City of San Marcos Fire Department

San Marcos, TX

Community Risk Assessment

Standards of Cover

May 2020

ESCI Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

CONTENTS

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…and each of the firefighters and support staff who daily serve the citizens and visitors of San Marcos with honor and distinction.

Section I:
COMMUNITY RISK ASSESSMENT

COMMUNITY OVERVIEW & DEMOGRAPHICS

The following section provides a general overview of the community and population served by the San Marcos Fire Department.

Community Description

Located in Central Texas, the City of San Marcos lies primarily within Hays County and serves as the county seat. The City encompasses approximately 30 square miles, and consists primarily of land. The 2017 estimated population of San Marcos was 63,071 persons.[1] For calendar year 2018, City staff have estimated the population to be 63,509 for budgetary references. For two years in a row, San Marcos was named by the U.S. Census Bureau as the fastest growing city in the United States.[2]

Hays County is comprised of approximately 680 square miles, with a 2017 estimated population of 214,485 residents.[3] The County is part of the Austin-Round Rock Metropolitan Statistical Area (MSA). The major highways that run through the County include Interstate 35, U.S. Highway 290, State Highway 21, and State Highway 80. Interstate 35 runs through San Marcos.

San Marcos Economy

The City of San Marcos considers itself a business-friendly community committed to the promotion of development and improving the quality of life of its residents. Some of the major employers in San Marcos include:

- Amazon
- Texas State University
- San Marcos Premium Outlet Mall
- Tanger Outlet Mall
- Central Texas Medical Center
- Hunter Industries
- HEB Distribution Center
- San Marcos CISD

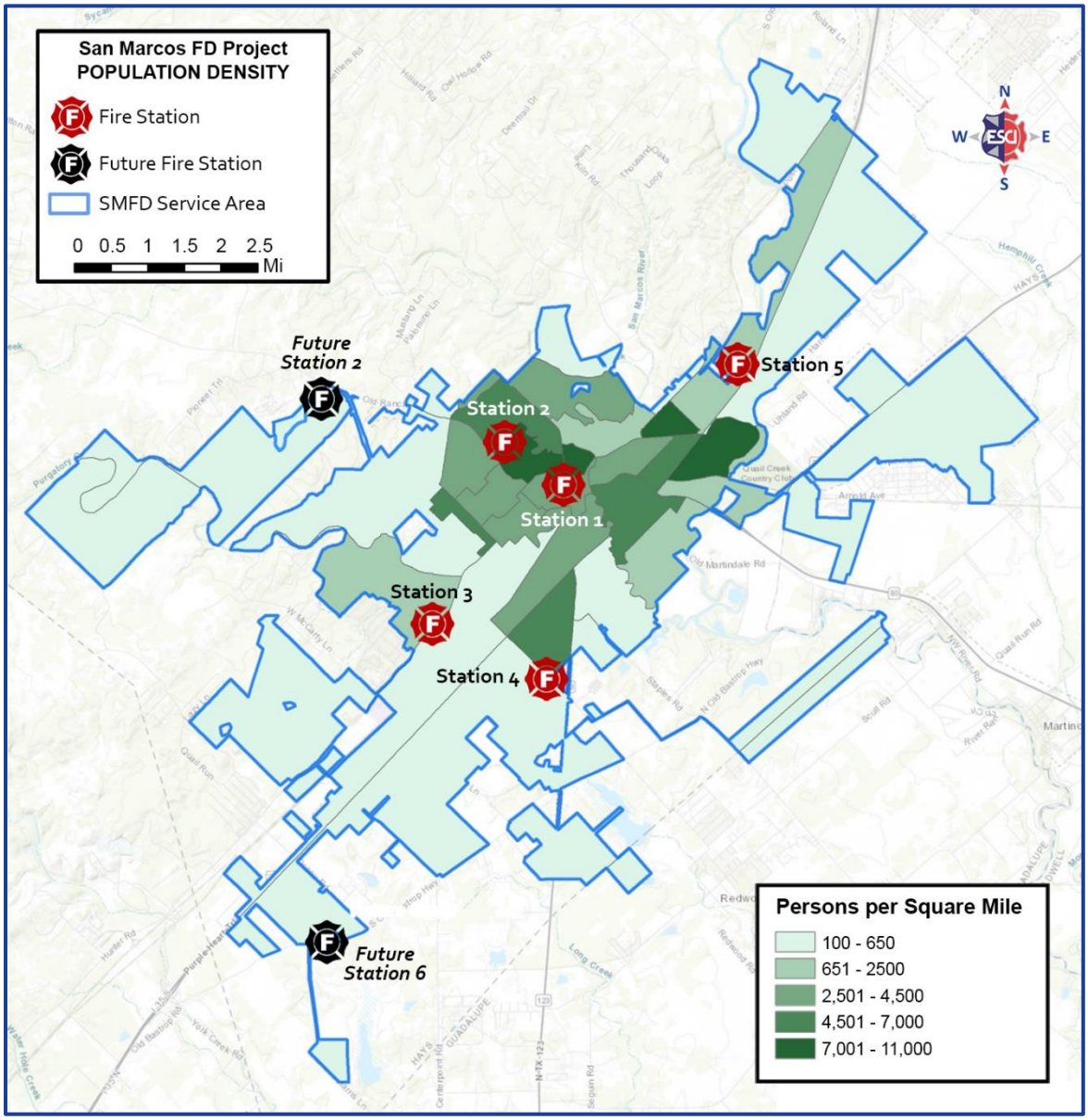
In 2017, the median household income in San Marcos was $34,748; which represented a 12.1% annual growth rate from 2016.[4] These figures contrast considerably compared to the overall Hays County median income of $62,815.[5] Between 2016 and 2017, employment grew at a rate of 6.2% (30,100 employees to 31,900 employees).

The most common industries in San Marcos are retail trade, accommodation and food services, and educational services.[6] By median earnings, the highest paying jobs held by San Marcos residents are health diagnosing and treatment practitioners, in addition to other technical occupations ($69,741), law enforcement employees and supervisors ($48,603), and computer and mathematical occupations ($44,375).[7]

General Population Characteristics

The population of the City of San Marcos has averaged an annual growth rate of nearly 5% between 2013 and 2017.[8] As of July 2018, females comprised nearly 52% of the population, with 4.6% under the age of five years, and 7.2% at 65 years and older.[9] Caucasians represented 48.7%; Hispanics (Latino) 41.8%; and Black or African American 5.5% of the population.[10] Over 26% of San Marcos residents speak a language other than English—most commonly Spanish or Spanish Creole.[11]

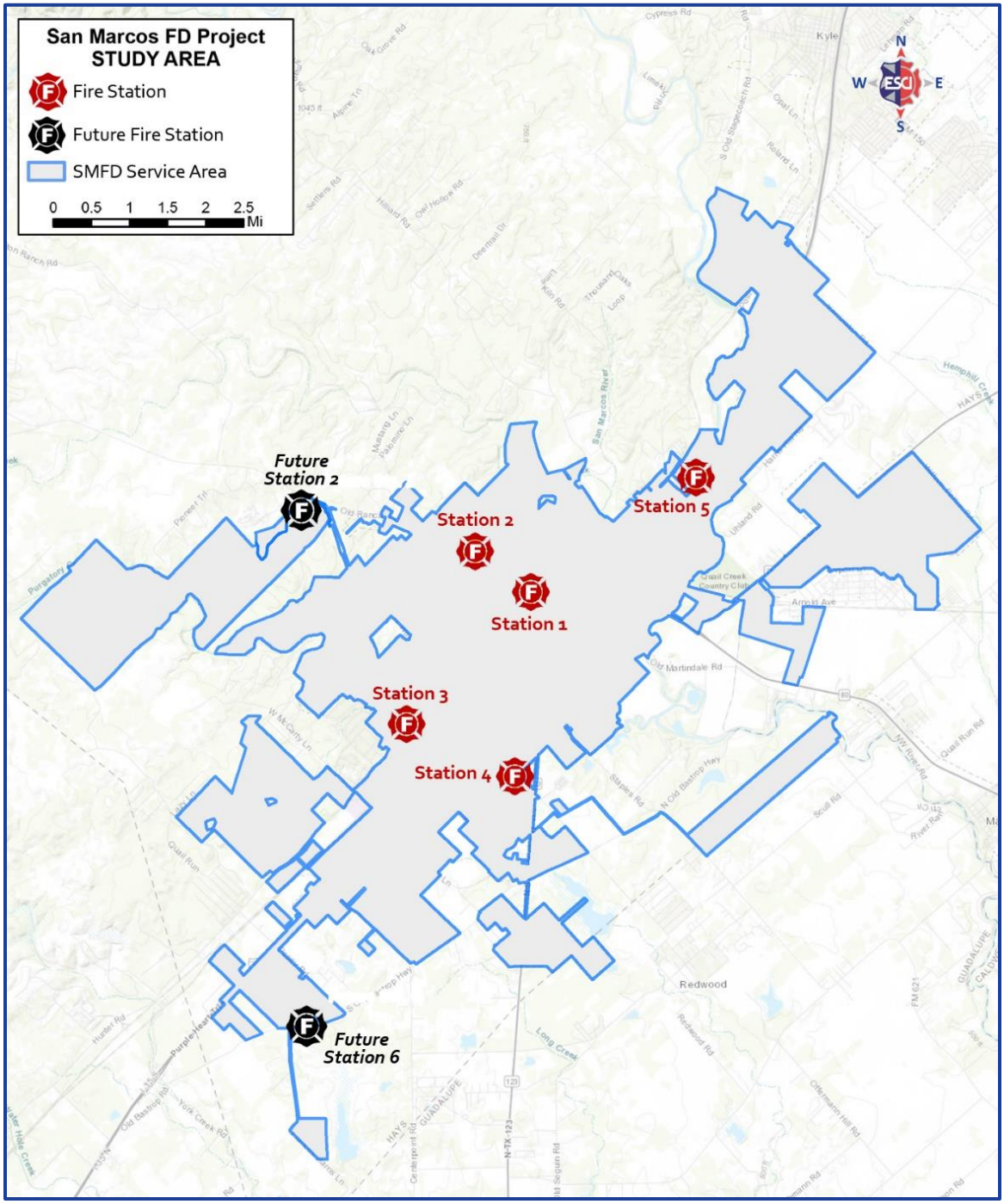
Figure 1: Population Density in San Marcos



Study Area

The following figure displays the general study area of the San Marcos Fire Department.

Figure 2: San Marcos Fire Department Study Area



COMMUNITY RISK

This section of the report provides information about community characteristics, hazards, and risks as determined from information provided by San Marcos Fire Department (SMFD), San Marcos Hays County Emergency Medical Services (SMHCEMS), and other sources. This information was then reviewed by the categorical risks that have the potential to threaten persons and businesses within the community. Additionally, as mentioned previously, it has a direct correlation to the safety of SMFD personnel and the corresponding workload. ESCI recommends that the SMFD review the categorical risks and revise, as needed, the response plan(s). ESCI developed the assessment from a broad base of information, including:

- Current hazard classification, planning, and mitigation measures from various sources.
- Specific information provided by SMFD about target hazards and land use.
- Planning zones established by SMFD.

Risk management is the assessment of the chance of an event occurring and the loss that will arise as a result of the event. As the actual or potential risk increases, the need for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished, and the numbers and types of apparatus to be dispatched need to be determined.

Risk management should also take into account the fiscal and political environment of the community served. Ultimately, policymakers must determine what services will be provided and to what level they will be funded to deliver appropriate coverage throughout the jurisdiction.

At-Risk Populations

The *Journal of General Internal Medicine* defines Populations at Risk broadly and includes the poor, frail, disabled, economically disadvantaged, homeless, racial, and ethnic minorities, and persons with low literacy.[12] The National Fire Protection Association (NFPA) *Urban Fire Safety Report* further reinforces the "at risk" groups as:[13]

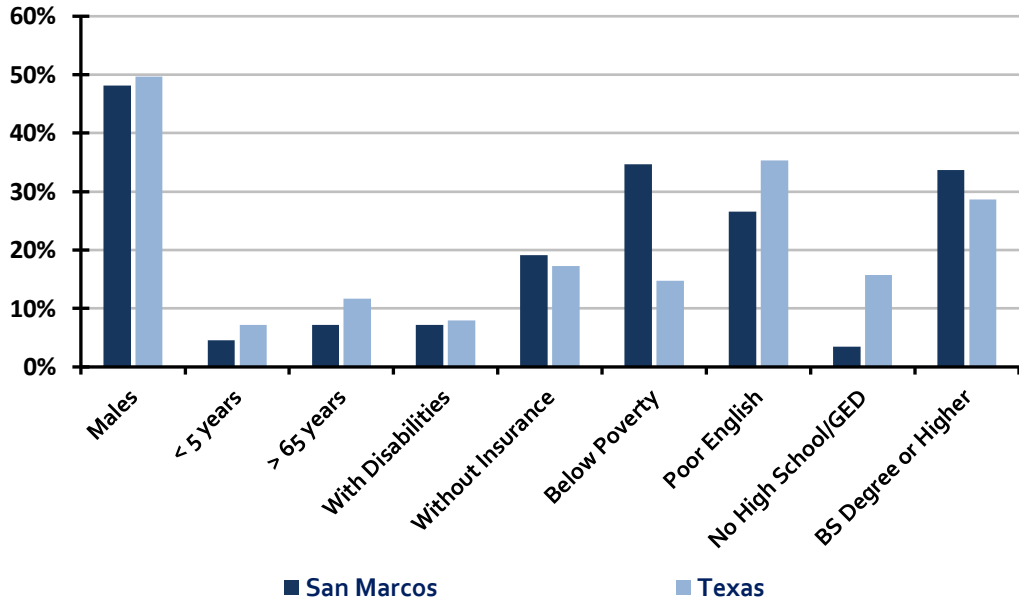
- Males
- Children under 5 years of age
- Adults over the age of 65 years
- Persons with disabilities
- Persons with language barriers; and
- Persons in low-income communities

The U.S. Census Bureau's 2017 *American Community Survey* (ACS) identified benchmark data for the at-risk population groups in San Marcos.[14] Unless otherwise mentioned, the figures in this section are adapted from the U.S. Census Bureau.[15] The findings are illustrated in the following sections.

Benchmark Risk

The following figure provides a comparative analysis of the risk groups between San Marcos and the State of Texas. One can quickly see that San Marcos has a larger percentage of the population that lives below the poverty line and poses a unique challenge to overcome the inherent risks associated with it. We will discuss this finding in further detail in a subsequent section.

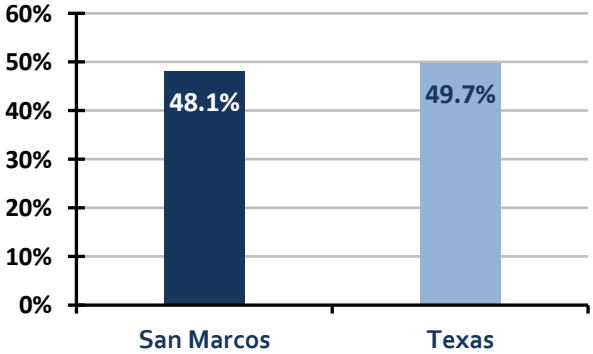
Figure 3: Comparative "At Risk" Groups as Percentage of Population



Males

As is common in many communities, males make up slightly less than half of the population. Males, especially those under 25-years of age, are more prone to engage in risky activities and may require higher levels of emergency response. Additionally, males are 1.7 times more likely to die in fires than females. This is somewhat, but not completely, offset by complications during pregnancy. There is not a significant difference between the percentage of males in San Marcos when compared to the State of Texas.

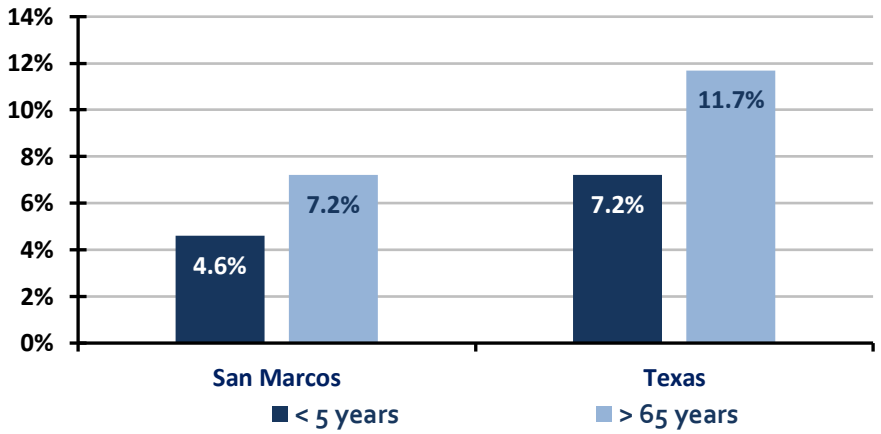
Figure 4: Males as a Percentage of the Population



Persons by Age-Risk

When compared to the State of Texas and other similar-sized communities, San Marcos has a lower percentage of the population that is less than 5 years and over the age of 65 years. This is reinforced through a median age of 23.2 years when compared to a statewide median age of 34.3 years. There is an increase in demand for service as a community ages and a corresponding increase in community risk. Quality of life issues and increased reliance on assisted living could affect service delivery and the number of resources required due to an increase in service demand for emergency medical services. The very young also represent a vulnerable population, both regarding their ability to escape a structure fire as well as their susceptibility to serious medical ailments such as asthma, traumatic events, choking, or injury from vehicular accidents.

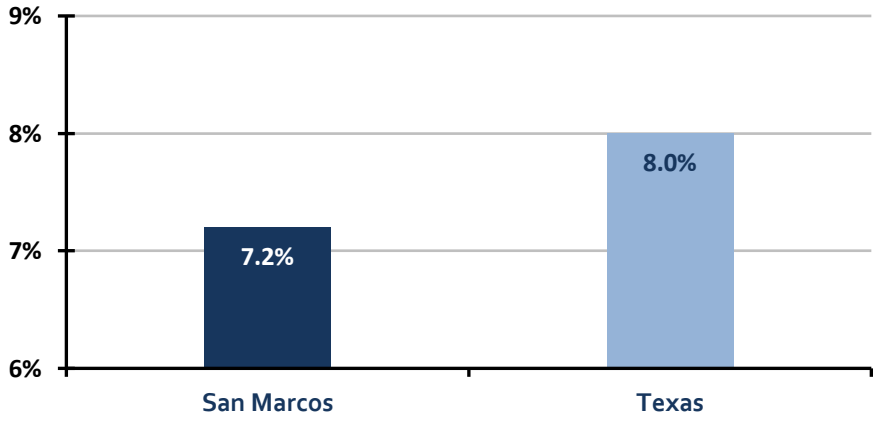
Figure 5: Percentage of Population by Age Risk (2017)



Persons with Disabilities

People living with a disability under 65 years of age may have difficulty or be incapable of self-preservation during an emergency. Likewise, people under 65 with no health insurance are more prone to chronic illness or exhibit poor physical condition simply because they do not seek treatment promptly. Thus, they may require a higher level of fire-rescue and EMS responses.

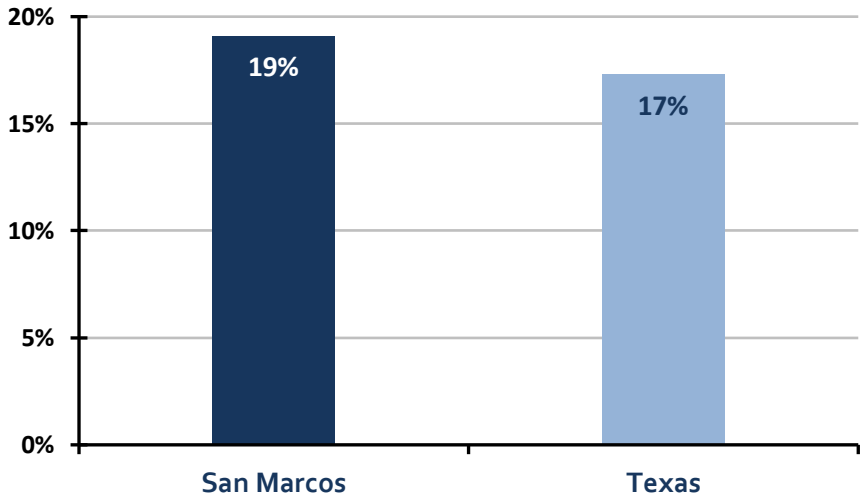
Figure 6: Percentage of Population with Disability (2017)



Persons without Health Insurance

Although access to health insurance is not included in the NFPA at-risk categories, it is well documented and known that persons without health insurance are more susceptible to developing chronic health conditions and/or a dependence on emergency services. The percentage of persons without health insurance is slightly higher than the state. This is of particular concern when considered in conjunction with the high poverty rate.

Figure 7: Percentage of Population without Health Insurance (2017)



Persons Living in Poverty

Persons living in poverty experience an increased risk from fire or medical condition due to age or condition of housing level, inability to pay for routine medical care, lack of medical insurance, and general health conditions. Sometimes, the lack of access to transportation leads to increased use of care and transport. Those living below the poverty line are the most at-risk. The low-income category is often combined with other factors such as education, disability, and work status. In rural communities, low-income residents may live far from treatment centers and require extended response times.

Figure 8: Percentage of Population Living in Poverty (2017)

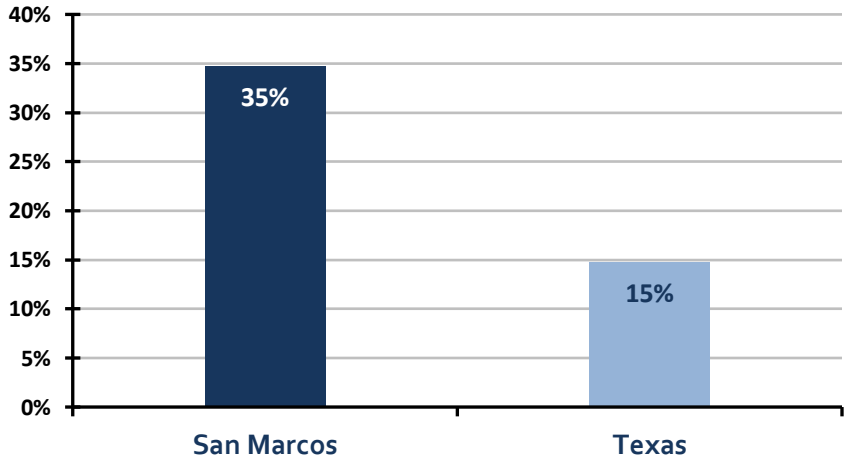
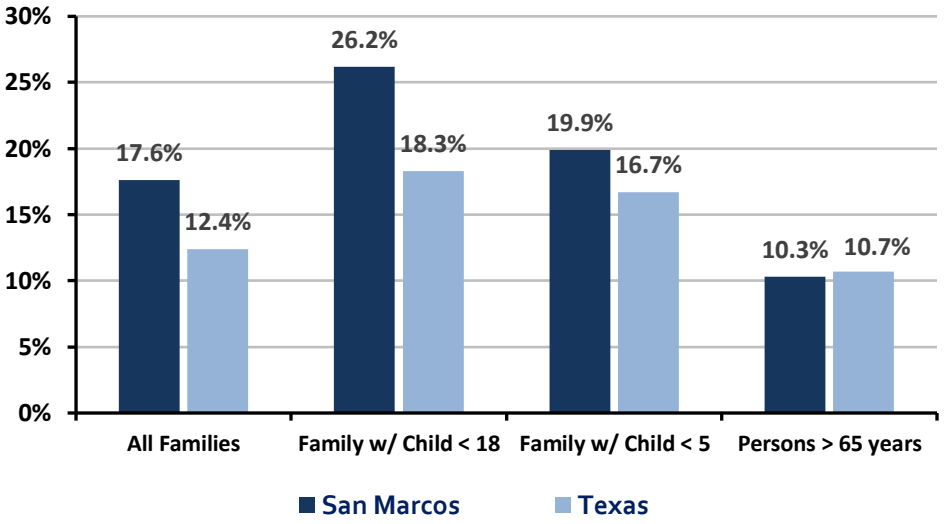
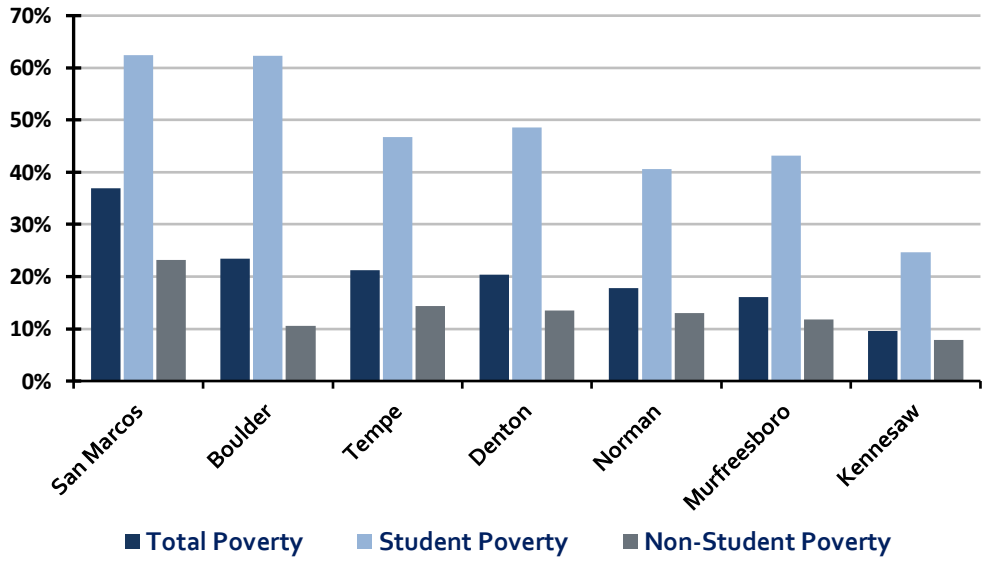


Figure 9: Poverty by Family Unit Type and Age of Children (2017)



In 2017, Texas State University authored a research report entitled *Understanding Poverty in San Marcos, Texas: A Comparative Perspective*.[16] This report suggests that college town poverty rates are "inflated" and that this is attributable to the inclusion of a student population that meets the federal poverty income limits. As such, the following figure has been adapted from the report mentioned previously, and contrasts the total poverty rates with the non-student poverty rates. It is readily visible that, despite San Marcos being one of the fastest-growing cities in the nation, it is experiencing a two-fold increase in poverty when compared to similar fast-growing college towns within the United States.

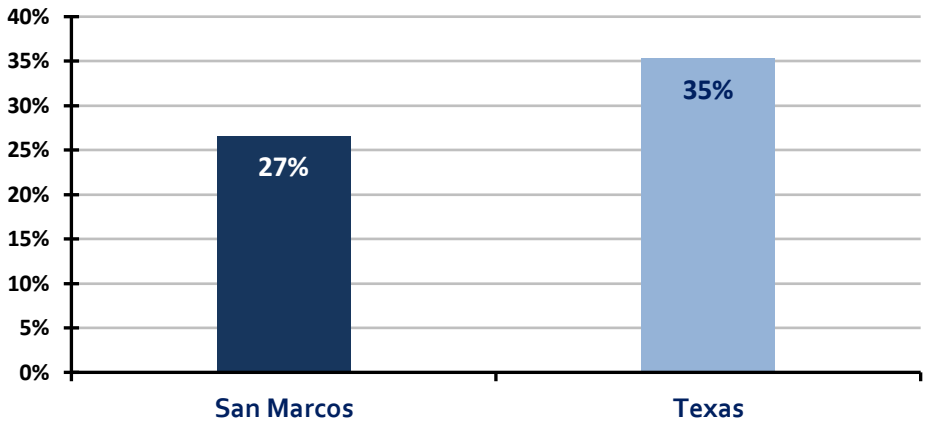
Figure 10: Poverty Rate in Fastest-Growing College Towns (2015)



Persons with a Language Barrier

Nearly 25% of the population in San Marcos is less than fluent in the English language. This is even more pronounced when removing the college student population. According to the NFPA, "Language barriers, cultural differences, and inexperience with unfamiliar home technologies are factors that mark the challenges of helping newcomers live safely from the threat of fire in the home." By itself, speaking a language other than English at home does not directly contribute to difficulties in communicating with others; however, if a person has difficulty speaking English, it may contribute to negative outcomes during an emergency.

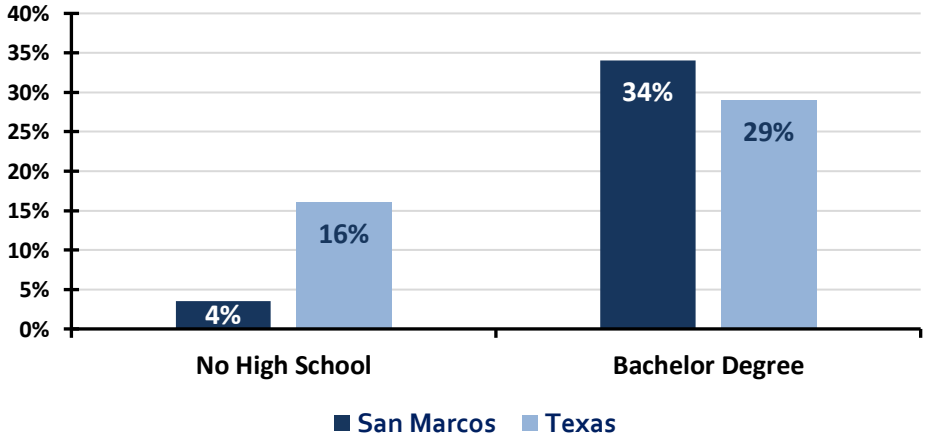
Figure 11: Percentage of Population with Language Barrier



Education Level

Although education level is not included in the NFPA at-risk categories, several studies link educational attainment to financial security and poverty levels. It is interesting to see that San Marcos fairs better than the State of Texas when comparing high-school diploma attainment and/or college education for persons over the age of 25 years.

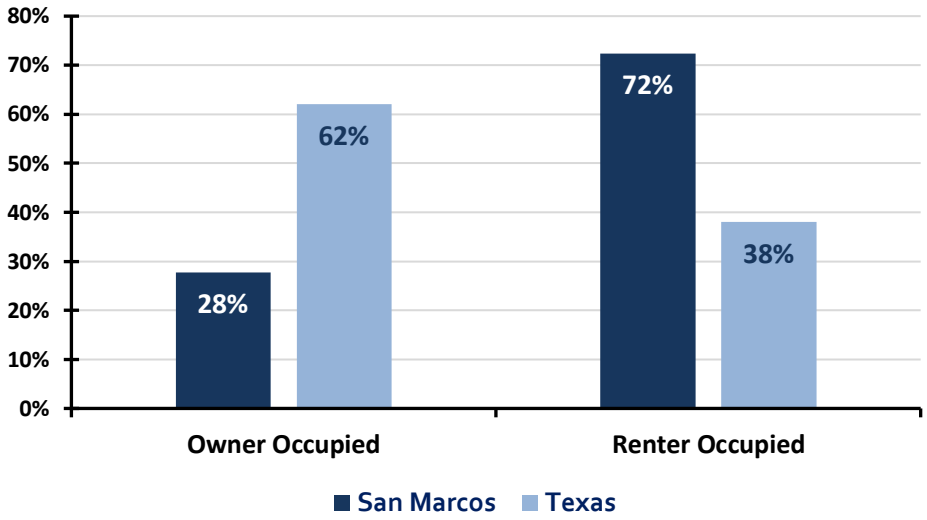
Figure 12: Educational Level of Population Over 25 Years of Age



Housing

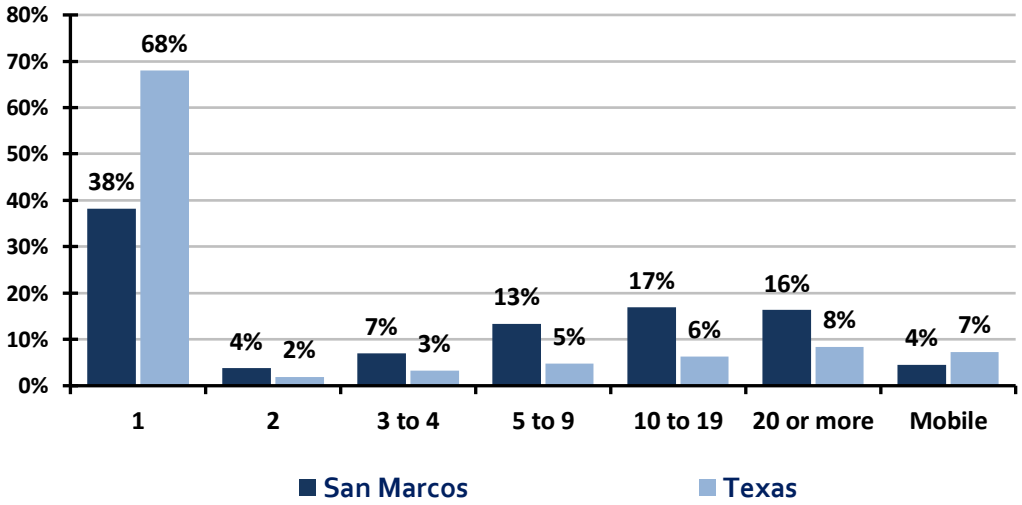
Although housing type is not included in the NFPA at-risk categories, certain housing types, such as older multi-family units and/or mobile homes pose a higher risk due to potential loss of life or lack of fire protection features. When compared to the State of Texas, San Marcos has a low percentage of the population that maintain home ownership. This is due, in part, to the student population. Approximately 72% of San Marcos residents live in multi-unit/multi-family properties, mobile homes, manufactured housing, or other non-traditional types.

Figure 13: Comparative Housing Type (2017)



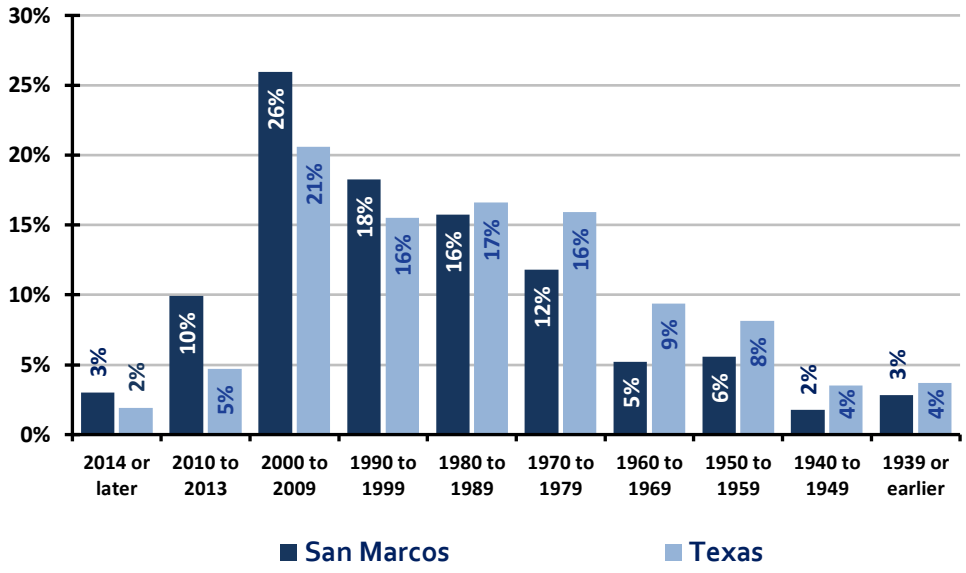
San Marcos has a larger percentage of multi-unit housing than the State of Texas. This correlates with an increased life safety risk for fires that are not contained by a fire sprinkler.

Figure 14: Comparative Analysis of Living Units per Occupancy (2017)



Newer construction is typically considered to have a lower fire risk due to newer construction standards and fire protection safety features. When compared to the State of Texas, San Marcos has a larger percentage of housing that has been constructed within the last 30 years.

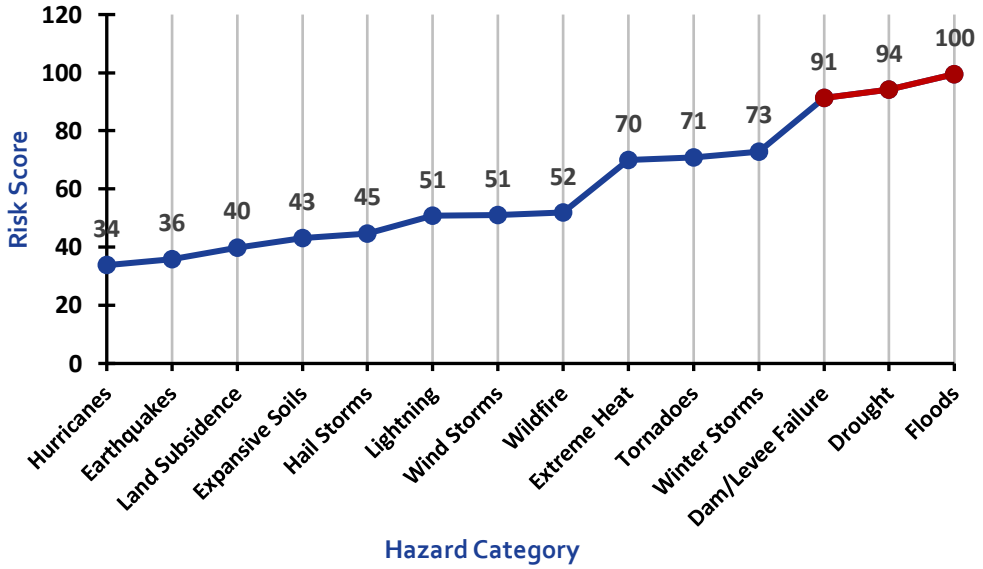
Figure 15: Construction Year of Housing (2017)



Natural Hazards

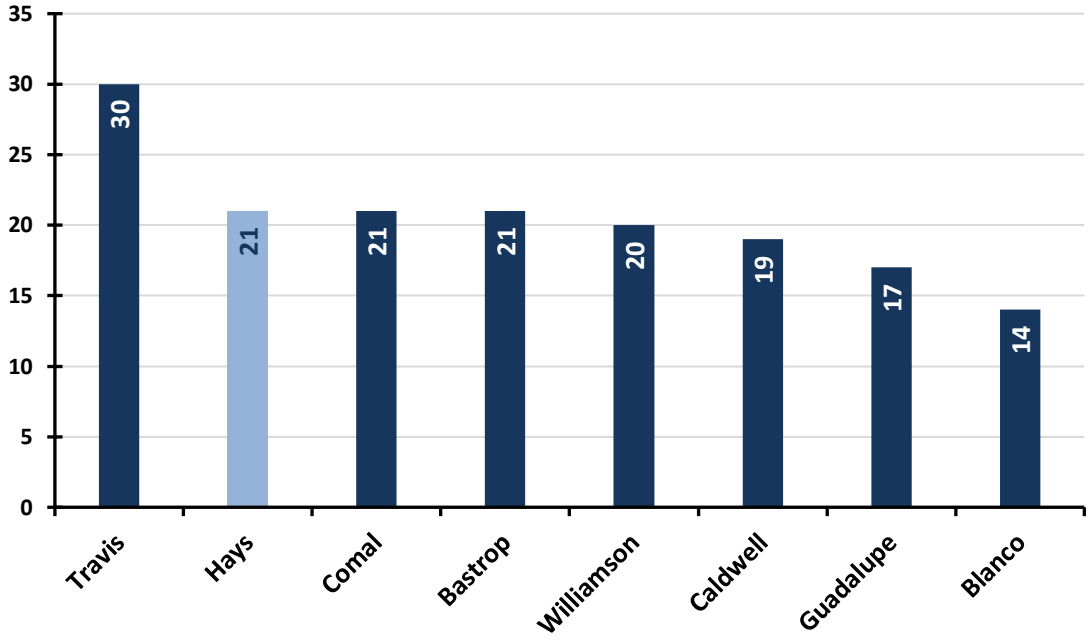
In 2017, Hays County updated the Hazard Mitigation Plan, including updates to a risk assessment for the City of San Marcos.[17] Within this report, a risk ranking was provided for the major natural disaster categories. The most recent major flooding event occurred on April 11, 2017, when a storm flooded the City with approximately 7 inches of rain within a 2-hour period and resulted in nearly 50 water rescues throughout the day.[18] As can be seen in the following figure, water-related risks (flooding and dam/levee failure) and drought pose the greatest natural disaster risks to the San Marcos community.

