

**FIREScope, INC.**  
**FIRE PROTECTION CONSULTANTS**

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**CITY OF SANTA ROSA**

**FIRE STATION LOCATION &  
DEPLOYMENT STUDY**

**FINAL REPORT**

**MAY 2002**

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## **EXECUTIVE SUMMARY**

### **Objectives of the Study:**

- To determine the extent to which the existing fire station locations and response resources meet the standards adopted by community.
- To determine what station placement and resources are necessary to meet the community standards.
- To make recommendations regarding the placement of additional fire stations and response resources, and to recommend relocation of existing assets as needed.

The following recommendations are made as a result of an extensive review of the available data, current practice and geography of the City, as well as a comprehensive literature search. The study included two site visits and a detailed analysis of the ability of the Santa Rosa Fire Department to cover the designated response area. The response time analysis was accomplished with a proven computer program that uses ArcView software. The base map was prepared by the Santa Rosa Information Services Department. The program determines response times over the actual roadway network in the City. The computer model was calibrated using actual response data and a series of tests conducted during the site visits.

The recommendations are based upon the stated response goals of the City, and recognized good practice, all focused on providing quality service to the citizens in a safe and effective manner. Further, the proposed fire station locations and resource deployment plan will provide the desired first call coverage as well as reasonably compensating for fire companies that may be out or service on a call or other official duty. Recommendations are in abridged format in this executive summary and the numerical order does not indicate any priority.

### **Summary of Recommendations:**

1. The dynamic deployment engine company should be moved to Fire Station 3 if there will be a significant delay in implementing the fire station relocation recommendations.
2. The dynamic deployment engine company should be moved to Fire Station 1 when the fire station relocation recommendations are implemented.
3. The ladder truck at Fire Station 3 should be moved to Fire Station 2, and an additional fully staffed ladder truck should be activated at Station 6.
4. A second Battalion Chief per shift should be established to share the burden of emergency response and general supervision.
5. Each new fire station should house at least one fully staffed engine company.

6. The Fire Department and Public Works Department should work together to find acceptable solutions for traffic control devices that do not materially impact emergency vehicle response.
7. Traffic signal pre-emption devices should be installed on all signalized intersections.
8. Fire Station 5 should be moved from its present location to the vicinity of Fountain Grove Parkway and Parker Hill Road.
9. Fire Station 6 should be moved from its present location to Middle Rincon Road.
10. Fire Station 8 should be moved from its present location to the vicinity of Sebastopol Road and Timothy Road.
11. A new fire station should be constructed in the vicinity of Mendocino Avenue and Steele Lane.
12. A new fire station should be constructed in the vicinity of Northpoint Parkway and Kingfisher Way.
13. A new fire station should be constructed in the vicinity of Kawana Springs Road and Franz Kafka Avenue.

**SANTA ROSA FIRE DEPARTMENT**  
**REPORT ON ANALYSIS OF FIRE STATION LOCATIONS AND RESOURCE DEPLOYMENT**

**INTRODUCTION**

Firescope, Inc. has prepared this report for the Santa Rosa Fire Department following a study of the issues specified in the request for proposal.

**Objectives of the Study**

- To determine the extent to which the existing fire station locations and response resources meet the standards adopted by community.
- To determine what station placement and resources are necessary to meet the community standards.
- To make recommendations regarding the placement of additional fire stations and response resources, and to recommend relocation of existing assets as needed.

**Scope of the Study**

1. Review current response time data including the elements of:
  - Call Processing Times
  - Reflex Times
  - Elapsed Travel Times
2. Review existing and anticipated development activity within the City and adjacent areas covered by the Santa Rosa Fire Department response.
3. Conduct a study of existing fire station locations using computer analysis of the street and roadway network.
4. Identify optimal locations for both new and existing fire stations using computer analysis of the street and roadway network.
5. Review the distribution of existing response resources and the procedures for utilizing those resources.
6. Review the current data relating to the alarm frequency, responding resources and elapsed time for those resources.
7. Identify optimal locations for and numbers of response resources.

## GLOSSARY OF TERMS

The following glossary of terms is included to assist the reader of this report in understanding the specific fire service terminology used and to insure continuity of understanding.

- **Automatic Vehicle Location System (AVL):** A computer driven system using vehicle mounted radio sending devices and a series of fixed receiving sites to determine the location of a vehicle at any given time. These systems use Global Positioning System (GPS) technology and can be connected to dispatching computers to guide in the dispatching of units closest to a call for service.
- **Battalion Chief:** A middle management position that is assigned to supervise day to day operations of 1 fire department shift or a portion thereof. This officer is typically assigned to work the same 24-hour shift as the employees and would ideally supervise a maximum of 5 to 7 company level officers located in several fire stations. An important duty of the Battalion Chief is responding to all significant emergency incidents (or reports) and assuming the on scene command responsibilities.



**BATTALION CHIEF AND VEHICLE**

- **Code 3:** Fire apparatus responds with red lights and siren.
- **Dynamic Deployment Engine Company:** An engine company assigned and deployed to provide fill in coverage for other companies that may be engaged in emergency response, training, maintenance or other activities that would preclude them from responding. Dynamic deployment engine companies are generally assigned to a busy station to help relieve the normal response burden. However, they are available for assignment to any station when a regular response unit is out of service.
- **Emergency Medical Technician (EMT):** An emergency responder who has been trained and certified to provide a standard level of emergency medical care above that of the basic first responder, but below the skills of a paramedic. Continuing education and experience is required to maintain a certification.
- **Engine Company:** A standard fire department work unit consisting of a pumper and the staffing assigned to it. Staffing would include a first line supervisor, someone designated to drive the vehicle and firefighters, all working at an assigned station to provide the basic response unit for a fire department.



**TYPICAL ENGINE COMPANY IN SANTA ROSA**

- **First Responder:** An emergency responder who has been trained and certified to provide a standard level of emergency medical care at the basic level acceptable to the fire service. First Responders typically respond to the scene of a medical emergency via the response of a fire department engine or ladder truck. Continuing education and experience is required to maintain a certification.

- **Heavy Rescue Company:** A fire department work unit consisting of a specialized rescue equipment vehicle and the staffing assigned to it. Staffing would include a first line supervisor, someone designated to drive the vehicle and firefighters/rescue technicians, all working at an assigned station. The heavy rescue company is equipped to handle most rescue situations in a given community as well as perform a number of specialized tasks at fire scenes and emergency medical incidents.
- **Ladder Truck Company:** A fire department work unit consisting of a specialized vehicle and the staffing assigned to it. Staffing would include a first line supervisor, someone designated to drive the vehicle (2 people if the rear of the vehicle is steerable) and firefighters, all working at an assigned station. The ladder truck company has a special set of skills and duties at fire scenes that use equipment carried on these large vehicles. These duties may include use of the powerful hydraulic ladder or other extensive ground ladders carried on the truck. These duties may include use of the powerful hydraulic ladder or other extensive ground ladders carried on the truck.



**TYPICAL LADDER TRUCK COMPANY IN SANTA ROSA**

## **CITY OF SANTA ROSA**

The City of Santa Rosa has a population of approximately 150,000 residents occupying approximately 42 square miles of land. The Roseland Fire Protection District adds an additional 3,000 residents to the protection area. The area is characterized by a mix of level terrain surrounded by steep, vegetation covered hills. Its climate is mild and damp in the winter, and warm and dry in the summer.

Santa Rosa has experienced significant growth over the past two decades and continues to enjoy a steady economic and population growth. The City has an active planning function as well as extensive capital improvement implementation programs.

## **SANTA ROSA FIRE DEPARTMENT**

The Santa Rosa Fire Department serves the City of Santa Rosa as well as the Roseland Fire Protection District, through a contractual agreement. The coverage area includes approximately 42 square miles with in excess of 150,000 inhabitants. In addition, the Department has a boundary drop agreement with the Rincon Valley Fire Protection District with whom they jointly utilize the equipment and personnel assigned to the Rincon Valley Station on Todd Road (designated as Station Nine).

The Fire Department is staffed with 135 FTE employees and 3 limited term, part-time positions. It is organized into 3 divisions, Administration, Fire Operations and Fire Prevention. The Administration Division provides the overall management of the Department by the development of new programs, the promotion of life safety and environmental protection, the provision of administrative support for Fire Department personnel, and the administration of the Roseland Fire Protection District contract. The Administration Division is housed at the Headquarters Fire Station.

The Fire Operations Division is responsible for response to emergency incidents. These incidents include fires of all types, medical emergencies, technical rescues, hazardous materials incidents and other customer needs as necessary. To provide a timely response, 8 fire stations are strategically located throughout the City and in the Roseland Fire Protection District (Station 8). Each fire station houses an engine company with a minimum of 3 personnel assigned to each engine. Station 6 has a dynamic deployment engine company housed at its location. The dynamic deployment engine company may be deployed to other fire stations in the City when the resident fire company is not available. Stations 1 and 3 also house a ladder truck company staffed with a minimum of 4 personnel. In all cases, the companies are staffed on a 24-hour per day basis. All



Operations Division personnel are required to have medical training to at least the level of “Emergency Medical Technician” and are proficient in the use of Department provided emergency cardiac defibrillation equipment. The Division responds to all emergency medical incidents in the City and Roseland Fire Protection District, along with the designated ambulance service provider.

The Fire Operations Division also staffs a Hazardous Materials Response Unit, which provides emergency response services to isolate, contain, identify and mitigate unplanned and uncontrolled releases of hazardous substances with the City.

The Department responded to 16,341 calls for service in calendar 2001, which represents a 6.8% increase over the previous year, a trend that has been occurring since the early 1980's. The growth in service demand over the last two decades is portrayed in Table 1 on the following page.

