CITYGATE ASSOCIATES, LLC
FOLSOM (SACRAMENTO) MANAGEMENT CONSULTANTS

CITY OF VACAVILLE, CA

STANDARDS OF RESPONSE COVER STUDY (VOLUME 1)

Final Report

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CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

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VACAVILLE STANDARDS OF RESPONSE COVER STUDY

A. SYNOPSIS

This report presents Citygate Associates, LLC's findings regarding fire service deployment in the City of Vacaville. Citygate engaged with the Department leadership to develop an in-depth Standards of Response Cover assessment. This multifaceted approach to understanding fire crew deployment needs will serve to guide the Department and City leadership as the community grows.

At Citygate's recommendation, the Department purchased advanced geographic mapping software for fire crew deployment called *FireView*^{TM} that combines fire unit travel time analysis with call for service data from the Fire Department's records system. For this report, Citygate has used *FireView*^{TM} to model the necessary elements of deployment. In the future, as growth plans receive final approvals, the Fire Department can continue to perform their own *FireView*^{TM} deployment models to precisely site fire stations.

The findings and recommendations at the conclusion of this study show that Vacaville will need to add fire stations as growth occurs at the city edges. The current four-station system will not provide adequate response times to the outer city areas. Additionally, the current level of daily firefighter staffing is stretched more thinly with an increasing call volume, especially for ambulance service.

B. BACKGROUND

The Commission on Fire Accreditation International recommends a systems approach known as "Standards of Response Coverage" to evaluate deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to assist elected officials in making informed decisions on fire and EMS deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station location. Depending on the size of the study, the depth of the components can vary.

Such a systems approach to deployment rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local need (risks and expectations) with the costs of various levels of service. In an informed public policy debate, the city council or governing board "purchases" the fire and EMS service levels (insurance) the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than any singular component can. If we only look to travel time for instance, and not look at the frequency of multiple calls, the analysis could miss over-worked companies. If we do not use risk assessment for deployment, and just base deployment on travel time, a community could under-deploy to incidents.

The Standard of Response Cover process consists of eight parts:

1. Existing deployment – each agency has something in place today.
2. Community outcome expectations – what is expected of the response agency?
3. Community risk assessment – what assets are at risk in the community?

4. Distribution Study – the locating of first-due resources (typically engines).
5. Concentration Study - first alarm assignment or the effective response force.
6. Historical reliability – is there a multiple call for service frequency issue (call stacking)?
7. Historical response effectiveness studies – what percent of compliance does the existing system deliver?
8. Overall evaluation - proposed standard of cover statements by risk type.

Fire department deployment, simply stated, is about the ***speed*** and ***weight*** of the attack. Speed calls for first-due, all risk intervention units (engines and paramedic ambulances) strategically located across a city. These units are tasked with controlling everyday moderate emergencies without the incident escalating to second alarm or greater size, which then unnecessarily depletes the city resources as multiple requests for service occur. Weight is about multiple unit response for serious emergencies like a room and contents structure fire, a multiple patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled in a reasonable time frame in order to safely control the emergency without it escalating to greater alarms.

Thus, small fires and medical emergencies require a single or two-unit response (engine and ambulance) with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The art of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes, without spreading the stations so far apart that they can't mass together quickly enough to be effective in major emergencies.

Given the need for crews to be stationed throughout a community for prompt response instead of all crews responding from a central fire station, many cities such as Vacaville are faced with neighborhood equity of response issues. When one or more areas grow beyond the reasonable travel distance of the nearest fire station, the choices available to the elected officials are few; add more neighborhood fire stations, or tell certain segments of the community that they have longer response times, even if the type of fire risk found is the same as other areas.

C. VACAVILLE FINDINGS

Existing Deployment Situation

The City of Vacaville is served by four fire stations from which it provides fire and ambulance services. The Department also provides ambulance service to 165 square miles within the county around the City. As the City has grown to its current population of 92,000 and 28 square miles, these four fire station locations are challenged by an expanding service area to provide desirable response times within the City, the goal of which is to generate positive outcomes. In 2002, the Department responded to 6,300 calls for service, 80 percent of which were medical in nature. Further, the ambulance service often dilutes the on-duty staffing for fires and other emergencies.

The City is growing, and the following areas will add more geography and calls for service demand on fire and ambulance services

Estimated Development:	# of Housing Units	Buildout	Population
North Village	2,500	8-10 years	7,500
Reynolds Ranch	350	2-3 years	1,050
South Town	1,500	5 years	4,500
Lagoon Valley*	1,300	5 years	3,900
TOTAL	***5,650***		***16,950***

* *Plus 1 million square feet of office space increasing the daytime population.*

In addition to these major projects, there are a total of 1,205 new units in previously approved, but not yet built projects, and approximately 655 units in development for which the application review process has not been completed. These new 1,860 units, if all are completed, are likely to be built within the next five to eight years and add 5,580 residents to Vacaville's population.

The current Fire Department response standard is that an appropriately staffed unit will arrive at the scene of a critical emergency within the city limits in six minutes, 85 percent of the time from the time of fire crew notification. The Department defines "appropriately staffed unit" as an Engine, Truck, or Ambulance unit. A "critical emergency" is defined as one of four types of calls; they are: simple medical, complex medical, residential or commercial structure fires. Six minutes is comprised of 1.5 minutes "turnout" time (to hear the dispatch, don the appropriate protective clothing and get the apparatus moving), plus 4.5 minutes of actual driving time.

The Department does have automatic/mutual aid response agreements with the neighboring fire departments of Dixon, Fairfield, and the Vacaville Fire Protection District. It is important to note that the fire protection district is a volunteer department and not staffed 24/7, so the City cannot always expect prompt help from this resource. Unfortunately, the Dixon station is 11.5 miles away from Vacaville's Station 73 area, and Fairfield's stations are from 3.3 to 5.7 miles away from developed Vacaville areas. These stations are too far to be "first responders" in lieu of a Vacaville crew and they only help with second alarm or specialty incidents when multiple units over a longer period of time are needed.

California Medical Facility (Department of Corrections) is also one of the City's mutual aid partners, but they cannot respond alone as first-due to incidents as they are subject to lengthy delays due to the process of clearing inmates to leave the prison grounds. When subject to lock-down, they have no ability to respond.

Currently, the minimum daily staffing for the City's fire units is:

Per Unit			Extended
3 Engines @	3	firefighters/day	9
3 Ambulances* @	2	firefighters/day	6
1 "Quint" Ladder unit @	3	firefighters/day	3
Battalion Chief @	1	per day for command	1
		Total:	19

Note: A 4th ambulance can be staffed, but only by taking one of the three engines out of service.

This daily staffing is in the range of that needed for the average type of fire risk presented in the City as will be discussed later in the risk and outcomes section of this report. However, for this staffing statement to be accurate for a building fire, the assumption is that the ambulance crews are available and not already operating on another emergency medical call, which is unlikely. What the City is facing with proposed growth at the edges of the community is ***both*** the number of firefighters on-duty, as well as their location for prompt, effective outcomes.

Community Outcome Expectations and Existing Response Performance Measures

Vacaville, like most suburban cities that are on the edge of a major metropolitan area, expects excellent fire and emergency medical operations from its Fire Department. Its performance goal of providing the first-due unit at the scene of a critical emergency within the city limits in six minutes, 85 percent of the time is in the range that will deliver acceptable outcomes, ***if*** all parts of the system perform as designed and are available to respond. The Department does not have an adopted performance goal for the arrival of multiple units for serious fires or rescues.

As previously mentioned, the six-minute response goal is comprised of two parts, "turnout" time of 1.5 minutes and actual road travel time of 4.5 minutes. Such a 4.5-minute travel time goal is very appropriate for built-up, traffic-congested communities such as Vacaville. The Insurance Services Office (ISO) Fire Department Grading Schedule would like to see fire stations spaced 1.5 miles apart, which given travel speeds on surface streets, is a three to four minute travel time. A newer National Fire Protection Association (NFPA) guideline on fire services deployment, suggests a four-minute travel time for the initial fire apparatus response.

More importantly within the Standards of Response Coverage Process, positive outcomes are the goal and from that crew size and response time can be calculated to allow efficient fire station spacing. Emergency medical incidents have situations with the most severe time constraint. In a heart attack that stops the heart, a trauma that causes severe blood loss, or in a respiratory emergency, the brain can only live eight to ten minutes maximum without oxygen. In a building fire, a small incipient fire can grow to involve the entire room in an eight to ten minute time frame. If fire service response is to achieve positive outcomes in severe EMS situations and incipient fire situations, ***all*** the crews must arrive, size-up the situation and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Given that the emergency started before or as it was noticed and continues to escalate through the steps of calling 911, dispatch notification of the crews, their response and equipment set-up once on scene, there are three "clocks" that fire and emergency medical crews must work against to achieve successful outcomes:

A. The time it takes an incipient room fire to fully engulf a room (five to ten minutes), thus substantially damaging the building and most probably injuring or killing occupants.

B. When the heart stops in a heart attack, the brain starts to die from lack of oxygen in four to six minutes and brain damage becomes irreversible at about the 10-minute point.

C. In a trauma patient, severe blood loss and organ damage becomes so great after the first hour that survival is difficult if not impossible. The goal of trauma medicine is

to stabilize the patient in the field and get them to the trauma surgeon inside of one hour.

Somewhat coincidently, in all three situations above, the first responder emergency crew must arrive on-scene within five to seven minutes of the 911 call to have a chance at a successful resolution. Further, the follow-on (additional) crews for serious emergencies must arrive by about the ten-minute point.

The three event timelines above start with the emergency happening. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine actually starts to drive the response route. It is hoped that the emergency is noticed immediately and the 911 system is activated. This step of awareness – calling 911 and giving the dispatcher accurate information – takes, in the best of circumstances, one minute. Then crew notification and travel take additional minutes. Once arrived, the crew must walk to the patient or emergency, size-up the problem and deploy their skills and tools. Even in easy to access situations, this step can take two or more minutes. It is considerably longer in multi-storied office complexes, apartment or shopping center buildings.

Thus from the time of 911 receiving the call, an effective deployment system is ***beginning*** to manage the problem within seven to eight minutes total reflex time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point to leave the room of origin and become very serious. Thus, Vacaville's adopted response policy is within the range to give the situation hope for a positive outcome. Yes, sometimes the emergency is too severe even before the Fire Department is called in for the responding crew to reverse. However, given an adopted response time policy, the system is designed appropriately and usually only issues like bad weather, poor traffic conditions or multiple emergencies slow the response system down, giving the citizen the hope of a positive outcome for their tax dollar expenditure.

Performance of the City's fire units in 2001/2002 at the six-minute, 85 percent point on serious *fire* and *medical* emergencies was:

- Station 71: 6:18 minutes
- Station 72: 5:55 minutes
- Station 73: 7:02 minutes
- Station 74: 6:28 minutes

Median: *4:13 minutes*

Overall, the Department responded to 85 percent of the critical calls within 6:24 minutes or less.

While an 85 percent measure is better than the use of average (where it is unknown how many calls for service are just over, or way over average), an 85 percent measure still can leave a lot of calls unaccounted for. Many agencies today use, and the NFPA recommends, a 90 percent measure to add more rigor to the system, while still leaving 10 percent for responses to fringe areas, or for the occasional periods when the Department is short of resources.

The point of this brief overview of response time performance is that the Department's station spacing is already challenged meeting an 85 percent performance goal by traffic on the non-gridded street network. Spreading the stations further apart is not desirable, nor is it likely that established neighborhoods would like to see "their" fire station moved further away.

Additionally, the Department's current performance measure does not measure from the time of 911 answer, but rather when the fire crew is alerted. Data measuring dispatch performance was not available for this report. However, nationally, most communication centers strive to meet a baseline of processing the call within one minute or less. Assuming Vacaville uses one minute for call processing, then the actual ***total*** reflex time measures at 85 percent are actually pushing 7 minutes 15 seconds and in some response areas even higher as will be discussed later. Arriving at the 7 minute point gives precious little time for the crew to walk to the patient, and start treatment before brain death occurs in a full cardiac arrest or to deploy hose lines before a fire is totally out-of-control.

From the above overview, we can see there is just enough on-duty staffing ***if*** the ambulance crews are available for fire responses, arriving ***just*** at the outer acceptable time frames a large percentage of the time, to begin intervention at serious fire and medical emergencies. The community, if asked, would probably expect that fires be confined to the room or nearby area of fire origin and those medical patients salvageable upon arrival have their injuries stabilized and be transported to the appropriate final care location. Thus, the challenge faced by the City Council is to maintain an equitable level of fire service deployment across the entire City as it grows, without adding significantly more resources.

Vacaville Building Fire Risk Assessment

In order to best relate the discussion of response time and outcome expectations, those measures must be tied to the type of risks found in the City. Citygate reviewed the community zoning, interviewed Fire Department members and drove through some of the community. As is expected in a suburban Bay Area community, the vast majority of the City's area consists of low and medium density residential housing. There are some pockets of higher density residential housing and some retail/commercial/industrial development. Along many of the main transit routes, there are typical suburban community commercial, mixed and public uses. Then of course there are the high value jobs and tax base producers found in the emerging business parks.

In a Standards of Response Coverage study, building fire risk is typed using a standard classification tool. For this study, the Department staff used the building fire classification tool jointly developed by the Commission on Fire Accreditation and the U.S. Fire Administration. The tool is called RHAVE or "Risk Hazard and Value Evaluation." It is a multi-part analysis tool built in a database format that allows fire personnel to identify key issues about a building such as size, construction type, fire flow, and occupant safety factors. Based on those factors, the tool generates a point value on a categorization scale that ranges from low to Maximum.

The Fire Department staff used this tool to RHAVE score the predominate building type found in each fire department Internal Response Area (IRA). On map exhibit #2, the IRAs are color coded to show the different building fire risk values. Vacaville is no different from most suburban communities where housing and neighbored commercial uses comprise most of the building types. The RHAVE tool categorizes these classes of building as ***moderate*** for fire risk.

We can see on the map exhibit that most of Vacaville is moderate fire risk. There is one IRA that is scored as significant for building fire risk and no IRAs are rated as maximum risk. The IRA rated as significant risk is the older downtown commercial area, still mostly without fire sprinklers and sub standard building codes compared to today's standards. The use of this tool is to ensure that an effective, multiple unit response force is designed to arrive in a timely enough

fashion to get to work quickly on the more serious fire problems. Given Vacaville's still relatively compact size and the current fire station locations, the Fire Department is able to aggregate fire units into the "core" significant hazard areas since they are in the interior of the City. In the future, good zoning and use of fire sprinklers will keep areas of significant fire risk out of the City edge areas where they will be hard to serve in a timely manner with multiple units.

Many fire department deployment studies using the Standards of Response Coverage process, as well as NFPA guidelines, arrive at the same fact – that a typical risk structure fire needs a minimum 15 firefighters, plus one commander. The usual recommendation is that the first unit should arrive on-scene within 6 minutes of call receipt (1-minute dispatch, 1-minute crew turnout and 4-minute travel), 90 percent of the time. The balance of the units should arrive within 10 minutes of call receipt (8-minute travel), 90 percent of the time, if they hope to keep the fire from substantially destroying the building.

Combining Outcome Expectations and Hazards at Risk

Outcomes desired such as "keep the fire damage to the room of origin" must be related to the hazard class of the building. For an extreme example, to confine a fire to one room in a high rise building requires many more firefighters than in a single story family home in a suburban community. How much staffing is needed can be derived from the outcome and hazard class. If Vacaville desires to confine a one-room fire in a residence to the room or area of origin, that effort will require three to four suppression units plus a battalion chief and rapid intervention team for a minimum of 12-15 firefighters. This number is needed to safely conduct the simultaneous operations of rescue, fire attack, and ventilation plus providing for firefighter accountability. A serious fire in a one story commercial building would require additional engine and truck companies for a minimum of 15-25 personnel, thus triggering mutual aid. A typical auto accident requiring patient extrication or other specialty rescue incidents will require a minimum of 8 firefighters plus the battalion chief for accountability and control.

In order to understand all the tasks necessary on a typical house fire and emergency medical rescue, the Department conducted several timed trials using their existing standard operating procedures to demonstrate what has to be done to accomplish the outcome and how much time the tasks take. The following two charts start with the time of 911 call receipt and finish with the outcome achieved. In the charts below, the total time clock is shown running alongside the individual completion time of the task.

There are several important lessons contained in the charts below:

A. These results were obtained in the best of circumstances on clear, sunny days with optimum arrival times for the units.

B. It is noticeable how much time it takes after arrival to actually accomplish key tasks to arrive at the actual outcome. Critical steps are highlighted in ***yellow*** in the table.

C. The time for task completion is usually a function of how many personnel are ***simultaneously*** available.

D. Several of the tasks, especially on the fire scenario, were done in a linear manner due to a smaller number of personnel being available.

E. The total firefighter count on the fire scenario assumed that the ambulance crew was also available to respond.

Structure Fire (Room and Contents)

Total Response Time Interval	
911 Call	0:00
Call Processing Interval	1:00
Turnout Time Interval	1:30
Travel Time Interval	4:30
Response Time Subtotal	**7:00**

Total Call Time	On scene Time	
7:00	0:00	*Engine 72 On scene*
		Medic 72 On scene
		Rapid Intervention Crew (RIC) setup begins
		Scene size-up begins
		Primary fire hose attack line deployment begins
		Setup of Engine 72 fire pump begins
8:00	1:00	*Engine 71 On scene (hydrant)*
		Battalion 71 On scene
		Engine 71 forward lay to supply Engine 72 begins
		RIC established
		Firefighter accountability system established
		Placement of RIC tool cache begins
		Setup of Engine 72 fire pump completed
8:30	1:30	Scene size-up completed
		Primary fire hose attack line deployment completed
		Forcible entry of front door begins
9:00	2:00	*Truck 74 On scene*
		Engine 71 forward lay to supply Engine 72 completed
		Securing of hydrant supply and changeover from tank to hydrant water begins
		Placement of 24' ladder for roof access begins
		Placement of secondary ladder for roof access begins
9:30	2:30	Forcible entry of front door completed
		Fire attack with primary hose line begins
10:00	3:00	Water supplied to Engine 72

Structure Fire (Room and Contents)

		Positive pressure ventilation provided
		Placement of RIC tool cache completed
		Safety hose line deployment begins
		Establishment of positive pressure ventilation begins
		Establishment of ventilation crew tool cache begins
10:30	3:30	Primary Search for fire victims ***begins***
11:00	4:00	Placement of 24' ladder for roof access completed
11:30	4:30	Placement of secondary ladder for roof access completed
		Securing of utilities begins
12:00	5:00	Safety hose line deployment completed
		Establishment of positive pressure ventilation completed
		Secondary fire hose attack line deployment begins
		Establishment of ventilation crew tool cache completed
		Vertical ventilation of roof begins
12:30	5:30	Securing of hydrant supply and changeover from tank to hydrant water completed
		Charging of safety hose line begins
13:30	6:30	Charging of safety hose line completed
		Charging of secondary fire hose attack line begins
		Securing of utilities completed
14:00	7:00	Utilities secured
		Secondary fire hose attack line deployment completed
14:30	7:30	Primary Search for fire victims ***completed***
		Charging of secondary fire hose attack line completed
		Fire attack with secondary hose line begins
16:00	9:00	Vertical ventilation of roof completed
17:30	10:30	Salvage operations begin
18:00	11:00	Fire placed under ***control***
		Salvage operations of building contents begins

Vehicle Accident (3 patients with extrication needed)

Total Response Time Interval	
911 Call	0:00
Call Processing Interval	1:00
Turnout Time Interval	1:30
Travel Time Interval	4:30
Response Time Subtotal	**7:00**

Total Call Time	On scene Time	
7:00	0:00	*Engine 74 arrives on scene*
		Medic 74 arrives on scene
		Incident Command
		Evaluation of Patients 1, 2, and 3 starts
		Engine 74 pump put into operation
8:00	1:00	*Squad 71 arrives on scene*
		BC 71 arrives on scene and assumes command
		Additional Medic unit requested for third patient
		Setup of extrication tools for removal of car door begins
8:30	1:30	Primary evaluation of patients completed
		Scene management begins (safety, hazard removal, disconnect batteries, cones, fluid control)
		Patient 1 secondary survey begins
		Patient 2 secondary survey begins
		Base hospital contact by primary paramedic begins
9:00	2:00	*Medic 72 dispatched*
		Stabilization of vehicles begins
9:30	2:30	Safety hose line deployed and charged
10:00	3:00	Setup of extrication tools for removal of car door begins
		Removal of car door to reach Patient 3 begins
10:30	3:30	*Medic 72 enroute*
11:00	4:00	Patient 1 secondary survey completed
		Patient 1 C-spine treatment procedure begins
		Patient 2 secondary survey completed

Vehicle Accident (3 patients with extrication needed)

		Stabilization of vehicles completed
12:30	5:30	Base hospital contact by primary paramedic begins
		Patient 3 minor treatment begins
13:30	6:30	Removal of car door to reach Patient 3 completed
		Patient 3 secondary survey begins
		Patient 2 C-spine treatment procedure begins
16:00	9:00	*Medic 72 arrives on scene*
		Patient 3 secondary survey completed
		Patient 3 minor treatment begins
17:00	10:00	Patient 1 C-spine treatment procedure completed
18:00	11:00	Patient 1 loaded into Medic 72
		Patient 3 C-spine treatment procedure begins
18:30	11:30	*Medic 72 enroute to hospital with Patient 1*
19:30	12:30	Patient 2 C-spine treatment procedure completed
20:30	13:30	Patient 2 loaded into Medic 74
24:00	17:00	Patient 3 C-spine treatment procedure completed
25:00	18:00	Patient 3 loaded into Medic 74
		Medic 74 enroute to hospital with Patients 2 and 3
28:00	21:00	*Medic 72 arrives at hospital with Patient 1*
		Patient 1 unloading and turnover to hospital begins
30:30	23:30	Patient 1 unloading and turnover to hospital completed
34:30	27:30	*Medic 74 arrives at hospital with Patients 2 and 3*
		Patient 2 unloading and turnover to hospital begins
37:00	30:00	Patient 2 unloading and turnover to hospital completed
		Patient 3 unloading and turnover to hospital begins
39:30	32:30	Patient 3 unloading and turnover to hospital ***completed***

Effective Response Force

Given these findings, it is a challenge for 12 personnel (of the 19 available on-duty) to keep a fire to the room of origin as the fire was stopped at about the 18 minute point, which is long after the room of origin would have become fully involved in an 6 to 10 minute time frame. Of the critical task studies conducted by Citygate, the Standard of Response Cover documents reviewed from accredited fire departments, and NFPA recommendations all arrive at the need for 15 firefighters at a room and contents structure fire to be able to ***simultaneously and effectively*** perform rescue, fire attack and ventilation.

