1995 Strategic Plan

Poudre Fire Authority
RESOLUTION 95-11
ADOPTION OF THE 1995 STRATEGIC PLAN

Whereas, Poudre Fire Authority has used strategic planning as an integral part of major policy development for a period of 15 years, and

Whereas, Poudre Fire Authority has completed a third Strategic plan, and

Whereas, the strategic planning process has included due consideration of public, interagency and internal input, and

Whereas, the Poudre Fire Authority Board of Directors has conducted publicized public hearings, and

Whereas, the Poudre Fire Authority Board of Directors has reviewed all of the plan's Recommendations and Planning Assumptions, and

Whereas, Adoption of this resolution combines the attached Addendum and draft Plan into the final plan.

NOW, THEREFORE, be it resolved that the Board of Directors of the Poudre Fire Authority hereby adopts the 1995 Strategic Plan and the Addendum to 1995 PFA Strategic Plan Draft

Chairman, Poudre Fire Authority
Date 12/12/95

[Signature]

fitness
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Executive Summary

The purpose of this plan is to assist Poudre Fire Authority in identifying and meeting community needs for the remainder of the 1990’s and into the next century. It is a culmination of almost three years work by PFA Board of Directors and staff. It is also a continuation of a planning process begun in 1980 with the development of PFA’s first Master Plan and followed by the 1987 Strategic Plan. These plans have guided PFA policy development over the past 15 years and have contributed to successfully maintained high quality and cost-effective fire protection and emergency services in the City of Fort Collins and the Poudre Valley Fire Protection District.

This plan is both future and short term oriented. It provides a strategic vision of what citizen needs are and PFA’s ability to meet those needs. It specifically takes into consideration the community environment now and into the future, as well the community’s ability to support fire protection and emergency services. From a short term prospective it outlines specific actions that should be taken to address pressing current issues. It is hoped that these actions will lead to an improved ability to reach the strategic goals. Both of these directions are embodied in the four major sections of this plan. These are:

Mission and Goals - The mission and goals describe PFA’s reason for existence and the primary outcomes of our efforts.

Benchmarks - These establish both performance targets for major service delivery components and total system performance. They also provide the basis for comparisons with other fire departments, cities and fire districts.

Planning Assumptions - These describe the data used to develop the benchmarks, the operating policies currently in use, and the projections of future community data and service needs.

Recommendations - The 34 recommendations represent the operational substance of the plan. They provide the specific changes to existing programs as well as new initiatives that the plan anticipates will be needed to meet the goals and fulfill the mission.

The scope of this plan is ten years (1996-2005) for the purpose of substantive programmatic and resource planning. In some areas it will project twenty or more years into the future, with the knowledge that internal and external environments can, and will change, thus impacting operational planning. While this may be contrary to the tenants of “pure” strategic planning it has been our position that our strategic plan must be realistic and attainable. Our experience has been that substantive planning beyond ten years loses focus, and detracts from the ability to do the operational planning necessary to actually implement change.

It is a principle objective of the planning process to be flexible and able to adapt to the changing conditions of the future. For this reason some of the recommendations are dependent on events rather than time. It is anticipated that the final plan will be evaluated yearly similar to the Service Level Indicator review initiated in the 1987 Strategic Plan.

The 34 specific recommendations are organized into six strategic areas. Some continue and enhance strategic programs initiated in past plans while others are
new. They reflect our desire to continue an emphasis on providing the highest quality fire protection and emergency services possible, while also moving towards increased levels of citizen service and accountability. Since a major objective of this plan is flexibility to changing conditions, the exact sequence and timing of implementation is not specified. Some of the recommendations anticipate relatively quick action while others will require long-term, multi-year processes. We anticipate that the implementation of this plan will be the major focus of annual budgeting and long-term policy development.

**Recommendation Summary**

**Fire Response System** - PFA's primary responsibility is to provide fire protection and the largest commitment of public resources is devoted to insuring a rapid and effective response to all fires. The success of firefighting forces in controlling fires is heavily dependent on the number and type of fire companies available, their staffing levels, training and response time.

There are 13 specific recommendations that are intended to maintain current firefighting performance throughout the city and fire district. This takes into consideration the expected increase in service demands in newly developed areas within, and adjacent to the urban area as well as rural areas of the fire district. As such, it takes into account the expected increase in emergency calls and the realistic funding capability of the city and fire district. The plan anticipates that within it's 10 year scope, five major response issues will need to be addressed:

- Addition of a new fire station in the North College/Country Club area
- Expansion of new fire stations in the southern portions of the city and fire district
- Expansion of truck company services throughout the city and district
- Improvement of the rural volunteer firefighter system
- Maintenance of an average six minute total response time

In general the plan anticipates that the revenue contributed by the city and fire district will be sufficient to support these initiatives.

**Emergency Medical Services** - This plan recommends expanding the PFA Mission Statement to reflect it's commitment to emergency medical services. Although PFA has provided first response Basic Life Support (BLS), including Automatic External Defibrillation (AED) since the mid-1970's, it has not been reflected in the Mission Statement. This plan recommends supporting the expanded mission with new interagency agreements with Poudre Valley Hospital and the Poudre Emergency Communications Center to better coordinate the total EMS system. It also recommends that three other system improvements. These are a process for determining the seriousness of a medical emergency during dispatch and sending an appropriate response (Variable Response), greater involvement in preincident education and some form of cost recovery for PFA medical services beyond the BLS and rescue role.

**Building and Fire Codes** - The plan suggests a continued emphasis on controlling fire risk through built-in fire protection, primarily fire sprinkler systems. This has been a strategic emphasis since the 1980 Master Plan and has resulted in several local initiatives that have increased the number of buildings protected by sprinkler systems. Recommendations in this area are to increase fire sprinkler protection in the following types of buildings.
• Large single family homes which present fire fighting needs beyond current capabilities.
• Large assembly occupancies that serve alcohol.
• Group homes for people with diminished self-preservation capabilities.
• Existing nursing homes without full sprinkler protection.

This plan will also examine the effectiveness of the 5,000 square foot separations adopted in 1984 and the long-term use of residential fire sprinklers in all homes. It also recommends that PFA do all that it can to minimize the cost of fire sprinklers and investigate the need for and possible adoption of design standards for new types of higher density urban residential development.

Public Education, Communication and Participation - The plan recommends several new initiatives in improving existing educational services and communications with citizens. It also suggests several new strategies to create more opportunities for citizens to participate in program development, implementation and evaluation.

Customer Service - The plan proposes that PFA become more involved in providing customer services beyond its traditional emergency response role. It recommends reevaluating its mission statement, removing organizational barriers to effective customer service and decentralizing the provision of these services.

Mobile Homes - The plan identifies fires in mobile homes in general, and some mobile home parks in particular, as the most pressing fire problem in our community. Research clearly shows that higher numbers of people are injured and die in mobile home fires than other types of housing. Fires in mobile homes also cause higher individual property losses as compared to the value of the home, often resulting in a total loss. This plan recommends that intensive educational efforts be targeted at mobile homes in the mobile home parks with the highest fire rates. It also recommends that PFA become more proactive in encouraging safe and affordable housing.
Introduction

Purpose
This plan is intended to assist Poudre Fire Authority in identifying and meeting community needs for the remainder of the 1990's and into the next century. It is a culmination of almost three years work by PFA Board of Directors and staff. It is also a continuation of a periodic planning process begun in 1980 with the development of PFA's first Master Plan and followed by a Strategic Plan in 1987. These plans have guided PFA's policy development over the past 15 years and have been successful in maintaining high quality and cost-effective fire protection and emergency services in the City of Fort Collins and the Poudre Valley Fire Protection District.

This plan is both future and short term oriented. It provides a strategic vision of what citizen needs may be and PFA's ability to meet those needs, within the context of the community environment. From a short term perspective, it outlines specific actions that should be taken to address current issues which should lead to an improved ability to reach the strategic goals. Both of these directions are embodied in five major sections of the plan. These are:

Mission and Goals - PFA's Mission Statement is described in Section V. This mission is supported by five primary goals. Together these describe PFA's reason for existence and the primary outcomes of PFA's efforts.

Benchmarks - Section VI describes a set of performance measurements that are intended to indicate PFA's success in fulfilling its goals. These establish performance targets for major components of service delivery and total system performance. They also provide the basis for comparisons with other fire departments.

Planning Assumptions - Section VII summarizes the internal and external environment that affects PFA's ability to provide services. It includes the data used to develop the benchmarks, the operating policies currently in use, and projections of future community data and service needs.

Recommendations - Section VIII outlines 34 specific recommendations in six major policy areas. These recommendations represent the operational substance of the plan. They provide the specific changes to existing programs as well as new initiatives that the plan anticipates will be needed to meet the goals and fulfill the mission.

Appendices - Section IX is a set of appendices that contain detailed descriptions of data and background information used to develop this plan. In addition to providing information on this plan, they create an institutional memory for future decision makers.

Scope
The scope of this plan is ten years (1996-2005) for the purpose of substantive programmatic and resource planning. In some areas it will project twenty or more years into the future, with the knowledge that internal and external environments can and will change, thus impacting operational planning. While this may be contrary to the tenants of "pure" strategic planning it has been our position that our
plans must be realistic and attainable. Our experience has been that substantive planning beyond ten years loses focus and detracts from our ability to do the operational planning necessary to actually implement change.

It is a principle objective of the planning process to be flexible and able to adapt to the changing conditions of the future. For this reason some of the recommendations are dependent on events rather than time. It is also anticipated that the final plan will be evaluated yearly similar to the Service Level Indicator review process initiated in the 1987 Strategic Plan.

**Research and Data**

The majority of the research in this plan has been done over the last three years. It includes extensive analyses of local data, national and regional information and recognized fire protection practices. The data shown has been compiled from this research. In most cases it is summarized and condensed from a much larger database.

Every effort has been made to use the most current and relevant information. In many respects fire protection research is not well documented and local data previous to the last ten (10) years is only marginally reliable. In some cases, data used is two to three years old, especially nationally published data and comparisons to other jurisdictions. The most intensive research was done in 1993 and 1994. Where possible, data has been adjusted for inflation and updated to 1995 information.

Two major surveys influenced portions of the research. The first compared similar cities and fire departments (Appendix A). The information gained was used in developing the benchmarks. The second was a citizen satisfaction survey conducted under contract by Colorado State University (Appendix B). This included two survey populations, residents and businesses. Data from this survey identified new citizen needs which are reflected in the Planning Assumptions and Recommendations.

**Urban/Rural Definition**

PFA provides fire protection, fire prevention, emergency medical, rescue and similar emergency services to a 235 square mile area, encompassing both urban and rural environments. In this plan reference is often made to urban and rural services, risks and related data. Even though PFA is a single agency and strives to maintain as much uniformity as possible in service provision, it does recognize that there are two distinctly different environments. There are differences in fire risk, resident expectations and funding capability. In general the urban area is defined as the City of Fort Collins and the adjacent suburban areas of the Poudre Valley Fire Protection District (approximately 60 square miles). The remainder of the district constitutes the rural area (approximately 175 square miles).

**Recommendation Summary**

Fire Response System - PFA's primary responsibility is to provide fire protection; therefore, the largest commitment of public resources is devoted to insuring a rapid and effective response to all fires. The success of firefighting forces in controlling fires is heavily dependent on the number and type of fire companies available, their staffing levels, training, and response time.
There are 13 specific recommendations that are intended to maintain current firefighting performance throughout the city and fire district. This takes into consideration the expected increase in service demands in newly developed areas within and adjacent to the urban area, as well as rural areas of the fire district. It takes into account the expected increase in emergency calls and the realistic funding capability of the city and fire district. The plan anticipates that within its 10 year scope, five major response issues will need to be addressed:

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**Emergency Medical Services** - This plan recommends expanding the PFA Mission Statement to reflect its commitment to emergency medical services. Although PFA has provided first response Basic Life Support (BLS), including Automatic External Defibrillation (AED) since the mid-1970's, it has not been reflected in the Mission Statement. This plan recommends supporting the expanded mission with new interagency agreements with Poudre Valley Hospital and the Poudre Emergency Communications Center to better coordinate the total EMS system. It also recommends three other system improvements. These are: implementing a process for determining the seriousness of a medical emergency during dispatch and sending an appropriate response (Variable Response), becoming more involved in pre-incident education and developing some form of cost recovery for PFA medical services beyond the BLS and rescue role.

**Building and Fire Codes** - The plan suggests a continued emphasis on controlling fire risk through built-in fire protection, primarily fire sprinkler systems. This has been a strategic emphasis since the 1980 Master Plan and has resulted in several local initiatives that have increased the number of buildings protected by sprinkler systems. Recommendations in this area are to increase fire sprinkler protection in the following types of buildings:

- Large single family homes which present firefighting needs beyond current capabilities.
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**Public Education, Communication and Participation** - The plan recommends several new initiatives in improving existing educational services and communications with citizens. It also suggests several new strategies to create more opportuni-
ties for citizens to participate in program development, implementation and evaluation.

Customer Service - The plan proposes that PFA become more involved in providing customer services beyond its traditional emergency response role. It recommends reevaluating its mission statement, removing organizational barriers to effective customer service and decentralizing the provision of these services.

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Planning History

This plan is the third in PFA history. The first was in 1980, immediately prior to the consolidation of the city and district fire departments. It was called the 1980 “Master Plan.” Its major emphasis was to improve the correlation between local firefighter capabilities and the fire risk presented by buildings and facilities. It was considered successful because the city and county subsequently adopted building code amendments that limited the size of fire areas in new buildings or required automatic fire sprinkler protection. Additionally, the city adopted an ordinance that required all existing highrise buildings to be retroactively equipped with fire sprinklers or better compartmentalization. Internally the 1980 plan adjusted fire company staffing levels to the risk environment of the community and recommended moving an existing fire station to a new location to reduce coverage redundancy. Both were completed in the early 1980’s.

The planning process for the 1980 plan was externally focused. It used a citizens advisory committee in addition to PFA and city staff. It also adopted the first set of performance objectives and developed the first planning assumptions. Both these concepts have been carried forward for the past 15 years, including this new plan.

In 1987 PFA adopted its first titled Strategic Plan. In many respects it followed and reinforced the concepts adopted in the first plan. This plan, however, was more internally focused and examined the expansion of fire and emergency services into newly developed areas. Major recommendations of that plan included: the increase of staffing levels at Station Four (4) in southwest Fort Collins, the addition of a Squad company at Station Five (5) and the construction and opening of Station Ten (10). This plan placed greater emphasis on firefighter training by increasing the training staff and building a training facility. It also established new initiatives in hazardous material control and fire prevention education. All of these projects have been completed.

The 1987 plan drew strongly from within the PFA organization. A large number of PFA employees were involved with its development. There was relatively little external involvement other than with the development of the Hazardous Materials Risk Reduction Program. Other significant advancements over the first plan were expansion of the performance objectives into “Service Level Indicators” and revenue and expenditure modeling based on the funding formulas adopted in the consolidation contract in 1981.
Planning Process and Organization

This planning process began in 1992. Drawing on the past experience of previous plans, the process was designed to include both internal and external components. Internally, a Steering Committee was used to screen staff work and policy direction (membership roster below). This committee met regularly during the first two-thirds of the process. It was especially helpful during the development of the benchmarks, planning assumptions and recommendations. Several PFA employees and management staff conducted extensive research and compiled data. In addition to the Steering Committee, many other PFA members participated on various task groups and discussion teams.

The PFA Board of Directors was heavily involved throughout the project. They reviewed and approved major policy components at critical junctures. The Board was most active during the final third of the project and conducted several special work sessions in late 1994 and early 1995.

Steering Committee

John Mulligan ......................... Fire Chief
Warren Jones ......................... Project Manager
Ron Uthmann ......................... Operations Chief
Mike Pretz ............................ Fire Marshal
Gene Chantler ......................... Support Chief
Mel Carlson ......................... Battalion Chief
Glen Levy ............................ Battalion Chief
Randy Mirowski ..................... Battalion Chief
Mike Gress .......................... Training Chief
Brad Kobielusz ..................... Company Officer
Bill Flint .......................... Company Officer
Jim Norris ........................ Company Officer
Rick Baldwin ...................... Firefighter
Dave Kelin ......................... Firefighter
Guy Boyd ......................... Administrative Services Director
Chuck Willis ......................... Fire District Manager
Diane Jones ......................... Deputy City Manager
Jerry Wallace .................... Fort Collins Police, Dispatch Center Manager
Linda Geisk ......................... Poudre Valley Hospital, Associate Administrator
Dr. Dan Turner .................. Poudre Valley Hospital, Physician Advisor
Lyle Huff ........................ Poudre Valley Hospital, Paramedic Manager
Poudre Fire Authority

Poudre Fire Authority (PFA) is a consolidated fire protection and emergency service agency serving the City of Fort Collins and the Poudre Valley Fire Protection District. Its 133 full-time employees staff eight (8) fire stations and operate eight (8) engine companies, one truck and one squad company. It additionally operates three volunteer fire stations with 25 volunteers. The total service area is 235 square miles, completely encompassing the city and fire district (PFA Map). Within the district are the smaller communities of LaPorte, Timnath and Bellvue. In 1994 an estimated 125,000 people lived in PFA's jurisdiction. The estimated property value was $5,930,470,000.

PFA was organized in 1981 with the consolidation of the City of Fort Collins and the Poudre Valley Fire Departments. At that time both the city and district adopted an intergovernmental contract establishing the authority. This contract is the basis of PFA's existence and outlines the governance, funding, and operation of the authority. PFA is governed by a five person Board of Directors, appointed by the City Council and District Board. The board includes two city council members and two district board members. The fifth member is chosen jointly by these four and has historically been the Fort Collins City Manager. PFA's fire chief is appointed by the Board, and all other employees are under the jurisdiction of PFA's personnel rules adopted by the Board. These personnel rules are modeled after the city's and are similar to those used in other cities and fire districts. John Mulligan has served in the position of fire chief since consolidation, and before that as the Fort Collins fire chief.
PFA is organized in three divisions: Operations, Fire Prevention, Support Services and the Office of the Fire Chief. The organizational chart below shows the responsibilities of each division.

**PFA Organizational Chart**

**PFA BOARD**

**FIRE CHIEF**

**EMERGENCY OPERATIONS**
- Fire Suppression
- Equipment Maintenance
- Equipment Replacement
- Pre-Fire Planning
- Training:
  - Firefighter Skills
  - Volunteer Program
  - Driver/Operator Program
  - Company Officer Training
  - Educational Opportunities
  - Miscellaneous Opportunities
  - Task Force Program
  - Helga
- EMS - AED/CPR Program
- EMS - EMS Training
- EMS - Medical Supplies
- EMS - Coordinator
- Facilities Maintenance
- Haz Mat Emergency Response
- Research & Development
- SCBA Maintenance
- Wildland

**SUPPORT**
- Occupational Health & Safety
- Promotional Testing
- Hiring & Recruitment
- Special Projects

**FIRE PREVENTION BUREAU**
- Inspection Services
- Fire Investigation
- Public Education
- Haz Mat Regulation
- Youth Fire Awareness
- New Construction
- Fire Protection Systems
- Res. Fire/Life Safety

PFA is funded by the city and fire district through a combination of property taxes in the district, and property, sales and use taxes in the city. PFA also generates a small amount of revenue from fire prevention permits and hazardous materials recovery fees. PFA also receives some compensation for wildland firefighting and hazardous materials services provided outside its jurisdiction. In 1995 PFA had an operations and maintenance budget of $9,301,256. It also had reserves of $1.3 million in several accounts. Capital expenditures vary from year to year depending on equipment purchases and facility construction. PFA's capital fund receives approximately $650,000 per year from the city. This fund supports major equipment replacement and new fire stations. Shown below are PFA's four organizational units, the number of full time positions and the 1995 O+M budgets.

<table>
<thead>
<tr>
<th></th>
<th>Fire Chief</th>
<th>Operations</th>
<th>Fire Prevention</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL TIME POSITIONS</td>
<td>4</td>
<td>119</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1995 O+M BUDGET</td>
<td>$802,098</td>
<td>$7,755,886</td>
<td>$607,032</td>
<td>$136,240</td>
</tr>
</tbody>
</table>
Mission Statement and Goals

Described below are PFA's mission statement and our goals. The mission statement states what PFA does and how it does it. In essence, it describes PFA's reason for existence. The goals are statements of qualitative purpose that establish direction under the general umbrella of the mission statement. The goals, furthermore, are the linkage between the mission and the benchmarks described later. Neither the mission statement nor goals can be specifically measured. The benchmarks provide measurement at the strategic level and program objectives at the operational level. Together they form the standards to which all PFA actions are held.

