

Winston-Salem Fire Department Growth Management Plan

March 2001



Emergency Services Consulting Group

WINSTON-SALEM FIRE DEPARTMENT

Growth Management Plan

Emergency Services Consulting Group

...a subsidiary of the Glatfelter Insurance Group

25200 SW Parkway, Suite 3

Wilsonville, Oregon 97070

503-570-7778

800-757-3724

fax: 503-570-0522

www.escg.com

March, 2001



©Copyright 2001, MDI Consulting Group Inc. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopy, recording or otherwise without the expressed written permission of Emergency Services Consulting Group

Table of Contents

<i>Executive Summary</i>	3
<i>Community Conditions and Trends to Year 2020</i>	5
Population	6
Infrastructure	8
Geography	10
<i>The City of Winston-Salem Fire Department</i>	12
Services	12
Resources and Service Delivery	14
Stations, Apparatus and Personnel	14
Emergency Medical Services	19
Standard Response Assignments	20
Emergency Service Performance	21
Non-Emergency Services:	23
Support Services:	27
<i>Service Quality Criteria and Standards</i>	32
Dynamics of Fire	32
Emergency Medical Event Sequence	35
ISO Rating	36
Serving Demand versus Geography	37
Staffing for Risk Protection	40
Performance Objectives	42
Other Standards	42
<i>Critical Service Issues</i>	44
Emergency Services	44
Staffing	44
Workload	45



Winston-Salem Fire Department – Growth Management Plan

Facility Deficiencies	47
Apparatus Deficiencies	48
Rescue Services	50
Emergency Medical Services	52
Non-Emergency Services	58
Code Enforcement Staffing	58
Support Services	59
Training	59
Communications	61
Maintenance	62
<i>Options and Recommendations</i>	63
FACILITIES:	63
Fire Station Location	63
Facility Condition	64
STAFFING:	66
STANDARD RESPONSE ASSIGNMENTS:	67
APPARATUS:	68
RESCUE SERVICES:	68
EMERGENCY MEDICAL SERVICES:	69
CODE ENFORCEMENT:	72
TRAINING:	72
COMMUNICATIONS:	73
MAINTENANCE:	74
<i>Ongoing Performance Monitoring</i>	75
Community Fire and Emergency Service Performance Objectives	75
<i>Capital Asset Descriptions</i>	77



Executive Summary

The City of Winston-Salem is a richly historic community encompassing just over 107 square miles and nearly 175,000 people. Over the last decade or so, significant growth has occurred through annexation. During the coming decade, growth is anticipated to occur primarily due to an increase in infill development, research and high-tech industry and further expansion of commercial space. In addition to permanent population growth, this is anticipated to increase the transient population of the community and add to the service demand in the public safety environment.

The Winston-Salem Fire Department is an extremely resourceful and dedicated organization providing a wide range of professional services. After undergoing dramatic organizational change during the mid 1970's and 1980's, the department is now rebuilding its structure as a more traditional style, full service, urban fire department. Utilizing 17 neighborhood fire stations and 285 employees, the department maintains an Insurance Services Office community class rating of 3. The average response time to emergency incidents is 3 minutes, and 90% of all incidents have a units arriving on scene in less than 5 minutes. The department also provides code enforcement and public education services.

Administrative and support staffing is at approximately 3.8%, significantly lower than the average 10 to 15% for municipal fire departments. Recently, the department has added the highly valuable service of first response to emergency medical incidents, providing basic life support care until arrival of a transporting medical unit. This service has impacted workload and training, as well as resource distribution.

During this Growth Management study, every aspect of the fire department's operation was reviewed. In addition to studying the organization's response to known community trends and issues, the department was also benchmarked with other municipal fire departments in the region and nationwide. Efficiency levels, productivity, resource distribution, training, support services, workload and many other factors were closely examined. Critical service issues, those having most significant impact on the department's ability to serve the public, were identified and studied in depth.



As a result, a variety of recommendations were developed and presented. Each is intended to assist the department in achieving its goals as community growth continues through the next decade. Among the most significant recommendations made in this study are:

- Improvement of certain existing facilities and the projected addition of future facilities to facilitate community growth
- The establishment of a minimum staffing policy of four firefighters per company and the associated addition of suppression personnel to maintain this policy
- The addition of one company to standard response assignments in high-risk structures
- A significant restructuring of rescue services, roles, authority and responsibility, beginning at the policy setting level with elected officials
- Increasing code enforcement staffing and reorganizing this division to reduce staff turnover
- Significant restructuring of the department's training program, its facilities and resources
- Improvements in interagency communication systems to enhance EMS, mutual aid, and automatic response cooperation

It is the conclusion of this report that these recommendations will be necessary to maintain adequate services meeting the performance goals set forth by the community and to adequately address the impact of community growth during the coming decade.



Community Conditions and Trends to Year 2020

The City of Winston-Salem Planning Department is responsible for the development of comprehensive planning for the City. It is worth noting, however, that in a slight deviation from traditional methodology, the City has recently introduced what is known as “The Legacy Plan” that is intended to improve coordination of planning and zoning across municipal boundaries and throughout Forsythe County. This plan, which has been adopted by the Planning Board of Winston-Salem, is currently being presented to the various individual government entities within the County. The plan recommends, among other things, a joint City-County Planning Board that would enable a more cohesive regional planning program to be enacted.

In the simplest of terms, a typical comprehensive plan for any city uses demographic, economic, population, and land use historical data from various sources to predict community change over the next twenty years. This information then assists decision-makers in evaluating options for community improvement, services and infrastructure.

Most of the information that serves as the basis for growth and planning projection is accessed from the City of Winston-Salem, the US Census Bureau, the publications of the Greater Winston-Salem Chamber of Commerce, and the Winston-Salem Annual Financial Report. We use much of the same data to help predict the level of need for fire protection in the year 2020.

Community conditions that are universal to a fire and emergency medical system tend to govern the level of hazard to life in that community. Public and private investment in infrastructure and systems can act to reduce the hazard to life from fire and emergency medical accident. Generally, though, the amount of investment required is inversely proportional to the amount of mitigated hazard; that is to say, incremental costs increase as hazard levels decrease. Consequently, each community must carefully balance the cost of fire and emergency medical systems to a corresponding acceptable level of risk. We design this report to help the citizens and policy makers of the community to determine acceptable costs and risks of the local fire and emergency medical system.



The conditions and trends that influence the level of hazard in Winston-Salem fall into three general categories: **population**, **infrastructure**, and **geography**. We discuss each category below.

Population

In its year 2000 annual report, the City of Winston Salem estimates the population of the City at 173,571. The City's Planning Department uses a 1% annual growth factor for the year 2001, providing a current population figure of approximately **175,307**.

Human activity tends to generate need for fire protection and emergency medical service. Activities such as transport, commerce, industry, and recreation are most apt to result in a demand for emergency services. On the other hand, passive forms of human behavior (such as sleeping) invariably generate fewer emergencies within a geographical system.

Records of emergency response typically illustrate this phenomenon. Fire departments experience rising and falling alarm rates throughout a 24-hour day, depending largely on the time of day. As a rule, the numbers of alarms begin to increase at the start of the business day and continue to rise until reaching a peak at about 5:00 pm. Subsequently, the numbers of emergencies tend to decline throughout the evening and night until reaching low ebb at around 4:00 am. This cyclic nature of alarms with respect to the time of day correlates directly to human activity. Thus, knowing the number of people that are within a geographical area at any given time is an important factor when judging the demand for fire protection and emergency medical services.

Just as important, however, is consideration for the types of activities those people are involved in and the correlation that activity has to service demand. Residential population estimates are commonly available but such numbers do not typically consider the highly mobile characteristics of modern culture. Each day in Winston-Salem, people move in and through all areas of the city, creating a highly dynamic transient population that is not typically measurable on any convenient scale.



A 1990 study of population, employment, and alarm data in and around Portland, Oregon demonstrates a direct relationship between employment and emergency response.¹ The work suggests that a change in the number of jobs in a given zone results in a proportional shift in the number of emergencies in the same region. No such clearly defined statistical relationship connects residential population to emergencies; a circumstance explained by the notion that requests for emergency assistance are the natural outcome of active rather than passive human behavior.

Various projections exist regarding the future population of Winston-Salem and Forsyth County. Most estimates place the population of the entire County at around 319,359 by the year 2010, or about a 7.9% increase from current. This percentage of growth compares to just over a 10% increase from the previous decade of 1990 to 2000 and an increase of 9.1% from 1980 to 1990. Another useful projection shows that the Winston-Salem Metropolitan Statistical Area (MSA) is expected to grow by 9.9% by the year 2010.

While the City of Winston-Salem itself realized nearly a 21% increase in population during the last decade, consideration must be given to patterns of significant annexation that took place during that decade but are **not** expected to continue into the coming decade. Additional annexation would likely be in the form of involuntary annexations, an option not currently favored by the Board of Alderman. By examining the various projections for the County, the Metropolitan Statistical Area and the City itself, it is appropriate to consider a projected City residential population growth between 8 and 10 percent.

As previously stated, an increase in residential population does not directly equate to a matching increase in emergency response. Consequently, we judge that it is reasonable to presume that even a 10 percent increase in residential population over 10 years is likely to have only a small effect on the emergency workload of Winston-Salem Fire Department. On the other hand, we know that changes in the number of jobs in a region are likely to have a direct effect on the numbers of emergencies in the fire protection system.

¹ Research done by R. Carl Goebel, Economic Resource Associates Inc., P.O. Box 9190 Portland, Oregon 97207, phone (503) 225-0626.



In recent years, estimates of job growth in Forsyth County have been as high as 2% annually. Notably, the statistics indicate that extremely strong growth has occurred in the service sector with dominance in high-paying health care jobs. This trend is likely to continue as the City's reputation as a leading medical research and treatment center continues to grow. Jobs in the service sector tend to attract a large transient population (customers), which in turn is very likely to impact the alarm load of the fire department.

It seems reasonable therefore, for us to assume that the emergency workload of the Winston-Salem Fire Department will increase over the next 10 years due to changes in residential and transient populations. Our estimates of the increase in emergency responses range between 10 percent (reaction to residential population) and 20 percent (reaction to jobs).

Infrastructure

Fire departments have almost no authority to regulate the fire safety of owner occupied homes. In years past, the issues of occupant egress and fire resistive construction of residential structures merited little consideration. Therefore, the age and condition of a residence can have a material effect on the manner in which it burns. Fire may spread so rapidly in an older, or poorly maintained, residence that the ability of people to escape the structure soon becomes impossible. The swiftness of fire spread easily outpaces even the most quickly responding firefighters. In most cases, the fire department has little opportunity to preserve human life after a fire starts in an older home. Consequently, fire departments with responsibility for the protection of older communities must develop other strategies for dealing with neighborhoods of aging residential structures. Usually fire departments rely on aggressive fire prevention and education programs targeting such structures and occupants before a fire ever occurs.

It should be noted that the age of much of Winston-Salem's housing stock is relatively old. The older neighborhoods are chiefly located near the city core, which for the most part are fully "built-out" although the city does anticipate some residential infill and neighborhood redevelopment. New home construction now occurs primarily in the fringe, or suburban, portions of the city. In 1999, there were 3,441 new residential



construction starts in Forsyth County, with the nearly half of those occurring inside city boundaries.

The non-residential structures of Winston-Salem include a mix of office, commercial, institutional, industrial, and manufacturing occupancies with ages that range from very old to comparatively recent. Unlike residential buildings, the fire department actively regulates the fire safety of commercial, industrial, institutional and manufacturing structures through code compliance inspections. Although some of the older buildings have undergone renovation that includes compliance with newer fire codes, many aging or even vacant manufacturing buildings remain.

The downtown core contains several large manufacturing structures that are a part of the R.J. Reynolds complex, in addition to the normal mix of stores and offices, historical buildings and City Hall. The city's New Century Plan, adopted in 1998, has helped to fuel the excitement of downtown planning and development. The Piedmont Triad Research Park includes construction and renovation of six downtown blocks, anchored by the 60,000 square-foot Piedmont Triad Community Research Center. The Wake Forest University and Baptist Medical Center are a vibrant and growing part of the city, recently launching a \$100 million expansion, and are located not far from the city core.

The cost of construction in the Winston-Salem area is among the lowest in the nation. This has encouraged expansion and development not only in the downtown area, but in the suburban sections of the City as well. The Hanes Mall and I-40 business corridor boasts the recent addition of a 396,300 square-foot shopping center in addition to various freestanding retail, office and hotel projects.



We list the top ten employers of the area in Table 1 below.

Top Ten Employers of the Winston-Salem metropolitan area²	
Company	Employees
1. North Carolina Baptist Hospitals, Inc.	6,314
2. Sara Lee Branded Apparel	6,000
3. Novant Health	5,950
4. R J Reynolds Tobacco Co.	5,930
5. Wachovia Bank	5,333
6. Winston-Salem Forsyth Co. Schools	4,700
7. Wake Forest School of Medicine	3,800
8. The Budd Group	2,800
9. Golden Personnel Services	2,700
10. City of Winston-Salem	2,600

Table 1

We anticipate that the city core will continue to generate a large number of requests for emergency assistance. Over time however, increased transient population in the commercial I-40 corridor will be responsible for a greater percentage of emergencies in those areas. Consequently, planning for future fire protection service demand should preserve fire protection capabilities in the downtown core, while preparing for growth in the residential north and commercial west sectors of the city.

Geography

The City of Winston-Salem encompasses 107.5 square miles, with existing development covering a large percentage of the city's total land area. Still, the city has adequate vacant land to accommodate the economic growth and population increases projected for year 2010.

Various small rivers and streams cut through the city, providing for urban drainage, but presenting few obstacles for travel distance and response time. The region is located just east of the Blue Ridge Mountains, but is primarily made up of gently rolling land with easily traveled roadways.



The campus of Wake Forest University, located just northwest of downtown, is a scenic and relatively private campus with some narrow roadways and speed control devices. Due to the size of the campus and the layout of its private roadways the complex must be considered for its geographic impact to travel and response time.

It should be noted that the Interstate 40 corridor bisects the southern portion of the City, providing some limitations to travel from north to south. Likewise, plans are developing for construction of additional highway corridors, including a northern beltway around the City and an Interstate 74 corridor passing through the City via the current U.S. 52 route. These developments should be monitored for their future effect on travel and response times.



The City of Winston-Salem Fire Department

Services

The Winston-Salem Fire Department (WSFD) is an extremely resourceful and dedicated organization that has attained a high degree of professionalism. The department has an interesting history of organizational change that has created some unique challenges to its development while at the same time equipping its members to adapt to new ideas and methods.

In the mid 1970's, the City of Winston-Salem began to utilize a somewhat unique modification of the Public Safety Officer organizational model. In many such cases, the fire and police departments within a jurisdiction are fully consolidated into a single organizational structure with a unified administrative system and fully cross-trained personnel acting as PSO's. In contrast, the City of Winston-Salem did not consolidate the two agencies, but rather continued to operate them as separate departments that coordinated and worked together when a fire was reported. Fire Department staffing was systematically reduced to only two full-time firefighters per company, while a select group of the City's police officers, cross-trained for fire fighting duties, would respond with them to assist at fire scenes. Training was privatized and any new fire stations built during the period were downsized to support only a skeleton crew.

By the early 1980's, the City had begun to recognize the side effects of an ailing system. As with many organizations utilizing this staffing model, problems were soon recognized with definition of roles, staffing inconsistencies, training and qualifications, and a confusing chain of command. Across the country, fire departments were being tasked with a growing array of new and challenging services such as hazardous materials, technical rescue and code enforcement, all of which required additional skills and dedicated staffing. It eventually became obvious that the City would need to return to a more traditional organizational system for its public safety agencies if the fire department was to be expected to remain as modern and capable as its counterparts in other metropolitan areas of the Southeast.



In the mid 1980's, the City made the transition away from the Public Safety Officer concept. The Police Department returned to its originally defined role in law enforcement and the Fire Department began the process of rebuilding. However, many signs of the old system remain to this day and a few of those continue to create substantial challenges for officers and firefighters alike.

Today, the Winston-Salem Fire Department is regaining a high degree of pride, determination and progressive innovation. There is a palpable attitude among the staff that the department has the full potential to become recognized as a leading organization in the industry, providing a full array of modern, professional services to the community. In November of 1999, WSFD took a major step toward that goal with a return to providing emergency medical services, initiating basic life support care on all medical calls within the city limits until the arrival of the County's transport paramedic service.

Services currently rendered by the department include:

- Structural fire fighting
- Emergency medical service (basic life support first response)
- Hazardous materials team response
- Fire prevention and code compliance inspections
- Fire investigation
- Fire safety education
- Emergency management
- Limited (light) rescue and extrication

WSFD also demonstrates effective working relationships with other city departments and with the fire departments of neighboring jurisdictions. The fire department observes mutual aid or automatic aid agreements with all neighboring fire departments. The agreements ensure that each municipality has access to adequate resources during major emergencies.



Resources and Service Delivery

Stations, Apparatus and Personnel

Fire departments need a balance of three basic resources to successfully carry out their emergency mission: specifically- people, equipment and facilities. Because firefighting is an extremely physical pursuit, the adequacy of personnel resources is a primary concern, but no matter how competent or numerous the firefighters are, the department will fail to execute its mission if it lacks sufficient fire apparatus distributed in an efficient manner.

