Standards of Response Coverage

2007

2/14/07, 21:21 hours, 200 W. Central Avenue (Incident #7000880)

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INTRODUCTION

This document examines the Tracy Fire Department's ability to respond to and mitigate emergency incidents created by natural or human-made disasters, and is a comprehensive analysis of detailed fire, EMS, and rescue protection systems. Data for this report was compiled from the fire department's existing deployment strategy, community risk analysis, critical task analysis, resource distribution study, resource concentration study, performance study of historical data, and fire station concept study.

Included in this examination is historical perspective of all three entities that make up the South County Fire Authority; data for the past seven years related to performance objectives and the Department's ability to meet those goals; and a community risk assessment which identifies those areas of vulnerability in the current response areas, that will assist the Department in its efforts to re-establish its performance measures and help to improve service delivery across the entire response system.

Information for this report was collected and scrutinized in an effort to assist the South County Fire Authority Board of Directors in its effort to make informed decisions concerning its ability to balance the community risk against the Authority's ability to fund service enhancements. The Tracy Fire Department is committed to improving its provision of services in South County Fire Authority's coverage area to ensure that all residents receive the most comprehensive service possible.

Standards of Response Coverage and Accreditation

A "Standards of Response Coverage" is defined as those adopted policies and procedures that determine the distribution, concentration and reliability of fixed and mobile response forces for fire, emergency medical services, hazardous materials and other forces of technical response. The "Standards of Response Coverage" process provides evidence of compliance for fire service "Accreditation."

The Accreditation process, which is coordinated by the applicant organization with the assistance of the Commission on fire Accreditation International (CFAI), provides a well-defined, internationally recognized benchmark system used to measure the delivery of fire and emergency services to a community. One of the key components involved in the accreditation process includes the completion of the self-assessment through a Standards of Response Coverage study.

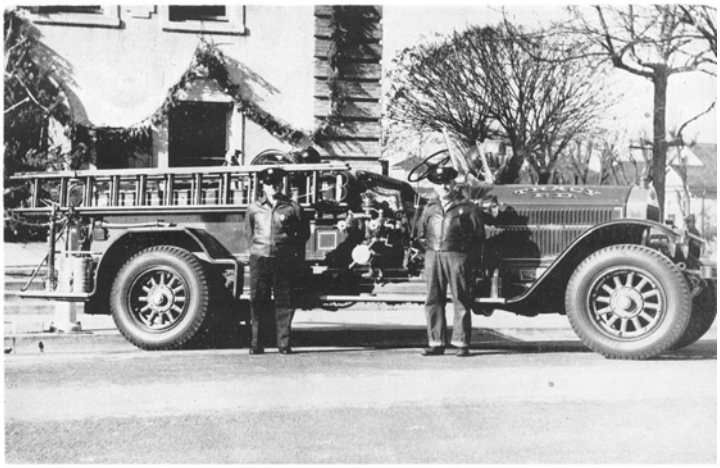
Attaining accreditation can benefit a fire department by helping to create a culture that focuses on providing improved service through the effective utilization of current resources. This process also assists fire departments by helping them take a look at the policies, procedures and practices to better implement changes that will positively impact the organizational culture.

I. COMMUNITY BASELINES

A. History of the Tracy area Fire Departments

City of Tracy

Tracy was established in 1878 at the junction of two railroad lines and was named after a Central Pacific Railroad official, Lathrop J. Tracy. The City of Tracy incorporated in 1910 when its population was 2,000. The town was a booming railroad hub surrounded by farms and ranches. Several devastating structure fires struck downtown Tracy and prompted the City to organize a fire department in 1912.



The City's main fire station was erected in 1917 when the fire department operated with a small force of full-time firefighters supplemented by a group of volunteers. Sixty-six years later, in 1983, the City added a second fire station at Grantline Road and Parker Avenue.

During the late 1970's and early 1980's Tracy saw growth from the San Francisco bay area began to spill over the Altamont Pass. People migrated to Tracy looking affordable housing and a family oriented life style. The population of the City of Tracy grew to 20,000 by 1985 when a third fire station was added on the southern edge of town. Each fire station continued to be staffed with 2 firefighters.

The City grew rapidly in the 1990's. Residential neighborhoods, shopping centers, auto dealerships, industrial parks and distribution centers began to pop up all around Tracy. By 1997 the City's population was over 50,000 and the fire department handled approximately 2,600 emergency calls for service per year. In response to the rapid growth, the City Council decided to relocate its downtown fire station to the west and increase minimum staffing from 2 firefighters per fire station to 3 per fire station. In 2005 the planned relocation of the downtown fire station was completed.

Today the population inside of the city limits of Tracy is approximately 82,000 and the fire department responds to over 4,500 calls per year.

Tracy Rural Fire Protection District

In 1945 the Tracy Rural Fire Protection District was established to protect the greater Tracy Region that encompassed an area of approximately 200 square miles. The rural area of Tracy was protected by a mainly volunteer fire department with four stations.

Throughout the sixties and seventies the rural department worked to better equip its personnel and began to emerge as professional force. Like many departments throughout California, the Tracy Rural Fire Protection District began to utilize such innovations as Self Contained Breathing Apparatus, Hurst rescue tools, and water tenders.

In September 1999, after years of talks, the City of Tracy Fire Department and the Tracy Rural Fire Protection District merged to form the South County Fire Authority.

Between 1999 and 2003 there were no significant changes in service delivery in the Tracy Rural Fire Protection District. In late 2003 personnel from one of Tracy Rural Fire Protection District fire stations were relocated as a third jurisdiction (Mountain House) was added to the South County Fire Authority.

Mountain House

Mountain House is a planned community located approximately 5 miles northwest of the City of Tracy. Trimark Communities, LLC, the developer of Mountain House, obtained County approval for the new town in 1994. On July 4th, 2003 the first resident moved in with fire protection being provided by the South County Fire Authority.

The Mountain House Community Services District contracts for fire protection services with Tracy Rural Fire Protection District. The land for the new town, which had been used primarily for agriculture, was originally part of the Tracy Rural Fire Protection District. In July 2003 the personnel from Tracy Rural Station 95, at Linne Rd., were relocated to staff the new Mountain House fire engine. On December 12, 2005 the town of Mountain House opened its first fire station.

B. Governance Models of the the South County Fire Authority

The South County Fire Authority

The South County Fire Authority was established in 1999 through a Joint Exercise of Powers Agreement (JPA). A JPA is permitted under Section 6500 of the State Government Code and allows two or more government agencies to centralize responsibility in an effort to provide services across jurisdictional boundaries. A Joint Powers Authority is a distinct entity and requires its own Board of Directors. The Board of Directors for a JPA are given powers inherent in all of the participating agencies.

The jurisdictions currently covered under the South County Fire Authority JPA include:

- City of Tracy
- Tracy Rural Fire Protection District
- Mountain House Community Services District

The Board of Directors for the South County Fire Authority JPA include two (2) members from the City of Tracy's City Council and two (2) members from the Tracy

Rural Fire Protection District's Board of Directors. The Tracy City Manager serves as the Executive Director of the JPA and the City of Tracy Finance Director is currently the JPA's Chief Financial Officer. The Chief of the Tracy Fire Department serves as the Fire Chief for the City, the Rural District and the JPA. The Fire Chief reports to the City Manager/Executive Director on matters concerning the JPA.

The following is a list of the governance structures for each area included in the South County Fire Authority.

The City of Tracy: Council/Manager form of government. The City of Tracy Council consists of the Mayor and four Council Members who are all elected at-large.

The Tracy Rural Fire Protection District: Special-Purpose District. The Tracy Rural Fire Protection District Board of Directors consists of five members who are elected at large.

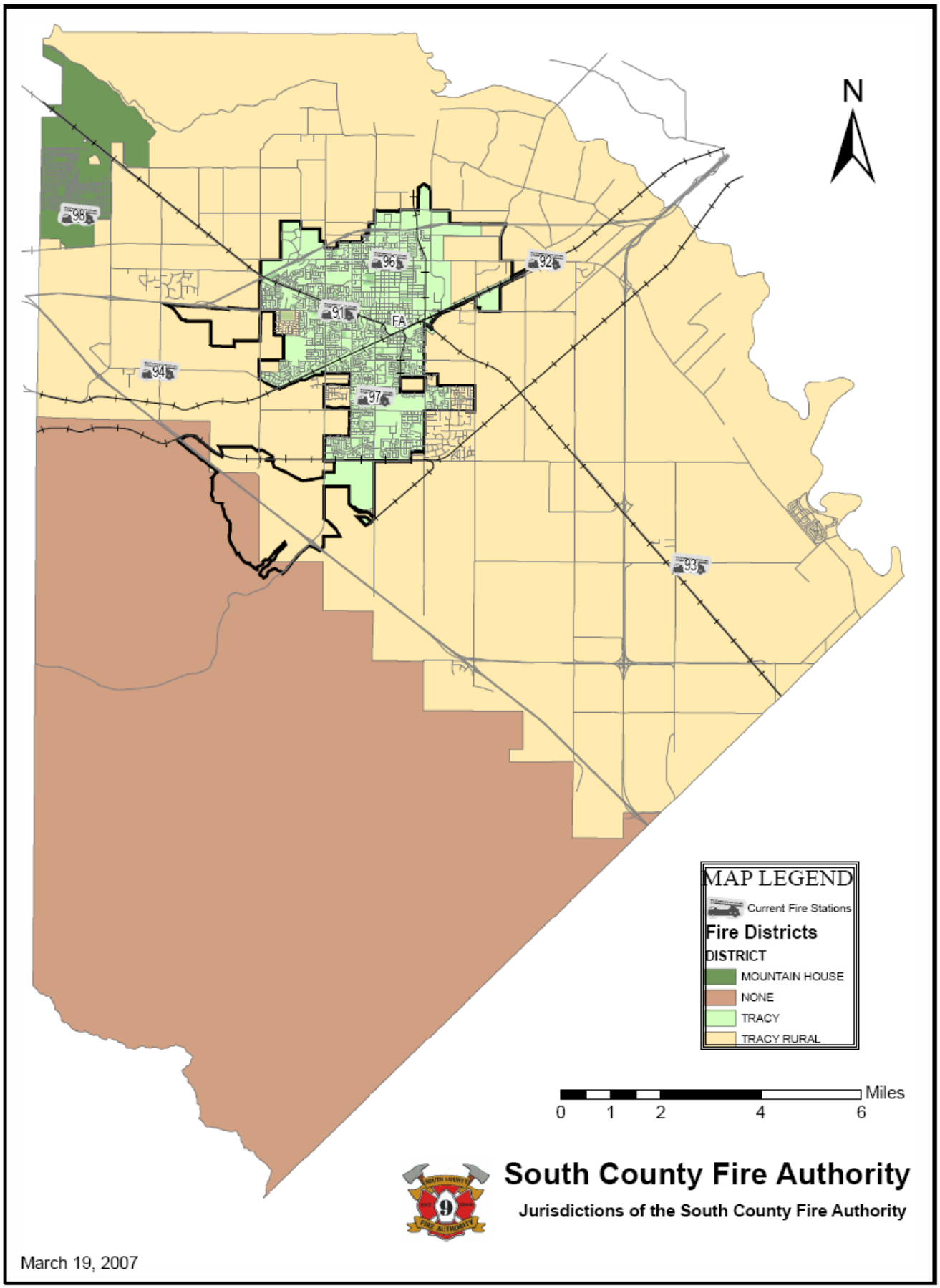
The Town of Mountain House: Currently the Mountain House Community Service District is managed by San Joaquin County and governed by the County Board of Supervisors.

C. Existing Fire Deployment

Currently there are seven (7) fire stations within the jurisdictions of the South County Fire Authority. Each station within the current jurisdictional boundary is assigned a primary and secondary response area. Three (3) stations are located within the corporate boundaries of the City of Tracy and have primary and secondary response areas that include the City of Tracy and areas in the Tracy Rural Fire Protection District.

There are also three (3) fire stations located within the boundaries of the Tracy Rural Fire Protection District. Like those stations located in the City of Tracy, the stations in the rural area also have primary and secondary coverage areas that include the rural area and areas in the City of Tracy. At this time, one (1) fire station serves the Mountain House Community Service District. This facility has a primary and secondary coverage area that includes the Mountain House CSD as well as portions of the rural area.

During fiscal year 05/06 approximately 5,900 calls for service were handled by the South County Fire Authority. The Fire Department utilizes two different deployment objectives to measure the effectiveness of emergency service delivery. The map on the following page identifies the three jurisdictions currently served by the SCFA. This map also includes of the location of the seven fire stations that serve the entire response area.


N
98
96
92
91
FA
94
97
93
MAP LEGEND
Current Fire Stations
Fire Districts
DISTRICT
MOUNTAIN HOUSE
NONE
TRACY
TRACY RURAL
Miles
0
1
2
4
6
South County Fire Authority
Jurisdictions of the South County Fire Authority
March 19, 2007

The City of Tracy

In 2006 the existing incorporated area of the City of Tracy consisted of approximately 22 square miles and a population of approximately 80,461. Under the City's newly adopted General Plan the sphere of influence constitutes an additional 29 square miles. During FY 2005/2006 the Fire Department Units responded to 4,143 emergency calls for service within the City of Tracy's corporate boundaries.

From Fiscal Year 99/00 through Fiscal Year 05/06 the Fire Department's emergency calls for service, in the City of Tracy, have increased by approximately 69%. Much like the increase in calls for service, during the same time period the City's population has increased by approximately 64%.

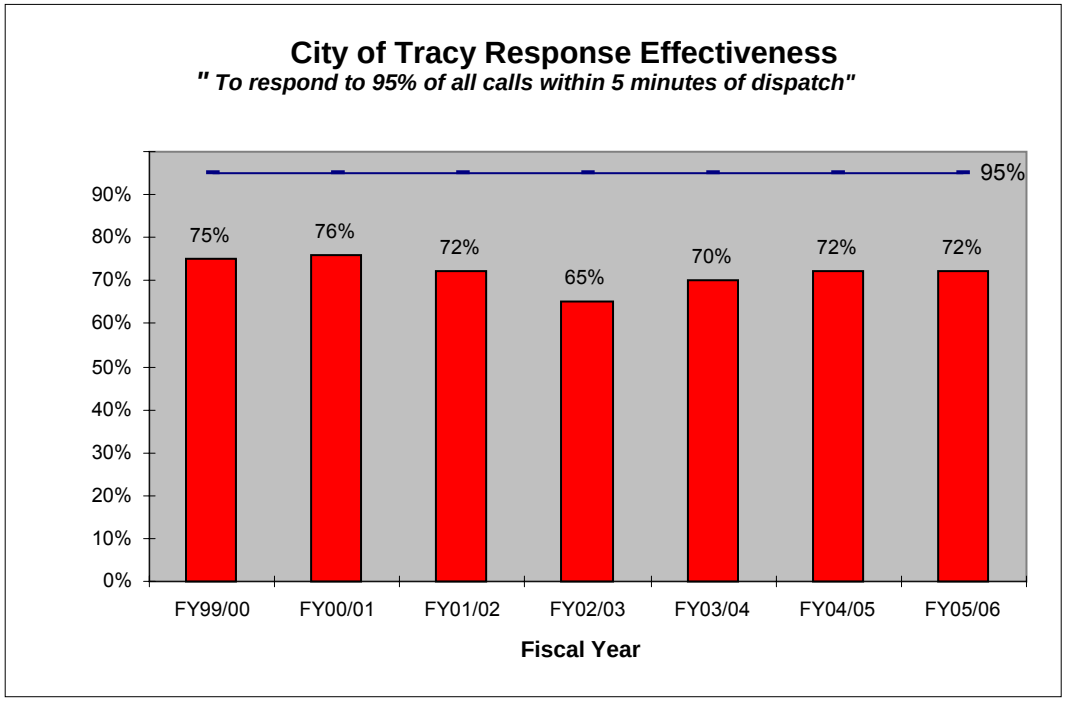
At this time the City of Tracy is served by three (3) fire stations:

- **Station 91**, 1701 W. Eleventh St., Truck 91.
- **Station 96**, 301 W. Grantline Rd., Engine 96.
- **Station 97**, 595 W. Central Ave., Engine 97.

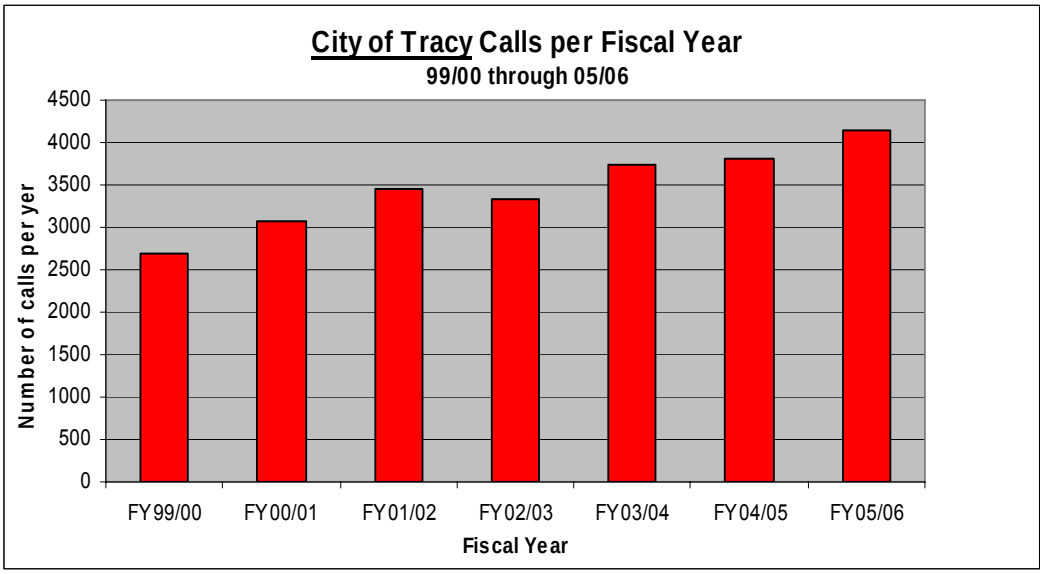
The current Fire Department response objective for the City of Tracy is:

"To respond to all emergency calls for service in 5 minutes, 95% of the time."

The following graph displays the Fire Department's ability to meet the five (5) minute response objective in the City of Tracy from FY 99/00 through FY 05/06.



The following graph displays the number of calls that occurred in the City of Tracy during the same time period.



The Tracy Rural Fire Protection District

The Tracy Rural Fire Protection District currently consists of approximately139 square miles of coverage area, with a population of 14,825 residents.[1] During FY 05/06 the Fire Department responded to 1360 calls for emergency service in this coverage area. From FY 99/00 through FY 05/06 the calls for service in the rural response area has increased 16% while the population has increased by approximately 12%.

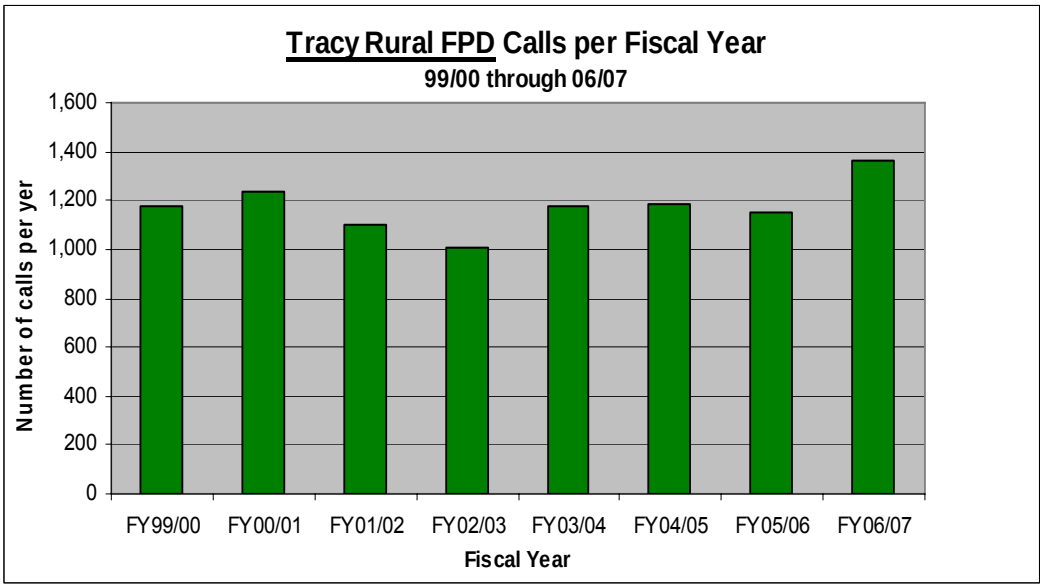
At this time there are three (3) fire stations serving the rural protection area. Those stations include:

- **Station 92**, 22484 S. Seventh St., Engine 92.
- **Station 93**, 1551 Durham Ferry Rd., Engine 93.
- **Station 94**, 16502 W. Schulte Rd., Engine 94.

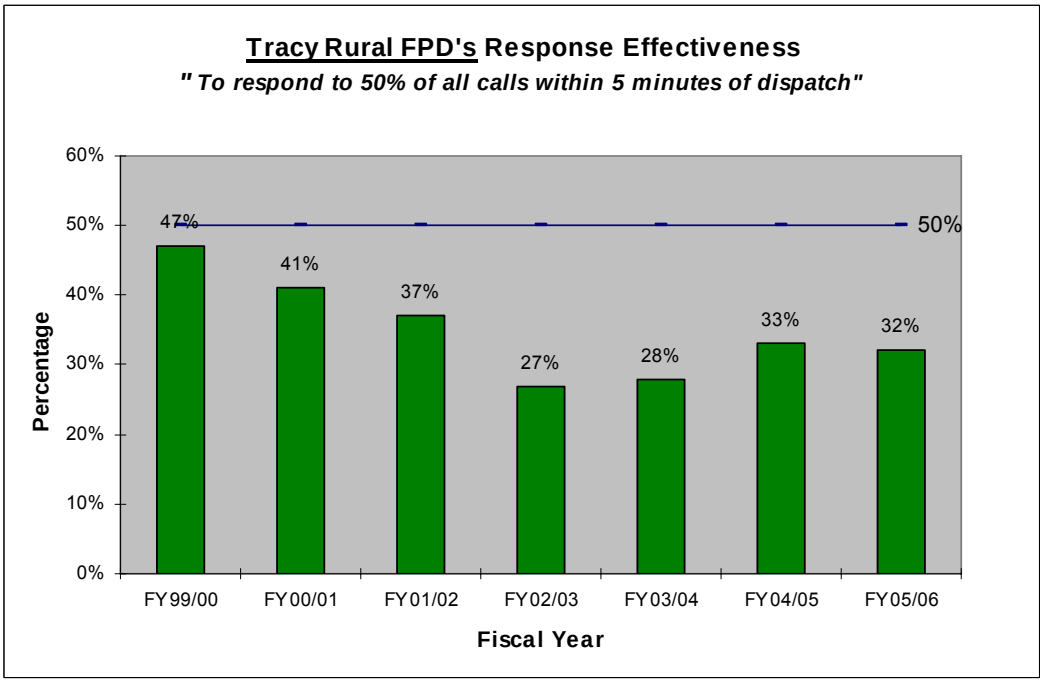
The Fire Department's response objective for the rural area is:

"To respond to all emergency calls for service within 5 minutes 50% of the time."

The following graph displays the calls for emergency service in the rural areas between Fiscal Years 99/00 through 05/06:



The graph below displays the Fire Department's ability to meet the current response objective of 5 minutes 50% of the time in the rural area.



The Town of Mountain House

At this time the Mountain House Community Service District (MHCSD) has built out approximately two (2) square miles of the total land available for the MHCSD. Mountain House has a population of approximately 5,600 residents.

The MHCSD, in conjunction with local developers is constructing infrastructure that will allow for the development of an additional 3.5 square miles of residential, commercial and industrial development. The anticipated total build out date for the Mountain House Community Service District is estimated to be 2021, with the town including 7.5 square miles of developed area, with a population of approximately 40,000 residents. Calls for service in the CSD have increased between FY 03/04 and FY 05/06. In FY 03/04 the Fire Department responded to 118 emergency calls for service compared to 160 calls for emergency service in FY 05/06. This increase constitutes an increase of approximately 27%.

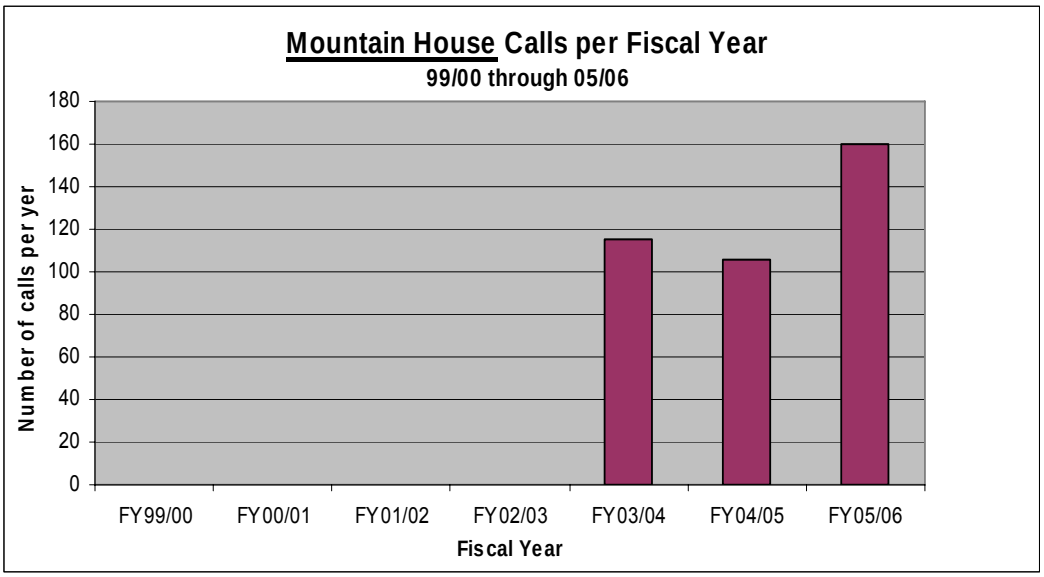
At this time the Mountain House CSD has one fire station:

- **Station 98**, 911Tradition St., Engine 98.

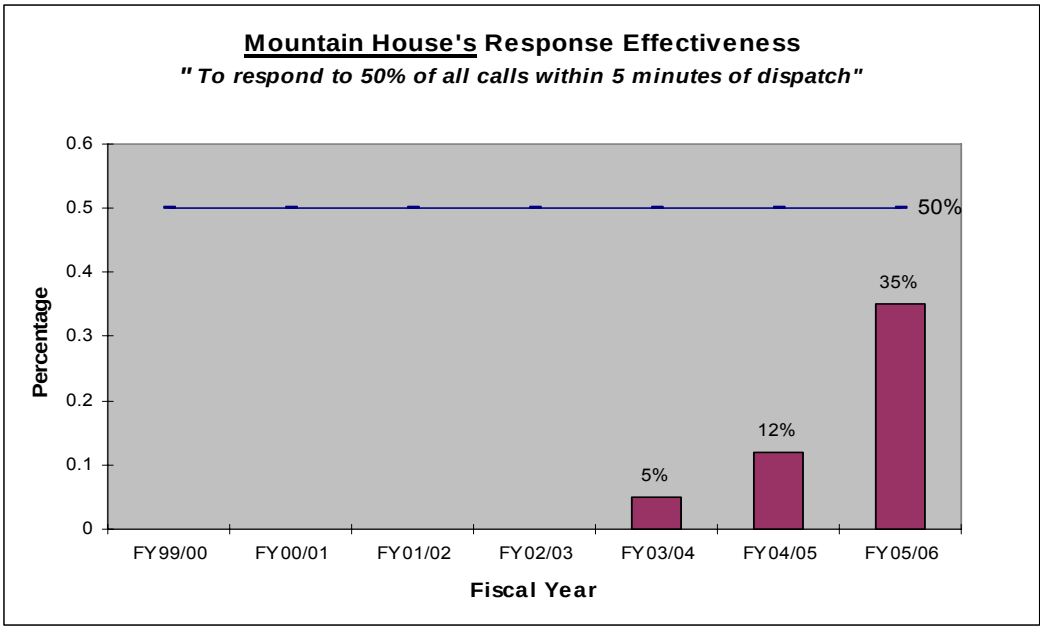
The Fire Department's response objective for the Mountain House CSD is:

"To respond to all emergency calls for service within 5 minutes, 50% of the time."
(Originally this objective was established to match those of the rural area)

The following graph displays the number of emergency calls for service in the Mountain House CSD between FY 03/04 through FY 05/06.

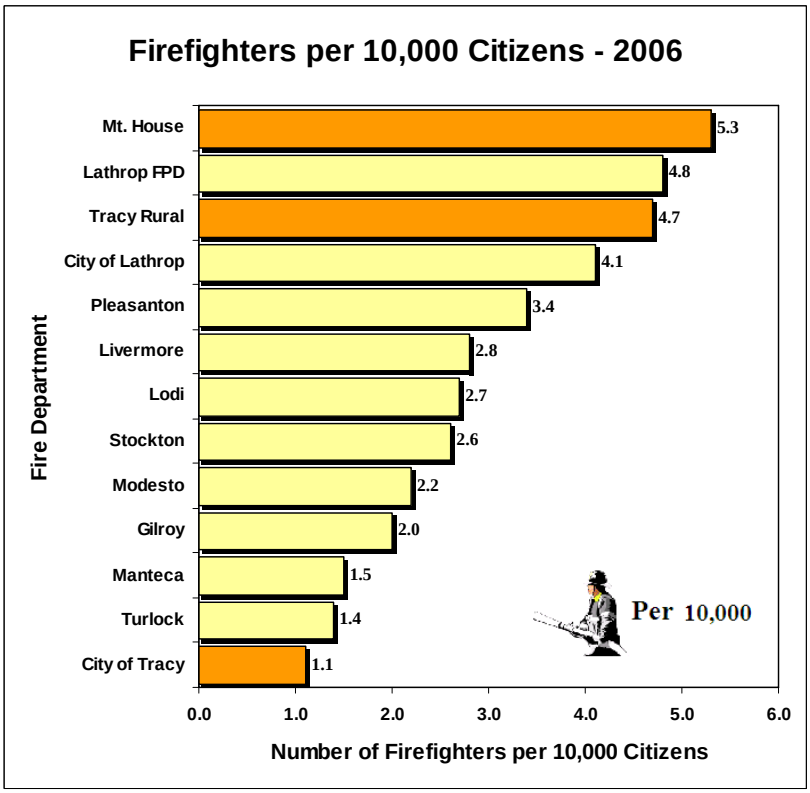


The graph below demonstrates the Fire Department's ability to meet the response time objective in the Mountain House CSD between FY 03/04 through FY 05/06.

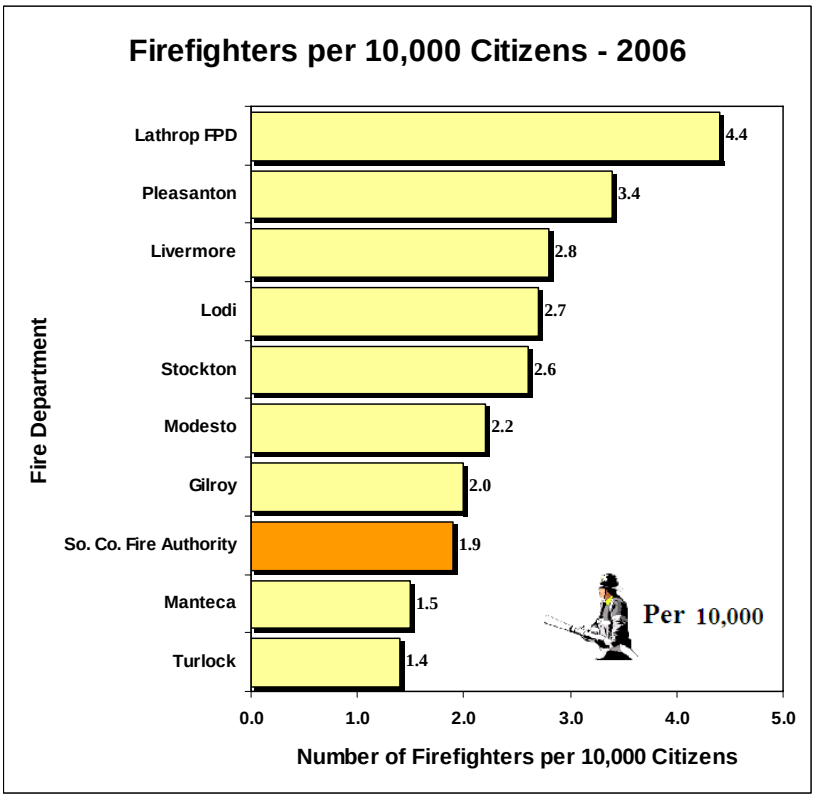


Firefighter to Citizen Ratios

Another element of existing fire department deployment is the number of firefighters per citizen. The following chart illustrates the firefighter to citizen ratio for each of the jurisdictions of the South County Fire Authority. The chart also compares those ratios to neighboring communities.



This chart displays the firefighter to citizen ratio with all of the jurisdictions of the South County Fire Authority combined into one agency. The City of Lathrop and the Lathrop Fire Protection District have also been combined.

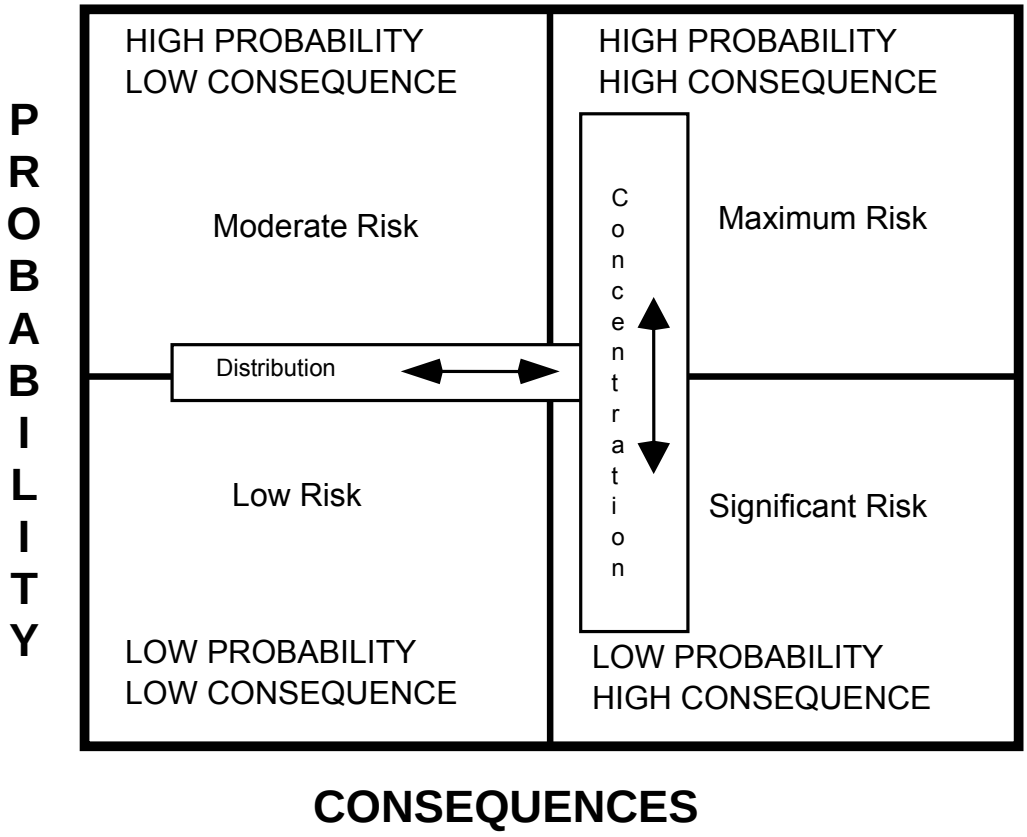


II. RISK ASSESSMENT

This section helps the Department identify and understand the various risks that exist in the current response area. This section begins by discussing a risk assessment model based on the probability of an emergency event occurring and the consequences that can be expected if the emergency event occurs. This section introduces two key concepts; Distribution and Concentration, which are critical components when assessing a fire department's ability to deliver effective emergency response service to the community it protects. Distribution and Concentration are clearly defined in the following pages. In this section Communities are defined in order to categorize response expectations. The section concludes by discussing each of the risk categories that the fire department is challenged to address during emergency situations.

A. Risk Assessment Model

The following risk matrix diagram identifies the elements that must be considered when assessing community risk. Each quadrant of the matrix represents a specific level of risk based on the probability of that risk occurring and ties the probability to the consequences that will be experienced if the risk occurs. Each risk that a community faces can be identified and categorized using this probability/consequences matrix. As the level of risk increases, a different commitment of fire resources is needed to keep the risk from escalating.



The following information defines the levels of risk identified in the matrix.

1. **Maximum Risk**: Maximum risk includes a high probability and maximum consequences. This level of risk has the potential for a high level of life and property loss as well as significant property damage across the entire geographic area. Maximum risks will certainly have a devastating impact on the community's ability to maintain its commercial, residential and industrial tax base. An event of this magnitude would severely impact the community in multiple ways and challenge the community's ability to recover. An event of this nature would most likely include a disaster declaration by the Governor and/or the President of the United States. An example of a Maximum Risk event would be Hurricane Katrina, the Loma Prieta Earthquake, the Oakland Hills Fire or the bombing of the World Trade Center in New York.

2. **Significant Risk**: Significant risk level has a low probability of occurrence and a high level of consequences. This risk level has the potential for high to moderate life and property loss. A significant risk may vary in magnitude and may create varying threats to those people in the immediate area of impact. Significant risks can also impact those in close proximity to the immediate threat zone. The financial impact related to a significant risk is usually high by threatening the community's economic and social structures. A significant risk will require an extended recovery period but a community that has prepared can recover within a reasonable period of time.

3. **Moderate Risk**: Moderate risk has a high probability of occurrence and a low level of consequences. This level of risk can present a potential for life and property loss but these are usually limited to only those areas, properties and residents in the immediate threat zone. A moderate risk usually has an impact both financially and socially but is limited to specific areas, unless the community has allocated adequate resources to respond to a risk of this level. Inadequate resource allocations for moderate risk incidents can cause them to escalate to a significant level of risk requiring additional resources and the possibility for increased life and property loss. Recovery from a moderate risk is usually completed within a brief period of time. Moderate risk incidents seldom require assistance from outside the jurisdictional area.

4. **Low Risk**: Low risk has a low probability of occurrence and a low level of consequences. This risk level presents little threat to the community's ability to function unless the community does not have adequate resources allocated to handle this level of risk. The occurrence of this type of event is infrequent and presents little, if any, potential for significant life and property loss or damage.

Distribution:

The term distribution is used in the fire service to describe the location of fire department emergency response resources in an effort to ensure their availability to provide intervention for all risk levels. Because of the cost related to the allocation of fire resources, fire departments use a static response system. A static response system is a system in which fire stations are strategically located in designated response areas across the community, or coverage area. This allows fire department units to travel from one point to another in a pre-designated period of time known as response times or performance objectives.