**TABLE 1. SUMMARY OF EMERGENCY RESPONSES BY YEAR**

Calendar Year	Number of Responses	% Change
1980	3,987	+ 5.9%
1981	4,739	+ 18.9%
1982	4,709	- 00.6%
1983	5,299	+ 12.5%
1984	5,983	+ 12.9%
1985	7,338	+ 22.6%
1986	8,317	+ 13.3%
1987	8,669	+ 4.2%
1988	8,799	+ 1.5%
1989	9,193	+ 4.5%
1990	9,613	+ 4.6%
1991	9,310	- 03.2%
1992	10,091	+ 8.4%
1993	10,352	+ 2.6%
1994	10,212	- 01.4%
1995	11,229	+ 10.0%
1996	11,243	+ 0.0%
1997	11,963	+ 6.4%
1998	12,549	+ 4.9%
1999	13,442	+ 7.1%
2000	15,290	+ 13.7%
2001	16,338	+ 6.9%

There has been a 310% increase in emergency responses from 1980 to 2001. Although emergency medical calls make up the majority of calls for service, the percentage of those calls is below the national average of 78%. Table 2 illustrates the division of service requests for the last 3 years.

**TABLE 2. RESPONSES BY TYPE OF CALL (3 YEAR AVERAGE)**

Call Classification	Calls	% of Total Calls
Fires, Explosions	757	5.03%
Overheating, no fire	40	0.00%
Rescue, Medical*	8891	59.81%
Hazardous Cond.	423	2.82%
Service Calls	1576	10.49%
Good Intent*	2124	14.14%
False Calls*	1162	7.73%
Natural Disasters	2	0.00%
Other	52	0.00%

\* Certain calls that ultimately must be reported as Good Intent or False Calls should, for analysis purposes, be considered Medical, Rescue. This would result in the Medical, Rescue category representing 70% of the call volume, or about 10% more than the table indicates.

### **TIMELY DELIVERY OF SERVICE**

The primary function of all fire departments is the timely delivery of quality emergency services. The critical performance measures of service delivery are commonly known as response time. In using response time as a performance measure, it is important that the elements of response time be defined and understood.

**Response Time:** For the purpose of this study response time is defined as the total amount of time between the receipt of the initial call in the dispatch center (phone ring) and the arrival of fire apparatus (wheel stop) at the incident scene. Response time consists of several time elements that are listed and defined below.

- **Dispatch Time:** The amount of time that it takes to receive and process an emergency call. This includes receiving the call, determining the nature of the emergency, the location of the emergency, determining what resources are required to handle the call and notifying the units that are to respond.
- **Get Out Time:** The amount of time that it takes a fire crew to react after receiving dispatch information and prepare to leave the station.

- **Reflex Time:** The sum of dispatch time and get out time.
- **Travel Time:** The amount of time that it takes for a piece of fire apparatus to travel from the fire station to the incident scene (wheel start to wheel stop).

Many fire departments establish service delivery standards or response time goals for their departments so that they have an indicator or benchmark by which to measure their service delivery. Some of the elements that determine these are:

- Staffing
- Risk
- Density of:
  - Population
  - Buildings
  - Development
- Geography
- Layout of streets and roads
- Outside or adjacent fire and rescue resources that can assist

In addition, the National Fire Protection Association adopted and issued the first national standard in 2001. This Standard, NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public By Career Fire Departments, specifies response times coupled with staffing requirements to cover 90% of the emergency incidents in a given jurisdiction.

**This study was conducted using the standards for emergency response for the Santa Rosa Fire Department, as defined by the City of Santa Rosa. Those standards are:**

- **A citywide average response time not to exceed four minutes**
- **Response time of no more than four minutes to 80% of the code three calls**
- **Response time of no more than five minutes to 90% of code 3 calls**
- **Response time of no more than six minutes to all code 3 calls**

**Note:** For the purposes of these standards, the City has defined response time as the measure of time from the time of call receipt in the dispatch center (phone answered) to the time that the first fire company arrives on the scene (wheel stop).

The City of Santa Rosa standards for emergency response were in place before the adoption of the national standard. The City standards provide a good level of service to the citizens of Santa Rosa for the delivery of fire and rescue services by the Santa Rosa Fire Department.

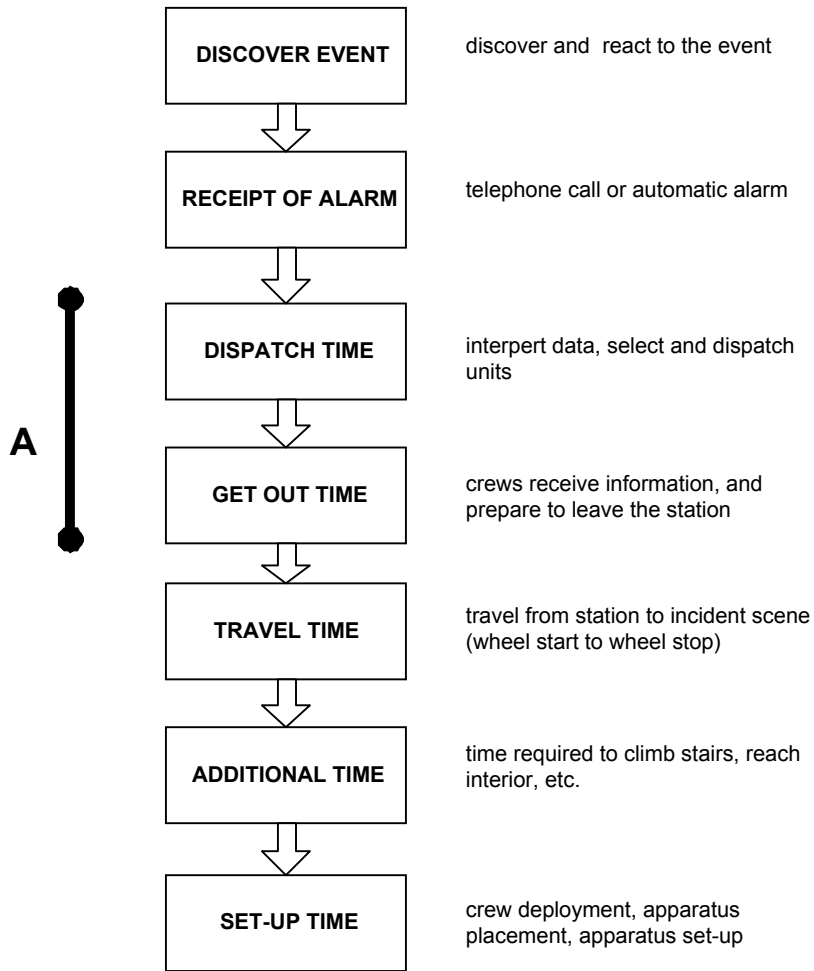
### **Response Time Sequence**

Fire System Response Time is manageable. The receipt of the alarm and the dispatch of units are manageable by the way that alarms are received and the way that dispatch activities are handled. Properly designed and used Enhanced 911 and computer aided dispatch systems have effectively minimized the time required to receive and handle alarms.

The time segment "A" in Figure 1 represents **Reflex Time** and includes Dispatch Time and Get Out Time. The latter may be managed to some degree by decreasing the time required for crews to receive alarm information and to don protective clothing.

Travel time is one of the most manageable segments of time in the entire sequence. This is the amount of time required for a piece of fire apparatus to travel from a fire station to an incident scene (wheel start to wheel stop). **Santa Rosa response goals are inclusive of Reflex Time AND Travel Time. When calculating and illustrating the travel times for this study, Firescope, Inc. and the Santa Rosa Fire Department have agreed that a figure of 1.5 minutes will be used for Reflex Time and 2.5 minutes for travel time, yielding the four-minute goal. Existing data supports the fact that this will be a correct assumption in more than 90% of incidents.**

**FIGURE 1. RESPONSE TIME SEQUENCE**

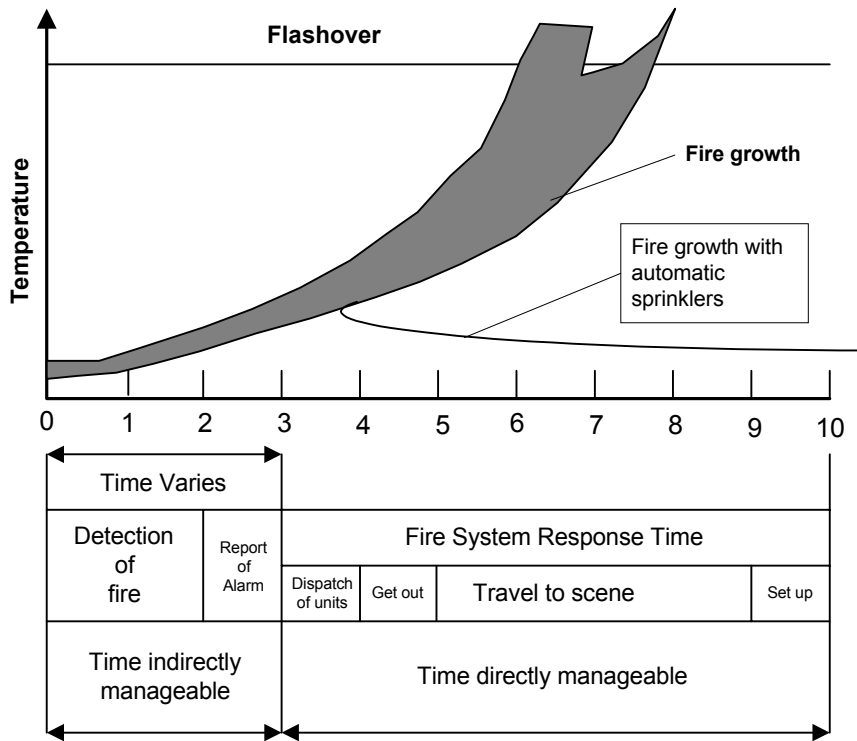


**Establishing Fire Suppression Response Goals**

Fire growth can expand at a rate of 50 times its volume per minute. The time segment between fire ignition and the start of fire suppression activities is critical and has a direct relationship to fire deaths and injuries and fire loss, as well as the safety of fire fighters initiating search, rescue and fire fighting operations.