WSFD deploys personnel and apparatus from seventeen community fire stations, numbered 1 through 18 (with 13 excluded), located across the 107.5 square mile jurisdiction. Firefighters assigned to each fire station are responsible for emergency first response in a correspondingly numbered "fire home territory". The territories vary in size but average approximately 6.3 square miles per station, a very reasonable service area for an urban environment.

We note that the distribution and size of the territories has as much to do with history as with geography, density, or system demand. For example, certain stations were targeted for replacement or consolidation but, when it came time to close the existing facility, public and political pressures kept the facility open. In addition, several stations are quite old and the location/design considerations of the stations accommodate response in the city, as it existed at the time they were built. In the years since, the character of the city has changed. Streets, bridges, and rail crossings are greatly improved. Modern fire equipment is able to respond greater distances more quickly than the apparatus of the early twentieth century.

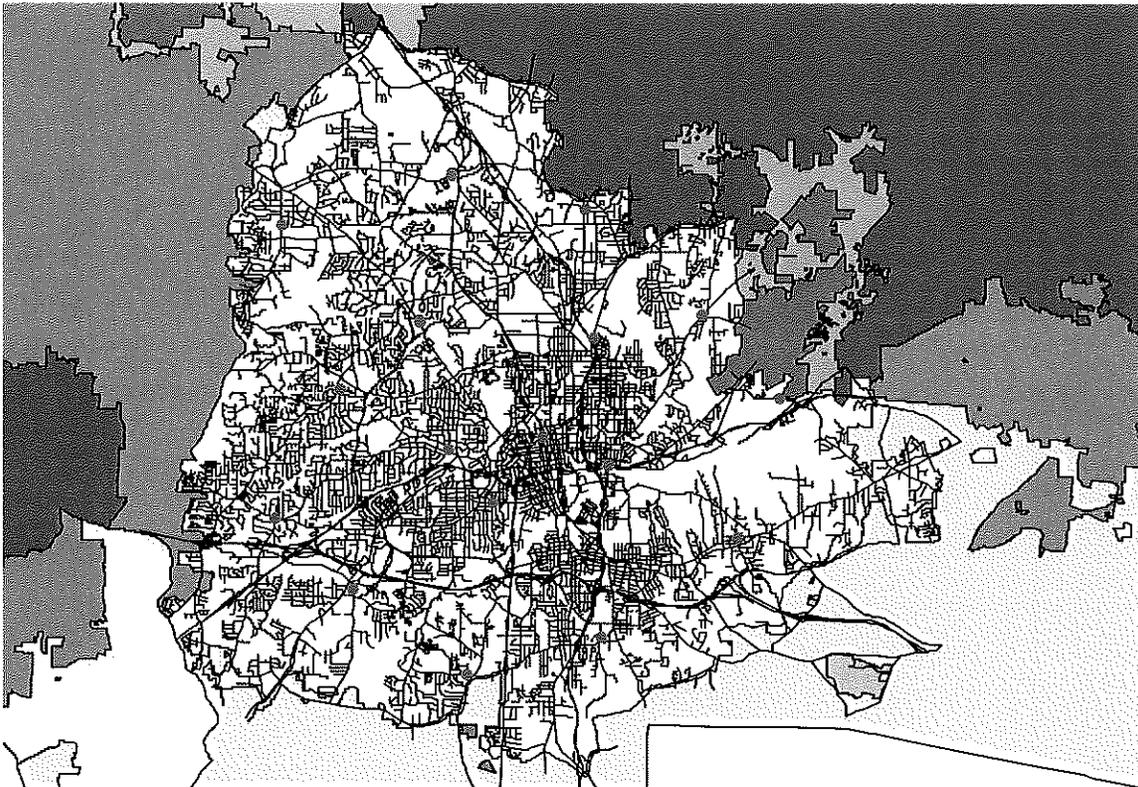
Insurance Services Office (ISO) rates fire departments based on a complex schedule of measurements that cover a wide range of factors significant to fire protection. The ISO classification provides insurance companies with a standard estimation of conflagration risk for fire insurance rating. One component that the schedule weighs is the distribution of fire companies within the community. The grading schedule suggests that developed



areas in a city should have a fire company within 1½ miles travel distance.³ A circular response area with a radius of 1½ miles enclose about seven square miles, greater than the current average service area of existing stations. Fire stations within the central Winston-Salem area all have response distances within the 1½ mile limit suggested by ISO. Stations 2, 5, 10, 11, 12, 14, 15, 17, and 18 have longer travel distances, but typically to areas of relatively low response volume.

While a community should never base fire protection decisions solely on the ISO grading schedule, the generally accepted standard is worth considering when planning for the overall protection of the community.

The map below shows the boundaries of the WSFD and the locations of each of its fire stations.

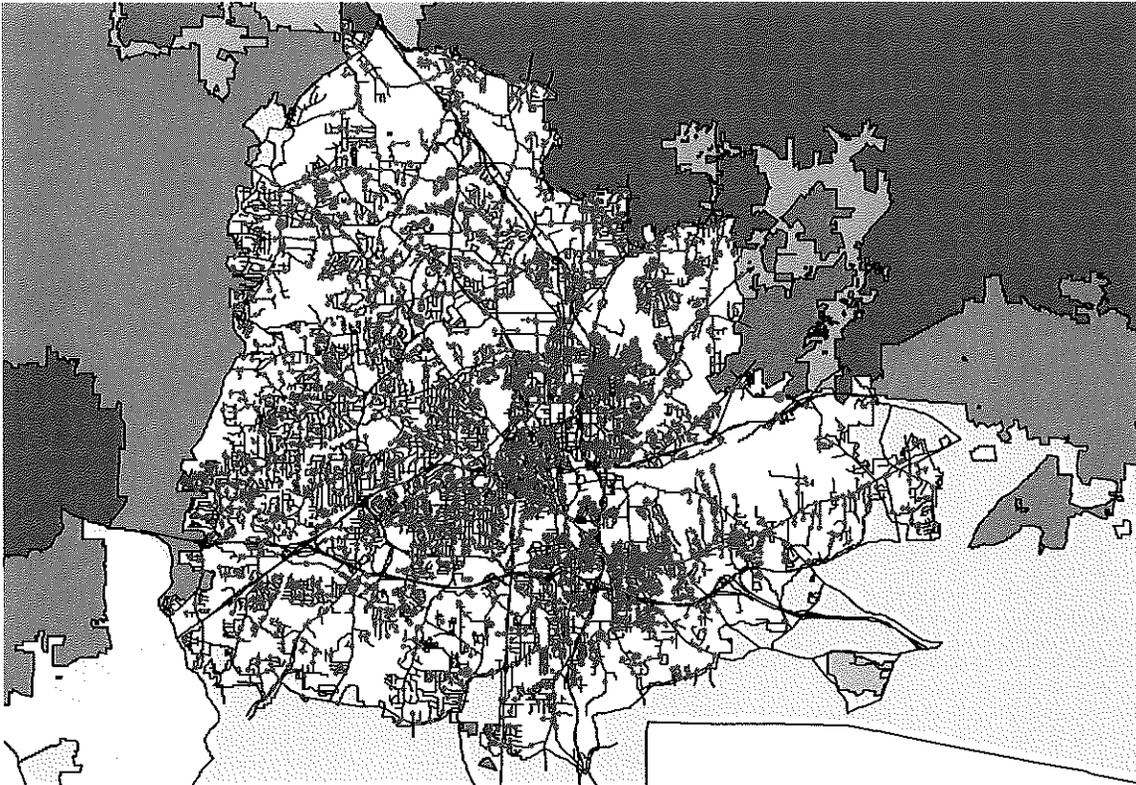


³ Insurance Services Office, "Fire Suppression Rating Schedule", edition 6-80, page 22.



The distribution of fire stations tends to be more concentrated in the central portion of the service area, an area with a higher structure and population density. This is appropriate.

The map that follows shows the locations of emergencies that occurred between January 1, 2000 and October 31, 2000.



As is expected the density of emergency incidents is greater in the central area and more dispersed around the outer regions. This disbursement supports the greater concentration of fire stations in the central area.

Several of the stations lack modern conveniences for a diverse workforce. Insufficient space is available for existing or needed staffing levels at some older stations. Toilet, bathing, dressing and sleeping areas in older stations, those built during the time when the department was operating under the PSO model, are now grossly undersized for full staffing. Of the 17 stations, only one contains a dedicated classroom, none contain a



specific study area or library, and none contain dedicated facilities for physical fitness of firefighters.

Certain older stations also have inherent limitations on the assignment of apparatus and resources due to their outdated design. For instance, Station #8 can house only a moderately sized pumper truck. Any attempt to deploy a truck company, service truck, rescue squad or other type of vehicle to this station would be impossible because of the size of the facility. These types of limitations cause resource deployment decisions to be based on existing and outdated infrastructure, rather than true need.

The Winston-Salem Fire Department has a total of 285 employees. Of those, 258 are assigned to field operations duty, excluding the nine Battalion Chiefs. The department's established staffing target is four firefighters per engine company and five firefighters per aerial company. However, units will be allowed to "run short" at three firefighters per engine company and four firefighters per aerial company due to employee leave requirements (Stations 1, 4 and 17 staff engines with 5 maximum and 4 minimum). The following chart describes the apparatus and on-duty staffing assigned to each station:

Station	Unit Type	Staffing (max/min)
1	Engine	5/4
	Aerial	5/4
	Command	1/1
2	Engine	4/3
3	Engine	4/3
	Command	1/1
4	Engine	5/4
	Command	1/1
5	Engine	4/3
	Aerial	5/4
6	Engine	4/3
7	Aerial (Quint)	4/3
8	Engine	4/3
9	Engine	4/3
10	Engine	4/3
11	Engine	4/3
12	Engine	4/3
14	Engine	4/3
	Aerial	5/4
15	Engine	4/3
16	Engine	4/3
17	Engine	5/4
	Hazardous Materials	cross-staffed
18	Engine	4/3



WSFD's target staffing requires a minimum of 86 field operations personnel (excluding battalion chiefs) on duty 24 hours per day. Assuming a very conservative leave ratio of 15% (leave time per hours worked for vacation, sick leave, jury leave, etc.), the department should have a minimum of 98 response personnel assigned to each of its three shifts for a total of 294. With only 258 currently assigned, it appears the department is only at 87% of the level needed to obtain target staffing.

Another consideration when evaluating personnel resources for emergency response is the workload placed on personnel by the addition of emergency medical first responder services. Adding EMS services dramatically increases the volume of responses handled by a fire and emergency service agency and must be accommodated in the staffing plan.

Winston-Salem Fire Department operates a fleet of front line apparatus that includes 16 engines, four aerial ladder trucks and a hazardous materials response truck. Of these, 14 have been categorized in fair, good or excellent condition and six have been categorized in poor condition. The model year of the front line apparatus ranges from current back to 1983. Average age of the front line fleet is nine years.

In addition to the front line fleet, the department holds three engines and three aerial trucks in reserve. Of these, four are categorized in fair condition, while two are rated in very poor condition. The oldest reserve unit is a 1976 model and the average age of the reserve fleet is 20.5 years. The department also maintains five command response vehicles, an air support truck, a tactical support truck and a fleet of 12 general staff support cars.

It was noted that the department does not currently maintain any vehicles dedicated to heavy rescue or technical operations. This is unusual for a municipality the size of Winston-Salem. While some existing apparatus are equipped with light to medium duty extrication equipment, no vehicles are stocked with equipment for heavy rescue, tactical operations, surface or fast-water rescue, and other similar specialized services commonly provided by urban fire departments. While the historical approach to these services in Winston-Salem has been to rely heavily on the volunteer rescue squads located in and around the City, the reliability of this system is faltering. Firefighters



readily admit to being involved in under-equipped rescue and tactical situations while waiting for the arrival of those squads.

Emergency Medical Services

From an emergency medical services (EMS) perspective, there is no current crisis calling for immediate change to the system. The roles of EMS first response, rescue and ambulance transport appear to be somewhat integrated and, for the most part, get the job done. That is not to say, however, that significant upgrades and efficiencies are not possible.

The department should be commended for its recent expansion into Basic Life Support (BLS) first response and for the current goal to provide automatic external defibrillator (AED) training to its field personnel. The department should also be recognized for its willingness to explore alternative delivery methods to address the challenges of a changing health-care delivery system and what such changes could mean for the agency and its workers.

An emergency medical event is dispatched currently by two different dispatch entities. There is discussion underway to consolidate into a single multi-jurisdictional agency. Significant opportunities are available if this consolidation is completed with careful consideration given to the needs of all participants.

WSFD has completed training of its response personnel to the basic EMT level. Some have trained and certified as EMT-Defibrillator. Further expansion of its EMS role to paramedic level service is a legitimate question to be answered.

EMS services are managed as an “other duty” assigned to the department training officer. There is some concern about the adequacy of EMS management and oversight as a result of this assignment. EMS issues are significant and time consuming to address on a regular basis.

A single medical authority exists within the county. However continuous quality improvement programs are not a regular part of the WSFD EMS program due to logistical limitations at the county level.



Ambulance transportation is operated by Forsyth County. The county employs paramedics, maintains ambulances, establishes fees and charges for service and manages the patient billing process. In addition, a county employed medical director provides medical oversight.

The county through a number of volunteer and partially paid agencies provides heavy rescue and extrication services. This appears to be a rather significant service issue. The usual challenges of maintaining reliable response through volunteer staffed entities, the difficulty coordinating a vital service provided by multiple sources, and the duplication of resources this system creates strongly suggests this practice be reviewed.

Standard Response Assignments

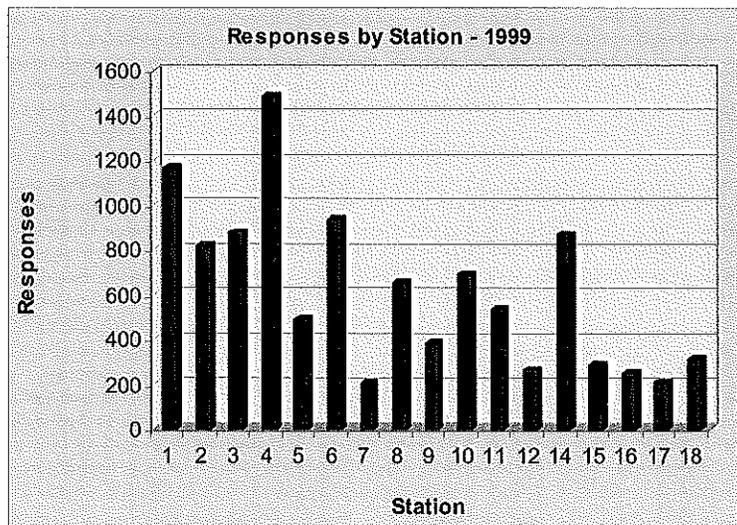
WSFD has developed standard assignments for the dispatch of personnel and apparatus to various types of calls for service. These assignments vary from as many as five emergency vehicles to as few as one depending on the type and severity of the emergency, and the staffing usually needed. The following table lists the assignments. While we judge them typical of the industry in so far as evaluating the number of apparatus, current WSFD staffing conditions could result in the response of only eleven firefighters to a structure fire. This could create safety concerns on initial operations, particularly in mid to large sized structures.



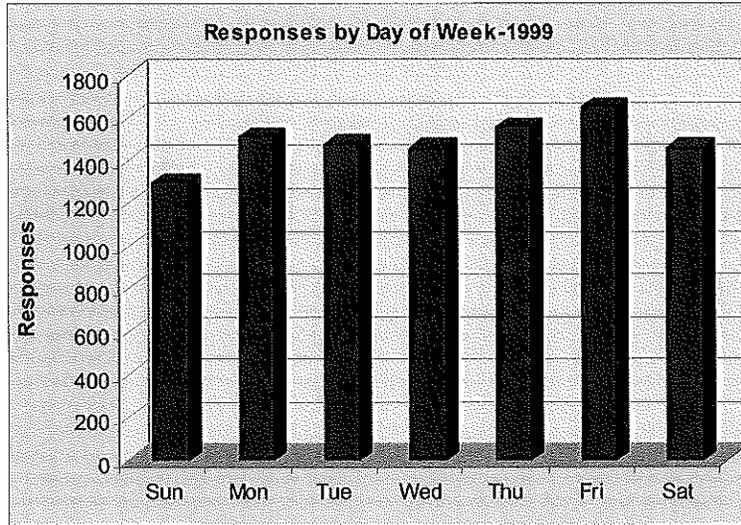
Standard Response Assignments				
Type of Emergency	Engine	Truck	Special	Bn Chief
Apartment Fire	2	1		1
High-Rise Fire	3	2		1
Emergency Medical	1			
Commercial Fire	2	1		1
Grass Fire	1			
Hazardous Material	2	1	HM 1	1
Industrial Fire	2	1		1
Vehicle Fire	1			
Single Family Residence Fire	2	1		1
Misc. – Public Service	1			

Emergency Service Performance

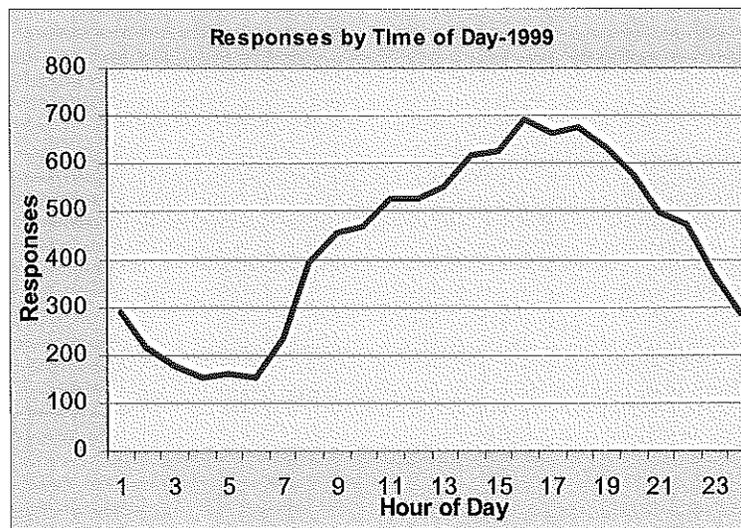
The WSFD responded to 10,425 calls for service in 1999. The following chart shows how these responses were distributed geographically by fire station. Response workload by company appears reasonable. Workload at fire stations 1 and 4 should be monitored as these two stations currently incur the highest response volume. However, response time performance, as will be shown later, is still very good from both stations.