Figure 16: Risk of Natural Hazards in San Marcos



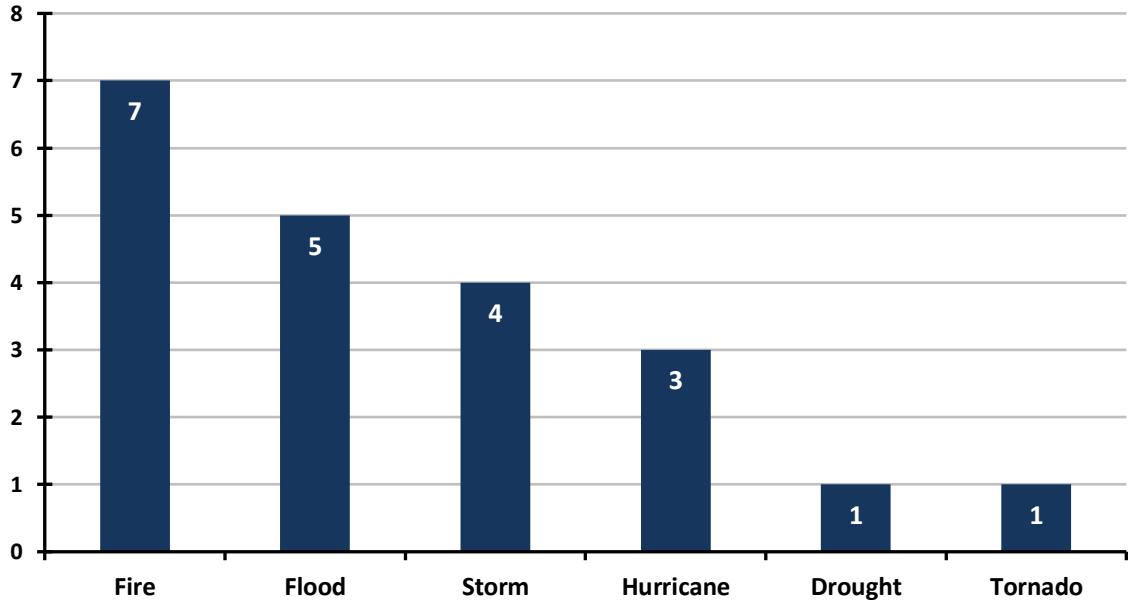
The Federal Emergency Management Agency (FEMA) assists states, counties, and localities that experience significant hardship during and after a natural disaster. Accordingly, FEMA maintains a database that documents federally supported and declared disasters. The following figures have been adapted from FEMA's Data Visualization tool.[19]

Figure 17: Federal Disasters by Central Texas Counties (1953–2017)



As can be seen in the preceding figure, Hays County experienced 21 federal disasters since 1953, and this aligns with the average experienced throughout the Central Texas region. Further analysis shows that 33% of the disasters were fire-related, and 24% involved flooding. The following figure highlights the historical events by disaster type.

Figure 18: Federal Disasters in Hays County (1953–2017)



Technological Hazards

Technological or human-caused hazards result from accidents or failures of systems and structures; or the actions of people, either accidental or intentional. Intentional actions are always deliberate; however, the intent may differ (e.g., a deliberate action may be planned, careless, reckless, or with the intent to cause harm). In careless or reckless acts, or those that are poorly planned and or executed, the outcome may have unintended consequences.

Transportation Hazards

Geographical Restriction

The National Fire Protection Association Standard for the Organization and Deployment 1710 Standard was updated in 2020 and includes a new reference—*geographical restriction zone*.[20] These zones are defined as a "condition, measure, or infrastructure design such as a railroad crossing, drawbridge, [or] narrow street that is inaccessible by fire apparatus, traffic demand pattern, long supply line lay, or other similar circumstance that impedes an apparatus' travel to an incident." The following figure highlights these zones within the San Marcos community.

Transportation corridors and configurations directly impact emergency service provider response capabilities. This is evidenced in limited access freeways and railways that force emergency vehicles to utilize alternative, and sometimes lengthier, routes to an emergency scene. The following figures illustrate the various geographical restriction zones within the City of San Marcos.

Figure 19: Geographic Restrictions—Rivers & Bridges

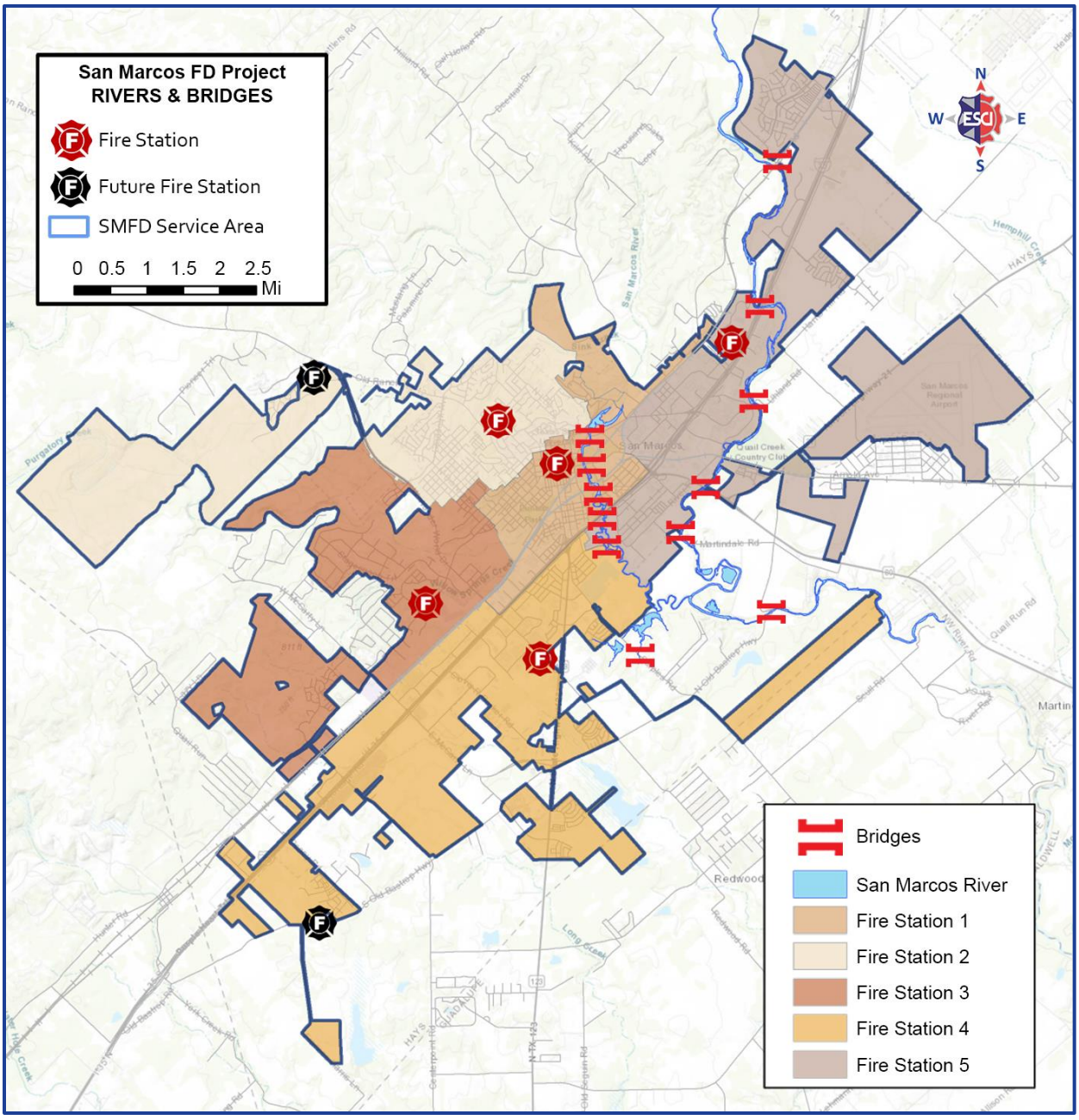
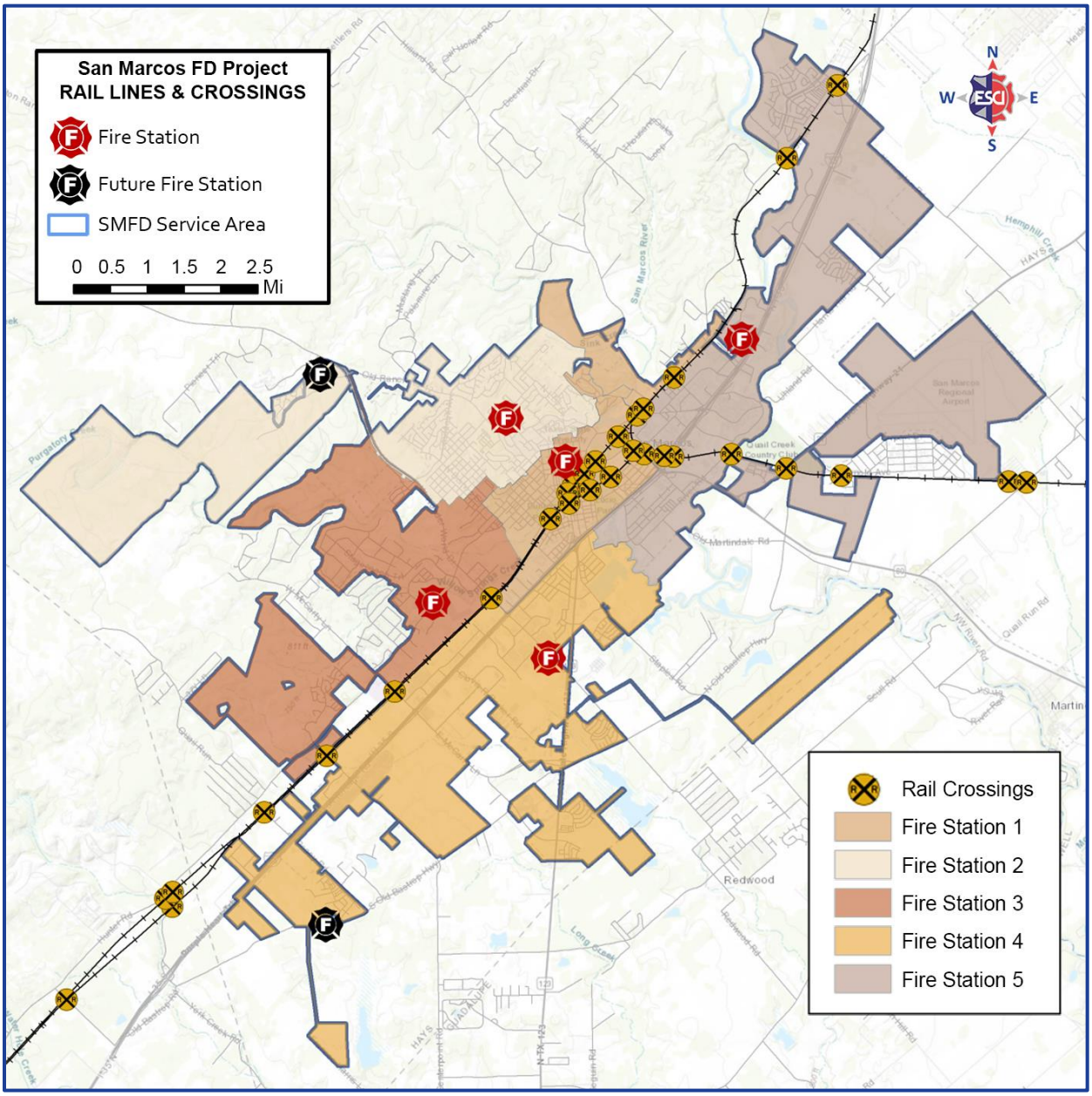


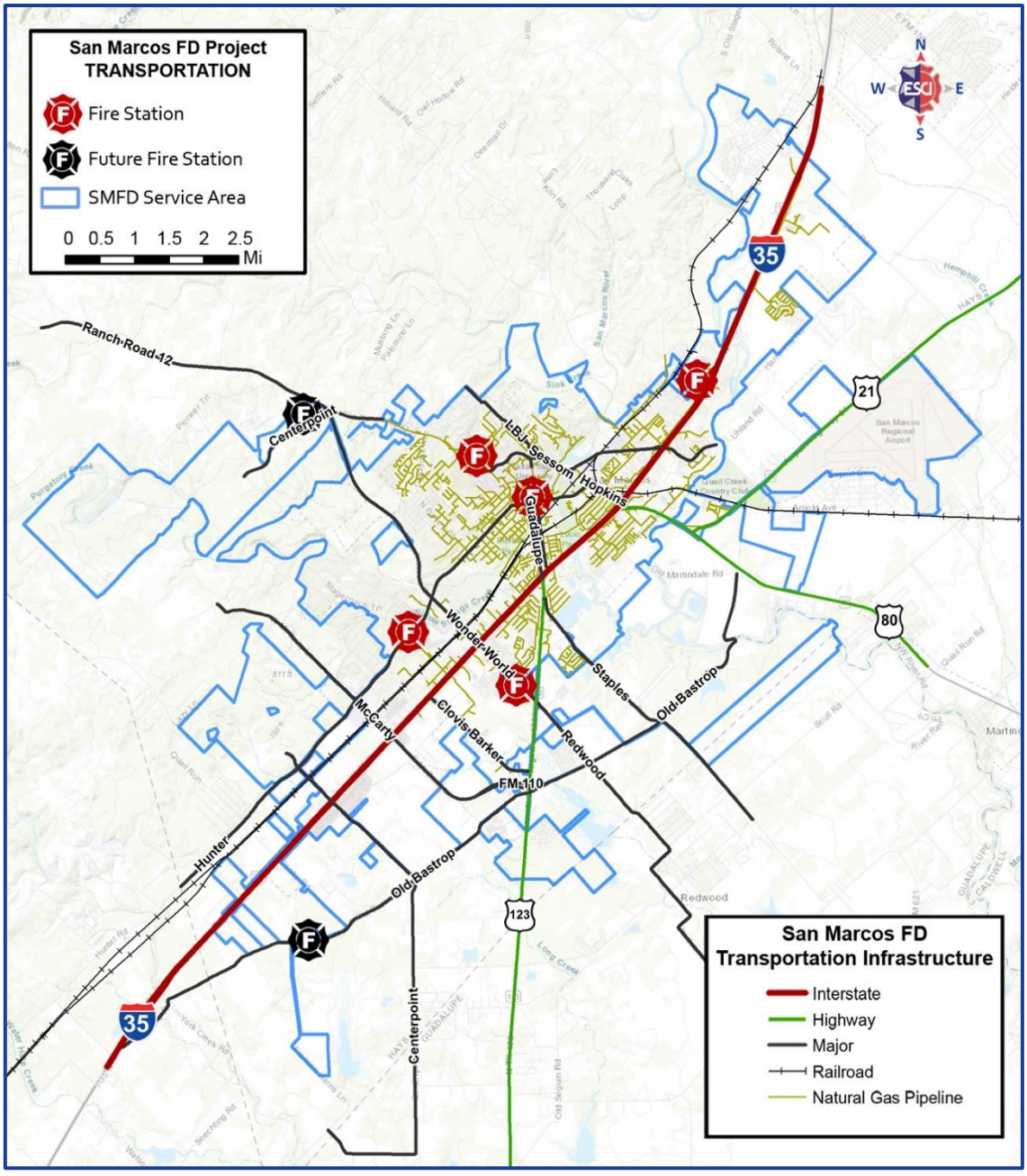
Figure 20: Geographic Restrictions—Rail Lines & Railroad Crossings



Freeways

The City of San Marcos has a major interstate highway, IH-35, that separates the eastern and western developments of the City. Moreover, fire stations are located on each side of the freeway to ensure timely response and service. The IH-35 freeway serves as a major transportation thoroughfare and routinely experiences congestion from the large volume of transit operators. This can best be illustrated by the 2018 Urban Mobility Study that cites the southern aspect of Austin, along IH-35, as the third most congested roadway in Texas.[21]

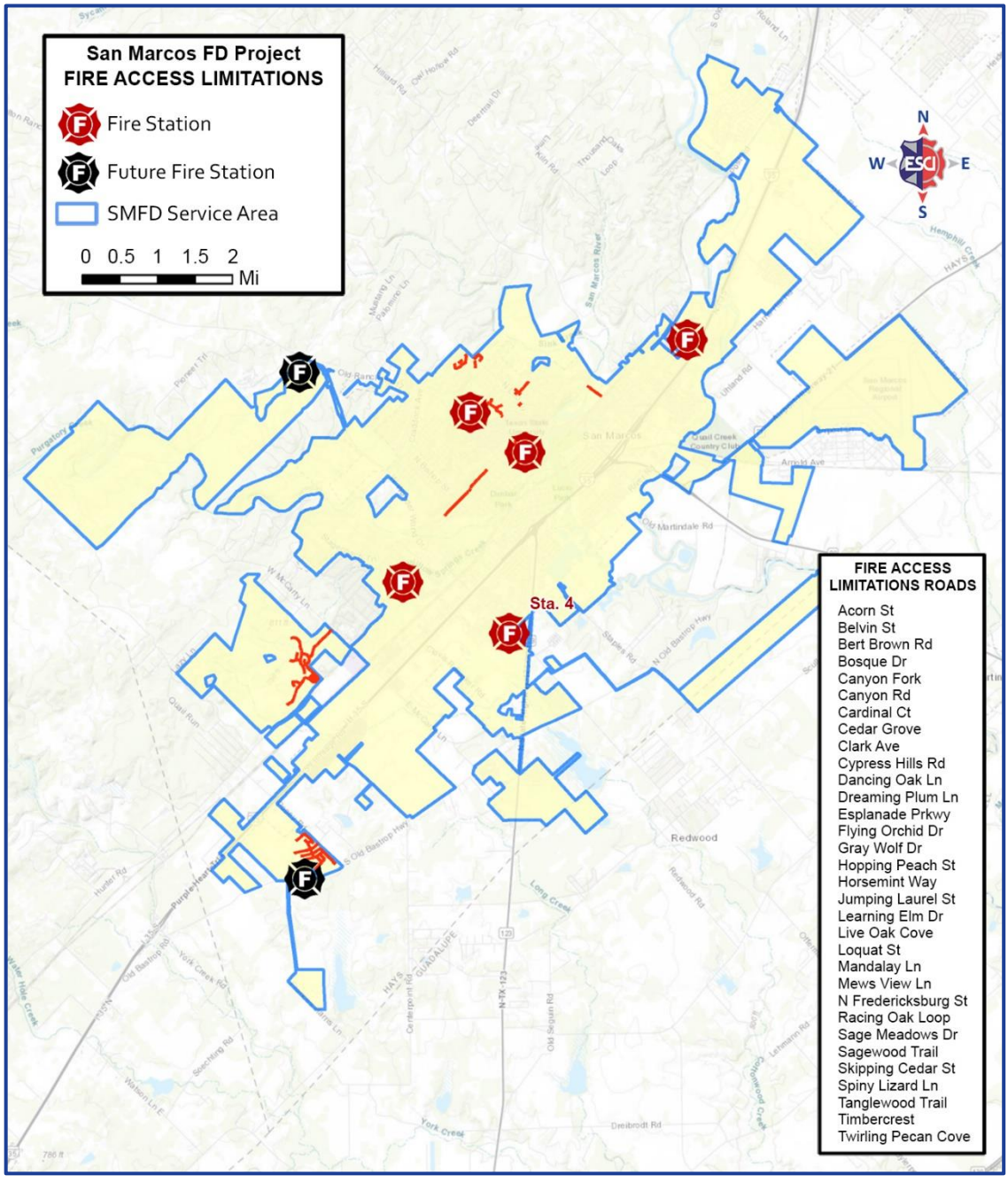
Figure 21: Major Roadways



Emergency Response & Fire Department Access Roads

Properly designed and enforced fire apparatus access roads provide a critical role in response times and the ability to access an emergency incident. Generally speaking, a road width must provide at least 20 feet of unobstructed width to maximize the response capabilities of emergency units. The City of San Marcos has adopted the 2015 International Fire Code, which provides guidance to approved road widths, turning radius, and slopes. The following figure illustrates roadways that may or do pose response challenges for fire apparatus.

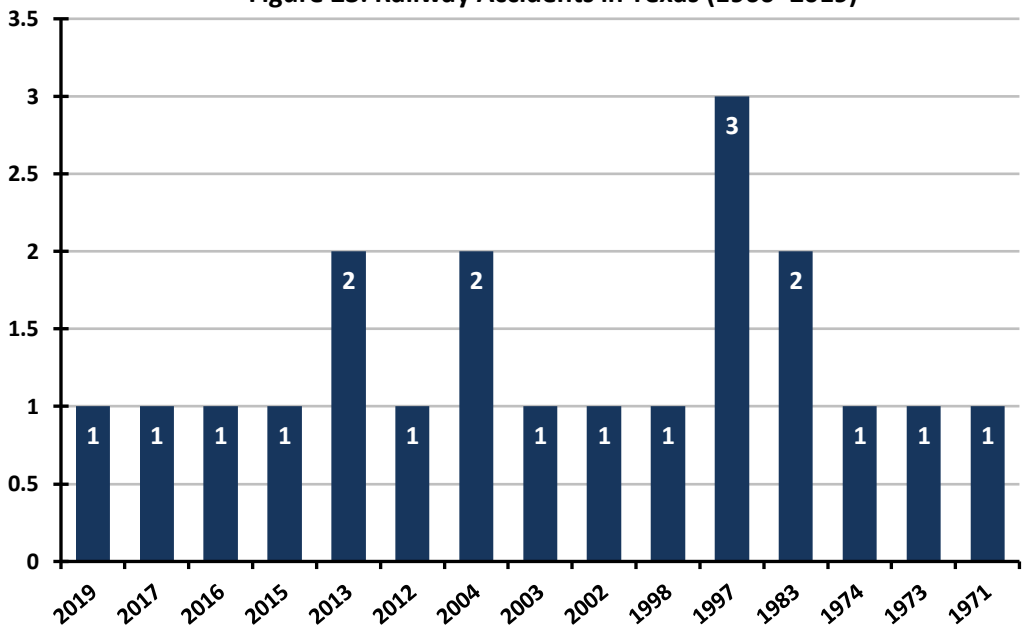
Figure 22: Fire Apparatus Access Road Limitations



Railroad

In March 2019, the City of San Marcos approved zoning for the development of a 734-acre industrial park that is referred to as the San Marcos Air, Rail, Truck (SMART) terminal. Upon completion, the park is expected to be served by Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) railways.

Figure 23: Railway Accidents in Texas (1966–2019)



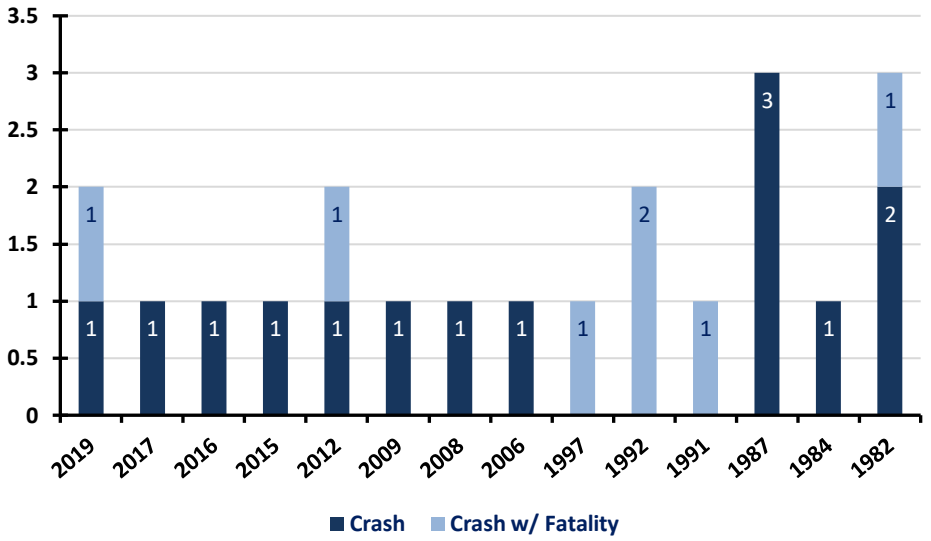
Railway transit is generally considered a safe mode of transportation. The National Transportation Safety Board (NTSB) maintains responsibility for investigating railroad-related accidents and the subsequent investigation report(s). According to the NTSB Railroad Accident Reports portal, approximately 4.2% (20) of railroad accidents have occurred in the State of Texas since 1966.[22] The portal does not list any major incidents in San Marcos.

Aircraft

The San Marcos Regional Airport (SMRA) is in the northeastern section of the City. Texas Aviation Partners (TAP) manages the airport, which was first opened in 1965. According to records submitted to the Federal Aviation Administration (FAA), the airport averages 123 flights per day that include 53% transient general aviation, 44% local general aviation, and 2% military.[23]

A review of the National Traffic Safety Board (NTSB) crash records reveals 20 incidents that include seven fatalities since 1980.[24] The most recent incident occurred on November 20, 2019, and the second most recent occurred on August 15, 2019, and involved small planes. The following figure summarizes the SMRA crash history.

Figure 24: San Marcos Regional Airport Crash History (1980–2019)



Structural Fire Hazards

Residential Fire

In December 2018, the National Fire Protection Association (NFPA) authored the *Home Structure Fires* research report that analyzed fire causation, confinement, and occupancy related data for all residential structure fires that occurred from 2012 to 2016.[25] The following figures are adapted from the aforementioned report and illustrate the correlation between cooking fires and fire containment. Note that there was a 39% containment rate for residential cooking fires and this closely aligns with the fire causation/origin of cooking fires at 38%. Multi-family has a similar correlation with a 70% confinement rate and 72% causation to cooking related items.

Figure 25: Residential Structure Fire Cause (2012–2016)

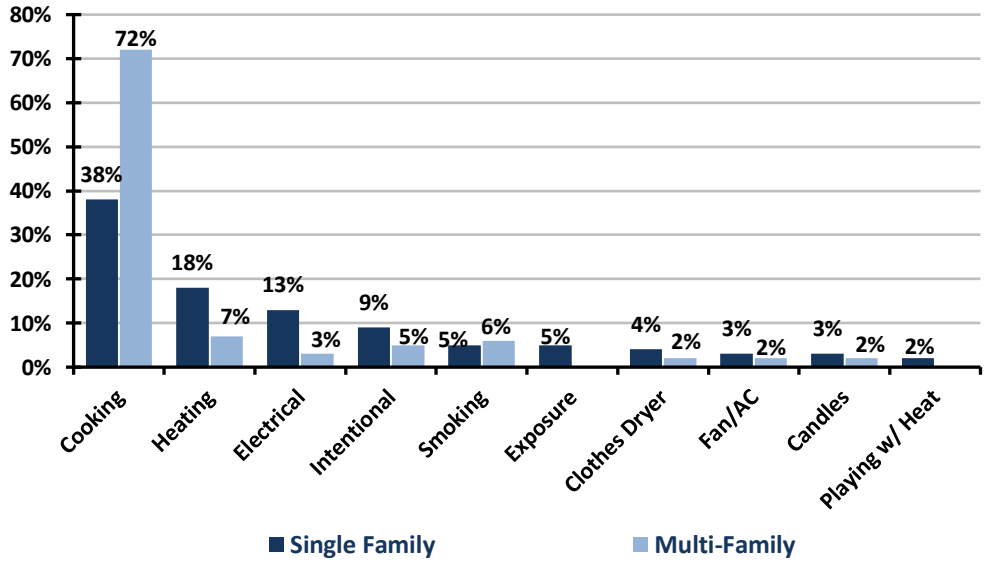
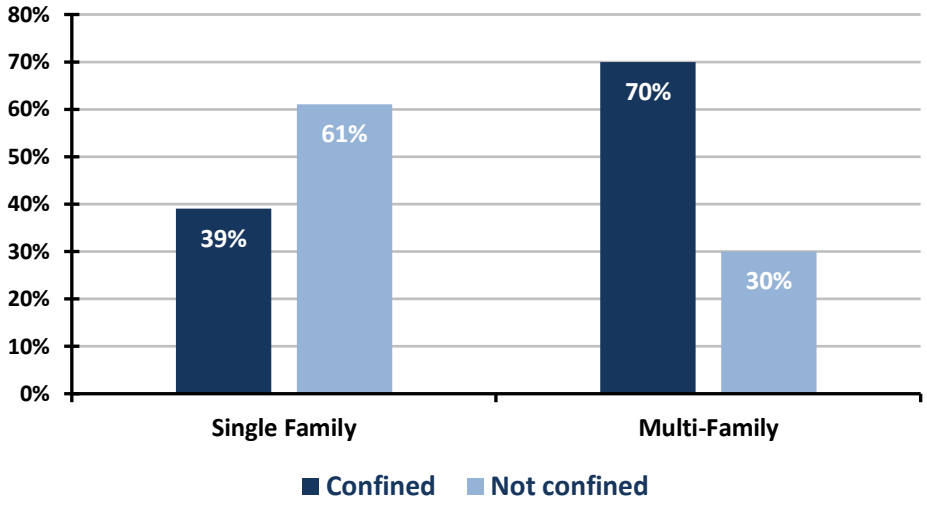


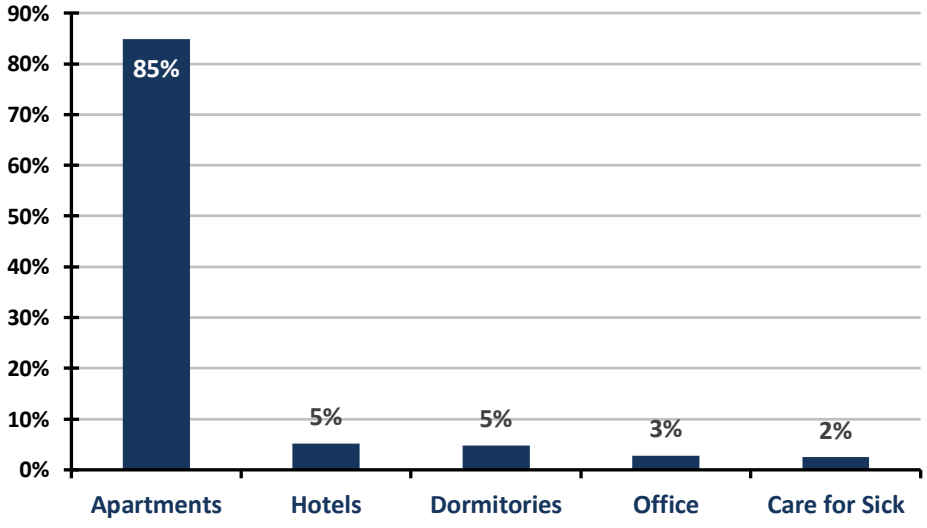
Figure 26: Single-family versus Multi-family Fire Containment (2012–2016)



Large Structure & High-Risk Fires

In November 2016, the National Fire Protection Association authored a report entitled *High-Rise Building Fires.* Within this report, the author evaluated more than 14,500 structure fires that occurred in high-rise buildings between 2009 and 2013.[26] For this community report, a *high-rise* is defined as a building with an occupied floor that is taller than 55 feet in height above the lowest level of fire department vehicle access. The following figure represents national high-rise fires, and the data helps illustrate risk within the San Marcos community. Moreover, the data illustrates fire propagation outcomes related to sprinklered versus non-sprinklered buildings and high-rise versus shorter buildings. Nearly three-quarters (73%) of high-rise fires occur within one of five occupancy types: apartments, hotels, dormitories, offices, and facilities that care for the sick. The following figure further illustrates that within the previous five categories, apartments carry the largest probability (85%) of occurrence.

Figure 27: National High-Rise Fires (2009–2013)



Multi-story buildings were further compared to evaluate fire spread (propagation) beyond the room of origin and beyond the floor of origin. Three of the primary influencing factors are building construction materials, and the presence of a functional fire detection (alarm) and fire suppression system (sprinkler). The value of these fire safety features should not be understated. The City of San Marcos has an increasing density of low to mid-rise developments, and the following figures illustrate the comparative risk of fire spread between high-rise and shorter buildings. The SMFD enforces the 2015 International Fire Code and requires fire protection systems, such as sprinklers, in large buildings and multi-family developments. Note that legacy buildings and other non-sprinklered buildings will require a much larger fire flow and place a greater demand on SMFD resources and the water utility infrastructure.

Figure 28: Percent of Fires with Fire Spread Beyond Room of Origin (2009–2013)

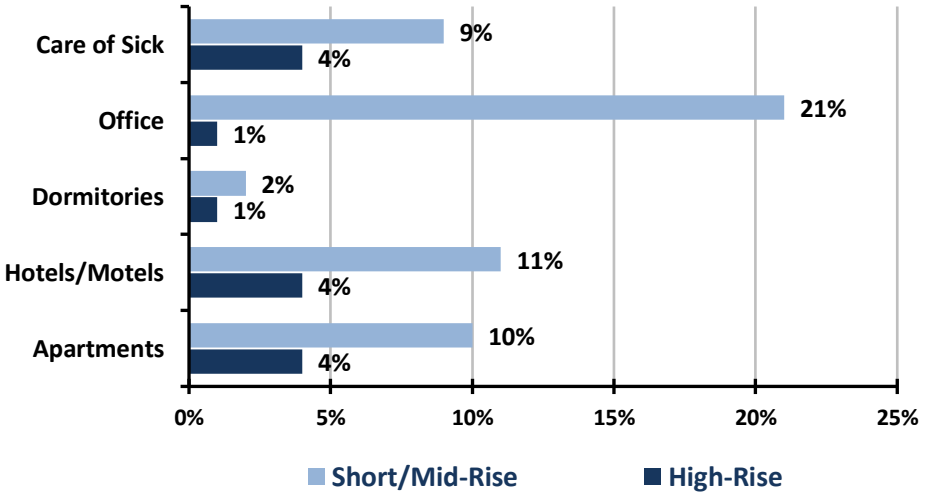


Figure 29: Percent of Fires with Fire Spread Beyond Floor of Origin (2009–2013)

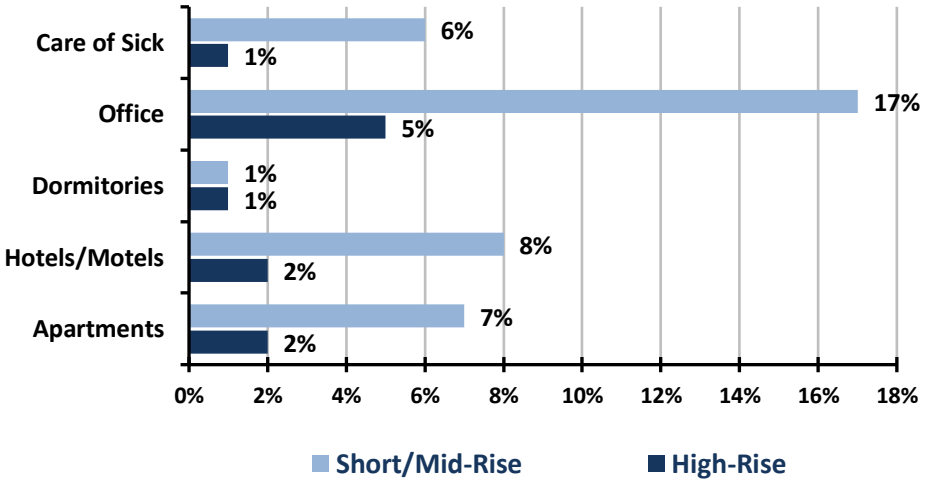
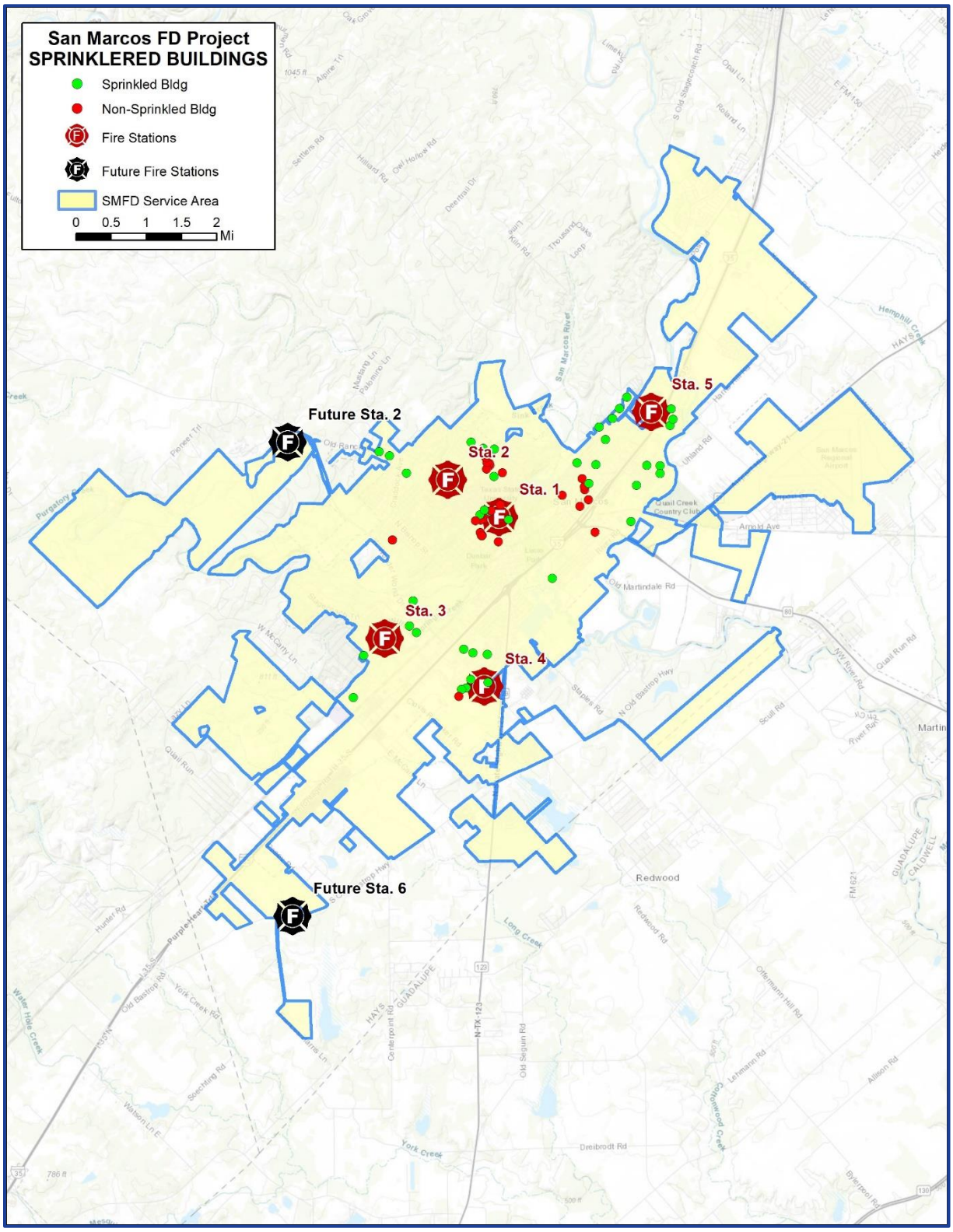


Figure 30: Sprinklered & Non-Sprinklered Multi-Story & High-Rise Facilities in the City of San Marcos



Target-Hazard Locations

The San Marcos Fire Department is responsible for the response and mitigation of fire, medical, and rescue related incidents that occur throughout the City. As such, the following section of this report highlights the location of infrastructure that may pose a unique response or need during an emergency. The infrastructure is categorized by use/occupancy type as follows:

Figure 31: Listing of Community Target Hazards

Occupancy/Hazard Area	Description
Large Buildings	Sprinklered vs Non-Sprinklered MF, HR, > 50,000 square feet
Public Assembly	Churches, Restaurants, Bars, Libraries, Sports Stadiums
Educational	Public/Private K–12, University, Day Care
Medical/Congregate Care	Hospitals, Urgent Care, Dependent Care Facilities
Government	Detention Centers, Jails, Court, Local/State/Federal Offices
Energy Systems	Pipeline, Major Power Grids
Communication	Cell Towers, Radio Towers, Broadcast Facilities
Tier II Facilities	Facilities (Superfund Amendments & Reauthorization Act)
Major Employers	Major Employment Centers
Largest Tax Generators	Facilities with High Sales/Property Tax Contributions
Distribution Centers	Large Distribution and Fulfillment Centers
Dam & Flood Prone Areas	Dam or Levee Sites with Flood-Prone Areas
Wildfire Risk	Wildland-Urban Interface Locations

The following pages and figures illustrate the target-hazard locations in the preceding figure. Note that data and information were unavailable to develop a wildland-urban interface map.