Mission Statement

To limit the loss of life, injury and property damage by providing the best fire protection and emergency services in the most cost-effective manner.

Goal 1

Minimize deaths and injuries due to fires, medical emergencies and related emergency situations.

Human casualties are the most tragic result of uncontrolled fires and other emergencies. Minimizing the number of casualties is the primary goal of any fire protection and emergency services organization. To accomplish this goal, we must continually identify and evaluate risk. We must then develop and apply risk reduction and emergency response actions to provide the best potential for enhanced life safety. It is also our intent to minimize human casualties that result from sudden illness or injury.

Goal 2

Minimize direct and indirect losses due to fire and related emergency situations.

Direct losses are the loss of property, usually represented in the tangible value of buildings, contents and similar property. Indirect loss is the less tangible loss of personnel and business income, loss of customers, business interruption, loss of skilled employees, displacement of residents and reduction in tax revenue. In some cases these losses are irreplaceable both to individuals and communities. Similar to minimizing human casualties, we must identify and evaluate risk and apply risk reduction and emergency response actions. Additionally, we must insure that all losses, which can extend well beyond an immediate emergency, are minimized.

Goal 3

Minimize the costs of fire protection and emergency services.

The costs to provide fire protection and emergency services must be matched with the risk protected and the ability of the community to support these costs. This goal requires systematic evaluations in several areas.

• We will continually evaluate and balance public and private costs.
• We will seek the most cost-effective relationship between one-time capital costs and the ongoing personnel costs.
• Insurance costs to citizens and businesses will be evaluated to seek the best match between the cost of insurance and the public costs of maintaining firefighter forces.

**Goal 4**

*Minimize the number and adverse effects of hazardous materials incidents.*

Emergency incidents involving hazardous materials have emerged as an important issue in our complex and technologically-oriented society. The broad definition of hazardous materials includes many types of fuels, radioactive substances and thousands of chemical and biological materials. Once these materials escape into the environment, especially under the uncontrolled circumstances during a fire or emergency, it is difficult to predict and control the consequences. To accomplish this goal, hazardous materials risks must be constantly evaluated and the best control technologies applied to prevent releases. Likewise, effective emergency response capabilities must be maintained to keep minor incidents from becoming major disasters.

**Goal 5**

*Maximize the level of resident and business satisfaction with PFA services.*

As the Mission Statement states, PFA exists to provide the best service possible. An important component of this is knowing what services citizens want, and how well their needs are being met. To accomplish this goal, methods of eliciting input from citizens must applied. All programs must be subject to evaluation and adjustment to meet changing citizen needs. The unique needs of businesses should also be paramount.
Benchmarks

Benchmarking is a system of improving the production of any good or service. It emphasizes quantitative measurement of key components of both the final products themselves and the processes used to produce them. Critical to successful benchmarking is comparison with other producers of the same product. From this, the best and most effective outcomes and efficient production methods can be identified. In addition, benchmarking provides policy makers, citizens and employees with realistic measurements of organizational performance.

Past PFA Strategic and Master Plans have used some form of benchmarking. In the 1980 plan, performance “objectives” were developed using historic local experience and comparisons with early International City Manager’s Association (ICMA) data. In 1986 these were expanded to “Service Level Indicators”. These are the organization performance measures the PFA Board of Directors reviews annually. Since some of this plan’s benchmarks were first identified in 1980, clear trends can be easily illustrated and compared to other communities and fire departments. Others are new and establish only baseline information.

The benchmarks used in this plan are not “pure” in that they represent a combination of comparisons with other communities and fire departments (Appendix A), past local performance and hoped-for future performance targets. They are aggressive and long-term oriented. For some it may be several years before enough data can be accumulated to determine their realistic long-term applicability. We also hope to move towards a better separation of benchmarks and performance targets as our data analysis capability improves.

The 17 benchmarks in this plan are organized into five areas related directly to the Goals described earlier. In this way, they provide some indication of our ability to move towards, or away from, our goals. For some, illustrations are provided to show local historical performance and our relative position with survey jurisdictions in 1992.

Goal 1

Minimize deaths and injuries due to fires, medical emergencies and related emergency situations

Benchmark 1.1 Civilian Fire Deaths

Limit civilian fire deaths to a five year average of .5 deaths per 100,000 population.

Death by fire has long been one of peoples’ greatest fears. It is unfortunate that almost all of the approximately 4,500 civilian fire deaths that happen each year can be prevented. “If they had only awakened in time” or “if they had only known how to get out of the building” are common statements that firefighters hear when someone dies in a fire. While it may be impossible to prevent every fire death, it is possible to minimize the number of these needless deaths by teaching people to prevent fires, recognize the danger of fire and to escape quickly. When fires do occur, firefighters must be able to search for and rescue people who have not, or can not, escape on their own.

This benchmark measures total system performance which is a result of prevention, education, firefighting, rescue and built-in protection. Because fire deaths infre-
sequently occur, the use of a five year average provides a measurement that is less impacted by the dramatic differences that would occur using only annual data. The rate of .5 deaths per 100,000 population per year is slightly better than recent years' experiences and represents the hope that the strategies recommended in this plan will lead to better performance than in the past. Like many other aspects of emergency services, fire death rates are heavily influenced by social factors such as poverty, low education attainment, and substandard housing. In the Fort Collins area, these problems are not as significant as in other communities where the fire death rate is higher than the national average.

This benchmark is measured somewhat differently than in past plans. In those plans civilian deaths were counted as fatal fires rather than individual deaths. This made it difficult to compare local experience with national and regional data. This plan uses individual death rates rather than fatal fire rates. The graph below shows the last ten years of fire deaths in this new format. The high rates in the late 1980's were due to nine deaths between 1985 and 1987. The overall national rate in 1992 was 1.7 and 1.2 in the western region. The .5 rate in this benchmark is less than either of these comparisons.

![CIVILIAN FIRE DEATHS PER 100,000 POPULATION](image)

**Benchmark 1.2 Civilian Fire Injuries**

Limit civilian fire injuries to 6.5 injuries per 100,000 population.

Like fire deaths, human injuries are a tragic consequence of uncontrolled fire. Unlike deaths, however, civilian injuries occur more frequently and can be measured annually. Severe burns in particular are disfiguring and painful, and require extensive reconstructive surgery. Fortunately, the vast majority of fire injuries experienced in the Fort Collins area are minor. Smoke inhalation, which causes few long-term effects, is our primary type of injury.

Like fire deaths, injuries are measured as a rate per 100,000 population. They are difficult to compare to other jurisdictions due to inconsistencies in definition. For the purposes of this plan, a fire injury is defined as an injury that requires treatment at a
medical facility. This is a change from past plans that sought to identify any injury, no matter how minor. In past plans this tended to report more injuries than comparable jurisdictions. This change brings this benchmark into the general range of half of the national average of 11.6 and closer to other jurisdictions. The graph below illustrates this benchmark with past years converted to this new format.

![Graph showing civilian injuries per 100,000 population.]  

**Benchmark 1.3 Firefighter Deaths**

Limit firefighter deaths to zero (0).

Firefighting is a very hazardous occupation. In 1995, 95 firefighters died in the line of duty. This includes deaths from actual firefighting as well as from all other emergency response duties and related training and response. The only firefighter death in Fort Collins occurred in 1964 when a wall fell on, and killed, the Fire Chief, Clifford Carpenter. This benchmark identifies no such deaths as the only acceptable goal. While there are always risks inherent in firefighting, these risks can be reduced by superior training, adequate equipment, sound operational policies and by analyzing the risks and benefits of every action.

This benchmark seeks to measure only firefighter deaths attributed to direct firefighting actions. It does not include casualties that may occur in providing other services, training, or other non-fire activities.

**Benchmark 1.4 Firefighter Injuries**

Limit firefighter injuries to 1.5 per 100 fires.

Like firefighter deaths, firefighter injuries are a result of providing vital public services in an inherently high risk environment. Firefighter injuries, however, occur more frequently and can be measured on an annual basis. Like deaths, these injuries are measured from the perspective of fireground injuries. For jurisdictions of 100,000 to 250,000 population, this rate is 2.8 with a rate of 1.9 for the western region.
Benchmark 1.5 Total Fires

Limit the number of total fires to four (4) per 1,000 population.

Keeping the number of fires low has proven to be one of the most effective methods of controlling a community's fire risk. It is often cited as a measure of fire prevention effectiveness, but it is also influenced by other community characteristics such as the age and condition of buildings, the economic environment, and the diversity of the population. Fort Collins is fortunate in that these factors are relatively favorable and contribute to a low risk environment and fewer fires than other jurisdictions.

The benchmark of 4 fires per 1,000 population is lower than the 6 per 1,000 in previous plans. Even though fires increased in 1994, this benchmark represents a decreasing fire rate in recent years. In general the number of fires has not increased as fast as the increase in population. It also represents the expectation that fire prevention and education efforts will continue to be successful. Compared to national and regional data, this rate is considerably lower than the national rate of 8, the western region rate of 7.2, and our survey jurisdiction's of 4.94 (1992).

![Graph: Fires per 100,000 Population]

Benchmark 1.6 Full Room Involvement

Intercede before full room involvement occurs in 95% of all structure fires within the urban area.

This benchmark measures the success of the entire fire protection system in controlling fires before they reach full room involvement. This means that an entire fire area, usually a building compartment, becomes fully involved in fire. At this point human survival is impossible in the original fire compartment and adjacent areas, and property losses accelerate rapidly. In past plans, this benchmark referred to "flashover" as this critical stage of fire growth. Because flashover itself is difficult to observe, the more easily observed full room involvement is used.

As in past plans, the relationship between full room involvement and human
casualties and property losses is impressive. In the period between 1988 and 1992 only 8.5% of structure fires grew to full room involvement. These fires caused 71% of the property loss and all the fire deaths. For this reason stopping fires before they reach this stage continues to be a critical evaluation point. This is also the area where PFA and the Fort Collins area have experienced the most success since strategic planning began in 1980. As shown below, the percentage of success has improved steadily from the 85% in past plans. The 95% benchmark represents recent performance and the hoped-for continuation of this trend.

**FULL ROOM INVOLVEMENT PERCENTAGE**

![Graph showing full room involvement percentage from 1983 to 1994.]

**Benchmark 1.7 Response Time**

Maintain an average total response time of 6 minutes or less to reported emergencies.

Response time is a critical component of any emergency service delivery system. The ability to successfully intercede in fires and medical emergencies is highly dependent on trained personnel arriving quickly. This benchmark specifies six (6) minutes as the average for all emergency responses including fires, medical emergencies, hazardous materials incidents, rescues and other emergencies. It further defines total response time from the time a call is received in the dispatch center until the first unit arrives on the scene.

Customer service research indicates that an overall average is most easily understood by the general public. Other measurements such as percentiles and frequency distributions within specific incident types will be used internally to manage specific portions of system design and management.
Goal 2

Minimize direct and indirect loss due to fire and related emergency situations

Benchmark 2.1 Property Loss Per Capita

Limit direct estimated fire loss to $10 per capita.

Direct per capita property loss due to fire is one of the most common methods of measuring the performance of fire protection systems. This includes the value of buildings, contents, manufactured products, raw materials and similar tangible items that are destroyed or damaged by fire. It is a total system measurement in that it is the result of prevention, education and suppression efforts, as well as the successful performance of built-in fire protection equipment and building features. The vast majority of the data used to determine fire loss comes directly from insurance loss reports and is as accurate as this data allows.

The per capita measurement has been the foremost loss comparison used in the fire service. The National Fire Protection Association (NFPA) has compiled this for many years and classifies it by size of jurisdiction and region. The Fort Collins area has historically experienced per capita fire losses well below the national and regional averages. In 1994, PFA's loss per capita was $13.32. Compared to an average of $15.06 in our 1992 survey, this benchmark represents a particularly aggressive performance target.

Benchmark 2.2 Loss Per Value of Property Protected

Limit direct estimated fire loss to $.25 per $1,000 value of property protected.

This benchmark measures estimated property loss from another perspective, in relation to the value of property protected. Compared to per capita measurements, this offers better controls for differences in the type and value of risks protected. Like per capita losses, it also measures total system performance.
This benchmark designates $.25 per $1,000 of property protected as the performance target. It includes the value of all buildings, contents, equipment, physical improvements and mobile homes that are subject to property taxes as defined by Colorado law. It does not include the value of vehicles or land.

Benchmark 2.3 Loss per Fire

Limit the average estimated loss per fire to $2,000.

The loss per fire is a measurement weighted towards fire suppression effectiveness. Lower per-fire losses indicates more effective system performance, especially the success of firefighting forces in controlling fires before they damage additional property. While firefighting forces cannot impact losses that occur before they arrive, their ability to stop a fire from extending to more property is paramount. While this appears to be an aggressive performance target, it is well below the relative average of survey jurisdictions in 1992 ($3,333).

Benchmark 2.4 Urban Fire Spread

Limit structure fires within the urban area from spreading to other significant structures. Goal: five year average of 99%.

Even though structure fires rarely grow to a size that threatens other structures, preventing that spread is an important strategic objective of firefighting forces. This is especially vital in high density urban areas where buildings are located close together. The most devastating fire losses occur when a single fire burns many buildings while overwhelming firefighting forces. When interior firefighting fails or fires are too well advanced for interior fire attack, firefighting forces must revert to heavy exterior fire streams with high fire flows. This type of fire represents the worst case scenario and if firefighting forces are not successful, entire blocks of commercial, multifamily residential and even single family dwellings can be lost. The term "conflagration" is sometimes used to describe this type of fire. Because fires of this magnitude occur rarely, the five year average is used to measure this benchmark. The 99% performance target represents the past five years’ experience.
Benchmark 2.5 Wildland Fire Spread

Limit wildland fires from spreading to significant buildings and agricultural facilities.
Goal: five year average of 99%.

Within PFA's jurisdiction there are approximately 175 square miles of rural area that present the hazard of wildland fires. 40 square miles, primarily west of Overland Trail, are classified as moderate, high and severe brush hazard areas. PFA's first objective in fighting wildland fires is to protect significant structures and agricultural facilities. These include homes, commercial buildings, barns and similar outbuildings. They also include agricultural crop storage, processing buildings and corrals. Small outbuildings, sheds, abandoned buildings and similar structures are not included. After protecting these facilities a running wildland fire can then be contained and extinguished.

Like building fire spread, wildland fires that threaten significant buildings are infrequent. For this reason the five year average is used. The 99% performance target represents the experience over the past five years.

Goal 3

Minimize the costs of fire protection and emergency services

Benchmark 3.1 Public Fire Protection Costs

Maintain a public fire protection system cost below the average of Rocky Mountain and Western Regions.

PFA's Mission Statement states that fire protection, EMS, and related emergency services should be provided in the most cost-effective manner. This benchmark seeks to keep PFA's per capita costs below the average of other jurisdictions in the Rocky Mountain region. This data is obtained annually from the ICMA. One factor that complicates this comparison is the difference in how capital costs are reported in the ICMA data. In many cases, fire department capital is included in a city's general capital budget and is not directly included in reported fire department budgets. This may cause PFA's total per capita costs to periodically appear higher than average.
Benchmark 3.2 Insurance Rating

Maintain an insurance rate of four (4) within the City of Fort Collins and five (5) within the urban area of the Poudre Valley Fire District.

Fire insurance costs within a community are influenced by a rating provided by the Insurance Services Office. In general, the lower the rating, the lower the insurance cost to the consumer. The current ISO rates are 4 in the city, and 5 in the urban area of the fire district. These are both comparable with similar jurisdictions and represent a good balance between the public costs incurred in maintaining firefighting forces and the premiums paid by consumers.

The last time the Fort Collins area was evaluated by ISO was following consolidation in 1981. PFA has requested that a new evaluation be done in late 1997. We hope that the ratings will improve due to the completion of the fire training facility, the addition of Engine 10 and Squad 5, and improvements in dispatching and communications technologies.

Goal 4

Minimize the number and adverse effects of hazardous materials incidents

Benchmark 4.1 Hazardous Materials Incidents

Limit hazardous materials incidents to 1.2 per 1,000 population.

The response to hazardous materials emergencies and the control of hazardous materials are relatively new fire service responsibilities. PFA established its Hazardous Materials Response Team in 1980 and began hazardous material risk reduction efforts as a result of the 1986 Strategic Plan.

The benchmark described here seeks to anticipate and minimize the number of hazardous materials emergencies that may occur. It is targeted primarily at release prevention and quantity controls. It recognizes that much of the technology, such as container construction and containment methods, is developed on the national level and as such is difficult to address on the local level.

Goal 5

Maximize the level of resident and business satisfaction with PFA services

Benchmark 5.1 Overall Resident Satisfaction

Maintain an 85% percent overall satisfaction rate with residents.

Meeting customer needs with a high level of satisfaction is an important new objective. This benchmark follows a citizen satisfaction survey conducted in 1993 that evaluated how well PFA was meeting the needs of residents. It included 10 evaluation points on emergency response, education, prevention, and communications. It also included not only direct experience with PFA but information gained from others and the media.
The primary evaluation instrument used to measure this benchmark will continue to be a survey. A survey of this magnitude is expensive and time consuming. For this reason it is expected that this benchmark will be evaluated at multiple year intervals rather than annually. Until a future survey is done, this benchmark represents a baseline performance.

**Benchmark 5.2 Overall Business Satisfaction**

Maintain a 90% percent overall satisfaction rate with businesses.

The 1993 citizen satisfaction survey included a companion survey of businesses with additional evaluation points concerning fire code inspection and enforcement. Past customer service research indicated that businesses have more specific and special fire protection needs. Like resident satisfaction, we anticipate that similar surveying will be needed to measure this benchmark in the future with multiple year evaluations.

**Benchmark 5.3 Emergency Response Satisfaction**

Maintain a 95% percent satisfaction with emergency response.

Because emergency response is the most recognized component of PFA's services, citizen satisfaction with these services is important. Unlike overall resident and business satisfaction, this benchmark is intended to measure satisfaction soon after an emergency service is received. Unlike overall satisfaction, this benchmark can be evaluated annually due to a more rapid feedback system.
Planning Assumptions

The 12 planning assumptions summarized below are the basis for much of the decision making in this plan. As in past plans, these assumptions are an integral part of the planning process. They detail the operational concepts that drive current decision making and future planning. They provide the data used to develop the benchmarks described earlier and the recommendations later in this plan. They describe the external environment in which PFA exists. In some cases they project into the future based on the best information available at the time.

In past plans the planning assumptions have proven invaluable. They represent to a large degree a consensus on what PFA does, how it does it and where it should go. In many cases these planning assumptions have been developed from the research and programs initiated by past plans. For some issues, current and future problem areas are identified. Finally, they provide the body of knowledge and institutional memory that allow future decision makers to know how and why major policy decisions were made.

Due to the length and complexity of these planning assumptions, only summaries are provided in the body of the plan. The full text and data are provided in Appendix C.

1.0 FIRE RISK ENVIRONMENT

The fire risk environment describes the context within which a fire protection system operates. It is a combination of the type and size of fires that may occur and the likelihood of their occurrence. If risk reduction and protection strategies are not correctly matched to the risk, the losses a community may suffer and the costs incurred to protect that risk, both public and private, may exceed community expectations. For this reason defining and understanding the concept of fire risk is essential to good fire protection planning. This Planning Assumption describes the fire risk environment from two perspectives, that which currently exists and that which is expected in the future.

1.1 The fire risk environment of the Fort Collins area is moderate to low with some areas of isolated higher risks.

1.2 The future fire risk environment is expected to continue towards lower risk with the exception of two categories. These are large single family dwellings that impose firefighting needs beyond current resources and development in the wildland interface area.

In general, the Fort Collins area enjoys a moderate to low fire risk environment. The categories of buildings and demographics are particularly favorable. Past Master Plans have examined the relationship between fire risk and firefighting capabilities and have sought to reduce the risk presented by new buildings and in some existing buildings by requiring higher levels of fire sprinkler protection or smaller fire areas in buildings constructed since 1985. In new construction this is especially evident in the southern portion of the area (south of Prospect Road) where 81% of all new commercial construction has been equipped with fire sprinkler protection. In the highest commercial construction area, south of Horsetooth Road and east of College Avenue, this percentage exceeds 90%.
2.0 URBAN FIREFIGHTING CAPABILITIES

Defining firefighting capabilities is one of the most difficult and challenging tasks of fire protection planning. Fire departments have historically focused on resource commitment (number of companies and staffing) as a measure of this capability. Firefighting resources and capabilities are only two aspects of total fire protection performance. As described in the previous planning assumption, the demographic composition of the community, the age and condition of the building stock, the topography and climate of the area, and any special hazards that may exist, contribute greatly to firefighting performance.

