FINAL REPORT

FIRE SERVICE ASSESSMENT FOR THE JACKSONVILLE FIRE AND RESCUE DEPARTMENT

Jacksonville, Florida

February 2001

TriData

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FIRE SERVICE ASSESSMENT FOR THE JACKSONVILLE FIRE AND RESCUE DEPARTMENT

Submitted to

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ACKNOWLEDGMENTS

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We also thank the City of Jacksonville Planning Department, IAFF Local 122, and the many members of the Fire Department interviewed during the study who provided much information.

While many in the City of Jacksonville assisted the TriData project team, the findings and recommendations are the responsibility of TriData.

The principal members of the project team for this study and their main responsibilities were as follows:

TriData Corporation	
Philip Schaenman	Project Manager
Renzy Hanshaw	Support Services
Charles Jennings	Operations and Demand Projection
Martha Word-Haley	Management Information Services
Vicki Murphy	Technical Review
Ruth Barth	Project Coordinator
Sarah Lathom	Production Support
Dufresne & Associates, CPA	Data Analysis and Costing Analysis
Barfield & Associates	Support Services

EXECUTIVE SUMMARY

Jacksonville has a population of about 735,000 and is expected to grow to about 856,000 by 2020. A comprehensive evaluation of the Fire and Rescue Departments' current level of service and needs to handle the future growth was charted by the city in 2000. TriData Corporation of Arlington, Virginia, a well-known fire protection consulting firm, was competitively selected to undertake the study.

The principal findings and recommendations are summarized below. It was found that the Fire Department is functioning well and using its resources efficiently but is in need of improvements in several areas. The large geographic size of the city poses a major problem for providing adequate response times in a cost-effective manner, and some difficult public policy choices.

The citizens of Jacksonville can be proud of their fire rescue department. The main choices facing the city and its political leadership are whether to provide the added resources needed to maintain the current level of protection, or improve upon the current level with faster response times, especially in the suburban and rural areas. The recommendations here tried to steer a middle course of improving levels of service to generally accepted national practices, but not to provide the urban level of service in the outlying areas because of the high cost and inefficiency of doing so. Hopefully the study will provide the additional information to help make those choices wisely.

Management And Organization

The Fire and Rescue Department has excellent leadership and is functioning very well overall. However, the organization chart is awkward, and the Chief has too wide a span of control, with ten functions reporting directly to him. The current organization resulted from reducing the Department by one administrative Division Chief in the past, which caused sub-parts of Support Services to be scattered.

We recommend revising the organization to better group like functions and to consolidate Administrative Services. Administrative support activities could be consolidated under a single Support Services director, which could be a uniformed or civilian position.

Under Support Services could be two major groupings: administrative support services (e.g., finance, recruiting, compliance, EEO) and technical support services (e.g., communications, tactical support, logistical support, and facilities). Some large cities break these into two separate support organizations.

The span of control of the Division Chief in charge of Operations is also too large. Moving responsibility for the communications center and management information systems out from Operations, and possibly moving training in, might be a better grouping and would reduce the management burden. This will be especially important if the ambitious growth program for the next decade takes place, with many new units and stations needed to be blended into Operations.

We also recommend consolidating the public education function under Prevention, while maintaining ties to the public information function with which it is currently grouped.

The current rank structure is fairly typical and reasonable. We had no recommendations to change it.

An area paid little attention in many fire departments is administrative support to the chief officers. While seemingly innocuous, it causes senior officers to spend undue amounts of time on minor functions. We strongly recommend that the battalion chief's position temporarily assigned to the Operations Chief be made a permanent position and that at least one additional clerk be added to support Operations. Other divisions may also require an additional clerk, too.

There are many organization charts that work in the fire service. The most important of the above recommended changes is grouping support services under a new division head.

Risk Analysis and Demand Projection

Jacksonville has an unusual profile for a city because of its having incorporated many rural areas. It has big city risks with many high-rise buildings in the central city area and then large areas that are sparsely populated, relatively undeveloped, and rural in

nature. But there is increasing development spreading out from the central city, and incident patterns are spreading along with it, as is to be expected.

Approximately 77 percent of emergency calls in Jacksonville are for medical service, somewhat higher than the 70 percent average for communities its size. As is the case in most large cities, the trend in fire incidents is slightly downward, along with structure fires, despite increasing population. Stronger building codes and effective prevention are combining to create this national trend. On the other hand, emergency medical calls are increasing sharply. They comprised about three-quarters of all JFRD calls in the year 2000.

Of concern is that the EMS calls are increasing per capita, not just proportional to population in Jacksonville. In the year 2000, there were about 93 emergency medical calls per 1,000 residents in Jacksonville, versus 83 per 1,000 in 1996. That is an alarming increase per capita that bodes for huge increases in call volume over the next decade if the trend does not level off or turn downward. It is not clear what is causing the increase in demand per capita. A strong public education program, in coordination with the media, is needed to encourage the public to "make the right call" when true emergencies occur and not to abuse the service. Otherwise, the City should be prepared to add at least 11 stations and 15 fire companies over the next 20 years, much to keep up with burgeoning demand (discussed further below).

We project that demand will rise from the approximately 97,000 incidents in the year 2000 to about 104,000 incidents in the year 2010 and 113,000 by year 2020 under a low-growth scenario in which incidents increase only in proportion to population. If the calls per capita continue to rise, and demand increases both from population increase and usage per capita, then we forecast 143,000 incidents by 2010 and 190,000 by 2020. The analysis here considered the implications for additional stations and units for both the low and high projections. Reality will probably fall between the two projections.

As would be expected, fire incidents and rescue incidents are more concentrated in the central city area than in the more rural areas. The major pressures for adding resources to the Fire Rescue Department are both the increasing number of incidents and the geographic spread of incidents. It is difficult to justify adding new stations and around-the-clock companies in rural areas with higher than desired response times but very few incidents. That is a public policy decision, but as a rule of thumb, one would

not add a station to an area until there are at least one or two calls per day in its first-due district.

Sprinklering – Although prevention was not included in this study's scope, as part of risk reduction we suggest that local codes be amended to require that all new construction be sprinklered, including homes. If that is not done, then the square foot threshold requiring sprinklering should be reduced. It is especially important for property owners to sprinkler all properties that are remotely situated from fire stations.

Current Fire and Rescue Operations

Overall, fire and rescue operations are well led, and good use is made of the existing resources.

Workloads – About 11 units are near or over the benchmark 3,000 run threshold over which a unit is considered busy and possibly in need of relief. Most of these busy units not surprisingly are in the downtown area. The unit hour utilization rates are 18 percent for rescue units and 8 percent for fire units. (The UHU measures the percent of time spent on emergency calls.) These levels are reasonable but expected to increase as workload increases over the next decade.

Call Processing Time – The time from receipt of a call from the public to when a fire unit is dispatched is typically 60 to 90 seconds in Jacksonville. A sample of one day's calls found that 30 percent took over 90 seconds to dispatch. The JFRD should work with the Dispatch Center to reduce the initial dispatch time to less than one minute. A desired goal is an average of 50 seconds for dispatch.

Response Time Goals – There are no true standards for response times. In general it is desirable to guarantee a first response within 6 minutes from call arrival to having a unit on the scene. Another common benchmark is for 90 percent of incidents to receive advanced life support within 8 minutes of being called.

In a widely diverse area such as Jacksonville, different service level goals should be considered for the urban, suburban, and rural areas. The goals might be 6 minutes for urban, 8 minutes for suburban, and 10 minutes for rural areas 80 percent of the time. It would be prohibitively expensive to meet the urban level response time goal in a rural

area. At present, about two-thirds of the calls are being responded to in less than 7 minutes from call intake, which is fairly good for a city the size of Jacksonville. On the other hand, 16 percent of the calls take over 9 minutes, and 10 percent take more than 10 minutes.

There are significantly fewer ladder companies than engine companies (11 vs. 47), as is normal, and their response times are significantly worse than the engine companies. Ladder company responses need to be improved in the more built up areas outside the city core.

Staffing – All engines and ladders are staffed with a crew of three. Rescue units (ambulances) have a crew of two. For a variety of reasons, we recommend that the ladders and squads be staffed with a crew of four. For one thing, this allows them to be split into two groups of two to undertake in parallel search and rescue, ventilation, and other tasks. Any engine companies that are stationed by themselves and are more than 3 minutes from the next closest unit, and that have non-trivial numbers of structure fires, should also have crews of four. Engine 17 is the leading candidate for a fourth crewmember, based on frequency of structure fires and provision of protection to heavily industrial areas. Most of the other relatively isolated stations have low numbers of structure fires (less than 20 per year).

Jacksonville has 1.32 uniformed firefighters per 1,000 population, which is about average for departments its size. The larger area to protect requires more firefighters per population than would a denser city with the same population. Cost per capita for fire service in Jacksonville is actually below average for communities of its population size.

Volunteers – The volunteers have been gradually yielding way to career fire service in various parts of the County. The volunteers are still valuable as supplemental staffing, and use of them should be continued so long as there is a minimum core group that meets training and fitness standards.

Special Operations – Jacksonville has well-trained hazardous materials and heavy rescue units. They provide specialized services that can make a huge difference in averting a major hazardous materials incident or in saving lives in a variety of rescue situations. The approach to special operations appears sensible, and we have no additional recommendations.

Wildland Fires – The City has a small fleet of six brush trucks deployed for small wildland fires and participates with the State in fighting larger wildland fires. Preparation for wildland firefighting should be supported. Again, the approach is good, and we had no additional recommendations here.

Port Operations – Ship fires are a major risk, though they occur infrequently. The Department has an engine company stationed within the Blount Island shipping terminal and one at the entrance to Tallyrand shipping terminal. These would just be first-due units; others would be arriving to fill the alarm assignment. The Department has generally done an excellent job in preparing to fight ship fires but needs to update the training given over six years ago to all units. An increase in units at the port itself cannot be justified unless the port is will to pay for them.

International Airport – The Airport Fire Department typically has seven firefighters on duty. There does not seem to be any reason for it to be an independent fire department and some real advantage for incorporating it into the rest of the JFRD. That is the approach taken by cities such as Chicago, Philadelphia, Boston, and also Palm Beach County. There would be little or no cost saving but better integration, better career paths, and fewer separate fire department entities to deal with.

Small Airports – The Fire Department protects Craig Field, Herlong Airport, and Cecil Field. The level of protection is about right. It is too expensive to station units permanently at these airfields for 24-hour duty. If the level of traffic at these airports increases, that may need to be reconsidered.

Deployment Alternatives for the Future

The demand estimates in terms of incidents were converted to unit responses and then disaggregated by individual fire and rescue units to estimate the impact on unit workloads. Under the low growth forecast, about 11 units can be expected to be over the 3,000 response threshold by 2005, 16 units by 2010, and 23 units by 2020. Under the high growth forecast, 21 units will be over the 3,000 threshold by 2005, and 52 units out of 127 by 2020. Rescue 1 is forecast to be the busiest unit.

Although there is uncertainty in forecasting demand, the overall picture is clear: If demand falls anywhere in the range between the low and high estimates, which we

think likely, there will be many overloaded units within the system. Response times will degrade because the first due unit will often be out on a call, requiring units from farther away to handle the call. That creates a cascading effect where a call into the area where a unit moves up to help its neighbor in turn becomes vacated and generates longer response times. In addition, as growth fills in the suburban and rural areas, more and more calls will have high response times just from geographic distances from the nearest station.

We therefore recommend a 20-year plan that phases in additional stations and additional units in some existing stations to handle the increased demand and improve service to the suburban and rural areas. In the short term, three new stations are needed by 2005 in addition to the one new station (57) that is in the CIP but not yet budgeted. We recommend new stations at J. Turner Butler Boulevard and Hodges; Phillips Highway and St. Augustine; and Beaver and Chaffee. The first serves an area with a growing population that is relatively isolated from existing stations, filling a geographic gap and improving response times. The second is justified primarily on workload of surrounding stations and on reducing long response times to the extreme southeastern part of the city. The third is needed to fill a huge gap in the western area of the city and assist in being the second-in unit running to the south and east; there are not yet many calls in that area, but the travel distances are great between the existing stations. If demand continues to accelerate per capita, then a fifth new station will be needed by 2005 in addition to the above.

Over the next 20 years, we estimate that under the low growth forecast, six new stations, one relocated station, six engines, nine rescues, and three ladder trucks would be needed. Under the high growth scenario, 11 new stations, one relocated station, 11 engines, one quint, 14 rescues, and four ladders would be needed. These forces would fill gaps to improve response times for emergency medical service and fire coverage in areas farther away from the center city, and also provide additional units to handle demand. These stations are required in addition to the stations that need to be rebuilt or remodeled on site.

Many county-size jurisdictions have even greater station demands: Palm Beach County, for example, has added 10 stations in the last six years and is planning to add 10 in the next six. Miami-Dade County had had a similar level of construction and is still adding stations.

To help improve the efficient use of the existing fleet, several moves of ladder companies are proposed, and upgrading some current squads (like ladder companies without their hydraulic ladder) to true ladder companies.

Although there are a number of companies in the downtown area with overlapping areas of coverage, we do not recommend reducing the number of companies because of the heavy demand and high risk in that area.

The number of units actually needed to keep up with demand will be significantly affected by the degree to which the population of Jacksonville can reduce the number of emergency calls per thousand population by heeding fire and injury prevention concepts, being careful, and not calling for emergency services when there is no true emergency.

Support Services

Support services are not the glamorous side of a fire department but are essential for the effective and efficient delivery of emergency services. They include station and vehicle maintenance, logistical support, training, personnel services, and other support.

Station Maintenance – There are many fire stations in Jacksonville that need major rehabilitation or replacement. None of the fire stations are protected with sprinklers or pollution exhaust systems. Few are in compliance with the City's own fire and building codes. None were designed to accommodate female firefighters. Most can be rebuilt on or near their current site.

A set of stations was taken over from volunteer fire departments that did not have accommodations for around-the-clock firefighters. The volunteer stations also need to be rehabilitated or replaced. Table 25 (in Chapter V) lists the stations needing major renovation or replacement, in addition to the need for new stations and relocating two stations for operational effectiveness.

The JFRD has developed an appropriate capital improvement plan (CIP) to improve the stations, but it is not adequately funded. The City of Jacksonville must fund station improvements and implement the CIP to improve the health of firefighters and the ability of the stations to provide adequate service going into the future. New stations

should be sprinklered and built with extra room for vehicles of the future, with at least one spare bay, and with facilities for female firefighters.

A position of Facilities Maintenance Assistant needs to be established to assist the Facilities Manager to cope with the backlog that has built up on station maintenance projects. One position is insufficient to handle them over the next decade. Too much rehabilitation work is behind schedule, and newer facilities need to be constructed, too.

Apparatus Maintenance –Most of the front-line fire vehicles seem to be in good condition, despite their age and, in some cases, higher than average mileage. There is a good plan for preventive maintenance comparable to national standard practices, but it may not be implemented everywhere. In 1999, there were 11 vehicles out of service over 100 days and an average out-of-service per vehicle of 57 days, which is much too high. The data in the year 2000 pointed to an improvement but were not considered complete because of a change in data systems.

We strongly recommend that the planned preventive maintenance program be fully implemented. Data on the maintenance status of vehicles and planned preventive maintenance can be put on the web and made accessible to operations officers and individual fire crews, many of whom are concerned about the attention being paid to their vehicles.

Rather than purchase fire vehicles in bunches when the need becomes acute, we recommend a comprehensive funding plan for continuously upgrading and replacing the vehicle fire apparatus. There is a vehicle replacement plan in place, but it has not been adequately funded. As new vehicles are purchased, the fleet of spare vehicles needs to be increased. The rule of thumb and recommended NFPA guideline is that the number of spares be equivalent to 20 to 25 percent of the frontline fleet. At least three spare engines are needed; the best of the older engines should be retained as spares as they are retired from frontline service.

Logistical Support – The Department should continue with its efforts to computerize its inventory system. The logistics unit needs more adequate space to operate efficiently.

Training – Overall, the Training Division is doing well compared to those in other fire departments in the State. However, several areas need improvement: The Training Division needs to train officers on how to be instructors. Company officers need training on the management of people, not just the technical side of the job (a problem found in most fire departments). There needs to be an instructor evaluation system for the officers and adjunct instructors. A performance evaluation process for firefighters should be instituted to demonstrate competency in various subjects.

Recruitment and Selection – The Department has made efforts to increase the number of employees in under-represented classes. This includes minorities and females. That effort needs to continue.

The adoption of the retirement "DROP" plan has created a need to plan to replace about 240 firefighters in a two- to three-year period. There will be a significant loss of experience in a relatively short time. A mentoring program should be considered to speed up the transfer of experience from the soon-to-be retirees to their potential replacements.

Hiring of civilians has been a problem and needs to be improved at the City level. Salary comparisons are needed to ensure that JFRD civilian salaries are competitive, especially for information technology professionals.

Other administrative support services were generally satisfactory, except for Management Information Systems, which is a large technical area addressed separately below.

Management Information Systems

It was difficult to assess trends in fire and EMS incidents during this study because of the lack of reliable data from previous years. The data problem seems to have decreased in the last two years, with more attention from senior management, but further attention needs to be given to collecting reliable data on which to base management decisions, especially deployment decisions.

The Fire Department has made huge strides in the last several years under the current Fire Chief and Division Chief of Operations to increase the use of modern

information technology in the Department. The problem now is to provide adequate IT personnel support to maintain the hardware and software and to develop new applications programs. A Help Desk is needed on a 24-hour basis to answer questions from firefighters entering data. Overall, 7 to 9 new employees are needed within the Fire Department's own IT organization, and the organization needs to be reorganized, as discussed in detail in the text.

On the software side, the current records management system is primarily a data collection system and does not provide adequate reports. Needed is a standard, robust data base management system. This would provide more convenient access by more people to dispatch and fire incident data.

This project established some new links between the Geographic Information System and Fire Department analysts and managers to make more use of GIS for management decisions. Many other detailed information technology recommendations are made as text.

I. INTRODUCTION

Jacksonville stands at the verge of some major decisions about its Fire Department. The City is growing rapidly and has a correspondingly growing need for fire services, but, as always, budget limitations. Tough decisions have to be made about how many stations to have, where they should be, and how to equip and staff them for the short and longer terms. It is not easy to move or close a station once built, so the decisions need to be made with care.

The mix of calls to the Fire Department has changed significantly over the past decade. "Fire stations" are now really fire, rescue, and emergency medical service (EMS) stations, and often hazardous materials stations, too. EMS calls have sharply increased and false alarms from automatic alarm systems are up.

The nature, quality, and flexibility of the fire department role in the EMS function also is critical. Since EMS calls are a significant part of the workload, they affect the analysis of response times and resource deployment of all fire units, not just rescue units.

The City is wisely considering its needs in the context of a long-range 10 to 20 year plan, and considering the staffing and functioning of the entire Department. Since the staffing of fire, EMS, and other services are so entwined today, and the whole Department works synergistically, it made sense to undertake a comprehensive study that considers all of its services to the citizens.

TriData Corporation of Arlington, Virginia, was selected to undertake this study with the prime focus on staffing, stations, resource deployment, and support services. TriData has assisted many other cities and counties in Florida and across the nation in similar studies. In Florida, they include Palm Beach County, St. John's County, Daytona Beach, and Deerfield Beach; elsewhere they include Chicago; Washington, D.C.; Nashville; and Houston.

Scope

The Jacksonville Fire and Rescue Department (JFRD) serves not only the urban services district but also provides protection to Atlantic Beach and Neptune Beach under contract. All areas provided service by JFRD were considered in this study. The scope

included the impact of JFRD assuming responsibility for the Port Authority facilities (seaport) and all airports. We also considered the impact of providing services for the currently unprotected urban services districts. The scope included considerations of the support services in the Department but not prevention, nor emergency medical service other than its response times.

The time horizon set for the study was 20 years (to 2020), with the realization that it is often difficult to plan beyond 5 to 10 years because of changes in technology, public sentiments, growth rates, immigrant patterns, etc.

Study Approach

The approach used for this study has evolved over our 19 years of working with fire departments. We started with a triage of the Department's issues so as to prioritize expenditures of the project's resources. After obtaining a set of background materials on the Department, three senior project team members met with the Fire Chief, City management, the heads of the major fire department divisions, GIS analyst, the City Planning Department, and local union officials to identify their concerns and information available.

We visited a sample of fire stations and viewed the apparatus. We visited the Communications Center to observe how dispatching is handled and how assignments are made. We familiarized ourselves with the geography of the City.

At the end of this first week on site, we triaged the issues, identifying the more important issues that required detailed study, the areas that could be disregarded, and those that needed only moderate attention.

As the study progressed, we analyzed much of the available data on the fire department response and stimulated development of a variety of data analysis maps. The JFRD ran many special data analyses at our request, some never considered before. The GIS capability was much less than expected and hampered the ability to do all of the analyses originally envisioned. But we worked around those problems to make many recommendations on deployment.

The City

The City of Jacksonville has an area of 840 square miles, making it among the largest cities in terms of area in the United States. With the exception of four incorporated areas, all of Duval County is part of the City of Jacksonville. The four incorporated areas are Baldwin, and three contiguous beach communities – Jacksonville Beach, Neptune Beach, and Atlantic Beach. Baldwin, located in the western part of Duval County, maintains its own combination fire department. The City of Jacksonville provides fire protection to Atlantic Beach and Neptune Beach. Jacksonville Beach has its own department.

The City originated as a trading and shipping center, with its access to the St. Johns River and Atlantic Ocean being its principal attraction. The City's economy continued to be concentrated for a long time in shipping, trade, and agricultural processing. More recently, the City's economy has become much more diversified. Service industries, finance, and corporate headquarters functions have come to be located there.

The City originated along the banks of the St. John River, and this remains the urban center today. As the City grew in population, settlement occurred along the river and to the south. The area north of the St. Johns River was not settled very densely due to its geographic isolation from the rest of the City.

Transportation – The City has an extensive transportation network. In addition to the Port of Jacksonville, numerous railroads serve the City. Three interstate highways pass through or terminate in the City, as well as several highways. The City is served by four civilian airports and two military airfields. The primary commercial airport is Jacksonville International Airport.

The transportation features create challenges for emergency operations. The City is divided by a river and by railroad tracks, which significantly affects fire and EMS responses and planning for station locations. There are a limited number of bridges and the river is quite wide, so emergency vehicle transit times from one bank to the other are significant. This increases the importance of developing a comprehensive long-range plan for the proper placement of fire stations.

There are many hazardous materials coming through the various transportation networks, in addition to the hazardous materials, which are stored and used, at a large number of facilities.

Demographics – The City of Jacksonville has a population of approximately 735,000 in the year 2000. The JFRD services slightly more than that in adjacent areas. The City has a dense urban area, a less dense suburban area, and a quite sparsely populated rural area, though the suburban and rural areas are continually increasing in population. The City has a diverse population, with large African-American and Hispanic populations.

Unlike much of central and southern Florida, Jacksonville does not have an unusually large elderly population. The elderly are not concentrated in any one area, but rather are found in almost all census tracts throughout the City. There are no large retirement "Century Village" type communities. There are 13 census tracts with between 1,000 and 1,800 elderly, and no one with more than 1,800. Cardiac calls and other serious illnesses occur more frequently among the elderly, but there do not appear to be any particularly concentrated spots that require special attention, an important input to planning emergency services. This distribution makes the elderly more difficult to reach with special services and prevention information than when they are concentrated.

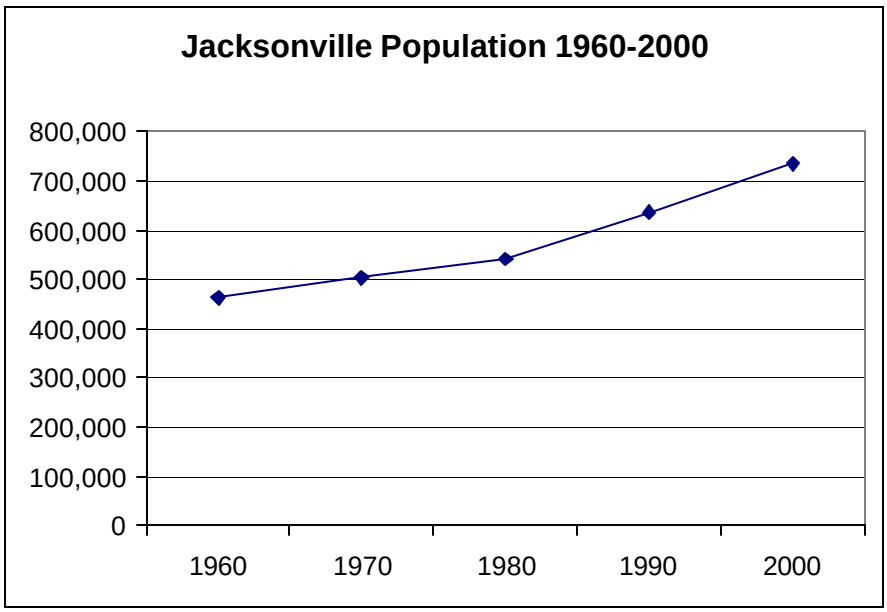
Employment – The City's largest single employer is the U.S. Navy, with a 1990 employment of 35,497. Every category of employment has increased from 1990 to 1995, with the exception of wholesale trade, which saw a slight decrease (after nearly doubling from 1980 to 1990), and government, which remained steady.

Population Growth – Jacksonville's population has increased steadily over the past 40 years, with an accelerated increase after 1980 (see Figure 1). It has increased by nearly 100,000 people per decade in the past 20 years and is still growing at about 10,000 people per year.

This population change has occurred despite a decrease in population in the urban core; the rapid growth has been outside the urban core. The population increased most dramatically in Greater Arlington, Southeast, and Southwest. The City's current

population (Year 2000) is estimated at 734,910.[1] Population growth is expected to continue into the foreseeable future, with a somewhat slower rate of growth after 2010.

Figure 1



The City is divided into six planning districts, as shown in Figure 2. The smallest, but most densely populated (#1 on the figure) is the urban core, located at the historic center of the City. To the east is Greater Arlington (#2), followed in a clockwise direction by Southeast (#3), Southwest (#4), Northwest (#5), and North (#6). The beaches outside the city are District 7. These areas were used in this study to refine examination and analysis of trends in population and other demographic and service levels. They will be referred to later in population and other planning estimates.

[1] City of Jacksonville. *City of Jacksonville 2010 Comprehensive Plan, October 1999. Background Data, Volume III.* pp. XI-8, 9. Note that the population estimate for year 2000 here (734,910) is not exactly the same as the estimate in the City's land use plan (727,404), but they are very close.

The City's population is expected to grow to 856,350 by 2020, a growth of about 17 percent, slightly slower than in the past two decades. This assumes an increase of some 51,000 people per decade, or about 5,100 new residents per year.

Figure 2

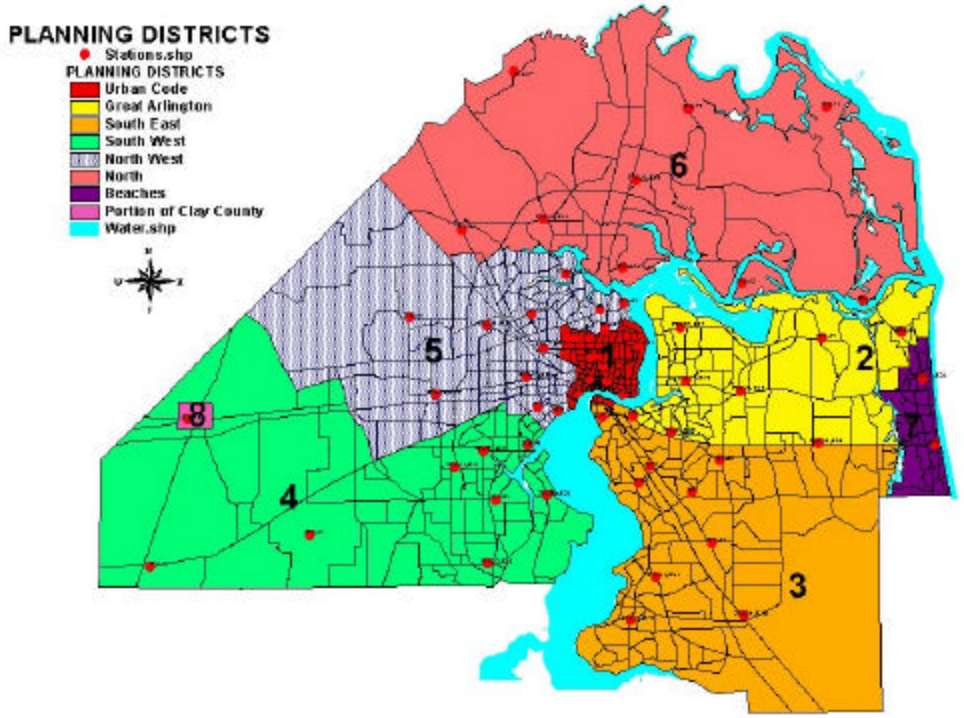


Table 1 shows the projected population increase between now and 2020. This data is broken down by planning district. The residential growth in the City is far from uniform. This has important implications for meeting future demand for fire and rescue services. Most critical for planning purposes is where the new growth will occur, especially whether there will be substantial increases in the more rural areas of the city, far from most existing stations.

Table 1: Population by Planning District, 1990-2020 (estimated)

Planning District	1990	2000	2010	2020	Change 2000-2020
Urban Core	46,222	44,529	43,345	41,978	-2,551
Greater Arlington	147,927	182,132	192,463	204,067	21,935
Southeast	146,175	182,087	204,035	230,483	48,396
Southwest	122,584	141,649	154,921	168,429	26,780
Northwest	132,584	137,658	142,166	146,162	8,504
North	39,395	46,855	54,351	65,231	18,376
Total	635,230	734,910	791,281	856,350	121,440

Source: Comprehensive Plan, p. XI-9.

While most areas of the City are increasing population, the urban core is expected to see a continued trend of slightly decreasing population over the next 20 years. That is the only area that will not increase. The highest growth will occur in the Southeast, which is expected to gain almost 50,000 population, followed by the Southwest and Greater Arlington, at over 20,000 each. These changes are illustrated in Figure 3, which shows the areas expected to have the most change from 2005 to 2020. Figure 4 shows that there is little, if any growth, expected in the urban core.[2]

[2] Note that the yellow and green areas have the largest population, but the size of the areas varies. A group of low population areas of small size may sum to a total greater than the larger areas. It would be better in the future to view the population density as well as absolute population.

Figure 3

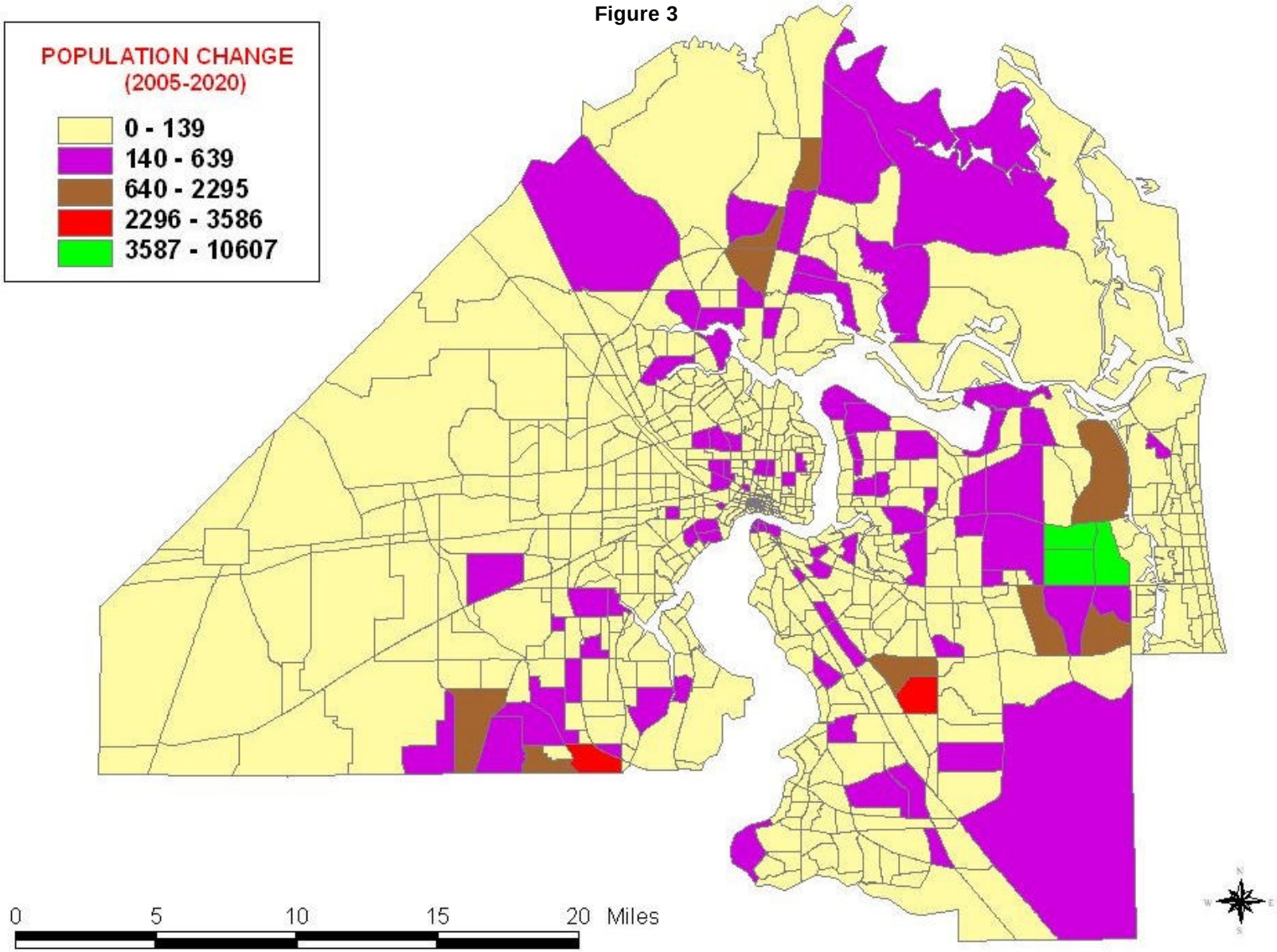
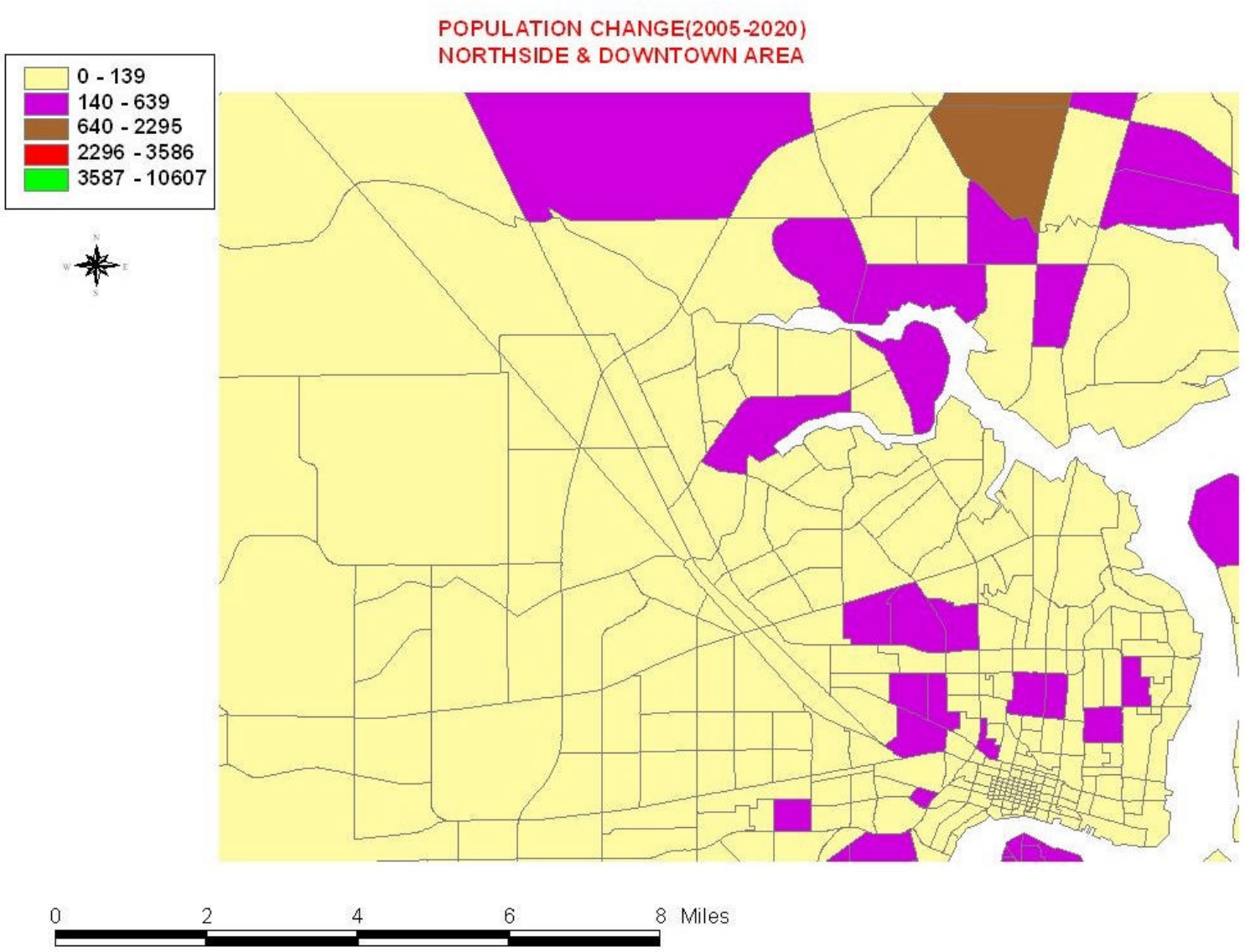

POPULATION CHANGE
(2005-2020)
0 - 139
140 - 639
640 - 2295
2296 - 3586
3587 - 10607
0
5
10
15
20 Miles

Figure 4


POPULATION CHANGE(2005-2020)
NORTHSIDE & DOWNTOWN AREA
0 - 139
140 - 639
640 - 2295
2296 - 3586
3587 - 10607
0
2
4
6
8 Miles

Land Development – At present, the population of Jacksonville and its associated buildings occupy 31.7 percent of the City's total land area.[3] The potential for development is illustrated in Table 2, which shows vacant or undeveloped land in each of the six planning districts.

Table 2: Developable Land by Planning District

Planning Area	Total Area	Area Vacant or Undeveloped
Urban Core	7,132	2,334
Greater Arlington	47,363	17,036
Southeast	101,956	21,519
Southwest	115,057	19,202
Northwest	76,695	18,911
North	139,324	37,635

Source: *Comprehensive Plan,* p. XI-3

The City's 2010 Comprehensive Plan identifies projected land development needs according to the land use. The largest land need is projected to be for residential development to meet growing population. The second highest land need will be for public facilities such as schools and parks, followed by industrial property and commercial uses (see Table 3). This land needs do not include post-2010 development.

Table 3: Land Use Present and Projected in 2010 by Use Category

Land Use Category	Existing Acreage	Projected Acreage Needs 2010	Net New Developed Acres
Residential	75,269	101,857	26,588
Commercial	7,168	10,072	2,904
Industrial	10,143	13,943	3,800
Public Facilities	56,170	63,581	7,411

Source: City of Jacksonville. *Comprehensive Plan 2010: Future Land Use.* May 2000. p. 79.

[3] City of Jacksonville. *City of Jacksonville 2010 Comprehensive Plan, October 1999. Background Data, Volume III.* pp. XI-32.

There will be considerable demand for new housing units within the City over the next twenty years, according to the Housing Element of the City's Comprehensive Plan (p. H-40). Table 4 lists the past and projected numbers of residents, housing units, average occupancy or household size, and housing supply information for 1985 - 2010.

Table 4: Land Use Present and Projected in 2010 by Use Category

Year	Population	Average Size	Total Households*	Total Dwelling Units	Replacement Units	Percent of Total Units	New Units Needed	Total Units Needed
1985	595,093	2.62	222,120	245,434	2,665	1.09	0	2,665
1990	654,047	2.56	248,635	270,726	3,053	1.13	25,314	28,367
1995	694,444	2.50	270,547	294,034	3,373	1.14	23,308	26,601
2000	727,404	2.46	288,210	314,148	3,670	1.17	20,112	23,782
2005	754,985	2.43	302,985	331,490	3,917	1.18	17,342	21,259
2010	780,533	2.43	317,364	343,326	4,133	1.20	11,036	15,969

* Excludes group quarters

As indicated in the table, there will be a need for considerable housing development in the next ten years. Given the assumptions in this table, we can expect a similar pattern to continue for the 2010-2020 time period. Generally, slightly over one percent of the existing housing stock is replaced annually, which creates a need for additional new units to accommodate the in-migrants and demand for housing from internal population growth.

Because a significant share (over 20 percent) of the housing stock will be constructed over the next twenty years, there is an opportunity to assure that it is constructed in a fire-safe manner, so as to increase citizen safety and reduce the impact on the demand for fire suppression services. Although not explicitly charged with evaluating prevention methods in this study, this growth alone is compelling enough to make the following recommendation:

Recommendation: Strengthen fire codes to require sprinklers in all new structures, including housing units. If not politically feasible, increase sprinkler requirements to cover as much new property as is feasible. This will help slow fire protection cost increases, especially for the more remote areas. This would have a considerable impact on the City's fire problem and growth of the fire services over the forecast period. It is not unreasonable to expect a 10 percent or more decrease in fire

deaths annually, based solely on the prospect of having a large portion of the City's housing stock equipped with sprinklers.

One of the key reasons for planning for growth and developing detailed forecasts of new population and development is to allow for an orderly accommodation of this new growth. Efficiency in meeting this challenge is facilitated by controlling land use to minimize the need for public investment to support new growth.

The City has established Level of Service Standards (LOS), which delineate the desired performance of public facilities and services. The LOS standards are used to identify areas of deficiency in the provision of services. LOS feed into the timing and location of development decisions because the City attempts to direct development to areas where LOS are exceeded and attempts to maintain LOS in areas where growth has surpassed the ability of existing facilities. For newly developing areas, public services are added in a gradual fashion to assure that by the time a certain level of development is reached, that service levels will be at levels comparable to other areas in the community.[4]

One of the City's stated goals is to "ensure that the type, rate, and distribution of growth in the City results in a compact and compatible land use patterns, [and] an increasingly efficient urban service delivery system."[5] Fire protection and emergency medical services are an important component of the City's services and will be considered in the same manner.

Fire Losses – There were 31 civilian deaths over the three years 1995-97, which is equivalent to a fire death rate of 14 per million population. That is somewhat below the national average of 17-19 deaths per million.

Fire loss has been averaging about $20 million a year, which is a slight decline in real dollars over what it had been. This is about $28 per capita, below the national average of $34.

[4] City of Jacksonville. *2010 Comprehensive Plan: Background Data, Volume III.* October 1999, p. XII-67.
[5] City of Jacksonville. *Future Land Use. City of Jacksonville Comprehensive Plan.* May 2000, p. 1.

Report Outline

The next chapter discusses the overall management and organization of the Fire Department.

Subsequent chapters (III-V) address the expected growth of demand for emergency services, the adequacy of current deployment to meet that demand, and the future needs.

Later chapters address support services. A separate chapter (VII) is devoted to Management Information Systems.

II. MANAGEMENT AND ORGANIZATION

This chapter discusses the overall organization of the Jacksonville Fire Department and selected issues related to its management.

Organization Chart

Figure 5 shows the top-level organization chart of the Department (with clerical support deleted). Directly reporting to the Chief of the Department are five line function chiefs plus the "management improvement officers" responsible for such functions as EEO, PIO, Compliance, Finance, and Recruiting.

The Fire Operations Division Chief directly oversees all of the line fire companies. The field forces are divided into two battalions, each with four districts.

The Fire Rescue Division Chief heads emergency medical service activities.

The Fire Prevention Division Chief heads fire inspections, plans reviews, and fire investigations; Public Education reports to the public information officer who in turn reports to the Chief.

The Training Division Chief also reports directly to the Fire Chief.

The Emergency Preparedness Director coordinates Emergency Management functions for the City, not just the fire department. Many jurisdictions have their Emergency Preparedness Directors report directly to the city manager or mayor. This is because the fire department generally has such a large role in mitigating an emergency that it is often difficult to coordinate other departments as well. But that is a local choice, especially if it is not perceived to be a problem.