A key component to a static response system is to ensure fire department resources are properly placed based on current and future growth. Properly spaced fire stations are needed to assure a rapid deployment of emergency resources in order to respond to and mitigate average, or routine, emergency calls for service in a timely manner.

The Commission on Fire Accreditation International recommends fire departments have specific service level objectives to address the distribution of resources for each risk area. The following is an example of a distribution objective:

"The first due unit will arrive on the scene of an emergency incident within five minutes of total reflex time for 90% of all incidents. The first-due unit shall be capable of advancing the first line for fire control, implementing rescue activities, or providing basic life support for medical incidents."

Concentration:

The term concentration is used to describe the spacing of multiple fire department resources so a fire department can assemble an "effective response force" at the scene of an emergency incident. An effective response force is that which will most likely stop the escalation of the emergency incident as it is categorized in each risk type. Differing incident types require different levels of initial and secondary staffing based on the nature of the incident. These incident specific resource requirements are called critical tasking and are explained in detail later in this document.

It is a critical factor for fire departments to develop specific service level objectives to address the concentration of resources for each risk area.

The following is an example of a concentration objective:

> ***"An effective response force for the initial incident shall arrive within 10 minutes total reflex time 90% of the time. This workforce will be able to provide 1500 gpm for fire fighting, or be able to handle a five patient emergency medical incident upon arrival."***

B. Community Size

Community size places a direct demand on the fire department with respect to the department's ability to handle increases in calls for service as well as the community's expectations related to emergency response services. The following terms have been used to describe different community types[2]:

Urban: A fully developed community with a high population density of permanent or transient occupants. These communities have a high number of buildings per square mile, a street network that generally fits a standardized grid system, and a limited amount of open space. Urban areas usually have concentrations of multiple (3-5) story buildings as well as high-rise structures. Urban communities normally have industrial areas that provide employment, economic development and commercial development opportunities. Urban area governments are generally funded through property and sales tax revenue, user fees and special district assessments.

Suburban: Communities with mixed occupancies fringed around urban areas. The population of suburban areas is predominantly residential. There are a moderate number of buildings per square mile that include some single story and multiple (3-5) story structures, strip malls, fast food restaurants or warehouse type retail businesses. Areas of these communities have streets that conform to specific grids, residential developments with cul-de-sacs, dead-end streets in residential development, and gated communities. Access to these areas can be limited by railroads, highways and freeways. Suburban communities usually have moderate tax bases that are predominantly funded through revenue generated by property taxes, sales taxes and development fees.

Rural: Rural areas generally agricultural in nature and have large open spaces with low to moderate population density. Rural areas are typically remote from other developed areas and are normally protected by special fire protection districts as opposed to municipal fire departments. Residential occupancies predominate agricultural and service businesses.

Wilderness: Wilderness areas are remote from any significant development, usually have a limited road network, and have extended response times frequently in excess of 15 minutes.

Generally communities are defined using the above information. The following table displays the population and fire station density for the City of Tracy, Tracy Rural Fire Protection District, and Mountain House:

	City of Tracy	Tracy Rural FPD	Mountain House
Population per square mile	3657	107	2811
Fire Companies per square mile	0.14	0.02	1.5

The information included in the table above, in conjunction with the information related to community types identify the City of Tracy and the community of Mountain House as Suburban Communities. The areas surrounding the City of Tracy can be identified as rural areas.

C. Risk Typification

Understanding community risk is important when conducting a fire department response coverage assessment. Each risk presents the need for varying fire resources. Based on the potential posed by the risk, each type may require an increased number of fire department personnel, apparatus, equipment, and water supply to keep each risk level from escalating beyond the department's mitigation capabilities. This section explains the various risk types in the community.

The Fire Department conducted an all hazard assessment for the City of Tracy and for the Tracy Rural Fire Protection District in an effort to identify and categorize these risks. The potential risks include the following categories; Building Risk, Emergency Medical Services, Wildland Fires, Hazardous Materials, Technical Rescue, and Airport Operations.

1. Building Risk & Value Identification

Building Risk:

In order to conduct this risk assessment the Department used Risk, Hazard and Value Evaluation (RHAVE) software to collect and analyze data regarding the identification and assessment of structure risks within the jurisdictions of the City of Tracy and the Tracy Rural Fire Protection District. RHAVE software was provided by the United States Fire Administration (USFA) and developed under the direction of the Commission on Fire Accreditation International's RHAVE subcommittee. This software provides a means of scoring each building in the area being assessed and placing into a risk category. The final result of this assessment is called an Occupancy Vulnerability Assessment Profile (OVAP) score. The following components are used to develop the OVAP score:

Component Class	Criteria
Building	● Property Use ● Size and Height ● Access ● Occupancy Type ● Square Footage ● Exposure Separation
Life Safety	● Occupant Load ● Occupant Mobility ● Alarm Systems ● Fire Protection Systems
Risk	● Fire Code Enforcement ● Human Activity ● Fire Event History
Consequences	● Capacity to Control Fire ● Hazards in Building ● Fire Load
Water Demand	● Fire Flow ● Availability of Fire Flow ● Fire Sprinklers
Value	● Property Value

Once the OVAP score is determined for a building it is placed in one of four (4) risk categories. Those categories, along with their OVAP Score Ranges, are explained on the following page.

Category	OVAP Score Range
• **Maximum**	**60 +**

A building categorized as Maximum Risk will be significant in size, not have built in fire protection and alarm systems, require a large amount of water to contain a fire and have a potential for a high life loss due to existing and non-conforming exiting. These buildings will have an irreplaceable or major financial or social impact on the community if lost. A key factor that places a building in this category is inadequate water availability for fire suppression operations at the site of this building. An example of a building categorized as Maximum would be an as follows: An older, multi-story, non-reinforced masonry building considered to have historical significance. This building would have no fire protection or alarm system, poor exiting, and a marginal water supply for firefighting operations. Portions of Tracy's downtown business district fall into the Maximum category.

• **Significant**	**40 - 59**

A building categorized as Significant Risk will be substantial in size and have the potential for life and property loss. The potential for life loss varies between those occupants in the immediate area to threatening the lives of all of the people in the building. The financial impact to the community created by this level can be high due to loss of jobs and/or loss of tax revenue. These buildings usually have built-in fire protection and alarm systems. Examples of Significant buildings include common hallway apartments, warehouses, office complexes, moderate to large sized retail stores, hospitals, medical buildings, and older downtown buildings that have retrofitted their buildings with fire protection systems.

• **Moderate**	**15 - 39**

Buildings categorized as Moderate Risk are average in size and can present a potential for a high life loss but are usually limited to threatening only the immediate occupants of the structure. The financial impact due to the loss of this structure has an impact on the occupants or owners and not the surrounding properties. Examples of these buildings vary widely with the most typical in this class being a single family residence. Smaller apartment buildings are also included in this category.

• **Low**	**15 - 39**

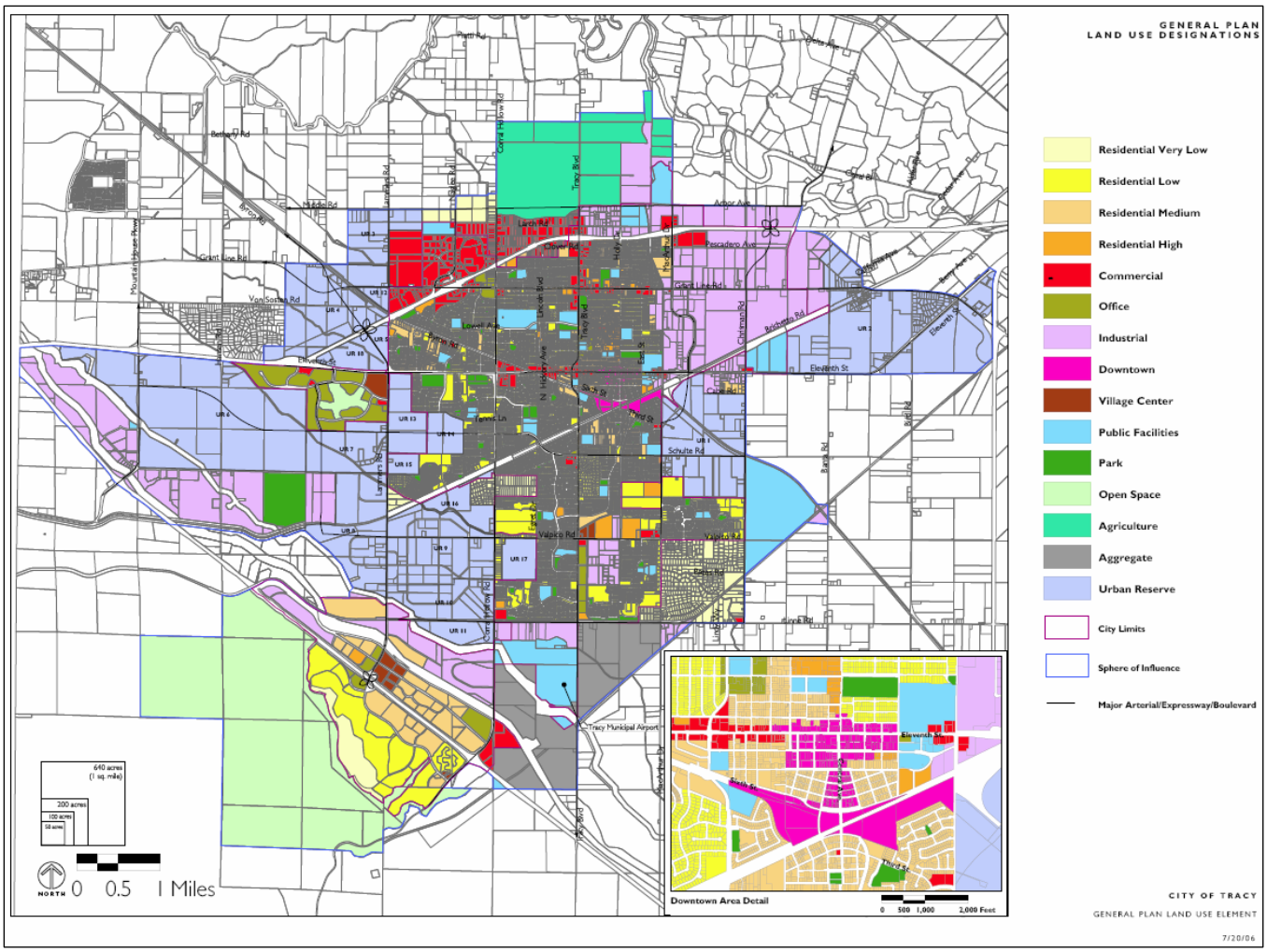
Buildings categorized as Low Risk have a very limited exposure. They are small structures that are not normally occupied by people. They also generally have a reduced amount of fire load, require small amounts of water to extinguish, have limited potential to spread to other buildings, and have little financial impact to the owners or the community. An example of a building in the Low Risk category would be a carport, shed, or out building with limited potential for spreading to nearby buildings.

City of Tracy Building Risk

As previously explained the RHAVE Assessment was conducted to determine the OVAP score for all properties in the City of Tracy. The following table identifies the percentages assigned to the various structure fire risk categories and identifies the percentage of structures in the City based on this assessment data.

Structure Fire Risk Category	Percentage of Risk
Maximum Risk	**1.1 %**
Significant Risk	**7.7 %**
Moderate Risk	**91.1 %**
Low Risk	**.1 %**

The map below identifies the various land use designations as described in the City's recently updated General Plan. A majority of the existing land use (91.1%) in the City is residential. There are; however, three areas that pose a Significant or Maximum risk for the City. Those areas include the commercial area along Interstate 205, the Northeast Industrial area, and the Downtown District in the City of Tracy.



Tracy Rural Fire Protection District Building Risk

The structure fire risk in the Tracy Rural Fire District was determined by using property file data from the San Joaquin County Tax Assessors Office and data from the City of Tracy Finance Department. The level of risk was assessed using the Risk, Hazard, And Value Evaluation (RHAVE) software. The following table identifies the current level of structure fire risk in the Tracy Rural Fire District.

Structure Fire Risk Category	Percentage of Risk
Maximum Risk	**.1 %**
Significant Risk	**7.8 %**
Moderate Risk	**91.9%**
Low Risk	**.2 %**

Value Identification:

The following table compares various statistics from the three coverage areas including the assessed property values, square miles covered, population per square mile, fire units per square mile and assessed property values. Information for this table was obtained from the San Joaquin County Tax Assessor's Office.

Significant findings in this comparison include the fact that the assessed property value for the City of Tracy is twice that of the Tracy Rural Fire Protection District, the overall population for the City of Tracy is significantly higher than those of the Rural District and the Mountain House CSD, and the assessed property value is twice that of the Rural District.

	Population	Sq. Mi.	Population per Sq. Mi.	Assessed Property Value
City of Tracy	80461	22	3657	$5,131,000,000
Tracy Rural FPD	14825	139	107	$2,523,000,000
Mountain House	5621	2	2811	

2. Emergency Medical Services (EMS) Risk

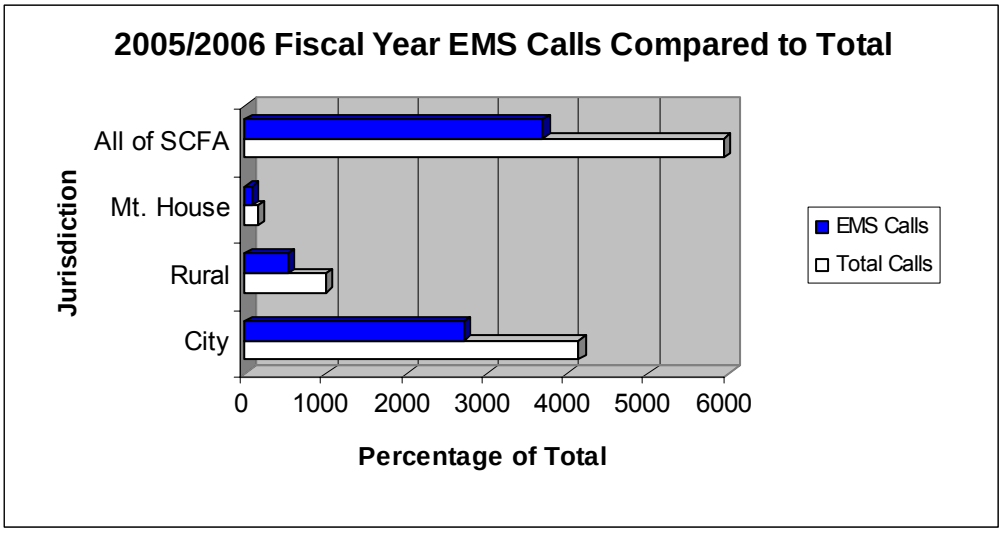
Routine, single patient emergency medical service incidents in the Fire Department's coverage area can be considered "Low" to "Moderate" risk. These types of incidents have a very high probability of occurring but their consequences only effect immediate family. EMS incidents with multiple patients, also known as Mass Casualty Incidents (MCI's) can be considered "Moderate" to "Significant" risks. These call types occur less frequently but have the potential to affect a greater number of people.

Emergency Medical Service (EMS) incidents make up the largest percentage of responses in the South County Fire Authority. This fact is also true for the Fire Service nationwide. During the past 15-20 years fire departments across the country have taken a lead role in providing basic and advanced life support services in their protection areas in an effort to provide comprehensive pre-hospital care for the citizens they protect. Nationally, EMS calls for service make up approximately 60-70% of any fire department's overall emergency call volume.

Assessing the risk related to the EMS system involves understanding the history and types of EMS calls being responded to as well as the location in which those calls are occurring. As the population in the United States ages, calls for emergency medical service are certain to increase, further, during difficult economic times fire departments experience an increase in calls for EMS service. The following discussion begins with some basic statistics related to EMS calls for service and the general areas in which those calls are occurring in the Fire Department's entire coverage area. The study then provides an overview of the history of EMS service in the City of Tracy and the Tracy Rural Fire Protection District, and concludes with information on the potential for EMS calls on freeways.

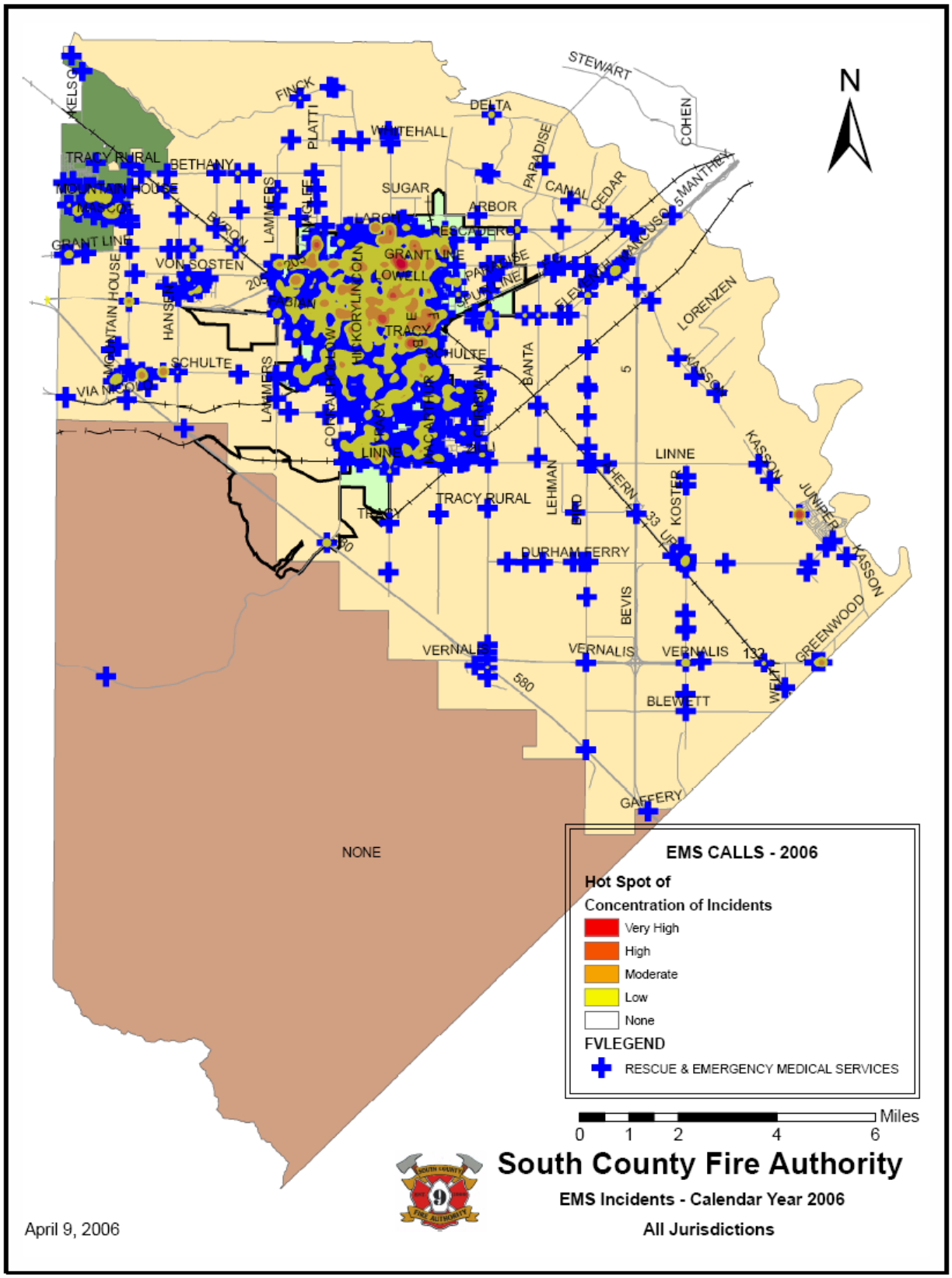
South County Fire Authority - EMS:

Emergency Medical Calls made up approximately sixty-four percent of all emergency calls for service in the Fire Department's emergency response area during Fiscal Year 05/06. The following table identifies the numbers of EMS calls that occurred in the South County Fire Authority and in each respective jurisdiction compared to the total number of calls:



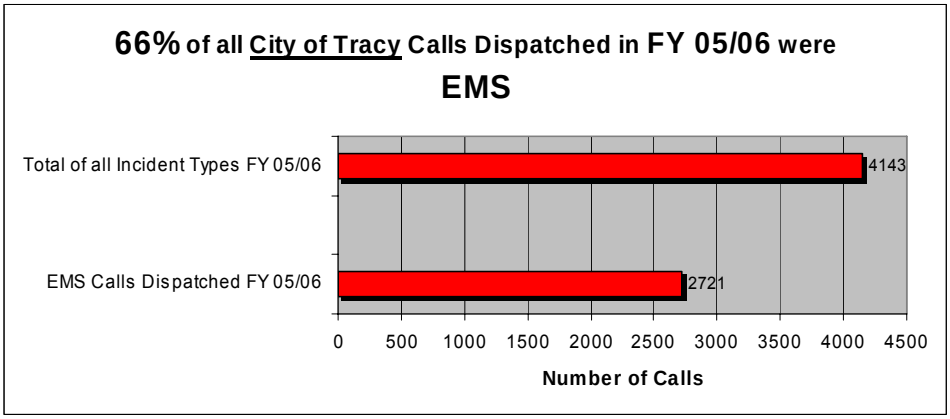
This chart identifies the Department responded to 3691 EMS calls for service across the entire response area. Of those 3691 EMS calls for service 2721 (73%) occurred within the City of Tracy's corporate limits.

The following map identifies the locations where EMS calls occurred in the South County Fire Authority during Calendar Year 2006. The "hot spot" areas, which are identified in the map legend, indicate where the largest ratios of EMS calls occurred.



City of Tracy - EMS:

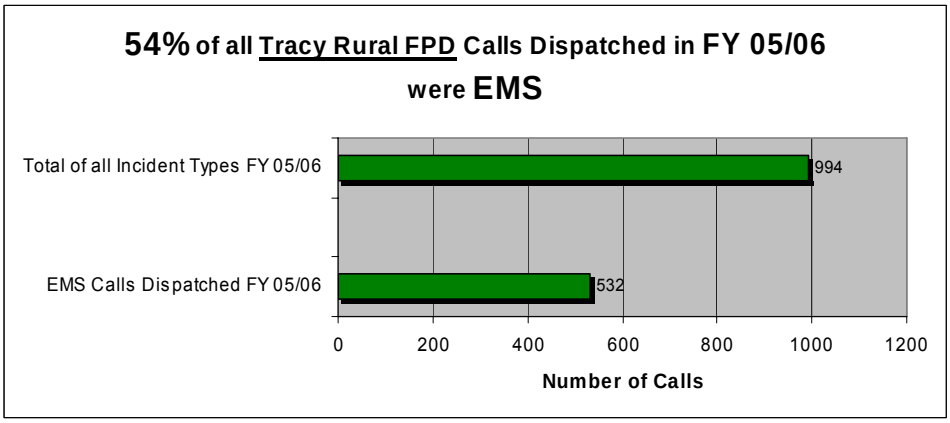
Emergency Medical Service (EMS) responses are the most prevalent incident type in the City of Tracy. During FY 05/06 the Fire Department responded to 4143 calls for emergency service in the City of Tracy. Of those calls, 2721 (66%) were calls for emergency medical service. The most typical types of patient symptoms generating EMS calls in the City of Tracy were for patients experiencing altered level of consciousness, cardiac arrest, chest pains, shortness of breath and seizures. The following graph displays the number of EMS responses compared to the total number of incidents in the City of Tracy.



In 2006 the Fire Department implemented an Advanced Life Support (ALS) Program that allows fire fighter paramedics to provide ALS services to patients in a pre-hospital setting. By providing this increased level of service the fire fighter paramedics are able to bring emergency room care to a patient's living room, which increases the patient's rate of survivability and helps responding paramedic's package and transport the patient in a more expedient manner.

Tracy Rural Fire Protection District EMS:

Calls for emergency medical service also occur more frequently than any other call type in the Department's rural coverage areas. During FY 05/06 the Fire Department responded to 994 calls for service in the rural area. Of those 994 calls for emergency service, 532 (54%) were emergency medical in nature. The following graph displays the number of EMS responses compared to the total number of incidents in the rural response area.



Much like those calls in the City of Tracy, altered level of consciousness, cardiac arrest, chest pains, back pain, and breathing problems are the most typical EMS call types in the rural response area.

EMS on Freeways

EMS calls on the freeways that run through the Department's response area accounted for 5% of all EMS calls for the Department during FY 05/06. Vehicle accidents accounted for 87% of all fire department responses to the Freeways. The probability of a multi-patient EMS incident on the surrounding freeway system is high due to rapid driving speeds, commuter traffic during peak morning and evening commute times and inclement weather conditions during the early Spring, Fall and Winter seasons. The predominant patient complaint from patients on the freeways is neck and back pain due to vehicle accidents.

The picture below is an example of a vehicle accident that occurred on the freeway system in the Department's coverage area.

Wildland Risk

Wildland fire risk in the rural response areas is considered “Moderate” to “High.” The wildland fire risk in the City of Tracy’s urban, wildland interface zone is considered to be a “Low” to “Moderate” threat. Understanding the Wildland fire risk in the Department’s coverage area requires knowledge of local fire behavior related to wildland fires as well as examining past wildland response history, and conducting a wildland risk and hazard assessment.

Wildland Fire Behavior Factors:

Wildland fires are driven by three primary factors, fuel, topography, and weather. The predominant fuel for wildland fires in the Fire Department’s response area are the grasses that grow annually. These grasses are considered to be light fuels with high flammability levels. They present a danger due to their dry nature which allows them to easily ignite. Light fuels are described as one hour fuels because they require one hour to respond to changes in the humidity levels. These grasses can be found in open fields as well as surrounding rural and suburban homes.

There are also areas that contain heavy fuels in the Department’s response area. Heavy fuels, such as brush and peat, are found along the banks of local rivers, canals and sloughs.

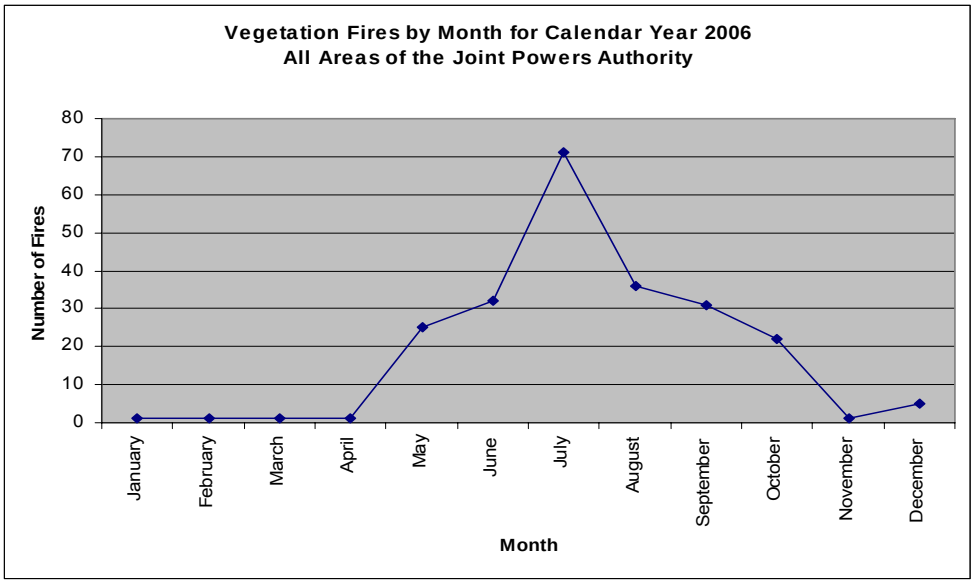
Weather also plays a critical role in determining the level of risk related to the wildland areas surrounding the community. The weather in the Department’s response area is normally hot and dry from late Spring through the late Fall months. Summer temperatures frequently reach the 100 degree mark, with average daily temperatures in July and August in the mid-90’s. During this time the relative humidity in the afternoon may drop below 25%.

One of the most significant factors that contribute to the wildland fire risk are the West and Southwest winds. These winds, especially on the west side of Tracy, are strong and gusty.

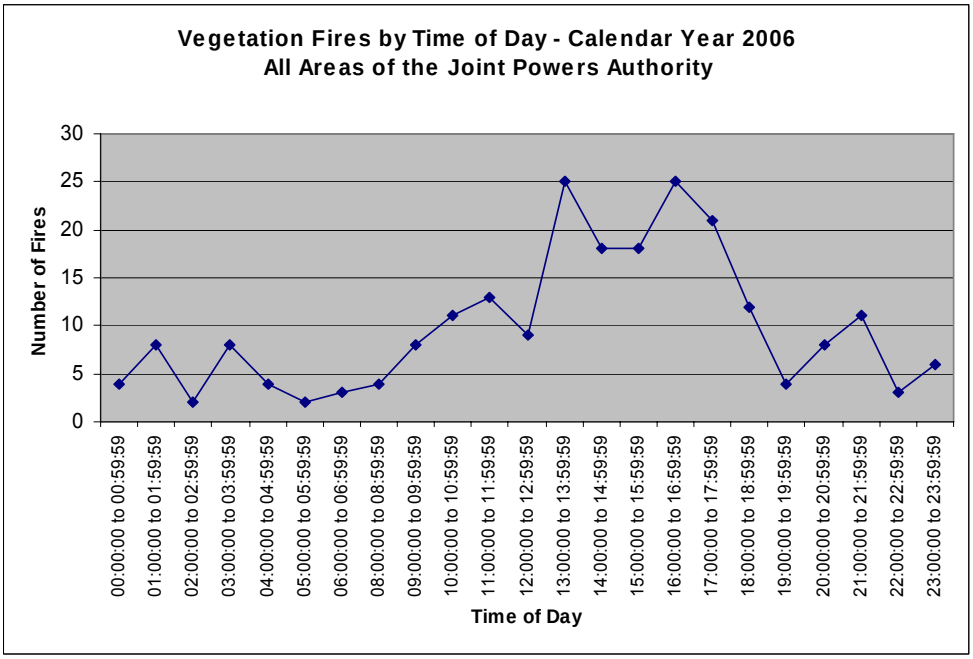
These winds are the result of cool ocean air drawn into the warm San Joaquin Valley. A fog bank visible on a summer morning usually means cooling temperatures. A summer fog bank is also an indicator of dangerous winds that gust up to 40 mph.

Fire Season:

Wildland fire season in the area typically lasts between April and October. July is the busiest month for wildland fires in our coverage area. The time of day when most wildland fires occur is between 1:00 pm and 5:00 pm. The chart below shows the number of Wildland fires that occur each month in our coverage area.



The following chart shows the key times of day when most Wildland fires occur.



Over the past five fire seasons the majority of wildland fires in the rural area have been between ½ an acre and 1 acre in size. In the urban protection areas vegetation (wildland) fires consumed between 1/10th of an acre and 1 acre. The following table categorizes the size of wildland fires in each jurisdiction from FY's 2002 through 2006.

Size of Wildland Fire	City of Tracy (urban)	Tracy Rural FPD (rural)
< or = 1/10th acre	73%	29%
Between 1/10th and 1 acre	23%	55%
> 1 acre	4%	16%

Wildland Fire Risk and Hazard Assessment:

The National Fire Protection Agency (NFPA) has developed a method for classifying wildland fire risks. NFPA Standard 1144, Protection of Life and Property from Wildfire, establishes criteria for planning developments in areas that may be threatened by wildland fires.[3] NFPA 1144 was used for this study to quantify the wildland fire risk in the Tracy Rural Fire Protection District. Currently, the Tracy Rural Fire Protection District has several areas in the "High Hazard" classification range.

NFPA1144 grades a home or subdivision based on the following elements:

- Access
- Vegetation (Fuel Model)
- Topography (slope %)
- Building Construction and Roof Type
- Built in Fire Protection and Water Supply

Points are tallied from the above elements and a final score categorizes the home or subdivision into the following hazard classes:

Hazard Assessment	*Total Points*
Low Hazard	***<40***
Moderate Hazard	***40 – 69***
High Hazard	***70 – 112***
Extreme Hazard	***>112***

Five residential areas were used to get a sampling of the Tracy Rural Fire Protection District's risk level using NFPA 1144. Random homes were used in each area in order to conduct this sampling. The table on the following page identifies the targeted areas:

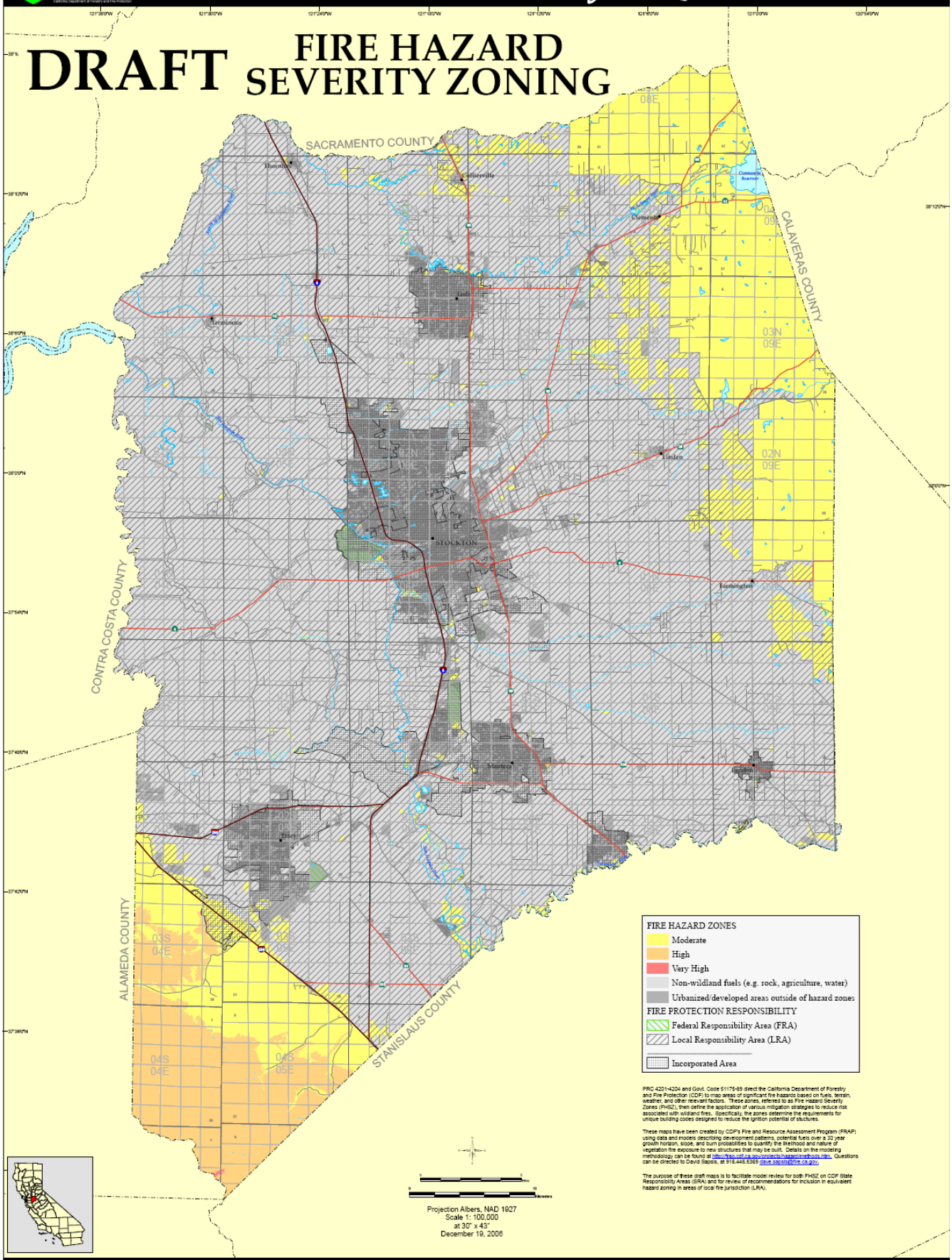
Area of Assessment	Hazard Classification	Points
Par Country Estates, South end of Chrisman Rd.	***Moderate to High Hazard***	***62 - 90***
Hansen Road, South of Schulte Road	***Moderate to High Hazard***	***62 - 90***
Kasson Road, in the area of the SJ River Club	***Moderate to High Hazard***	***62 - 90***
Grantline Road at the Alameda County line	***High Hazard***	***87 - 98***
Larch Road, between Corral Hollow and Tracy Blvd.	***High Hazard***	***88 - 99***

The grass fire in the following photograph occurred on July 8, 2006 and was started by a bird on an electrical wire. This incident required four engines companies from the Tracy Fire Department to bring the incident under control. This incident posed a significant threat to the homes located on Pottery Court and Midway Drive.

The California Department of Forestry and Fire Protection (CalFire) mapped areas of significant fire hazards in California and San Joaquin County. Their mapping analysis looks at fuel load, terrain, weather and other relevant factors. The map identifies areas along the I-580 corridor as being “moderate” to “high” hazard wildland risks. The map on the following page is map developed by CalFire Fire and identifies the wildland fire hazard zones in San Joaquin County. As you can see, the area immediately south and west of the South County Fire Protection District is considered to be a moderate to high fire hazard zone as identified by the California Department of Forestry.

SAN JOAQUIN COUNTY

DRAFT FIRE HAZARD SEVERITY ZONING



PRC 4201-4204 and Govt. Code 51175-89 direct the California Department of Forestry and Fire Protection (CDF) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZ), then define the application of various mitigation strategies to reduce risk associated with wildland fires. Specifically, the zones determine the requirements for unique building codes designed to reduce the ignition potential of structures.

These maps have been created by CDF's Fire and Resource Assessment Program (FRAP) using data and models describing development patterns, potential fuels over a 30 year growth horizon, slope, and burn probabilities to quantify the likelihood and nature of vegetation fire exposure to new structures that may be built. Details on the modeling methodology can be found at http://frap.cdf.ca.gov/projects/hazard/methods.htm. Questions can be directed to David Sapsis, at 916-445-5369 dave.sapsis@fire.ca.gov.

The purpose of these draft maps is to facilitate model review for both FHSZ on CDF State Responsibility Areas (SRA) and for review of recommendations for inclusion in equivalent hazard zoning in areas of local fire jurisdiction (LRA).

Projection Albers, NAD 1927
Scale 1: 100,000
at 30" x 43"
December 19, 2006

The State of California and the Department of Forestry and Fire Protection make no representations or warranties regarding the accuracy of data or maps. Neither the State nor the Department shall be liable under any circumstances for any direct, special, incidental, or consequential damages with respect to any claim by any user or third party on account of, or arising from, the use of data or maps.

Obtain FRAP maps, data, metadata and publications on the Internet at http://frap.cdf.ca.gov
For more information, contact CDF-FRAP, PO Box 944246, Sacramento, CA 94244-2460, (916) 327-3939.