Figure 32: Educational Facilities in the City of San Marcos

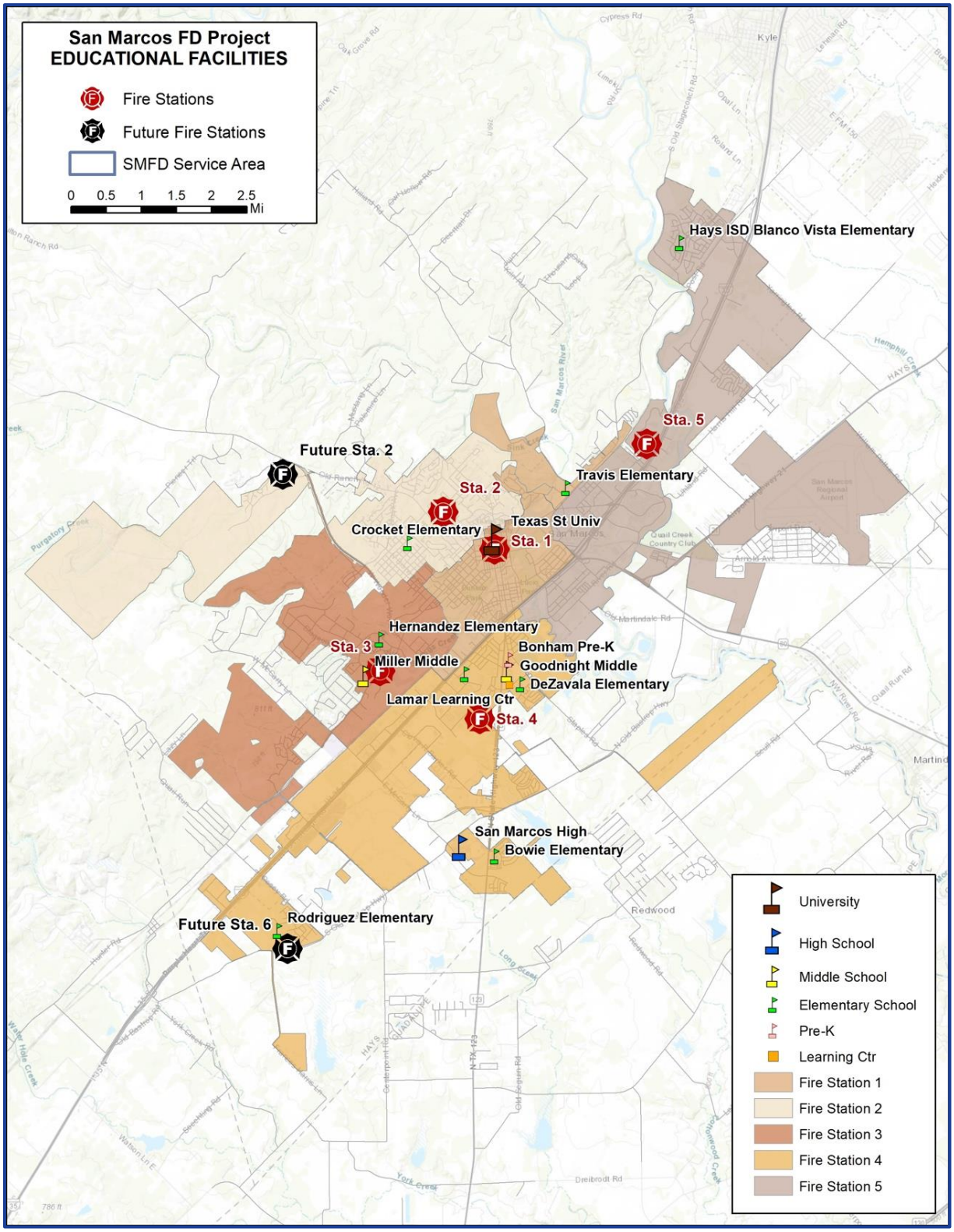


Figure 33: Healthcare & Congregate-Care Facilities in the City of San Marcos

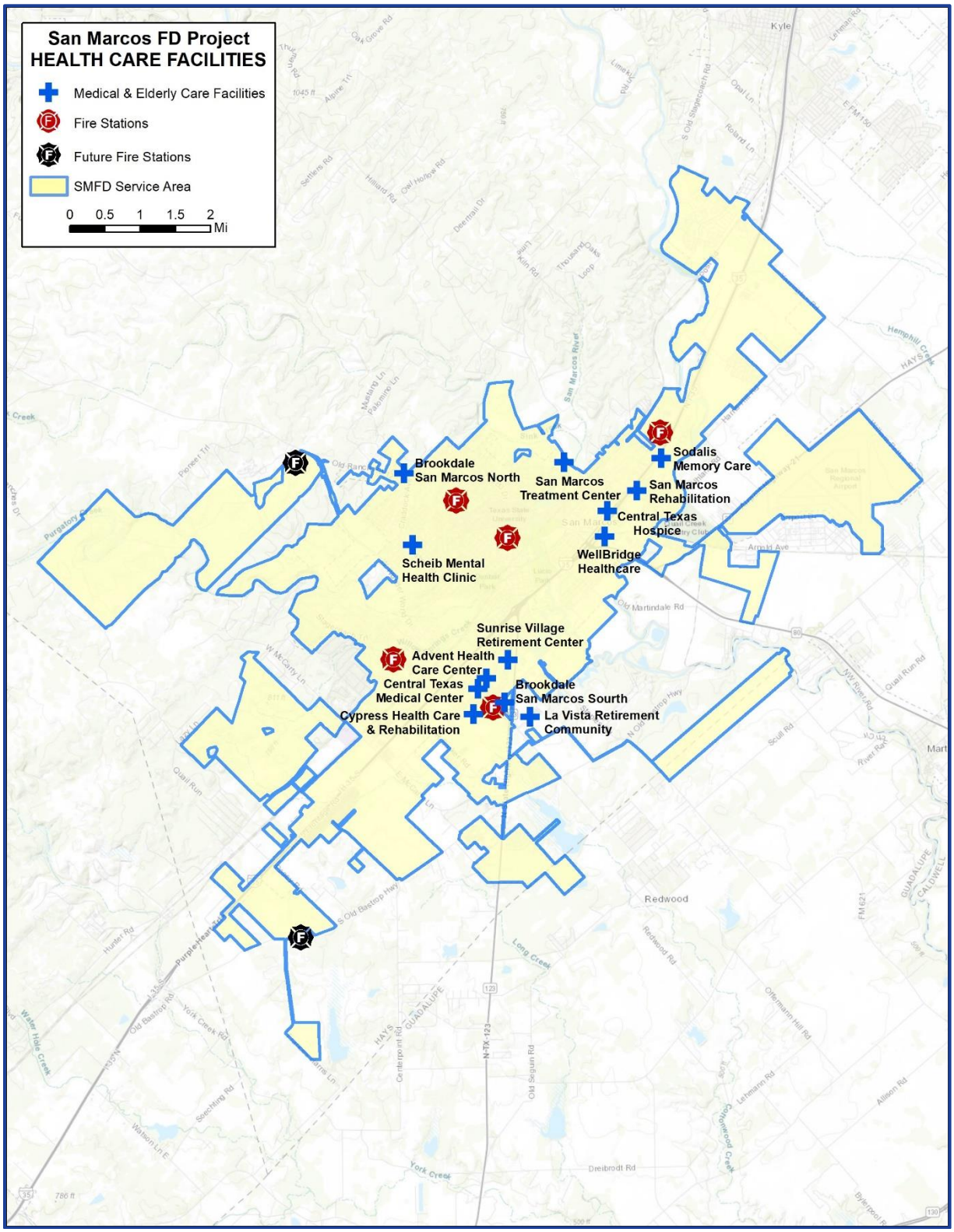


Figure 34: Major Employers in the City of San Marcos

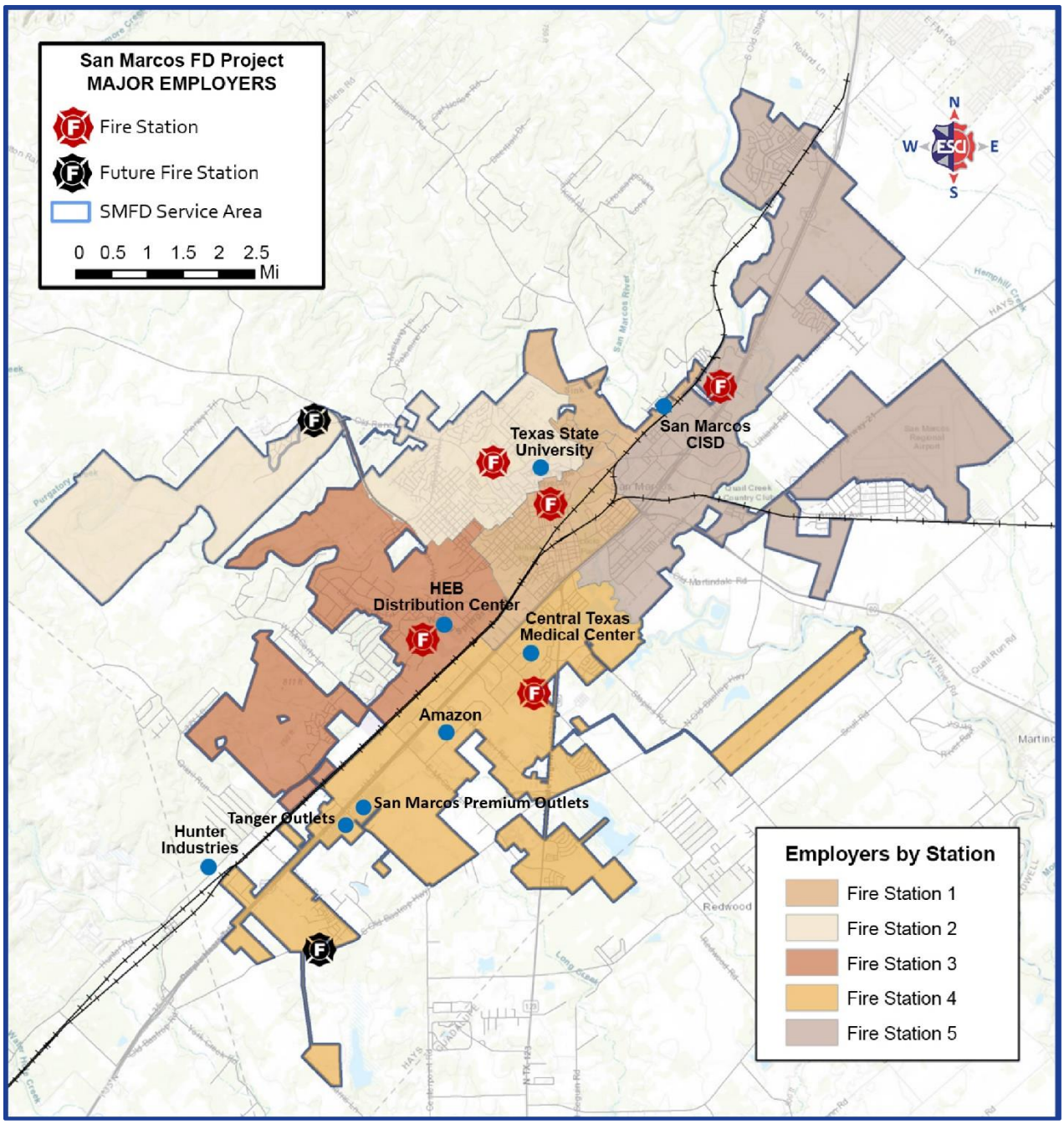


Figure 35: Distribution Centers in the City of San Marcos

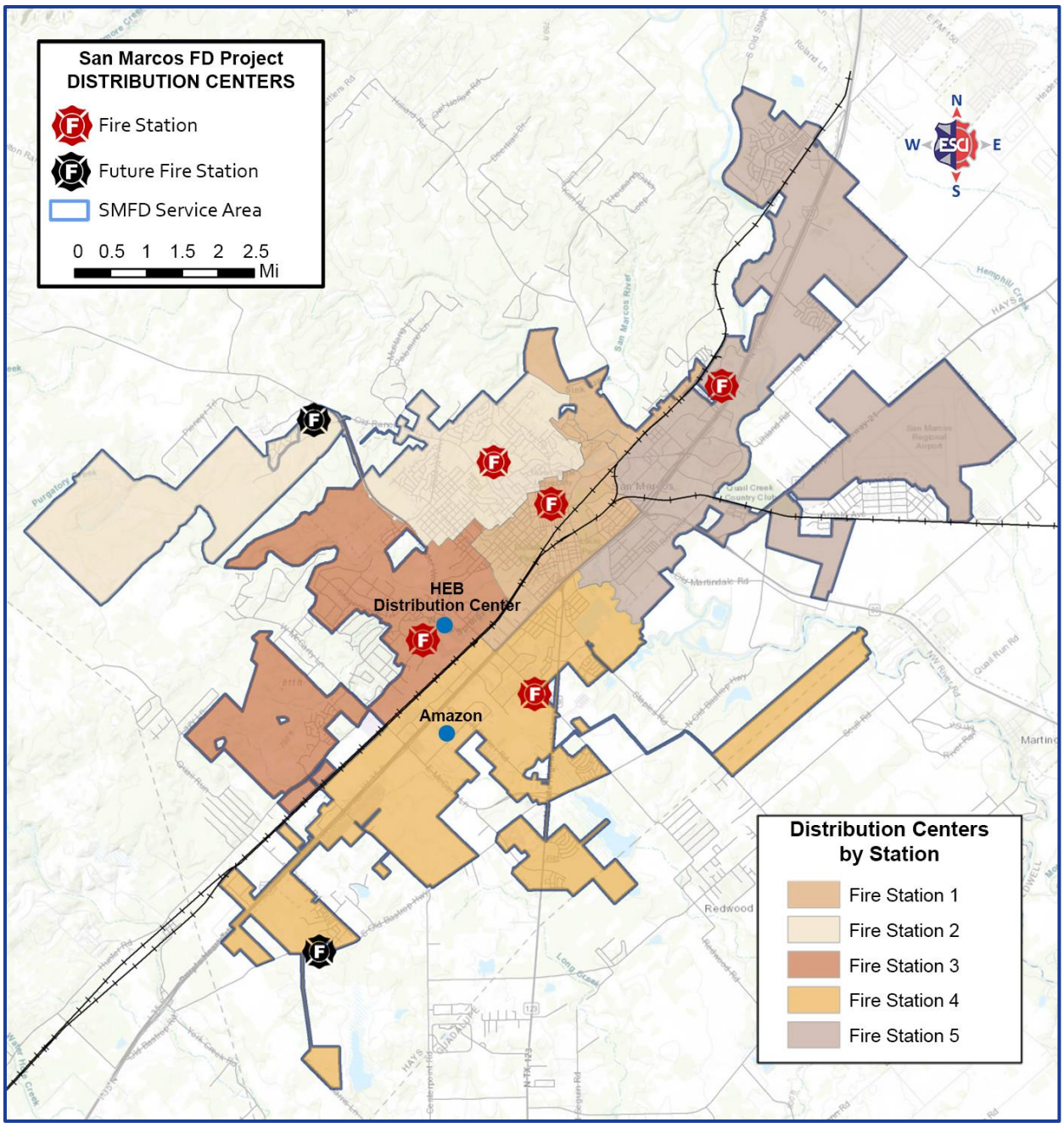
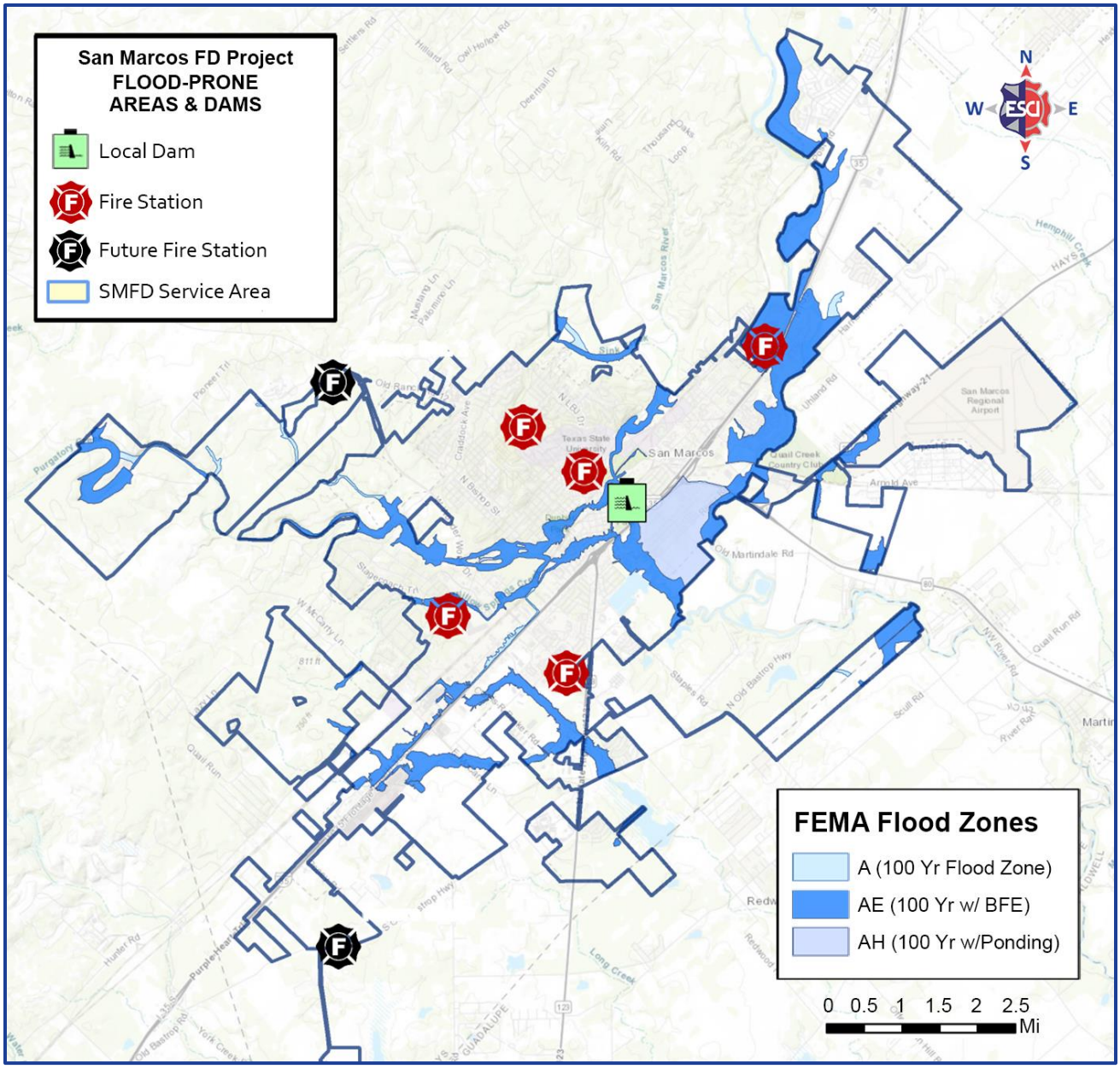


Figure 36: Flood-Prone Area & Dams in the City of San Marcos



Land-Use & Zoning

Current and future land use plans have a direct impact on determining the probability and risk of occurrence. For example, open space zoning and low-density residential development are considered low risk. Moderate risk zoning would include medium-density residential development, low-intensity retail, and professional office or business. High-risk zoning includes mixed-use areas, high-density residential, industrial, warehousing, and large retail, or mercantile centers. The following figure illustrates the current zoning and land use plan for the City of San Marcos.

Figure 37: Commercial and Industrial Zoning in the City of San Marcos

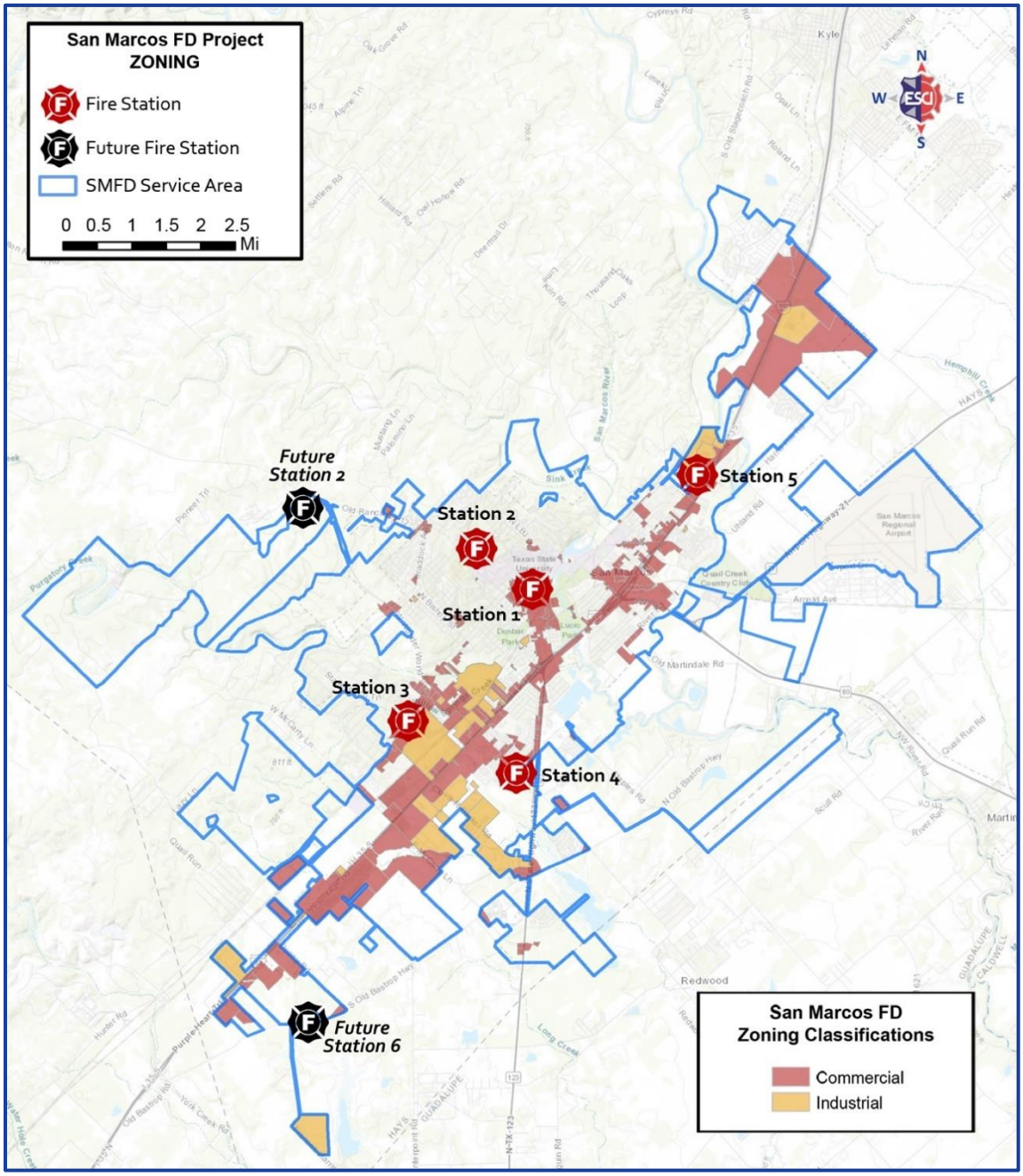
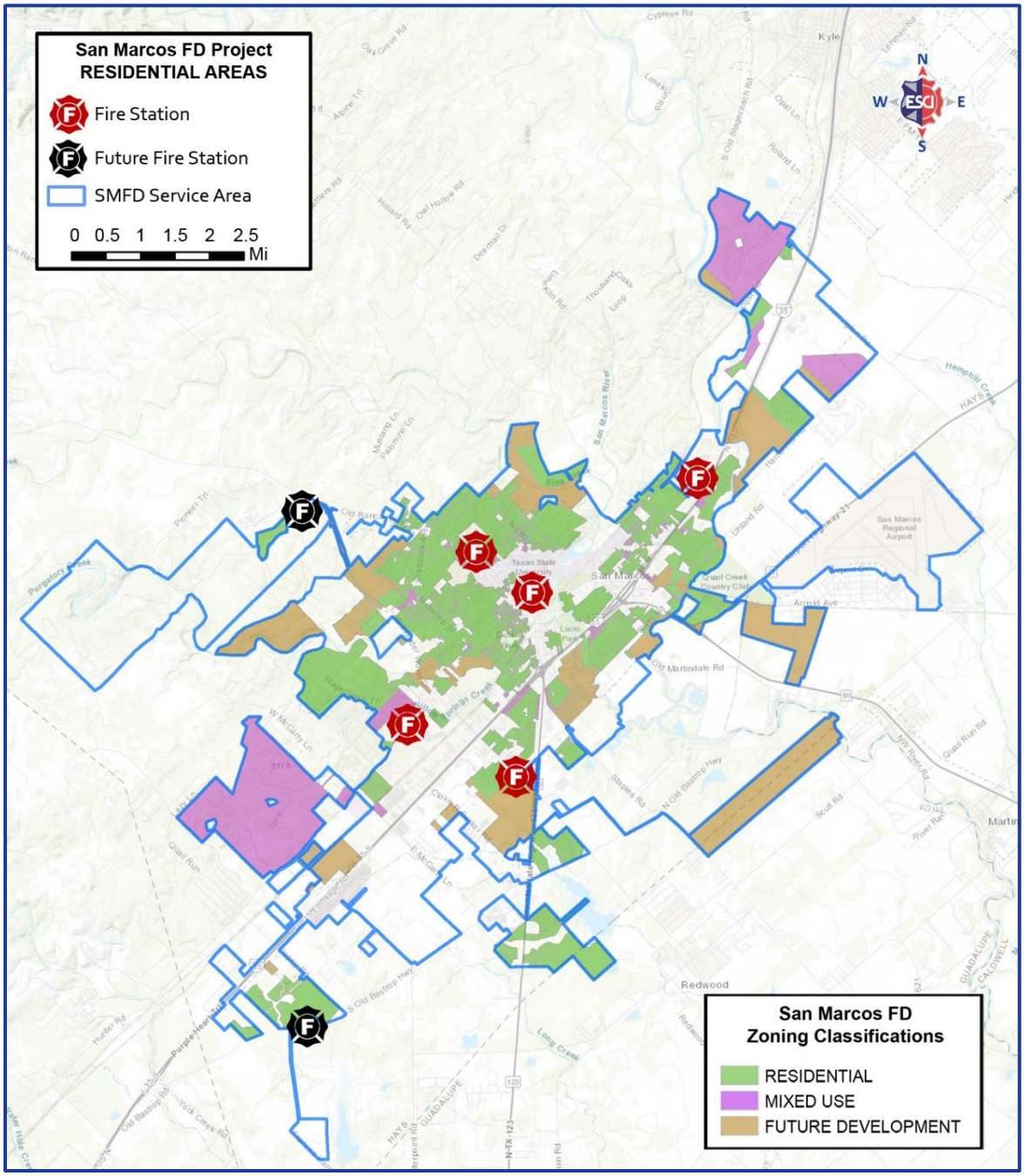


Figure 38: Residential & Mixed-Use Zoning in the City of San Marcos



Risk Assessment Methodology

In September 2019, ESCI facilitated a risk assessment workshop with the San Marcos Fire Department (SMFD) leadership team. This workshop resulted in the development of an internal process to identify, assess, categorize, and classify risks within the City of San Marcos.

The Three-Axis Heron's Formula was used to calculate risk. This model was selected because it provided a more accurate means of communicating the organizational impact of the emergent responses. The formula takes into account the probability of occurrence, the severity of consequence, and the impact to fire department resources.[27]

Use of the Three-Axis Heron's Formula includes the following formula:

$$\text{Risk} = \sqrt{\frac{(PC)^2 + (CI)^2 + (IP)^2}{2}}$$

The risk is graphically illustrated through a three-axis model as follows:

- **P** = Probability (Y-Axis)
- **C** = Consequences (X-Axis)
- **I** = Impact (Z-Axis)

The *probability* of risk was determined through a review of the SMFD incident response records from 2016 to 2018 to determine the likelihood of an event. The *consequences* to the community were determined through an evaluation of the incidents' impact on lives and property. The organizational *impact* was determined through a critical tasking and analysis of the SMFD personnel needed to mitigate the risk. The following figure illustrates the assessment model.

Figure 39: Risk Assessment Scoring Methodology

Score	Probability	Consequence	Impact
2	Rarely (annual or longer)	No life or property loss	< 4 personnel
4	Quarterly	Life or property impaired	4–7 personnel
6	Monthly	Life or property loss	8–11 personnel
8	Weekly	Loss > 1 life or property loss	12–17 personnel
10	Daily	Loss of > 3 lives or major building	> 17 personnel

The San Marcos Fire Department is responsible for providing four major services that include (1) Fire Response, (2) Medical Response, (3) Rescue Response, and (4) Hazardous Materials Response. This risk assessment was applied to each of the aforementioned areas to calculate a risk category of (1) Low, (2) Moderate, (3) High, and (4) Extreme. The ranking scale was set to establish two (2) as the lowest score and ten (10) as the highest score to illustrate the risk score.

Critical Tasking Assessment

Analysis of the critical tasking serves as the foundation of the deployment section of this report to encourage a stronger correlation between risk and resources. To determine this, ESCI met with the SMFD leadership and reviewed the critical tasking to establish the personnel required to mitigate the incident. This is formally known as the *effective response force* (ERF). Additionally, the *ERF Remaining* of the organization is determined by quantifying the remaining personnel available to respond to a concurrent incident(s). The following figure illustrates an example of critical tasking and personnel requirements for each fire risk category, as recommended by NFPA 1710.

Figure 40: Critical Tasking & ERF for Fire-Risk Categories

Task	Low-Risk (Dumpster Fire)	Moderate-Risk (House)	High-Risk (Apartment)	Extreme Risk (High-Rise)
Command	1	1	2	2
Apparatus Operator	1	1	2	1
Handlines (2 members on each)	2	4	6	4
Support Members	2	2	3	
Victim Search & Rescue Team		2	4	4
Ground Ladders/Ventilation		2	4	
Aerial Operator (if ladder used)		(1)	(1)	
Initial Rapid Intervention Team		4	4	
Initial Medical Care Component			2	
Building Fire Pump Monitor (if equipped)				(1)
Hoseline–Floor Above Fire				2
Rapid Intervention Team				4
Accountability Officers (fire floor & floor above)				4
Evacuation management teams				4
Elevator Operations Manager				1
Incident Safety Officer				1
Interior Staging Manager				1
Member Rehabilitation				2
Vertical Ventilation Crew				4
Lobby Control				1
Transport Equipment				2
External Base Operations				1
EMS Crews with Transport				4
Total Required:	**6**	**16 (17)**	**27 (28)**	**42 (43)**

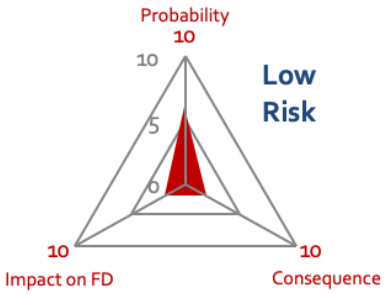
Fire Response

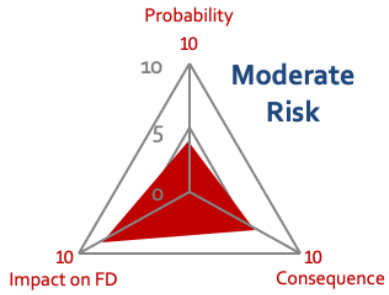
The San Marcos Fire Department is responsible for mitigating a wide range of fire-related incidents that range from low-risk dumpster fires to the extreme risk associated with a high-rise fire. As was referenced in the preceding pages, a standardized risk assessment scoring process was applied to a sample incident in each of the risk categories. The SMFD is currently staffed to handle low and moderate fire risks. High and extreme risk fires will require additional staffing or aid from neighboring jurisdictions. The following figure illustrates the risks and illustrates the organizational and community impact during fire responses.

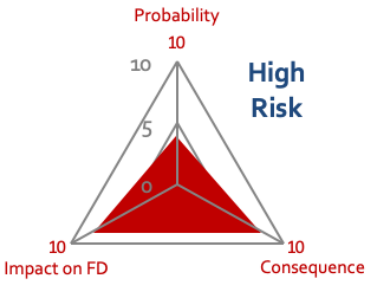
Figure 41: Fire-Incident Risk Assessment

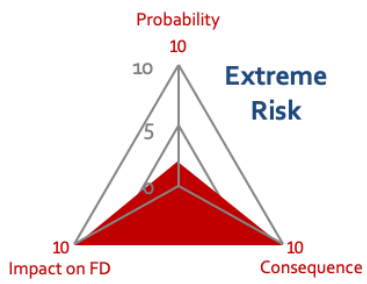
Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	**Dumpster Fire**			**House Fire**			**Apartment Fire**			**High-Rise Fire**		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	6	2	2	4	6	8	4	8	8	2	10	10
Score Assigned	12.33			44.18			55.43			73.48		
Max/Min Staffing	20	17		20	17		20	17		20	17	
ERF Assigned:	**6**			**17**			**28**			**43**		
ERF Remaining:	**14**	**11**		**3**	**0**		**-8**	**-11**		**-23**	**-26**	

Risk Classification









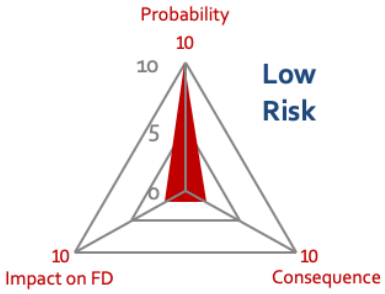
Medical Response

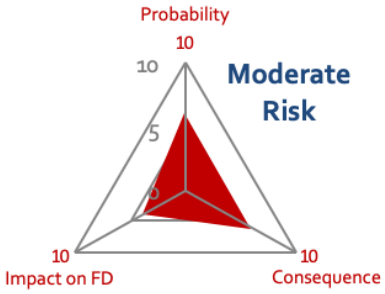
The San Marcos Fire Department is a first-responder organization that plays an integral role in stabilizing and treating pre-hospital medical emergencies. All members are cross-trained firefighters that are certified Emergency Medical Technicians. Over the past few years, the SMFD leadership has implemented a plan to expand its response capabilities further to include advanced life support equipment and staffing. Cardiac arrest or mass casualty outcomes are highly influenced by early activation of 911 and initiation of pre-hospital stabilization and emergent transport. The ability to arrive quickly with trained personnel is essential to reducing life loss. SMFD relies upon the SMHCEMS agreement for ambulance transport services. The following illustrates the impact of various medical incident responses.

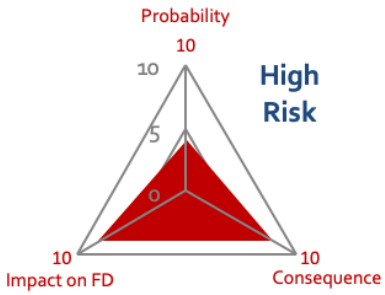
Figure 42: Medical Incident Risk Assessment

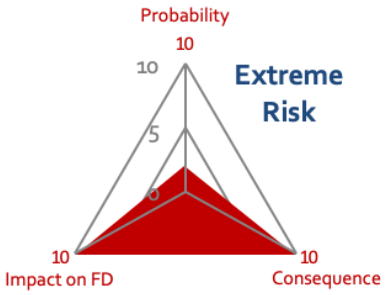
Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	**Sick Person**			**Cardiac Arrest**			**Vehicle Accident w/ 3 Patients**			**Mass Casualty Incident (MCI)**		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	10	2	2	6	6	4	4	8	6	2	10	10
Score Assigned	20.20			34.99			55.43			73.48		
Max/Min Staffing	20	17		20	17		20	17		20	17	
ERF Assigned:	**3**			**7**			**12**			**17**		
ERF Remaining:	**17**	**14**		**13**	**10**		**8**	**5**		**3**	**0**	

Risk Classification









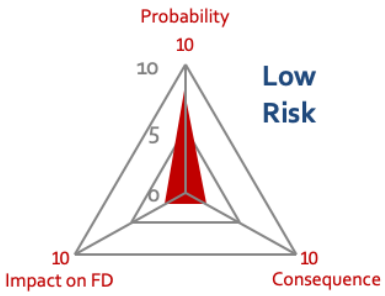
Rescue Response

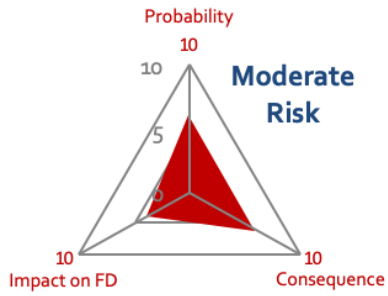
Rescue service includes a wide variety of technical and specialized skills that can sometimes exceed the training, staffing, or equipment needs of an agency. The SMFD is trained and equipped to manage low- to high-risk incidents that range from the routine elevator rescue to the more technical and resource-intensive swift water rescue. The SMFD relies upon the Austin Fire Department to assist during concurrent and extreme-risk rescues that include building collapse, trench rescue, or confined space incidents. Rescue responses may be coordinated through the City of San Marcos Office of Emergency Management. The following figure highlights the rescue appraisal for each risk category.

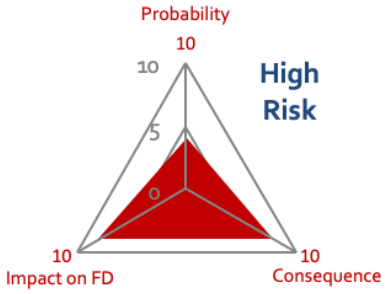
Figure 43: Rescue Incident Risk Assessment

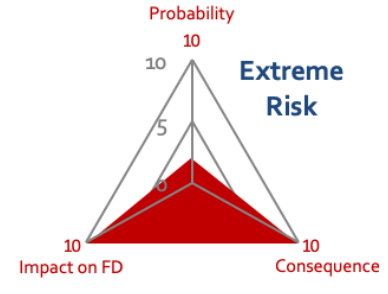
Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	**Elevator**			**Motor Vehicle Extrication**			**Swift Water**			**Building Collapse**		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	8	2	2	6	6	4	4	8	8	2	10	10
Score Assigned	16.25			34.99			55.43			73.48		
Max/Min Staffing	20	17		20	17		20	17		20	17	
ERF Assigned:	**3**			**7**			**12**			**17**		
ERF Remaining:	**17**	**14**		**13**	**10**		**8**	**5**		**3**	**0**	

Risk Classification









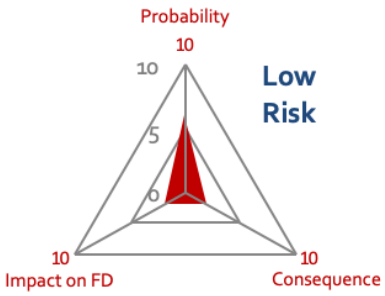
Hazardous Materials Response

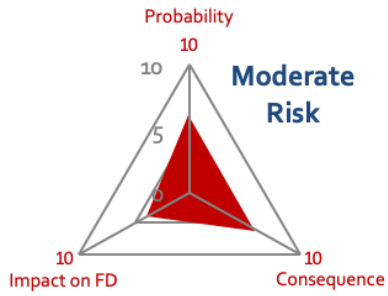
As is common in the primary service areas, hazardous materials responses range from the routine and low-risk fluid spill to the more extreme risk associated with a rail car incident involving unknown or dangerous commodities. In the early stages of a hazardous materials incident, it may be necessary to send additional SMFD resources to address life safety issues and coordinate mitigation efforts through specialized regional teams through the Hays County Office of Emergency Management. The SMFD is trained to handle the low- and moderate-risk incidents but relies on agreements with regional hazardous materials teams to mitigate high and extreme risk incidents. The following figure illustrates the risk matrix.