The performance of the total fire protection system in the Fort Collins area has been very good. Property losses, as measured by property losses per capita, the value of property protected and per-fire are low compared to the similar jurisdictions in our comparative survey and to national figures. Per-fire loss is especially indicative of the effectiveness of firefighter forces. Few structure fires in the urban area grow beyond the original area involved when firefighters arrive. Fire deaths are also lower than national and survey jurisdictions.

PFA's firefighting capabilities are influenced by six critical and interrelated factors. The following illustration shows this relationship. Each is represented by a separate planning assumption.

2.1 Structure fires must be controlled before FLASHOVER occurs.

Fire is a physical and chemical event which follows the basic laws of nature. While its growth is influenced by many factors, it follows predictable stages of growth and decay. The basic strategy of firefighting is to stop the fire before it begins its rapid growth or to protect adjoining properties while its fuel is consumed. The best tactic is to apply water in high enough quantities to overcome the heat generation of the fire. The faster firefighters arrive on the scene with an adequate number of personnel, the proper equipment, and enough water, the more successful they will be in controlling the fire.
The most important aspect of fire behavior is the phenomenon of “Flashover”. This is the point in a structure fire where all contents in a room, as well as any exposed combustible building materials, simultaneously ignite. Temperatures at this time reach over 1200 degrees and human survival is impossible. Additionally, after flashover, the potential for human survival in adjacent building areas decreases greatly and property loss and firefighting difficulty increases dramatically.

The objective of PFA’s fire protection system is to intercede in a structure fire before flashover occurs. In some cases this is accomplished by firefighters arriving quickly and controlling the fire in its early stages. In others, automatic fire sprinklers operate before flashover occurs and hold the fire in check until firefighters can complete extinguishment. In many cases sprinklers fully extinguish a fire. Finally, in some cases citizens extinguish fires using portable fire extinguishers or other makeshift means. Fires that are controlled before flashover cause fewer human casualties and less property loss. Research of local fire statistics clearly shows that although only 8.8% of structure fires grow beyond flashover, they cause 71% of all property loss and have accounted for all the fire deaths in the last five years.

The concept of controlling fires before flashover has been a major premise of the past two PFA Master Plans and was the basis of the local Building Code amendments requiring higher levels of fire sprinkler protection. Shown below is the performance of our fire protection system in interceding before flashover since 1982. Of all the measurements adopted through strategic planning, this indicates the most improvement. In this plan a slightly different measurement is introduced. Rather than attempting to define when flashover occurs in the field, which is difficult given the complexity of the event, this plan measures the more easily observed outcome of flashover, full room involvement.

**INTERCEDE BEFORE FLASHOVER**

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2.2 The total response time to fires must be six (6) minutes or less within the urban area.

Response time is perhaps the oldest and most recognized fire service performance measurement. Because fire grows so rapidly, the ability to arrive on a fire scene
quickly has always been a high priority for both the fire service and citizens. This was confirmed in a 1993 citizen satisfaction survey where respondents ranked a quick response second only to access to the 911 telephone system (Appendix B). In older urban areas response times (not including dispatch time) of three minutes have been standard with four to five minutes more common in suburbs and newer, less dense cities. Response times in rural areas are much longer, including the rural areas of PFA.

Since the development of PFA’s first Master Plan in 1981, the concept of response time has evolved significantly. For many years response time referred only to the time it took firefighters to travel from a fire station to a fire. This did not consider the time it takes to process an alarm before dispatch or the time it takes for firefighters to begin a response. In this plan the concept of Total Response Time is used. This is the time from the initial receipt of an alarm at the dispatch center to the arrival of the first fire unit. We believe this is how citizens who call for assistance measure response time rather than how it has been measured in the past. This concept, however, is more difficult to measure than travel time alone. Dispatch times can vary due to emergency call load in the dispatch center, and due to the increasing use of cellular telephones, which do not trigger the exact time keeping system of E-911.

In 1995 the average PFA total response time for structure fires was 5 minutes and 57 seconds (5:57) within the urban response area. Total response time is illustrated below.

2.3 Fire companies must be organized and function as units with adequate staffing to conduct effective firefighting operations. Firefighter resources must be distributed throughout the response area to provide a uniform level of response at any time.

Firefighting requires the coordinated actions of several interrelated functions to be successful. The major ones are directly attacking the fire with hose lines, securing a water supply for attack personnel, searching for and removing victims, ventilating smoke from the structure, protecting property from further damage, controlling utilities, and overall incident management. The basic functional units used to accomplish these tasks are pumping engines that supply hose lines and truck and squad companies which provide rescue, ventilation and property conservation.

These units are called fire companies. The number of firefighters assigned to a company is intended to maximize the efficiency of the unit and provide a reasonable level of safety for the firefighters within the context of the risk environment. The standard unit staffing for PFA is three for engines, four for the ladder truck and two for the squad. While higher staffing levels are more effective in accomplishing many tasks and may improve firefighter safety, the current cost/benefit relationship does not suggest higher levels. Staffing levels below this standard, however, cause greatly
decreased effectiveness and higher risk to firefighters.

Structure fires require the efforts of at least four companies (two engines, one truck and one squad) and an Incident Commander for a total complement of 12-15 firefighters. In addition to this standard structure fire response, a multi-alarm system must be maintained to summon additional resources. A second alarm essentially doubles the initial alarm resources with three additional engine companies and an off-duty truck company. A third alarm brings all remaining on-duty units to a fire scene and initiates a general recall of all off-duty personnel. Multialarm incidents also recall all staff personnel to implement various portions of the incident management system. Finally, mutual aid can be requested from neighboring fire departments to cover PFA fire stations, provide additional resources at a very large fire or respond to other incidents in the jurisdiction.

In addition to unit function and staffing, the number of companies available to adequately cover a given jurisdiction is also important. The 1987 PFA Strategic Plan developed a station location criteria. This criteria is described in another Planning Assumption but generally recommends that a fully staffed engine company be provided in the urban portion of a given response area when that area is approximately one half developed. From that point onward, that area is provided with fire protection 24 hours a day, 365 days a year. PFA’s experience has been that urban residents and businesses expect a uniform level of fire protection and the “neighborhood” fire station represents that coverage.

2.4 All firefighting personnel must be trained to a high degree of competency and these skills must be maintained over the course of a firefighter’s career.

Firefighting is an intensive and highly skilled occupation. It requires a wide variety of cognitive and manipulative skills that entail high levels of physical activity. Because the number of structure fires in the Fort Collins area is relatively low, firefighters do not have the opportunity to exercise their skills frequently enough on real fires to maintain those skills. For this reason, comprehensive and continuous individual and unit training is essential.

The completion of the new PFA Fire Training facility in 1995 significantly improved training capabilities and effectiveness. This was a project of the 1987 Strategic Plan and represents the commitment to training that is absolutely necessary to maintain cost-effective public fire protection.

2.5 Adequate quantities of water at proper pressures must be provided at fires to support rapid and effective firefighting operations.

The amount of water needed to control a given fire is called fire flow. It is represented by an application rate of gallons per minute (gpm). Fire flows vary depending on the size of a building, its use, combustibility of contents, and construction type. Fire flow is also limited by the physical capability of firefighters to handle hose lines. The inability to generate and apply sufficient fire flow contributes to higher losses and fire spread beyond the building of origin.

The fire flow method used by PFA has been developed by the International Fire Code Institute. Fire flows range from a minimum of 1,000 gpm for moderate sized single family dwellings to 3,000 gpm for larger commercial buildings. While fire
flows above this are possible, the actual application rate is compromised by the number of firefighters available to handle hose lines. Buildings requiring fire flows exceeding 2,000 gpm are generally equipped with fire sprinkler systems which reduce the fire flow needed for the building.

Fire flow for all new buildings in the urban area is provided from underground water supply systems. These systems have large capacity treatment systems, large water lines and fire hydrants. Fire flow is a component of the total water system capacity which is under the jurisdiction of one of several water purveyors that service the Fort Collins area. In cases where the existing fire flow is inadequate for new buildings, higher levels of fire resistive construction, smaller fire areas and fire sprinkler systems are used to reduce the fire flow needs of the building.

2.6 New buildings must be built within the capabilities of local firefighting resources.

As discussed in the risk environment planning assumption, the size, height, construction type, occupancy, and contents of a building contribute greatly to the size of a fire. In general, the Uniform Building Code (1991 Edition) used by the City of Fort Collins and Larimer County allows buildings to be built well beyond the firefighter capabilities of most fire departments. Past analysis showed that PFA’s firefighting capabilities were adequate to control fires in undivided 5,000 square foot areas in low and moderate risk buildings. Based on this analysis the building codes were amended in 1983 to restrict the size of potential undivided fire areas to smaller areas than found in the model code. The basic 5,000 square foot area is increased when higher levels of fire resistive construction is used. Buildings with larger open areas must be provided with fire sprinkler protection.

3.0 RURAL AND WILDLAND FIREFIGHTING CAPABILITIES

PFA provides fire protection to a large area in the Poudre Valley Fire District. This includes approximately 175 square miles and includes farms, rural subdivisions, recreation areas and forests. Rural and wildland areas present different risks and different fire protection strategies. The following two planning assumptions describe these differences and strategies.

3.1 Structure fires in rural areas sustain higher fire losses than comparable fires in urban areas due to long response times, inadequate water supplies and poor site access

The critical firefighting factors described in the urban firefighting planning assumption apply to rural firefighting as well. Other factors, however, contribute to higher average fire losses. These include longer response times, the lack of a sustainable water supply, circuitous street networks and poor site access. For single family residences, the average property loss is four times higher in rural fires than in similar urban fires.

Response time to rural structure fires is the single largest factor that impacts firefighting effectiveness. Outside the urban area, response times average 10:10 minutes as compared to 5:57. This additional response time for the first arriving unit coupled with even longer arrival times for support units, allows fires to grow larger before firefighting operations can be initiated. Water supply is often lacking in rural fires. Water must be provided with tanker (water tenders) shuttles using the four
water tenders available in the PFA system. This shuttle system is capable of providing a typical sustained fire flow of only 250 gpm. This is well below the flow needed for well-developed fires. Additionally, long driveways and rural streets impose long distances over which equipment and hoses must be carried which further depletes the number of firefighters.

Like many public services, fire protection requires a certain density and number of calls for service to justify the expenditures necessary to maintain on-duty firefighter forces. For this reason rural fire protection depends heavily on volunteer firefighters, or a combination of career and volunteer firefighters. Within PFA, rural fire response is provided from the outlying career stations in the urban area and three volunteer companies. A standard rural structure fire response is two engines and a squad company, an initial complement of at least eight (8) career firefighters. If necessary, the entire on-duty force can be applied to a rural fire the same as in urban areas. These career personnel are supplemented by volunteer firefighters in the Timnath, Horsetooth, and Redstone canyon areas. The Timnath and Horsetooth companies have been in place since the 1970’s with the Redstone company added in 1994.

There is no question that volunteer fire companies provide a valuable service. They can often arrive on scene before career units, begin scene assessment and sometimes initiate a fire attack. This is especially true of the Horsetooth company where the response time of the closest career company is in excess of 20 minutes to the far southwestern perimeter of the district. Their effectiveness, however, is heavily dependent on the number of active volunteers. In early 1994 membership fell so low that it endangered the viability of these companies. Since that time, the total number of volunteers has grown to over 25 in 1995, significantly improving their ability to respond.

There are, however, significant challenges in maintaining viable volunteer companies. The first is that it takes four to six active members per position to insure that there are enough members available at any given time to make an effective and safe response. This means that each volunteer company should have 12-18 members. It has proven difficult to recruit and maintain this number as past experience shows. When membership is low, it is not uncommon for a volunteer company to be unable to respond with enough personnel. Second, the competency levels needed to operate effectively and safely on all emergencies, especially structure fires, have increased significantly in recent years, making it difficult for volunteers to keep up with training requirements. Finally, the physical capability and health status of all firefighters has become a major concern. It has proven difficult to monitor and regulate the health status and physical fitness of volunteers.

3.2 Wildland fires in the wildland interface that escape initial fire suppression efforts can endanger lives and cause extensive loss of property and resources.

Wildland fires are those that involve natural vegetation sometimes covering large areas and threatening dwellings, agricultural facilities and similar buildings. More specifically fires in the “wildland interface”, where homes and similar buildings are interspersed with high concentrations of flammable vegetation, can cause the loss of many homes during a single fire. Unlike structure fires, which rarely last more than a few hours, wildland interface fires can last days and require campaign type firefighter operations involving thousands of firefighters, hundreds of vehicles, and aircraft.
PFA's objectives are the protection of lives followed by the preservation of property. To achieve these, PFA's first strategy is to rapidly attack a fire when it is still small. In cases where a fire grows too quickly or escapes initial firefighting efforts the strategy shifts to one of evacuation and protecting significant structures. PFA has been extremely fortunate in that it has not experienced a wildland interface fire which has caused the loss of multiple buildings. Other similar jurisdictions, however, including Boulder and Colorado Springs, have experienced devastating fires of this kind in recent years. In addition to fires originating in its jurisdiction, PFA must also be prepared to defend against fires that may move into the district from other areas.

The primary focus of the wildland interface is in the foothills, generally west of Overland Trail and the hilly area north of LaPorte. This area includes steep slopes, high concentrations of brush and some areas of dense forest. It encompasses approximately 73 square miles with 1,116 homes. An analysis of past county building permit records indicates that the number of homes in the foothills is increasing at an average rate of 50 homes per year. The greatest risk is in severe brush hazard areas. In these areas, a wildland fire will burn intensely and rapidly due to heavy concentrations of brush and steep slopes. There are approximately 561 homes in these areas. The majority of these homes are also served by poor streets and inadequate water systems, making firefighting efforts extremely difficult. In addition to the foothills, there are other areas within the city and district of isolated wildland risk including undeveloped open areas, city and county open space, river beds, storm drainages, wetlands and similar natural areas.

Currently there are few planning and regulatory tools available to guide development in wildland areas that reduce fire risk in the long-term. While new public streets and private roads serving multiple homes must meet current development standards, many existing roads and private driveways are severely deficient. Water supplies are also completely unavailable or inadequate in many areas. Finally, there are no mechanisms to control combustible fuel load around and between structures. Although there are guidelines available to reduce the wildland fire risk, experience in other jurisdictions has been that many residents are reluctant to take the precautions necessary or incur the cost to significantly reduce fire risk. At this time new codes and standards are under development at the national and regional levels. These will be available in the future to better control wildland fire risk.

To provide wildland fire protection, PFA maintains several four-wheel drive firefighting vehicles and water supply tenders. These are located in both paid and volunteer stations and are staffed by on-duty personnel when needed. Many PFA firefighters have received wildland firefighting training and the companies located on the west side of the jurisdiction practice special wildland tactics. PFA also maintains a wildland strike team which has highly specialized training and equipment. This team operates under contract with the state and federal forest services and all costs incurred outside PFA are reimbursed by those agencies. Operationally initial fire suppression actions are initiated by on-duty personnel. The wildland strike team takes longer to mobilize. Additionally, firefighting resources of the Larimer County Sheriffs Department, the Colorado State Forest Services and surrounding volunteer fire departments could also be called upon under existing mutual aid agreements.

**4.0 FIRE PREVENTION**

Fire prevention is generally believed to be effective in reducing the number of fires
and limiting deaths, injuries and property loss when they occur. Jurisdictions with higher levels of fire prevention often have fewer casualties and less property loss. The basic assumption of this plan is that fire prevention is an effective method of controlling risk, limiting human casualties, reducing property loss and enhancing firefighter safety. Each of the four major areas of fire prevention activity is described by a separate planning assumption.

4.1 Periodic fire prevention inspections reduce fire risk by identifying and correcting fire hazards, providing educational information and familiarizing firefighters with buildings.

Fire prevention inspections have been the mainstay of fire prevention efforts for many years. Their stated purpose is to identify and correct fire hazards. Secondary purposes are education and building familiarization. Like most other fire jurisdictions, the focus of PFA's inspection programs has been businesses, industries, public facilities and multifamily residences. In general, single family dwellings and the interiors of multifamily units are not included in compulsory inspection programs. PFA firefighters inspect all businesses at least once every three years with buildings of higher fire and life safety risk inspected more often.

The effectiveness of these inspections is indicated in two ways. The first is that fires that are caused by hazards that would have been detected by a routine fire inspection in buildings subject to inspections are rare. When PFA began wide scale inspections in the late 1980's, an average of 1.6 hazards were noted for each inspection. This declined to .91 in 1988. Additionally, a review of the hazards cited during this period exhibited a distinct trend towards less serious hazards.

4.2 Properly designed, installed and maintained fire protection systems and features reduce the potential for deaths, injuries and property loss.

In order to be effective, fire protection systems and features must be designed, installed and maintained properly. It has been a historic responsibility of the fire prevention bureau to insure that this occurs through plan review, installation inspection, and maintenance monitoring. Fire prevention efforts in this area are closely related to fire protection engineering, architecture and various building trades.

The maintenance of fire protection equipment is critical to the total fire protection system. In many cases, especially with fire sprinklers, manual firefighting effectiveness is dependent on proper fire protection system operation. For all fire protection systems except sprinklers, fire system maintenance is the responsibility of the building owner, with actual inspections conducted by private contractors. Because fire sprinklers are so important to the community's fire protection, PFA is directly involved by providing high quality and consistent inspections. In 1993 this program provided over 700 inspections in 354 properties. It is funded by direct user fees which generated $27,478. Since the inception of this program there have been no sprinkler failures in inspected properties and the problems associated with sprinkler systems in other communities (freezeups, equipment failures, false alarms, etc.) have been greatly reduced.

4.3 Determining the cause of fires can prevent future fires.

The vast majority of all fires are caused by some human act or omission, or the
failure of some piece of equipment, consumer product or construction feature. For this reason, determining fire causes is instrumental in preventing future fires. Identifying electrical and heating equipment that are susceptible to starting fires are examples of successful fire investigation. Information gained by investigations is reflected in safer consumer products and better construction methods. Likewise, information gained on human behavior during fires is frequently used in designing education programs.

An important aspect of fire investigation is the apprehension of people who intentionally set fires. This is arson investigation and is often recognized as the predominant fire investigation function. The fire prevention significance of arson investigation is that fire setters who are incarcerated or are otherwise treated cannot start new fires. Arson is a serious problem in many areas of the country although sustained arson trends have not been evident in the Fort Collins area. Individual arson fires, however, have caused major losses and six deaths in recent years. In both fatal fires the people responsible are currently serving sentences in the Colorado State Penitentiary.

A serious arson related problem in the Fort Collins area is juvenile fire setting. Children playing with fire or intentionally setting fires are responsible for many fires annually. This behavior has been responsible for three fire deaths in recent years (1989 and 1993). During the years 1992-1993, 31 fires were attributed to children playing with fire for a total estimated property loss of $65,255, eight injuries and one death. During this period children playing with fire accounted for an average loss per fire of $2,105 and .25 injuries per fire. During this same period, all other incendiary and suspicious fires accounted for an average loss of $654 and .008 injuries per fire. While identification and treatment programs are in place, juvenile fire setting is compounded by complex social, psychological and family conditions. For these reasons it has proven to be a very difficult problem to address.

4.4 Citizens with higher levels of knowledge of fire survival and prevention have a lower potential for casualty or loss.

Education of citizens in fire prevention and survival has become a major component of fire prevention efforts. Fire prevention education seeks to teach observable skills that enhance a person’s ability to perceive danger and take appropriate actions. Education programs also teach people to recognize fire hazards so that they can be corrected before they cause a fire. Most fire education is targeted at children under the assumption that skills taught in childhood are more likely to be used successfully throughout life. Because so many poor fire behaviors are rooted in past learning and experience, changing adult fire safety behavior has been difficult to accomplish. In recent years an average of 5,000 people have been taught fire prevention and survival skills annually through PFA’s education programs.

The 1993 Citizen Satisfaction Survey identified education as the most important area of needed improvement of all PFA’s services. Respondents recognized the favorable impact of children’s education but desired more adult and business opportunities. This indicates that the importance of this assumption is recognized by citizens (Appendix B).