Arnold Schwarzenegger, Governor,
State of California
Mike Chrisman, Secretary for Resources,
The Resources Agency
Ruben Grijalva, Director,
Department of Forestry and Fire Protection

MAP ID: FHSZ_MAP

DATA SOURCES
CDF Fire Hazard Severity Zones (FHSZ06a1)
CDF State Responsibility Areas (SRA05_2)
CDF Incorporated Cities (Incorp05_2)

Weed Abatement:

Weed abatement programs have been instituted in the urban and rural fire protection areas in an effort to reduce the risk of wildland fires. The weed abatement program is administered by the Department's Prevention Division. This program provides a defensible space around the residential and commercial structures in the protection area. The Fire Prevention Division administers these programs on a year round basis.

4. Special Risks

Hazardous Materials

The storage and use of hazardous materials creates a "Significant" risk to the community. Hazardous materials incidents occur less frequently than other types of incidents. However, these incident types present a greater hazard potential due to their volatility, toxicity, and pluming ability. Hazardous materials incidents, because of the nature of their physical properties, pose a risk to more than the surrounding area; they can move from one jurisdiction to the next and have the potential to create significant life and property loss. Assessing the level of risk related to hazardous materials involves looking at hazardous materials that are currently in, or traveling through the community. This assessment process looks at the history of hazardous materials incidents in the area as well as evaluating how Fire Department has responded to, and mitigated those risks.

The hazardous materials risk in the Tracy area comes in several forms. With the storage of hazardous chemicals in fixed facilities, the transport of hazardous materials on roadways, the transmission of hazardous materials through underground pipelines, along railway systems, or the use of these materials in agricultural applications, it is certain that the area has the potential of experiencing a hazardous materials incident at any time.

Hazardous Materials at Fixed Facilities:

Hazardous chemicals are used and stored in numerous businesses throughout the community. The most common hazardous chemicals found in fixed facilities in the Tracy area include Anhydrous Ammonia (NH3) and Chlorine. The table on the following page lists an example of the fixed facilities that currently use or store hazardous chemicals on site in the fire protection area.

Company Name	Address	Chemical	Avg. Daily Quantity
Chevron Banta Terminal	22888 S. Kasson Rd.	Unleaded Gasoline	500,000 Gallons
City of Tracy	3900 Holly Dr.	Chlorine	25,000 Lbs.
Costco Distribution	25862 Schulte Rd.	Anhydrous Ammonia	57,000 Lbs.
Leprino	2401 N. Mac Arthur Dr.	Anhydrous Ammonia	72,000 Lbs.
McLane Food	800 Pescadero Ave.	Anhydrous Ammonia	18,000 Lbs.
GWF Energy	14950 Schulte Rd.	Ammonium Hydroxide	30,000 Lbs.
Pioneer Americas	26700 S. Banta Rd.	Chlorine	540,000 Lbs.
Safeway Distribution	16900 Schulte Rd.	Anhydrous Ammonia	60,000 Lbs.
Tracy Cold Storage	24500 S. Mac Arthur Dr.	Anhydrous Ammonia	Unknown Quantity
United States Cold Storage	1400 N. Mac Arthur Dr.	Anhydrous Ammonia	35,000 Lbs.
Western Farm Services	35100 S. Hwy 33	Anhydrous Ammonia	22,000 Lbs.

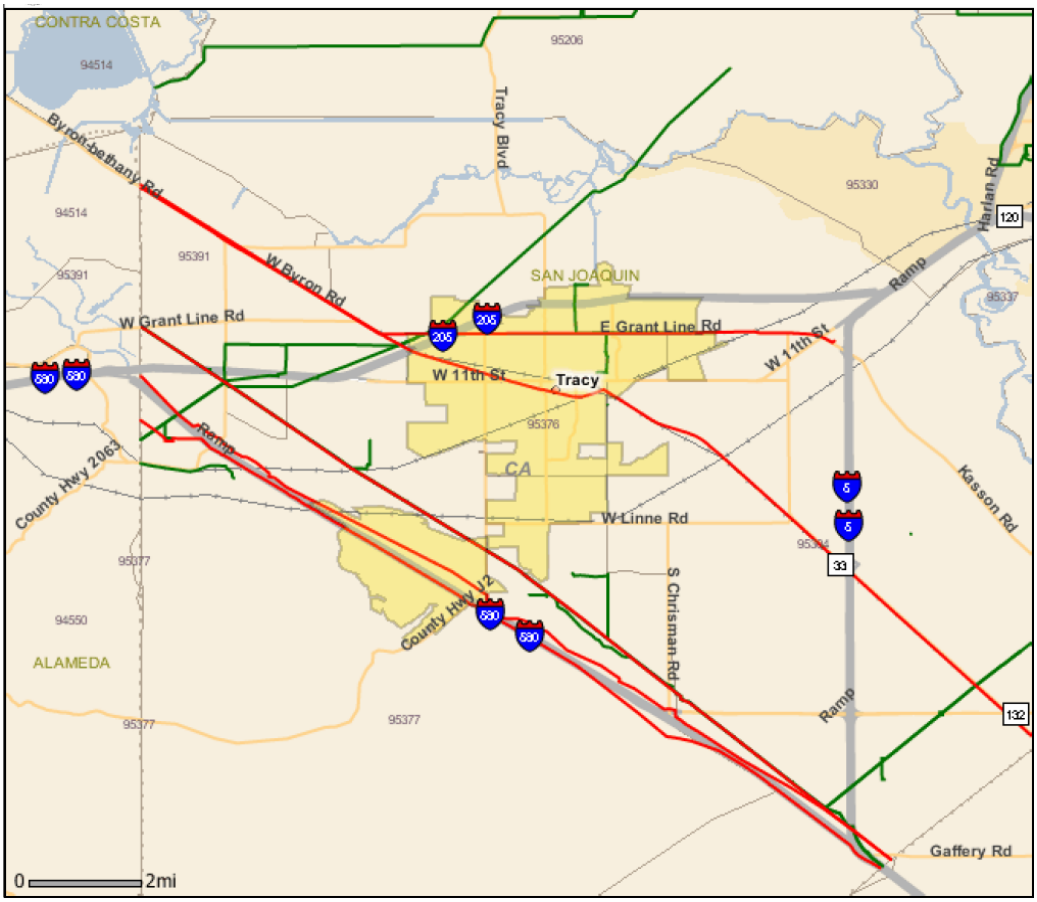
Hazardous Materials Management Plans (HMMP) can provide a listing of the fixed facilities risks. HMMP's are required for all businesses storing or using hazardous materials above threshold quantities pursuant California Health and Safety Code, Section 25503.5. The threshold quantities for the requiring of a HMMP are:

- 500 pounds or more for solids
- 55 gallons or more for liquids
- 200 cubic feet or more for compressed gases

There are 710 businesses in the Fire Departments response area that are required to submit HMMP's under the California Health and Safety Code, Section 25503.5. In 95376 Zip Code area there are 471businesses, in 95377 there are 172 businesses, and in 95304 there are 67 businesses.

Hazardous Materials in Pipelines:

Natural gas and petroleum pipelines currently run through the South County Fire Authority response area. The map on the following page displays the pipelines that travel through the Fire Department's response area. The red lines on the map indicate the oil and liquid fuel transmission lines while the green lines identify the natural gas transmission lines.



Hazardous Materials on Roadways:

The Tracy Fire Department response data identifies that hazardous materials incidents are more likely to happen on the local roadways. This is due in part to the fact the emergency response area lies within a triangle of freeways that completely encompass the community.

The three major interstate freeways surrounding Tracy include Interstate 5, Interstate 580, and Interstate 205. Interstate 205 is the busiest of these freeways. In 2005 Caltrans reported the Average Daily Traffic (ADT) on I-205 was 112,000 vehicles with the peak traffic hour on eastbound I-205 occurring at 5:00 p.m. and the average number of vehicles per hour being 7,900. The Average Daily Traffic on Interstate-580 (at the Alameda County line) was 46,500, and on I-5 (at Kasson) was approximately 28,500 per day. [4]

4/17/07, Pipeline rupture - Interstate 580 near Bird Rd

Truck traffic constitutes approximately 12% of the total daily traffic traveling along Tracy's freeways. Caltrans reports that approximately 22,440 trucks per day travel on Tracy's three freeways. The Federal Motor Carrier Safety Administration reports that 7.2% of all trucks on the road are hauling large enough quantities of hazardous materials to require placarding.[5] This means there are approximately 1,615 trucks carrying hazardous materials that pass through Tracy on a daily basis.

3/24/2006

Railroad transportation, which was once very active in Tracy, is also on the rise. Trains transporting all types of freight pass through Tracy several times a day. Chlorine is an example of a hazardous material that is shipped through Tracy by rail. Approximately two-hundred and seventy tons of Chlorine and Sodium Hydroxide Solution are shipped to one of the facilities in Tracy several times a week.

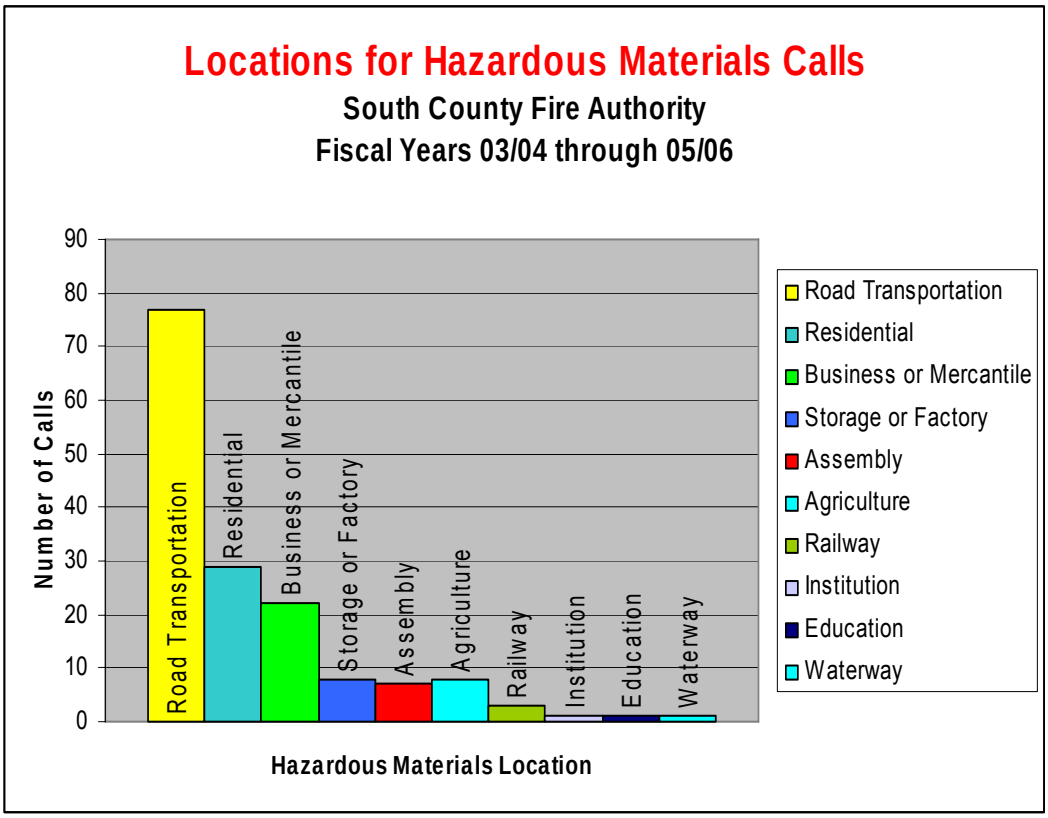
Hazardous Materials for Agriculture:

Land use in the Tracy Rural Fire Protection District is predominately agricultural with agricultural pesticides and fertilizers posing a significant hazardous materials risk. The Environmental Protection Agency (EPA) defines a "pesticide" as any substance that is used to prevent, destroy, repel, or mitigate any pest. The most widely used agricultural pesticides in San Joaquin County are sulfur, petroleum oils, copper hydroxide, dichloropropene, metam-sodium and chlorpyrifos.[6] There are numerous other agricultural pesticides that are toxic, such as hexazinone, trifluralin, sethoxydim, clethodim.[7] Agricultural fertilizers also pose a hazardous materials risk.

Fertilizer contains one or more of the following elements, Nitrogen, Potassium, and/or Phosphorus. One of the most hazardous fertilizers used in agriculture is Anhydrous Ammonia. Anhydrous Ammonia is a compressed hazardous, caustic, and corrosive gas that is used by local farmers to produce Nitrogen which is critical to local crops.

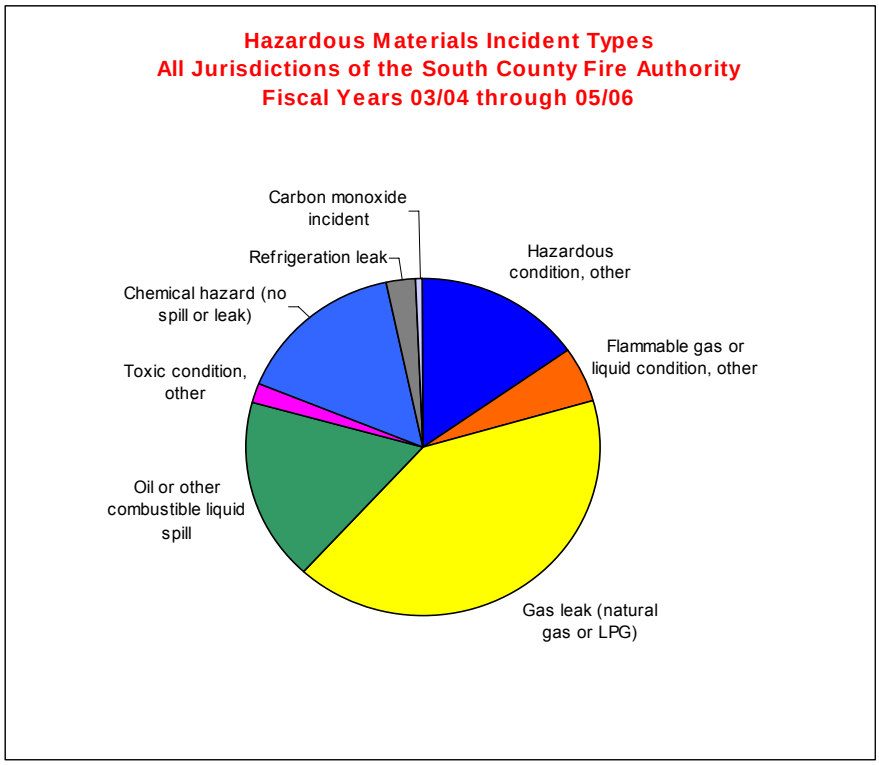
Hazardous Materials Incident History:

The location of a hazardous materials incident, as well as the hazard type, often helps emergency responders calculate the risk level. The following graph displays the locations in which hazardous materials incidents have occurred in the Fire Departments current protection area.



Hazardous materials incidents in the Tracy area occur most often on roadways. The most common hazardous materials incident that has occurred on roadways involved spills of combustible and flammable liquids. The majority of hazardous material calls occurring in residential occupancies were natural gas leaks. The number one hazardous materials incident occurring at businesses was also the natural gas leak. The type of hazardous materials incident can also help to determine the level of risk.

The following chart displays the types of hazardous materials incidents that the fire department has responded to over the past three fiscal years in the South County Fire Authority.

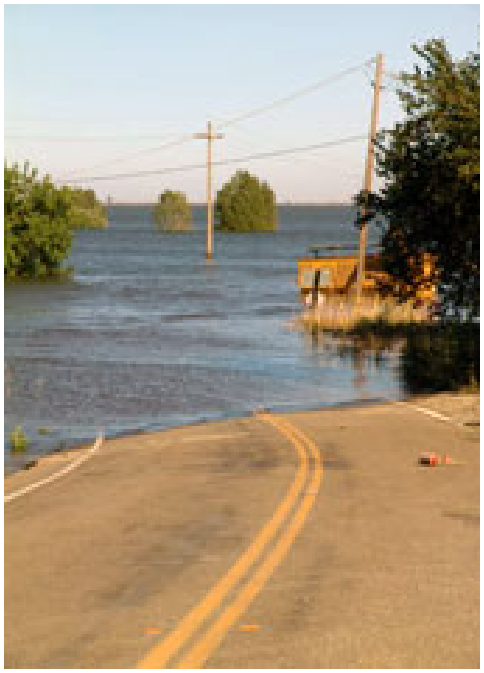


Forty-one percent (41%) of all hazardous materials incidents were natural gas leaks. Combustible and Flammable liquids incidents made up 23% of all hazardous chemical calls.

Rescue

Rescue is defined by NFPA's Standard 1670 (The Standard on Operations and Training for Technical Search and Rescue Incidents) as "the application of special knowledge, skills, and equipment to safely resolve unique and/or complex rescue situations". The disciplines of "rescue" are used to save victims who are dangling from a tower, trapped under a collapsed building, lost in the wilderness, trapped by a piece of machinery, stuck inside of a pipe, buried under ground, stranded by rising flood waters or struggling in a fast moving canal. Rescue is comprised of three different disciplines, technical rescue, confined space rescue, and swift water/flood rescue. Technical rescue can be divided into the following disciplines:

- High and low angle rope rescue
- Structure collapse
- Wilderness Search and Rescue
- Machinery extrication
- Trench rescue



The Rescue risk in Tracy has been classified as “Significant.” Rescue calls for service are classified as Low Probability – High Consequence types of incident. They do not occur often but can create a technical challenge for the Fire Department due to the highly specialized equipment and training necessary to perform rescues.

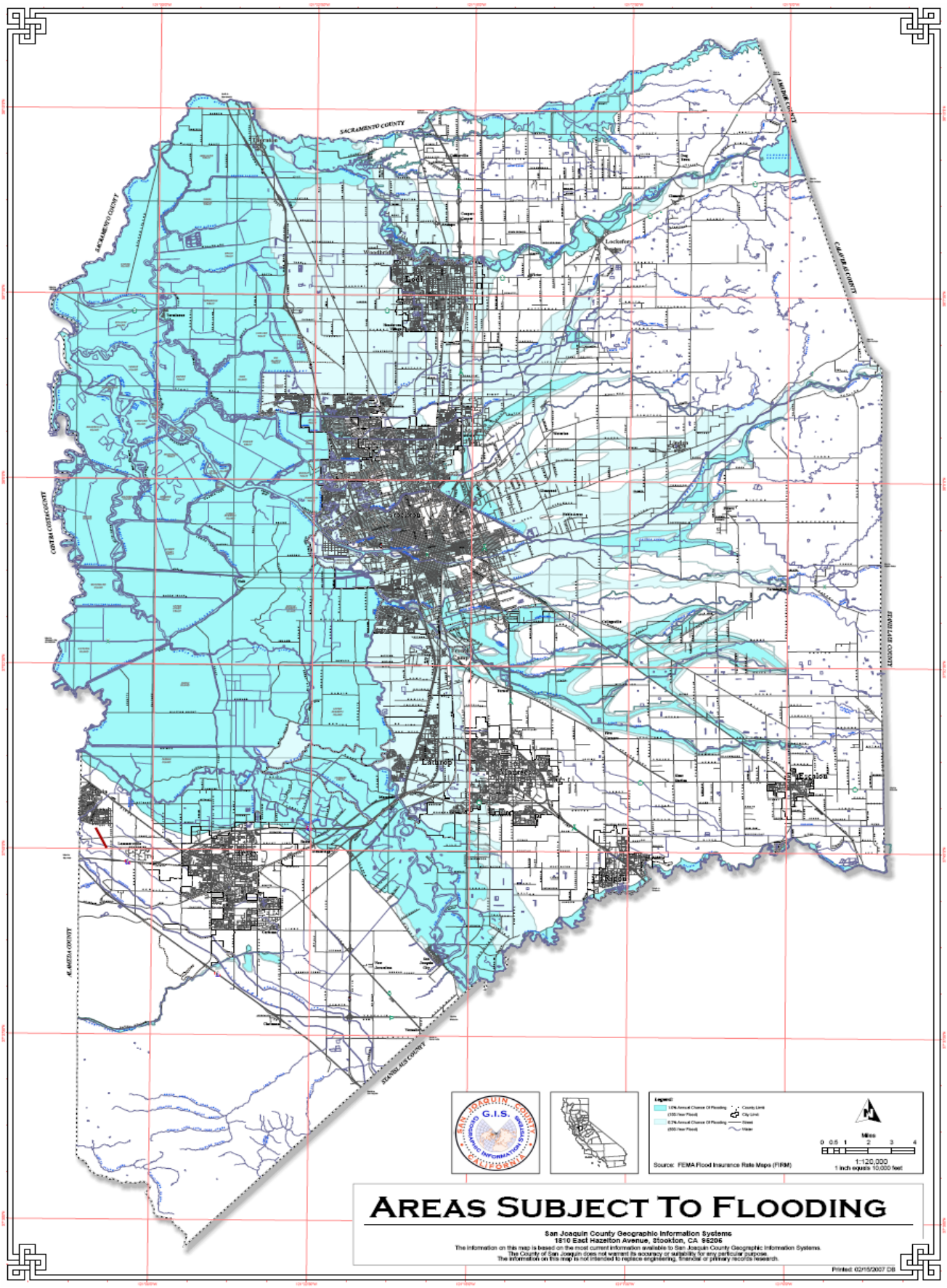
Search and Rescue incidents can be caused by natural disasters (like earthquakes), by unintentional man-made events (such as transportation accidents, structural collapses, cave-ins, fires, and by people trapped in precarious places like on towers or inside of confined spaces) or by intentional man-made events (like the Oklahoma City terrorist act).

Flooding also poses a “Significant” risk in the Tracy area.

- **Flood Rescue**

The flood risk in the Tracy area is “Significant.” There is a low probability of a flood occurring; however, when a flood does occur, the consequences can be life threatening, destroy property, and impact the community, the region, and the State. Numerous waterways travel in and through the area of the South County Fire Authority. These waterways include the San Joaquin River, the Old River, the Middle River, Grantline Canal, Delta Mendota Canal, California Aqueduct, Tom Payne Slough, Mountain House Creek, Corral Hollow Creek, Peg Leg Creek, Patterson Run, and numerous other irrigation canals and ditches. Theses waterways pose rescue and flooding risks.

The following page includes a map of areas in San Joaquin County that are subject to flooding. It displays areas in which there is a one percent (1%) risk of flooding during any given year. These areas are known as the 100-year floodplain. The boundary of the 100-year floodplain is the basic planning criterion used to demarcate unacceptable public safety hazards. [8]


SACRAMENTO COUNTY
AMADOR COUNTY
CALAVERAS COUNTY
CONTRA COSTA COUNTY
ALAMEDA COUNTY
STANISLAUS COUNTY
Lodi
Stockton
Lathrop
Manteca
Ripon
Escalon
Legend:
County Limit
City Limit
Streets
Water
Miles
0 0.5 1 2 3 4
1:120,000
1 inch equals 10,000 feet
Source: FEMA Flood Insurance Rate Maps (FIRM)
AREAS SUBJECT TO FLOODING
San Joaquin County Geographic Information Systems
1810 East Hazelton Avenue, Stockton, CA 95205
The information on this map is based on the most current information available to San Joaquin County Geographic Information Systems.
The County of San Joaquin does not warrant its accuracy or suitability for any particular purpose.
The information on this map is not intended to replace engineering, financial or primary records research.
Printed: 02/15/2007 DB

Airport Rescue and Firefighting

The airport rescue and firefighting risk at the Tracy Municipal Airport is considered to be “low” but could rise to “significant” depending upon where an incident occurs and the type of aircraft involved. The probability of an airplane incident occurring is low due to number of airplane accidents that have occurred and the size of Tracy’s airport.

The Tracy Municipal Airport is an uncontrolled airport covering 310 acres and has two runways. Its use is classified by the Federal Aviation Administration (FAA) as a “general aviation” airport and provides for recreational use and the transportation of personnel or cargo by business firms and individuals with privately owned aircraft. Aircraft classified as air carriers, commuter/air taxi or military can not use the Tracy Municipal Airport under its current use classification.

Specialized airport rescue firefighting vehicles are not required at “general aviation” airports; however, if Tracy Municipal Airport increased its runway length or allowed passenger services, the FAA would change its use classification and require a staffed airport fire/rescue company.

The National Transportation Safety Board’s Accident Database lists nine aircraft accidents in the Tracy area since July 2001. Two of those nine involved fatalities, 1 incident with major injuries, 1 incident that resulted in minor injuries and five incidents that resulted in no reported injuries. One incident involved a fire and two of the 9 accidents involved agricultural aircraft and 7 were general aviation.[9]

III. ESTABLISHING OBJECTIVES

This section discusses the basis for fire department response objectives. Fire Department response objectives are typically based on the dynamics of fire growth and the events involved in a life threatening emergency medical incident. These two types of emergency responses have extensive scientific information available thus making them quantifiable. This section provides a discussion on each, as well as a brief discussion on the elements of response time.

A. Dynamics of Fire Growth and Flashover

In order for firefighters to provide the most effective service, and to significantly reduce the risk of life and property loss, they must arrive at a structure fire in a short period of time with adequate resources. Matching the arrival of resources with a specific point in the fire's growth is one of the greatest challenges for a fire department. Finding the specific point in a fires growth can be done by looking at the stages of a fire.

Stages of a Fire

Regardless of the speed of growth, or length of burn time, all fires inside a compartment or building go through the same stages. A fire in a compartment begins with the "Smoldering" stage and when left unaddressed will develop through the Ignition, Growth, Flashover, Fully Developed, and Decay stages.[10] One particular stage emerges as being very significant because it marks a critical change in conditions. This phase is called the "Flashover" phase.

The following provides a brief overview of the stages of fire within a compartment:

- **Smoldering Stage** – This is the first stage of any fire when heat is applied to a combustible material. The heat oxidizes and the combustible material's surface into combustible gases. Heat is released which raises the temperature of more material. A fire can progress from the smoldering stage immediately or slowly, depending on the fuel and the surrounding air. For example, a newspaper will smolder for only a few seconds before proceeding to the next stage, while a sofa with a burning cigarette can smolder for more than an hour before breaking into the Ignition phase.

- **Ignition Stage** – This stage combines the four elements necessary for combustion and becomes self-sustaining with flames becoming visible.

- **Growth Stage** – During this stage, the combustion process continues to release increased levels of heat while nearby objects reach their ignition temperature, and begin to burn. Superheated gases rise to the ceiling, spread outward and begin to bank down the walls of the enclosure consuming all available oxygen in the room and raising the heat levels to reach the next stage.

- **Flashover Stage** – As the volume of gases increase they bank down to the floor heating all combustible objects regardless of their proximity to the burning object. These gasses also begin to displace the available oxygen in the room. Simultaneous ignition occurs during this phase. Temperatures inside the compartment can range from 900 to 1200 degrees Fahrenheit.

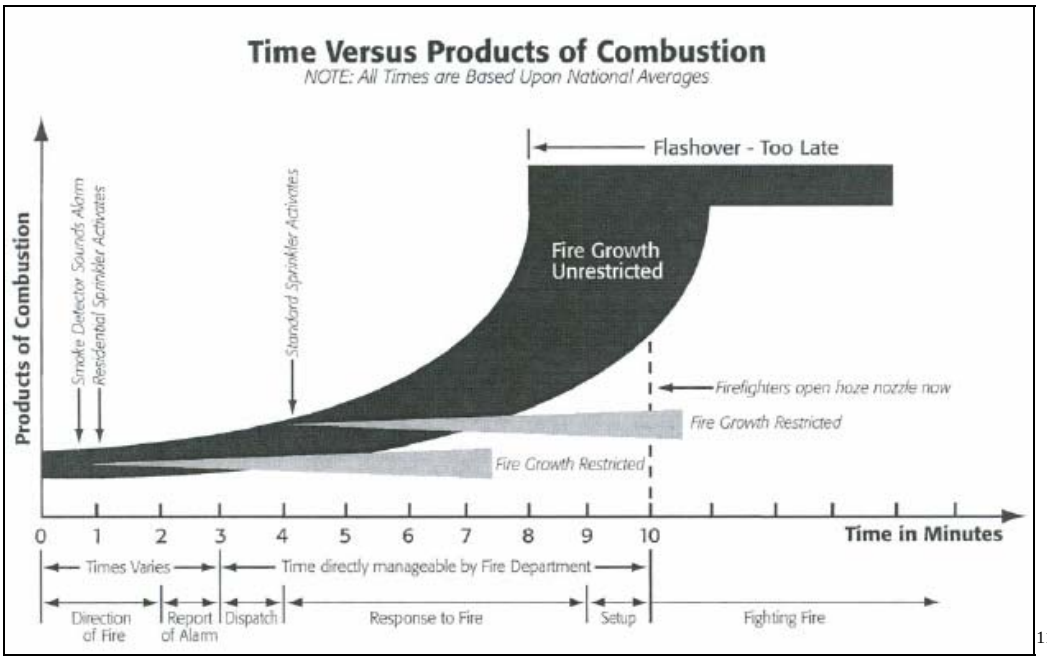
- **Fully Developed Stage** – This stage involves the consumption of all flammable materials in the compartment.

- **Decay Stage** – During this stage, the fire diminishes and temperatures begin to decline because the fire has already consumed the available fuels in the compartment.

Flashover

"Flashover" is a critical stage of fire growth for various reasons. The predominant reasons that this phenomenon is so critical is that no living thing can survive in the flashover room and that it creates a rapid increase in the rate of combustion which requires a greater amount of water to reduce the burning material below their ignition temperature. After flashover has occurred the fire burns much hotter and spreads at a much more significant pace. Once flashover has occurred search and rescue efforts become more difficult in the remainder of the building. Also, the occurrence of flashover causes an increased need for fire suppression personnel to mitigate the incident in a timely manner.

The following graph represents the stages of fire growth. This graph also identifies the time elements involved in flashover such as the detection and reporting of the fire, dispatch processing time, and the fire department's response time.



[11]

The following table compares pre and post flashover conditions:

The Significance of "Flashover" [12]

Before Flashover	After Flashover
Limited to one room	May spread beyond one room
Requires smaller attack lines	Requires more and larger attack lines
Search and rescue is easier	Compounds search and rescue
Initial assignment can handle	Requires additional companies

The next nationally recognized benchmark used for establishing fire department response objectives is developed based on life threatening medical emergencies.

B. Emergency Medical Services Benchmarks and Expectations

Life Threatening Medical Emergencies – Basis for Response Objectives

Using life threatening medical emergencies as a basis for setting EMS response time performance objectives has become a fire and EMS industry norm. The American Heart Association has shown that the likelihood of a patient surviving a life threatening medical emergency is improved if CPR and defibrillation are initiated within 5 minutes of the onset of the medical emergency.

The American Heart Association states:

> *"Brain death and permanent death start to occur in just 4 to 6 minutes after someone experiences cardiac arrest. Cardiac arrest can be reversed if it's treated within a few minutes with an electric shock to the heart to restore a normal heartbeat. This process is called defibrillation. A victim's chances of survival are reduced by 7 to 10 percent with every minute that passes without CPR and defibrillation. Few attempts at resuscitation succeed after 10 minutes."*[13]

Over the past several years numerous studies have been conducted that justify the use of CPR and defibrillation as acceptable means of developing EMS response objectives. In 1998 the Emergency Medical Directors' Association of California (EMDAC) published a position paper on response time performance objectives. The EDMAC paper recommends the following response time objectives:

> *"Current best medical evidence suggest that response time intervals for presumptively life-threatening emergencies, measuring from the time of the first ring at the primary public safety access point (PSAP) until arrival at the scene with wheels stopped, should be 5 minutes for responders capable of performing CPR and defibrillation . . .."*[14]

The information contained in the matrix below identifies the recommended maximum response time standards for emergency medical service response as identified by the California State EMS Agency. These recommended standards utilize the same 90% threshold for response criteria that is used by the NFPA when determining response time performance objectives.

California State EMS Agency Maximum Response Time Standards

Level of Responders	Metro/Urban	Suburban	Rural	Wilderness
Basic Life Support	5 minutes	15 minutes	15 minutes	As quick as possible
Defibrillator	5 minutes	As quick as possible	As quick as possible	As quick as possible
ALS (not 1st responder)	10 minutes	20 minutes	20 minutes	As quick as possible

(The 1993 Standard for ALS response to a Metro/Urban area was 8 minutes. A 1998 revision of those guidelines adjusted that standard to 10 minutes)[15]

EMS Agency Population Density Definitions:

The population of a community is used as a basis for EMS benchmarking. These further define the terms defined on page 13 of this report. The California State EMS Agency uses the number of persons per square mile to define communities to determine response time standards.

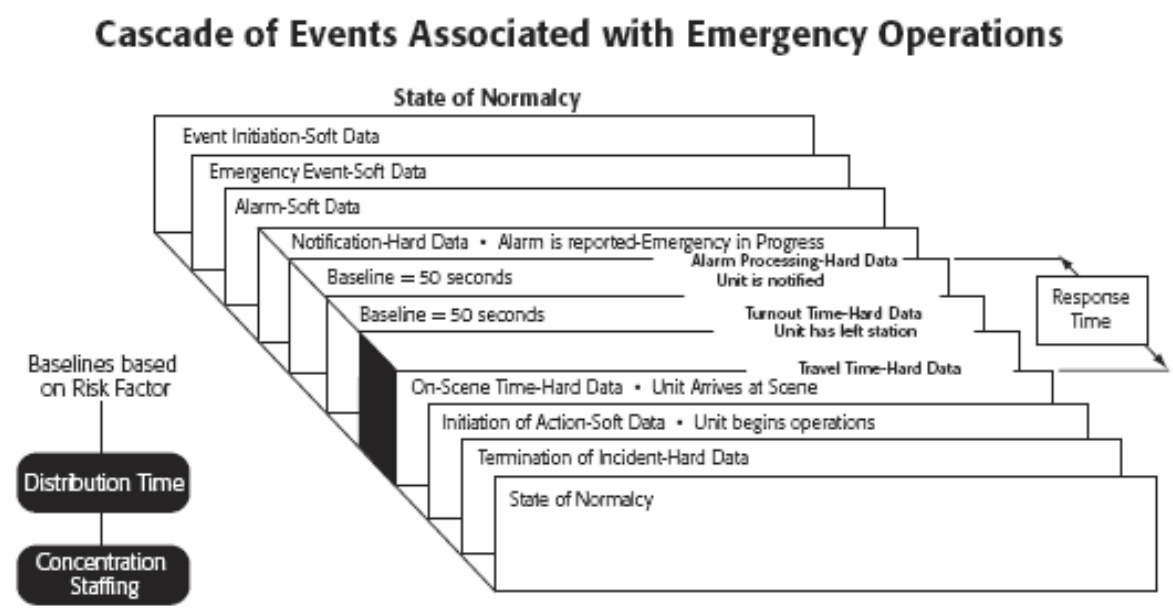
- **Metro:** All census places with population density >500 persons per square mile.
- **Urban:** All census places with population density of 101 to 500 persons per square mile.
- **Suburban:** All census places with population density of 51 to 100 persons per square mile.
- **Rural:** All census places with population density of 7 to 50 persons per square mile.
- **Wilderness:** All census places with population density < 7 persons per square mile.

Population Per Square Mile

	City of Tracy	Tracy Rural FPD	Mountain House
Population per square mile	3657	107	2811

C. The Element of Response Time

Response times are a critical component in the control and mitigation of an emergency incident. Understanding the standardized elements of response time is important in order for a fire department to measure its response performance. It is important to understand the components of response time in order to make educated decisions regarding resource allocation and to prepare for evaluation by the Insurance Services Office. The following diagram and definitions describe the elements of response time by breaking down the key elements and events that take place during the call screening, dispatching and response to a routine emergency call for service.[16]



Elements of Response Time

- **Event Initiation.** The point at which the incident begins. An example of this element would be when a patient becomes aware of, and makes a decision to seek assistance for a medical emergency. This is also known as the point of awareness. It is difficult to quantify when this event occurs as there are varying factors related to this element.

- **Emergency Event.** The point when a human being or technologic sentinel (i.e., smoke alarm, infrared heat detector, etc.) becomes aware that conditions exist that requires an activation of the emergency response system.

- **Alarm.** The point when awareness triggers an effort to implement the emergency response system. An example of this point in time when the transmittal of a local or central alarm to a public safety answering point (PSAP).

- **Notification.** The point when a call for service or an alarm is received by a 9-1-1 call center also knows as a "public safety answering point" (PSAP). This call may take the form of electronic or mechanical notification received and answered by the PSAP.

- **Call processing interval.** This is the interval of time between the time the call is received in the 9-1-1 system at the dispatch center to the time the dispatcher activates the computer-aided dispatch (CAD) system that alerts the emergency response unit.

- **Dispatch time.** Dispatch time begins when the dispatcher, having selected appropriate units for response, initiates the notification of response units.

- **Turnout Interval.** The interval of time required for fire fighters to receive notification of an incident, don their protective gear, board the apparatus and the apparatus begins moving in response to the incident.

- **En Route Time.** This component begins when the fire unit exits the station, or begins moving toward the incident, until the unit arrives on the incident scene.

- **On-Scene Time.** The point when the responding fire department unit(s) arrives on scene of the incident.

- **Initiation of Action.** The point when emergency mitigation activities begin. This may include size-up, resource deployment, patient contact, etc.

- **Termination of Incident.** The point when fire units have completed the assignment, secured the equipment utilized to mitigate the previous incident and become available to respond to another request for service.

The call processing and dispatching components are critical aspects of emergency incident mitigation. During the emergency response process every second counts and fire departments can often shorten emergency response times by making sure the call processing and call dispatching time is effectively managed. A fire department's ability to receive and dispatch calls in a timely manner speeds up the agencies ability to deploy resources. This in turn saves time needed to assess patients, deploy fire suppression resources or mitigate incidents.

Call Processing Relative to the ISO Public Protection Classification Process.

The Insurance Services Office, Inc (ISO) is a community risk assessment company that conducts community risk assessments for insurance companies across the country. These risk assessments are used to identify a community's Public Protection Classification (PPC) or ISO Rating. This classification provides each community with a score on a scale of 1 to 10 (1 being the best score and 10 being the highest score) that is based on ISO's evaluation of three primary components. Those components include the community's water system, the community's communications system and the community's fire department. A brief explanation of each component is included on the following page.

- **Fire Alarms:** This portion of the rating process relates to fire alarms and emergency calls for service. ISO evaluates the fire department's ability to receive and dispatch fire department emergency calls for service. This classification measures a dispatch center's ability to receive and process automatic fire alarms as well as the ability to receive, process and either transfer or dispatch a fire call within a specific time frame. This portion of the ISO PPC rating constitutes 10% of the overall rating for the community.

- **Water Supply:** Forty percent (40%) of the community's PPC rating is associated to the community's water supply system and the ability to provide and manage the public water system. This portion of the rating specifically deals with issues related to fire hydrant locations, hydrant functionality and the water systems ability to maintain adequate needed fire flow for mitigation of a fire incident.

- **The Fire Department:** The final and most significant component of the ISO PPC is the fire department's ability to deploy emergency response resources to an incident scene and the department's ability to maintain emergency coverage during the course of those incidents. The Fire Department component constitutes fifty percent (50%) of the overall score. The following aspects are evaluated during the ISO's review of the fire department: The number and location of fire units in a community; the department's ability to deploy those units within specific time frames; the types of equipment carried on fire apparatus relative to emergency operations; the department's ability to conduct emergency rescue operations in the community; the number of available ladder trucks in the community; and the maintenance of training records and response records relative to the department's emergency and non-emergency activities.