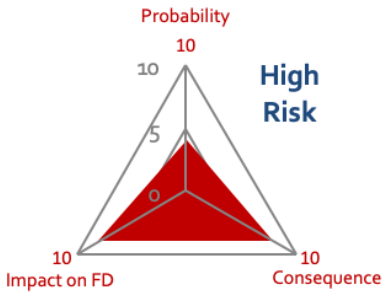
Figure 44: Hazardous Materials Incident Risk Assessment

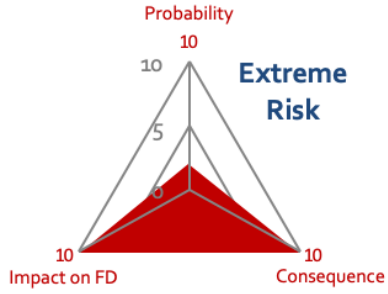
Description	Low			Moderate			High			Extreme		
Risk Score Range	0 to 24.99			25 to 49.99			50 to 69.99			70 to 100		
Incident Type:	**Fuel Spill**			**NG Gas Leak**			**18-Wheeler**			**Rail Car Incident**		
Risk Score	P	C	I	P	C	I	P	C	I	P	C	I
	6	2	2	8	6	4	2	8	8	2	10	10
Score Assigned	12.32			34.99			55.43			73.48		
Max/Min Staffing	20	17		20	17		20	17		20	17	
ERF Assigned:	**3**			**7**			**12**			**17**		
ERF Remaining:	**17**	**14**		**13**	**10**		**8**	**5**		**3**	**0**	

Risk Classification









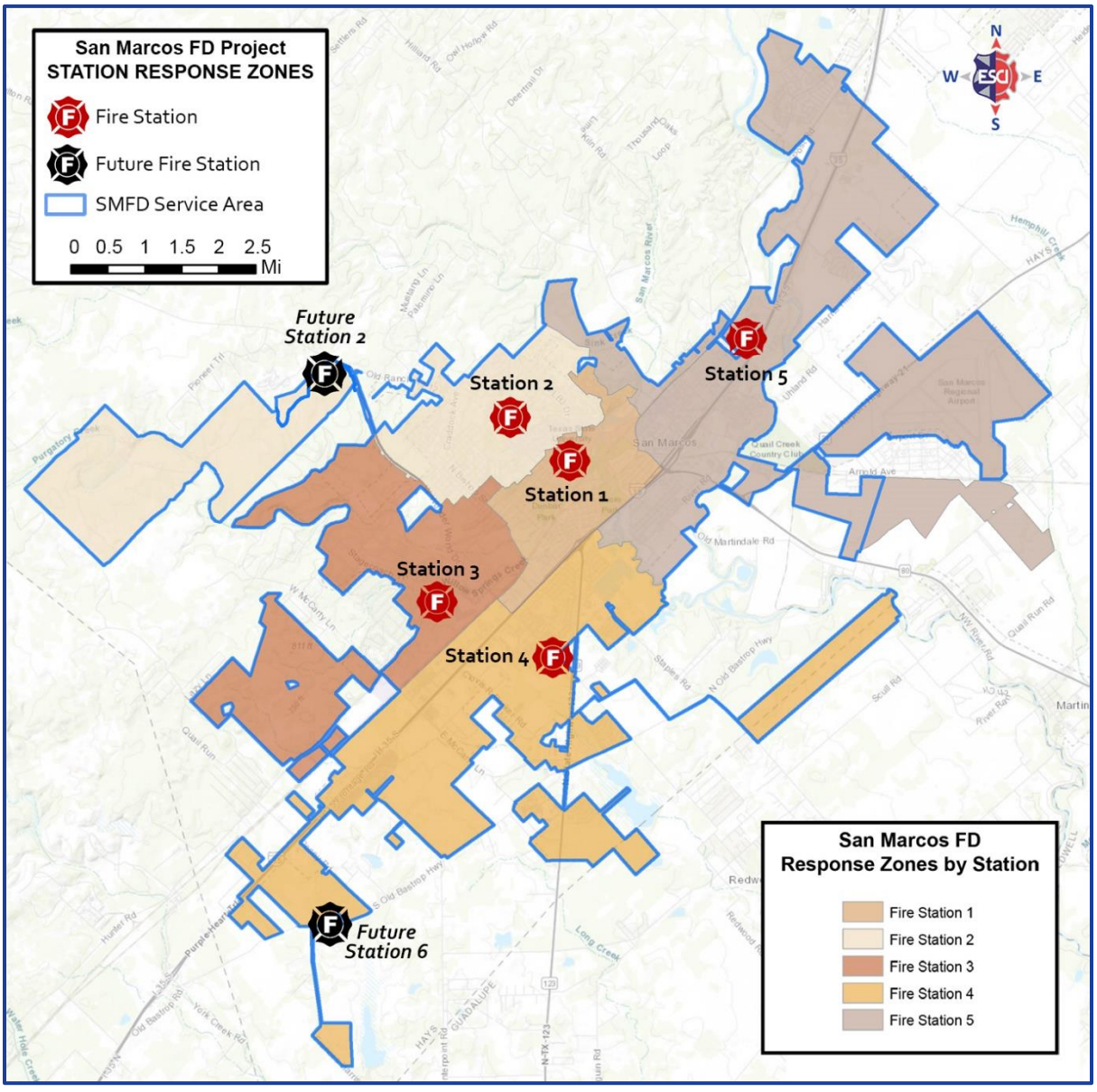
Summary Findings of Risk Analysis

In this section, figures are provided that illustrate the impact on personnel and resources for each risk classification within SMFD's main service areas. It begins with an overview of the SMFD service area, followed by the planning zones for each station, and finally a display of the current and potential future effective response force configurations for San Marcos.

Area Planning Zones

Upon consultation with SMFD leadership, the City of San Marcos Community Risk Assessment (CRA) planning areas were aligned with the existing fire station response districts. This decision was based upon the need and interest in better identifying risks within each response area with the goal of matching resources with risks.

Figure 45: SMFD Fire Station Response Zones



Fire Station Planning Zones/Response Areas

The following figures illustrate the planning zones and response areas of each of the current fire stations, along with detailed population densities for each.

Figure 46: SMFD Fire Station 1 Planning Area

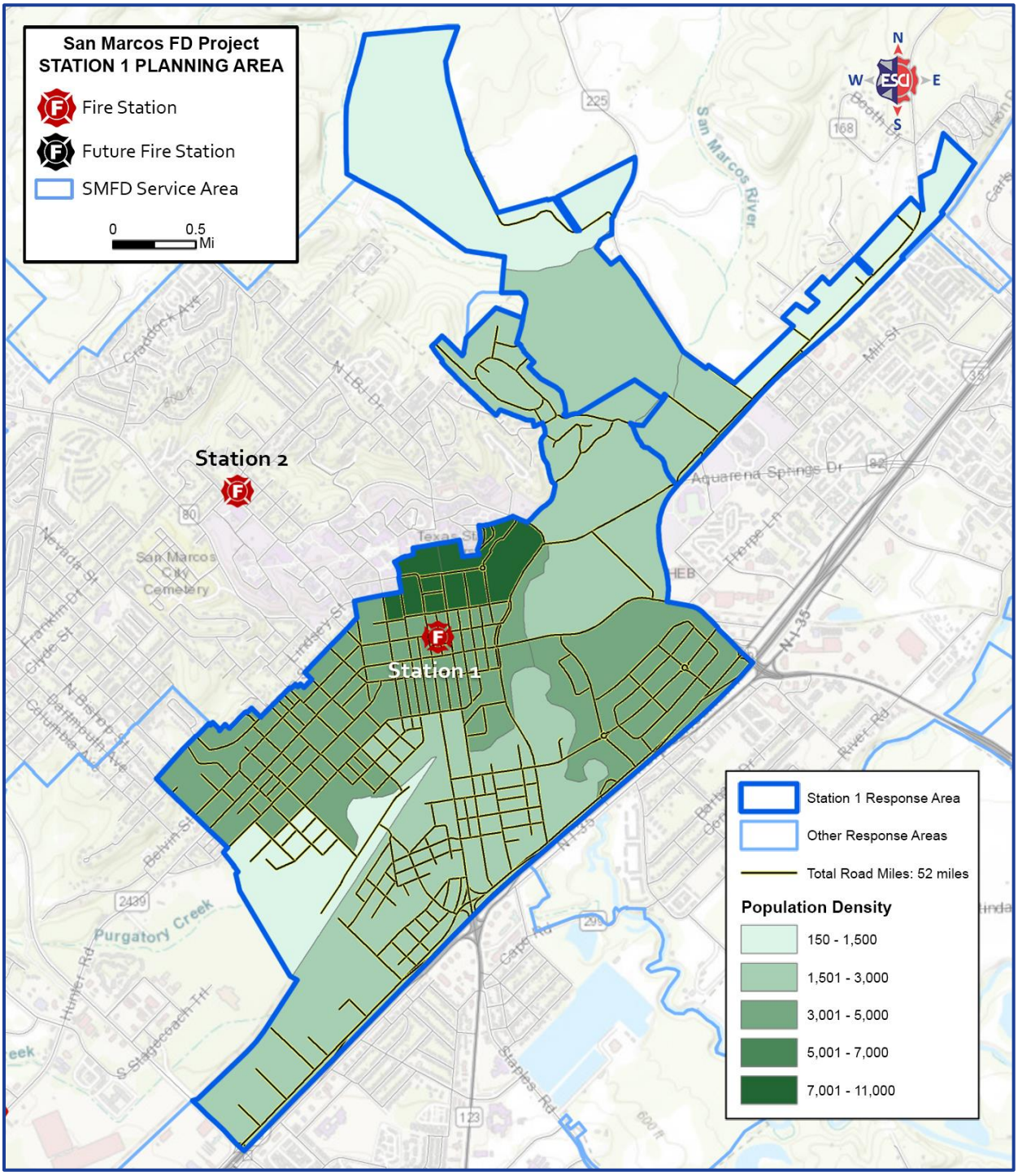


Figure 47: SMFD Fire Station 2 Planning Area

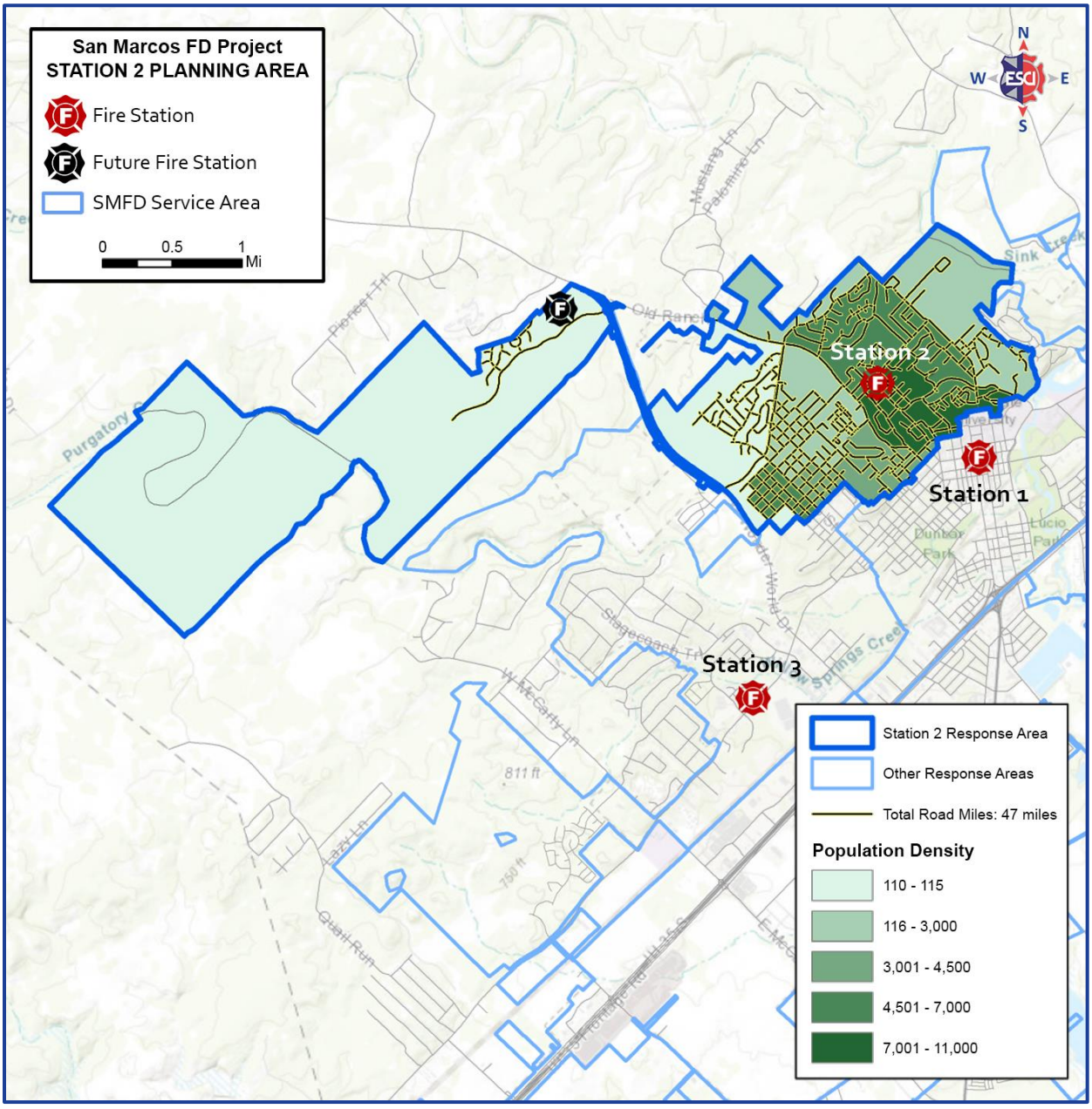


Figure 48: SMFD Fire Station 3 Planning Area

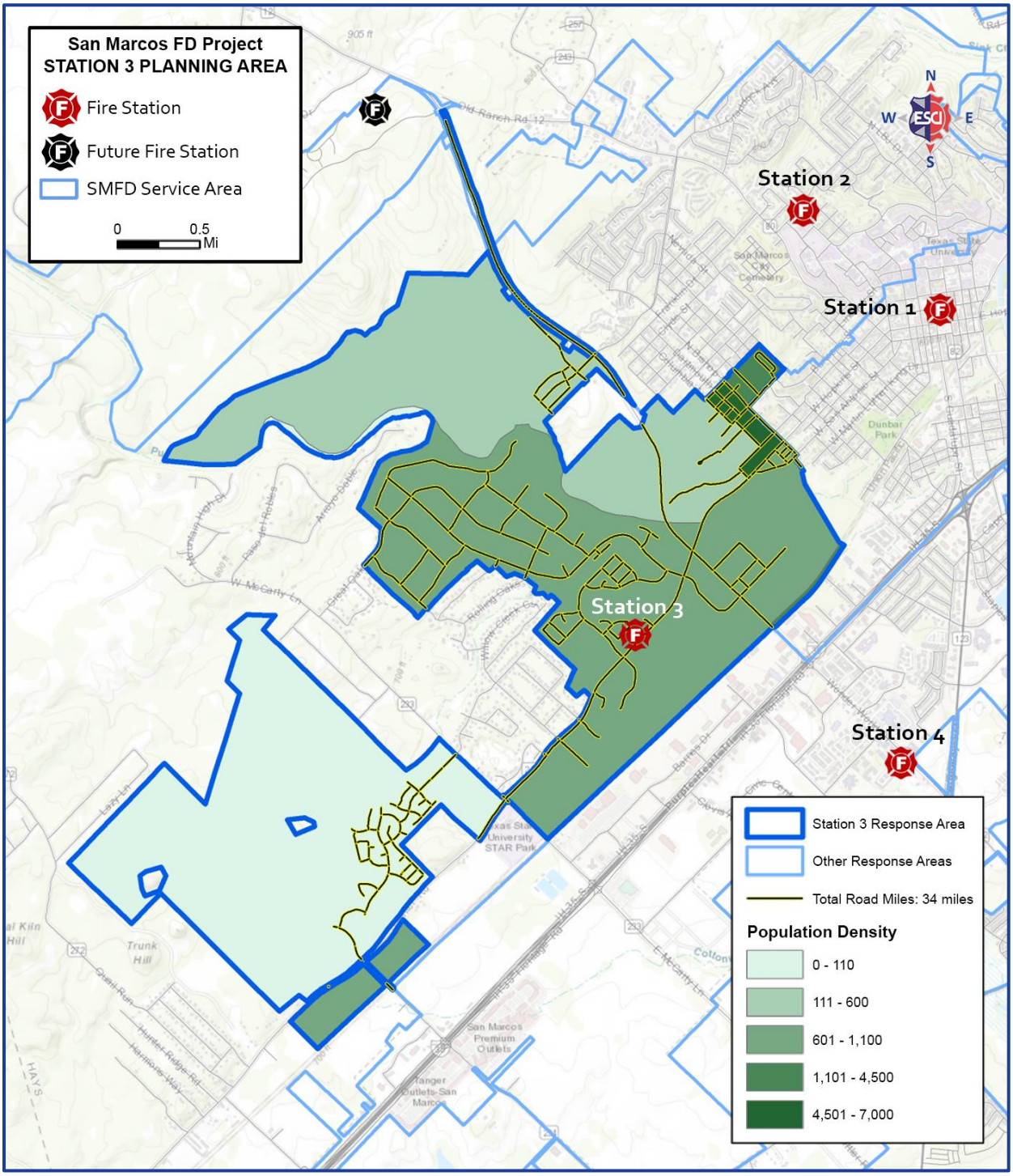


Figure 49: SMFD Fire Station 4 Planning Area

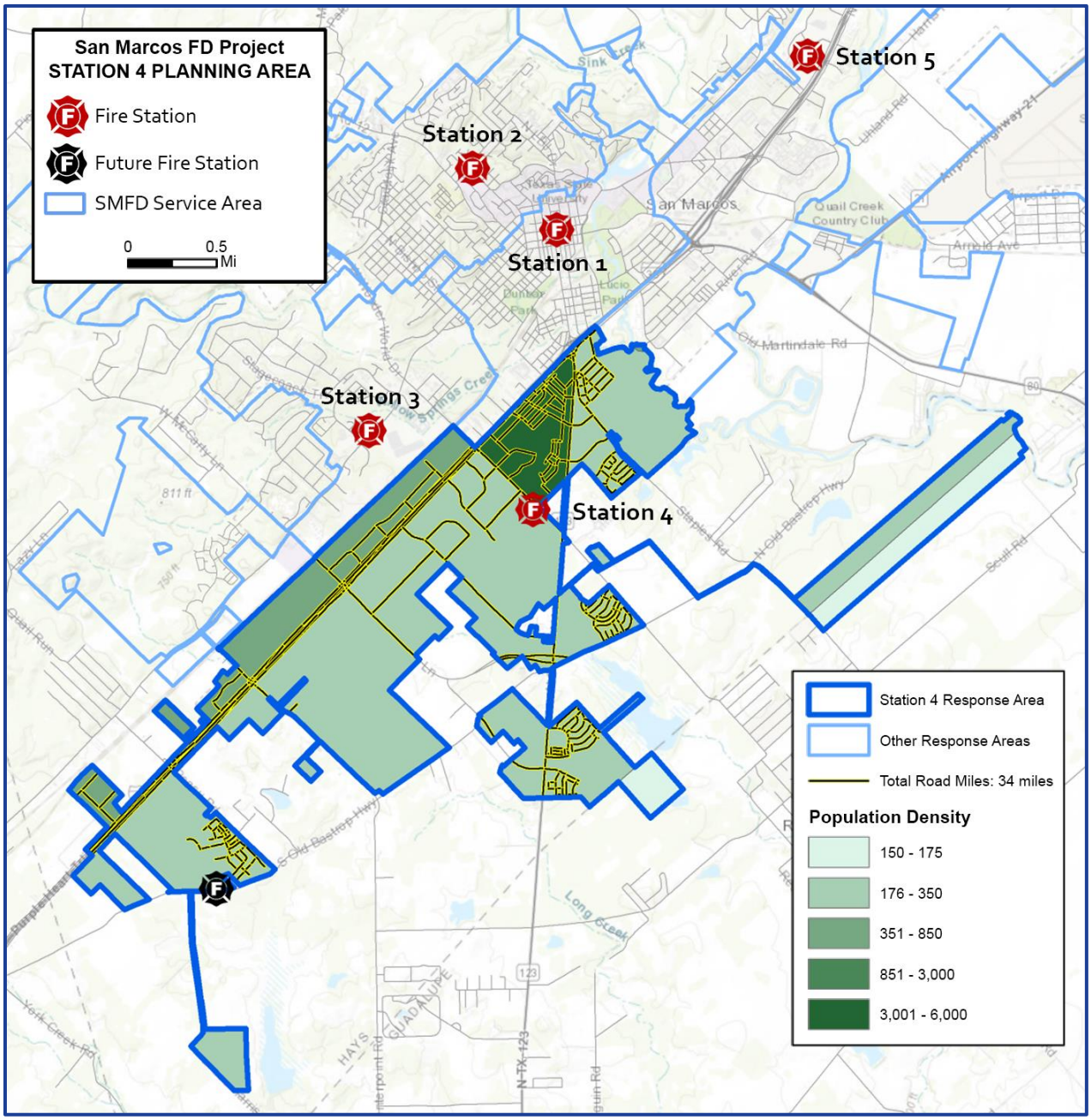
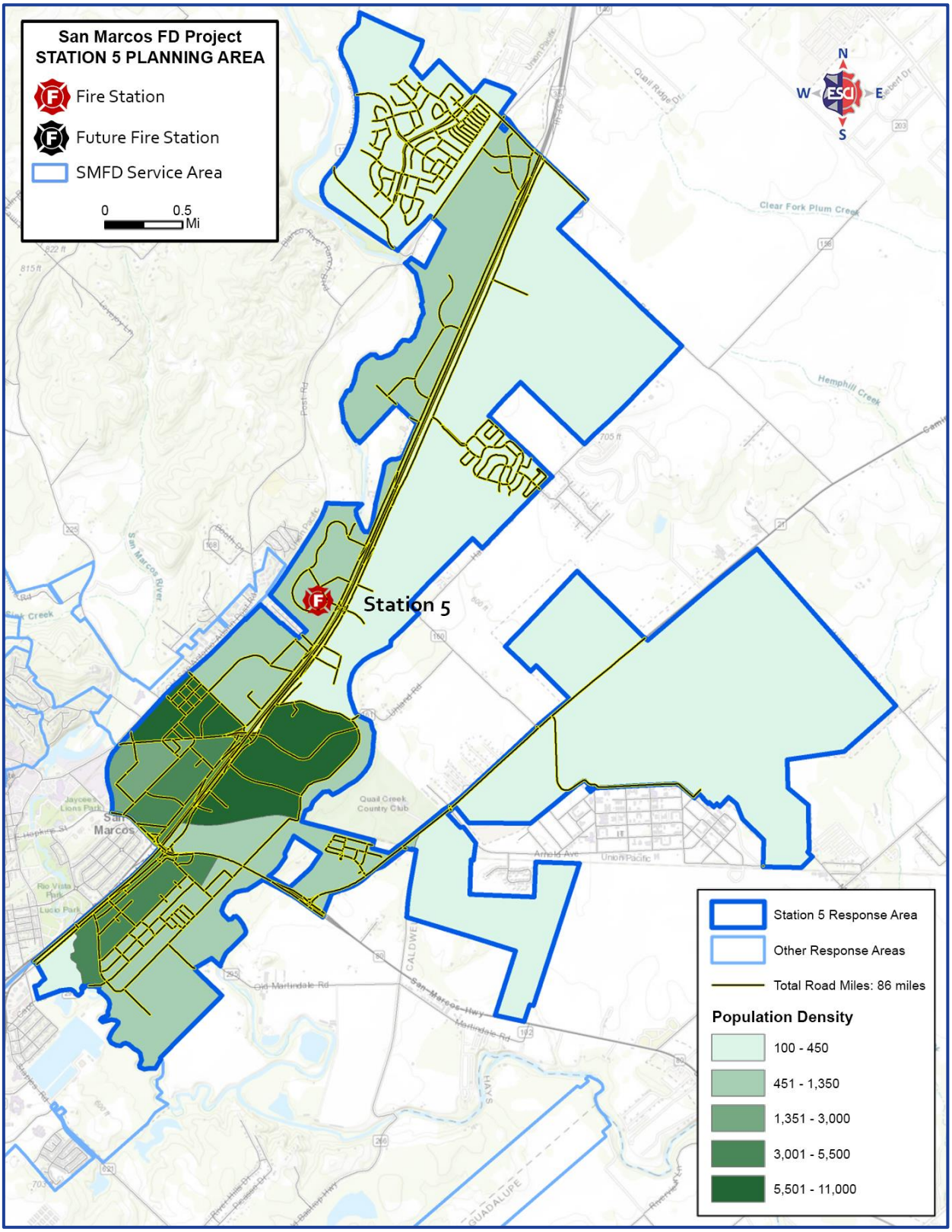


Figure 50: SMFD Fire Station 5 Planning Area



The following figure provides a GIS illustration showing the Effective Response Force capability of SMFD with 8-minute travel times. Future Fire Station 2 and Fire Station 6 were excluded from the ERF travel-time calculations. The captions note the stations and staffing levels represented in each figure. Additionally, these figures illustrate that SMFD's remaining ERF is severely impaired when operating with minimal staffing and exceeds the number of on-duty personnel when dealing with concurrent calls or escalating risk profiles.

Figure 51: Existing SMFD 8-Minute Effective Response Force

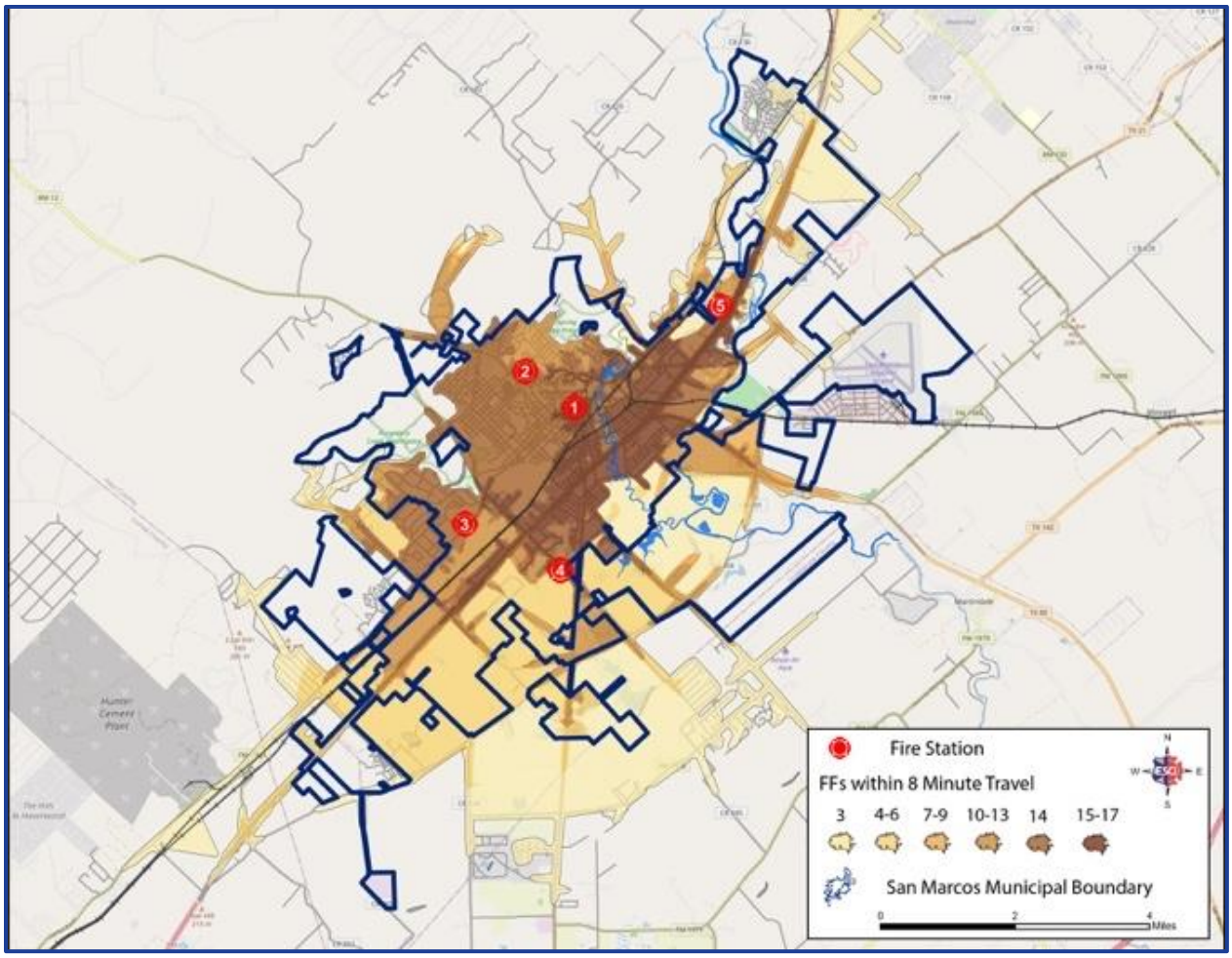


Figure 52: SMFD 8-Minute Effective Response Force

Existing five fire stations with Station 2 relocated to Centerpoint and minimum staffing of 17 personnel.

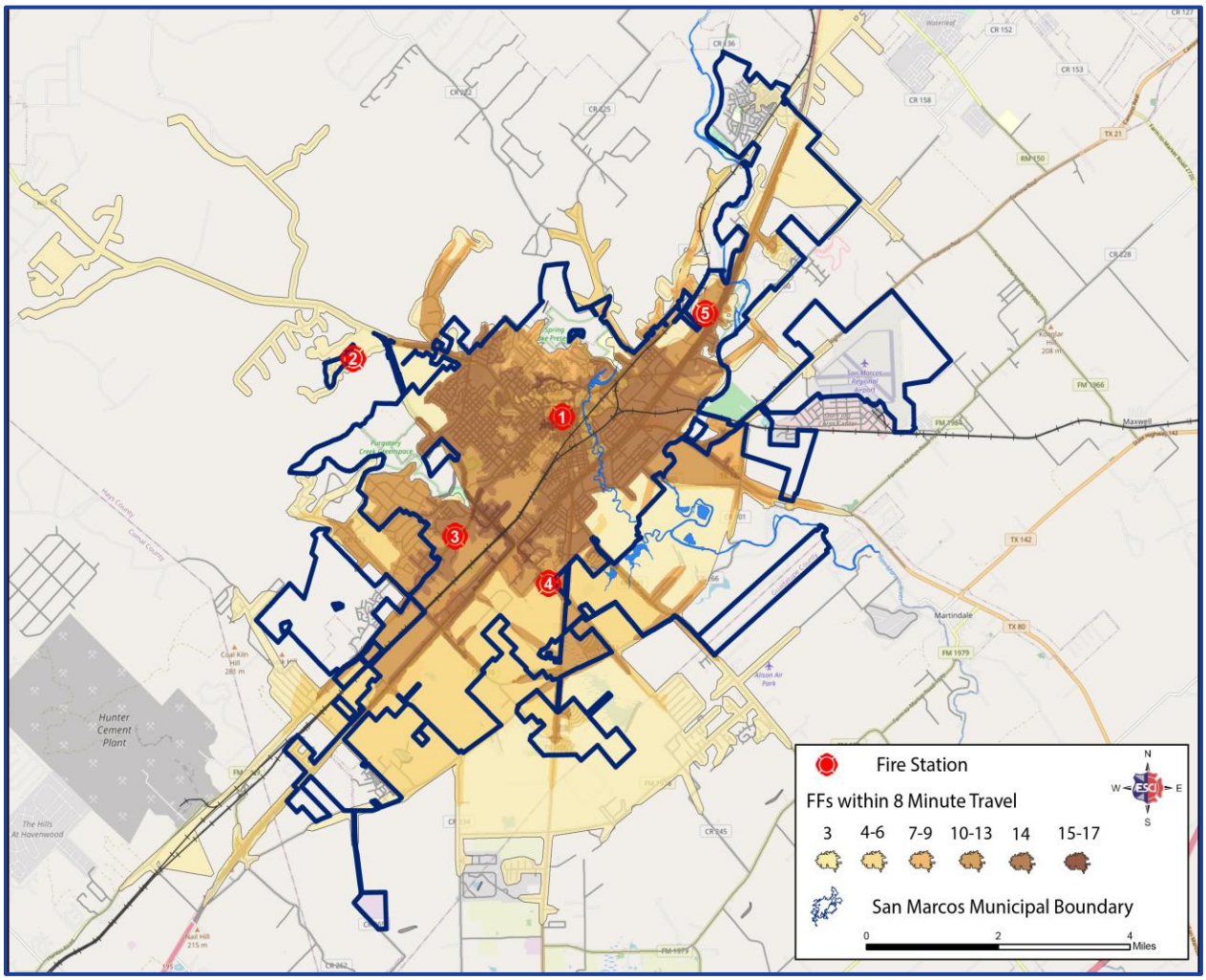


Figure 53: SMFD 8-Minute Effective Response Force

Six fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey with minimum staffing of 20 personnel.

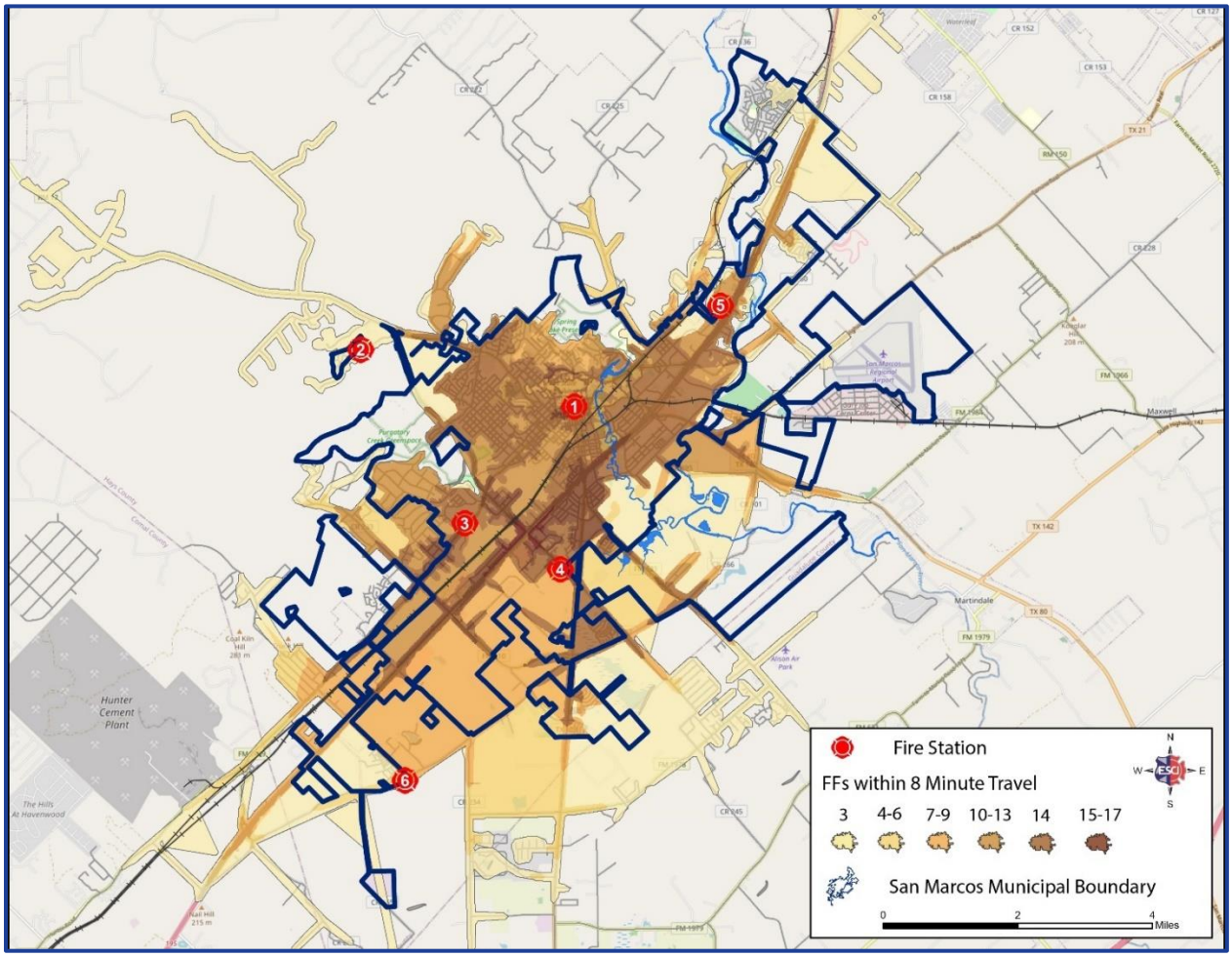


Figure 54: SMFD 8-Minute Effective Response Force

Seven fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, and Station 7 at Yarrington on the east side of IH-35 with minimum staffing of 23 personnel.

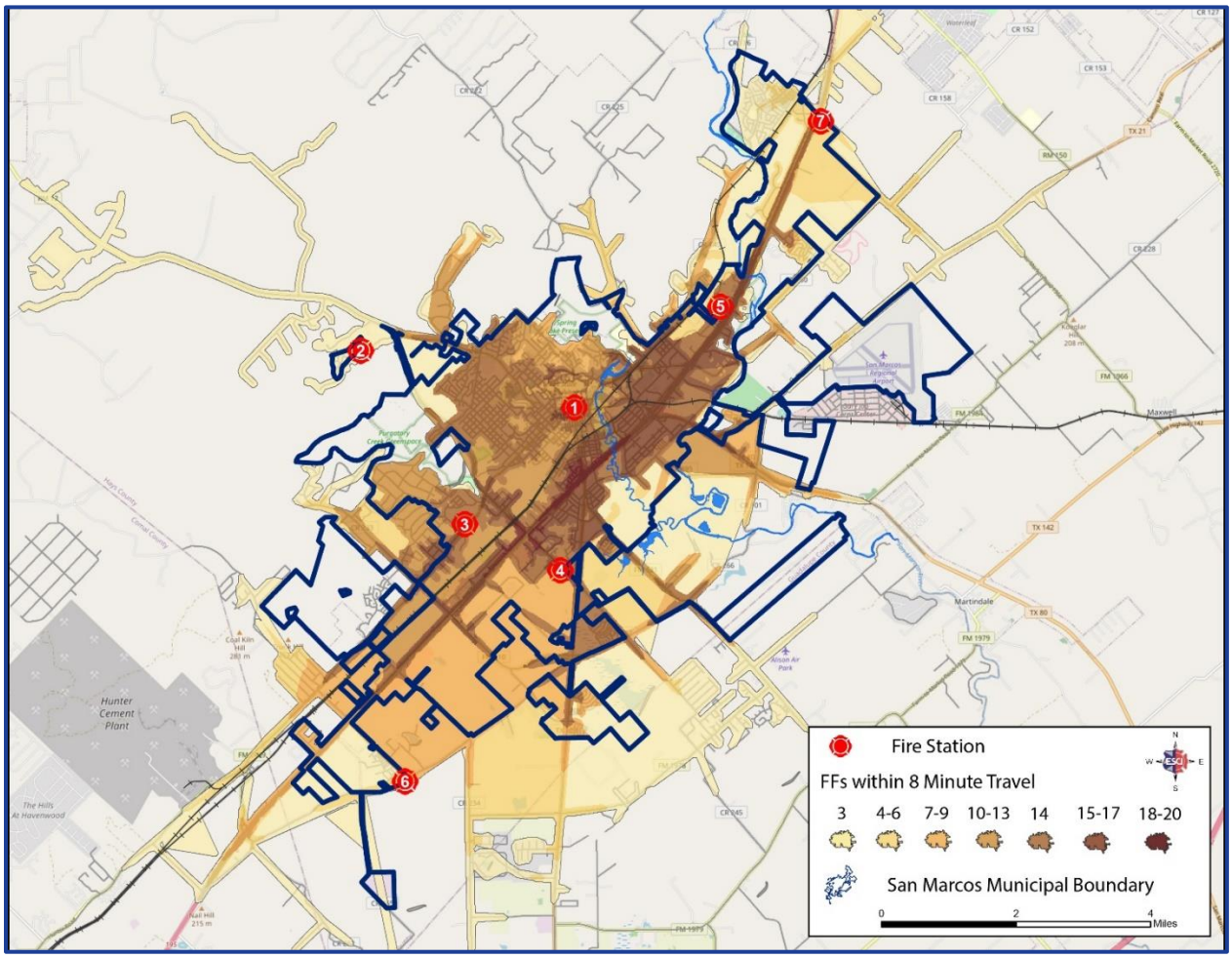


Figure 55: SMFD 8-Minute Effective Response Force

Eight fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, Station 7 at Yarrington on the east side of IH-35, and Station 8 at Hwy 21 west of William Pettus, with minimum staffing of 26 personnel.