Responses by day of week do not vary significantly as shown by the chart below.



However, as is typically the case, responses do vary significantly by time of day. This verifies the previously discussed assumption that human activity more readily translates to response volume than does population numbers alone.

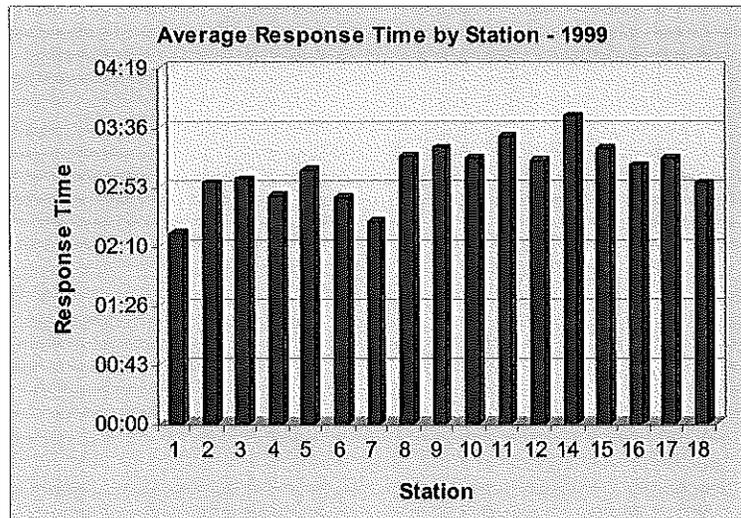


The Winston-Salem Fire Department provides very good service as measured by response time. As will be seen in an upcoming section of this report (Service Quality and Criteria) providing rapid response to emergencies is a key determinant to producing desired outcomes on emergencies.



Overall, the WSFD delivered service to the scene of an emergency within 3 minutes on the average. 90% of emergencies had the first unit on scene within 4:59 or less. This performance is very good and well within proposed response time objectives currently being discussed at the national level (NFPA 1710).

On a station-by-station basis, response time performance is still very good. As can be seen by the following chart, average response times, in all cases, are prompt.



This performance reflects not only the degree to which WSFD has well distributed its fire stations and response companies, but also the rapid manner in which personnel initiate a response once notified.

Non-Emergency Services:

Fire departments routinely provide a variety of services to the community that does not involve emergency response. These services can, however, have a significant impact on the ability of a department to accomplish its primary mission. For instance, code enforcement and public education can be methods of reducing the occurrence of fire by eliminating possible fire causes and teaching fire avoidance. Since it is always better to prevent a fire than fight it, this is a direct step toward protecting the community from the dangers of fire. Likewise, the Winston-Salem Fire Department provides non-emergency services that impact its mission.



It has been shown that aggressive fire inspection and code enforcement programs can reduce fire occurrences by eliminating ignition sources. In addition, proper enforcement of life safety codes can improve the chances of survival for occupants should a fire occur. In the City of Winston-Salem, the responsibilities for code enforcement are shared between the Fire Marshal, his staff of four Assistant Fire Marshals and the various duty crews at the community fire stations.

The North Carolina Fire Prevention Code (Volume 5) provides a model schedule for conducting code enforcement inspections in all commercial and public buildings. Depending on the type of occupancy, these inspections should take place every one to three years. Most departments, however, find that the greatest effect is gained from an annual inspection and this has been established as the target for WSFD. The State also certifies fire inspectors at three levels. Level I and Level II inspectors can conduct most routine inspections while more complex occupancies, such as manufacturing, industrial or public assembly, typically require the attention of a Level III inspector. In addition, Level III inspectors are generally required for conducting plan reviews for new construction and approving occupancy permits.

With only four full-time fire inspectors in the City, WSFD has integrated the suppression personnel into its code enforcement program in an effort to reach its goals for annual inspection. Company-level personnel typically do routine inspections of small commercial occupancies and handle enforcement using firefighters or officers certified as Level I inspectors. The four full-time inspectors inspect the more complex occupancies, conduct plan reviews and final occupancy permits, and follow up on enforcement issues passed on by the suppression personnel. In addition, they respond as requested to conduct fire investigations and follow up on arson cases.

The four full-time Assistant Fire Marshals are all civilian employees. Their positions are not integrated into the career path of the department and suppression personnel cannot transfer into these positions without leaving their career track. This leads to problems with turnover as well as finding qualified applicants when inspection positions come open. These complications have been identified as a reason that openings take an extended period of time to fill, often leaving the staff running short.



In 1998-99, the Fire Marshal's staff conducted 2,596 of the more complex inspections along with 733 plan reviews and 155 fire investigations. During that same period, the suppression personnel conducted 8,815 of the more routine inspections. Figures indicate that the Fire Marshal's staff identified an average of 1.6 violations per inspection, while suppression personnel identified only 0.7 violations per inspection. While this difference may be attributed, in part, to the more complex nature of the occupancies inspected by the Fire Marshal's staff some concern can be raised over the quality of the inspections conducted by suppression personnel. Since code enforcement is not within their primary job functions as firefighters it may be assumed that some inspections may suffer from a lack of experience, training, or priority.

It is also worth noting that the average time spent per inspection is .74 man-hours. This indicates that the suppression personnel spent at least 6,523 hours involved in code enforcement, or an average of 383 hours per station. This would be the equivalent of over nine standard 40-hour workweeks spent in the field conducting inspections. As the demand for emergency response service increases, particularly for emergency medical calls, the competition for available time will also increase. This demand will be particularly dramatic for companies with high-density service areas, since those areas have both higher service demands and more occupancies requiring inspection. It can be anticipated that the lower priority code enforcement may likely suffer.

Public fire safety education is another non-emergency service that is shared between the Fire Marshal's staff and the suppression personnel. The department employs one Public Safety Community Educator. Activities are coordinated through the Administrative Offices.

A somewhat unique aspect of the delivery system that WSFD employs for public education involves the assignment of smaller, individual divisions of each fire station's territory, to each of the three shifts operating from that station. Each shift then takes responsibility for the delivery of a variety of community-based services in that area. Not unlike the concept of community policing, this neighborhood assignment concept



provides a direct connection between that area and a specific set of staff members from the fire department. As requests for public education programs are received assignments are made to a specific shift of firefighters based on the geographic location of the request.

Statistics from 1998 indicate that the department's public safety education programs were delivered to 68,000 people in the community, nearly 40% of the entire population. In addition it should be noted that the department has addressed a growing Hispanic population with impressive translation efforts and programs targeted directly at the Hispanic culture.

Disaster preparedness is often considered a non-emergency function of cities since it involves planning, practice and public education in preparation for natural or man-made disasters that it is hoped will never occur. In the City of Winston-Salem the Department of Emergency Management has traditionally provided this service. Recently, however, the City reorganized this function and is transitioning it to be a part of the Fire Department. While this represents a new role for the department, it is not without precedent, since many communities combine the roles of emergency preparedness and emergency response.

Two things have led to this new approach. In the early days of disaster planning most efforts concentrated on natural disasters such as hurricanes, winter storms, earthquakes and so on. Now, however, much of the attention has turned to man-made disasters such as chemical spills, terrorist actions, mass-casualty accidents and the like. At the same time traditional fire departments have accepted many new roles in the mitigation of such events. With the advent of specialized hazardous materials teams and advanced emergency medical training fire departments are increasingly called upon to be the first responder to these types of incidents. Thus it makes reasonable sense to combine the functions of disaster planning and emergency response to disasters under the same organizational structure.

It should be noted that Winston-Salem has had an efficient and professional Department of Emergency Management. In fact a recent study by the Citizen's Efficiency Review Committee rated the department's performance as "exceeds standards" when



benchmarked with other similar agencies in North Carolina. The organizational change did not appear to be in response to problems within that department but rather was made with a progressive eye to the future for improved efficiency and integration of the disaster plans with the disaster responders.

The Emergency Management Division currently maintains a staff of five full-time employees including the EM Director, a Planning and Operations Officer, a Logistics and Public Education Officer, a Hazardous Materials Coordinator, and an Administrative Secretary. The Division has complete and up-to-date emergency response plans and is properly maintaining documentation related to the Community Right-To-Know Act (SARA Title III). It coordinates the activities of the Local Emergency Planning Committee (LEPC). The Division is a City-County consolidated function and conducts these activities on behalf of both the City of Winston-Salem and Forsyth County.

Support Services:

It is impossible for any fire department to operate efficiently without adequate support systems that provide the tools necessary for effective delivery of services. As with any other large organization, adequate supervision and administration is necessary to deal with human resource issues, budgets, purchasing and supplies. Proper maintenance and repair of the stations and fleet keeps the infrastructure and rolling assets on line. Likewise, without adequate and up to date training of personnel the quality of services delivered deteriorates. Finally, the ability to communicate incident responses and emergency assignments is a critical component of successful outcome.

The Winston-Salem Fire Department staffs a number of non-emergency administrative and support (A.S.) positions. In simplest terms, the primary job of the Fire Chief and other A.S. staff is to make sure that firefighters have the ability and means to do their job on the emergency scene. Good A.S. is critical to the success of the fire department. With insufficient oversight, planning, documentation, training and maintenance, the operational sections of the department will fail any emergency test. However, like other parts of the fire department, A.S. requires resources to function properly.



The addition of A.S. staff to any fire protection system should not cause a reduction of the emergency capacity of the fire department. Policy makers usually look for a good balance in funding the A.S. and operational functions of a fire department. The administrative and support resources of each department should be just adequate to assure the high efficiency of emergency operations without detracting from the emergency mission.

Administrative and Support personnel of WSFD include one Fire Chief and ten others, not including the Emergency Management Division. The organizational design features a four-branch, top-down scheme, with the Fire Chief responsible for the direct oversight of the managers of each of these four branches of the department. Considering only the fire department, (and not the Emergency Management Division) there are 285 full-time positions authorized; 274 operational personnel, seven administrative or management personnel and four in clerical or records support. Of particular note in this department is the absence of both a dedicated training officer and a dedicated emergency medical services coordinator.

We commonly look at the ratio of A.S. compared to total positions of the fire department to gain a sense of the relative amount of resources that are committed to this important function. As we state earlier, the suitable balance of the two components (A.S. and emergency personnel) is crucial to the success of the emergency mission of every fire department. A number of emergency workers sufficient to be able to fight fire, effect rescue, and provide other emergency services at the expected level is fundamental to the delivery of fire protection. The age of increased statutory regulation, however, makes it even more crucial that that proper documentation and oversight take place.

There are 285 full-time personnel in the fire department, 3.8 percent of those persons function at the A.S. level. We believe that each agency should determine the proper ratio of A.S. and emergency positions dependent on local need, but based on our experience with similar agencies, we judge that the number of A.S. positions here is marginal, at best. Organizations with administrative to operational job ratios as low as 5



percent run the risk of insufficient support of operational membership and/or difficulty in meeting the many requirements of modern fire protection. In our experience similarly based municipal fire departments usually have 10 to 15 percent A.S. jobs in the system.

Maintenance of facilities and equipment are handled by separate methods. Routine maintenance and repair of fire stations is under contract with the City Property Maintenance Department. The arrangement calls for WSFD to be back-charged for parts and labor when non-budgeted repairs and renovations take place. Major repairs are usually timely, while some non-emergency repairs take lower priority and occasionally frustrate station personnel.

The WSFD Maintenance Shop conducts apparatus and equipment maintenance. This facility, located adjacent to fire station #5, is operated by two full-time employees. Personnel assigned to the fire station next door assist the Shop Manager and Fire Mechanic on occasion. Capabilities of the facility include routine preventive maintenance, apparatus and small-engine repairs, and even occasional overhaul of pumps or aerial devices. For the most part, heavy transmission and engine overhaul work, frame and bodywork, and vehicle refurbishing are contracted to private outside firms.

The Maintenance Shop tracks vehicle repair costs and downtime using special computer software and boasts a vehicle in-service to downtime ratio in the high 90 percent range. The Maintenance Shop seems to enjoy a good reputation and complaints from suppression and response personnel are reasonably low.

Consideration is currently being given to providing services to other municipalities by way of contractual agreements. While this reflects well on the ability and reputation of the current shop employees it is of some concern that the current facility and staff may be too small to consider any serious expansion of services. Statistics indicate an efficient ratio of mechanics to heavy apparatus serviced of 1:25. Total heavy fleet size for WSFD is currently 27. If the Shop Manager is considered to also function as a mechanic at least 2/3 of the time and in an administrative capacity for the other 1/3, then the department is within this ratio. However, addition of more than twelve additional heavy apparatus would exceed the ratio. Although there are many benefits to be derived by a professional



and efficient shop catering to the needs of several departments, caution should be exercised when evaluating any such agreements under current staffing levels.

Firefighter training at WSFD is generally the responsibility of the Station Captains. A Deputy Chief does some coordination of certification programs and recruit training but these responsibilities are shared with other roles. While the Station Captains are required to maintain some level of fire instructor certification, competency as a fire instructor is not formally evaluated and variations in the quality, delivery and substance of training programs exist from station to station and shift to shift.

Highly unusual for a department of this size, WSFD has no dedicated training facility, no practice tower and no live burn simulation facility. In fact, there is no capability for centralized training delivery whatsoever, save the coordination of class delivery at the local community college.

Although WSFD is one of the few fire departments in North Carolina approved as a "delivery agency" for firefighter certification, most such programs are delivered through the community college, which pays the instructors for teaching. This system is not unusual in the state and seems to hold advantages for both the department and the college.

A branch of the Winston-Salem Police Department's Information Systems Division handles radio communications and emergency dispatch. The department operates on two non-trunked radio channels. Dispatch assignments are made by a "home-grown" computer aided dispatch (CAD) system that is approximately ten years old. "ARC Info™" is used as the basis for geographical information in the CAD system. Current consideration is being given to replacement of that system in order for police CAD to better integrate with their new records management system.

In addition to potential changes in the CAD system, a bond issue recently passed to allow development of a countywide trunked radio system. Evaluations are currently underway on the issue of consolidating the system and the dispatch functions between City and County.



The CAD dispatch software is not fully integrated with the records management system. There is no means for sharing data between the two systems. Run reporting must be completely entered from scratch at the fire stations with outdated software or by hand. Past response histories, inspection and occupancy data, and pre-fire planning information is not available to the dispatcher at the time a call is processed.

Dispatching of emergency medical calls is disjointed and confusing. When a medical call is received in the City's 911 Public Safety Answering Point (PSAP), it must be handed off immediately to the County PSAP by a one-button manual transfer. This is because the County provides sole dispatching services for the Department of Emergency Medical Services, which provides the transport paramedic service. Once the County dispatcher has obtained sufficient information to initiate a response of the assigned ambulance, he/she manually calls the City PSAP back and requests the dispatch of the nearest fire company for BLS first responder service. Information regarding the call-type, location, etc must be manually shared by voice since the two data systems are incompatible and are not currently linked. Although minimized by experienced and knowledgeable dispatchers, this unwieldy system inserts unreasonable delay into the response of the closest available medical aid.

Staffing of fire department dispatch is marginal. One dispatcher is routinely assigned full-time to the fire dispatch console and is supplemented by others during major incidents. Due to the limited number of dedicated call-takers, however, the amount of time spent in answering 911 calls by this individual detracts from the primary role. Dispatch staff is not currently trained or certified in Emergency Medical Dispatch (EMD) protocols.



Service Quality Criteria and Standards

The first goal of any emergency service delivery system is to provide sufficient resources (personnel, apparatus, and equipment) to the scene of an emergency in time to take effective action to minimize the outcome of the situation. This need applies to fires, medical emergencies, and any other emergency to which the fire department responds. An understanding of the dynamics of fire and medical emergencies, as influenced by time, is important.