While the Department has been functioning quite well, there are too many functions homing directly on the Fire Chief; he has a span of control of 10, without counting his administrative assistant. This organization apparently resulted when a previous City administration reduced the organization by one Division Chief, which caused what had been the Support Services Division to be scattered. While there are a wide variety of fire department organizational structures that work, the current

organization chart overloads the two busiest senior positions (the Fire Chief and the Chief of Operations) and does not logically group functions. A major reorganization seems warranted.

The most important organizational problem is the scattering of administrative support functions, which adds to the management burden of the Fire Chief and Operation Division Chief.

Recommendation: Revise the organization of the Fire Department to better group like functions and to consolidate administrative services. Figure 6 shows a recommended organization chart. The key changes are: 1) Consolidating the administrative support activities under a Support Services Director, which could be a uniformed or civilian position, and 2) Moving Training under Operations. The Support Services organization would also include Communications and MIS. This organization makes both the Chief's span of control and the Operations Division Chief's job more reasonable.

Support Services has two logical groupings of functions: Administrative/ Personnel Services and Technical Services. An alternative to having one Support Service Division Chief is to split Support Services into two divisions, with Training put under one of them.

Training, while somewhat autonomous, is increasingly being assigned to Operations in other fire departments (except the very largest) for two reasons 1) many, if not most, training "adjunct faculty" are borrowed from the Operations staff for teaching various specialties; and 2) problems discovered in Operations can be quickly given to Training to address with remedial lessons without having one Division Chief having to ask another to proceed. By taking Communications and MIS away from Operations and assigning Training there, the net workload on the Operations Chief should decrease.

Alternatively, Training could be left where it is or put it under Administrative Services. Sometimes training takes a low priority when under Operations. If it is under Administrative Support, Training can better coordinate continuing education for all divisions. Additionally, due to the close involvement in health and safety issues, recruitment, hiring, promotions, and department investigations and discipline it may be advantageous to align Training close to the Department Personnel Management and Human Resource functions under the Administrative Services Division.

Figure 5: Jacksonville Fire Rescue Division -- Current Organization Chart

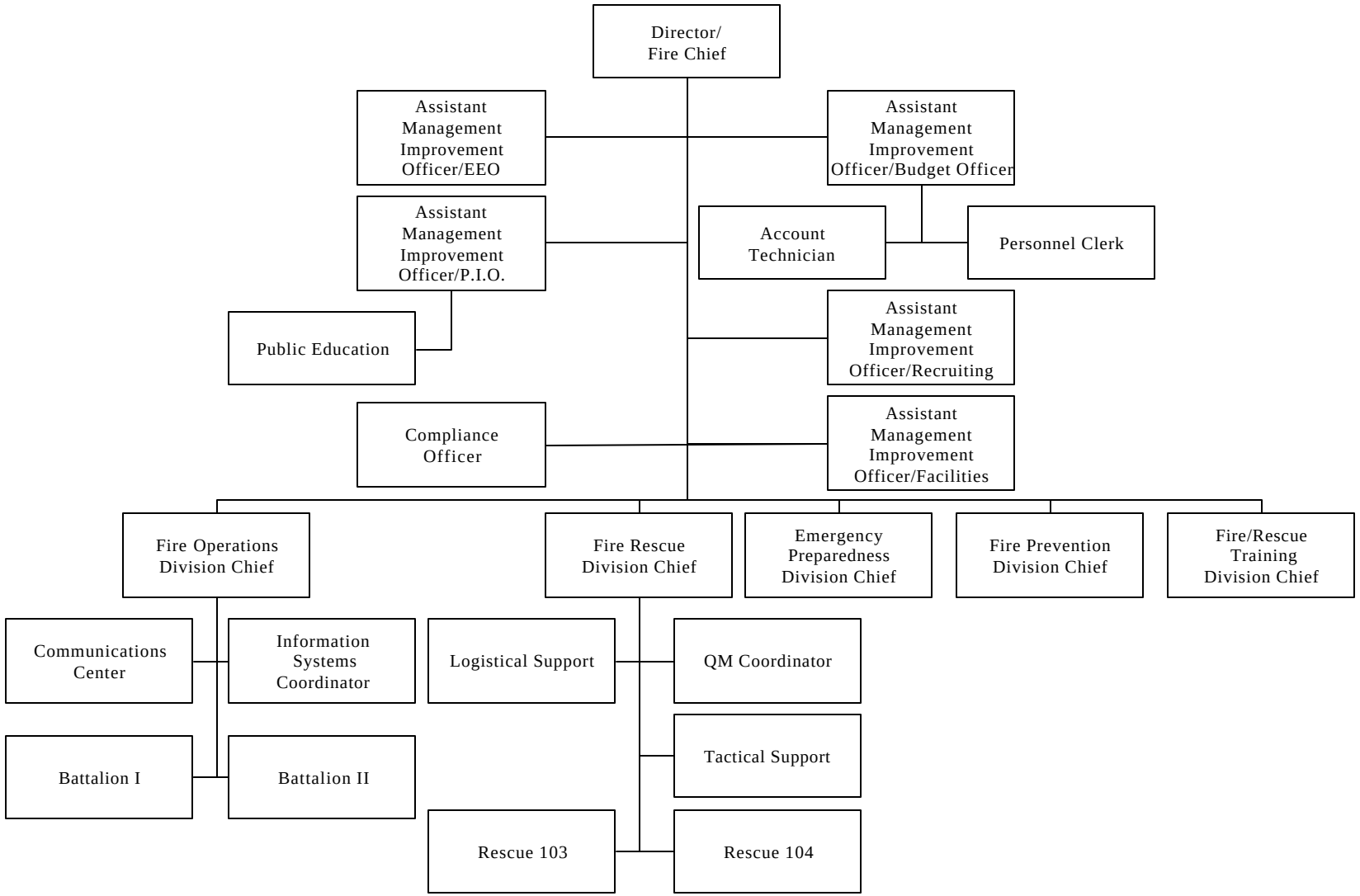
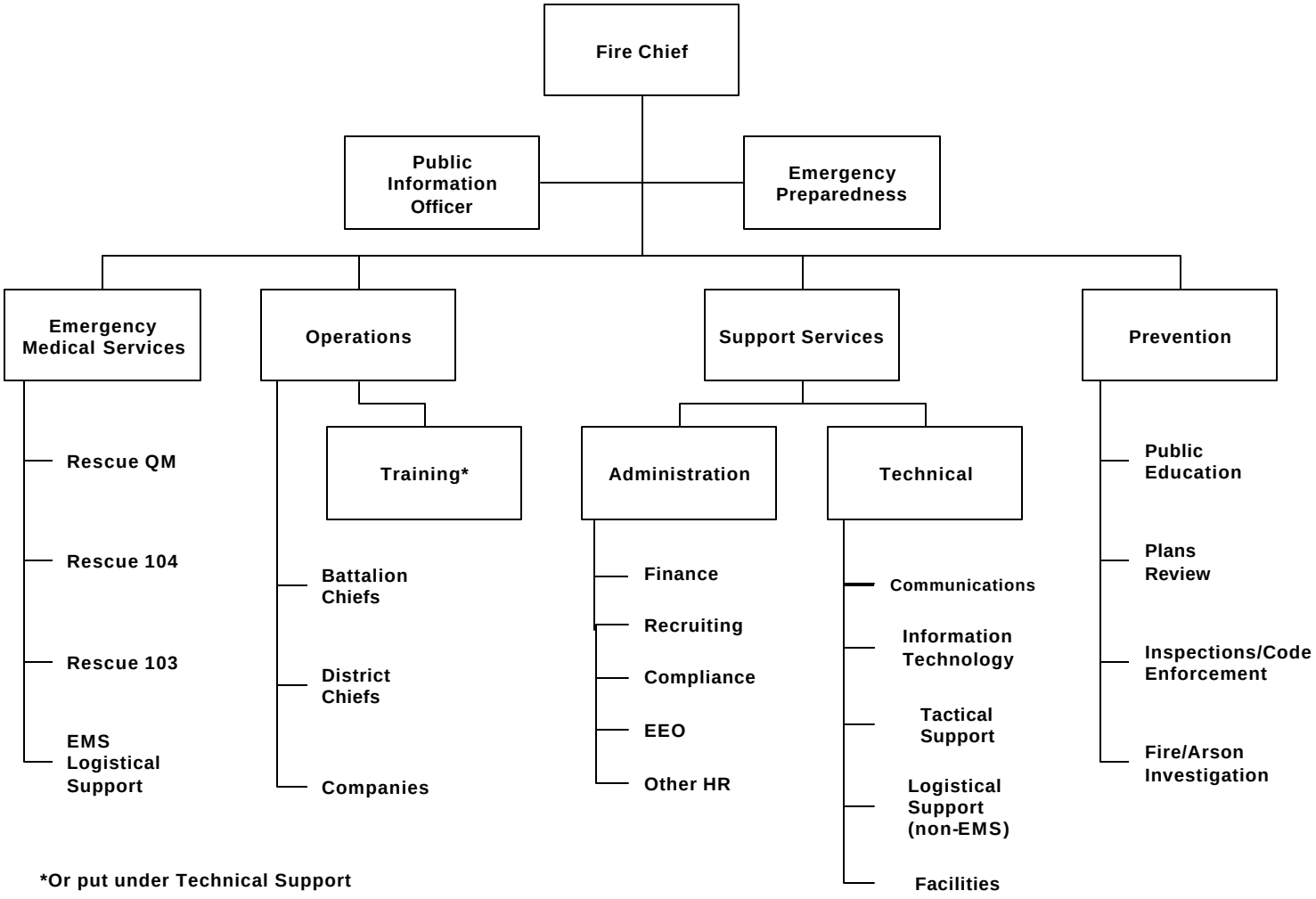


Figure 6: Jacksonville Fire Rescue Division – Proposed Organization Chart



While there are a number of options in the organizational structure for placement of various department functions, considering all of the activities that need to be addressed, there is a definite a need for the addition of at least one Division Chief.

Recommendation: Consider consolidating Public Education under Prevention. While Public Education needs close ties to the public information officer and media, it is more important that Public Education links closely with the rest of Prevention and with data on the changing nature of the fire problem. This is not absolutely necessary, and if the JFRD prefers leaving things as they are, that is workable, too.[6]

Rank Structure

The current rank structure appears to be fairly typical and reasonable. Some departments do not have Lieutenants and Captains. So we use different nomenclatures, but the current rank structure used by JFRD is one of the "standard" models found to be workable.

Administrative Support for Division Chiefs

As is common in many fire departments, clerical and administrative support to the Division Chiefs is thin. The most exacerbated example is the Operation Chief, who has one secretary and a Battalion Chief detailed from the line, despite having an extraordinary span of control that includes the Communication Center and Information Technology. As discussed earlier, transferring these functions to a Support Services Chief will significantly reduce the administrative burden. But even so, the Battalion Chief detailed to the Division Chief should be a full-time position (not a detail) and a second junior clerk added. Other Division Chiefs may also need more clerical support, but it is most glaring in Operations.

Recommendation: Add at least one clerk and a Battalion Chief to H2 for support of Operations. Other divisions may also need more clerical support and should request it in the budget.

[6] Evaluation of prevention activities was outside the scope of this study, and we have no comment on how well public education works where it is organizationally.

Overall, the management of the Fire Department has been functioning very well, in the sense that the Department is generally delivering high quality of services and using existing personnel to full advantage. While one might quibble here or there, overall the leadership is doing a very good job with the existing resources.

III. ANALYSIS OF RISK AND DEMAND PROJECTION

The last chapter considered the overall organization of the Fire Rescue Department. This chapter addresses risk and projects demand. The next chapters will discuss deployment of units in light of the current and projected demand.

The first element in assessing the need for fire suppression and emergency medical services is an analysis of community risk. Risk can be defined as the chance of a loss based on the expected probability of an event. The probability of experiencing a loss, or risk, must be considered in conjunction with the severity of a loss, or its consequence. Both the probability of a fire or EMS call and its consequence must be considered.

Fire prevention programs act to reduce the frequency of losses, while fire protection systems and fire suppression measures can reduce the consequences of a loss after an event has occurred. Owing to the relatively recent boom in the City's growth, many of its housing units and commercial structures were built under modern codes and are equipped with fire detection and suppression systems. These systems reduce severity of a fire and can help to keep a lid on the level of losses, even in the face of increased numbers of people and structures at risk.

Risk Analysis

There are several methods that can be used to assess fire and EMS risks. In the absence of definitive information, as is the case in most places, we use available data to assess risk. Perhaps the simplest and often most effective approach is to examine the historic demand for service within the community. A related approach is to consider the type and distribution of hazards within a community to get a better understanding of the potential risk, especially for relatively rare, high consequence events. We considered both.

Fire Frequency – Examining the trends in the numbers of fires in the City gives insight into the level of fire risk in the community. Table 5 shows the trend in fires over

the past six years.[7] The data are plotted in Figure 7. Structure fires have fluctuated, but exhibited a slight downward trend since 1994, despite the increase in population and business.[8] Over the past three years, the most recent and probably most accurate data, the trend is essentially flat. There are about 1,100 to 1,200 structure fires a year, or roughly 3 to 4 a day. The number of "other fires," which includes outdoor fires, fires in vehicles, and brush fires, appear to be trending downward over the past four years. Shaded years have questionable data that is probably undercounted.

Table 5: Fire Incidents 1994-2000

	1994*	1995*	1996	1997*	1998	1999	2000[9] (est.)
Structure Fires	1,903	766	2,109	)01-1140**	1,176	1,117	1,188
Other Fires	3,527	1,673	4,236	3,111	4,193	3,560	3,107
Total	**5,430**	**2,439**	**6,345**	**4,01?**	**5,369**	**4,736**	**4,295**

*Data for these years are all questionable; they may be undercounts.
**Based on computing proportion of structure fires from originally printed data (1140/6969) and multiplying by revised total of fires (4012)

Given the City's natural environment, the most serious fire scenario is the structure fire. Of course, structures vary by use. Generally, the larger the structure, the more fire service resources will be required to respond to such an incident, and the greater the potential for loss.

Special Hazards – The City of Jacksonville, like any large City, has a broad range of risks present. For the most part, these risks are within expected limits. However, Jacksonville has a number of unique hazards that can have a significant influence on its overall fire risk and demand for service. Primary among these is the presence of the port facilities and shipping traffic. Ship fires are low frequency but high consequence events. Fires involving vessels can cause very large economic loss and require sustained

[7] There is question as to the accuracy of JFRD incident data prior to 1998. For example, we were initially given data for 1997 from one source that left out several months. The revised total incidents for 1997 is still suspiciously low. The data for 1994-1995 are known to be undercounted. The data for 1998-2000 were produced with more attention and should be more accurate than for the previous years. Until proven otherwise all data, especially any with unexplained large year-to-year changes, should be considered suspect. A major side finding of this study is that more care is needed by JFRD to assure its key data are accurate.
[8] Some of the variation is attributable to record keeping policy.
[9] Extrapolated to a full year from data through December 6, 2000.

commitment of large numbers of fire service resources to contain an incident. With the recent decision for Jacksonville to host the Super Bowl, there is also a potential increase in fire and life safety risk for such and event: cruise ships tied up as hotels and many revelers.

Figure 7: Fire Incidents 1994-2000

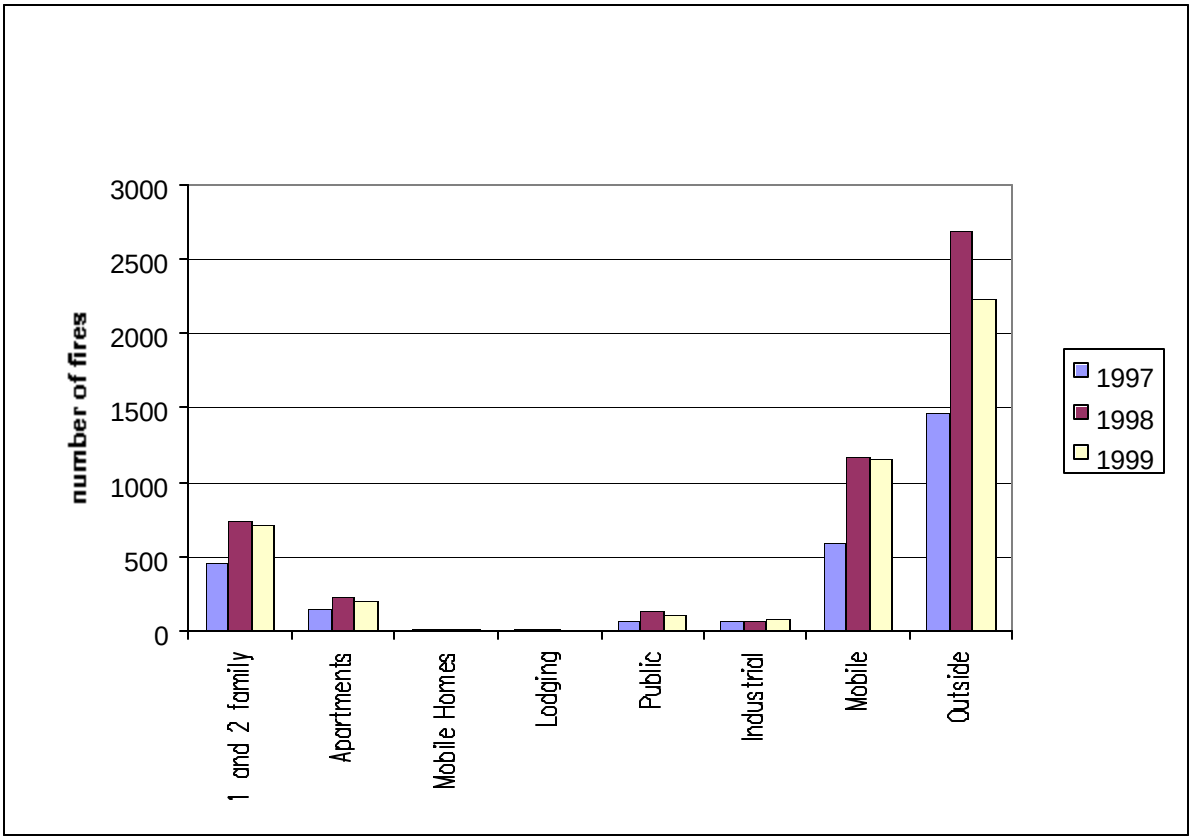
A second major unique influence on fire risk is the presence of a large number of military facilities in the City. These major facilities include the Naval Air Station Jacksonville and the Naval Air Station Mayport, which also includes a large number of naval vessels and associated facilities. While these military facilities maintain their own fire services, they are not self sufficient in the event of a significant fire or emergency and require assistance from the City's resources. The fire services in these facilities also respond to emergencies in the City that are adjacent to their borders. Further, both civilian and military air traffic may have accidents well away from the airports.

Other major fire risks are industrial facilities and high-rise buildings. High-rise buildings are highly concentrated in the city center. There are about 65 high-rises, and not all are sprinklered. Industrial facilities, while also significant, are less concentrated but can be found primarily in several well-defined areas.

To summarize, the City, given its size, contains the expected distribution of risks for a large city but also specialized risks in shipping and military facilities.

Fires by Property Use – Figure 8 shows the distribution of fires by property use, drawn from the Department's National Fire Incident Reporting System records. The data are shown for three years, all of which are similar in profile.[10] The profiles are similar to those found nationally.

Figure 8: Fires by Property Use, 1997-1999



[10] The 1997 profile is based on partial year's data, as was available at the time the analysis was done. The full year's data has questionable categorization of incidents and was not used.

Among structure fires, fires in one- and two-family dwellings are the most common, followed by apartments. The third most common but much less frequent type of structure fire occurs in public assembly properties, which includes theaters, churches, restaurants, bars, clubs, and other public gathering places. The last three categories of structure fires, industrial, lodging, and mobile homes, are relatively infrequent. Much of this variation across categories is attributable to the numbers of structures by type. The pattern for Jacksonville is common in the United States.

The spatial distribution of structure fires and not just their number is also important to consider. The degree to which they are concentrated suggests whether a concentration of fire suppression resources is or is not needed. Figure 9 shows the distribution of structure fires in 1999 in terms of numbers per TAZ.[11] The structure fires were fairly well dispersed. The areas in red and yellow had the most fires, followed by magenta. Many large areas of the City had no structure fires in 1999; and many parts outside the core area had only one or two structure fires.

Dollar Loss – Dollar loss is an intuitively important measure and a figure of merit for overall fire protection. Only direct dollar loss that is attributable to property damage is customarily recorded. Indirect loss, which includes lost wages, business interruption, inconvenience, and pain and suffering, are not recorded but can often exceed direct loss.

[11] In Chapter V we show the distribution of structure fires as a pin map, with the specific locations of fires shown.

Figure 9: Spatial Distribution of Structure Fires

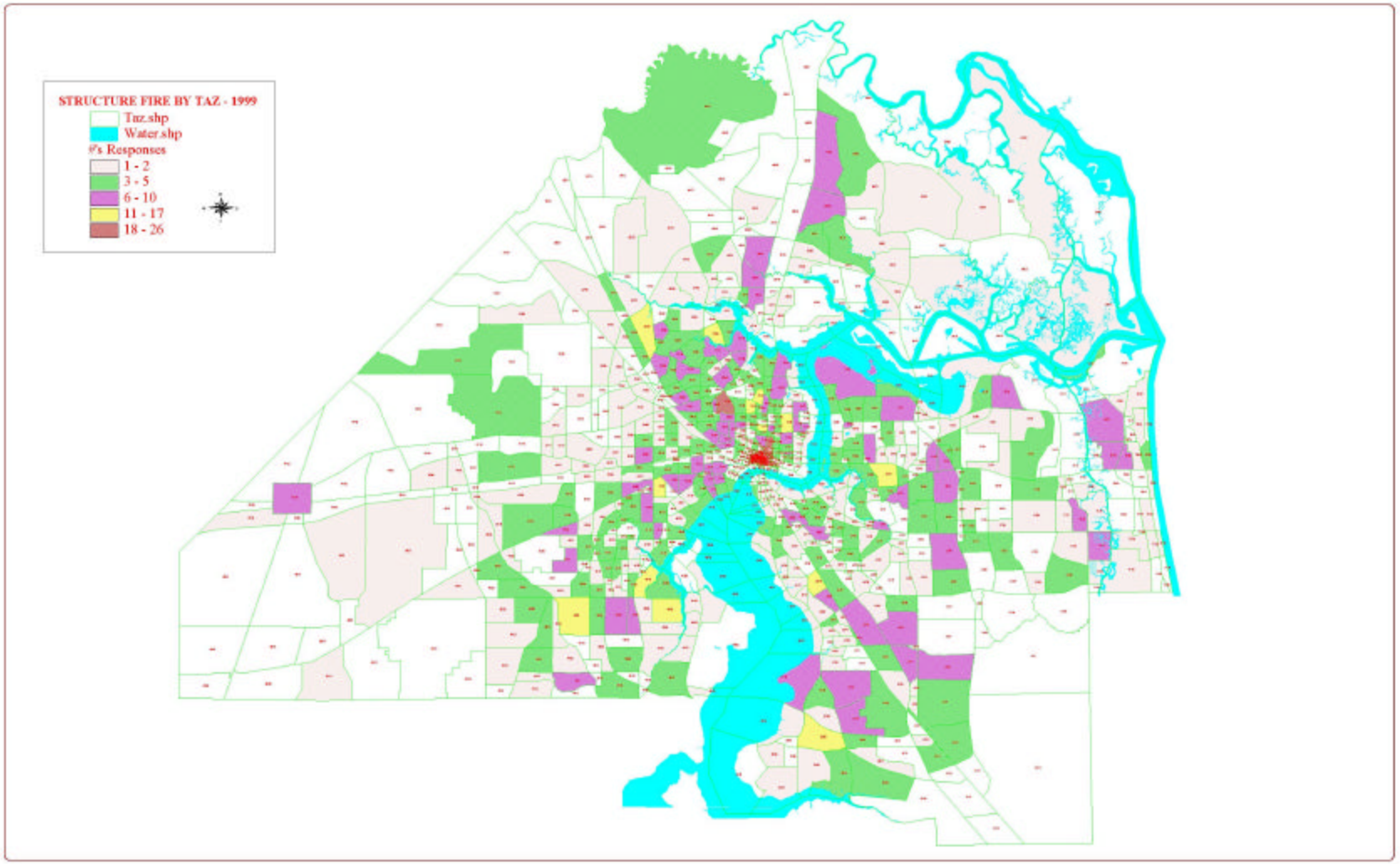
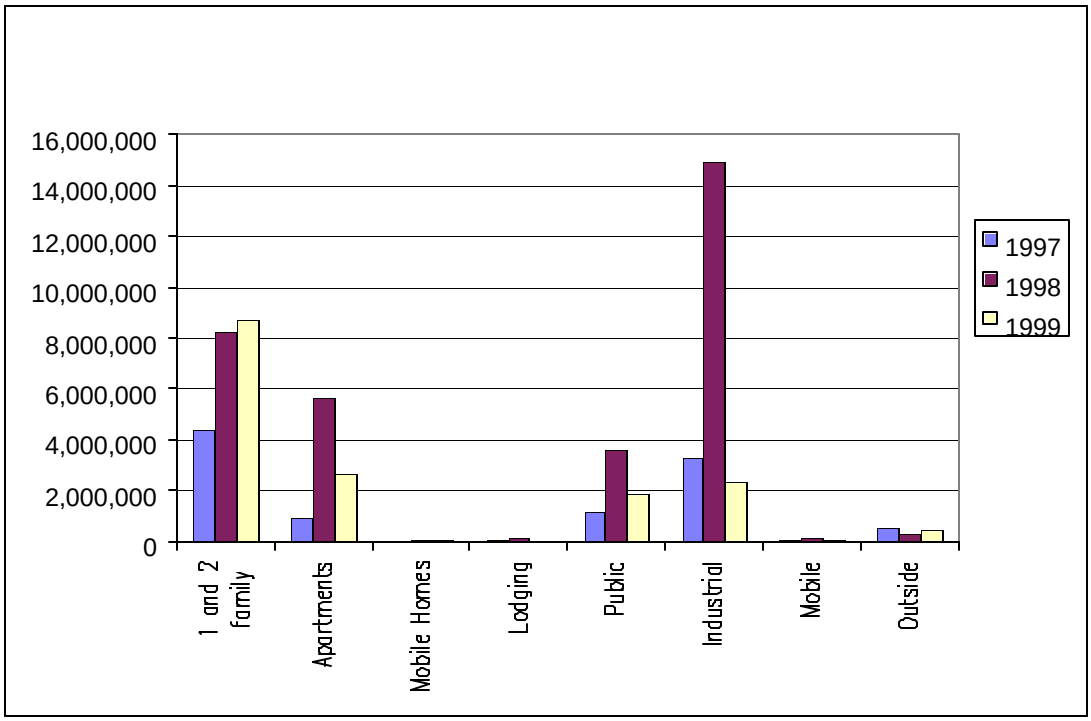


Figure 10 shows that the category with the highest dollar loss from fires for two of the most recent three years was in one- and two-family-dwelling properties. For 1998, industrial losses were by far the highest, due to a single large-loss incident (a $14 million fire). In 2000 (through December 8), industrial fires again had the highest loss, $9 million, ahead of single-family dwellings with $8 million. Losses due to fires in apartments are second to single-family-dwelling fires, followed by industrial and public assembly fires. Although fire in larger structures have more damage per fire, the much larger number of residential fires makes them the leading category of dollar loss.

Figure 10: Fire Loss by Property Use 1997-1999



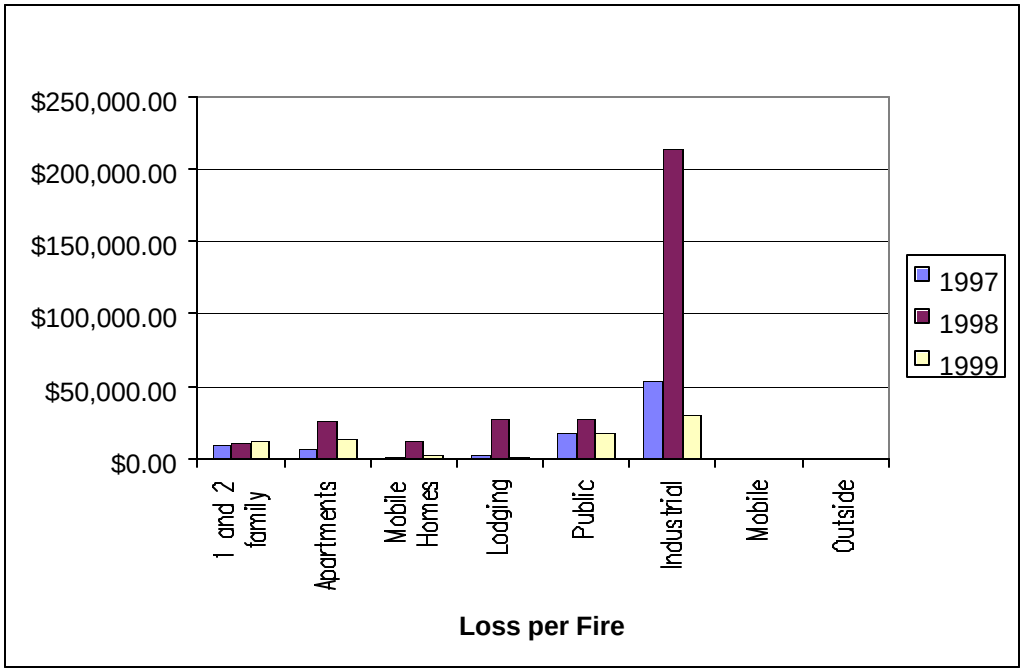
Note: 1997 was based on partial year.

Figure 11 shows the dollar loss per fire in the different property use classifications.

The highest dollar loss per fire occurs in industrial properties, followed by public assembly, apartments, residences, and lodging. "Industrial" fires include fires in utilities and government buildings – given the extensive military facilities within the City. The number of mobile home fires is so small as to be statistically insignificant, but we might expect that because of their limited size and value, they have little potential to exceed the

losses per fire from other dwelling fires. Generally, the larger the building and the higher the value of its contents, the higher the expected loss per fire. To the extent that property uses defy this rule, we can expect that the differences must be attributable to prevention measures such as fire codes and public fire education.

Figure 11: Loss per Fire by Property Use, 1997-1999

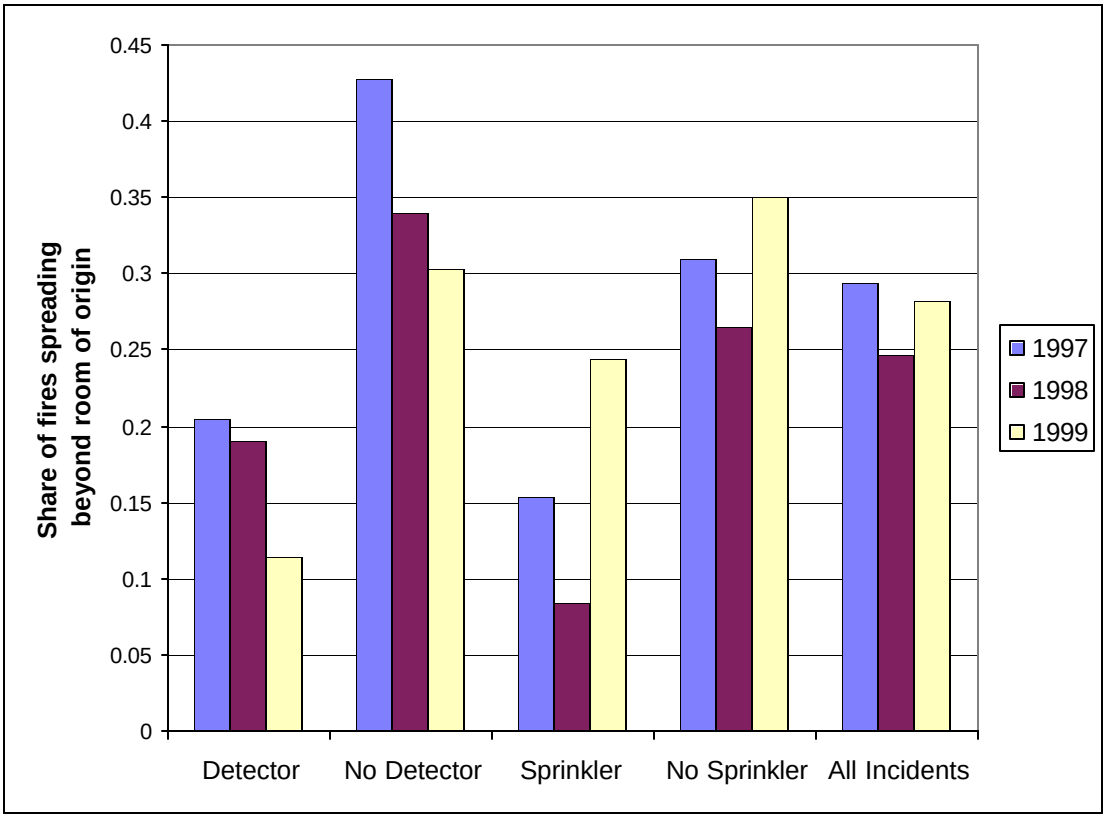


Fire Spread – A measure of the effectiveness of fire suppression and also code enforcement is the percentage of fires that extend beyond the room of origin. This is a good general indicator of the overall effectiveness of the fire protection system. It is heavily influenced by variations in the building stock and by delays in reporting fires, but these characteristics should remain fairly stable from one year to the next. The accuracy of this measure is better than estimates of dollar loss, and can be used to compare cities with decent reliability. It more directly measures what the fire department and built-in fire protection try to achieve – limiting spread.

The percentage of fires spreading beyond the room of origin is shown in Figure 12. In 1997, there were a total of 781 structure fires where this information was recorded. Of them, 78 had sprinklers present. It fluctuates from 25 to 30 percent, which is reasonable and similar to other cities. It also appears to be stable or declining. The

likelihood of spread is profoundly affected by whether a detector was present and by sprinklering.[12] This all indicates that the effectiveness of fire protection in the City is working and stable.

Figure 12: Flame Spread Beyond Room of Origin, 1997-1999



Overall, in terms of frequency and type of fires, dollar losses, and risks faced, Jacksonville appears fairly typical, if not better than average, compared to other large U.S. port cities.

Demand Projection

This section takes the information on past history and estimates the number of fire and rescue incidents over the next 20 years, based on trends and what is expected in

[12] A more refined analysis should be done comparing spread when sprinklers operated, not just when sprinklers were present. Likewise, smoke detectors. Better yet, do this analysis in future years by property type.

population and industrial growth. Needless to say, 20 years is a long time, and the further one peers into the future, the less certainty there is with regard to the estimated demand for service. Various local, state, and federal factors may affect the demand for service and the nature of the fire service. Nevertheless, it is interesting to develop scenarios for the future as an aid in planning for service delivery.[13]

Trends in Incidents – The overall workload of the JFRD is shown in Table 6 below. We first deal with incidents; i.e., emergency calls handled by the department. Each incident can result in multiple unit responses or runs. Shaded areas are years with questionably complete data.

Table 6: JFRD Incidents 1994-2000[14]

	1994	1995	1996	1997[15]	1998	1999	2000 est.[16]
Fires	5,430	2,439	6,345	4,012	5,369	4,736	4,295
Overheat, Overpressure	18	8	46	---	89	119	---
EMS/Rescue	9,567	3,669	58,437	51,425	63,826	63,825	68,420
Hazardous Condition	1,301	473	1,656	1,433	1,898	1,727	1,796
Service	436	163	793	1,625	2,624	3,344	3,898
Good Intent	1,823	734	2,482	3,150	4,968	5,504	5,921
False	2,633	919	3,666	3,562	5,126	5,633	6,237
Other	390	185	285	680	470	506	703
Unclassified	0	11,752	11,494	---	35	132	---
Total	**21,598**	**20,342**	**85,204**	**65,207**	**84,405**	**85,526**	**91,341**

Source: JFRD fire incident data. 1994-1995 is unreliable; 1997 is probably incomplete.

Companion of NFIRS vs. CAD Data – Table 7 shows the difference between the JFRD CAD data and the NFIRS data. They are similar but not identical and should be closer.

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[13] The RFP for this study directed that a 20-year time horizon be used.

[14] The 1994 and 1995 data are known to be undercounted. The 1997 data are probably undercount, though less so than 1994-1995.
The revised 1997 data provided by different sources within JFRD still do not agree, depending on whether they use CAD data or incident reports. Only since 1998 has JFRD Fire Operations been able to reconcile Fire Incident reports with fire dispatch data.

[15] Although the 1997 data is of questionable reliability, the direction of the questionableness is toward being an undercount. It is more questionable for non-fire incidents than fires. So this peak in fires may be real.

[16] Projected based on 11 months of data.

Table 7: Data Source Comparison -- NFIRS vs. CAD

		1996	1997	1998	1999	2000 (est.)
EMS	NFIRS	58,437	51,425	63,826	63,825	68,420
	CAD	54,970	58,263	59,055	65,855	67,672
TOTAL	NFIRS	85,204	65,207	84,405	85,526	91,341
	CAD	71,483	76,275	77,750	84,270	86,308

In some years, the CAD data is higher and some it is lower. The good news is that both the trend in the CAD data and the trend in the NFIRS data are very similar: total calls increasing, driven by the increase in EMS calls.

The 10-year trend in incidents cannot be computed because of poor data. It is likely that the numbers increased dramatically since the early 90s, as the JFRD provided primary service delivery throughout the City. Considering just the four good data years of 1996 and 1998-2000, we can see that some types of incidents are increasing while others are stable or declining over the past five years.

The total number of fires (including structural, non-structural, and outside fires) has fluctuated but is down from the high in 1996-1997. EMS/Rescue incidents have been trending upward, going from 58,000 in 1996 to 65,000 in 2000, a gain of 17 percent in just four years. EMS is by far the largest category of incidents for the JFRD, accounting for three-quarters of emergency calls. This is consistent with national experience. Among the other incident types, good intent calls, false alarms, and service calls had large increases over the past four years. Good intent and false calls each outnumber fire incidents! False alarms are increasing as a result of the increased number of built-in alarm systems. The increases in good intent and service calls are harder to explain.

Good intent calls may have been stimulated by good public education programs that encourage people to help the fire service by reporting even suspected emergencies, i.e. what appears to be smoke or fire in the area or vehicle accidents where there are no injuries and no need for fire or EMS services. Also, good intent has become a catchall for miscellaneous reporting. This combined with an increasing all-trouble response service may help explain the growth.

Regarding service calls, people tend to view the fire and EMS services as their answer to almost all their problems. Also, the Department never used to report service

calls in NFIRS. A change in people's perception of the role of the fire and EMS may be needed.

The population of Jacksonville is increasing, which of course is partly responsible for the increasing numbers of incidents overall. But the rate of growth in calls (17 percent) has been much greater than the growth in population (4 percent) over the last four years. Total incidence of calls is affected by changes in demand per capita as well as by total population; total calls are the product of calls per capita and population. Either or both factors may grow. To examine this more closely, an analysis was made of incidents on a per capita basis.

Incidence Per Capita – Experience in many cities finds that the per capita demand for service, or utilization rate, is not static. In fact, changes in per capita demand can have a major impact on the number of incidents, even in areas where population may not be changing significantly.

The changes in per capita demand often are attributable to changes in public perceptions and awareness of service availability, demographic changes, and socioeconomic changes in the community's composition. For example, many locales report increasing utilization of emergency medical services as the population ages. Per capita demand may also be disproportionately affected by the many people who do not have health insurance and who may defer medical attention until it is an emergency requiring public intervention.

Table 8: Incidents by Type per 1,000 Residents

	1996	1997*	1998	1999	2000[17]
Fires	9.08	5.67	7.49	6.52	5.84
Overheat, Overpressure	0.07	---	0.12	0.16	---
EMS/Rescue	83.60	72.63	88.98	87.90	93.10
Hazardous Condition	2.37	2.02	2.65	2.38	2.44
Service	1.13	2.30	3.66	4.61	5.30
Good Intent	3.55	4.45	6.93	7.58	8.06
False	5.24	5.03	7.15	7.76	8.49

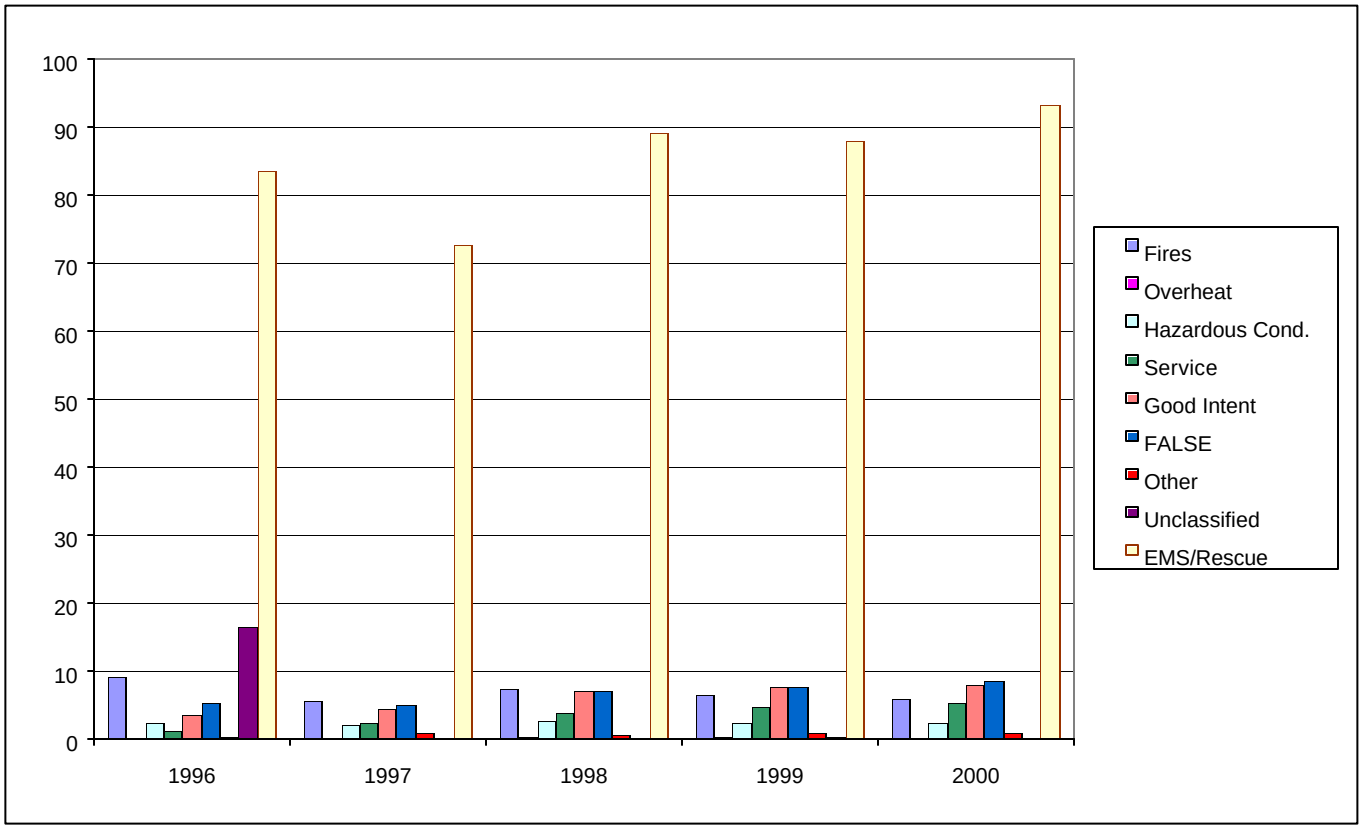
[17] Projected based on 11 months of data.

	1996	1997*	1998	1999	2000[17]
Other	0.41	0.96	0.70	0.88	0.96
Unclassified	16.44	---	0.05	0.18	---
Population	699,000	708,000	717,000	726,000	735,000

*Revised December 9, 2000. May still be an undercount.

Figure 13 shows the trend in JFRD incidents per capita. Table 8 shows the numbers of incidents by type of incident for the last five years. (1997 is shaded because the data by type is questionable.) EMS calls per capita are trending upward in Jacksonville, as in many Metro departments, while fire incidents per capita declined sharply. Hazardous condition, service, good intent, false alarms, and other calls all increased on a per capita basis. Overall, the rates fluctuated too much over the past decade to confidently predict the trend. (The completeness and accuracy of the data is uncertain.) Usually, assumptions about per capita rates are based on a ten-year trend, but in this case, because the data in 1997 and prior to 1996 is incomplete, we relied on the past few years, 1996-2000. While less than optimal, it should not pose an insurmountable problem in making estimates for future demand for service.