5.0 BUILT-IN FIRE PROTECTION

Built-in fire protection features such as automatic sprinklers, fire alarm systems,
important components of a community's total fire protection system. This assumption builds upon assumptions developed in prior plans that have served as the basis for the strategy of continually improving the level and effectiveness of built-in protection.

5.1 Structures equipped with built-in fire protection features and systems are less likely to be involved in serious fires. They also lessen the demands on firefighting forces and improve firefighter safety. Automatic fire sprinklers in particular are the single most effective system available in controlling structure fires before flashover occurs.

Automatic fire sprinkler systems are the single most effective fire protection system for reducing the potential for human casualties and property loss in structures. Recent data published by the National Fire Protection Association indicates that overall the chances of a person dying in a building equipped with sprinklers is one to two thirds lower than in non-sprinkler equipped buildings. Likewise, property loss is one half to two thirds lower. From a life safety perspective, fire sprinklers are particularly effective in preventing multiple-death fires. Occupancies with higher casualty rates such as health care and public assembly facilities, and motels and hotels benefit the most. Residential fire sprinklers installed in single family dwellings and multifamily buildings, where the vast majority of fire deaths occur, can reduce human casualty potential 82% when combined with the smoke detectors required by current building codes.

Locally, fire sprinkler performance has been tracked since 1981, after the adoption of PFA's first Master Plan. During this 14 year period there have been 20 instances where there were sprinklers in the area of fire origin which should have controlled the fire. In all cases the sprinkler system operated properly, confining the fire to the immediate area of origin. In none of these fires were there any serious injuries, and the property loss was small in relation to the loss that would have occurred if only manual firefighting forces were used to control the fire.

Even though fire sprinkler systems are unquestionably effective in controlling fire risk, there are two significant impediments to their widespread use. The first is a set of "myths" that project sprinklers in an unfavorable light and the second is installation cost. Fire sprinkler "myths" include such beliefs as: all sprinklers activate at the same time; sprinklers are activated by smoke or small flames; sprinklers cause greater water damage than a fire itself; sprinklers are ineffective as a life-safety device; all sprinklers are ugly and detract from the architectural design of the building; sprinklers require water supply greater than manual hoselines. None of these myths are true but they are nevertheless believed by the general public, architects, engineers, elected officials and even some firefighters. It is an unfortunate but true fact that sprinkler systems are portrayed by television and movies with all these myths. A major problem in evaluating the success of sprinklers is that the vast majority of successful activations result in such small fires that they are not reported in the media or national data bases.

In contrast to the sprinkler myths, the issue of installation cost is real and significant. Sprinkler installation in new commercial construction averages $1.45 per square foot of building area in Colorado and $1.96 locally. National statistics indicate that sprinklers can add 1%-2% to the cost of a new building. Unusual applications or installation problems can also push these costs higher. Sprinkler opponents often
focus on these high costs. Although it can be argued that the installation cost is small compared to the loss that would be sustained from a serious fire, any cost which does not enhance the business productivity of a building is suspect.

6.0 EMERGENCY MEDICAL SERVICES

Since 1977 PFA has been a partner with Poudre Valley Hospital in providing Emergency Medical Services to the citizens of the Fort Collins area. PFA's primary responsibilities in this system are first response Basic Life Support (BLS) and rescue. PVH's responsibilities are Paramedic Advanced Life Support (ALS) and ambulance transportation.

The EMS system in general and PFA's involvement specifically are driven by three assumptions. These are the EMS system's six primary functions, response time and personnel commitment. A more detailed description of the overall EMS system as it existed in early 1994 is included as Appendix D.

6.1 The total EMS system must include the six primary functions of pre-incident education, response, patient assessment and stabilization, on-scene patient treatment, transportation, and rescue.

Shown below is a model that illustrates these six functions. Although in most cases these functions take place linearly, patient assessment and stabilization, on-scene patient treatment and rescue often take place simultaneously.

PFA's responsibility in these functions involves first response, patient assessment and stabilization (including CPR and AED) and to a smaller extent assisting with on-scene treatment and transportation. Rescue is solely a PFA responsibility within its jurisdiction. PVH's responsibility involves on-scene treatment and transportation. Pre-incident education is provided to some extent through fire prevention education programs but primarily through other community organizations such as the American Red Cross, American Heart Association, Boy and Girl Scouts, service clubs and similar organizations.

6.2 The EMS system must respond in as short as time as possible, generally in less than six (6) minutes for BLS and less than nine (9) minutes for ALS, from the time of system notification.

The benchmark used in EMS to determine response time parameters is cardiac arrest. The reason this condition is used is because the time between an arrest, the inability of the heart to circulate oxygenated blood, and irreversible brain damage is well-documented. It is generally recognized that six (6) to ten (10) minutes is the critical time window in which EMS can be effective.
A number of studies indicate that effective cardiac arrest treatment in the field must include three components. These are performing Cardio Pulmonary Resuscitation (CPR), delivering a defibrillation shock, and administering Advanced Life Support (ALS). These studies predict patient survival rates of between 0% and 35% depending on the time intervals these three treatments are delivered. These studies also identify a fourth factor. This is the actions citizens take in recognizing the onset of cardiac arrest and quickly summoning EMS help. When this is done rapidly and citizens start CPR before the arrival of EMS responders survival rates improve. This is perhaps the most troublesome factor to measure because it is very difficult to determine the length of time it takes to summon emergency assistance and to evaluate the effectiveness of citizen actions.

In the Fort Collins EMS system, PFA provides BLS, CPR and defibrillation. Poudre Valley Hospital Ambulance Service provides primarily ALS. The best survival rates for this type of system appear to be a BLS response time of 4 minutes, CPR within 5 minutes, defibrillation within 6 minutes, and ALS response time of 10 minutes with ALS provided in 12 minutes. An analysis of EMS response times in 1994 shows that the average arrival time of the first unit capable of CPR and defibrillation was 5.33 minutes with a CPR time of approximately 6.33 minutes and defibrillation time of 7.33 minutes. The average response time of the PVH ambulance was 6.8 minutes with ALS administered in approximately 9.8 minutes. At the time of this research, local survival rates have not been evaluated using the same methodologies as the studies. However, by extrapolating the data in the studies we conclude that the local EMS system should produce a survival rate of 18% to 22%.

Analysis indicates that local BLS response times, CPR, and defibrillation application are approximately one minute longer than the research indicates provide the best survival rates. The ALS response and treatment times, however, are approximately two minutes shorter. A more detailed evaluation of the data in the studies indicates that a one minute decrease in BLS response time would only produce a 2% to 3% potential improvement in survival rate. While future EMS system design improvements may focus on reducing BLS response times, all the system components should be considered. Improving citizen knowledge, especially in initiating CPR earlier, and quicker ALS treatments are also possibilities. The best and most cost-effective approach may be a combination of several adjustments that may net better survival rates than any one by itself.

6.3 The EMS system must be able to respond with a standard complement of trained personnel to provide quality patient care.

It is generally recognized that it takes four to six (4-6) trained EMS personnel to provide all six primary functions for the benchmark response of cardiac arrest. Currently these personnel are provided by PFA and PVH. PFA provides the 2-4 personnel on the first response fire apparatus and PVH provides a Paramedic or Paramedic/EMT team of two.

7.0 HAZARDOUS MATERIALS

Hazardous materials response and risk reduction has been the responsibility of Poudre Fire Authority since the early 1980’s and was developed as a Strategic Program in the 1987 Plan. The following planning assumptions are derived from past PFA actions and the implementation of the Hazardous Materials Risk Reduction Program.
7.1 **PFA will continue to maintain a high-quality hazardous material response function in relation to the risk presented in the community.**

PFA has been the primary emergency Hazardous Material Response Team (HMRT) for the City of Fort Collins, the Poudre Valley Fire Protection District, northern Larimer County and Colorado State University since 1980. This team provides a multi-tiered response capability sufficient to address small and medium hazardous material releases and similar emergency incidents. It also has sufficient capability to initiate containment and mitigation actions for large scale incidents and serves as the primary coordinating agency for large scale incidents requiring multiagency response.

The PFA HMRT responds to 215 emergency hazardous materials incidents annually. These incidents represent a rate of 1.2 emergency hazardous materials incidents per 1000 population. This plan assumes that this rate will continue into the foreseeable future.

7.2 **PFA will continue to maintain a hazardous materials data base that provides information for emergency responders to effectively and safely operate at hazardous materials incidents.**

In 1990 PFA implemented a Hazardous Materials Management Plan (HMMP) system. This requires that all businesses that use or store certain quantities of hazardous materials prepare a Hazardous Materials Management Plan and submit that plan annually to PFA. This system is compatible with the requirements of SARA Title III of the National Resource Conservation and Recovery Act of 1986. At this time only the submittal portion of this program has been implemented. Larimer County continues to be the jurisdiction responsible for the public information portion of SARA Title III.

7.3 **PFA will continue to be the lead agency in insuring that all hazardous materials facilities are constructed and operated in conformance with applicable fire codes, building codes and local ordinances.**

In 1991 the City of Fort Collins, Larimer County, and the Poudre Valley Fire District adopted the hazardous materials provisions of the 1991 Uniform Fire and Building Codes. These codes contain extensive construction and operation requirements for hazardous materials facilities as well as special containment, treatment and fire extinguishing systems. Additionally, the City of Fort Collins has adopted special land use ordinances that require that a Hazardous Materials Impact Analysis (HMIA) be prepared on all new hazardous materials facilities. PFA is also responsible for insuring that all hazardous materials facilities are operated in conformance with applicable fire codes and local ordinances through its fire prevention inspection program.

8.0 **SERVICE EXPANSION**

8.1 **New fire stations and engine companies should be provided in developing areas when the urban portion of a projected service area is approximately one half developed.**
Providing fire protection, EMS and related emergency services to newly developed areas has been a major challenge for many years. Since 1975 the total fire protection system has doubled, from four career fire stations to eight, with a corresponding career staffing increase from 68 to 133. In the 1987 Strategic Plan a Resource Implementation Criteria was adopted. This model located new fire stations in accordance with four factors: emergency response criteria, workload constraints, opportunity benefits and system impact.

This model proposed that new fire stations (engine companies) be provided in new areas when the urban portion of an area to be served is approximately one half developed. Based on the past 20 years, this equates to a population base of 10,000-15,000 with an estimated emergency call load of 400-500 incidents per year. Both Fire Station Four (1980) and Fire Station Ten (1995) have been implemented under this criteria. Station Four currently serves a population of approximately 23,000 and responded to 799 incidents in 1993. Station Ten opened in May 1995, serving approximately 13,000 residents and responding to approximately 500 emergency incidents in its response area.

As important as the first responding engine response time is, the response time of support units must also be considered. The addition of Station Ten and Squad Five reduce this response time for additional resources, although not within the same parameters as the central area of the city. At this time there is no specific criteria for the addition of support units such as new truck and squad companies or shift battalion chiefs. The fire department survey of similar jurisdictions found that PFA has the highest population served by truck and squad companies (Appendix A).

9.0 COMMUNITY GROWTH

Growth of population, housing units, commercial buildings, businesses and government facilities has been one of the defining characteristics of the Fort Collins area for many years. In population alone the area has grown from approximately 25,000 in the 1960’s to well over 100,000 in the mid-1990’s. The City of Fort Collins itself has grown from 10 square miles to 42 with suburban development extending beyond city boundaries. The fire services have expanded from one fire station in downtown Fort Collins to eight within the urban area.

This Planning Assumption describes two aspects of growth that impact fire and emergency services, population growth, and development patterns. As this plan is being prepared, the issue of community growth is under scrutiny in both the City of Fort Collins and Larimer County. For this reason it is difficult to make definitive projections of the future. However, the underlying assumption concerning community growth is that growth will continue to be a defining characteristic of the Fort Collins area, but that the rate of growth and development patterns may vary due to the combination of political and market forces.

9.1 Population growth will continue within the foreseeable future as it has in the recent past.

The population of the Fort Collins area has steadily increased for many years. The best population statistics are compiled by the City of Fort Collins Planning Department, and because the majority of the population served by PFA is within the city, this data is considered the most relevant. In 1994 the total PFA population is estimated at 125,000, with 95,889 within the city (76.7%).
The population within the fire district is more difficult to assess because population statistics are compiled countywide. However, an analysis of current PFA maps and 1990 census data indicates that the current population of the fire district is 29,249. The greatest population growth in the fire district occurred in the late 1960’s and 1970’s with the development of several subdivisions and mobile home parks. Since 1987 an average of 150 dwelling units per year have been constructed in the district, contributing a population increase of 450 annually. Overall, this data indicates an average population growth rate of 2685 new residents per year over this 23 year period for the entire PFA area.

Based on the population data of the past, it is reasonable to expect that the population of the Fort Collins area will continue to increase an average of 2685 residents per year. This estimate must be qualified because specific population growth estimates beyond the immediate future and in specific areas is highly speculative. Population growth is also influenced by many factors beyond local conditions and local consensus on growth management may change over time. From a fire protection perspective, the total population is not as important as the development patterns of that population within the jurisdictional area.

9.2 Suburban type growth will continue predominately in the southeastern and southwestern portions of the urban area at densities between three and four dwelling units per acre. Development will also occur in the northern portions of the area but at lower rates.

Since the late-1970’s, urban and suburban development has been managed through a cooperative agreement between the City of Fort Collins and Larimer County. This is called the Fort Collins Urban Growth Area (UGA) and requires that development of suburban/urban densities must occur within this area and be annexed to the city. Development outside this area is intended to be at rural densities. The intent of this management tool is to maximize the effectiveness of urban services and reduce the negative impacts of urban sprawl. For fire protection planning, the most important aspects of development patterns are the location of new development and residential densities.

Location of New Development

Within the scope of this plan, we assume that the location of new development will continue in the same patterns as the past 20 years, primarily in the southeast and southwest portions of the UGA. Over the past two decades 85% (17096) of all new dwelling units built within the city were south of Prospect Road. In the fire district the greatest number of new homes have been in three subdivisions in the southwest corner of the UGA (Springfield, Taft Canyon and Westridge). Outside the UGA approximately 51 residential units are built annually, predominately on existing platted lots, 35 acre or larger lots, or Minor Residential Developments approved by the county in the late 1980s and early 1990s.

Continued development in the north and northeast is expected to continue but at rates slower than the south. While some large scale higher density development has been proposed, residential development in this area has tended to be of a lower density, semi-rural nature. Commercial development, especially in the North College corridor, has been slow. The City, however, has recently adopted a new North College Corridor Plan which seeks to encourage growth in this area. Major
improvements to the Poudre River bridge on College Avenue were completed in 1995 and a large grocery store and related retail complex is under construction.

Like residential development, new commercial construction has occurred predominately in the southern portions of the UGA. Approximately 66% of the 4.1 million square feet of new commercial buildings in the last five years have been south of Prospect Road. The largest single area of commercial building activity has been in the area two miles south of Horsetooth Road, east of College Avenue, including the Harmony Road corridor. The majority of the remaining 33% has occurred in the existing industrial parks on Highway 14 and east Prospect Road, and in the Center for Advanced Technology.

In the long-term, well beyond the 10 year scope of this plan, suburban development may occur along the I-25 corridor from the Anheuser Busch brewery on the north to Harmony Road on the south. The city has annexed several parcels of land along and east of I-25 and both the city and county have zoned this area for commercial and industrial development. Within the urban area are many undeveloped parcels that could be developed. The timing of this infill development is not known, but it is reasonable to expect that over time they will be developed.

**Residential Density**

Residential density is an important factor in fire protection planning because it directly affects the cost of providing services. Because response time is such a critical criteria in defining service levels, the best economies of scale can be realized by serving higher numbers of residents. Appendix E describes a hypothetical model which illustrates the relationship between suburban densities and per capita costs. This model predicts that per capita costs increase 77%, from $44 to $78, as densities decline between 4.5 and 2.5 dwellings per acre. This indicates that higher suburban densities support more cost-effective services.

**10.0 INCIDENT RATES**

**10.1 The number of emergencies and nonemergencies, except fires, will continue to increase at rates faster than the increase in population. Fires will continue at current rates and may decline.**

In the 23 year period since 1973, PFA has experienced a 437% increase in incidents while the population served has increased by only 120%. Even though EMS responses, which began in 1977, contributed greatly to this increase, it is still a pronounced phenomenon. This is not unique to PFA. Increases of this magnitude are common in all growing metropolitan areas. While there is no definitive information on why this occurs, it is reasonable to expect that greater residential densities, wider economic diversity and more urban congestion contribute to these increasing rates.

Fire rates have been relatively static in recent years. This is not unique to the Fort Collins area. The number of fires has been decreasing gradually for many years. Although there is no single factor that has been identified, we surmise that greater numbers of fire safe consumer products, less smoking, better construction methods, electrical and mechanical equipment, and more aggressive fire prevention efforts all contribute to this favorable trend.
Nonfire/EMS incidents have increased faster than the population but less so than medical emergencies. Some of this increase may be due to the reclassification of some incidents that may have been recorded as fires in the past. Beginning in 1992, a new classification of Hazardous Condition was added. It includes various electrical, mechanical and water hazards as well as spills of hazardous materials.

A major difficulty of past plans has been the inability to accurately predict future incident rates. In both past plans, population growth was overestimated and incident rates underestimated. For this reason, this planning assumption does not attempt to make definitive predictions on an annual basis. Shown below, however, is an estimate of potential incident rates and growth in two five year increments, the likely time frame of this plan. These estimates are based on the experience of other cities and fire jurisdictions that have followed similar growth patterns as well as past local experience. These estimates are also based on PFA continuing to provide current services in a similar manner. It cannot be emphasized enough that these estimates are highly speculative. They should be viewed with the knowledge that many factors impact incident rates and that it is unlikely that all aspects of service delivery will remain the same in the future.

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<th>Fire</th>
<th>Rate/1000 Population</th>
<th>Medical Emergencies</th>
<th>Rate/1000 Population</th>
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11.0 REVENUE

11.1 PFA will continue to receive sufficient revenue to provide existing service levels and to meet service needs. However, due to a modestly reduced rate of revenue growth, the time line for implementation of new services may be lengthened.

In the 1987 Strategic Plan, the conceptual framework for the extension of services was that there would be a reasonably close relationship between the need for new services and the revenue produced by the development causing the service demands. Indeed, in the eight years since that plan was drafted, PFA received sufficient revenue to implement the strategic programs envisioned for the community’s emergency service needs.

However, adoption of a statewide government revenue limitation measure by Colorado’s voters in 1992 has altered this relationship. This limitation, Article 10, Section 20 (A.105.20) of the State Constitution, may slightly reduce revenue growth and thereby slow the provision of new services. This reduction will not prevent the provision of high quality fire suppression and emergency services, but it does provide a new challenge that must be addressed in the future.

A.105.20 and The Poudre Fire Authority

It is not possible to predict with any precision what future revenue will be in light of A.105.20. However, since the hallmark of this strategic plan is long-range contingency planning to insure the flexibility to adapt to community needs, a range of possible revenue scenarios is set out below. These scenarios range from a high growth rate of 5% (3.4% inflation plus 1.6% real growth) to a low growth trend of
3.9% (3.4% inflation plus .5% real growth). The high growth line is similar to past revenue growth rates and the lowest trend is indicative of extremely slow growth. It is reasonable to assume that revenue growth probably would not fall below this level due to the economic viability of the community provided by a well-educated work force, diverse service sector and high tech industrial base, regional retail activity, and the stability provided by major employers such as Colorado State University.

Between these two growth rates is a projection that may be a more realistic prediction of future revenue. This projection of 4.5% (1.1% real growth plus 3.4% inflation) uses a guesstimate of the revenue reduction that may be caused by A.105.20.

The logical extension of this planning assumption is that in order for the PFA to continue to provide high quality fire protection and emergency services and to extend those services into newly developed areas as was accomplished during the 1987 strategic planning cycle (1987-1995), real growth must continue at the rate experienced in the recent past. If this does not occur, the time lines for implementing new service units must be lengthened, other services reduced, additional funding secured, or new means of providing services created.

![Projected Future Revenue Graph]

**12.0 CITIZEN PARTICIPATION**

12.1 Citizens want to participate in a meaningful way in the development and implementation of fire protection policy if provided with the appropriate opportunities.