Dynamics of Fire

Most fires within buildings develop in a predictable fashion, unless influenced by highly flammable material. Ignition, or the beginning of a fire, starts the sequence of events. It may take some minutes or even hours from the time of primary ignition until flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be generated during early phases.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heats and ignites, which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and all are highly toxic.

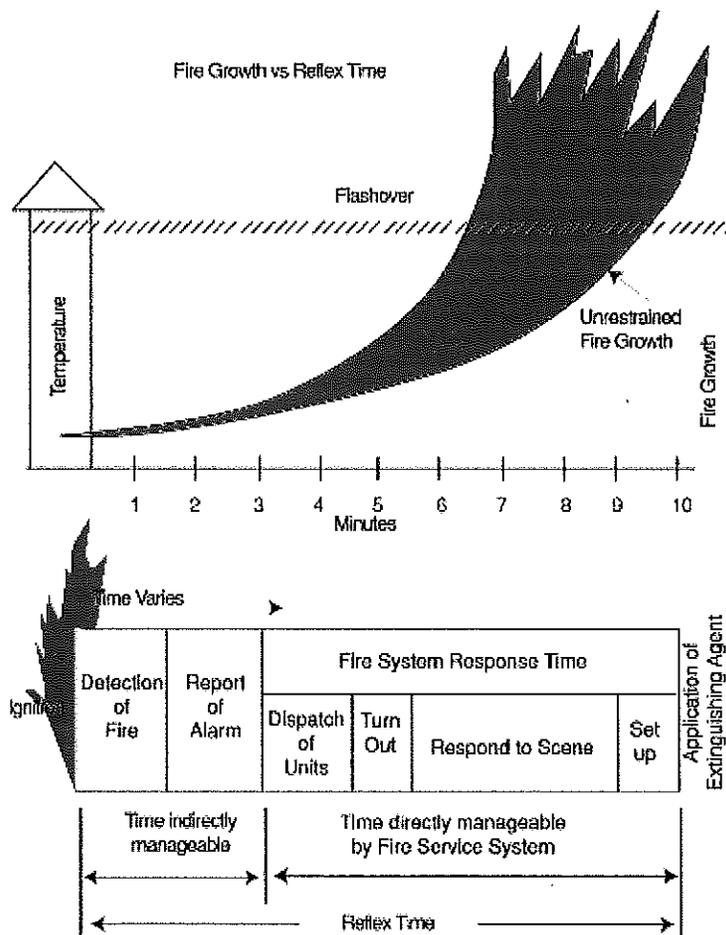
The spread of the fire continues quickly. Soon the flammable gases at the ceiling reach ignition temperature. At that point, an event termed "flashover" takes place; the gases ignite, which in turn ignites everything in the room. Once flashover happens, the damage caused by the fire is significant and the environment within the room can no longer support human life.

Flashover usually occurs about five to eight minutes from the appearance of flame in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to be able to apply water to a fire before flashover takes place.



Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. "Light weight" roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a very dangerous environment for firefighters. In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for the early application of water to a fire essential to a successful outcome.

A number of things must happen quickly to make it possible to achieve fire suppression prior to flashover. The figure below illustrates the sequence of events.



The reflex time continuum consists of six steps, beginning with ignition and concluding with the start of the application of (usually) water. The time required for each of the six components varies. The policies and practices of the fire department directly influence four of the steps, but two are only indirectly manageable. The six parts of the continuum are:

- 1. Detection:** The detection of a fire may occur immediately if someone happens to be present or if an automatic system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period.
- 2. Report:** Today most fires are reported by telephone to a 9-1-1 center. Call takers must quickly elicit accurate information about the nature and location of the fire from persons who are apt to be excited. Poor training of 9-1-1 operators or the lack of modern equipment may add time to this component.
- 3. Dispatch:** The dispatcher must identify the correct fire units, subsequently dispatch them to the emergency, and continue to update information about the emergency while the units respond. This step offers a number of technological opportunities to possibly speed the process.
- 4. Turnout:** Firefighters must don firefighting equipment, assemble on the response vehicle, and begin travel to the fire. Good training and proper fire station design can minimize the time required for this step.
- 5. Response:** This is potentially the longest phase of the continuum. The distance between the fire station and the location of the emergency influences response the most, but the quality and connectivity of streets, traffic, driver training, geography, and environmental conditions are also a factor.
- 6. Set up:** Last, once firefighters arrive on the scene of a fire emergency, fire apparatus is positioned, hose lines stretched out, additional equipment must be assembled and/or donned, and certain preliminary tasks must be performed (such as rescue) before entry is made to the structure and water is applied to the fire.

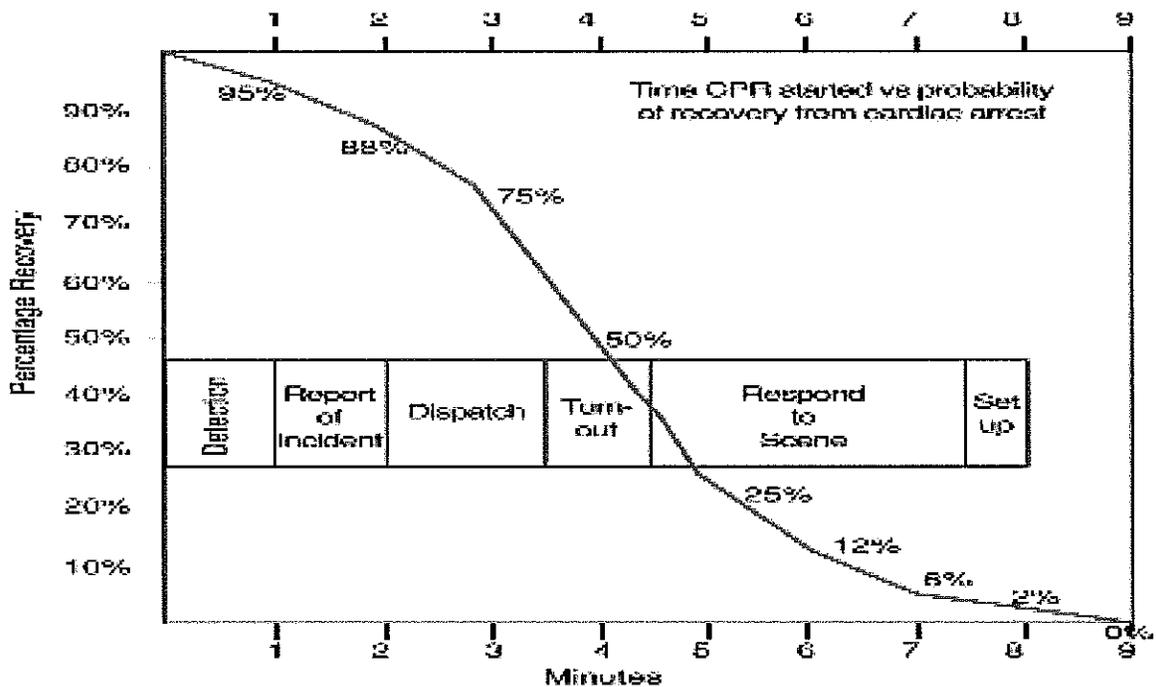
As is obvious by the sequence, application of water in the time before flashover is a serious test of any fire department. It is reasonable though, to use the continuum as a tool in planning community standards for emergency response from strategically located fire stations.



Emergency Medical Event Sequence

Cardiac arrest is the most significant life threatening medical event. A victim of cardiac arrest has mere minutes in which to receive definitive lifesaving care if there is to be any hope for resuscitation. On August 15 of this year, the American Heart Association (AHA) issued a new set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include new goals for the application of cardiac defibrillation to cardiac arrest victims. Heart attack survival chances fall by seven to ten percent for every minute between collapse and defibrillation. Consequently, the AHA now recommends the administration of clot-busting drugs as soon as professional medical care is available, and the goal of cardiac defibrillation within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be visually shown as in the following figure.



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for emergency fire response. Recent research stresses the importance of



rapid cardiac defibrillation and administration of certain drugs as a means of improving the opportunity for successful resuscitation and survival. The WSFD's plan to upgrade service capability to include automatic defibrillation is a positive move.

ISO Rating

The Insurance Services Office (ISO) last rated WSFD in 1988. The ISO assigned the Winston-Salem community a class 3 rating. The ISO uses a 1 through 10 rating scale with Class 1 being the best level of service and Class 10 designating no fire protection.

The ISO reviews fire protection in three major categories:

- Receiving and Handling Fire Alarms (value 10 percent) – The function and reliability of the dispatch service is evaluated. WSFD received 8.03 of a possible 10 percent in this category.
- Water Supply (value 40 percent) – The community's ability to deliver firefighting water in sufficient volume to combat fire in buildings is measured. The city received 31.99 of a possible 40 percent in this category.
- Fire Department (value 50 percent) – An assessment is made of the capability of the fire department to effectively respond to and extinguish a structural fire. The process provides for the review of apparatus, staffing, training, station locations, and other issues. The fire department scored 33.11 of a possible 50 percent.

The ISO rating is important to a community. Many property insurance companies base the fire risk portion of property insurance premiums on the community's ISO grade. The table below shows an example of how fire insurance rates change based on the ISO rating that is assigned.⁴

⁴ A similar chart is not available for commercial properties. Property use affects the premium and many are individually rated.



Fire Department ISO Class Compared to Insurance Premium Cost								
ISO Class	Annual Insurance Premium Based on Home Value in Thousands⁵							
	\$100	\$150	\$200	\$250	\$300	\$350	\$400	\$500
10	\$894	\$1,358	\$1,856	\$2,341	\$2,826	\$3,311	\$3,844	\$4,918
9	\$806	\$1,224	\$1,674	\$2,112	\$2,549	\$2,986	\$3,468	\$4,436
7	\$430	\$652	\$892	\$1,125	\$1,359	\$1,592	\$1,848	\$2,365
6	\$399	\$607	\$829	\$1,046	\$1,262	\$1,479	\$1,717	\$2,196
5	\$373	\$566	\$744	\$976	\$1,046	\$1,380	\$1,603	\$2,051
4	\$373	\$566	\$744	\$976	\$1,046	\$1,380	\$1,603	\$2,051
3	\$373	\$566	\$744	\$976	\$1,046	\$1,380	\$1,603	\$2,051

As the ISO class improves, fire insurance rates for homes decrease dramatically until reaching a class 5. Businesses generally benefit from reductions all the way to insurance Class 1. While it is good to want to design a fire protection system to take advantage of the low-cost insurance premiums for the community, it is very important to remember that the grading schedule is merely a tool of the insurance industry. As such, the ISO schedule only measures the risk of fire to the insured *structures* of a community. The schedule does not evaluate the safety, security, or personal services that a fire department provides to the *citizens* of the community. Municipalities should consider the grading schedule when designing local fire protection systems, but should never make a decision based solely on the ISO class. Officials should try to make improvements to fire and emergency medical services that are best for the community first; but if during the process insurance classifications are improved, so much the better.

The ISO classification of WSFD rates in the top grouping of the comparable North Carolina fire departments. Of the items noted in the classification details, many have already been addressed by the WSFD, particularly staffing improvements.

Serving Demand versus Geography

There are two basic service philosophies used in fire resource deployment planning; specifically, the two approaches are geographic-based and demand-based coverage. A *geographic-based* model assumes that citizens and businesses of the jurisdiction are entitled to reasonably equitable fire and emergency services regardless of where they may reside within the jurisdiction. Under this strategy, deployment of resources includes



as much service area as possible within a maximum travel distance. On the other hand, the *demand-based* model acknowledges that all life and property is of equal value and, as such, focuses on saving as much life and property as possible. Rather than attempting to insure geographic coverage, this strategy attempts to keep available resources near the next most likely emergency.

Geographic-Based Protection

Jurisdictional area drives the geographic-based fire protection model. Workload becomes a distant second factor. The strategy essentially focuses on being able to cover ground; that is, the ability to respond from a given point to any location within a specified time regardless of how frequently (or infrequently) a response may be required at that place.

The primary advantage of geographic fire protection is that it satisfies the fundamental desire for fairness in the distribution of a public service. It is politically agreeable and minimizes potential conflict. Geographic-based protection provides stability to the location of resources. The property and population of a response zone may change significantly over time but the geographic model places the priority on maintaining emergency response abilities in the given area only.

The principal disadvantage of a geographic strategy is its inability to function with limited resources. Actually, equitable geographic-based protection only exists when all resources are ready to respond. Once a limited resource is committed to an emergency, protection is no longer uniform unless another unit is available to take the place of the deployed resources. The geographic model is inherently inefficient when resources are committed to bases where few emergencies occur. Busier areas might better use the resource.

Demand-Based Protection

Workload becomes the most important focus of a demand-based protection model. Resources are positioned in a manner that puts them nearest the highest number of likely emergencies. The strategy has been widely used in the ambulance industry for

⁵ Source: Survey of insurance companies in the southeastern United States



years (commonly referred to as “system status planning”). Ambulance bases are located after a careful analysis of the historical record, taking into account the statistical probability of the location of the next emergency.

The advantage of the demand model is that it increases the percentage of emergencies answered in the least amount of time. Since time is significant in the outcome of many emergencies, this increased percentage of short response times produces a greater number of favorable outcomes. In a system with limited resources, the strategy acknowledges that the next most likely incident to occur is just as important as one in progress, and more important than the call that is *least* likely to occur. A demand-based model is more efficient than geographic protection because resources are not placed in areas of low or non-existent call volume.

The leading disadvantage of the demand model is that it creates a basis for conflict. By its very nature, the strategy requires identifying those people and properties that will receive reduced protection right up front. It ensures that response times in low workload areas will always be longer than busier areas. The strategy does not allow for the same stability of deployment as geographic-based protection. Demand-based coverage must be highly mobile as conditions change, particularly with emergency medical calls. A constant re-evaluation of workload and demand changes must take place to ensure the proper positioning of resources. Importantly, the demand-based model is at odds with the ISO survey, which evaluates resources based solely on distance of travel within a response area.

Winston-Salem Service Model

The City of Winston-Salem is currently delivering service primarily based on the demand-based service model. While some station locations are based on geographic considerations made many years ago, the result continues to be a distribution of stations that assures rapid response within performance objectives to nearly every portion of the city.

While some duplication or overlap areas exist, they are reasonably minimal and chiefly occur in the more densely populated areas of the City where risk and service demand is higher. Stations are more closely located in those areas of the City that have traditionally



been the most active in terms of emergency response. From this standpoint, the geographic service model has served the City reasonably well and is likely to contribute to improved ISO credit.

The demand-based protection model is currently utilized in the newer annexation areas of the City. Demand for services in these areas is lower because they are less densely developed and populated. Thus, the longer response times occurring in these areas has not yet significantly impacted the performance objectives of the department. In some cases, service contracts or agreements have been put in place as temporary measures to decrease response time and maintain performance, even if the arriving company is from a neighboring jurisdiction. The demand-based service model suggests that stations not be built based only on geographic need, but at the point when demand in a particular area begins to impact the performance objectives.

Thus, we can conclude that the Winston-Salem Fire Department will need to add fire stations in the newly annexed areas at some point in the future, when development and population densities increase the service demand to a level where longer response times are no longer acceptable based on their overall impact to the department's performance objectives.

Staffing for Risk Protection

Operations at the scene of emergencies are key to the protection of life and property. Sufficient trained personnel must be available on the emergency scene to carry out all of the tasks required to effectively control a fire. Fireground tasks can be broken down into two key elements: *life safety*, and *fire flow*. The number of building occupants, their location, status, and ability to take action for self-preservation governs the priority of life safety actions. Life related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering ample water to extinguish the fire and to create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action dictates the number of firefighters required to combat different types of fires. In the absence of enough workers



to take concurrent action, the commander must prioritize the tasks, completing some in chronological order rather than together. The tasks include:

command **scene safety** **search and rescue** **fire attack**
water supply **pump operation** **ventilation** **backup**

The Commission on Fire Accreditation International of the International Association of Fire Chiefs (IAFC) publishes standards for the number of personnel required on the emergency scene for various levels of risk. The following two tables detail that information.

Minimum Firefighting Personnel Needed Based On Level of Risk				
Task⁶	Max. Risk	High Risk	Mod. Risk	Low Risk
Attack line	4	4	2	2
Search and rescue	4	2	2	
Ventilation	4	2	2	
Backup line/rapid intervention	4	3	2	2
Pump operator	1	1	1	1
Water supply	1	1	1	
Utilities support	1	1	1	
Command/safety	2	2	2	1**
Forcible entry	*			
Salvage	*			
Overhaul	1*			
Communication	1			
Chief's aide	1	1		
Operations section chief	1			
Logistics	1			
Planning	1*			
Staging	1*			
Rehabilitation	1			
Division/group supervisors	2*			
High-rise evacuation	10*			
Stairwell support	10*			
Total	49	17	13	6

*Additional personnel may be required at maximum and high-risk fires.

**The officer of the first due fire company can often handle these tasks.

⁶ All tasks may be performed somewhat concurrently during the early moments of firefighting, but sometimes certain duties take place in sequence depending on the situation, thus reducing the total number of people needed.