Given the Vacaville response times and staffing levels, compared with mostly average building fire risk, the current response system ***just*** meets the community's needs, and becomes more effective only when supplemented with additional on-duty personnel or mutual aid for major fires. Outward growth at the edges, additional high value business park or retail growth will continue to place pressure on the Fire Department's ability to perform. The inescapable fact is that more residents and jobs will mean more traffic, which will slow Fire Department travel times, while at the same time population growth generates more calls for service.

Thus, today, Vacaville has enough on-duty personnel to handle a moderate one to two room building fire without mutual aid, or a modest one-room fire and a one or two patient medical incident at once. The City has been well served by its existing staffing and equipment capabilities. When the on-duty staffing is stretched thin, the City has excellent automatic or mutual aid agreements that bring in outside assistance, but from a distance.

The City needs to start tracking better the simultaneous demand for service. Multiple calls at the same time, especially when combined with rush-hour traffic delays, can degrade a department's ability to perform to the citizens' prompt expectations.

Distribution and Concentration Studies – ***Existing Situation***

To analyze first-due fire unit travel time coverage for this study, Citygate used a geographic mapping tool from ESRI Corporation called *Network Analyst* along with a fire department response-mapping program called *FireView*^{TM} that can measure travel time over the street network. Citygate and the Fire Department purchased a publicly available street data set with the most recent city/county streets and speed limits. We added in the streets and common speed limits for the proposed annexation areas. Using these tools, Citygate ran several deployment options and measured their impact on various parts of the community. The time measure used was 4.5 minutes travel over the road network, which is consistent with current Vacaville Fire Department first-due unit response goals. Again, this equals a 6-minute fire department response time, which is from the time of notifying the fire crew, to their arrival on-scene.

Map #1

This view shows the existing city limits and fire station locations. This is a reference map view for the other map displays that follow.

Map #2

This map shows the Fire Department Internal Response Areas (IRAs) factored by color as to the type of building fire risk present in each zone. Risk determines how many pieces of equipment and how much staffing must arrive to effectively stop a building fire from escalating to greater

alarms. Much of the City is suburban residential and as such under a nationally used typing system, is rated moderate or average risk for possible severity of building fires. There are some areas of low risk within the city limits where there is open space or very low-density housing. There is also one area of significant risk, the older downtown 11 area, where if a fire occurs, it will be more severe, requiring more resources in a shorter time frame to control.

In brief, there are three concerns to fire station deployment:

- **Distribution** – the spreading out or spacing of first-due fire units to stop routine emergencies.
- **Concentration** – the clustering of fire stations close enough together so that building fires can receive enough resources from multiple fire stations quickly enough.
- **Effective Response Force –** the collection of a sufficient number of firefighters on-scene arrived within the concentration time goal to stop the escalation of the problem.

Map #2 displays the risk zones to be related later to the distribution and concentration of the fire crews.

Map #3

This map using various colors by fire station area shows the *distribution* or first-due response time for each station per the Vacaville response formula. Thus, the computer shows how far each company travels within 6 minutes fire department response time, or 4.5 minutes road travel time. Thus, the limit of color per station area is the time an engine or ambulance could reach by the 6-minute points, ***assuming*** they are in-station and encounter no unusual traffic delays. In addition, the computer uses mean speed limits per roadway type. Thus, the projection is optimal or "perfect" world. Real dispatch data will show response times longer than six minutes in some of the edge areas of the 6-minute zones. This is due to traffic congestion or the crew being on a prior call and another unit covering the incident.

The purpose of computer response mapping is to determine and balance district design. This geo-mapping design is then checked in the study against actual dispatch time data, which reflects the real world. There also should be some overlap between station areas so that a second-due unit can have a chance of an adequate response time when they cover a call in another district.

The lesson from this map exhibit is that the road segments in ***red*** are outside the 6-minute ideal response zones. These areas do correspond with a response problem area between Stations 71 and 73 and the edge areas where annexations are proposed. It is readily apparent that growing Vacaville cannot continue to maintain adequate first-due response coverage from the current four fire station sites.

Map #4

This map exhibit displays the Insurance Service Office (ISO) requirement that stations cover a 1.5-mile distance response area. The 1.5 miles is measured on the roadbed. This 1.5-mile measure is shown as a different colored area around each station. It is apparent that the 1.5-mile distance measurement is smaller than the 6-minute response zones. Depending on the road network in a city, the 1.5-mile measure usually equates to a 3 to 3.5 minute travel time. The 1.5-

mile measure also is used for any type of risk from large metro cities to suburban types, where as Map #2 showed, Vacaville is almost all moderate risk. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. This type of measure shows Vacaville has station areas 71, 72 and 74 with fairly good coverage, but with little to no overlap. Station 73's area when viewed from the ISO measure is too large to be effectively served. The edges of some areas are not covered, and the gap between areas 71 and 73 is quite apparent.

Map #5

This map exhibit shows the concentration or massing of fire crews for serious fire or rescue calls. Building fires in particular require 12-15 firefighters arriving within a reasonable time frame to work together and effectively to stop the escalation of the emergency. Otherwise, if too few firefighters arrive, or arrive too late in the fire's progress, the result is a greater alarm fire, which is more dangerous to the public and the firefighters.

Given Vacaville's current fire unit and ambulance staffing, three or all four stations need to respond to serious building fires. For the purpose of analyzing concentration effectiveness, we need to assume at least one ambulance is committed on an EMS call, which would mean all four stations would need to respond to a commercial building fire, leaving only one ambulance available in the City. Thus, the concentration map exhibits look at the Department's ability to deploy four of its fire apparatus to building fires within 8 minutes travel time (9.5 minutes fire department response time). This measure ensures that a minimum of 14 firefighters and one Battalion Chief deployed via three engine companies, one truck company, one ambulance and one command vehicle can arrive on-scene to work ***simultaneously*** and effectively to stop the spread of serious fires.

The colors in the map show the area in ***green*** where Vacaville's current fire performance measures would deliver four fire station crews. Red areas are three-unit or less coverage.

Therefore, only the core of Vacaville is effectively covered by four stations and this assumes only one of the ambulances is committed to a prior call. It is also apparent that none of the annexation areas will receive adequate multiple unit coverage from the existing four fire station locations.

Map #6

This exhibit shows the locations of two years of all emergency incident types layered over the RHAVE building fire risk coded layer Internal Response Zones (IRAs).

Map #7

This map displays the emergency medical incidents for two years over the base streetmap.

Map #8

This is an overlay of all fire department incident types for two years layered over the RHAVE risk coded layer Internal Response Zones (IRAs).

Map #9

This map further breaks out just the structure fire locations for two years, over the RHAVE risk zone types. We find that the location of fires is somewhat uniform across the existing built-up

area of the City, with a slightly higher quantity in the older, higher risk core of the City. Where newer housing areas have been added, the fire count is lower as would be expected with more modern building codes and newer buildings.

Map #10

This map takes another view of all calls for service by location, quantity and density. The grid is the IRAs over the street layer. Then all calls for service for two years is shown first in increasing density. As the color of an IRA moves from light to pale red to dark red, the quantity of calls is increasing. On top of this for the same two years of all incident data, is overlaid "hotspots" of the greatest quantity of incidents shown increasing in color from yellow to dark red. Thus, a dark red spot in a yellow circle is an area that generates the most calls for service.

What can be learned from this map is that Station 71 is busiest in the center and southern half of its district. Relocating Station 71 easterly would actually increase response times to the moderately busy IRAs on the west side of its district, while improving response times to the hot spot at the southern edge of IRA #206.

Station 73 is making most of its responses to the southwest of its location. If it were relocated southwest of its current location, it could not well serve northeast Vacaville and the North Village area. Stations 72 and 74 are well located in the center of higher activity areas. A relocation of Station 74 easterly to improve coverage to the South Town development would pull it further away from moderate to significant workload areas.

Map #11

This map is similar to the previous map, but only displays emergency medical service incident density and hot spots of activity.

Map #12

This map view combines the display of density by IRA, hot spot activity and the location of all incidents over the street map layer.

These incident workload maps help to see that the call for service activity is fairly evenly distributed throughout the developed area of the City. Some of the business park areas in Station 73's area have a lower call volume; this is not unexpected as the employees are not in these areas 24 hours per day. The other trend from the hot spots of activity is how much freeway and near freeway ambulance activity there is, which again is not surprising.

Map #13

This map zooms in on the Internal Response Areas (IRAs) between Stations 71 and 73. Some of these streets are shown with no color, which means there is not 6-minute response coverage. The computer predicated travel time across this gap ranges from 1 minute 12 seconds to 1 minute 24 seconds. In these IRAs, the dots show all incident types for a two-year period. Remember, the colored 6-minute zones are the ideal and in fact larger than the ISO 1.5 mile zones. Please refer to the attached spreadsheet (**Appendix C**) from the Department records systems, which analyzes the actual response times that are running about a minute over the 6-minute goal in six IRAs. While there is not a large quantity of calls in these IRAs relative to other IRAs, there are certainly enough calls to present a risk to residents. The response data clearly supports the

geographic map measures that a response time gap exists beyond the six minute 85 percent point between Stations 71 and 73.

Map #14

This map zooms in on six IRAs of concern in the Southeast corner of Station 74's response area. Depending on the IRA, the attached spreadsheet (**Appendix C**) shows two zones are hovering about the 7-minute point and the others are running at the 6-minute point, so all are at the outer limit of desired performance. While the color streets segments show the ideal 6-minute performance, it is apparent that traffic congestion or being on another call is delaying response to the calls in the fringe IRAs.

Given these actual response times and the fact the ideal 6-minute measure ends close to the current city limits, it is not possible for Station 74 to provide adequate first-due response coverage into the South Town area. Much of the proposed South Town area is up to 2 minutes 19 seconds further than the 6-minute response goal.

Map #15

Another appropriate question of the City's is: Would a relocation of Station 71 to the east, close the response gap with Station 73? Citygate selected a test location at the intersection of East Monte Vista and Cernon Street (not knowing if property was available) as a simple test of an eastward relocation. This intersection area was chosen because it had good north/south and east/west access. The response area of alternative site 71A is shown in ***light purple*****.** The map shows that 71A covers all of 71's area to the west because the purple street distribution color goes just west of the current city limits. However, even ***if*** the City could find suitable, available property in the area of 71A, not all the issues are solved. We need to remember that the geo-map solution is the ideal world and traffic conditions could make the actual 71A response area somewhat smaller. Additionally, 71A still does not serve the northwest and Reynolds Ranch areas well as its 6-minute first-due travel time stops northbound at Tipperary Drive and Browns Valley Parkway.

There are other considerations to an easterly relocation of Station 71. First, traffic signal pre-emption control could be used to give the responding fire apparatus improved response times up into the gap area to help travel times right away before another station north of the freeway can be funded, designed, built and staffed. Additionally, having only two stations on the north side of the freeway does not improve third and fourth due unit concentration measures shown in map #5 to be weak in the northwest area.

Map #16

To further demonstrate that the current four station system is stretched thin, this map shows the same two years of building fire occurrence as in Map #9, but layered over the green coverage area of concentration for four stations to respond within 9.5 minutes. We can readily see today there are building fires that occur in the areas only covered by two or three units outside of the four-unit 9.5 minutes total response time area which is shown as light red colored streets. As the edges of the City develop and the building stock ages, there will be more fires in these areas that do not receive effective 3rd and 4th due unit coverage. An analysis of the outer IRAs in the City showed that the 4th due unit has actually arrived in 10 to 15 minutes response time based on distance and unit availability.

Historical Reliability

In a Standards of Response Coverage study, the effect of simultaneous calls on each fire company as well as the entire Department should be evaluated. This is especially important in Vacaville with the Fire Department also being the ambulance provider. The Department has some data to show how many calls in each first-due (primary call) district are responded to by another or "2nd-due" (secondary call) unit:

April 2002 – February 2003
Primary vs. Secondary Number of Responses to Station Areas

	Primary #	Secondary #	Overall #
Station 71	747	145	892
Station 72	1,200	134	1,334
Station73	174	61	235
Station 74	990	85	1,075
All Areas	3,111	425	3,536

Primary vs. Secondary Response % to Fire Areas			
	Primary %	Secondary %	
Station 71	83.7%	16.3%	
Station 72	90.0%	10.0%	
Station 73	74.0%	26.0%	
Station 74	92.1%	7.9%	
All Areas	88.0%	12.0%	

While multiple calls for service do occur, the Department's secondary call volume is fortunately small at 12 percent and the Department seems to "get by" during periods of simultaneous call activity. However, as ambulance calls account for 80 percent of the workload, and county area ambulance calls can take the ambulance out-of-service for an hour or more, it does not take more than two calls for service at once to greatly reduce the Department's staffing and hence its ability to deal with a serious fire at the same time. If the Department needs to operate 3 ambulances at once, then 6 to 7 of the 19 firefighters on duty are committed to the ambulances, leaving 12 or 13 for firefighting. This figure does not count any engine company support that may be needed to assist on these ambulance calls. If the 4th ambulance needs to be activated out of Station 73, then one engine is out of service because of cross-staffing, dropping the firefighter count to 10 firefighters. The impact of the county calls is more than the actual quantity; it is the length of time they take:

April 2002 – April 2003:

	No. of 800&900* calls	Average Spent Time**	Median Spent Time	No. of 900 Calls Only	Average Spent Time	Median Spent Time
Station 71	88	1:10:33	1:08:19	70	1:13:02	1:17:06
Station 72	44	1:05:33	1:08:59	36	1:08:20	1:03:28
Station 73	206	1:04:50	1:03:22	168	1:06:41	1:04:38
Station 74	34	1:12:13	1:25:06	33	1:11:35	1:10:36

** 800 area calls are freeway and 900 area calls are County areas.*
*** Hours, minutes and seconds*

The freeway calls also take more time due to a longer response time and more time on-scene for extrication rescue work. Additionally, longer ambulance times are seen with trauma calls or Kaiser patients, both of which need transport to hospitals out of the City. Another unseen factor to the out-of-city ambulance transports is the return time it takes the ambulance if they have to drive back in rush hour traffic.

Citygate recommends the Department start aggressively measuring the "unit hours" the ambulance crews are actually out-of-service on calls and track that on a time of day basis vs. other call for service types. It may well be that staffing is down enough due to ambulance calls that peak periods of the day go without an effective firefighting force also being present in the City.

Historical Response Effectiveness Studies

In this section of a Standards of Response Coverage study, the Department's response time performance, fire loss and medical case outcomes are studied and contrasted to the community's types of risks and outcome expectations. As discussed earlier, the available firefighting personnel and response times are just acceptable for the building fire risk found in the community. In FY 2002/2003, fire loss was approximately $1,573,457 dollars for about 124 building fires. Given the age and socio-economic mix of Vacaville, this amount of fire loss is not atypical. Patient outcomes for medical emergencies are not easily available for this station location study. However, the staff feels they are doing a good job and meet or exceed the county's emergency medical systems requirements.

The following charts show the Department's performance at the current 85 percent performance goal for serious call types. In other words, this is the quantity of calls answered at the 85 percent point or less and the times shown are the longest seen at the 85 percent point. These charts do not tell how many calls were answered more quickly.

April 2002 – April 2003:

Response Times Per Area *	
	85.0%
Station 71	5:59
Station 72	6:10
Station 73	7:44
Station 74	6:28

	# of Calls	85% Time
Medical-Simple	973	7:20
Medical Complex	2,454	5:58
House Fire	62	6:17
Commercial Fire	47	6:00
All Critical Calls	3,536	6:24

** Times are minutes and seconds*

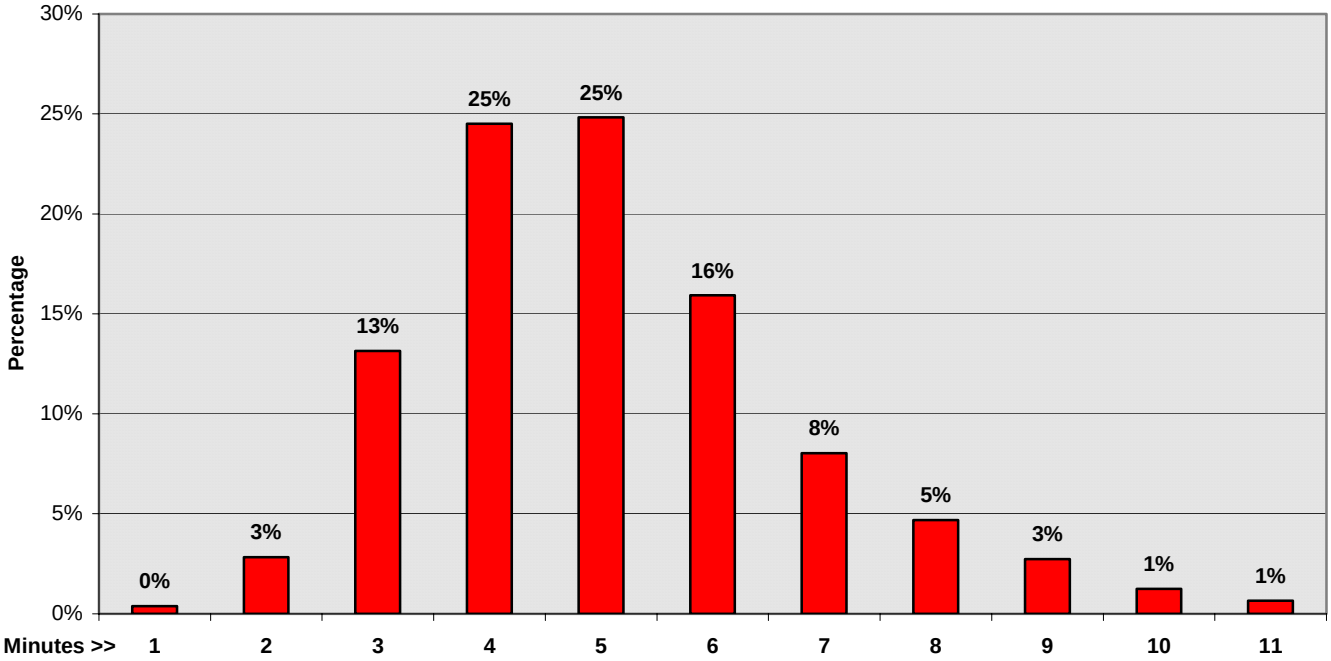
For comparison to the above data, the twelve month period from April 1, 2001 through March 31, 2002, the Department responded to 85 percent of critical calls within 6:15. During this same period, they responded to 89 percent of these calls with the primary units assigned to each area.