ISO utilizes Item 560, which is found in the Fire Suppression Rating Schedule (FSRS), to provide criteria for the evaluation of fire company distribution in communities. The following excerpt is from the ISO criteria for distribution of companies:

> *The built-upon area of the city should have a first-due engine company within 1-1/2 miles and a ladder-service company within 2-1/2 miles. ISO establishes "standard response districts" around each existing fire station. The standard response district for an engine company is a polygon defined by streets leading from the fire station out to a distance of 1.5 road miles. For a ladder-service company, the standard response district is a polygon defined by streets out to a distance of 2.5 road miles.*
>
> *For each fire station, we count the fire hydrants within the standard response district. When fire hydrants are not available, we measure the total linear road miles in the standard response district. We then identify contiguous built-upon areas in the community that do not have a fire station within the specified distance.* [17]

The ISO PPC rating plays a significant role in a community's ability to sustain economic development. The PPC is used as a component for calculating local business and residential insurance rates. When a community's classification rating is high, insurance rates are increased, which has an adverse effect on local businesses. Increased insurance rates may cause businesses to look past the community when planning to relocate in an effort to reduce the impact on the company's profit margins.

Currently the area known as the South County Fire Authority carries a split classification ISO PPC rating of **3/5/8**. The City of Tracy is rated at **3**, the areas just outside the Tracy city limits are rated at **5** and the rural areas in the District are rated at **8**. Rural areas that have an established water system are rated at **5** as well. It should be noted that the most recent ISO PPC assessment for the South County Fire Authority was conducted in 2000 immediately following the consolidation of the Tracy Fire Department and the Tracy Rural Fire Department.

IV. CRITICAL TASK ANALYSIS OF THE DEPARTMENT

In order to provide life safety and emergency mitigation efforts in an effective manner it is imperative that firefighters respond to emergencies in a timely manner and with enough trained firefighters to safely mitigate the emergency. Critical tasks are those duties that must be conducted by firefighters in order to safely control emergency incidents.

In order to effectively determine the Fire Department's ability to ensure effective service delivery while maintaining a safe working environment the Department must conduct a critical task analysis. The critical task analysis is the process of matching the fire department resource deployment to each type of risk. A critical tasks analysis identifies the necessary staffing level required to safely perform each task and successfully mitigate each risk. A critical task analysis was conducted for the following risk types:

- Structure Fires
- Emergency Medical Calls
- Wildland Fires
- Hazardous Materials Incidents
- Technical Rescue Incidents
- Airport Rescue and Firefighting Incidents

1/15/2005, 14:10 hours, 54 E. 7th Street

A. Critical Task Analysis – Structure Fires

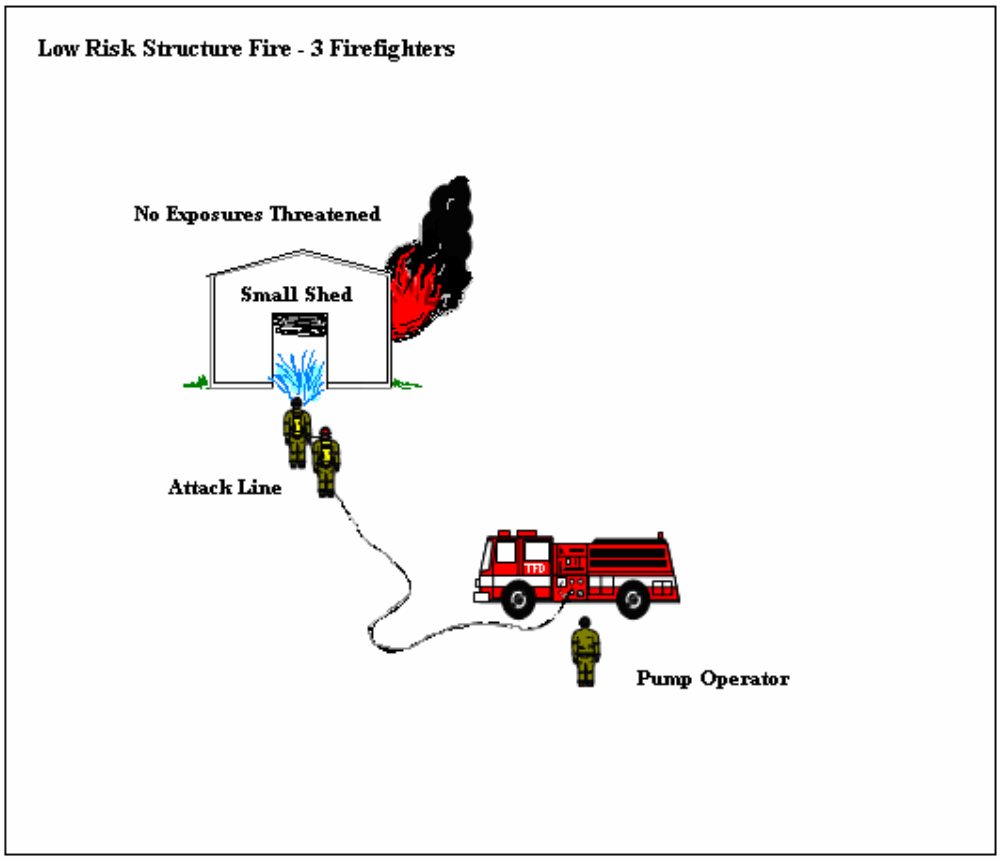
Structure fire risks are categorized into Low, Moderate, Significant and Maximum risks. The critical task analysis for structure fires was developed by reviewing current Tracy Fire Department firefighting operations and comparing them to the nationally recognized standards for fire ground operations in an effort to ensure the Department provides a safe working environment for fire fighters. [18]

1. Low Risk Structures

The following table provides a task analysis for Low Risk structure fires and/or incidents like rubbish fires, small grass fires and incidents that involve a light fire load. The example also takes into consideration the potential for injury or life loss is non-existent and that the potential for exposure issues related to adjacent properties is non-existent.

Task	Number of Firefighters
Attack line	2
Pump operations	1
TOTAL NUMBER OF FIREFIGHTERS:	**3**

Low risk structure fires are normally handled by one fire unit with three fire fighters as demonstrated in the following picture.

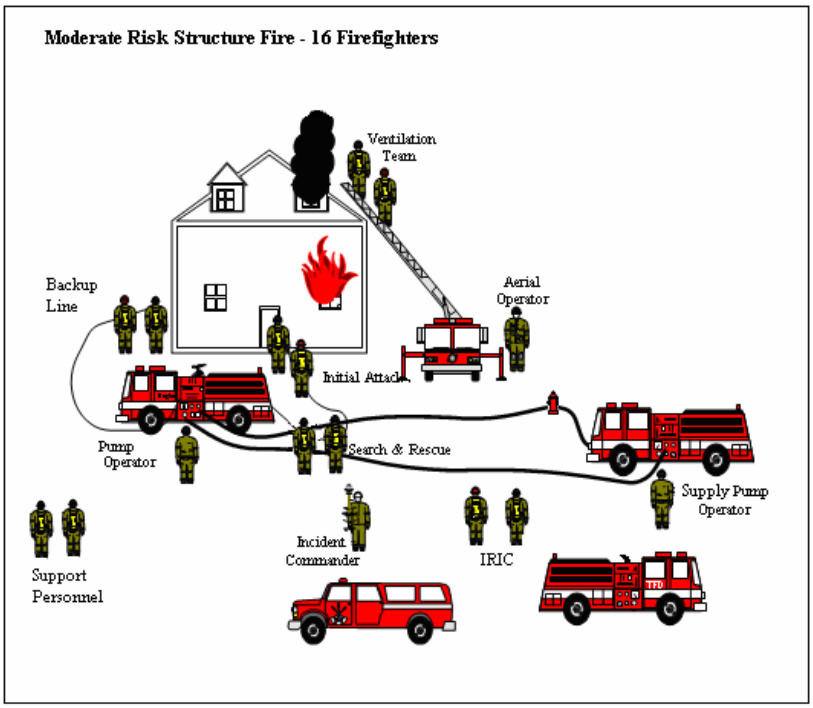


2. Moderate Risk Structures

The following table represents the critical task assignments and personnel requirements for an initial alarm assignment at a "Moderate Risk" structure fire. National response standards recommend that fire departments have the capability to deploy a full first alarm assignment with the initial unit arriving within 5 minutes 90% of the time and the department be able to assemble an effective work force on the scene of the incident within 9-minutes of the time of dispatch 90% of the time.[19]

Task	Number of Firefighters
Attack line	2
Attack support	1
Pump operations	1
Water supply	1
Search and rescue	2
Ventilation	2
Aerial operations	1
Incident Command/Safety	1
Backup line	2
Backup support	1
Initial Rapid Intervention Team	2
TOTAL NUMBER OF FIREFIGHTERS:	**16**

The Tracy Fire Department's initial alarm response to a structure fire includes 3 engines, a ladder truck, a chief officer and a code 2 private ambulance. The ambulance response is utilized for patient care and not as a component of the firefighting force. The number of firefighters currently responding as part of an initial alarm response in Tracy is 12 to 13 firefighters. The following diagram provides an example of how these personnel are utilized and tasks required at a typical "Moderate risk" structure fire.



3. Significant and Maximum Risk Structures

Fire departments should maintain the capability to provide additional alarm assignments when situations are beyond the capacity of the initial first alarm assignment. The National Fire Protection Agency (NFPA) standard recommends when an incident escalates beyond an initial full alarm assignment, or when a significant risk is presented, the Incident Commander (IC) upgrade the number of resources at the incident scene to provide for the increase of the Rapid Intervention Crew (RIC) from a partial crew of 2 fire fighters to a full Rapid Intervention Crew with 4 members. NFPA further recommends that the IC also deploy a Safety Officer.

A critical task analysis for multiple alarm assignments, such as the Sycamore Village Apartments Fire, would require the following response component in order to effectively mitigate the incident and to provide for emergency scene operations, to provide search and rescue activities, to make forcible entry, to preserve property, to provide for fire fighter and resident accountability, and to coordinate support activities such as staging, victim relocation and other duties. The following table is a critical task analysis for a typical "Significant" and "Maximum" Risk structure fires in Tracy.

Task	Number of Firefighters
Attack line	4
Attack support	2
Pump operations	2
Water supply	1
Search and rescue	4
Ventilation	2
Aerial operations	1
Incident Command (IC, Ops, 4-Div's)	6
Safety Officer	1
Information Officer	1
Accountability	1
Backup line	2
Backup support	3
Rapid Intervention Crew	4
TOTAL NUMBER OF FIREFIGHTERS:	**34**

The Tracy Fire Department has a total of 20 firefighters on duty on a daily basis. When the community experiences a significant or maximum risk incident the Department is required to depend on mutual aid resources to mitigate an incident and to provide back-up coverage for the other incidents that may occur in the community. Generally speaking, when fire fighters do not have adequate support resources they will frequently put their own safety at risk in order to handle life threatening situations, perform rescue operations or to mitigate an incident. This increases the likelihood of injury for those fire fighters and often causes those fire fighters to utilize a defensive mitigation mode in order to protect themselves.

The following is an excerpt from an article by Mark Emery that can be found in a recent issue of Firehouse Magazine. This article provides a brief explanation of the impacts of minimal staffing at emergency incidents.

> *Without sufficient resources available for the unexpected, the fire department becomes the victim. Often, a fire department will initiate a "big city" fire ground operation without the resources to support such an operation. Corners are rounded, such as ignoring the "two-in/two-out rule," no safety officer, no rapid intervention, utilities are not stabilized, no coordinated ventilation, no teams in staging, span of control out of control, no exchange teams ready for immediate deployment.*[20]

B. Critical Task Analysis – EMS

1. Routine, Single Patient EMS Incident

Routine EMS incidents can be described as any EMS incident that requires Code 3 (with lights and siren) patient transport to the emergency department. Typical examples of a routine EMS incident include: chest pain, respiratory difficulty, altered level of consciousness, minor trauma, etc.

At a routine EMS incident there are numerous critical tasks that take place in an effort to ensure effective patient care. Normally, the medical aspects of patient care at a routine EMS incident can be competently handled with one Paramedic and one EMT; however, these calls for service also require 3 to 4 additional personnel to perform the following critical tasks that allow for effective patient care:

- Retrieval of equipment
- Maintaining incident scene safety
- Conduct a primary patient assessments (ABC's & vitals)
- Maintaining patient information and obtaining patient records.
- Providing patient interventions as needed
- Reassessment and conducting secondary patient assessments
- Reassess patient status
- Loading patient(s)
- Equipment inventory restocking as needed
- Return to service

One Fire Department company, along with a private ambulance, can provide adequate staffing for a routine single patient EMS incident.

2. Multiple Patient EMS Incident

A multiple patient EMS incident involves more than one (1) patient with major injuries. These types of incidents may or may not be handled with an initial alarm assignment (2 fire companies, 1 Chief Officer, and 1 private ambulance). An example of a multiple patient EMS incident would be a high speed vehicle accident. Typical tasks involved in managing a multiple patient EMS incident are:

- Scene safety
- Incident Command/Safety
- Triage
- Patient assessment
- Fire control
- Vehicle stabilization
- Extrication/disentanglement
- Patient packaging and handling
- Helispot management
- Patient transport
- Fire apparatus to hospital
- Inventory equipment and restock as needed
- Return to service

The number of EMS personnel required at multiple patient EMS incidents depends upon the incident. If ancillary task are required, like extrication, vehicle stabilization, fire control, or landing an air ambulance, then the incident will require additional resources.

3. Multi-Casualty Incident (MCI)

A Multi-Casualty Incident (MCI) is defined as an incident that requires more resources than are required to mitigate a routine single or multiple patient incidents. Generally speaking, an MCI incident involves more than two patients. When mitigating an MCI incident routine procedures are no longer adequate for dealing with the situation. In this situation emergency responders operate under the guidance of the jurisdiction's Multi-Casualty Incident Plan.[21]

The main objective at a Multi-Casualty Incident is to sort and triage patients, while coordinating their packaging and transfer to hospitals best suited to provide appropriate treatment for their injuries. The management of an MCI usually develops from an initial response to a multi-branch organization, depending on the nature and location of the incident as well as the number of patients involved.

The initial response to a possible MCI's in Tracy includes two fire companies, one chief officer, and one private ambulance. Additional resources are often ordered based on the nature of the incident, the triage of patients, and other special needs.

C. Critical Task Analysis – Wildland Incidents

During peak fire season Tracy Fire units respond to multiple wildland incidents both inside and outside of the primary boundaries of our response area. Whether responding to a wildland incident in the San Joaquin Valley or in southern California the process and protocols for mitigating this type of incident are standardized by the California Department of Forestry and the State Office of Emergency Services (OES). The following information focuses on the critical tasks involved in wildland fire mitigation.

1. Small Wildland Fire – Initial Alarm Response

A typical wildland fire response in the South County Fire Authority can be handled by a first alarm assignment which includes two (2) fire units and a chief officer. This constitutes approximately 6 to 7 fire suppression personnel.

2. Large Wildland Fire – Multiple Alarm Response

When wildland fires escalate beyond a first alarm assignment, additional resources must be requested either from within the Department's service delivery system or from the mutual aid response partners in adjoining communities. If agencies other than Tracy Fire units have not been requested prior to arrival, the IC can request additional resources as needed. Typical critical tasks required during a large wildland fire are listed below:

- Establish a Unified Incident Command Structure
- Provide an Incident Safety Officer
- Delegate Division and Group Supervisor responsibility
- Request and direct fire control activities using air tankers helicopters
- Fire control with Fire Engines
- Fire control with Dozers
- Fire Control with hand crews
- Provide water supply (water tenders)

When a large wildland fire continues to escalate, or if multiple wildland fires occur at the same time, the number of resources required can demand some or all of the South County Fire Authority resources which may preclude them from providing other emergency response services in the normal response areas.

D. Critical Task Analysis – Hazardous Materials

This section identifies and explains the critical task requirements for various levels of hazardous materials incidents. There are two basic levels of haz-mat response classification types in our jurisdiction. Those include minor incidents and County hazardous materials responses. These two types of incidents do not happen on a frequent basis; however, hazardous materials incidents have the potential to create severe life and property loss if not mitigated in a timely and effective manner.

1. Hazardous Materials – Minor Incident

Minor hazardous materials incidents involve known substances and can usually be handled by the initial jurisdiction having authority over the incident. All South County Fire Authority personnel are trained to the First Responder Operational (FRO) level as required by 29 CFR 1910.120. Fire personnel are also trained and capable of performing decontamination activities at a hazardous materials incident.

An initial alarm assignment to a hazardous material incident in the South County Fire Authority will include one fire company with 2 to 3 firefighters. An Engine company responding to a minor hazardous materials incident is expected to investigate and perform the following task:

- Approach the incident scene safely
- Set up initial isolation perimeters until the nature of the incident is determined
- Request resources as needed
- Notify those agencies that regulate haz-mat storage and use
- Establish an Incident Command structure
- Hazard identification from a safe distance (outside of the exclusion zone)
- Develop an initial action plan
- Begin protective actions (evacuations or shelter-in-place)
- Decontaminate suspected exposures

The actions of a hazardous materials first responder (FRO) are typically defensive. Seldom do the initial responders implement controlling measures inside of hazardous areas. At this time the Fire Department has three firefighters per shift who are trained and available to provide Hazardous Materials Technician level response.

A Hazardous Materials Technician can make an entry into an exclusion zone (also known as the “hot zone”). These Technicians have received over 160 hours of specialized hazardous materials training; however, entry into an exclusion zone requires more than 3 Hazardous Materials Technicians. A minimum of six Hazardous Materials “Technicians” are required to make a safe entry into a hazardous material Exclusion Zone. Assembling six Hazardous Materials Technicians can often require a significant amount of time and frequently require a mutual aid request from the County Hazardous Materials Team.

2. Hazardous Materials – San Joaquin County Hazardous Materials Team Response Incident

Hazardous materials incidents requiring entry into the Exclusion Zone usually require a response from other agencies who are members of the San Joaquin County Hazardous Materials Team. Hazardous Materials Technicians and Specialists responding as members of the San Joaquin County Hazardous Materials Team are needed to accomplishment the following task:

- Establish a Hazardous Materials Group
- Assign an Assistant Safety Officer to the H-M Group*
- Set up Control zones and access points to the incident
- Provide a safe refuge area
- Provide a Haz-Mat technical reference specialist*
- Provide entry personnel*
- Provide for medical monitoring
- Provide decontamination

(* HM Technicians or Specialists are required to fill these positions)

Relying upon other agencies to assist at a hazardous materials incident takes time. Frequently it takes over an hour to assemble the 6 to 15 Hazardous Materials Technicians and Specialists needed to form a Hazardous Materials Group. These resources come from as far as the City of Lodi. Consequently, when a response in other areas of the County occur the Tracy Fire Department may be called to respond to that area.

E. Critical Task Analysis – Rescue

The components of rescue operations have been divided into three categories, Technical Rescue, Confined Space Rescue, and Swift water/Flood Rescue. Each category has a critical task analysis to determine the resource needs for each rescue risk.

1. Technical Rescue

The level of qualified rescuers for each type of technical rescue varies based on the nature of the incident. The following table identifies the minimum number of rescuers required for the various types of rescues. [22]

Type 1 (Heavy)	Type 2 (Medium)	Type 3 (Light)	Type 4 (Basic)
• Heavy floor construction • Pre-cast concrete construction • Steel frame construction • High angle rope rescue (incl. highline systems) • Confined space rescue (permit required) • Mass transportation rescue • Personnel per Company	• Heavy wall construction • High angle rope rescue (not incl. highline systems) • Confined space rescue (NO permit required) • Trench and excavation rescue • 6 Personnel per Company	• Light frame construction • Low angle rope rescue • 3 Personnel per Company	• Surface rescue • Non-structural entrapment in non-collapsed structures • 3 Personnel per Company

There are four operational levels of rescuer training, basic, light, medium and heavy rescues. The following paragraphs further explain the nature of each type of training.

Basic – Responders at this level have the basic information to recognize the type of incident, establish command, request appropriate resources, and start initial company operations. Personnel are trained in equipment use and techniques required to operate safely and effectively at incidents involving non-structural entrapment. They are competent at surface rescues that involve minimal removal of debris and can extricate easily accessible victims.

Light – In addition to the Basic training level, personnel can operate safely and effectively at a building collapse involving light frame construction. Light frame construction includes wood construction as well as some metal construction. These responders can perform low angle, one person loads, and rope rescues. The training for this group of responders includes but is not be limited to:

1. Rope system anchors
2. Evacuation litters
3. Rescuer and patient packaging
4. Lowering and raising systems
5. Mechanical advantage systems

Medium – In addition to the Light training, personnel are trained in the use of specialized rescue equipment as well as techniques required to operate safely and effectively at structural collapse incidents involving the collapse or failure of heavy wall construction, high angle rope rescues (not including highline systems), confined space rescues (no permit required), and trench and excavation rescues.

Heavy – In addition to the Medium level of Training required, personnel are trained in the use and techniques of specialized equipment required to operate safely and effectively at structural collapse incidents involving the collapse or failure of heavy floor, pre-cast concrete and steel frame construction, high angle rope rescue (including highline systems), confined space rescue (permit required) and mass transportation rescue.

The Tracy Fire Department can provide Type-4, Basic technical rescue services. The majority of the fire fighters in Tracy are trained to operate at the Basic level. Currently there are eight (8) Tracy firefighters that are trained to the Type-3, Light level and two (2) fire fighters who are trained to the Type-2, Medium level.

The Tracy Fire Department has acquired approximately $90,000 worth of specialized rescue equipment in order to be certified as a Type-2 Medium rescue company. This equipment was received through a Homeland Security Grant.

2. Confined Space Rescue

Ten Tracy firefighters are currently certified as Confined Space Rescue Technicians. The remainder of the Department is trained to the Confined Space Awareness level. The critical task assignments for confined space rescue are identified in the left column of the matrix below.

Position	Minimum Training Requirements To Fill Position
Incident Commander	Hazardous Materials Incident Commander
Entry Supervisor	Confined Space "Operational" & Haz-MatFirst Responder Operational
Attendant	Confined Space "Operational" & Haz-Mat Technician
Primary Entrant #2	Confined Space "Operational" & Haz-MatFirst Responder Operational
Primary Entrant #2	Confined Space "Operational" & Haz-MatFirst Responder Operational
Back-up Entrant #1	Confined Space "Operational" & Haz-MatFirst Responder Operational
Back-up Entrant #2	Confined Space "Operational" & Haz-MatFirst Responder Operational
Safety Officer	Confined Space "Operational" & Haz-MatFirst Responder Operational
Air Monitor	Confined Space "Awareness" & Haz-Mat Technician

The ability to perform confined space rescue is a critical skill to have in this geographic area. Frequently confined space rescue operations occur in agricultural areas as well as in areas that are experiencing commercial and industrial growth. Facilities like the new Waste Water Treatment Facility often present the potential for confined space rescue events.

The California Code of Regulations, Title 8, Chapter 4, Section 5192 requires certain positions be filled during a confined space rescue incident. Further the NFPA's 1670 Standard for Confined Space Rescue Operations outlines the training requirements necessary to conduct confined space rescue operations in a safe and effective manner. Those levels of training for the respective critical task positions are also outlined in the right column of the matrix above.

Confined space incidents require a total of seven rescuers. Most will need to be trained at the Confined Space Technician level. One must have Hazardous Materials Incident Commander certification, and one must be a certified Hazardous Materials Technician who is skilled in air monitoring. Air monitoring is a critical component in a confined space rescue due to the potential for encountering areas that have trapped gasses and hazardous chemicals.

3. Swift Water/Flood Rescue

The ability to safely rescue victims from rapidly moving water depends upon the training of the rescuers and the type of equipment available. There are three levels of water rescue training; Awareness, Operational, and Technician.

The following table lists the critical tasks as well as the types of swift water rescue resources required to conduct and successfully complete a swift water rescue.

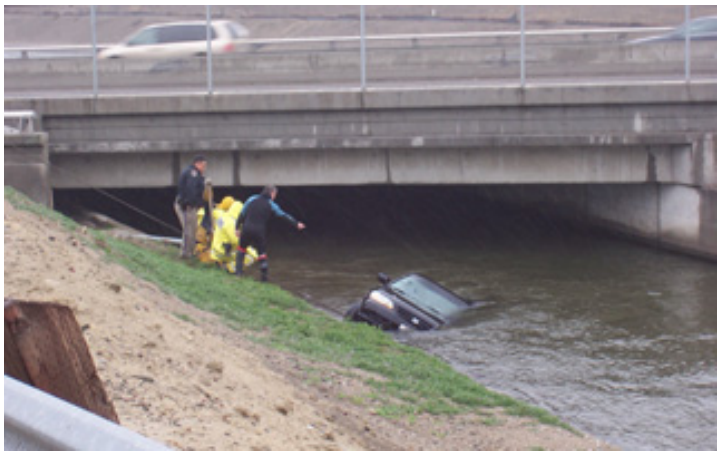
Swiftwater/Flood Search and Rescue Resource Typing

Type 1	Type 2	Type 3	Type 4
• Manage search ops • Power vessel ops • In-water contact rescues • Helicopter operational • Technical rope systems • Haz-Mat • Animal rescue • EMS-ALS • Communications • Logistics • Capable of 24 hr. ops • 14 members with 6 trained at Tech level or above	• Manage search ops • Power vessel ops • In-water contact rescues • Helicopter operational • Technical rope systems • Haz-Mat • Animal rescue • EMS-BLS • Capable of 24 hr. ops • 6 members trained at the Technician level or above.	• In-water contact rescues • Assist in search ops • Non-power water craft • Haz-Mat • Animal rescue • EMS-BLS • Capable of 24 hr. ops • 4 members trained at the Operational level or above.	• Low risk • Land based rescue • Haz-Mat • EMS-BLS • Capable of 24 hr. ops • 3 members trained at the Awareness level or above.

Each apparatus in the Tracy Fire Department's response system is considered a Type-4 Swift Water/Flood Search and Rescue resource. Each unit carries 3 life jackets and throw ropes that allow them to safely perform land based water rescues. The majority of Tracy Fire personnel are trained to the water rescue Awareness level. To provide a higher level of Swift Water/Flood Search and Rescue service, the Fire Department needs to provide additional training. Due to the proximity of waterways in the response area the Fire Department is working on a training plan that will incorporate swift water rescue as a key component of the overall rescue training protocols.

Currently the Department has a 12' inflatable non-powered water craft that is stored at Fire Station 91 on W. Eleventh St. One Department employee is also qualified to teach the Operational level of Swift Water/Flooding Search and Rescue Training.

The Tracy Fire Department does not have underwater dive capabilities; however, the Stockton Fire Department provides emergency rescue dive team services in the area. Their response depends on the availability of their resources and a normal response time can exceeds 30 to 35 minutes.



F. Critical Task Analysis – Airport Rescue and Firefighting

An emergency incident involving aircraft is separated into two categories based on the size of the aircraft. Those types are small scale aircraft incidents and large aircraft incidents. The critical task analysis for both categories is included below.

1. Small Aircraft

Small aircraft incidents are similar to multiple patient EMS incidents such as high speed vehicle accidents. These incidents can normally be handled with an initial alarm assignment (2 fire companies, 1 Chief Officer, and 1 private ambulance).

Typical critical tasks for a small aircraft incident include:

- Scene safety
- Incident Command/Safety
- Patient Triage and Assessment
- Fire control
- Aircraft stabilization
- Extrication/disentanglement
- Patient packaging and handling
- Helispot management
- Patient transport
- Fire apparatus to hospital
- Inventory equipment and restock as needed
- Return to service

The number of personnel required to mitigate a small aircraft incident depends upon the nature of the incident and the number of souls involved. If ancillary task such as extrication, fire control water supply management or Helispot landing of an air ambulance are required the incident will certainly require additional resources.

2. Large Aircraft

Depending on the location of the incident, large aircraft incidents are often similar to a combination of multiple incidents. Large aircraft incidents can generate multiple casualties, structure fires, and specialized or confined space or water rescue incidents based on their location. The initial response to a large aircraft incident in the Tracy area includes four fire companies, one chief officer, and one private ambulance. Additional resources are then ordered based on the incident, a triage of patients, and other special needs.

V. RESPONSE EFFECTIVENESS

With an understanding of risks in the community and how the Fire Department provides appropriate staffing for each risk, it is necessary to discuss response performance and response reliability in the service area. This section looks at actual South County Fire Authority incident history in an effort to measure performance and reliability of fire resources. Performance is measured by looking at historical response data from three different perspectives. Those perspectives are:

- Jurisdiction
- First-in response areas
- Specific geographic areas.

Company reliability, or a fire stations ability to handle calls in its primary response area, is also discussed in this section.

A. Compliance with existing response objectives for each jurisdiction

This section identifies each jurisdiction, the current response objectives for that region and a graph displaying past response performance for each specific area. Due to the nature of the population, the demands for service and occupancy types, the City of Tracy and Tracy Rural Fire Protection District utilize different response objectives.

City of Tracy

The following are the existing response objectives for the City of Tracy. These objectives were adopted by the Tracy City Council as part of the 1998 Standards of Response Coverage Report:

1. ***To respond to 95% of all calls for emergency assistance within 5 minutes of dispatch.***

2. ***To provide a minimum of 13 firefighters for initial attack to low risk structural fires within 10 minutes of dispatch 95% of the time.***

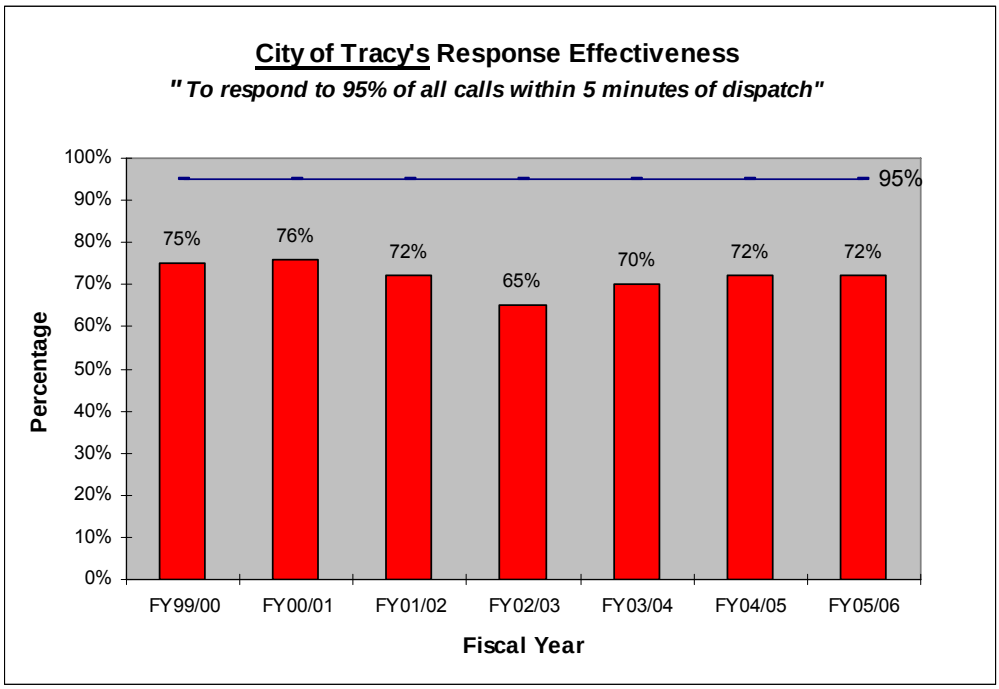
3. ***To provide a minimum of 17 firefighters for initial attack to moderate risk structural fires within 15 minutes of dispatch 95% of the time.***

4. ***To provide a minimum of 21 firefighters for initial attack to high risk structural fires within 20 minutes of dispatch 95% of the time.***

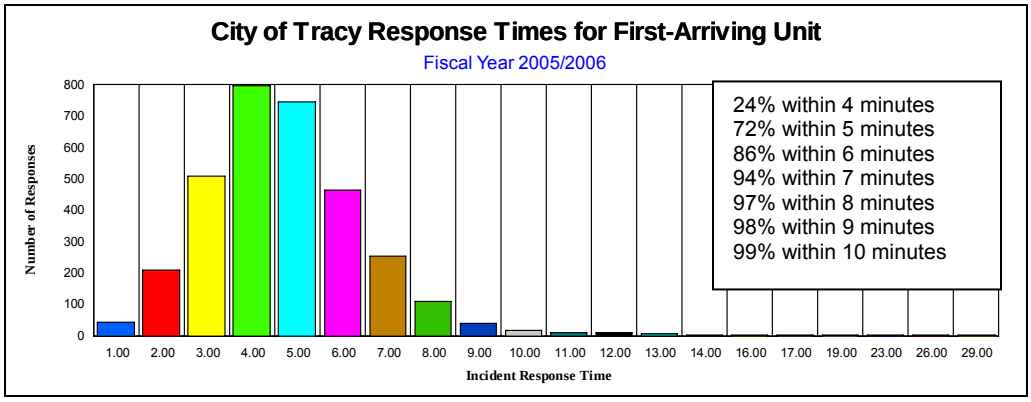
5. ***To maintain fire losses at a per capita dollar level not to exceed the last five year annual loss averages adjusted for inflation and market value (property + content of structure fires only).***

The charts below display the Fire Department's ability to meet Response Objective 1 from FY 99/00 through FY 05/06.

Response Objective 1: "To respond to all calls for emergency assistance within 5 minutes of dispatch, 95% of the time."

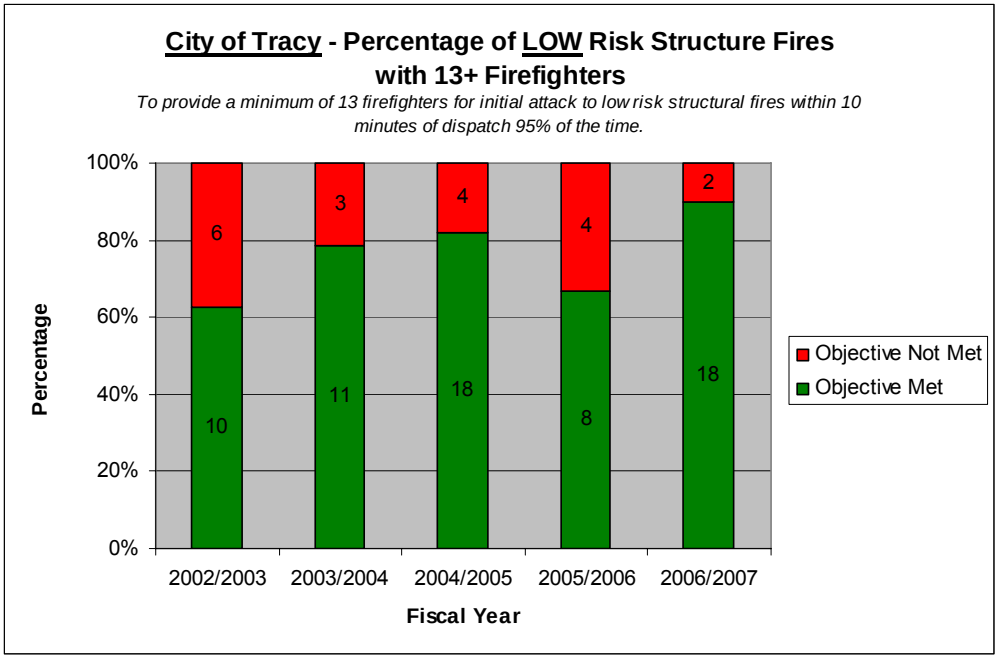


As the above listed chart demonstrates, the Fire Department has been unable to meet this response goal during any of the fiscal years identified in the chart. The closest the Department came to meeting this goal was in FY 00/01 with the total performance percentage of 76%. The chart below displays response performance for first arriving Fire Department Units across the entire City of Tracy during FY 05/06. This chart demonstrates the Fire Department arrived on the scene of emergency incidents within 7 minutes 94% of the time.



Response Objective 2: "To provide a minimum of 13 firefighters for initial attack to low risk structural fires within 10 minutes of dispatch 95% of the time."

The chart below identifies the number of times the Fire Department met the minimum staffing goal for structural fires between FY 02/03 and FY 05/06. Although the number of fire incidents represents a small portion of the overall call volume for the Department, structure fires present a significant risk to the health and safety of residents and fire fighters when minimum critical tasking levels are not met. The chart shows the objective was met in approximately 63% of the incidents in 02/03, 79% of the incidents in 03/04, 82% of the incidents in 04/05, 67% of the incidents in 05/06 and 90% of the incidents 06/07.

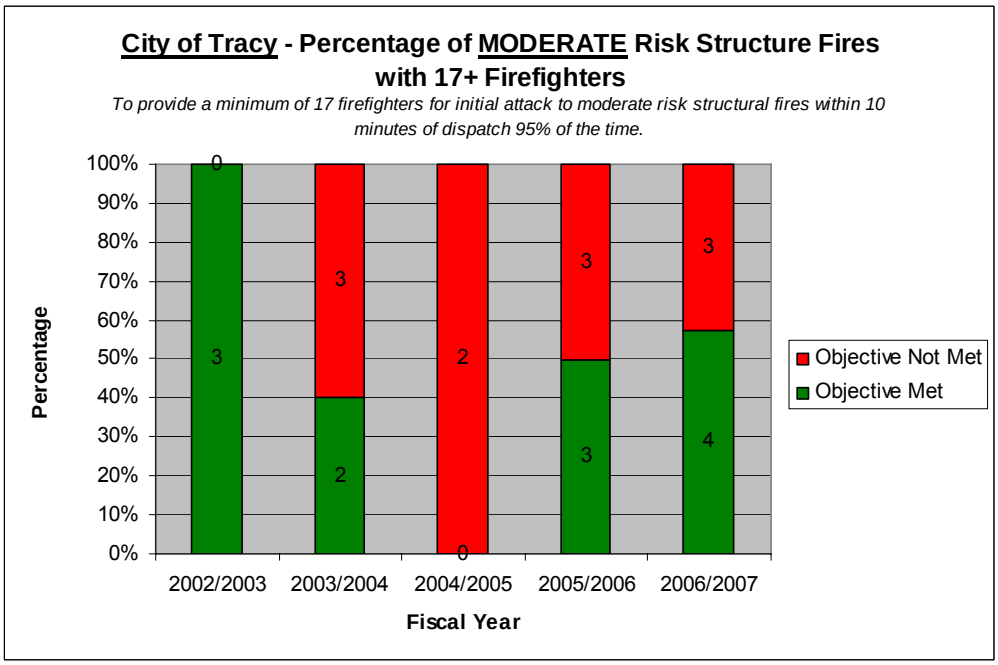


Since FY 05/06 the Department has made every effort possible to ensure adequate staffing levels were provided at fire incident scenes in an effort to provide adequate levels of safety for fire fighters and citizens. This has happened by changing response protocols and deployment strategies.

Response Objective 3: "To provide a minimum of <u>17 firefighters</u> for initial attack to <u>moderate</u> risk structural fires within 15 minutes of dispatch 95% of the time."