Minimum Personnel Needed for a Typical Moderate Risk Fire⁷			
Task	Firefighters	Company Assigned	GPM
Attack line	2	1 st engine	180
Search and Rescue	2	truck	
Ventilation	2	truck	
Backup/ rapid intervention	2	engine	180
Pump operator	1	engine	
Water Supply ⁸	1	engine	
Utilities support	1	rescue or truck	
Command	1	chief or company officer	
Safety	1	rescue or truck	
Total	13		360

Performance Objectives

Desired outcomes should provide the basis for staffing and deployment decisions. WSFD does have accepted performance objectives to define their desired level of service. Of primary interest is the department's objective to arrive at the scene of emergencies within 4 minutes or less. The department is achieving this objective.

Safety regulations require that there be at least four qualified personnel at the scene of a building fire before interior firefighting operations begin.⁹ The standard does not stipulate that the four persons need to respond on the same vehicle or from the same station.

Other Standards

There are a variety of other standards and performance criteria developed by various organizations with an interest in fire and emergency services. The table below lists a number of the standards and compares WSFD with the identified standard.

⁷ A typical residential or small commercial structure with one or two rooms involved in fire is a "moderate risk". It is the most common type of fire that happens in a suburban setting.

⁸ The first arriving engine company is responsible for water supply. One person usually completes the task in less than 60 seconds after arrival. The person is then available for other assignment.

⁹ OSHA *Respiratory Protection Standard* 29 CFR 1910.134.



Comparison of National Standards to Winston-Salem Fire Department		
National Standard	Organization	Current WSFD Standard
4 firefighters per engine company	Dallas Fire Dept. Study Seattle Fire Dept. Study NFPA Stds., Fed. OSHA	Most engines are staffed with 3 personnel at a minimum
Engine company within 1½ miles of built upon areas	Insurance Services Office (ISO)	Predominately achieved
Ladder truck within 2½ miles of built upon areas	Insurance Services Office (ISO)	Achieved within high density areas
Staffed ladder truck if 5 or more buildings exceed 35'	Insurance Services Office (ISO)	4 staffed ladder trucks
Average fireground staffing to be 13 (49 at mall or high-rise, etc.)	Commission of Fire Accreditation (International Association of Fire Chiefs)	Initial alarm yields 11 personnel at a minimum, however rapid backup is available
National average of on-duty personnel = 0.48 per 1,000 population	International City/County Management Association (ICMA)	0.38 per 1,000 population at minimum staffing
National average total uniformed personnel = 1.59 per 1,000 population	International City/County Management Association (ICMA)	1.48 per 1,000 population
Arrive at structure fire prior to flashover (typically 5 minutes from ignition)	Federal Emergency Management Authority (FEMA) National Fire Academy	Average response time is currently 3 minutes
Arrive at EMS call within 4 to 6 minutes of cardiac or respiratory arrest	American Red Cross	Average response time is currently 3 minutes



Critical Service Issues

The following section provides a listing of those issues, both current or anticipated, that will need to be adequately addressed in order to assure the long-term success of the Winston-Salem Fire Department and advance the organization to the pinnacle of industry standards.

Emergency Services

Staffing

As was discussed previously, its not sufficient to simply “get there quick”. Enough people and equipment must arrive in time to ensure a positive outcome to the emergency.

Review again the following typical task analysis of a single-family residential “room and contents” fire. Even a brief analysis of the tasks that must be performed to assure effective, safe operations in the first several minutes would likely reveal the following list:

Task	Number of Firefighters	Company Assigned	GPM
Attack Line	2	1 st Engine	180
Search and Rescue	2	1 st Truck	
Ventilation	2	1 st Truck	
Back-Up/Rapid Intervention	2	2 nd Engine	180
Pump Operator	1	1 st Engine	
Water Supply / Hydrant	1	1 st Engine	
Utilities Support	1	2 nd Engine	
Command	1	Chief Officer	
Safety	1	2 nd Engine	
Total Personnel	13		360 gpm

The standard assignment for a structure fire is two engines, one aerial and a battalion chief. At a minimum this assignment level delivers 11 personnel to the scene, two short of the requirements identified in the chart above. In order to deliver the identified 13 personnel, a fourth unit must be dispatched.



13 personnel are considered the minimum effective response force for a moderate sized fire (single family residential or small commercial structure). The number of tasks that must be performed becomes even more significant for larger and more complex incidents. If the above scenario involved the rescue of a critically injured victim the efforts of the initial responders would have to be re-directed to life saving medical care.

Staffing shortages lead to difficult decisions involving compromise of resources. In other words, when insufficient manpower is on the scene, the Incident Commander must prioritize his or her available personnel and often must pass up actions that are directly intended for the safety of the firefighters and the potential victims. Perhaps the utilities do not get shut off or the second floor window is not laddered. Maybe ventilation is delayed or the back-up line is not staffed. Any one of these decisions can, and all too often does, result in catastrophe if something goes wrong.

In an urban setting such as Winston-Salem, four-person company staffing is an accepted industry standard. In fact, it is not unusual for companies in high-density neighborhoods with multiple target hazards such as high-rises, apartments and so forth to operate with five-person companies because of the increased complexity of the incidents. With these accepted company-staffing levels, eight or nine functioning firefighters and a command officer can be assembled quickly and efficiently with the arrival of the first two adjacent companies assigned to the incident.

Workload

As the various types of services provided by WSFD increases so do the demands on the current workforce. While this can bring about an enviable increase in overall productivity factors, it can also lead to problems with job proficiency and burnout.



Currently, the operations workforce at WSFD is expected to have a significant involvement in the following widely diverse program deliveries:

- Fire suppression
- Emergency medical services
- Rescue
- Hazardous materials incident mitigation
- Fire inspection / code enforcement
- Public education
- Hydrant testing and maintenance
- Pre-incident planning

The one recently added program in the above list that is likely to have the greatest impact on the workload of the department is emergency medical services. In most communities, it is normal to have a 3:1 or even a 4:1 ratio between EMS incidents and fire incidents. Thus it becomes apparent that the addition of emergency medical services will cause a significant increase in the response activity of the department, particularly in certain station territories.

It should be considered an eventuality that quality may begin to suffer in work performance. This is likely to begin with the areas deemed of lowest priority by the overall suppression workforce. It may first appear in the hydrant testing and maintenance program as assigned objectives are not met on time, or perhaps pre-incident plans will get put on the back burner. Enthusiasm for public education may eventually begin to dip. Of significant concern would be a decrease in the quality of fire inspections leading to an increase fire incidents.

In addition, it should be expected that personnel in certain extremely busy companies will begin to suffer burnout at a faster rate than has been apparent in the past. When demands for service increase, and expectations for performance in existing program objectives remain, personnel can become frustrated with being expected to be “all things to all people”. This frustration can become exaggerated by the stress associated with the more heavily “victim oriented” work of emergency medical response.



Facility Deficiencies

Inadequate facilities for housing firefighters and apparatus detract from the department's mission. They can significantly limit the available options for resource assignment. They can hinder the ability to maintain a well-trained and fit workforce and can affect employee morale. In the case of WSFD, the design and construction of certain stations occurred during a time when the department was operating under a significantly different and unique organizational scheme. These facilities may no longer be suitable for the operation as it exists today.

The primary functions that should take place within the fire station environment should be closely examined and adequate, efficient space for all functions should be provided. Here are some examples:

- Housing and cleaning apparatus and equipment
- Residential living for on-duty crew members (male and female)
- Administrative office duties
- Firefighter training
- Firefighter fitness

While this list may seem elementary, compromises in the ability of the facility to support any of these functions can detract from its primary purpose for existing. The Winston-Salem Fire Department operates many fine facilities with modern and efficient design. However, it also continues to operate facilities that are unable to support one or more of the primary functions without the enterprising and creative compromises of the staff.

Stations with extremely limited, or under-sized apparatus bays, place confining limitations on the assignment of resources. For instance, if it is determined that a truck company should be relocated to an adjacent territory to achieve optimum efficiency, travel time, distribution, or ISO credit, it becomes a performance compromise if this cannot occur due to inadequate apparatus bay space or living quarters. The inability to add vehicles at some stations, such as light or medium rescue trucks or quick response vehicles, again becomes a performance compromise.



Very few of the facilities provide specific or adequate space for professional training. While training may be able to be conducted in the day room or kitchen, it would not be without compromise. An efficient facility, even for routine shift trainings, should provide for the use of overhead projectors, computer simulations, chalk or dry marker boards, flip charts and so forth. Likewise, a well-stocked library of reference materials and manuals should be available for all firefighters to use and study.

Firefighters must stay fit. It is no longer an option. Analysis of firefighter deaths has made clear that cardiac-related stress is the primary reason firefighters are lost. Every major national fire industry organization, including both the International Association of Fire Chiefs and the International Association of Fire Fighters has set firefighter fitness as one of their primary issues. In addition, it is becoming increasingly obvious that employers bear some of the obligation for providing for a fit workforce. As a result, progressive fire departments nationwide are setting up department-wide fitness and wellness programs that provide both the facilities and expertise to assist their employees in reaching optimum fitness standards. Where newer fire stations are being built or older facilities remodeled, sufficient square footage should typically be included to allow a reasonable combination of aerobic and strength training equipment to be on hand for on-duty personnel.

Apparatus Deficiencies

The overall state of WSFD's front-line apparatus fleet is acceptable for a department of this size. However, it must be noted that several of the primary engine companies are operating pumpers that are as much as 16 or 17 years old. This exceeds the department's target of 15 years of front-line service, which is a reasonably liberal goal by industry standards. Many departments rotate engines off front-line service after 10 years. Still, the current apparatus is well maintained and thoroughly tested annually.

Of concern is the state of the reserve apparatus fleet. The department maintains three pumpers in reserve, two of which are well over 20 years old. The reliability of these vehicles may be questioned by the ISO unless continuous maintenance and testing proves their suitability.



The Winston-Salem Fire Department has proposed a reasonable and effective Apparatus Replacement and Purchase Schedule that will bring the fleet up to industry standards and provide for a more dependable and modern reserve fleet. If the schedule were followed as proposed, five pumpers, one platform and four quints would be purchased within the next seven years. This would significantly reduce the average age of the front-line fleet and allow the reserve fleet to be replaced by trucks within the twenty year age goal. In addition to this effort, consideration should be given to expansion of the reserve pumper fleet.

Additional consideration must be given to the effect that an increased run load will ultimately have on the maintenance and operating cost of apparatus. WSFD has now taken on responsibility for responding to all emergency medical calls within their jurisdiction to provide basic life support services until the arrival of a transport paramedic unit. In certain station territories, this is already having a tremendous impact on the response load.

This service is currently being provided in all station territories by responding the assigned engine or aerial ladder company. This is an acceptable method of transporting the initial medical responders to the incident and allows the engine or aerial crew to remain together and available for immediate re-assignment after concluding a medical call. However, it must be recognized that this type of response is not the primary design purpose of these vehicles. A truck of massive size and weight is being used basically as a simple transport mechanism for medical response.

Many communities, particularly in urban settings, have initiated the use of smaller medical response units, often designed around a stock S.U.V. or pick-up truck, to handle medical responses in particularly busy territories. This configuration relieves the heavy engine or aerial of the majority of its run load, extends the life and reduces operating costs. In addition, the smaller vehicles are often more maneuverable and easier to operate in heavy traffic than their full-size counterparts, reducing the risk of accidents and apparatus downtime.



Rescue Services

For purposes of this report, we will be discussing rescue services with the assumption that the term includes such activities as vehicle extrication, machinery entrapment, trench collapse, confined space, water rescue, vertical line (rope) rescue, etc. North Carolina is somewhat unique in its history of the development of rescue services. In many areas of the state, rescue services were originally initiated by independent volunteer organizations that operated the local ambulance service. In some cases, volunteer organizations popped up to provide only rescue services, independent of patient care & transport or fire suppression.

This differs somewhat from the traditional development of these services in many parts of the country where fire departments, both career and volunteer, saw the provision of rescue services as an extension of their existing programs. Often the equipment utilized for these types of services was already on board the fire apparatus. Newer, more modern rescue tools were often seen as having a benefit for fire suppression activities as well doing double-duty in forcible entry, ventilation or fire access. The fire suppression training and experience of firefighters was also considered a plus when dealing with rescue incidents that often involved situations at high risk of fire, such as an automobile accident.

These different approaches to the development of modern rescue services have created unique challenges for many North Carolina communities. Winston-Salem is clearly one of these. Long ago, the City determined the need for its fire suppression forces to transition to a fully staffed and paid service, consistently available at a moment's notice to respond to emergencies in an increasingly urban setting. Likewise, Forsyth County took its responsibility for emergency medical services to this same level by long ago initiating a fully staffed and paid ambulance transport system to provide optimum patient care 24 hours a day. However, neither the Winston-Salem Fire Department, nor the Forsyth County Department of Emergency Medical Services, took on clear and direct responsibility for seeing that the provision of rescue services in the community took the same determined track towards modern, efficient, and professional services that matched the needs of a growing urban city.



In Winston-Salem, a variety of organizations are attempting to fill the gap. Independent volunteer organizations, organized as non-profit corporations, are providing differing levels of rescue services in different parts of the city. Loosely falling under a contract with Forsyth County but receiving funding from varied sources, these organizations are under no direct authority from either the City or County and determine their own operating practices and procedures. Some have even begun staffing their operation with paid employees who do not work for the government and are under little direct obligation to coordinate their practices with either the fire department or the County paramedics.

Where these organizations are occasionally falling short, the Winston-Salem Fire Department is attempting to act as a safety net. While the fire department has been given no official role in rescue services it is often on the scene of these types of incidents long before the arrival of the volunteer rescue squad. This causes firefighters to attempt mitigation of the incident without clear responsibility, perhaps without proper equipment and with limited training. In addition when the volunteer squads are unable to provide adequate manpower to an incident, particularly during daytime hours, the fire department's staff that is already on scene must step in, using the third party organization's equipment and resources with limited familiarization.

Even the various laws and ordinances dealing with the provision of rescue services are unclear. While the responsibility for fire suppression seems to clearly rest with the City of Winston-Salem and the role of emergency medical services appears to be a County responsibility, where does rescue fit in?

It is clear from observation that the system of providing rescue services in the City of Winston-Salem is outdated and disorganized. The current system simply does not provide sufficient clear authority and responsibility to any single entity in order to allow that entity to work to ensure professional, modern service. The disjointed methods currently utilized almost certainly increase the risk of poor response time, conflict of roles and authority on an incident scenes, and even injury to personnel performing at levels for which they are not prepared.



The City of Winston-Salem should take the initiative to work with Forsyth County to negotiate an agreement and understanding of the clear placement of responsibility for rescue services. Any ambiguity regarding the specific roles should be eliminated. One organization should have clear and unquestionable responsibility for assuring that these services are provided in the most efficient, effective, and professional manner possible. In addition, a clear and written plan should be prepared identifying the steps in a smooth transition from the current methods and clarifying each organization's roles and relationships in the new delivery system.

In short, the provision of rescue services must be elevated to the same level of significance and recognition as are fire suppression and emergency medical care, and these services must be professionally delivered on the basis of a clear and organized plan.

Emergency Medical Services

The following is intended as a discussion of certain key observations including recommendations where appropriate. In making recommendations, ESCG recognizes the size and complexity of the Winston-Salem Fire Department and that change will not come quickly or easily. Winston-Salem is a typically large and complex agency complete with the fiscal, cultural and political constraints that demand patience and tenacity when attempting to implement significant change. While change is good, it does not come without a certain degree of pain.

Dispatch: Working with the County, Winston-Salem is currently evaluating the future of its 9-1-1 call-taking and dispatch functions. Current options include combining the area's dispatch centers into a single multi-jurisdictional agency providing service all area public safety providers. While ESCG was not engaged to specifically evaluate dispatch, this makes sense from an EMS perspective.

Currently, because the call taking and ambulance dispatch functions reside at one agency, and first response dispatch at another, there is potential for unnecessary time delays in deploying essential resources. Support should be given those models where both call taking and dispatch of all EMS resources reside at a single agency.



Consideration is currently being given to a Computer Aided Dispatch (CAD) upgrade. It has been our experience that such discussions are often dominated by law enforcement at the expense of EMS. Careful consideration must be given to the needs of EMS managers and regulators who require certain data not typically available in many CAD systems. Additionally, the nature of contemporary EMS systems is to deploy ambulance resources based upon demand, availability and traffic flow patterns. Because many CAD systems cannot effectively accommodate such requirements, EMS representatives must be integral to the discussions to ensure the right CAD software is acquired.

Area call-takers are not currently trained as Emergency Medical Dispatchers and therefore do not provide pre-arrival instructions. This is, in part, due to the current practice of rotating personnel between fire/EMS and police. As the future of the area's 9-1-1 and dispatch functions are contemplated, we recommend dedicating personnel to either fire/EMS or police. Doing so will help facilitate training and certifying personnel in EMD.

First Response: The department has achieved its goal of training all response personnel to the basic EMT level. A number of individuals have been trained and certified to the EMT intermediate level – which in North Carolina includes endotracheal intubation. The question is whether the department should promote further expansion of its first response role up to and including the provision of paramedic level services.