Citizen participation is the process by which the public becomes involved in the operation of their government. In the past this has been characterized by representation, interest groups and general voting. More recently this has evolved to include direct issue voting, narrowly defined interest groups, and direct participation in policy development with administrators and elected officials. Citizen participation has become so strong that many governments actively encourage it. Locally citizen participation has taken the form of neighborhood meetings and interest groups, town meetings, ballot issues, surveys, advisory groups and increased communications.
It has been the experience of PFA staff that citizens do want to participate in significant policy decisions, especially when they are directly impacted. We have seen that citizens want to contribute in meaningful ways that respect their time and efforts. This indicates that a variety of participation strategies may be more appropriate than just advisory committees. This appears to be especially true for the business community with its specific needs. Citizen participation appears to be hampered by a lack of knowledge of fire protection issues. Citizens often appear to defer to the professional judgement of fire personnel without considering alternatives and costs. Real citizen participation should provide opportunities for uninhibited communication from citizens rather than “educating” them in what they should think.
Recommendations

I. Fire Response System

PFA's primary responsibility is to provide fire protection. The largest commitment of public resources is devoted to insuring a rapid and effective response to fires. As discussed in the Planning Assumptions, the success of firefighting forces in controlling fires is heavily dependent on the number and type of fire companies available, their staffing levels and response times.

The following 13 recommendations are intended to maintain current firefighting performance in the face of continued development within and adjacent to the urban areas. These recommendations take into account the expected increase in emergency calls and the realistic funding capability of the city and fire district. This plan anticipates that within its 10 year scope, six major fire response issues will need to be addressed:

- Addition of a new fire station in the North College/Country Club area
- Expansion of new fire stations in the southern portions of the city and fire district
- Integration of fire response planning and landuse planning
- Expansion of truck company services throughout the city and district
- Improvement of the rural volunteer firefighter system
- Maintenance of a six minute total response time average

Included at the conclusion of this section are several other issues and programs that will likely become issues of discussion during the scope of this plan. While they are not identified as strategic recommendations, they may affect the implementation of the major recommendations due to their need for funding.

North College/Country Club Fire Station

The North College/Country Club area is presently served by Fire Stations One, Six and Seven, with response times in excess of the six minutes that have been identified as the maximum average for the urban area. This area has an estimated population of 10,000 and there are approximately 792,000 square feet of commercial buildings. In the long term this area may grow to 15,000-17,000 residents and several million square feet of commercial buildings. Approximately two thirds of the area's residents are in the district but virtually all the commercial buildings and projected commercial growth are in the city. This area also includes several large mobile home parks.
The North-College/Country Club area generates approximately 400 emergency calls annually of which 98% are beyond the six minute total response time. Using the projected population rates for this area, the number of future emergency calls could grow to 900-1100 per year. This area also experiences approximately 25% of the significant structure fires in the entire jurisdiction.

This area also lies north of the east-west Burlington Northern railroad and switching yard. This railroad parallels Vine Drive, crossing College Avenue, Lemay Avenue and Summit View Road. These three grade crossings provide the only access for emergency vehicles in the four miles between College Avenue and I-25. When any of these grade crossings is blocked by a train, the initial response of emergency vehicles is at least doubled. Residents living in this area have consistently identified this issue as a major problem.

The service needs of this area have been known for many years but the relatively slow growth rate has not generated sufficient revenue on its own to support the cost of a new fire station. The majority of the development in this area also existed prior to the consolidation of the city and fire district fire departments. Because the funding mechanism adopted at consolidation was intended to maintain existing services and expansion into new development, there has never been sufficient revenue to address what is primarily a pre-consolidation need.
Recommendation 1.1 New North-Central Fire Station

A new fire station should be added in the North College/Country Club area as soon as possible.

Discussion: This station should house a standard engine company of three personnel providing full service fire protection, EMS and other related emergency services. It should be located in the general area between Willox Lane and Country Club Road on College Avenue or Highway 1 to provide the most effective coverage.

The addition of this fire station will provide three primary benefits:

- **Immediate improvement in response times both within the initial response area and district wide.** Virtually all the current 400 emergency responses would move within the six minute average and it would improve district wide response average by 6%.

- **Improved backup to the downtown, northeast and northwest.** This would reduce backup response times into these three areas. It would have the most favorable impact on Stations One and Two by reducing their out of service time and reducing the long backup times to LaPorte and Anheuser Busch.

- **Improved response north of the Burlington-Northern railroad.** The initial response from this station would not be obstructed by railroad traffic.

New Station Area
**Cost:** The cost of (9) new positions needed to place a new fire station and engine company in service is $446,000 in 1995 dollars. The capital costs are approximately $1,587,000 for a fire station of the same design as Station 10 and a new engine. Current budget projections indicate that this fire station can be funded by 1998. A site has been purchased and a preliminary architectural design has been approved. If these budget projections are accurate, this fire station should be open in 1998.

### Expansion of Southern Fire Stations

**Recommendation 1.2 New Southern Fire Stations**

The next southern fire station should be built between 1999 and 2002 depending on the rate of growth and the fire protection, EMS and related emergency service needs of the new response area. The site of this new station should be selected and land acquired between 1997-2000. Continued growth in the south will also require a second new fire station towards the end of the ten year scope of this plan, again dependent on the rate and location of growth.

**POSSIBLE NEW SOUTHERN FIRE STATIONS**

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**Discussion:** As in past plans, this one continues to identify the need to service new growth in the southern portions of the city and fire district. While growth occurs in all areas, it is most pronounced in the south, thus driving the obvious need for service expansion. This area is defined as south of Drake Road on the north to County Road 32 in the south and between the foothills on the west and Interstate 25 on the east. Within this area is approximately 21 square miles available for development with the potential for 75,000 new residents. It is currently served by Fire Stations Four, Five and Ten with three engine companies and one squad company.

The focus of this recommendation is to provide services to portions of this area that cannot be serviced by these existing stations at full development. This includes approximately 14 square miles with a new population potential of 30,000 to 50,000. In 1994 the population of this area was estimated at 4,500. At projected growth rates this could grow to a total of 15,000 within five years. In accordance with the Resource Implementation Criteria adopted in the 1986 Strategic Plan, a new fire station and engine company should be added before this occurs.
In the past, development in the south has been relatively uniform at suburban densities capable of supporting current service levels. However, future land use patterns will most likely include an increased integration of natural open space, large recreation areas, and active agriculture uses with conventional suburban development. The Loveland-Fort Collins Corridor Plan will direct suburban development towards the South College corridor with lower densities and large tracts of open space to the east and west. The ultimate configuration of these land uses and residential densities will influence the location of new fire stations. Potentially lower housing densities will also influence the cost of services, driving per citizen costs higher for current service levels. Like most public services, fire protection is most cost-effective at higher densities. Due to the uncertainty of the ultimate landuse patterns, this plan does not identify a specific location for the next southern fire station.

While a specific site is not designated, the general area between Timberline Road and Shields Street on Triby Road or on East Harmony Road appears to be the most likely. Criteria for this location (as well as all new stations) should include:

Density: New stations should serve the highest population densities and largest number of residents and buildings as possible. New fire stations should be sited to minimize response times to the greatest number of anticipated calls for service and the most significant fire risks.

Adjacent Land Uses: New stations should be sited adjacent to commercial or mixed residential/commercial land uses. Sites in residential areas should be
buffered to reduce the impact of noise and nondondaylight activity.

Transportation: Stations should be sited adjacent to major arterials. Special consideration should be given to the limitations imposed by the lack of railroad crossings.

Joint Use: When possible new stations should be located with other public facilities such as parks, public maintenance facilities, police stations and schools.

Future System Integration: New stations should be sited to afford the best integration into the current and future response system.

**Future Southern Fire Station Locations**

Cost: Using an implementation time of 2000, the annual operations and maintenance cost (O+M) of a new fire station and engine company would be $662,000–$882,000 (depending on the need for leave coverage positions). The capital cost of constructing and equipping a new station would be $1.7 million. Based on the revenue projections of the Planning Assumptions, it is anticipated that new development will generate sufficient funding to fund both the O+M and capital needs.

The relationship between expanding fire response resources and providing the necessary funding is highly dependent on PFA's ability to continue using two important financial strategies. The first is accumulating and protecting the revenue generated by new development. PFA has used annual growth related increases in O+M revenue to fund small capital projects, one-time program needs and reserve
accounts. When the total amount of O+M revenue is accumulated, it is then
converted to new permanent service units. The second strategy has been the use of a
long-term capital fund to build new fire stations and to purchase new and replace-
ment fire apparatus.

Both of these strategies have been critical to the success of expanding fire response
resources since the 1987 Strategic Plan. They have allowed the increase in staffing at
Station Four in 1987, the establishment of Squad 5 at Station Five in 1990, and the
opening of Station Ten in 1995. Erosion of either of these strategies would directly
impair the ability to place new fire stations in service when they will be needed.

Recommendation 1.3 Land Use Impact Review

PFA should expand its review of new development proposals to include information
on future costs, service level impacts due to densities, remoteness from existing
facilities and proximity to unique hazards.

Discussion: PFA reviews all development proposals for conformance with technical
standards of street design and water supplies. This review should be expanded to
include information on the distance from existing fire stations, the number of
emergency calls that will be generated, the availability of adequate fire flow and the
limitation of existing street networks for emergency access. Information on unique
fire risks inherent in the location, such as proximity to high risk wildland areas and
hazardous materials uses, can also be provided.

The intent of this recommendation is not to establish new development standards
but to provide better information for planners, developers and owners. For develop-
ers, this will provide better indications of site opportunities, limitations and costs.
For public policy makers, it will provide information on service demands and
possible future costs. It will also improve PFA's integration with city and county
comprehensive land use plans. This will be especially important as development
occurs in the south and could impact the location, cost and timing of new southern
fire stations.

Cost: There is no anticipated new cost for this expanded review. Much of this
information is already discussed during the review process but is not structured in a
formal procedure.

Truck Company Criteria

Truck companies provide critical firefighting functions during structure fires. These
include searching for and rescue of building occupants, ventilation of smoke and fire
gases, raising ladders, and protection of building contents during firefighting
operations. These companies are generally known by the public as Hook and
Ladder or Ladder Trucks because they carry a large complement of ladders and
powered aerial ladders. Other non-firefighting duties of these companies are heavy
rescue, extrication of victims of vehicle wrecks, and above and below grade rescue.

PFA currently provides these services with a full truck company of four personnel
(with aerial ladder) at Station One and a squad company of two personnel (without
aerial ladder) at Station Five. This plan follows the direction of both the 1980 and
1987 Strategic Plans in anticipating that two full truck companies will be needed at
full buildout in the urban area. The addition of Squad Five in 1990 was the first
step towards this goal. On structure fires these two companies work together to provide truck functions.

**Truck/Squad Service Areas**

![Truck/Squad Service Areas Map]

**Recommendation 1.4 Expansion of Squad 5 to a Full Truck Company**

Squad 5 should be expanded to a full truck company of four personnel when the population of the total city and district reaches approximately 160,000. The squad apparatus should then be replaced with an aerial ladder apparatus.

**Discussion:** In past plans the primary criteria for truck company expansion was an eight minute response time (from time of dispatch). This produced a demarcation line between north and south truck service areas at Drake Road. In 1990 Squad 5 was added as a first step towards this goal. Neither plan, however, stipulated any criteria for determining when Squad 5 should be upgraded to a full truck company.

This recommendation would establish a population ratio of 80,000 to 100,000 per truck company. The current ratio is 83,000 per company using 1.5 truck companies. Near the end of the 10 year scope of this plan, when the total population is at 160,000 per company, the per-company ratio would be returned to the optimum level of 80,000. At that time each truck company would be expected to be responding to over 1000 emergency calls per year while maintaining an average eight minute response time in the urban area. This expansion does more than improve truck service to the southern portions of the city and district. It will significantly improve multi-alarm and simultaneous fire capabilities throughout the entire jurisdiction by providing two full truck companies on duty at all times.
This recommendation further specifies that the existing squad apparatus should be replaced with a full aerial ladder apparatus which would provide the full range of support functions including aerial ladder rescue and elevated large capacity water streams.

### POSSIBLE EXPANSION OF TRUCK COMPANY SERVICES

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**SCOPE OF 1995 STRATEGIC PLAN**

**Cost:** Current revenue projections indicate that revenue generated from new development will be sufficient to fund this expansion towards the end of the 10 year scope of this plan. Because the 1990 renovation of Station Five anticipated this expansion, no major new capital costs are expected. The replacement of the squad apparatus with an aerial ladder is also already included in the existing capital program.

**Recommendation 1.5 Interim Truck Company Actions**

Until the expansion to two full truck companies, PFA should take any interim actions possible to bolster truck company services.

**Discussion:** This plan expects that the existing truck and squad companies will continue to provide truck services for up to another 10 years. During this time, the population of the entire jurisdiction is projected to increase by 30,000, primarily in the south. This will stress truck services greatly with Truck 1 and Squad 5 responding to approximately 2500 emergency calls annually. This plan recommends that any actions possible be implemented to reduce the stress on these companies, and provide effective response capability. These actions may include incremental staffing increases, some form of joint use companies and response patterns that maximize the use of truck and squad companies.

**Cost:** Each new firefighting position costs $181,000 in 1995 dollars (three personnel).

### Rural Volunteer Firefighters

Fire protection, EMS and related emergency services are provided by volunteer firefighters in the Timnath, Horsetooth and Redstone Canyon, supported by career firefighters responding from the urban area. The Timnath and Horsetooth volunteer companies have been in existence for many years and have provided varying degrees of service, depending primarily on the number of active volunteers. The Redstone company was organized in 1994 and provides primarily wildland firefighter services.
PFA is committed to maintaining an effective volunteer firefighting and emergency response system in these areas until they have need for, and the capability to support career companies. The recommendations described below are intended to improve the rural volunteer system within the context of low density rural communities. Because the fire risk and community characteristics are different in each area, some recommendations are specific to individual areas. The Horsetooth area, in particular, has a high risk profile and little capability to generate an adequate weekday volunteer response.

In addition to improving services, increasing the size of the volunteer companies also provides an opportunity for local residents to gain fire service experience that may improve their chances of pursuing a fire service career. Most new career PFA firefighters have some type of previous fire service or related emergency service experience. Serving as a PFA volunteer can help residents gain this experience and may be helpful in the competitive hiring process here or in other jurisdictions.

**Recommendation 1.6 Increase Volunteer Membership**

The number of active volunteers should be increased and maintained at a minimum of 12 per volunteer company in Timnath and Horsetooth.

**Discussion:** The membership of these companies has varied greatly over the years. In 1994 the number of volunteers in both Timnath and Horsetooth was very low, significantly limiting their ability to provide effective service. Since that time, both companies have increased their membership significantly. Due to this recruiting
success, this recommendation should focus on training the new members and maintaining the minimum membership into the future.

Fire service literature indicates that four to six volunteers are needed to staff each position 24 hours a day, 365 days a year. In order to insure that three qualified volunteers are available to respond to a structure fire, this means that the total volunteer membership should be between 12 and 18. Because the population base in both areas is relatively small (approximately 2,000), the lower level of 12 was chosen as the minimum membership target. Because experience indicates that approximately 30% of the total membership will leave every year, four new members per year should be recruited per company.

This recommendation is somewhat qualified due to the lack of local experience in maintaining volunteer companies of this size. Recent experience has shown that relatively small populations cannot generate sufficient numbers of volunteers who can make the commitment to maintain the training levels to be fully qualified structural firefighters. Attempting to impose this requirement on all members has contributed to the low number of volunteers. This directly impacts both companies’ abilities to respond to non-structure fires and medical emergencies. In order to address this problem, a new volunteer classification system was adopted in 1995. This allows members to choose training qualifications and response capabilities relative to their interest and availability. These classifications include full service firefighting (including structural), wildland firefighting, water tender support, EMS or some combination. The recent increases in membership have been attributed to this change. At this time, however, it is unknown how many members will choose the various qualification options, so it is difficult to know if a minimum membership of 12 will be sufficient to maintain an adequate structural fire response.

In addition to this classification system, other methods of attracting and maintaining volunteers should be adopted. These could include increasing non-monetary compensation, providing better facilities with sleeping and recreational space, as well as offering improved physical fitness opportunities. As an additional inducement, some form of recognition of volunteer service should be included in the career hiring process. Some fire departments use an internship program combined with their volunteers as a bridge between volunteer and career service.

Cost: Because PFA has no experience in maintaining a volunteer system of this size, the annual O+M costs have not been exactly determined. Preliminary estimates are that the per capita costs needed to provide high quality volunteer services are similar to the per capita costs in the higher density areas in the city. With a population base in the combined volunteer areas of approximately 4,000 this would be $250,000 to $300,000. This includes recruiting, training and equipping volunteer firefighters at the turnover rate anticipated, providing adequate apparatus, facility and apparatus maintenance, and utilities and paid staff support. PFA’s current cost for the existing volunteer system is approximately $150,000. Although the funding source to support a larger volunteer system has not been identified, a portion of the duties of a new battalion chief position in the proposed 1996 budget will be devoted to increased volunteer support.

Recommendation 1.7 Increase Volunteer Company Identity

The identity of each volunteer company should be expanded to include the community it serves in addition to being a unit of the larger PFA.
Discussion: In evaluating the needs of the volunteer areas it has become apparent that residents of the volunteer areas do not think of themselves as citizens of Fort Collins, but as residents of unique smaller communities. In addition to providing emergency services, another traditional function of volunteer fire departments is the projection of community identity. Increasing this identity can provide benefits by improving community support of the volunteers and helping attract and maintain membership. Possible strategies may include signage and apparatus markings that are unique to the community, emphasizing community names over numbers within the larger PFA system, and encouraging community involvement in support of the company.

Cost: All of the costs anticipated are minimal and within the capability of current budgets.

Recommendation 1.8 Timnath Water Tender

The mission of the Timnath station should be expanded to include a greater emphasis on water tender support to the east side of the district.

Discussion: The Timnath company currently operates a water tender which provides rural water supply support to the entire eastern portion of the district. By enlarging this role, volunteers could respond with fewer personnel and with less rigorous training. This will allow rural water supplies to be set up quicker than is now possible. This will also improve the company's ability to recruit and maintain members.

Cost: Maintenance of existing water tenders is included in current budgets.

Recommendation 1.9 Facility Upgrades

The Timnath and Horsetooth stations should be renovated, upgraded or replaced.

Discussion: Both the Timnath and Horsetooth stations can best be described as spartan. Both are inadequate to accommodate the apparatus that is stationed in them and neither has training rooms or adequate restrooms. The Timnath station dates from the turn of the century and is deteriorating. Its apparatus bay doors and ceilings are too low to accommodate new fire apparatus, it does not have restroom facilities and it has only a small training and meeting room. It also has no off-street parking and difficult access from the primary response bay to the street. The Horsetooth station is too small to adequately accommodate the apparatus stationed there, it has no training or meeting room, and it has only minimal restroom facilities. It has little off street parking and is severely impacted by storm water runoff across its driveway. Neither building provides an opportunity for joint use with the community.

Both of these stations should at least be upgraded to include adequate apparatus bays and access to the street, ADA compliant training rooms and restrooms, and off-street parking. Additionally, some level of residential and cooking capability should be provided to encourage greater use by volunteers. It may also be possible to cooperate with the community to provide some degree of joint use. Even though no architectural or engineering evaluations have been done, it is unlikely that upgrades of this magnitude can be accomplished without constructing entirely new facilities.

Cost: Although no total cost estimates have been obtained, it is reasonable to expect that each facility will require a capital investment of several hundred thousand dollars. Preliminary estimates are that construction costs would be $45 per square foot for new facilities. The Poudre Valley District Board has appropriated $318,000
from its reserves in 1996 to replace the Horsetooth station. This is consistent with Recommendation 1.10 which focuses on the Horsetooth area due to its remoteness and risk. The capital funding for improvements or replacement of the Timnath station has not been identified but will be investigated in the future.

**Recommendation 1.10 Horsetooth Weekday Coverage**

The weekday response of the Horsetooth station should be improved to insure that an adequate number of qualified personal are able to respond to all types of emergencies.

**Discussion:** A major challenge with volunteer fire departments is that many volunteers are unavailable during weekday hours. This is especially acute in the Horsetooth area where there are no employment centers, and residents must leave the area for jobs and virtually all services. Even at the higher membership levels recently attained, it is unlikely that volunteers alone can insure an adequate response during weekday hours.