Figure 13: JFRD Incidents per 1,000 Residents by Type, 1994-2000



To recapitulate: determining the future demand for service in the JFRD is a function of two factors – population increase and changing per capita demand. One must make assumptions about both population increases and per capita utilization rates to make forecasts of demand for service in the future. We begin with the basic information presented thus far, and then make assumptions that allow us to produce estimates of the number of incidents going into the future.

High and Low Demand Forecasts

Population projections through 2020 were developed by the Planning Department. We interpolated between the forecast years to produce annual population estimates. Then, for each year of the forecast, we estimated the number of incidents by multiplying the estimated population for that year by the per capita demand for service, by type of incident, and then summed across all types of incidents. By estimating each incident type individually, one can account for different estimated rates of demand per capita by incident type. This results in a changing composition of incidents over time.

We produced two forecasts, which we call low growth and high growth.

Low Growth – The low forecast assumes that per capita demand for service will not change beyond 2000. In fact, demand per capita often (but not always) levels out at some point for EMS, the main service today, and some other services. In this scenario, any increases in demand for service would be due to changes in population only (by assumption). Because these forecasts are intended as a conservative planning tool, we assumed that per capita demand will not decrease from current levels (even though there is a decreasing trend in fires per capita). Actually, we assumed that the per capita demand rates would increase in 2000 by 3 to 5 percent for fires and EMS calls respectively, and by larger percentages for most other calls. This was a one-time adjustment that assumed the rates per capita will increase somewhat over the next several years by the factors shown in Table 9, which are the increases over 1999.[18] We worked with the average change in per capita demand at varying time frames coupled with judgment to arrive at our estimates. Some incident types experienced rapid growth, but in some cases, we

[18] At the time this analysis was undertaken, in mid-2000, we did not have as clear a picture of the increase of 2000 over 1999. The actual changes were less than Table 9 indicates for most categories except EMS; for EMS, the increase was 1.06 vs. the estimated 1.05.

assumed that that rate of growth was not likely to be sustained, and selected a lower rate. This was done for EMS/Rescue incidents, because they represent such a large number of incidents, and some of the per capita demand fluctuation is attributed to record keeping issues.

Table 9: Change in Per Capita Demand Assumed for Low Growth Forecast (Factors used to multiply the 1999 rates)

Incident Type	Multiplier Used
Fire	1.03
Overheat/Overpressure	1.47
EMS/Rescue	1.05
Hazardous Condition	1.14
Service	1.74
Good Intent	1.47
False	1.34
Other/Unclassified	1.01

After 2000, the multiplier did not change, and increases in demand were assumed to be due to population increase only.

The resulting "low overall growth" forecast is presented in Table 10. Based on the assumptions presented and the expected population growth in Jacksonville, the number of incidents would increase to 113,382 by 2020. EMS will continue to dominate the demand for service, while structure fires will be exceeded by all categories except for "other" and "overheat, overpressure." EMS is responsible for the bulk of the increased demand for service, although false alarms and good intent are both expected to increase by over 1,000 incidents each.

Table 10: Low Demand Forecast of Incidents

	2000	2005	2010	2015	2020
Population (1,000s)	734.91	753.755	791.281	823.049	856.35
Structure fire	1,131	1,159	1,217	1,266	1,317
All fires	4,937	5,064	5,316	5,529	5,753
Overheat, rupture	177	182	191	198	206
Rescue/EMS	67,827	69,566	73,029	75,961	79,035
Hazardous Condition	1,993	2,044	2,145	2,232	2,322
Service	5,889	6,040	6,341	6,595	6,862

	2000	2005	2010	2015	2020
Good Intent	8,189	8,399	8,817	9,171	9,542
False Alarm	7,640	7,835	8,226	8,556	8,902
Other	652	669	702	730	760
Total	**97,303**[19]	**99,798**	**104,767**	**108,973**	**113,382**

High Growth – In the high growth forecast, per capita demand was assumed to continue to rise for certain types of incidents. Based on the analysis of per capita demand by incident type over 1994-1999, a unique rate was selected for each incident type as a baseline, and a growth factor was applied based on historic trends. Judgment was used to adjust the growth rates to account for the likelihood that the growth rates would level off in the future. Because of the long-term nature of the forecast, it was assumed that some incident types would increase on a per capita basis throughout the forecast, but a lower rate of growth would apply after 2010. This results in ten years of higher growth, followed by more modest but continued growth from 2011 through 2020. In other words, this technique captures the likelihood that rates will continue on their present pattern for the near future, but will "level off" in the future.

Table 11 presents the multipliers used in the high growth forecast. These multipliers were applied in a compound manner in each succeeding year to indicate continuing growth in per capita demand, consistent with recent experience. The multipliers can be interpreted as percentage growth figures; i.e. 1.02 refers to a two percent annual growth in calls per capita. For the most part, incident growth rates were assumed to decline after 2010. While there was considerable uncertainty in the development of these multipliers, the overall effect is illustrative of high growth.

Table 11: Annual Multipliers by Incident Type, High Forecast

	High 2000-2010	High Long-Term 2011-2020
Structure Fire	1.02	1.00
All Fires	1.03	1.015
Overheat, Rupture	1.15	1.05
Rescue/EMS	1.03	1.01

[19] The actual number for 2000 appears likely to be in the 91,000 to 92,000 range. The low growth estimate starts higher than this but then is flatter.

	High 2000-2010	High Long-Term 2011-2020
Hazardous Condition	1.05	1.02
Service	1.07	1.03
Good Intent	1.05	1.025
False Alarm	1.10	1.05
Other	1.01	1.005

The high growth forecast is shown in Table 12. In this forecast, the total number of incidents would reach 190,000 by 2020. This is a more than a doubling in demand over the next 20 years. Again, EMS dominates the demand for service. False alarms also increase to become the second most common type of incident with over 32,000 in 2020. Remember, that policy changes (such as a false alarm ordinance) can have an impact on these long-range forecasts.

Table 12: High Demand Forecast of Incidents

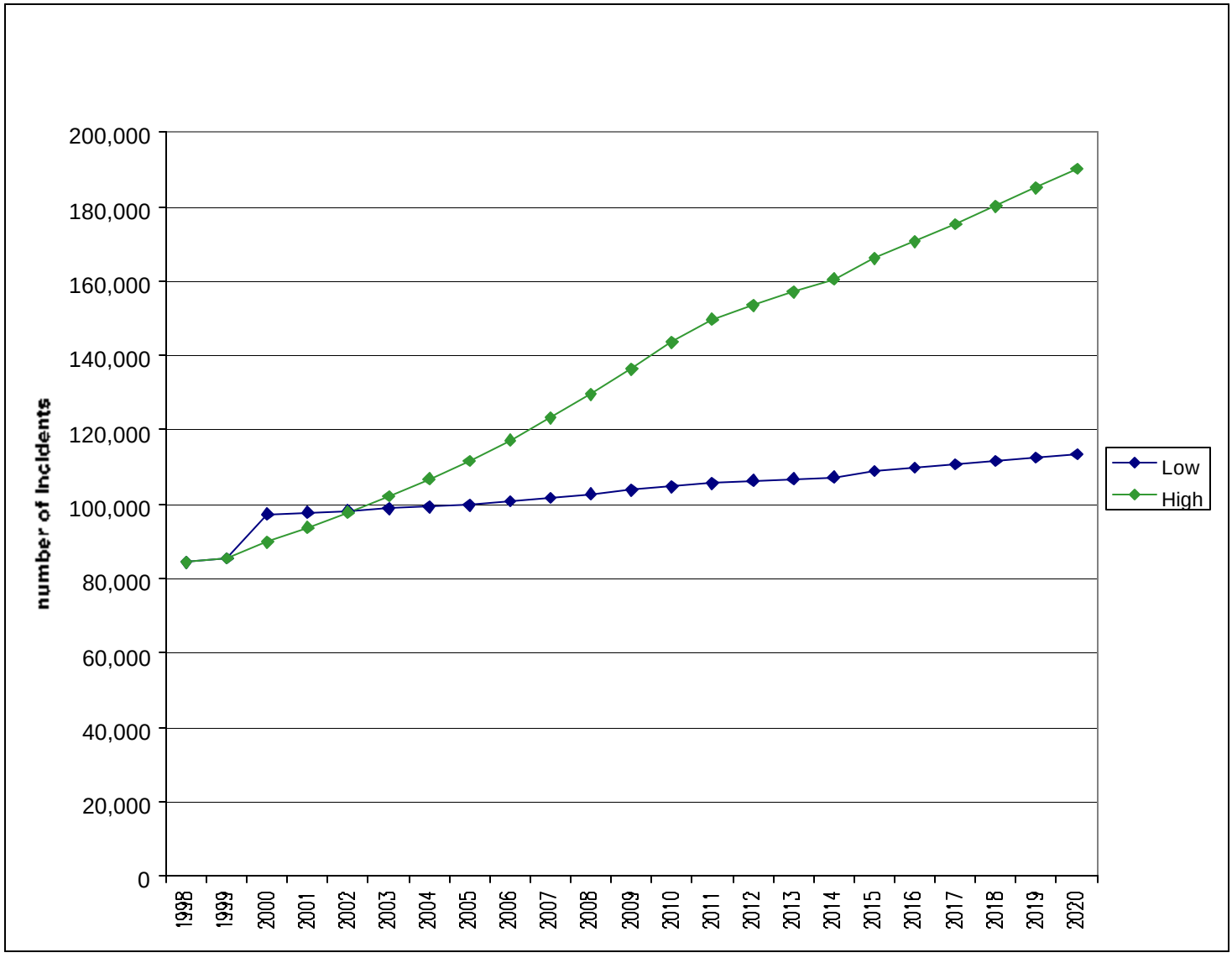
	2000	2005	2010	2015	2020
Structure Fire	1,153	1,306	1,513	1,574	1,638
All Fires	4,937	5,870	7,144	8,125	9,107
Overheat, Rupture	139	286	603	841	1,117
Rescue/EMS	66,535	79,110	96,276	106,302	116,245
Hazardous Condition	1,835	2,402	3,219	3,770	4,331
Service	3,621	5,209	7,670	9,526	11,490
Good Intent	5,849	7,657	10,258	12,374	14,567
False Alarm	6,271	10,359	17,514	24,412	32,418
Other	652	703	776	831	887
Total	**89,840**[20]	**111,596**	**143,460**	**166,183**	**190,162**

When looking at the two forecasts together, we can see that the difference between the low and high scenarios amounts to almost 80,000 incidents by 2020. We expect that in the short term (next five years), the "high growth" forecast will be the most likely, although we expect growth in per capita demand to slow in the future, producing a final result somewhere between the two bounds presented here. Figure 14 shows the total incidents under the low and high growth scenarios.

[20] As noted earlier, it appears that 2000 will be in the 91,000-92,000 range.

In summary, it is virtually certain that the JFRD will face increasing demand for service over the next decade, and possibly longer. The question is by how much. Shifts in the distribution of population and increased overall demand will require changes to the existing distribution of personnel and equipment. There will be needs to add resources to accommodate this growth both in demand and in the spatial distribution of population. These issues will be addressed in the next chapter.

Figure 14: Jacksonville, Total Incidents: 1998-1999 and Forecasts 2000-2020



IV. CURRENT FIRE AND RESCUE OPERATIONS

This chapter discusses and evaluates various aspects of current fire and rescue operations, including workload, station location, staffing, mutual aid, and special operations. A separate analysis of EMS was not in the study scope, but the workload and station location aspects of EMS are indeed considered here. This chapter focuses on the present; the next chapter considers needs in the future based on the demand projection of the last chapter.

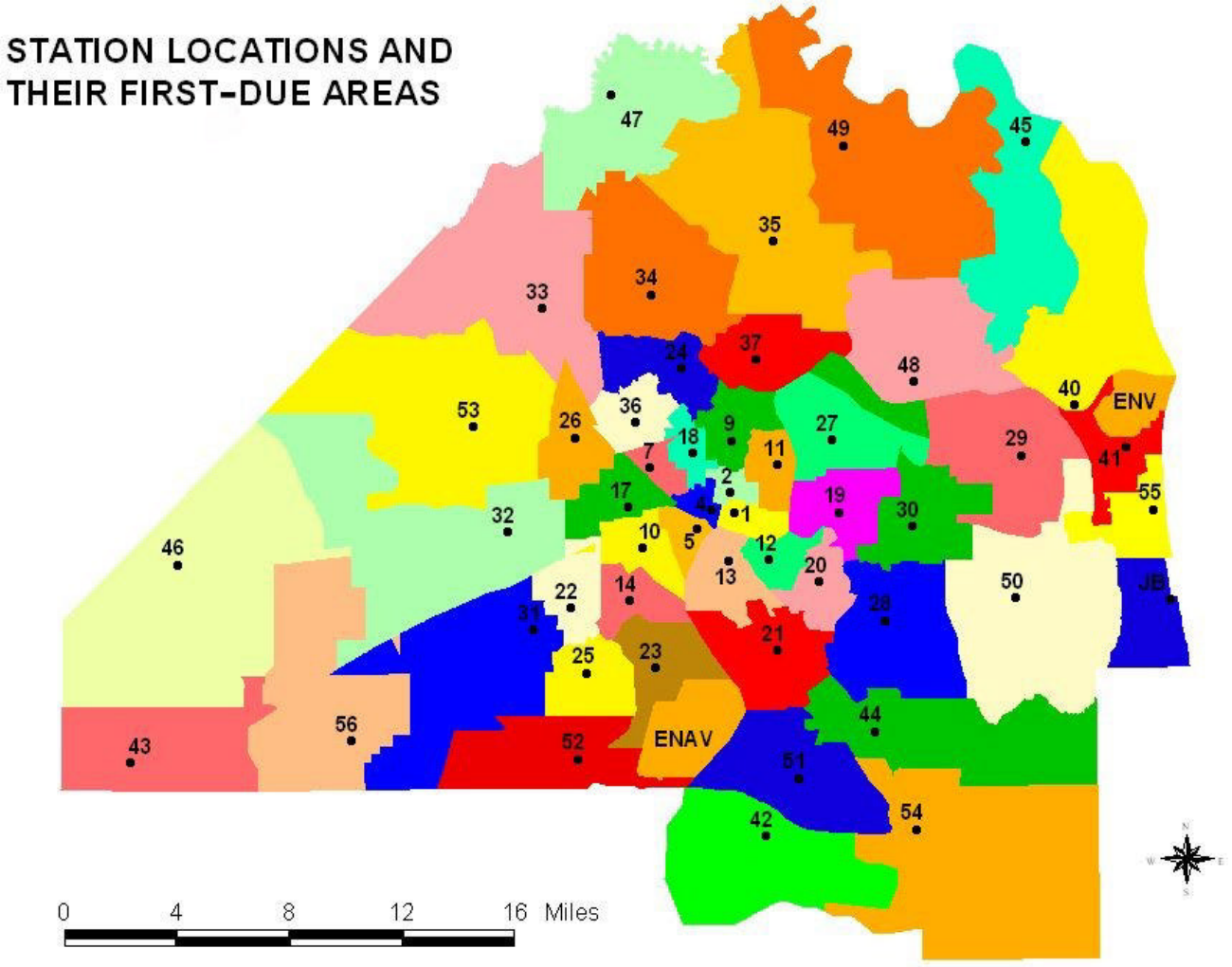
Overview of Resources

The JFRD provides fire, rescue, and emergency medical services through 1,076 career and 145 volunteer personnel. Of the 1,076 career employees, about 80 are civilians. About 749 personnel are assigned to the Suppression Operations Division and another 202 to the EMS Division. JFRD delivers services from 52 stations (including one in Baldwin that is owned by them but staffed by JFRD and two at portside for fireboats' crews).

Fleet – The front-line fleet consists of 47 engines, 7 ladders, 1 quint, 4 squad trucks, 26 ALS units, 2 marine units, 11 tankers, 4 air supply trailers, 1 command van, 1 hazardous materials unit, 2 special utility vehicles, and 6 brush trucks. In addition are chief's cars and some miscellaneous vehicles.

Current Station Distribution – Figure 15 shows the current "first-due" districts for engine companies in the City. The first-due district is the geographic area for which a particular company would be the first arriving unit. For the most part, resources are distributed proportionate to the residential population and/or intensity of building. The distribution of stations is highly concentrated in the center of the City, which is the area of highest demand for service and highest risk. It is a sensible overall use of the JFRD's resources. By and large the JFRD's leadership appears to be making good use of their resources.

Figure 15: Stations Locations and Their First-Due Areas



While the overall distribution of stations works reasonably well, there are large areas of the City that are not served within desired response times. Many of the stations inherited from former volunteer departments are not optimally distributed. There can and should be continual (at least annual) reevaluation of demand vs. resource locations and actual response times. Additional units should be considered – not necessarily added, but considered – when individual units have unit hour utilization ratios in the 30 to 40 percent range or workloads that exceed 3,000 responses, or when the number of missed calls by a unit get too high. (The UHUs are discussed below.) There are no hard and fast standards for adding stations or response time. Additional stations should be considered to reduce response times into areas with at least 1 to 2 calls per day where response times exceed chosen objectives. The issue of response time goals and workloads will be discussed throughout this and the next chapter.

After the urban core, the densest concentration of resources is Greater Arlington. Next is the Southeast. The least dense concentrations of stations are in the Southwest, Northwest, and North, which are generally rural in character, but have some large or high-hazard structures. As would be expected, the first-due districts of the outlying stations are huge compared to those of the inner city core. Correspondingly, the response times for the stations with large areas to cover will be much higher than those with smaller districts, but their workloads are likely to be much lower and hence their availability better, which is a partially compensatory factor.

Workload and Unit Hour Utilization

A less obvious factor than station distribution that affects response times and service levels is the degree to which fire and EMS units are busy answering calls. Higher unit hour utilization – the percent of time a unit spends on calls – may sound like higher productivity, and in a sense it is, at the unit level. But if unit activity levels are too high, their reduced availability can increase system-wide response times and reduce effectiveness, and thereby overall system productivity. As units get busier, they are unavailable for an increasing share of their first-due calls, which then requires neighboring units to respond into their areas to service the demand, at longer response times. The neighboring units then are out of position if they get a call, which can lead to a chain of high response time incidents. When this happens frequently, the overall level of service declines.

Because of the large distances between Jacksonville's outlying stations, a busy station in these areas would be a particular concern; the next closest unit may be a long way off. Fortunately, for the most part, the workload at outlying stations is so low that availability delays are a minor issue. But there are areas of the City where simultaneous incidents can quickly create a situation in which the next unit available to respond to that area will be coming from a long distance. This is a cause for concern but "comes with the territory" of having such a large and diverse service area.

Unit workload depends on the number of unit responses made, not just the number of incidents handled. EMS calls in Jacksonville usually result in two vehicles being dispatched, and most fire calls have more than two dispatched. Some incidents may only have one vehicle dispatched. The number of apparatus responses will typically be more than twice the number of incidents. The number of responses per unit and the average time per response must be considered in determining unit availability. We will discuss workloads in more depth later in this chapter. One needs to be aware for the moment that they, too, affect response times.

Unit Hour Utilization Rates – The Unit Hour Utilization Rates (UHUs) are the average daily percent of time spent on emergency calls.[21] The time spent on a call starts with dispatch of the unit and ends when the unit is available for the next call, which is when it finishes up at the scene of the last call or, for rescue transports, finishes at the hospital. It includes turnout time, drive time, and, where appropriate, time spent driving to the hospital and time spent at the hospital.

Table 13 shows the "Hours Available" and the UHUs for rescue units. Table 14 shows the same for all the other JFRD units. "Hours Available" are those not spent on emergency calls; those hours subtracted from 24 hours and then divided by 24 hours is the UHU.

[21] Usually UHUs are computed only for time on emergency calls on the theory that the units could be dispatched if needed from training or other non-emergency tasks. We used this definition, which allows comparison with other cities. It would be instructive to compute UHUs including the time spent on training or other out-of-service reasons. The Colorado Springs Fire Department has gone even further, and developed a model that examines all time spent by its operations force, including prevention; one use of this type of analysis is to determine how much time is available for prevention activities as a function of the busyness of line companies on emergencies, and considering all other daily tasks.

RESCUES: The UHUs for rescue units range from 11 percent to 24 percent. Of the 26 rescue units in 1999, 11, over half, had UHUs of 20 to 24 percent, which is busy but reasonable.

At a UHU of 25 percent, the next call received would have a one in four chance of not being served by the closest unit. At 50 percent UHU, the next call would have a 50-50 chance of not being served by the closest unit, which would be very poor. On the other hand, a unit with a 5 percent UHU is not on an emergency call 95 percent of the time and would have very good availability but relatively poor productivity. There is a tradeoff between increasing workloads to increase unit productivity vs. increasing response times, which affects the bottom line of safety and hence reduces the true productivity of service in terms of outcomes vs. costs.

Although several rescue units were at or over 3,000 calls, none yet had UHUs that required immediate relief (in 1999). R22 had the most runs and the highest UHU, so the two are clearly correlated.

An even better measure than UHU is the number and percent of calls missed by the first-due unit. This reflects not only unit busyness but also how often simultaneous calls come into the same first-due area. Palm Beach County is using this measure.

Recommendation: Jacksonville should track the number of calls missed by the first-due unit. Palm Beach County records the number of calls handled by another unit or by mutual aid for each first-due district.

ENGINES: As would be expected, the engine companies have much lower UHUs than the rescues, ranging from 4.8 percent to a high of 18.7 percent (E34). None are at a level requiring relief from too high an emergency workload.

OTHER: All other units had much lower UHUs than the engines and rescues.

Table 13: Unit Hour Utilization Rates[22] – Rescue Units (1999)

Unit ID	Hours Available per 24 hours	UHU
R1	19.58	18%
R2	21.25	11%
R4	19.98	17%
R7	18.16	24%
R9	19.20	20%
R10	18.85	21%
R13	19.24	20%
R19	19.45	19%
R20	18.53	23%
R22	18.20	24%
R23	20.54	14%
R24	18.52	23%
R26	18.16	24%
R27	20.49	15%
R28	18.78	22%
R30	18.89	21%
R31	18.72	22%
R32	19.36	19%
R34	19.09	20%
R35	20.11	16%
R42	20.20	16%
R50	19.49	19%
R52	19.79	18%
R55	20.32	15%
R71	19.82	17%
R80	20.30	15%
R103	23.06	4%
R104	22.70	5%
Average	19.67	18%

[22] Don Macleod of the JFRD computed the average number of hours available per day per unit. TriData computed the UHU from this, which is: $UHU = \frac{24 - \text{Hours Available}}{24}$

Table 14: Unit Hour Utilization -- Fire Units

Unit ID	Hours Available per 24 hours	UHU
E01	21.45	10.60%
E02	21.7	9.60%
E04	21.53	10.30%
E05	21.84	9.00%
E07	20.79	13.40%
E09	21.24	11.50%
E10	20.76	13.50%
E11	22.38	6.80%
E13	21.16	11.80%
E14	22.03	8.20%
E17	21.02	12.40%
E18	21.24	11.50%
E19	20.38	15.10%
E20	21.36	11.00%
E21	21.36	11.00%
E23	22.5	6.30%
E24	20.73	13.60%
E25	21.06	12.30%
E26	21.84	9.00%
E27	21.45	10.60%
E28	21.24	11.50%
E29	22.15	7.70%
E30	21.02	12.40%
E31	20.31	15.40%
E32	20.56	14.30%
E33	21.78	9.30%
E34	19.51	18.70%
E35	21.77	9.30%
E36	20.8	13.30%
E37	22.85	4.80%
E40	22.56	6.00%
E41	22.28	7.20%
E42	21.72	9.50%
E43	21.82	9.10%
E44	21.43	10.70%
E45	22.39	6.70%
E48	22.71	5.40%
E49	22.36	6.80%
E50	20.84	13.20%
E52	21.4	10.80%
E53	22.39	6.70%
E54	21.74	9.40%
E55	22.01	8.30%
F01	23.15	3.50%
F02	23.01	4.10%
F03	22.81	5.00%
F04	22.44	6.50%
F05	23.06	3.90%
F06	22.51	6.20%
F07	22.92	4.50%
F08	22.86	4.80%
HAZ7	21.65	9.80%
L01	22.56	6.00%
L04	22.54	6.10%
L10	22.34	6.90%
L18	22.72	5.30%
L30	22.45	6.50%
L44	22.53	6.10%
M01	22.74	5.30%
M03	22.82	4.90%
P04	21.19	11.70%
S21	22.47	6.40%

Unit ID	Hours Available per 24 hours	UHU
S28	22.57	6.00%
S34	22.75	5.20%
S36	22.03	8.20%
T25	22.78	5.10%
T28	22.86	4.80%
T29	22.78	5.10%
T31	22.62	5.80%
T32	22.17	7.60%
T33	22.46	6.40%
T34	23.08	3.80%
T40	22.79	5.00%
T42	23.37	2.60%

Unit ID	Hours Available per 24 hours	UHU
T44	23.04	4.00%
T49	22.55	6.00%
TL9	22.95	4.40%
TS22	20.84	13.20%
U13	21.94	8.60%
W29	22.28	7.20%
W31	22.46	6.40%
W32	21.94	8.60%
W35	22.66	5.60%
W42	22.59	5.90%
W43	22.44	6.50%
Average	**22.03**	**8.23%**

Response Times

Goals for service levels should be quantifiable and clear. The most easily understandable performance measurement for fire and rescue operations is response time. It is an intermediate outcome measure in the sense that it is one factor that contributes toward the true outcome measures of reduced casualties or losses. But it is also an outcome measure itself because people want a fast response; i.e., they consider responsiveness an end in itself.

A key question for strategic planning of fire protection in Jacksonville (or anywhere else) is the selection of response time goals for the urban, suburban, and rural areas. Once the desired levels of response time are established for urban, suburban, and rural areas, system performance can be monitored to measure the ability to meet these levels of service and to identify the need for additional resources in the future.

Definitions – The most widely used definition of response time is the time from receipt of a call from the public to arrival on the scene with the first fire apparatus or rescue unit (not counting a chief). Response time includes call processing time, turnout time (the time to leave the station) and travel time. It does not include time from arrival

in the street to get to the fire or patient, though that would be desirable to track and is important for high rises and large complexes.

The JFRD has used the term "response time" to mean the time from dispatch to arrival, leaving out call processing time because the JFRD field units do not control it. We have tried to be careful in this report to indicate which version of response time is being used.

At present, the JFRD tracks response times in two formats – as an average and as a percentile. While averages are still the most commonly used and perhaps more easily understood measure, they have limitations. In a large area such as Jacksonville, the average response time can be misleading because it can be affected by a few very large response times that are either actual responses or data entry errors. To overcome this limitation, the use of response times expressed as percentiles is recommended.

Percentile response times convey a more complete indication of service level in that they give information not only on average performance, but also on the percentage of times the desired performance levels are met. For example, a typical response time goal experienced as a percentile measure is "90 percent of ALS incidents responded to in eight minutes." The 90th percentile implies that 10 percent of incidents may have longer response times than the selected threshold. It is important that the public understand that it is prohibitively expensive to meet virtually any response time goal 100 percent of the time. Also, there is nothing sacred about using the 90^{th} percentile other than custom. A goal can be stated as the 80^{th} percentile or any other percentile as well.

Call Processing or Dispatch Time – The time from receipt of a call to making the dispatch should average no more than a minute. Call processing time for Jacksonville typically is between 60 and 90 seconds. In-house observations by the JFRD Division Chief of Operations found that dispatch time might frequently range up to two minutes. A sample of one day's EMS calls in mid-May 2000 by the Operations Chief found that 38 percent of calls took over 90 seconds to dispatch. If so, that is a significant problem. It costs many millions of dollars to improve response times by one

minute. Time must be saved in the dispatch process. Call-processing times should be reduced to 50-60 seconds.[23]

Recommendation: Work with the Dispatch Center to dispatch the initial unit in less than one minute.

There is a strong suspicion that the delays are caused by dispatchers going through many questions in the Emergency Medical Dispatch (EMD) protocol before dispatching. In some modern dispatch centers, dispatch times have actually grown worse with the introduction of EMD and CAD systems than when they were dispatched manually and had no screening because of the number of questions asked of the caller to triage the call before dispatching. If that is a limiting factor, then JFRD should dispatch at least a first-responder unit while questions are still being asked.

The JFRD has recently implemented a new computer-aided dispatch system (CAD) that hopefully will reduce call processing and dispatch times further as it is refined. It will also enable more accurate tracking of response times. The JFRD reviews any responses that take longer than 6 minutes and any dispatch delays of 90 seconds or more. An exception report is generated for these incidents and e-mailed to select individuals within the Department. This is a very good practice.

Turnout Time – This is the time from receipt of the dispatch by the station until the unit leaves the station. The turnout time is included in the "response times" used in the maps in this chapter, but call-processing time is not.

The Division Chief of Operations estimated that it took about 30 seconds for crews to turn out for a fire call and 45 to 60 seconds for crews to turn out for an EMS call. If correct, this is outstanding performance. (Data was not available to compute turnout times.) When crews can turn out in 30 to 45 seconds, the time available to drive to the scene of an incident is greater to meet a given response time goal. For example, if the goal for the time from dispatch to arrival is five minutes, and if it takes one minute to turn out, then four minutes are available for driving, with a potential outreach of about two miles. If instead of one minute, turnout time averaged 30 seconds, then vehicles could reach another quarter mile within five minutes. The actual performance could then

[23] The IAFC Accreditation manual specifies a target goal of 50 seconds for call processing

be better than the theoretical performance computed by using diamonds drawn around stations, where the common assumption is one minute for turnout.

Recommendation: The turnout time should be measured periodically for at least a sample of stations, both in daytime and at night, and for fire and EMS calls. Efforts should be made to meet the above estimated turnout times (30 to 45 seconds) consistently.

Response Time Goals – Nationally, there are no true standards for response time.[24] The closest thing to a nationally used standard is the benchmark of getting to 90 percent of incidents for advanced life support EMS incidents within eight minutes, a desire of medical authorities. Local medical authorities sometimes set their own desired response time objective. (Having response time goals is also needed as part of the IAFC Accreditation process for fire departments; the IAFC does not specify goals, but rather the need for a city to formulate them based on some rationale.)

Given limited resources, one should position resources to minimize the response time for the greatest number of incidents. One does not want to locate stations solely on a local geographical basis, at the expense of not optimizing service levels for the whole city. That is, one should avoid making decisions solely station by station. One must consider the demand served by the whole set of stations. Adding a second unit to a station in a busy area may have more impact on response times overall than adding a unit to a poorly served remote area with low demand. On the other hand, all citizens want to be protected by a fast-responding unit, even if they and their neighbors do not call on it often. That leads to difficult political choices.

The response times standard should not be expected to be the same everywhere in the City. Because of the large service area of the Department and the great variation in the density of settlement, we recommend that a minimum of two service levels and preferably three be established. The settlement patterns of the City may eventually render the distinction between suburban and rural levels meaningless, but we include it here in the interest of completeness.

[24] Response time standards are in development by NFPA. They are proving extremely controversial, with little factual basis to back up the selection of an optimal level. Faster is better, but at what cost and what benefit?

Table 15: Suggested Service Levels (Dispatch to Arrival Time) for JFRD*

Classification	Initial Response	Extended Response Complement
Urban	80 percent of incidents in 5 minutes	Three engines and one ladder within 10 minutes
Suburban	80 percent of incidents in 7 minutes	Two engines and one ladder company within 12 minutes
Rural	80 percent of incidents in 9 minutes	Two engines within 12 minutes

*Add 60-90 seconds call processing time to these times to obtain total response time.

Table 15 lists recommended service levels for the JFRD. These levels are a compromise between truly desirable, more stringent goals and what is likely to be feasible. They are suggestions; the setting of service levels is a local decision that should have the informed consent of elected officials and the public. An iterative process may be needed: select a tentative level, consider the costs for meeting the goal, and then revise the goal if prohibitive. We would anticipate that achieving the initial response goals in Table 15 is feasible in the near term, while reaching the goals for the extended response complement might take some time to achieve (and also some time to measure). Bear in mind that these service levels do not include call processing, which should add an additional 60 to 90 seconds to the total response time.

Across the United States and the United Kingdom (which, unlike the U.S., has national standards for response times and fire vehicle response complements), higher response time goals are tolerated for both fire and EMS calls in suburban and rural areas than in urban areas. (Appendix B summarizes the UK response criteria.) If citizens in rural areas want the same coverage as in urban areas, they would need to pay much higher taxes because of the diseconomies of scale in serving them.

A major complicating factor is that while most of the high-risk structures in Jacksonville tend to be found in the city core, the need for EMS response is more scattered. A downtown high-rise fire needs more fire vehicles to handle it than does a fire in a small rural structure, but a citizen having a heart attack needs the same number of people and same equipment regardless of whether in a rural area or urban area. The density of EMS calls is higher in the core, but the need per EMS call is the same everywhere.

The answer to the City's response time needs thus is not simply to add stations until the entire area to the City limits is served with a consistent level of service. This would be impractical due to the cost of maintaining facilities and personnel that would be utilized very infrequently in the more rural areas. In fact, a policy of this sort could be considered a poor use of resources, given the constraints of public funding. Because of the City's large land area, there will be areas that are not served with optimum response time for a long time to come, if ever.

Before locking in on any particular response time goal, the current, actual response times need to be examined in light of the results obtained, the satisfaction of the community and leadership with the current level of service, and the expected cost-effectiveness of making improvements. Unfortunately, there are no proven mathematical simulations that can be used to test the benefits of increases in the number of stations and units in terms of expected reductions in losses.

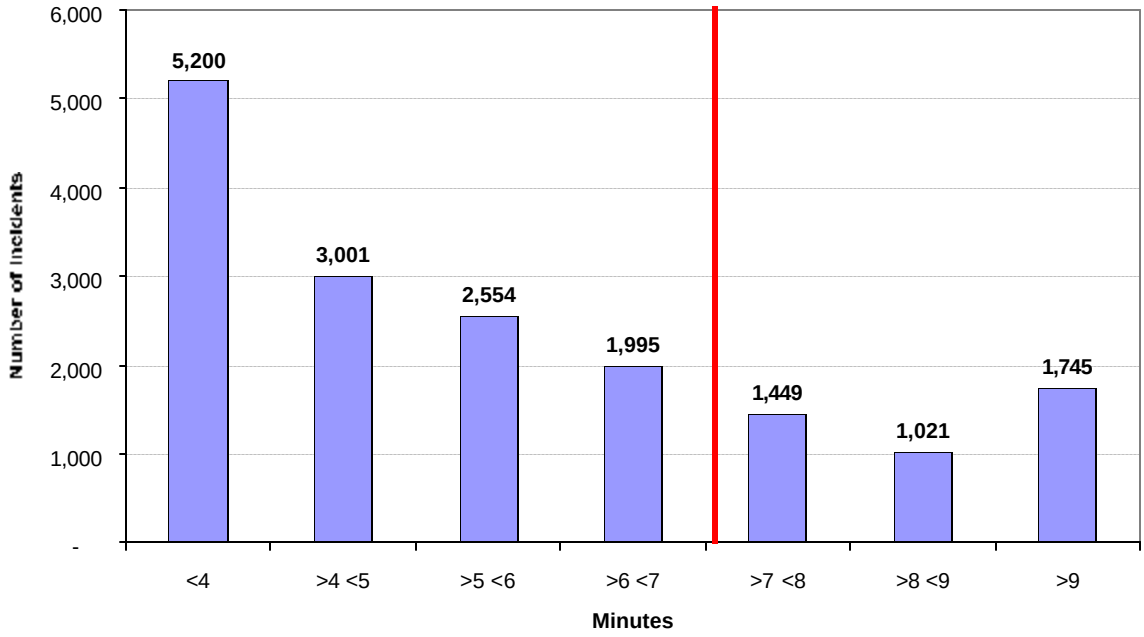
Actual Engine and Rescue Response Times – By examining the current levels of service provided, one can better appreciate the complexity of determining a level of service standard for fire and EMS services and also determine the baseline from which iterations can be made.

In 1999, the average "response time" (without call processing) for fire calls was 5:15 and 6:37 for the EMS/rescue calls. Both are quite reasonable averages for a large city.

Figure 16 presents the fractile distribution of first-due "response times" (without call processing) citywide for 1999.[25] About 30 percent of incidents were responded to in 4 minutes or less. Another 17 percent are responded to in 4 to 5 minutes. This equates to approximately 47 percent (or half) of all incidents being reached within 5 minutes. For the 16,965 fire incidents for which response times were known for fire calls, 63 percent, just short of two-thirds, were responded to in less than 6 minutes. For a city the size of Jacksonville, with a significant rural component, responding to two-thirds of calls within six minutes is quite good.

[25] Because call volume tends not to vary sharply from one year to the next, and no new stations opened or closed, the response time analysis based on 1999 should be reasonably representative of the 2000-2001 period.

Figure 16: Citywide "Response Times" (without call processing time) (1999)



Note: Add about one minute for call processing to set total response times.

On the other hand, 16 percent of the calls, almost 2,500, took over seven minutes, and slightly over 10 percent of the calls took more than eight minutes. With call-processing time added in, over 20 percent of calls took 8 minutes or more. This compares unfavorably to the 10 percent or less over 8 minutes (i.e. 90th percentile of 8 minutes) considered good for an all-urban area. Appendix A lists EMS response times at the 90th percentile level for each district in Jacksonville. All of the districts with the highest response times (9 minutes or greater 90th percentile) are rural, not surprisingly.

The response times for each area of the city are given in Figure 17 (EMS) and Figure 18 (Fires). The figures show the 90th percentile "response times" (excluding call processing) for each traffic analysis zone (TAZ) for 1999. The TAZ areas were designed for traffic modeling purposes. They are of a size such that each first due fire district is composed of several individual TAZs.[16] The data shown is for 1999, though it would be similar for 2000. The general pattern is one of adequate response times in the center,

[16] The boundaries of the TAZs are set by the Planning Department, and change slightly over time. As a result, there are some minor divergences between the TAZs used by the JFRD and the TAZs used by the Planning Department.

with poorer response times (but for generally fewer calls) as one moves to the fringes of the City, as would be expected.

Figure 19 shows that slightly over one-third of the traffic analysis zones (TAZ) in the City had 90 percent or more of calls responded to in less than 4 minutes (5.0 to 5.5-minute total response time). These are outstanding response times. Twenty-eight percent of TAZ had 90th percentile response times of less than six minutes (7.0 to 7.5 minute total response). In other words, about two-thirds of the TAZs have good or better response times and about one-third have less than desirable response times. At the extreme were about 13 percent of the TAZ (112) for which the 90th percentile response was greater than 9 minutes (10.0 to 11.5 minutes total response).

Ladder and Squad Response Times – The ladder/squad response times are below average and not as good as they need to be outside the central city.[27] The root cause is the ratio of engines to trucks and squads is 47/11, or 4.3 to 1, which is on the high side of Metro fire departments. With the telesquad, a quint, counted, the ratio is 3.9 to 1. The more relevant question is not the overall ratio but whether there are enough ladder trucks to respond fast enough in practice. There are actually only 7 ladder companies with aerial ladders, with another 4 squad trucks doing the same type of work as ladder companies other than having a tall hydraulic ladder to deploy. More on this later.

Response Complement

The preceding discussion of response times focused on the first-in response unit, which is arguably the most important element of response. But the follow-on units are also important for all but incipient (small) fires. Both the total complement sent on first alarm and their response times need to be considered in assessing the level of service.

[27] The first-in ladder companies' response times to structure fires should be computed and tracked. The data were available for only a small fraction of structure fires, and not considered reliable enough to quote here.

