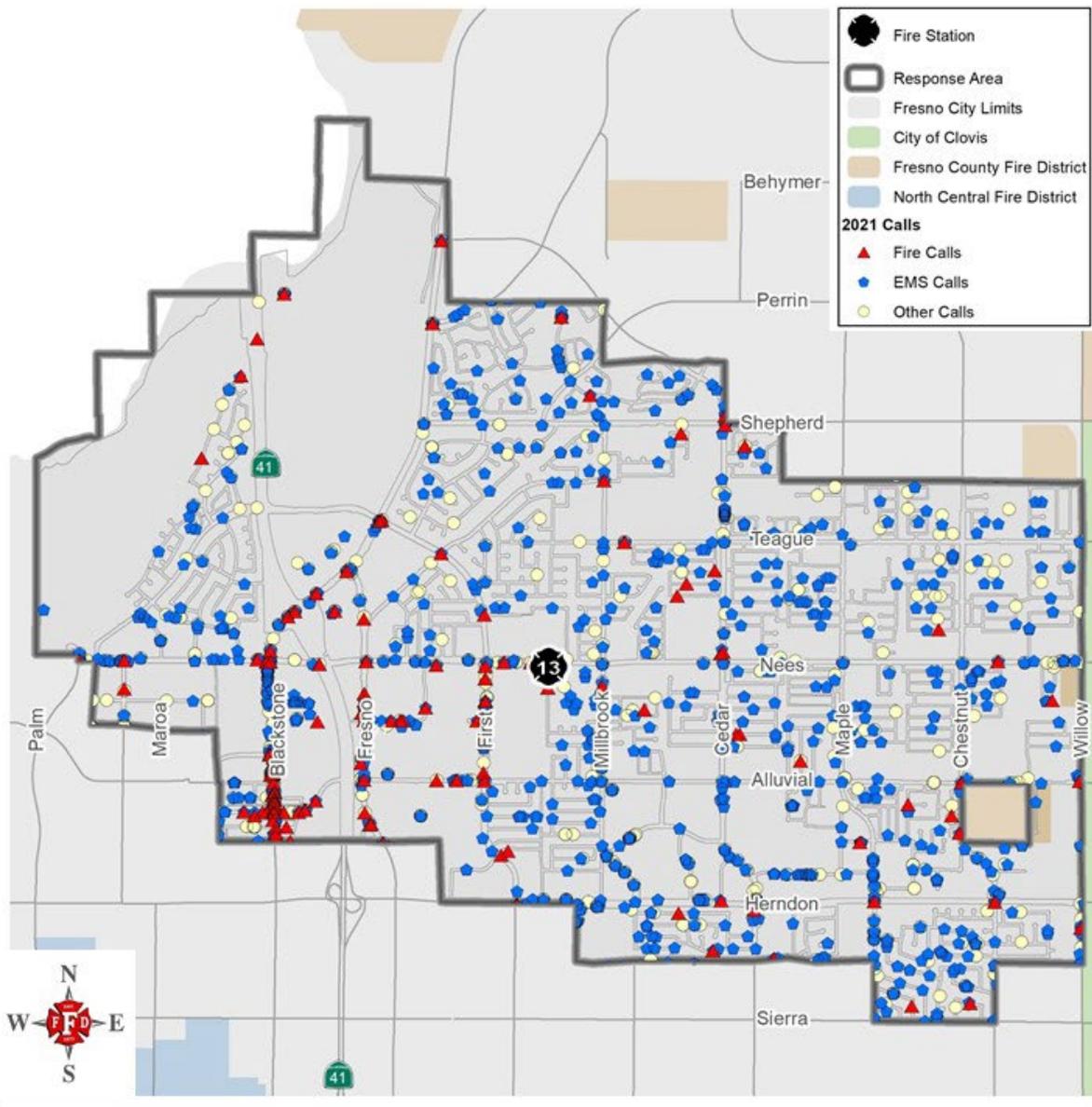
- Engine 13

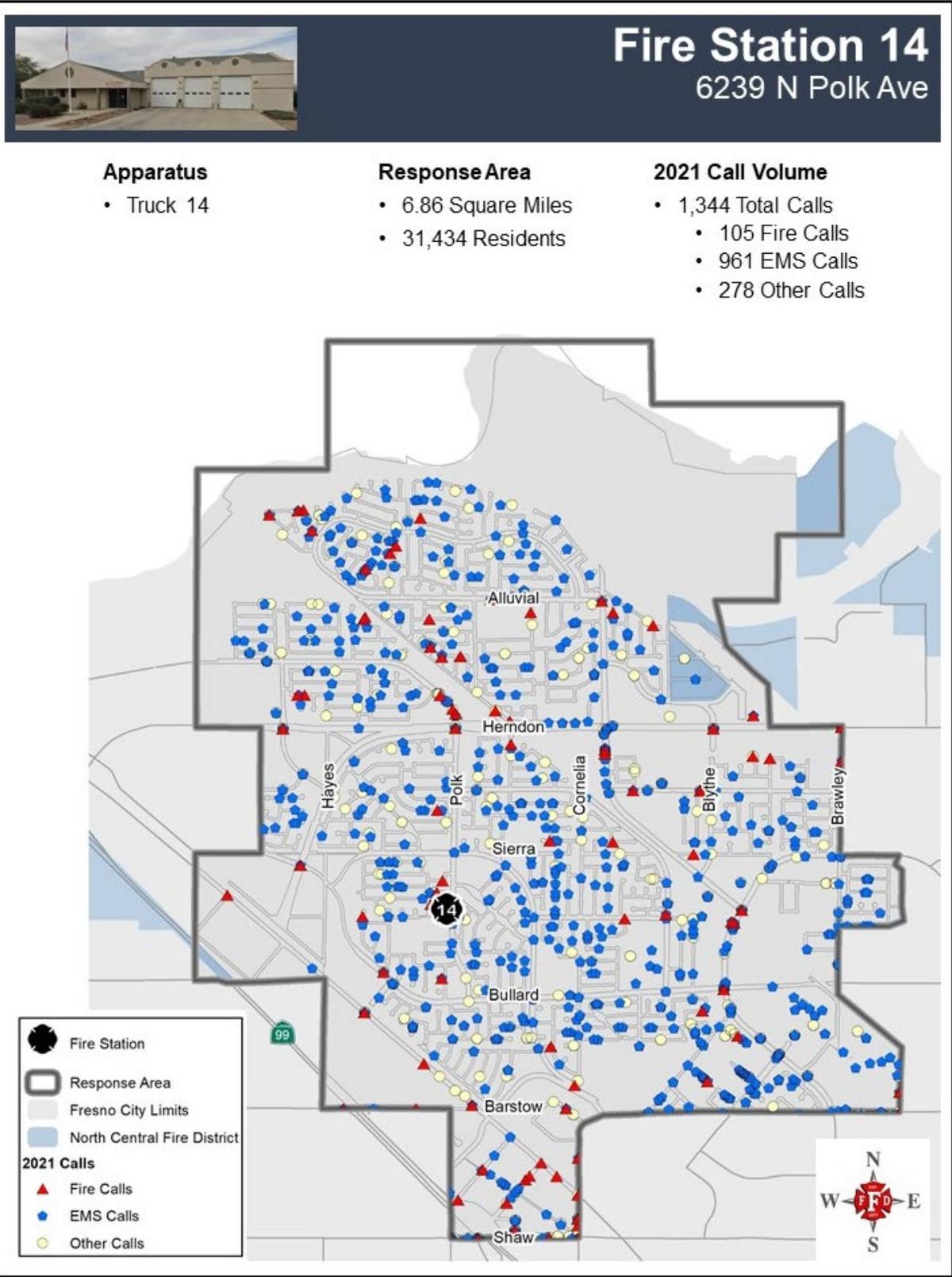
### Response Area

- 9.70 Square Miles
- 43,562 Residents

### 2021 Call Volume

- 2,281 Total Calls
  - 181 Fire Calls
  - 1,403 EMS Calls
  - 697 Other Calls







# Fire Station 15

5630 E Park Circle Dr

### Apparatus

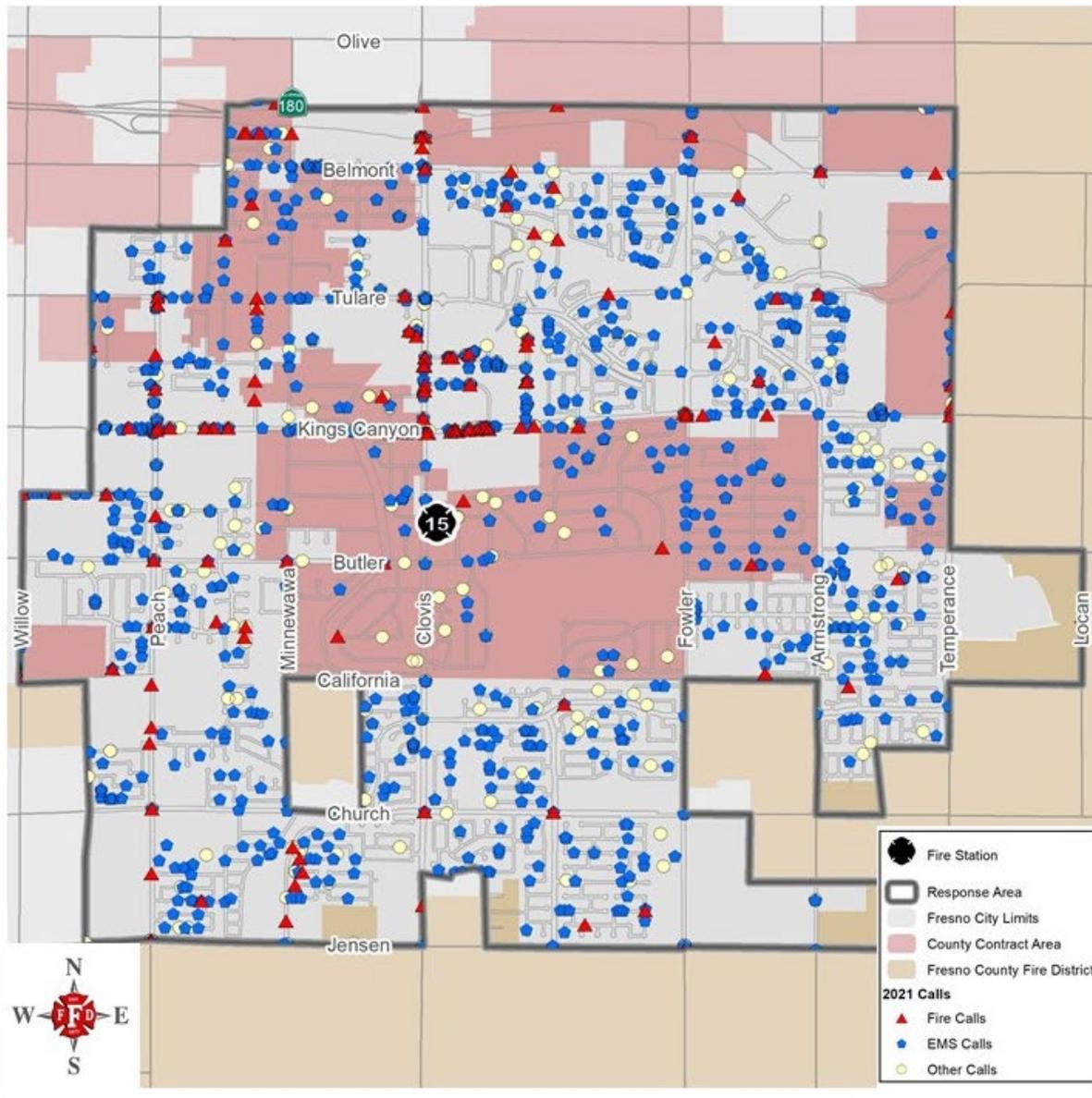
- Engine 15

### Response Area

- 9.83 Square Miles
- 43,621 Residents

### 2021 Call Volume

- 1,916 Total Calls
  - 165 Fire Calls
  - 1,358 EMS Calls
  - 393 Other Calls





# Fire Station 16

2510 N Polk Ave

### Apparatus

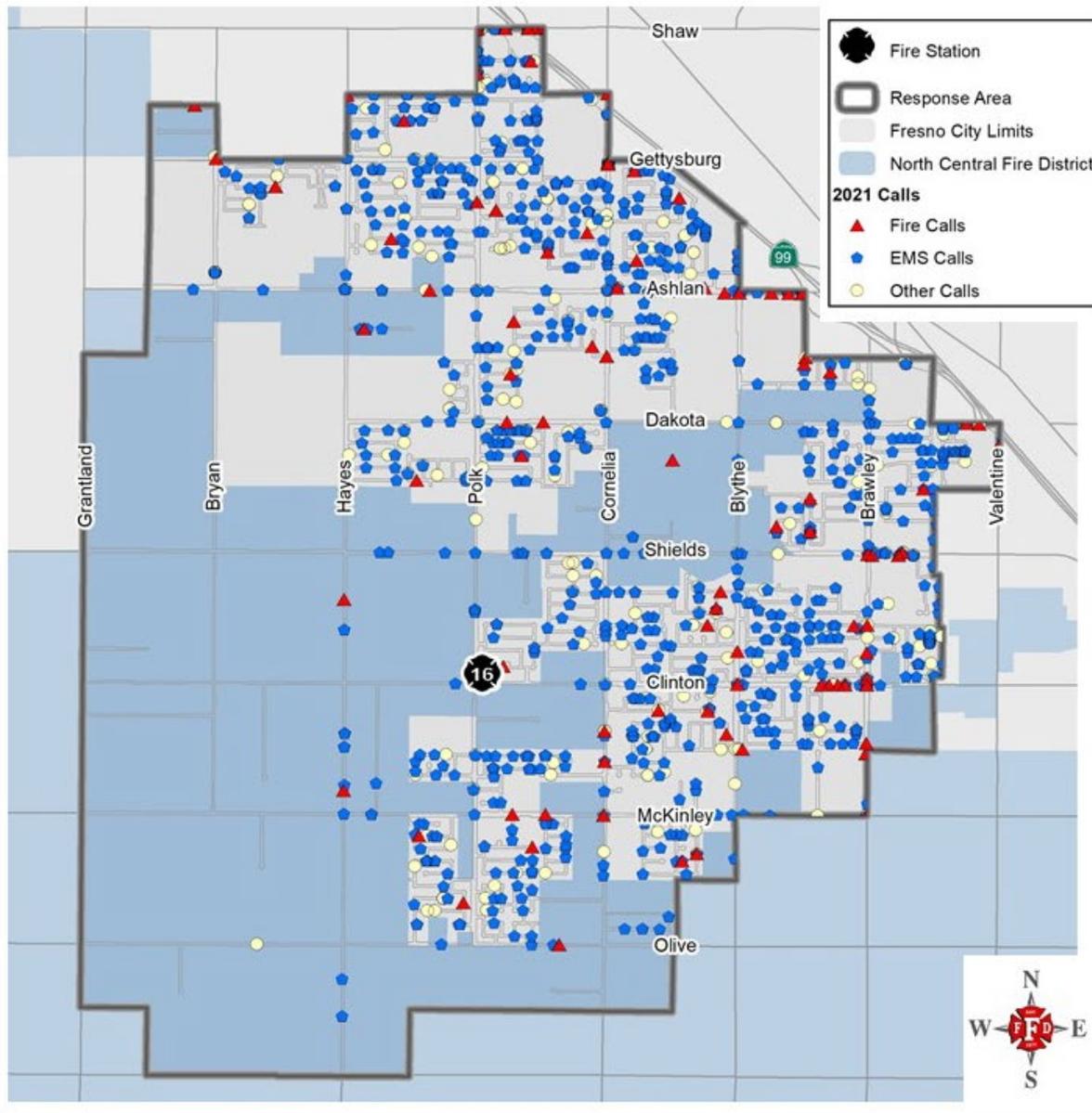
- Engine 16

### Response Area

- 9.79 Square Miles
- 36,136 Residents

### 2021 Call Volume

- 1,578 Total Calls
  - 123 Fire Calls
  - 1,153 EMS Calls
  - 302 Other Calls





# Fire Station 17

10512 N Maple Ave

### Apparatus

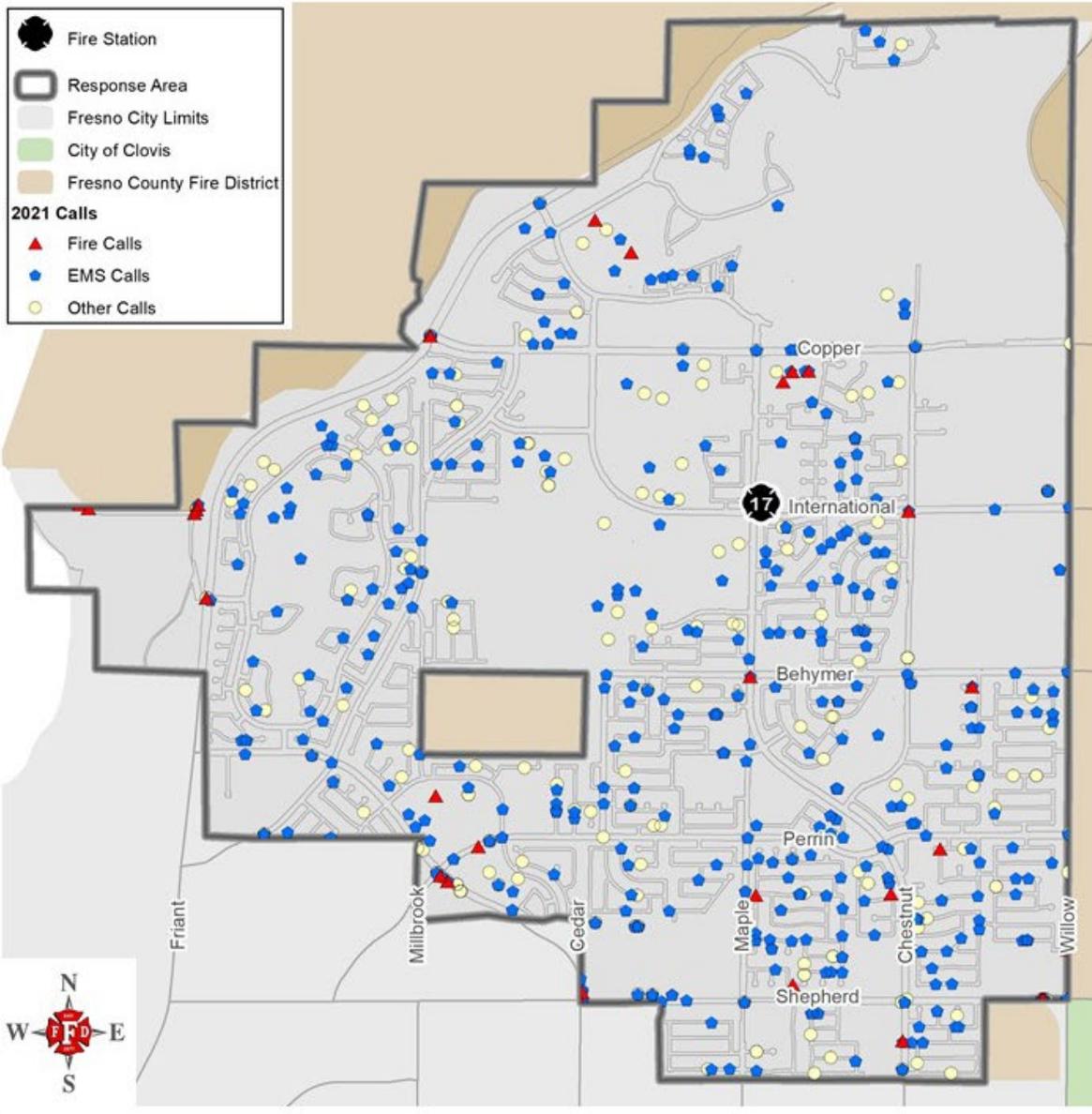
- Engine 17

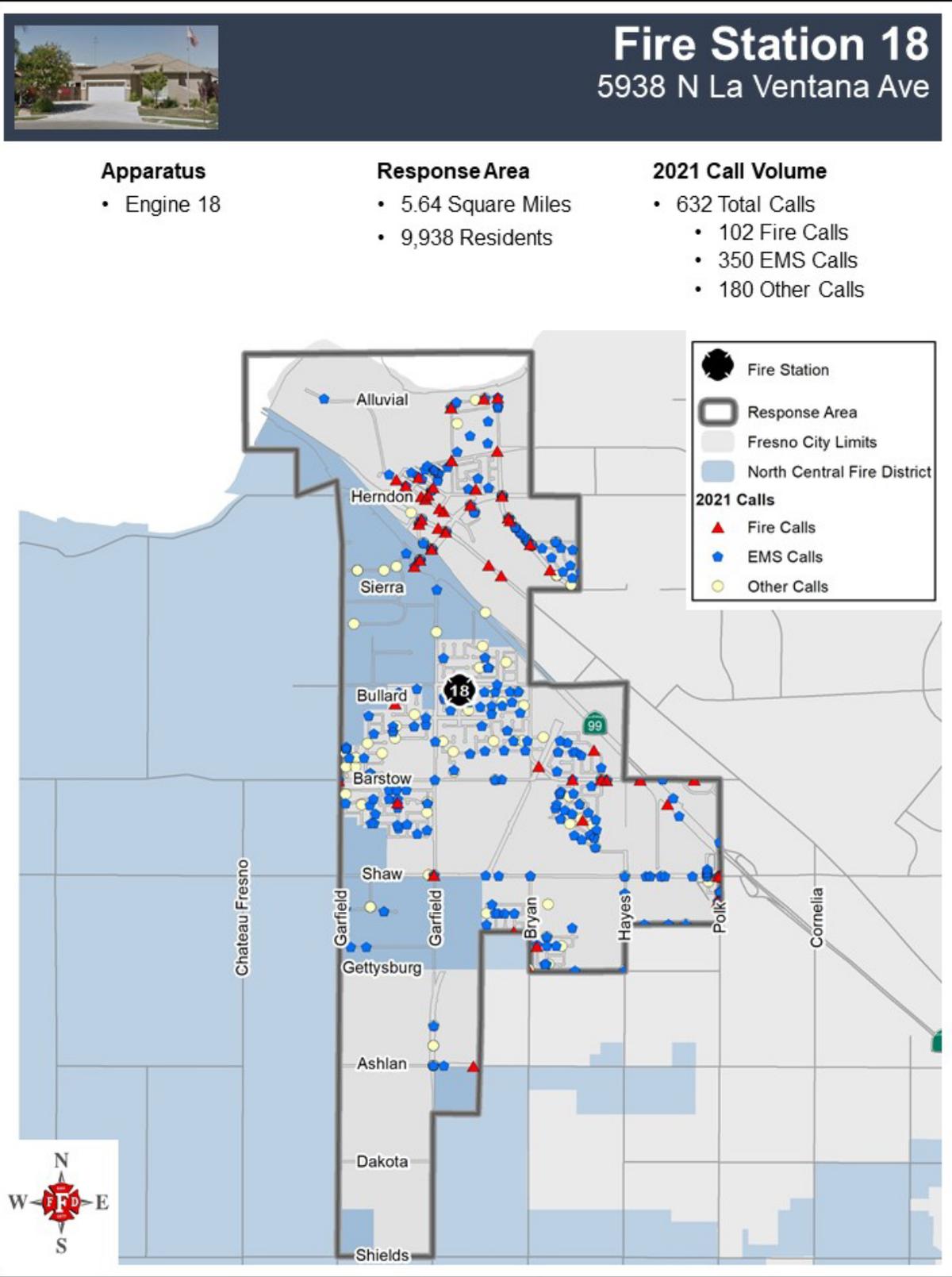
### Response Area

- 6.90 Square Miles
- 28,233 Residents

### 2021 Call Volume

- 807 Total Calls
  - 42 Fire Calls
  - 546 EMS Calls
  - 219 Other Calls







# Fire Station 19

3187 W Belmont Ave

### Apparatus

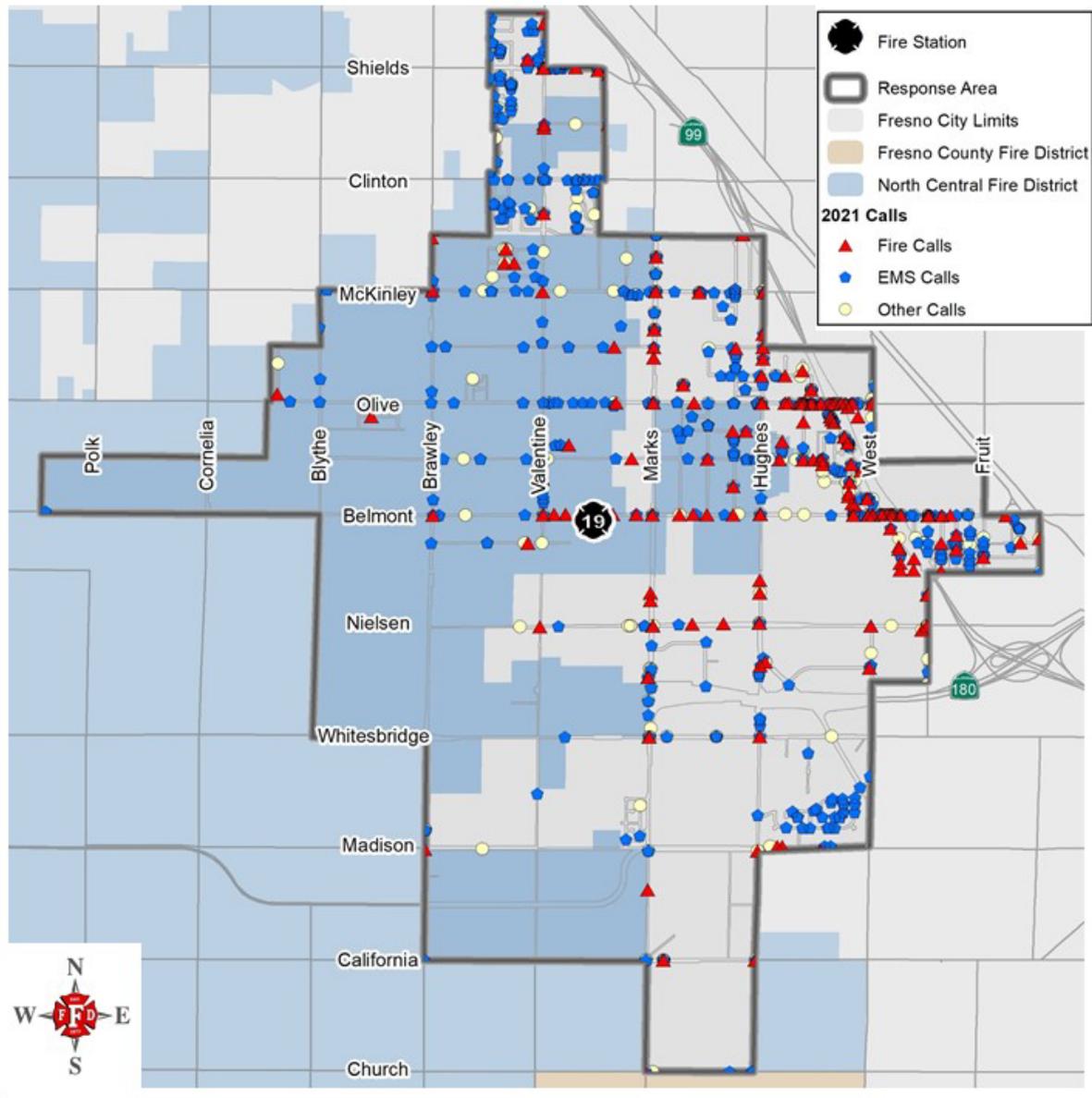
- Engine 19
- Battalion Chief 02