Figure 2 provides an illustration of fire growth over time, and the sequence of events that represent fire detection and response times.

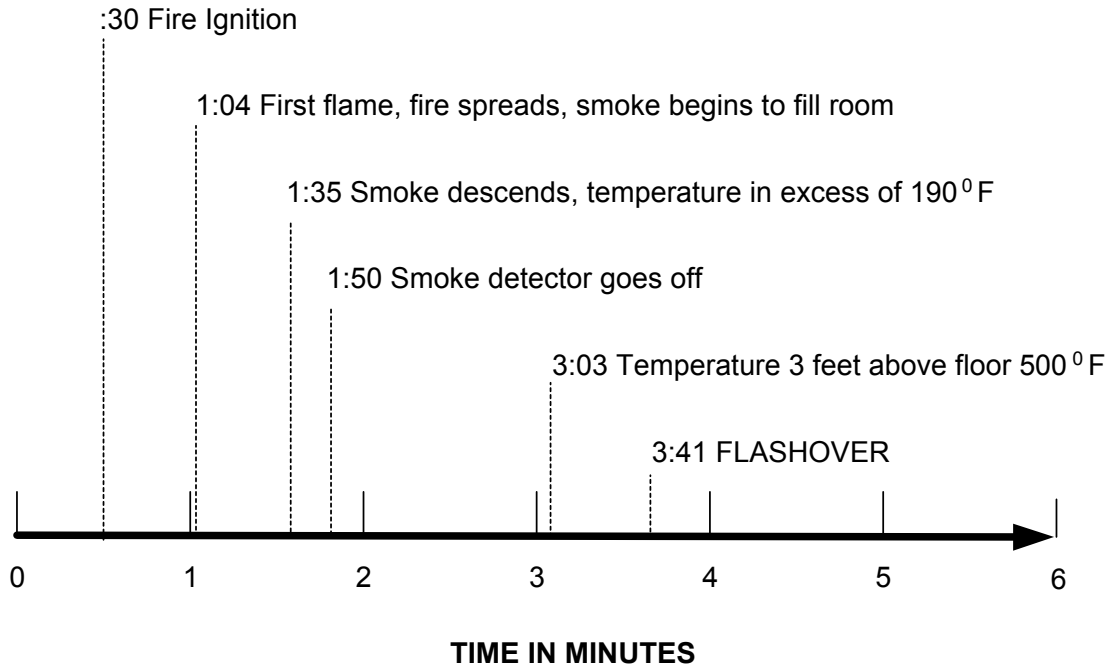
**FIGURE 2. TIME/TEMPERATURE CURVE RELATIONSHIP TO RESPONSE TIME**



The time segment between the ignition of a fire and the reporting of a fire will vary and is indirectly manageable by the fire department. The amount of time between ignition and detection of a fire will vary depending upon the means of detection. Some types of heat detection and smoke detection along with automatic extinguishing systems provide the fastest means and most reliable means of detecting fires. The use of sight and/or smell may take somewhat longer depending upon circumstances. The fire department can manage this time by requiring the installation of automatic alarm and/or extinguishing systems.

Figure 3 shows the ignition and fire growth sequence that was recorded for a fire in a single-family dwelling that was intentionally set and documented for educational purposes.

**FIGURE 3. SEQUENCE OF EVENTS IN A TYPICAL RESIDENTIAL FIRE**



Flashover is defined by the International Fire Service Training Association as the "stage of a fire at which all surfaces and objects within a space have been heated to their ignition temperature, and flame breaks out almost at once over the surface of all objects in the space."

Both figures show the need for a timely and efficient response once a fire has been reported.

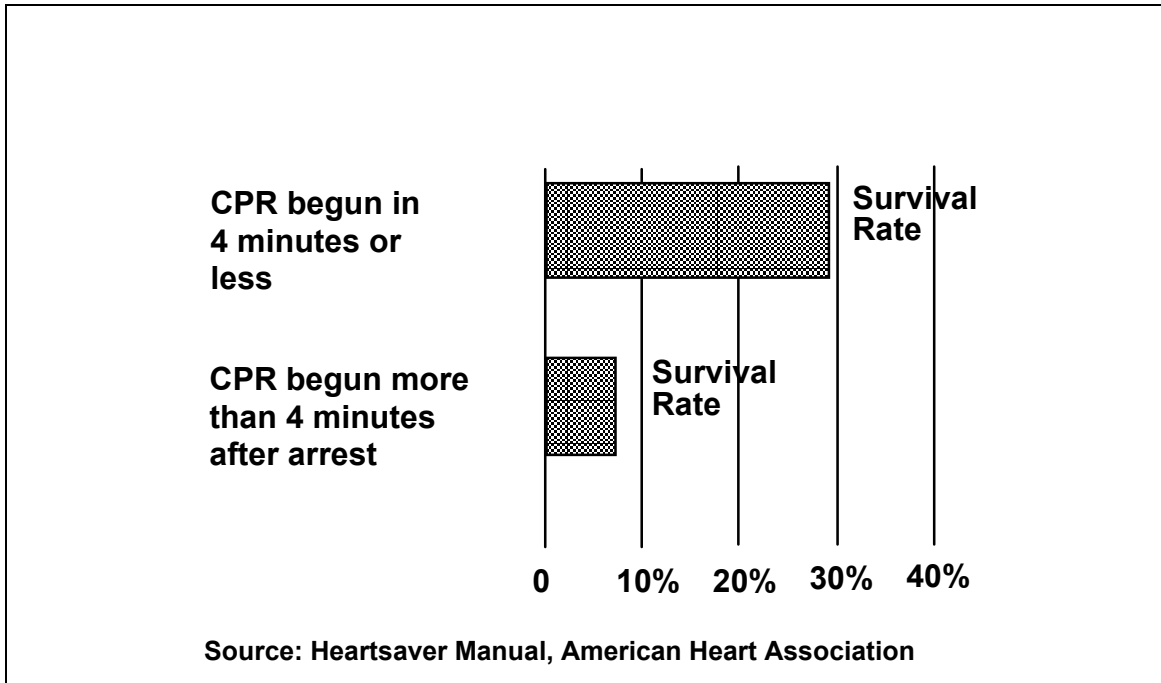
### **Emergency Medical Response Goals**

The delivery of emergency medical services by First Responders is time critical. Several publications state that when cardiopulmonary resuscitation (CPR) is started within 4 minutes, the victim's chances of leaving the hospital alive are four times greater than if



the victim did not receive CPR until after 4 minutes. Figure 4 illustrates the importance of emergency intervention in relation to survivability.

**FIGURE 4. RELATIONSHIP OF CPR TIMING TO SURVIVABILITY**



## **OBSTACLES AND ENHANCEMENTS TO EMERGENCY VEHICLE MOVEMENT**

### **Obstacles**

Speed bumps, speed dips, speed humps, neck-ins and other traffic calming techniques can represent significant obstacles to the rapid and uninterrupted movement of emergency response vehicles.

During the visit by the consultants in January 2002, the Santa Rosa Fire Department conducted several responses using Ladder Truck 1 to determine the maximum speed at which the vehicle could safely be driven over the bumps.

The first test response was on San Miguel Avenue near Coffey Lane. The results indicated that the driver would have to slow the vehicle to a speed of between 12 and 18 miles per hour to safely traverse the bumps. Although the driver was able to accelerate between the bumps, he had to apply the brakes as he approached every bump. The test provided clear indication of how speed bumps slow response time. The following pictures show the actual test.



**TYPICAL SPEED BUMP**



**LADDER TRUCK 1 ON SAN MIGUEL AVENUE**



**LADDER TRUCK 1 ON SAN MIGUEL AVENUE**

The second test was conducted on Orchard Street between Benton Street and Spencer Avenue. This area of the City contains concrete dips. The tests again indicated that the driver must slow the vehicle to a speed not exceeding 15 miles per hour through the dip. Again, the results indicated that there is a significant impact upon response time. The following pictures show the actual test.



**SPEED DIP ON ORCHARD STREET**



**LADDER TRUCK 1 ON ORCHARD STREET**

Another type of device that is being built in the City is the “neck-in”. The following pictures show neck-ins that have been incorporated into the design of the streets at Kawana Springs Road area.