Figure 17: 90th Percentile by TAZ: 1999 (EMS)

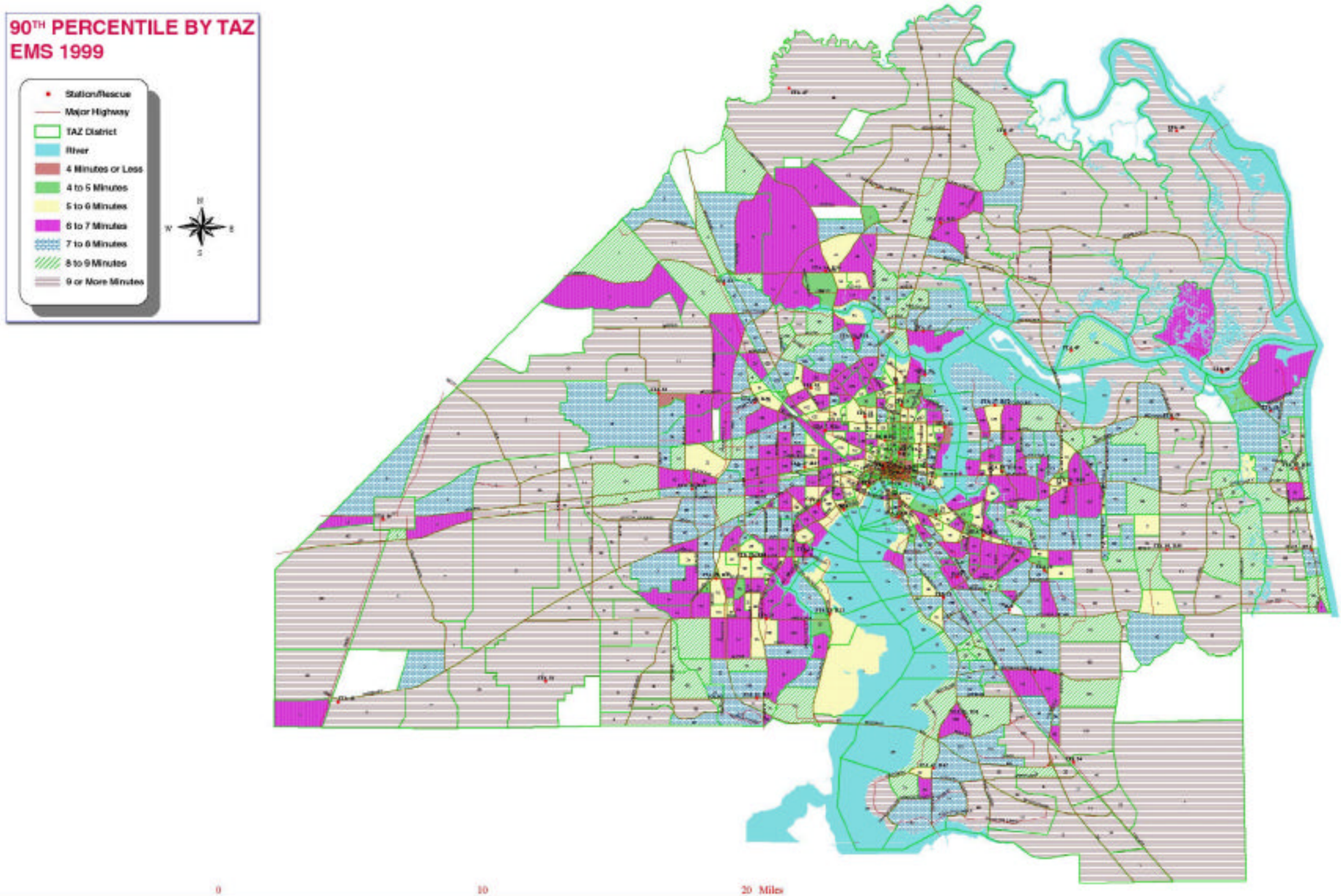


Figure 18: 90th Percentile by TAZ: 1999 (Fire)

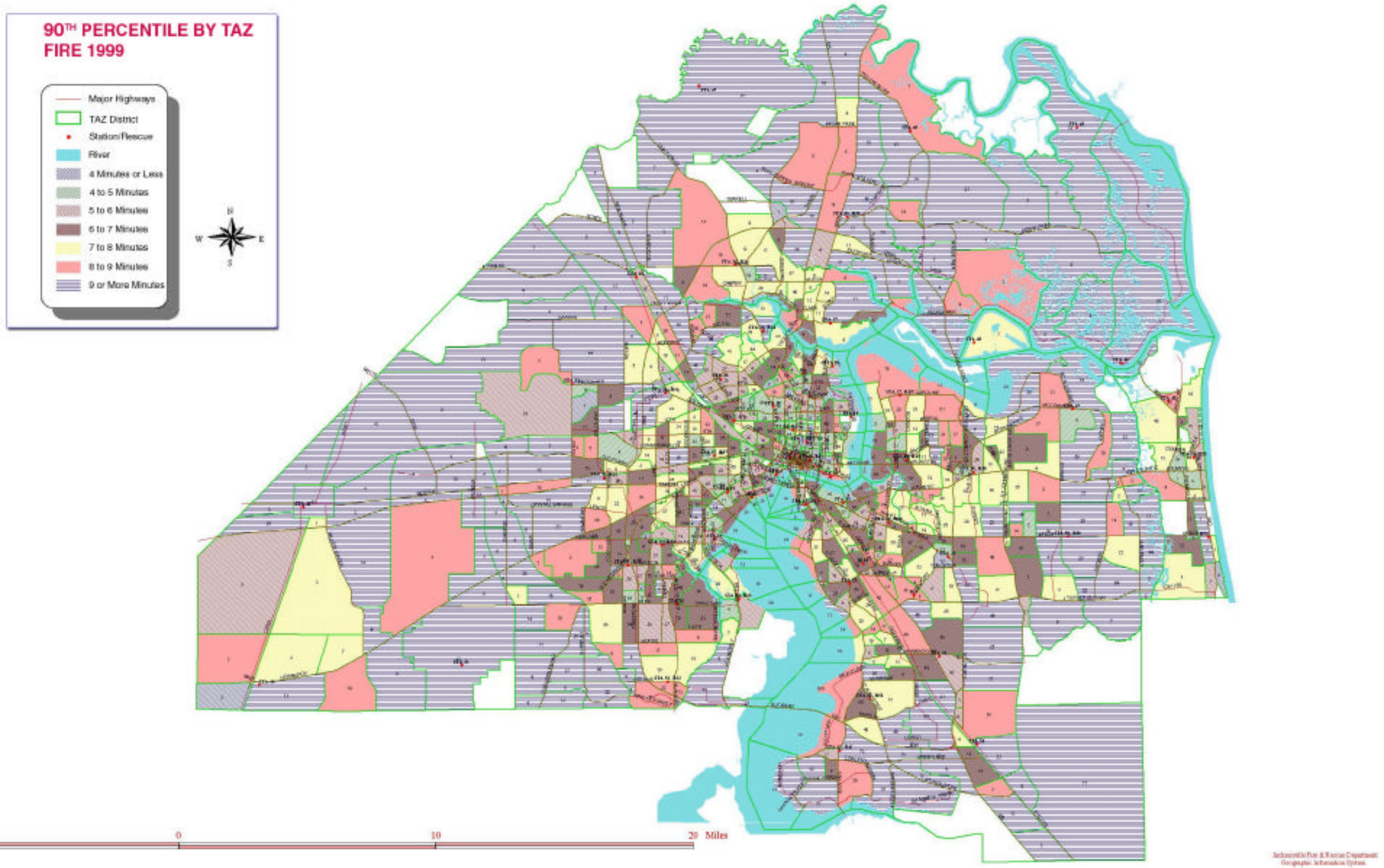
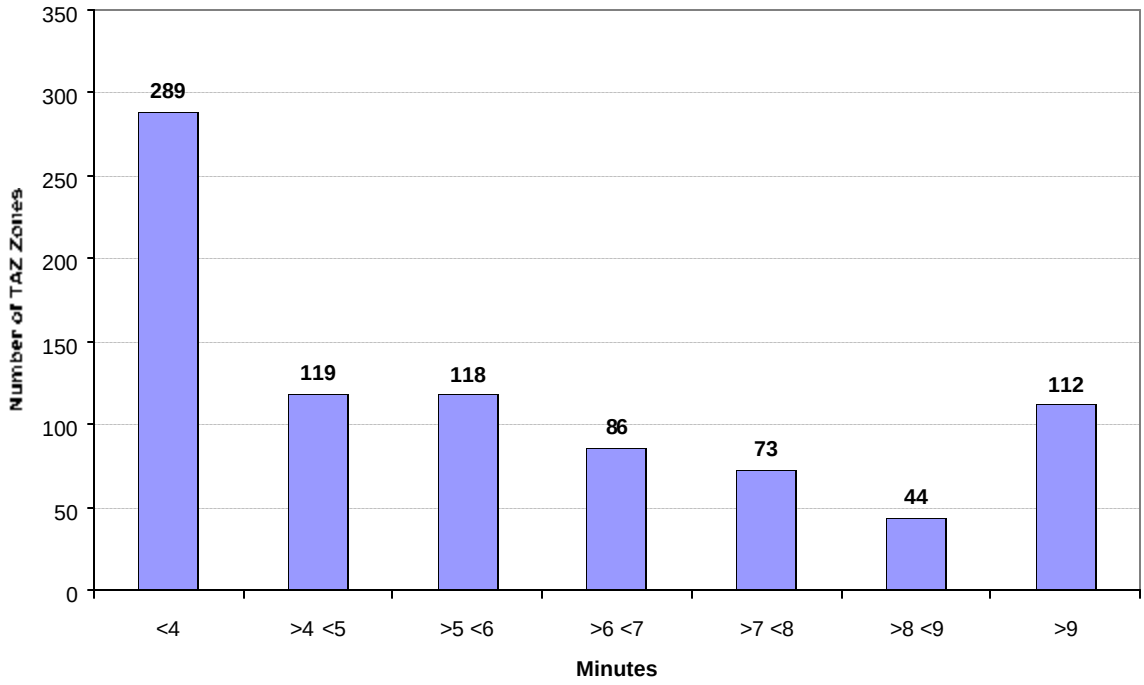


Figure 19: Distribution of TAZs by Their 90th Percentile Fire Incident Response Times (excluding call-processing)



The complement dispatched to a fire in Jacksonville varies with the type of occupancy or hazard, as is standard practice. The complements by level of hazard are shown in Table 16.

Table 16: Standard Response Complements

Level of Hazard	Complement Sent on First Alarm	Minimum Staffing
Light Hazard (e.g. single family dwelling)	2E + 1L + 1R +1C+ 1T (if needed)	12 -14
Medium Hazard (e.g. Residential duplex)	3E + 2L + 1R +2C + 1T (if needed)	18-20
High Hazard (e.g. high rise)	4E + 2L + 1R+ 2C +2T (if needed) + Special Ops + Hazmat (for industrial or if needed)	25-29

E=Engine L=Ladder or Squad R=Rescue C=Chief T=Tanker

The variation in minimum staffing comes from whether 4-person ladder trucks or 3-person squad units are sent as the "ladder" units, and whether a tanker unit is sent. Tankers are sent when the fire is in an area without hydrants. A hazmat unit may be added if there are known or suspected hazardous materials. A rapid intervention team (RIT) unit is now routinely sent in addition to the other units for every working fire, to safeguard the firefighters, but should not be counted in the response complement.

The *NFPA Fire Protection Handbook*, 18th ed., Table 10-2A, "Typical Initial Attack Response Capability Assuming Interior Attack and Operations Response Capability," makes recommendations for the first-due number of firefighters arriving on the scene of a fire depending upon the type of occupancy (low-, medium-, and high-hazard occupancy). While the NFPA recommends 4-person staffing of major fire units, the guidelines for the total staff of the first due complement may be met with different numbers of units. The NFPA staffing recommendations by the type of hazard are as follows:

High-Hazard Occupancies (e.g. schools, hospitals, nursing homes, explosive plants, Refineries, high-rise buildings, and other high-risk or large fire potential occupancies):

> At least four pumpers, two ladder trucks (or combination apparatus with equivalent capabilities), two chief officers, and other specialized apparatus as may be needed to cope with the combustible involved; not fewer than 24 firefighters and two chief officers. *[26 in total]*

Medium-Hazard Occupancies (e.g. apartments, offices, mercantile and industrial occupancies not normally requiring extensive rescue or firefighting forces):

> *At least three pumpers, one ladder truck (or combination apparatus with equivalent capabilities), one chief officer, and other specialized apparatus as may be needed or available; not fewer than 16 firefighters and one chief officer. [17]*

Low-Hazard Occupancies (e.g. one-, two-, or three-family dwellings and scattered small businesses and industrial occupancies):

> *At least two pumpers, one ladder truck (or combination apparatus with equivalent capabilities), one chief officer, and other specialized apparatus as may be needed or available; not fewer than 12 firefighters and one chief officer. [13]*

Generally, JFRD meets or exceeds the guidelines both in terms of vehicles and personnel. The NFPA guidelines were formulated before RITs became standard practice

and do not include provision for them. In an emergency, the RIT unit could be used to pitch in and another unit or second alarm sent.

The current Jacksonville policy on response complements is satisfactory. Response times for arrival of the full complement were not available, but we did consider the response times of the first ladder truck, perhaps the second most important element of the response after the first arriving unit, which is usually an engine or rescue.

Staffing of Units

The JFRD staffs its units as follows:

- Engine – 3
- Ladder – 4
- Squad – 3
- Rescue – 2 (firefighter/EMT and firefighter/paramedic, or two paramedics)
- Chief – 1 (no aide)
- Tanker – 1
- Hazmat – 4 (3 on engine + 1 on specialty unit)
- Special Operations (rescue) – 4 (3 on engine + 1 on specialty unit)

Like many fire departments nationwide, JFRD staffs its engines with three personnel, consisting of an officer, driver, and firefighter. The engine staffing levels are similar to those used by many Metro departments but lower than the 4-5 used by some of the larger and some of the older Metro departments. The fact that the JFRD has been successfully mitigating incidents to the degree it has is testimony to the caliber of individuals employed by the Department, their high level of dedication and training, and the number and types of fires typically faced.

Ladders are staffed with four, but the squads, which are expected to perform basically the same function as the ladder units, have only three personnel.

The staffing levels are not in total conformance with the NFPA guidelines and standards. NFPA's Standard 1500, *Fire Department Occupational Safety and Health Program,* says that "… a minimum acceptable fire company staffing level should be four members responding or arriving with each engine and each ladder company responding to any type of fire." The proposed draft of NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression, Emergency Medical Operations, and*

Special Operations to the Public by Career Fire Departments, also suggests that fire suppression units be staffed with a minimum of four personnel. It further states, "In jurisdictions where tactical hazards and high-hazard occupancies are defined, these companies shall be staffed with a minimum of five or six on-duty personnel." Proposed Standard 1710 is scheduled to be voted on by the NFPA membership in Spring 2001.

The NFPA standards and guidelines are recommendations developed by committees. They are not legally binding, and, for staffing levels, not adequately supported with data. It is, however, important to at least consider the NFPA standards, whether or not they are adopted locally, because they have become a benchmark for the industry. When litigation is considered related to suppression operations, lawyers often turn to the applicable standard of care in determining their course of action. It is up to decision-makers in political jurisdictions to determine levels of acceptable risk and the degree of liability exposure they will tolerate.

While there is no reliable statistical data we are aware of on the cost-benefit of four-person staffing vs. three-person staffing, it is demonstrable that four-person staffing of engines and squads is more efficient and effective on the fireground than three-person staffing for non-trivial fires. One four-person unit can do as much work as two three-person units in many situations because it can be split into two two-person teams, whereas a three-person unit should not be divided for safety reasons.

Another reason to consider four-person staffing on units is the "Two-In/Two-Out" rule of the Occupational Safety and Health Administration (OSHA). It requires that at least four firefighters be present to start interior fire operations unless there is a confirmed life hazard in the burning structure. Interior operations are not supposed to start until a two-person rescue team is available outside of the structure to go to the aid of the two firefighters inside. Having four personnel on the first arriving unit makes it possible to start interior operations immediately upon arrival of the first unit; a three-person unit has to wait for a second unit to arrive. [28] Fires tend to grow in size exponentially with time. The longer you wait, the larger the fire, and the more resources needed to control it.

[28] The JFRD, like many other departments nationwide, will use the pump operator as part of the "two-out" crew. This scenario is not ideal and should be avoided when possible; the pump should be monitored constantly, and the two standby rescue crews preferably should not have a major duty other than standby.

The staffing per unit also affects the rapidity with which a given size force can be assembled, but the more important criterion is how fast the total team can be assembled regardless of the number of vehicles they ride on.

Jacksonville has the same dilemma as other large-area Metro fire departments: whether to have a larger number of three-person units or a smaller number of four-person units for a given budget. If affordable, it would of course be preferable to staff all units with four firefighters. The decision varies with the risks to be covered, the desired response times in the outlying areas, and considerations of firefighter safety. Our recommendations attempt to reflect that combination of concerns.

Ladder and Squad Staffing – The ladder and squad specialty units have many simultaneous functions to perform that are labor intensive. A four-person unit can be divided into two two-person teams to do search and rescue, ventilation, and other tasks. A three-person specialty unit can only do one function at a time. Sometimes it can be teamed with a two-person rescue unit to form a five-person ladder task force, but one cannot count on the rescue being present.

Not having four-person squads reportedly has reduced fireground effectiveness in Jacksonville. The three-person squads have not been able to do as much timely ventilation as is desirable and feasible with four-person squads. Not being able to quickly ladder a home and get someone onto the roof to ventilate it often leads to greater smoke damage. That has been observed to happen, according to the Division Chief of Operations. As the numbers of multi-unit residences and multi-story buildings increase, there will be a correspondingly increasing need for more adequate ladder operations and faster ladder response. This means not only increasing the squads to four people, but also increasing the number of ladder companies or squads citywide, as will be discussed later.

Recommendation: Staff all ladders and squads with a crew of four. JFRD has proposed the conversion of two of the four squads to four-person ladder units. (Squads currently have three.) Regardless, all squads should have four if expected to perform as ladder units.

Engine Staffing – It would be desirable to staff all engines with four people. However, if it is not economically feasible to staff all engines with a crew of four, then priority should be given to any three-person engines that stand alone in their stations, are based far from other units (over 3 minutes drive time), and have a non-trivial number of structure fires (at least 1 to 2 per month) that are not out on arrival. These units may have

to function on their own when first arriving at a fire, and cannot start interior fire operations until a second unit arrives. Having a crew of four would allow them to enter the fire building immediately. Having four is critical if they have a significant fire call volume or if they have high risks to protect.

Recommendation: Any stand-alone engine companies more than three minutes away from the next closest unit and with non-trivial numbers of working structure fires should have four-person crews. Table 17 shows the annual numbers of structure fires for the three-person engine companies that are based by themselves. Engine 17 is the leading candidate for a fourth crewmember based on frequency of structure fires and its protection for a heavily industrial area. They average almost one structure fire per week. Engines 11, 12, and 14 average one to two structure fires per month; the rest average less than that.

Table 17: Structure Fires Per Year (for 3-Person Isolated Engine Companies)

Station #	2000 YTD (11 months)	1999	1998	1997
11	13	27	21	17
12	12	13	24	24
14	12	15	10	17
17	36	47	52	31
37	7	5	8	10
40	2	1	5	9
43	13	3	4	4
45	4	5	1	1
47	0	2	0	1
48	4	5	4	6
53	8	16	12	7
54	9	8	7	7
56	6	1	0	0

Recommendation: In the long run, increase the number of stations with at least four personnel, preferably to 100 percent. A station with four might also have a non-staffed rescue unit, so they could handle two simultaneous rescue calls (two going out on the rescue call and two on the engine for a second rescue call).

Overall, given the vast space to cover, the use of three-person units seems appropriate to improve response times in Jacksonville but only when co-located with another unit or in an area with low demand and low risk.

Tanker Staffing – Of the 11 tanker units in the fleet, their usage ranged from 200 to 900 runs per year. They have one person assigned and usually run with an engine

company with whom they are co-loaded. They are necessary for the areas without hydrants. Tanker 40 had a disproportionately low number of runs in year 2000 (24 through November) but is on the edge of a large rural area.

Special Operations

The JFRD is prepared to undertake a wide variety of special operations, including mitigation of hazardous materials incidents, high-angle rescue, water rescue, and confined space rescue. Generally, the Special Operations area seems to be going well.[29]

Hazmat and Heavy Rescue – When the hazmat or Special Operations (heavy rescue) units are dispatched, they usually respond with an engine and a specialized vehicle. Four people are assigned to these specialty companies vs. three to the ordinary engine companies. One of the four people is assigned to drive the specialty support vehicle. These companies also have first-due areas as ordinary companies, which is good use of the resources when their special operations workload is light (about 300 to 400 hazmat runs and 100 to 130 runs for the special rescue in 1999-2000).

The JFRD is considering placement of its heavy rescue and hazmat units in stations where there would be a ladder unit and rescue unit along with the specialized units. The co-located units and rescue personnel would all be trained in the specialty. This would create a larger team that can handle larger incidents or multiple small incidents simultaneously. (For example, several pairs of personnel could suit up in hazmat suits instead of one or two.) We strongly concur with this plan and recommend that it proceed.

Because the City is so large, the response times for hazmat and technical rescue units may be extremely long, as much as half an hour or more. While in many situations the first-due engine and ladder companies will have at least basic knowledge of how to handle hazmat and rescue incidents, the wait still could be unacceptable. Therefore, JFRD needs to monitor the number and geographic distribution of hazmat and rescue incidents, by type. Figure 20 shows the location of special operations incidents in 2000. Most are handled by E13. The data for 1999 was very similar. The current location of the unit is excellent, in the center of the mass of special operations incidents. (There may

[29] Jargon: Nationally, the term "special operations" usually includes hazmat and heavy rescue calls. In Jacksonville, it usually does not include hazmat.

be some bias to label responses of E13 as special operations, and not to label as special operations those they do not attend, but even so it is in a good location.)[30]

Figure 21 shows the location of hazardous materials incidents in 2000. Most were handled by E7. Again, the choice of location for the unit appears to be excellent. There is no compelling reason to have a second location for hazmat or special operations units at this time, nor to relocate them. It may be necessary to establish additional specialty units to improve response times, as well as increase the size of incident that can be handled and the ability to handle simultaneous incidents.

This approach to hazmat and special operations seems sensible and appears to be working well. We have no additional recommendations.

Wildland Fires – The JFRD gets called upon to participate in statewide wild land firefighting, as well as fighting brush and some wildland fires within its boundaries.

A small fleet of 6 brush trucks is deployed in stations that also have an engine and tanker or an engine/tanker (engine with a large water tank). Together they made about 3000 runs in 2000. W32 was busiest with close to 900 runs, or 2 to 3 per day

[30] Some question was raised as to the completeness and accuracy of the calls labeled as "special operations" and hazmat. We are not sure of the total counts nor of the ability of the GIS system to code each incident address. Again, the accuracy of data needs to be given more attention if there is to be confidence in making decisions on it.

Figure 20: Special Operations Incidents in 2000

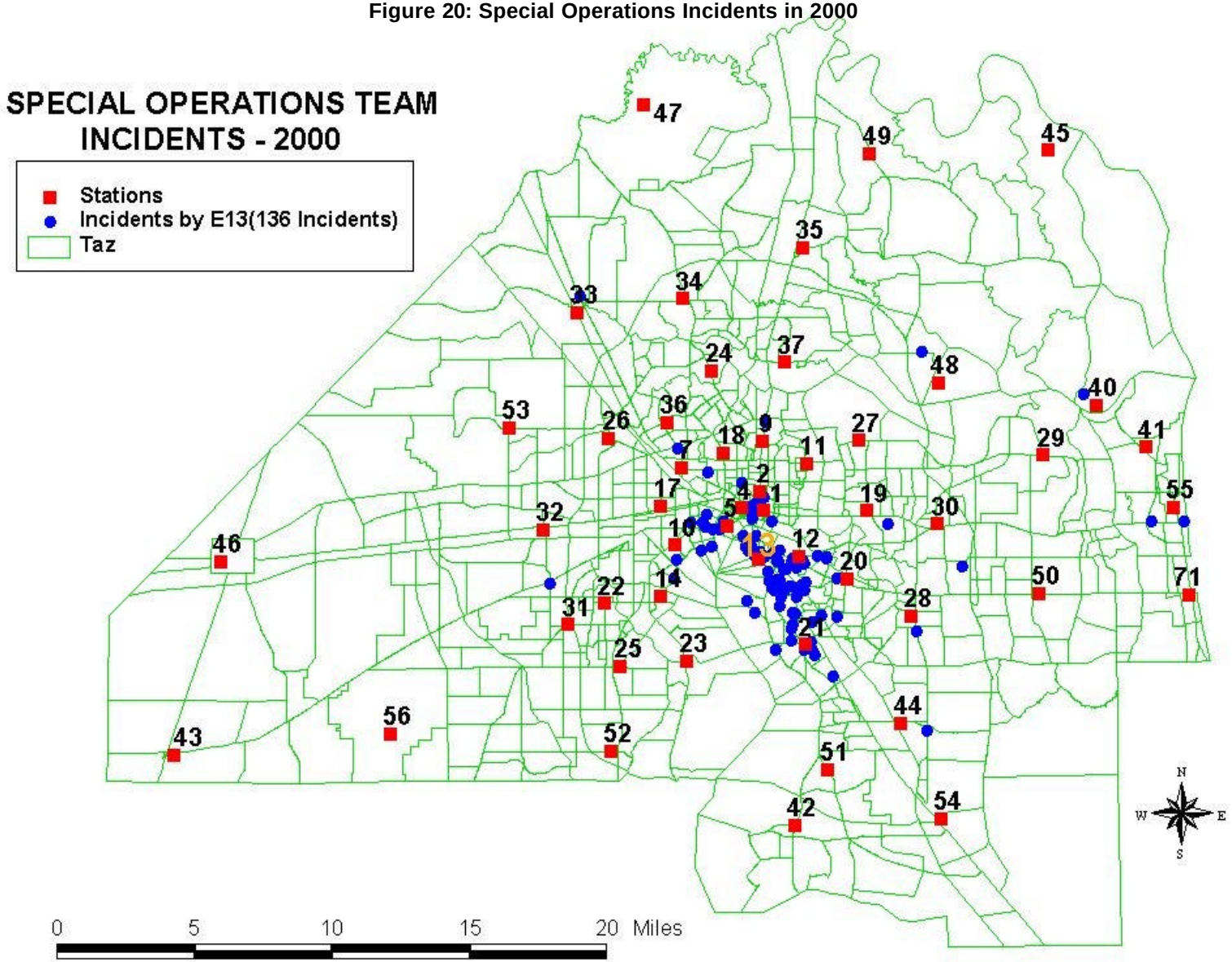
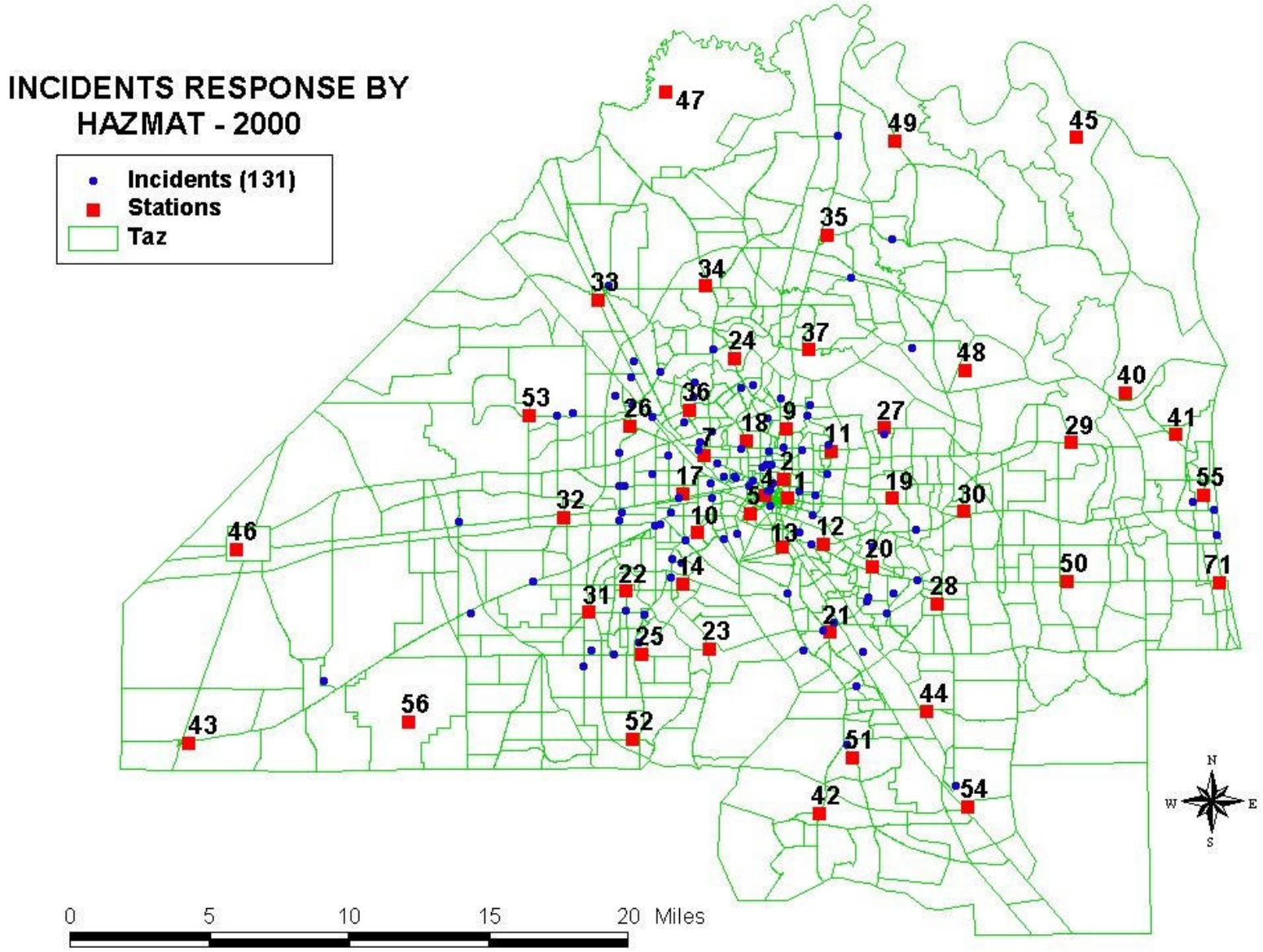


Figure 21: Hazmat Incidents in 2000



An engineer is assigned to the brush trucks. For the everyday calls that are not brush fires, the engineer serves as a third person on the engine company (four in total go to the fire, one on the tanker). We had no recommendations on them.

The JFRD adds some staffing during periods of high wildfire hazard. The brush truck, usually cross-staffed, gets a dedicated person during this period. It also maintains a close relationship with the State Division of Forestry.

This approach to wildland fires also is sensible.

Port-related Fires – Fires on the water or accessible from the water are fought with one or both marine units, Marine 1 and Marine 3. The larger marine unit, Marine 1, is a 65-foot fireboat with 6,000 gallons per minute pumping capacity. It carries a three-person crew. It also has a smaller boat, designated Marine 2, for rescues and other tasks when the large boat is not needed. The second boat carries a two-person crew and is primarily used for rescues or dealing with fires on small pleasure craft. Marine 1 and 2 had only 23 runs in year 2000. Marine 3 had 82. Although lightly used, they are essential for port safety and for helping to market Jacksonville as a safe place for large ships and pleasure boats.

A subspecialty of special operations that may involve all of the Special Operations units is fighting a ship fire. Jacksonville is a major port and large numbers of commercial vessels as well as a large fleet of pleasure vessels constantly using the harbor. The city is also trying to get cruise ships to dock more regularly.

Overall, the current deployment of units and plans for addressing fires on docked ships seems adequate protection for the seaport. E48 is stationed within the Blount Island shipping terminal within the gates, a major docking area for container vessels. E11 is stationed at the entrance to the Talleyrand shipping terminal. Those would just be the first-due units; others would be arriving to fill the alarm assignment; the full response to a cruise ship fire would be similar to that of a major hotel fire: four engines, two ladders, two chiefs, a hazmat unit, Special Operations, and probably a heavy squad and two or three rescues. A docked container ship fire would receive only slightly less: three engines, two ladders, two chiefs, Special Operations, hazmat, and two rescues. Ship fires would also receive both marine boats.

Virtually every commercial ship and certainly every Navy ship trains its crews to fight fires. The on-board crews are the first line of defense, especially for any small fires. But the City has to back them up for anything significant. Ships often have hazardous materials and may also need the JFRD's heavy rescue capability for accidents on or within the structure of a ship.

Stationing additional units within the Port Authority does not seem cost effective for the JFRD in light of other needs. Ship fires have been few and far between, especially major ones. If not immediately contained by the first unit, they are likely to require a major operation. However, as with major structure fires, faster is better for ship fires. If the Port Authority wanted to increase its "insurance policy" against ship fires or port fires, it could fund an additional position on the existing front-line engines or, better yet, fund additional units. But it does not seem cost effective for the JFRD to add these units on its own.

While the risk of a ship fire is continuous, a special additional concern stemming from Jacksonville's having won the bid to host the 2005 Super Bowl will be the docking of ships to be used as hotels during that event. Discussions have been held about stationing an engine and a rescue unit near cruise ships during the Super Bowl. We concur that this would be a good safety practice, as there is likely to be a significant number of people who will be out for a good time and not be familiar with the City or the ships. There also is likely to be considerable alcohol consumption. A fire and life safety watch should be mounted.

An interesting sidelight on preparing for shipboard fires is that many of the ships that come to Jacksonville have foreign crews who may not speak English. There is a maritime requirement for having at least one person on board who speaks English, and it usually is an officer. But if that person is incapacitated or not present, there could be a language problem in communicating to the Fire Department exactly what the problem is.

In the early '90s, the Department developed a 10-part video training course on marine fires. The tapes cleverly assisted the land crews in thinking about ship fires by making analogies to hotel fires (cruise ships), warehouse fires (container ships), and some others. All operations units were given the training at that time. However, the training has not been repeated. With the continuing turnover in the Department, and the increased

amount of ship traffic and potential for cruise ships, it is time to update training and planning for ship fires.

Recommendation: Update training of the Department on ship fires. This can be done using the video series on shipboard fires, or something equivalent. This might be updated or given some introductory remarks, since it was produced over six years ago.

International Airport – The Jacksonville International Airport has its own airport fire department, which is run by the Port Authority. JIA has 7 firefighters on duty at a minimum, including a structural engine with a crew of 3 to 4. They respond off-airport on request. The JIA firefighters earn less than the City firefighters. The on-airport fire service is primarily intended for aircraft-related emergencies. Structural incidents, including at the terminal, are the prime responsibility of the JFRD. So far as we know, there have not been any particular problems there, and it is in compliance with FAA regulations.

There are some real advantages for incorporating the airport's fire department into the JFRD. The complement of firefighters at the airport would continue to be the nucleus of protection there, but consolidation would provide immediate automatic aid rather than require a request for mutual aid and would provide better coverage of the area around the airport grounds by the airport. It would also provide better coordination of disaster and terrorist threats. JFRD already covers the three other airports and any crashes that occur off the airport grounds. Since an aircraft may come down virtually anywhere in the area, not just on an airfield proper, the full Department's resources come into play in protection for all of the airports.

The only disadvantage in consolidating the airport department with JFRD is the limited specialization of JFRD firefighters and management in ARFF, as well as the need to raise the salaries of the airport firefighters. But there would be some economies of scale for logistical support, and better integrated protection of JIA. All airport firefighters must be specialists in ARFF, and there would be a learning curve for them and the Department in each other's duties. Moving firefighters between the JFRD and airport would mean re-training and could not be done casually but would help keep personnel fresh and not on a career dead-end. That is not much different from the cross-training issues involved in Special Operations.

Many Metro cities such as Chicago, Philadelphia, and Boston and counties such as Palm Beach County have integrated airport fire departments into the city's fire department. There would be little or no cost-savings but better integration.

A growing major function of airport fire departments is to safeguard the flying public with prompt EMS care and hazmat response. An integrated fire department would better train and serve in these capacities and ensure smooth interface and planning with the surrounding EMS units. JFRD already has prime responsibility for EMS calls at the airport.

Recommendation: Consider consolidation of the Jacksonville International Airport fire department with the JFRD. Other than self-pride and local autonomy, there really is no good technical, cost, or firematic reasons to have many small departments serving a city.

Small Airports – The two small, private plane airports are Craig Field and Herlong Airports. A third airport, Cecil Field, is used primarily for ferrying planes in and out that are going to be serviced near that field. Craig and Herlong airports are used primarily for small private planes and charter services. Neither has permanent firefighting crews, nor do they require them.

Engine 56 is stationed at Cecil Field. It would respond to any problem with facilities or aircraft. When there is known to be air operations scheduled, up to six firefighters who specialize in air crash rescue are brought into service with up to five ARFF crash units. They may be stationed at the airport for ten hours or some other time period. Engine 56 provides immediate backup to them and protection to the airport when the ARFF unit is not staffed.

Herlong airfield does not have a crash truck. JFRD fire units respond to any emergency at the airfield. Craig Field has a single combined Agent vehicle AARF vehicle staffed 12 hours a day, Monday through Friday.

The air traffic level and the nature of threat at the small airports is not enough to warrant dedicated ARFF units at either station or adding any more specialty units to the Department at this time. If either airport gets busier, that position may need to be re-evaluated.

Inter-Jurisdictional Comparisons

The City of Jacksonville shares the challenges of maintaining excellent services while handling community growth with many communities around the country. While inter-jurisdictional comparisons are fraught with dangers of incomparable data, definitions, and different circumstances, they still are interesting to consider (and required by the scope here). Such benchmarking is useful as an input to planning purposes but does not indicate the quality of the services provided by the members of the JFRD, and must, therefore, be taken with the proverbial grain of salt. The comparisons are useful for identifying pertinent questions to explore to understand reasons for the differences.

We researched several communities within the state of Florida and others around the country meriting comparison because of their similarity in population size, geographical proximity, and/or method of delivery of services. Some of the key comparisons are discussed below.[31]

Several of the counties in Florida, which we used as comparisons, respond to calls for service in the unincorporated areas of their county and to contracted communities and render assistance (mutual aid) to surrounding communities.

Fire Station Coverage – Two rough indicators of station workload are the square miles protected per fire station and the number of citizens protected per station. In an urban setting with a high population density, stations will be located more closely than in rural and suburban areas, and thus will protect fewer square miles but possibly more people. The average population protected per station, therefore, is partly an indicator of population density and partly an indirect measure of the level of service, since the number of stations in a given area is related to response times.

Table 18 shows station coverage comparisons. The City of Jacksonville has fewer miles protected per station than several other high population large Florida counties but more than dense metro areas with similar populations.

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[31] Sources of the comparative data included *Fire Engineering's* Directory of Municipal Fire Departments, direct contact with the departments, department web pages, and The Municipal Yearbook 2000 published by the International City/County Management Association.

Table 18: Square Mileage Per Station

City	Population Served	Land Area (Square Miles)	# Of Stations	Sq. Mi per/Station
Miami-Dade County, FL	1,900,000	1924	43	44.74
Orange County, FL	540,706	830	31	26.77
Hillsborough County, FL	600,000	931	36	25.86
Palm Beach County, FL	561,409	583	33	17.67
Jacksonville, FL	**754,048**	**840**	**50***	**16.8**
Montgomery County, MD	835,476	495	33	15.00
Fairfax County, VA	931,452	399	34	11.74
Dallas, TX	1,075,894	380	55	6.91
Tampa, FL	296,720	125	21	5.95
Seattle, WA	539,700	91	34	2.68
Arlington County, VA	265,800	25.8	10	2.58
AVERAGE	***754,655***	***602***	***34***	***16.0***

* Jacksonville has 48 regular stations, plus two fireboat stations, a rescue-only station, and Baldwin Station, which has no staff, only a vehicle. We use 50 here, including Baldwin and the rescue-only station.

Table 19 shows population served per station. Jacksonville's 14,500 population protected per station is below the average for the comparison group. The main reason is the lower population density per square mile in the area served.

Table 19: Population Served Per Station

City	Population Served	Land Area (Square Miles)	# Of Stations	Pop/Station
Miami-Dade County, FL	1,900,000	1924	43	44,186
Fairfax County, VA	931,452	399	34	27,396
Arlington County, VA	265,800	25.8	10	26,580
Montgomery County, MD	835,476	495	33	25,317
Dallas, TX	1,075,894	380	55	19,562
Orange County, FL	540,706	830	31	17,442
Palm Beach County, FL	561,409	583	33	17,012
Hillsborough County, FL	600,000	931	36	16,667
Seattle, WA	539,700	91	34	15,874
Jacksonville, FL	**754,048**	**840**	**50**	**15,080**
Tampa, FL	296,720	125	21	14,130
AVERAGE	***754,655***	***602***	***34***	***21,714***

Fire Apparatus – Table 20 shows a comparison of the fire suppression apparatus among the selected jurisdictions. Included in this analysis is the Engine to Truck ratio and the number of Engines per 1,000 people within the jurisdictions. Jacksonville has 5.9 to 6.7 engines per truck, depending on whether the quint is counted as a truck. This is above the group average of 4. However, Jacksonville has four "squads" that are used like ladder companies; with them counted, the engine/ladder ratio would be about average. JFRD has 0.06 engines per 1,000 people, which is slightly above the comparison group average of 0.04. Overall, JFRD is in the range of its peer departments in numbers of vehicles. Apparatus placement and quantity, however, cannot be based purely on this type of comparative analysis. One must consider the nature of JFRD's fire risk, accessibility, composition of the City's infrastructure, and response times. The more spread out a community, the more firefighters and dollars it takes to achieve the same response time.

Table 20: Fire Suppression Apparatus Comparison

City	Population Served	# Engines	# Trucks	E/T Ratio	Engines/ 1,000 Pop.
Palm Beach County, FL	561,409	23	0(2)*	11.5*	.04
Orange County, FL	540,706	32	3	10.7	.06
Hillsborough County, FL	600,000	42	6	7.0	.07
Jacksonville, FL	**754,048**	**47**	**7(1)****	**5.9 - 6.7**	**.06**
Tampa, FL	296,720	19	4	4.8	.06
Miami-Dade County, FL	1,900,000	31	7	4.4	.02
Seattle, WA	539,700	33	11	3.0	.06
Fairfax County, VA	931,452	34	12	2.8	.04
Arlington County, VA	265,800	8	3	2.7	.03
Dallas, TX	1,075,894	54	21	2.6	.05
Montgomery County, MD	835,476	31	14	2.2	.04
AVERAGE	***754,655***	***32***	***8***	***4***	***.04***

Note: Numbers in parentheses are the number of quints, in addition to the number of ladders shown.
* Engine/Quint Ratio; Palm Beach has two quints and no pure ladders.
** Jacksonville has one quint. The E/T ratio is therefore shown as a range. The quint is used as a truck except when first due in its own area.

Staffing – Table 21 shows the different levels of staffing per 1,000 population in the cities in the comparison group. Jacksonville, with 1.32 firefighters per 1,000 population, is in the middle of the group.

Table 21: Staffing per 1,000 Population

City	Population Served	Total Employees	Uniformed Personnel	Uniformed Personnel/ 1,000 Pop.
Seattle, WA	539,700	1,063	998	1.85
Tampa, FL	296,720	586	528	1.78
Dallas, TX	1,075,894	1,923	1,638	1.52
Palm Beach County, FL	561,409	949	830/100vols	1.48
Orange County, FL	540,706	807	757	1.40
Jacksonville, FL	**754,048**	**1,076**	**996/45 vols**	**1.32**
Fairfax County, VA	931,452	1,316	1139/384 vols	1.22
Montgomery County, MD	835,476	2,715	916/1800 vols	1.10
Hillsborough County, FL	600,000	645	598/200vols	1.00
Arlington County, VA	265,800	268	255	0.96
Miami-Dade County, FL	1,900,000	1,730	1,478	0.78
AVERAGE	***754,655***	***1,184***	***929***	***1.30***

Calls per Capita – Table 22 shows the calls per 1,000 population for the departments compared. Calls per 1,000 population are an important measure of relative demand, and Jacksonville is about average. EMS calls per 1,000 population are above average, while fire calls per 1,000 population are below average.

Table 22: Calls per 1,000 Population

City	Population Served	Total Incidents	Fire Calls per 1,000 pop.	EMS Calls per 1,000 pop.	Calls per 1,000 pop.
Tampa, FL	296,720	58,849	86	112	198
Palm Beach County, FL	561,409	74,066	35	96	132
Seattle, WA	539,700	70,822	30	102	131
Jacksonville, FL	**754,048**	**83,682**	**25**	**86**	**111**
Montgomery County, MD	835,476	87,807	42	63	105
Hillsborough County, FL	600,000	60,625	29	72	101
Miami-Dade County, FL	1,900,000	170,371	21	69	90
Arlington County, VA	265,800	23,021	30	56	87
Fairfax County, VA	931,452	77,699	27	57	83
AVERAGE	***742,734***	***78,549***	***36***	***79***	***115***

Mix of Calls – Table 23 shows comparisons of the relative mix of calls. EMS calls constitute a large percentage of the calls in virtually all fire departments, but the percentage in Jacksonville is even higher than the average, over 77 percent. That is both because EMS calls per capita are above average and fire calls are below average.

Table 23: Mix of Calls

City	Total Incidents*	Fire	EMS	Percent Fire	Percent EMS
Seattle, WA	70,822	16,044	54,778	23%	77%
Jacksonville, FL	**83,682**	**14,519**	**64,575**	**17%**	**77%**
Miami-Dade County, FL	170,371	7,661	130,634	4%	77%
Palm Beach County, FL	74,066	19,903	54,163	27%	73%
Hillsborough County, FL	60,625	5,135	43,230	8%	71%
Fairfax County, VA	77,699	20,763	52,794	27%	68%
Arlington County, VA	23,021	7,066	15,002	31%	65%
Montgomery County, MD	87,807	2,583	52,907	3%	60%
Tampa, FL	58,849	11,608	33,302	20%	57%
AVERAGE	***78,549***	***11,698***	***55,709***	***18%***	***70%***

*Total Incidents includes not only Fire and EMS, but also false alarms (no patient or incident found), patients refusing treatment, patients refusing transport, non-emergency calls, and other calls that do not fit the Fire and EMS category.

There are proven public education programs designed to slow the growth or even diminish EMS call volume. The more successful efforts have combined public education with well-coordinated alternatives to EMS.

Cost per Capita – For public managers, a measure of the relative cost efficiency of a fire department is the cost per capita of fire protection. This should be considered relative to the level and quality of service, though it is difficult to make meaningful comparisons of quality. Jacksonville ranks seventh out of 11 in the comparison group, with $102 being spend per person on fire protection and emergency medical services.

Table 24 shows the average cost per capita of all the other jurisdictions in the comparison group is $114. Jacksonville's population is paying proportionately less for its protection than Palm Beach County and many cities with higher density.

Table 24: Cost Per Capita

City	Population Served	Operating Budget	Cost/Per Capita
Palm Beach County, FL	561,409	105,000,000	187
Seattle, WA	539,700	81,408,000	151
Tampa, FL	296,720	37,284,762	126
Dallas, TX	1,075,894	133,105,377	124
Orange County, FL	540,706	61,615,905	114
Montgomery County, MD	835,476	91,739,360	110
Jacksonville, FL	**754,048**	**76,600,000**	**102**
Miami-Dade County, FL	1,900,000	186,000,000	98
Fairfax County, VA	931,452	78,804,735	85
Hillsborough County, FL	600,000	49,300,000	82
Arlington County, VA	265,800	20,856,000	78
AVERAGE	***754,65***	***83,792,194***	***114***

Other Issues

Service Levels in the Beach Cities – The Jacksonville Fire and Rescue Department provides service to two of the three beach communities that lie along its Atlantic coast. Atlantic Beach and Neptune Beach are served by Station 55 in Atlantic Beach, which is operated by the JFRD under contract with Atlantic Beach and provides mutual aid to Neptune Beach. Neptune Beach has its own station and apparatus, but no staffing. Neptune Beach pays Atlantic Beach for the mutual aid. Jacksonville Beach has a single station operated by its own Fire Department.

As part of this study, we were asked to evaluate the adequacy of fire and rescue resources in these communities, as well as comment on the desirability of consolidating services with the JFRD. For the most part, the beach communities are narrow and cover relatively small areas, which allows adequate response times from one station under most circumstances. As was mentioned in discussing the airport fire department, there is no good technical reason for not consolidating all of these small departments into one, other than local pride. Consolidation is a more cost-effective and fairer way to provide service to a region than having many small departments that have to call on mutual aid any time there is a non-trivial incident.

The Intracoastal Waterway (ICW) defines the western boundary of each of these cities. Because land immediately adjacent to the waterway may be undevelopable and because there are limited crossings from the mainland to the beach areas, these communities are somewhat isolated from the rest of the City of Jacksonville and its fire and rescue resources. That isolation is a good reason for stationing some units along the beaches.