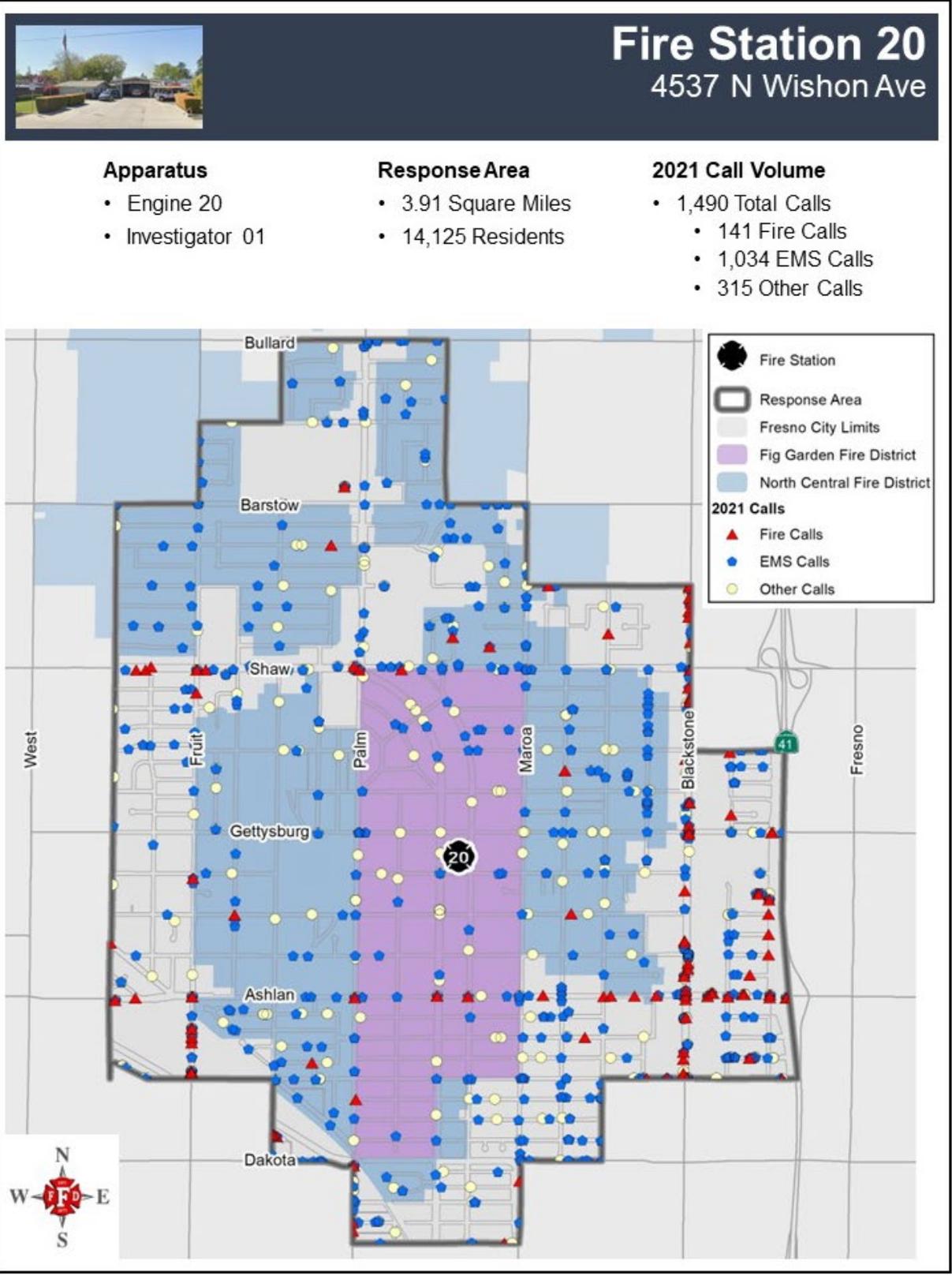
### Response Area

- 8.49 Square Miles
- 14,946 Residents

### 2021 Call Volume

- 1,654 Total Calls
  - 273 Fire Calls
  - 1,065 EMS Calls
  - 316 Other Calls







# Fire Station ARFF

5065 E Andersen Ave

### Apparatus

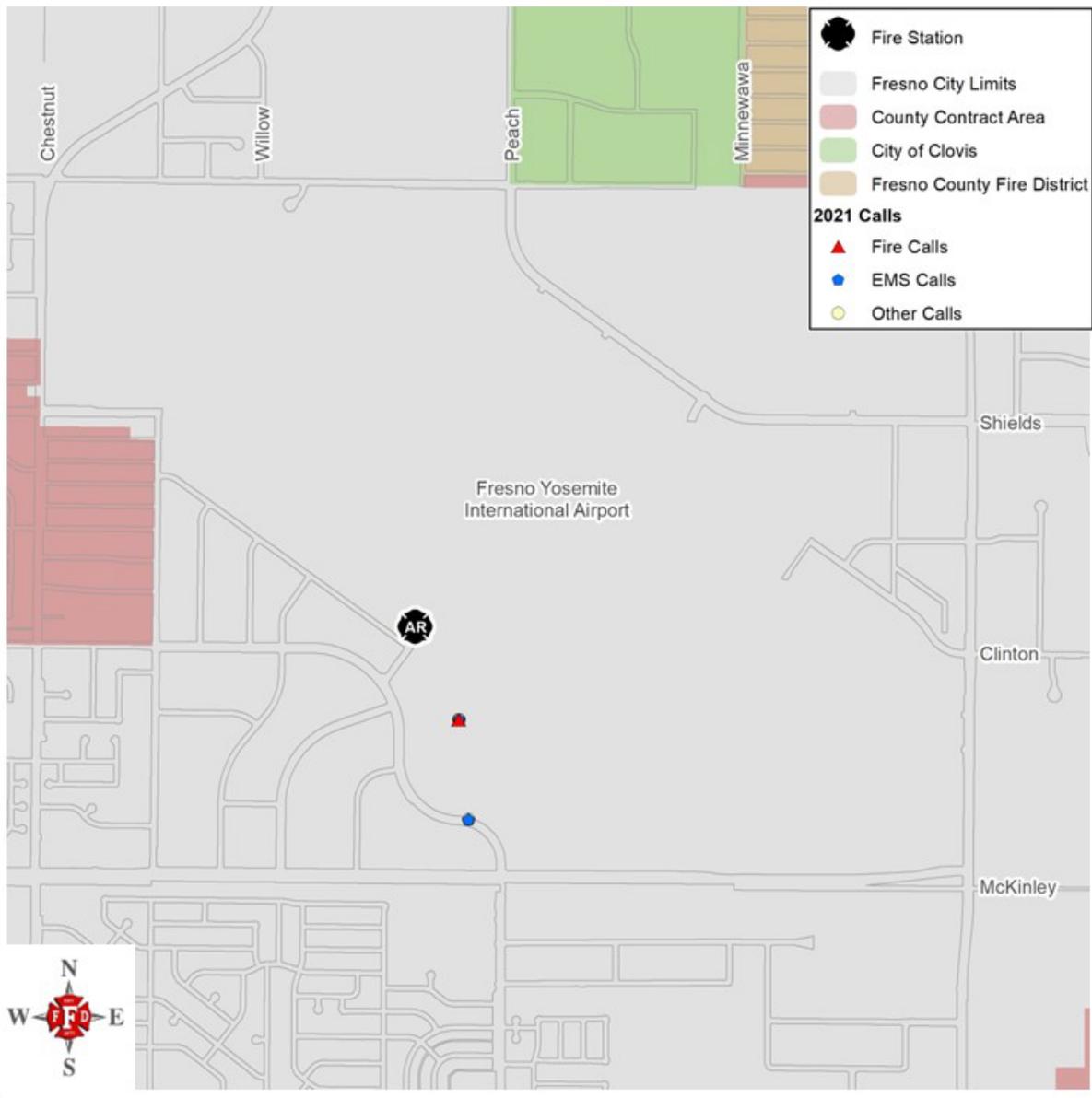
- Aircraft Rescue 01
- Aircraft Rescue 02

### Response Area

- N/A

### 2021 Call Volume

- 105 Total Calls
  - 2 Fire Calls
  - 58 EMS Calls
  - 45 Other Calls





Appendix

Census Data

Demographics	Fresno
<b>Population</b>	
Population, Census, April 1, 2020	542,107
Population, Census, April 1, 2010	494,665
<b>Age and Sex</b>	
Persons Under 5 Years, Percent	8.1%
Persons Under 18 Years, Percent	28.2%
Persons 65 Years and Over, Percent	11.6%
Female Persons, Percent	50.6%
<b>Race and Hispanic Origin</b>	
White Alone, Percent	55.3%
Black or African American Alone, Percent	7.2%
American Indian and Alaska Native Alone, Percent	1.2%
Asian Alone, Percent	14.4%
Native Hawaiian and Other Pacific Islander Alone, Percent	20.0%
Two or More Races, Percent	9.2%
Hispanic or Latino, Percent	49.7%
White Alone, Not Hispanic or Latino, Percent	26.1%
<b>Population Characteristics</b>	
Veterans, 2016 - 2020	19,302
Foreign Born Persons, Percent 2016 - 2020	19.6%