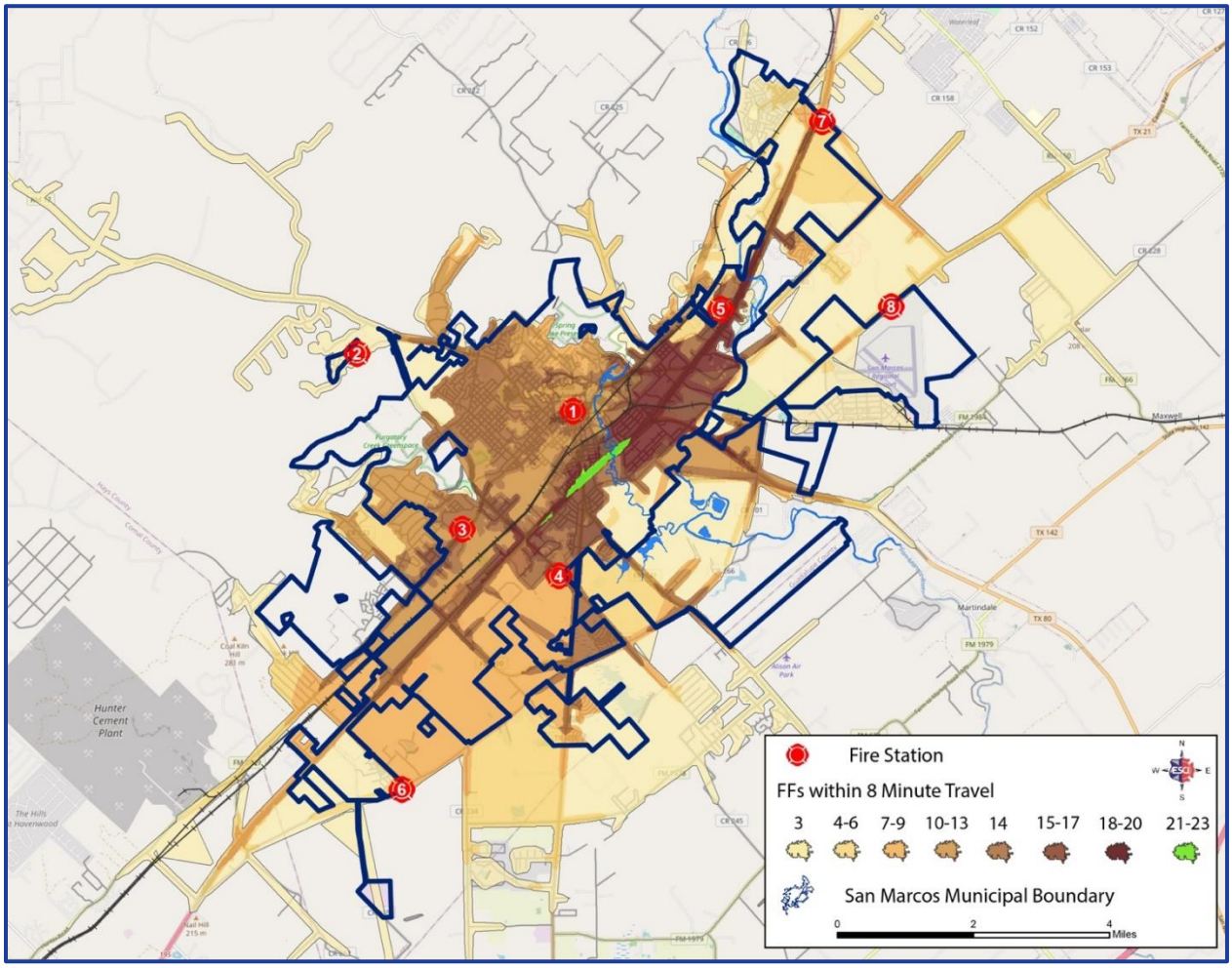
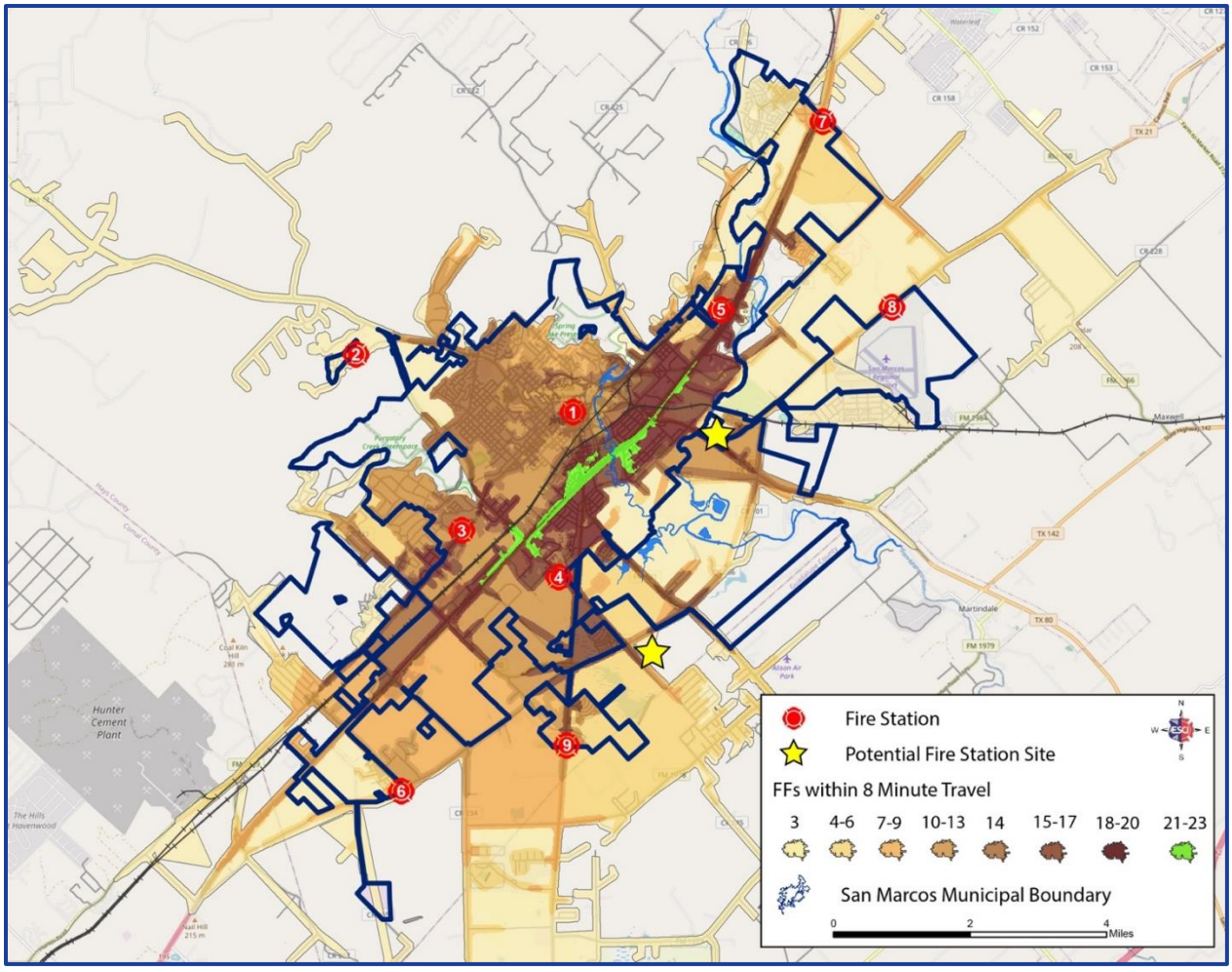


Figure 56: SMFD 8-Minute Effective Response Force

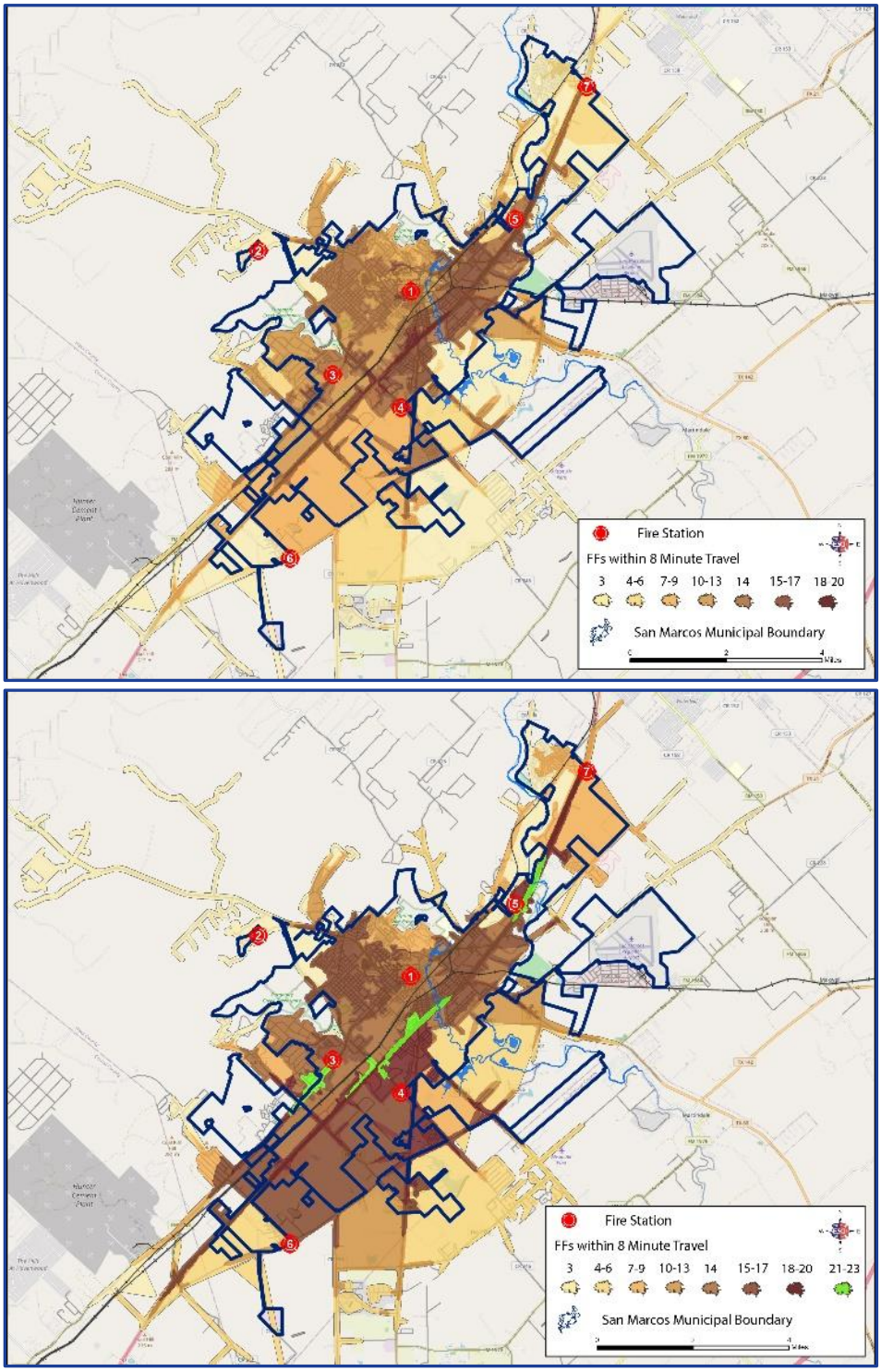
Nine fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, Station 7 at Yarrington on the east side of IH-35, Station 8 at Hwy 21 west of William Pettus, Station 9 at Hwy 123 south of Rattler with minimum staffing of 29 personnel. This includes two additional Station 10 and 11 sites off Redwood south of Old Bastrop and the north star located on Hwy 80 at Hwy 21



Finally, to provide a comparison of the impact of adding additional fire stations versus upstaffing once Stations 6 and 7 are constructed, the following figure provides a side-by-side comparison of a seven station model with upstaffing at Stations 4, 5, and 6 from three personnel to six personnel each.

Figure 57: SMFD 8-Minute Effective Response Force

Seven fire stations with 3 personnel at Stations 4, 5, and 6 minimum staffing of 23 personnel versus seven fire stations with 6 personnel each at Stations 4, 5, and 6 minimum staffing of 32 personnel.



These station locations are included for consideration upon additional development and service demand exceeding adopted performance triggers discussed in the Recommendations section of this report.

Section II:
STANDARDS OF COVER

BASELINE ORGANIZATIONAL ASSESSMENT

The following section represents a baseline assessment of various organizational elements of the San Marcos Fire Department (SMFD).

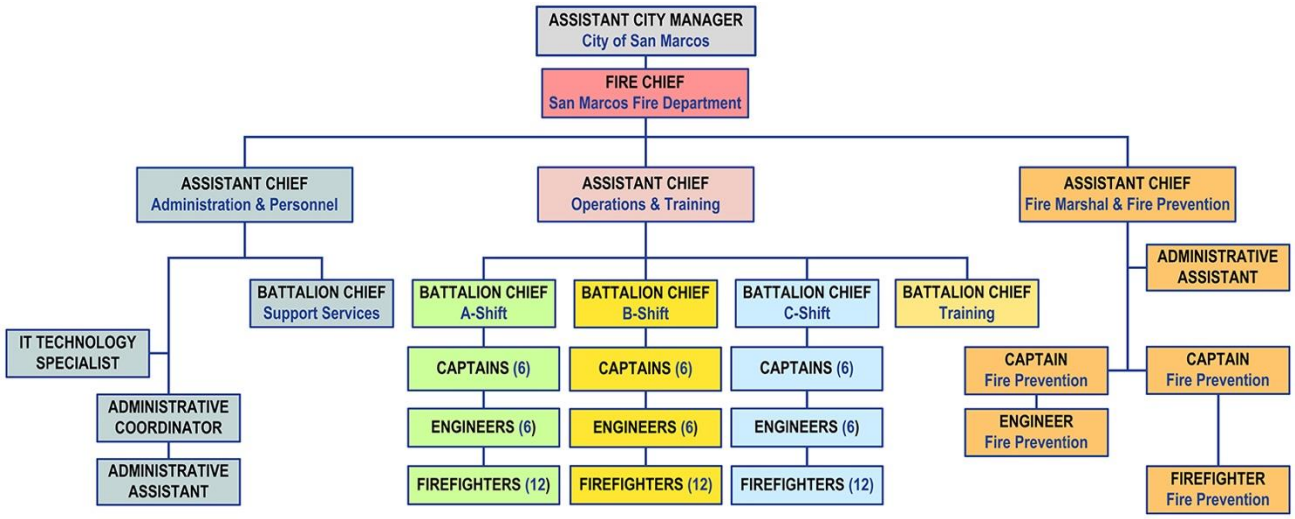
Overview of the San Marcos Fire Department

SMFD is an all-career municipal fire department operating under a Council-Manager form of government. The Department has a long and rich history, having been established between 1882 and 1884. SMFD has developed a comprehensive vision statement:

> *We, the San Marcos Fire Department, shall create an organization that is engaged with the community and a crucial part of it. We shall create and preserve an environment that inspires success by trusting and empowering each other to strive for perfection. We shall train to the highest standards and act selflessly in our dedication to community, organization, and each other. We shall support, encourage, and hold each other accountable. We shall take pride and ownership in everything entrusted to us with the protection of our citizens and our members as our top priority.*

The San Marcos Fire Department employs 88 approved full-time equivalents (FTE), although some positions are unfilled. The following figure lists the current authorized positions at SMFD.

Figure 58: San Marcos Fire Department Organizational Chart (January 2020)



As shown in the preceding figure, the Fire Chief has a span of control over three Assistant Chiefs for Administration & Personnel; Operations & Training; and Fire Marshal & Prevention. Each operational shift has a Battalion Chief with six Captains, six Engineers, and 12 Firefighters.

SMFD's Fire Marshal & Fire Prevention Division provides fire inspections; plan review; public education and prevention; and fire and arson investigation.

Operations & Deployment

The San Marcos Fire Department deploys apparatus and career staff from five fire stations within the City. The Department provides traditional fire suppression and medical first-response (MFR) at both the Basic Life Support (BLS) and Advanced Life Support (ALS) levels.

Of the five stations, three have a three-person first-due engine company, and two have a three-person truck company. Wildland and other apparatus are cross-staffed by the primary companies as the need arises. Three of SMFD's fire stations house personnel and an ambulance from *San Marcos Hays County EMS* (SMHCEMS).

In addition, SMFD provides a variety of specialty services that include water, rope, and confined space rescue, as well as vehicle extrication. The Department provides hazardous materials response at the Technician level, and is a member of the *Capital Area Council of Governments* (CAPCOG) *Regional Hazmat Response Team.*

Capital Facilities & Equipment

Three basic resources are required to successfully carry out the mission of a fire department—trained personnel, firefighting equipment, and fire stations. No matter how competent or numerous the firefighters, if appropriate capital equipment is not available for use by responders, it would be impossible for the San Marcos Fire Department to deliver services effectively. The most essential capital assets for use in emergency operations are facilities and apparatus (response vehicles). Of course, the fire department's financing ability will determine the level of capital equipment it can acquire and make available for use by emergency personnel. This section of the report is an assessment of the respective capital facilities, vehicles, and apparatus of SMFD.

San Marcos Fire Department Facilities

Fire stations play an integral role in the delivery of emergency services for several reasons. A station's location will dictate, to a large degree, response times to emergencies. A poorly located station can mean the difference between confining a fire to a single room and losing the structure. Fire stations also need to be designed to adequately house equipment and apparatus, as well as meet the needs of the organization and its personnel. It is important to research needs based on service-demand, response times, types of emergencies, and projected growth prior to making a station placement commitment.

Consideration should be given to a fire station's ability to support a fire department's mission as it exists today and into the future. The activities that take place within a fire station should be closely examined to ensure the structure is adequate in both size and function. Examples of these functions may include:

- The housing and cleaning of apparatus and equipment; including decontamination and disposal of biohazards.
- Residential living space and sleeping quarters for on-duty personnel (all genders).
- Kitchen facilities, appliances, and storage.
- Bathrooms and showers (all genders).

- Administrative and management offices; computer stations and office facilities for personnel.
- Training, classroom, and library areas.
- Firefighter fitness area.
- Public meeting space.

In gathering information from the San Marcos Fire Department, ESCI asked the department to rate the condition of each of its fire stations using the criteria in the following figure.

Figure 59: Criteria Utilized to Determine Fire Station Condition

Excellent	Like new condition. No visible structural defects. The facility is clean and well maintained. Interior layout is conducive to function with no unnecessary impediments to the apparatus bays or offices. No significant defect history. The building's design and construction match its purposes. Age is typically less than 10 years.
Good	The exterior has a good appearance with minor or no defects. Clean lines, good work flow design, and only minor wear of the building interior. Roof and apparatus apron are in good working order, absent any significant full thickness cracks or crumbling of apron surface or visible roof patches or leaks. The building's design and construction match its purposes. Age is typically less than 20 years.
Fair	The building appears to be structurally sound with weathered appearance and minor to moderate non-structural defects. Interior condition shows normal wear and tear, but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building's purposes well. Showing increasing age-related maintenance, but with no critical defects. Age is typically 30 years or more.
Poor	The building appears to be cosmetically weathered and worn with potentially structural defects, although not imminently dangerous or unsafe. Large, multiple full-thickness cracks and crumbling of concrete on apron may exist. The roof has evidence of leaking and/or multiple repairs. The interior is poorly maintained or showing signs of advanced deterioration with moderate to significant non-structural defects. Problematic age-related maintenance and/or major defects are evident. May not be well suited to its intended purposes. Age is typically greater than 40 years.

ESCI toured each of the stations operated by the San Marcos Fire Department, and combined with the information provided, produced the observations listed in the following figures.

Figure 60: SMFD Station 1 (Central Station)

Address/Physical Location:	114 E. Hutchison Street, San Marcos, TX 78666

General Description:
Station 1 was constructed in 1968 and appeared to be well maintained. It is located in a historic corridor that is adjacent to Texas State University. This facility is properly positioned from a deployment standpoint. An intermittent sewer line blockage has been identified and there are plans to address this. Station apparatus are limited in placement and must remain within the apparatus bay because of the limited length of the front driveway/apron.

Structure						
Construction Type	Masonry					
Date of Construction	1968					
Auxiliary Power	Natural gas generator					
General Condition	Fair					
Number of Apparatus Bays	0	Drive-through bays			3	Back-in bays
Square Footage	3,864					
Facilities Available						
Separate Rooms/Dormitory/Other	9	Bedrooms	9	Beds	0	Beds in dormitory
Maximum Station Staffing Capability	9					
Exercise/Workout Facilities	In apparatus bay					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes (in bedrooms)					
Shower Facilities	Three					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Card reader and camera					
Apparatus Exhaust System	Direct source capture; MagneGrip					

Figure 61: SMFD Station 2 (Holland Street)

Address/Physical Location:	1314 Academy Street, San Marcos, TX 78666

General Description:
Station 2 was constructed in 1955 and does not meet industry standards for operations. The City is currently constructing a new station to relocate and replace this facility with a more contemporary and operationally efficient design.

Structure						
Construction Type	Masonry					
Date of Construction	1954					
Auxiliary Power	Natural gas generator					
General Condition	Fair					
Number of Apparatus Bays	0	Drive-through bays			2	Back-in bays
Square Footage	3,104					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	3	Beds	0	Beds in dormitory
Maximum Station Staffing Capability	3					
Exercise/Workout Facilities	In apparatus bay					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes, in bedrooms					
Shower Facilities	Yes					
Training/Meeting Rooms	No					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	No					
Security	Door locks					
Apparatus Exhaust System	MagneGrip "Air Hawk" bay exhaust system					

Figure 62: SMFD Station 3 (Hunter Road Station)

Address/Physical Location:	2420 Hunter Road, San Marcos, TX 78666

General Description:
Station 3 was constructed in 2001 and serves as the Hazardous Materials response facility. Access to the apparatus bays is challenging and poses unintended collision risks. Due to the site orientation and bay length, this facility is challenged to deploy an aerial apparatus safely. Additionally, this station lacks floor drains to capture contaminants and/or water leaks from the apparatus.

Structure						
Construction Type	Masonry					
Date of Construction	2001					
Auxiliary Power	Natural gas-powered generator					
General Condition	Good					
Number of Apparatus Bays	3	Drive-through bays			0	Back-in bays
Square Footage	7,564					
Facilities Available						
Separate Rooms/Dormitory/Other	6	Bedrooms	6	Beds	0	Beds in dormitory
Maximum Station Staffing Capability	6					
Exercise/Workout Facilities	In living quarters (former meeting room)					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	In bedrooms and locker room/bathroom					
Shower Facilities	3					
Training/Meeting Rooms	No					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Card reader					
Apparatus Exhaust System	Direct source capture; MagneGrip					

Figure 63: SMFD Station 4 (Wonder World Station)

Address/Physical Location:	1404 Wonder World Drive, San Marcos, TX 78666

General Description:
Station 4 was constructed in 2018 and is SMFD's newest fire facility. The aesthetics and operational efficiencies are commendable. Staff is still working through minor post-construction issues.

Structure						
Construction Type	Masonry					
Date of Construction	2018					
Auxiliary Power	Diesel-powered generator					
General Condition	New					
Number of Apparatus Bays	4	Drive-through bays			0	Back-in bays
Square Footage	14,000					
Facilities Available						
Separate Rooms/Dormitory/Other	10	Bedrooms	10	Beds	0	Beds in dormitory
Maximum Station Staffing Capability	10					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	In each bedroom					
Shower Facilities	5					
Training/Meeting Rooms	No					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Electronic locks, cameras, card reader, and secured parking for staff					
Apparatus Exhaust System	Direct source capture; MagneGrip					

Figure 64: SMFD Station 5 (River Ridge Station)

Address/Physical Location:	100 Carlson Circle, San Marcos, TX 78666

General Description:
Station 5 was constructed in 2010 and serves as a multi-purpose facility that includes Fire Administration, Fire Station, Fire Marshal's Office, and Training. The training room is set up for 40 students with additional capacity for up to 50 as well as seven computer workstations. The administrative conference room can accommodate 12 people. The administrative offices are at capacity with limited expansion options without renovation and additions.

Structure						
Construction Type	Masonry					
Date of Construction	2010					
Auxiliary Power	Diesel-powered generator					
General Condition	Good					
Number of Apparatus Bays	5	Drive-through bays			1	Back-in bays
Square Footage	19,000					
Facilities Available						
Separate Rooms/Dormitory/Other	13	Bedrooms	13	Beds	0	Beds in dormitory
Maximum Station Staffing Capability	13					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	In each bedroom					
Shower Facilities	4					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Electronic locks that are ID card activated, cameras					
Apparatus Exhaust System	Direct Source Capture; MagneGrip					

San Marcos Fire Department Apparatus Inventory

Fire apparatus and other vehicles utilized by fire departments are unique and expensive pieces of equipment customized to operate for a specific community and defined mission. Other than its firefighters, officers, and support staff, emergency apparatus and vehicles are likely the next most important resource in a fire department.

Apparatus must be sufficiently reliable to transport firefighters and equipment rapidly and safely to an incident scene. Such vehicles must be properly equipped and function appropriately, in order to ensure that the delivery of emergency services is not compromised. For this reason, they are very expensive and offer little flexibility in use and reassignment to other missions.

The following figure is an inventory of the San Marcos Fire Department's frontline fleet.

Figure 65: SMFD Frontline Fleet Inventory

Apparatus	Type	Manufacturer	Year	Condition	Features
Engine 1	Engine	Spartan	2012	Good	1500 gpm; 500 gal.
Engine 2	Engine	Smeal	2007	Good	1500 gpm CAFS; 500 gal.
Engine 4	Engine	Spartan	2017	Good	1500 gpm; 500 gal.
Truck 3	Quint	Spartan	2014	Good	2000 gpm; 400 gal. ;100 ft.
Truck 5	Quint	Spartan/Smeal	2010	Good	2000 gpm; 400 gal.; 105 ft.
Brush 2	Type 6	Ford F-550	2003	Good	70 gpm; 150 psi.; 270 gal.
Brush 4	Type 6	Metro Fire	2013	Good	70 gpm; 150 psi.; 270 gal.
Brush 5	Type 6	Metro Fire	2013	Good	70 gpm; 150 psi.; 270 gal.
Command & Staff Vehicles					
Battalion 1	SUV	Chevrolet	2011	Good	Light tower, command board
601	SUV	Chevrolet	2013	Good	AC Ops & Training
602	SUV	Chevrolet	2013	Good	AC Admin. & Personnel
650	Pickup	Chevrolet	2019	Good	Fire Marshal
651	Pickup	Chevrolet	2019	Good	FMO Inspector/Investigator
652	SUV	Chevrolet	2015	Good	FMO Inspector/Investigator
658	Pickup	Chevrolet	2019	Good	FMO Inspector/Investigator
655	Pickup	Chevrolet	2019	Good	FMO Inspector/Investigator

As shown in the preceding figure, all frontline apparatus, command units, and staff vehicles were rated in "good" condition. Both frontline engines and frontline trucks had a median age of seven years. Engine mileage ranged from 25,591–83,361, with a median of 58,818. The two trucks ranged in mileage from 47,107–79,794, with a median of 63,451.

Figure 66: SMFD Special Operations Apparatus & Other Vehicles

Apparatus	Manufacturer	Year	Condition	Features
MERV 1[A]	Polaris® 900XP	2013	Good	Side-by-side 4x4 w/stretcher carrier
MERV 3[A]	Kubota® UTV	2015	Good	4x4 w/pump; 85 gal.; 1 gal. foam tank
Boat 1[A]	Zodiac®	2015	Good	Rescue boat w/trailer
Boat 5[A]	Zodiac®	2016	Good	Rescue boat w/trailer
EVAC 1[A]	LMTV	N/A	Good	AWD; special operations; flood rescue
EVAC 2[A]	LMTV	N/A	Good	AWD; special operations; flood rescue
EVAC 3[A]	LMTV	N/A	Good	AWD; special operations; flood rescue
EVAC 4[A]	LMTV	N/A	Good	AWD; special operations; flood rescue
SAR 3[A]	Kawasaki Mule	—	—	On loan from local dealer

[A]Some apparatus cross-staffed.

Apparatus Station Assignments

The following figure lists the SMFD fire stations and the apparatus types and minimum staffing assigned to each station. Some wildland and specialty apparatus are cross-staffed by the engine or truck personnel when necessary. San Marcos Hays County EMS houses an advanced life support (ALS) ambulance and two personnel at three of the SMFD fire stations.

Figure 67: SMFD Frontline Apparatus & Staffing per Fire Station

Fire Station	Engine	Truck	Wildland[A]	Other[A]	Station Staffing
Station 1[A,B]	1	0	0	4	5
Station 2[A]	1	0	0	1	3
Station 3[A,B]	0	1	0	3	3
Station 4[A,B]	1	0	1	0	3
Station 5[A,B]	0	1	1	1	3

[A]Some apparatus cross-staffed. [B]SMHCEMS ambulance & two personnel located at these stations.

Apparatus Maintenance & Replacement Planning

No piece of mechanical equipment or vehicle can be expected to last indefinitely. As apparatus age, repairs tend to become more frequent and more complex. Parts may become more difficult to obtain, and downtime for repair and maintenance increases. Given that fire protection, EMS, and other emergencies are so critical to a community, downtime is one of the most frequently identified reasons for apparatus replacement.

Because of the expense of fire apparatus, most communities develop replacement plans. To enable such planning, fire departments often turn to the accepted practice of establishing a life-cycle for apparatus that results in an anticipated replacement date for each vehicle. The reality is that it may be best to develop a life-cycle for planning purposes, such as the development of replacement funding for various types of apparatus; yet, apply a different method (such as a maintenance and performance review) for determining the actual replacement date—thereby achieving greater cost-effectiveness when possible.

Those within the fire department responsible for managing and maintaining the fleet should be concerned about aging apparatus and vehicles, and ensure that a funded replacement schedule is in place. As frontline units age, fleet costs will naturally be higher, and more downtime will be associated with necessary repairs and routine maintenance. The following figure is one example that can be used for determining the condition of fire apparatus and vehicles.

Figure 68: Example Criteria & Method for Determining Apparatus Replacement

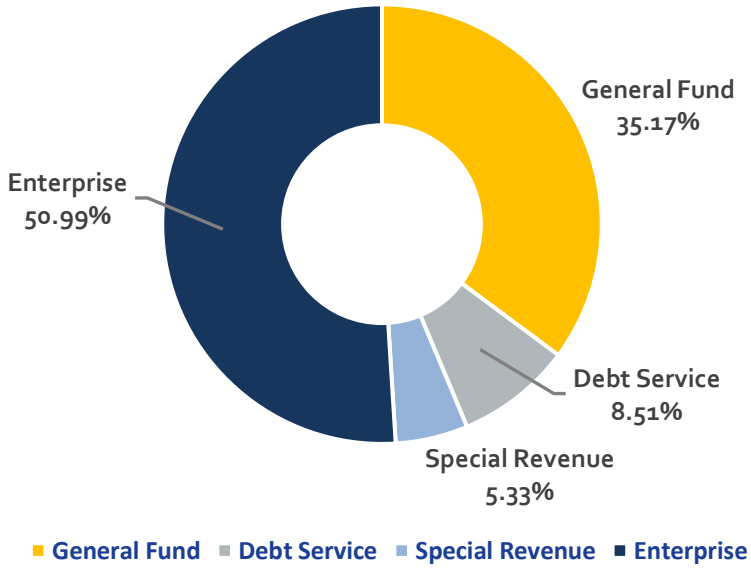
Components	Points Assignment Criteria	
Age:	One point for every year of chronological age, based on in-service date.	
Miles/Hours:	One point for every 10,000 miles or 1,000 hours	
Service:	1, 3, or 5 points are assigned based service-type received (for instance, a pumper would be given a 5 since it is classified as severe duty service).	
Condition:	This category takes into consideration body condition, rust interior condition, accident history, anticipated repairs, etc. The better the condition, the lower the assignment of points.	
Reliability:	Points are assigned as 1, 3, or 5; depending on the frequency a vehicle is in for repair (for example, a 5 would be assigned to a vehicle in the shop 2 or more times per month on average; while a 1 would be assigned to a vehicle in the shop an average of once every 3 months or less.	
Point Ranges	**Condition Rating**	**Condition Description**
Under 18 points	Condition I	Excellent
18–22 points	Condition II	Good
23–27 points	Condition III	Consider Replacement
28 points or higher	Condition IV	Immediate Replacement

Financial Analysis

The Finance Department is responsible for administering budget policies and processes. Annually, each department, including the fire department, is responsible for developing a one-year program-based operating and capital expenditures budget. The San Marcos Finance Division receives fiscal direction from the City Manager's Office and City Council.

SMFD is funded through the *General Fund*, which is one of the four major operational funds within the FY2019 authorized budget of $229,369,620. When compared to the prior fiscal year, the *General Fund* expanded by 10.02% to a total of $80,659,797 in FY 2019. This represents 35.17% of the total budget. The following figure is a breakdown of the five major funds contained within the authorized budget.

Figure 69: City of San Marcos Operating Funds by Budget Allocations

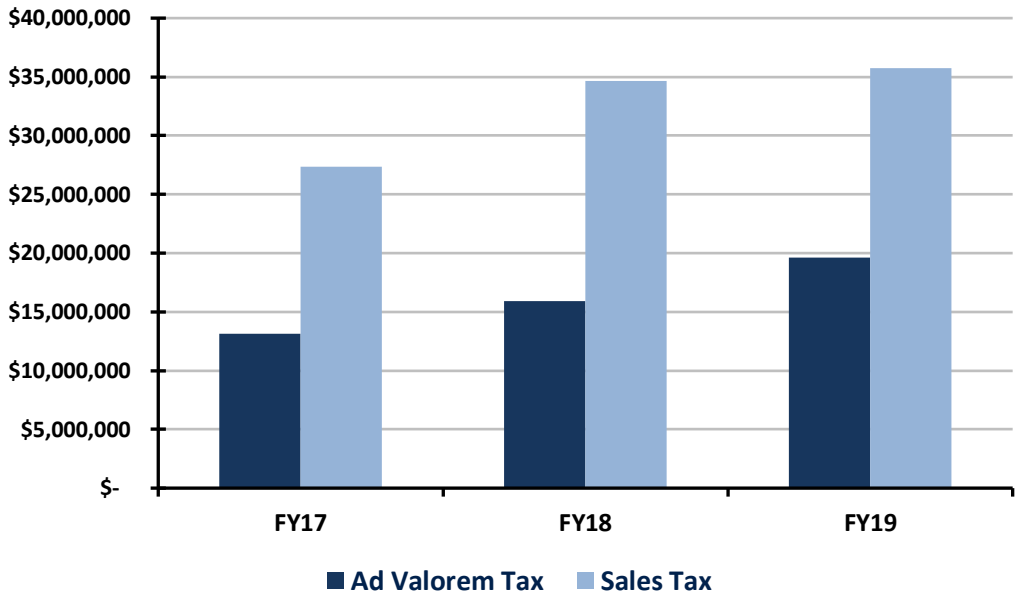


Revenue

As is common in most municipalities, the *General Fund* is predominantly funded through ad valorem tax and sales tax. Continued growth within the region allowed the *General Fund* to grow by 10.02% from the prior year. The ad valorem tax represents 24.42% of the *General Fund* revenue, and sales tax provides 44.44% of the revenue.

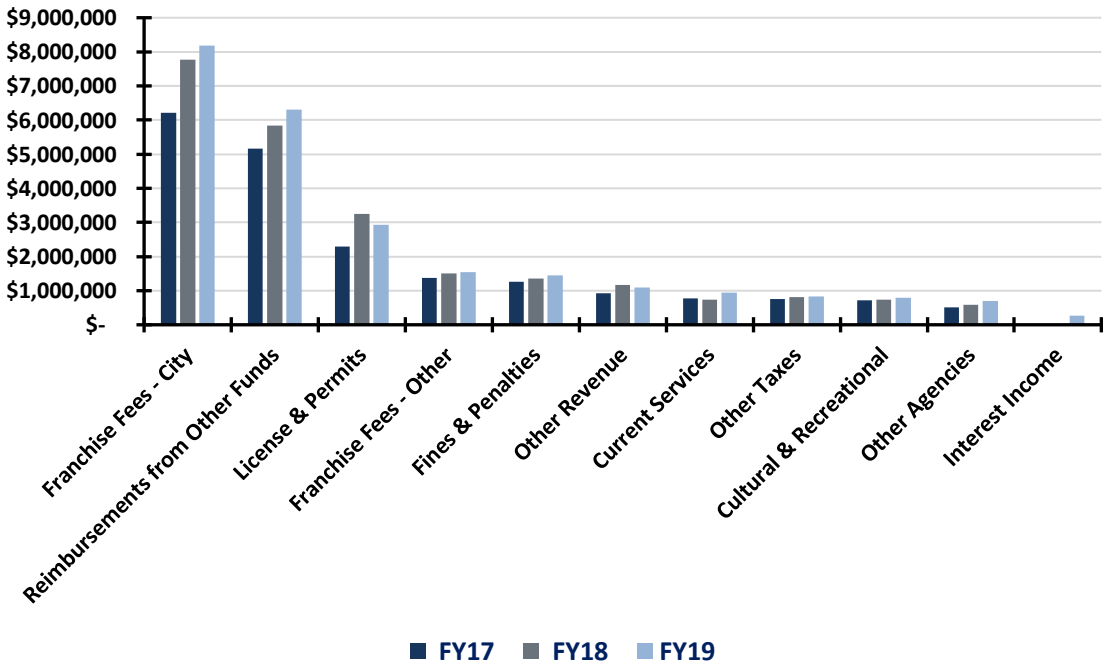
In FY 2019, the property tax rate was maintained $0.61 with an effective rate of $0.59, a rollback rate of $0.66, and a debt rate of $0.23. Based upon FY 2019 assessed valuations, the City of San Marcos receives approximately $506,234 of revenue for every $0.01 of authorized ad valorem tax.

Figure 70: Major Revenue Sources for General Fund



Franchise fees accounted for 12.09% of the FY 2019 revenue with licensing, permits, fines, reimbursements, and other related fees accounting for the remaining 19.05% of the revenue. The following figure illustrates a three-year trending of the *General Fund* revenue sources.

Figure 71: Additional Revenue Sources for General Fund



Major Industries & Employers

As with other communities, the City of San Marcos maintains a broad range of retail centers, distribution centers, warehousing, and property development. The FY 2019 Budget and FY 2018 Comprehensive Annual Financial Report (CAFR) identified Hays Energy, Amazon, and HEB Warehouse as the three largest valuation properties operating within the City. Interestingly, Amazon and HEB are also listed in the subsequent figure that highlights major employers.

Figure 72: Largest Valuation Properties (2018)

Property Name	Category	Assessed Valuation
Hays Energy	Energy	$167,466,790
Amazon	Distribution Center	$140,074,503
HEB Warehouse	Distribution Center	$128,832,364
San Marcos Premium Outlet	Retails Center	$62,513,347
CFAN	Manufacturing	$56,900,317
CCSHP	Retail Center	$53.414,920
Prime Outlets	Retail Center	$47,398,314
RELP	Property Development	$47,058,647
Jefferson Loft	Apartments	$45,198,671
Woods of San Marcos	Property Development	$42,750,000
Total Valuation:		**$791,607,873**

Texas State University and Amazon are the two largest employers and account for 45% of the 14,532 employees listed within the Top 10 List of San Marcos Employers. Further evaluation shows that the two outlet malls provide employment for 22% of the total listed in the following figure.

Figure 73: Top 10 Major Employers (2018)

Employer	Category	No. of Employees
Texas State University	Education	3,600
Amazon	Distribution Center	3,000
San Marcos Premium Outlet	Retail Center	1,600
Tanger Factory Outlet	Retail Center	1,540
San Marcos Independent Schools	Education	1,116
HEB	Grocery	810
Hays County	County Government	807
Central Texas Medical Center	Healthcare	700
HEB Warehouse	Distribution Center	680
City of San Marcos	Local Government	679
	Total Employees:	**14,532**

General Fund

The *General Fund* is comprised of eight service areas, and within each area, there may be multiple operational departments. For example, the *Public Safety* service area is comprised of police, fire, municipal court, and emergency management.

A three-year analysis shows that *Public Safety* experienced the lowest change (9.97%) in budget allocation between FY 2017 and FY 2019. The largest change (105%) occurred within the *General Services* area between FY 2017 and FY 2018 appears to be associated with a change to economic development incentives. The FY 2019 Annual Budget was used as the source document and highlighted within the following figure.[28]

Figure 74: General Fund Service Areas

Budget Category	FY17 Actual	FY18 Estimate	FY19 Budgeted	3-Year Change
General Government	$6,079,001	$6,427,585	$6,955,708	14.42%
Technology	$1,917,343	$2,141,814	$2,313,516	20.66%
Community Development	$5,891,063	$6,298,613	$6,370,799	14.25%
Public Safety	**$25,680,111**	**$25,651,294**	**$28,239,971**	**9.97%**
Public Services	$4,728,653	$5,251,691	$5,454,521	15.35%
Neighborhood Enhancement	$2,496,477	$2,732,268	$3,287,062	31.67%
Community Services	$6,918,793	$7,622,699	$7,964,383	15.11%
General Services	$9,30,634	$17,185,978	$19,714,838	109.94%
General Fund:	**$63,102,075**	**$73,311,942**	**$80,659,797**	**27.83%**

Fire Department Funding

A three-year review of the *General Fund* budget appropriations illustrates an average funding level of 12.97% for the SMFD. The FY 2019 SMFD budget was slightly below the three-year average, with 12.83% of the *General Fund* allocation(s).

Figure 75: SMFD Budget History (2017–2019)

Budget Category	FY17 Actual	FY18 Estimate	FY19 Budgeted	3-Year Change
Personnel	$8,063,646	$8,374,825	$9,640,246	19.55%
Contracts	$130,916	$141,572	$134,072	2.41%
Equipment & Supplies	$458,733	$246,607	$362,224	-21.04%
Other Charges	$12,278	$153,762	$209,167	72.47%
Total Fire Department:	**$8,774,573**	**$8,916,766**	**$10,345,709**	**17.91%**
General Fund:	**$63,102,075**	**$73,311,942**	**$80,659,797**	**27.83%**
FD % of General Fund:	**13.91%**	**12.16%**	**12.83%**	**-7.76%**

Fire Department Capital Funding

SMFD has received support for several new capital projects that include the relocation of Fire Station 2 and the development of a new Training Facility. The following figure highlights the three-year projected *Capital Fund* allocations for *Public Safety*.