When incidents such as structure fires occur, multiple stations must respond. None of the communities has sufficient resources to handle a structure fire without outside assistance. On the peninsula, the cities receive assistance from the Mayport Naval Base and JFRD Stations 29, 41, and 50. All the JFRD resources are available to assist, but these four stations are the closest.

Response times to assemble a full complement of apparatus for a fire in the beach communities can be excessive in the event that one of the existing stations is on another response. While this is not a frequent occurrence, it will become more frequent as each of the stations responds to more incidents in the future.

There are several new stations being recommended in this report (next chapter) that will greatly improve the ability to assemble a full complement of resources in a timely fashion in the beach communities. The construction of new stations at Atlantic and Hodges Rd and J. Turner Butler Blvd. and Hodges Rd. would contribute in two ways. First, they will be a closer source of assistance for incidents in these communities. Second, they will reduce the number of times that the Beach communities will need to send resources across the ICW to respond to incidents. The timing of these new stations varies with the forecast, but the first of the facilities is called for by 2003 in each scenario.

The proposed new stations will improve the availability of stations serving the beach communities and reduce the reliance of the JFRD on the resources stationed in Neptune, Atlantic, and Jacksonville Beaches.

Jacksonville Beach is unique in providing its own fire and rescue services. It has a population of about 21,000 people. We understand that “pride of ownership” and control that comes with directly providing municipal services is a significant attraction for many communities. However, there are considerable operating efficiencies that could

be gained by consolidating fire and rescue services with the JFRD. There is a savings in administration, reduced overtime expenses based on a larger pool of personnel, the enhanced ability to balance staffing without resorting to overtime, and efficiencies in training and operations. There also can be move-ups to continue protection of the Beaches when any have a serious incident.

Recommendation: Consolidate all Beaches' fire departments into one regional JFRD department. This can be a win-win situation for the city government, employees, and citizens. It may not be politically feasible in the short run but should be a medium term regional goal. It will assure better service to the beaches and be fairer to Jacksonville's taxpayers.

Moving Station 5 – This is an old station on a very valuable piece of downtown property. The City is considering selling the property for use by a developer, but it is not clear whether historic preservation will require retaining this old station. The station's location is not ideal in that it only has a semi-circular first response area around it, because it backs up to the river. Generally, one wants to place stations so that the units can move out in every direction, to maximize the useful range of the unit in all directions. A potential new site for this station is at or near I-95 and I-10, west of where it presently is.

Service to Black Hammock Island and Other Remote Communities – Black Hammock Island is a community of about 300 people, many of whom live in doublewide manufactured homes. The Department placed a three-person paramedic engine unit in Station 45 to serve them. However, it is about 14 minutes from the next closest fire station, which was one of the former volunteer stations. There is a question here, as in other places in rural Jacksonville, as to whether the numbers of calls or people protected justify having a closer, new station. There are 60 to 80 calls per year from this community, really too low to justify a unit unless it also served other areas within a reasonable response time. In general, it is hard to justify opening a unit that has less than one call per day. But so long as citizens of Jacksonville are willing to pay for service, it is their prerogative.

Remote communities could improve their safety with a stringent smoke detector maintenance program, encouragement, if not mandating of, automatic sprinkler systems, and perhaps some strategically placed automatic defibrillators coupled with CPR classes. Note that the City could install sprinkler systems at $2,000 a piece in every home in

Black Hammock Island for the cost of one fire company for one year, and give it better protection.

Use of Volunteers – The requirements on volunteers in Jacksonville and nationally has continually increased toward requiring them to meet operational and safety standards of career firefighters. This has been a difficult and sometimes intolerable burden for many volunteers, which has been reducing their ranks nationally.

The size of the volunteer force has been decreasing in Jacksonville and seems likely to phase out eventually. It is cost-effective to retain the volunteers as long as possible so long as they can meet training and performance standards.

At present, only one station, E47, relies on volunteers for staffing, and that is only on weekends. Elsewhere volunteers have been used to support career units. This is a common practice that has been very effective in many counties, such as Fairfax County, VA. A volunteer can serve as the fourth person on an engine company when the city cannot afford or chooses not to spend funds on the fourth person positions. Encouraging volunteers to be the fourth person significantly improves the capability of the engine companies; the value of a four-person company was discussed earlier.

At E47, volunteers are required to stand duty shift at the station, which dramatically improves response time over having to respond from home. About 45 volunteers were said to be active in meeting physical exam and agility test requirements. They are required to spend at least eight hours a month on duty or training to be considered active.

Recommendation: Keep volunteers on as supplemental staffing so long as there is a minimum corps that meets the training and fitness standards. The volunteers need to meet most of the key training requirements, physical fitness, and safety standards of career firefighters.

Keeping Positions Filled – Jacksonville has a similar problem to that in many other cities – the ability to keep its fully authorized complement of firefighting positions filled. At the time this study began in Spring 2000, there were about 50 vacancies. With the lean staffing of the Fire Department, vacancies translate into higher amounts of overtime to maintain minimum staffing levels.

There are two approaches to reducing this problem. First is to accurately compute the staffing factor – the multiplier that expresses the number of firefighters needed to maintain each position in light of average number of hours off. A staffing factor needs to be computed, based on several recent years. If there usually are a number of vacancies occurring unexpectedly for early retirements and disability, then that should be included in the staffing factor computation.

The staffing factor is computed as follows, on a per firefighter basis:

$$\frac{\text{\# Of Days in Year}}{(\text{\# Of Days in Year} - \text{Average Days off} - \text{Average Days Disability Leave})}$$

A second solution to this problem is maintaining a pool of people who complete training through recruit school but do not start working until a position opens up. They are guaranteed a job but may have to wait several months to start. Most people who apply to be a firefighter will already have a job and be willing to wait for the opportunity of a lifetime. There is a small risk that other departments will hire them first.

Recommendation: Establish a pool of trained recruits from which to draw to fill vacancies. Train several more than the number of openings in each class and feed them into the department as vacancies open unexpectedly because of sudden retirements or disabilities.

Residential Sprinkler and Smoke Detection Program – Although the scope of this study did not include prevention, a major issue in public fire safety is the degree to which citizens take care of themselves versus depending on the public sector. Homes and businesses that are fully sprinklered assure themselves of much greater fire safety than can be afforded to them through municipal fire protection. They essentially have instantaneous response time for getting water on a fire.

Especially for a city the geographic size of Jacksonville, with large spacing between fire stations, it is highly desirable to get zoning that requires sprinklering of isolated residential developments rather than adding additional nearby fire stations. There would still be a need for dual-role, cross-trained firefighters to provide emergency medical service, for which there is no analogy to a sprinkler system. But that is easier and less expensive than adding whole fire stations with large apparatus. Sprinklering is

especially important though still rarely used by people living in the outlying areas of the city, where fire department response times are higher.

Recommendation: Require all new construction to be sprinklered, if acceptable to the citizens. If not, reduce the area (square foot) threshold for required sprinklering as far as possible. At a minimum, require all new homeowners to be given information about the desirability and cost of sprinklering new homes before plans for them are accepted. This is especially important to people living in the areas of the cities with higher than desired fire response times.

Smoke detectors, too, can make an enormous difference in fire safety through early detection. The only problem is their lack of being maintained. The City has an ordinance requiring hard-wired detectors in new homes. Earlier detection can make a bigger difference than faster fire response because there is a larger variation in the times to detect a fire than there is in the potential times to respond. Fires may go undetected for 10, 15, or even 30 minutes, especially smoldering fires. Line companies inspect homes upon request, and also will install a free smoke detector, under the Mayor's Home Fire Safety Program, in place since 1991.

V. DEPLOYMENT ALTERNATIVES FOR THE FUTURE

The previous chapter focused on description and evaluation of the current services. This chapter focuses on alternatives for the future, especially the addition of stations and units to meet the growing population and its growing demand for emergency services.

JFRD Station Plans

The JFRD is faced with the triple station planning problem of:

a) having a group of stations in need of repair or replacement because of their condition and its impact on firefighter health (and morale) and/or the lack of adequate space for staff and apparatus;

b) having a group of stations that once were owned and operated by volunteers, without adequate facilities for full-time crews (plus the problems above) and not all in optimum locations;

c) needing new stations to keep up with growth and fill gaps in coverage.

Prior to the start of this study, the JFRD developed an intense capital improvement plan (CIP) to modernize and reconstruct its facilities. Until Fiscal Year 1999, there had been no major station projects in over seven years, despite annual JFRD requests and inputs to the City's CIP. This program new has five projects underway in the current fiscal year, but the total program is woefully under funded. The result is a large backlog of overdue construction work.

CIP Plans – Table 25 lists the current and proposed JFRD station projects involving construction of a new facility or major renovations that are in the CIP. Most are not yet funded even though included in the CIP. They are listed in the table in chronological order by their proposed year of initiation. Only one totally new station (57) is listed; the rest are replacements of existing stations in the same location, with the exception of Station 56, which would be moved off the old airbase (Craig Field) on which it is located to a major road (near Chaffee and 103rd, northeast of its current

location. This will dramatically improve its response time. We concur with the move of Station 56.

Part of the CIP is to purchase and renovate or replace all of the volunteer stations in the County. However, only $2.7 million is budgeted for this purpose in the period 2000-2005, about $4.1 million short of the need, as shown at the end of Table 25.

Recommendation: The CIP should be funded to renovate, replace, or build anew the stations listed in Table 25. With respect to the formerly volunteer stations, Station 27 should be purchased and the others (32, 40, 42, 43, 45) replaced. The $2.7 million for their replacement is not yet budgeted, and the budget for the volunteer stations is $4.1 million short of what is needed. The total needed for the next two years is therefore $21.4 million.

The replacement and renovation of stations is a major concern but does not affect response times because the location of the facilities will not change much if at all, except for Station 56 (moved) and Station 57 (new). The renovations are important for employee health and safety and for efficiency of operations. The remainder of this chapter focuses on station location and unit deployment rather than renovations.

Table 25: Proposed JFRD Plan and Funding Analysis

Station	Project	Location	Cost	Funded	Proposed
18	Renovate	3504 Myrtle Ave.	$ 291,100	**YES**	FY 2000-01
33	Replace	New Kings Rd. N. & Harrell	$ 1,120,000	**YES**	FY 2000-01
36	Renovate	2926 Lippa Rd.	$ 120,200	**YES**	FY 1999-00
37	Replace	Main St. & Dunn Ave.	$ 934,700	**YES**	FY 2000-01
38 Marine 1	Replace	Trout River	$ 1,200,000	**YES**	FY 1999-00
		Total On-going CIP Funding	**$ 3,666,000**		
Station	**Project**	**Location**	**Cost**	**Funded**	**Proposed**
Tactical Support	Replace	Undetermined	$ 760,000	**NO**	FY 2000-01
2	Renovate	1335 N. Main St.	$ 595,000	**NO**	FY 2000-01
4	Renovate	639 W. Duval St.	$ 490,000	**NO**	FY 2000-01
22	Replace	Jammes Rd. & San Juan Ave.	$ 1,312,000	**NO**	FY 2000-01
24	Replace	Edgewood Ave. & Lem Turner Rd.	$ 1,118,000	**NO**	FY 2000-01
25	Replace	Timuquana Rd. & Seaboard Ave.	$ 1,168,000	**NO**	FY 2000-01
26	Replace	5710 Picketville Rd.	$ 1,038,000	**NO**	FY 2000-01
35	Replace	Main St. N. & Duval Station Rd.	$ 1,168,000	**NO**	FY 2000-01

Station	Project	Location	Cost	Funded	Proposed
41	Renovate	985 Gavin Rd.	$ 165,000	**NO**	FY 2000-01
Current Projects Requested in thee CIP but Not Funded			**$ 7,814,000**		
Station	**Project**	**Location**	**Cost**	**Funded**	**Proposed**
5	Replace	I-95 & I-10 Interchange	$ 1,116,800	**NO**	FY 2001-02
10	Replace	Post St. & Edgewood Ave.	$ 1,168,000	**NO**	FY 2001-02
21	Renovate	3518 Morrow St.	$ 378,000	**NO**	FY 2001-02
28	Replace	Southside Blvd. & Skinner Parkway	$ 1,422,000	**NO**	FY 2001-02
31	Replace	7443 Wilson Blvd.	$ 1,038,000	**NO**	FY 2001-02
56	Replace	Brandonfield/Chaffee Rd. & Normandy Blvd.	$ 1,168,000	**NO**	FY 2000-01
57	New	San Pablo/Hodges Rd. & Atlantic Blvd.	$ 1,558,000	**NO**	FY 2001-02
27,32,40, 42,43,45	Purchase/Renovate/Replace Formerly Vol. Owned Stations		$ 2,675,000	**NO**	FY 2001-02
Projects Forecast for Implementation in 2001-02			**$ 9,407,000**		
Total Funding Requested for CIP FY2001 and FY2002 to Address Needs			**$17,221,000**		
Details on Formerly Volunteer Stations					
Station	**Project**	**Location**	**Cost**	**Funded**	**Proposed**
27	Purchase	6241 Ft. Caroline Rd.	$ 200,000	**NO**	
32	Replace	Marrietta Area	$ 1,558,000	**NO**	
40	Replace	Ft. George Area/Heckscher Dr.	$ 1,168,000	**NO**	
42	Replace	San Jose Blvd./Loretto Rd.	$ 1,558,000	**NO**	
43	Replace	Maxville Area/Normandy Blvd.	$ 1,168,000	**NO**	
45	Replace	Black Hammock Island Area/Sawpit Rd.	$ 1,168,000	**NO**	
Total Cost to Purchase or Replace the Existing Volunteer Stations			**$ 6,820,000**		
		Proposed CIP Funding	$ 2,675,000		FY 2001-02
		Additional Funding Short-fall	$ 4,145,000		Not Yet
Grand Total Funding Required to Address All Existing CIP Needs			**$21,366,000**		

Note: All costs in the table are estimated circa 1999 and may be higher now.

JFRD Proposed Future Stations – In addition to the stations in the CIP, the JFRD identified four locations for future construction of other new stations:

A. J. Turner Butler and Hodges
B. Phillips Highway and St. Augustine
C. J. Turner Butler and St. John's Bluff
D. Pecan Park Road and I-95.

There has been no fire timetable attached to the construction of these facilities, and they are not yet programmed into the CIP. We were asked to review these proposed stations as part of this study. In order to assess their need, we considered projected unit workloads as well as response times. As we shall see, all will be needed, and then some.

As noted earlier, new stations should not be sited solely on the basis of geographic analysis. One should consider the current and projected demand for service and the impact on the entire system of units and stations. If demand is higher than one unit can handle in a given geographic area, then another unit may be needed in the same station, a nearby station, or a new station nearby. Many areas of the City have very low demand for service; indeed, many traffic analysis zones have fewer than one structure fire per year.

Workload Forecast by Unit

In order to assess the likely impact of increased population and demand for service on the workload of stations and units, we start with the forecast of incidents discussed in Chapter III. Relying on the historic ratio of responses to incidents to estimate total unit responses, and allocating unit responses in part based on their historic proportion by station and unit, and in part by judgment about changes, we developed two forecasts of unit activity.

Low Growth Scenario – The first forecast of unit workload, shown in Table 26, is based on the low growth projection of incidents from Chapter III. This projection assumes no changes in units or stations, meaning that the new stations planned for construction in the next year are not included. This is the status quo approach. The forecast begins in 2000 and presents five-year increments through 2020.

In this scenario, several units were expected to exceed 3,000 responses by 2000 or sooner (the shaded boxes in the table.) We used a threshold of 3,000 responses per year as an indication that a unit's activity level is high enough to be unavailable for a significant share of the responses in its first-due district. It is not a firm rule, just a flag of the level where reduced availability could become a major factor in degradation of response times.[32] In the year 2000, 10 units were forecast to be over the 3,000 call threshold. (In actuality, all were close to but not over 3,000.) R1, R10, and R22 appear to be the busiest units, and in fact were the busiest in 2000, though with slightly lower responses than projected.

Table 26: Low Growth Forecast of Unit Responses*

Key: E=Engine, L=Ladder, S=Squad, M=Marine (boat), T=Tanker, TS=Telesquad, W=Brush Truck, F=Chief, R103-105=Rescue Chiefs, TL=Tower Ladder, EJB=Jax Beach, Shading=3,000 or more responses

.

Unit	Year				
	2000**	2005	2010	2015	2020
E1	2,992	3,069	3,222	3,351	3,487
E10	3,217	3,300	3,464	3,603	3,749
E11	1,015	1,041	1,093	1,137	1,183
E12	1,282	1,315	1,381	1,436	1,494
E13	1,844	1,892	1,986	2,065	2,149
E14	1,261	1,293	1,357	1,412	1,469
E17	2,550	2,615	2,745	2,855	2,971
E18	2,866	2,939	3,086	3,210	3,339
E19	2,845	2,918	3,064	3,187	3,316

Unit	Year				
	2000**	2005	2010	2015	2020
E2	2,820	2,893	3,037	3,159	3,286
E20	1,832	1,879	1,972	2,051	2,134
E21	2,029	2,081	2,184	2,272	2,364
E23	833	854	897	933	970
E24	2,310	2,369	2,487	2,587	2,691
E25	2,248	2,306	2,421	2,518	2,620
E26	1,043	1,070	1,123	1,168	1,216
E27	1,845	1,893	1,987	2,067	2,150
E28	2,502	2,566	2,694	2,802	2,915

[32] The critical measure is unit hour utilization, or better yet, number of missed first-due responses, rather than the number of responses, per se. Since rescue units are typically out of service for a longer period per response than fire units, they will become overloaded more quickly than fire units, given the same number of responses.

Unit	Year				
	2000**	2005	2010	2015	2020
E29	1,116	1,145	1,202	1,250	1,301
E30	2,719	2,789	2,928	3,045	3,168
E31	3,373	3,460	3,632	3,778	3,931
E32	2,353	2,413	2,533	2,635	2,742
E33	922	945	992	1,032	1,074
E34	2,077	2,131	2,237	2,327	2,421
E35	1,605	1,646	1,728	1,798	1,871
E36	2,597	2,664	2,797	2,909	3,027
E37	504	517	543	564	587
E4	2,451	2,513	2,639	2,745	2,856
E40	61	63	66	69	72
E41	1,043	1,070	1,123	1,168	1,216
E42	1,761	1,806	1,896	1,972	2,052
E43	524	538	565	587	611
E44	2,074	2,127	2,233	2,323	2,417
E45	91	93	98	102	106
E46	216	222	233	242	252
E47	27	28	29	31	32
E48	322	330	347	361	375
E49	521	534	561	584	607
E5	1,679	1,722	1,808	1,881	1,957
E50	2,614	2,681	2,815	2,928	3,046
E51	2,409	2,470	2,593	2,697	2,807
E52	1,817	1,863	1,956	2,035	2,117
E53	584	599	628	654	680
E54	1,087	1,114	1,170	1,217	1,266
E55	1,172	1,202	1,262	1,313	1,366
E56	81	83	87	90	94
E7	1,996	2,047	2,149	2,235	2,325
E9	2,875	2,949	3,096	3,220	3,350
EJB	1,122	1,151	1,208	1,256	1,307
F1	364	373	392	408	424
F2	399	410	430	447	465
F3	403	413	434	451	469
F4	394	404	424	441	459

Unit	Year				
	2000**	2005	2010	2015	2020
F5	373	383	402	418	435
F6	573	588	617	642	668
F7	563	578	606	631	656
F8	300	308	323	336	350
HAZ7	440	452	474	493	513
L1	795	816	856	891	927
L10	941	965	1,013	1,054	1,096
L18	654	671	704	733	762
L30	750	769	807	840	874
L4	519	532	559	581	605
L44	545	559	587	610	635
M1	18	19	20	20	21
M2	16	16	17	18	19
M3	79	81	85	88	91
R1	3,384	3,470	3,643	3,789	3,943
R10	3,338	3,424	3,594	3,738	3,890
R103	233	239	251	261	272
R104	419	429	451	469	488
R105	85	88	92	96	99
R13	2,363	2,424	2,544	2,646	2,753
R19	2,721	2,791	2,930	3,048	3,171
R20	3,081	3,160	3,317	3,450	3,590
R22	3,277	3,361	3,528	3,670	3,818
R23	1,694	1,737	1,824	1,897	1,974
R24	2,857	2,930	3,076	3,199	3,329
R26	3,076	3,155	3,312	3,445	3,585
R27	1,023	1,049	1,101	1,145	1,192
R28	2,446	2,509	2,634	2,739	2,850
R30	3,016	3,093	3,247	3,378	3,514
R31	3,093	3,173	3,331	3,464	3,605
R32	2,533	2,597	2,727	2,836	2,951
R34	2,299	2,358	2,476	2,575	2,679
R35	1,877	1,925	2,021	2,102	2,187
R4	2,567	2,632	2,764	2,874	2,991
R41	778	798	838	872	907

Unit	Year				
	2000**	2005	2010	2015	2020
R42	1,876	1,924	2,020	2,101	2,186
R50	2,584	2,650	2,782	2,894	3,011
R51	2,473	2,537	2,663	2,770	2,882
R52	2,001	2,053	2,155	2,241	2,332
R55	1,143	1,173	1,231	1,281	1,332
R7	3,249	3,333	3,499	3,639	3,786
R71	1,857	1,904	1,999	2,079	2,164
R80	2,753	2,824	2,964	3,083	3,208
R81	484	496	521	542	563
R9	2,686	2,755	2,892	3,008	3,130
S21	866	888	932	970	1,009
S28	824	845	887	922	960
S34	622	638	670	697	725
S36	768	788	827	860	895
T25	438	449	472	491	510
T28	340	349	366	381	396
T29	240	246	258	269	280

Unit	Year				
	2000**	2005	2010	2015	2020
T31	629	645	677	705	733
T32	601	616	647	673	700
T33	179	183	192	200	208
T34	241	247	260	270	281
T40	15	15	16	17	17
T42	204	209	219	228	237
T44	314	322	338	352	366
T49	131	134	141	147	152
TL9	700	718	753	784	815
TS22	2,751	2,821	2,962	3,081	3,206
W29	217	223	234	243	253
W31	391	401	421	438	456
W32	117	120	126	131	137
W35	222	228	239	248	259
W42	221	226	238	247	257
W43	383	393	413	429	447

* Table is based on projections from 1999, the latest data available at the time of the estimate
** Forecast, not actual. The actuals were somewhat lower, as shown for the highest workload units in Table 27. The "low growth" forecast by a quirk in the methodology starts higher than the high growth scenario but tapers off much quicker. We could have made the adjusted level occur in the middle of the 2000-2005 period, but it is clearer for consistency within the approach used.
*** E55 handles the runs to Neptune and Atlantic Beaches; runs to the latter are sometimes reported separately in JFRD data as EAB and ENB.

Although several units are near the threshold for being busy, the system as a whole can absorb many more calls without overloading most units in the near future. The unit hour utilization rates (UHUs) indicate that availability of even the busier engine companies is still good, but the rescues have higher UHUs and more availability problems.

By 2005, 11 units would be at or over the 3,000 threshold, and three (E9, E18, and R24) would be approaching it.

By 2010, the number of units at or over 3,000 calls would be about 16. In addition, four more (R19, R80, E30, TS22) would be approaching the threshold.

By 2020, 23 units would be at or over the threshold, and two others would be close.

There are many Metro fire departments across the nation that have units with over 3,000 responses and sometimes 4,000 or 5,000 responses per year. The busiest units are often the pride of the fire service. *Firehouse Magazine* annually lists the busiest units, and many fire companies vie for that status. Morale is often high in the busy engine companies, and firefighters maneuver to get into them, though less often when the call volume is largely EMS calls. The very busiest units often are rescue units. They may suffer from employee fatigue and high unit hour utilization rates, which lengthen response times.

That said, and despite the fact that the overall system has capability to handle more calls, there is a need to add some resources over the next decade beyond those already planned by the JFRD, even under this low growth forecast. Without adding these units, response times will degrade and several units will become even more overloaded. By 2020, almost half of the existing rescue units and 10 engines would exceed 3,000 responses annually if none were added, which would affect the whole system.

Besides the effect on response times of handling a larger number of incidents, changes in the geographic distribution of incidents may result in more responses to areas that currently have poor response times. As units that normally serve these areas become busier, and the likelihood that the first-due unit will be unavailable increases, there will be even longer response times. Units will more often have to travel long distances outside their first response zone to be the first responder. One would expect that overall system response time performance would decline without the addition of any units.

We recommend specific additional stations and units later in this chapter. It should be clear that, even in the low growth scenario, units may have to be added to reduce not only long response times because of geographic spread but also the longer response times stemming from overloading and hence reduced availability of busy units and the need for backup units to travel further to fill in.

High Growth Scenario – The high growth forecasts of unit workloads are shown in Table 27. In this scenario, growth rates in demand per capita were applied annually, so that increased demand is attributable not only to increased population but also to rising per capita demand.

In this high growth forecast, there are many units that exceed 3,000 responses. By 2005, there would be 21 units that high versus 11 in the low growth forecast. By 2010, this would increase by another 17 units, and by yet another 11 by 2015. By 2020, three more would exceed 3,000 runs, for a total of 52 out of 127 units. The busiest unit in the department would be Rescue 1, with 3,900 to 6,600 responses, depending on the forecast year. The high-utilization, limited availability of rescue units under this demand scenario would further impact the ability to maintain current response times overall. In fact, the busier units might not have the total workloads shown because some of their calls would spill over to other units.

Table 27 shows in the parentheses in the Year 2000 column the actual number of responses for the busiest units in 2000.[33] The actual data were slightly under the projections in most cases, but higher for E31 and R31.

Implications – It would take a full-scale simulation to identify the call load per unit more exactly as system call volume increases. Nevertheless, the overall picture is clear. If demand falls anywhere in the range between the low and high demand estimates, which we think is likely, then without additions to the system there will be many overloaded units. The additions are needed to cope with rising workloads of existing stations, not just geographic spread of the population and industry. If demand per capita continues to rise at the high-growth level, the Department would have about half of its prime units overloaded, and response times would surely degrade. Some form of relief is needed in the form of additional units, as will be discussed below.

[33] This data became available late in the study, after projections for 2000 were made.

Table 27: High Growth Forecast of Unit Responses*

Key: E=Engine L=Ladder S=Squad M=Marine (boat) T=Tanker TS=Telesquad W=Brush Truck F=Chief R103-105=Rescue Chiefs TL=Tower Ladder EJB=Jax Beach Shading=3,000 or more responses

Unit	Year				
	2000**	2005	2010	2015	2020
E1	2,763	3,432	4,412	5,110	5,848
E10	2,971 (2711)	3,690	4,744	5,495	6,288
E11	937	1,164	1,496	1,733	1,983
E12	1,184	1,471	1,890	2,190	2,506
E13	1,703	2,115	2,719	3,150	3,604
E14	1,164	1,446	1,859	2,153	2,464
E17	2,354	2,924	3,759	4,354	4,983
E18	2,646	3,287	4,225	4,895	5,601
E19	2,627	3,263	4,195	4,860	5,561
E2	2,604	3,235	4,158	4,817	5,512
E20	1,691	2,101	2,701	3,128	3,580
E21	1,873	2,326	2,991	3,464	3,964
E23	769	955	1,228	1,422	1,628
E24	2,132	2,649	3,405	3,944	4,514
E25	2,076	2,578	3,315	3,840	4,394
E26	963	1,197	1,538	1,782	2,039
E27	1,704	2,116	2,721	3,152	3,606
E28	2,310	2,869	3,689	4,273	4,889
E29	1,030	1,280	1,646	1,906	2,181
E30	2,511	3,119	4,009	4,644	5,314
E31	3,115 (3202)	3,869	4,973	5,761	6,593
E32	2,172	2,698	3,469	4,018	4,598
E33	851	1,057	1,359	1,574	1,801
E34	1,918	2,383	3,063	3,548	4,060
E35	1,482	1,841	2,367	2,742	3,137
E36	2,398	2,979	3,829	4,436	5,076
E37	465	578	743	861	985

Unit	Year				
	2000**	2005	2010	2015	2020
E4	2,263	2,811	3,613	4,185	4,789
E40	57	70	91	105	120
E41	963	1,197	1,538	1,782	2,039
E42	1,626	2,020	2,597	3,008	3,442
E43	484	602	773	896	1,025
E44	1,915	2,379	3,058	3,542	4,053
E45	84	104	134	155	178
E46	200	248	319	369	422
E47	25	31	40	47	53
E48	297	369	475	550	629
E49	481	598	768	890	1,018
E5	1,550	1,926	2,476	2,868	3,282
E50	2,414	2,998	3,855	4,465	5,109
E51	2,224	2,762	3,551	4,113	4,707
E52	1,678	2,084	2,679	3,103	3,551
E53	539	669	860	997	1,141
E54	1,003	1,246	1,602	1,856	2,123
E55***	1,082	1,344	1,728	2,001	2,290
E56	75	93	119	138	158
E7	1842	2,289	2,942	3,408	3,900
E9	2,654	3,297	4,239	4,910	5,619
EJB	1,036	1,287	1,654	1,916	2,192
F1	336	418	537	622	712
F2	369	458	589	682	780
F3	372	462	594	688	787
F4	363	451	580	672	769
F5	345	428	550	637	729
F6	529	658	845	979	1,121
F7	520	646	830	962	1,101

Unit	Year				
	2000**	2005	2010	2015	2020
F8	277	344	443	513	587
HAZ7	407	505	649	752	860
L1	734	912	1,172	1,358	1,554
L10	869	1,079	1,387	1,607	1,839
L18	604	750	964	1,117	1,278
L30	692	860	1,105	1,280	1,465
L4	479	595	765	886	1014
L44	503	625	803	931	1,065
LJB	8	10	13	16	18
M1	17	21	27	31	36
M2	15	18	23	27	31
M3	72	90	116	134	153
R1	3,124 (2828)	3,881	4,989	5,779	6,613
R10	3,082 (2895)	3,828	4,921	5,701	6,524
R103	215	267	344	398	456
R104	387	480	617	715	818
R105	79	98	126	146	167
R13	2,182	2,710	3,484	4,036	4,618
R19	2,513	3,121	4,012	4,648	5,318
R2	18	22	29	33	38
R20	2,845	3,533	4,542	5,262	6,021
R22	3,025 (2854)	3,758	4,831	5,596	6,404
R23	1,564	1,943	2,498	2,893	3,311
R24	2,638	3,276	4,212	4,879	5,583
R26	2,840	3,528	4,536	5,254	6,012
R27	944	1,173	1,508	1,747	1,999
R28	2,258	2,805	3,606	4,178	4,780
R30	2,785	3,459	4,447	5,151	5,894
R31	2,856 (2917)	3,548	4,561	5,283	6,046
R32	2,338	2,905	3,734	4,325	4,949
R34	2,123	2,637	3,390	3,927	4,494
R35	1,733	2,153	2,768	3,206	3,669

Unit	Year				
	2000**	2005	2010	2015	2020
R4	2,370	2,944	3,784	4,384	5,016
R41	719	892	1,147	1,329	1,521
R42	1,732	2,152	2,766	3,204	3,666
R50	2,386	2,963	3,809	4,413	5,049
R51	2,284	2,837	3,647	4,224	4,834
R52	1,848	2,295	2,951	3,418	3,911
R55	1,056	1,311	1,686	1,953	2,235
R7	3,000 (2812)	3,727	4,791	5,549	6,350
R71	1,714	2,129	2,737	3,171	3,629
R80	2,542	3,158	4,059	4,702	5,381
R81	446	555	713	826	945
R83	3	4	5	6	7
R86	2	3	3	4	4
R9	2,480	3,081	3,960	4,588	5,250
S21	799	993	1,276	1,479	1,692
S28	761	945	1,214	1,407	1,610
S34	575	714	918	1,063	1,216
S36	709	881	1,132	1,312	1,501
T25	404	502	646	748	856
T28	314	390	502	581	665
T29	222	275	354	410	469
T31	581	722	928	1,075	1,230
T32	555	689	886	1,026	1,174
T33	165	205	263	305	349
T34	223	277	356	412	471
T40	14	17	22	25	29
T42	188	234	300	348	398
T44	290	360	463	536	614
T49	121	150	193	223	256
TL9	646	802	1,032	1,195	1,367
TS22	2,540	3,155	4,056	4,698	5,376
W29	201	249	320	371	425
W31	361	449	577	668	765
W32	108	134	173	200	229

Unit	Year				
	2000**	2005	2010	2015	2020
W35	205	254	327	379	434
W42	204	253	325	377	431

Unit	Year				
	2000**	2005	2010	2015	2020
W43	354	440	565	655	749

* Table is based on projections from 1999, the latest data available at the time of the estimate
** Forecast, not actual. The actuals were somewhat lower, as shown in parentheses for the highest workload units in year 2000. The "low growth" forecast by a quirk in the methodology starts higher than the high growth scenario but tapers off much quicker. We could have made the adjusted level occur in the middle of the 2000-2005 period, but it is clearer for consistency within the approach used.
*** E55 handles the runs to Neptune and Atlantic Beaches (which are sometimes reported separately in JFRD data as EAB and ENB.

Transportation Plan

Before discussing positions of new staffing, another input to the planning process must be considered: the master thoroughfare plan. As streets are added, new response routes become available that can alter the suitability of a particular location for a station and affect response times from existing stations for better or worse.

The City's master transportation plan indicates expected road projects through 2010. These projects are as important in suburban and outlying areas as they are in urban areas.

Many of the planned transportation projects are intended to maintain transportation service levels in the face of increases in traffic flow; they are also important to maintain travel speeds of emergency vehicles.[34] However, the area of the most interest here is new road projects because these alter the existing response patterns and provide access to areas that may have been difficult to reach in the past. Table 28 summarizes major new roads to be added under the plan by planning district. Some of these projects may be underway or completed by the end of this study.

[34] If travel speeds decrease because of traffic congestion, more stations might have to be added just to maintain travel times. Naperville, Illinois (pop. 120,000), is an example of a community where stations are being added because of inadequate transportation planning early on. They have too few arterials, and projected emergency vehicle travel speeds of 15 to 20 mph.

Table 28: Post-1995 New Roadways – 2010 Comprehensive Plan

Planning District	Project
1. Urban Core	- Riverside Avenue via Acosta, to Prudential/Hendricks Ave
2. Urban Core	- Hart Expressway, New Ramp to Tallyrand - "Liberty Street" Bridge, Haines Street - Expressway to Hendricks Ave./Gulf Life Drive
3. Greater Arlington	- Atlantic Blvd., Mayport Rd. Interchange - Lone Star Rd., Extension SR113 to Monument Rd. - SR 9A – Monument Rd. to Beach Blvd., 6 Lane Fwy. - Wonderwood Dr. – A1A to SR9A, 6 Lane Urban Divided section
4. Southeast	- Caron Dr. – Old St. Augustine Rd. to Losco Rd. - Commodore Pt. Connector, University Blvd./St. Augustine Rd. to Emerson St./Commodore Pt. Expy. - I-95 Old St. Augustine Rd., new interchange - I-95 J. Turner Butler Blvd., new interchange - I-95 leg – State Rd. 9A to Phillips Hwy. - Kerman Rd. – UNF to J. Turner Butler Blvd. - New N/S Connector, J. Turner Butler Blvd. To Touchton Rd. (West Interchange) - SR9A – I295/I-95 Interchange to Beach Blvd. - SR98 – South of Phillips Hwy. To I-95 - SR98 – South of I-295 Leg to south of Phillips hwy. - I-95 Interchange at St. Augustine Rd.
5. Southwest	"Timuquana Bridge" Vicinity of University Blvd./SR13 to vicinity of Timiquana Blvd./US 17
6. Northwest	Outer Beltway – Branan Field – Chaffee Rd. to I-95
7. North	- Pecan Park Rd. – Main St. to Yellow Bluff Rd. Extension - Alta Dr. – Bridge Across Rushing Branch - Faye Rd. – Bridge across Dunn Creek

Recommended New Stations and Units

Based on all of the foregoing considerations, we now can discuss specific alternatives for new stations and units for the next 20 years. Any or all of these

recommendations should be fine-tuned by JFRD as the actual growth and demand unfold, and as other considerations such as accessibility of property and changes in the transportation system take place.

There are three major criteria used here for deciding on when to add stations: correcting response time problems in particular areas and for the overall system; balancing workloads and improving availability of units; and the cost-effectiveness of any proposed additions – will the stations have enough calls, protect large enough hazards, or meet perceived needs of the citizens for peace of mind to justify their cost? These concerns must be balanced in any decision-making. The decisions also should be based on the Mayoral and City Council choices regarding level of service standards for fire protection and rescue services.

As stated previously, one new station (57) is planned but not yet budgeted for construction within the next two years. In addition, the City has proposed four other station locations. There was no firm time scale for the construction of these facilities, and so we developed a reasonable schedule based on our analysis of Jacksonville's needs. Any decisions in this realm involve the use of judgment.

We considered various alternatives for adding new stations and units. The recommendations are based on the assumptions that the timing and magnitude of population growth will follow that in the City's Comprehensive Plan. While we present sharply distinct recommendations for the low and high growth scenarios, in reality one should expect that these two forecasts would serve as bounds for the actual trend in incidents and responses, and that the needs would fall between the two sets recommended.

Another input to the planning here was analysis of the existing pattern of structure fires. (This was the first time they were plotted this way.) Figure 22 to Figure 26 show the pattern of fires. These are the fires that cause the most loss and that require multiple units to respond, including ladder trucks. It is no surprise that they are densest in the core area, but they are spreading out in significant numbers.

Figure 22

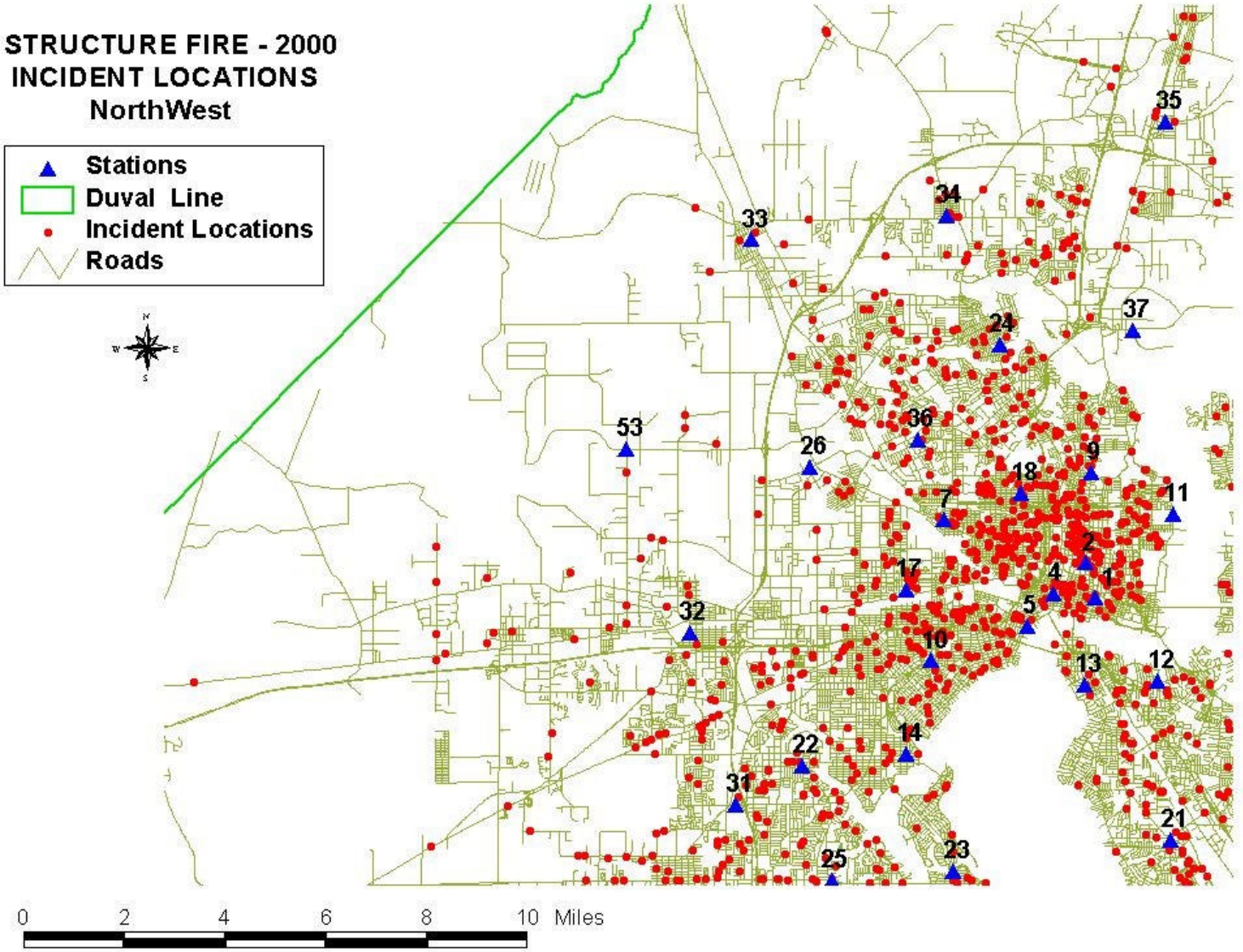

STRUCTURE FIRE - 2000
INCIDENT LOCATIONS
NorthWest
Stations
Duval Line
Incident Locations
Roads
N
W
E
S
35
34
33
37
24
53
36
26
9
18
11
7
2
17
4
1
32
5
10
13
12
14
22
31
21
25
23
0
2
4
6
8
10 Miles

Figure 23

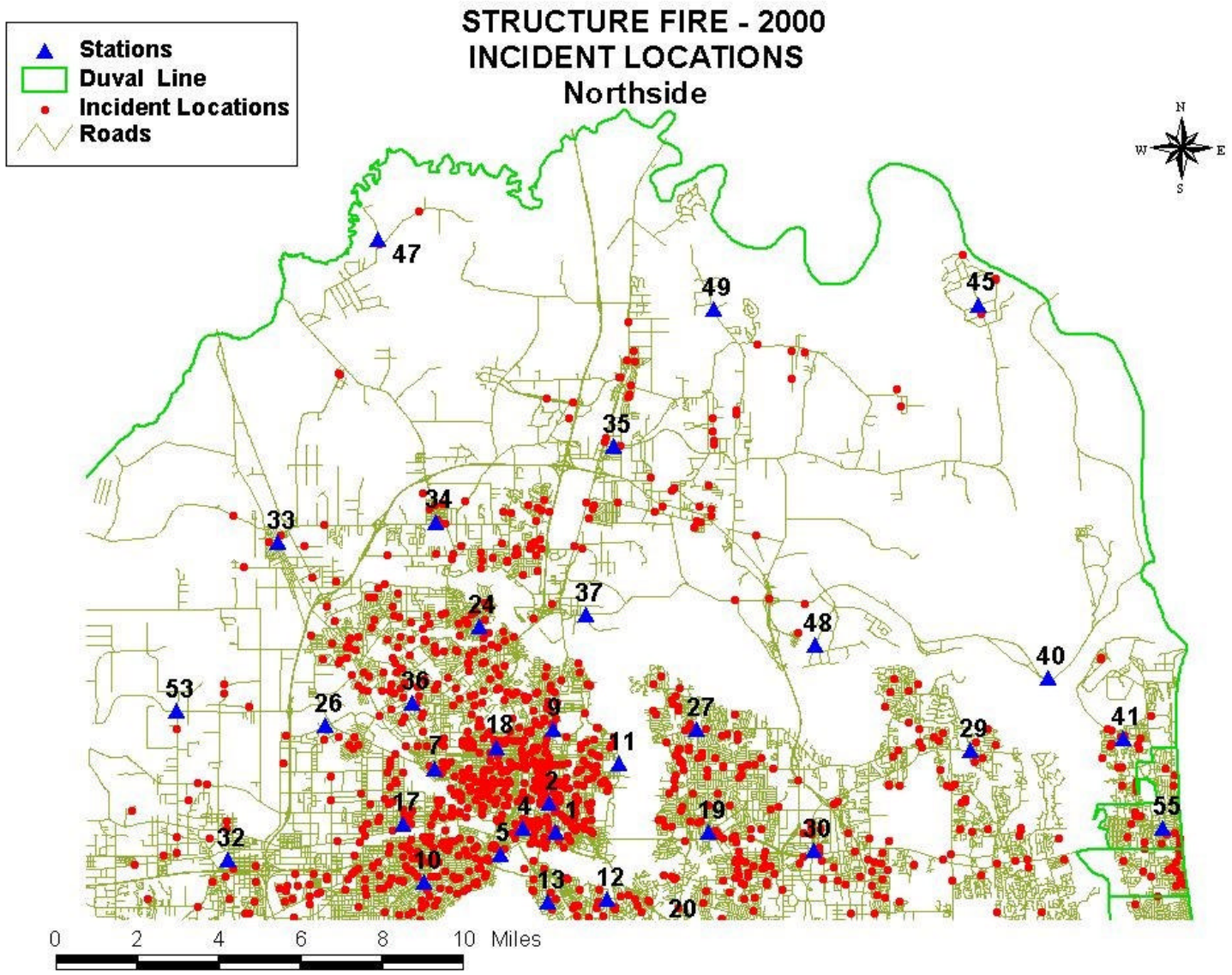

STRUCTURE FIRE - 2000
INCIDENT LOCATIONS
Northside
Stations
Duval Line
Incident Locations
Roads
N
W
E
S
47
49
45
35
34
33
37
24
48
40
53
36
26
9
27
18
11
29
41
7
2
17
4
1
19
55
32
5
30
10
13
12
20
0 2 4 6 8 10 Miles