<b>Housing</b>	
Housing Units, July 1, 2019	X
Owner-Occupied Housing Unit Rate, 2016 - 2020	46.8%
Median Value of Owner-Occupied Housing Units, 2016 - 2020	\$256,000
Median Selected Monthly Owner Costs - With a Mortgage, 2016 - 2020	\$1,599
Median Selected Monthly Owner Costs - Without a Mortgage, 2016 - 2020	\$481
Median Gross Rent, 2016 - 2020	\$1,041
Building Permits, 2020	X
<b>Families &amp; Living Arrangements</b>	
Households, 2016 - 2020	170,137
Persons Per Household, 2016 - 2020	3.04
Living in Same House 1 Year Ago, Percent of Persons Age 1 Year+, 2016 - 2020	84.9%
Language Other Than English Spoken at Home, Percent of Persons Age 5 years+, 2016 - 2020	43.5%
<b>Computer and Internet Use</b>	
Households with a Computer, Percent, 2016 - 2020	91.4%
Households with a Broadband Internet Subscription, Percent, 2016 - 2020	83.3%



<b>Education</b>	
High School Graduate or Higher, Percent of Persons Age 25 Years+, 2016 - 2020	78.7%
Bachelor's Degree or Higher, Percent of Persons Age 25 Years+, 2016 - 2020	22.9%
<b>Health</b>	
With a Disability, Under Age 65 Years, Percent, 2016 - 2020	10.4%
Persons Without Health Insurance, Under Age 65 Years, Percent	8.3%
<b>Economy</b>	
In Civilian Labor Force, Total, Percent of Population Age 16 Years+, 2016 - 2020	61.5%