Unless there is a crisis calling for immediate change within a system, WSFD should not take on additional responsibility until certain basic services are delivered at the highest possible level. Therefore, because there are several basic EMS functions requiring the department's attention, we are recommending against expansion at this time. Following are a list of issues the department should address before ALS first response or ambulance transport receive serious consideration:

EMS Management/Oversight: While department representatives acknowledge that EMS represents the vast majority of its emergency response activity, there is no chief officer having exclusive responsibility for managing the EMS program and only the EMS program. In the current organizational structure, EMS is assigned to a position having additional responsibilities including oversight of the department's training function. EMS



requires the commitment of a single full-time manager to oversee the department's current BLS first responder program.

Training: Consistent with the department's approach to training, there is no organized EMS training program ensuring consistency and accountability in EMT continuing medical education. In the course of developing its overall training program the department should hire or promote a firefighter/paramedic to the position of EMS training officer. Such an individual would be responsible for ensuring personnel meet all state mandated continuing medical education requirements as well as those promulgated by the area's EMS Medical director. Additionally, he/she would be responsible for overseeing the agency's EMS continuous quality improvement (CQI) program (see discussion below).

Quality Improvement: The department and its personnel enjoy the benefit of functioning in an EMS environment complete with a single medical authority including standardized patient care treatment protocols. Current system-wide logistics, however, preclude the medical director from conducting a comprehensive CQI program focused on BLS personnel. Rather, the medical director is appropriately focused on quality control within the ranks of the county's paramedic workforce.

The department should develop a non-punitive CQI program based, in part, on chart review that considers both sentinel and frequency indicators as established by the medical director. The findings of such a comprehensive process would provide the foundation for the department's ongoing continuing medical education program.

Medical Control: As stated above, the Winston-Salem area benefits from a single EMS medical authority providing consistent off-line medical control through the adoption and enforcement of standardized patient care treatment protocols. The ALS component of the system also benefits through the medical director's direct and continuous involvement in CQI. Logistics, however, preclude the medical director's ability to provide similar CQI services to the BLS first responders.



By his own admission, Dr. Stringer, the county's EMS medical director, would like to do more in the area of BLS CQI and should be encouraged to do so. The appointment of an EMS trainer, accountable to the county's medical director for purposes of quality control, would enable Dr. Stringer to complete the CQI loop.

On-line medical control is a function of the receiving hospitals providing guidance and direction to field personnel when requested. While this is a function primarily for system paramedics, and therefore of less concern to the department at this time, it is an area that should be improved. Specifically, it does not appear that any formal training is required of physicians responding to radio requests from field personnel nor does it appear that there is any requirement to know and fully understand the EMS field protocols. While the system of on-line medical control appears to work well, there is a certain system liability associated with the apparent lack of formality which should be addressed.

Charting: While the department has adopted a standardized "Patient Information Report (FD-104)", in speaking with field personnel, there does not appear to be much consistency in its application. Additionally, there does not appear to be a mechanism for easy retrieval of patient care and EMS response data in electronic format.

Further, there do not appear to be comprehensive agency-imposed standards for completing patient care forms, including a requirement that the primary care-giver author the document, and there does not appear to be an effective mechanism for ensuring completion in an expedient manner.

This is an example of the department's evolution as an EMS provider versus a reflection on the agency's commitment to prehospital care. It is, however, an area that demands the immediate attention of a designated EMS manager.

Rescue: It appears one of the most pressing EMS related issues has to do with the department's role as a provider of "rescue" services. Rescue and heavy extrication services are a function of the county, which at varying levels subsidizes a number of volunteer and partial paid agencies. Within the City, there is growing concern regarding



the future of these agencies and whether it remains practical and cost-effective to retain rescue as a function separate from the fire department.

Clearly, in the vast majority of metropolitan and urban areas of the country rescue or heavy extrication is a fire department function. This, like EMS first response, is due to its logical extension of the emergency services capacity that is inherent within fire agencies. With this said, we understand and appreciate the history and commitment of these various programs.

The fact is, however, that concerns regarding response capacity during certain times of the day, response times, scene control and the difficulty in recruiting and retaining volunteers create uncertainty about the programs' future. Coupled with the department's decision to appropriately duplicate certain rescue services within the City, the City should work with the County to effect an orderly transition of rescue services to the City fire department. In doing so, the City should develop a program to keep the volunteers involved in a meaningful way thereby capturing the benefit of their experience and commitment.

Ambulance Transport: During the initial site visit, ESCG met with several individuals, both within and outside the department, who expressed their belief that 9-1-1 ambulance transport services should be transitioned to the fire department. In doing so, however, they described an existing system that, from their perspective, works reasonably well.

For reasons described above, it would be premature to conduct serious discussions concerning a purely fire-based ambulance transport system. With this said, however, if the department believes it can use certain existing production capacity to provide 9-1-1 ambulance services without substantial increases in personnel costs it may wish to establish a five-year goal of adding transport to the extensive list of services already provided.

Fire-based ambulance transport makes sense under one of two circumstances. First, if there is a clinical quality of care problem with the community and the local fire department can quantify its belief that it can do a better job, then fire-based transport should receive serious consideration. Aside from some deployment issues that may



effect response times, this does not appear to be the case in Winston-Salem. The second, and more common reason, for fire-based transport is to achieve certain cost efficiencies.

The issue of cost effectiveness is complicated and has much to do with issues of public policy. If, for example, an agency can use part of its existing workforce to directly provide the service (i.e., cross trained/dual-role firefighter paramedics) thereby reducing personnel costs, it can be argued that a fire-based model is less expensive. If, on the other hand, a fire-based model takes the form of a third-service system with dedicated personnel, much like the county's existing system, it is unlikely there are any savings and could cost actually cost more.

While there are countless other public policy considerations, the issue of personnel cost, and how it is allocated and paid for, outweighs all others. Fundamental decisions in this area will determine whether taking on ambulance transport is a proper business decision.

In considering its future as a possible provider of ambulance transport services the City must also consider the potential impact on surrounding communities. Unlike the current system that appropriately ignores the jurisdictional boundaries of various local governments, it is likely the City would only be interested in serving its own constituents. While this may be desirable from the City's perspective, it could create non-economically viable service areas in the balance of the county thereby stripping county residents of essential services.

Regardless what decision the City makes concerning its role as an ambulance transport provider, the department should work toward more effective integration of ambulance transport and first response. There are substantial economies for the overall system and potential improvements in services delivery by working more closely together. As an example, serious consideration should be given to the possibility of housing ambulances and their crews in strategically located fire stations. Such a move would improve ALS response times to many of the City's residents and promote a better working relationship between ambulance and first responder crews.



Summary: The department should make BLS first response a priority by dedicating the management personnel resources required to perform the task competently and efficiently. Once in place, the department should develop a five-year plan with a primary focus on creating an environment of enthusiasm and accountability among field practitioners and consideration of paramedic engine companies and 9-1-1 ambulance transport services.

Non-Emergency Services

Code Enforcement Staffing

The primary purpose of any code enforcement effort is to decrease community risk. For fire departments that are involved in code enforcement, this means eliminating potential sources of ignition or fire spread, as well as assuring proper and safe egress for occupants in the event of an emergency. These efforts can only be effective if the individuals conducting the inspections have the proper combination of training, experience and motivation.

WSFD's code enforcement program relies heavily on the efforts of the company-level personnel. The firefighters are expected to conduct many of the inspections in their station's home territory. Certain personnel are trained and certified at the Inspector I or II level. This system is not unusual and is utilized in many communities.

However, in the case of WSFD, the availability of only four full-time assistant fire marshals who are certified at Inspector III level cause the system to be overly dependent on the fire companies. It is all too likely that the code enforcement program will begin to conflict with the demands of additional emergency response brought about by the increase in emergency medical service calls. The problem will be noticed first in the high-demand territories, where run load is greatest. These stations can be expected to have increasing difficulty accomplishing the objectives of the code enforcement program and may continually fall behind on the inspection schedules. In addition, there should be concern over the potential decrease in the quality of the inspections that do occur.



Turnover within the fire marshal's staff worsens the problem. Since the inspection personnel are civilian, recruitment of qualified individuals becomes a problem. Once experience is gained, these individuals become a coveted commodity among the area's growing communities. Staff shortages result as vacancies are being filled and new individuals are trained. A lack of any integrated career path with the sworn fire suppression personnel makes the fire marshal's bureau unattractive as a career step for those who do possess skills and training in this arena.

An increase in the full-time staffing of the code enforcement program will be necessary to assure its continued effectiveness. While the company-level inspection program should be continued, full-time inspection personnel must be used for complex facilities and to decrease the workload on fire suppression personnel in high-demand zones. In addition, methods must be found to reduce staff turnover.

Support Services

Training

In order for the Winston-Salem Fire Department to reach its goal as a top quality, state-of-the-industry organization, the training program must be elevated to the highest priority. An examination of some of the most dynamic and advanced fire departments in the country reveals one thing in common- top emphasis on quality personnel development programs. The training program cannot exist as an "afterthought" or an obligation that is merely fulfilled to create numbers on an annual report.

A description of the condition of the current training program at WSFD is difficult to soften. It simply does not compare in any reasonable fashion to other communities and organizations of this size and complexity.



The reorganization of any training program should begin with the mission of that division. The program should, at a minimum, provide for complete development of personnel at four distinct levels:

- Initial Job Training: to provide recruit-level, basic firefighter certification and training that will enable a new employee to begin effective job performance.
- In-Service Training: to provide a continuous stream of updated information related to job duties and assure firefighter skills retention
- Advanced Certification: to provide an avenue for personnel to obtain new information on specialized or advanced skills, improving their self-worth and value to the organization
- Career Development: to provide knowledge and skills aimed directly at preparing individuals for advancement to officer's positions and improving the leadership and management skills of existing supervisors.

This four-part training program provides for continuing development throughout an entire career. It should be planned, coordinated, supervised and delivered by the fire department. If outside delivery agencies are utilized, such as the community college system, those providers should be integrated into the program under the direct coordination of the fire department to assure that their program delivery matches the goals and objectives of the training division. Likewise, the delivery of certain aspects of the program, such as in-service training and skills retention, can be conducted at the company officer level, but must be coordinated department-wide by a central training division that oversees curriculum, schedules and quality assurance.

In addition to the need for reorganization of the training program, the fire department is in desperate need of adequate and modern training facilities that will facilitate top-notch program delivery. This need appears to exist throughout the area and serious consideration should be given to pursuing any and all avenues to combine efforts with other agencies in the county. Consolidation of training facilities in many areas of the country has often resulted in extremely modern and highly functional programs and can encourage mutual aid and automatic aid arrangements as departments begin to receive similar or joint training delivery.



Communications

An effective communications system is more than the electronic gadgetry that allows the transmission of signals. It begins when the call is answered and ends with the filing of collected data at the close of the incident. The efficiency of these, and every other operation in between, combines to determine the success or failure of the communication system. WSFD's communications system has a relatively high level of efficiency, given the age and style of the radio hardware systems. However, improvement can and should be made in certain areas.

An examination of the route a typical call takes provides evidence of certain deficiencies. For instance, it is critical to keep sufficient call-takers on duty to assure that the attention of the fire dispatcher is not diverted from critical radio traffic when acting as a back up for busy call volume. Nationally, there are many tragic examples of dispatchers missing important safety messages related to the safety of personnel while their attention was diverted to other duties in the communications center.

After a call is received, a modern and fully functional Computer Aided Dispatch system can integrate information from multiple sources to assist in getting the proper resources assigned to the call and fully informed of its potential. The current "home-grown" CAD system does not integrate with any of the adjoining public safety communications centers and does not exchange adequate information with the other fire department databases. Systems are now available that can fully integrate information from GIS sources, fire pre-planning programs, occupancy and inspection data and response history files to assist dispatchers in assigning resources and informing responders.

When exchange of response information with the County 911 center is required for an emergency medical call, the operation is particularly clumsy. While dispatchers have become adept at making this exchange as quickly as possible, there is no denying that the call is handed off from one center to the other, then the information is manually exchanged back to the original center for the first responder request. These two CAD systems should be integrated to automate this process. Further, consideration should be given to an advanced, regionally consolidated, communications center that integrates, at a minimum, fire and EMS dispatching for the adjoining jurisdictions in Forsyth County.



The improved exchange of information in such a center can facilitate highly efficient mutual and automatic aid programs, resource sharing and other innovative efforts.

The radio system itself will not be strongly addressed in this report. Efforts are currently underway to finance and design a new trunked radio system to handle the future needs of the area's public safety entities. However, it is imperative that any such system allows for the seamless exchange of transmissions directly between WSFD and all assisting agencies.

Maintenance

The maintenance division of the Winston-Salem Fire Department is reasonably productive for its size. There is one full-time mechanic and a Shop Manager who also performs as a mechanic operating on a fleet of 27 apparatus. This is a very reasonable figure in comparison to similar sized communities. The high-stress environment of emergency vehicles accentuates the workload and demand on these individuals. This level of workload can allow very limited time for additional training and development of these staff members. As the complexity of the apparatus increases, so must the training and skills of the individuals maintaining it.

The size of the facility will make it difficult to expand operations to any significant level. As the number and complexity of apparatus increases, consideration should be given to some expansion and improvement of the current maintenance facility. Certainly, no significant increase in workload from outside maintenance contracts should be considered without the addition of both staff and facility space. In particular, a reasonable ratio of 25 heavy apparatus to each full-time mechanic should not be exceeded without expectation of efficiency problems. Administrative functions performed by the Shop Mechanic must also be taken into consideration in these calculations as well, particularly as it may increase with outside contracts and their associated paperwork and reports.



Options and Recommendations

The following contain the options and recommendations developed for each functional area in which deficiencies, concerns or issues were noted by the research team.

FACILITIES:

The discussion of facilities falls within two categories; location and condition.

Fire Station Location

When evaluating the locations of fire stations two primary considerations are important.

They are:

- Ability to meet established response time performance objectives
- Contribution to a reasonable ISO rating

In reviewing the current locations of Winston-Salem fire stations it is readily apparent that both considerations are well satisfied. The distribution of fire stations provides very good response time performance throughout the service area. The entire service area is served, on the average, in less than 3 minutes with the longest average in any single station area just over 3.5 minutes.

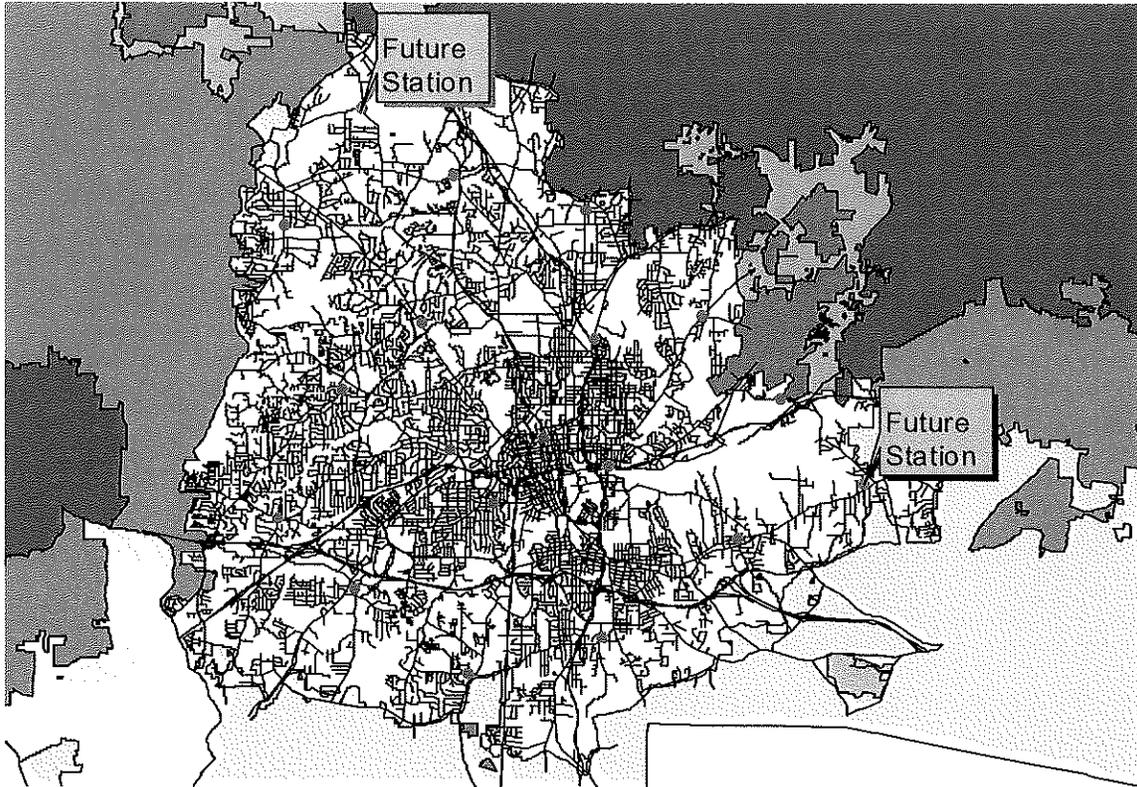
The Winston-Salem ISO rating of Class 3 is very good. There will likely be little opportunity to improve this rating through increases in the number of fire stations. The additional 2 rating points that can be gained for engine company distribution will not, by itself, improve the rating. Much greater opportunity for rating improvement exists in providing additional staffing on apparatus.