Figure 24

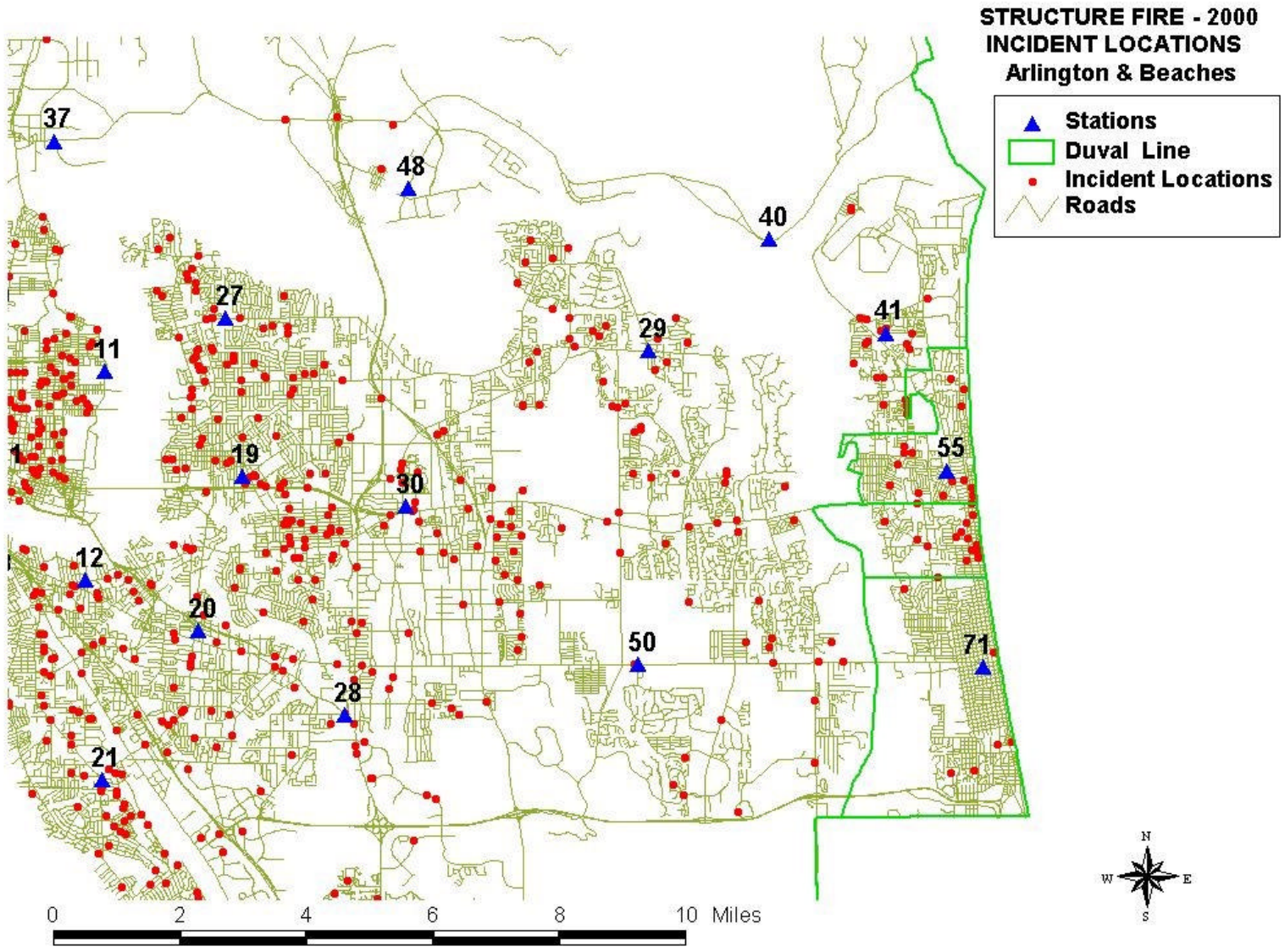

STRUCTURE FIRE - 2000
INCIDENT LOCATIONS
Arlington & Beaches
Stations
Duval Line
Incident Locations
Roads
37
48
40
27
29
41
11
19
55
30
12
20
50
71
28
21
0 2 4 6 8 10 Miles
N
W
E
S

Figure 25

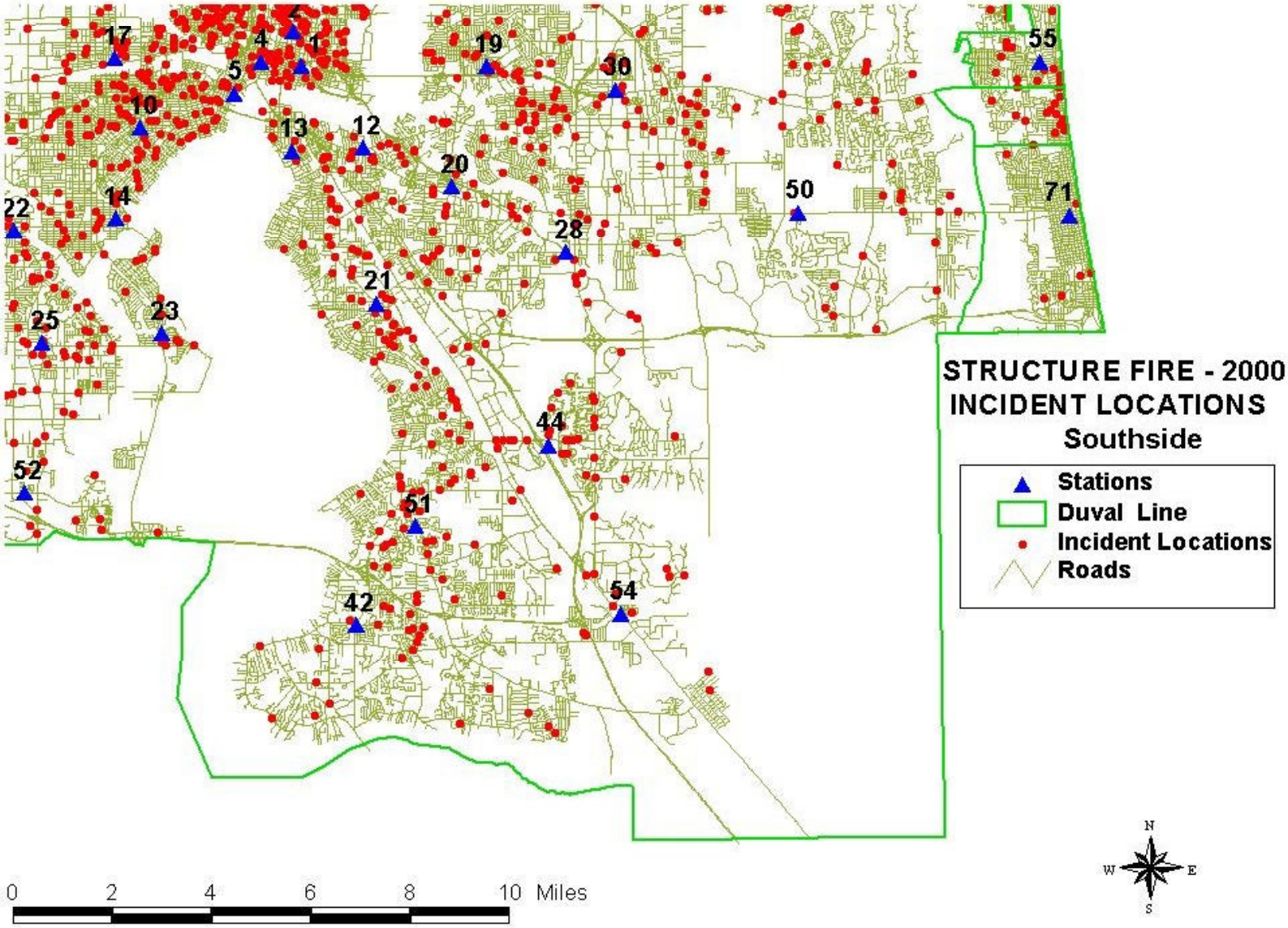
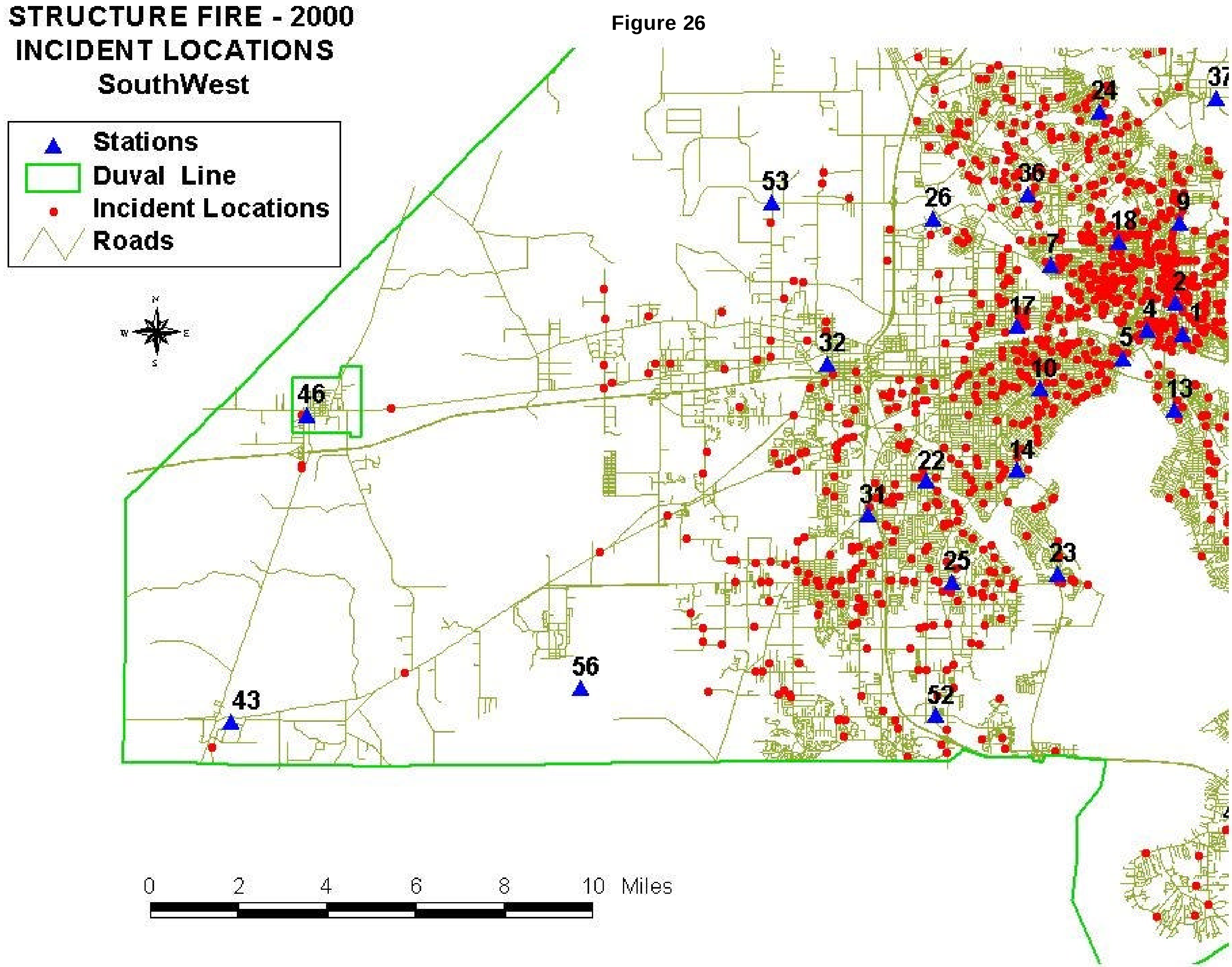

STRUCTURE FIRE - 2000
INCIDENT LOCATIONS
Southside
Stations
Duval Line
Incident Locations
Roads
17
4
1
19
30
55
5
10
13
12
20
50
71
22
14
28
21
25
23
44
52
51
42
54
0 2 4 6 8 10 Miles
N
W
E
S

Figure 26


STRUCTURE FIRE - 2000
INCIDENT LOCATIONS
SouthWest
Stations
Duval Line
Incident Locations
Roads
N
W
E
S
53
26
24
37
36
9
18
7
2
17
4
1
5
32
10
13
46
14
22
31
25
23
56
43
52
0 2 4 6 8 10 Miles

Additions for Low Demand Forecast:

The station location and unit recommendations for the low demand forecast are the minimum that will be needed if the population and development forecasts are generally correct. The four stations that were already being considered by the JFRD are needed to meet even the low growth assumptions, in addition to new Station 57 and moving Station 56. These five are all necessary but not sufficient to meet the minimum needs of the next decade. Our recommendations are below. The exact locations of additional stations and units should be left to the JFRD to fine tune. We focused on the approximate best location of the units rather than the capability of particular stations to house more units. The priority ordering can be altered so long as the total is about the same.

By 2005

Station A: J. Turner Butler Boulevard and Hodges – The first priority appears to be a station at about J. Turner Butler Boulevard and Hodges by 2003. Initially staff it with an engine and rescue. This area has a growing population and is relatively isolated from the existing stations. Adding this station will fill a serious geographic coverage gap and provide improved response times to this part of the City. It will also provide needed staffing and equipment to strengthen the network of stations in its general area and provide added support for second-due and multiple unit responses for the beach communities, reducing the need to draw units from nearer the urban center to this distant location.

Station B: Phillips Highway and St. Augustine Road – Our second recommended priority among the potential stations identified by the JFRD would be to add a facility at Phillips Highway and St. Augustine Road. Initially staff it with an engine and rescue. This station is justified primarily on workload grounds and to reduce long response times to the extreme southeastern part of the city. It also will reduce the second-in time for Station 54's response area and also allow at least two units to reach the southeast in reasonable response time. Strategically, it will reduce the need to draw units from the center of the city to the far Southeast, which in turn affects response times in the area vacated. The station also improves availability of some heavily loaded units. As the planned highway improvements take place, particularly the ramp to I-95 and the North/South connector, the station's response times will be enhanced.

Alternatively, Station C (at J. Turner Butler and St. John's Bluff), which is suggested for the next priority, could be built before B, depending on which area fills in first. Both are needed.

Rescue 17 – A rescue is needed to provide additional support for the heavily loaded units serving the City's center, particularly Rescues 1, 4, 7, and 26. It could be located at Station 17, which would require some remodeling. Alternatively, add a rescue elsewhere in, or near, the downtown area, preferably a station without a rescue now, such as Station 36.

Ladder 48 – Additional ladders are needed in several areas, but they have relatively low usage and high cost. A ladder company is needed to improve special service coverage in the Northeast, and more staffing to respond to the Port. Station 48 is one candidate. (The Port Authority might be approached for cost-sharing.) Another alternative is to exchange that engine for a quint, or add the ladder elsewhere.

Station 58[35] – Add a station with a quint (telesquad) and rescue in the vicinity of Beaver and Chaffee. It will fill a huge gap in the Western area of the city and assist as the second in unit south to Station 56 and east to Station 32.

2005-2010

Station C: J. Turner Butler Boulevard and St. John's Bluff Road – Add a station at J. Turner Butler Boulevard and St. John's Bluff Road. Staff it with an engine and rescue. This is a populated area with poor coverage. This station would reduce the gap in coverage and share workloads/improve availability at Stations 28, 44, and 50. Its location will prove even more valuable to provide support to other stations to its south with the construction of the North/South Connector.

Station D: Pecan Park Road and I-95 – The fifth priority station is needed in the vicinity of Pecan Park Road and I-95, primarily to reduce long response times in the northern end of the City. It would house an engine and rescue. Although this facility

[35] Note that this station was referred to by a different number in previous drafts; it once had been considered by JFRD for the CIP.

will have a minimal workload, it will strengthen the ability to assemble a full response in the northern section of the City adjacent to the airport as well as to the airport itself and provide quick access to I-95 for motor vehicle accidents and related emergencies. The Rescue will reduce the workload on Rescue 34. This should not precede the highway improvements in its vicinity.

Telesquad 58, Ladder 22, and Engine 22 – Consider replacing Telesquad 22 with a ladder and engine, and move the Telesquad to Station 58, which will provide special service support to the much of the West and reduce some of the long responses for the company from Station 22.

Ladder A – Add a ladder company to new Station A at J. Turner Butler Boulevard and Hodges. Ladder coverage in this area is poor, and increased demand will make adding this unit worthwhile. It will also provide ladder support to the beach communities and reduce the need to draw a ladder company from further away.

Rescue 12 – A rescue should be added at Station 12. This unit would provide support to surrounding heavily loaded units. The station currently has a single bay and would have to be remodeled. If not there, add to a station in the vicinity, such as Station 21.

2010 - 2015

Relocate Station 30 – There are coverage gaps both to the north and east of Station 30. Relocate Station 30 to the South Connector and Merrill. This move would close one of the gaps and reduce the workload for Stations 27 and 19. The gap left by moving Station 30 would be partly covered by a new Station H (see below).

Station H – Add a new station at Atlantic and St. John's Bluff. This station, which would be staffed with an engine and rescue, would cover the eastern part of old Station 30's territory and close a gap in coverage to the Atlantic Avenue area in conjunction with Station 57, added earlier. This station also would add coverage for Craig Field.

Rescue 56 – A rescue unit should be added to Station 56. This unit would improve coverage and reduce the need for Rescues 31 and 52 in particular to make long responses.

2015 - 2020

No additional units or stations needed in this time period under the low growth scenario, though in reality there could well be changes as the details of growth and its impact on demand and traffic congestion unfolds. Some of the recommended changes for 2010-2015 might be stretched into this period, depending on the rapidity of demand buildup.

Additions for High Demand Forecast:

The high demand forecast requires everything required in the low demand forecast, with some elements accelerated. It also requires about double the additions of the low growth forecast!

By 2005

In addition to the new stations and units called for in the low forecast (Stations A and B, Station 58, Rescue 17, and Ladder 48):

Station E – Add Station E near 20th Street and Davis Street. This station would be equipped with an engine and rescue and would provide support to all the downtown stations, many of which are becoming overloaded. The rescue unit would also be instrumental in maintaining availability of existing units.

Ladder A – Add a ladder company to the proposed new station at J. Turner Butler Boulevard and Hodges, to address not only long response times for ladders, but also a growing workload. This ladder company would be the second arriving ladder company in the beach communities.

Ladder 22 – As was recommended for the low growth scenario, but even sooner here, we recommend a new ladder company and engine at Station 22 and relocating Telesquad 22 to Station 58. This change would greatly improve ladder and special service

support in the southwestern part of the city and reduce the workload for Ladder 22, which would no longer be the first due special service company all the way to the City's western boundary.

Rescues 12, 17 – New rescues would be placed in service at Station 12 and 17. These units would provide relief to the heavily loaded units around them and improve rescue response times.

2005 - 2010

New Stations C and D would be added at St. John's Bluff and J. Turner Butler, and at Pecan Park and I-95 as in the low forecast. Two additional stations would be needed:

Station F – The first, at Sibald, between Gilchrist and Moncrief, would staff an engine and rescue. This station would close a gap in coverage and reduce the workload of nearby Stations 24, 36, and 33.

Station G – The second station, at Ramona and Ellis, would close a similar gap between Stations 10 and 32. This station would have an engine and rescue and would reduce overload on all the surrounding stations, especially for Stations 10, 22, 32.

Rescues 56, E – Rescues would be added to Station 56 and new Station E (20th and Davis). Both these rescue units would reduce overloads on surrounding, heavily loaded units.

2010 - 2015

Station I – In addition to the relocation of Station 30 and the addition of Station H (Atlantic and St. John's Bluff), as in the low growth scenario, we recommend an additional Station I at Belfort and J. Turner Butler Boulevard. This station would be equipped with an engine and rescue and would provide support for surrounding stations, especially 44, 51, 21, and 28.

Station J - An additional station, located at Shindler and Morse Avenue, should be constructed once the two streets are connected. This station would house an engine

and improve coverage in a large geographic area. It would also reduce overloads on Stations 31 and 52.

Ladder E – A ladder company would be added to proposed new Station E (20th Street and Davis Street). This unit will reduce the growing overload on ladders into downtown area by this time and provide faster responses when one of the existing units is unavailable.

2015 - 2020

Stations – We do not call for additional stations in this time period, though some scheduled for 2010-2015 might be stretched into this period, depending on demand buildup.

Rescue 25 – Add a Rescue unit at Station 25 to reduce the overload on Rescues 22, 23, and 52.

Ladder 29 –Add a Ladder Company at Station 29. This is primarily for coverage purposes, and to provide better times for the full complement structural fire response to its neighboring areas.

Summary of Additions

The above recommendations are summarized in Table 29. This analysis assumes that the new, JFRD-planned Station 57 and the moved Station 56, both in the CIP, will be funded and have rescue units as well as engines; if not, add rescues in those stations or nearby to the recommendations for both the Low and High Forecasts scenarios.

The additional stations and units needed over the next two decades range from a low demand forecast requiring 6 stations, 6 engines, 9 rescues, and 3 ladder companies, to the high demand forecast requiring 11 new stations, 11 engines, 14 rescues, and 4 ladder companies. These are needed to keep up with demand and to better serve the area outside the central city. If service level goals are to be reduced, then less will be needed, but if the desire is to provide better response times to the more rural areas, then all are needed.

The addition and timing of units should be driven by actual demand for service, which of course may vary from the forecast presented here, but is likely to fall between the low and high estimates. If any systematic deviation from the forecast is to be expected at this time, it would be a relatively higher increase in demand in companies outside the urban core, which could accelerate the need for additional support in outlying areas. That is, development may take place faster than currently planned in the outlying areas.

Additional or fewer units could be required depending on the level of service adopted as a standard by the City. Generally, one should not add units solely to correct deficiencies in response time unless there is a corresponding demand of one to two calls per day. The need for additional stations can of course be further affected by political/community desires to improve response times in areas far from the planned stations even if their demand is low.

To put the recommendations for new stations in perspective: Palm Beach County has added 10 stations in the past six years and is planning and already budgeting 10 more in the next six years. This proposal is modest relative to that time period.

Table 29: Summary of Minimum Number of New Units and Stations Needed

Forecast Time Period	Low Growth	High Growth
2000-2005	Add Station A (Engine, Rescue) Add Station B (Engine, Rescue) Add Station 58 (Quint, Rescue) Add Rescue 17 Add Ladder 48	Add Station A (Engine, Ladder, Rescue) Add Station B (Engine, Rescue) Add Station E near 20th Street and Davis St. (Engine and Rescue) Add Station 58 (Quint, Rescue) Add Rescues 12, 17 Add Ladder 48 Replace TS22 with a Ladder and Engine Company and add the TS to Station 58
2006-2010	Add Station C (Engine, Rescue) Add Station D (Engine, Rescue) Replace TS22 (Quint) with a ladder and engine	Add Station C (Engine and Rescue) Add Station D (Engine and Rescue) Add Station F on Sibald (Engine and Rescue) Add Station G at Ramona and Ellis (Engine and Rescue)

Forecast Time Period	Low Growth	High Growth
	Add a TS at Station 58 Add Ladder A Add Rescue 12	(Engine and Rescue) Add Rescues to Station E, 56
2011-2015	Relocate Station 30 to South Connector and Merrill Add Station H at Atlantic and St. John's Bluff (Engine, Rescue) Add Rescue 56	Relocate Station 30 to South Connector and Merrill Add New Station H at Atlantic and St. John's Bluff (Engine, Rescue) Add Station I at Belfort and J. Turner Butler Blvd. (Engine and Rescue) Add Station J at Shindler and Morse Ave (Engine) Add Ladder E
2016-2020	No additional needs projected	Add Rescue 25 Add Ladder 29
Total Additions	**6 new stations, 1 relocated station, 6 Engines, 9 Rescues, 3 Ladders**	**11new stations, 1 relocated station, 11 Engines/Telesquads, 14 Rescues, 4 Ladders**

The recommended priorities and timing for the JFRD-proposed new stations (A-D) are summarized in Table 30 along with their suggested timing and the timing for other new stations.

Table 30: Recommended Priority and Timing of New Stations

Station Number	Location	Low Growth	High Growth
A	Hodges and J. Turner Butler	By 2003	By 2003
B	St. Augustine and Phillips	By 2005	By 2005
58	Chaffee and Beaver	By 2005	By 2005
C	St. Johns Bluffs and J. Turner Butler	2005-2010	2005-2010
D	Pecan Park and I-95	2005-2010	2005-2010
E	20th Street and Davis Street		By 2005
F	Sibald and Portsmouth Avenue		2005-2010
G	Ramone and Ellis		2005-2010
H	Atlantic and St. John's Bluff	2010-2015	2010-2015
I	Belfont and J. Turner Butler Boulevard		2010-2015
J	Shindler and Morse Avenue		2010-2015
	Total	**6**	**11**

Battalion and District Chiefs – At present, District Chiefs supervise 4 to 8 stations; over 6 is on the high side of reasonable workloads. As additional stations are added, District Chiefs should also be added to keep spans of control in the 5 to 6 range, and definitely not over 8. One extra District Chief can be added to the four now under each of the two Battalion Chiefs and still have a reasonable span for the Battalion Chiefs. However, at some point, one additional Battalion may have to be created.

Workload Impact from the New Stations and Units – To help evaluate the potential impact of the above station additions and help validate our recommendations, we estimated the workload of the engine companies in new stations and recalculated the projected workloads of the engines in surrounding stations that would be most affected by the addition of the new stations. The workloads for other stations would be affected, too, but to a lesser extent. These projections are presented in Table 31 for both low and high growth scenarios.

The opening of new stations and addition of units not only significantly reduces the workload on units in surrounding stations, but it also significantly improves the overall system of suppression forces, because it reduces rippling effects when units are sent out of their first due areas.

It was too complex to compute the reduction in rescue workloads by unit, because they spend much time out of their first due areas and get substituted for by other units, but the reduction in rescue response times would be substantial relative to the "no additions" projection. Under the high demand forecast, EMS calls were forecast to increase from the 66,500 level to 116,200, an increase of 75 percent. The number of rescues would increase by 50 percent. The average UHU of the rescues is 18 percent at present. If the average time spent out of service per rescue stayed the same, the UHU overall would increase by a factor of 1.17 (1.75 / 1.5), to be about 21 percent, which is tolerable for a city. The UHU might actually be closer to what it is or even decrease because the average time out of service decreases as more units are added, and new units are closer to some calls than any had been before. True demand is likely to be lower than the high growth scenario. On the other hand, if more of the calls were in outlying areas far from hospitals, or if the percent of calls requiring transport increases, then the system still might get overloaded overall or in some areas.

As can be seen from Table 31, new stations A, B, C, D, 57 and 58 all would have enough calls to merit their existence even under the low growth scenario. [Usually, a station is not cost-effective until it has at least 1 to 2 calls a day, which even Station D, the least heavily loaded of the new stations, would have.]

Improved Coverage – The changes outlined in this chapter will result in significantly improved response time performance citywide, and in most areas of the City that have less than desired response times today. The bulk of these changes will be necessary just to maintain the current response times and level of service being provided in most areas, in the face of growth, some changes will improve other areas to meet the suggested short-term level of service standards (i.e. the goals for the first-in units) recommended earlier in this chapter.

Table 31: Engine Company Workloads With New Stations Added

Engine #	Low Growth				High Growth			
	2005	2010	2015	2020	2005	2010	2015	2020
New								
57	1,354	1,422	1,479	1,539	1,515	1,947	2,255	2,581
58	614	644	670	697	686	882	1,022	1,169
A	1,930	2,026	2,108	2,193	2,158	2,775	3,214	3,678
B	1,648	1,730	1,799	1,872	1,843	2,369	2,744	3,140
C	1,369	1,437	1,494	1,555	1,530	1,967	2,279	2,608
D	577	606	630	655	645	829	961	1,099
E					2,446	3,145	3,643	4,168
F						1,473	1,707	1,953
G						2,612	3,026	3,462
H			1,827	1,901			2,786	3,188
I							3,133	3,585
J							2,754	3,152
28	1,924	2,020	2,101	2,186	2,152	2,766	3,205	3,667
29	916	961	1,000	1,040	1,024	1,316	1,525	1,745
30 (old)*	2,510	2,635	*	*	2,807	3,608	*	*
30 (new)			1,702	1,770			2,130	2,438
31	2,768	2,906	3,022	3,145	3,095	3,979	4,609	5,274
32	2,172	2,280	2,371	2,467	2,429	3,122	3,616	4,138

Engine #	Low Growth				High Growth			
	2005	2010	2015	2020	2005	2010	2015	2020
35	1,153	1,210	1,258	1,309	1,289	1,657	1,919	2,196
42	1,626	1,707	1,775	1,847	1,818	2,337	2,707	3,098
44	1,638	1,720	1,789	1,861	1,832	2,355	2,728	3,121
46	200	209	218	227	223	287	332	380
47	25	26	28	29	28	36	42	48
49	454	477	496	516	508	653	756	866
50	1,073	1,126	1,171	1,219	1,199	1,542	1,786	2,044
54	891	936	973	1,013	997	1,282	1,485	1,699
55	583	612	637	662	652	838	971	1,111
56	425	446	464	482	475	610	707	809

Shaded numbers indicate workloads over 3,000.

* Moved to new location.

Figure 27 shows the current and proposed station locations under the low growth scenario, and Figure 28 for the high growth scenario. The stations in the figures are surrounded by 2-mile "radius" diamonds, which correspond approximately to 4-minute travel times at 30 miles-per-hour, or about 6 minutes total response time, when call processing is included.[36]) The figures show the location of proposed new stations and station moves superimposed on data showing where incidents occur at present.

The figures show adding the new stations would fill many gaps in the current system. Although the current number of structure fires in the immediate area of some of the proposed new stations is low, they are where the predicted growth will occur. (Also, the maps do not show rescue calls, which are far more numerous and widespread, and would also be served from the new stations.[37] Adding these stations also adds to the robustness of the entire system, increasing the ability to handle simultaneous calls and

[36] More exactly, the 2 miles correspond to the driving distance along streets and roads from the station to corners of the diamond or to any point on the perimeter of the diamond if the street network were complete and comprised of horizontal and vertical streets. It would be preferable to plot the actual driving distance within 4 minutes using actual fire department vehicle travel speeds. But the GIS did not have the complete street network entered and neither GIS nor JFRD could compute the average speeds (That should be done in the future). The approximation of the diagram is probably fairly good, but it would be much better with the actual driving times. Part of the delay in finishing this project came from the lack of adequate JFRD staffing for the IT and R&D functions to generate the necessary data and maps. We recommend IT staffing improvements in Chapter VII.

requiring fewer units to move out of their first due areas to respond to calls. That in turn improves overall response times, not just response times in the vicinity of the new stations.

Recommendation: Build all five stations (A-D and 57) suggested by JFRD within the next decade. They all are needed to fill gaps and reduce overloads in the system. The first three (A, B, and 57) are needed by 2005, and the other two (C and D) by 2010, even under the low growth scenario. Under high growth, at least three more stations will be needed by 2010 (E, F and G).

No Downtown Station Closures – We carefully examined and then rejected the idea of relocating one or more stations from the urban core into the suburban area, which seemed like a viable option initially. Although there are some units in the urban core with relatively low workloads, the overall network of stations downtown should be maintained, to avoid overloading units in the near future, and to maintain protection of the downtown area – the ability to assemble a full high-hazard complement within 8 to 10 minutes in the area with the most high hazards. Figure 29 shows the density of structure fires in the downtown area in year 2000, one reason the stations are needed there.

[37] Generally these types of maps broke new ground for the JFRD's analysts. Now that they have been developed, they can be used to examine rescue unit response ranges vs. demand. (A full EMS study was outside the scope here.)

Figure 27: Low Growth Scenario

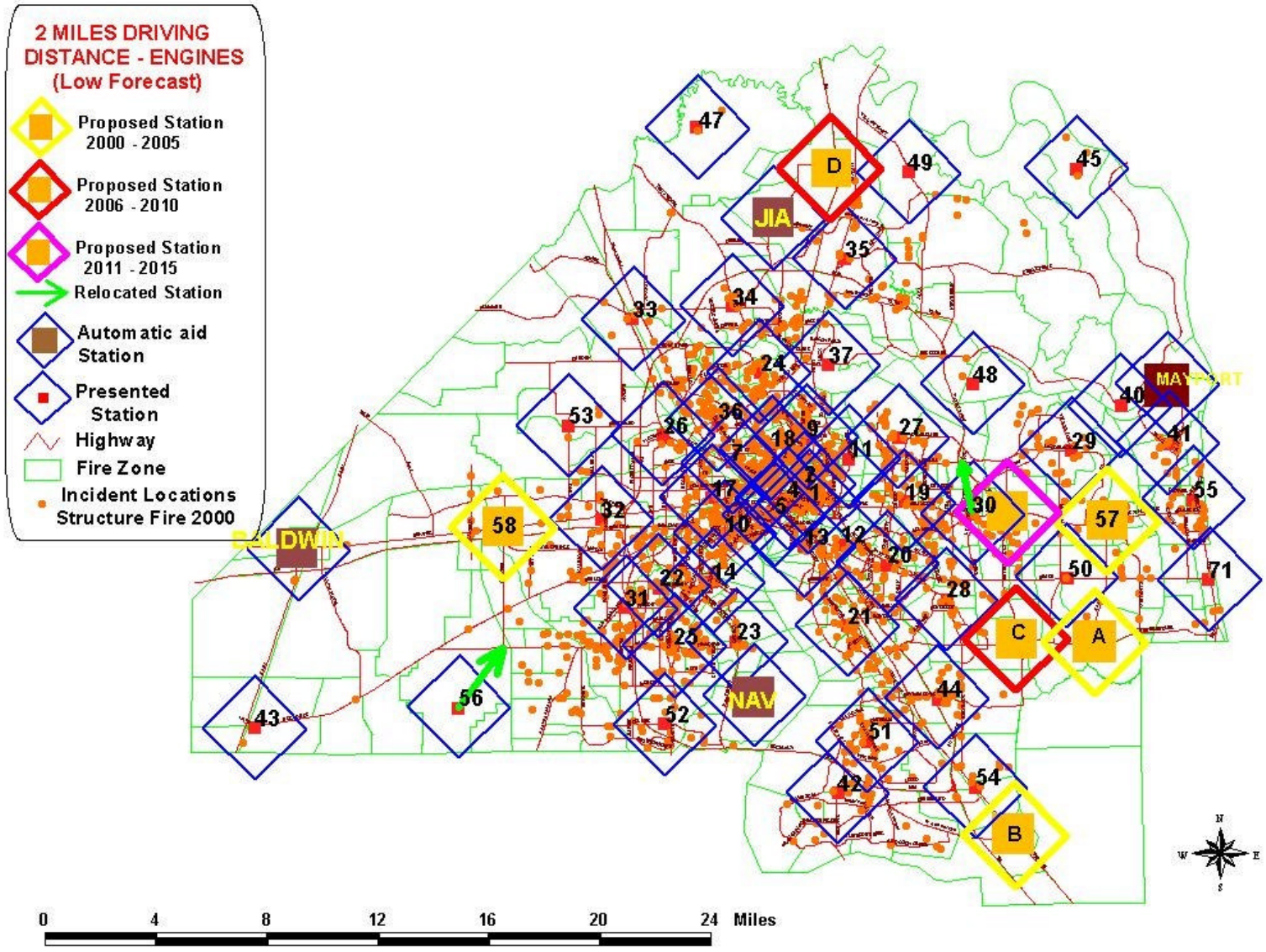


Figure 28: High Growth Scenario

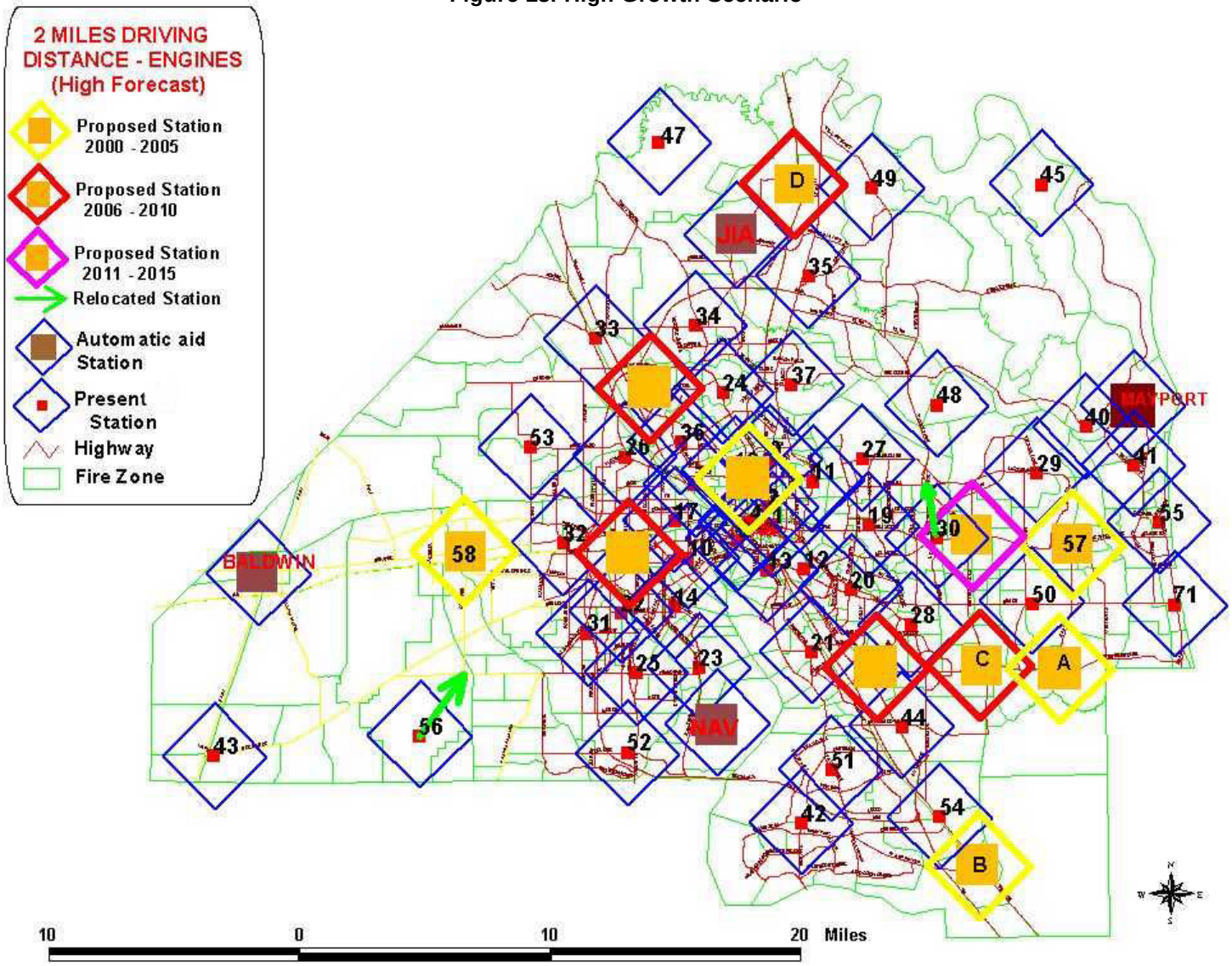
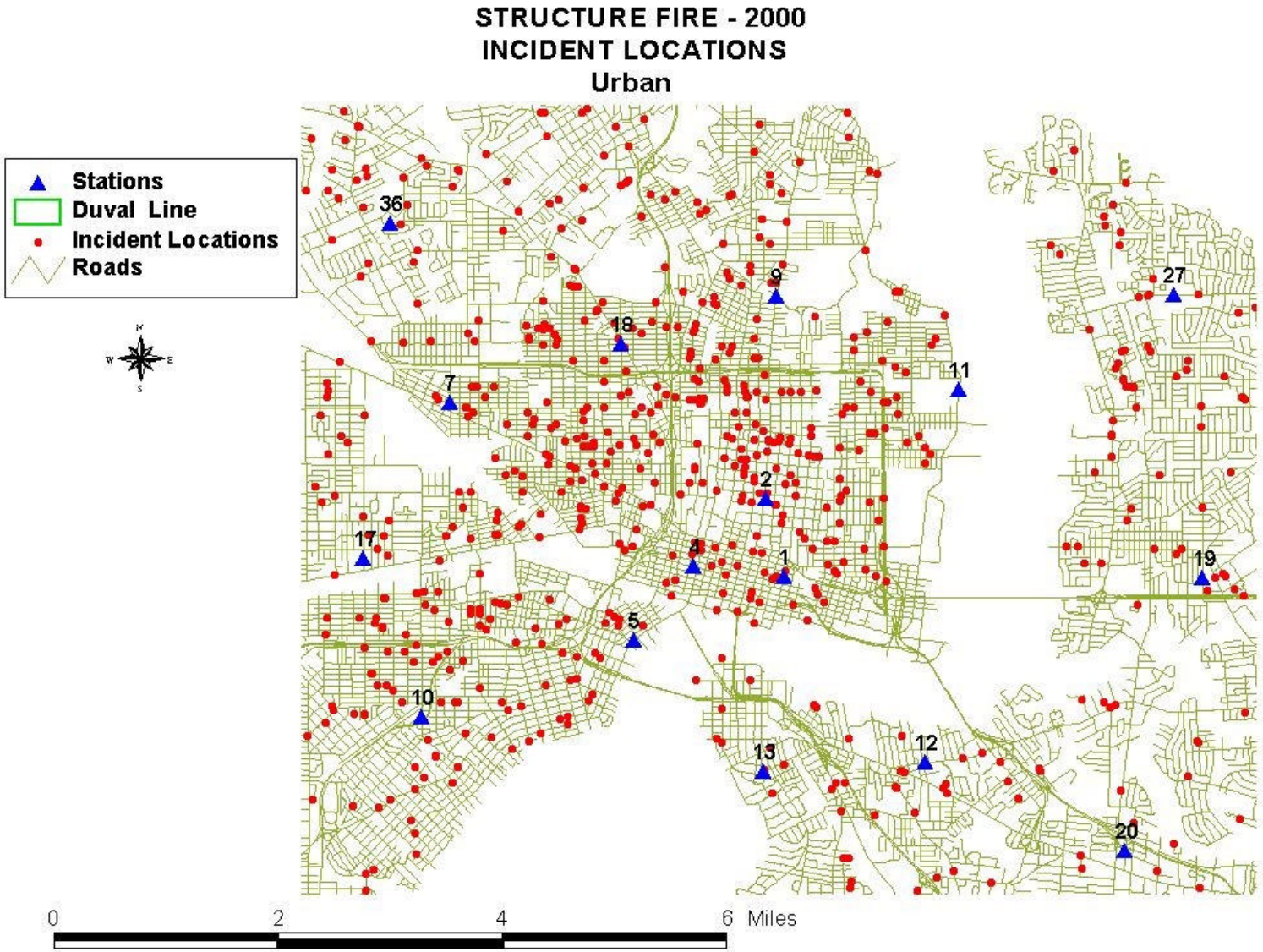


Figure 29: Downtown Structure Fires in 2000



New Ladder Companies

There are 12 stations that house ladder companies or squads that provide ladder company functions, including TS22, the quint. Three more ladder companies are available through mutual aid with the Navy (2) and Jacksonville Beach. Their locations are shown in Figure 30.

The distribution of these special units is critical to the success of structural fire suppression operations, particularly for multi-story buildings. The ladder companies are concentrated in the city center, where there are many high-rises and other large structures.