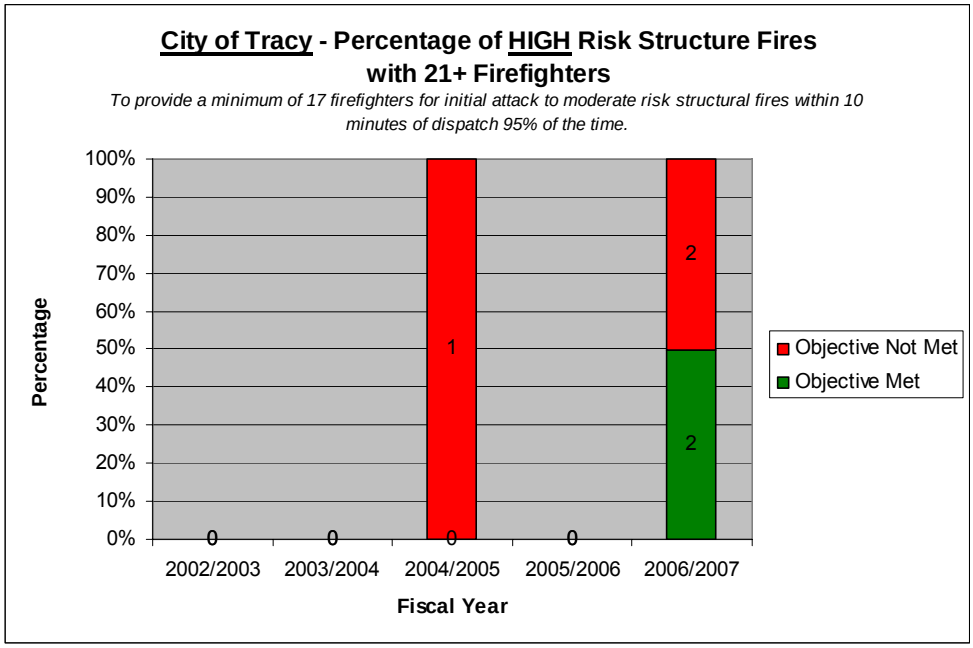
The following matrix identifies that Department goals in this area were not met at all prior to FY 06/07. Due to the distribution of current response resources the Department is challenged to meet this goal. In order to meet this goal the Department would be required to utilize six of the seven emergency response units from across the current response system which would leave the remaining coverage areas unprotected until mutual aid resources could arrive and backfill stations. The utilization of mutual aid resources as primary response units make our community dependent on the availability of those resources and cause the community to assume an unnecessary level of risk.

Given the fact that the closest mutual aid resources respond from either Lathrop or Alameda County, it could take from 20 to 30 minutes to receive the assistance necessary to provide adequate safety and protection to our community based on the availability of those resources as well as the traffic pattern and time of day.



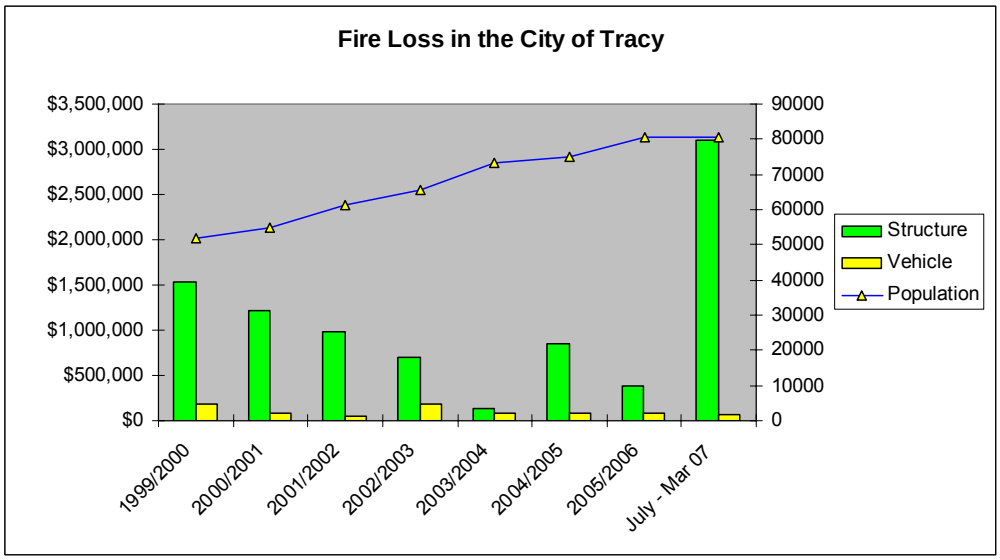
Response Objective 4. "To provide a minimum of <u>21 firefighters</u> for initial attack to <u>high</u> risk structural fires within 20 minutes of dispatch 95% of the time."

This objective is infrequently measured or utilized and is currently under review.



Response Objective 5. "To maintain fire losses at a per capita dollar level not to exceed the last five year annual loss averages adjusted for inflation and market value (property + content of structure fires only)."

When developing annual performance measures, fire departments frequently use the control of dollar to measure the success of the agency. Due to the fact that fire departments have little control over the number of fire incidents that occur in their respective jurisdiction it is difficult to anticipate the potential for controlling fire loss. Given this fact, Response Objective 5 is also under review with a probable recommendation this measure be removed from the performance objectives and replaced with another more meaningful objective.



Tracy Rural Fire Protection District

Response objectives for the Tracy Rural Fire Protection District were developed at the time of consolidation. Those performance objectives are:

1. **To respond to 50% of all calls for emergency assistance within 5 minutes of dispatch.**

2. **To provide a minimum of 13 firefighters for initial attack to low risk structural fires within 10 minutes of dispatch 80% of the time.**

3. **To provide a minimum of 17 firefighters for initial attack to moderate risk structural fires within 15 minutes of dispatch 95% of the time.**

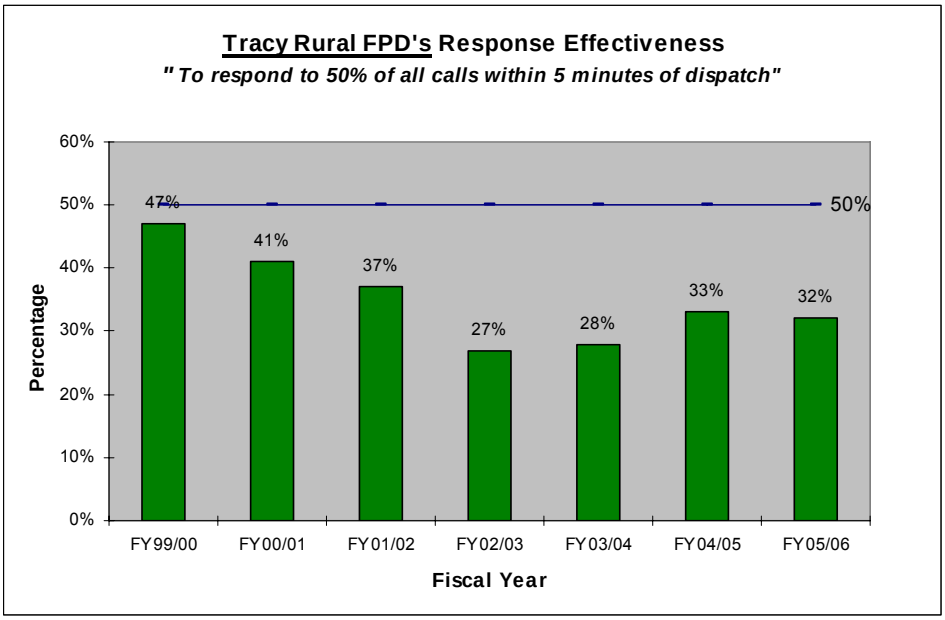
4. **To provide a minimum of 21 firefighters for initial attack to high risk structural fires within 20 minutes of dispatch 95% of the time.**

5. **To maintain fire losses at a per capita dollar level not to exceed the last five year annual loss averages adjusted for inflation and market value (property + content of structure fires only).**

The charts on the following pages display how the Fire Department has done over the past seven fiscal years at accomplishing existing Tracy Rural Fire Protection District response objectives.

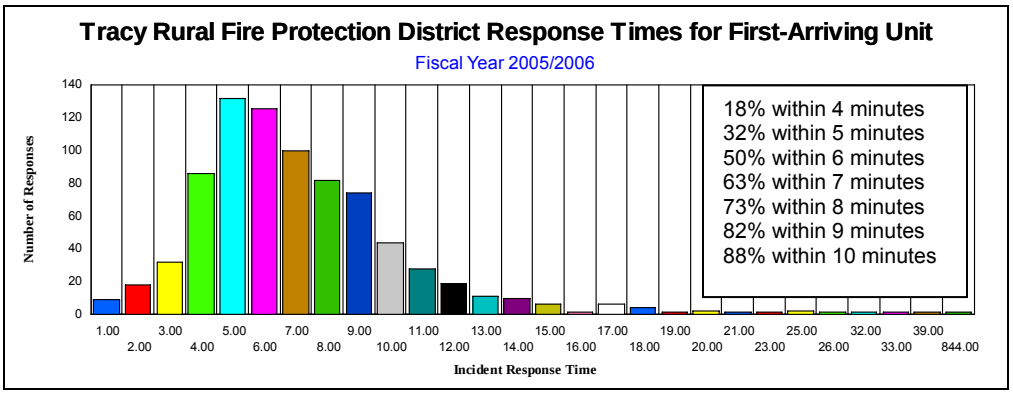
Response Objective 1: To respond to 50% of all calls for emergency assistance within 5 minutes of dispatch.

This chart shows that Fire Department units struggle to meet the response objective. This is due to several reasons, but the predominant reason is the vast amount of coverage area currently protected.



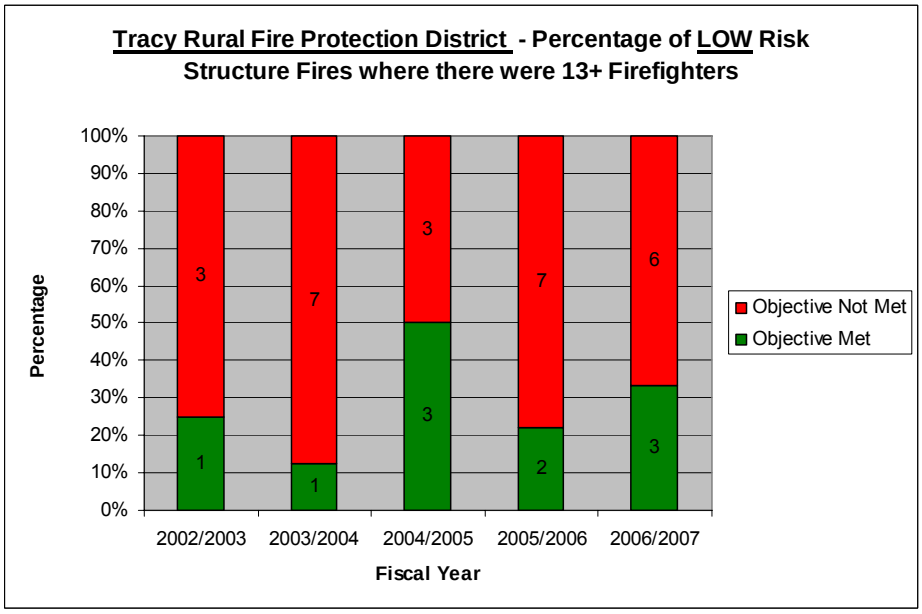
At this time, three (3) fire units provide primary response to approximately 140 square miles of coverage area. It is true that a large portion of this area is undeveloped agricultural land, which when incidents do occur; it takes fire units a significant amount of time to travel long distances in order to provide emergency response service. In addition, two of the units located in rural response areas that border the City of Tracy also have primary response areas in the City of Tracy. This fact creates situations in which these units may be tied up on a call in the City and may be unavailable to respond to a call in their rural area in a timely manner.

The underlying theme of these performance statistics begs the question regarding how this objective was established, whether it's realistic and whether, or not, it needs to be changed. The Department will be making recommendations regarding this goal. The following chart displays the response performance for the first arriving unit to all emergency incidents in the Tracy Rural Fire Protection District during Fiscal Year 2005/2006. As this chart identifies Fire Department units have arrived on the scene within 6 minutes 50% of the time during FY 05/06.

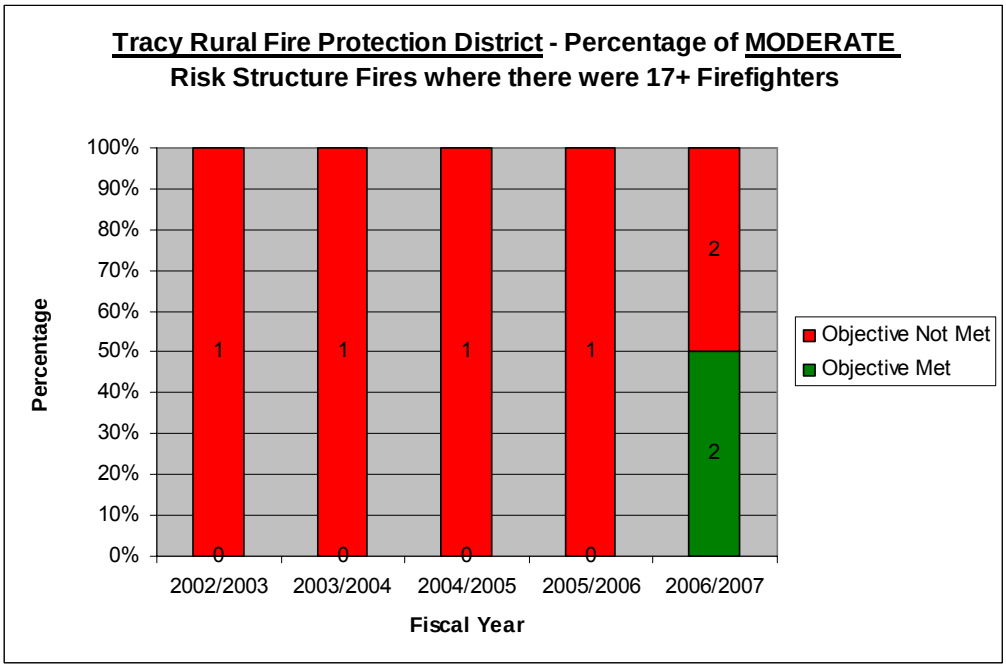


Response Objective 2. "To provide a minimum of <u>13 firefighters</u> for initial attack to <u>low</u> risk structural fires within 10 minutes of dispatch 80% of the time."

This chart identifies the rural areas are experiencing similar situations to those in the City.

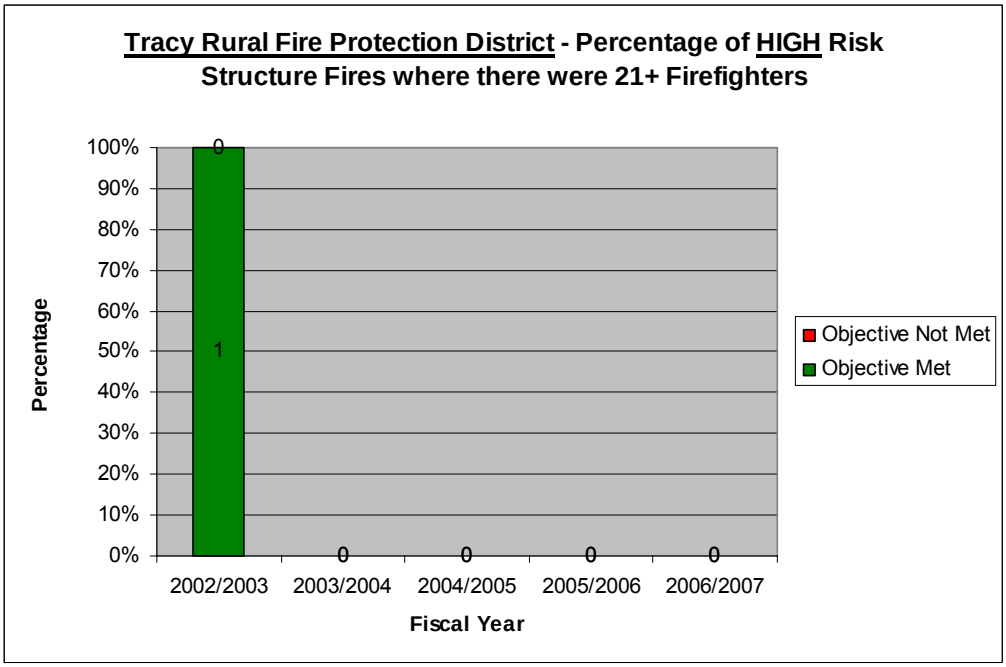


Response Objective 3. "To provide a minimum of <u>17 firefighters</u> for initial attack to <u>moderate</u> risk structural fires within 15 minutes of dispatch 95% of the time."



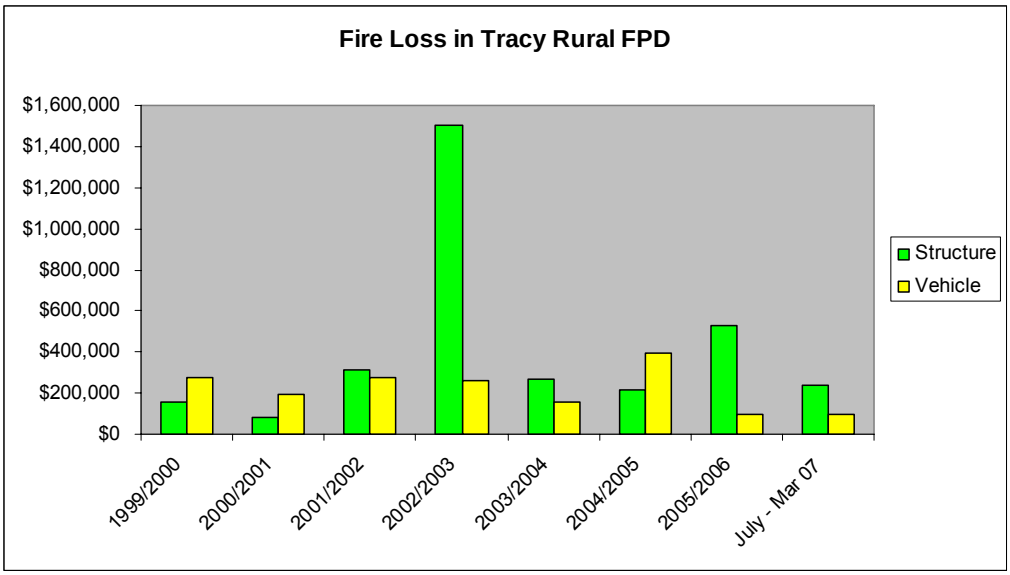
Response Objective 4. "To provide a minimum of <u>21 firefighters</u> for initial attack to <u>high</u> risk structural fires within 20 minutes of dispatch 95% of the time."

Other than information from FY 02/03 no statistics relative to this performance measure are available.



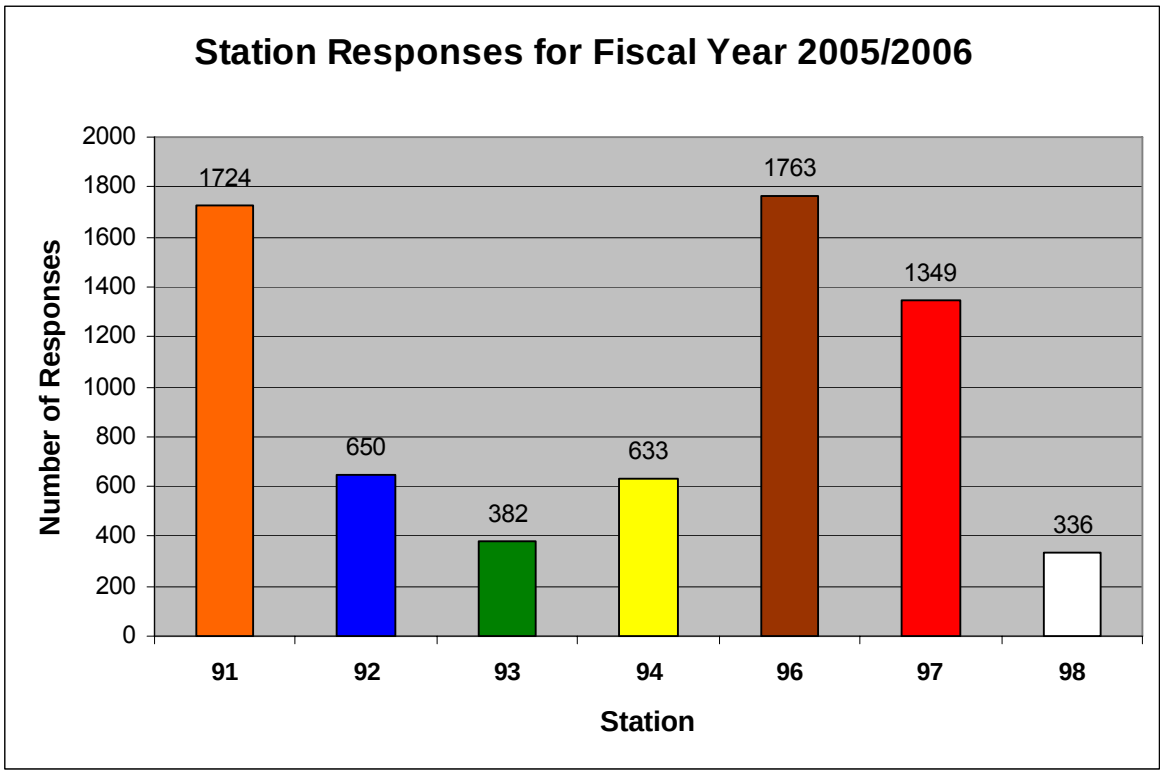
Response Objective 5. "To maintain fire losses at a per capita dollar level not to exceed the last five year annual loss averages adjusted for inflation and market value (property + content of structure fires only)."

As previously mentioned, utilizing fire loss as an official performance measure requires the Department to measure based on a statistic they have little control over. This objective is also under review.



B. <u>First-in response areas for each jurisdiction</u>

A closer look at data for each station's response area provides a more in-depth picture of response performance. The following information represents the number and types of calls in each stations response area, where each stations responses have occurred, and how each station has performed relative to the response objectives. The chart on the following page compares the number of incidents that each company responded to during Fiscal Year 2005/2006.



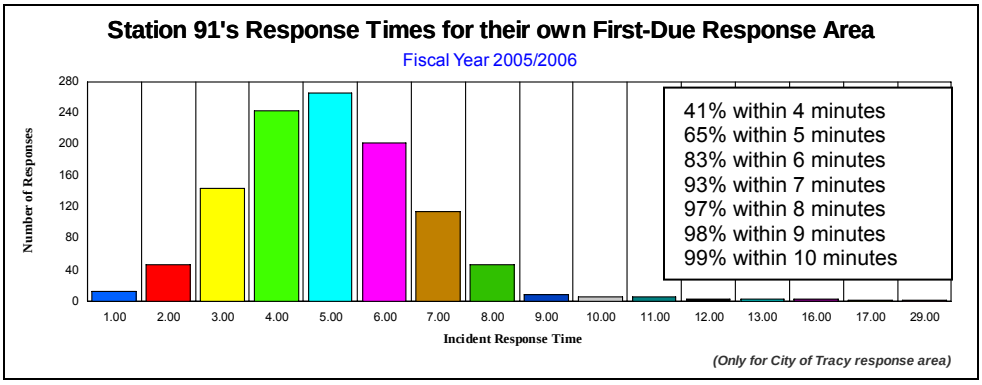
Station 91

During FY 05/06 Station 91 responded to 1724 calls for emergency service. Ninety-six percent (96%) of these calls were in the City of Tracy, two percent (2%) were in the rural area, one percent (1%) was on the freeway system and one percent (1%) occurred in the unprotected area north of the district. EMS calls made up 65% of the calls for service for Station 91 with this unit's busiest area being in and around the West Valley Mall and west of Downtown Tracy. Station 91 arrived at 65.8% of all the code 3 calls in their own response areas within the City in five minutes or less during Fiscal Year 2005/2006.

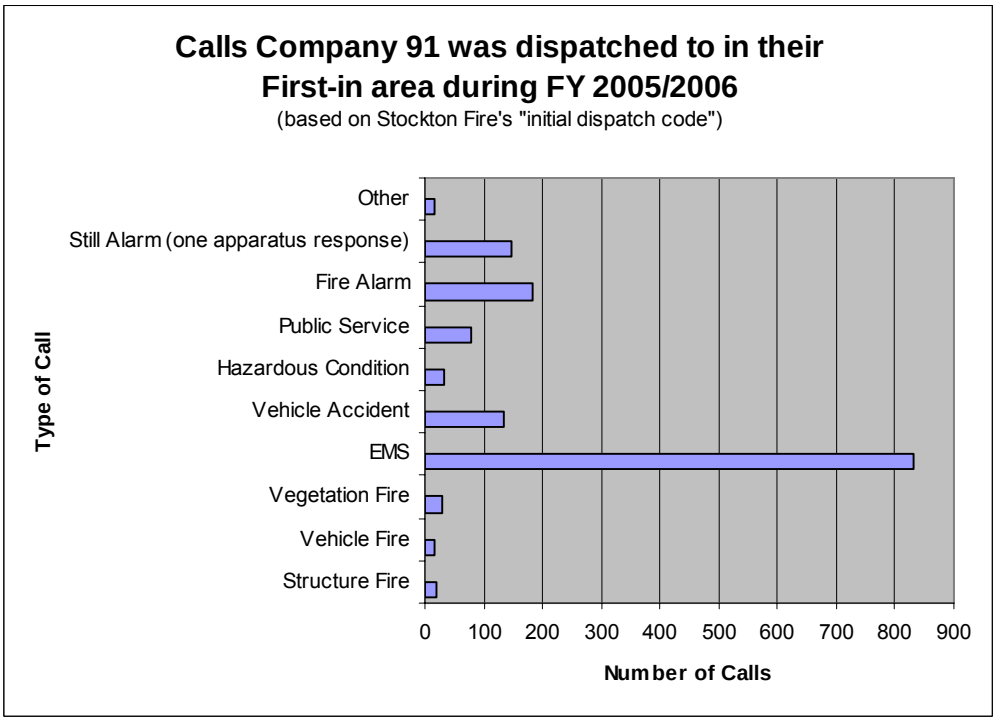
Station 91 First-in Performance (code 3 calls for 1st arriving unit only)

91	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	443	474	617	1534
Total Calls in 1st due area:	870	901	938	2709
Response % <or = 5 min in 1st due:	50.9%	52.6%	65.8%	56.6%

The following chart identifies Station 91's response times in its first due response area.



The following chart identifies the various call types responded to by Station 91. This chart identifies that EMS calls were the primary source of calls for service for Station 91with more than 800 EMS calls during FY 05/06.



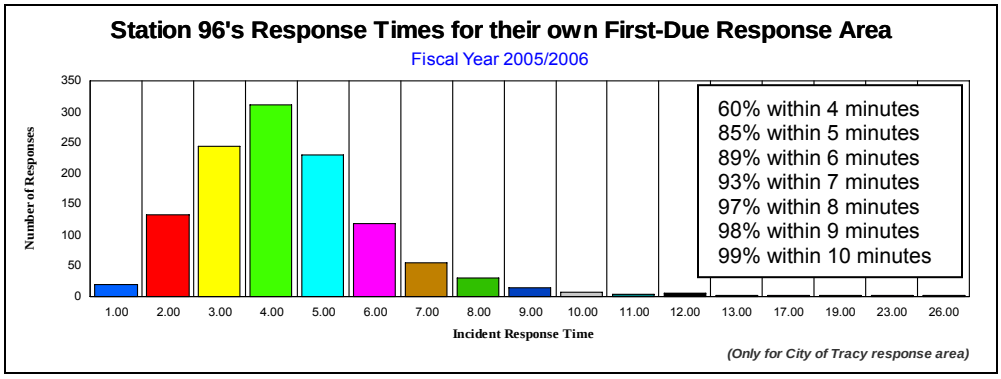
Station 96

Station 96 responded to 1763 calls for emergency service during FY 05/06. Eighty-four percent 84% of these calls occurred in the City. Eight percent (8%) occurred in the rural area, six percent (6%) occurred on the freeways and two percent (2%) occurred in the unprotected area. EMS calls made up sixty-eight percent (68%) of the responses for Station 96 inside of the City of Tracy. The company's busiest areas were near convalescent hospitals and assisted living homes as well as the industrial occupancies along Mac Arthur Drive. Station 96 arrived at 85.1% of all the code 3 calls in their own response areas within the City in five minutes or less during Fiscal Year 2005/2006.

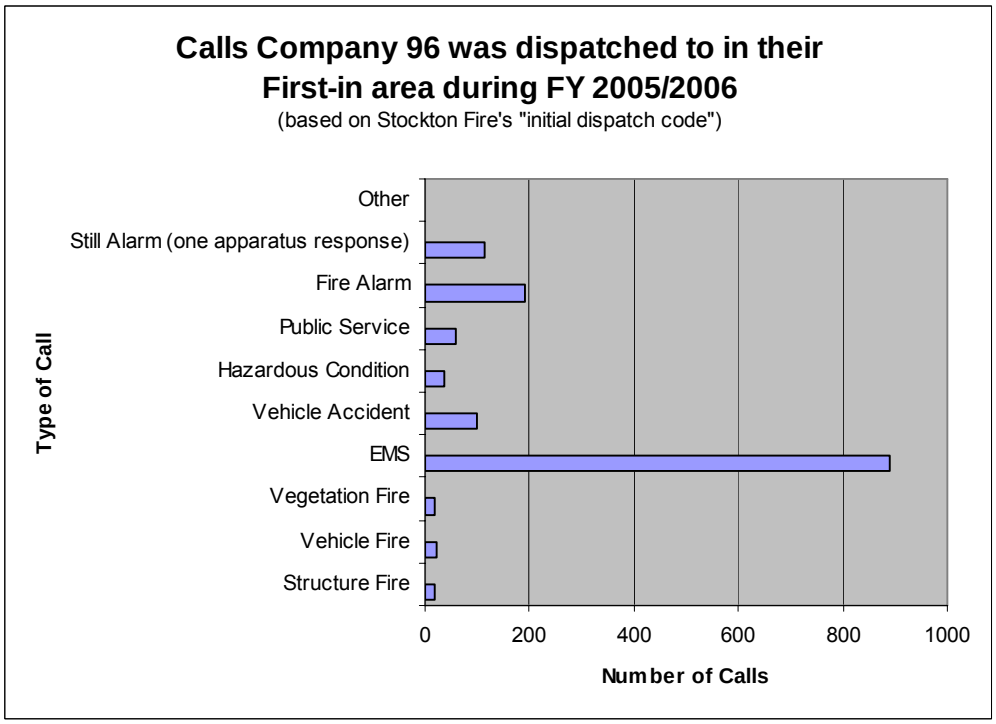
Station 96 First-in Performance (code 3 calls for 1st arriving unit)

96	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	906	879	847	**2632**
Total Calls in 1st due area:	1052	1041	995	**3088**
Response % <or = 5 min in 1st due:	**86.1%**	**84.4%**	**85.1%**	**85.2%**

The following chart identifies the response time performance for Station 96 in their first due response area.



The following chart identifies the predominant call types for Station 96 during FY 05/06



City Station 97

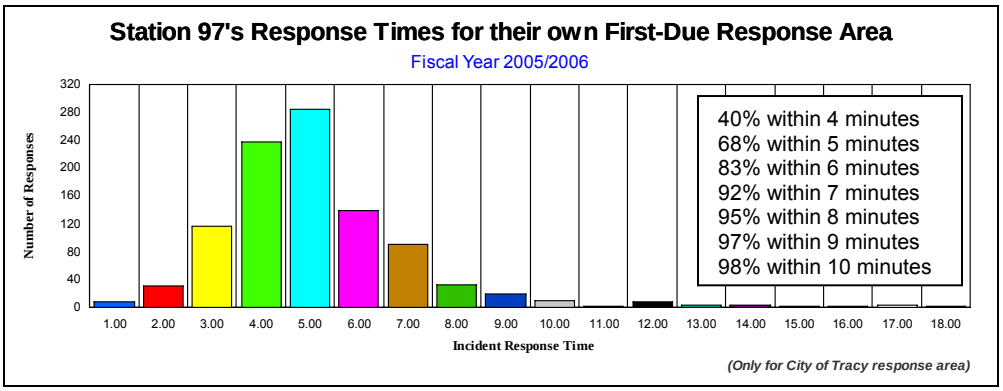
Station 97 responded to 1349 calls for emergency service during FY 05/06. Eighty-six percent (86%) of those calls occurred within the City, eleven percent (11%) occurred in the rural area, one percent (1%) on the freeways and one percent (1%) occurred in the unprotected area as well as one percent (1%) involved the provision of mutual aid to other cities. EMS calls and vehicle accidents made up 64.7% of all of the calls that Station 97 handled inside of the City of Tracy. Station 97's busiest areas were around the downtown and in the neighborhoods of Hidden Lake, Glenbriar, and Brookview.

Station 97 arrived at 68.2% of all the code 3 calls for service in their primary response areas in the City within five minutes or less during Fiscal Year 2005/2006.

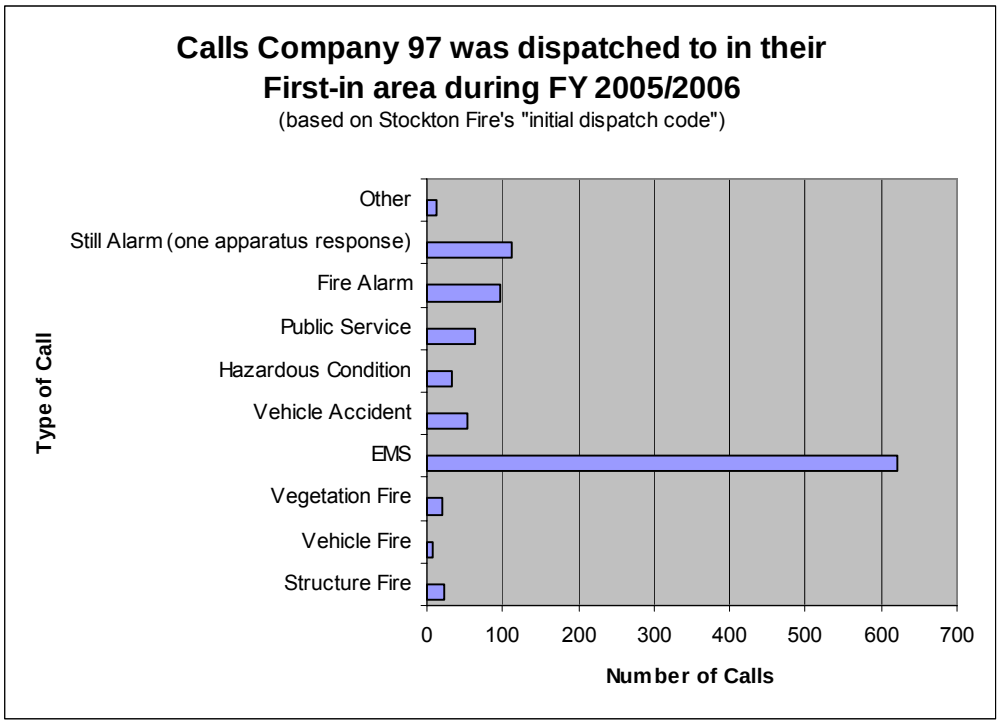
Station 97 First-in Performance (code 3 calls for 1st arriving unit)

97	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	603	528	484	**1615**
Total Calls in 1st due area:	842	732	710	**2284**
Response % <or = 5 min in 1st due:	**71.6%**	**72.1%**	**68.2%**	**70.7%**

The following chart identifies Station 97's response time compliance in their first due response areas.



The following chart identifies the predominant call types responded to by Station 97.



Rural Station 92

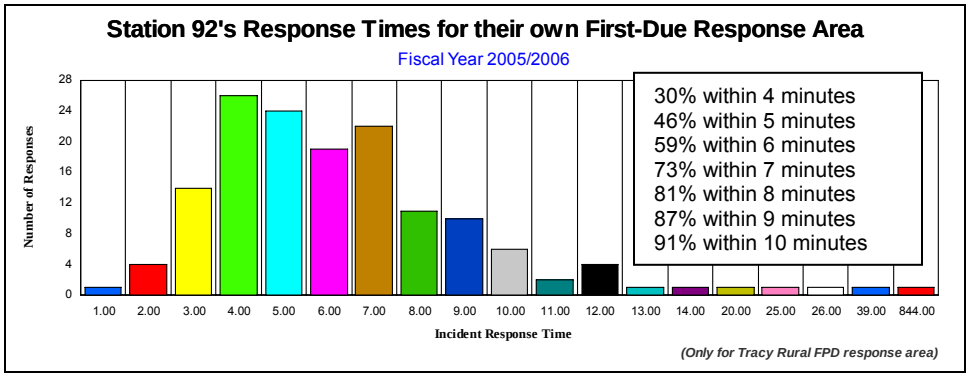
Station 92 responded to 628 calls during Fiscal Year 2005/2006. Twenty-four percent (24%) of those calls occurred in the City, thirty-nine percent (39%) in the rural areas, twenty-one percent (21%) on the freeways, and sixteen percent (16%) in the unprotected area and providing mutual aid response to other communities. EMS and Vehicle accidents made up 52.7% of all Station 92's calls in their own response area. The majority of Station 92's responses occurred on Interstate 5 and 205.

The following table displays the number of code 3 calls in Station 92's first-in area where the Fire Department arrived in 5 minutes or less. These calls do not include freeway, City of Tracy, or mutual aid calls.

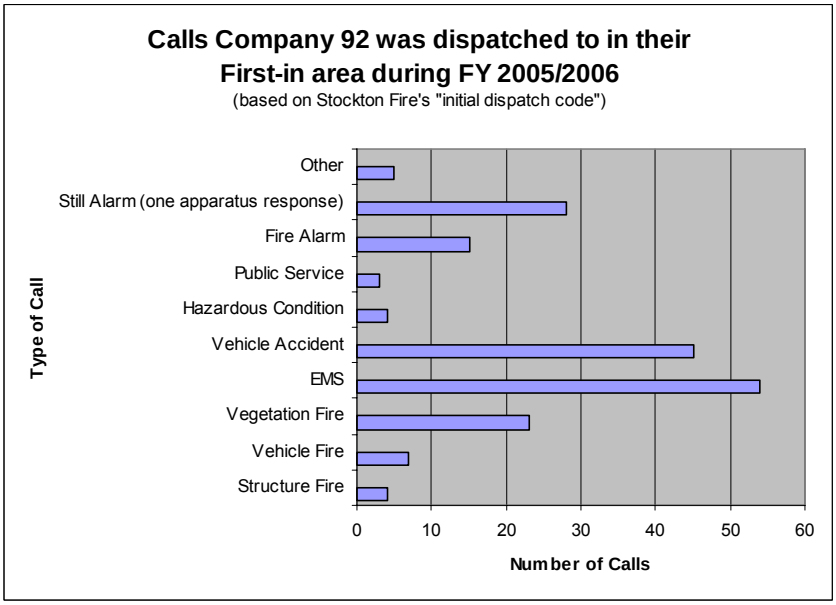
Station 92 First-in Performance (code 3 calls for 1st arriving unit in 92)

92	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	47	71	68	**186**
Total Calls in 1st due area:	121	128	148	**397**
Response % <or = 5 min in 1st due:	**38.8%**	**55.5%**	**45.9%**	**46.8%**

The following chart identifies Station 92's ability to meet the response time goal in its first-due area.