There are selective opportunities to improve overall distribution that can be realized. However these opportunities should only be implemented for those stations that require improvement beyond what can be reasonably accomplished at their existing locations.

However, on the aggregate, no fire station additions or relocations are recommended at this time. As growth within the community continues there may be a need for additional stations to serve new demand.



The following map suggests locations for two additional stations in the future. These locations were selected for two reasons. First, the geographic distance to properties they would serve as compared to distances from current stations, and second, the level of response demand in their respective areas.



The primary indicator of the need for an additional station should be the inability of current stations to maintain desired response time objectives. In other words, when stations currently serving the areas in which proposed stations are located can no longer achieve the four-minute objective then an additional station would be warranted.

Facility Condition

There is a strong need, in many facilities, for improvement in the physical structure to make stations more livable, and functional. As was discussed previously a number of stations lack the physical space for the size of existing crews and lack specific features that are necessary in a fully functional fire station.



It is recommended that WSFD establish a ten-year capital improvement plan specifically for facilities, which targets replacement or improvement of deficient stations. In addition, we strongly recommend the department work to establish partnerships with other city and civic agencies that will encourage collaborative efforts. A facility that combines a fire station with a park building, post office, community center or other centralized civic operation provides much greater value to the community and has the added benefit of bringing the community closer to the fire department. Furthermore, this concept would directly support the efforts of neo-traditional community redevelopment that is gaining popularity in Winston-Salem, as described by the City Planning Director. Again, as facilities are replaced, consideration should be given to locations that enhance rapid response.

The following fire station space analysis is provided as guidance to the department in its facilities planning. This station space plan provides the needed living and other functional spaces for one fully staffed company with some expansion capacity. Any other uses added such as community use space are in addition to that shown in this analysis.



Fire Station Space Requirements

Space Description	Size	Square Feet
Administration		
Entry Vestibule	5x8	40
Communications/watch room	10x10	100
Storage	6x8	48
Living Quarters		
Dayroom/classroom	20x20	400
Kitchen	12x15	180
Dining area	12x15	180
Sleeping rooms	8 @ 10x12	960
Washroom – men's	12x15	225
Washroom – women's	12x12	144
Locker room – men's	10x15	150
Locker room – women's	10x15	150
Utility storage	8x12	96
Supply storage	8x8	64
Laundry room	10x10	100
Physical fitness room	15x20	300
Apparatus Room		
Apparatus bays (2)	40x60	2,400
Tools and parts storage	8x10	80
Equipment decontamination room	8x12	96
Hose tower	8x12	96
Hose storage	8x10	80
Turnout storage	8x15	150
Site maintenance storage	10x10	100
Subtotal of room/space sizes		6,139
Plus 20% of office/quarters for circulation		627
Total Recommended Square Feet of Space		6,766

STAFFING:

This study recommends that improved minimum staffing standards for most companies be established. The minimum allowable staffing of engines and truck companies should be established at four firefighters per company. The WSFD should consider a combination of full-time employees and use of “call-back” personnel to accomplish its staffing needs. Attempting to meet minimum staffing entirely through on-shift personnel is a costly approach.



The following is recommended:

1. Conduct a mathematical analysis of leave time averages for all personnel and utilize this formula to create a target number of suppression employees that will ensure an average number of on duty personnel sufficient for minimum standards. (ESCG can assist in this analysis and formulation)
2. Establish a policy and system for assigning overtime shifts when minimum staffing standards are not met, filling vacancies by use of off-duty personnel.
3. Utilize a combination of the above options to achieve minimum company staffing standards with best-cost efficiency. Utilize mathematical analysis to determine the most cost-effective ratio of additional full-time staff vs. the use of overtime shifts. (ESCG can assist in this analysis and formulation)

STANDARD RESPONSE ASSIGNMENTS:

Effective emergency event outcomes are dependent on delivering sufficient numbers of properly trained and equipped personnel within a short enough time period from the onset of the emergency. In reviewing response time performance and resource assignment by incident type it was noted that additional resources should be initially assigned to higher risk structure fires.

This study recommends the addition of one engine company to the response assignment for commercial, industrial and multi-family alarm responses. These responses are considered medium to high risk and analysis indicates a larger number of firefighters (13 for medium, 17 for high) is required early in the incident for safe and effective operation. The addition of one engine company (4 person staff) will ensure that 16 firefighters are responding to initial alarm assignment for medium and high risk structures.

The use of the Commission on Fire Accreditation International incident staffing guidelines is recommended to determine the minimum initial assignment to structure fires.



WORKLOAD:

This study recommends that the department conduct an in-depth workload analysis for stations 1, 2, 3, 4, 6, and 14, the busier WSFD fire stations. The intent of this analysis is to determine whether these stations can continue to maintain responsibility for all current task assignments. Consideration should be given to reassignment of certain non-emergency duties in order to ensure a reasonable balance of emergency and non-emergency workload. The following options can be considered:

1. Assign full-time code enforcement personnel to these territories to relieve suppression crews of some inspection responsibility
2. Assign other personnel to hydrant testing and maintenance in these territories. Temporary summer civilian crews might be used for this purpose.

APPARATUS:

The department has established a reasonable and intelligent plan for apparatus replacement. This study supports that established plan and reinforces the need to stay on track. Consideration should be given to retaining one additional reserve engine. ISO's minimum recommended ratio is one reserve for each five engines and Winston-Salem is on the fringe of that standard.

RESCUE SERVICES:

This study recommends that local elected officials at both the City and County level adopt a resolution declaring responsibility for rescue services within the City limits of Winston-Salem. It is our recommendation that this resolution names the Winston-Salem Fire Department as the responsible agency and establishes a requirement for the development of a "Rescue Services Development Plan" by no later than August 1, 2001. Further, we then recommend that a working committee be established under the direction of WSFD and including representatives from County EMS, County Fire, and the four independent rescue squads now serving portions of the district.



The specific objectives of this committee should be the establishment of the following:

1. Criteria for equipment and services provided at the following three levels of response:
 - a. First Rescue Responder: initial arriving response unit (typically stabilization and patient access)
 - b. Medium Rescue: light to medium squad (typically auto and machinery extrication)
 - c. Heavy Rescue: special duty unit (typically advanced technical rescue, heavy extrication and other special skills and equipment)
2. Response time targets for each of the above levels of service
3. Deployment plan for all three levels of service
4. Capital improvement plan and schedule to support the above objectives

The plan for meeting the objectives set forth by the committee may involve the use of various agencies' personnel and equipment, but should do so in a planned and coordinated fashion, with WSPD being the lead agency for assuring objectives are met.

EMERGENCY MEDICAL SERVICES:

EMS Management/Oversight: Develop a job description and list of minimum credentials for the position of EMS Chief. Duties should include, but not be limited to, day-to-day management of the department's EMS program, representation of the EMS division on the Chief's executive staff, and liaison duties with affiliated government and EMS agencies.

Minimum credentials should include North Carolina State paramedic certification, or the ability to obtain it, a bachelor's degree and experience in managing an EMS system. Direct fire related experience, while helpful, is not essential.

The department's organizational structure should be modified to place the EMS position below Assistant Chief but above Battalion Chief.

EMS Training and Quality Improvement: Develop a job description and minimum credentials for the position of EMS Trainer. Unlike the EMS Chief, who should be a chief officer, the EMS Trainer need not receive chief officer status. Duties should include coordination of all EMS training activities, to include state-mandated continuing medical



education (CME) and maintenance of CME records. Duties should also include coordination of the departments EMS Continuous Quality Improvement (CQM) program.

Minimum credentials should include paramedic certification or registered nurse (RN) with a background in critical care nursing. Credentials should also include experience in teaching. Again, while direct fire-related experience may be helpful, it is not essential.

Within the department's organizational structure the EMS Trainer should report to the EMS Chief or, in the event the department designates a full-time Training Chief, reporting to that position would also be appropriate.

Hire or promote an EMS Chief and EMS Trainer: Following development of necessary job descriptions, and within the constraints of the City's recruitment and hiring guidelines, post the positions both within and outside the department. Particular effort should be made to conduct a nation-wide recruitment to ensure the best field of qualified candidates from which to make a selection. The selection process should include a comprehensive skills and background assessment using a combination of department personnel, including a representative of the bargaining unit, the County's EMS Medical Director, and other area EMS leaders.

Basic Life Support (BLS) First Response: As the department has already achieved its goal of basic EMT certification for field personnel, we recommend a comprehensive program of skills and certification maintenance administered by the department's EMS Trainer. Using state-mandated continuing education requirements as a minimum standard, the EMS Trainer should work with the County's EMS Medical Director and the department's CQI Committee to establish a yearlong EMS training curriculum.

If not already in place, policies should be revised to require maintenance of basic EMT certification as a condition of employment, for both field personnel and chief officers, and it should be required that all new-hires have basic EMT certification prior to starting employment.

EMT Defibrillation: The department should continue down the path of certifying all personnel to the EMT-D level.



Medical Oversight: Working with the County Medical Director, the department should secure additional physician oversight in the form of ride-along and case review. Based upon his own admission, Dr. Stringer does not have the time or capacity to fully provide the department's EMTs with the attention they require.

To accomplish this important goal, the department should consider retaining the services of an additional physician who is board certified in emergency medicine and familiar with the area's EMS system. Such a physician would work at the direction of the EMS Chief and Dr. Stringer.

EMS Charting: Working together, the EMS Chief, the EMS trainer, and Dr. Stringer should develop a comprehensive set of guidelines for completing patient care report forms (FD-104).

Such guidelines must include minimally acceptable data points and should ensure the legal defensibility of the document(s). Further, such guidelines should require that the primary care giver author the report, that the report be completed and submitted prior to the completion of the EMT's shift, and describe how, if at all, reports may be altered after completion.

Quality Improvement: The department should immediately implement a peer-based CQI program staffed by the department's EMS trainer. Criteria for chart review should follow the internally developed guidelines described above under "EMS Charting."

Using a chart review process that identifies both frequency and sentinel indicators, Dr. Stringer and the EMS trainer can create a comprehensive CME curriculum for all field personnel and, when required, a program of remedial CME for individual employees.

Advanced Life Support (ALS) First Response: Following full implementation of the aforementioned recommendations, and an acceptable period to develop an organizational culture that values high quality BLS first response, the department should consider implementing a paramedic-level first responder program. Much of the analysis



will be driven by the County's plans for the future of its ALS ambulance delivery system which cannot be predicted at this time.

With this said, the department should acknowledge its role as the community's failsafe in the event the ambulance provider, for whatever reason, cannot perform and should develop a plan for immediate takeover in the event it becomes necessary.

Ambulance Transport: Notwithstanding the previous reference to the department's role as the community's failsafe, we recommend against serious consideration of ambulance service at this time. EMS has not risen to the required level of importance within the department, consistent with adding this complex and labor-intensive function.

CODE ENFORCEMENT:

This study recommends increasing the number of full-time code enforcement personnel as well as employing strategic steps to reduce employee turnover. Consideration should be given to eliminating the civilian status of these personnel and developing a plan for integrating their positions and rank into the overall department career ladder. Experience has shown that management-level personnel having significant experience in code enforcement assignments during their career obtain great value. This should be encouraged through the re-development of the rank structure for code enforcement personnel. Full-time, Level III Inspectors should be used for all medium and high-risk occupancies to assure quality inspections, leaving low-risk occupancies to the current engine company inspection program.

TRAINING:

This study recommends the establishment of a Training Division within the WSFD, headed by a chief-level officer specifically selected for this sole assignment. This division should be responsible for development and delivery of the four-part training program described in this report, as well as ensuring the quality of training delivery by both department personnel and outside agencies.



Adequate and modern facilities for firefighter training should be established either independently or in collaboration with other agencies and the local community college. Training libraries and training facilities within each station should be improved. Consideration should be given to use of local cable television, video-conferencing and other modern delivery systems for weekly firefighter shift training.

This study also recommends that the department initiate a physical fitness training program utilizing the services of certified fitness coordinators. These fitness coordinators may be trained in-house or contracted from an outside agency. The fitness coordinators, working with the Training Division, should conduct annual fitness evaluations of suppression personnel and assist in formulating the employee's fitness goals and objectives for the following year. Fitness training should be mandated and facilities provided, whenever possible, to allow completion of mandatory fitness training while on duty. Modest equipment for aerobic and basic strength training should be available. Where stations are simply not sufficiently large enough to accommodate such equipment and no replacement or remodeling of the station is anticipated, consideration could be given to outside contracts. This option would seek to establish arrangements with fitness facilities located in the station territory where personnel could conduct fitness training while on duty. An alternate option would be to provide centrally located fitness facilities for personnel to use off duty. It should be noted, however, that this option limits enforcement of mandatory fitness training time.

COMMUNICATIONS:

This study recommends that the existing split between City and County fire and EMS dispatching be mended through development of a combined dispatch center or use of advanced technology. The following options should be considered:

1. Development of a combined dispatch center for all fire and EMS agencies within Forsyth County. Such a facility would greatly enhance both mutual and automatic aid, as well as facilitate the most rapid and coordinated response of medical personnel to EMS emergencies.
2. Coordination and integration of Computer Aided Dispatch systems if the agencies retain separate dispatch centers. Design should facilitate automatic cross-transfer of call information and equipment status between agencies.



In addition, we recommend that the existing “home-grown” CAD system be abandoned in favor of more modern, integrated packages that work with other departmental databases, sharing information from occupancy, inspection, pre-plan, hydrant, GIS, and other files.

MAINTENANCE:

This study recommends that consideration be given to an additional part-time mechanic to assure that adequate time is available for sending individuals to ongoing technical training. In addition, if serious consideration is given to extensive outside agency contracts, further staff and facility enhancements should also be considered.



Ongoing Performance Monitoring

Ongoing performance monitoring must be conducted to ensure the WSFD is providing the level of service desired. Variations in community growth patterns over what have been forecast, changes in workload demand patterns, and a variety of other influences can affect desired outcomes.

What follows is a list of critical community fire and emergency service performance objectives that should receive regular monitoring and review. Doing so will give the WSFD management important information upon which to evaluate the quality of services delivered and make adjustments as necessary.

Community Fire and Emergency Service Performance Objectives

1. *Provide for the arrival of adequate resources to initiate emergency medical services at the scene of any medical emergency occurring in this community within four (4) minutes following dispatch, 90% of the time.*

2. *Provide for the arrival of adequate resources to initiate fire suppression operations at the scene of any fire occurring in this community within four (4) minutes following dispatch, 90% of the time.*

Assignment of a minimum of four personnel to all fire engines will have a positive effect on achievement of this objective since interior fire suppression actions can be taken by the first arriving engine company.

3. *Maintain sufficient staffing to ensure a minimum on-duty emergency operations force of .45 per 1,000 total population within the service area.*

Maintaining sufficient staffing, properly deployed, is critical to ensuring achievement of the desired level of service.



4. *Maintain average annual responses per on-duty emergency responder to at or below 200 responses per on-duty staff.*

Workload, expressed in responses per on-duty emergency responder, directly affects availability. The greater the workload the less available fire personnel are for responses. Thus, maintaining workload at reasonable levels helps to ensure personnel will be available to respond quickly to emergencies.



Capital Asset Descriptions



Emergency Service Consulting Group

Station Information Worksheet

Station Engine I 651 N. Marshall Street

Date Constructed	1978
Square Footage	10,198
Seismic Tested/Upgraded	
Facility Insured	yes city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices ✓	0	3 Offices for personnel, Captains and Battalion Chiefs
Conference/Classroom ✓	0	Bed room/Dormitory used as training room
Training Library	1	station has cabinet that contains manuals and pamphlets
Storage Area	2	One inside station, one attached with outside entry
Communications/Dispatch	1	back up for emergency use
Prevention/Public Educ.		Personnel perform fire inspections and Public education programs
Kitchen ✓	1	
Dormitory ✓	3	Large room has 6 beds, second room has 5 beds, has 2 beds in Battalion Chief's bedroom
Exercise/Workout Area	0	rear bedroom used for exercise
Restroom/Shower/Lockers ✓	5	5 bathrooms, 3 showers, 72 built in lockers,(1 stand alone
Apparatus Bays ✓	4	Each bay large enough for two fire engines each .Bay will house any ladder truck
Drive Through Bays ✓		Same as above(all bays drive through bays)
SCBA Fill Station ✓	0	
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 2 2050 Griffith Road

Date Constructed	1982
Square Footage	3748
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	2	station office for personnel/officers 2
Conference/Classroom	0	
Training Library	1	cabinet housing manuals, pamphlets,
Storage Area	1	presently has a 8'x8' storage shed and a attached storage room with outside entry
Communications/Dispatch	0	encoder system set up in station
Prevention/Public Educ.		Personnel perform fire inspections and public education programs
Kitchen	1	
Dormitory (12 beds)	1	has 4 pull down beds
Exercise/Workout Area	0	exercise equipment in truck bay area (owned by personnel)
Restroom/Shower/Lockers	2 6	2 bath with shower, 1 half-bath, 24 lockers (stacked in twos) 12 cubicle in bedrooms for personnel linen
Apparatus Bays	2 3	one truck per bay. Will not house ladder truck longer than 65'
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 3 2995 North Liberty street

Date Constructed	1961
Square Footage	4,778
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	1 office for fire personnel, 1 for battalion chief (non administration)
Conference/Classroom	0	
Training Library	1	station Library: small cabinet containing manuals, pamphlets
Storage Area	3	2 in station, 1 outside storage shed
Communications/Dispatch		encoder system in house for dispatch
Prevention/Public Educ.		Personnel perform fire inspections and public education programs
Kitchen	1	
Dormitory	1	large room with 4 beds, 2 small bedrooms and 1 bed in office
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 bath with 2 person shower, 1 small half bath, 16 lockers in locker room, 2 in captains office, 3 in battalion chiefs office, 10 in back bedroom [all lockers are six foot locker with small locker on top]
Apparatus Bays	2	can house 1 fire engine each, some ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station	0	
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 4 290 Martin Luther King Dr.