Figure 76: Public Safety Capital Funding (2019–2021)

Public Safety	FY19 Budgeted	FY20 Budgeted	FY21 Budgeted	Total
New Fire Station (Yarrington/IH35)	—	$350,000	$4,150,000	$4,500,000
New Fire Station (SH21/H80)	—	—	$1,000,000	$1,000,000
Relocate Fire Station 2	$5,600,000	—	—	$5,600,000
Replace Fire Engine (52-614)	—	$785,000	—	$785,000
Training Facility	—	$2,000,000	—	$2,000,000
Mobile Video Technology	—	—	$600,000	$600,000
Total Funding:	**$5,600,000**	**$3,135,000**	**$5,750,000**	**$14,485,000**

Future Funding Challenges

The 86th Texas State Legislature authorized property tax reform, via Senate Bill (SB2), to require many cities, counties, and other taxing units to hold an election for budgets that increase property tax revenue more than 3.5% from the prior year. According to an article published in the Texas Tribune, Moody's Investors Service has issued an analysis into the new law and opined that "the law would lead to minimal homeowner savings and hurt local governments substantially."[29]

Review of Historical System Performance

An organization must consider its past to plan for the future properly. An indicator of success is the balance of resources to the utilization of services. If the need for emergency service response exceeds the department's resources, then there can be a negative effect on response-time performance.

The following two figures show the workload over the past four years. Like most fire departments, emergency medical response constitutes the greatest number of calls for service. The second figure shows trending for fire, EMS, and other responses. Over the past four years, fire responses have decreased by about 5%. During the same period, EMS has gone up 18%, and other responses have dropped about 2%. SMFD's overall demand for service has increased by 9% over the past four years.

Figure 77: San Marcos Fire Department Service-Demand (2014–2018)

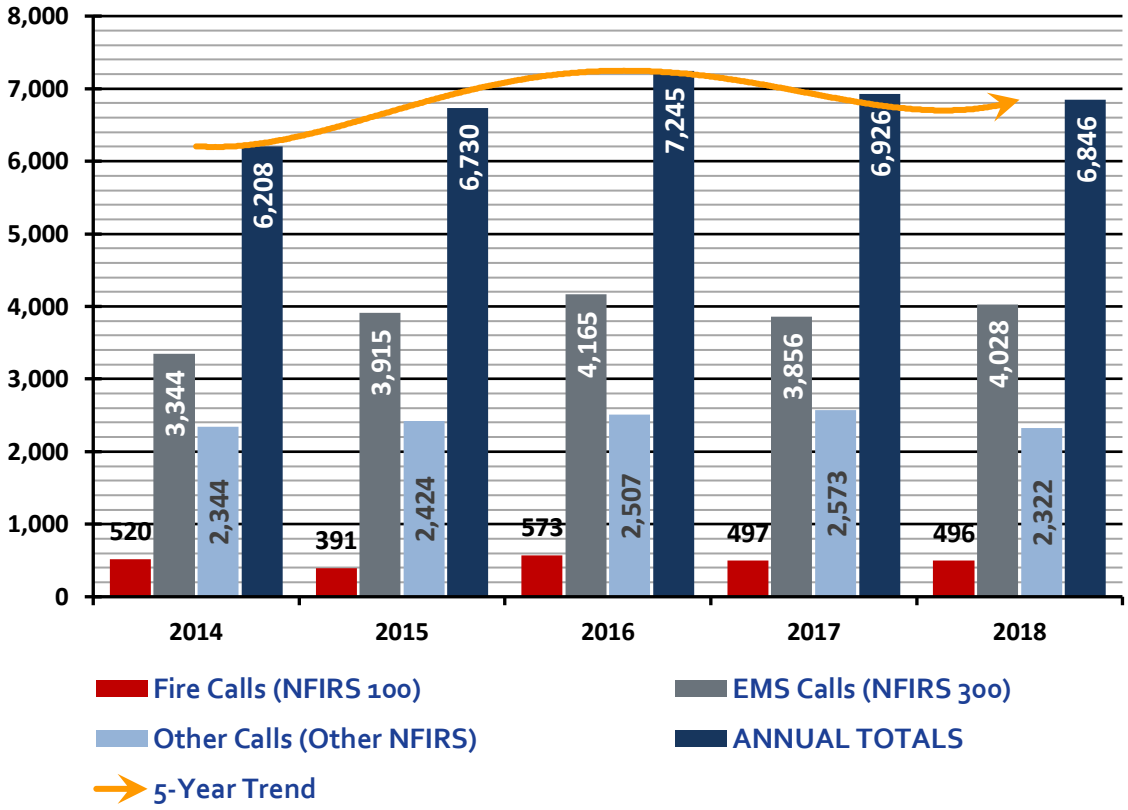
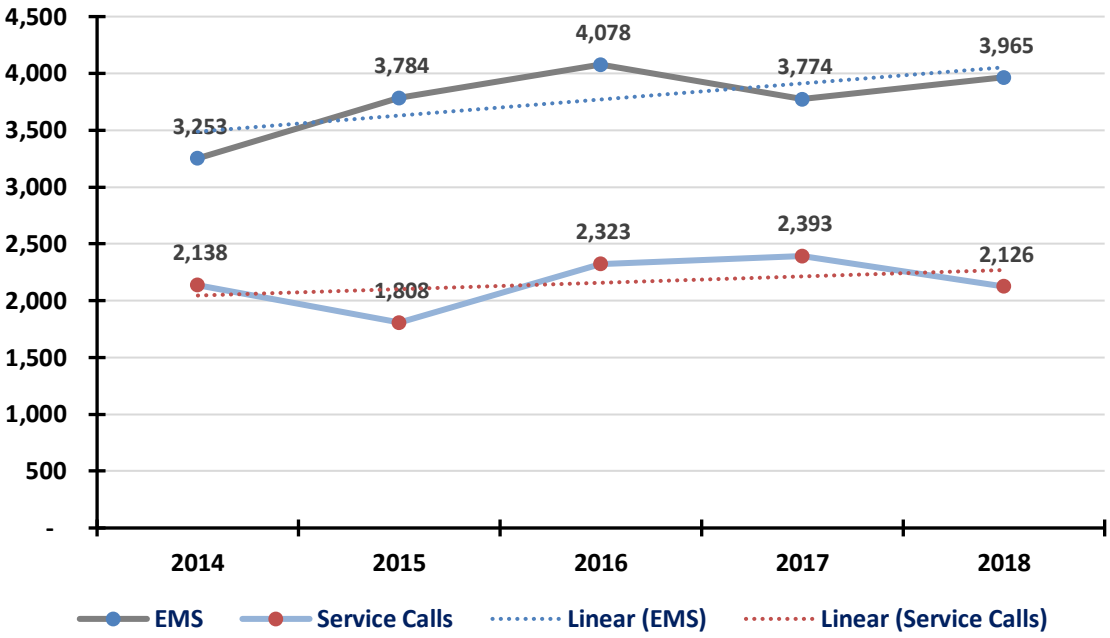
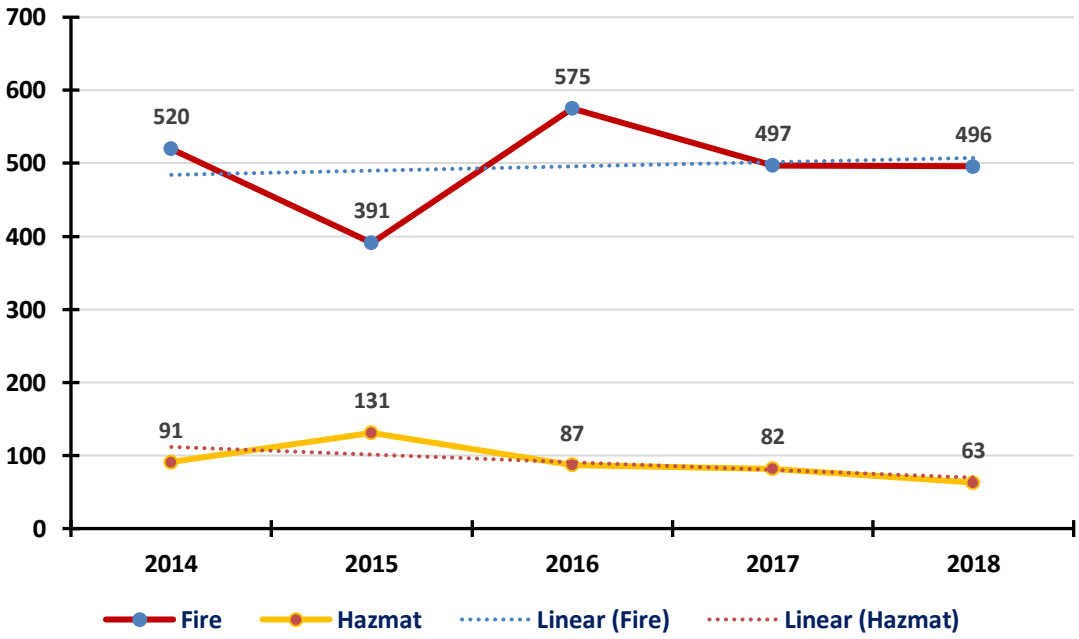


Figure 78: Linear Trends of SMFD Service-Demand (2014–2018)





Service-Demand Study

SMFD had a total of 6,846 requests for service in 2018. As previously mentioned, EMS, including MVAs, constituted most of the calls at 58%. The national average for EMS response by fire departments is 64%, leaving 36% for fire and other types of service-demand.[30] SMFD is slightly lower than the national average, in part, due to the use of medical priority dispatching and limiting unnecessary fire department responses.

Figure 79: SMFD Incident-Responses by Type (2014–2018)

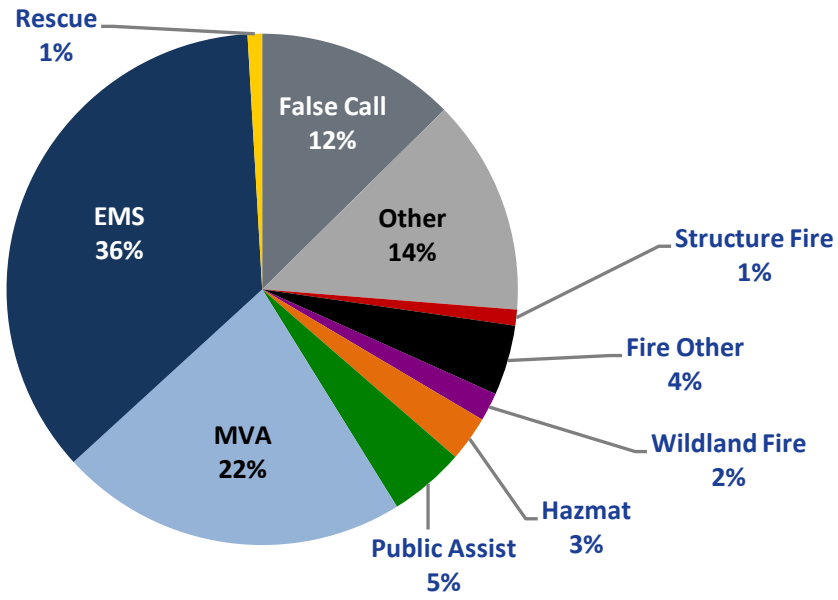


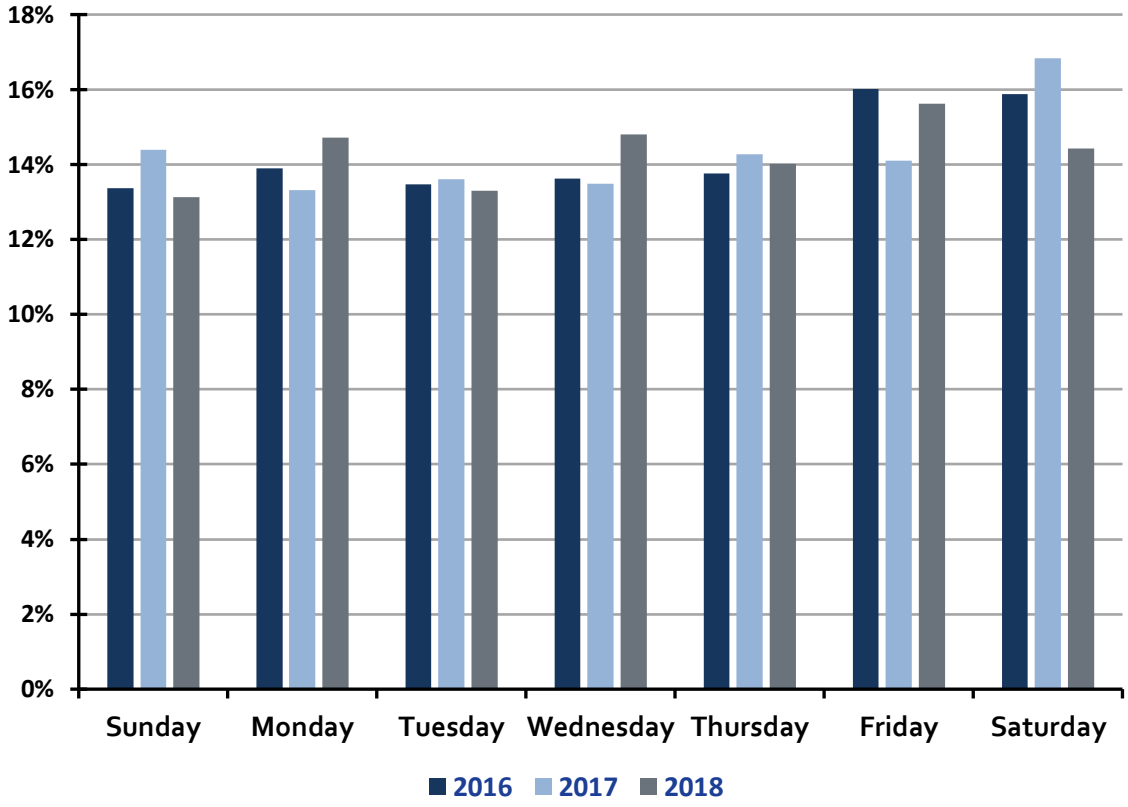
Figure 80: Quantity of SMFD Incident-Responses by Type (2018)

Incident Type	Quantity
Structure Fire	69
Fire Other	304
Wildland Fire	123
Emergency Medical Services	2,456
Motor Vehicle Accidents	1,509
Rescue	63
Hazard Materials	196
Public Assist	328
False Calls	863
Other	935
Total:	**6,846**

Temporal Analysis

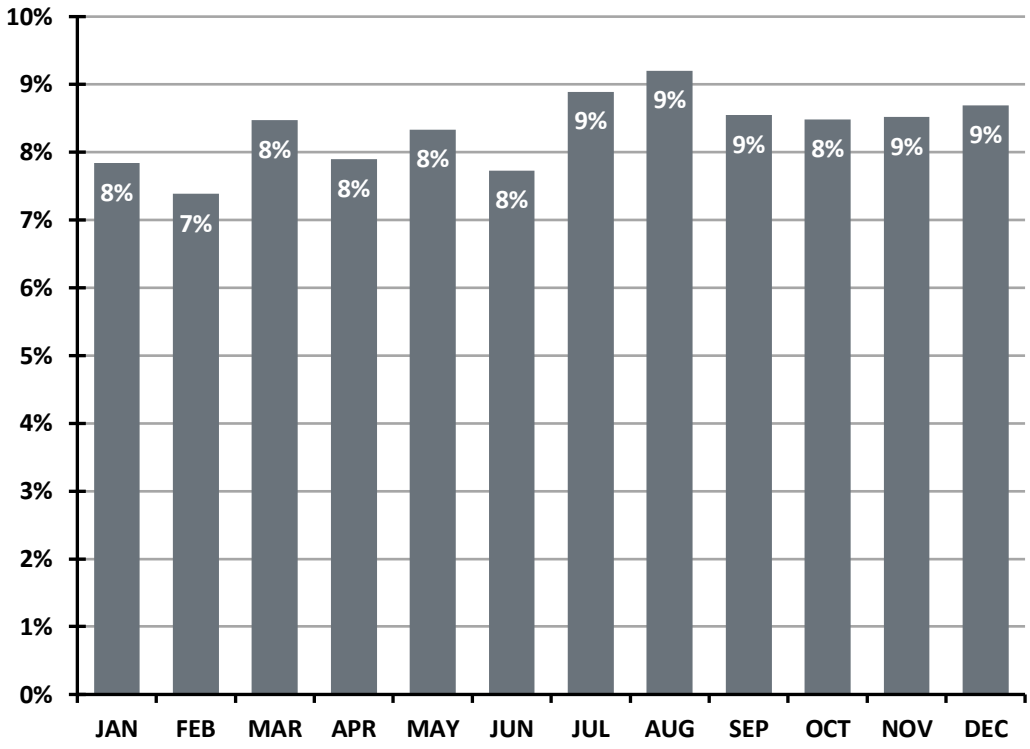
The next set of figures break the demand for service into day-of-week and calls by month. The following figure shows trendlines that support a pattern of increased call-volume starting on Friday and peaking on Saturday night.

Figure 81: SMFD Service-Demand by Day-of-Week (2016–2018)



The following figure shows a consistent demand for services throughout the year with slight increases during July–September. The data did not support the need for seasonal staffing due to the consistent call volume.

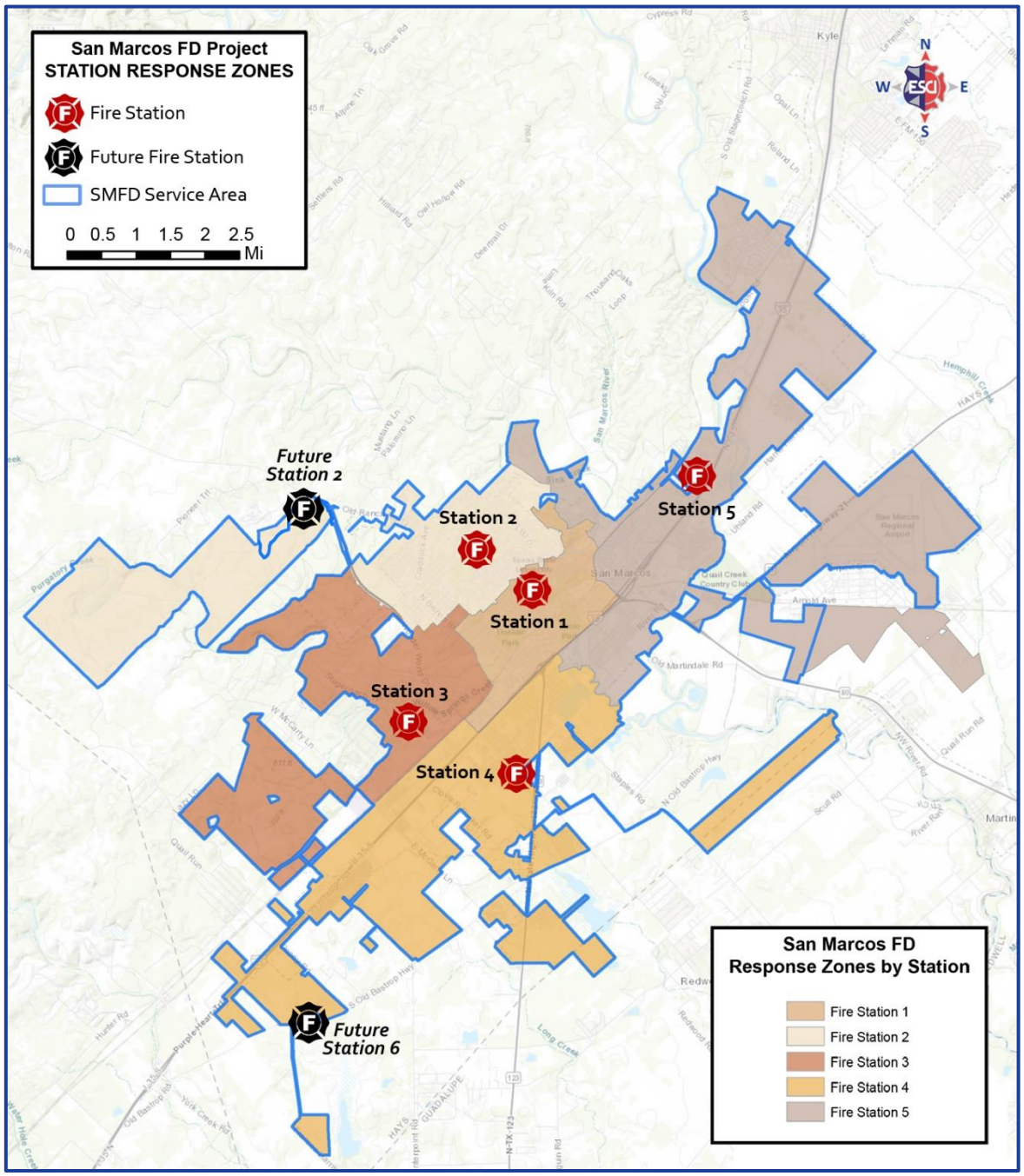
Figure 82: SMFD Service-Demand by Month (2016–2018)



Geographic Distribution of Service-Demand

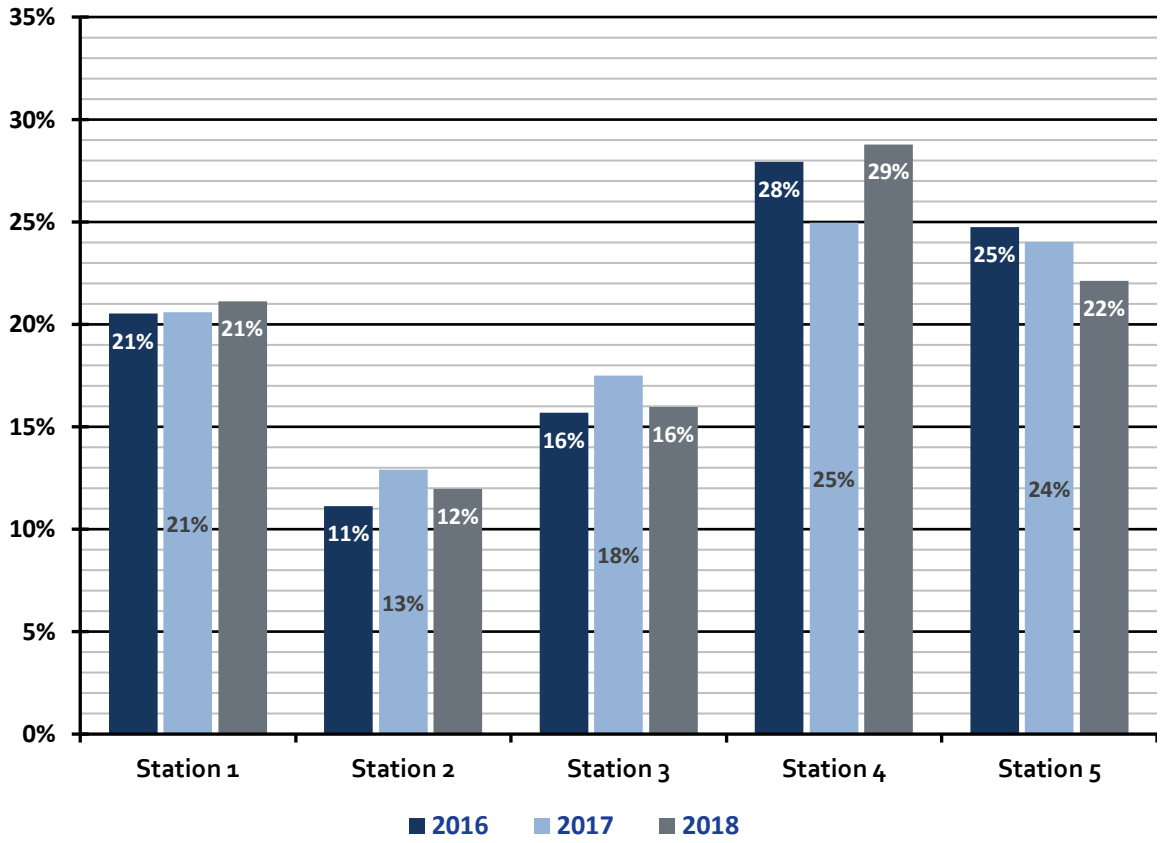
In addition to the temporal analysis, it is useful to examine the geographic distribution of service-demand. The following figure shows the current station response zones, including future Fire Stations 2 and 6.

Figure 83: SMFD Fire Station Response Zones



The following figure indicates the distribution of emergency incidents in the SMFD response-zones during 2018. The data shows all activities, and apparatus responding from each station. The total will be higher than the yearly call-volume due to multiple apparatus dispatched to the same incident. As shown, the highest demand for service occurred within Station 4's response zone.

Figure 84: SMFD Service-Demand by Fire Station (2016–2018)



Travel-Time Projections

The following figures compare station response zones to the 8-, 10-, and 12-minute travel-times for each station. The analysis confirms the delayed response in the southwest and northwest areas of the City and supports the need to evaluate and consider future fire stations in these areas. The next figure is a GIS illustration showing the projected travel distances within an 8-minute travel time from each SMFD fire station.

Figure 85: SMFD 8-Minute Travel-Time Distances from Fire Stations

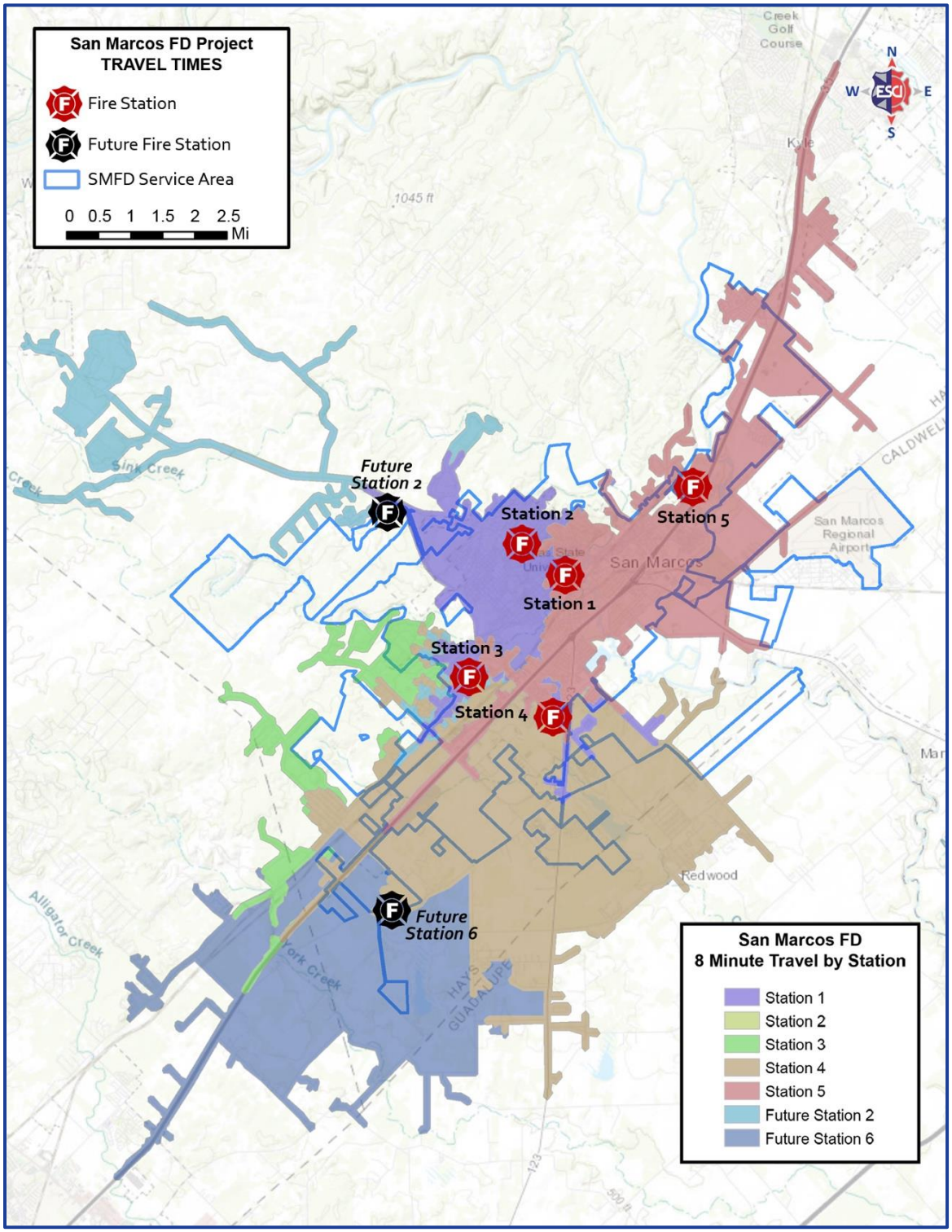


Figure 86: SMFD 10-Minute Travel-Time Distances from Fire Stations

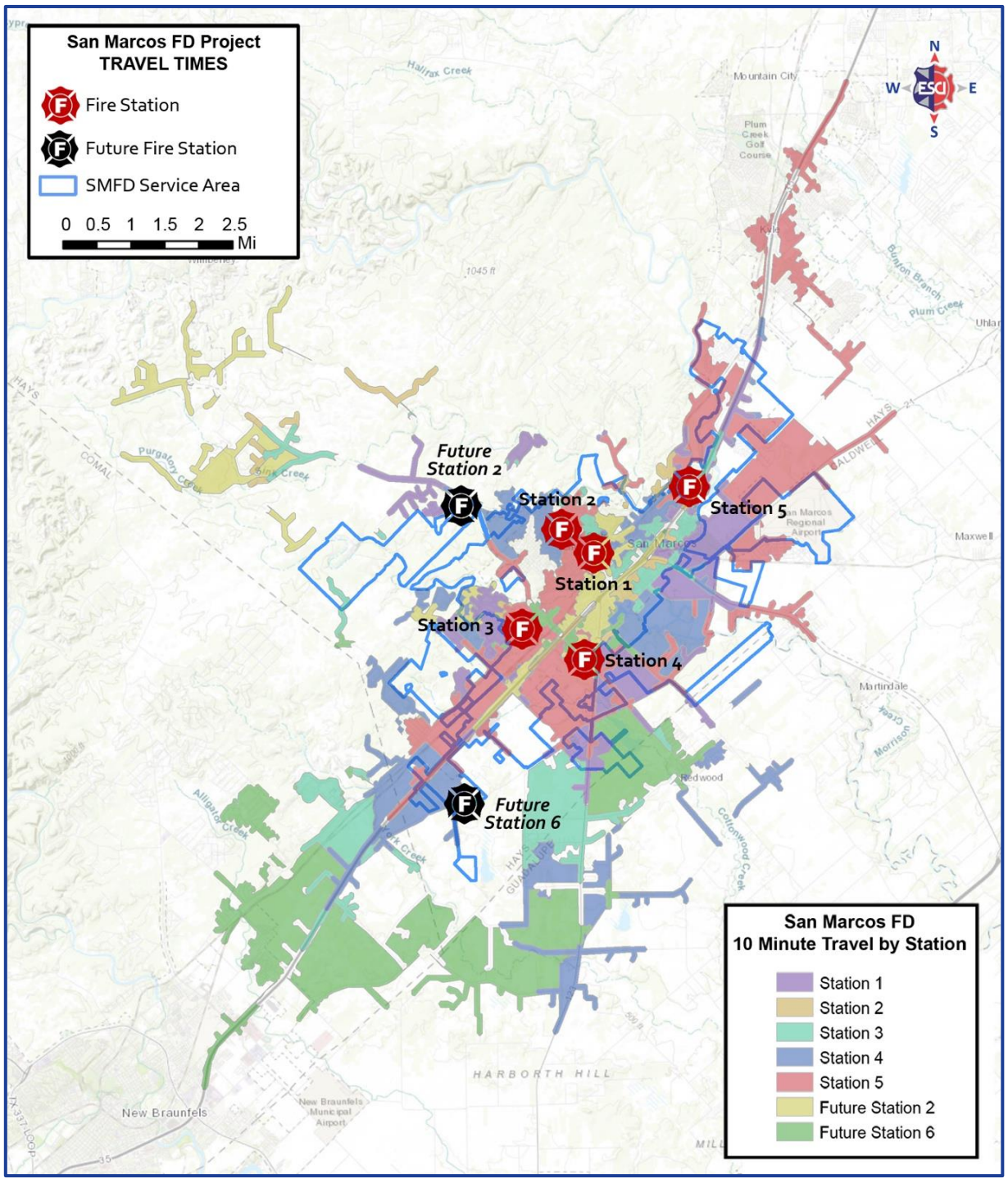
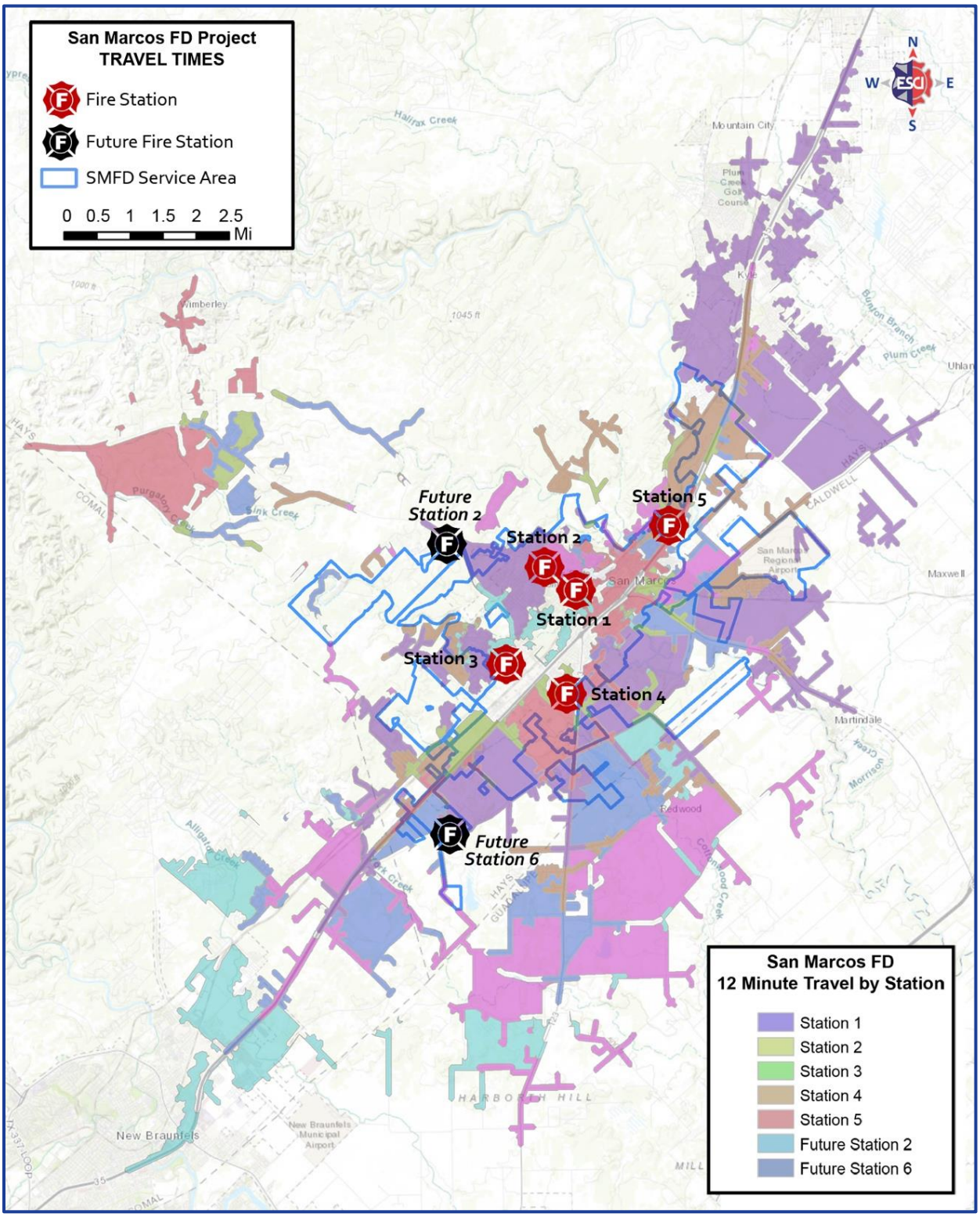


Figure 87: SMFD 12-Minute Travel-Time Distances from Fire Stations

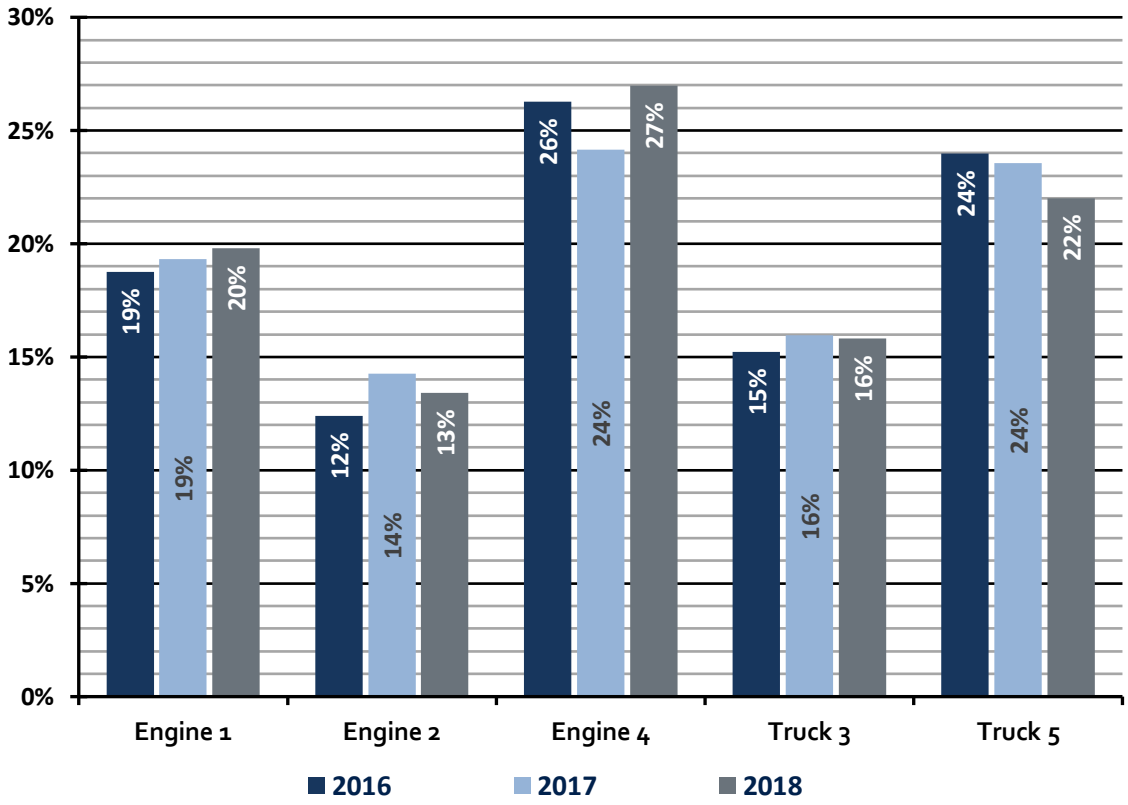


Reliability Study (Unit Workload Analysis)

The following section provides an overview of unit response time performance. For an organization to meet response goals, an evaluation is required to determine the utilization of each apparatus. Based on a unit-workload analysis, the Department can determine concurrent requests for services, which results in increased response times from distant units.

SMFD provides its primary response through the utilization of three engines and two trucks—each housed in separate stations. Focusing on 2018 data, much of the call-volume was broken down into three call types, which included EMS responses, motor vehicle accidents, and fires.

Figure 88: SMFD Incident Responses by Apparatus (2018)



Analysis of the data shows that during the 36-month period between 2016 and 2018, the average daily service demand by individual apparatus showed the following results:

- Engine 1: 2.25 calls/day
- Engine 2: 1.55 calls/day
- Engine 4: 3.01 calls/day
- Truck 3: 1.82 calls/day
- Truck 5: 2.7 calls/day

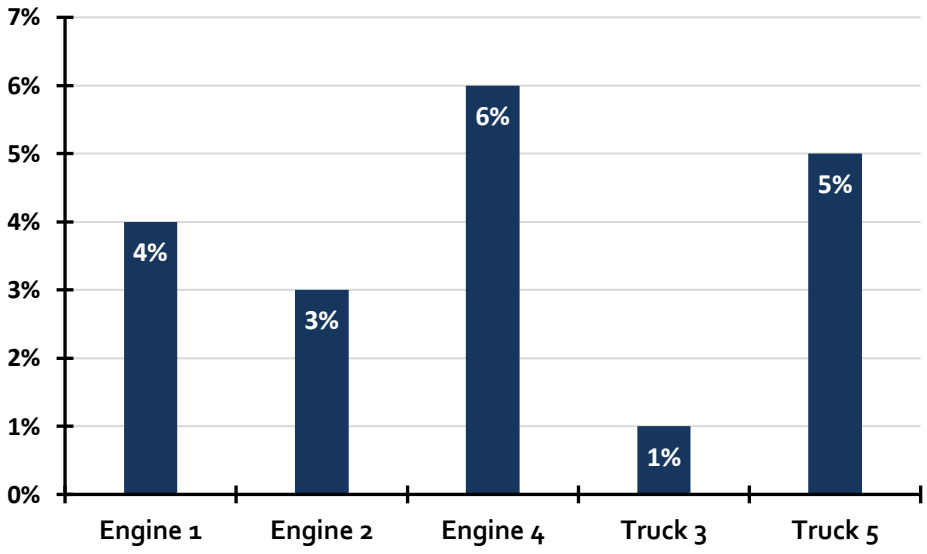
Unit Hour Utilization

The next process for evaluating apparatus response is to determine the overall amount of time that an apparatus is assigned to a specific incident. This is a measurement from the initial dispatch time until the unit is available for another incident.