Station	Quarterly Response Time*	2001/02 12 Month Response Time*	3 Month Primary vs. Secondary	12 Month Primary vs. Secondary
71	6:09	6:18	90/10	92/08
72	6:04	5:55	89/11	89/11
73	7:16	7:02	74/26	74/26
74	6:53	6:28	90/10	88/12
All	6:20	6:15	89/11	89/11
Median	4:16	4:13		

** Times are minutes and seconds*

Another view of department response performance can be obtained by the data shown in the following chart where the number of calls answered per minute of response time is shown:

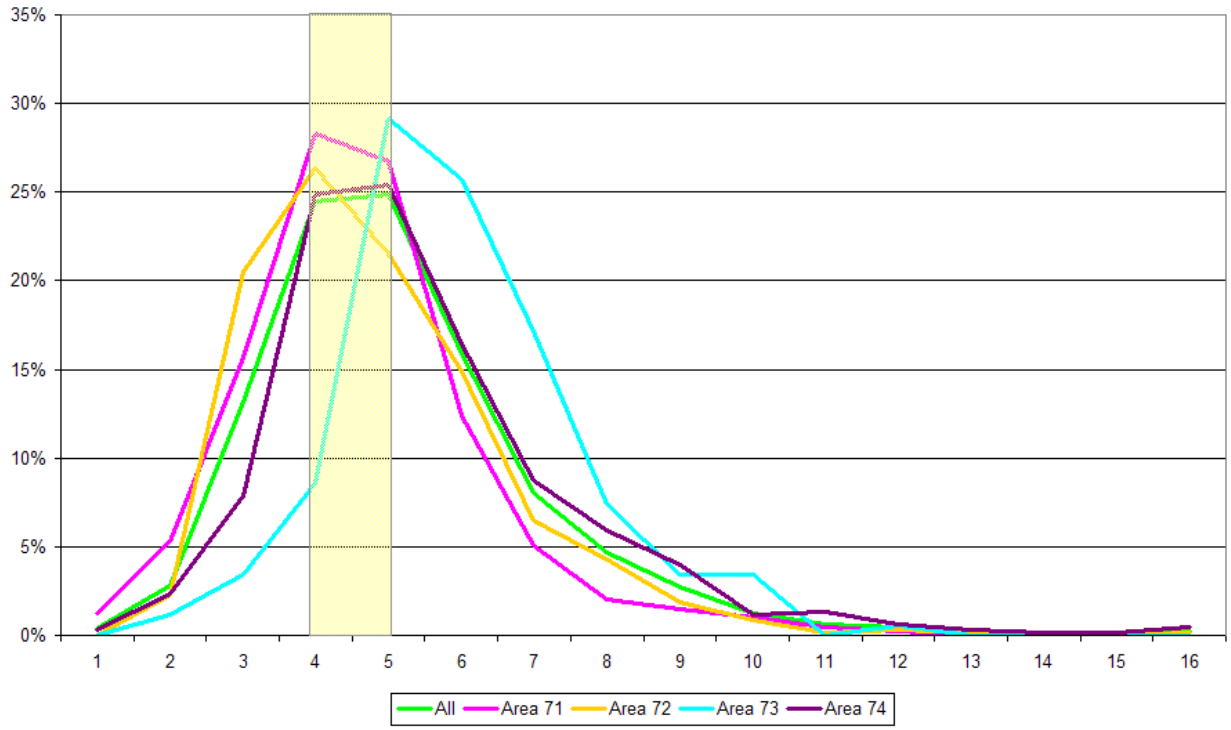
Response Time per Minute



In the above chart, we can see that the bulk of the Department responses are answered within the 4th and 5th minute. The longer response time calls are for the freeway and fringe areas. However, there are a number of calls answered from the 6th to 8th minute, which as discussed before is at the outer limits of desirable performance.

The chart above looked at all incidents, citywide. The chart below looks at calls by response minute, but in addition to citywide, also by area. When the areas are broken out, we can see that area 72 being compact, performs the best and that area 73, being too large, has response times more in the 4th to 9th minute.

Response Times: Citywide and by Districts



While the citywide *mean* response time "minute" is highlighted in yellow in the chart above, we can see how a citywide performance measure can be misleading because a better performing couple of areas can mask the poorer performance of one area.

Several observations can be made from this brief overview of historical response performance:

1. The performance at the 85 percent goal point is running from 6 to a little over 7 minutes. This is from crew notification to on-scene, ***not*** from the time of 911 call receipt.
2. Thus, if 1-minute were to be added for dispatch answering work, then the Department is actually arriving on the longer calls at the 7 to 8 minute point. As discussed in the critical task section earlier, when set-up time is taken into account after crew arrival, then work on the patient or starting firefighting is not really beginning until minute 8 or 9, which is at the outer limits for patients or fire victims in life threatening situations.
3. The Department is not reporting data to determine what the performance would be at a 90 percent performance goal point, which is more commonly seen in fire and EMS measures.
4. The response times and secondary call impacts are the most significant in Station 73's area, which also has a high quantity of freeway and county calls for service. This is not surprising given the size of Station 73's area and the distance it is from backup by the other stations.

Distribution and Concentration Studies – ***Proposed Solutions***

Given the above comprehensive review of the current fire and EMS deployment system in Vacaville, Citygate used the *FireView*™ geographic mapping software to analyze how many and where additional fire stations could be necessary to maintain existing levels of service to the growth areas.

Map #17

The best way to improve first-due unit and multiple unit coverage north of the freeway to cover all the current and potential city limits, is to add one station "BVGE" located at Browns Valley Road 1300 feet north of Glen Eagle (no vacant site is available) and re-locate Station 73 to the east at Akerly Drive and Vaca Valley Parkway.

This map displays a close-up view of the northeast area showing the positive effect of the relocation. All of North Village is now covered and a significant part of the far northeast corner of the City is covered. From the location mapped in this exhibit, the site gets just to, but not into, the annexed parcel at the far northeast corner in the area of I-80 and Midway Road. However, in the next minute of travel they would. There are at least two options for this area – continue to find a Station 73 relocation site a little closer to this corner or use the site proposed here and require the full use of fire sprinklers for anything built in the far pocket area.

Map #18

Moving to the south half of the City, this map shows the Lagoon Valley and South Town areas without first-due unit coverage within the existing performance goal of six minutes.

Map #19

Shown in this exhibit is the positive effect of adding two appropriately located stations – one in Lagoon Valley (labeled LV) and one in the South Town area (labeled VST) located at Vanden Road 2300 feet south of Alamo Drive. These stations were sited to maximize their coverage of the new areas while also providing needed improvements from Lagoon Valley back up the freeway and southwest sides and for the proposed VST site.

Map #20

This map displays the concentration coverage for four stations to cover a significant fire. With the addition of the two southern stations shown on this map, the green four-unit covered area is increased south of the freeway (compared to the four-station map shown in Map #5). There is, of course, no improvement north of the freeway. It is not likely that there will ever be good four-station coverage out into the corners of Lagoon Valley and South Town. The first, second and perhaps third due unit coverage will be adequate.

Map #21

As discussed in the critical tasking staffing section of this report, currently Vacaville is sending initially 12 firefighters to a building fire. The time to complete the needed on-scene tasks would be significantly decreased by sending 15 firefighters, which is more in line with the fire risk in the community and industry expectations. One way to do this without depending on the ambulances always being available is to send four engines and the ladder truck for a total of five

units. This map shows the coverage area of five units in 9.5 minutes ***after*** adding the two additional stations in the south. Since it is a greater requirement to cover the area with five stations instead of four, the resulting green "covered" area is smaller than for four stations.

If this green five-unit coverage area is compared to Map #12 which showed calls for service density, the five-unit cover area is the core of Vacaville, where the highest density of calls occurs. Thus, the addition of two stations in southern Vacaville provides not only the appropriate first-due unit response for the growth areas, the stations provide more firefighters on duty and the City can then start sending five units to building fires in the core of the City.

Map #22

This map shows the optimum *7*-station first-due distribution solution for Vacaville to adequately cover the new growth areas as well as the gap between Stations 71 and 73.

- An additional station is added called "BVGE" located at Browns Valley Road 1300 feet north of Glen Eagle (although no vacant site is available).
- Station 73 is relocated easterly to site "AKVV" at Akerly Drive and Vaca Valley Parkway.
- New growth area stations are added for Lagoon Valley (LV) and South Town (VST) located at Vanden Rd 2300 feet south of Alamo Drive.
- Station 71 is left at its present location.

This system will provide good first-due unit coverage at the current 6 minute, 85 percent response goal. All but some of the outer edges of the current or near-term city limits are covered by a first-due unit.

Map #23

This map is the 4-unit concentration model for the 7-station system described above in Map #22. There is a significant increase in the area that four stations can cover in 9.5 minutes with a seven-station deployment system. While there will not be 4-station coverage out to the city limits, there will be 3-station coverage in most cases, plus some of the time, the ambulance crews are available for fire responses.

Map #24

Shown here is the 5-station concentration coverage to get 15 firefighters to the scene of a serious fire without relying on ambulance crews to be available. In a seven-station system, while there is not 5-station coverage to the city limits, there is 5-station coverage over the core of the City and the higher risk areas. Additionally in this model, the 5-station coverage area is larger along the freeway areas and northerly up Browns Valley Parkway than in the 6-station model shown in Map 21.

Map #25

This map displays the distance mutual aid or automatic aid units are from the City. While these units are needed for greater alarm fires, they are too distant to take the place of first through fourth due units in Vacaville. Or, in the case of the Vacaville Fire Protection District, much of the staffing is volunteer and all the stations are not staffed 24/7.

Dixon Station 81 at 205 Ford Way is 11.49 miles away from Vacaville Station 73 and is 4minutes 22 seconds from the nearest Vacaville city limits. Fairfield currently has two stations under construction that are expected to open in September. One is Station 41 at 3200 North Texas Street. It would be the closest Fairfield station to respond to incidents using the I-80 corridor. For incidents to the east side of Vacaville, Fairfield's Station 39 at 1975 Huntington Court would respond via Peabody Road. Those stations are approximately 6.5 and 5.7 miles out, respectively. Map 25 shows the projected travel time of a Fairfield unit and we can see that only Station 41 gets just into the south city limits around Lagoon Valley within 6 minutes response time. Station 39 is too far to be of help for immediate coverage into South Town.

Thus, automatic or mutual aid stations, while important, cannot be used in lieu of dedicated Vacaville stations to the new growth areas. The Department needs these mutual aid agreements for more serious greater alarm fires, or when Vacaville's units are all busy on smaller emergencies. In mutual aid responses, Travis Air Force Base Station 46 and California Medical Facility (Department of Corrections) Station 70 can respond.

Overall Evaluation

Vacaville is a growing city between the Bay Area and Sacramento metropolitan areas. The street system is not an easy to serve traditional "grid" layout. Many of the streets meander with a mix of street widths that are bisected by natural barriers such as I-80, drainage channels and open spaces. ***Not all streets within an original subdivision may have been connected to newer areas.***

A busy, major freeway traverses the City, and the City's few prime arterials are busy for much of the day as a result. The result is a street system that makes fire company travel time difficult at times. The City has maintained reasonable fire company coverage by using good fire station sites, supplemented with ambulance crew staffing and automatic aid response from the neighboring fire agencies. However, it must be stated that the ambulance crews are not always available for fire responses, and Vacaville's mutual/automatic aid partners are farther away than desirable in most cases.

The challenge and the exception to the above findings are the proposed annexation areas. Vacaville is fortunate to still have prime land on which to develop new jobs, tax base and housing on. Unfortunately, these growing, economically important areas will be underserved by a first-due fire company from the existing fire station sites. Mutual aid partners cannot reach the area either and the I-80 worsens traffic congestion on the surface street crossings that fire units must use to get across the freeway. The Lagoon Valley project area is really only reachable via the freeway (which is very congested at some times of the day) from the existing fire stations. There are no immediate, close-by mutual aid "cavalry" companies to come to the rescue for the annexation areas.

As a result, the Vacaville City Council faces the issue of "equity" of service. It cannot be said that the proposed annexation areas will have the same access to a readily available, first-due fire unit that can mitigate typical routine emergency medical and fire emergencies on their ***own***. Citygate finds that multiple unit coverage is ***also*** a problem outside the core area covered adequately by all four fire stations within a reasonable 9.5-minute effective response force time (as defined on page 14). Yes, major fires can be limited by the use of automatic fire sprinklers, but all property is not sprinklered and fire sprinklers do not handle EMS incidents. Fire crew staffing availability is also decreased during periods of peak ambulance activity.

Looking at the first-due coverage "gaps" on Map #3, it is apparent that Vacaville needs a minimum of seven fire station locations. This concept will develop over time as development begins to take place. Three stations are needed north of the freeway. Ideally, Station 73 would be relocated to the northeast and an additional station added between Station 71 and 73, but a little more up to the northwest to provide coverage to the Reynolds Ranch area. South of the freeway, one additional station is needed in Lagoon Valley. South Town cannot be covered from Station 74. Ideally, a station southeast of Stations 74 and 72 if located far enough to the north, could cover South Town and east of Leisure Town Road (along with Station 72) if it develops in the future.

Thus, three stations north of the freeway and four south of the freeway will be needed as projected growth occurs over the next several years. Not all fringe areas will receive coverage but some of this is accounted for with an 85 or 90 percent performance measure. With six to seven stations there will be better concentration coverage for multiple unit response, better overlap for second unit response when the closest unit is on another incident and more firefighters on-duty so that an effective response force of 15 firefighters plus the Battalion Chief always exists for structure fires, even with multiple ambulance calls occurring. The City also should consider the use of residential fire sprinklers in fringe areas like Lagoon Valley, Reynolds Ranch, South Town and North Village where multiple unit coverage will be slower on serious building fires. The completion of major streets and parkways (Foxboro Parkway, Vaca Valley Parkway, etc.) will also contribute to more effective emergency response.

Traffic Signal Pre-emption

Citygate also discovered that Vacaville is one of the few cities its size that does not use traffic signal pre-emption called Opticom to turn red lights green in the direction of fire engine travel. Such systems really help to maintain travel times. More importantly, they are a huge safety improvement for the citizens and firefighters to reduce the chance of intersection collisions. Just one red light collision found to be the Fire Department's fault could result in a large liability exposure. Given growth in traffic, barriers to response such as the freeways and open space areas when combined with growth in the community at its edges, the current deployment system is marginally performing at the 85 percent point. Vacaville is challenged to provide its desired high quality of service in edge growth annexation areas or the Station 71-73 gap area without additional fire stations and traffic signal pre-emption to maintain response times.

Attached is an appendix report that reviews traffic signal pre-emption locations and costs for Vacaville. Citygate asked the system manufacturer's (3M Company) representative to study the Station 71/73 response issue and see if Opticom could improve the response times prior to another station being funded.

Citygate obtained traffic level of service information for the four signalized intersections that Station 71 uses to travel northbound up to the Markham Avenue area. These four have level of service ratings of "A" for Monte Vista and Orchard, "A" for Monte Vista and Cernon, "C" for Monte Vista and Dobbins, and "C" for Monte Vista and Depot. The service ratings of C for two of these four indicate moderate traffic congestion during peak hours.

It is the finding of 3M and other cities using the Opticom system that response time reductions of up to 20 percent are typical, especially on long corridors. Even in heavy congestion, fire engines can operate at safe speeds without encountering traffic delays. A 7-minute emergency travel time response could be reduced to about 5.6 minutes saving as much as 90 seconds. A 60-90

second savings for Station 71 or 73 to get into the "gap" areas along Markham Avenue would substantially improve response times into the area, assuming either unit was actually available to respond.

Vacaville could install Opticom equipment on the Monte Vista Corridor for about $160,000 plus $36,333.00 for the Opticom components. There is no ongoing cost for the use Opticom. Given the safety and travel time improvements into a hard to serve area, this expense is far less and far faster than adding a fire station. While the additional station is still necessary, Opticom will stretch the existing system while the City can obtain the staffing and construction funding for another station.

D. RECOMMENDATIONS

1. Install Opticom traffic pre-emption on traffic signals on high response route corridors.
2. Lagoon Valley and South Town must each contribute an additional fire station staffed at a minimum with one engine, a wildland unit and a three-person crew.
3. The City should acquire the site for an additional station between Stations 71 and 73 that could also serve the Reynolds Ranch project. This station must be opened ***before Station 73 can be re-located easterly.***
4. Acquire a site to relocate Station 73 easterly to better serve the northeast corner of the City.
5. Consider the use of residential fire sprinklers in the Lagoon Valley and South Town and Reynolds Ranch areas where fires must be kept small because it is highly unlikely that the City will be able to deliver 12-15 firefighters from three to four stations within 10 minutes or so in these areas.
6. Consider ***converting*** the current response time measure from 6 minutes (crew notify to on-scene) at 85 percent of the time to a more complete measure of total reflex time from the time of 911 answer with a fractal performance measure of 90 percent. Thus, the revised measure would read "*the first-due unit shall arrive at critical emergencies within 7.0 minutes of the call receipt, 90 percent of the time.*"
7. Consider ***adding*** a performance measure for the total effective response force needed on structure fires. This measure could be: "*An effective response force of at least 15 firefighters shall arrive within 10.5 minutes of the receipt of the call, 90 percent of the time.*"
8. The Department should start collecting the time at which a fire advance is stopped and the dollar loss controlled. This will be useful in the evaluation phase of future deployment analysis.
9. At a minimum, the Fire Department and Police Department need to start collecting response data from the time of 911 call receipt with the goal being of getting notification to the crew within one minute, 90 percent of the time.
10. The Department should collect better data on the effect of county ambulance calls for service on City staffing availability.

11. Citygate recommends the Department start aggressively measuring the "unit hours" the ambulance crews are actually out-of-service on calls and track that on a time of day basis vs. other call for service types. It may well be that staffing is down enough due to ambulance calls that peak periods of the day go without an effective firefighting force also being present in the City.
12. The City needs to record and evaluate the simultaneous demand for service impact. Multiple calls at the same time, especially when combined with rush-hour traffic delays, can degrade a department's ability to perform to the citizens' prompt expectations.