This situation, combined with the remoteness of the Horsetooth community, long response times of career companies, the single response route from Fort Collins and the relatively high fire risk of the area, suggest that some form of paid or part-time paid coverage should be provided on weekdays. Options include some form of part-time paid personnel, paid seasonal coverage during higher call periods, resident volunteers, and cooperative or joint use personnel with the county.

**Cost:** A solution to this problem has not been developed so no cost has been determined. The most expensive option would be year-round, full-time career coverage for 50 hours per week. The least expensive would be resident volunteers and similar resident interns. Mid-range cost options are year-round, part-time coverage or seasonal staffing during peak call periods. Some of these costs may be addressed in the $250,000-$300,000 described in Recommendation 1.6.

**Recommendation 1.11 Increased Training and Administrative Support**

All of the coordination, administrative and training functions needed to support the volunteer system at the levels recommended should be consolidated into a single paid position.

**Discussion:** The current volunteer system is managed on a part-time basis by a paid firefighter with assistance from administrative, training and operations personnel. The effectiveness of this support has varied for many years depending on the dedication of the part-time coordinator and the time constraints of other staff personnel.

**Cost:** The cost to accomplish the level of volunteer support needed is included in Recommendation 1.6.

**Response Time**

Response time, the time it takes for firefighters to arrive at a fire, medical, or related emergency scene, is a critical component of all fire protection and emergency response systems. As described in the planning assumptions and benchmarks, six minutes has been identified as an average total response time target in the urban area. This total response time is measured from the time an alarm is received in the dispatch center to the time the first fire unit arrives on the scene. It includes three
primary components: dispatch time, turnout time and travel time.

**TOTAL RESPONSE TIME**

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The time average in 1995 was 5:57 minutes. This has increased steadily due to longer responses as development occurs on the edges of the urban area, increasing call volumes, simultaneous calls, units out of their areas for training and other duties, and traffic congestion. The recommendations described below, in conjunction with other strategic programs (i.e. new southern fire stations and north-central fire station) are intended to keep response times below the six minute average.

**Recommendation 1.12 Performance Targets**

PFA should adopt and track performance targets for the three primary components of response time.

**Discussion:** Maintaining low response times is a critical PFA objective. Performance targets must be designated and tracked. Establishing these targets will help the organization focus on specific standards and provide the ability to measure the effectiveness of various methods of maintaining response times. Tracking these three primary components and making them available to responders, will help them recognize what conditions impair response times and where improvements can be made.

**Cost:** None

**Recommendation 1.13 Response Time Control Strategies**

PFA should implement relevant policies and equipment necessary to control response times as they are needed.

**Discussion:** Short of adding new fire stations, controlling response time relies on implementing policy changes that improve response unit availability, applying new dispatch and communications technology, reducing turnout time, and moving fire equipment through traffic with fewer stops. In the past Enhanced 911, dispatch pre-alerts and Opticom have helped keep response time at reasonable levels. These programs can be further expanded, and related communications technologies implemented, to improve station area coverage.

Of critical importance to maintaining low response times are receiving, processing and dispatching fires, medical emergencies and other emergency calls. These services are provided by the Poudre Emergency Communications Center in the Fort Collins Police Department and are not under direct PFA control. In order to be effective, PFA must maintain effective relationships with dispatch center management and staff. This will become more important as new communications technology and dispatch staffing needs are considered.

**Cost:** Some policy issues involve little or no new costs. Others, such as new technologies, can be expensive.
II. Emergency Medical Services

PFA is one of three agencies involved in providing Emergency Medical Services (EMS) in the Fort Collins area. The Fort Collins Police Department manages the Poudre Emergency Communications Center which provides the 911 emergency telephone answering point and dispatching center for all EMS in the city and fire district. The Poudre Valley Hospital Ambulance Service (PVH) provides advanced life support (ALS) and ambulance transportation in the city, fire district and the much larger Hospital District. PFA provides first response basic life support (BLS/AED) and rescue as well as ALS and transport assistance in the city and fire district.

This system has evolved over a period of almost twenty years. In general, it provides good service and is well within the norm of single-tiered multi-agency systems. The five recommendations described below seek to improve the relationship between the three agencies, improve the effectiveness of PFA’s participation, and position the entire system to address the community’s EMS needs in the future. The EMS issue, however, is the most complex and dynamic one addressed in this plan. Unlike fire protection, where the vast majority of services are under the publically controlled or regulated public safety umbrella, much of EMS is controlled by private health care influences. It is unknown how EMS will evolve in the longterm, or what PFA’s role will be. Although the local EMS system is stable, experience in other communities has been that it can change quickly. For this reason, none of these recommendations should be considered as PFA’s only position, and future conditions may precipitate greater PFA, city or county involvement.

Recommendation 2.1 Expansion of PFA Mission

PFA’s Mission Statement should be expanded to reflect PFA’s current involvement in EMS.

Discussion: Although PFA has participated in the EMS system for many years, this responsibility has not been explicitly stated in its mission statement. This recommendation would expand the Mission Statement to reflect PFA’s current commitment to EMS. The PFA Mission Statement should be amended to read as follows:

**PFA Mission**

To limit the loss of life, injury and property damage  
by providing the best fire protection, rescue, emergency medical  
and other emergency services in the most cost-effective manner  

Cost: None

Recommendation 2.2 System Documentation

The current EMS system should be documented in regard to agency responsibilities, expectations, interagency cooperation, performance standards and cost-sharing. The primary vehicle for this documentation should be a set of interagency agreements.

Discussion: The current EMS system is based on cooperative services between PFA, the Fort Collins Police and Poudre Valley Hospital. While each participant has policies, procedures and some form of performance level standards, they are not tied together with formal processes or documents as a total system. Neither the city nor county have adopted service level standards and there is only limited accountability to elected community leaders. Even though the system has worked well in the past,
it is vulnerable to duplication of services, higher citizen costs, lower service levels and inadequate patient care.

This recommendation seeks to develop a higher degree of structure and formal cooperation between the participating agencies. The method advocated by this plan is interagency agreements. As a minimum these should include:

- Definition of agency responsibilities.
- Total system and component performance standards.
- Interagency training.
- Incident management system for command and control of emergency medical incidents.
- Cost and revenue sharing.

The interagency agreements envisioned in this recommendation would be less formal and less legally binding than city and/or county ordinances that could accomplish the same results through regulation and contracts. This choice of interagency agreements is due to the cooperative history of the current participants and the desire not to complicate a system that is already working well. This recommendation recognizes that the number of participants may change, making the current level of cooperation more difficult. In this case, a more formal ordinance-based regulatory system may become a better method of insuring total system effectiveness.

**Cost:** There is no cost to intergovernmental agreements themselves. It is anticipated, however, that there will be periods of high intensity administrative work in developing these agreements that may require increased, but short-term, administrative costs.

**Recommendation 2.3 Variable Response**

PFA should actively research and, when practical, adopt a system of EMS response that is capable of dispatching an appropriate combination of PFA and PVH units matched to the degree of medical need.

**Discussion:** The current EMS system responds to all medical emergencies as if they require the full range of basic and advanced life support, as well as patient transport to the hospital by ambulance (a PFA engine or truck company, a PVH ambulance and sometimes a law enforcement officer). The reason for this is that it is difficult to determine the seriousness of an injury or illness over the telephone without a trained medical provider on the scene. While this often causes an over-response, it insures that the best patient care is available should it be needed. Conversely, this is seen by many as wasteful and, in fact, does deplete emergency resources that should be available for more serious emergencies. With medical emergencies increasing at a rate of 7.3% per year since the 1986 Strategic Plan, it is conceivable that the current system could become overloaded to the point where fire protection and other services are compromised.

Any system adopted must be able to:

- Differentiate between the seriousness of medical emergencies.
- Dispatch an appropriate level of response (a full EMS response or a single PFA or PVH unit).
- Differentiate between the need for nonemergency vs. emergency response.
- Keep dispatch call processing times within reasonable parameters.
- Keep total response time for all potential categories within citizen expectations.
• Emphasize customer service and citizen needs in addition to emergency patient care.

Cost: There are two potential costs to a system of variable response. The first is the purchase of computer hardware and software. The second is the ongoing costs of keeping dispatchers trained to a higher level of EMS capability. There is also the possibility that dispatcher workload could be increased, driving the need for more dispatchers. These costs have not been thoroughly investigated.

Recommendation 2.4 EMS Education

PFA should increase its involvement in pre-incident education.

Discussion: Virtually all the emphasis of the current EMS system is directed towards response after a medical emergency has occurred. There are, however, actions citizens can take prior to an emergency that can improve patient survival and possibly lessen the impact on the response portion of the system. Examples are: improving citizen capability to recognize the onset of an emergency medical condition and summoning EMS assistance quicker, starting basic life support actions such as CPR before the arrival of EMS personnel, and using proven personnel protective devices such as seatbelts and bicycle helmets.

While there are many agencies involved in pre-incident education and CPR training, it does not appear that it is widespread enough to affect overall survival rates. PFA could pursue greater use of its personnel and facilities in CPR and EMS pre-incident training, inclusion of pre-incident information in existing fire prevention education, and better coordination of multiagency efforts.

Cost: The costs of these type of initiatives have not been thoroughly researched. Some, such as the use of PFA facilities, would be negligible in those facilities that are suitable to this use. Increasing EMS information in standard fire prevention programs may likewise be small. More intensive efforts would require greater commitments of staff support and higher administrative costs.

Recommendation 2.5 Cost Recovery

PFA should institute a system of cost recovery for some EMS services.

Discussion: The current EMS system is funded through a combination of private user fees and general tax revenue. All paramedic and ambulance services are supported by user fees as part of the PVH system. Much of this is paid for by private and government insurance programs. Dispatching services are provided under contract between PVH and Fort Collins Police and as such are considered as part of PVH's cost. All of PFA's EMS services are supported by the general tax revenue of the city and fire district. PFA currently charges no fees for EMS services. The relationship between the services provided and their funding sources is illustrated in the graphic below.

**EMS SYSTEM FUNDING**

![Diagram of EMS funding sources]

**HEALTH CARE SYSTEM**

**PRIVATE FUNDING (INSURANCE)**

**PUBLIC SAFETY SYSTEM**

**PUBLIC FUNDING (TAXES)**
As can be inferred from the illustration, there is a significant amount of overlap between BLS/AED, ALS and patient transport. In many cases, PFA is assisting in, or directly providing, services that are paid for by insurance and are collected by PVH through their billing process. PFA incurs expenses in training, equipment and personnel protection to assist in ALS and patient transport which are supported solely by general taxes. This raises questions as to which services should be provided as tax supported public services, and which should be supported by user fees, regardless of which agency provides the actual service.

This recommendation suggests that all the costs of the EMS system be studied and categorized according to which should be tax supported and which should be user-fee supported. Mechanisms should then be developed that reimburse the service provider for those costs. An example may be PVH providing reimbursement to PFA for PFA patient care and transportation assistance, because this allows PVH to reduce on-scene time and the need for additional ambulances. Another example is patient treatment that is provided by PFA such as immobilization, AED and oxygen use, that can be paid for by insurance.

**Cost:** While there may be some increased administrative costs in implementing a cost recovery system, it must be designed to provide a positive revenue/cost relationship.
III. Building and Fire Codes

This plan recommends continued emphasis on controlling fire risk through built-in fire protection, primarily fire sprinkler systems. This has been a strategic policy since the 1980 Plan and has resulted in several local initiatives that have increased the number of buildings protected by sprinkler systems. This strategy has been instrumental in keeping fire risk in new construction low and has helped control public fire protection costs. The recommendations described below seek to strengthen risk reduction strategies through built-in fire protection in both existing and new programs.

All of the recommendations described below will impose increased private costs due to wider use of fire sprinkler systems. The costs incurred would be capital improvements, primarily in the original installation of these systems with small annual maintenance costs. Except for wide scale single family residential sprinklers, all of these recommendations are intended to address very specific risks with only a small number of buildings actually impacted. New public costs involve the staff time required to develop and adopt these programs. Additional new staff time is anticipated to be small due to the time already devoted to similar risk reduction issues since 1980. It is anticipated that the tradeoffs between increased private costs, lower risk potential and losses, and lower public costs will become important discussion points as each of these recommendations is considered for implementation.

Recommendation 3.1 Large Single Family Homes

PFA should pursue amendments to city and county building codes to require residential fire sprinkler protection in single family dwellings larger than 3,600 square feet.

Discussion: Large single family dwellings have emerged as the most significant challenge to manual firefighting forces in recent years. These homes, generally in excess of 3,600 square feet in size, present firefighting needs beyond the first alarm firefighting capabilities of PFA. Many of these homes are three stories in height, have large open interior areas, remote and separated sleeping areas and fire flow requirements exceeding current fire flow standards (1,000 gpm). In many cases these homes are built on existing lots that are not subject to the access and water supply requirements of current landuse standards and are inaccessible to structural firefighting apparatus. From a firefighting and life safety perspective, these homes present a higher risk than many new commercial buildings. While fires in these homes are infrequent, when they do occur property losses are high and the demand on firefighting forces great.

This recommendation proposes the use of residential fire sprinkler systems as the only viable method of bringing these buildings within the capabilities of firefighting forces. Residential sprinkler technology has been available for 15 years and over 150 homes in the Fort Collins area are equipped with these systems. There is no question that the installation of sprinkler systems imposes an additional construction cost. When weighted against the amplified demands placed on firefighting forces and the large property losses that can occur, PFA believes this cost is justified.

This plan recognizes that pursuing this recommendation will require significant interaction between PFA, building officials, water purveyors, home builders, sprinkler installers and realtors. Past experience has shown that programs of this
magnitude can take as long as two to three years to develop. Important issues that must be resolved as part of this process are:

- The definition of home size.
- Adequate sprinkler system design.
- Water supply connections.
- Long term maintenance of sprinkler systems.

**Recommendation 3.2 Non-sprinklered Nursing Homes**

PFA should pursue a retroactive fire code amendment requiring all non-sprinklered nursing homes to be equipped with fire sprinkler systems.

**Discussion:** There are currently two nursing homes in the Fort Collins area that are not equipped with full fire sprinkler protection. This type of protection is essential to life safety in these type of occupancies and have been required in new nursing homes for many years. Nursing homes by definition provide care for patients who are incapable of taking self preservation actions during a fire. Serious fires in non-sprinklered nursing homes and residences of a similar nature have resulted in many deaths. Fire sprinklers are the only viable method of providing fire protection for this type of population.

This plan recognizes the difficulty of implementing any retroactive code requirement. For this reason it will be necessary for PFA to work closely with the owners and management of the impacted nursing homes to identify funding mechanisms and reduce the impacts on residents during a transitional period. It may also be necessary to allow a reasonable time period for the two impacted facilities to install full sprinkler systems.

**Recommendation 3.3 Group Homes**

PFA should develop a program to increase fire sprinkler protection in new and existing group homes.

**Discussion:** Group homes are residences where people live together in a common, family type environment who also have limited self-preservation capabilities. Common examples are board and care homes for senior citizens and homes for people with physical and psychological disabilities. The fire protection problems presented by this type of living arrangement are well documented. The potential of deaths and injuries is much higher than in all other types of housing. As these problems have been recognized, regional and local building and fire codes have responded with new design and operative criteria. In the city of Fort Collins, fire sprinklers are required in all new group homes with more than six residents. Some group home operators have also chosen to install sprinklers in lieu of other code requirements, to obtain less costly insurance, and to provide the safest environment for their clients.

While the larger new group homes fall under the new building and fire codes, there are many that are existing, or are operating just below the code limitations. Past research has found that installation cost is the primary impediment to sprinkler installation. The vast majority of existing and smaller homes are operated on a nonprofit basis catering to residents of very limited financial means. This recommendation recognizes that some form of financial assistance may be necessary. Possibilities may be assisting with grant applications or providing no interest or low interest loans.
Recommendation 3.4 5,000 Square Foot Separation

PFA, in cooperation with the city and county building departments, should evaluate the performance of the one hour fire containment separation wall requirement and pursue changes as necessary.

Discussion: The 1980 PFA Master Plan precipitated the adoption of building code requirements that limit the size of open areas in new buildings (except single family dwellings and farm buildings) based on building construction type and occupancy. These sizes range from 5,000 to 10,000 square feet with 5,000 being the most common. Open areas over this size must be protected by fire sprinkler systems. These design standards allow substitution of one hour rated fire containment area walls with special opening protection in lieu of sprinklers. The performance of these separation walls should be evaluated based on ten years of experience, and the design standards adjusted if necessary.

Recommendation 3.5 Large Assembly Occupancies with Alcohol Use

PFA, in cooperation with city and county building departments and liquor licensing boards, should pursue building and/or fire code requirements that provide fire sprinkler protection in large assembly occupancies where alcohol use contributes to high life safety risk.

Discussion: The consumption of alcohol in large public assembly occupancies such as bars, nightclubs, dance halls and similar occupancies has contributed to multiple deaths during serious fires. The current sprinkler requirements of the building and fire codes are based on building square footage and allow assembly uses with occupant loads of several hundred without sprinkler protection. A sprinkler requirement based on occupant load for these very specific types of assembly uses is more appropriate and would reduce the potential of multiple death fires.

This recommendation is intended to address only the most serious life safety problems associated with the combination of alcohol use and large numbers of people in relatively small spaces. It is not intended to include assembly uses such as churches, restaurants, theaters and similar performance facilities where the consumption of alcohol does not contribute to higher life safety risk.

Recommendation 3.6 Residential Fire Sprinklers

PFA should actively research the wide scale installation of residential fire sprinklers in all new homes, and should adopt programs that encourage and/or require residential sprinklers as conditions permit.

Discussion: The installation of fire sprinkler systems in all homes is the most promising method of reducing future deaths, injuries and property loss in homes. Because the vast majority of fires, deaths, injuries and property loss occur where people live, the ability to control these risks has the most impact on a community’s risk profile and long-term public and private costs. Adopting such programs, however, has proven extremely difficult.

Both the city and fire district adopted residential sprinkler codes and alternative development design criteria in 1987. This program, along with the constantly improving technology and installation methods, has contributed to over 150 single family dwellings being equipped with these systems. Since the adoption of the 1991 Uniform Building Code, all large multifamily residential buildings also must be equipped with these systems.
This recommendation emphasizes a longterm implementation strategy. Even though residential sprinklers are available and successful as a fire protection strategy, their wide-scale acceptance and use has been slow. Initial installation does increase construction costs, longterm maintenance issues have not been completely resolved, and their promotion is plagued by the same unfounded myths as all fire sprinklers. PFA has been involved in the development of similar programs in the past and has found the most success with phased-in approaches. Both the city and fire district adopted residential sprinkler codes and alternative development design criteria in 1987. This program, along with the constantly improving technology and installation methods, has contributed to over 150 single family dwellings being equipped with these systems. While current programs have been successful in addressing unique development problems, they have not been effective in promoting the large scale shift needed to impact community-wide risk.

This recommendation represents a significant strategic shift towards built-in fire protection in the largest segment of risk, single family homes. It is heavily opposed by the home building industry, and attempts to adopt residential sprinkler programs in many communities have failed. Communities that have been successful have adopted entirely new fire safety related development criteria that reduce the cost of water supply and street infrastructure.

This recommendation suggests a long-term, phased approach based on research, education and participatory policy development. Participation by home builders, realtors, fire sprinkler installers, water purveyors, transportation designers, and elected leaders will be vital.

**Recommendation 3.7 Sprinkler System Cost Control**

PFA should continue to pursue methods of holding sprinkler system installation and maintenance costs as low as possible.

**Discussion:** Commercial sprinklers cost an average of $ .96 per square foot in the Fort Collins area. This compares to a statewide average of $1.45. Even with these favorable rates, installation cost is still a significant impediment to sprinkler use, and any means of minimizing these costs improves the overall success of all sprinkler programs. Strategies that have been successful in the past include the application of new installation techniques and materials, close coordination between contractors and inspection personnel, local maintenance inspections, and the adoption of state of the art installation standards.

This recommendation recognizes that while fire departments cannot directly control the cost of sprinkler systems, they can contribute to higher costs by adopting unreasonably redundant standards, charging high permit fees and maintaining adversarial relationships with installers. PFA should maintain a review and inspection system that balances cost with reasonable installation standards.

**Recommendation 3.8 Urban Design Standards**

PFA should develop and adopt, where necessary, design standards and operational policies for providing fire protection and emergency services in new urban development.