In Civilian Labor Force, Female, Percent of Population Age 16 Years+, 2016 - 2020	56.4%
Total Accommodation and Food Services Sales, 2012 (\$1000)	841,297
Total Health Care and Social Assistance Receipts/Revenue, 2012 (\$1000)	4,486,734
Total Manufacturers Shipments, 2012 (\$1000)	4,367,746
Total Retail Sales, 2012, (\$1000)	5,960,155
Total Retail Sales Per Capita, 2012	11,782
<b>Transportation</b>	
Mean Travel Time to Work (Minutes), Workers Age 16 Years+, 2016 - 2020	22.3
<b>Income &amp; Poverty</b>	
Median Household Income (in 2020 Dollars), 2016 - 2020	\$53,368
Per Capita Income in Past 12 Months (in 2020 Dollars), 2016 - 2020	\$24,814
Persons in Poverty, Percent	23.5%
<b>Businesses</b>	
Total Employer Establishments, 2019	X
Total Employment, 2019	X
Total Annual Payroll, 2019 (\$1000)	X
Total Employment, Percent Change, 2018 - 2019	X
Total Nonemployer Establishments, 2018	X
All Firms, 2012	35,334
Men-Owned Firms, 2012	17,898
Women-Owned Firms, 2012	13,763
Minority-Owned Firms, 2012	19,484
Nonminority-Owned Firms, 2012	14,375
Veteran-Owned Firms, 2012	2,595
Nonveteran-Owned Firms, 2012	30,889
<b>Geography</b>	
Population Per Square Mile, 2010	4,418.40
Land Area in Square Miles, 2010	111.96