The chart below identifies the predominant call types for Station 92.



The following table displays where Station 92's responses occurred during Fiscal Year 2005/2006:

# of Responses	% of Total	Location of Responses
148	23.6%	92's First Due Response Area
98	15.6%	Other Tracy Rural FPD response areas
32	5.1%	Interstate 5 (Only Tracy Rural FPD areas)
99	15.8%	Interstate 205
150	23.9%	City of Tracy (20 in the NE Industrial area)
101	16.1%	Mutual Aid (87 were on I-5 in Lathrop-Manteca)

The busiest areas inside of Station 92's 5 minute response zone were around the town of Banta (15 responses) and the 11th Street corridor between Banta Road and Interstate 5 (13 responses). Looking at all of Station 92's responses, their busiest areas were the freeways.

Station 92 responded to 218 freeway incidents during Fiscal Year 2005/2006 (including freeway calls to the Lathrop-Manteca area). Freeway incidents accounted for 35% of all of Station 92's responses. There were 119 responses to Interstate 5 (87 were in the Lathrop-Manteca area and 32 were inside of the Tracy Rural Fire Protection District) and 99 responses to Interstate 205.

Station 93

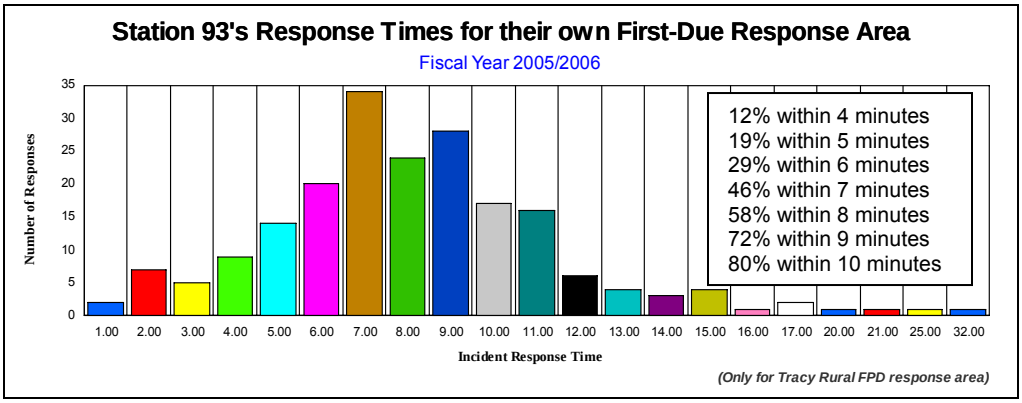
Station 93 responded to 382 emergency calls for service during Fiscal Year 2005/2006. Three percent (3%) occurred in the City, eighty-one percent (81) in the rural area, eight percent (8%) on the freeways and seven percent (7%) in the unprotected areas and on mutual aid. EMS and Vehicle accidents made up 54.6% of all Station 93's calls in their own district. That company's busiest area was the San Joaquin River Club (48 calls).

Station 93 arrived at 18.6% of the 156 code 3 calls in their own response area within five minutes or less during Fiscal Year 2005/2006. The 5 minute 50% of the time response objective was only achieved 4.1% of the time at the San Joaquin River Club which is one of Station 93's busiest areas.

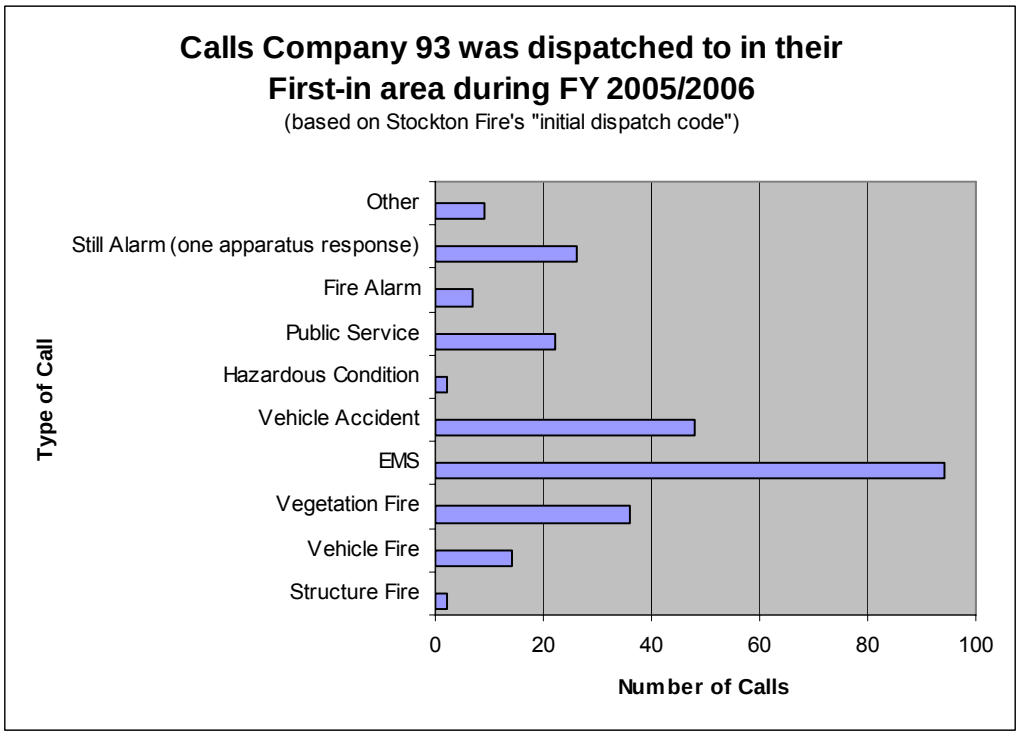
Station 93 First-in Performance (code 3 calls for 1st arriving unit only)

93	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	26	45	29	**100**
Total Calls in 1st due area:	167	201	156	**524**
Response % <or = 5 min in 1st due:	**15.6%**	**22.4%**	**18.6%**	**19.1%**

The following chart identifies Station 93's ability to meet the response objective in their first due response area.



The following chart identifies the predominant call types in Station 93's response area.



Station 94

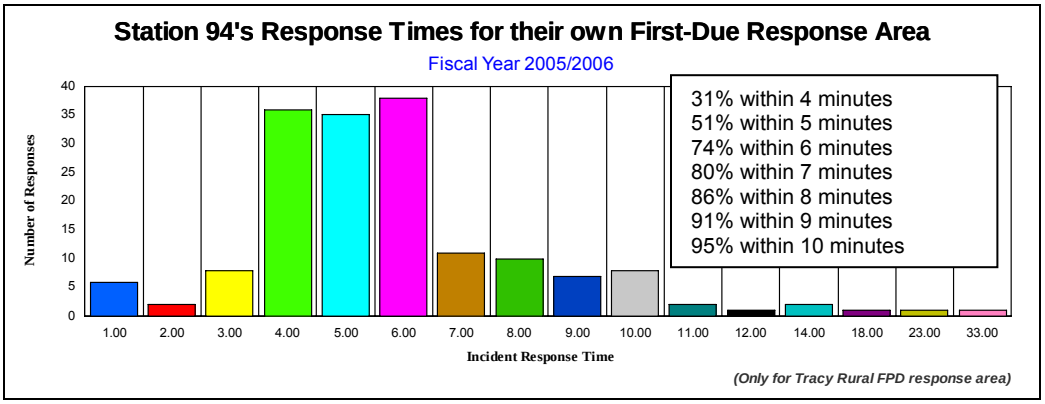
Station 94 had 633 responses during Fiscal Year 2005/2006. Twenty percent (20%) in the City, thirty-one percent (31%) in the rural area, eleven percent (11%) in Mountain House, twenty percent (20%) on the freeways and eighteen percent (18%) in the unprotected areas and on mutual aid. EMS and Vehicle accidents together made up 54.4% of all Station 94's calls. The majority of Station 94's calls occurred on freeways and in the industrial area around Station 94.

The table on the following page displays the number of code 3 calls in Station 94's first-in area where the Fire Department arrived in 5 minutes or less. These calls do not include freeway, City of Tracy, or mutual aid calls.

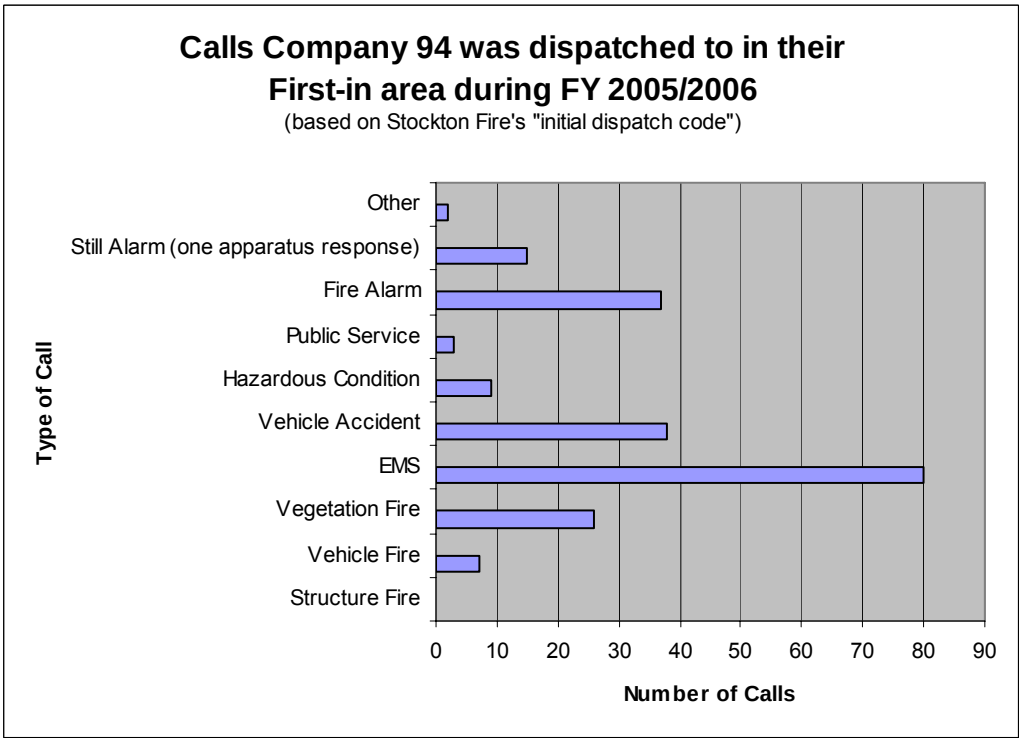
Station 94 First-in Performance (code 3 calls for 1st arriving unit)

94	FY03/04	FY04/05	FY05/06	Totals x 3 years
Calls < or = 5 minutes from dispatch:	55	65	71	**191**
Total Calls in 1st due area:	134	117	134	**385**
Response % <or = 5 min in 1st due:	**41.0%**	**55.6%**	**53.0%**	**49.6%**

The following chart identifies Station 94's performance relative to the response objectives in their first due response areas.



This chart identifies the predominant call types for Station 94 during FY 05/06



The following table displays where Station 94's responses occurred during Fiscal Year 2005/2006:

# of Responses	% of Total	Location of Responses
134	21.2%	94's First Due Response Area
109	17.2%	Other Tracy Rural FPD response areas
53	8.4%	Interstate 580 (Only Tracy Rural FPD areas)
99	15.6%	Interstate 205
126	19.9%	City of Tracy (24 were near Redbridge & 20 were near the West Valley Mall)
112	17.7%	Mutual Aid (98 were on I-580 in Alameda Co.)

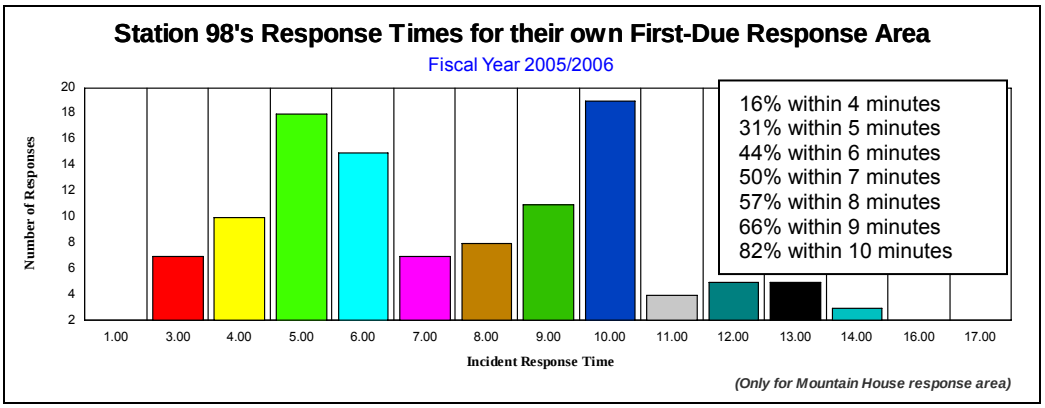
The busiest area inside of Station 94's 5 minute response zone was the industrial area surrounding the fire station (99 responses). Fifty-five percent of the responses in the industrial area around Station 94 were EMS and 30% were Fire Alarms. Looking at all of Station 94's responses, their busiest areas were also the freeways.

Station 94 responded to 231 freeway incidents during Fiscal Year 2005/2006 (counting freeway calls in Alameda County). That makes up 36% of all of Station 94's responses in that period. There were 132 responses to Interstate 205 in Alameda County and 34 were inside of the Tracy Rural Fire Protection District. An additional 99 responses were to Interstate 205.

Mountain House Station 98

Mountain House Station 98 opened on December 8, 2005. During Fiscal Year 2005/2006 that station responded to 336 calls for service. Seven percent (7%) were in the City of Tracy, thirty-four percent (34%) were in the rural areas, forty-one percent (41%) were in the Mountain House CSD, eleven percent (11%) were on the freeways, and eight percent (8%) were in the unprotected areas or providing mutual aid response.

The following chart identifies Station 98's performance related to the response time goals.



C. Specific response areas

A closer look at specific areas of the South County Fire Authority can identify areas of concern relative to overall response coverage.

West Valley Mall

West Valley Mall is considered Tracy's economic engine. The entire I-205 retail corridor generates a significant amount of sales and property tax revenue for the City of Tracy. This area is home to the West Valley Mall, the Auto Mall, Tracy Market Place, and the Tracy Pavilions.

Calls in the area of the West Valley Mall accounted for **12.1%** of all of the responses the Fire Department handled in the City of Tracy during Fiscal Year 2005/2006. The Fire Department met its response time goal of 5 minutes for only forty percent (40%) of the calls dispatched to that area. There were 503 Fire Department responses into the West Valley Mall area during Fiscal Year 2005/2006, 750 in 2004/2005, and 541 in 2003/2004.

Downtown

The downtown area is the cultural and historical hub for the City of Tracy. This area holds great historical significance for the community and is home to the City's Civic Center, the central business district, and the newly remodeled Grand Theater. The area also includes former railroad property known as the "bow-tie." The City of Tracy plans to develop the "bow-tie" area which will include mixed-use occupancies centered around a multi-modal transit plaza.

During Fiscal Year 2005/2006 **14%** of all Fire Department responses in the City of Tracy occurred in the downtown area. The Fire Department arrived at those calls for service in the downtown area within 5 minutes of dispatch, 60% of time. During Fiscal Year 2005/2006 there were 581 Fire Department responses into the downtown area. There were 426 in 2004/2005 and 517 in 2003/2004.

The Westside of Tracy (Redbridge)

The area around Redbridge made up **4.3%** of the total calls in the City of Tracy during Fiscal Year 2005/2006. The Fire Department made it to these calls for service in 5 minutes or less, 54% of the time.

Calls on Freeways

Tracy is surrounded by three major interstate freeways, 205, 580, and 5. These freeways have a demand for service from the South County Fire Authority. A typical fire department response to an incident on a freeway includes two fire companies, a chief officer, and a private ambulance. Generally, two engine companies are dispatched to calls on the freeway in an effort to ensure the highest level of fire fighter safety when operating in an environment that involves vehicles moving at high speeds. The demands placed on the fire department relative to these freeways are discussed in this section. The following discussion answers the questions regarding responses to each of the areas freeways.

There are approximately 165 fire department responses per year on Interstate 205. During Fiscal Year 2005/2006 11% of all code 3 calls on Interstate 205 were handled in 5 minutes or less. Emergency responses to Interstate 205 are handled by Station 96, Station 94, and Station 92. In the past three Fiscal Years (03/04 through 05/06) Station 96 was dispatched to 49% of the calls on I-205, Station 94 was dispatched to 24%, and Station 92 was dispatched to 21%.

INTERSTATE 205
RESPONSE TIMES

5% within 5 minutes
18% within 6 minutes
32% within 7 minutes
47% within 8 minutes
64% within 9 minutes
74% within 10 minutes

There are approximately 126 fire department responses per year on Interstate 580. Calls on Interstate 580 are handled by Fire Station 94, Station 97, Station 93, and Station 98. In the past three fiscal years (03/04 through 05/06) Station 94 went to 50% of all of the calls on Interstate 580, Station 97 went to 26%, Station 93 went to 17%, and Station 96 went to 8%.

INTERSTATE 580
RESPONSE TIMES

9% within 5 minutes
13% within 6 minutes
30% within 7 minutes
41% within 8 minutes
52% within 9 minutes
67% within 10 minutes

There are approximately 130 fire department responses per year on Interstate 5. Emergency responses to Interstate 5 are handled by Station 92 and Station 93. In the past three Fiscal Years (03/04 through 05/06) Station 92 was dispatched to 50% of the calls on I-5 and Station 93 went to 48% of the I-5 calls.

INTERSTATE 5
RESPONSE TIMES

3% within 5 minutes
7% within 6 minutes
18% within 7 minutes
32% within 8 minutes
40% within 9 minutes
55% within 10 minutes

D. Reliability/Queuing

Reliability and Queuing are terms used in this study to describe the occurrence of simultaneous calls in one Fire Company's first-due area. When simultaneous calls are dispatched in one company's first-due area, a response from another company is required. This pulls the resource from another area thus creating a void in the service delivery system and potentially creating a delay in response. There are several ways of predicting a company's reliability or the number of queued calls.

In this section queuing is discussed by looking at how often a company is able to handle their own calls and by looking at real data to make trend predictions.

Percentage of calls handled by first-due Company

The following table displays the number and percentage of calls that were handled by each first-due company as well as the percentage of calls that had to be taken by another company because of queuing.

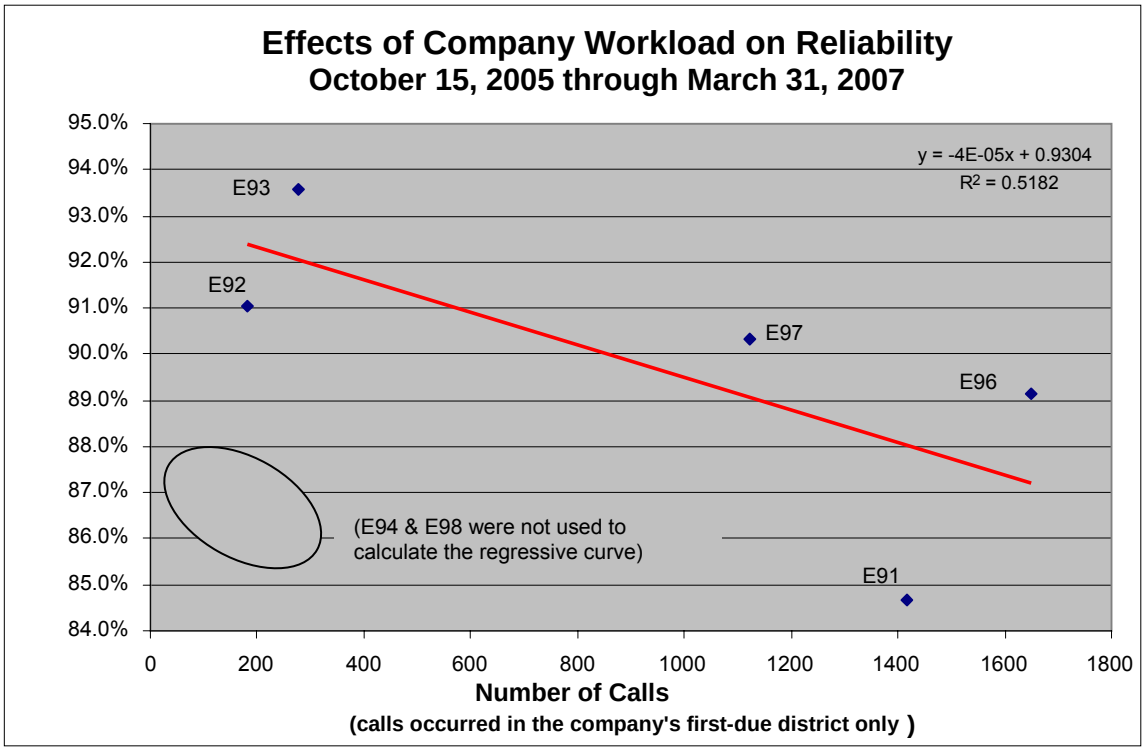
Reliability/Queuing between October 2005 and March 2007

Station	# Incidents handled by first-due	Total Incidents in first-due	% of incidents handled by first-due	% of incidents handled by non-first-due
91	1418	1675	84.7%	15.3%
92	183	201	91.0%	9.0%
93	277	296	93.6%	6.4%
94	189	220	85.9%	14.1%
96	1648	1849	89.1%	10.9%
97	1121	1241	90.3%	9.7%
98	170	196	86.7%	13.3%

Station 91's first-due area has had the most obvious queuing issue. In Fiscal Year 2005/2006 14.5% of their calls were handled by other companies. In Fiscal Year 2006/2007 17.2% of their calls had to be handled by other companies. The number of calls in Station 91's first-due increased 13.8% from Fiscal Year 2005/2006 to 2006/2007. The rapid trend upward in the number of responses and the queuing issue in Station 91's area has prompted a closer look at current statistics. In July 2007 the percentage of Station 91's calls handled by other companies was up to 19%. A certain level of queuing is anticipated for fire department units relative to a static response system; however, the nationally accepted standard for queuing ranges from zero to twelve percent (0% to 12%). As you can see by the chart listed on the previous page Station 91 has exceeded the standard. When the issue of queuing is left unaddressed fire departments find it difficult to meet response time goals.

Historical trends of company reliability using regression analysis

Past response data can be used as a predictor of future fire station reliability. The statistical technique called "regression analysis" is used to predict each company's future reliability. The chart below predicts each fire station's reliability. Each fire station's call volume and the percentage of time that they were able to handle all of their own calls was plotted on a graph. The result is the red trend line that illustrates the fact that as a fire station's call volume increases, the percentage of time it can handle all of its own calls decreases.



(This regressive curve graph was performed using only the "first arriving units" for "code 3" responses. Companies 94 and 98 are statistical outliers on the above graph and have been removed from the regression curve analysis because 94 and 98 often fill in each others district)

Understanding the causes of Reliability or Queuing is important. This discussion continues by looking at where and when calls have occurred.

Crossing Jurisdictional Lines and its Effect on Fire Station Reliability

One of the benefits of the 1999 consolidation between the City of Tracy Fire Department and Tracy Rural Fire Protection District was the dropping of borders and the dispatching of the closest fire station to an emergency. Since consolidation, each jurisdiction has reciprocated almost equally when it comes to responding to each others calls. The following table displays the number of calls that each jurisdiction handled in the others response area over the past four fiscal years.

	02/03	03/04	04/05	05/06	TOTALS
City of Tracy Responses into the TRFPD	367	442	392	323	1524
TRFPD Responses into the City of Tracy	565	501	383	289	1738

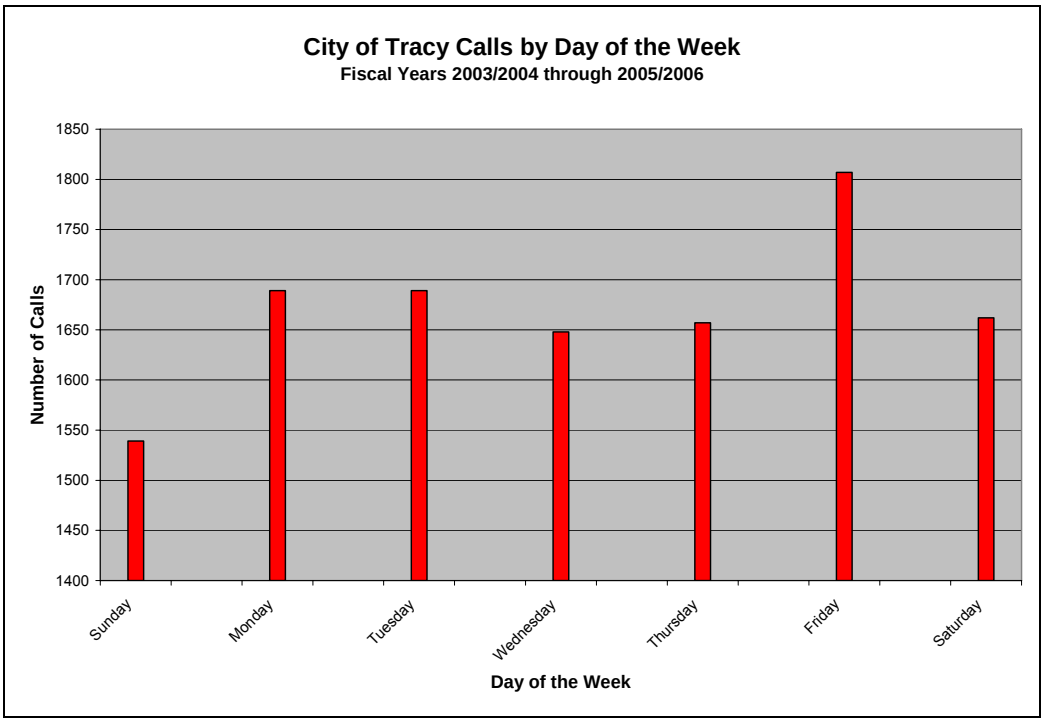
A closer look at where these calls have occurred can help determine which fire station's responses are across jurisdictional lines. The following table illustrates the number of calls where each fire station crossed jurisdictional lines during Fiscal Year 2005/2006 (not including Mountain House, automatic aid, or mutual aid calls). It also identifies where those calls have occurred most frequently.

City Responses in Tracy Rural FPD			Tracy Rural FPD Responses into the City		
Station	# Calls	Busiest Area (# of calls)	Station	# Calls	Busiest Area
91	12		92	150	Northeast Industrial (24)
96	139	Finck & Grimes Roads (49) Larch & Clover Roads (33)	93	13	
97	148	Linne Estates/Fair Oaks (21) Midway & Mountain View (16)	94	126	Redbridge (24) West Valley Mall (20)
Other	24				
TOTAL	323		TOTAL	289	

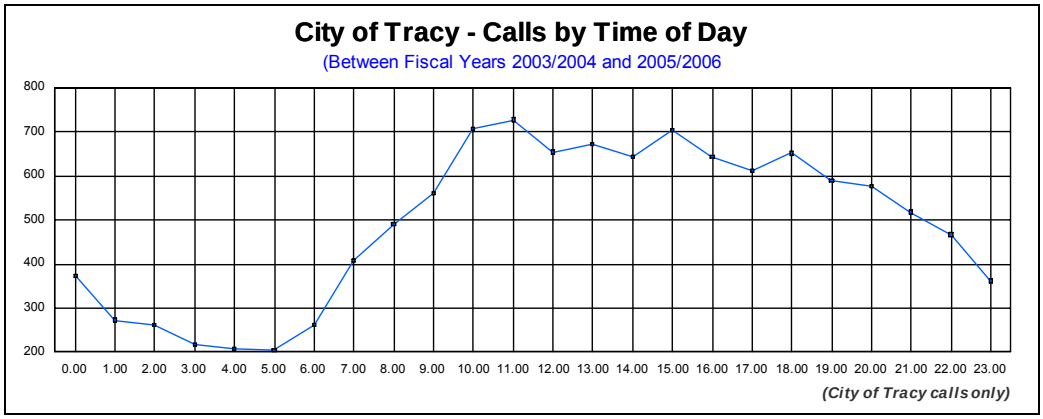
When are calls occurring?

The charts and graphs on following pages identify the days of the week and the times of day in which incidents most frequently occur in both the City of Tracy and the Tracy Rural Fire Protection District. The data for these charts and graphs is from the combined Fiscal Years 2004/2005 and 2005/2006.

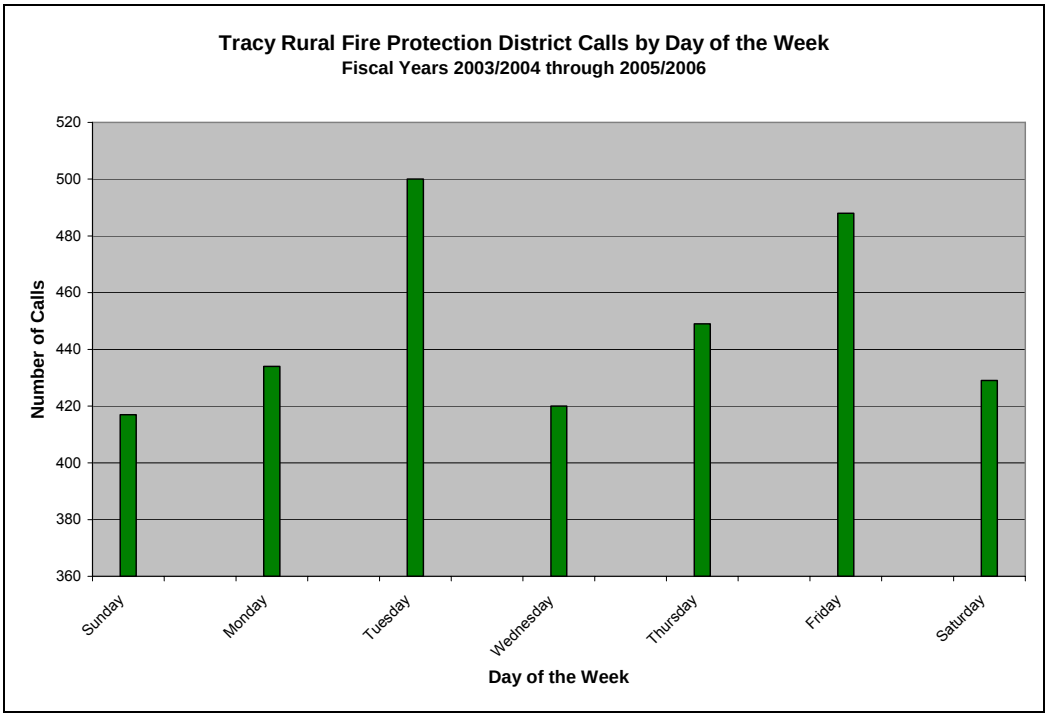
The following chart displays calls by “day of the week” for the City of Tracy.



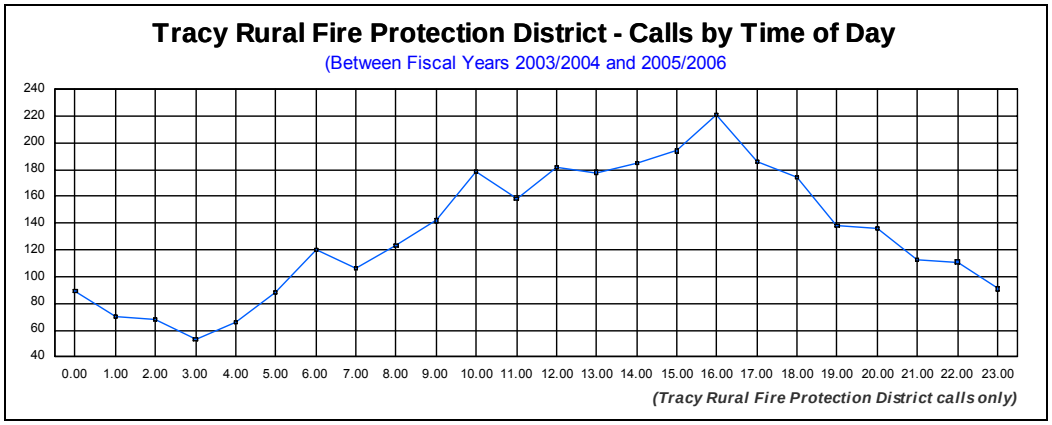
The graph below displays the “time of day” that calls occurred in the City of Tracy (for Fiscal Years 2004/2005 and 2005/2005).



The following chart displays calls by "day of the week" for the Tracy Rural Fire Protection District.



The graph below displays the "time of day" that calls occurred in the Tracy Rural Fire Protection District (for Fiscal Years 2004/2005 and 2005/2005).



Fire Department Resource Exhaustion and Mutual Aid Agreements

Emergency incidents can occur that require a commitment of all or most of the on-duty resources in the South County Fire Authority. Examples of these types of emergencies include structure fires, large wildland fires, and multiple incidents occurring at the same time. When emergency incidents occur that exhaust on-duty resources, there are several methods of obtaining additional resources.

There are three methods of obtaining firefighting resources in the South County Fire Authority when on-duty companies are exhausted or busy. First, off-duty firefighters can be called back to staff reserve fire apparatus. Second, nearby fire department resources can be requested and automatically dispatched to cover stations. Lastly, firefighting resources can be requested from departments throughout the region or the State.

Off-duty firefighters can be summoned back to duty to staff reserve fire apparatus in the event of a major incident. Firefighters are required by contract to respond to their assigned station when notified. Firefighting resources from other agencies are often automatically dispatched to emergencies in the South County Fire Authority. A shared dispatch center allows resources from Tracy and the Lathrop-Manteca Fire Protection District to be automatically dispatched to aid each other. In addition, assistance from other agencies can be requested through the use of mutual aid agreements.

The South County Fire Authority is a party to several agreements that provide reciprocal emergency response aid. These include local, county, and State agreements. Here are brief summaries of these agreements:

- The South County Fire Authority has agreed to provide one fire engine to the Lawrence Livermore Laboratory Fire Department (in the Site 300 area) in exchange for a similar response to the I-580 corridor.

- The San Joaquin County Fire and Mutual Aid Plan (1997) was signed by all fire agencies in the County. It provides for aid within and outside of the County and is managed by an “area” coordinator.

- Parties of the California Disaster and Civil Defense Master Mutual Aid Agreement agree to volunteer aid to each other in the event of a disaster.

- The State of California has entered into an agreement with the City of Tracy to provide a Type 1 reserve fire apparatus (OES-236). To reciprocate, the State can call for this apparatus to respond to disasters or a wildland fires.

VI. OVERALL EVALUATION

This study has identified risks in the community, provided a basis for fire department response objectives, conducted a critical task analysis of fire resources, and taken a look at past fire department response performance. This section evaluates fire department response capabilities for the City of Tracy and the Tracy Rural Fire Protection District.

Each jurisdiction is evaluated starting with an explanation of recent history, followed by a review of response performance and concluding with a list of specific causes for current response performance.

City of Tracy

1980's to Today – City of Tracy

The spacing of fire stations throughout the community is a major factor in a fire department's ability to provide life saving and fire suppression services. In 1983 the City of Tracy added its second fire station at the corner of Grantline Road and Parker Avenue. A third fire station was opened in 1986 at Tracy Boulevard and West Central Avenue. The three City of Tracy fire stations were each staffed with two firefighters. The Fire Department's ability to provide a rapid response to all areas of the City of Tracy became a concern as growth pushed west during the 1990's.

In 1997 the City's rapid growth stimulated a Fire Department response study. A Standards of Response Coverage study was completed in 1998 and the following recommendations were made in order to improve response:

- Relocate the downtown fire station to West Eleventh Street, near Corral Hollow Road.
- Occupy the vacated downtown fire station with a private ambulance in order to provide a rapid emergency medical response to the downtown area.
- Increase minimum staffing on a fire engine from two to three personnel.
- Install Zetron Fire Station alerting systems in all stations.
- Improve emitter traffic control devices.
- Pre-alert fire companies of calls via radio.
- Provide 13 Firefighters at the scene of a Moderate Risk structure fire.

Each of these recommendations was approved by the City Council. Staffing was increased to three per engine between 1999 and 2000. In March of 2005 the relocated Station 91 was opened at 1701 West Eleventh Street. American Medical Response moved into the vacated downtown fire station. In addition, each of the recommended response time improvements was also implemented. As the City grew the Fire Department's response objectives have been tracked.

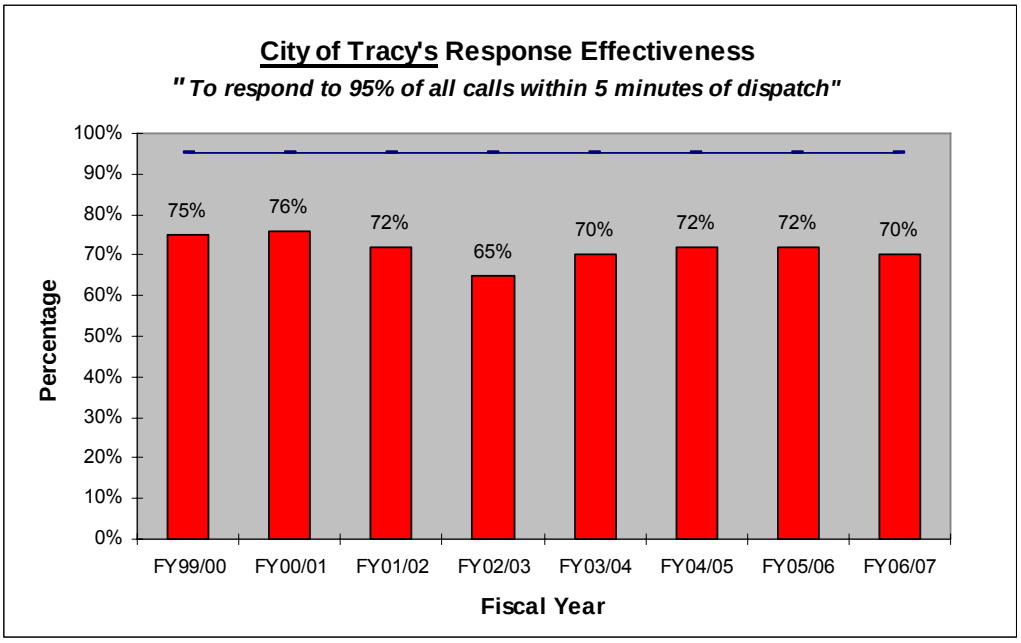
Fire Department Response Performance - City of Tracy

Distribution of Fire Stations

A fire department's performance is measured by how quickly and competently it can respond to the emergency needs of its customers. The Fire Department's response objective in the City of Tracy has been:

"To respond to all calls for emergency assistance within 5 minutes of dispatch, 95% of the time."