**Discussion:** The effectiveness of firefighting operations is heavily influenced by the combination of firefighting resources, response time, building characteristics such as size, open areas and construction type, and site characteristics of street access and water supply. In Fort Collins, there has always been a close relationship between
these factors resulting in high effectiveness and relatively low public costs. In cities with less favorable building and site characteristics, the greater demands placed on firefighting forces require higher staffing levels, more fire companies and higher public costs.

In residential settings street width and parking lot design, interconnected streets, large water lines and fire hydrants are critical design factors governed by the fire code. These standards have been constant for many years and allow rapid fire attack during fires and quick access during medical emergencies. In the commercial and industrial environment, these standards have evolved more towards the built-in fire protection offered by fire sprinkler systems. Residential fire sprinklers can be used in a similar manner but have not seen the same usage as compared to commercial buildings.

From time to time developers and urban planners propose new types of residential developments that provide less vehicular access with higher residential densities of single family type homes. These designs often seek to utilize fewer and smaller streets and closely placed buildings. These conditions impair firefighting effectiveness, especially under the company staffing and response times PFA currently maintains. In general PFA has opposed these designs and has recommended against relaxing public safety related standards without built-in protection. These type of designs, however, are becoming more prevalent, and new approaches to fire protection should be investigated.

PFA should develop information that clearly demonstrates the effects of lowering street, water supply, and building construction standards. This will allow elected decision makers a better opportunity to weigh the advantages and disadvantages of new design standards. PFA should also investigate making changes in equipment and operational policies that would be better suited to new urban designs. Finally, PFA should more strongly promote residential sprinklers as an alternative to the loss of standard design aspects.
IV. Public Education, Communication and Participation

This plan recommends continued expansion of educational programs and new initiatives in public communications and participation. Our citizen survey indicated that citizens want more and varied education on fire and safety related topics, more information on fire protection issues and better opportunities to participate in policy development and implementation. The recommendations described below represent an increased emphasis of service beyond emergency response and conventional childhood fire safety education.

Recommendation 4.1 Fire Safety Education

PFA should continue to expand fire safety education programs in accordance with citizen expectations.

Discussion: In 1995 PFA added a full-time public education position in response to the residential fire safety educational needs identified in the 1987 Strategic Plan. This new position, in conjunction with the existing Public Education Team, is expanding current educational programs. In addition to emphasizing programs targeted at children, new ones directed at the special needs of seniors and citizens who speak Spanish in the home are being developed. Surveys identified adult education and business education as areas needing more attention. Programs are being developed in these areas.

Cost: This new position and current program funding should be adequate for the immediate future. However, continued program improvements and new citizen needs will almost certainly impose new costs. The Youth Fire Awareness Program and mobile home programs, in particular, may require increased funding soon.

Recommendation 4.2 Improved Communications and Information

PFA should evaluate its entire public information system and make necessary changes to meet citizens' needs.

Discussion: PFA provides information from several locations through several mediums. Local research has indicated that this information is not as consistent or easy to obtain as citizens want. This evaluation should determine what citizen needs are, especially those of specific groups. Surveys indicate that while better general information is needed, some groups have more extensive informational needs.

Cost: This plan does not project a cost of this evaluation or of the improvements it may suggest. Focus-group surveys, additional public input, and outside expertise may be needed. Specific improvements may include a centralized telephone system, better after-hours information, increased media contact, more consistent public information, better content-specific information, and fire station open houses.

Recommendation 4.3 Improved Citizen Participation

PFA should place a greater emphasis on citizen participation and community input.

Discussion: This plan assumes that citizens want to participate in the design and implementation of policies that affect them. Furthermore, it assumes that citizens must be offered realistic opportunities to participate, which consider their interest in
the subject and their time. This was confirmed in the survey research. Program components may include the expanded use of survey research, establishment of advisory groups and more aggressive gathering of input on program design by staff. The business community has expressed a desire to be more involved in fire prevention planning and program implementation.

**Cost:** This is a relatively new area for PFA and the fire service in general. For this reason, it is unknown what future costs may be involved. We anticipate that some degree of trial and error may be needed before a true citizen participation strategy is developed. Survey research can be expensive because of the use of outside expertise and internal staff time.
V. Customer Service

Fire departments are best known as providers of such emergency services as fire suppression, rescue, emergency medical response and, more recently, hazardous materials control and specialized rescue. Fire departments have historically provided non-emergency services related to their emergency response role such as fire prevention inspection, fire safety education and disaster planning. In recent years many fire departments have expanded their service scope to include citizen training in personal safety, minor medical assistance, promotion of safety equipment such as seatbelts, bicycle helmets and child seats, helping citizens protect their property from water damage not associated with fires, and helping at risk youth and other citizens with unique needs. These types of services fall under the broad umbrella of customer service.

The concept of customer service is not new. It has been a tenant of the private sector for many years and is the driving philosophy of many successful service organizations. In the public sector, citizens are more than consumers of public services; they are customers who ultimately decide what services should be provided and how well they meet their needs. While the concepts of competition and profit are not as prevalent in the public sector, citizens do have the ultimate choice in what services are provided and how they are funded. This has been clearly demonstrated in recent years at all levels of government, through elections and greater citizen activism.

As an example, survey research discovered that citizens wanted more assistance during and after a fire than has been provided in the past. This need led to the establishment in 1994 of an Incident Representative Program. On all fires, a PFA employee is assigned to help citizens cope with the effects of the fire and begin recovery even before the fire incident itself is over. This program has been well received and represents an extension of an unexpected service to people during a time of critical need.

The recommendations described below seek to strengthen PFA’s customer service orientation and to expand into new areas of citizen service. They recognize that PFA is uniquely positioned through its geographic distribution of facilities, constant staffing and current service philosophy, to meet wider citizen needs. They also recognize that PFA’s emergency response role must not be jeopardized. Citizen input continues to show that rapid response and effective action are paramount. Finally, they emphasize allowing all PFA employees to determine what customer services can be provided at the time of need with a minimum of centralized control.

Recommendation 5.1 Mission statement

PFA’s Mission Statement should be evaluated and changed, if necessary, to reflect a greater emphasis on customer service.

Discussion: PFA’s current Mission Statement emphasizes emergency response, risk reduction and efficiency, in relation to minimizing human casualties and property loss. A re-examination of this Mission Statement will help assure that future organizational efforts will focus on improving non-traditional customer services.

Recommendation 5.2 Barrier Removal

PFA should examine all existing policies and procedures and remove barriers to reasonable customer service.
**Discussion:** PFA has many policies and procedures that govern service provision and employee behavior. In many cases these are intended to maintain consistent emergency response coverage and readiness, and are essential to meeting the mission and goals. Many are also intended to reduce risk to the organization and employees, to control liability and centralize decision making. While these all have logical foundations, they may limit employee ability to use initiative and good judgement in providing customer service. Evaluating all organizational polices from the perspective of the customer, in addition to organizational needs and reasonable risk, will position the authority to better meet citizen needs.

**Recommendation 5.3 Decentralized Services**

PFA should decentralize the provision of as many non-emergency and customer services as possible.

**Discussion:** Because fire stations are located throughout the community, they provide a unique opportunity to decentralize education, communication, citizen participation and customer service programs. Although such programs all require some degree of centralized support, the actual provision should be centered in neighborhood fire stations. Additionally, firefighters should be encouraged to participate in neighborhood activities and to become part of the neighborhoods they serve. Wherever possible, fire stations should be made available for public safety related services.

**Cost:** In order to decentralize these type of programs fire stations will need more in-house resources. This could include maintaining higher levels of printed materials as well as audio and video resources. Some stations are not well suited to this use and may require remodeling. New communications capabilities may be needed to allow citizens better access to fire station personnel when they are out of the station. There may also be some long-term increased staff costs in supporting a wider array of services.
VI. Mobile Homes

In recent years the problem of fires in mobile homes has emerged as a serious one, both locally and nationally. Local data indicates that people living in some mobile homes are more likely to be injured or die in a fire and suffer higher proportionate property losses than residents of other types of housing. The reasons for this are related to both the construction and size of many mobile homes and the social and financial conditions many mobile home residents experience. Due to this combination of factors, some mobile home parks experience significantly higher fire rates.

Since 1989 PFA has implemented special education programs at mobile home parks with the highest fire rates. These programs stress fire survival training, smoke detectors, fire prevention unique to mobile homes and encouragement of juvenile fire setter counseling. These programs have reduced some fire rates but have not resulted in wide-scale improvement.

Recommendations 6.1 Targeted Education

PFA should intensify the targeted education program now in place in the mobile home parks with the highest fire rates.

Discussion: Even though the current program has been somewhat successful, the turnover in some mobile home parks requires more frequent education contacts. Some have Spanish-speaking residents and some are resistant to conventional educational methods. Juvenile fire setting activity also appears to be higher in some parks and many residents are unable to participate in conventional counseling programs.

This recommendation suggests:
- Offer more programs at more convenient times.
- Use effective educational methods.
- Continue efforts to insure that all homes have working smoke detectors.
- Enroll juvenile fire setters into YFAP program.

Cost: The current cost of this program is very low. Increasing the number and intensity of these programs is expected to require a modest increase in costs.

Recommendation 6.2 Safe, Affordable Housing

PFA, in cooperation with the city and county, should encourage safe, affordable housing for all residents.

Discussion: Research clearly shows that lower economic status is directly related to poor fire experience. People living in conditions of low income, under-employment, low educational attainment and unstable families experience higher fire rates, more deaths and injuries, and greater relative property losses. While PFA cannot impact many of the root causes of these problems, it can be more proactive in encouraging safe and affordable housing.

In the Fort Collins area mobile homes provide an affordable housing option for many residents of limited financial means. Older mobile homes, in particular, pose increased fire risk due to deterioration, lack of multiple exits and smoke detectors, and inadequate heating and electrical systems. Some mobile home parks and lower cost housing areas also have poor emergency access and no, or inadequate, fire
hydrants. Where possible, these units should be phased out and replaced with newer units with higher levels of protection and life safety features. New mobile home parks, when developed, should provide better access and water supplies.

For new affordable housing developments new fire safety approaches should be considered. Wide streets, large water mains and greater distances between buildings are vital to effective fire suppression, but are also costly in an affordable housing environment. PFA should be able to clearly demonstrate the impacts on fire protection and emergency services of changes in development standards intended to improve affordability. PFA should research other methods of providing services within the context of more affordable site designs and encourage the use of residential fire sprinklers in lieu of operational design standards. Residential fire sprinklers, in particular, should be encouraged in lieu of standard design requirements. Finally, PFA should become a more active participant in seeking creative solutions to balancing safety and affordability earlier in the planning process.
Other Important Issues and Programs

Both current and future strategic programs will be influenced by several anticipated non-strategic issues. Some may require significant expenditures and could precipitate organizational and policy changes not anticipated in this plan. Others are incremental and will occur with normal organizational growth and change. Some may develop past the ten year scope of this plan and may become strategic programs in the future.

Emergency Operations Management - PFA currently operates with only one on-duty shift commander (battalion chief). This chief officer is responsible for eleven fire stations, ten career fire companies, 36 career personnel and approximately 20 volunteers. Each on-duty shift responds to one third of over 7,200 calls for service over a 235 square mile area. In addition to routine management, supervisory and staff functions, the on-duty battalion chief must respond to and manage all major emergencies within the jurisdiction. Their administrative responsibilities, combined with size of the jurisdiction and increasing call volume, contribute to increasingly longer response times. Lengthy battalion chief response time reduces the number of firefighters and company officers that can be assigned to fires and other serious emergencies, because company officers must assume fire ground management functions until the battalion chief arrives.

This plan does not recommend that a full second battalion be added at this time. The estimated annual O+M cost of three new battalion chief positions is $220,000 in 1995 dollars. At some point, however, these additional positions will become necessary if the current level of fire ground management is to be maintained. This plan does recognize that for the current number of battalion chiefs to be effective, their administrative workload must be minimized. We anticipate that increased administrative support will be necessary within the scope of this plan.

Non-firefighting Positions - This plan is not recommending any new strategic programs that require the immediate addition of non-firefighting personnel, including fire prevention, training, administrative and clerical positions. While it is PFA's policy to avoid adding new non-firefighting positions without first exhausting all other possibilities, it is likely that the increasing workloads in all these areas will require some new positions.

New Technology - It has been PFA policy to take advantage of new technology to improve program effectiveness and reduce long-term costs. This plan does not identify any specific technology applications for short-term application but does recognize that there are several on the verge of availability that hold significant promise.

Opticom - Opticom is a traffic control device that turns traffic lights green in the direction of emergency vehicle travel. This reduces the need for emergency vehicles to come to a complete stop at signaled intersections, thereby helping control response times. It also improves traffic safety by stopping cross traffic as emergency vehicles approach.

It was a long-term goal of the 1986 Strategic Plan to increase the number of intersections with Opticom. Many intersections have been equipped with Opticom but to complete the system it may be necessary to increase funding levels and/or ask new development to contribute towards equipping new intersections.
Radio Refarming - Within the next 10 years the federal government will require that all radio equipment be converted to a new digital technology. During this time all PFA radio equipment will have to be converted or replaced. All new radio equipment purchased in recent years has this technology, but the full conversion will be expensive.

Video Conferencing - Currently all multi-company training, on-duty meetings and post-incident critiques require that some station areas be uncovered for periods of time. There is new video conferencing technology available that provides multi-site, real time video conferencing using standard telephone lines. This would greatly improve communication effectiveness and reduce the out-of-area time of companies.

Automatic Vehicle Location - This technology automatically tracks vehicle location and allows precise dispatch of the closest unit to fires, emergency medical calls and other incidents.

Digitized Pre-Alert Dispatching - This is a further advancement of the Computer Aided Dispatch and E911 system now in use. It reduces dispatch time, and thereby total response time, by alerting the appropriate unit while the dispatcher continues to collect all the needed information. Current estimates are that it may reduce dispatch time 30-45 seconds.

Facility Upgrades - PFA directly owns and operates 13 facilities which are in constant need of major maintenance and upgrading. While many of these items can be anticipated and included in long-term capital planning, some cannot. Serious roof leakage has been an expensive problem in the past. Other examples are the renovation required as part of the American's with Disability Act (ADA) and federal and state underground fuel storage tank programs.

Diversity - In recent years PFA has successfully recruited and hired many qualified women and minorities as firefighters. From the perspective of new hires, PFA is well within the norm of fire service organizations, and continued improvement in entry level diversity is anticipated. A possible area of concern, however, is the promotion of women and minorities to supervisory and management positions. Because significant numbers of employees in these classifications are just now reaching competitive levels of experience, it is not known how well they will fare in the current promotional process. This will require close monitoring in the future to insure that all employees have the best opportunity for advancement as possible.
Appendices

Appendix A
Fire Department Survey

In 1993 PFA conducted a survey of eight fire departments as part of the benchmarking process. These departments and the communities they serve were chosen due to their similarity with the Fort Collins area. They are independent cities and all have a significant university presence. These cities are:

- Boulder, Colorado
- Greeley, Colorado
- Pueblo, Colorado
- Eugene, Oregon
- Salem, Oregon
- Spokane, Washington
- Casper, Wyoming
- Boise, Idaho

The data compiled from these eight cities and Fort Collins included 1469 individual data points covering all aspects of the community, the fire department and fire department performance. Shown below are summaries of the most important data and comparison categories. All data is based on 1992 statistics. In 1995 PFA opened a new fire station. This increased the number of engine companies to 8 and added 11 new firefighters. The relationship to the survey data and population increases remains the same.

**Community Information**

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* Estimates based on unknown data variations in reporting methods

**Resources**

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* Poudre Fire Authority 1995 Strategic Plan

A1
## Performance

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<tr>
<td>Total response time*</td>
<td>5.21 minutes</td>
<td>4.1 minutes</td>
<td>5.2 minutes</td>
<td>5.21 minutes</td>
</tr>
<tr>
<td>Fires per 1,000 population</td>
<td>6.9</td>
<td>3.13</td>
<td>4.94</td>
<td>4.09</td>
</tr>
<tr>
<td>EMS per 1,000 population</td>
<td>74.11</td>
<td>33.6</td>
<td>48.57</td>
<td>33.6</td>
</tr>
</tbody>
</table>

* Data calculation is based on best estimates due to unknown variations in comparison data.
Appendix B
Executive Summary
Poudre Fire Authority
Community Survey Results

Introduction
The Poudre Fire Authority (PFA) contracted with the Department of Social Work at Colorado State University to design and conduct two telephone surveys (April and May, 1993) of their household and business constituents. The purpose of the surveys was to answer several questions for PFA as they sought input for their strategic planning process. The primary research questions were to validate a previously commissioned internal needs assessment (CNA) and to ask for evaluative feedback from the communities they serve. The following presents a summary of the research findings and recommendations for PFA consideration.

Summary Of Findings
The following research questions were addressed. (Please note that it is important to read the research report in its entirety as the comments below do not reflect the depth and breadth of information obtained.)

Current Performance Evaluation Overall, both the household and business communities gave PFA high ratings, particularly in relation to incident response, and the lowest rating in the area of prevention planning. Refer to the attached summary tables A, B and C.

Were the concerns identified in the internal study on target with what the community would identify? There was some difficulty comparing survey results with the CNA, as there were a number of measurement incompatibilities. The household community differed as they placed education as the highest priority with reference to education/prevention services and notification (911) and quick response as the highest incident response concern. A clear difference with the business sample is that they do not report the need to be “sold” on inspections, but rather desire a more participatory and consistent code application process. A related concern emerged which addresses the quality of relationship between PFA and the business survey respondents – professional behavior. This category includes communication skills, attitude and nature of interactions.

Is the Fire Department focused on “what the community identifies as important?” Or does there need to be a shift in priorities to better address community needs? Acknowledging that both samples give highest priority to incident response, there are some areas upon which they would like PFA to place greater focus. The number one request is to increase the education of adults throughout the community. Household members would like more accessible fire, EMS and hazardous material information, as well as one identified contact number at PFA. Business respondents request that education be integrated with regular code visits.

Are there additional identified customer needs the Fire Authority could address in the future? The overriding theme in response to this question is increased education for adults. The suggestion for a central information number came from both sample groups as a way to facilitate communication and information sharing. A number of other suggestions are included in the body of the report.
Recommendations For PFA Consideration

It is evident that the vast majority of residents served by the PFA think highly of PFA services related to emergency incident response. The recommendations that came out of the research are based upon consumer feedback to improve a department that is already doing a very good job in fulfilling its primary area of responsibility. The findings are strengthened by the strong internal consistency that occurred both within and between sample groups.

1. PFA needs to examine how personnel communicate with their client systems. Is there a way to facilitate more participatory relationships between PFA and the public?

2. Efficient approaches to increasing adult education need to be explored.

3. PFA should explore the feasibility of providing one central information number. PFA would be responsible for follow-up.

4. Because both sample groups were unaware of some services that are currently available from the PFA, it is important that the PFA examine current PR efforts to help the community become more fully informed.

5. There appear to be inconsistencies in the code inspection process, and PFA may want to explore their current procedures and look for ways to lessen the variability. Suggestions included: have one inspection team; include a broad sample of the business community in code development; and approach code inspection as more of a partnership.

An effort of this magnitude is perhaps unique among fire departments and reflects genuine concern on the part of the PFA for the community it serves. The results of the study create opportunities for increased excellence of current services. It also enables PFA to serve as a model to other fire departments across the nation.

**HOUSEHOLD EVALUATION OF PFA SERVICES**

**BY AVERAGE SCORE ON 4-POINT LIKERT SCALE**

- **INCIDENT RESPONSE:** 3.50
- **PREVENTION EDUCATION:** 3.18
- **SPECIAL NEEDS PLANNING:** 3.15
- **FIRE REGULATION INFORMATION:** 3.05

NUMBER OF RESPONSES = 304
BUSINESS EVALUATION OF PFA SERVICES
BY AVERAGE SCORE ON 4-POINT LIKERT SCALE

EXTREMELY POORLY - EXTREMELY WELL

3.66 INCIDENT RESPONSE
3.54 CODE VIOLATION HANDLING
3.47 FIRE CODE VISITS
3.32 FIRE CODE PLANNING

NUMBER OF RESPONSES = 306

HOUSEHOLD & BUSINESS EVALUATION OF PGA INCIDENT RESPONSE SERVICES
BY MEAN (AVERAGE) SCORE ON 4-POINT LIKERT SCALE

EXTREMELY POORLY - EXTREMELY WELL

3.79 DEMONSTRATES CARE FOR PERSONS
3.74 RESPONDS WITHIN APPROPRIATE TIMELINE
3.70 COOPERATES WITH OTHER AGENCIES
3.70 RESOLVES INCIDENT SATISFACTORY
3.59 DEMONSTRATES CONCERN FOR PROPERTY
5.61 PROVIDES ACCURATE INFORMATION
3.46 PROVIDES NECESSARY FOLLOW-UP SERVICES

HOUSEHOLD N = 304
BUSINESS N = 306
Appendix C

Planning Assumptions
Described below are 12 planning assumptions. These assumptions are an integral part of the planning process. They detail the operational concepts that drive current decision making and future planning. They provide the data used to develop the benchmarks described earlier, and in the recommendations later in this plan. They describe the external environment in which PFA exists. In some cases they project into the future based on the best information available at the time.