**NECK-INS IN THE KAWANA SPRINGS ROAD AREA**



**NECK-IN IN THE KAWANS SPRINGS ROAD AREA**



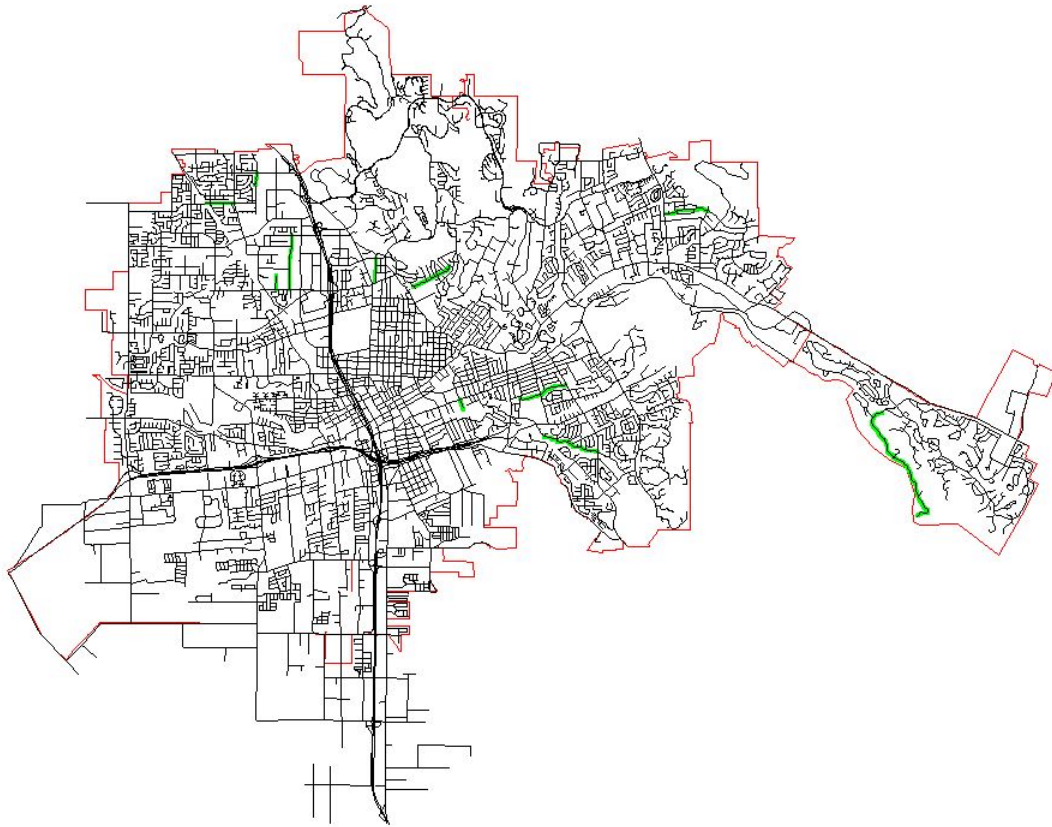
**LADDER TRUCK 1 APPROACHES NECK-IN AREA**



**NOTE NARROW WIDTH**

The neck-ins are designed to make intersections more pedestrian friendly by creating a shorter distance to travel between curbs. However, the foregoing pictures show that the narrow travel way created at the intersection may slow emergency apparatus since it will take both lanes for apparatus such as Ladder Truck 1 to pass through the neck-in.

In calculating response times, data is included that accounts for delays created by these techniques. The Santa Rosa Public Works Department understands the Fire Department's concern and is currently investigating techniques that will achieve traffic-engineering solutions while limiting impact on emergency response vehicles.



**MAP 11 – LOCATION OF SPEED CALMING DEVICES**

## **Enhancements**

Traffic signal preemption devices can be a valuable enhancement to the movement of emergency vehicles. These devices are designed to sense an approaching fire apparatus and to cycle a traffic signal as quickly as possible to present a green light in the direction of travel of that fire apparatus. There are several technologies available, but all are designed to accomplish the same objectives.

Although there is a temptation (and an economic impact) to install the sensing devices so that they detect apparatus approaching from predictable directions, it is prudent to equip signals with preemption from all directions. This is particularly important with the use of Automatic Vehicle Location (AVL) systems that often facilitate response of the closest vehicle to an emergency scene from unpredictable directions.

Traffic signal preemption devices require some time to work properly. First, they must recognize the vehicle signal emitter as the vehicle approaches the intersection. Second, the signal must give appropriate warning that it is going to change, to both vehicles and pedestrian so that they might clear the intersection. When trees, other obstacles or curved roadways interrupt a clear and timely sensing process, it is important to place sensing devices at locations that detect the vehicle signal with ample time to cycle the signal light, including any required lane or pedestrian clearance times.

Gated communities are very popular, but can introduce lengthy delays for emergency vehicles. If these subdivisions are permitted, they must be required to place readily accessible fire department key safes or an electronic means of opening gates. Even with these enhancements, delays of 30 to 45 seconds can be expected at each gate location.



## **ANALYSIS**

### **Computer Software and Map**

The computer analysis for this study was conducted using the ArcView geobased information software. The base map used for the analysis is a base map prepared by the Santa Rosa Information Services Department. Each street segment on the map has a specific distance that is scaled to the actual distance. Firescope, Inc., using a number of sources assigned a travel speed in miles per hour to each segment. Initially the speeds were assigned using the code for that segment that was assigned by the City. Later revisions used speeds determined from actual travel times to emergencies and review by fire department personnel. Allowances were made for heavily traveled streets and for areas where fire apparatus are required to travel at reduced speeds.

### **Calibration**

Firescope, Inc. calibrated the base map to reflect actual travel times as closely as possible. The calibration uses historical travel times from a fire station or fire stations to several points in the area being examined to determine if the model is performing accurately. Historical travel times are actual recorded times using minutes and seconds that were supplied by the Santa Rosa Fire Department. In addition, some actual test drives were conducted on certain streets to determine if speeds needed to be adjusted.

Initial maps were reviewed by Santa Rosa Fire Department personnel to determine accuracy. The base map was corrected when necessary to reflect actual response and travel times.

### **Analysis Plan**

Following calibration of the base map, several scenarios were analyzed to determine the coverage provided for each of the fire station configurations, starting with the coverage provided by the existing locations and proceeding to the coverage provided by the proposed locations.

A Map Index that shows the Map Number, the Fire Stations Analyzed, the Response Time and the Map Type, is included in the next section of this report.

**Area Under Study**

The area that was analyzed is defined as the existing Response Area for the Santa Rosa Fire Department and the Roseland Fire Protection District, as defined on January 1, 2002.

The following Map Index is provided as a guide to be used with the separate Map Book that accompanies this report. The next portion of this report discusses results of the computer analysis of the fire station locations. The analysis is divided into a series of six scenarios that were analyzed. The results of the analysis are a series of color maps that are contained in the Map Book.

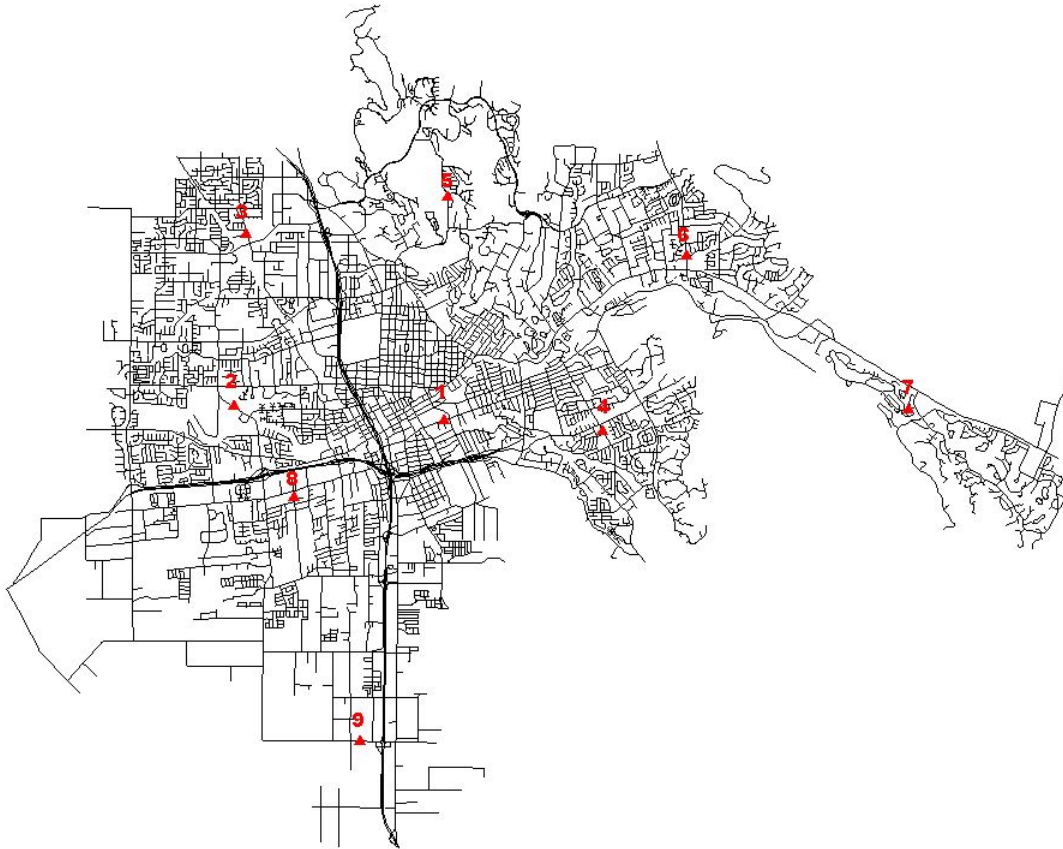
**MAP INDEX**

MAP NUMBER	SCENARIO NUMBER	FIRE STATIONS	RESPONSE TIME	MAP TYPE
1		1 - 9		Base Map Showing Current Station Locations
2	1	1 - 9	4 minutes	Shows Area Covered By Each Station
3	2	1 - 9	5 minutes	Shows Area That Can Be Covered By Two Stations
4	3	1 - 9	6 minutes	Shows Area That Can Be Covered In Six Minutes
5		1 - 12		Base Map Showing Current & Proposed Station Locations
6	4	1 - 12	4 minutes	Area Covered By Each Station
7	5	1 -12	5 minutes	Shows Area That Can Be Covered By Two Stations
8	6	1 -12	6 minutes	Area Covered By Each Stations
9	7	1 & 2	4,5,6,7,8 minutes	Truck Coverage From Stations 1 & 2
10	8	1,2 & 6	4,5,6,7,8 minutes	Truck Coverage From Stations 1,2 & 6
11				Location of Speed Calming Devices

- Area Covered:** The area-covered maps indicate those areas of the City that are generally accessible to the indicated fire station within the stated time frame. The area is defined by a polygon with the respective fire station (existing or proposed) near the center of the polygon.
- Overlap:** The maps also show the overlaps between fire stations for the specific response time. The overlap area is indicated where two or more polygons overlap each other. In the overlap area, it can be assumed that one or more stations can generally reach these areas within the stated time frame.

- **Areas of Deficiency:** The maps also indicate the areas where coverage is deficient. These areas are delineated by the fact that they are not within any polygon. In the areas of deficiency, it can be assumed that locations generally cannot be serviced within the stated time frame. Maps 3,4,7 and 8 show, by the color red, the areas that cannot be reached by two stations within the specified time.