The Fire Department strives to meet this 5 minute objective 95% of the time. In Fiscal Year 2006/2007 the Fire Department met this objective 70% of the time. The following graph displays the Fire Department's ability to meet its response time objective over the past eight fiscal years:



The nationally recognized response time objective for the arrival of the first-due unit is 5 minutes or less, 90% of the time.

Another factor in the performance of a fire department is its ability to bring together an adequate number of resources to safely and competently handle an emergency incident.

Concentration – Assembling an Adequate Work Force

Assembling an effective work force is an important factor in safely and effectively mitigating an emergency incident. This is evident at structure fires. Sufficient numbers of firefighters arriving on the scene before a structure fire reaches the point of flashover can prevent it from destroying more property or taking more lives. Appropriate staffing at emergency incidents also helps to prevent firefighter injuries and can increase victim survivability. The nationally recognized standard for assembling an effective workforce at a full first alarm assignment is 9 minutes or less, 90% of the time.

Defining an "effective work force" has been done by analyzing the critical tasks that need to be accomplished to safely mitigate an emergency incident. When firefighting resources are available at an emergency incident, specific tasks are accomplished, and the odds of a positive outcome are increased.

The Fire Department has quantified past "concentration" performance by counting the number of firefighters assembled at the scene of different risks. The results of these response objectives have been inconsistent and the positive or negative outcome of providing or not providing an adequate number of firefighters at an emergency has not been tracked.

It is necessary for a fire department to provide a means to measure the outcome of having an adequate number of firefighters at the scene of an emergency incident. The current fire service trend is to track the percentage of structure fires confined to the room of origin.

Specific Causes for Response Performance – City of Tracy

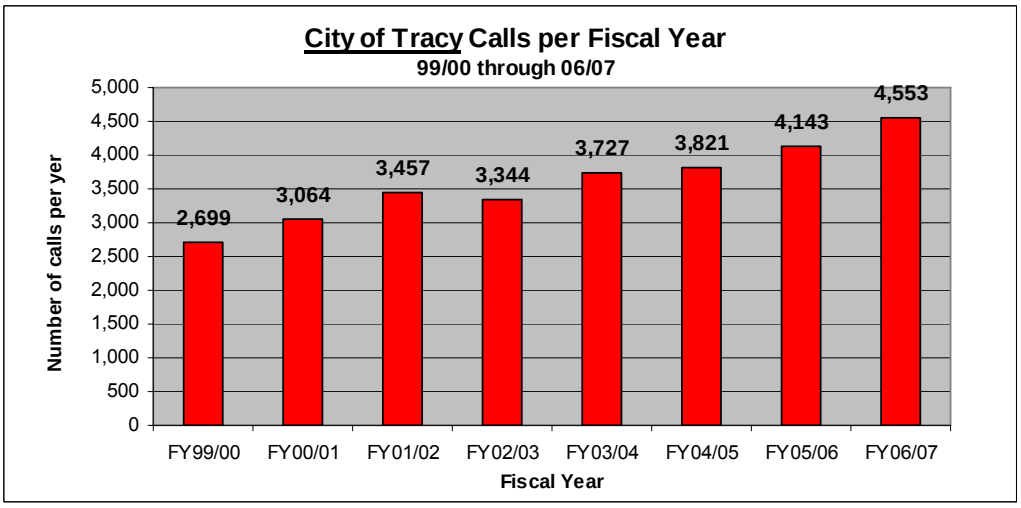
Current Fire Department response performance in the City of Tracy can be attributed to the following factors:

a) Portions of the built upon areas of the City of Tracy are beyond the 5 minute response areas of fire stations. In Fiscal Year 2006/2007 1365 calls for emergency service fell outside of the 5 minute response objective.
   See: **Map # 5**

b) Between 1999 and 2007 the Fire Department's call volume in the City has increased by 68.7% (2699 calls in FY 1999/2000 to 4553 calls in FY 2006/2007).

c) In spite of this significant population and residential growth the number of fire department response units has remained static since 1986.

The following graph displays the number of fire department responses in the City of Tracy over the past eight years:



d) The increase in call volume has reduced the ability of fire companies to handle all of their own calls. When a fire company is already committed to an emergency call in their first-due area and another emergency call occurs in that same area, the next closest fire station must take the call. This is called "queuing."

The following table displays the number and percentage of emergency calls that were handled by each first-due company and the percentage of calls that had to be handled by another company due to queuing:

Queuing of Emergency calls between October 2005 and March 2007

Station	# Incidents handled by first-due	Total Incidents in first-due	% of incidents handled by first-due	% of incidents handled by non-first-due
91	1418	1675	84.7%	15.3%
92	183	201	91.0%	9.0%
93	277	296	93.6%	6.4%
94	189	220	85.9%	14.1%
96	1648	1849	89.1%	10.9%
97	1121	1241	90.3%	9.7%
98	170	196	86.7%	13.3%

The reliability of Fire Stations 91 and 96 have become a concern over the past two fiscal years. On the following page is a list of queued calls that occurred in Fire Stations 91 and 96 first-due areas.

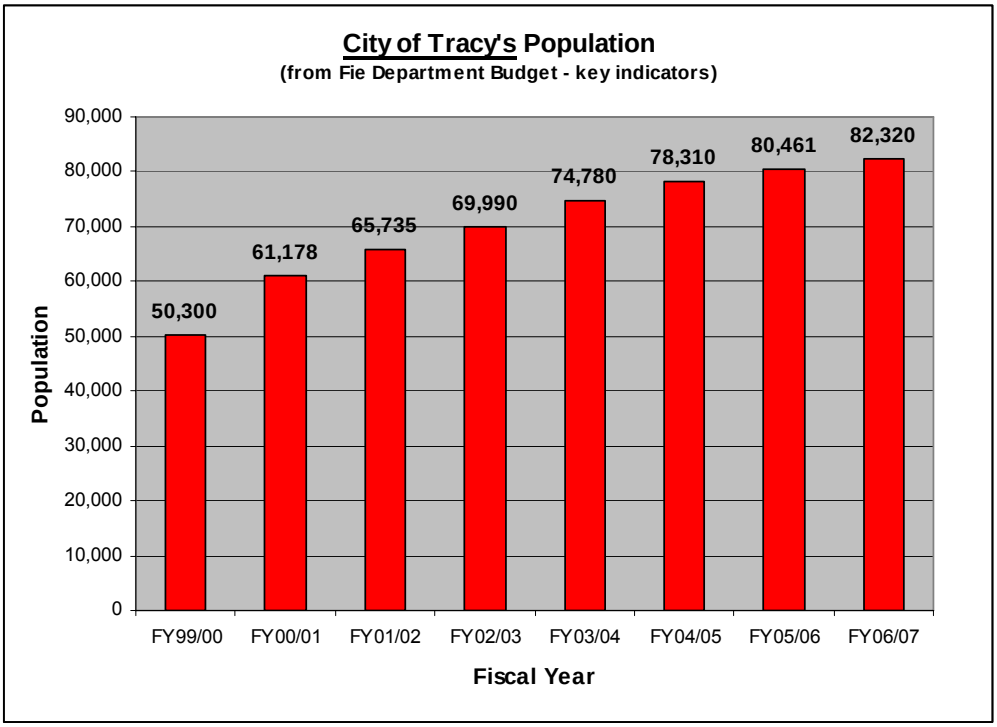
Reliability and Queuing in Fire Station 91's first-due area:

- In FY 05/06 **14.5%** or **157** of 91's code 3 calls had to be handled by other companies.
- In FY 06/07 **17.2%** or **220** of 91's code 3 calls had to be handled by other companies
- Between 7/1/07 and 8/9/07 **19.8%** of 91's code 3 calls were queued (30 of 151 calls).
- Station 91 arrived at 65.8% of all of their own "code 3" City calls within five minutes or less during Fiscal Year 2005/2006.

Reliability and Queuing in Fire Station 96's first-due area:

- In FY 05/06 **10%** or **109** of 96's code 3 calls had to be handled by other companies
- In FY 06/07 **16.5%** or **241** of 91's code 3 calls had to be handled by other companies
- Between 7/1/07 and 8/9/07 **15%** of 91's code 3 calls were queued (21 of 140 calls).
- Station 96 arrived at 87.1% of all of their own "code 3" City calls within five minutes or less during Fiscal Year 2005/2006.

e) The City has grown. The City of Tracy's population has increased 63.7% over the past eight years. With this increase in population comes an increase in calls for service. The following graph displays the population of the City of Tracy since Fiscal Year 1999/2000:



f) There is no longer a private ambulance company providing emergency medical response from the downtown Fire Station at 9th Street and Central Avenue. That service lasted only eleven months in the Year 2005.

g) The “5 minutes, 95% of the time” performance objective is inconsistent with national standards. Nationally recognized standards recommend an objective of “5 minutes, 90% of the time.”

h) The Fire Department’s performance objective addressing the assembling of an adequate number of firefighters at an emergency incident have not measured the outcome.

Other issues that have an effect on our ability to meet response objectives include:

- Limited access to neighborhoods from arterial streets
- Limited access due to railroad right of ways
- Limited access due to freeways
- Dead end streets and Cul-de-sacs
- Gated neighborhoods
- Traffic calming methods
- Fire station design
- Railroad crossing delays

B. Tracy Rural Fire Protection District

1980’s to Today –Tracy Rural Fire Protection District

In July 2003 response coverage from Fire Station 95, at Linne Road, was combined with the New Jerusalem area Fire Station (Station 93). Three personnel from Fire Station 95 were relocated to Station 94, Schulte Road, and began providing response services to the new Town of Mountain House.

Fire Department’s Response Performance - Tracy Rural Fire Protection District

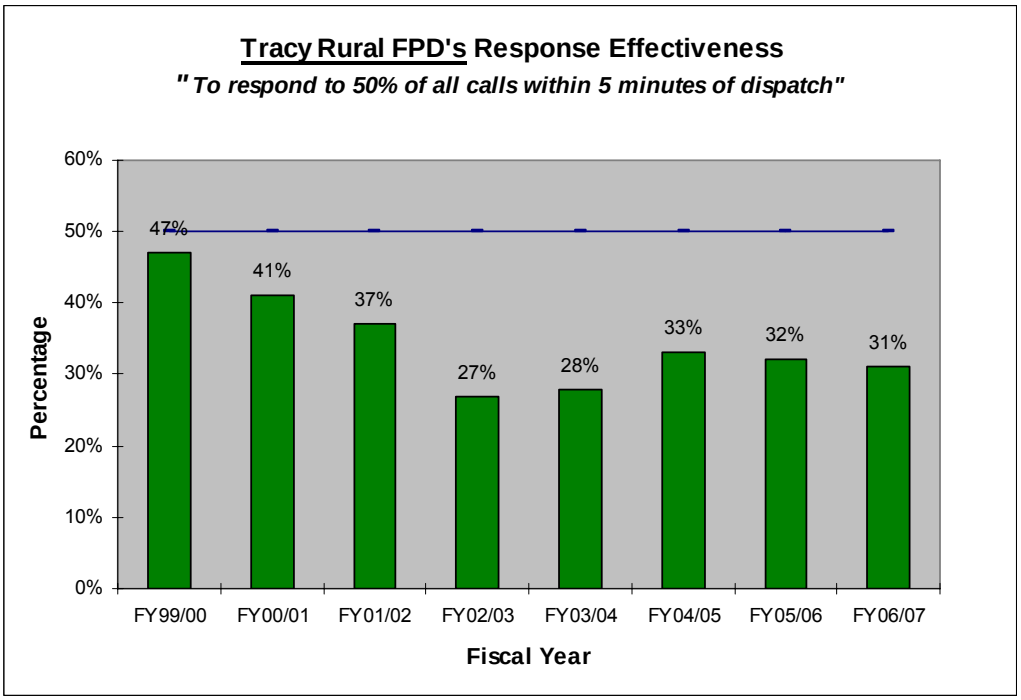
Distribution of Fire Stations

Between 00/99 and 06/07 the number of responses per year in the Tracy Rural Fire Protection District has remained relatively flat, with an overall drop of 4.3% (1176 calls in FY 99/00 to 1125 calls in FY 06/07). Population in the Tracy Rural area during that same period increased 12.3%.

Tracy Rural Fire Protection District established the following response time objective in 1999:

“To respond to all calls for emergency assistance within 5 minutes of dispatch, 50% of the time.”

The Fire Department met this objective 31% of the time in Fiscal Year 2006./2007. The following graph displays the percentage of responses in the past eight fiscal years where the Fire Department arrived within 5 minutes:



There are no recognized response time standards for the arrival of a first-due unit in rural communities.

Concentration – Assembling an Adequate Work Force

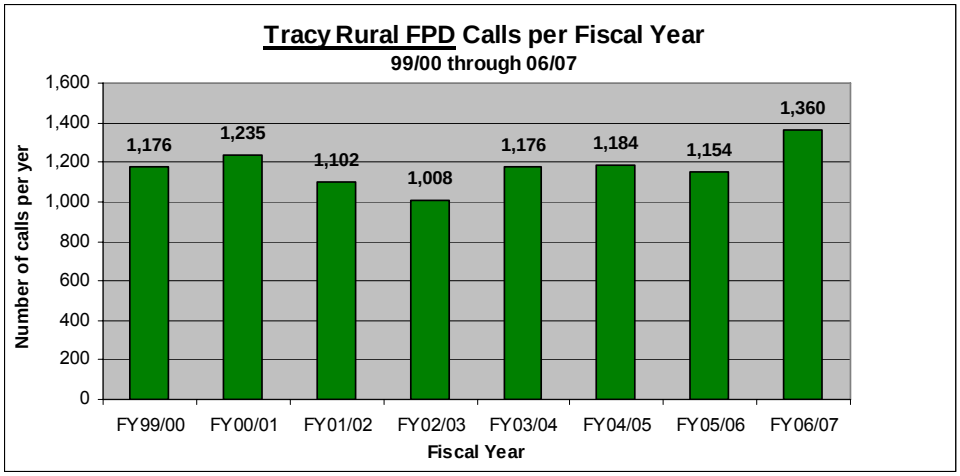
The mitigation of an emergency incident, like a structure fire, in rural communities is consistent with national standards set for urban communities. The nationally recommended response standard for the arrival of an effective work force at suppression incidents is “9 minutes or less 90% of the time.”

The Fire Department is capable of delivering an adequate workforce in 5 of the 139 square miles in the Tracy Rural Fire Protection District. There is a direct relationship between the amount of fire spread and the length of the fire department’s response. Therefore, the percentage of time that a structure fire is confined to the room of origin should be expected to be lower in rural areas.

An additional workforce concern identified in this study is the fact that minimum staffing levels on emergency response units in the South County Fire Authority vary between 2 & 3 on-duty fire fighters per unit.

Current response performance in the Tracy Rural Fire Protection District can be attributed to the following factors:

a) Fire Stations are spread out too far to provide a five minute response to all areas of the Tracy Rural Fire Protection District. There are currently 114 of the 139 square miles in the Tracy Rural Fire Protection District that are beyond the 5 minute response coverage. During Fiscal Year 2006/2007 there were 776 code 3 calls were outside of the 5 minute response coverage in the Tracy Rural Fire Protection District. The following graph displays the number of responses in the Tracy Rural Fire Protection District over the past eight fiscal years:



b) There are currently no nationally recognized fire department response standards for rural areas. The only rural fire department in San Joaquin County that is even considering response objectives is the Oakdale Rural Fire Protection District. They are looking at a tiered system that is based on population density. However, there are emergency medical response standards for rural areas.

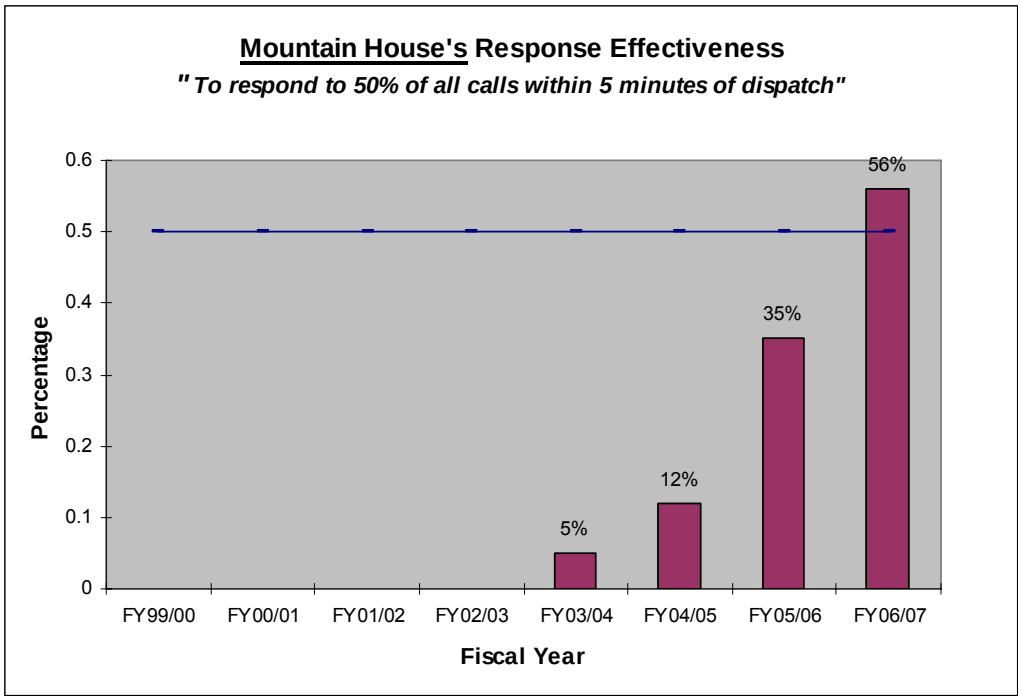
Emergency medical response time standards have been established by the California State EMS Agency and by the San Joaquin County Exclusive Emergency Ambulance Provider Contract. The 2006 San Joaquin County Exclusive Emergency Ambulance Provider Contract response time standards for Advance Life Support (ALS) are the most stringent. Below are the ALS response standards for local ambulances:

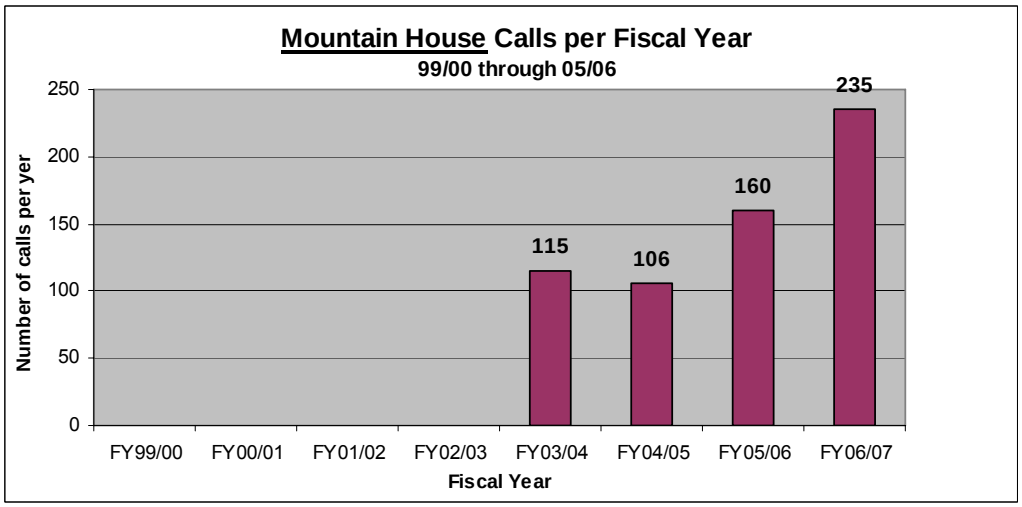
Community Population Density	Response Time Standard
Urban (> 101/sqare mile)	7:29
Suburban (51 – 100/square mile)	9:29
Rural (7 – 50/square mile)	17:29
Wilderness (< 7/square mile)	29:29

B. Mountain House

The community of Mountain House was mentioned in this study as a jurisdiction that is currently served by the South County Fire Authority. Further study is being conducted as part of the service agreement with the Mountain House Community Services District.

The following charts display the response effectiveness and calls per fiscal year for the Mountain House area.





MAP ATLAS

Map #1	South County Fire Authority – Existing Stations
Map #2	Existing Stations First-Due Area
Map #3	Existing Stations 5 Minute Response Area
Map #4	Existing Stations 5 Minute Response Area (Polygon)
Map #5	All calls outside of the 5 minute response coverage - FY 2006/2007
Map #6	All calls outside of the 5 minute response coverage - FY 2006/2007 (Polygon)
Map #7	Existing Ladder Truck Coverage – 2.5 mile drive Zones
Map #8	All Incidents - Fiscal Year 2006/2007
Map #9	Hot Spots for All Incidents - Fiscal Year 2006/2007
Map #10	All Medical Incidents - Fiscal Year 2006/2007
Map #11	Hot Spots for All Medical Incidents - Fiscal Year 2006/2007
Map #12	All Fire Incidents - Fiscal Year 2006/2007
Map #13	Hot Spots for All Fire Incidents - Fiscal Year 2006/2007
Map #14	Concentration Analysis
Map #15	Concentration Analysis with Working Structure Fires – FY 2006/2007

END NOTES

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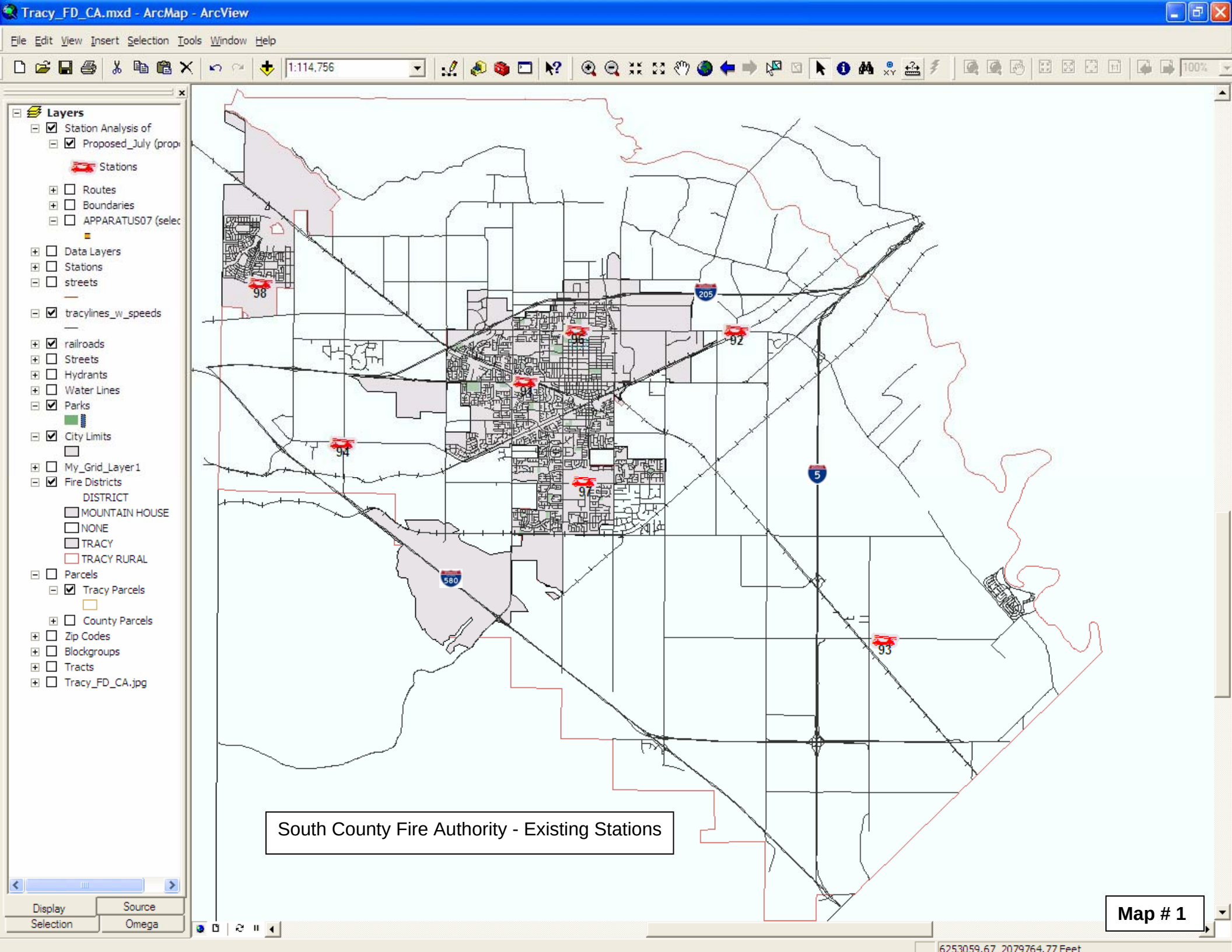
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My_Grid_Layer1
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Tracy_FD_CA.jpg
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South County Fire Authority - Existing Stations
Map # 1
6253059.67 2079764.77 Feet

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- Water Lines
- Parks
- City Limits
- My_Grid_Layer1
- Fire Districts
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  - MOUNTAIN HOUSE
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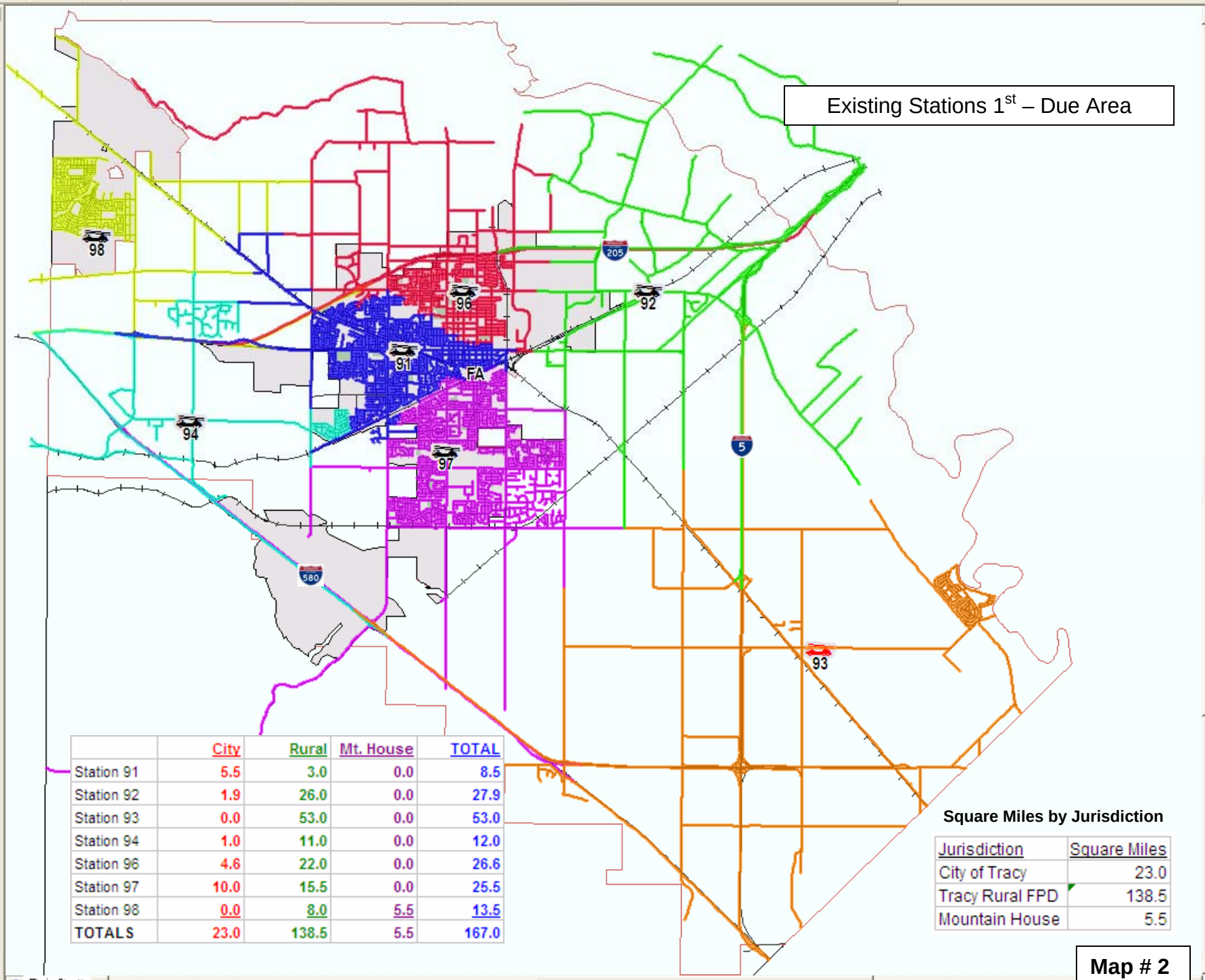


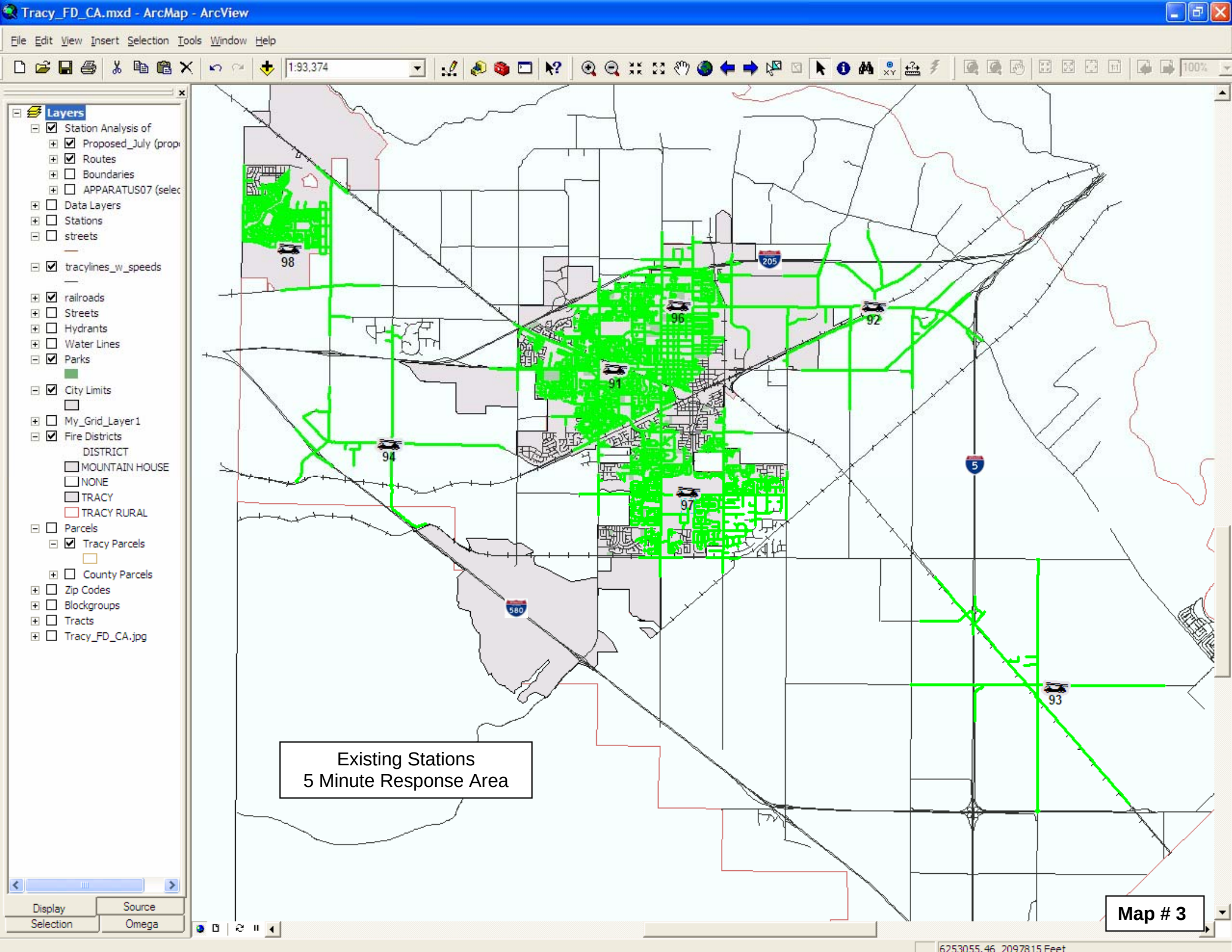
	City	Rural	Mt. House	TOTAL
Station 91	5.5	3.0	0.0	8.5
Station 92	1.9	26.0	0.0	27.9
Station 93	0.0	53.0	0.0	53.0
Station 94	1.0	11.0	0.0	12.0
Station 96	4.6	22.0	0.0	26.6
Station 97	10.0	15.5	0.0	25.5
Station 98	0.0	8.0	5.5	13.5
TOTALS	23.0	138.5	5.5	167.0

Square Miles by Jurisdiction

Jurisdiction	Square Miles
City of Tracy	23.0
Tracy Rural FPD	138.5
Mountain House	5.5