Projected Population and Employment Growth within SOI

Table 1 – Population and Employment Projections by Jurisdiction Sphere of Influence

JURISDICTION	2019	2020	2025	2030	2035	2040	2045	2050
<b>Total Population</b>								
<b>County</b>	1,018,240	1,023,360	1,069,800	1,112,010	1,151,390	1,185,850	1,215,740	1,240,090
Clovis SOI	134,210	134,780	141,700	147,760	153,420	158,370	162,660	166,160
Coalinga SOI	13,530	13,690	14,570	15,210	15,800	16,320	16,770	17,140
Firebaugh SOI	7,720	7,720	8,790	9,200	9,580	9,920	10,210	10,450
Fowler SOI	6,380	6,580	6,930	7,200	7,460	7,680	7,870	8,030
Fresno SOI	592,350	596,060	621,540	647,980	672,650	694,240	712,960	728,200
Huron SOI	5,700	5,700	5,930	6,200	6,460	6,680	6,880	7,030
Kerman SOI	14,220	14,290	15,660	16,340	16,980	17,540	18,020	18,420
Kingsburg SOI	13,350	13,410	14,360	14,960	15,510	15,990	16,410	16,750
Mendota SOI	11,170	11,220	11,830	12,330	12,790	13,200	13,560	13,850
Orange Cove SOI	9,170	9,170	9,660	10,070	10,450	10,780	11,070	11,310
Parlier SOI	14,040	14,140	14,740	15,380	15,980	16,500	16,950	17,320
Reedley SOI	25,170	25,170	26,100	27,240	28,300	29,230	30,040	30,700
Sanger SOI	28,660	28,770	30,090	31,370	32,560	33,600	34,510	35,240
San Joaquin SOI	3,500	3,500	3,610	3,750	3,880	3,990	4,090	4,170
Selma SOI	26,960	27,000	29,130	30,360	31,510	32,520	33,390	34,100
Balance of County	112,110	112,160	115,160	116,660	118,060	119,290	120,350	121,220
<b>Total Jobs</b>								
<b>County</b>	405,300	375,200	418,800	432,400	444,800	456,500	466,800	475,000
Clovis	36,060	33,260	36,890	38,770	40,540	42,240	43,820	45,200
Coalinga	2,700	2,540	2,930	3,000	3,070	3,140	3,190	3,240
Firebaugh	1,160	1,090	1,230	1,310	1,390	1,470	1,550	1,620
Fowler	2,990	2,740	3,440	3,490	3,530	3,570	3,590	3,610
Fresno	257,140	237,950	264,140	272,810	280,710	288,170	294,730	299,960
Huron	1,240	1,180	1,470	1,510	1,540	1,570	1,600	1,630
Kerman	2,800	2,590	3,690	3,780	3,870	3,960	4,030	4,090
Kingsburg	3,750	3,490	4,400	4,490	4,560	4,620	4,680	4,720
Mendota	910	840	940	970	1,000	1,020	1,050	1,070
Orange Cove	640	600	630	650	670	680	700	710
Parlier	2,300	2,150	2,210	2,300	2,380	2,450	2,510	2,570
Reedley	5,820	5,390	6,730	6,810	6,880	6,890	6,940	6,960
Sanger	5,570	5,150	5,620	5,930	6,220	6,500	6,760	7,010
San Joaquin	480	440	410	430	450	460	480	490
Selma	6,540	6,090	7,400	7,530	7,660	7,770	7,860	7,930
Balance of County	75,200	69,700	76,670	78,620	80,350	81,980	83,320	84,210

Source: ADE. Note: Totals may not add due to rounding.

\*From the Fresno County Council of Governments: Fresno County 2019-2050 Growth Projections report



**Table 46 – Job Projections for Fresno SOI by Sector, 2019-2050**

JOB SECTOR	YEAR							
	2019	2020	2025	2030	2035	2040	2045	2050
Agriculture	1,310	1,220	1,330	1,350	1,370	1,380	1,380	1,380
Mfg./Mining	13,880	14,210	15,531	15,530	15,530	15,470	15,300	15,120
Other Industrial	43,320	37,830	45,686	47,700	49,650	51,360	52,610	53,770
Retail	25,510	23,690	26,600	27,290	27,840	28,320	28,730	28,840
Office	41,730	39,020	43,419	44,180	44,910	45,530	45,970	46,160
Education	26,100	26,060	26,145	27,110	28,070	28,650	29,370	29,510
Health Services	53,640	52,060	53,640	56,500	58,900	61,740	64,760	67,830
Hospitality	23,220	15,300	23,417	23,940	24,390	24,820	25,240	25,570
Government	28,420	28,560	28,372	29,210	30,040	30,910	31,380	31,770
<b>Total</b>	<b>257,140</b>	<b>237,950</b>	<b>264,140</b>	<b>272,810</b>	<b>280,710</b>	<b>288,170</b>	<b>294,730</b>	<b>299,960</b>

Source: ADE, Inc.

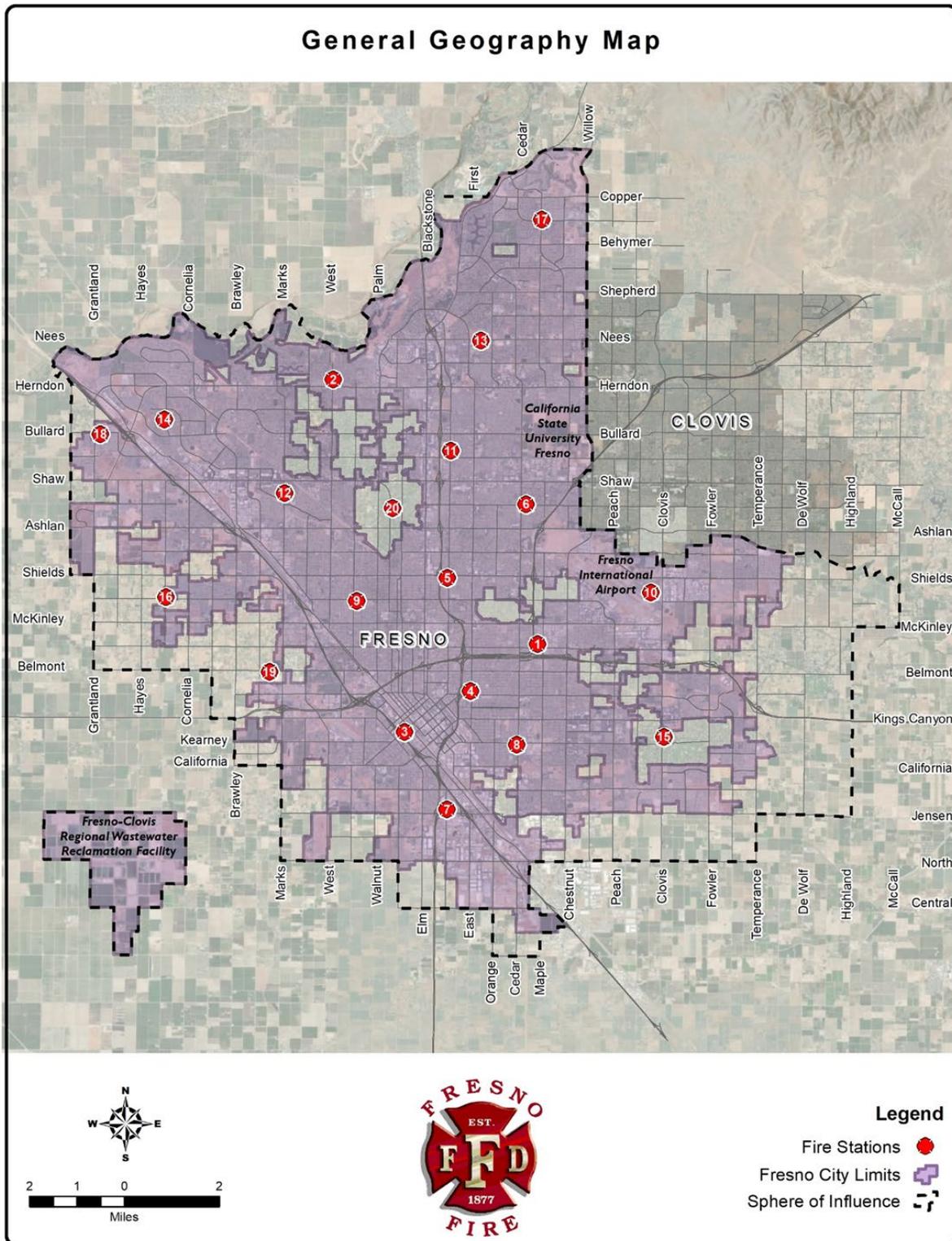
**Table 47 – Population Projections: 2019-2050: Fresno SOI**

POPULATION VARIABLE	YEAR								2015-2050	
	2019	2020	2025	2030	2035	2040	2045	2050	CHANGE	CAGR*
Tot. Nos. of Persons	592,350	596,060	621,540	647,980	672,650	694,240	712,960	728,200	135,850	0.7%
Tot. Nos. of Persons in Group Qtrs.	10,290	10,240	11,060	11,550	11,920	12,300	12,640	12,910	2,620	0.7%
Tot. Nos. of Persons in HHs	582,060	585,820	610,480	636,430	660,730	681,940	700,320	715,290	133,230	0.7%
Tot. Nos. of HHs	188,710	189,930	201,270	210,540	216,370	221,830	226,300	230,380	41,670	0.6%
Persons Per Household	3.08	3.08	3.03	3.02	3.05	3.07	3.09	3.10		