Unit hour utilization (UHU) is but one measure indicating workload. It is calculated by dividing the total time a unit is committed to all incidents during a year divided by the total time in a year. Expressed as a percentage, it describes the amount of time a unit is not available for another response since it is already committed to an incident. The larger the percentage, the greater a unit's utilization and the less available it is for assignment to an incident.

Most fire-service organizations measure performance based on the 90th percentile. This is often an indicator that additional apparatus and staffing are warranted in a specific response area. Based on the data provided to ESCI, SMFD apparatus have the capacity for increased call volume over the next five years based on a 9% growth rate.

Figure 89: Primary SMFD Apparatus UHU Rates (2016–2018)



Incident Concurrency

One way to look at resource workload is to examine the number of times multiple incidents happen within the same time frame. The following figure shows the number of times that one or more units were assigned to incidents. The data indicates that in 2018 there was a slight increase in the number of times more than one apparatus was committed to an incident. This trend can impact SMFD's ability to assemble an effective response force (ERF) on structure fires.

Figure 90: SMFD Concurrent Calls (2016–2018)

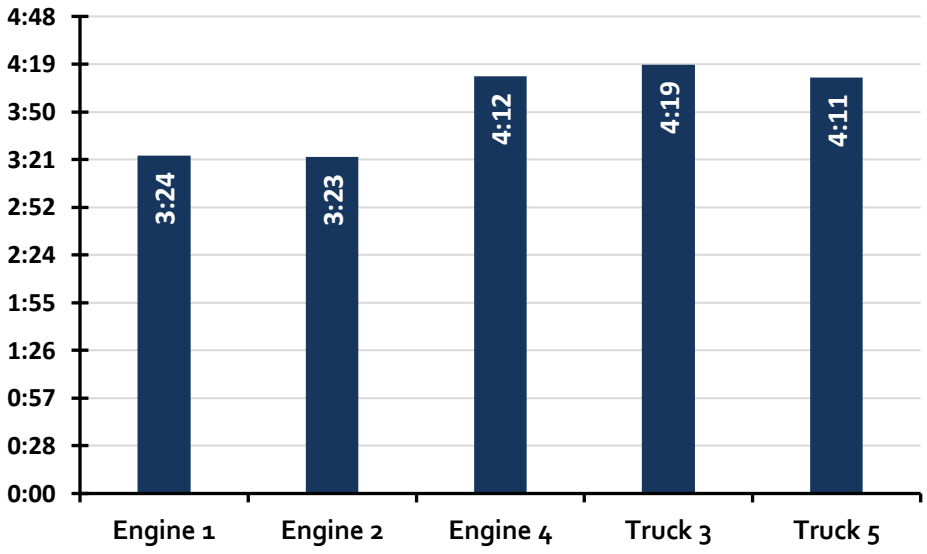
Concurrent Calls	2016	2017	2018
One Incident	80.3%	78.8%	76.8%
Two Incidents	17.8%	17.9%	20.3%
Three Incidents	2.1%	2.7%	2.5%
Four or More	0.1%	0.3%	0.2%

Response-Performance Study

In addition to UHU, an organization must evaluate various measurements of performance to determine overall response-efficacy. The following section looks at the various time stamps for each phase of emergency response, and then an analysis of total response time.

The next figure presents the average travel times of each SMFD primary apparatus during 2018 only. While average times do not reflect actual performance, these figures are presented here to show the contrast with the fractile response-performance at the 90th percentile.

Figure 91: Average Travel Time by SMFD Apparatus (2018)



As shown in the preceding figure, the calculations demonstrate a substantial disparity when comparing average times to those at the 90th percentile.

SMFD Overall Response-Time Performance

The following figure lists each of the components of the overall cumulative *Total Response-Time* performance of the San Marcos Fire Department during the 36-month period from 2016 through 2018.

Figure 92: SMFD Response-Time Performance at the 90th Percentile (2016–2018)

Response Time Type	90th Percentile
Call-Processing Time	3 min., 7 sec.
Turnout Time	2 min., 50 sec.
Travel Time	8 min., 8 sec.
Total Response Time:	**10 min., 28 sec.**

The next figure lists various annual SMFD response times analyses for each year 2016 through 2018.

Figure 93: Overall SMFD Response-Time Analyses by Year

Response Type	2016	2017	2018
Response Time (90%)	6 min., 47 sec.	6 min., 47 sec.	6 min., 24 sec.
Total Response Time (90%)	9 min., 27 sec.	9 min., 48 sec.	10 min., 20 sec.
Average Response Time	3 min., 48 sec.	3 min., 58 sec.	3 min., 47 sec.

Section III:
PERFORMANCE OBJECTIVES & RESPONSE CAPABILITIES

ESTABLISHMENT OF PERFORMANCE OBJECTIVES

SMFD benefits from having an engaged leadership team that is committed to improving community and firefighter safety. An example of this commitment can be seen in the establishment of benchmark and baseline performance objectives. The baseline performance objectives are developed through a historical review of service-demand and performance. SMFD has agreed to adopt an internal practice of annually reviewing and updating its baseline performance for call-processing time, turnout time, travel time, and total response time for the first arriving unit and effective response force needs—also known as critical tasking—for the various incident types.

Benchmark Performance Objectives

Fire Suppression Benchmarks

For 90% of all *low*, *moderate*, *high*, and *extreme* risk fire-related incidents, the total response time for the arrival of the first-due unit, staffed with a minimum of one officer and two firefighters, shall be within 6 minutes, 20 seconds (6:20) in urban areas, and 7 minutes, 20 seconds (7:20) in suburban and rural response zones. The first-due arriving unit shall carry a minimum of 500 gallons of water and be capable of producing 1,500 gallons per minute pumping capacity. The first-due unit shall establish command, declare scene priorities, establish an uninterrupted water supply, perform life-saving and property-saving interventions, and provide scene safety and accountability for the SMFD members and citizenry.

For 90% of ***Low-Risk*** fires, the minimum effective response force (ERF) staffing shall be six firefighters that arrive within 8 minutes, 20 seconds (8:20) in urban areas, and 10 minutes, 20 seconds (10:20) in suburban and/or rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and control an escalating incident.

For 90% of ***Moderate-Risk*** fires, the minimum effective response force staffing shall be 17 firefighters that arrive within 10 minutes, 20 seconds (10:20) in urban areas, and 12 minutes, 20 seconds (12:20) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***High-Risk*** fires, the minimum effective response force staffing shall be 28 firefighters that arrive within 10 minutes, 20 seconds (10:20) in urban areas, and 14 minutes, 20 seconds (14:20) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***Extreme-Risk*** fires, the minimum effective response force staffing shall be 43 firefighters that arrive within 12 minutes, 30 seconds (12:30) in urban areas, and 14 minutes, 30 seconds (14:30) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

EMS/Rescue Benchmarks

For 90% of all *low*, *moderate*, *high*, and *extreme* risk medical and rescue related incidents, the total response time for the arrival of the first-due unit, staffed with a minimum of one officer and two firefighters, shall be within 6 minutes (6:00) in urban areas, and 7 minutes (7:00) in suburban and rural response zones. The first-due arriving unit shall be staffed with a minimum of one certified Paramedic and equipped with ALS equipment that allows for advanced patient care prior to the arrival of a transport-capable unit. The first-due unit shall establish command, conduct, and document the patient assessment, provide basic and/or advanced treatment, provide scene safety and accountability for the SMFD members and citizenry, and assist with packaging and transferring the patient to the transport unit.

For 90% of ***Low-Risk*** medical and rescue incidents, the minimum effective response force staffing shall be three firefighters that arrive within 6 minutes (6:00) in urban areas, and 7 minutes (7:00) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating and medical care guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***Moderate-Risk*** medical and rescue incidents, the minimum effective response force staffing shall be six firefighters that arrive within 8 minutes (8:00) in urban areas, and 10 minutes (10:00) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating and medical care guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***High-Risk*** medical and rescue incidents, the minimum effective response force staffing shall be 13 firefighters that arrive within 10 minutes (10:00) in urban areas, and 12 minutes (12:00) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating and medical care guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***Extreme-Risk*** medical and rescue incidents, the minimum effective response force staffing shall be 16 firefighters that arrive within 12 minutes, 10 seconds (12:10) in urban areas, and 14 minutes, 10 seconds (14:10) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating and medical care guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

Hazardous Materials Benchmarks

For 90% of all *low*, *moderate*, *high*, and *extreme* risk hazardous materials related incidents, the total response time for the arrival of the first-due unit, staffed with a minimum of one officer and two firefighters, shall be within 6 minutes, 20 seconds (6:20) in urban areas, and 7 minutes, 20 seconds (7:20) in suburban and rural response zones. The first-due arriving unit shall be staffed with personnel that are trained to the minimum level of hazardous material awareness and equipped with air monitoring, and commodity identification software or references. The first-due unit shall establish command, declare scene priorities, initiate confinement plans, and provide scene safety and accountability for the SMFD members and citizenry.

For 90% of ***Low-Risk*** hazardous materials incidents, the minimum effective response force staffing shall be three firefighters that arrive within 6 minutes, 20 seconds (6:20) in urban areas, and 7 minutes, 20 seconds (7:20) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***Moderate-Risk*** hazardous materials incidents, minimum effective response force staffing shall be seven firefighters that arrive within 8 minutes, 20 seconds (8:20) in urban areas, and 12 minutes, 20 seconds (12:20) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***High-Risk*** hazardous materials incidents, the minimum effective response force staffing shall be 12 firefighters that arrive within 10 minutes, 20 seconds (10:20) in urban areas, and 12 minutes, 20 seconds (12:20) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

For 90% of ***Extreme-Risk*** hazardous materials incidents, the minimum effective response force staffing shall be 17 firefighters that arrive within 12 minutes, 30 seconds (12:30) in urban areas, and 14 minutes, 30 seconds (14:30) in suburban and rural response zones. The ERF staffing shall be capable of safely controlling the incident in accordance with the adopted SMFD standard operating guidelines. ERF members shall be authorized to request additional resources to enhance safety and manage an escalating incident.

Public Assist & Service Call (Other) Benchmarks

For 90% of all ***low-risk*** public assist and service incidents the total response time for the arrival of the first-due unit, staffed with a minimum of one officer and two firefighters, shall be within 6 minutes (6:00) in urban areas, and 7 minutes (7:00) in suburban and rural response zones. The first-due unit shall establish command, conduct an incident assessment, initiate mitigation, and provide scene safety and accountability for the SMFD members and citizenry.

Baseline Performance Analysis

SMFD's performance was measured through actual incident responses that were recorded within the SMFD records management software and included the full calendar years from 2014 through 2018. The following figure provides a detailed review of the data size and exclusions.

Figure 94: Baseline Performance Data

Baseline Dataset Exclusions	Result
Performance Review Period	2014–2018
Size of Original Dataset	33,955
Duplicates Removed	14,328
Incomplete and/or > 60 minutes	1,003
Final Data Set:	**18,624**

As is reflected in the preceding figure, ESCI analyzed 33,955 unedited response-records and removed 14,328 duplicates. The dataset was further edited to remove 1,003 records that were incomplete and/or exceeded a response interval of 60-minutes. The following figure highlights the statistical relevance and limitations of the four primary-response metrics that were reviewed, and was based upon the *90th percentile performance* contained within a quality assured dataset containing 18,624 incidents.

Figure 95: Quality Assurance of Dataset

Baseline Dataset Analysis	Call Process Time	Turnout Time	Travel Time	Total Response Time
90th Percentile Value	02:29	02:51	06:38	09:56
Mean	00:58	01:47	03:51	06:36
Standard Deviation	01:39	00:58	02:39	03:18
Confidence Level (95%)	00:01	00:01	00:02	00:03

Fire-Suppression Baseline Performance

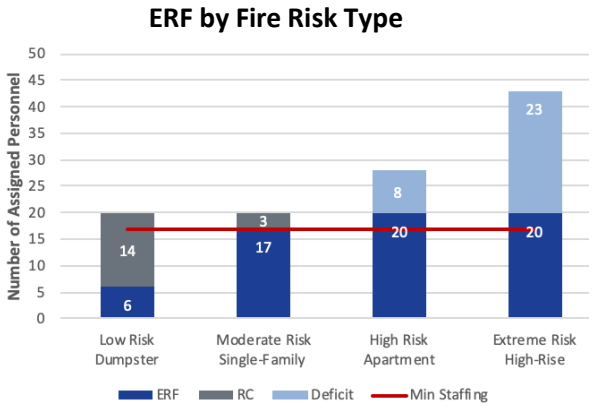
For 90% of all fire-related incidents, the total response time for the arrival of the first-due unit, staffed with three firefighters, is 10 minutes, 49 seconds (10:49). The first-due unit is capable of initial actions required at fire suppression events that include all incidents listed under National Fire Incident Reporting System 100, 200, and 700 codes. ERF concentration data by risk-type was unavailable. SMFD is encouraged to track this data for future reporting and benchmark purposes.

Figure 96: Fire Suppression Baseline Performance

Baseline Fire Performance (90th percentile)			2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Call Processing	Pick-up to Dispatch		03:18	03:05	02:44	02:58	03:12	**03:07**	**01:00**
Turnout Time	Turnout Time		02:58	03:03	02:56	02:58	03:01	**02:59**	**01:20**
Travel Time	1st Unit Distribution	City	06:35	06:48	06:46	06:43	07:07	**06:48**	**04:00**
		n =	416	414	497	488	509	2,324	
	ERF Concentration	City							
		n =							
Total Response Time	1st Unit On-Scene Distribution	City	10:59	10:46	10:35	10:34	11:52	**10:49**	**06:20**
		n =	416	414	497	488	509	2,324	
	ERF Concentration	City							
		n =							

Baseline ERF Capabilities by Risk Type

Baseline ERF staffing has been applied across the four suppression risk categories. The adjacent figure illustrates a draw-down on all available resources for moderate risk fires (house) and a staffing deficit on high-risk and extreme-risk fires involving vertical dwelling units or commercial/industrial fires. Staffing for these fires may be addressed through existing mutual and/or auto-aid agreements if resources are available.



Medical/Rescue Baseline Performance

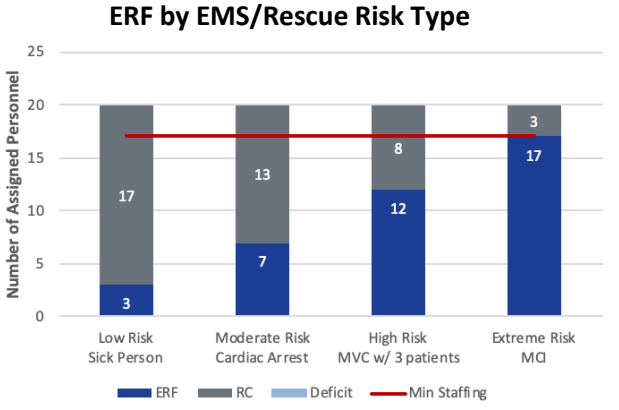
For 90% of all medical/rescue-related incidents, the total response time for the arrival of the first-due unit, staffed with three firefighters, is 9 minutes, 14 seconds (9:14). The first-due unit is capable of initial actions required at medical and rescue events that include all incidents listed under the National Fire Incident Reporting System (NFIRS) 300 code. ERF concentration data by risk type was unavailable. SMFD is encouraged to track this data for future reporting and benchmark purposes.

Figure 97: Medical/Rescue Baseline Performance

Baseline Fire Performance (90th percentile)			2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Call Processing	Pick-up to Dispatch		01:06	01:01	00:59	01:37	03:05	**02:03**	**01:00**
Turnout Time	Turnout Time		02:51	02:49	02:47	02:48	02:52	**02:49**	**01:00**
Travel Time	1st Unit Distribution	City	06:07	06:10	06:25	06:35	06:28	**06:21**	**04:00**
		n =	2,217	2,512	2,666	2,571	2,750	12,716	
	ERF	City							
		n =							
Total Response Time	1st Unit On-Scene Distribution	City	08:29	08:35	08:38	09:09	10:28	**09:14**	**06:00**
		n =	2,217	2,512	2,666	2,517	2,750	12,716	
	ERF	City							
		n =							

Baseline ERF Capabilities by Risk Type

Baseline ERF staffing has been applied across the four medical/rescue risk categories. The adjacent figure illustrates SMFD's ability to address most EMS and rescue incidents without a significant draw-down on resources. However, it is important to understand that additional SMHCEMS personnel are utilized at the scene and are not illustrated within the ERF calculation. Additionally, concurrent medical incidents are likely to occur and impact SMFD resource availability.



Hazardous Materials Baseline Performance

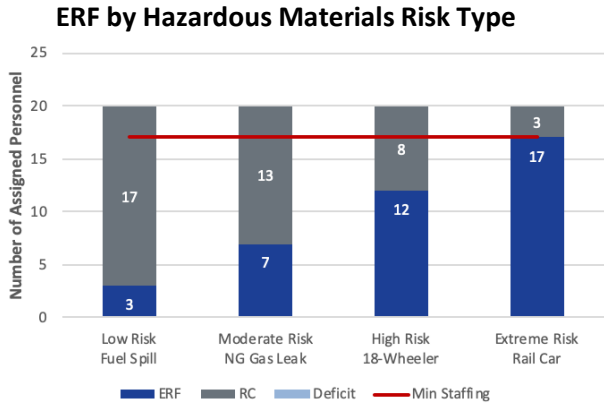
For 90% of all hazardous materials-related incidents, the total response time for the arrival of the first-due unit, staffed with three firefighters, is 11 minutes, 26 seconds (11:26). The first-due unit is capable of initial actions required at hazardous materials events that include all incidents listed under the National Fire Incident Reporting System 400 code. ERF concentration data by risk type was unavailable. SMFD is encouraged to track this data for future reporting and benchmark purposes.

Figure 98: Hazardous Materials Baseline Performance

Baseline Fire Performance (90th percentile)			2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Call Processing	Pick-up to Dispatch		03:06	02:58	03:36	03:40	03:11	**03:16**	**01:00**
Turnout Time	Turnout Time		02:52	02:50	02:52	02:54	02:56	**02:53**	**01:20**
Travel Time	1st Unit Distribution	City	07:00	06:52	07:20	08:11	07:46	**07:38**	**04:00**
		n =	169	208	164	226	177	944	
	ERF Concentration	City							
		n =							
Total Response Time	1st Unit On-Scene Distribution	City	10:27	10:52	10:37	12:14	12:10	**11:26**	**06:00**
		n =	169	208	164	226	177	944	
	ERF Concentration	City							
		n =							

Baseline ERF Capabilities by Risk Type

Baseline ERF staffing has been applied across the four hazardous materials risk categories. The adjacent figure illustrates SMFD's ability to address most hazardous materials incidents without a significant draw-down on resources. However, it is important to understand that the SMFD is limited in its ability to address large, complex, or escalating hazardous materials or complex events and would need to rely upon neighboring agencies and Austin Fire Department for personnel and resources.



Public-Assist & Service (Other) Baseline Performance

For 90% of all public-assist and service-related incidents, the total response time for the arrival of the first-due unit, staffed with three firefighters, is 11 minutes, 10 seconds (11:10). The first-due unit is capable of initial actions required events that include all incidents listed under the NFIRS 500, 600, 800, and 900 codes. ERF concentration data by risk type was unavailable. SMFD is encouraged to track this data for future reporting and benchmark purposes.

Figure 99: Baseline Public-Assist & Service (Other) Performance

Baseline "Other" Performance (90th percentile)			2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Call Processing	Pick-up to Dispatch		02:56	03:07	03:04	03:52	03:11	**03:13**	**01:00**
Turnout Time	Turnout Time		02:43	02:59	02:51	02:48	02:57	**03:16**	**01:00**
Travel Time	1st Unit Distribution	City	06:56	07:40	07:35	07:07	07:27	**08:08**	**04:00**
		n =	458	507	523	580	570	2,638	
	ERF Concentration	City							
		n =							
Total Response Time	1st Unit On-Scene Distribution	City	10:18	11:40	10:51	11:54	11:16	**11:10**	**06:00**
		n =	458	507	523	580	570	2,638	
	ERF Concentration	City							
		n =							

Performance Gap Analysis

Call-Processing Performance Gap

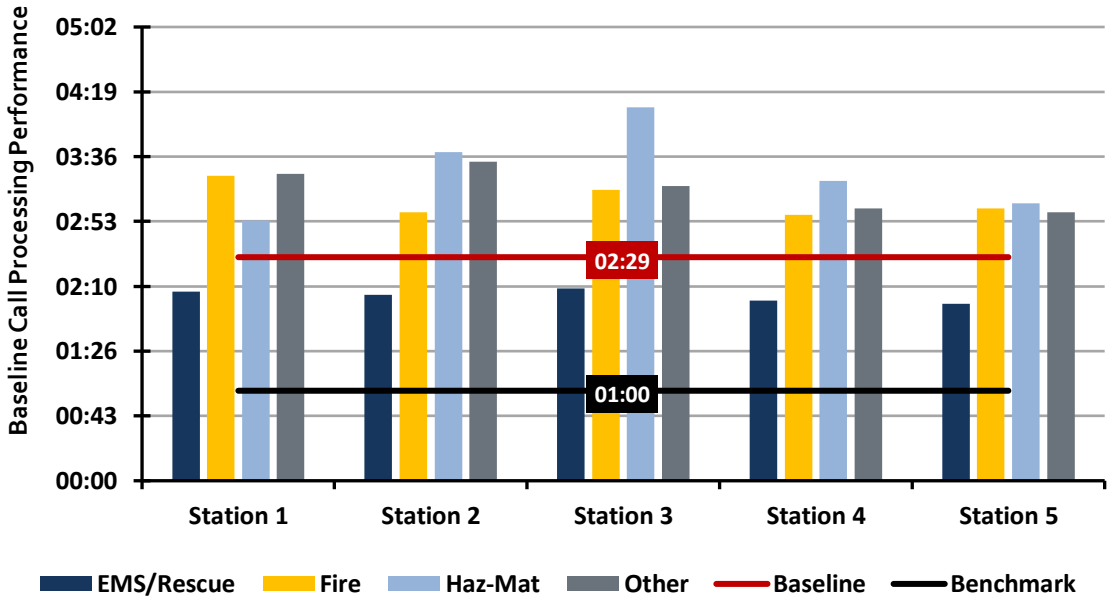
Call processing is defined as the time interval from the receipt of the alarm at the public safety answering point (PSAP) until the beginning transmittal of response information to an SMFD unit and facility. For this report, the measurements were based upon the time stamp noted for answering of the call and ended when the SMFD unit was dispatched. ESCI noted a *standard deviation* of 1 minute, 39 seconds (1:39) within the dataset, and has established the *90th percentile call-processing time* at 2 minutes, 29 seconds (2:29). A significant gap can be seen in all dispatch categories. Of particular concern is the year-over-year change in call processing performance for medical events.

Figure 100: Call-Processing Performance at 90% by Year

Call-Processing Performance	2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Fire	03:18	03:05	02:44	02:58	03:12	**03:07**	**01:00**
Medical/Rescue	**01:06**	**01:01**	**00:59**	**01:37**	03:05	**02:03**	**01:00**
Hazardous Materials	03:06	02:58	03:36	03:40	03:11	**03:16**	**01:00**
Other	02:56	03:07	03:04	03:52	03:11	**03:13**	**01:00**
Aggregated Performance Gap @ 90th Percentile:						**02:29**	**01:00**

The following figure represents the performance gap between the benchmark 90th percentile performance and SMFD's 5-year baseline performance in each planning zone (station) and incident category.

Figure 101: Call-Processing Performance Gap (90th Percentile)



Turnout-Time Performance Gap

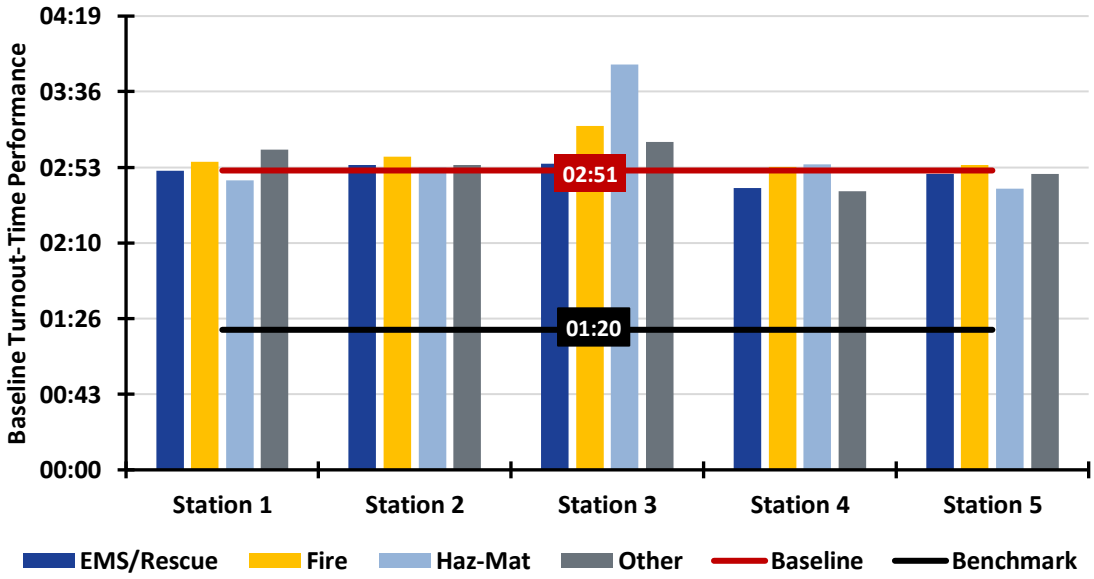
Turnout time is defined as the interval that begins when an SMFD facility or unit is notified and ends at the beginning point of travel-time (wheels in motion). ESCI noted a *standard deviation* of 58 seconds (0:58) within the dataset and has established the *90th percentile turnout-time* at 2 minutes, 51 seconds (2:51) for all incident responses, stations, and categories. SMFD's turnout performance has consistently underperformed the industry benchmark of 1 minute (1:00) for medical incidents and 1 minute, 20 seconds (1:20) for fire incidents.

Figure 102: Turnout-Time Performance at 90% by Year

Turnout Time Performance	2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Fire	02:52	02:50	02:52	02:54	02:56	**02:59**	**01:20**
Medical/Rescue	02:51	02:49	02:47	02:48	02:52	**02:49**	**01:00**
Hazardous Materials	02:52	02:50	02:52	02:54	02:56	**02:53**	**01:20**
Other	02:43	02:59	02:51	02:48	02:57	**02:52**	**01:00**
Aggregated Performance Gap @ 90th Percentile:						**02:51**	**01:00**

The following figure represents the performance gap between the benchmark 90th percentile performance and SMFD's 5-year baseline performance in each planning zone (station) and incident category. The primary baseline performance outliers were noted at Station 3, with the most significant involving hazardous materials turnout times.

Figure 103: Turnout-Time Performance Gap (90th Percentile)



Travel-Time Performance Gap

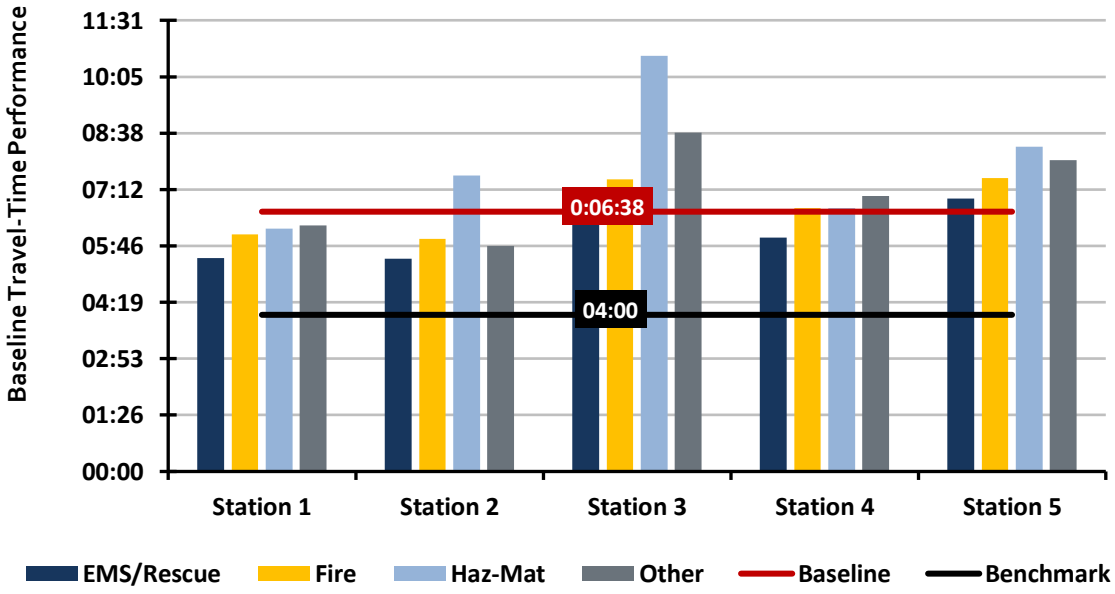
Travel-time is defined as the interval that begins when an SMFD unit is en route to the emergency incident and ends when the unit arrives on-scene. ESCI noted a *standard deviation* of 2 minutes, 59 seconds (2:59) within the dataset, and has established the *90th percentile travel time* at 6 minutes, 38 seconds (6:38) for all incident responses, stations, and categories. SMFD's travel-time performance has consistently underperformed the industry benchmark of 4 minutes (4:00) travel-time for the arrival of the first unit.

Figure 104: Travel-Time Performance at 90% by Year

Travel Time Performance	2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Fire	06:35	06:48	06:46	06:43	07:07	**06:48**	**04:00**
Medical/Rescue	06:07	06:10	06:25	06:35	06:28	**06:21**	**04:00**
Hazardous Materials	07:00	06:52	07:20	08:11	07:46	**07:38**	**04:00**
Other	06:56	07:40	07:35	07:07	07:27	**07:25**	**04:00**
Aggregated Performance Gap @ 90th Percentile:						**06:38**	**04:00**

The following figure represents the performance gap between the benchmark 90th percentile performance and SMFD's 5-year baseline performance in each planning zone (station) and incident category. The primary baseline performance outliers were noted at Station 3 and Station 5, with the most significant involving hazardous materials incidents.

Figure 105: Travel-Time Performance Gap (90th Percentile)



Total Response-Time Performance Gap

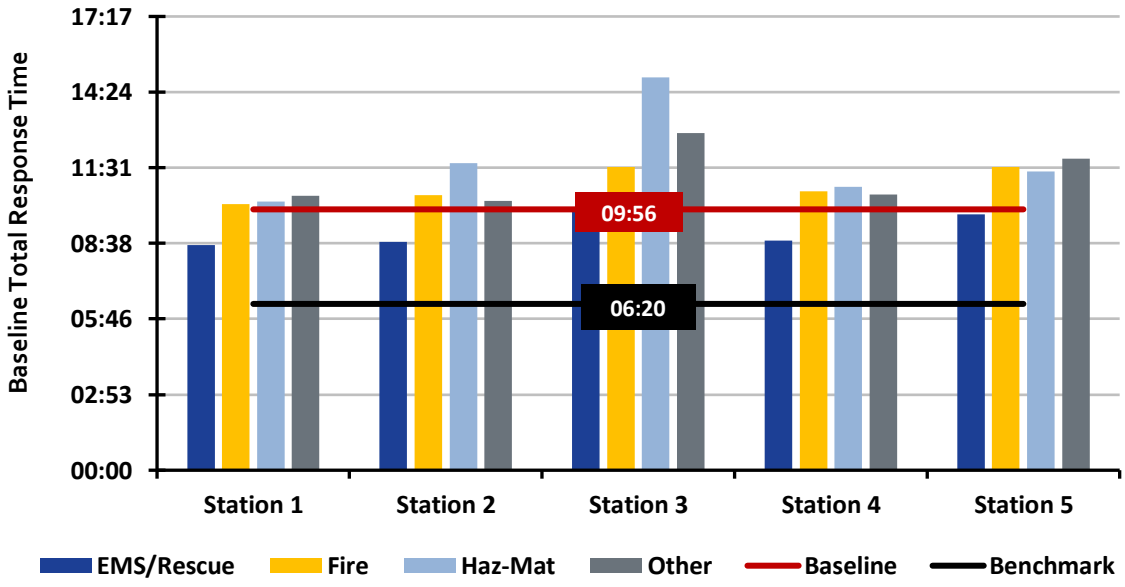
Total Response Time (TRT) is defined as the interval that begins when a call is received at the Public Safety Answering Point (PSAP) and ends when and SMFD unit arrives on-scene. ESCI noted a *standard deviation* of 2 minutes, 59 seconds (2:59) within the dataset, and has established the *90th percentile total response time* at 9 minutes, 56 seconds (9:56) for all incident responses, stations, and categories. SMFD's total response time performance has consistently underperformed the industry benchmark of 6 minutes (6:00) for medical incidents and 6 minutes, 20 seconds for fire incidents.

Figure 106: Total Response Time Performance at 90% by Year

Total Response Time Performance	2014	2015	2016	2017	2018	2014–18 Baseline	Benchmark
Fire	10:59	10:46	10:35	10:34	11:52	**10:49**	**06:20**
Medical/Rescue	08:29	08:35	08:38	09:09	10:28	**09:14**	**06:00**
Hazardous Materials	10:27	10:52	10:37	12:14	12:10	**11:26**	**06:20**
Other	10:18	11:40	10:51	11:54	11:16	**11:10**	**06:00**
Aggregated Performance Gap @ 90th Percentile:						**09:56**	**06:00**

The following figure represents the performance gap between the benchmark 90th percentile performance and SMFD's 5-year baseline performance in each planning zone (station) and incident category. The primary baseline performance outliers were noted at Station 3, with the most significant involving hazardous materials incidents.

Figure 107: Total Response Time Performance Gap (90th Percentile)



PLAN FOR IMPROVING RESPONSE CAPABILITIES

San Marcos Fire Department is committed to improving its current service-delivery model to further reduce the loss of life and property within the community. The following section of this report helps to reinforce SMFD's commitment through the following:

1. Implementation and maintenance of a quality assurance and improvement compliance model.
2. Comparative review and gap analysis of current performance and benchmark performance.
3. Development of an improvement strategy.
4. System and procedural recommendations.

Accountability & Responsibility

In accordance with the requirements set forth within the *Center for Public Safety Excellence (CPSE) Community Risk Assessment: Standards of Cover (CRA-SOC), 6th Edition,* SMFD is responsible for the creation of a compliance team to ensure that the CRA-SOC is maintained as a "living document" that is continually referenced, reviewed, and updated.

ESCI recommends that SMFD comprise a compliance team of the Fire Chief, Operations Chief, Fire Marshal, Administrative Assistant, and at least three members from the firefighter and officer ranks that represent each shift.

Quality Assurance & Improvement Compliance Model

As is evidenced within this CRA-SOC report, a formal process was used to assess organizational capabilities and deployment, as it pertains to risks within the San Marcos community. ESCI has referenced a six-step compliance model and included it within this report to assist SMFD in meeting current and future needs within the community. The following outlines the key tenets of an effective compliance model:

Figure 108: Compliance Model

Step 1: Establish/Review Performance Measures

Conduct a full review of the performance measures every five years. At a minimum, this process should:

- Identify service levels provided
- Define levels of risk
- Categorize levels of risk
- Develop performance measures and objectives:
  - By incident type
  - By geographic demand zone
  - Distribution (first on scene)
  - Concentration (arrival of full first alarm)

Step 2: Evaluate Performance

Performance measures are applied to actual services provided:

- System level
- First due area level
- Unit level
- Full effective response force

Step 3: Develop Compliance Strategies

Determine issues and opportunities:

- Determine what needs to be done to close identified gaps between goals and actual performance
- Seek alternative methods to provide service at desired levels
- Determine if resources can or should be reallocated
- Develop budget estimates as necessary
- Seek additional funding commitment as necessary

Step 4: Communicate Expectations to Organization and Stakeholders

Communicate expectations:

- Explain method of measuring compliance to personnel who are expected to perform the services
- Provide feedback mechanisms
- Define the consequences of noncompliance

Train Personnel:

- Provide appropriate levels of training/direction for all affected personnel
- Communicate consequences of noncompliance
- Modify (remediate) internal processes, application systems, and technical infrastructure as necessary to comply

Step 5: Validate Compliance

Develop and deploy verification tools and/or techniques that can be used by divisions of the organization on an ongoing basis to verify that they are meeting the requirements:

- Monthly evaluation:
  - Performance by unit
  - Overall performance
  - Review of performance by division
- Quarterly evaluation:
  - Performance by unit
  - Performance by first due
  - Overall performance
  - Review of performance by executive management

Step 6: Make Adjustments/Repeat Process

Review changes to ensure that service levels have been maintained or improved. Develop and implement a review program to ensure ongoing compliance:

- Annual review & evaluation
  - Performance by unit
  - Performance by first due
  - Overall performance
  - Review of performance by governing body
  - Adjustment of performance standards by governing body as necessary
- Five-year update of Standards of Cover
  - Performance by unit
  - Performance by first due
  - Full effective response force
  - Overall performance
  - Adoption of performance measures by governing body
- Establish management processes to deal with future changes in the SMFD service area

Performance Evaluation & Improvement Compliance Strategy

The success of the aforementioned compliance model will be improved through regular evaluation of service-level performance. As such, SMFD is encouraged to implement a perpetual review process to monitor and report its baseline service-delivery model capabilities, evaluate performance gaps, and develop improvement options. The service-delivery performance review should be formally conducted on a monthly basis and trended through a quarterly and annual report that is reviewed by the governing body and elected officials. Additionally, the report should be made available to the public via the fire department website to enhance the transparency of system capabilities and monitoring of performance trends. The following figure illustrates a format that may be used as a template for future response and effective response force (ERF) benchmark reporting, with consideration given to the establishment of City and rural performance benchmarks.

Figure 109: Sample Performance Reporting Template

Moderate Risk EMS Response 90th Percentile Performance			Jan	Feb	Mar	Q1 Gap	Apr	May	Jun	Q2 Gap	Benchmark
Alarm Handling	Pick-up to Dispatch										**1:00**
Turnout Time	Turnout Time	City									**1:00**
		Rural									**1:00**
Travel Time	1st Unit Distribution	City									**4:00**
		n =									
		Rural									**7:00**
		n =									
	ERF Concentration	City									**8:00**
		n =									
		Rural									**12:00**
		n =									
Total Response Time	1st Unit On-Scene Distribution	City									**6:00**
		n =									
		Rural									**9:00**
		n =									
	ERF Concentration	City									**10:00**
		n =									
		Rural									**14:00**
		n =									

Findings & Conclusions

As noted in the previous sections of this report, the SMFD operates in one of the fastest-growing metropolitan regions in the nation. Additionally, the Department and community maintain a unique composition that includes the following:

- Multiple geographic restriction zones that impact response times and reliability.
- 58% of residential properties are multi-unit and multi-story dwelling units.
- A large student population combined with low to moderate-income families.
- A major distribution and transportation pipeline via the Amazon fulfillment center, H.E.B distribution center, and the soon-to-be-built and expanded San Marcos Air, Rail, and Truck (SMART) terminal.
- Large retail presence with regionally recognized outlet mall that serves as a major attraction for visitors and retail shoppers.
- Limited staffing within the SMFD that challenges the Department's ability to effectively manage large and/or expanding fire events.

The Risk Analysis section of this report highlighted a broad range of community risks and identified the highest concentration of occurrence related to pre-hospital medical incidents. However, the greatest potential risk is associated with flooding events and structural fires in non-sprinklered, multi-family buildings.

Recommendations

Flooding Preparation

ESCI commends the City of San Marcos for establishing a strategic initiative that focuses on improving storm-water quality and community resiliency from regional and local flooding events. The City should engage SMFD in discussions related to resiliency measures and ensure that operational deployment plans are aligned with the critical staffing requirements for swift-water and flooding events.

Geographic Restriction Zones

ESCI recommends that the City and SMFD continue to review future site development plans with a goal to improve current thoroughfare conditions. Numerous grade-level rail-crossings were noted to impact SMFD unit responses due to congestion and the lack of alternate routes. This is most discernible when a multi-unit response is required because it extends the time to assemble an effective response force and the critical staffing needed to manage an escalating incident. Reduced road widths and reduced turning radius due to residential street parking were also noted within some new subdivisions. City development projects should consider compliance with the IFC.

Occupancy Risk Assessment

ESCI commends the City for extending funding to expand the Fire Marshal's Office. Additionally, ESCI was impressed with the professionalism exhibited by the SMFD Fire Marshal's Office. The Fire Marshal has begun the critical process of assessing and recording the fire risk for vertical multi-family structures and high-risk occupancies. ESCI recommends that SMFD continue the occupancy assessment plan and consider adopting a formal risk assessment program that assigns a risk score to occupancies. An example program is the *Occupancy Vulnerability Assessment Profile* (OVAP), which is described within the Vision 20/20 *Community Risk Assessment Guide*.