Map # 2

6286743.51, 2118333.35 Feet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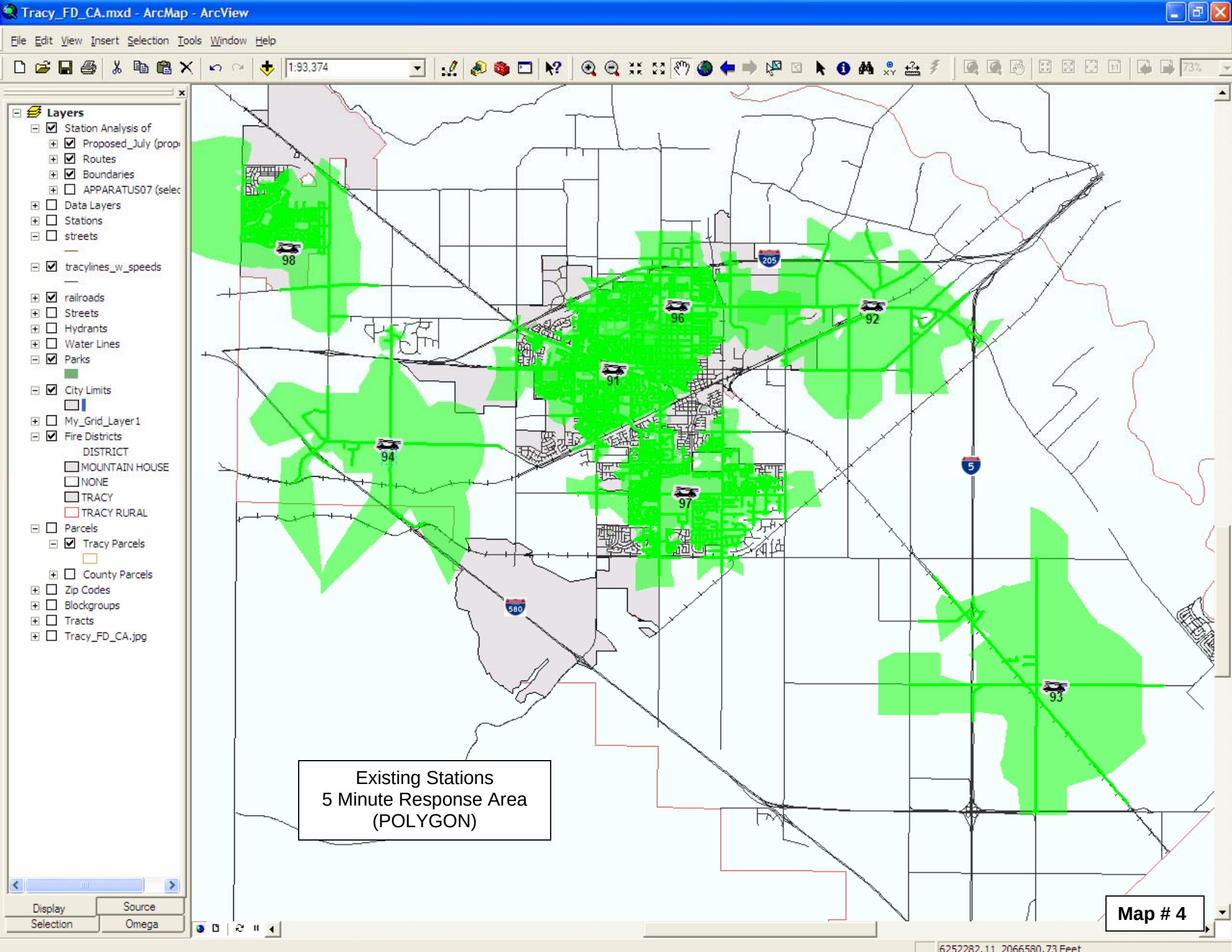
Existing Stations
5 Minute Response Area
Map # 3
6253055.46 2097815 Feet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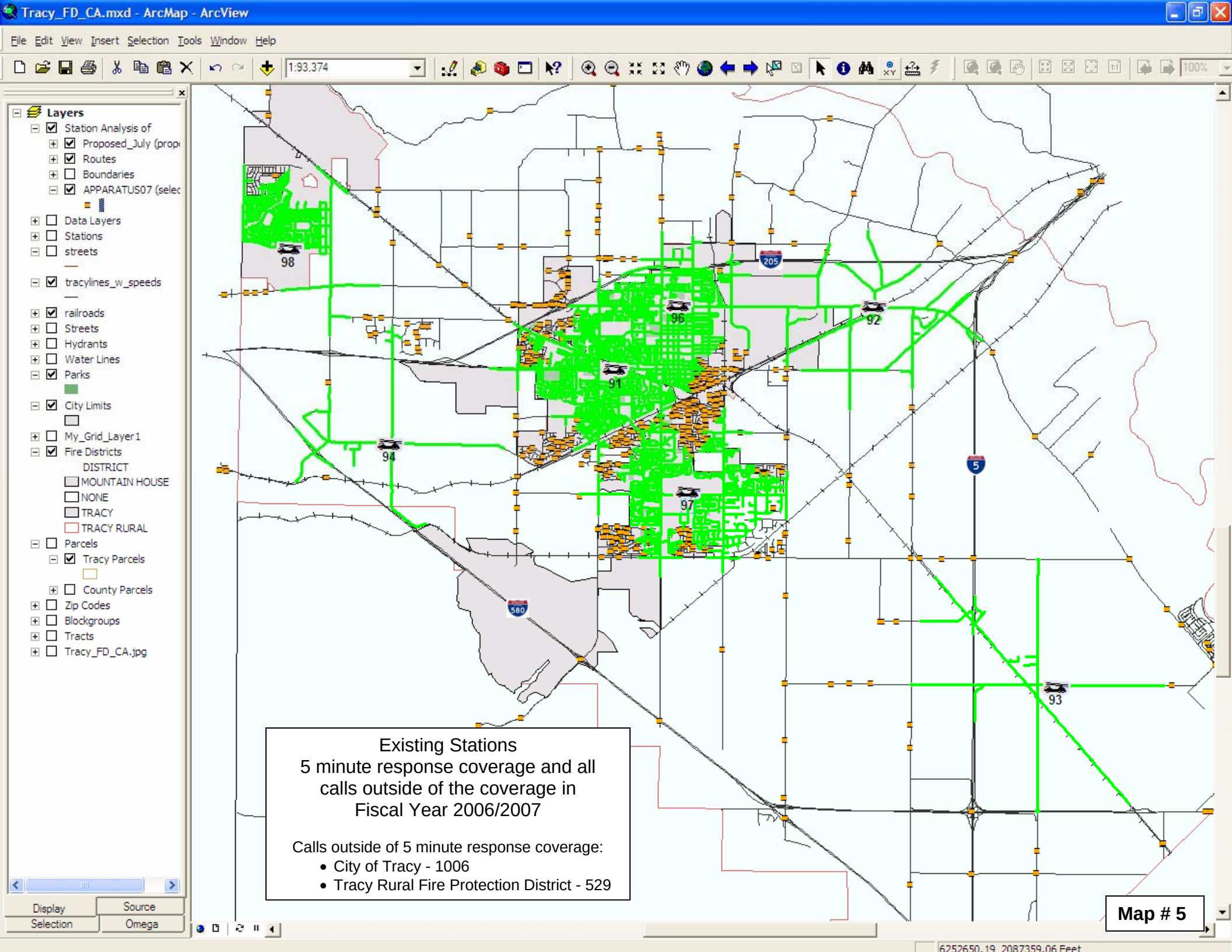
Existing Stations
5 Minute Response Area
(POLYGON)
Map # 4
6252282.11 2066580.73 Feet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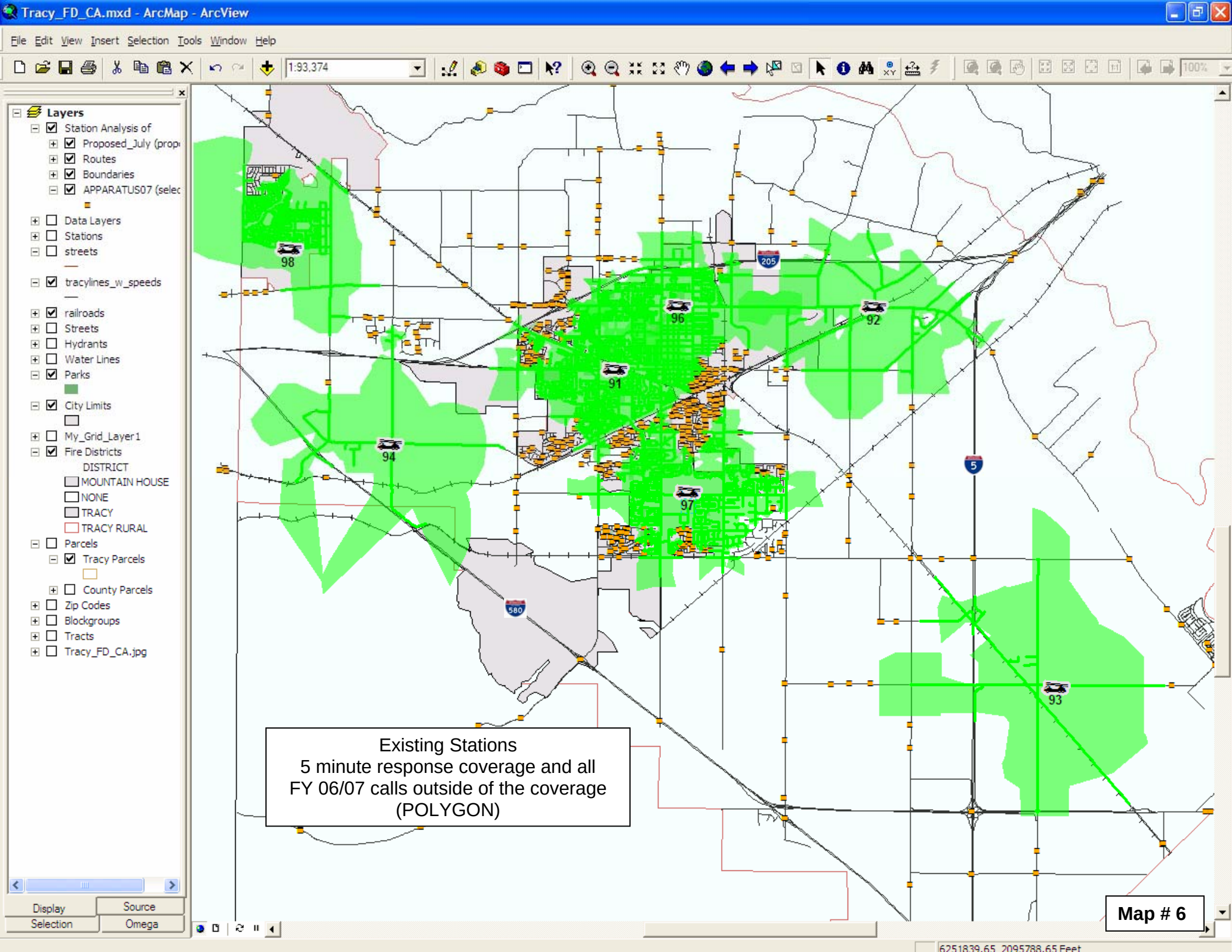
Existing Stations
5 minute response coverage and all calls outside of the coverage in Fiscal Year 2006/2007
Calls outside of 5 minute response coverage:
• City of Tracy - 1006
• Tracy Rural Fire Protection District - 529
Map # 5
6252650.19 2087359.06 Feet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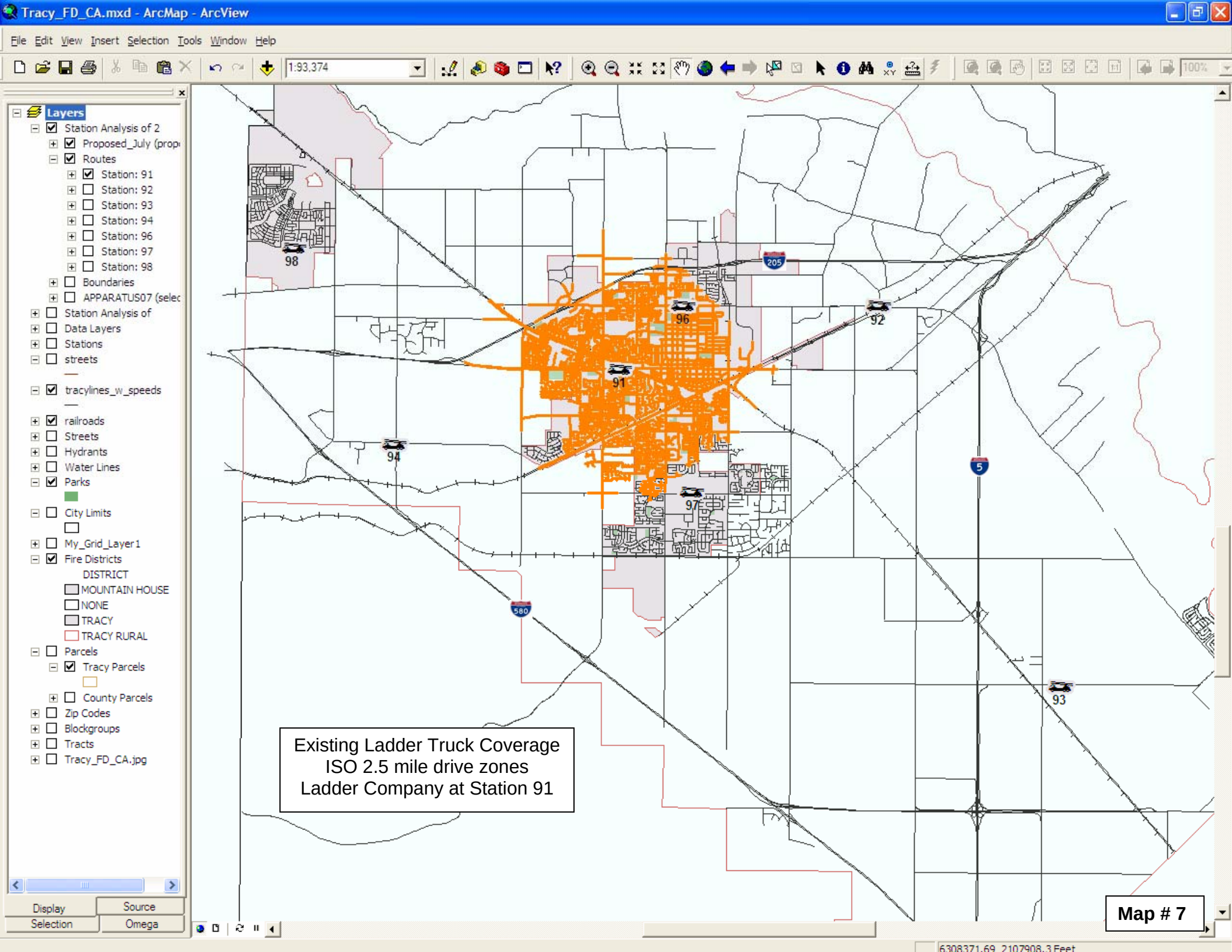
Existing Stations
5 minute response coverage and all
FY 06/07 calls outside of the coverage
(POLYGON)
Map # 6
6251839.65 2095788.65 Feet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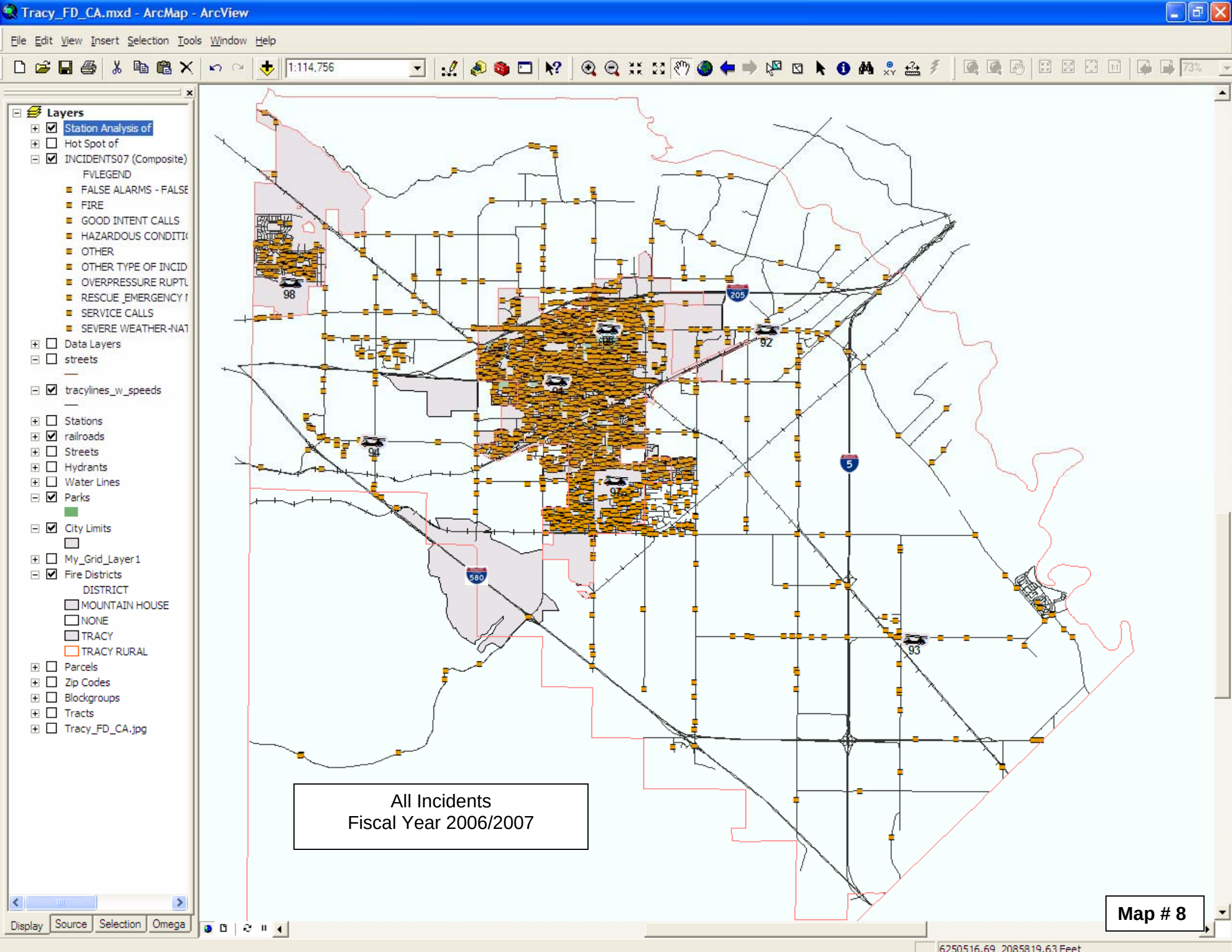
Existing Ladder Truck Coverage
ISO 2.5 mile drive zones
Ladder Company at Station 91
Map # 7
6308371.69 2107908.3 Feet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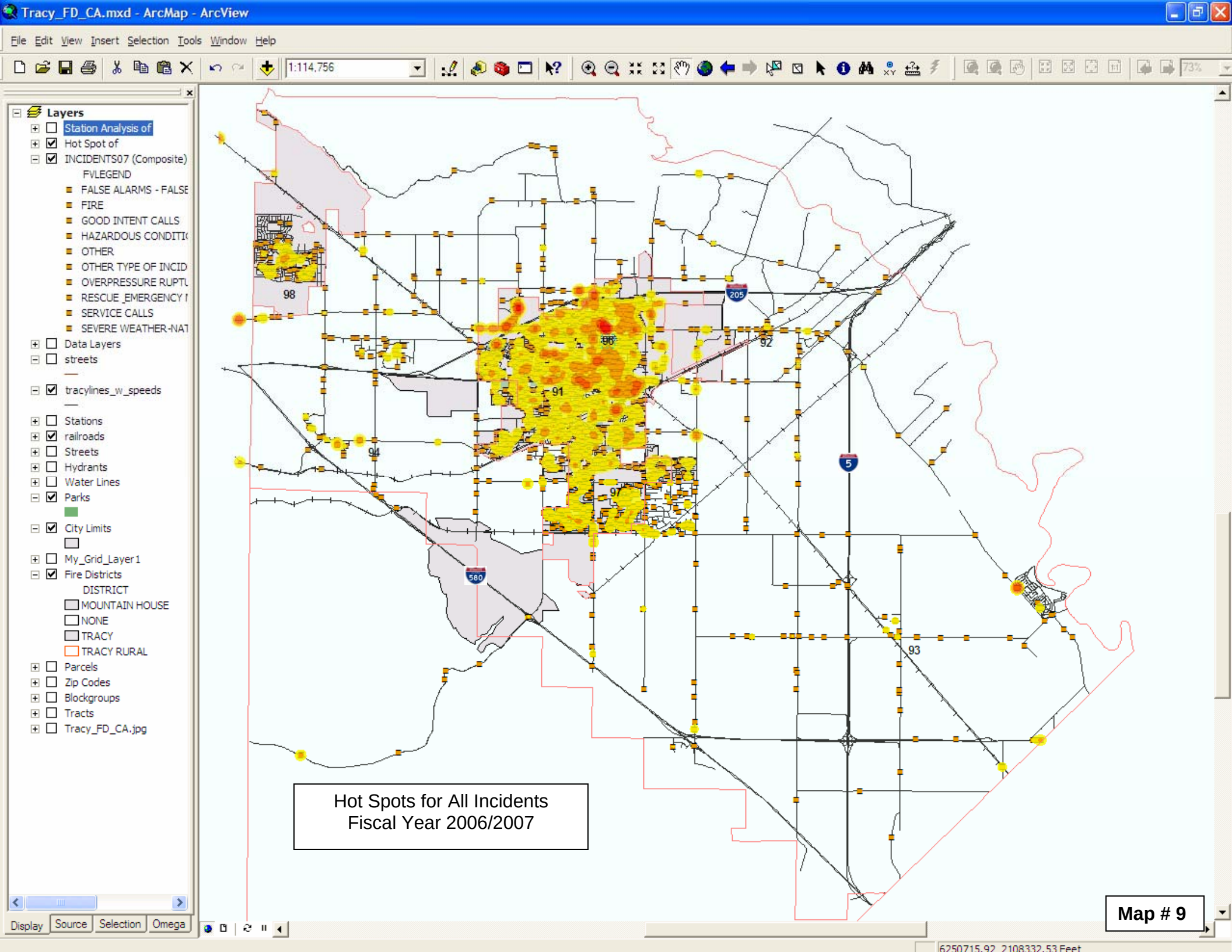
All Incidents
Fiscal Year 2006/2007
Map # 8
6250516.69 2085819.63 Feet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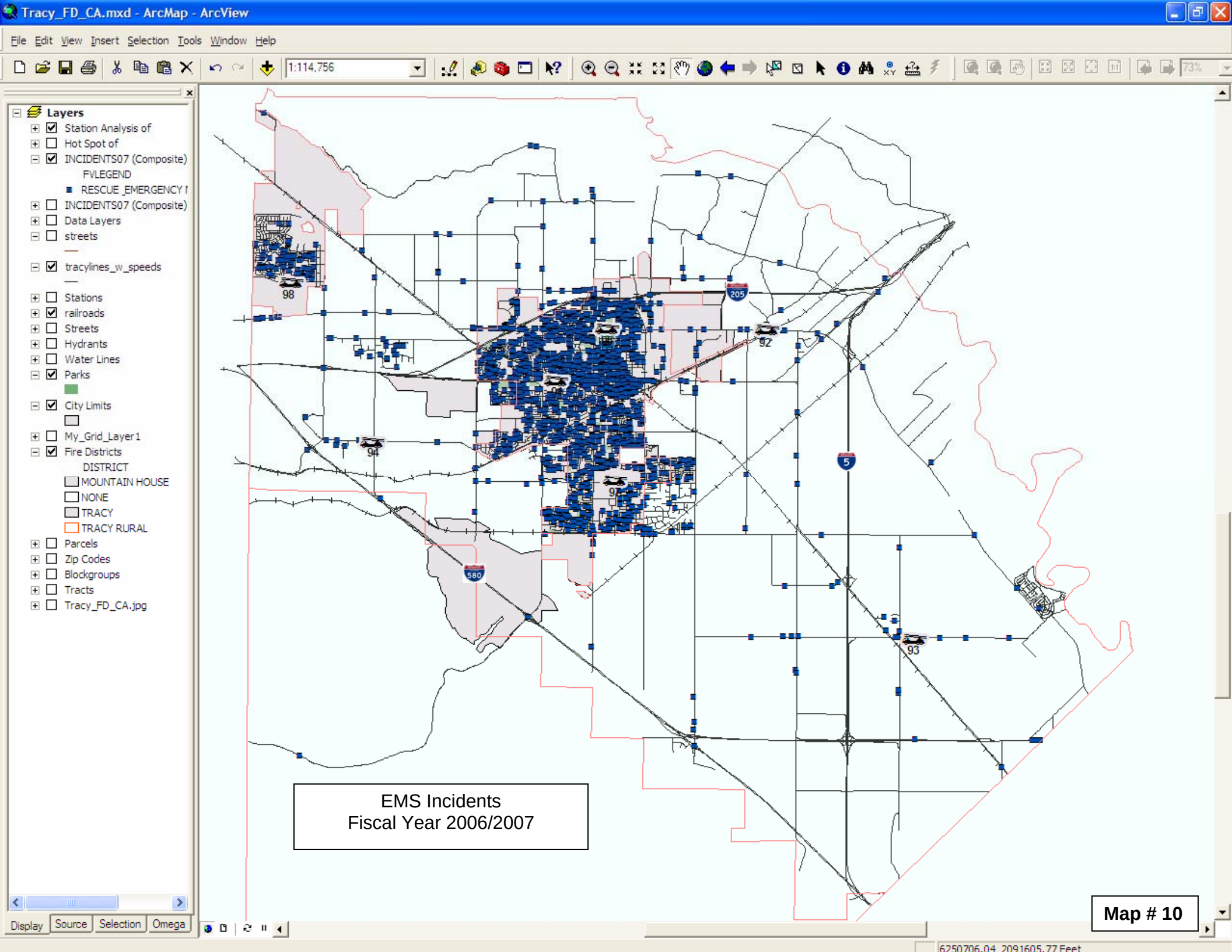
Hot Spots for All Incidents
Fiscal Year 2006/2007
Map # 9
6250715.92 2108332.53 Feet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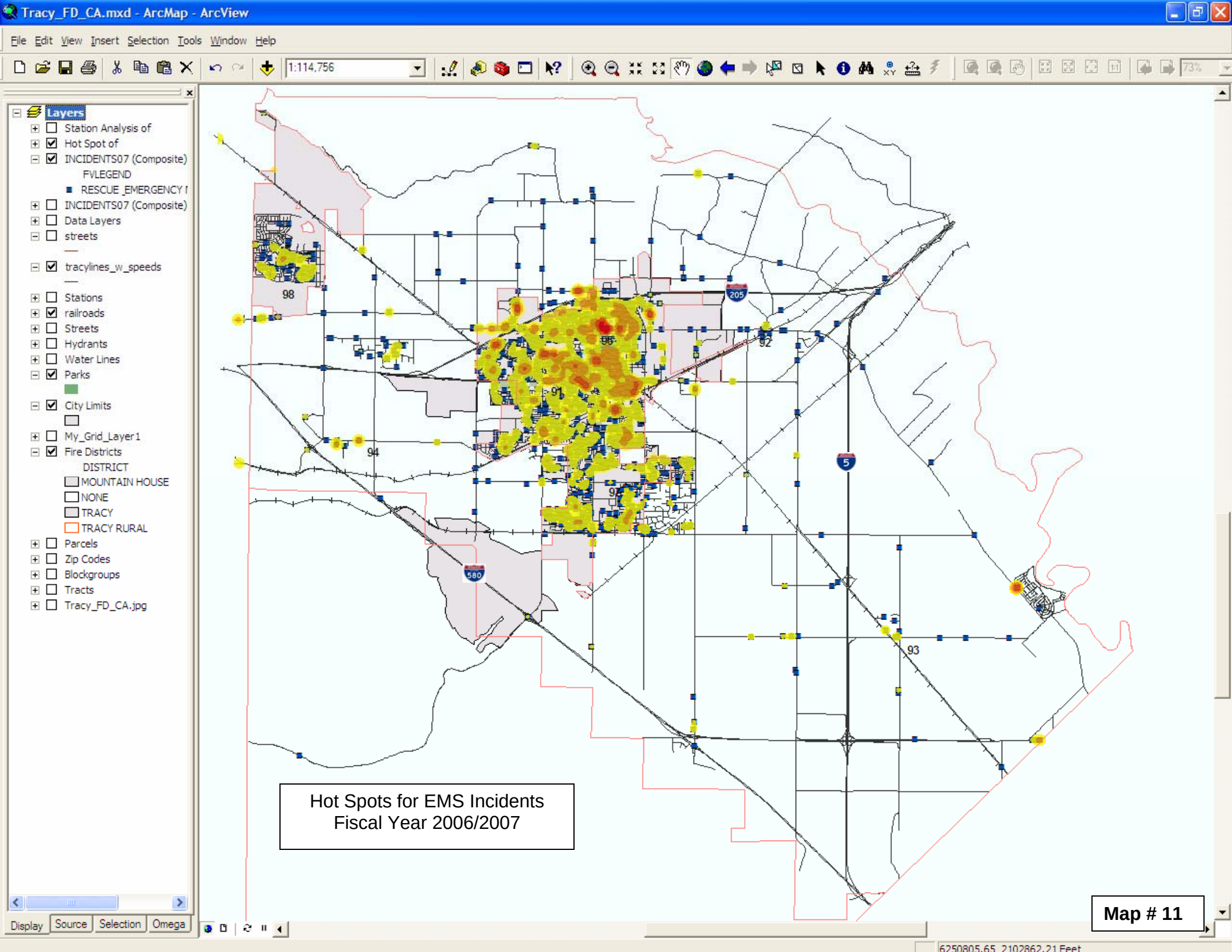
EMS Incidents
Fiscal Year 2006/2007
Map # 10
6250706.04 2091605.77 Feet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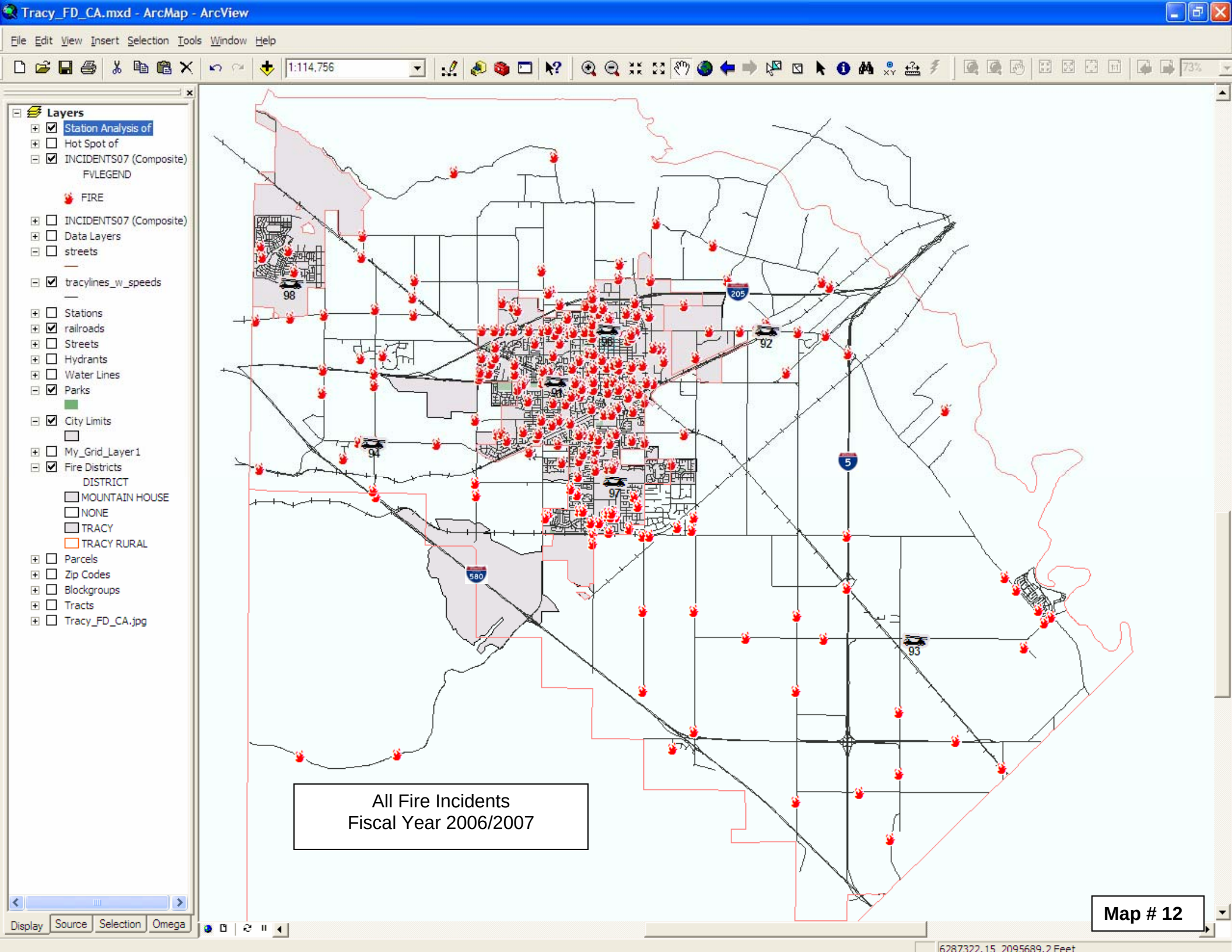
Hot Spots for EMS Incidents
Fiscal Year 2006/2007
Map # 11
6250805.65 2102862.21 Feet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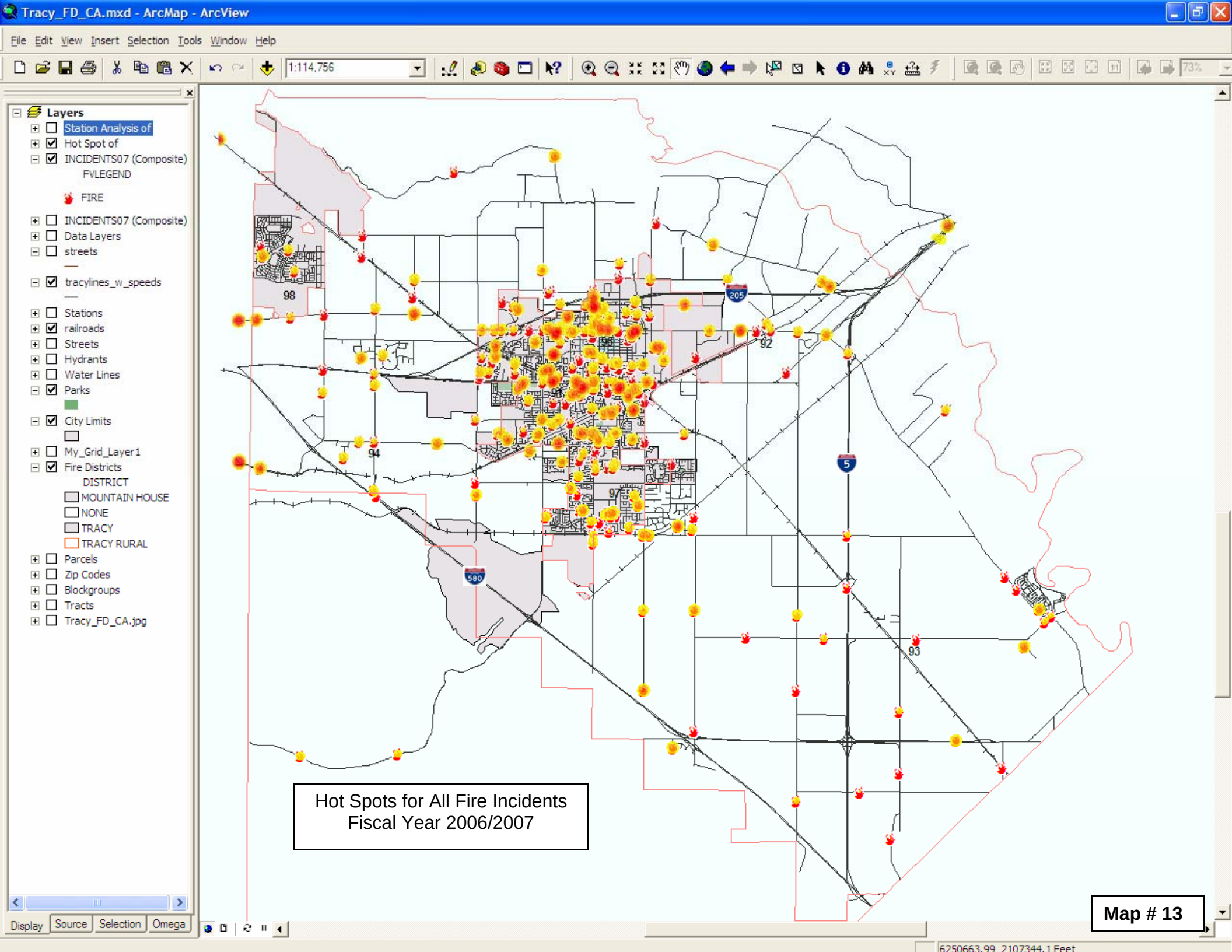
All Fire Incidents
Fiscal Year 2006/2007
Map # 12
6287322.15, 2095689.2 Feet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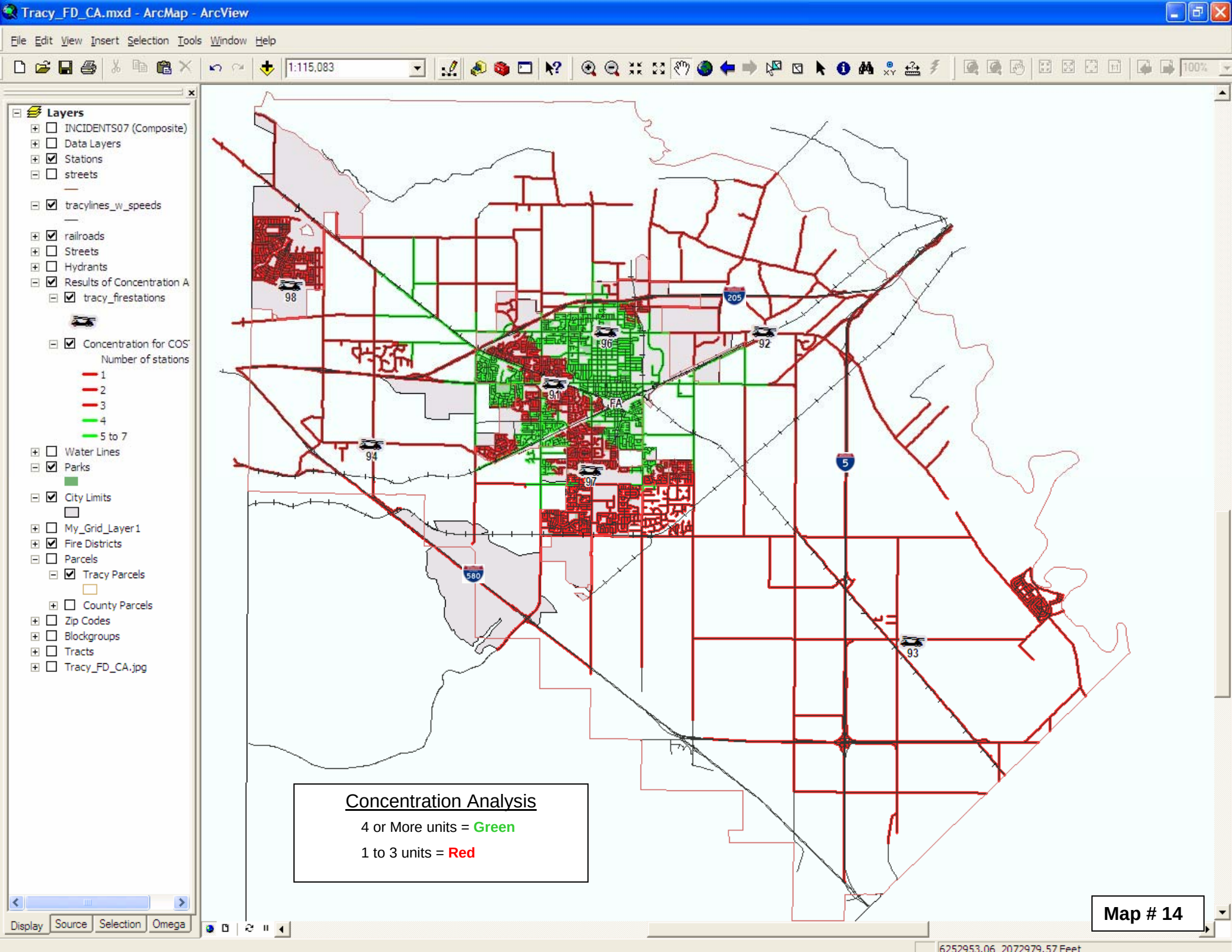
Hot Spots for All Fire Incidents
Fiscal Year 2006/2007
Map # 13
6250663.99 2107344.1 Feet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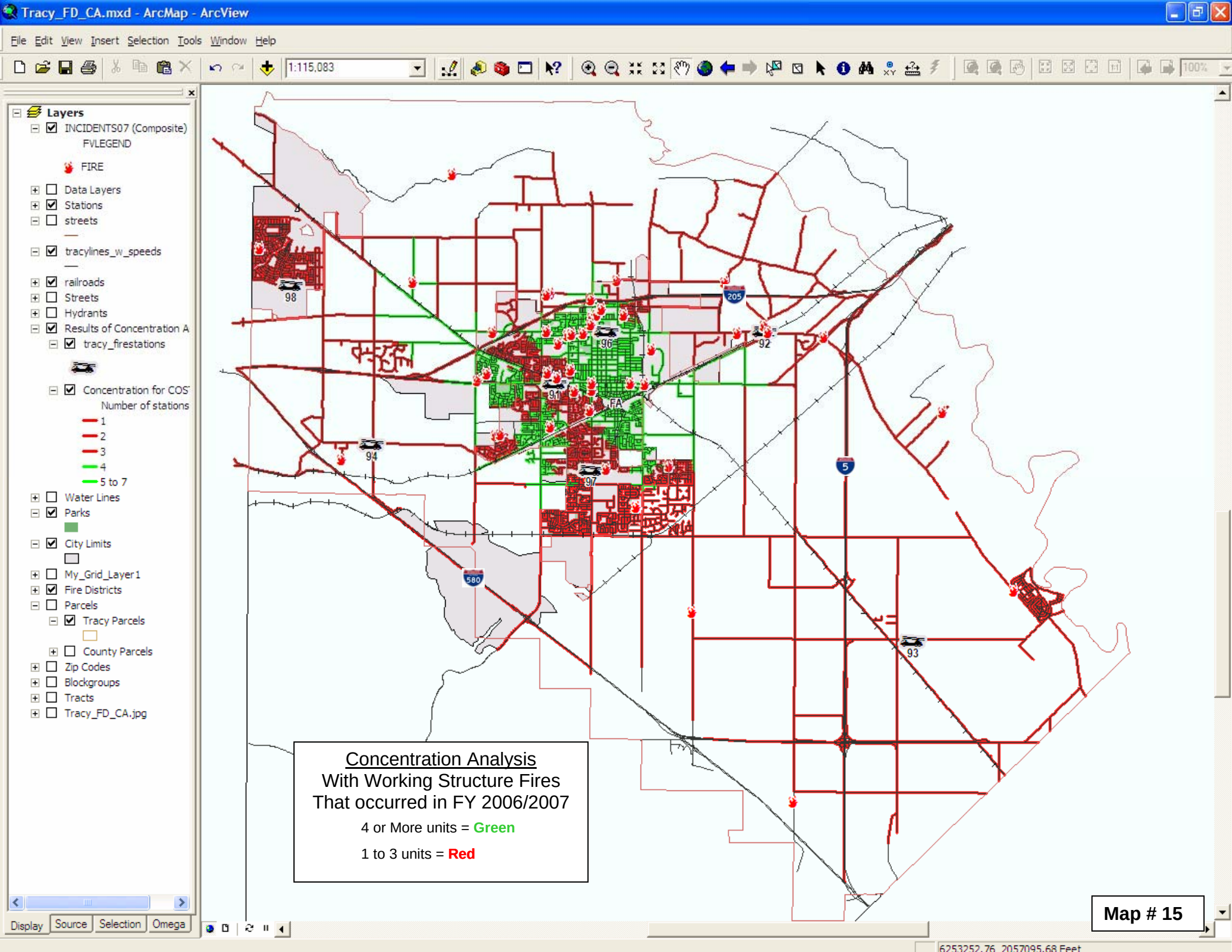
Concentration Analysis
4 or More units = Green
1 to 3 units = Red
Map # 14
6252953.06 2072979.57 Feet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Concentration Analysis
With Working Structure Fires
That occurred in FY 2006/2007
4 or More units = Green
1 to 3 units = Red
Map # 15
6253252.76, 2057095.68 Feet