Source: ADE

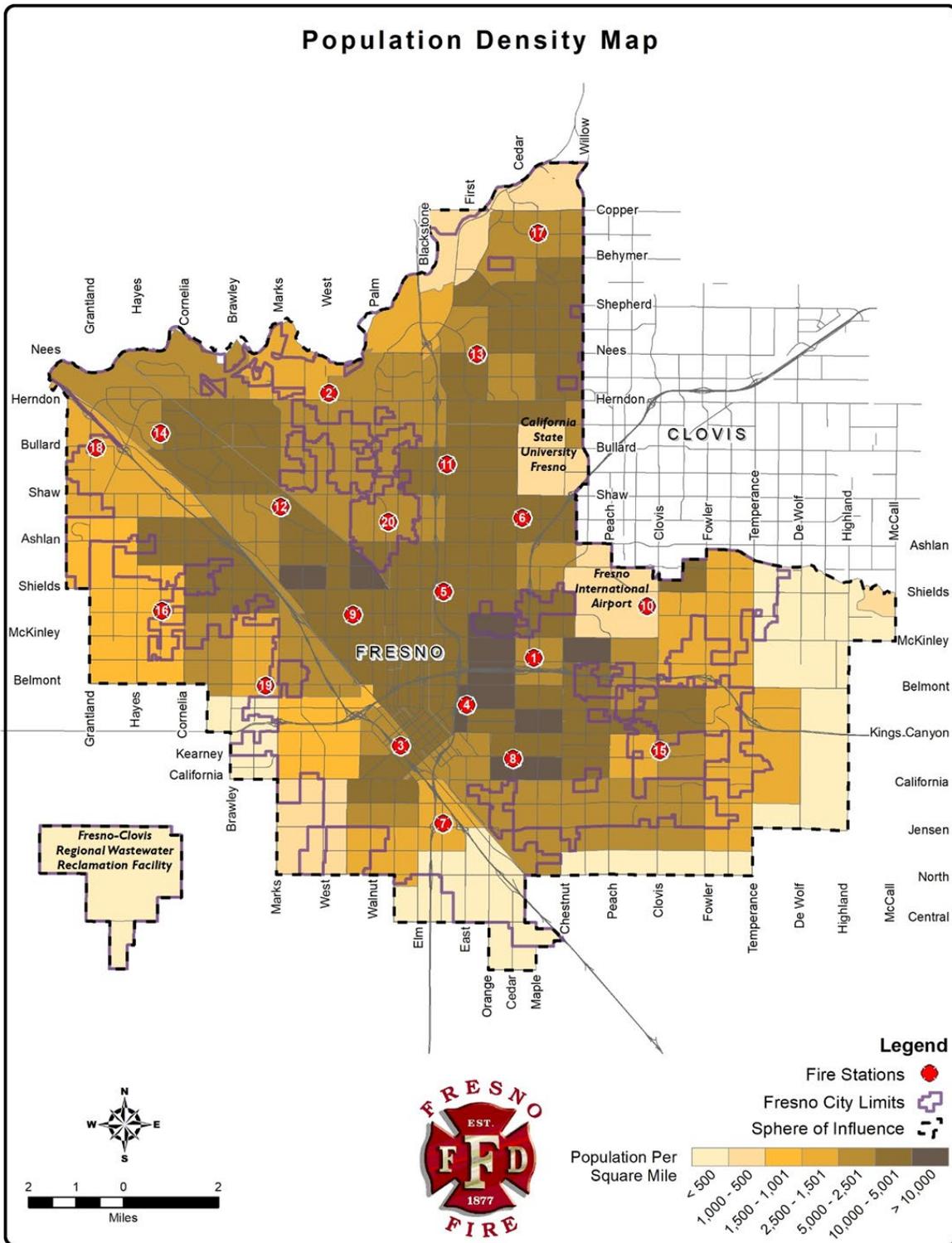


### General Geography Map



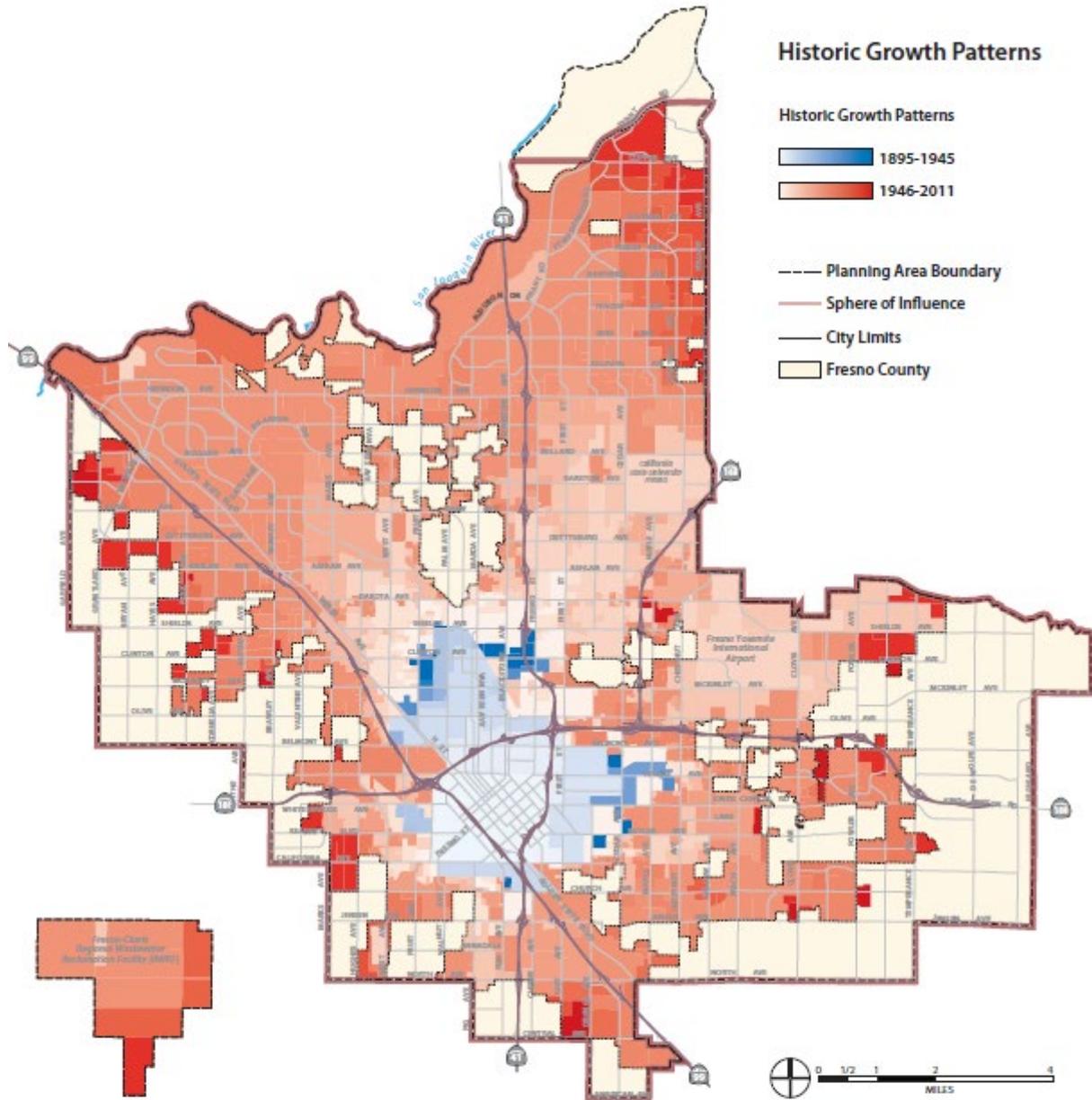


Population Density Map



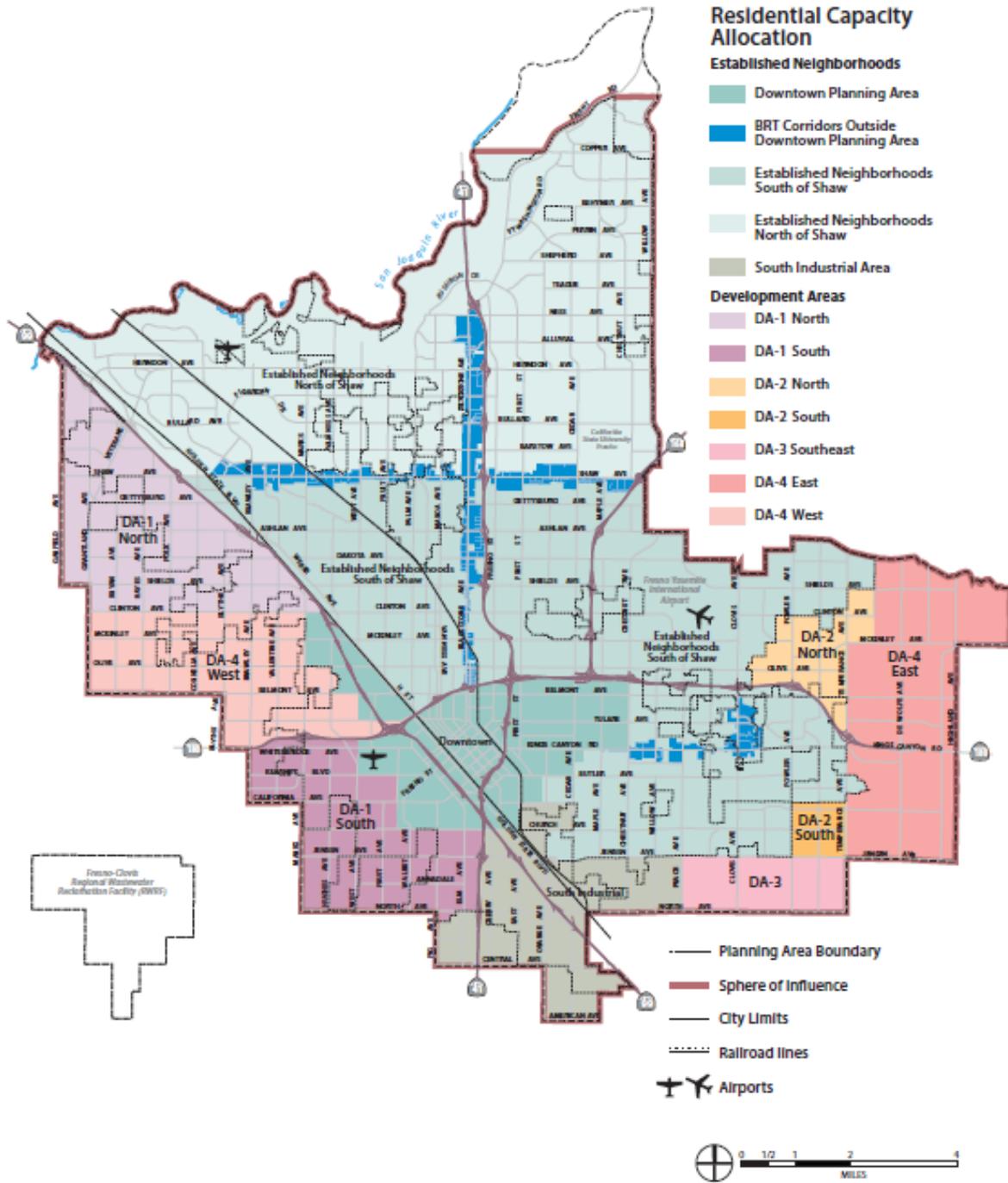