E. NEXT STEPS

1. Usable sites for the relocation of Station 73 should be identified and modeled near the intersection of Akerly Drive and Vaca Valley Parkway.
2. Reynolds Ranch should share in the cost of another station located between Stations 71 and 73, but ***not*** located in Reynolds Ranch proper.
    a. Sites should be investigated near Browns Valley Road 1300 feet north of Glen Eagle (no site available) or Browns Valley Road 500 feet south of Clarecastle Way.
3. Lagoon Valley and South Town will each have to provide an additional fire station.
    a. A site for South Town should be found to model that also can serve any proposed development east of Leisure Town Road, should that area be developed in the future. Proposed site VST on Vanden Road 2300 feet south of Alamo Drive can serve both areas.
    b. The Lagoon Valley station site could be located on or near the intersection of Lagoon Valley Road and the second street into the project as you travel east from the freeway along Lagoon Valley Road. This site serves all but a couple of the southeast blocks in the projects within the current Fire Department performance measure. If the station is placed at the first subdivision access road off Lagoon Valley Road, the station will not serve the southeast corner of Lagoon Valley. An alternate site may depend on final street layout.
4. The City is going to continue to have to work after this report not just on site selection, but on timing and service delivery issues such as:
    a. When do additional fire stations have to be on-line as compared to number of new buildings built?
    b. What will the staffing and equipment types be?
    c. How long a period of time will additional growth areas contribute to staffing costs for their required fire station?
    d. When will the General Fund grow enough to help carry the cost of any additional staffing for another station between Stations 71 and 73?
    e. How best to staff the ambulance service over a long period?
        i. How many ambulances?

ii. How many paramedic capable engine crews to cover in-between ambulance locations?

iii. Should all the ambulances be staffed with two cross-trained paramedic firefighters, or a paramedic/firefighter and an apprentice EMT firefighter, or a paramedic/firefighter and a non-safety emergency medical technician? Several such models exist in California.

iv. Should the ambulance service ever convert to all non-firefighting employees?

CITYGATE ASSOCIATES, LLC

FOLSOM (SACRAMENTO) MANAGEMENT CONSULTANTS

CITY OF VACAVILLE, CA

STANDARDS OF RESPONSE COVER STUDY (VOLUME 2)

Final Report

AUGUST 13, 2003

- APPENDIX A: MAP ATLAS
- APPENDIX B: OPTICOM INFORMATION
- APPENDIX C: HIGH RESPONSE TIME IRA CALL ANALYSIS
- APPENDIX D: CRITICAL TASK STAFFING STUDIES FOR FIRE AND EMS INCIDENTS

705 Gold Lake Drive, Suite 100 Folsom, CA 95630
(916) 355-1385 or (800) 275-2764 Fax: (916) 355-1390

CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

APPENDIX A

MAP ATLAS

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions

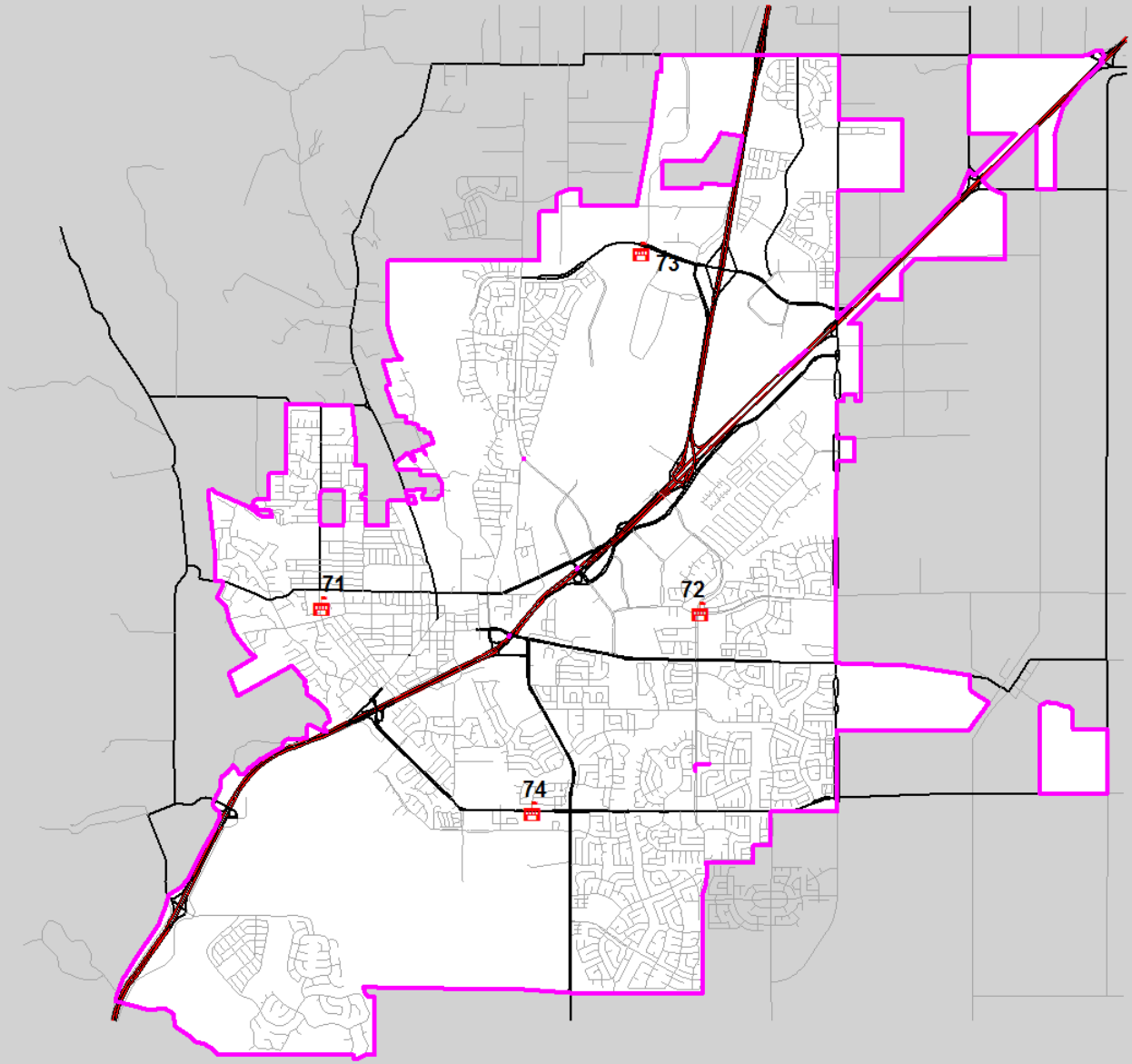
Scale 1: 49,433

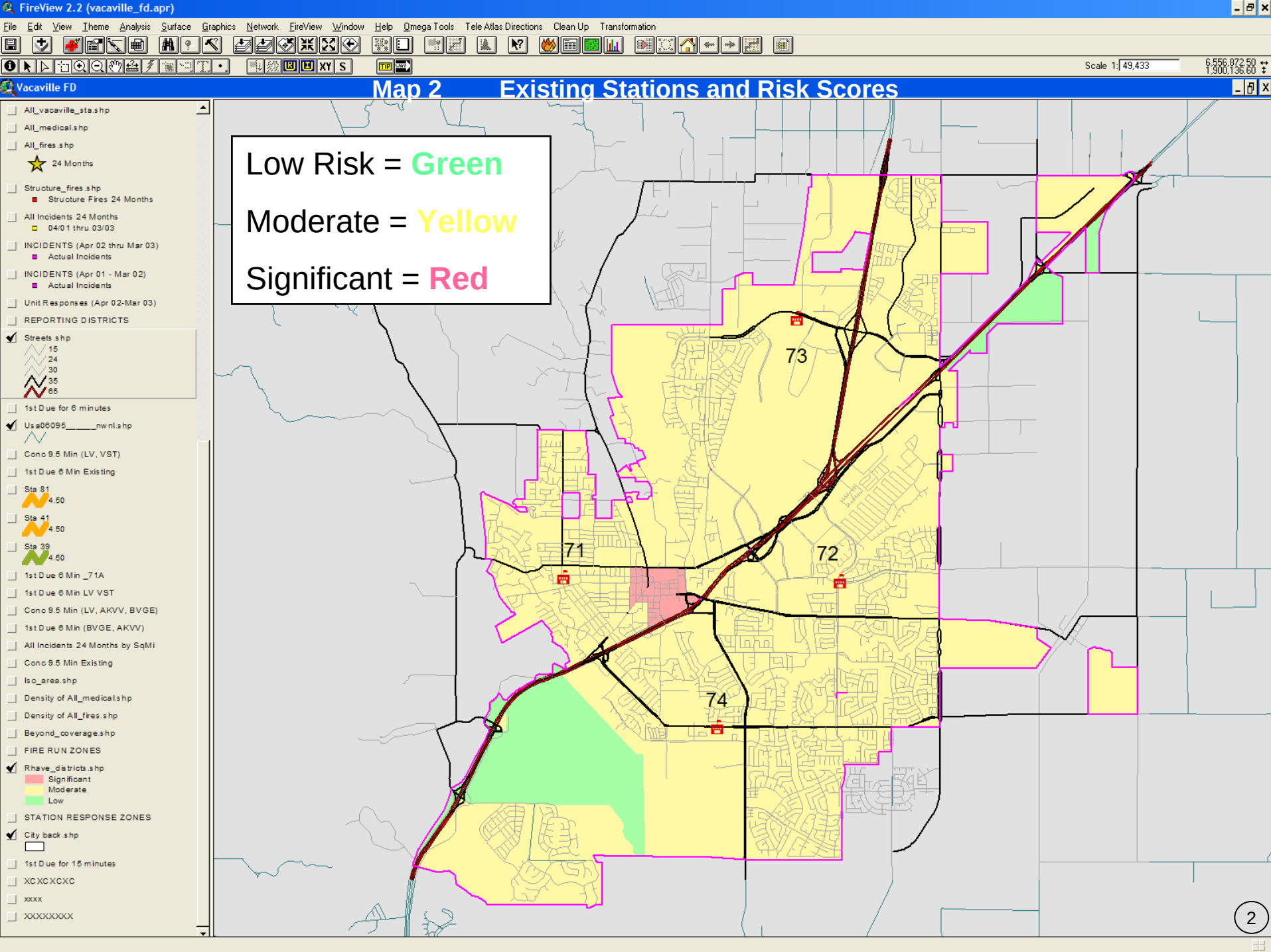
6,549,105.67
1,916,828.85

Vacaville FD

Map 1 Vacaville - Existing Stations and City Limits

- 4.50
- Sarea4 4.50
- Snet3 4.50
- Sarea3 4.50
- Snet2 4.50
- Sarea2 4.50
- Snet1 4.50
- Sarea1 4.50
- 0401-0302_fires.shp
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
- All_vacaville_sta.shp
- STATIONS
  - Station 71
  - Station 72
  - Station 73
  - Station 74
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Concentration for 9.5 minutes
- Iso_area.shp
- 1st Due for 6 minutes
- Beyond service.shp
- FIRE RUN ZONES
- REPORTING DISTRICTS
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
  - 71
  - 72
  - 73
  - 74
- City back.shp




FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 49,433
Vacaville FD
Map 2 Existing Stations and Risk Scores
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
All Incidents 24 Months
04/01 thru 03/03
INCIDENTS (Apr 02 thru Mar 03)
Actual Incidents
INCIDENTS (Apr 01 - Mar 02)
Actual Incidents
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
Streets.shp
15
24
30
35
65
1st Due for 6 minutes
Usa06095_____nwnl.shp
Conc 9.5 Min (LV, VST)
1st Due 6 Min Existing
Sta 81
4.50
Sta 41
4.50
Sta 39
4.50
1st Due 6 Min _71A
1st Due 6 Min LV VST
Conc 9.5 Min (LV, AKVV, BVGE)
1st Due 6 Min (BVGE, AKVV)
All Incidents 24 Months by SqMi
Conc 9.5 Min Existing
Iso_area.shp
Density of All_medical.shp
Density of All_fires.shp
Beyond_coverage.shp
FIRE RUN ZONES
Rhave_districts.shp
Significant
Moderate
Low
STATION RESPONSE ZONES
City back.shp
1st Due for 15 minutes
XCXCXCXC
xxxx
XXXXXXXX
Low Risk = Green
Moderate = Yellow
Significant = Red
73
71
72
74
2

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

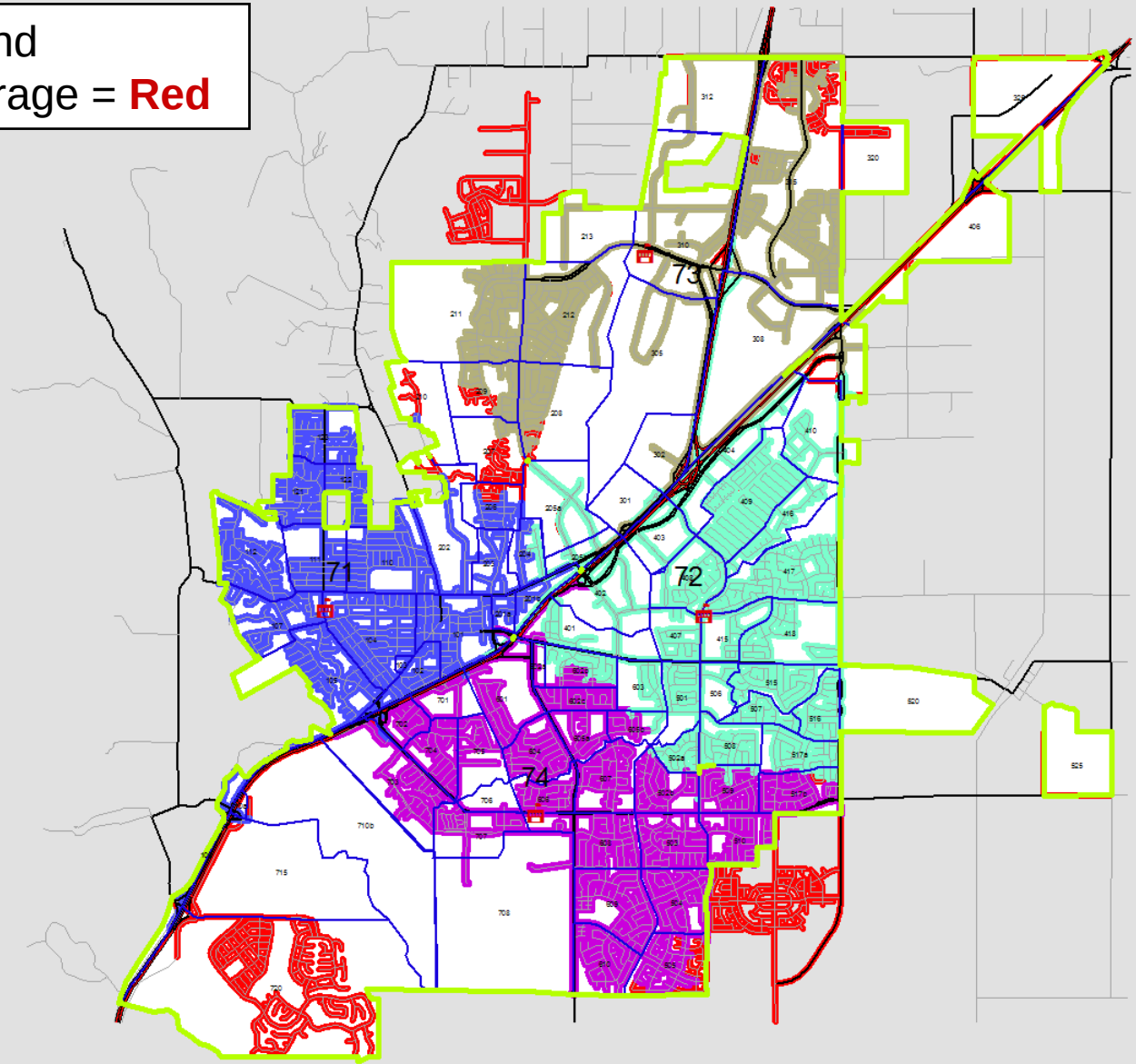
6,541,596.30
1,915,541.53

Vacaville FD

Map 3 Existing Distribution 6.0 Min Total Reflex Time

- Existing_ma.shp
- STATIONS Existing
- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
  - City Limits
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
  - 71
  - 72
  - 73
  - 74
- Existing 1st Due for 6 Min
  - 71
  - 72
  - 73
  - 74
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)

Beyond Coverage = **Red**



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

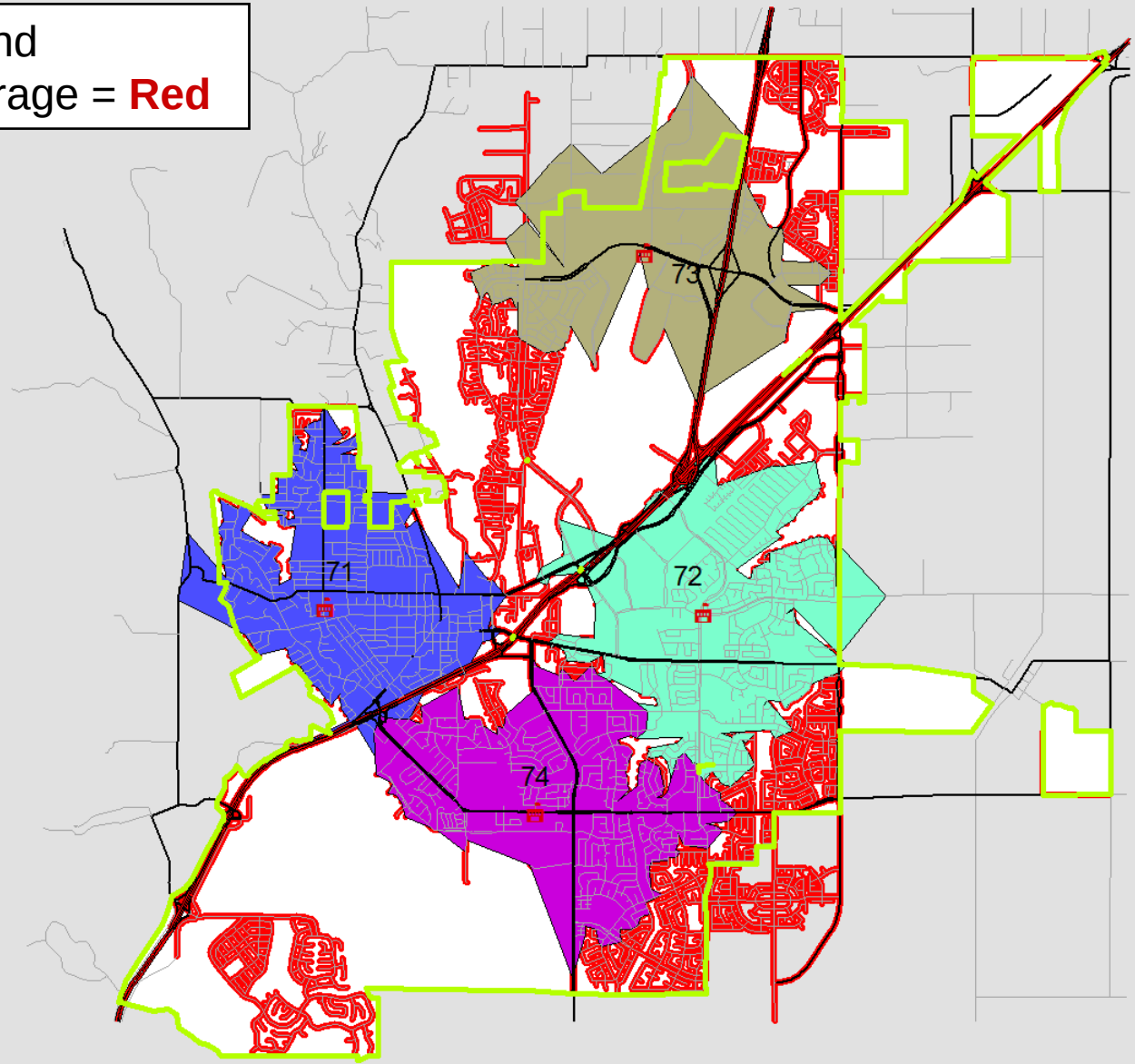
6,541,596.30
1,915,455.71

Vacaville FD

Map 4 Existing Stations ISO 1.5 Mile Drive Zones

- STATIONS Existing
- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
  - City Limits
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
- Structure_fires.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
- Iso_area.shp
  - 1
  - 2
  - 3
  - 4
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp

Beyond
Coverage = **Red**



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433 6,541,725.04 1,879,282.01

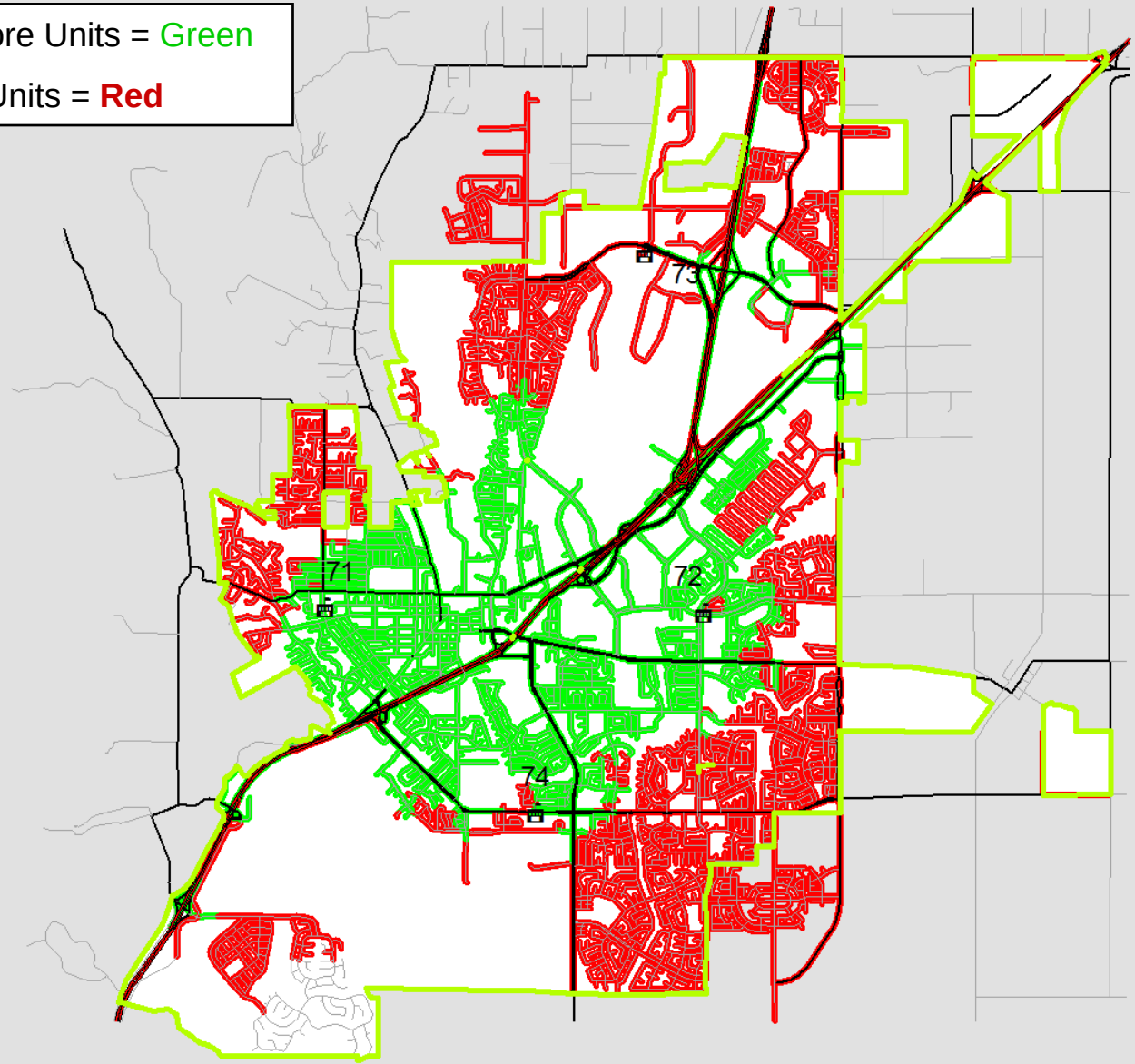
Vacaville FD

Map 5 Existing Concentration – 9.5 Min Total Reflex

- Existing_ma.shp
- STATIONS Existing
- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
  - City Limits
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
- Structure_fires.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.shp
  - 1 Station
  - 2 Stations
  - 3 Stations
  - 4 Stations
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp

4 or More Units = Green

1 to 3 Units = **Red**



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

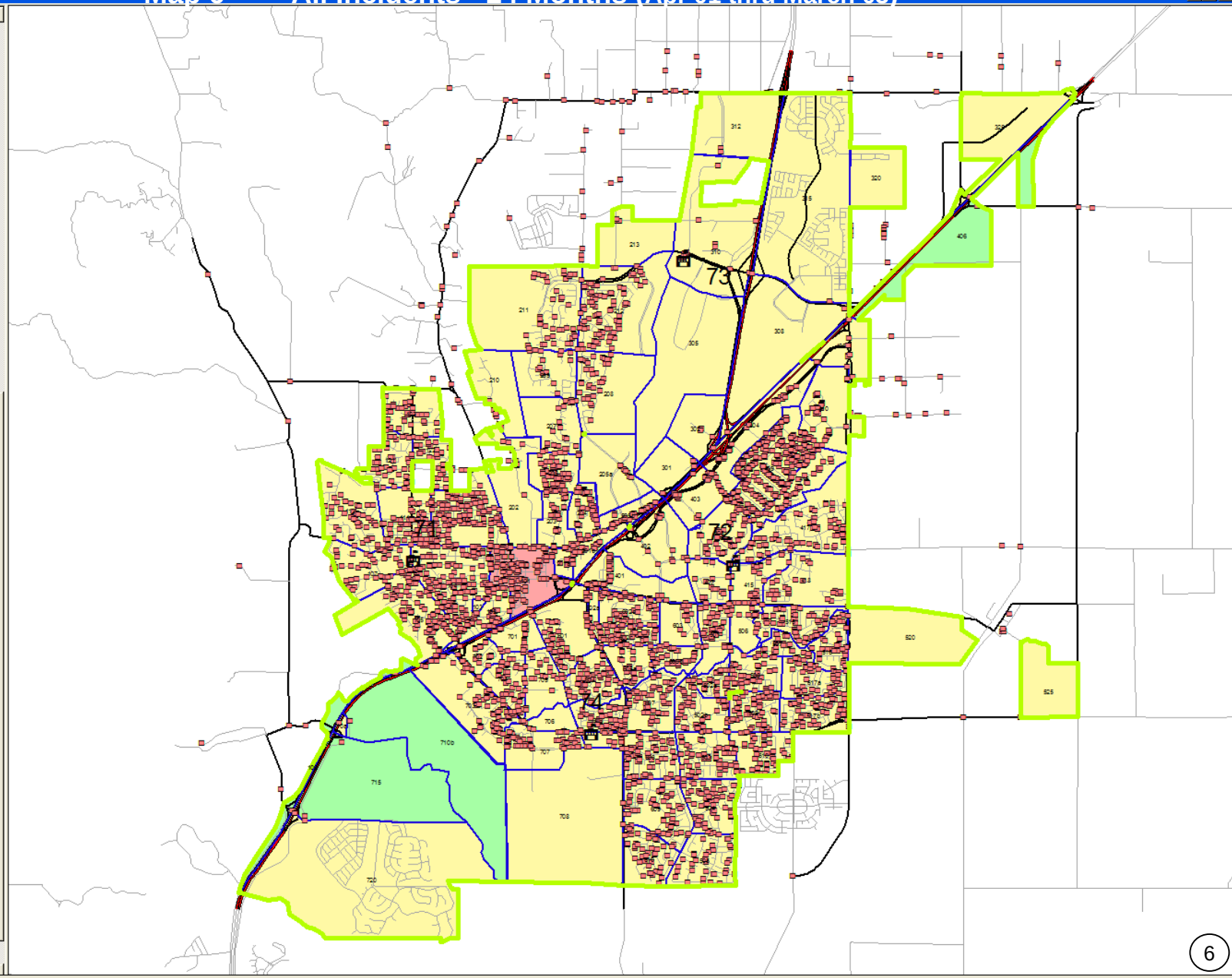
Scale 1: 49,433

6,545,029.16
1,905,285.88

Vacaville FD

Map 6 All Incidents - 24 Months (Apr 01 thru March 03)

- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
- Structure_fires.shp
- [x] All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- [x] REPORTING DISTRICTS
- [x] Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- [x] Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- [x] Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
- [x] City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- xxxxxxxx



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

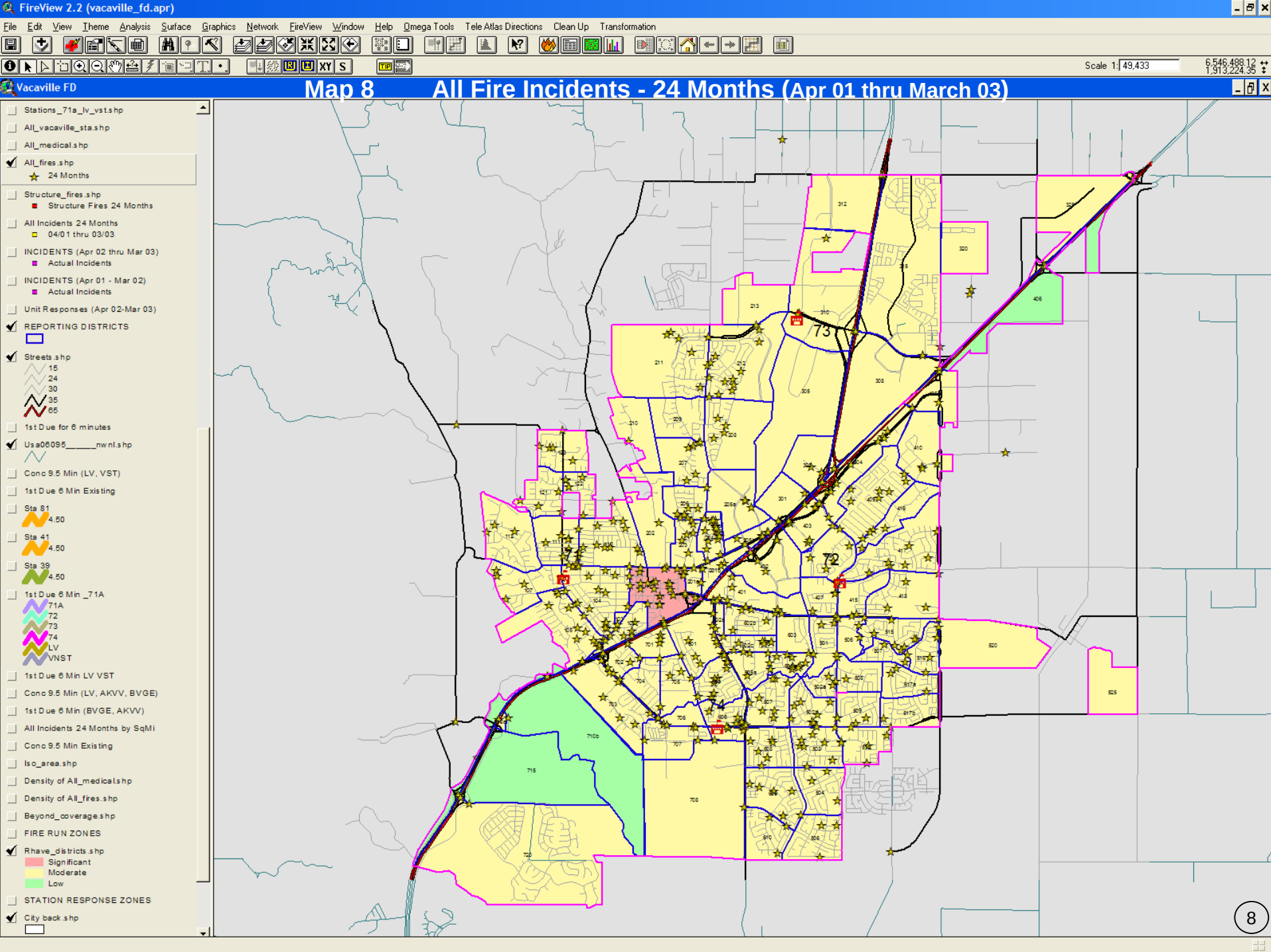
Scale 1: 49,433

6,544,428.41
1,900,479.88

Vacaville FD

Map 7 All EMS Incidents - 24 Months (Apr 01 thru March 03)

- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_fires.shp
- Structure_fires.shp
- ☑ All_medical.shp
  - 24 Months
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- ☑ REPORTING DISTRICTS
- ☑ Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- ☑ Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- ☑ Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
- ☑ City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- xxxxxxxx


FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 49,433
6,546,488.12
1,913,224.35
Vacaville FD
Map 8 All Fire Incidents - 24 Months (Apr 01 thru March 03)
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
All Incidents 24 Months
04/01 thru 03/03
INCIDENTS (Apr 02 thru Mar 03)
Actual Incidents
INCIDENTS (Apr 01 - Mar 02)
Actual Incidents
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
Streets.shp
15
24
30
35
65
1st Due for 6 minutes
Usa06095_____nwnl.shp
Conc 9.5 Min (LV, VST)
1st Due 6 Min Existing
Sta 81
4.50
Sta 41
4.50
Sta 39
4.50
1st Due 6 Min _71A
71A
72
73
74
LV
VNST
1st Due 6 Min LV VST
Conc 9.5 Min (LV, AKVV, BVGE)
1st Due 6 Min (BVGE, AKVV)
All Incidents 24 Months by SqMi
Conc 9.5 Min Existing
Iso_area.shp
Density of All_medical.shp
Density of All_fires.shp
Beyond_coverage.shp
FIRE RUN ZONES
Rhave_districts.shp
Significant
Moderate
Low
STATION RESPONSE ZONES
City back.shp
73
72
71
74
8

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

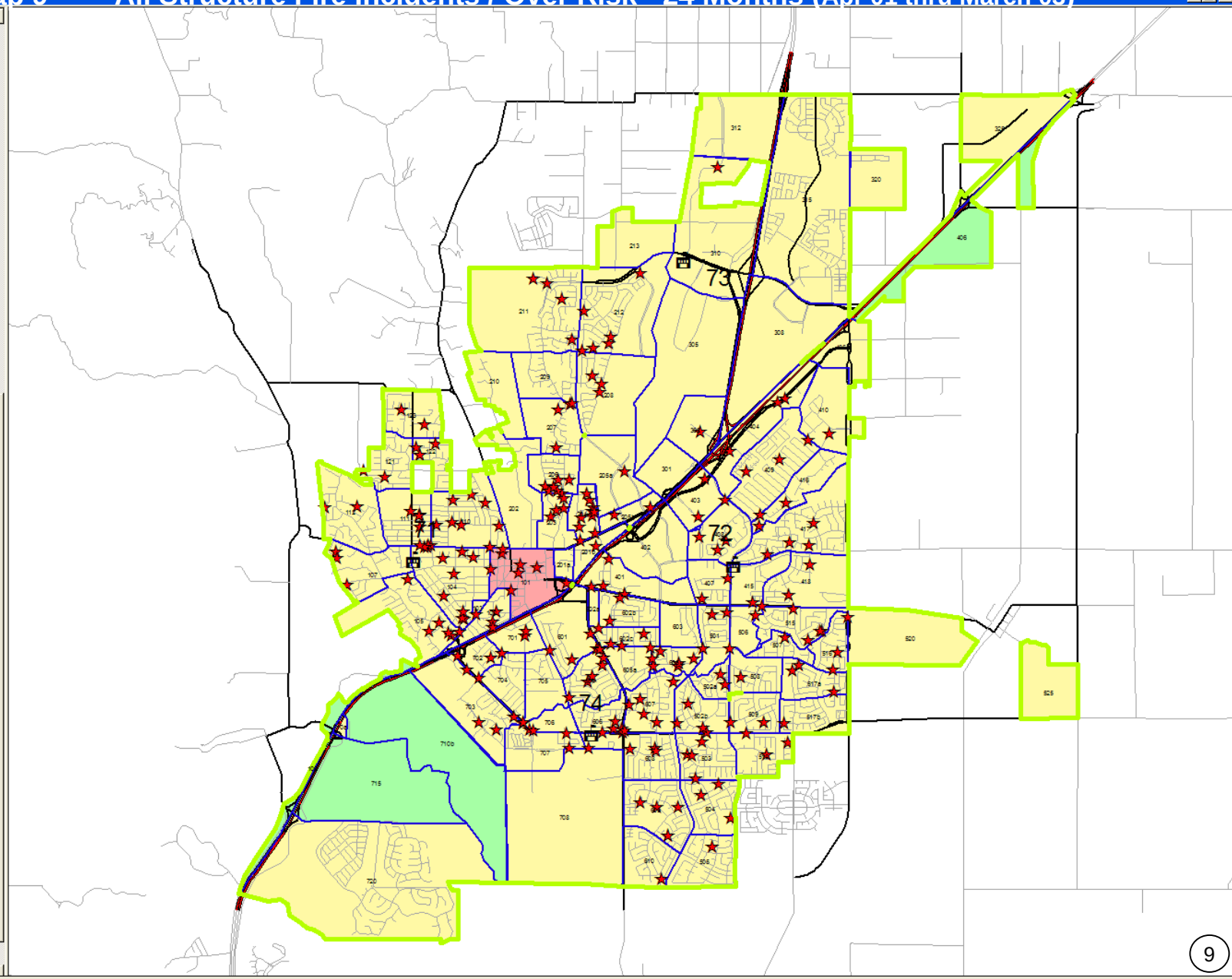
Scale 1: 49,433

6,542,239.96
1,884,517.11

Vacaville FD

Map 9 All Structure Fire Incidents / Over Risk - 24 Months (Apr 01 thru March 03)

- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

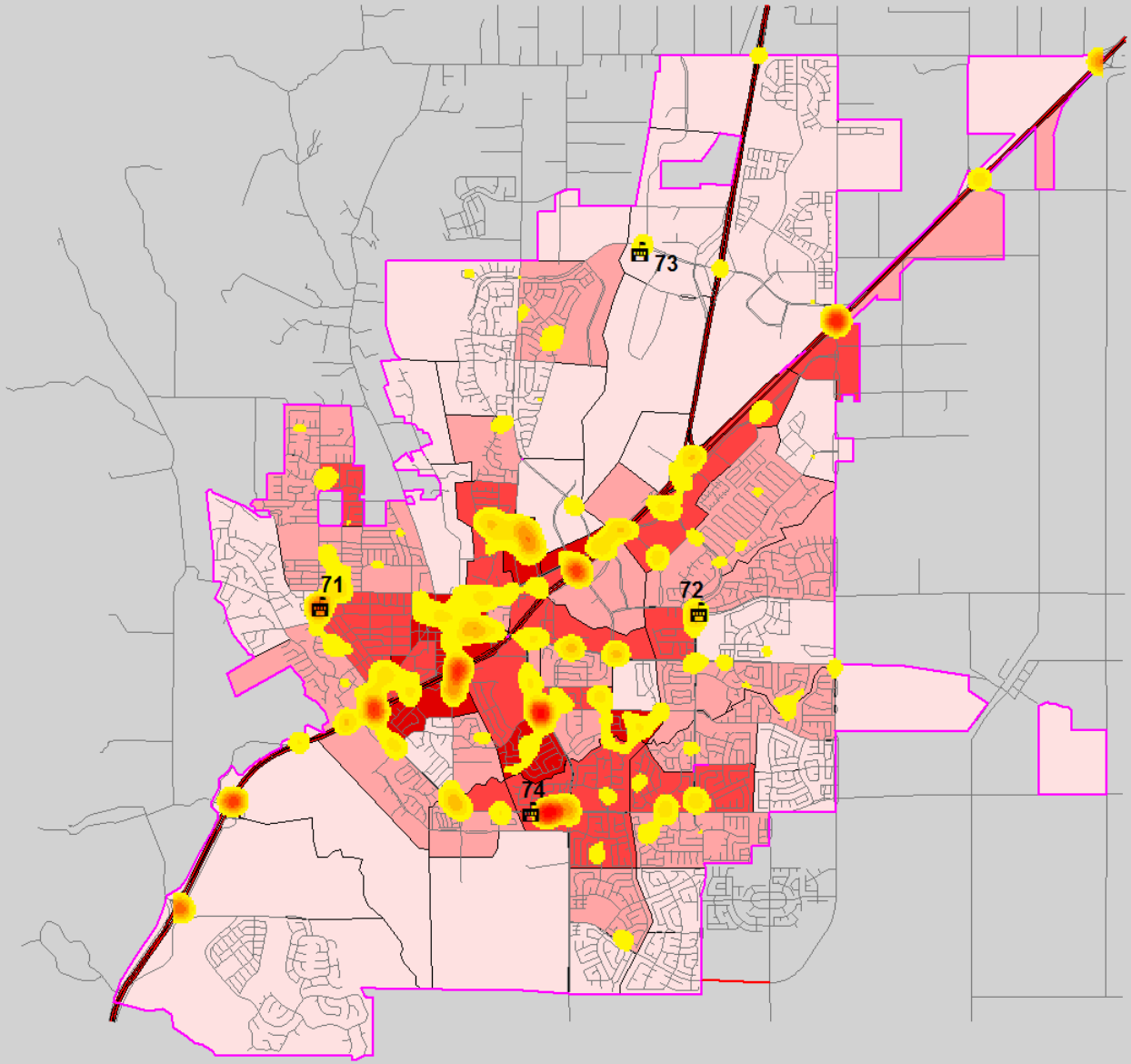
Scale 1: 49,433

6,541,596.30
1,917,300.87

Vacaville FD

Map 10 All Fires – Hot Spot / Over Density - 24 Months (Apr 01 thru March 03)

- Sarea1
- [x] Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- [x] Vacaville city limits.shp
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- Stations_1.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- [x] Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Conc 9.5 Min (LV, VST)
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
- Iso_area.shp
- 1st Due 6 Min Existing
- [x] Density of All_fires.shp
  - 0 - 19
  - 19 - 48
  - 48 - 95
  - 95 - 202
  - 202 - 698
- Beyond_coverage.shp
- FIRE RUN ZONES
- REPORTING DISTRICTS
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
  - 71
  - 72
  - 73



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

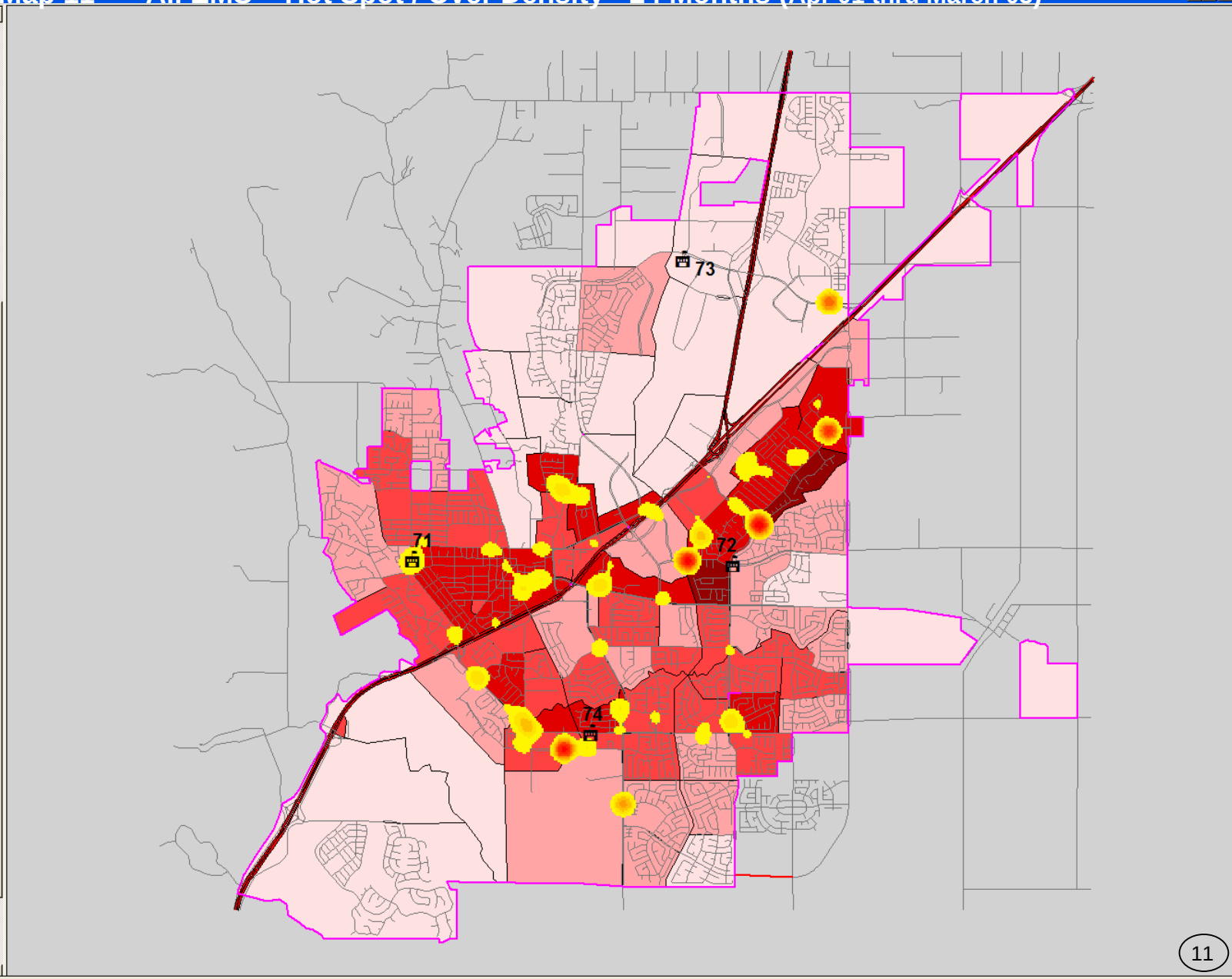
Scale 1: 49,433

6,544,428.41
1,913,953.83

Vacaville FD

Map 11 All EMS – Hot Spot / Over Density - 24 Months (Apr 01 thru March 03)

- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- ☑ Vacaville city limits.shp
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- Stations_1.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- ☑ Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Conc 9.5 Min (LV, VST)
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
- Iso_area.shp
- 1st Due 6 Min Existing
- ☑ Density of All_medical.shp
  - 0 - 159
  - 159 - 428
  - 428 - 755
  - 755 - 1270
  - 1270 - 2418
- Density of All_fires.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- REPORTING DISTRICTS
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
  - 71
  - 72
  - 73
  - 74
- ☑ City back.shp



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

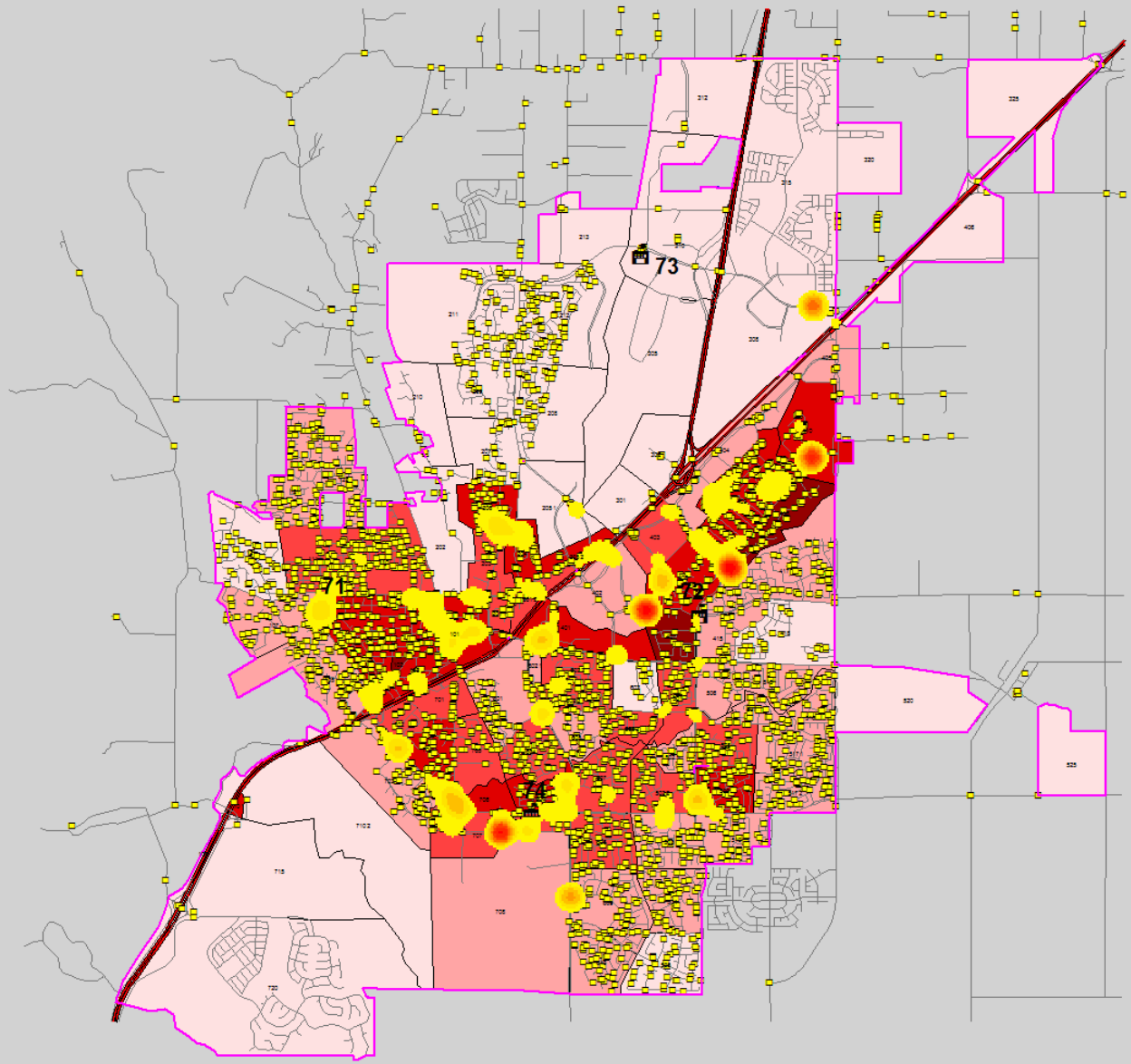
Scale 1: 49,433

6,541,939.59
1,914,940.78

Vacaville FD

Map 12 All Incidents & Hot Spot / Over Density - 24 Months (Apr 01 thru March 03)

- Sarea2
- Snet1
- Sarea1
- 0401-0302_fires.shp
- Hot Spot for All Incidents 24 Months
  - 0 - 1497
  - 1497 - 2995
  - 2995 - 4492
  - 4492 - 5990
  - 5990 - 7487
  - 7487 - 8985
  - 8985 - 10482
  - 10482 - 11980
  - 11980 - 13477
  - No Data
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
- All_vacaville_sta.shp
- STATIONS
  - Station 71
  - Station 72
  - Station 73
  - Station 74
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- All Incidents 24 Months by SqMi
  - 0 - 229
  - 229 - 581
  - 581 - 938
  - 938 - 1631
  - 1631 - 2637
- Concentration for 9.5 minutes
- Iso_area.shp
  - 1
  - 2
  - 3
  - 4
- 1st Due for 6 minutes
- Beyond_coverage.shp
- FIRE RUN ZONES
- REPORTING DISTRICTS
- Rhave_districts.shp



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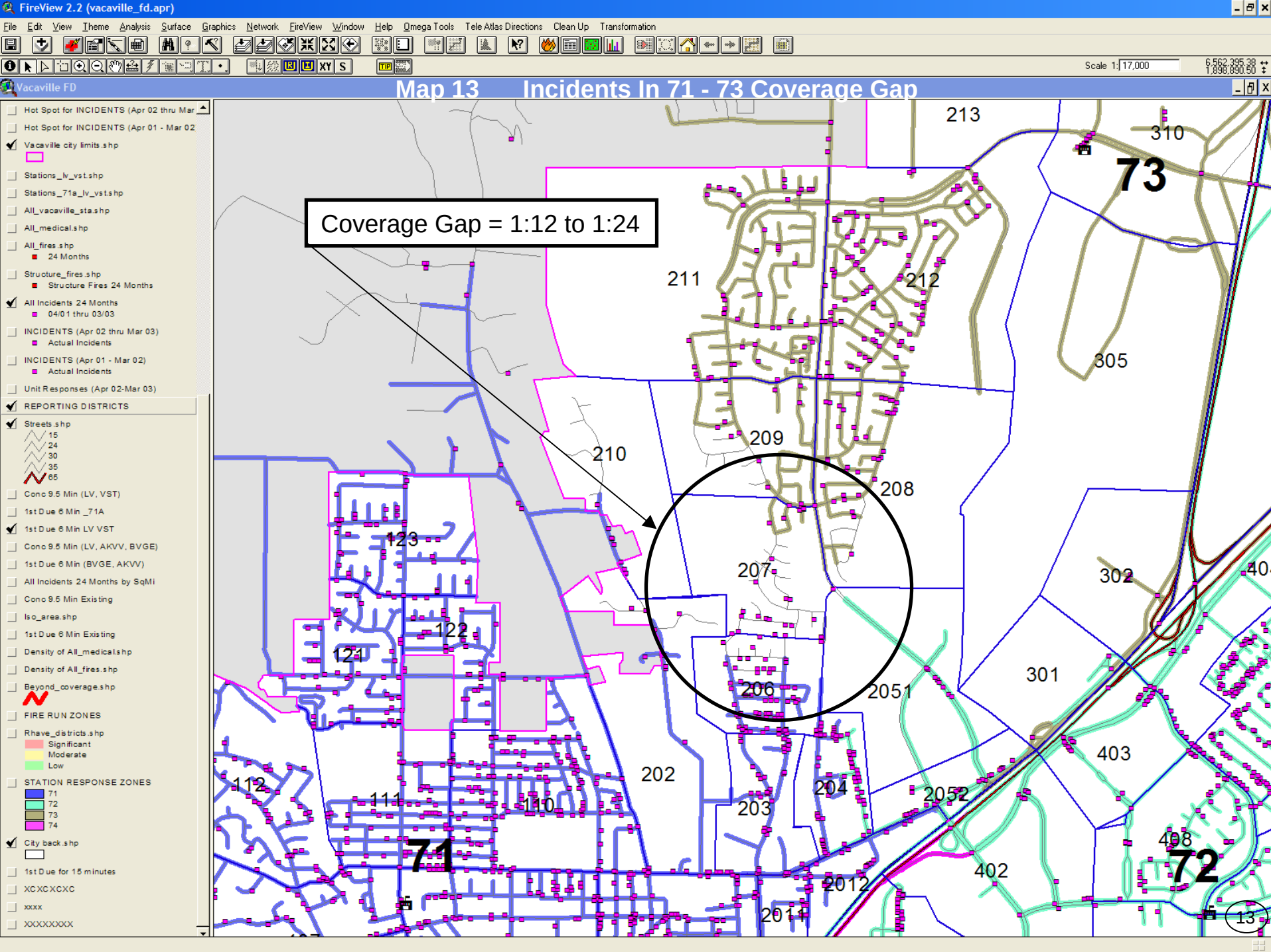
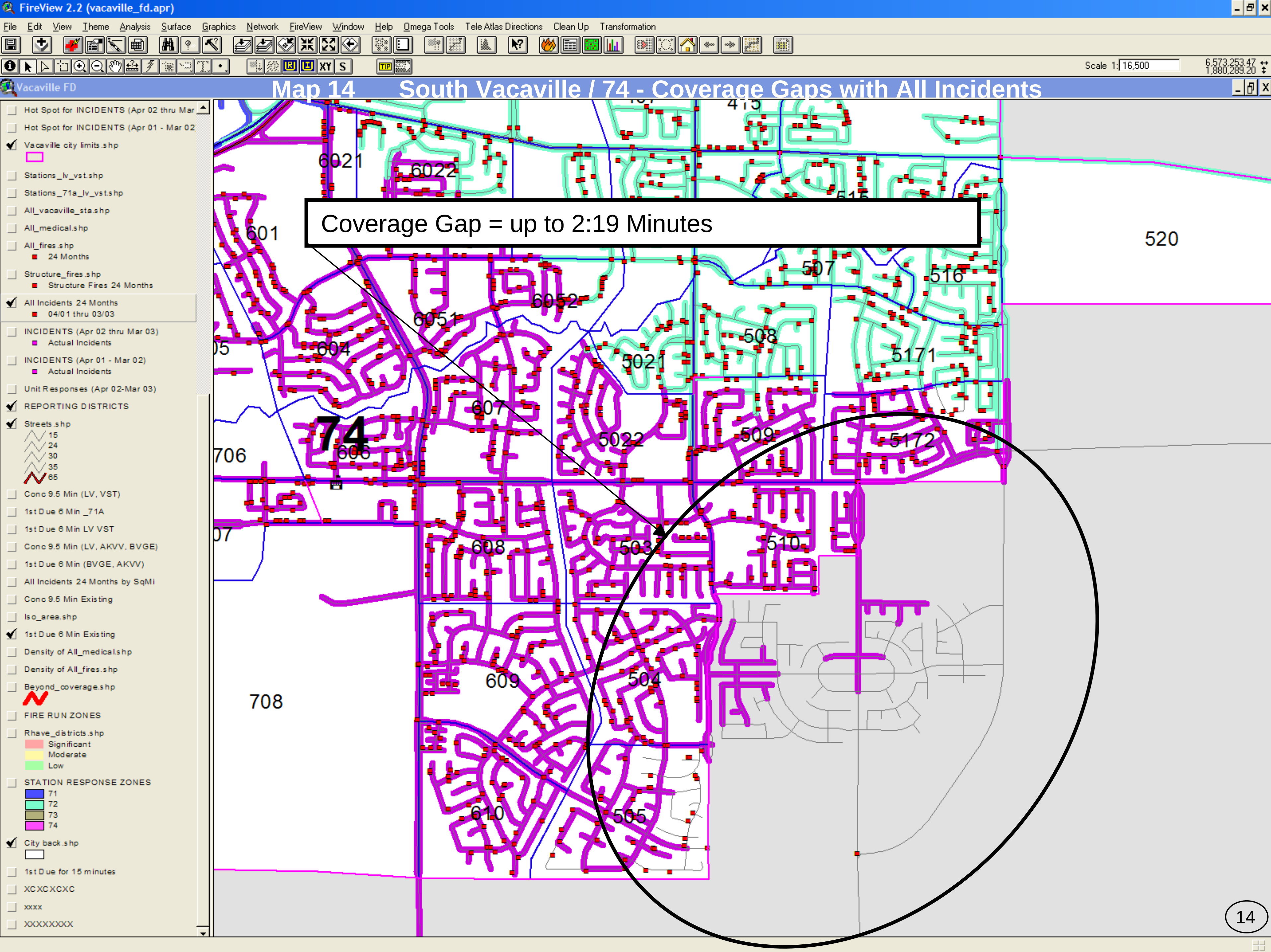
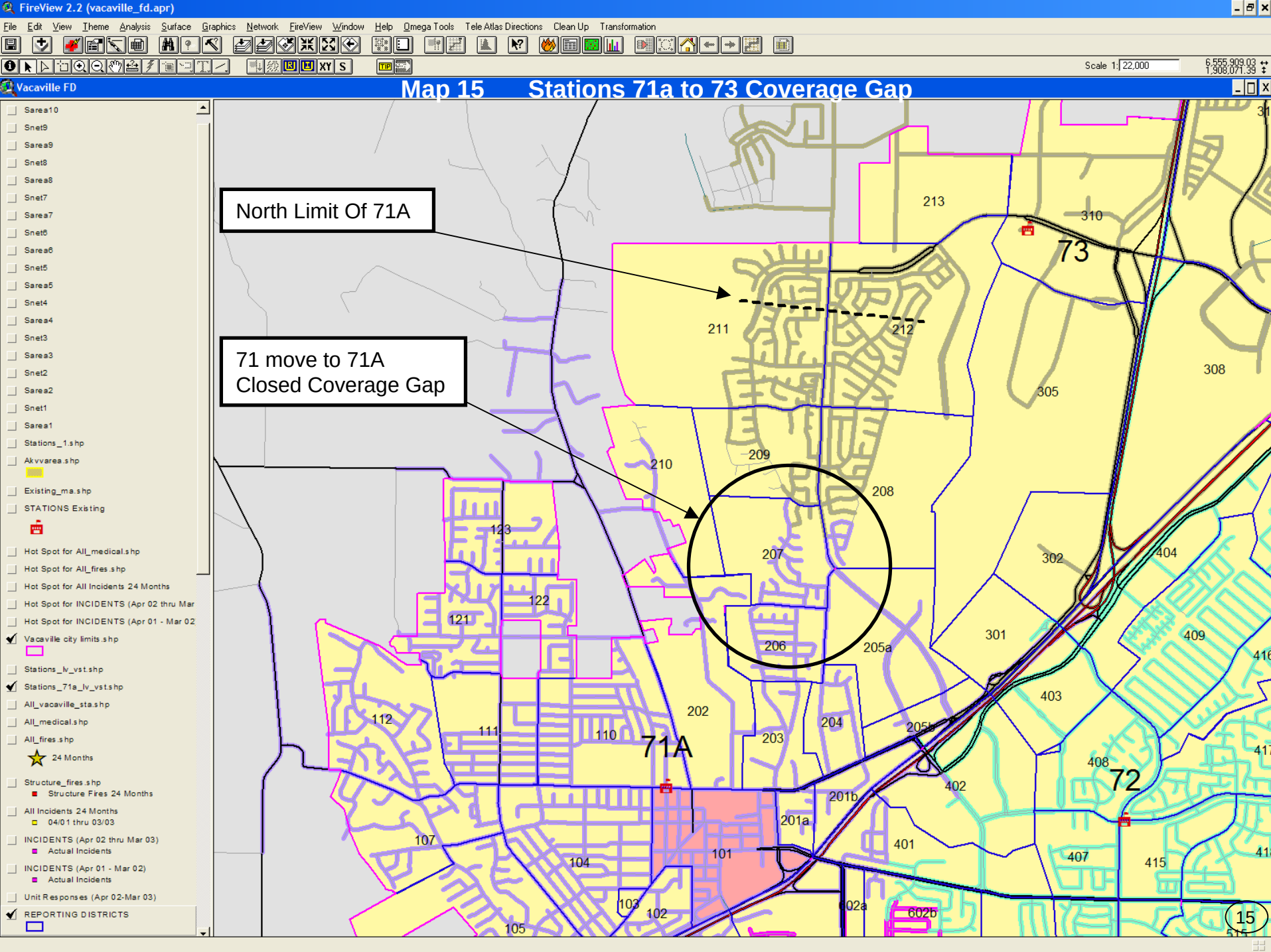

FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 17,000
Vacaville FD
Map 13 Incidents In 71 - 73 Coverage Gap
Hot Spot for INCIDENTS (Apr 02 thru Mar
Hot Spot for INCIDENTS (Apr 01 - Mar 02
Vacaville city limits.shp
Stations_lv_vst.shp
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
All Incidents 24 Months
04/01 thru 03/03
INCIDENTS (Apr 02 thru Mar 03)
Actual Incidents
INCIDENTS (Apr 01 - Mar 02)
Actual Incidents
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
Streets.shp
15
24
30
35
65
Conc 9.5 Min (LV, VST)
1st Due 6 Min _71A
1st Due 6 Min LV VST
Conc 9.5 Min (LV, AKVV, BVGE)
1st Due 6 Min (BVGE, AKVV)
All Incidents 24 Months by SqMi
Conc 9.5 Min Existing
Iso_area.shp
1st Due 6 Min Existing
Density of All_medical.shp
Density of All_fires.shp
Beyond_coverage.shp
FIRE RUN ZONES
Rhave_districts.shp
Significant
Moderate
Low
STATION RESPONSE ZONES
71
72
73
74
City back.shp
1st Due for 15 minutes
XCXCXCXC
xxxx
XXXXXXXX
Coverage Gap = 1:12 to 1:24
213
310
73
211
212
305
209
210
208
123
207
302
122
121
206
2051
301
403
112
111
110
202
203
204
2052
408
72
402
2012
2011
71
13


FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 16,500
6,573,253.47
1,880,289.20
Vacaville FD
Map 14 South Vacaville / 74 - Coverage Gaps with All Incidents
Hot Spot for INCIDENTS (Apr 02 thru Mar
Hot Spot for INCIDENTS (Apr 01 - Mar 02
Vacaville city limits.shp
Stations_lv_vst.shp
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
All Incidents 24 Months
04/01 thru 03/03
INCIDENTS (Apr 02 thru Mar 03)
Actual Incidents
INCIDENTS (Apr 01 - Mar 02)
Actual Incidents
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
Streets.shp
15
24
30
35
65
Conc 9.5 Min (LV, VST)
1st Due 6 Min _71A
1st Due 6 Min LV VST
Conc 9.5 Min (LV, AKVV, BVGE)
1st Due 6 Min (BVGE, AKVV)
All Incidents 24 Months by SqMi
Conc 9.5 Min Existing
Iso_area.shp
1st Due 6 Min Existing
Density of All_medical.shp
Density of All_fires.shp
Beyond_coverage.shp
FIRE RUN ZONES
Rhave_districts.shp
Significant
Moderate
Low
STATION RESPONSE ZONES
71
72
73
74
City back.shp
1st Due for 15 minutes
XCXCXCXC
xxxx
XXXXXXXX
Coverage Gap = up to 2:19 Minutes
6021
6022
601
520
507
516
6052
6051
508
5171
604
5021
607
74
606
5022
509
5172
706
608
503
510
609
504
708
610
505
14


FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 22,000
Vacaville FD
Map 15 Stations 71a to 73 Coverage Gap
Sarea10
Snet9
Sarea9
Snet8
Sarea8
Snet7
Sarea7
Snet6
Sarea6
Snet5
Sarea5
Snet4
Sarea4
Snet3
Sarea3
Snet2
Sarea2
Snet1
Sarea1
Stations_1.shp
Akvvarea.shp
Existing_ma.shp
STATIONS Existing
Hot Spot for All_medical.shp
Hot Spot for All_fires.shp
Hot Spot for All Incidents 24 Months
Hot Spot for INCIDENTS (Apr 02 thru Mar
Hot Spot for INCIDENTS (Apr 01 - Mar 02
Vacaville city limits.shp
Stations_lv_vst.shp
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
All Incidents 24 Months
04/01 thru 03/03
INCIDENTS (Apr 02 thru Mar 03)
Actual Incidents
INCIDENTS (Apr 01 - Mar 02)
Actual Incidents
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
North Limit Of 71A
71 move to 71A
Closed Coverage Gap
71A
73
72
213
310
211
212
308
305
210
209
208
123
207
302
404
122
121
206
205a
301
409
202
403
112
111
110
204
203
205b
408
402
201b
201a
107
104
101
401
407
415
103
102
602a
602b
105
15

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

6,543,312.73
1,887,735.41

Vacaville FD

Map 16 All Fires over Existing Concentration

- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.shp
  - 1 Station
  - 2 Stations
  - 3 Stations
  - 4 Stations
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- XXXXXXXX
- XJXJXJXJ

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 36,941

6,554,786.77
1,910,560.30

Vacaville FD

Map 17 NE Vacaville Coverage 4.5 Minute Travel

Station AKVV 4.5 Coverage Area

- STATIONS Existing
- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- 1st Due for 6 minutes
  - 71
  - 72
  - 74
  - BVGE
  - LV
  - VNST
  - VVAK
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV, VST)
- 1st Due 6 Min Existing
- Sta 81
  - 4.50
- Sta 41
  - 4.50
- Sta 39
  - 4.50
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
  - 1 Station

BVGE

AKVV

71

72

17

Project saved to 'vacaville_fd.apr'

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

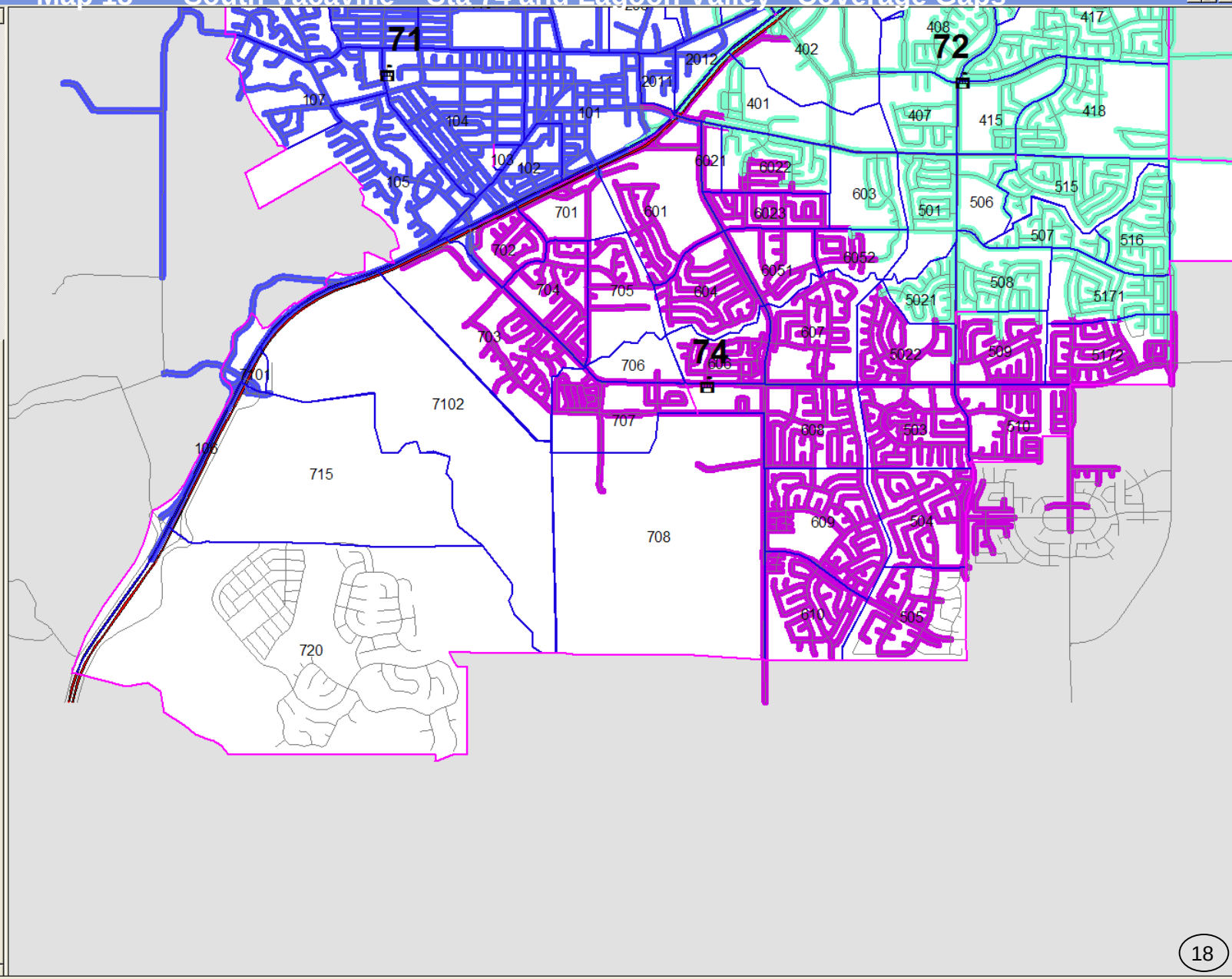
Scale 1: 27,460

6,555,541.72
1,876,843.87

Vacaville FD

Map 18 South Vacaville – Sta 74 and Lagoon Valley - Coverage Gaps

- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- ✓ Vacaville city limits.shp
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- ✓ REPORTING DISTRICTS
- ✓ Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Conc 9.5 Min (LV, VST)
- ✓ 1st Due 6 Min Existing
  - 71
  - 72
  - 73
  - 74
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
- ✓ City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- XXXXXXXX



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 27,460

6,568,819.26
1,886,712.63

Vacaville FD

Map 19 Distribution with 2 New South Vacaville Stations - 6.0 Min Total Reflex Time

- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_medical.shp
- All_fires.shp
  - 24 Months
- Structure_fires.shp
  - Structure Fires 24 Months
- All Incidents 24 Months
  - 04/01 thru 03/03
- INCIDENTS (Apr 02 thru Mar 03)
  - Actual Incidents
- INCIDENTS (Apr 01 - Mar 02)
  - Actual Incidents
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Conc 9.5 Min (LV, VST)
- 1st Due 6 Min Existing
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
  - 71
  - 72
  - 73
  - 74
  - LV
  - VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
  - Significant
  - Moderate
  - Low
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

6,541,853.77
1,916,571.39

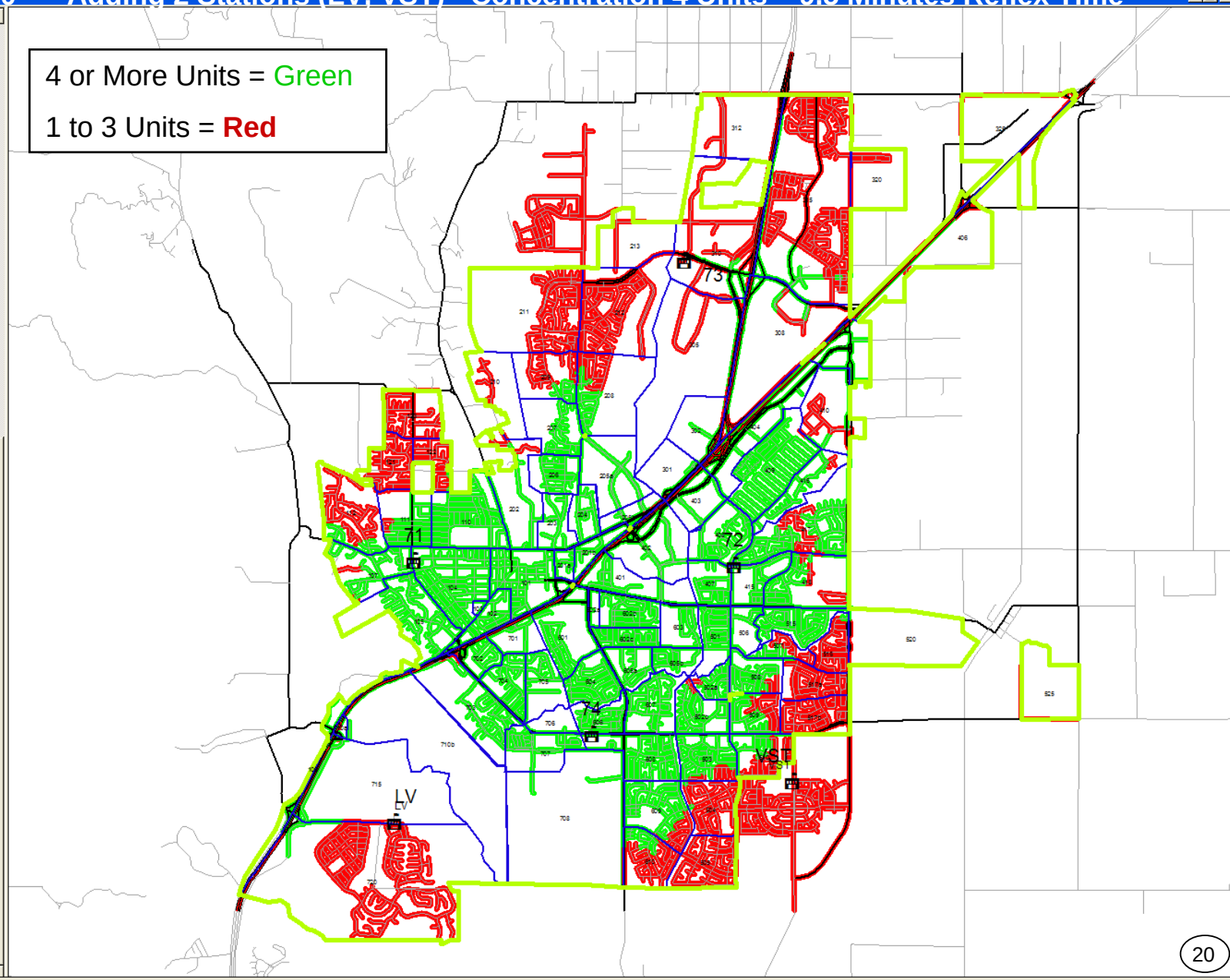
Vacaville FD

Map 20 Adding 2 Stations (LV, VST) - Concentration 4 Units – 9.5 Minutes Reflex Time

- Structure_fires.shp
- All_medical.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV,VST)CL
  - 1 Station
  - 2 Stations
  - 3 Stations
  - 4 Stations
  - 5 Stations
  - 6 Stations
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Exist CL.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- XXXXXXXX
- XJXJXJXJ

4 or More Units = Green

1 to 3 Units = **Red**



FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

6,541,853.77
1,897,733.60

Vacaville FD

Map 21 Adding 2 Stations (LV, VST) - Concentration 5 Units – 9.5 Minutes Reflex Time

- Structure_fires.shp
- All_medical.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV,VST)CL
  - 1 Station
  - 2 Stations
  - 3 Stations
  - 4 Stations
  - 5 Stations
  - 6 Stations
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Exist CL.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- XXXXXXXX
- XJXJXJXJ