The figure is drawn with approximately 3-mile driving distances drawn around each ladder company, which correspond to an 8-minute response time, the desired goal. Each dot on the figure represents the location of one or more structure fires.[38] As can be seen, the vast majority of structure fires that occur in the inner city are close to ladder companies, but many in the suburban and rural areas are not. The second or third arriving engine company can perform "ladder company" functions such as search and rescue or ventilation, but they may take too long and do not have equipment equivalent to the ladder companies. A large area of the city is far from a ladder company but rarely needs one.

Figure 31 and Figure 32 show the recommended locations for additional ladder companies by 2020, for a total of 14 to 15 ladder companies, depending on growth. The particular additions were summarized in Table 29. The added ladder companies significantly improve coverage.

[38] For future analyses, it would be better to use a dot-plotting program that shows a cluster of dots around a location that has multiple fires, to better portray the density of incidents. Alternatively, a plot of density of incidents per square mile or other unit can be used.

Figure 30: Current Ladders and Squads, 3-Mile Driving Distance

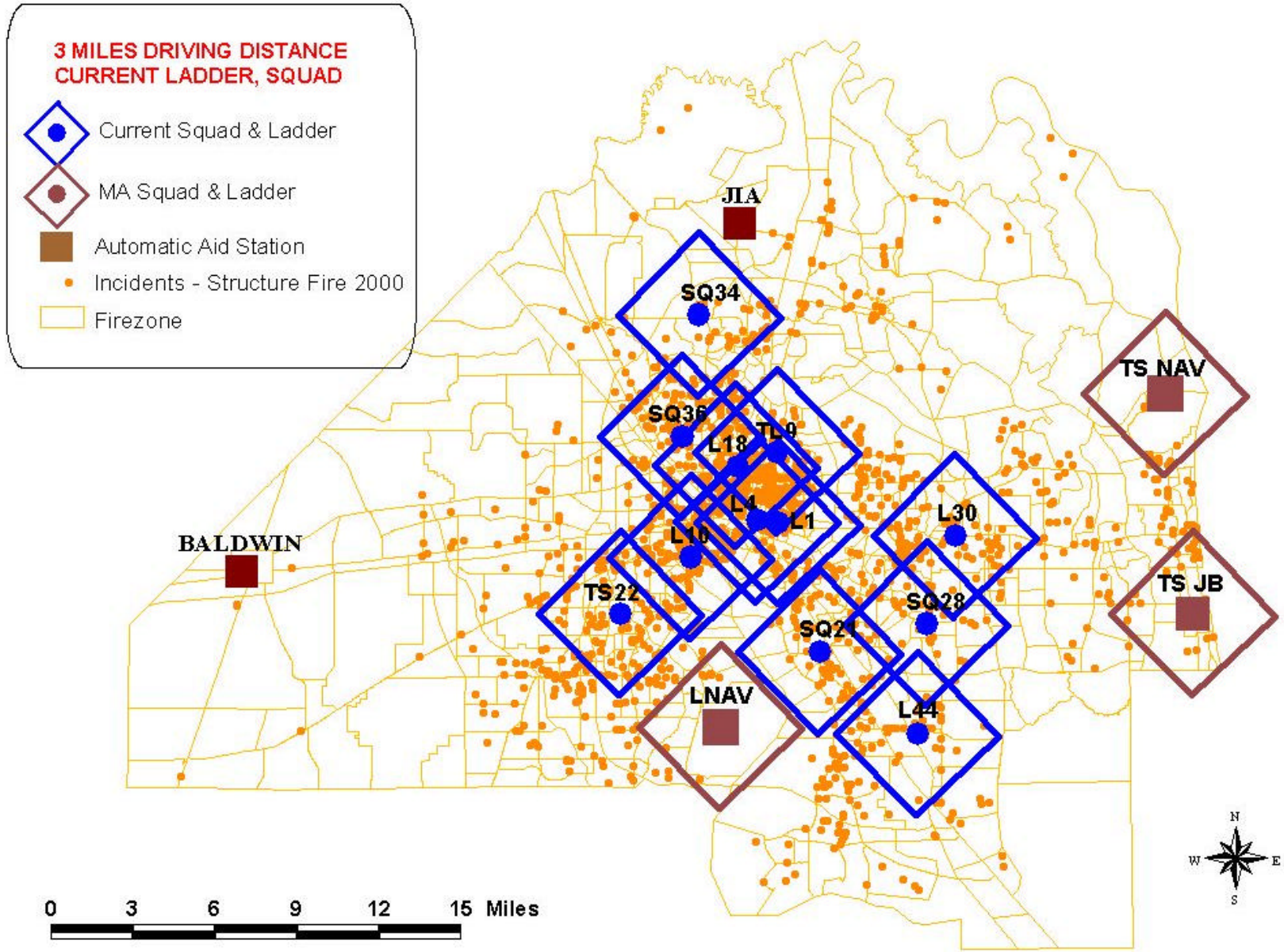


Figure 31: Ladder, Squad Company Locations by 2020 (Low Growth Scenario)

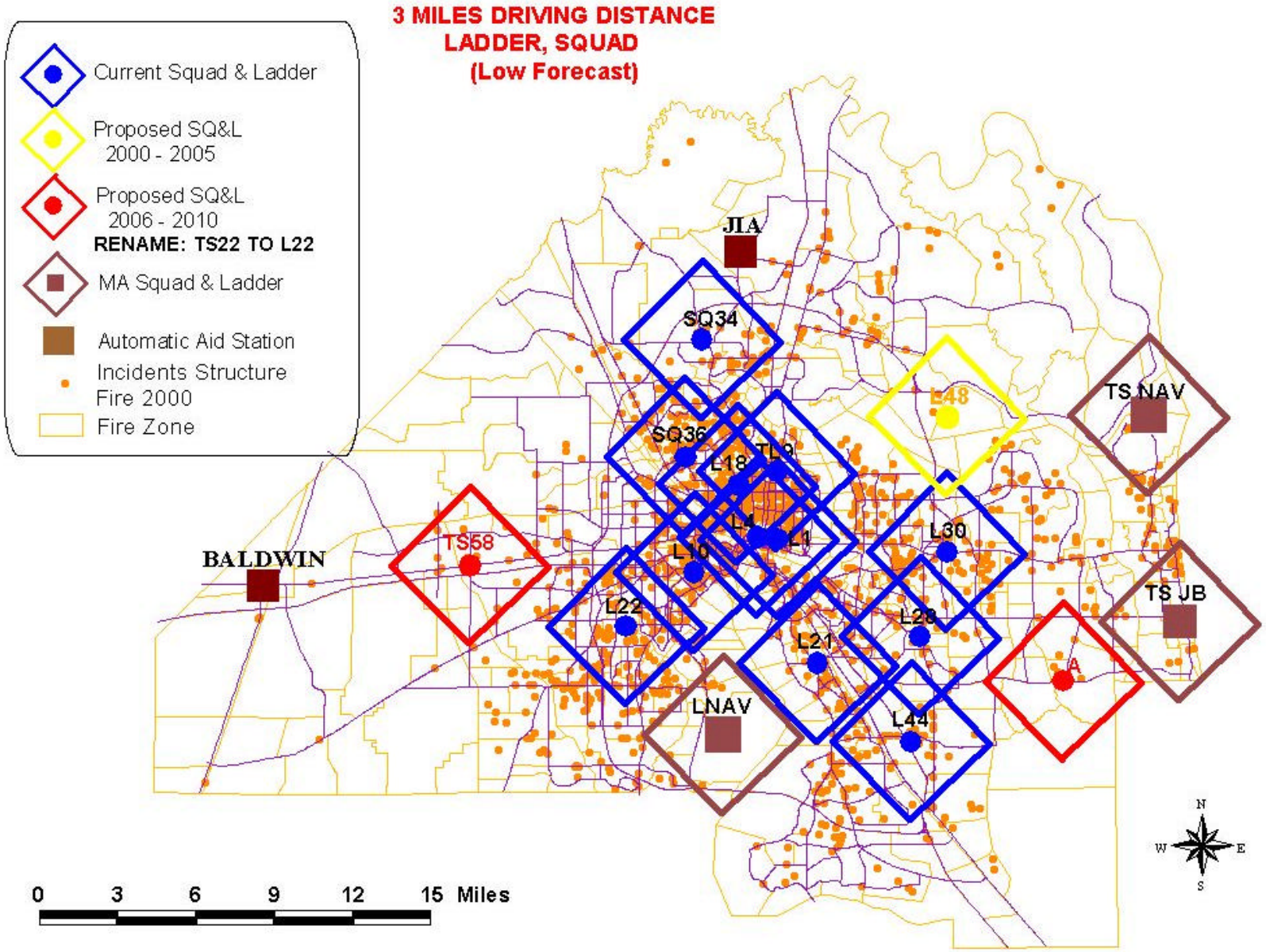
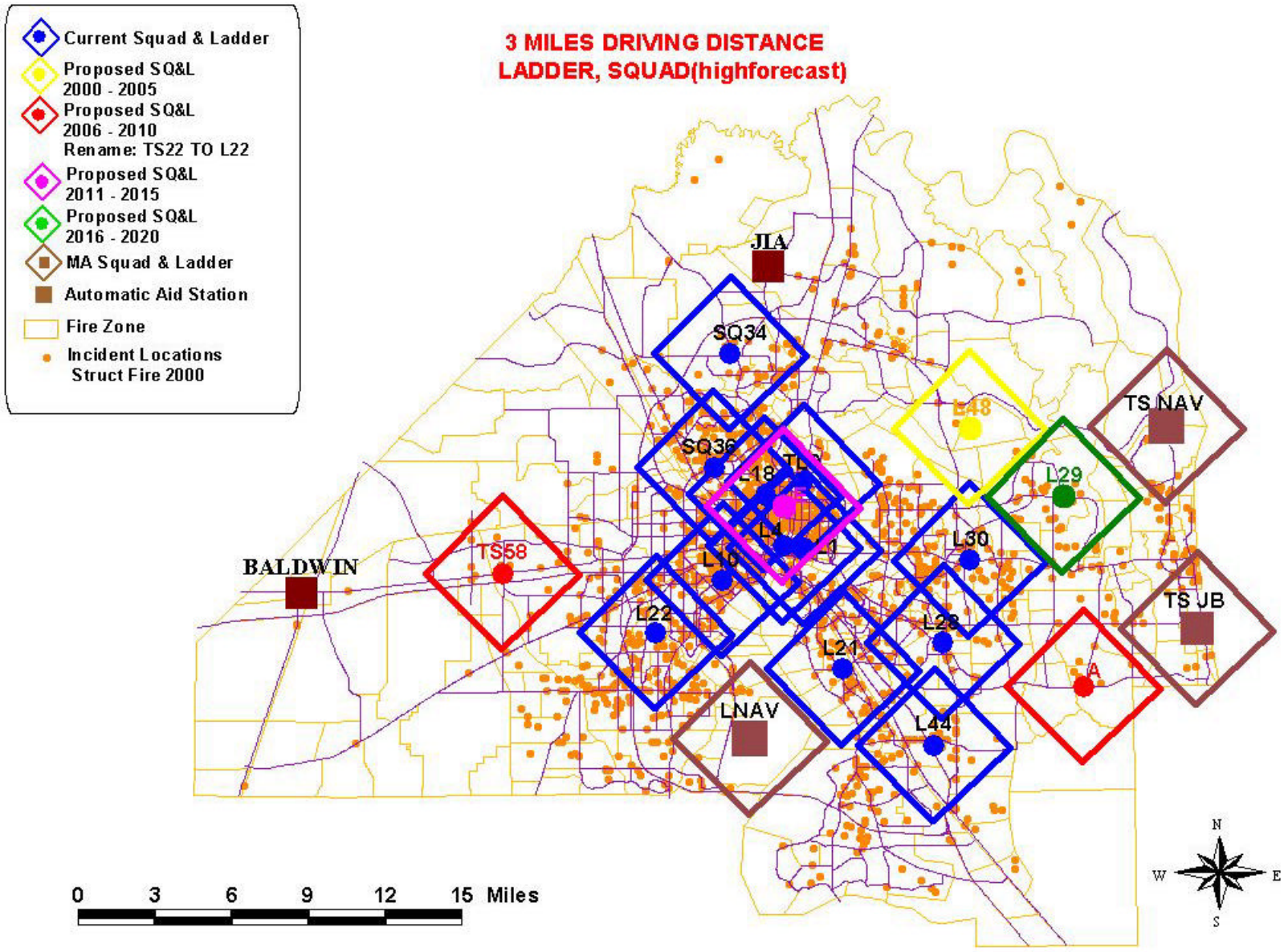


Figure 32: Ladder, Squad Company Locations by 2020 (High Growth Scenario)



A second alternative network of ladder companies and quints to be added was then discussed with JFRD Operations. It adds 3 new ladder companies and upgrades one engine to be a quint. Three squads would be upgraded to ladders. Importantly, four ladder units are moved to different stations. The two alternatives are very similar in total cost, but we favor the alternative developed with JFRD because it is more nuanced with moves that reflect intangibles and experience not obvious from gross demand estimates, and results in better geographic coverage with the same amount of resources.

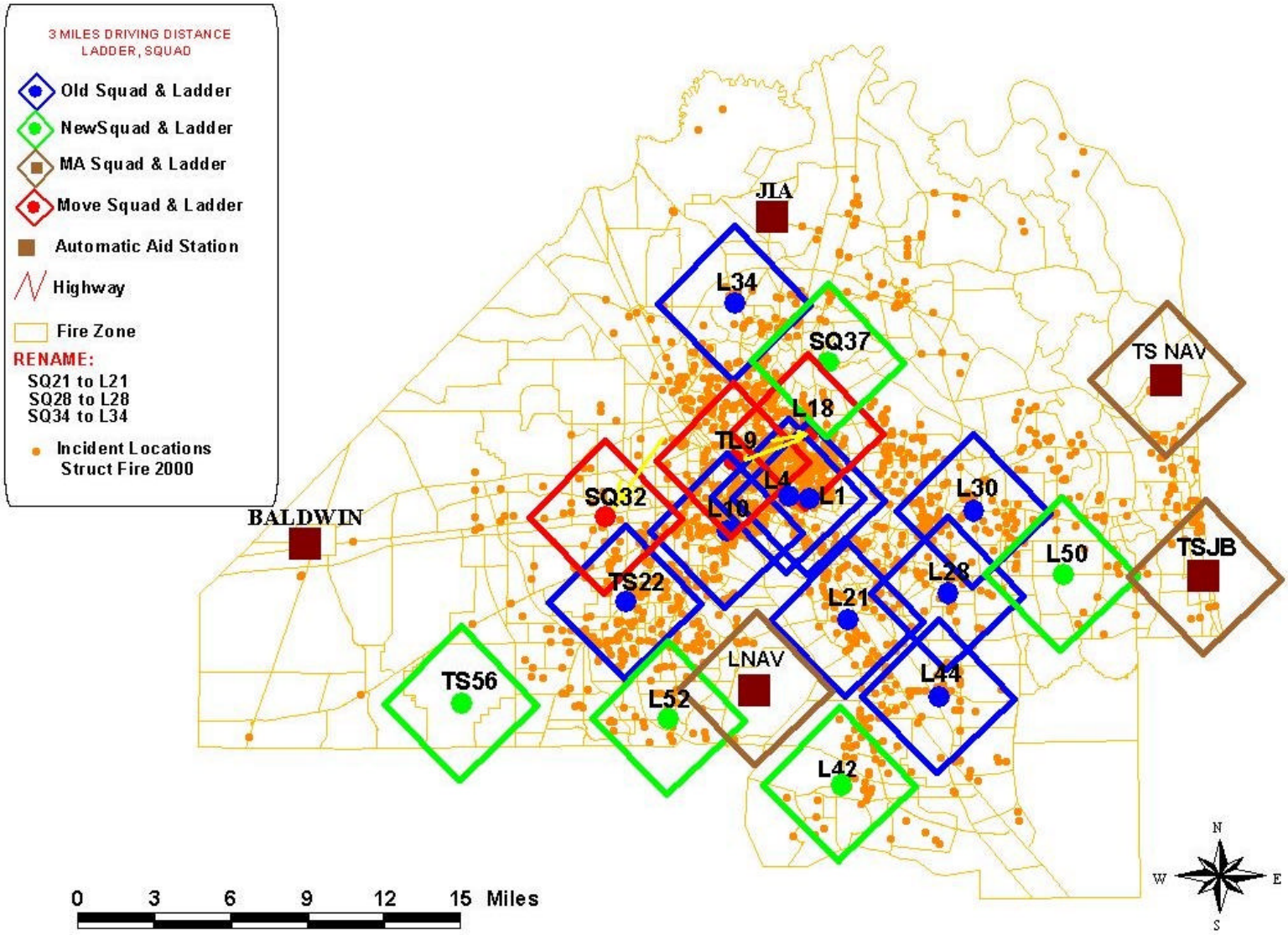
This second alternative includes the following changes:

1) Add new ladders at 52, 42, and 50
2) Move: L18 to 9
   TL9 to 7 (hazmat)
   S36 to 32
   S28 to 37 (new)
   TS22 to 31 (E31 to 22)
3) Upgrade: S21 to L21
   S28 to L28
   S34 to TL34
   E56 to TS56

Figure 33 shows the complete set of ladder additions and moves recommended under the second alternative. It would dramatically improve the time to get a ladder unit to the scene for more of the suburban and rural area than is possible at present. There would still be gaps in coverage in rural areas, but many fewer structure fires that would have poor response times than at present. Ladder companies cannot be counted on to respond everywhere there are structures within 8 minutes. The areas with the most structure fires would indeed be well covered with the additions.

Recommendation: Add at least 3 to 4 ladder companies over the next 10 to 15 years, upgrade the squads to full-fledged ladders and/or quints, and re-position four ladder units (as discussed above). The number and timing of added ladder companies depends on the number of structural fires and their geographic distribution. We recommend that 1 to 2 of the new ladder companies be added over the next 5 years. The placements of ladder units may be further fine-tuned in light of actual experience as to where structural fires occur and improved planning maps with more accurate portrayal of drive times.

Figure 33: 3 Miles Driving Distance – Ladder Squad (Recommended Alternatives to Figure 31)



Along with the additions should be the relocations, which cost little. Some can be made immediately. The relocations will change the ladder workloads, but no ladder would be overloaded. The intent is to preserve a concentration of ladder units in the most densely populated area, while also pushing the envelope of protection into the growing areas.

If the proposed complement of ladders were added, the majority of structure calls would be within reach of a ladder in 8 to 8.5 minutes – a good long-term goal. The ladders can be phased in as areas develop.

Adding ladder units comes with a price; three ladder units at four firefighters per unit will require about 45 to 48 new firefighters (with a staffing multiplier in the range of 3.6 to 4.0), about $2.2 million in operating cost per year.

VI. SUPPORT SERVICES

Support services are not the glamorous side of a fire department but are essential to the effective and efficient delivery of emergency services and should not be given any less importance.

In the Jacksonville Fire and Rescue Department, the term "support services" encompasses a variety of logistical, administrative, personnel and training functions. The services are not the responsibility of one department head. Rather, the tactical and the logistical units report to the Division Chief in charge of Rescue, while the supervisors of budget, personnel, facilities, and training report directly to the Fire Chief, and the head of information technology reports to the Division Chief in charge of Operations.

This chapter addresses maintenance, training, and personnel management. Management Information Services (MIS) was found to be a large and complex enough issue to merit a separate chapter (VI). The MIS chapter also addresses the computer aspects of the other support services, and so the two chapters should be viewed together.

Facilities Construction and Maintenance

The Fire Department administration is temporarily occupying two separate facilities. They are in the process of moving into what was formerly a federal reserve bank. Extensive rehabilitation is being done. Administrative staff, communications, and emergency management have already moved to the new facility. The personnel, budget, and facilities maintenance units will also soon occupy this facility. When the rehabilitation is completed, all fire department headquarters and most support services personnel will be housed in one facility. Co-locating administration and support personnel is an excellent move that will make it easier to integrate functions and share administration resources.

In addition to the headquarters facilities there is a Tactical Support unit facility, a warehouse (for logistics), and an 18-acre training facility with five separate buildings and 52 fire stations. The oldest fire station (#5) was constructed in 1905. The newest station (#54) was constructed in 1995.

Organization – Construction and maintenance for all fire department facilities are the responsibility of the fire department services/facilities manager. The current facilities manager has extensive professional experience in this area and a background in general construction. He is the only staff assigned to facilities maintenance. The facilities manager works directly with the City's Public Building Department and with private contractors who perform building maintenance and construction projects.

All City of Jacksonville bureaus and agencies are required to pay the Public Buildings Department 23 cents per square foot per year for building maintenance services. The Public Buildings Department is responsible for fire department maintenance projects that cost less than $25,000. Projects in excess of $25,000 are treated as capital improvement projects. Projects not handled by the Public Buildings Department are contracted out to the private sector.

Maintenance Program – Many fire stations are in need of considerable rehabilitation. In some situations, reconstruction on the same site or relocation to a better site may prove more cost effective than performing extensive repairs and renovations. Relocation may also improve operational efficiency by reducing apparatus response times. There is a five-year Capital Improvement Plan (CIP) to improve the stations on paper. The fire stations in greatest need of repairs and targeted for replacement or rehabilitation were listed in Table 25 in Chapter V. Some of these identified projects have been pending for as long as 12 years. Most are not yet funded.

A group of stations were initially owned by volunteer organizations, and inherited "as is" by the City during annexation. They were not designed to house today's fire apparatus and lack adequate office, work, and living space needed by 24-hour career firefighters. Fire apparatus specifications for Jacksonville have been limited by the size of the station that the apparatus will be assigned to, rather than being the optimal choice for operational needs.

None of the stations in the City are protected with fire sprinklers or air pollution exhaust systems. Few, if any, are in compliance with the City's fire and building codes and none were designed to accommodate female firefighters.

In addition to the problem with fire stations, the two facilities occupied by the Tactical Support unit and warehouse operations are small, cramped, and inadequate for what is needed to meet their intended purposes.

Future Station Design – The JFRD has grown quickly, and many of its facilities need improvement. Several of the stations originally designed for volunteer departments have little or no accommodation for living quarters. All new stations need to be designed with adequate accommodations, facilities for female firefighters, more than one bay to allow for expansion in the future, and modern firefighter safety considerations, such as vehicle emission control and full sprinklering (as a community example).

Recommendation: Fund station improvements and construction. As recommended in Chapter IV, the five-year Fire Department CIP needs to be adequately funded. The Fire Rescue Division's infrastructure must keep pace with the growth of Florida's largest area city. The CIP does not have adequate funding to move ahead with the existing plan.

Recommendation: New stations should be built with some extra room for vehicles of the future. ***The added space is a lot less expensive to build in from the start. It gives the Department more flexibility for storing spare apparatus as well as the front-line pieces. It could also be partitioned off for use by the community.***

Recommendation: Establish a position of Facilities Maintenance Assistant. This would help the Facilities Manager to cope with the workload and provide improved supervision and follow-up on station maintenance projects. One person is too few to manage the facilities improvements needed, especially if the recommended stations are built and the pace of maintenance accelerates as recommended here. The number of facilities occupied by Jacksonville Fire Rescue Division justifies the need for additional staff support. Too much work is behind schedule.

Recommendation: All new fire department facilities as well as major rehabilitations should include the installation of a sprinkler system. This is not just to protect personnel, who occupy the station, but also to protect the facility and expensive equipment, and to be a demonstration. Sprinklering the fire stations lets the City serve as an example to the community to whom it preaches doing the same.

Recommendation: Clarify areas of responsibility for building maintenance. The Fire Rescue Division and Public Buildings Department need to know who is responsible for what aspects of maintenance. For example, when repairs are needed on fire station overhead doors, the Public Buildings Department maintains the mechanical functions; the Fire Rescue Division is responsible for any electrical repairs.

Recommendation: Include in the management information system a computerized database to capture information on the condition and status of stations, station repairs, and equipment. This will allow for improved planning, budgeting, and scheduling of facilities maintenance and repairs. (See Chapter VII on staffing such new applications.)

Recommendation: When a decision is made to close or relocate a fire station, the JFRD should develop a well-planned public education and public information program for presentation to citizens in neighborhoods. Any changes are likely to be portrayed as dangerous to the neighborhood. They should be explained before the protests start.

Apparatus Maintenance

Overall, maintenance of apparatus appears to be working reasonably well, though, there are some problem areas. The first line fire vehicles generally seem to be in good condition in spite of their age and, in some cases, higher than average mileage.

Plans for preventive maintenance are comparable to standard practices. Apparatus are scheduled to receive "A," "B," and "C" levels of maintenance service. (These labels designate different groupings of routine maintenance procedures that include changing the oil, lubricating the chassis, and completing other basic in-station maintenance activities.)

There were varied opinions among the firefighters interviewed as to the adequacy of the maintenance. Some firefighters and officers complained about apparatus condition, and some cited the length of time apparatus remain out of service while being repaired. The JFRD keeps data on days each vehicle is out of service. The data for 1999 supports the opinions heard: there were 11 vehicles out of service over 100 days, and an average per vehicle entering maintenance of 57 days. The small number of 100+ day vehicles out of service skews the average, but the result is still significant. There appeared to be a dramatic reduction in vehicle days out of service from 1999 to 2000, but the data was said to be of questionable completeness because two systems were used.[39]

[39] There were 1,814 vehicle-days out of service through November 27, 2000. Annualized, this is about 2,000.

Officers and firefighters who raise concerns about the condition of their apparatus should be heeded. Their apparatus maintenance should be stepped up or explanations provided to them about its scheduling or proven adequacy. Maintenance is of course vital to citizen and firefighter safety and can be dealt with openly. It should not become a labor-management issue.

Recommendation: The planned preventative maintenance program should be fully implemented, if not already so done. The program is soundly planned, but there may be some exceptions in implementation. Also, JFRD should consider putting information on-line about the scheduled preventative maintenance of each vehicle and the status of each repair. That can be done by putting the output of modern fleet maintenance tracking software on the internet, available to each firefighter. Senior officers and individual firefighters can then track the status of individual vehicles. That reduces rumors and ill will and openly reveals problems, if they exist.

Organization – The Tactical Support unit is responsible for management of the Fire and Rescue fleet and facilities, small equipment maintenance, purchasing specifications and for warehousing and issuance of tools, safety equipment, hose, and other items. The unit is headed by a supervisor who reports to the Division Chief in charge of rescue (EMS) – a rather unusual organizational placement. The present staff is composed of four firefighters, three civil services employees and four temporary positions.

Major shop maintenance and repairs for most of Jacksonville's fire apparatus is performed at the City's Fleet Management facility by City technicians. Repairs and maintenance on hose, small tools, and equipment are normally completed at the tactical units facility.

The operational effectiveness of the Tactical Support unit is greatly hampered by the limited space of its facility and grounds. Hose, small tools and equipment are not properly stored, or secured. There is inadequate space to properly and safely perform apparatus repairs. The location of the facility at the intersection of Forest and Riverside is a high traffic area, which hampers accessibility to the facility.

The salary scale of the Fire Rescue Division apparatus technicians is well below that of their peers in the private sector. This limits the ability of the fire department to hire and keep competent technicians.

Recommendation: The Fire Rescue Division should locate a larger, more appropriate facility for the Tactical Support unit. The maintenance facility is not adequate in size or location to meet the operational needs.

Recommendation: The salary and benefit package for apparatus technicians should be made more competitive with the private sector. An option might be to contract select repairs out to the private sector if this proves to be more efficient and cost effective.

Fleet Age – Table 32 lists the vehicle fleet (as of April 1, 1999) by age and condition.[40] It is continually upgraded. The Fire Rescue Division primary fleet now includes 47 engines, 7 ladder trucks, 1 quint, 4 squad trucks, 26 advanced life support (ALS) rescue units, 2 marine units, 11 tankers, 4 air supply trailers, 1 command van, 1 hazardous materials truck, and 2 special utility vehicles, and miscellaneous other vehicles.

Table 32: JFRD Vehicle Fleet (including spares) (as of 4/1/99)

Chassis Year	Units	Age (years)	Average Mileage	Condition
Rescue (33 Units)				
89*	1	10	177,437	Worn out, excessive mileage
90*	1	9	193,380	Worn out, excessive mileage
93	5	6	167,345	Good, but high mileage
94*	10	5	148,205	Fair, but excessive maintenance costs (being replaced this year)
96	2	3	115,833	Good
97	12	2	62,648	Good
98	2	1	28,914	Good
*These units were assessed by JFRD as needing replacement.				
Pumpers (61 units)				
73*	4	26	147,663	Fair, refurbished in ‘89
74**	4	25	133,770	Poor, units worn out
75*	7	24	160,060	Fair, refurbished in ‘89
77**	1	22	183,210	Poor, worn out chassis
80**	3	19	159,429	Poor, chassis is obsolete
81**	3	18	137,458	Poor, chassis is obsolete
82**	3	17	163,918	Poor, chassis is obsolete

[40] A newer list was not available.

Chassis Year	Units	Age (years)	Average Mileage	Condition
83**	3	16	139,303	Poor, chassis is obsolete
84	2	15	96,374	Good, can be refurbished
87	1	12	48,248	Good, can be refurbished
88	2	11	105,460	Good
89	9	10	119,754	Good
92	5	7	55,727	Good
93	7	6	52,361	Good
94	7	5	58,967	Good
97	1	1	16,528	Good
*These units were refurbished in '89 with new cab and body; some parts are obsolete. **These units need to be replaced because of the general condition, excessive mi leage, inadequate storage, and continued maintenance problems. The Ford chassis are no longer in production. Parts are difficult to find for these units.				
Pumper Telesqurt (1 Unit)				
88	1	11	159,917	Fair, needs to be refurbished
Ladder Trucks (13 Units)				
57*	1	42	60,939	Out of service
67*	1	32	123,041	Out of service
72*	3	27	133,431	Poor/Two (2) out of service
74	3	25	25,272	Good
92	2	7	41,875	Good
93**	1	6	23,095	Good, '87 light duty aerial
94	2	5	31,447	Good
95	2	4	19,825	Good
*These units are light duty aerial devices and should be taken out of service as soon as possible. They were scheduled for replacement over the past 3 years, but not funded. **This unit is a '93 model tractor with an '87 model light duty aerial trailer.				
Squads (5 Units)				
75*	2	24	160,880	Poor, worn out, excessive mileage
86*	1	13	115,971	Poor, continued structural failure
94	2	5	55,871	Good
*These units need to be replaced because of excessive mileage, inadequate storage, and overall condition of the units. The older Squads need to be replaced with Ladder Trucks.				
Woods Truck (6 Units)				
96	3	3	25,814	Good
97	3	2	15,509	Good

Chassis Year	Units	Age (years)	Average Mileage	Condition
Tanker (13 Units)				
71*	4	28	125,400	Poor, obsolete parts
83	2	16	56,447	Good, chassis is obsolete
85	1	14	47,928	Good, chassis is obsolete
90	6	9	54,745	Good, chassis is obsolete
*These need to be replaced at this time.				
Air Trucks (3 Units)				
85*	1	14	86,060	Poor, compressor is broken
91	1	8	168,775	Good
93**	1	6	34,425	Good, compressor is 20 years old
*This unit needs to be redesigned to meet the Department's present needs. **This unit is used by the Training Academy and has only a 3,000 psi rated compressor.				

The average age of the engines is approximately 12 years. The newest engine was purchased in 1996. NFPA recommends use of engines for 10 to 15 years, depending on the level of wear and tear. The average miles on all JFRD engines are relatively high. Some of the older engines have mileage in excess of 150,000. Thirteen engines purchased in 1993 have an average of about 70,000 miles. The engine companies serve as life support units and respond to EMS calls, which leads to amassing high mileage but little pump time.

Twelve of the frontline engines and 12 of the reserve engines have open cabs. They should be retired for safety reasons as soon as possible. Firefighters in them should be seated and belted down, and drive even more carefully than other vehicles.

The overall age and mileage of Jacksonville's fire and rescue vehicle fleet is cause for some concern. Of the 54 primary and reserve fire suppression apparatus, only five pieces have been purchased since the 1993 procurement of the thirteen engines. In 1994 the Department took delivery of a new tanker/pumper and two new tiller trucks. In 1995 the department purchased one platform truck. A single engine was purchased in 1996.

Presently there are 17 new vehicles on order – 15 engines and two platform trucks. The engines are scheduled for delivery in January 2001, the two trucks in March

2001. This is a bold, needed move toward improving the existing fleet. The 12 open-cab vehicles should be given first priority for replacement when the shipment arrives, barring any worse problems with other vehicles.

The purchase of 17 vehicles at one time could create a situation downstream where a large number of vehicles will need to be replaced at the same time. A preferable and financially less traumatic replacement program is one in which a scheduled number of apparatus are replaced annually. While there are sometimes economies of scale from a large purchase, it generally is less disruptive to continually channel new vehicles into the fleet.

Suppression apparatus now are planned to be on a 10-year replacement plan, which is very good, on the low (better) end of NFPA recommended guidelines. However, considering the average mileage of the apparatus, a 10-year replacement goal is reasonable. When developing vehicle replacement plans, in addition to age, planners should also consider the expected service life of the vehicle, the average annual mileage, the repair record and critical nature of services that will not be provided when the vehicle is out of service, and the availability of reserve vehicles.

The age and condition of rescue vehicles operated by the Fire Rescue Division are generally good. Rescue units are scheduled be replaced every four years, which should be adequate.

Recommendation: The Fire Rescue Division needs a sound, comprehensive funding plan for the continuous upgrading and replacement of the Department's fire apparatus. While there is a vehicle replacement plan in place, the plan has not been adequately funded.

Spare Vehicles – There are 4 or 5 spare engines for the 47 line engine companies and two spare ladders for the seven ladder companies. The number of engine spares is below NFPA's recommended guidelines; they recommend that the number of spares be equal to 20 to 25 percent of the prime (first-line) fleet. The spare ladder, if in good shape, should be adequate for the short term. Jacksonville has spare engines equal to 10 percent of the fleet. The most important criterion is that there be enough spares so that no units are taken out of service for lack of a spare vehicle. The spares serve a secondary purpose of being available for service for a large emergency requiring callbacks.

The Operations Chief estimated that at present, a unit is out of service about twice a month for lack of a vehicle. In those cases, JFRD tries to use vehicles from a company that is in training. As the new engines arrive next year, the reserve fleet should be increased by at least two to three reserves, for a total of at least seven spare engines, including their equipment. This will allow for more efficiency when it is necessary to exchange units (no down time while switching equipment).

Recommendation: Add at least three spare engines. This can be done in the immediate future, when the new engines arrive and the best of the older engines is added to the reserves.

Logistical Support – This unit has several supply functions. They procure, maintain, and distribute uniforms and firefighter gear. They also stock and issue emergency medical supplies, including drugs, oxygen, and other items. The logistical staff are under the supervision of a fire department captain who reports to the chief of the rescue division.

The existing facility is cramped and has limited accessibility for delivery vehicles.

A department audit undertaken by City auditors a year ago gave the logistical function a poor rating. This resulted in the appointment of an oversight committee. The committee's initial task was to develop standard operating procedures for the logistical staff. In addition, the logistical staff is developing a computerized inventory system. The unit has had to struggle over past years without proper inventory control.

Recommendation: The Department should continue with efforts to computerize its inventory system. A method of ordering and receiving supplies and equipment, both internally and externally, should be included as a component of the system that is being developed. As recommended in Chapter VII on MIS, this and other applications software preferably should be developed under the aegis of the Department's IT group, to ensure compatibility with other software and to ensure its adequacy and maintainability.

Recommendation: The logistical function needs to be provided with adequate facilities. It would be preferable to house the Tactical Support unit and the logistics support unit in one facility. Sharing resources, especially in distributing equipment and supplies to the many fire stations, will produce savings in both cost and time.

Recommendation: The EMS supplies should be replenished bimonthly (vs. monthly now). Consideration should also be given to having the rescue captains complete the state inventory form, and submit it weekly.

Training

Training is a must if the fire department expects to maintain proficiency and learn new skills. It is not uncommon for the fire service to spend more time on training activities than on actual emergency situations. As the duties and responsibilities of the fire service expand into the diverse areas of EMS, hazardous materials intervention, technical and high angle rescue, urban search and rescue, dive rescue, public education, fire inspections, and more recently, terrorism and weapons of mass destruction training, training activities must address this broad spectrum of responsibility. The variety of equipment, and the complex and intricate operating procedures required to carry out these functions, necessitates continuous review and drilling.

Thus, there now exists a multitude of subjects that must be addressed by those responsible for fire department training, subjects once foreign to the fire service. Special training is also needed whenever a new procedure or piece of equipment is introduced. Many hours of in-service training are necessary for maintaining required certifications, and to meet legal mandates such as the hazardous materials training and blood-borne pathogens training required by the Federal Occupational Safety and Health Administration (OSHA). The Fire Department must also provide regular training on administrative and supervisory requirements, including sexual harassment issues and ethnic diversity.

A number of innovative fire departments have further expanded the charter of their training divisions to include citizens and fire service employees outside of the operations arena. A "Citizens Fire Academy" gives citizens a modified version of the firefighter recruit school. This type of training has proven to be extremely effective in promoting public education as well as being an excellent public relations tool. It is especially useful to have media and local government officials attend such "Citizen Fire Academies."

Staffing – Ten full-time instructors under the supervision of a Division Chief staff the Jacksonville Fire Rescue Training Division. It reports directly to the Chief. A cadre of adjunct instructors is also utilized. The adjuncts are usually firefighters and officers with have expertise in specific subject areas either on duty or hired back. In addition, the fire department safety officer and safety coordinators are assigned to the Training Division.

Training Facility – The fire training facility is a complex of five buildings situated on an 18-acre plot. It has modern classrooms with theatre-type seating, an up-to-date propane-fired burn building, outdoor burn pits and a five-story drill tower. There are numerous props and training aides that allow for simulation of actual firefighting situations. In addition, there is a drafting pond, an emergency vehicle driver training area and a building for physical fitness. The training facility is a joint project of the Florida Community College of Jacksonville and the Fire Rescue Department.

An excellent feature of the training facility is its video production studio. The Division utilizes this studio and local public access television to broadcast training to its fire stations – an excellent practice that saves time and keeps units in their stations. Video training is broadcast via a local TV cable company three hours each day, Monday through Saturday. Fire stations in remote areas without access to cable television are provided with tapes and VCR's.

Through the generous donations of local business and industry, a number of training props and simulators have been acquired, installed, and in some cases are continually maintained by the donors. Some of the items from private industry include railroad cars, gasoline tanker trucks, and other valuable pieces of training equipment.

All in all, the training facility is well above average.

Programs – The major activities of the Training Division are divided into three areas: fire operations, recruit, and EMS.

FIRE OPERATIONS TRAINING includes the basics of firefighting plus a host of specialized training activities such as hazardous materials, technical and high angle rescue, self-contained breathing apparatus (SCBA) training, and vehicle extrication.

The Training Division also spends a considerable amount of time developing and supporting the video training presentations primarily for operations training.

Training for inspectors and other prevention (fire loss management) functions are managed within the loss management division (prevention). Training for these units is usually delivered by the community college.[41]

RECRUIT TRAINING is handled by the Training Division. All new hires are certified firefighters and EMTs. The orientation presents a variety of basic topics and provides specific training on JFRD policies and procedures. Recruit training seems satisfactory.

EMS TRAINING has two primary objectives, the initial training and certification of EMTs and paramedics, and the on-going refresher and re-certification training for EMTs and paramedics. In order to re-certify, paramedics and EMTs are required under state regulations to receive 30 hours of continuing education every two years, plus current BLS or ALS certification.

When interviewing firefighters and officers on their perceptions of the Training Division's effectiveness, the responses were mixed. Some believed that the Training Division did an excellent job in responding to the Fire Department's training needs. Others believed that some aspects of training and the coordination of the many types of training were in need of improvement. Although training has the clear support of the fire chief and key fire department officials, it was perceived that there is not adequate follow-up throughout the organization to insure that training activities are adequately prioritized and coordinated. An example: more than 900 firefighters and officers have completed mitigation of weapons of mass destruction training, yet there is no on-going or mandated officer development training. (The availability of outside funds for WMD training may affect priorities, too.)

Overall, the Training Division is doing well when compared to other fire departments in the state. There are, however, a number of factors that pose problems for the Training Division. First is the high volume of training needed for the OSHA, hazardous materials, and emergency medical services requirements. Second, the number of positions assigned to the Training Division is lower than needed relative to the unit's workload. Third, there is little if any formalized testing to measure the effectiveness of

[41] We did not assess prevention-related training because prevention was outside the scope of the study.

the training activities, except in the area of EMS. The only specific instructor evaluation presently in place is in confined space rescue training. Fourth, training records are maintained for each firefighter, but the records do not present a clear picture of the performance level or of specific task accomplishments; these can pose a liability problem when training cannot be demonstrated.

Recommendation: The Training Division should institute a "train the trainer" program for line officers. Line officers who are expected to deliver much of the company level training can do a better, more consistent job if they are trained in instructional methodology and certified as fire instructors. They could then be trained to deliver select training packets on specific subject areas.

Recommendation: Develop an instructor evaluation system for adjunct instructors and company officers. The Battalion Chiefs would evaluate them in the delivery and organization of in-service training. Battalion chiefs should regularly observe training drills and in-class presentations. All instructors preferably should be certified as instructors. Remedial training should be provided to company officers who demonstrate unacceptable teaching skills. Adjunct instructors should receive evaluations from Training Division staff and/or battalion chiefs at least once annually.

Recommendation: Institute a divisional performance-based evaluation process for firefighters, engineers, lieutenants, captains and battalion chiefs. Employees would be required to demonstrate competency in required subject matter through both written and practical evaluation.

Recommendation: Concentrate the Training Division on curriculum development, testing of learned skills, and auditing of training records. The Training Division should focus on the role of developing curricula, scheduling, providing the necessary resources and insuring that records are properly maintained. A Steering Committee, chaired by the Chief of Training, might be established to identify training needs and review the curricula for each major subject area. Subcommittees for each subject area could supplement this committee. Each subcommittee could include six to eight personnel, including a member of the training staff.

Officer Management Training – There currently is no requirement for company officer development. Company officers need to be versed in tactics and strategy, but they also need to be versed in managing people and handling administrative duties. Most pick up the former skills, but many do not pick up the latter, and lack supervisory skills. As a result, many personnel issues get bumped up the line, much higher than where they should be solved. This is an all-too-common situation across the fire services, not just in Jacksonville.

Recommendation: Develop a program for training company officers in both command and management. Additional supervisory training should be given to District Chiefs and Battalion Chiefs when they get promoted. There are many curricula to emulate: one does not have to reinvent these courses.[42] Priority should be given to training incumbents, consideration should be given to making completion of the officer development program a prerequisite for promotion or serving as an acting officer (or give extra points for completing the program).

Human Resources Management

Managing human resources issues (HR) is one of the most time-consuming and difficult challenges faced in any company or business. The fire department is no exception, and perhaps worse off. Fair hiring and promotion practices, ethnic and gender diversity, worker safety, job selection, sick leave, labor management and many other issues all fall within the realm of responsibilities given to personnel management.

In Jacksonville, as in most cities, the union leadership is active in upholding the rights of its members through collective bargaining, conflict resolution, mediation and arbitration. The Public Employees Relations Commission lists the mandatory subjects of bargaining; these include wages, hours, and terms and conditions of employment. In addition, the modern fire department union leader can be expected to play an active role in the local political process.

Organization – Personnel management in the Jacksonville Fire Rescue Division is spread across a variety of activities, with supervisory responsibility shared by a number of persons. Recruitment is under the supervision of the department's civilian EEO officer, an unusual organizational placement. A fire department captain is assigned the title of Compliance Officer, and is responsible for handling all disciplinary actions. Division chiefs handle disciplinary actions that advance to the grievance stage.

The basic day-to-day supervision of personnel matters and the management of personnel pay and status transactions are delegated to a civilian employee who is also the fire department budget supervisor. The budget supervisor administers the classification and payroll process including accounting, time keeping, out of class pay, incentive pay,

[42] Our reports to the cities of Chicago (1999) and Houston (2000) give examples of the kind of training needed.

and the distribution of the payroll. In addition to administering and monitoring employee benefits, insurance, pensions, sick leave and vacations also are the responsibility of this same staff member. This all represents a serious overload. The JFRD needs to consider this in light of the new organization chart recommended. At least one additional HR person is needed somewhere to handle the workload.

Some aspects of the personnel function are extremely complex, given the different requirements that apply to each of five employee groupings. Local 122 of the International Association of Fire Fighters (IAFF) represents firefighters through captain level. The IAFF also represents chief officers through Battalion Chief level under a separate supervisory contractual agreement. The Jacksonville Supervisors Association (JSA) bargains for civilian supervisors. Council 79 is the official representative for some clerical staff, while others are excluded as management confidential employees (M&C).