The following section describes each of the scenarios that are included in the final report. Additional scenarios were analyzed prior to the selection of the chosen scenarios. From the analysis, each of the recommended locations was chosen as those providing the optimal coverage for the best service to the City of Santa Rosa.



**MAP 1 – CURRENT FIRE STATONS**

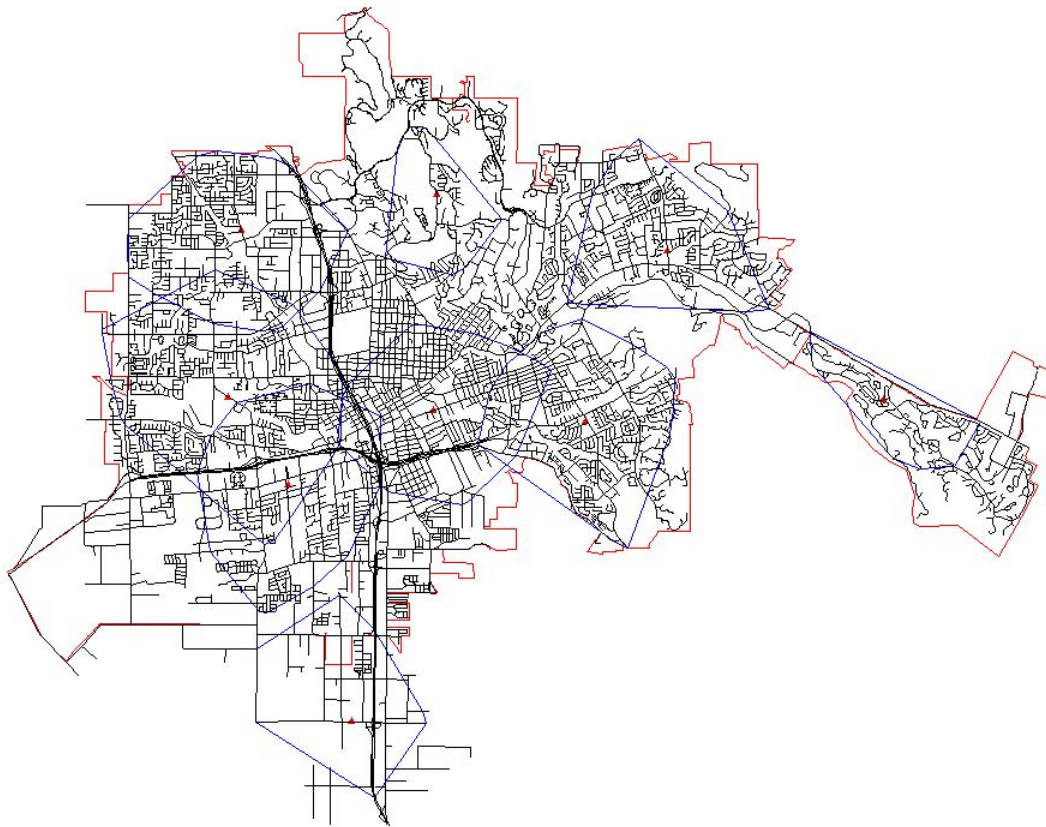
**Scenario 1    Map 2    4 minute response time**

Description: This scenario examined the coverage provided by the existing fire stations 1– 9. Stations 1 - 8 are staffed by the Santa Rosa Fire Department and Fire Station 9 is owned and staffed by the Rincon Valley Fire Protection District.

Review of Map 2 shows that there are many areas within the Response Area that are not covered by the 4 minute response time. This configuration of fire stations may be close to providing coverage to 80 percent of the response area. However, there are some critical areas that are not covered.

Comments:

- May be close to meeting the 80 percent coverage required for a 4 minute response time.
- There is minimal overlap between fire stations. This means if one station is out of service on another call, the adjacent station is usually well beyond the 4 minute response time.



**MAP 2 – 4 MINUTE RESPONSE TIME**

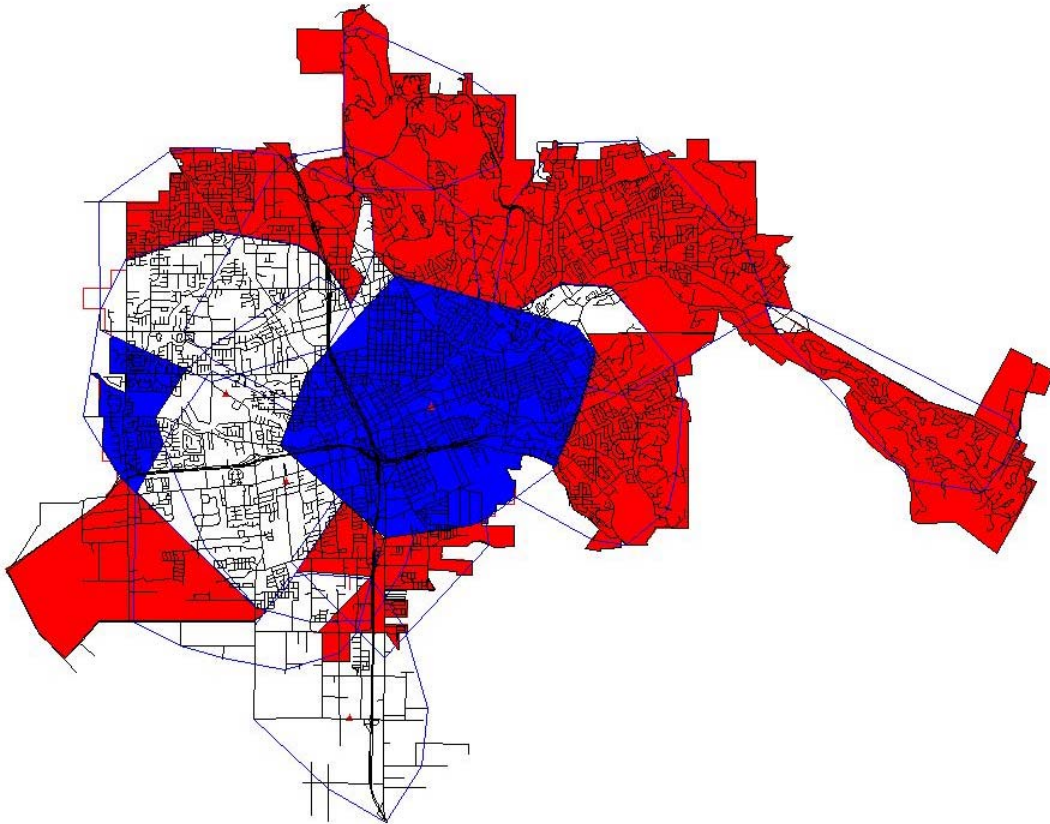
## **Scenario 2      Map 3              5 minute response time**

Description: This scenario examined the coverage provided by the existing fire stations 1– 9. Stations 1- 8 are staffed by the Santa Rosa Fire Department and Fire Station 9 is owned and staffed by the Rincon Valley Fire Protection District.

Review of Map 3 shows most of the area within the Response Area is covered by the 5 minute response time. This configuration of fire stations may be close to providing coverage to 90 percent of the response area. However, when examining the area for two-station coverage there is a significant area that is not covered. The areas that are colored in red on Map 3 show this area.

### Comments:

- Most likely meets the 90 percent requirement for a 5 minute response time, however the review of historic response data shows that at least 15% of the time the designated first due engine or ladder truck is not available because of another call.
- There is significant overlap in the center portion of the City between fire stations. This means if one station is out of service on another call, the adjacent station can generally meet the 5 minute response time requirement.
- There is a significant lack of overlap between stations on the outer portions of the City, which is indicated by the areas colored in red on Map 3. This means when stations in the areas colored in red are out of service on a call or in another part of the city, service cannot be provided within the 5 minute response time.
- The area colored in blue indicates areas that have two-company coverage from the same fire station. This is because Fire Station 1 and Fire Station 2 have Ladder Truck Companies in addition to Engine Companies.



**MAP 3 – 5 MINUTE RESPONSE TIME**

**Scenario 3    Map 4    6 minute response time**

Description: This scenario examined the coverage provided by the existing fire stations 1– 9. Stations 1- 8 are staffed by the Santa Rosa Fire Department and Fire Station 9 is owned and staffed by the Rincon Valley Fire Protection District.