Community Risk Reduction Division

Community Risk Reduction can be most simply defined as a process that manages risk through identification, documentation, prevention efforts, operational deployment, and a perpetual evaluation of modifying actions to reduce risk. ESCI recommends that the Fire Marshal's Office begin the transition of assuming responsibility for documenting and reporting the effects of life-safety prevention and education outreach. This should be done at least once per year and include a review of modifiable factors that can positively or negatively influence the outcome of structure fires. A full-time Public Educator is recommended and can be functionally assigned within the Fire Marshal's Office.

Fire Department Funding

ESCI noted that, despite the increased population growth and demand for service, SMFD's operational budget grew at a disproportionate rate to the General Fund. ESCI recommends that the City consider allocating a set percentage of the General Fund to SMFD during this growth period, in order to improve the predictability and reliability of funding the staffing and operational needs.

Emergency Medical Services

As is common in most cities, the demand for EMS represents the majority of responses by SMFD. SMHCEMS provides a high level of service and relies upon the SMFD to provide initial response and stabilization. Further efficiencies should be explored with a partnership and a possible reallocation of funding for services. Examples include a regional approach to ambulances that could consist of hybrid staffing of cross-trained personnel (fire and medical). This would aid in improving SMFD's current emergency response force deficit at multi-family, commercial, and high-rise fires.

Call Processing

As was noted in the preceding gap-analysis section, the 5-year, 90th percentile call processing time is 2 minutes, 29 seconds, and regressed to over 3 minutes in 2018. ESCI recommends that SMFD review call-processing workflow processes and performance measures monthly. The Department should reference NFPA 1221: *Telecommunications* standard for best practices within the communication center.

Turnout-Time

As was noted in the preceding gap-analysis section, the 5-year, 90th percentile call processing time is 2 minutes, 51 seconds, and is consistently underperformed, at all stations, when compared to the 1 minute, 20-second turnout time that is considered the industry benchmark. ESCI recommends that the Operations Chief and Battalion Chiefs clearly communicate the turnout-time performance goals of the Department, and review situations where the turnout time exceeds the benchmark. Care should be exercised when determining causal factors that could include technical issues and human error. SMFD could place countdown clocks within the fire station living area and apparatus bay to serve as a reminder of timeliness.

Arrival of the First Unit On-Scene

ESCI recommends that SMHCEMS response times be tracked by the SMFD to allow for a meaningful evaluation of system performance and the impact of SMFD's medical first response (MFR) role.

Records Management System

ESCI recommends that SMFD expand its recording and reporting within the records management system. The SMFD should aspire to maintain data that correlates incident responses with a more detailed triaging of risks in all categories of service (fire, medical, hazardous materials, and rescue). SMFD should ensure that computers maintain encrypted hard-drives and comply with the HITECH Act. Trending on fires calls, ROSC rates, STEMI, stroke, trauma, and other incidents should be done monthly.

Effective Response Force

As was illustrated with the critical tasking section of this report, SMFD does not maintain an adequate number of on-duty staff members to manage working fires, according to industry research, in multi-story apartments, high-rises, and commercial buildings. Due to the continued growth and development of these occupancies in San Marcos, ESCI recommends that the City begin to explore a multi-year plan to address staffing. Current SMFD staffing levels are limited to providing 17 members to all structural fires, regardless of size, risk, and/or complexity. When provided, mutual-aid resources from South Hays, New Braunfels, and Kyle have an extended response time and may have a limited ability in controlling an escalating or complex fire incident. To improve the safety and efficiency of critical tasks, SMFD should establish a goal of obtaining a minimum of 27 members each day.

The following station locations and staffing levels are recommended for consideration. They represent the current 8-minute effective response force (ERF), with increasing capabilities as stations and personnel are added based on adopted triggers. The captions note the stations and staffing levels represented in each figure.

Figure 110: Existing SMFD 8-Minute Effective Response Force

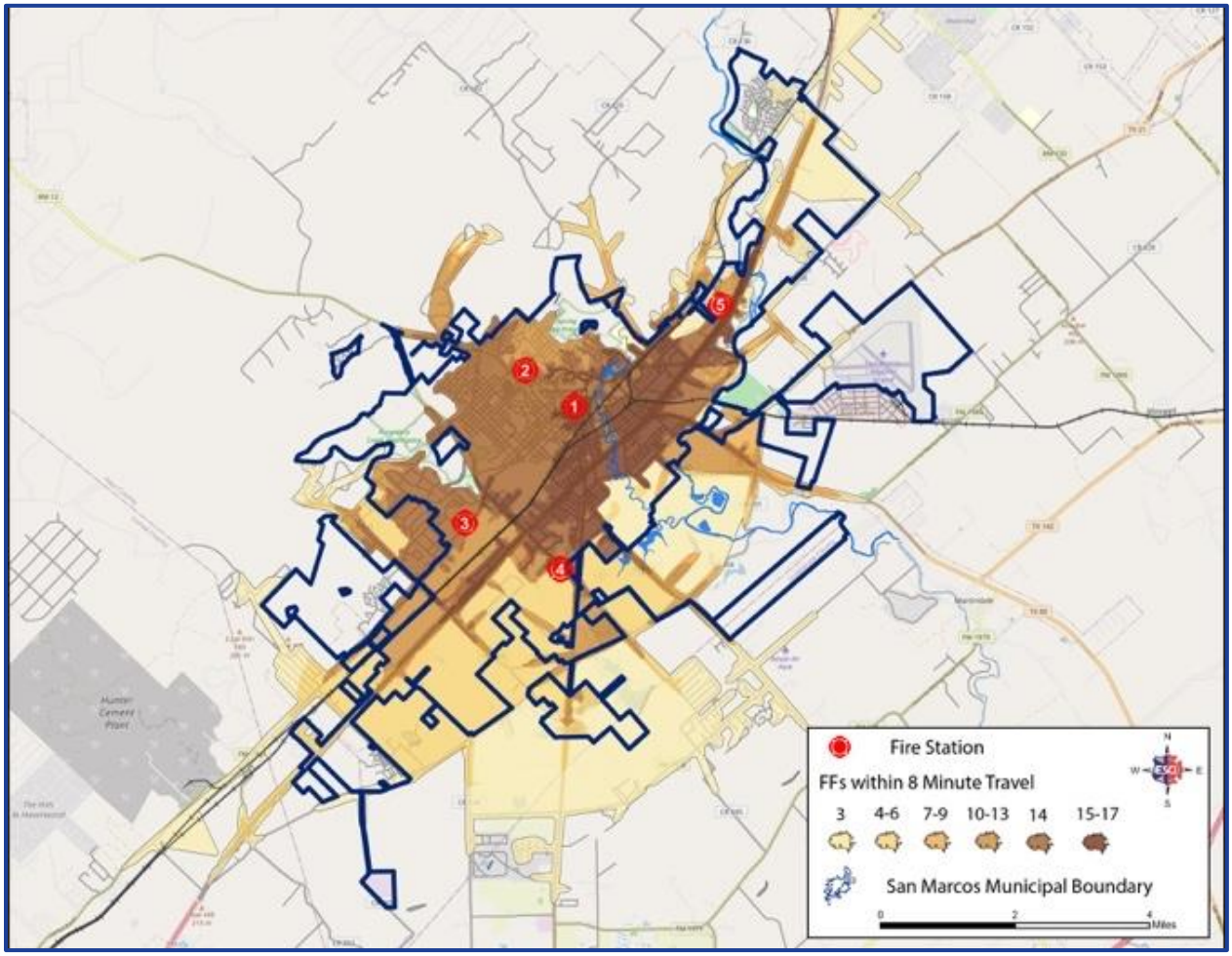
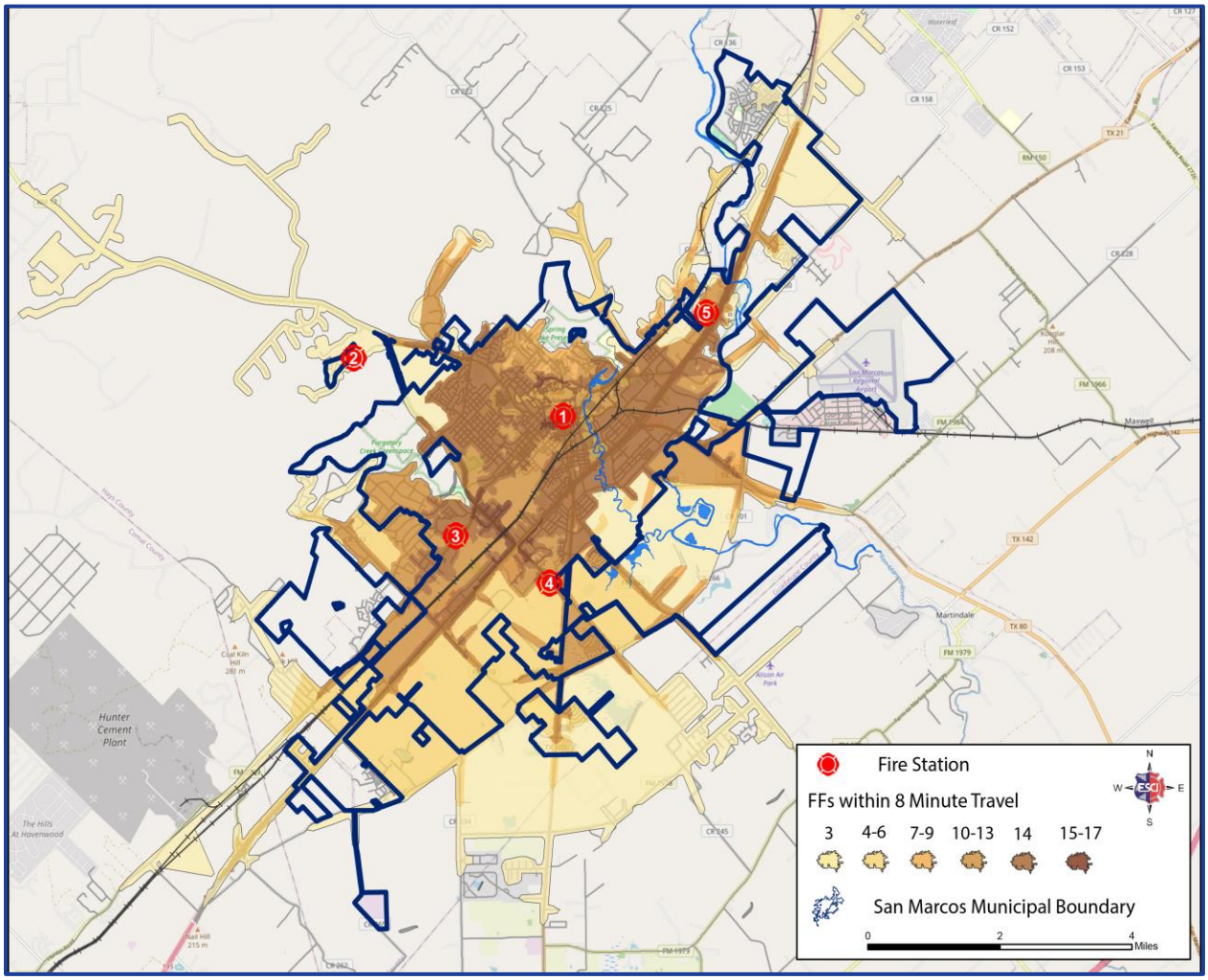


Figure 111: SMFD 8-Minute Effective Response Force

Existing five fire stations with Station 2 relocated to Centerpoint and minimum staffing of 17 personnel.



Future Fire Station Locations

To provide the City of San Marcos with future planning tools to determine the impact of adding additional fire station locations, GIS software was utilized to develop an analysis of how each proposed location would benefit the City. The potential locations of these were provided via the 2014 Master Fire Station Location Plan. To assess the impact of each station, the effective response force was calculated for each potential fire station and the final impact provided as the number of firefighters potentially available to respond. ESCI encourages SMFD leadership to consider future road networks, future development risk (OVAP), and roadway connectivity options to enhance operational efficiency and fiscal responsibility.

Figure 112: SMFD 8-Minute Effective Response Force

Six fire stations with Station 2 relocated to Centerpoint, and Station 6 at Old Bastrop west of Posey with minimum staffing of 20 personnel.

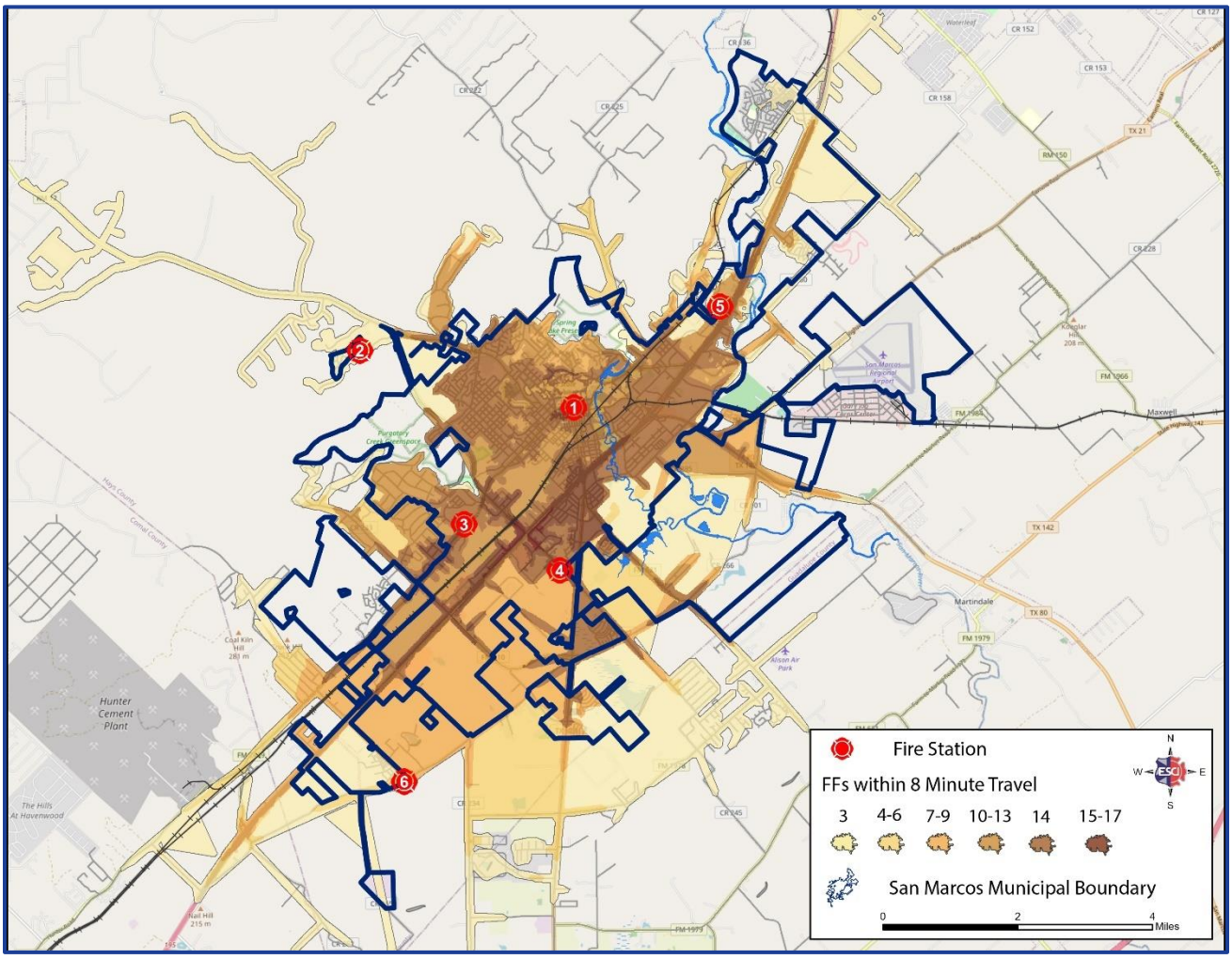


Figure 113: SMFD 8-Minute Effective Response Force

Seven fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, and Station 7 at Yarrington on the east side of IH-35 with minimum staffing of 23 personnel.

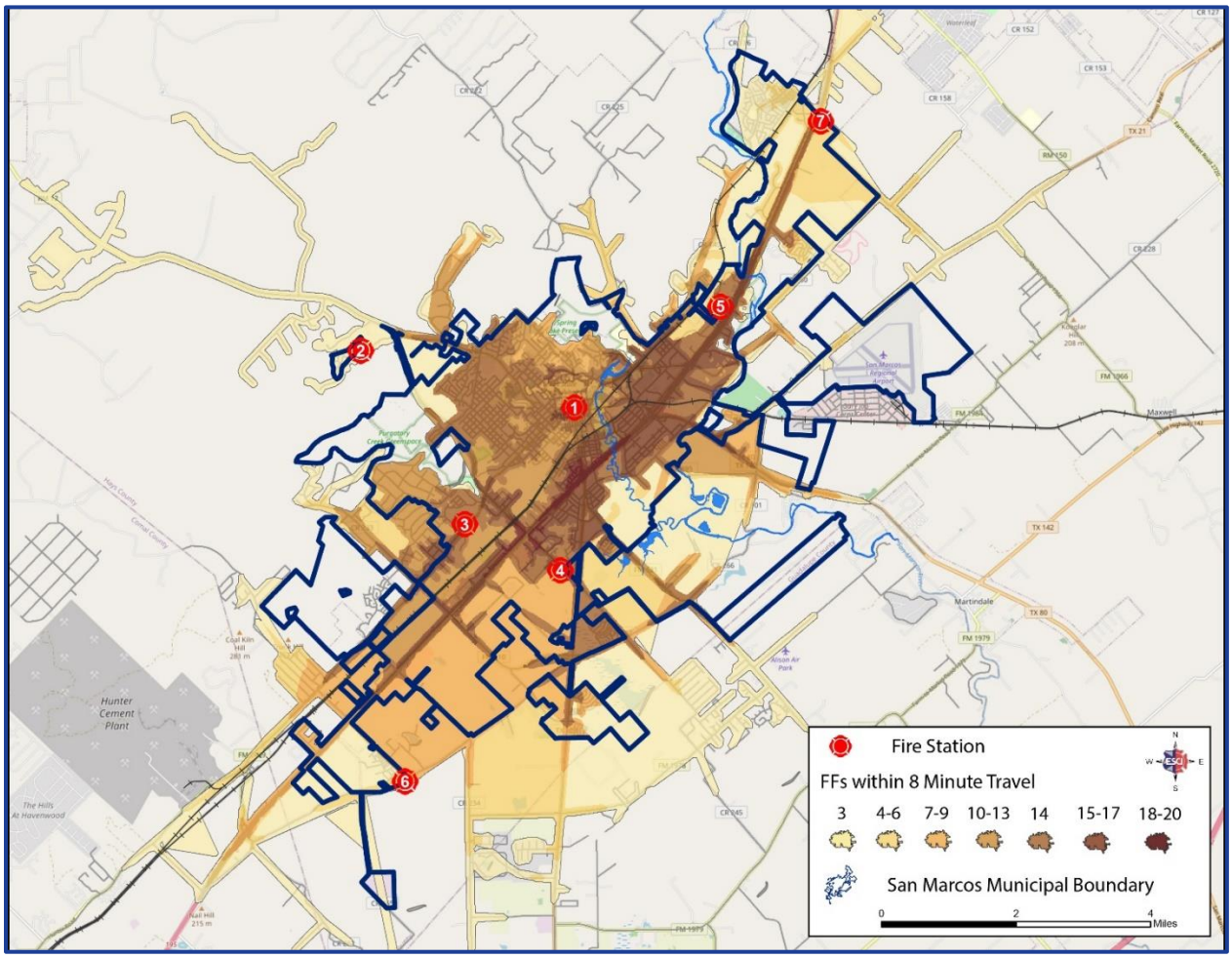


Figure 114: SMFD 8-Minute Effective Response Force

Eight fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, Station 7 at Yarrington on the east side of IH-35, and Station 8 at Hwy 21 west of William Pettus with minimum staffing of 26 personnel.

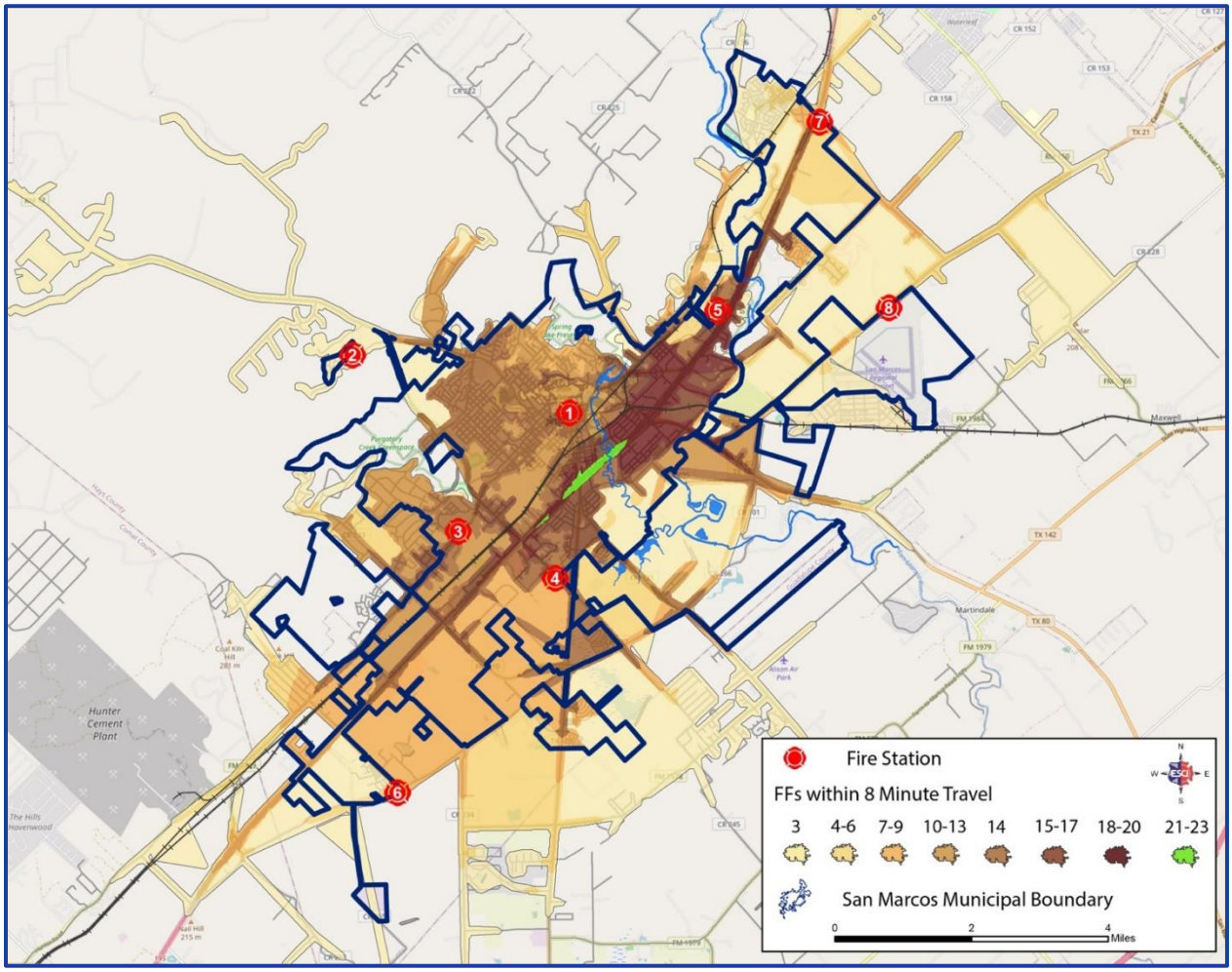
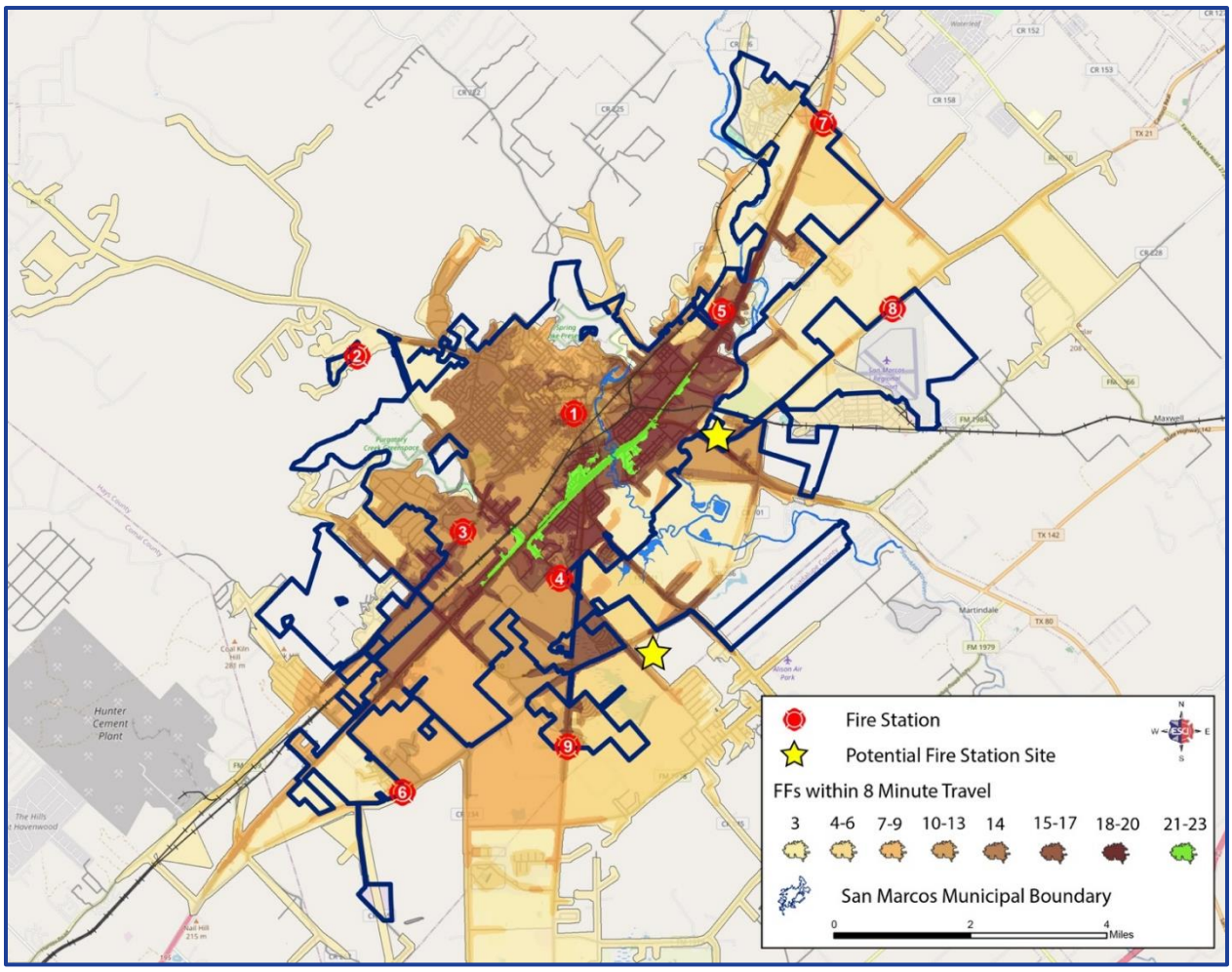


Figure 115: SMFD 8-Minute Effective Response Force

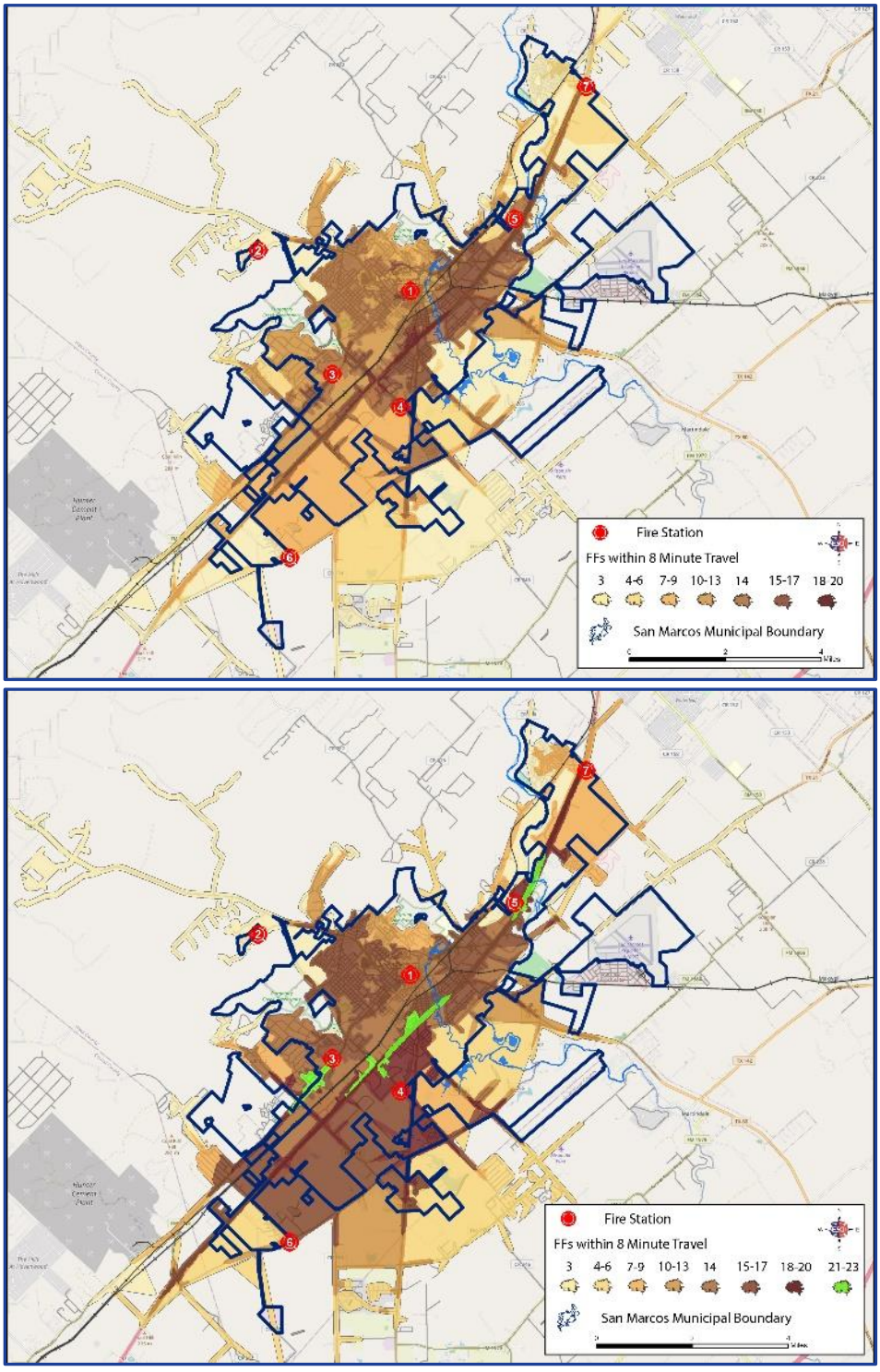
Nine fire stations with Station 2 relocated to Centerpoint, Station 6 at Old Bastrop west of Posey, Station 7 at Yarrington on the east side of IH-35, Station 8 at Hwy 21 west of William Pettus, Station 9 at Hwy 123 south of Rattler with minimum staffing of 29 personnel. This includes two additional Station 10 and 11 sites off Redwood south of Old Bastrop and the north star located on Hwy 80 at Hwy 21.



Finally, to provide a comparison of the impact of adding additional fire stations versus upstaffing once Stations 6 and 7 are constructed, the following figure provides a side-by-side comparison of a seven station model with upstaffing at Stations 4, 5, and 6 from three personnel to six personnel each.

Figure 116: SMFD 8-Minute Effective Response Force

Seven fire stations with 3 personnel at Stations 4, 5, and 6 minimum staffing of 23 personnel versus seven fire stations with 6 personnel each at Stations 4, 5, and 6 minimum staffing of 32 personnel.



These station locations are included for consideration upon additional development and service demand exceeding adopted performance triggers, as discussed in the next section.

Response-Time Thresholds and Triggers—*When is a new station needed?*

When a community creates a fire department and builds its first fire station, a response time criterion is usually established. This response time anticipates that it applies to 100% of the *area* covered by the boundaries of that fire station. This is especially true when there is only one fire station and a small area to cover. Simply speaking, a central fire station is among the first public buildings created in most communities, no matter how small. As the community grows away from that station in incremental steps, the expectation is that the original fire station will still provide adequate coverage. However, that expectation is fraught with many problems. In the simplest of terms, the total area covered by a fire department may or may not be highly developed initially; and even if a crew responds, it may not do so in a timely manner.

In fact, there are many variations on this theme. Older, established cities tended to be denser and smaller in dimension, but they often annexed new areas. Newer communities may be created from a much larger area than the first fire station can cover. Urban sprawl, which is currently an active discussion in other areas of public policy, has resulted in the timing of additional fire station construction and staffing being a topic of concern.

Station Siting

Many infrastructure components affect the *location allocation* concept. Among these are road and highway networks; impedance factors, such as traffic patterns and processes (stoplights and signs); and turn impedance, i.e., roadbed configuration and elevation impedance (slope). It is axiomatic that there is an inverse distance-weighting factor that results in longer response times to areas further away from the centroid of the station. This is called *distance decay*. The manner and means of response involve the use of the roadbed, but also involve dealing with differences in elevation and competing vehicles on the roadbed. In short, the further away from the location of an incident and the higher the impedance for response, the less effective any specific resource is in dealing with the initial stages of an emergency event as you move away from the station's location.

The use of the concept of using *travel time* itself is not exactly new. However, for many years the basic criterion was road mileage only. The standard that was normally applied was that a fire station was expected to be able to reach any incident within 1.5 miles of the station *within five minutes of driving time*. Time was a secondary consideration. That standard was based upon data from the 1940s with respect to road conditions and traffic patterns. A lot has changed since then. For decades, the Insurance Services Office (ISO) has based fire station locations on a 1.5-mile separation. In general, this has served as the *rule of thumb*, but it does not deal with the vagaries of physical response—such as geography, transportation, and weather. Secondarily, it does not place emphasis on response needed for Emergency Medical Services (EMS) incidents, such as basic life support (BLS) or advanced life support (ALS).

The concept of using actual travel time today is based upon a more accurate representation of the level of service for an all-risk approach. It is more performance-based. Today, most fire agencies set a time standard that includes three elements, two of which were missing from the strict use of mileage for station location—specifically, alarm processing time and turnout time. The actual time of road travel has often been used to set the community's expectation of performance.

When a New Station or Response Resource is Needed

The question that many communities have to address is when is a fire station, additional response resource, or alternative response program required to meet time goals? Obviously, this has been answered in any community that has more than one fire station or response unit. The problem comes in finding a quantifiable threshold to determine that point for each specific situation, because it varies from community to community and even within a specific jurisdiction. The overall answer is part financial and part professional judgment. In fact, in the literature of the fire service today, there is very little definitive guidance on how this should be accomplished.

Several steps can be identified. They consist of:

- Identifying areas with minimum coverage
- Identifying feasible locations for a new facility or response resource
- Evaluating those locations using a specific criterion

The description in this document is based upon a growing body of knowledge acquired by ESCI and aimed at quantifying this process. What is unfortunate is that there is no universally acceptable algorithm. The fire protection planning process does allow for an evaluation of potential loss as a result of deteriorating response times. One form of measurement is to assess the road and transportation network to ascertain the percentage of road mileage that theoretically is covered by the time criterion. This is done using computer-based modeling that will create a polygon that describes the areas of coverage. In fact, this process will also identify gaps and deficiencies where response time is not adequate.

As growth and development extend beyond the range of travel time of one station, the percentage of calls that exceed the performance requirement should begin to increase. It should be noted that growth, in and of itself, does not create an instantaneous demand. New construction has the advantage of better codes, a higher level of owner interest, and limited deterioration of fire-breeding conditions.

A more subtle difference in today's fire service is the fact that community demand for medical services is almost from day one of occupancy. In short, this means that new construction may place more valuables and lives at risk, but the demand for service will be incremental. When demand for service does begin, it will be based upon two factors—the nature of the occupancy and the hazards that are present.

The incident increase may first appear as a change in the performance of an existing company in the annual analysis of emergency calls. For example, if a station has 1,000 alarms and a 90 percent compliance rate with the response standard, there would be about 100 alarms per year that were beyond the goal. This would be the baseline for existing response performance. If the following year, the number of alarms was 1,200 and the percentage dropped to 85 percent, this would indicate that the department is losing ground on response performance. If the change in the number of alarms had merely increased because of more calls in the same area, the response time percentage should have remained similar. One exception to this rule is when a single company has such a high call volume that it cannot handle all calls without call queuing. However, since the alarm rate went up and the performance went down, the failure threshold may be approaching. The change in alarms that were not met may now go to 180 (15 percent of the overall). An analysis would need to be performed on the deficiency to determine how many of those incidents were handled in the increment of 60 seconds beyond the performance time.

Based upon actual response time analysis, one threshold that needs to be considered is the increase in alarms and the percent of calls handled under the criterion adopted. Anything more than a ten percent increase in calls and a ten percent reduction in performance is a signal to evaluate the level of service being provided.

In larger departments, most practitioners are factoring out non-emergency calls and for actual incident performance, only looking at *core emergencies*. The definition of *core* can be made locally based on risk and importance to the community, but they are usually structure fires and moderate to severe status EMS calls.

In general, if more than one measure must be slipping, an evaluation of all Standards of Coverage factors, along with the reason why the data is slipping, is required. A one-year snap-shot may not be valid **if** the agency had a big storm event, a catastrophic weather event, major wildland fire, and stacked a bunch of calls for just a month of the year.

The incident analysis approach depends upon having emergencies, which does not address what is at risk. That is where the mapping technology applies. As structures and different types of fire problems are constructed on the ground, they may represent additional lives and property that are at risk that deserve equity in protection. One of the elements for creating a governmental entity is to control land use and to create mechanisms for collecting taxes and determining ownership. Furthermore, these same individuals and properties are paying the taxes, fees, and permits for the level of service being provided. In one sense, when growth occurs, the new properties are usually safer than the older part of the community because they are constructed to a higher standard.

What is clear to almost any community is that being slightly out of the response standard range does not trigger a new facility or additional response unit from an existing facility.

Assessed valuation or increased revenues in the form of benefit assessment or mitigation fees, provide an incentive for new fire stations to be constructed and/or additional units staffed when the fire agency can afford them. One threshold that needs to be carefully monitored is the revenue stream that accrues from development. That revenue stream should provide a threshold when different elements of future fire stations or additional response units can be determined. For example, it takes several years to evolve a location into a fire station site. As the revenue stream proceeds, funds could be available for site acquisition, initial plans and specifications, site treatment, and construction. This may be a multi-year process.

One industry threshold for additional response capabilities should be to provide a new fire station or additional response unit into the appropriate zone in the city or jurisdiction that has more than 35 to 50 percent of its parcels developed. Examples of secondary measures currently being used are 300 to 500 calls for service for any individual fire company or a service population of 10,000 to justify a full-time paid company or response unit.

SMFD should establish triggers for the deployment of additional emergency equipment and personnel in the response areas that are difficult to currently serve and areas experiencing significant development. The decision process has to be placed in the context of staffing pattern decisions. It is not uncommon to have a station constructed and have the staffing patterns utilizing alternative response options evolve over the years from one system to another. In the case of a station or alternative response resource under consideration, it should be anticipated that a policy decision needs to be made with respect to the staffing system to be used as soon as possible. A fully-staffed paid company has a significant price tag. ESCI's experience has been that it takes multiple elements of the standards of coverage to be out-of-balance, along with having additional economic resources to justify an additional paid company or staffing increase on one or more companies.

Population Density

Population density and composition can be an indicator of risk. ESCI recommends that SMFD continue to monitor changes in population density within each of its fire station districts (planning zones). This should be trended with incident response data.

Baseline Performance Reporting

ESCI recommends that future datasets include response-metrics for each apparatus and risk categorization for each incident. The inclusion of this data will allow for greater examination of system capabilities through critical tasking of the effective response force and subsequent correlation to the incident risk matrix.

Annual Report

ESCI recommends that SMFD create a regular report that documents system-demand and performance. It should be grouped by individual apparatus and shifts. This should be compared to past performance and clearly communicate changes, and shared monthly or quarterly with all SMFD staff. This should not be used as a tool for punitive action. The annual report should also be publicly available and viewable on the SMFD website.

Strategic Plan

ESCI recommends that SMFD develop a five-year strategic plan to incorporate the elements of this report. The strategic plan should be coordinated with other City initiatives and be the foundation of SMFD's annual budget plan.

Section IV:
APPENDICES

APPENDIX A: TABLE OF FIGURES

APPENDIX B: REFERENCES

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