Recommendation: Add an HR person to assist the budget supervisor. As noted above, the workload is causing undue delays.

Recruitment and Selection – As noted above, recruitment of firefighter/EMTs is under the direction of the Fire Department's civilian EEO officer. The recruitment section is supervised by a fire department captain and includes two fire department engineers and a clerical specialist. In addition, a human resources specialist gives direction, validates all processes, and is the fire department's liaison with the City HR and other agencies.

The selection of entry-level firefighters uses a comprehensive, competitive process. All candidates must meet the following prerequisites at the time that they apply:

- Florida Minimum Standards Firefighter Certification
- Florida EMT Certification
- At least 18 years of age
- No Felony Conviction
- High School Diploma or GED
- U.S. citizen or resident status
- Florida Drivers License (Class D with an E endorsement) within one year
- Non-tobacco user

Firefighters in the State of Florida are required to be certified in accordance with Florida Statute 633, which requires successful completion of a 280-hour minimum standard training course in firefighting, including written and practical examinations. In order to receive a firefighter certificate, candidates must also be EMTs. All candidates must also pass the entrance firefighter medical evaluation, as prescribed in the National Fire Protection Association (NFPA) 1582 Standard. The Florida Bureau of Fire Standards administers the certification process and the course curriculum for this training. There are no re-certification requirements for maintaining firefighter certification, as long as the individual remains active.

Candidates who meet the initial requirements must apply for a firefighter/EMT position through the City of Jacksonville's Human Services Division. Each candidate is then given physical abilities test, and must under-go an in-depth background check that includes finger printing, criminal record, driving record, credit checks, reference checks, and lastly a polygraph test.

The candidates who survive the background checks and polygraph are then interviewed by a five-member interview board, which is composed of a union representative, three fire department personnel (two being from the recruit section), and the human resources specialists. This panel rates all applicants on five dimensions:

- Work Standards
- Team Building
- Job Motivation
- Adaptability
- Initiative

Following a successful interview the candidate is placed into one of five bands, the cumulative score determines bands. The fire department chief may then opt to select any candidate from any of the five bands.

The Department has placed such great emphasis on recruitment that the head of that section reports directly to the fire chief. The City and Department have implemented measures to increase representation of minorities and females through the recruitment process. Although it is a new process, it is reportedly moving well toward achievement of the intended results.

Recommendation: The Department should continue efforts to increase the number of employees in any under-represented classes. Statistical data should be collected and broken down by ethnicity and gender for each classification and rank in order to monitor progress. As an additional approach to increasing the number of minorities and females, the Department could consider sponsoring some to obtain fire and EMS certification.

Although the Department assists some current EMT firefighters in attending paramedic school, it should encourage more employees to go to paramedic school. This measure, combined with recruitment efforts, may allow more minorities and females to enter the applicant pool and be placed in a favorable hiring "band" (higher level on the tests).

DROP Problem – With the adoption and implementation of the retirement DROP Plan, the Department will be faced with the need to replace over 240 firefighters in two to three years. This exodus from JFRD will have a great impact on the Department. There will be a loss of many experienced personnel in a relatively short time period. There will be a need to initiate aggressive recruitment efforts aimed at gaining experienced replacements as well as attempting to maintain a representative workforce. There will also be a need to identify leaders to take the place of those leaving.

Many other fire departments in Florida have adopted the DROP Plan, and thus there is also a possibility of a short-term statewide shortage of firefighters, especially paramedic firefighters. It takes two years to complete the firefighter paramedic training process. Now is the time for Jacksonville to take a proactive approach to not only replacing bodies but to replacing the valuable experience that will also be lost. This concern could be somewhat alleviated if the department attempts to increase the number of firefighters within the existing force who are also certified paramedics (as suggested above).

Recommendation: Consider adding a mentoring program to speed up transfer of experience. There are proven techniques – in fact, 57 skills – for improving mentoring ability. Members planning to leave may enjoy mentoring younger firefighters.

Civilian Recruitment – As seems to be a common thread with many fire departments, there is a long turn around time in the hiring process in Jacksonville. The City HR does the recruiting for civilian positions. Often by the time individuals are offered a job, they have already accepted positions elsewhere. This seems especially true

for civilian technical positions such as budget personnel and mechanics. Another problem is competition among City departments for existing employees.

Recommendation: Consider establishing a citywide task force to examine the hiring process to determine areas where hiring timeframes could be shortened.

Recommendation: Conduct salary comparisons at least biannually, to assure that Jacksonville salaries are comparable to other fire departments and private industry. While this tends to be done for firefighter salaries by management and the unions, it also needs to be done for civilians.

VII. MANAGEMENT INFORMATION SYSTEMS

This chapter addresses the use of information technology (IT) and management information systems (MIS) to support the Fire Chief and various divisions and functions within the Jacksonville Fire and Rescue Department. It describes how IT is organized within JFRD and how the responsibilities are divided between the JFRD and the City's Information Technology Department (ITD). The existing application systems and future needs are described for each of the fire department divisions.

Management Information Systems have become a critical part of the Fire and Rescue Department as they have for other fire departments and for other Jacksonville departments. But the magnitude of the job of supporting the hardware system, developing and maintaining software, training firefighters in their use, and maintaining a help desk, has been underestimated, and the support staff for maintaining and further developing IT is inadequate – a problem we are finding in most Metro fire departments today.

The JFRD was one of the first city departments to use PCs starting in the late 1980s. However, when the current Fire Chief came into the department in 1995, there were no PCs in the fire stations. He established the goal of improving IT as one of three areas of concentration for his administration. Since then, PC workstations and printers have been installed in all stations, a departmental intranet has been developed, the administrative and headquarters computers have been connected to the internet, several departmental specific databases have been developed, and many computers have been upgraded to current standards – an enormous accomplishment toward modernizing the Department.

Further, a custom-developed computer-assisted dispatch (CAD) system has been implemented. It replaced the previous mainframe CAD. The City ITD has contracted with an IT services company to develop and maintain the CAD system; the fire department IT does not provide technical support for the CAD system used for fire and rescue dispatch.

Organizational Structure and Management

Approximately 11 years ago, JFRD hired a resource from the City's ITD as the EDP Methods Coordinator to organize and lead an internal information technology group. This JFRD IT organization has proven crucial for serving the specific computer needs of the fire department.

The EDP Methods Coordinator reports to the Division Chief of Fire Operations for direction and supervision. The Coordinator also reports to the Fire Chief for direction and to find funding for services and items when funds for IT are not made available from other divisional budgets.

The Division Chief of Fire Operations provides extremely good leadership for IT. The Fire Chief is very supportive and encourages the use of IT throughout the department. There is good teamwork among the division chiefs to support IT initiatives. There is department-wide interest and commitment toward using technology to improve operations. This top-level support for making the Fire Department a sophisticated IT user is among the best we have seen in metro fire departments.

However, the success of IT depends upon many working-level individuals, personal relationships among IT people, and adequate time to manage the function, not just upon organization structure and formal methods of IT budgeting and planning.

Recommendation: The JFRD IT group should be organized as a staff function reporting either to the Fire Chief or, preferably, to a new Division Chief for Administration, rather than to Operations. This reporting structure will help to ensure that IT efforts support all department priorities and that IT is considered as a potential problem solution alternative. It also relieves the Operations Division Chief of a support function for which he is highly capable but overloaded.

The EDP Methods Coordinator communicates very well with the division Chiefs to identify needs and obtain budget dollars to purchase hardware and software. However, the Coordinator must juggle competing priorities based upon his understanding of the department's focus and priorities. The following could help balance the priorities:

Recommendation: A JFRD IT Steering Committee should be formed to establish IT priorities and to monitor IT efforts. This Steering Committee should be a standing committee that meets monthly. The Division Chief of Fire Operations could

chair this committee, to ensure that the priorities are driven by operational needs; but the Administrative Division Head also could chair it. The committee should be comprised of all the Division Chiefs including the Director of Administration. The JFRD IT Coordinator should serve as staff to the committee. The Committee should recommend priorities for all IT efforts to the Fire Chief. The Committee should develop and recommend to the Fire Chief long-range plans for IT initiatives, capital expenditures, operating expenses, training, and staffing. Consideration should be given to inviting a liaison from the city ITD to attend some, if not all, of the meetings. The knowledge gained from this involvement should result in better coordination of the City's ITD and the JFRD IT initiatives.

IT Budget – Department IT personnel are budgeted as part of the Operations Division. However, expenses for IT hardware, software, communications, etc. are not specifically budgeted. Whenever any purchase is made, the Coordinator must seek funding from the Division Chiefs' budgets or from the Fire Chief's budget.

Recommendation: Consideration should be given to establishing a separate budget for JFRD IT personnel, expense, and capital equipment. Not having a separate budget makes it more difficult to plan and manage IT expenditures. With the current budget, it is not feasible to identify the total departmental expense for IT. If a separate IT budget is not desirable, all personnel and expenses for JFRD IT should be budgeted under a single division.

Division of Responsibilities – Over time the division of responsibilities between JFRD IT and the City's ITD has become more clearly defined. Basically, ITD installs and maintains a City network that provides the firewall security and fiber optic backbone to which JFRD IT connects the fire department network. ITD is also an Internet Service Provider (ISP) through which JFRD IT accesses the internet.

ITD installs, maintains, and provides operational support for the City's UNISYS mainframe and other City application servers. The fire department's CAD system runs on a UNISYS PC, and the dispatching system runs on the UNISYS mainframe. The CAD system was developed by ITD and is maintained by ITD via a contract services vendor; though the hardware and operating system configuration is maintained by JFRD's own IT personnel.

The City's GIS system used by the fire department is supported by ITD.

Traditional citywide application systems (such as budget preparation, position control, accounting, purchasing, etc.) are supported by ITD. Currently, ITD is

developing a custom Oracle-based payroll personnel system to replace the existing application.

Table 33 provides a list of most IT functions performed by the two IT groups for the JFRD and how responsibilities tend to be divided.

Table 33: Information Technology Functions by Provider

Wide Area Network Support (WAN)	
CITY ITD	**JFRD IT**
• Purchase hardware • Establish IP Standards • Jointly install CISCO Routers • Install and configure routers • Budget and Purchase Backbone, Cable and Some Software • Install and maintain the City's WAN	• Purchase hardware • Document functional requirements • Jointly install CISCO routers • Configure PCs printers and faxes
NOVELL NETWORK SUPPORT (4 Servers)	
• Install communication software on servers • Establish standards (no standards exist)	• Perform system administration functions • Assign user rights
NT SERVER SUPPORT (7 Servers)	
	• Buy, install and administer
COMMUNICATION SERVER SUPPORT	
• Services all the CAD software	• Services all other functions
WORKSTATION SUPPORT	
	• Configure, install and move all workstations • Maintain out-of-warranty in-house • Back-up data on station PCs • Purchase and install updated workstations hardware and software as needed
LAPTOP SUPPORT (70 Laptops)	
	• Return to vendor for maintenance
WEB SERVER SUPPORT	
• Serve as ICP Provider • Provide Internet and Firewall Support • Provide City Intranet Support	• Provide Fire Department Intranet support • Maintain Web applications
DISPATCH NETWORK SUPPORT	
• Maintain DDS System (Terminals, Printers, Light Panels, Claxon, Toning) • Maintain call data • Maintain call communication acknowledgment	

CITYWIDE APPLICATION SUPPORT	
• Develop, install, and maintain applications used by multiple city departments (e.g., accounting, payroll, personnel, inventory control, etc.)	
FIRE DEPARTMENT APPLICATION SUPPORT	
• Hire contractors to develop and maintain the CAD application • Install and maintain CAD hardware	• Develop, install and maintain applications used exclusively by Fire Department (e.g., CAD, Web Applications, Employee Records, Ledger, etc.) • Train Fire Department employees

For the most part, this division of responsibility seems appropriate. The City ITD supports the technological infrastructure to which JFRD IT connects. However, there are a few areas of responsibility that may need further clarification: support and documentation of the CAD system; the dispatch network and communications support for telephone, radio and other wireless communication; and emergency event and disaster recovery support.

Recommendation: JFRD IT and ITD should clarify the areas of responsibility where there still is potential for uncertainty. They should consider documenting how responsibilities are split, perhaps with a list such as in Table 33.

Help Desk – The City provides Help Desk services from Monday through Friday during daytime work hours. Basic help is provided for personal computers, mainframe, telephone, and radio. However, Help Desk services are not available the rest of the time (24 hours a day, 7 days a week) even though application systems are distributed to all fire stations and used around the clock. Lost productivity, frustration, mistakes in reporting, and resistance to using computer systems could result unless help is available around the clock on such basic IT questions as "Why can't I sign on to the network?" or "My password is not working" or "My PC or laptop is not working." A firefighter trying to enter data at night will not return for three days or longer and needs help immediately.

Recommendation: Help Desk services preferably should be available for the JFRD on a 24 by 7 basis. Since the JFRD IT serves the system administration functions (including maintaining passwords, network rights, etc.) as well as hardware trouble shooting and maintenance functions for fire department specific applications, the City's Help Desk can not deal with most issues mentioned above. This new JFRD IT function, which we recommend, could be combined with the network and hardware support (PC,

laptop and printer repair and out-of-service replacement maintenance) as well as the telephone and radio repair and maintenance support to justify the cost of 24 by 7 staffing.

Formal IT training is not provided on fire department specific applications. This too could be a function of the JFRD Help Desk. The recommended staffing for the Help Desk function is addressed below in the staffing section.[43]

Staffing

JFRD IT is staffed by five people, one of whom is the manager and EDP Methods Coordinator. The JFRD IT group is understaffed for the functions it performs.

The Coordinator manages the fire department's IT personnel and all of its IT functions. The Coordinator plans, purchases, and implements hardware installations and upgrades for servers, network communication, PCs, laptops, and printers. The Coordinator plans and implements all departmental software development and coordinates with City-developed systems such as the CAD, GIS, payroll, and other administrative systems. The EDP Methods Coordinator also functions as system administrator for the NOVELL network. The Coordinator works with the Division Chiefs to identify needs, define requirements, and develop and implement all hardware and software needs for the department.

One of the other four IT staff members is a programmer who serves as the Web Master. This programmer develops and maintains all web-based applications and serves as the system administrator for the department's intranet. Two hardware maintenance employees install and maintain the approximately 200 desktop PCs, 70 laptops, 12 servers, and 139 printers in the department. One analyst works with the GIS system and data. The IT personnel also do most of the operational data analysis for the department.

Management – The manager of the IT group not only performs the typical IT management functions of planning, purchasing, personnel management, coordination with fire department division chiefs, and liaison to the City's ITD, but also functions as a software development manager/leader, system administrator, network analyst, and hardware maintenance analyst. The non-managerial tasks performed by the EDP

[43] We are not aware of any fire departments yet providing this service around the clock for their people, other than identifying some firefighters with computer skills. Jacksonville would be a newsworthy first.

Methods Coordinator should be reassigned. The Coordinator could then focus his efforts and attention on establishing and staffing the JFRD IT Steering Committee, on working with the City's ITD to fully implement the GIS system, on creating department-wide programs (such as user training, help desk functions, etc.), and on defining departmental IT needs and priorities.

Recommendation: Create two new lead or senior analyst positions reporting directly to the EDP Methods Coordinator. This will free the Coordinator to focus on management, department-wide issues, and liaison with ITD. One lead analyst should be responsible for the software development functions such as programming, database, and web-based development. The other lead analyst should be responsible for server and other hardware maintenance as well as network maintenance. These analysts should be lead technical positions responsible for performing some of the work as well as assigning and supervising the work.

The software development lead analyst should supervise all the data analysis functions for JFRD IT. This includes supervising the existing software development programmer, the existing GIS analyst, fire and rescue data analysis, and other fire incident data analysis. The hardware and network lead analyst should supervise the two existing hardware maintenance employees as well as the new help desk function.

Staffing for Application Support – A typical guideline for staffing applications support is shown in Table 34: Applications Staffing Needed vs. Number of Systems Supported. The shaded ranges are applicable to the JFRD.

Table 34: Applications Staffing Needed vs. Number of Systems Supported

Staffing Type	Number of Personnel Needed		
	1-15 systems	16-30 systems	30+ systems
Application Development (per environment)	**1-3**	3-5	5+
Application Support (per environment)	**1-2**	2-3	3+
Training (train the trainer)	**1-2**	2-3	3+
Total Needed	**3-7**		

The one programmer currently available is not adequate to meet the application development and support needs of the Department. There are at least two environments currently supported by JFRD IT, the web based and database environments. Two other

environments are growing in importance and also supported by JFRD IT, the operational field system and the communications system. There are 9 special function servers, 4 office automation servers, and other applications and databases. This level of development calls for 1 to 3 employees in application development, 1 to 2 employees in application support, and 1 to 2 employees for training. The total needed is 3 to 7, versus the 1 currently available.

Development and support resources are not addressed separately in the following recommendations. Therefore, the staffing increases recommended here are more conservative than if these two functions were considered separately. (Training resources are addressed in the Help Desk recommendations.)

A minimum of one additional programmer is needed immediately to support database applications and one to support operational field applications such as the Prevention Inspection System. Assuming the lead analyst for application support has some time for programming and analytical tasks, this recommended staffing should be capable of supporting the concurrent development of approximately two small systems (less than 100 hours development time each) or one medium system (less than 1,500 hours development time) at any one time. If a larger number of concurrent application development projects or larger projects are needed, or the lead analyst does not have time to perform technical tasks, then consideration should be given to hiring a third new programmer/analyst or to augmenting the staff with contract programmers.

The new programmer/analysts can also augment the resources assigned to the GIS system. Currently, only one analyst is assigned to GIS, yet much work is needed to determine a standard address format and to utilize the full capability of the GIS system.

Staffing for Hardware and Network Support – A typical guideline for IT staffing levels for hardware and network support is shown in Table 35. The shaded ranges are applicable to the JFRD.

Table 35: IT Support Staffing Levels vs. Number of Users

Function	Number of Personnel Needed		
	50-500 systems	501-1000 systems	1000+ systems
User Support and Help Desk	**1-4**	3-5	5+
Hardware Installation and Support	**1-2**	2-3	3+
Network Management and Support	**1-3**	3-5	5+
Total Needed	**3-9**		

STAFFING FOR HELP DESK AND TRAINING FUNCTIONS: As noted earlier, Help Desk services and user training are not readily available.

Recommendation: A new JFRD Help Desk function should be established. It is estimated that between 4.5 and 5.5 employees are needed to staff this function on a 24 by 7 basis and also do training**.** Consideration should be given to hiring 3 to 5 employees to staff this function and user training. To fully use these employees on a 24 by 7 basis, consideration should be given to combining a) the desktop and laptop setup and maintenance functions and b) the hardware and network troubleshooting with c) the Help Desk functions as time permits and expertise is developed.

If only 3 (vs. 5) people can be hired, consideration should be given to utilizing the two existing hardware analysts as help desk staff in order to staff a 24 by 7 operation. This combination of responsibilities is suggested to minimize the staff required to perform all IT functions. However, use of all hardware analysts for Help Desk duties may not be feasible. It is dependent upon many factors, primarily the age of the hardware and the speed with which equipment must be returned to service. At least initially, all Help Desk employees who are not hardware analysts must be trained. This is a novel approach that may prove unworkable. If so, then 5 employees are needed for the Help Desk and 2 hardware analysts are needed.

Another alternative is to find firefighters on each shift who are knowledgeable about computers and willing to answer "help desk" questions. These firefighters might be given special training in applications and network troubleshooting. They would be considered "power users" or "super users" (terms in use in the IT field) and given a stipend for serving this function.

HARDWARE AND NETWORK INSTALLATION AND SUPPORT – Currently, there are two hardware analysts and the EDP Methods Coordinator to support all the hardware and networks for the Fire Department. Based on the standard rule of thumb, 2 to 5 analysts

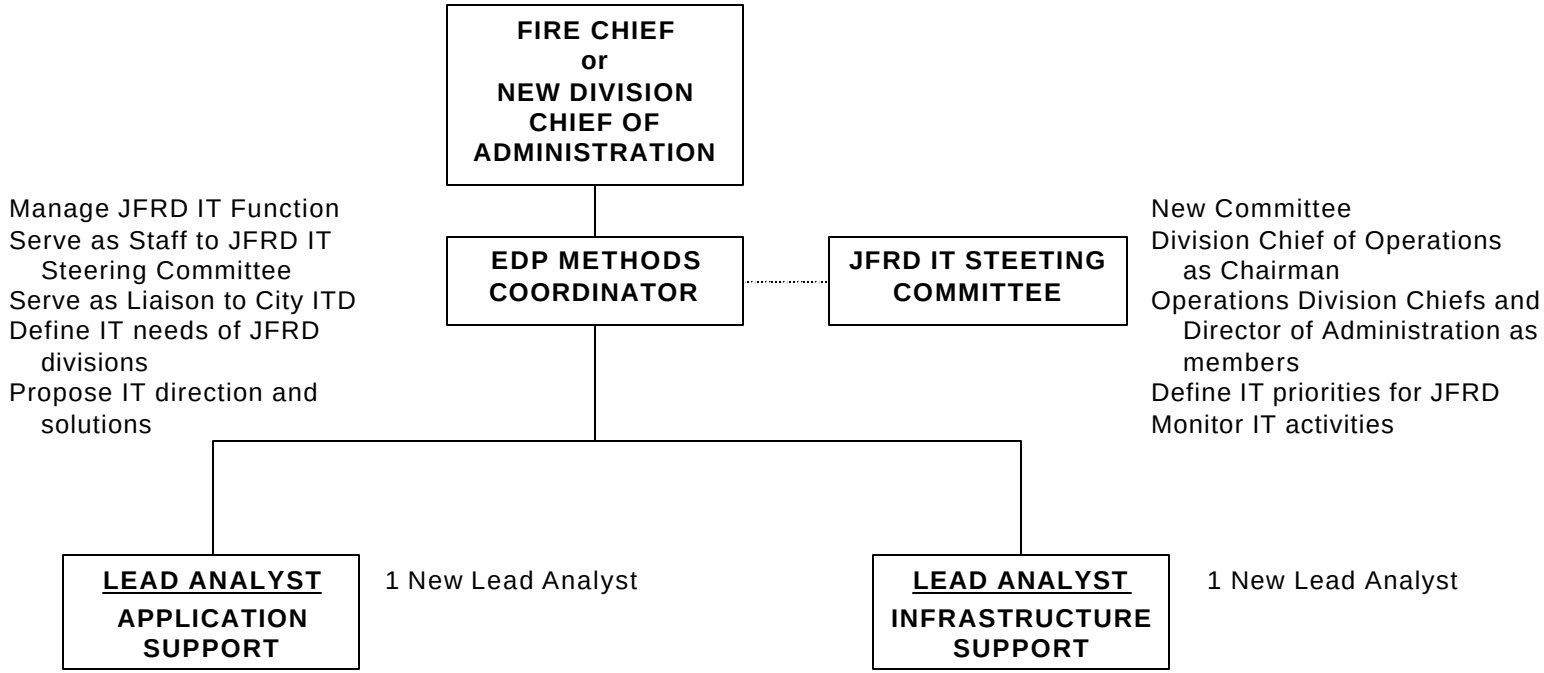
are needed to support these two functions. Again, the staffing recommendation we make is very conservative: add one lead analyst to supervise and perform technical tasks, in addition to maintaining the two existing hardware analysts.

Summary of Staffing Recommendations – In total, a conservative increase of 7 to 9 new employees is recommended for JFRD IT. A new IT organization chart is depicted in Figure 34. The help desk function might be reduced by two if shift firefighters could be found who would be available in the evening to answer questions. Table 36 summarizes the staffing needs.

Table 36: Summary of Recommended IT Staffing

Function	Current Staff	Recommended Staff
EDP Methods Coordinator	1	1
Supervise/Lead Application Support	Performed by EDP Methods Coordinator	1 (new)
Supervise/Lead Infrastructure Support	Performed by EDP Methods Coordinator	1 (new)
Application Programming and Support (and Web Master)	1	3 (2 new)
GIS Analyst	1	1
Hardware Analysts	2	2
Help Desk Analysts	0	3 to 5 (new)
Total IT Employees	**5**	**12-14 (7-9 new)**

Figure 34


FIRE CHIEF
or
NEW DIVISION
CHIEF OF
ADMINISTRATION
Manage JFRD IT Function
Serve as Staff to JFRD IT Steering Committee
Serve as Liaison to City ITD
Define IT needs of JFRD divisions
Propose IT direction and solutions
EDP METHODS
COORDINATOR
JFRD IT STEETING
COMMITTEE
New Committee
Division Chief of Operations as Chairman
Operations Division Chiefs and Director of Administration as members
Define IT priorities for JFRD
Monitor IT activities
LEAD ANALYST
APPLICATION
SUPPORT
1 New Lead Analyst
LEAD ANALYST
INFRASTRUCTURE
SUPPORT
1 New Lead Analyst
1 Existing Programmer/Analyst
2 New Programmer/Analysts
1 Existing GIS Analyst
Functions Include:
Software development
Database development
Operations Data Analysis
(Fire Incident, EMS, GIS, etc.)
2 Existing Hardware Analysts
3-5 New Help Desk Analysts
Functions Include:
Hardware, Network, Radio, and Telephone Installation and Maintenance for Desktop PCs, laptops, Handheld devices, printers, servers, routers, radios, phones, etc.
Desktop, laptop, and handheld software setup and maintenance
Staff User Help Desk 24 by 7
Develop and conduct user training
Perform System Administrator functions for Novell servers, Intranet, etc.

Technological Infrastructure

The JFRD IT staff supports approximately 200 desktop computers, 70 laptop computers, 13 servers, and 139 printers. This equipment is located at 57 fire stations and 5 support locations spread throughout the 840 square miles area served by JFRD.

Servers – Nine of the servers are dedicated special function servers supporting: 1) the new PDSI time and attendance, Telestaff, manpower and staffing application; 2) MDT (Mobile Data Terminal) application; 3) EMS applications; 4) Web applications; 5) GIS application; 6) the GPS and Automated Vehicle Location systems; 7) EOC applications and 8 and 9) two servers dedicated to the CAD system. The other four servers are NOVELL servers that support Headquarters, Tactical Support, Logistical Support, and Training.

The two servers dedicated to the CAD system are at the Fire Communications Center. JFRD's IT personnel install and maintain the hardware and communications network in the Communications Center. Data are mirrored to the second server as the call is entered. The risk of a server failure is minimized due to the architecture of the servers and the disc drives. Additionally, in the event of a failure of one server, the second server acts as a 'hot' backup system. If a server fails, the call takers would log into the second server to become operational. This should minimize the impacts of a failure. Although this is a very good hardware backup capability, it does not address the potential of a disaster rendering the headquarters building unusable.

Recommendation: The Fire Department IT should work with the City ITD to develop a disaster recovery plan to insure 24 by 7 support for the CAD system, the Communication Center and for telephone, radio and wireless systems support in emergency situations. An alternate location should be considered for a hot backup to the CAD system in the event the headquarters location is not operable.

Support Location Network – The five support locations are connected via a wide area network (WAN) to the City's UNISYS mainframe computer.

Currently, the fire stations' computers communicate with this network via Radio Frequency (RF), which limits the amount of data that can be transmitted to the stations. This is inadequate to meet the data transmission needs, and routers are being installed so

that each fire station is connected directly to the WAN. All stations are planned to be connected to the WAN by late 2000-early 2001, which is a good idea.

Future Technical Direction – The plan for the department's technology infrastructure is to move the SQL database to an NT Server, develop web-based user interface applications and develop a rules-based decision support application. The move to an Oracle database was a very good decision because it is a robust, fully functional database. (Only a few applications, if any, are on the SQL database at present.) The move to an NT Server is expected to simplify administration and increase available disk space to 37 GB. The move to web-based user interfaces will provide easier access to departmental applications and stored data from home, mobile units, etc. The move to rules-based applications simplifies data input because the software will guide users to enter the data required based on the data previously entered. Overall, this plan is widely accepted as the best for dependable future development.

The current and future technologies that have been selected by JFRD are extremely sound solutions. They are proven, reliable, and dependable. They utilize client/server and web-based technologies that are taught generally at colleges, universities, technical schools, and other continuing education organizations.

The major technological challenge for IT is to upgrade the department's data communications. The radio communications system is being updated to 800 MHz. The WAN is being extended to all fire stations. These systems will allow wireless communication of data to emergency vehicles, and that capability should be implemented in the future.

The 800 MHz system (First Coast Radio System) is important to implement as soon as possible. It will provide the following advantages:

- **Better communications coverage citywide.** Firefighters can hear each other more clearly. It has fewer dead spots. This translates to safer and more efficient operations.

- **Better inter-operability between fire departments.** The many small fire departments and the State Division of Forestry that provide mutual aid to each other will be able to have better, clearer radio communications and

need fewer separate radio per vehicle. This leads to better, more efficient, and safer joint operations between departments.

- **Better inter-operability between city agencies.** This provides communication among fire, police, public works, and other agencies. This is critical for hurricanes, other disasters, and many other situations.

- **Many more tactical channels.** This allows multiple simultaneous incidents to be conducted without interfering with each others communications.

- **Ad hoc talk groups can be set up quickly.** Groups of firefighters can talk together for emergency operations, training, administrative, or other purposes without interfering with each other.

- **Can set up "ruthless pre-emption" of channels.** Priorities can be set in real time in which command personnel or types of messages will be given radio priority. This improves safety and command.

Application Systems

Each fire department division is supported by departmental-specific application systems. Below are general descriptions of the applications used and a brief evaluation of how well IT supports each function.

Fire Chief and Executive Decision Support – Database and reporting functionality are limited and are not accessible widely throughout the department.

Communications Center - Computer Aided Dispatch (CAD) – The Sheriff is responsible for the 911 emergency system. The 911 operators receive the initial call and switch it to the Fire Department's Communication Center. The CAD system used for dispatching by the Fire Department is relatively new and makes use of newer technology. It is different from the system used by the Sheriff's Department for 911 call taking and dispatching. The 911 information is available to JFRD through Southern Bell, but the two CAD systems are not interfaced and cannot exchange data.

The CAD system is developed and maintained by a contractor, Computer Associates (CA), employed by the ITD. The City's ITD contracts for the CAD programming and software system support services. The maintenance of the hardware (servers, communication components, etc.) at the Fire Communications Center is undertaken by the JFRD IT personnel. Computer Associates is a large company with significant resources available to maintain the CAD system in emergency situations. The application is written in C++ which is a language widely used for newer developed systems. The system runs on two UNISYS servers, and supports the dispatching needs of the fire department very well.

Dispatch Network – There is a DDS system used to send alarms to the fire stations to dispatch apparatus and to provide en route call communications. This system is approximately 17 years old.

Recommendation: Consideration should be given to replacing the DDS system sometime in the near future. The system and its technology are quite old, though working well. But they need to be integrated into the new CAD.

Fire Incident Records Management and Reporting – The CAD system updates a records storage database on the UNISYS server. Reporting is tied to the CAD system through the use of this database. The department is using, or will soon be using, the NFIRS 5.0 format for reporting.

The current Records Management System is primarily a data collection system. There is ad hoc reporting on response time, a Daily Status Report with web page output, and some statistical reporting. However, the data must be manipulated manually to achieve accurate reporting because the system does not accommodate adding only so-called addendum reports (i.e. a revised incident report in addition to the original). There also is no address search capability.

Recommendation: Consider developing a reporting database using Oracle or another ITD standard, robust database management system. This would provide more convenient access by more people throughout the department for analyzing the CAD and fire incident data.

Rescue Transport Records Management and Reporting – EMS reporting is a PC-based system developed in the mid-1990s. Approximately two years

ago EMS reporting was interfaced with the CAD system. However, each morning data are imported via manual procedures to an Access database for subsequent reporting. This process should be automated.

EMS transport billing was audited about one year ago. The current process uses an independent billing contractor and is working satisfactorily. Transport data are entered on laptops in the rescue units by JFRD responders and then uploaded to the billing contractor. Confirmation is made of the number of records received. The number of transports billed and the collections are subsequently reported to the City's General Accounting. These controls should ensure that all transports are billed.

Transport reports are periodically reviewed for accuracy and for the care administered. Deviations from protocols must be justified. In addition, about 30 customer service surveys are completed each week. Complaints are recorded, and monthly statistical reports are prepared using Word Perfect and an MS Access statistical database. No other IT needs were identified to help monitor validity of codes used for procedures performed, proper completion of forms, nor collection rates by insurance provider.

There are 32 rescue units with laptops for run reporting. The run data are stored on the laptops for 60 days. There are logistical problems backing up and moving these data for long-term storage.

Recommendation: Consideration should be given to developing automated methods of interfacing rescue run data from the laptops to database(s) on the network. This may require developing a new application and use of Mobile Data Terminals (MDTs) in the rescue vehicles. Consideration should be given to using a more robust ITD standard database management system for rescue transport record keeping and reporting. There is a need to better manage data exchanges between the network and laptops.

GIS Support – The Geographic Information System (GIS) is supported by ITD. The JFRD IT only has one analyst assigned to GIS support. Various City departments have responsibility for maintaining various data in GIS. Currently, GIS is not fully developed nor is it populated with the data needed to fully support the needs of JFRD. The operations analysis of this TriData study was hampered by a lack of JFRD familiarity with GIS capabilities. (A by-product of the study will be more use made of GIS capabilities in the future.)

Recommendation: JFRD IT should work with ITD and other departments responsible for entering and maintaining the data in GIS. The data is important for planning new stations and changes in deployment, the heart of fire department operations, and costs. It also is needed for analyzing fire incident data by area and by various socioeconomic factors.

Emergency Management Support – Currently there is limited IT support for Emergency Management. There have been attempts to implement an applications system for the Emergency Operations Center (EOC), but it has not been possible to maintain a trained resource to continually update the system. As a result, there are several open needs for adequately managing disaster events. These include, but are not limited to, tele-notification, a remote EOC unit, hazardous material tracking, etc. Some of these needs are dependent upon an improved, complete GIS system. (Pinellas County is an example of a department that makes particularly good use of IT for emergency management applications, including the ability to pull up current evacuation status and news via the web, for any address in the city.)

Fire Prevention and Public Education Support – A new system is being implemented to capture the data from the inspection process. Fifteen inspectors recently began using laptops. This system will require time to field test and make adjustments to meet the needs of the inspectors. It is too early to determine the degree of development still needed. This represents the beginning of systems needed by Prevention. There is no automated support for construction plan review or for work assignment and scheduling. Prevention does not receive automated data or reporting on fire incident data, for guiding public education, nor do they have access to the data. This data shows the bottom line of prevention programs, and should be reviewed each year.

Recommendation: As a matter of policy, all IT applications should be developed by JFRD IT and not by the other individual JFRD units. Therefore, the inspection data system should be moved to JFRD IT for continued development.

Office Automation Support – The department uses Microsoft Office applications (Word, Excel, Access, and Power Point). This standard has changed over the years, but Microsoft Office appears to be the established standard for the City. This is a good choice for office automation.

Administration Support – This includes support of Personnel, Payroll, Purchasing, Accounts Payable, Accounts Receivable, Budget Preparation, Position

Control, and Expenditure Tracking and Control. The City's payroll system is used to pay employees and track accumulated leave. Currently, paper forms are completed for pay and status changes and forwarded to City Human Resources. JFRD Administration maintains a database in Microsoft Access. The database includes pay codes and employee records, which serve as position control mechanism and to maintain certifications. The data in the Employee Records database duplicates the position control data in the financial and accounting system (FAMIS) budget preparation. It also duplicates certification data maintained by Training and City HR, as well as pay codes maintained on the central payroll system.

Recommendation: The Fire Department should establish an internal standard to maintain administrative data once so that duplication is avoided and reconciliation is maintained. The owner of the data should maintain these data. Use of the data should be controlled through password and other data protection methods. More specifically:

- ***A single database should be used to maintain certification data to avoid duplication.*** The Certification Database should be maintained by Training. It should reside on the network with password protection so JFRD Administration personnel can access these data.

- ***A single database should be used to maintain pay code data.*** The new Payroll system may be the appropriate owner of these data with access by Administration.

- ***A single database should be used to maintain employee position control data.*** The FAMIS may be the appropriate owner of these data with access by Administration. Alternatively, the feasibility of an interface or load file from JFRD position to the City's position control should be evaluated to avoid duplication.

Recommendation: The feasibility of an interface from the Certification Database to the new Payroll system should be explored.

A new custom client server for Human Resource and Payroll applications is being developed by ITD using Oracle database technology. This application provides for remote entry of payroll data. Hopefully, the additional workload created will be offset by the reduction in paperwork in the future. The system is scheduled for implementation early in 2001.

A new time and attendance system from PDSI is being implemented to schedule staff. It has not been interfaced to the Oracle Payroll application. As yet, the FLSA overtime rules and other payroll related rules have not been customized for JFRD. To date, neither the JFRD Finance Officer nor the Payroll Clerk have been continuously involved in the design and development of the new PDSI system.

Recommendation: An interface should be developed from the time and attendance system to the new Payroll system to avoid key entry of output data from an automated system. An interface is an automated link between the two systems that passes data entered into one system to the next system. This eliminates the necessity of key entering the same data more than once.

Recommendation: The overtime rules and other payroll related rules should be built into the time and attendance system.

Recommendation: The Finance Officer (or proposed Support Service Division Chief) should be continuously involved in the design, development, and implementation of the time and attendance system. This is to ensure that the payroll requirements are built in.

JFRD maintains a Ledger database in Microsoft Access to track actual expenditures against the budget, by purchase order, etc. This duplication is necessary because the City system does not track expenditures and purchase order purchases at a sufficient level of detail. Approximately $9 million is tracked in this manner. The divisional breakdown established in the budget does reflect the organizational structure of the department. Although duplication exists, no changes can be made in this process unless and until the City's budgeting and accounting systems accommodate the level of detail required by the JFRD. This situation is not unique; as we have found it exists in most cities and counties that we have studied.

An on-line City system is provided for ordering supplies from approved vendors. This system has streamlined the supply procurement process. The City also provides the GAD system for entering field orders of less than $500. Other purchase requests are entered into a departmental Visual Basic Ordering system, 609 Purchase Request, with an SQL database. The purchase requests are uploaded directly to the City. This is a very good system that is unusual among the cities and counties we have studied. It has simplified and streamlined the procurement process greatly.

Recruiting – Recruiting is very well supported by information technology. Recruiting uses office automation (Microsoft Word and Excel), E-mail and database applications. A citywide recruitment system (developed in Microsoft Access with a dedicated database for the fire department) supports recording recruitment activities and status during the nine-step selection process. The departmental intranet is used for posting announcements and distributing notices to division chiefs and section heads. The internet access is used to research state and federal EEO offices for updates, training programs, etc. The City is developing an EEO database for quarterly and annual affirmative action reporting.

Security – The Building Security system is being upgraded to smart cards with computer chips, photo badges, bar-codes for uniform distributions, and fingerprints for building access. Several other needs were identified for the security of recruiting information. The needs include a Personnel Database with the Eyes Only designation for investigations; dedicated printers for printing confidential documents; faster computers or drives to accommodate multiple tasking; and three laptop computers.

Training – The Training Academy's use of information technology for training is highly unusual and is commendable. It should be used as an example to other fire departments of how technology can be used to facilitate training across many facilities and to employees working 24-hour schedules.

Six Microsoft Access databases were developed by Training personnel. Training maintains these databases to record the training and certifications completed by fire department employees and volunteers. Training also maintains the paper records supporting these certifications as required by state law. Queries are written to interrogate the databases for upcoming certification renewals and training needs. Access to these databases is restricted by password. A recommendation was made above, under Administration Support, to centralize all certification data on the training database(s) and to make these data available on the network to JFRD Administration personnel via password protection. This is an important goal as it will reduce redundancy and therefore the potential for inconsistencies.

Training Instructors use Microsoft Power Point for presentations. Each terminal also has Web access for research purposes.

The Fire Department makes extraordinary use of the cable TV channel to disseminate training programs and individual presentations to the fire stations. In the future, as a WAN is developed, interactive training may be distributed across the intranet. Although not interactive, training and classes could actually be done with a FrontPage-type of format, distributed on the web.

Facilities Maintenance – There is minimal information technology support for facilities maintenance or construction and renovation projects. Maintenance requests are received and assigned manually. There is no preventive maintenance program for facilities components and data are not automated to analyze renovation and replacement needs.

E-mail is the primary system used for communications regarding facilities maintenance. There also is a City ITD Work Order system that was developed but has not been useful. We identified several needs, including on-line collection, storage, and queuing of maintenance requests by station. There is also a need for a person to maintain the system. These requests must be evaluated and prioritized by the JFRD IT Steering Committee.

Logistical Support – Logistical Support includes EMS reporting and compliance and rescue unit inventory and maintenance. It also includes providing and maintaining uniforms and safety gear for the 1,200+ members of the suppression forces. EMS reporting was addressed previously. An inventory database was developed to track the supplies and equipment on the rescue units. The database was not developed as a perpetual inventory system with automated reordering. Currently, the rescue unit captain orders replenishment supplies once a month. A rescue unit may be taken out-of-service if state-required supplies and equipment are not aboard.

Recommendation: The inventory software system should be extended to include all supplies, not just EMS supplies.

Tactical Support – A Job System developed and maintained by ITD is used for fleet maintenance and repair for cars, fire apparatus, and rescue vehicles. There are needs for an inventory database for loose equipment on the apparatus and rescue vehicles. The current Job System serves only basic needs. A more efficient system is needed to meet the operational requirements of tactical support.

Recommendation: Maintenance tracking and equipment inventory programs should be evaluated to select a computer support system that will better meet the needs of the Technical Support Division.

Summary

Overall, JFRD IT performs extremely well considering the very limited IT personnel resources available, the lack of an independent IT budget, and the informal manner in which priorities are negotiated. An additional 7 to 9 IT personnel are urgently needed. Yet more resources may need to be hired or contracted for development activities as the priorities are identified by the IT Steering Committee.

APPENDIX A

Table A: 90th Percentile "Response Times" by District (1999)
(excluding call processing)

District	90th Percentile Response Time (Minutes)
1	4.1
2	3.6
4	4.0
5	4.1
7	4.3
9	5.2
10	5.5
11	4.8
12	4.7
13	4.8
14	4.8
17	5.0
18	4.6
19	5.8
20	5.2
21	6.0
22	5.5
23	5.3
24	7.0
25	4.7
26	7.0
27	6.3
28	6.5
29	7.0
30	6.0
31*	9.2
32*	10.3
33*	7.6
34*	6.3
35*	7.6
36	5.4
37	7.3
40	4.5
41	6.5
42	8.0
43*	7.3
44	6.4
45*	11.0
46	7.7
47*	10.2
48*	8.8
49	8.7
50*	8.0
51	6.1
52*	7.9
53*	8.4
54*	9.4
55	7.7
56*	9.0

NOTE: Times do not include call processing.

* Mostly rural areas, based on JFRD assessment.

APPENDIX B – UNITED KINGDOM STANDARDS FOR RESPONSE TIMES AND RESPONSE COMPLEMENTS

The following are the current standards of fire cover in the United Kingdom. They do not include call processing time.

		Response Standard (Pump Due time in minutes)		
Risk Level	**# Pumps**	**1st**	**2nd**	**3rd**
A	3	5	5	8
B	2	5	8	
C	1	8-10		
D	1	20		

The categories and attendances (response complements) are as follows:

Category A risks are normally found in the largest cities or towns of the country. For an area to be classified as A risk it should be of substantial size and should contain a predominating concentration of properties presenting a high risk of life loss or damage to property through fire. The recommended minimum first attendance is three pumps. Two to attend within a maximum of 5 minutes and one within 8 minutes from the time of call to the Brigade.

Category B risks are normally found in the larger cities or towns not falling within category A risk. For an area to be classified as B risk it should contain continuously built up areas of substantial size, with a predominating concentration of property presenting a substantial risk of life loss or damage to property in the event of fire. The recommended minimum first attendance is two pumps. One to attend within a maximum of 5 minutes and one within 8 minutes from the time of call to the Brigade.

Category C risks are normally found in the suburbs of the large towns and the built up areas of smaller towns. The recommended minimum first attendance is one pump within 8 to10 minutes from the time of call to the Brigade.

Category D risks include all areas other than those classed as remote, rural, or not falling within categories A to C. The recommended minimum first attendance is one pump within 20 minutes.

These standards were adopted by the Home Secretary and recommended to all fire authorities in the UK following a report from the Central Fire Brigades Advisory Committee in 1985.