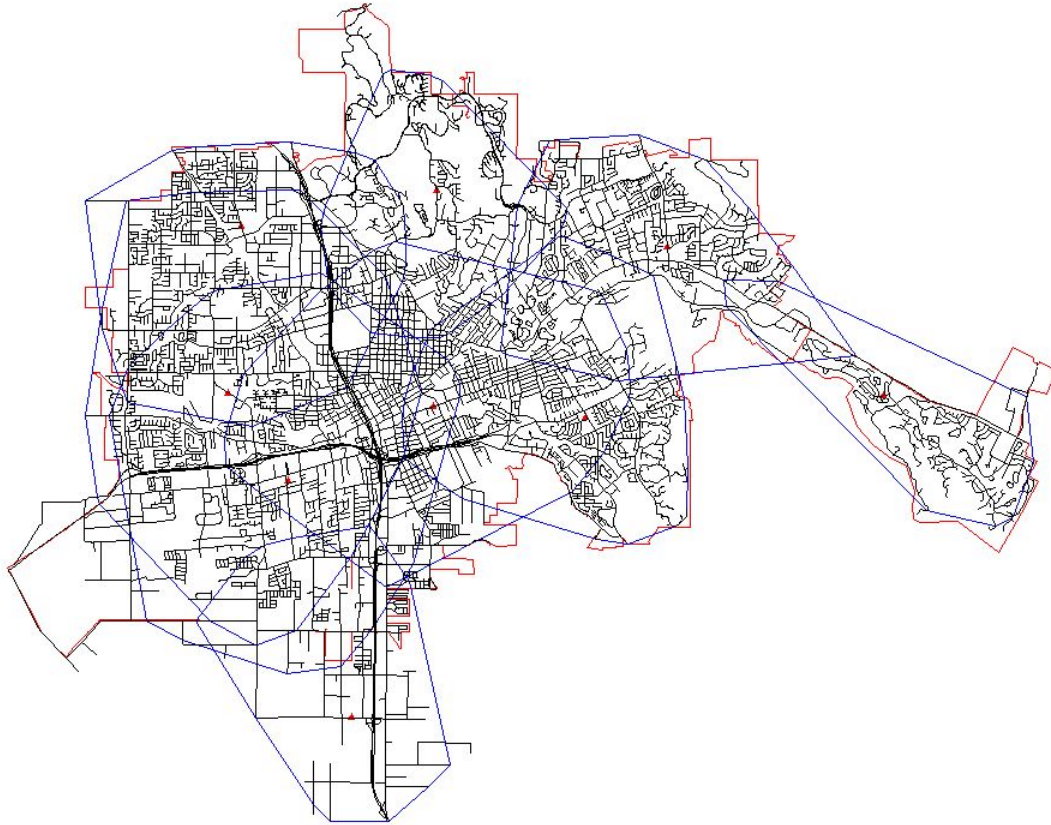
Review of Map 4 shows most of the area within the Response Area is covered by the 6 minute response time. This configuration of fire stations most likely meets the requirement for providing coverage to 100 percent of the response area. However, when examining the area for two-station coverage there are some areas that are not covered. These areas are shown in red on Map 4.

**Comments:**

- Most likely meets the 100 percent requirement for a 6 minute response time, however the review of historic response data shows that at least 15% of the time

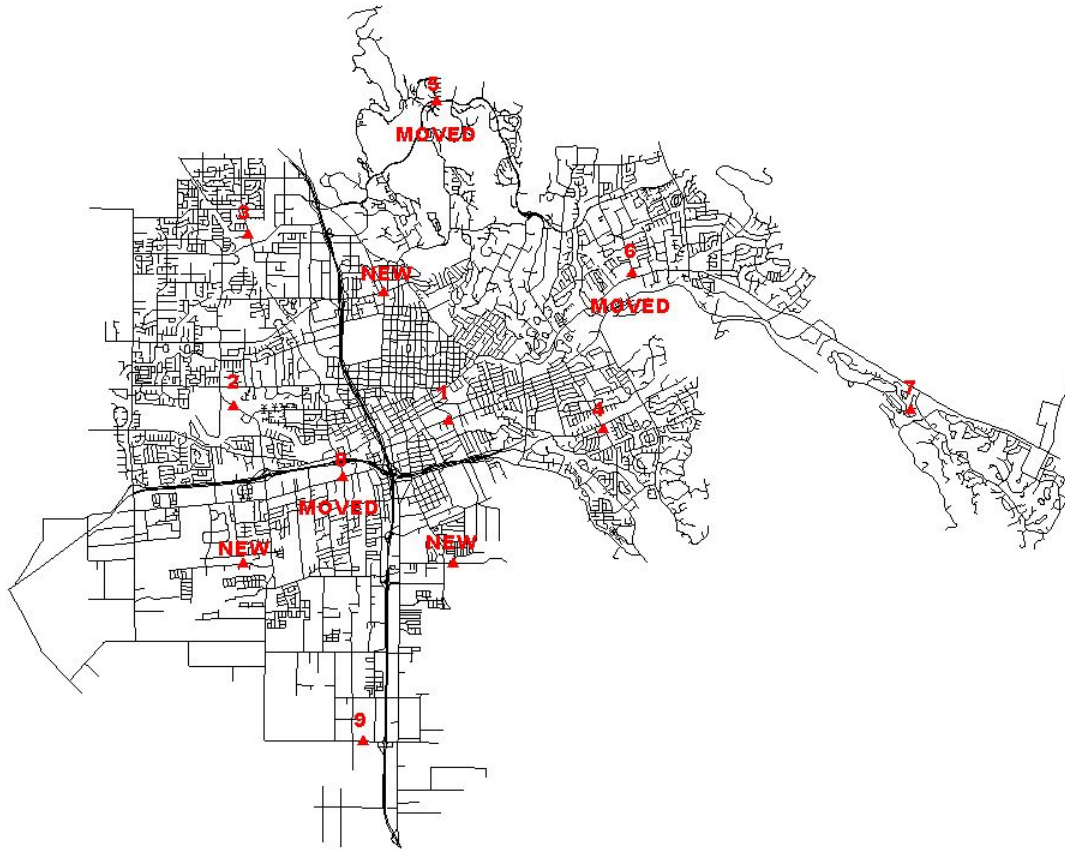
the designated first due engine or ladder truck is not available because of another call.

- There is significant overlap in most of the City among fire stations. This means if one station is out of service on another call, the adjacent station can generally meet the 6 minute response time requirement.



**MAP 4 – 6 MINUTE RESPONSE TIME**

**Note:** Before proceeding to the narrative for Scenarios 4, 5 and 6, review map 5. This map shows the recommended configuration of fire stations for the City of Santa Rosa. We are recommending that Fire Stations 1, 2, 3, and 4 remain in their current locations. Further, we are recommending that three of the current fire stations, 5, 6 and 8 be moved, and that three new fire stations be constructed. The following narrative describes the recommended changes.



**MAP 5 – CURRENT AND PLANNED FIRE STATONS**

**Fire Station 5:** Recommend that this fire station be relocated from its present location on Stagecoach Road to a location in the vicinity of Fountain Grove Parkway and Parker Hill Road.

**Fire Station 6:** Recommend that this fire station be relocated from its present location on Calistoga Road to a location on Middle Rincon Road that is now occupied by a fire station owned by the Rincon Valley Fire Protection District.

**Fire Station 8:** Recommend that this fire station be relocated from its present location on Burbank Avenue to a location in the vicinity of Sebastopol Road and Timothy Road.



**New Fire Station:** Recommend the construction of a new fire station in the vicinity of the intersection of Mendocino Avenue and Steel Lane.

**New Fire Station:** Recommend the construction of a new fire station on the north side of Northpoint Parkway between Thunderbolt Way and Kingsher Way. There is a parcel of land at this location that is now owned by the city.  
A picture of this location follows.



**Northpoint Parkway Location**

**New Fire Station:** Recommend construction of a new fire station in the vicinity of Kiwana Springs Road and Franz Kafka Avenue. The City currently owns a parcel of land at this location.

A picture of this of this location follows.



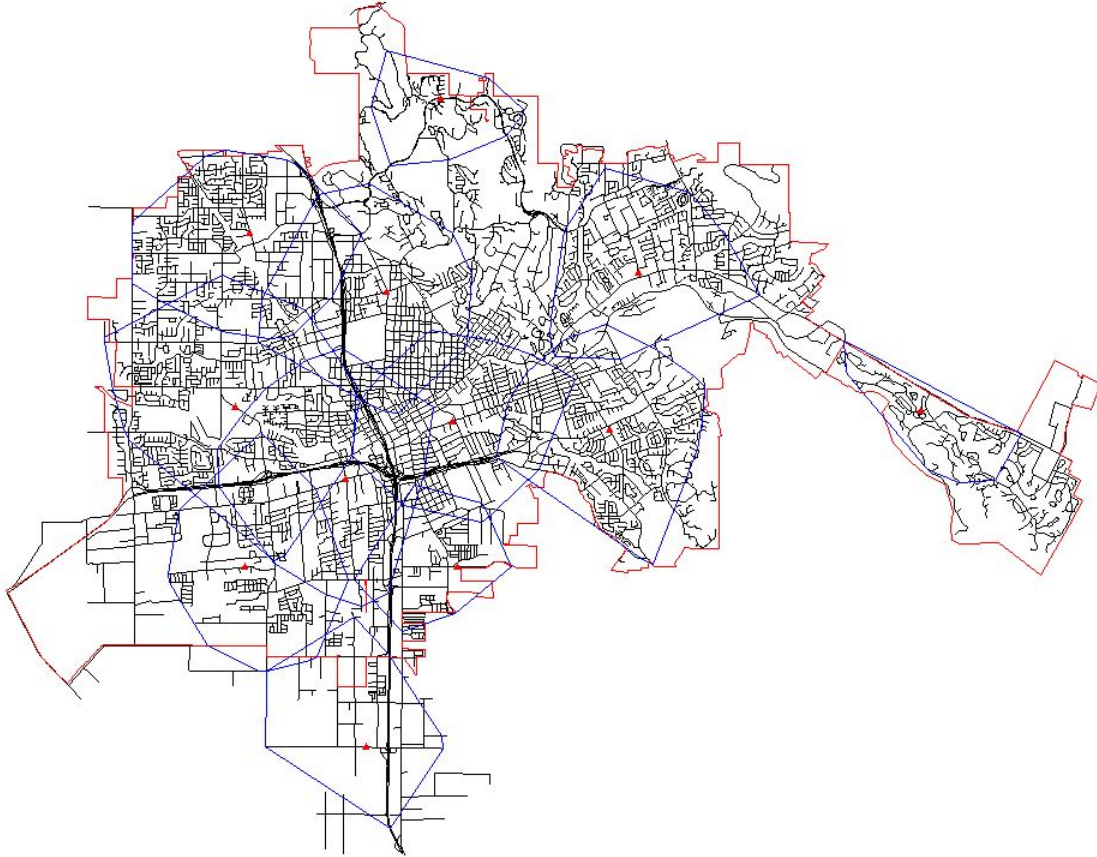
**Scenario 4      Map 6              4 minute response time**

Description: This scenario examined the coverage provided by the recommended configuration of fire stations as shown on Map 5. This configuration consists of current fire stations 1,2,3, and 4, new locations for fire stations 5,6 and 8, and new fire stations on Mendocino Avenue, Northpoint Parkway and the location on Kawana Springs Road, plus fire station 9.