5 or More Units = Green

1 to 4 Units = **Red**

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433

6,549,792.24
1,887,005.93

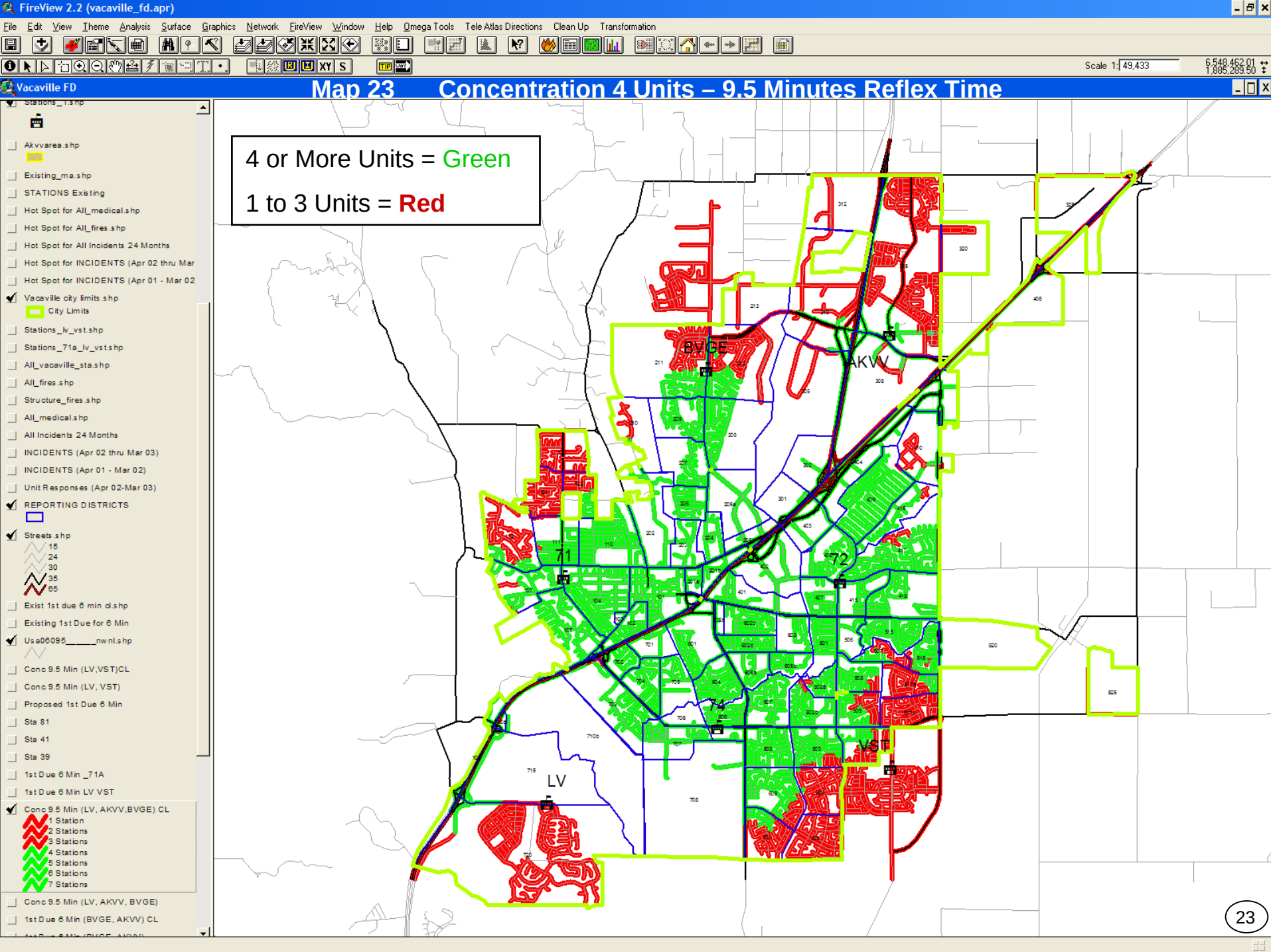
Vacaville FD

Map 22 Distribution with Reloc 73 and 3 new Stations - 6.0 Min Total Reflex Time

- All_medical.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV,VST)CL
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV) CL
  - 71
  - 72
  - 74
  - BVGE
  - LV
  - VNST
  - VVAK
- 1st Due 6 Min (BVGE, AKVV)
- All Incidents 24 Months by SqMi
- Conc 9.5 Min Exist CL.shp
- Conc 9.5 Min Existing
- Iso_area.shp
- Density of All_medical.shp
- Density of All_fires.shp
- Beyond cover cl.shp
- Beyond_coverage.shp
- FIRE RUN ZONES
- Rhave_districts.shp
- STATION RESPONSE ZONES
- City back.shp
- 1st Due for 15 minutes
- XCXCXCXC
- xxxx
- XXXXXXXX
- XJXJXJXJ

Beyond Coverage = **Red**

BVGE
AKVV
71
72
74
VST
LV


FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 49,433
6,548,462.01
1,885,289.50
Vacaville FD
Map 23 Concentration 4 Units – 9.5 Minutes Reflex Time
4 or More Units = Green
1 to 3 Units = Red
Akvvarea.shp
Existing_ma.shp
STATIONS Existing
Hot Spot for All_medical.shp
Hot Spot for All_fires.shp
Hot Spot for All Incidents 24 Months
Hot Spot for INCIDENTS (Apr 02 thru Mar
Hot Spot for INCIDENTS (Apr 01 - Mar 02
Vacaville city limits.shp
City Limits
Stations_lv_vst.shp
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_fires.shp
Structure_fires.shp
All_medical.shp
All Incidents 24 Months
INCIDENTS (Apr 02 thru Mar 03)
INCIDENTS (Apr 01 - Mar 02)
Unit Responses (Apr 02-Mar 03)
REPORTING DISTRICTS
Streets.shp
15
24
30
35
65
Exist 1st due 6 min cl.shp
Existing 1st Due for 6 Min
Usa06095_____nwnl.shp
Conc 9.5 Min (LV,VST)CL
Conc 9.5 Min (LV, VST)
Proposed 1st Due 6 Min
Sta 81
Sta 41
Sta 39
1st Due 6 Min _71A
1st Due 6 Min LV VST
Conc 9.5 Min (LV, AKVV,BVGE) CL
1 Station
2 Stations
3 Stations
4 Stations
5 Stations
6 Stations
7 Stations
Conc 9.5 Min (LV, AKVV, BVGE)
1st Due 6 Min (BVGE, AKVV) CL
BVGE
AKVV
71
72
74
VSTF
LV
23

FireView 2.2 (vacaville_fd.apr)

File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation

Scale 1: 49,433 6,553,697.11 1,887,864.14

Vacaville FD

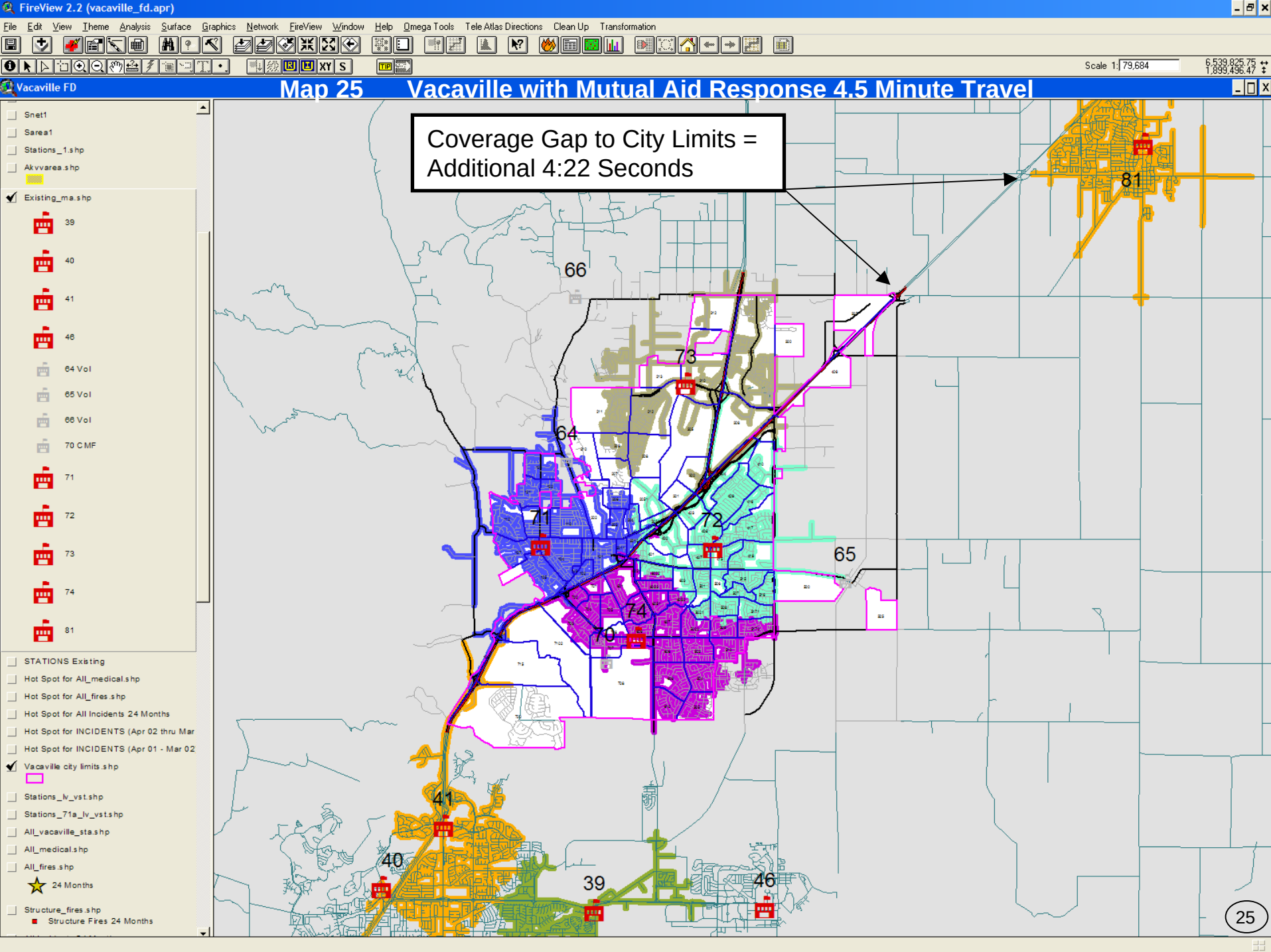
Map 24 Concentration 5 Units – 9.5 Minutes Reflex Time

- Stations_1.shp
- Akvvarea.shp
- Existing_ma.shp
- STATIONS Existing
- Hot Spot for All_medical.shp
- Hot Spot for All_fires.shp
- Hot Spot for All Incidents 24 Months
- Hot Spot for INCIDENTS (Apr 02 thru Mar
- Hot Spot for INCIDENTS (Apr 01 - Mar 02
- Vacaville city limits.shp
  - City Limits
- Stations_lv_vst.shp
- Stations_71a_lv_vst.shp
- All_vacaville_sta.shp
- All_fires.shp
- Structure_fires.shp
- All_medical.shp
- All Incidents 24 Months
- INCIDENTS (Apr 02 thru Mar 03)
- INCIDENTS (Apr 01 - Mar 02)
- Unit Responses (Apr 02-Mar 03)
- REPORTING DISTRICTS
- Streets.shp
  - 15
  - 24
  - 30
  - 35
  - 65
- Exist 1st due 6 min cl.shp
- Existing 1st Due for 6 Min
- Usa06095_____nwnl.shp
- Conc 9.5 Min (LV,VST)CL
- Conc 9.5 Min (LV, VST)
- Proposed 1st Due 6 Min
- Sta 81
- Sta 41
- Sta 39
- 1st Due 6 Min _71A
- 1st Due 6 Min LV VST
- Conc 9.5 Min (LV, AKVV,BVGE) CL
  - 1 Station
  - 2 Stations
  - 3 Stations
  - 4 Stations
  - 5 Stations
  - 6 Stations
  - 7 Stations
- Conc 9.5 Min (LV, AKVV, BVGE)
- 1st Due 6 Min (BVGE, AKVV) CL

5 or More Units = Green

1 to 4 Units = **Red**

BVGE AKVV 71 72 74 VST LV


FireView 2.2 (vacaville_fd.apr)
File Edit View Theme Analysis Surface Graphics Network FireView Window Help Omega Tools Tele Atlas Directions Clean Up Transformation
Scale 1: 79,684
Vacaville FD
Map 25 Vacaville with Mutual Aid Response 4.5 Minute Travel
Coverage Gap to City Limits = Additional 4:22 Seconds
Snet1
Sarea1
Stations_1.shp
Akvvarea.shp
Existing_ma.shp
39
40
41
46
64 Vol
65 Vol
66 Vol
70 CMF
71
72
73
74
81
STATIONS Existing
Hot Spot for All_medical.shp
Hot Spot for All_fires.shp
Hot Spot for All Incidents 24 Months
Hot Spot for INCIDENTS (Apr 02 thru Mar
Hot Spot for INCIDENTS (Apr 01 - Mar 02
Vacaville city limits.shp
Stations_lv_vst.shp
Stations_71a_lv_vst.shp
All_vacaville_sta.shp
All_medical.shp
All_fires.shp
24 Months
Structure_fires.shp
Structure Fires 24 Months
66
73
64
71
72
65
74
70
81
41
40
39
46
25

APPENDIX C

CHART OF RESPONSE TIMES TO CERTAIN IRAS

Fire Department Incident Responses by Station Run Zone Area with Emphasis on Selected Internal Response Areas (IRAs)

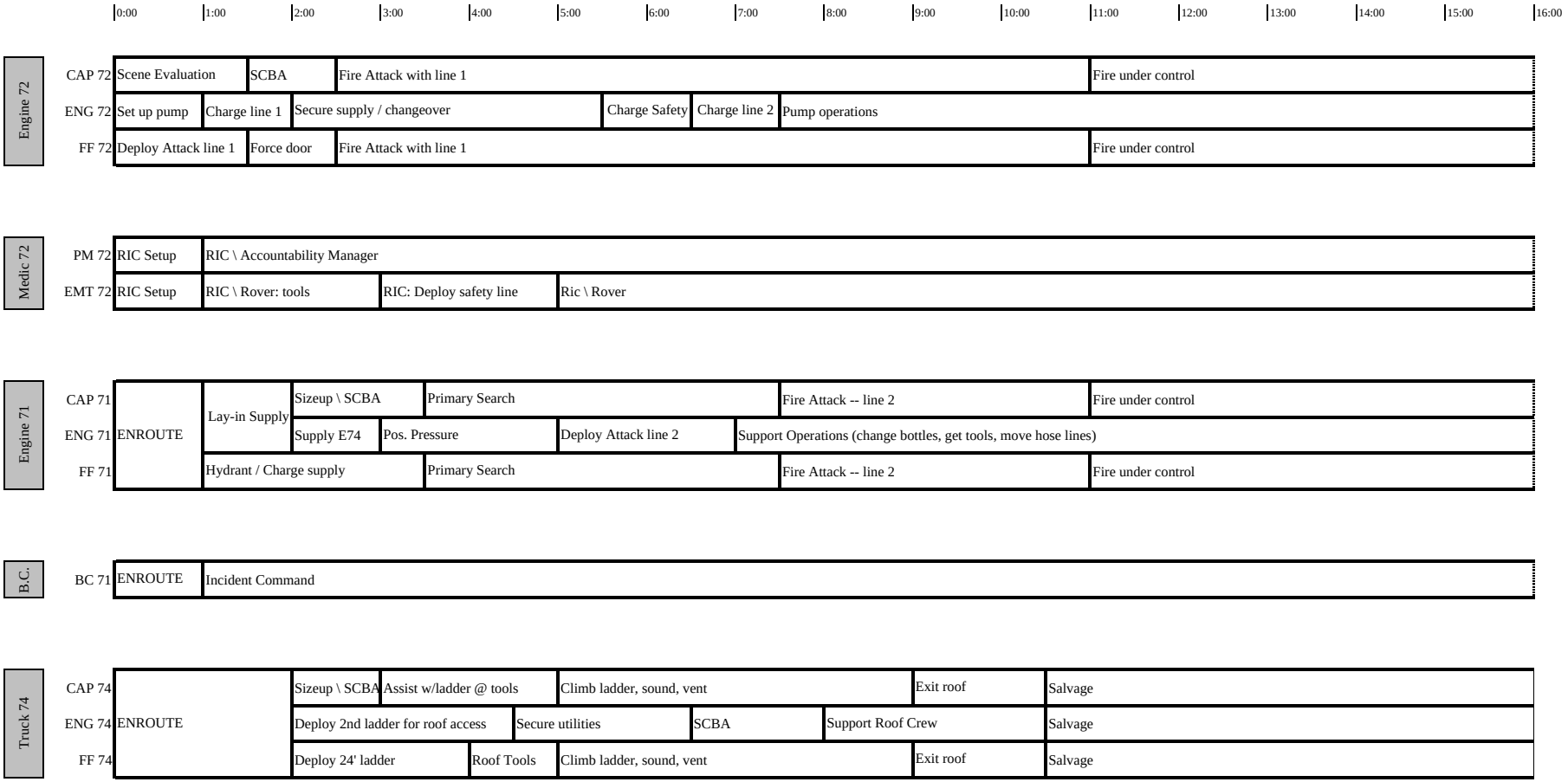
Station	All Calls	Critical Calls	85% Overall Time	# of Primary Calls	85% Primary Time	% of Primary Calls	# of Secondary Calls	85% Secondary Time	% of Secondary Calls
Station 71	1470	826	5:32	764	5:17	92%	62	8:41	8%
Station 72	2244	1392	6:06	1260	5:43	91%	132	8:15	9%
Station 73	728	281	7:17	197	6:59	70%	84	8:18	30%
** 206		46	7:29	13	8:55	28%	33	6:31	72%
207		17	7:03	10	7:44	59%	7	7:04	41%
208		15	7:27	11	7:27	73%	4	7:04	27%
209		7	6:49	6	6:49	86%	1	7:48	14%
211		23	7:11	23	7:11	96%	1	8:33	4%
212		42	7:04	35	6:12	83%	7	9:45	17%
Station 74	1783	1163	6:25	1060	6:09	91%	103	8:40	9%
504		23	6:15	23	6:15	100%	0	0:00	0%
505		26	7:04	24	6:58	92%	2	8:10	8%
510		34	5:43	33	5:55	97%	1	4:12	3%
516		14	5:58	13	5:58	93%	1	6:09	7%
517A		23	6:18	20	6:18	87%	3	4:53	13%
517B		34	6:58	31	6:58	91%	3	6:24	9%
Citywide	6225	3662	6:15	3281	5:50	90%	381	8:29	10%

** IRAs with suspected problems in Stations 73 and 74 areas were selected for closer review. Note: Dataset includes 4/8/02 through 4/7/03, edited to disregard calls with incomplete CAD information or calls in excess of 16 minutes. Responses to 800 and 900 areas are not included in the breakdown of Primary vs. Secondary calls.

APPENDIX D

CRITICAL TASK STAFFING STUDIES FOR FIRE AND EMS INCIDENTS

Critical FIRE Call Breakdown: Structure Fire (Room and Contents)



Critical EMS Call Breakdown: Motor Vehicle Accident

		0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00
Engine 74	CAP 74	Incident Command / Scene evaluation		Scene management (disconnect vehicles, hazard removal, cones)		Pt 1 -- C-spine (assisting FF74)						Load Pt 1 into M72	Pt 3 -- C-spine (assisting PM74)					
	ENG 74	Setup Pump	Pull safety hose line		Secure management (assist Cap 74)	Pt 1 -- C-spine (assisting FF74)						Load Pt 1 into M72	Pt 3 -- C-spine (assisting PM74)					
	FF 74	Pt 1 -- Evaluation & Primary survey		Pt 1 -- secondary survey		Pt 1 -- C-spine						Pt 1 Turnover to PM72	Pt 3 -- C-spine (assisting PM74)					
Medic 74	PM74	Pt 3 -- Evaluation & Primary survey		Base Hospital contact				Pt 3 -- monitor	Pt 3 -- secondary survey		Pt 3 -- treat	Pt 3 -- C-spine						
	EMT74	Pt 2 -- Evaluation & Primary survey		Pt 2 -- secondary survey		Pts 2 & 3 -- monitor		Pt 2 -- treat	Pt 2 -- C-spine					Load Pt 2 into M74	Pt 2 -- monitor in M74			
Squad 71	FF 71a	ENROUTE	Setup Squad		Stabilize/chock car 2		Remove door of car 2		Pt 2 -- C-spine (assisting EMT74)					Load Pt 2 into M74	Extrication Tool Cleanup			
	FF 71b		Setup extrication tools			Remove door of car 2			Pt 2 -- C-spine (assisting EMT74)					Load Pt 2 into M74	Extrication Tool Cleanup			
B.C.	BC 71	ENROUTE	Incident Command															

SECOND ALARM REQUEST @ 1:00

Medic 72	EMT 72	DISPATCH second alarm	TURNOUT TIME	ENROUTE	Monitor Pt 1	Pt 1 Turnover from FF71	Enroute VVH -- Pt 1	
	PM 72				Monitor Pt 1	Pt 1 Turnover from FF71		