### Historic Growth Patterns Map





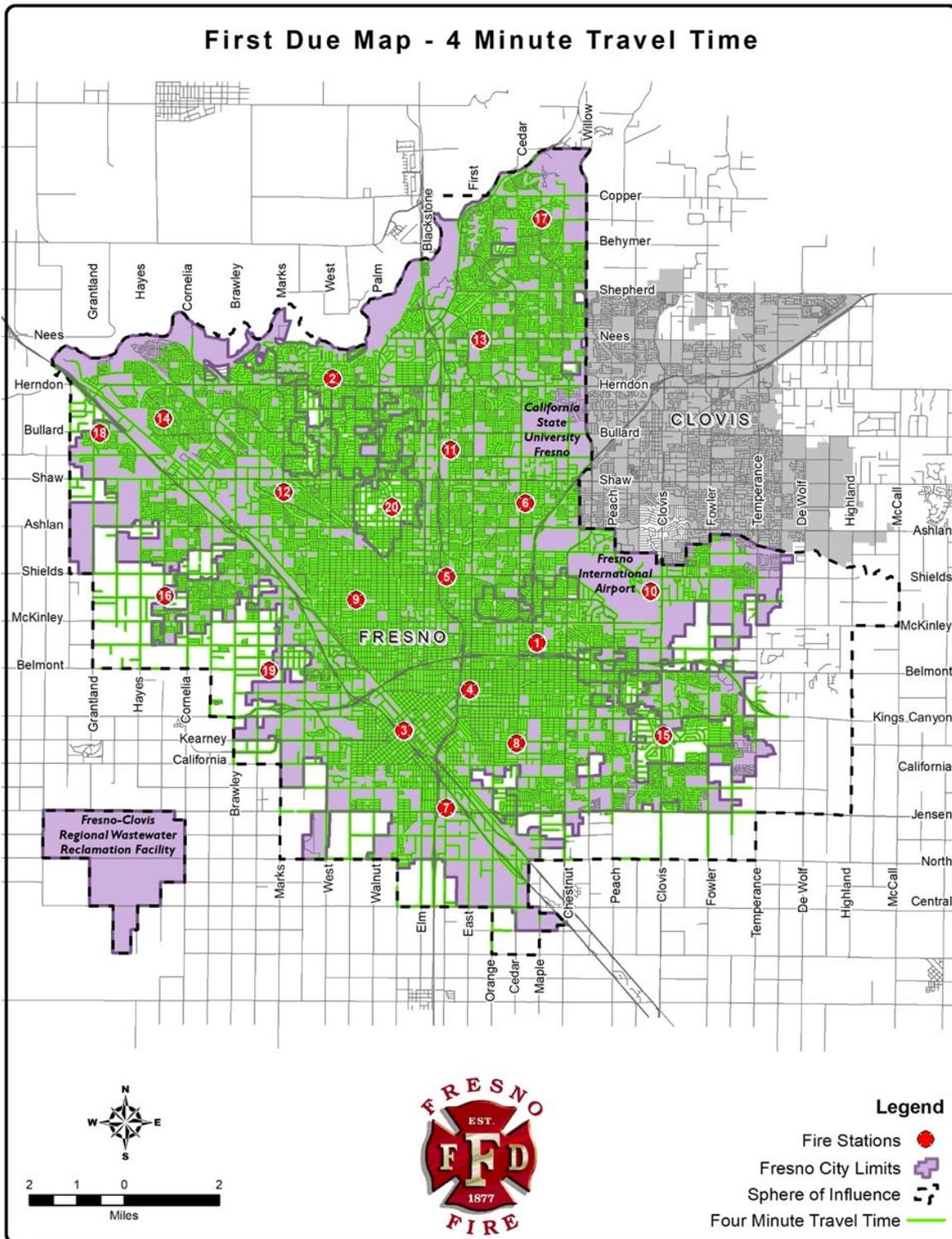
### Residential Capacity Allocation Map



Source: City of Fresno  
 Note: The Corridor along Shaw Avenue is to be supported by enhanced bus service.