Review of Map 6 shows most of the area within the Response Area is covered by the 4 minute response time. This configuration of fire stations most likely meets the requirement for providing coverage to 80 percent of the response area, and provides significant overlap for a 4 minute response time. When compared with Map 2, this configuration provides materially better coverage for a 4 minute response time.

Comments:

- Most likely meets the 80 percent requirement for a 4 minute response time.
- Much better coverage for a 4 minute response time than the current configuration of fire stations



**MAP 6 – 4 MINUTE RESPONSE TIME**

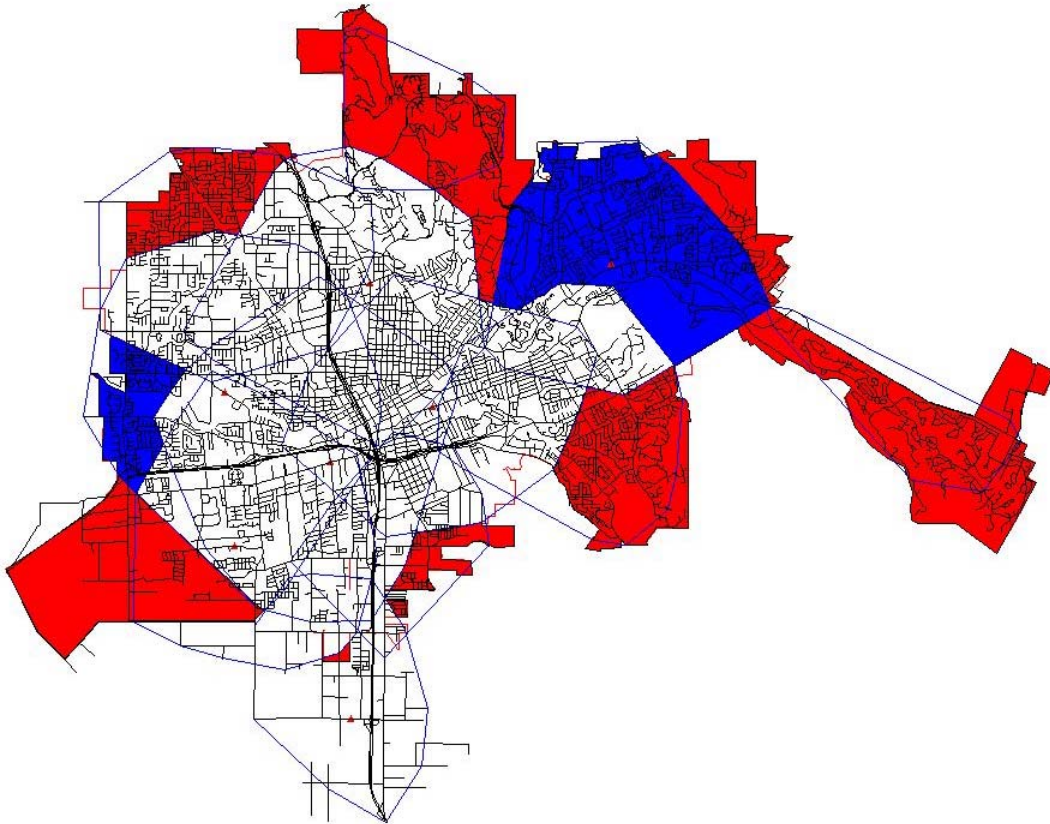
**Scenario 5      Map 7              5 Minute Response Time**

Description: This scenario examined the coverage provided by the recommended configuration of fire stations as shown on Map 5. This configuration consists of current fire stations 1,2,3, and 4, new locations for fire stations 5,6 and 8, and new fire stations on Mendocino Avenue, Northpoint Parkway and the location on Kawana Springs Road, plus fire station 9.

Review of Map 7 shows most of the area within the Response Area is covered by the 5 minute response time. This configuration of fire stations most likely meets the requirement for providing coverage to 90 percent of the response area, and provides significant overlap for a 5 minute response time. When compared with Map 3 this configuration provides materially better coverage for a 5 minute response time. The areas in red on this map are much smaller than those shown in Map 3.

Comments:

- Most likely meets the 90 percent requirement for a 5 minute response time.
- Much better coverage for a 5 minute response time than the current configuration of fire stations.



**MAP 7 – 5 MINUTE RESPONSE TIME**

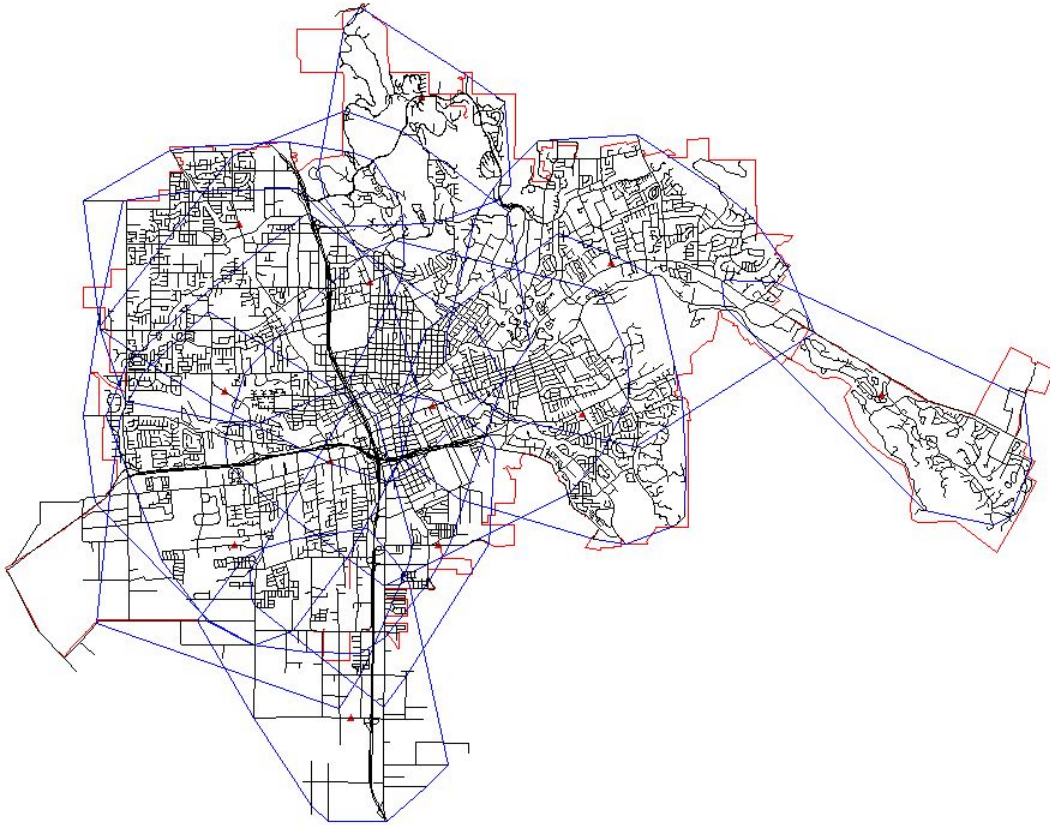
**Scenario 6      Map 8      6 Minute Response Time**

Description: This scenario examined the coverage provided by the recommended configuration of fire stations as those shown on Map 5. This configuration consists of current fire stations 1,2,3, and 4, new locations for fire stations 5,6 and 8, and new fire stations on Mendocino Avenue, Northpoint Parkway and the location on Kawana Springs Road, plus fire station 9.

Review of Map 8 shows most of the area within the Response Area is covered by the 6 minute response time. This configuration of fire stations most likely meets the requirement for providing coverage to 100 percent of the response area, and provides significant overlap for a 6 minute response time. When compared with Map 4 this configuration provides materially better coverage for a 6 minute response time. The areas in red on this map are much smaller than those shown in Map 4.

Comments:

- Most likely meets the 100 percent requirement for a 6 minute response time.
- Much better coverage for a 6 minute response time than the current configuration of fire stations.



**MAP 8 – 6 MINUTE RESPONSE TIME**

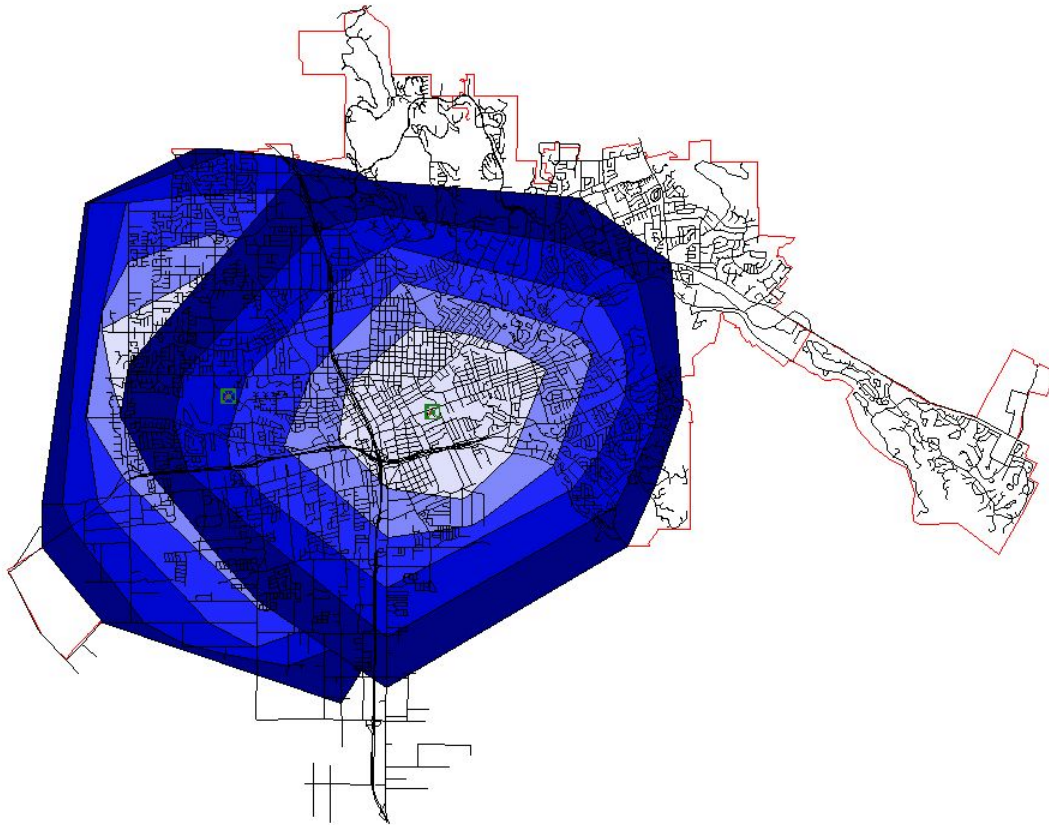
**Scenario 7    Map 9            4,5,6,7 and 8 minute response times**

Description: This scenario examined the coverage provided by ladder truck companies from fire stations 1 and 2 for the response times indicated above. Map 9 shows the coverage provided by this configuration and response times.