Date Constructed	1980
Square Footage	4,662
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	1 office for battalion chiefs, 1 for personnel
Conference/Classroom	0	
Training Library	1	station library: small cabinet with manuals, pamphlets
Storage Area	2	1 attached with outside entrance, 1 inside storage room
Communications/Dispatch		encoder system in station for dispatch
Prevention/Public Educ.		Personnel perform fire inspections and public education programs
Kitchen	1	
Dormitory	1	Large bedroom with 5 beds, 1 small bedroom with 2 beds
Exercise/Workout Area	0	equipment in station owned by personnel
Restroom/Shower/Lockers	2	2 full baths with shower, 20 sets of 2 in locker room, 6 sets of lockers in small bedroom
Apparatus Bays	2	each can house 1 fire engine and some ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 5 771 Palmer Lane

Date Constructed	1974
Square Footage	5,206
Seismic Tested/Upgraded	
Facility Insured	City self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	1 small office for station personnel/officer
Conference/Classroom	0	
Training Library	1	station library: small cabinet with manuals, pamphlets
Storage Area	1	1 8'x8' outside storage shed
Communications/Dispatch		encoder system in station for dispatch
Prevention/Public Educ.		personnel perform fire inspections and public education programs
Kitchen	1	
Dormitory	1	large bedroom has 8 beds, 3 small bed rooms
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 large bath with shower, 1 half bath, 50 station lockers(3'6" stacked one over the other)
Apparatus Bays	2	each can house 1 fire engine or a ladder truck
Drive Through Bays	2	same as above
SCBA Fill Station	1	SCBA repair and air bottle fill station housed at this station. System includes compressor and two bottle refill system. Personnel also do fit testing
Air Sample Tested - NFPA	yes	tested as per NFPA requirement
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 6 Ardmore Fire Station

Date Constructed	1998
Square Footage	6656
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	1 office down stairs for station personnel/officers, one small office up stairs also
Conference/Classroom	0	
Training Library	1	station Library; small book shelf with manuals, pamphlets
Storage Area	1	attached storage area with outside entry
Communications/Dispatch	0	encoder system in station for company dispatch
Prevention/Public Educ.		personnel perform fire inspections and do public education programs
Kitchen	1	
Dormitory		5 bedrooms for station personnel
Exercise/Workout Area	0	equipment owned by personnel in engine bay area
Restroom/Shower/Lockers		3 baths upstairs with shower, 2 half baths downstairs, 21 lockers
Apparatus Bays	2	can house 2 engines or some ladder truck
Drive Through Bays	2	same as above
SCBA Fill Station	0	
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 7 (Aerial 4) 100 Arbor Rd.

Date Constructed	1951
Square Footage	10,640
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	2 small offices for station personnel/officers
Conference/Classroom	1	1 class room seats about 30 persons
Training Library	1	1 cabinet in classroom with manuals, pamphlets, video, training materials, some props stored at this station
Storage Area	2	basement storage and 1 outside storage shed
Communications/Dispatch		encoder system in station for dispatch
Prevention/Public Educ.		each station performs fire inspections and public education programs
Kitchen	1	
Dormitory	1	1 bedroom sleeps 3 persons, 2 small bed rooms
Exercise/Workout Area	0	workout area set up in corner of basement, personnel own equipment
Restroom/Shower/Lockers	2	1 bath upstairs with 3 person shower, 2 half baths on main floor, 42 lockers
Apparatus Bays	2	each house an engine , both sides can accommodate some ladder trucks (rear of bay has a garage door but not large enough for fire apparatus)
Drive Through Bays	0	
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 8 2417 Reynolda Rd.

Date Constructed	1969
Square Footage	4,486
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	no emergency generator

Station Amenities	Number	Comments
Administration Offices	0	2 small offices for station personnel
Conference/Classroom	0	
Training Library	1	small cabinet with manuals and pamphlets(not a separate room)
Storage Area	1	1 small storage room (3'x2'), 1 outside 14'x16' storage shed
Communications/Dispatch	0	encoder system in station
Prevention/Public Educ.		personnel perform inspections and public education programs
Kitchen	1	small kitchen
Dormitory		bedroom now sleeps 3 people, one bed in rear office area
Exercise/Workout Area	0	
Restroom/Shower/Lockers	1	one bath with 2 person shower, 12 lockers sets(one 3'6" stacked) 3 linen lockers in bed room
Apparatus Bays	1	houses 1 fire engine
Drive Through Bays	1	same as above
SCBA Fill Station	0	
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 9 4685 Ogburn Avenue

Date Constructed	1967
Square Footage	3,616
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	1 office for personnel/officer
Conference/Classroom	0	
Training Library	1	library materials housed in small cabinet with manuals, pamphlets(not a separate room)
Storage Area	2	1 8'x8' outside storage building, one attached storage room with outside entrance, 1 inside storage room
Communications/Dispatch		encoder system in station
Prevention/Public Educ.		personnel perform inspections and public education programs
Kitchen	1	
Dormitory	1	bed room sleeps 6, 1 bed in office
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 bath with 2 person shower, 1 half bath, 18 lockers (6'locker with small locker on top)
Apparatus Bays	1	can house 1 fire engine
Drive Through Bays	1	same as above
SCBA Fill Station	0	
Air Sample Tested - NFPA	0	
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 10 4700 Country Club Rd.

Date Constructed	1966
Square Footage	4,486
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	station office for personnel/officer
Conference/Classroom	0	
Training Library	1	library materials housed in small cabinet includes manuals, pamphlets
Storage Area	2	1 8'x8' outside storage building, 1 attached room with outside entrance
Communications/Dispatch	1	encoder system in station emergency back up dispatch system at this station
Prevention/Public Educ.		personnel perform fire inspections and public education programs
Kitchen	1	
Dormitory	1	bedroom will sleeps 6 people
Exercise/Workout Area	0	exercise equipment in bed room Equipment owned by station personnel
Restroom/Shower/Lockers	2	1 bath with single shower, 1 half bath, 18 stacked sets(two 3'6" lockers stacked) (totals 36 lockers)
Apparatus Bays	2	house 2 fire engines
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 11 2745 Waughtown St

Date Constructed	1973
Square Footage	4,486
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	Office in station for personnel/officers
Conference/Classroom	0	
Training Library	1	station library: housed in a small cabinet in the station; includes manuals, pamphlets, etc.
Storage Area	3	1 inside storage room, one attached storage room with outside entrance, 1 8'x8' storage building
Communications/Dispatch	0	encoder system in station to receive dispatch
Prevention/Public Educ.		Personnel perform inspections and public ed. programs
Kitchen	1	
Dormitory	1	Bedroom can sleep 6 people
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 small bath with shower(female), 1 large bath, 18 sets(3'6" stacked one over the other) linen cubicles in bed room
Apparatus Bays	2	house a fire engine and can house a ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 12 3620 New Walkertown Rd.

Date Constructed	1974
Square Footage	4486
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	Office in station for personnel/officers
Conference/Classroom	0	
Training Library	0	station library: housed in a small cabinet in the station; includes manuals, pamphlets, etc.
Storage Area	3	1 inside storage room, one attached storage room with outside entrance, 1 8'x10' storage building, 1 14'x16' storage building for hose storage
Communications/Dispatch	0	encoder system in station to receive dispatch
Prevention/Public Educ.		Personnel perform inspections and public ed. programs
Kitchen	1	
Dormitory	1	Bedroom sleeps 6 people
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 small bath with shower(female), 1 large bath with shower 1, 18 sets(3'6" stacked one over the other) linen cubicles in bed room
Apparatus Bays	2	house a fire engine and can house some ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 14 5754 Shattalon Dr.

Date Constructed	1985
Square Footage	4,176
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	Office in station for personnel/officers
Conference/Classroom	0	
Training Library	0	station library: housed in a small cabinet in the station; includes manuals, pamphlets, etc.
Storage Area	3	1 inside storage room, one attached storage room with outside entrance, 1 9'x10' storage building
Communications/Dispatch	0	encoder system in station to receive dispatch
Prevention/Public Educ.		Personnel perform inspections and public ed. programs
Kitchen	1	
Dormitory	2	Bedroom sleeps 6 people. Presently being remodeled to house 4 to 5 persons and an additional office
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 small bath with shower(female), 1 large bath with shower 18 lockers sets (stacked one over the other)
Apparatus Bays	2	house a fire engine and can house some short ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 15 4548 Shattalon Drive

Date Constructed	1984
Square Footage	4,176
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	Office in station for personnel/officers
Conference/Classroom	0	
Training Library	1	station library: housed in a small cabinet in the station; includes manuals, pamphlets, etc.
Storage Area	3	1 inside storage room, one attached storage room with outside entrance, 1 8'x8' storage building
Communications/Dispatch	0	encoder system in station to receive dispatch
Prevention/Public Educ.		Personnel perform inspections and public ed. programs
Kitchen	1	
Dormitory	2	Bedroom can sleep 6 people.
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 small bath with shower(female), 1 large bath with shower, 18 lockers sets (stacked one over the other)
Apparatus Bays	2	house a fire engine and can house some short ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

Station Station 16 1701 Pope rd.

Date Constructed	1984
Square Footage	4176
Seismic Tested/Upgraded	
Facility Insured	city self insured
Auxiliary Power Supply	1 emergency generator

Station Amenities	Number	Comments
Administration Offices	0	Office in station for personnel/officers
Conference/Classroom	0	
Training Library	0	station library: housed in a small cabinet in the station; includes manuals, pamphlets, etc.
Storage Area	3	1 inside storage room, one attached storage room with outside entrance, 1 8'x8' storage building,
Communications/Dispatch	0	encoder system in station to receive dispatch
Prevention/Public Educ.		Personnel perform inspections and public ed. programs
Kitchen	1	
Dormitory	1	Bedroom sleeps 6 people
Exercise/Workout Area	0	
Restroom/Shower/Lockers	2	1 small bath with shower(female), 1 large bath with shower 18 sets of lockers in locker room
Apparatus Bays	2	house a fire engine and can house some ladder trucks
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

Emergency Service Consulting Group

Station Information Worksheet

FIRE DEPARTMENT MAINTENANCE SHOP _____

Date Constructed	1979
Square Footage	3600
Seismic Tested/Upgraded	
Facility Insured	CITY self Insured
Auxiliary Power Supply	1 generator

Station Amenities	Number	Comments
Administration Offices	0	office for shop personnel
Conference/Classroom	0	
Training Library	0	
Storage Area	4	2 inside storage rooms, 2 outside storage buildings
Communications/Dispatch		
Prevention/Public Educ.	0	
Kitchen	0	
Dormitory	0	
Exercise/Workout Area	0	
Restroom/Shower/Lockers	1	1 restroom with shower, 6 lockers
Apparatus Bays	2	2 large bays, one with lift, Building also has inside crane lift
Drive Through Bays	2	same as above
SCBA Fill Station		
Air Sample Tested - NFPA		
Energy Audit Conducted		

FIRST LINE APPARATUS

(Pumpers)		
Location	Vehicle #	Description
E-01	14	1994 Spartan Quality Pumper
E-02	17	1995 HME Quality Triple Combination Pumper
E-03	1093	1998 Spartan Quality Triple Combination Pumper
E-04	12	1994 Spartan Quality Pumper
E-05	44	1991 Spartan Quality Pumper
E-06	1098	1996 Spartan Quality Triple Combination Pumper
E-08	34	1988 Mack Pumper
E-09	31	1993 Spartan Ferrara Pumper
E-10	1091	1984 L700 Kenworth EEI Pumper
E-11	41	1986 L700 Kenworth EEI Pumper
E-12	1099	1995 HME Quality Triple Combination Pumper
E-14	1090	1984 L700 Kenworth EEI Pumper
E-15	29	1983 L700 Kenworth EEI Pumper
E-16	36	1988 Mack Pumper
E-17	22	1988 Mack Pumper
E-18	33	1992 Spartan Quality Pumper
(Aerials)		
A-1 (E-01)	18	1998 Sutphen 104' Aerial
A-2 (E-05)	15	1992 Spartan Tower Ladder
A-3 (E-14)	42	1985 Grumman 75' Telescopic Tower
A-4 (E-07)	16	1997 Spartan Quality AI 75' Ladder
(Command Vans)		
District I at E01	1095	1998 Ford Expedition
District II at E04	46	1996 Chevrolet Suburban
District III at E03	23	1996 Chevrolet Suburban
Spare at E01	11	1994 Chevrolet Suburban
Spare at E14	1097	1992 Chevrolet Suburban

(Reserve)		
A-4	21	1981 Sutphen 65' Aerial
E-18	30	1977 Ward LaFrance Pumper
E-11	26	1982 Mack Pumper
E-2	1092	1978 Ward LaFrance Pumper
E-12	1100	1976 Sutphen 85' Aerial Platform
E-16	19	1984 Grumman 75' Telescopic Tower
(Vehicles)		
Gist	1150	1997 Ford Crown Victoria
Lucas	40	1999 Ford Taurus
Grubbs	43	1999 Ford Taurus
Farmer	45	1999 Ford Taurus
Smith	993	1999 Ford Taurus
Brooks	37	1996 Chevrolet Corsica
Brown	35	1992 Ford Tempo
Fitts	38	1994 Dodge Spirit
West	24	1993 Chevrolet Cavalier
Fergusson	1094	1995 Pontiac Grand Am
Pool Vehicle	39	1991 Chevrolet Cavalier
(Other Vehicles)		
E-10	1500	1997 F350 Ford XLT Tactical Support Unit
Maintenance	20	1995 Chevrolet Pick-up
Haz Mat at E-17	27	1991 GMC Haz Mat Truck
E-01	32	1980 GMC Air Van

FIRST LINE APPARATUS

(Pumpers)		
Location	Vehicle #	Description
E-01	14	1994 Spartan Quality Pumper
E-02	17	1995 HME Quality Triple Combination Pumper
E-03	1093	1998 Spartan Quality Triple Combination Pumper
E-04	12	1994 Spartan Quality Pumper
E-05	44	1991 Spartan Quality Pumper
E-06	1098	1996 Spartan Quality Triple Combination Pumper
E-08	34	1988 Mack Pumper
E-09	31	1993 Spartan Ferrara Pumper
E-10	1091	1984 L700 Kenworth EEI Pumper
E-11	41	1986 L700 Kenworth EEI Pumper
E-12	1099	1995 HME Quality Triple Combination Pumper
E-14	1090	1984 L700 Kenworth EEI Pumper
E-15	29	1983 L700 Kenworth EEI Pumper
E-16	36	1988 Mack Pumper
E-17	22	1988 Mack Pumper
E-18	33	1992 Spartan Quality Pumper
(Aerials)		
A-1 (E-01)	18	1998 Sutphen 104' Aerial
A-2 (E-05)	15	1992 Spartan Tower Ladder
A-3 (E-14)	42	1985 Grumman 75' Telescopic Tower
A-4 (E-07)	16	1997 Spartan Quality AI 75' Ladder
(Command Vans)		
District I at E01	1095	1998 Ford Expedition
District II at E04	46	1996 Chevrolet Suburban
District III at E03	23	1996 Chevrolet Suburban
Spare at E01	11	1994 Chevrolet Suburban
Spare at E14	1097	1992 Chevrolet Suburban

(Reserve)		
A-4	21	1981 Sutphen 65' Aerial
E-18	30	1977 Ward LaFrance Pumper
E-11	26	1982 Mack Pumper
E-2	1092	1978 Ward LaFrance Pumper
E-12	1100	1976 Sutphen 85' Aerial Platform
E-16	19	1984 Grumman 75' Telescopic Tower
(Vehicles)		
Gist	1150	1997 Ford Crown Victoria
Lucas	40	1999 Ford Taurus
Grubbs	43	1999 Ford Taurus
Farmer	45	1999 Ford Taurus
Smith	993	1999 Ford Taurus
Brooks	37	1996 Chevrolet Corsica
Brown	35	1992 Ford Tempo
Fitts	38	1994 Dodge Spirit
West	24	1993 Chevrolet Cavalier
Fergusson	1094	1995 Pontiac Grand Am
Pool Vehicle	39	1991 Chevrolet Cavalier
(Other Vehicles)		
E-10	1500	1997 F350 Ford XLT Tactical Support Unit
Maintenance	20	1995 Chevrolet Pick-up
Haz Mat at E-17	27	1991 GMC Haz Mat Truck
E-01	32	1980 GMC Air Van