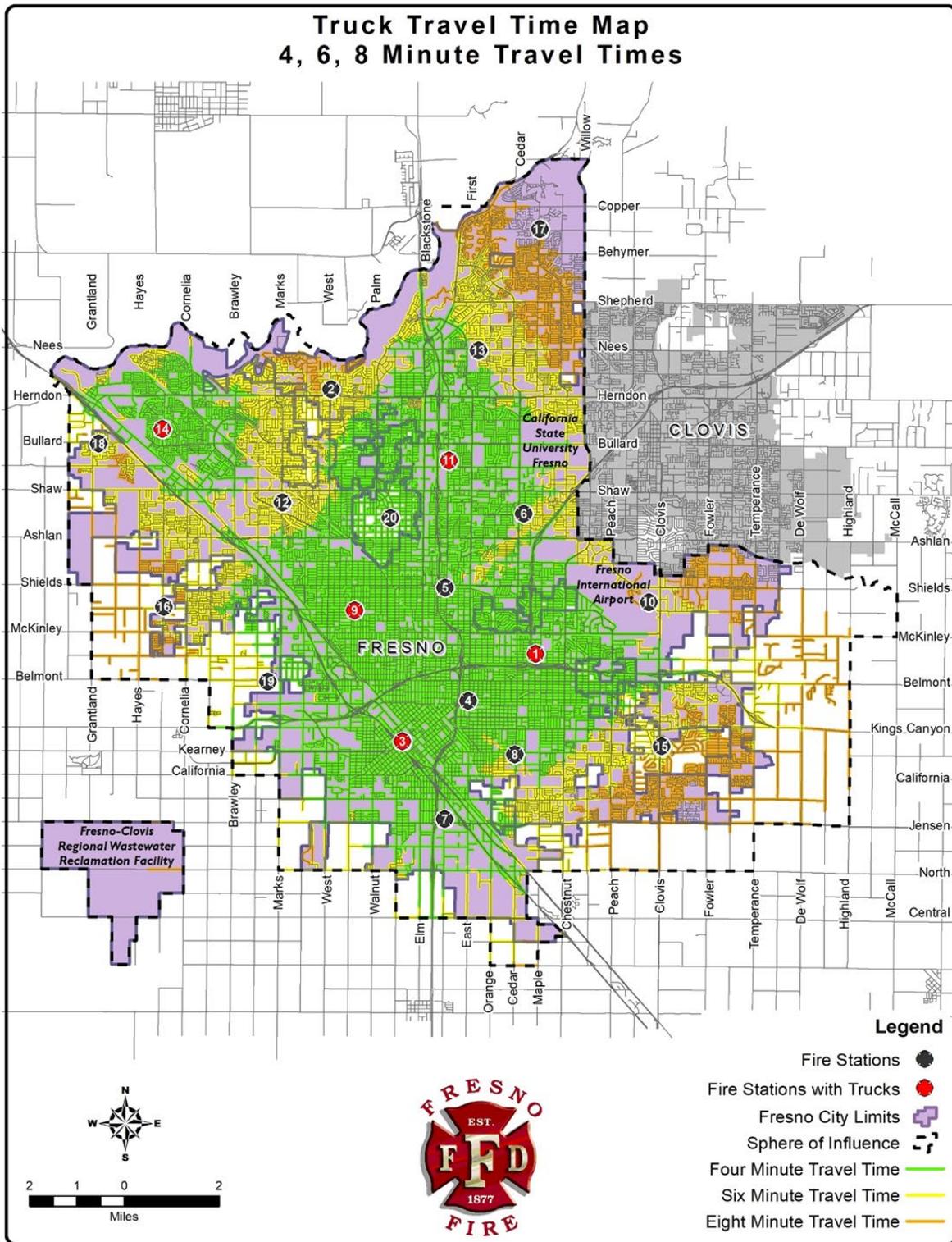


First Due Map - 4 Minute Travel



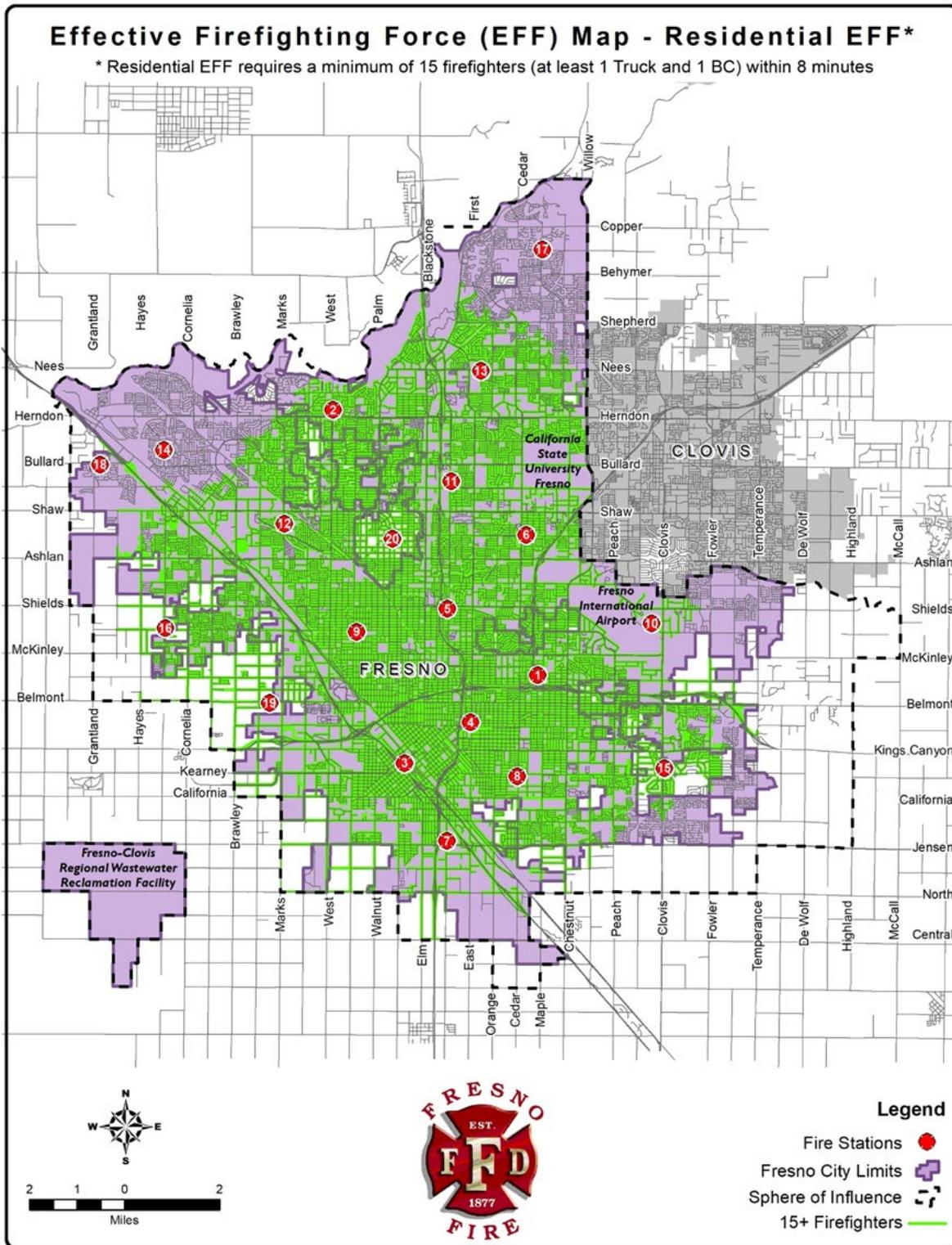


Truck Travel Time Map





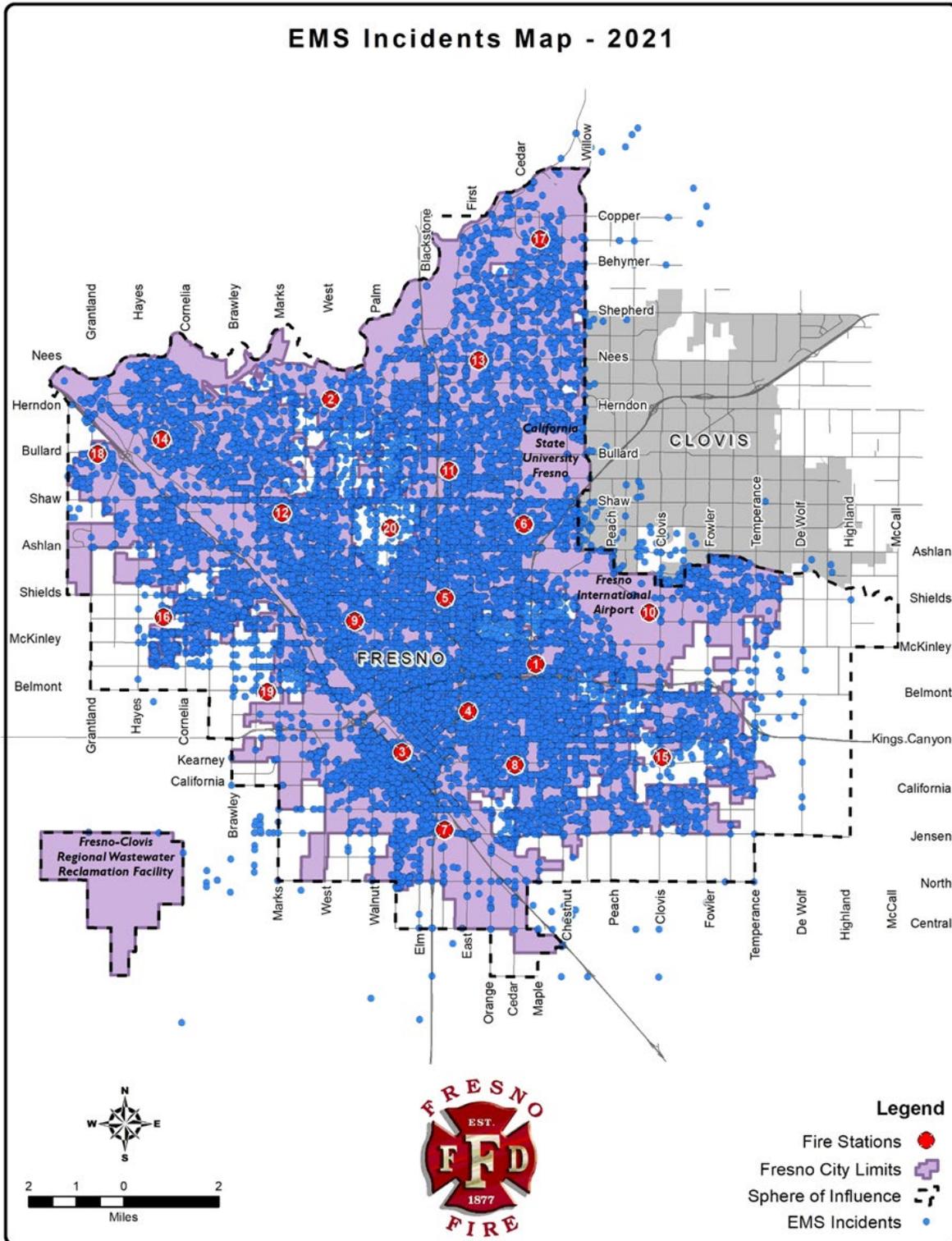
Effective Firefighting Force Map - Residential





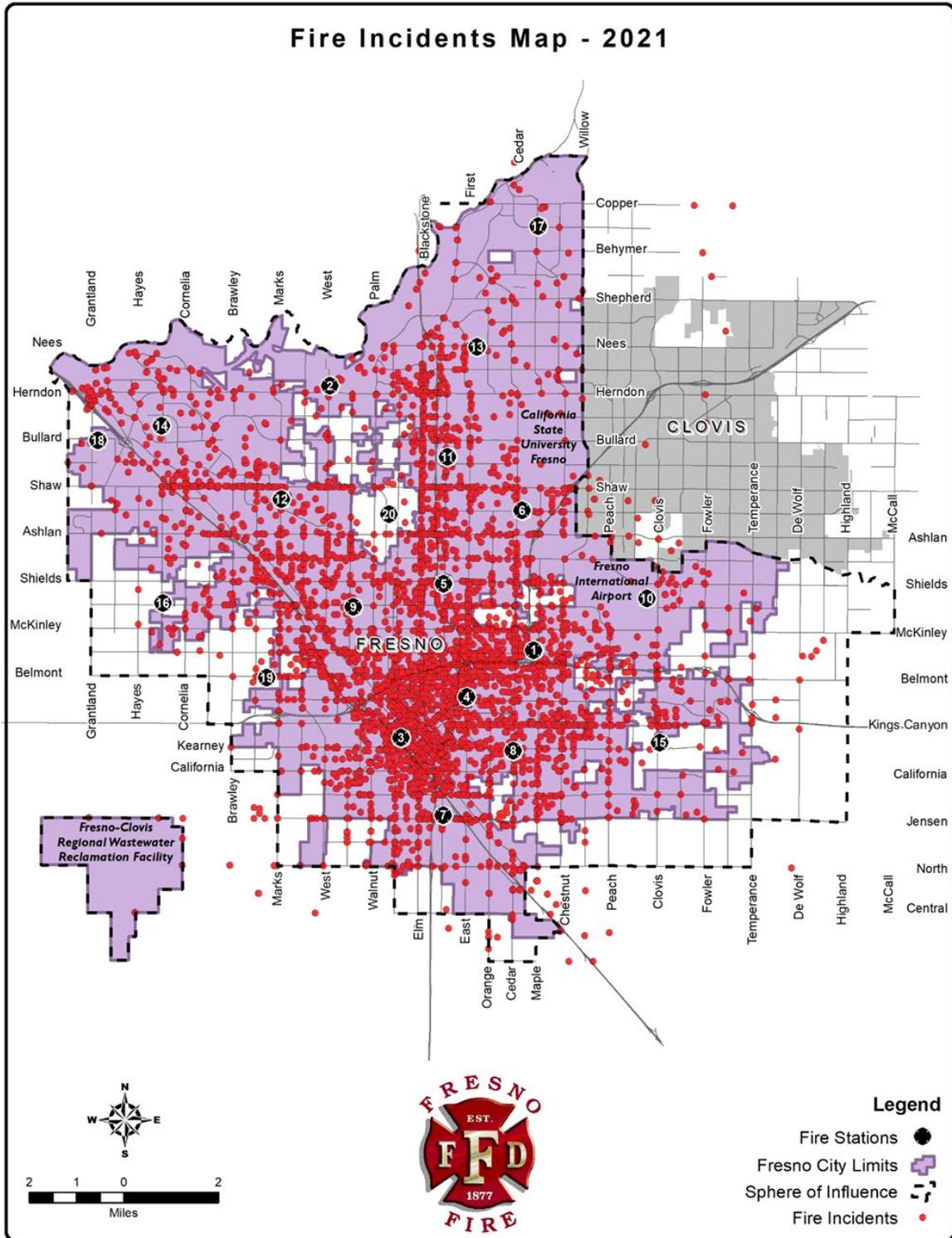


EMS Incidents Map





Fire Incidents Map





Incident Heat Map