Note that there is a significant portion of the City that cannot be reached within the 8 minute response time.

Comments:

- Map 9 shows the area in the eastern portion of the City that cannot be reached within the 8 minute response time.



**MAP 9 – 4,5,6,7 & 8 MINUTE RESONSE TIME**

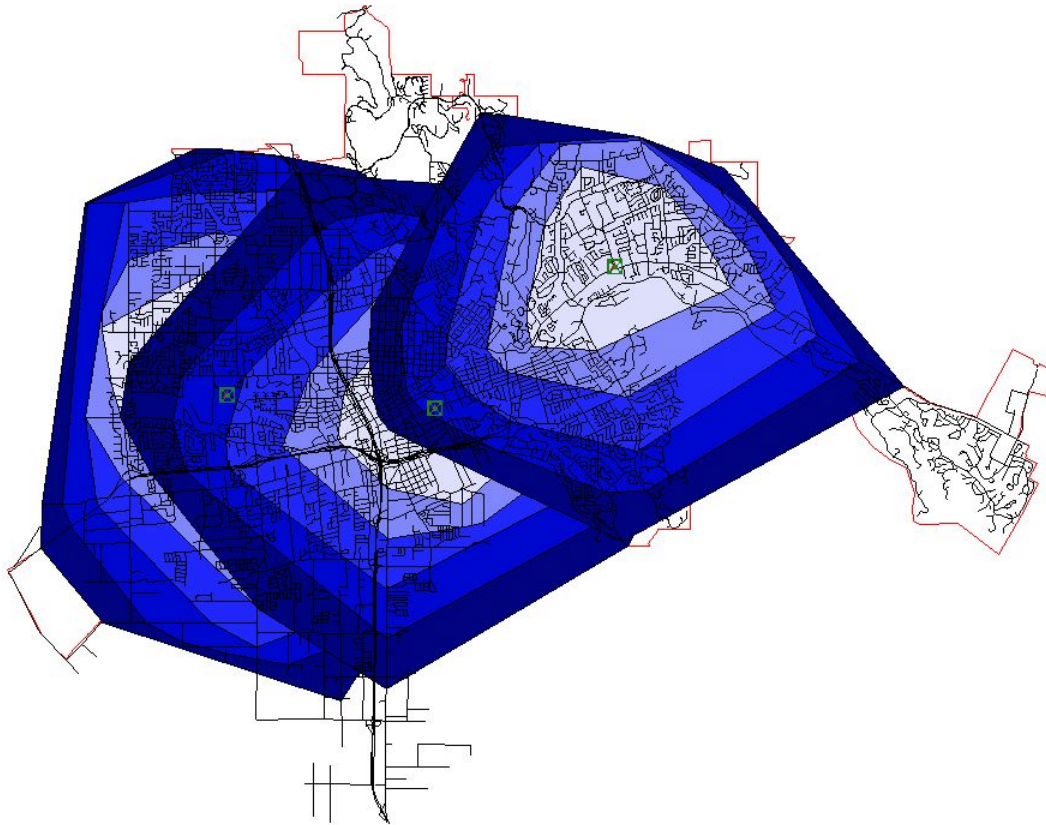
**Scenario 8      Map 10      4,5,6,7 and 8 Minute Response Time**

Description: This scenario examined the coverage provided by ladder truck companies from fire stations 1,2 and 6 for the response times indicated above. Map 10 shows the coverage provided by this configuration and response times.

Note that the addition of a ladder truck company at the new fire station 6 location provides significantly better coverage for the eastern portion of the City.

Comments:

- Map 10 shows the area on the eastern portion of the City that can be reached with the addition of another ladder truck company.



**MAP 10 – 4,5,6,7 & 8 MINUTE RESPONSE TIME**

**Conclusions**

The proposed configuration of 11 City fire stations and the Rincon Valley Fire Protection District Station (9) will provide a much improved service delivery capability over the current configuration.



The moving of three fire stations and the addition of three new stations, with companies, will provide coverage for the existing population and structures as well as the foreseeable future growth in the southern part of City. The important aspect of the proposed configuration is that it will allow better coverage by adjacent fire stations to most of the City. There are two important benefits:

- Improved response to all areas when an engine company is out of service on a call. This means that an adjacent engine or ladder truck can respond to cover in a minimum amount of time.
- Improved coverage to all areas of the city by multiple companies to the same incident. This means more personnel, which translates to better service to the citizens and a greater degree of safety for fire department personnel.

### **Deployment Analysis**

Firescope, Inc. also analyzed the deployment of suppression resources throughout the City. This analysis included an examination of data related to response time and availability of various types of fire companies. Although fire stations may be properly spaced to provide initial coverage for the entire area, if those companies have unbalanced workloads, certain areas of the City may be substantially uncovered for a high percentage of the time. This type of call loading is generally addressed through the use of a second, or dynamic deployment, engine or ladder company. In Santa Rosa, a dynamic deployment engine company is currently housed at Station 6 and Ladder Truck Companies are deployed at Stations 1 and 3.

Further, the deployment analysis examined the availability of critical services generally provided by other than engine companies. Tasks that are generally accomplished by a ladder truck or heavy rescue company are important to achieving standard outcomes, not only at commercial fires, but also at rescues and residential fires. Therefore, it is important to have properly deployed heavy rescue and/or ladder services as well as the basic engine company work groups.

Finally, the resources for supervision and command were analyzed. Timely response of a command officer to incidents where multiple companies are operating is essential to achieving standard outcomes and providing a safe working environment. The workload and travel time for the Battalion Chief were examined to determine if a deficit in service exists in this operational realm.

## RECOMMENDATIONS

The following recommendations are numbered for reference purposes and there is not an order of importance implied.

1. Although data would support the moving of the dynamic deployment engine to Station 3, it is recommended that this be reviewed internally in relation to the implementation of fire station location recommendations. It is believed that the workload imbalance indicated for Station 3 will be addressed with the implementation of new and relocated stations. If there will be a significant delay in implementing the construction of a new station near the Community College, the dynamic deployment engine should be moved to Station 3 to impact the percent of extended responses due to Engine 3 being assigned to other calls.
2. With the implementation of the fire station location plan, the dynamic deployment engine should be permanently assigned to Station 1. The most significant workload exists at Station 1 and it is more centrally located to provide an additional resource for the entire city.
3. An additional ladder truck or heavy rescue company, staffed at the same level as current ladder trucks, should be activated and placed at Station 6. The existing ladder company currently housed at Station 3 should be moved to Station 2. The existing ladder truck company housed at Station 1 should remain in place. As indicated in the graphic analysis of ladder truck company coverage, there is a significant delay likely in the north and east portions of the city. This is an issue in providing appropriate numbers of staff to do certain tasks at the scene of any structural fire.
4. A second Battalion Chief should be activated and the City divided into two Battalions for operational and administrative purposes. As the City continues to grow, the trend toward more alarms, some of which will ultimately be simultaneous with others, will continue to grow as well. Good practice suggests that a single command officer should not be responsible for more than 7 operating units on a day-to-day basis and not more than 5 operating units at the scene of an emergency. Relying upon response by on-call senior officers can result in significant delays in implementing proper strategy.
5. Each new fire station should house a minimum of one fully staffed engine company.
6. It is extremely important for the City of Santa Rosa Public Works Department and Fire Department to work together to limit the use of traffic calming devices that significantly impact the timely response of fire apparatus. In addition, citizens of the community should be consulted in order to achieve alternate solutions to traffic issues.
7. Traffic signal preemption devices should be installed on all current and future traffic signals. The sensing devices should be placed in strategic locations (sometimes a

distance away from the signal arms) to provide adequate sensing and reaction times for the system.

8. Move station 5 from its present location on Parker Hill Road to a location in the vicinity of the intersection of Fountain Grove Parkway and Parker Hill Road.
9. Move station 6 from its present location on Calistoga Road to a new location on Middle Rincon Road on the property now owned by the Rincon Valley Fire Protection District.
10. Move station 8 from its present location on Burbank Avenue to a new location in the vicinity of the intersection of Sebastopol Road and Timothy Road.
11. Construct a new fire station in the vicinity of Mendocino Avenue and Steele Lane and equip with an engine company and crew.
12. Construct a new fire station on the north side of Northpoint Parkway between Kingfisher Way and Thunderbolt Way on land that is currently reserved for a fire station and equip it with an engine company and crew.
13. Construct a new fire station near the intersection of Kawana Springs Road and Franz Kafka Avenue on land that is currently designated for a fire station and equip it with an engine company and crew.