In past plans the planning assumptions have proven invaluable. They represent, to a large degree, a consensus on what PFA does, how it does it, and where it should go. In many cases these planning assumptions have been developed from the research and programs initiated by past plans. They also provide the body of knowledge and institutional memory that allow future decision makers to know how and why major policy decisions were made.

1.0 Fire Risk Environment

The fire risk environment describes the context within which a fire protection system operates. It is a combination of the type and size of fires that may occur and the likelihood of their occurrence. If risk reduction and protection strategies are not correctly matched to the risk, the losses a community may suffer and the costs incurred to protect that risk, both public and private, may exceed community expectations. For this reason, defining and understanding the concept of fire risk is essential to good fire protection planning. This Planning Assumption describes the fire risk environment from two perspectives, that which currently exists and that which is expected in the future.

Risk Factors
Fire risk is determined by four factors that in combination, create the risk environment. In most cases these factors are treated as constants in fire protection planning, although some may be affected by regulatory actions such as building codes.

Buildings - The age, number, type, size and use of buildings have historically been regarded as the primary determinants of fire risk. In general older buildings constructed of combustible materials and placed close together present higher risks than newer, non-combustible buildings with larger setbacks. Older communities with tightly packed commercial and residential areas composed of wooden and masonry multistory buildings are considered the highest risks. These conditions are common in the northeast and midwest and in some cases characterize entire cities. The heights of buildings, especially in large numbers and without fire sprinkler protection, are also associated with high risk environments, as are large open buildings used for the storage and manufacture of combustible materials. Finally, buildings that are poorly maintained or that have substandard electrical and mechanical systems contribute to higher fire risk. Serious fires in these environments cause the loss of entire buildings and sometimes several city blocks. People living and working in higher risk environments also experience more deaths and injuries. In many cases the risks presented by very high risk environments exceed the firefighting capacity of even the largest fire departments.

In the Fort Collins area older commercial buildings are limited to the downtown business and industrial district (Risk Area map). There are also a small number of
older commercial buildings in isolated rural areas. In recent years many of these buildings have been renovated to higher fire protection standards including the installation of fire sprinkler systems. Existing highrise buildings were retrofitted with fire sprinklers or better compartmentalization in the mid-1980's, thus significantly reducing their fire risk.

The vast majority of residential buildings were built to modern building and fire codes with over half constructed since 1970. The only areas of concentrated older housing is adjacent to the downtown area. Some mobile home parks also have a high concentration of mobile homes constructed before modern fire safety standards. Older housing, including older mobile homes, present increased risk due to the lack of hard-wired smoke detectors, small or absent escape windows, deteriorating electrical systems and inadequate heating systems.

In newer housing, large single family dwellings pose the most serious firefighting challenge. These homes exceed 3,000 square feet, may be up to three stories in height, have combustible roofing and are sometimes set back from streets long distances. In many respects, these homes require greater firefighting resources than commercial buildings built to existing codes. While fires in these type of homes are not common, they can cause losses well in excess of several hundred thousand dollars.

A large degree of control can be exercised over this risk factor through the application of superior building standards. This is in fact the case in the Fort Collins area. While combustible building materials still predominate in residential and small scale commercial construction, the use of fire sprinkler systems, smaller fire areas, more fire resistive materials and greater building separations are prevalent in newer commercial and large multifamily buildings. Fires in individual new buildings still pose significant challenges to firefighting forces, but the threat of catastrophic losses or spread to other structures is far less than in jurisdictions with higher concentrations of high risk buildings.

**Demographics** - This risk factor describes the diversity, density and economic condition of people living and working in a given jurisdiction. It is well documented that people living in poverty are disproportionately affected by fire. The primary reasons for this include substandard housing, undereducation and lower parental presence. In larger cities where this research has been conducted, fire rates increase as the percentage of people below the poverty level increases (NFPA Fire Journal, 1989). Greater numbers of people living closer together are at higher life-safety risk, as are people who require self-preservation assistance during emergencies. People with less disposable income also have less ability to purchase fire-safe products and to maintain their homes in a fire-safe condition. Higher rates of arson are also associated with poor economic conditions in the business sector.

The Fort Collins area has relatively high household ($26,826) and per capita ($13,439) incomes, and the number of people below the poverty level (8%) is within the range of similar Colorado cities (1990 US Census). Shown below are the poverty percentages and fire rates of several Colorado cites that illustrate this relationship (1990-1991 data). This relationship becomes more pronounced as cities grow larger and more complex.
<table>
<thead>
<tr>
<th>City</th>
<th>Poverty Percentage</th>
<th>Fires/1,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Littleton</td>
<td>5.1%</td>
<td>3.12</td>
</tr>
<tr>
<td>Longmont</td>
<td>6.0%</td>
<td>3.48</td>
</tr>
<tr>
<td>Boulder</td>
<td>7.5%</td>
<td>3.76</td>
</tr>
<tr>
<td>Fort Collins</td>
<td>8.0%</td>
<td>4.33</td>
</tr>
<tr>
<td>Colorado Springs</td>
<td>8.6%</td>
<td>4.39</td>
</tr>
<tr>
<td>Denver</td>
<td>13.1%</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Even though Fort Collins has a relatively low poverty rate, the rate of fires in some mobile home parks far exceed the rates in other single family dwellings. Moreover, these fires are more damaging and contribute to a greater number of deaths and injuries. Although past analysis has identified several factors that may cause this, the role that poverty plays in the mobile home parks with the highest fire rates is consistent with the relationship between fire and poverty nationwide.

**Geographic Location** - This describes the geographic location of a jurisdiction and the limitations posed by climatic, topographic and locational characteristics. Jurisdictions that are remote from metropolitan areas cannot take advantage of large scale firefighting resource networks. Jurisdictions that are prone to extreme climatic conditions such as hard winters, low humidity and high winds impose severe demands on firefighting forces, and may contribute to a greater number of fire starts. Jurisdictions that are separated by rivers, steep slopes, railroads and major highways can experience increased response times and thus reduced firefighting effectiveness.

The Fort Collins area is a center city and is remote from other cities with similar firefighting forces. While assistance from Greeley and Loveland is available, the travel distances involved make it unlikely that their firefighters can be used for active fire suppression in Fort Collins. Mutual aid firefighters are more commonly used to provide system coverage while PFA forces are involved in active fire suppression.

Northern Colorado is subject to extreme weather conditions which have been a factor in high loss fires and depletion of firefighting resources. The Fort Collins area is bisected by railroads and the Poudre River. The railroads, in particular, contribute to response time delays.

**Special Risks** - These risks include those that are not present in every community, but when they are, can significantly affect the total jurisdiction risk environment. Common examples are major transportation facilities, hazardous materials facilities and wildland interface areas. Like buildings, the degree of risk presented varies by age, size and condition. Location within the community is also an important factor.

The Fort Collins area has several special risks although none are large enough individually to drive overall community fire risk beyond what would be expected of similar jurisdictions. Interstate 25 traverses the entire jurisdiction but is currently on the fringe of the urban area. Railroad tracks bisect the urban area and a small general aviation airport is located directly east of the downtown commercial area. There are several local fuel and agricultural chemical distribution facilities and several manufacturing plants that use moderate amounts of hazardous materials. Colorado State University operates many research facilities that use small quantities of many hazardous materials.
The wildland interface area exists generally from the foothills west of the city to the western boundary of the fire district and the area north of Laporte. This area encompasses approximately 73 square miles and includes approximately 1116 homes. Of this total number, approximately half (578) are at high or severe risk due to steep slopes, dense vegetation and poor (or nonexistent) access and water supply. The risk environment of this area is highly dependent on weather conditions and the individual characteristics of each building. Unusually dry conditions and high winds, as was the case during the summer of 1994, push areas and buildings to higher risk levels even though they would normally be designated as low or moderate risks.

1.1 The fire risk environment of the Fort Collins area is moderate to low with some areas of isolated higher risks.

The Fort Collins area enjoys a relatively favorable risk environment. Past Master Plans have examined the relationship between fire risk and firefighting forces, and have sought to reduce the risk presented by new buildings and in some existing buildings by requiring higher levels of fire sprinkler protection or smaller fire areas in buildings constructed since 1985. Past emphasis has been placed on maintaining firefighting service levels in relation to this risk. In addition to the overall moderate and low risk environment, there are several risk conditions within the jurisdiction that in themselves can be classified as high risks but in aggregate do not drive the overall risk environment beyond the moderate category.

1.2 The future fire risk environment is expected to continue towards lower risk with the exception of two categories. These are large single family dwellings that impose firefighting needs beyond current resources, and development in the wildland interface area.

The anticipated risk environment in developing areas and for new buildings under current codes, standards and policies will continue to trend towards lower risks. All new buildings must meet current building and fire codes which are generally correlated with current firefighting capabilities. In the southern portion of the area (south of Prospect Road), 81% of all new commercial construction has been equipped with fire sprinkler protection. In the highest commercial construction area, south of Horsetooth Road and east of College Avenue, this percentage exceeds 90%. Although demographic characteristics may diversify as the population grows, it is unlikely that new areas of higher poverty in combination with substandard housing will develop. Additionally, new hazardous materials facilities must conform to rigorous safety and land use standards. It is also possible that the existing transportation corridors and railroads may relocate, reducing some existing special risks. Finally, consumer products will continue to become more fire safe and accidental fire setting behaviors such as smoking will also likely continue to decrease.

Under current codes, standards and policies, the two higher risk categories that will continue to be evident are:

Large Single Family Dwellings - These are the large homes that require firefighting needs beyond current capabilities. These types of homes are common in the southeast and southwest segments of the urban area and in rural areas.

Wildland Interface - Development in the wildland interface area is occurring at the rate of approximately 50 homes per year. Some of these homes are at high risk due to
wildland fire. In many cases these homes are also very large and pose serious firefighting challenges, the same as in urban areas only more pronounced, due to longer response times, poor water supply and poor access. Although this type of development is occurring on relatively large tracts or existing, nonconforming lots, larger scale development in these areas is possible.

**Risk Area Map**

![Risk Area Map](image)

### 2.0 Urban Firefighting Capabilities

Defining firefighting capabilities is one of the most difficult and challenging tasks of fire protection planning. Fire departments have historically focused on resource commitment (number of companies and staffing) as a measure of this capability. It would then follow that fire departments with greater numbers of fire companies, higher company staffing levels and shorter response times should produce higher effectiveness, fewer casualties and lower fire losses. This is not the case, however, as many cities with large and highly competent fire departments suffer higher numbers of casualties and property losses. Firefighting resources and capabilities are only two aspects of total fire protection performance. As described in the previous planning assumption, the demographic composition of the community, the age and condition of the building stock, the topography and climate of the area, and any special hazards that may exist contribute greatly to firefighting performance. In communities where these conditions are favorable, a fire department's performance may be high even though its resources may be relatively low.
The performance of the total fire protection system in the Fort Collins area has been very good. Property losses, as measured by property losses per capita, the value of property protected and per-fire are low, compared to similar jurisdictions in our comparative survey and nationally. Per-fire loss is especially indicative of the effectiveness of firefighting forces. Few structure fires in the urban area grow beyond the original area involved when firefighters arrive. Fire deaths are also lower than national and survey jurisdictions. Shown below are the primary performance measurements compiled in our 1992 survey of similar fire departments.

<table>
<thead>
<tr>
<th></th>
<th>Deaths/100,000</th>
<th>Loss/Capita</th>
<th>Loss/Value</th>
<th>Loss/Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFA</td>
<td>.37</td>
<td>$8.09</td>
<td>$.25</td>
<td>$1,978</td>
</tr>
<tr>
<td>Survey Avg.</td>
<td>.81</td>
<td>$15.06</td>
<td>.54</td>
<td>$3,389</td>
</tr>
<tr>
<td>National</td>
<td>1.77</td>
<td>$37.60</td>
<td>Not Reported</td>
<td>$4,637</td>
</tr>
</tbody>
</table>


Critical factors
PFA's firefighting capabilities are influenced by six critical and interrelated factors. As illustrated below, these are fire behavior, response time, unit function, staffing and system coverage, training, fire flow and building standards. These are the variables used in determining firefighting capability as compared to demographics, existing building stock, topography and climate which are beyond the control of PFA. Changes in any of them affect the others and result in different overall system performance.

2.1 Structure fires must be controlled before FLASHOVER occurs.

Fire is a physical and chemical event which follows basic physical laws. While its growth is influenced by many factors, it follows predictable stages of growth and decay. The standard time-temperature curve illustrated below shows that fire grows in size and intensity until the fuel is consumed. The basic strategy of firefighting is to stop the fire before it begins its rapid growth, or to protect adjoining properties while its fuel is consumed. The best tactic is to apply water in high enough quantities to overcome the heat generation of the fire. The faster firefighters arrive on the scene, with an adequate number of personnel, the proper equipment, and enough water, the more successful they will be in controlling the fire.
An important derivative of the time-temperature curve is the phenomena of "Flash-over". This is the point in a structure fire where all contents in a room, as well as any exposed combustible building materials, simultaneously ignite. Temperatures at this time reach over 1200 degrees and human survival is impossible. Additionally, after flashover the potential for human survival in adjacent building areas decreases greatly, and property loss and firefighting difficulty increases dramatically. The illustration below shows the relationship between time, temperature, oxygen depletion and toxic fire gases.

The objective of PFA's fire protection system is to intercede in a structure fire before flashover occurs. In some cases this is accomplished by firefighters arriving quickly and controlling the fire in its early stages. In others, automatic fire sprinklers operate before flashover occurs and hold the fire in check until firefighters can complete extinguishment. In many cases sprinklers fully extinguish a fire. Finally, in some
cases citizens extinguish fires using portable fire extinguishes or other makeshift means. Fires that are controlled before flashover cause fewer human casualties and less property loss. The graphs below clearly show that although only 8.5% of structure fires grow beyond flashover, they cause 71% of all property loss and have accounted for all the fire deaths in the last five years.

The concept of controlling fires before flashover has been a major premise of the past two PFA Master Plans, and was the basis of the local Building Code amendments requiring higher levels of fire sprinkler protection. Shown below is the performance of our fire protection system in interceding before flashover in the last five years. Of all the measurements adopted through strategic planning, this indicates the most improvement. In this plan a slightly different measurement is introduced. Rather than attempting to define when flashover occurs in the field, which is difficult given the complexity of the event, this plan will measure the more easily observed outcome of flashover, full room involvement.

**INTERCEDE BEFORE FLASHOVER**
2.2 The total response time to fires must be six (6) minutes or less within the urban area.

Response time is perhaps the oldest and most recognized fire service performance measurement. Because fire grows so rapidly, the ability to arrive at a fire quickly has always been a high priority for both the fire service and citizens. This was confirmed in a 1993 citizen satisfaction survey where respondents ranked a quick response second only to access to the 911 telephone system. In older urban areas response times (not including dispatch time) of three minutes have been standard, with four to five minutes more common in suburbs and newer, less dense cities. Response times in rural areas are much longer, including the rural areas of PFA.

Since the development of PFA's first Master Plan in 1981, the concept of response time has evolved significantly. For many years response time referred only to the time it took firefighters to travel from a fire station to a fire. This did not consider the time it takes to process an alarm before dispatch or the time it takes for firefighters to begin a response. In this plan the concept of Total Response Time is used. This is the time from the initial receipt of an alarm at the dispatch center to the arrival of the first fire unit. We believe this is how citizens who call for assistance measure response time, rather than how it has been measured in the past. This concept, however, is more difficult to measure than travel time alone. Dispatch times can vary due to emergency call load in the dispatch center and due to the increasing use of cellular telephones, which do not trigger the exact time keeping system of E-911.

In 1995 the average PFA total response time for structure fires was 5 minutes and 57 seconds (5:57) within the urban response area. Response time can also be viewed as frequency distributions. From this perspective, the distribution in one minute intervals is shown below.

<table>
<thead>
<tr>
<th>Minutes and Less</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes and less</td>
<td>2.9%</td>
</tr>
<tr>
<td>3 minutes and less</td>
<td>11.7%</td>
</tr>
<tr>
<td>4 minutes and less</td>
<td>20.5%</td>
</tr>
<tr>
<td>5 minutes and less</td>
<td>36.3%</td>
</tr>
<tr>
<td>6 minutes and less</td>
<td>61.7%</td>
</tr>
<tr>
<td>7 minutes and less</td>
<td>79.4%</td>
</tr>
<tr>
<td>8 minutes and less</td>
<td>91.1%</td>
</tr>
<tr>
<td>9 minutes and less</td>
<td>97.5%</td>
</tr>
<tr>
<td>10 minutes and less</td>
<td>97.5%</td>
</tr>
<tr>
<td>11 minutes and less</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Response time is comprised of three distinct components: dispatch, turnout and travel times. Dispatch time is the time it takes a dispatcher to gather the information needed to initiate a response and actually dispatch fire units. In 1995 this time averaged 1:14. Turnout time includes the time it takes for firefighters to move from their standby status to response, and the travel time is the time it takes to travel to the scene. These average 55 and 3:48 respectively. Total response time is illustrated on the next page.
A difficult response time related problem is measuring and controlling detection time. This is the time it takes someone to become aware of a fire and to notify the dispatch center, usually by the 911 telephone system. Post-fire investigation often finds that a considerable length of time elapses between the time someone detects a fire and when the dispatch center is notified. Delayed alarms have been contributing factors in many large loss fires as well as fire deaths. There are many reasons for this including delayed access to a telephone, assuming someone else has called, and even embarrassment. This is a serious problem that has defied easy solutions. In some cases, automatic alarm systems provide early and thus quicker response. The wide scale use of monitored alarm systems, however, has failed as a strategy to reduce response times due the high rate of false alarms.

After an alarm is received, it is processed by the dispatcher and the appropriate fire units are dispatched. Additionally, dispatchers transmit a “pre-alert” during the initial telephone conversation that notifies all fire units of an impending alarm. This information includes the type of incident and the address. This allows the fire units to begin the response before the actual dispatch thus reducing total response time.

2.3 Fire companies must be organized and function as units with adequate staffing to conduct effective firefighting operations. Firefighting resources must be distributed throughout the response area to provide a uniform level of response at any time.

Unit Function - Firefighting requires the coordinated actions of several interrelated functions to be successful. The major ones are: directly attacking the fire with hose lines, securing a water supply for attack personnel, searching for and removing victims, ventilating smoke from the structure, protecting property from further damage, controlling utilities, and overall incident management. The basic functional units are pumping engines that supply attack hose lines and truck and squad companies which provide rescue, ventilation and property conservation. All these operations must occur within a very short period of time and the ultimate success of a firefighting operation is often decided in the first 30 minutes of a fire.

Structure fires require the efforts of at least four companies (two engines, one truck and one squad) and an Incident Commander, for a total complement of 12-15 firefighters. In addition to this standard structure fire response, a multi-alarm system must be maintained to summon additional resources. A second alarm essentially doubles the initial alarm, adding three additional engine companies and an off-duty truck company. A third alarm brings all remaining on-duty units to a fire scene and initiates a general recall of all off-duty personnel. Multialarm incidents also recall all staff personnel to implement various portions of the incident management system. Finally, mutual aid can be requested from neighboring fire departments to cover
PFA fire stations, provide additional resources at a very large fire, or respond to other incidents in the jurisdiction.

**Staffing** - The basic unit of fire service delivery is the fire company. The number of firefighters assigned to a company is intended to maximize the efficiency of the unit and provide a reasonable level of safety for the firefighters within the context of the risk environment. The standard unit staffing for PFA is three for engines, four for the ladder truck and two for the squad. While higher staffing levels are more effective in accomplishing many tasks, the current cost/benefit relationship does not suggest higher levels. Staffing levels below this standard cause greatly decreased effectiveness and higher risk to firefighters.

Company staffing has always been, and will probably continue to be, a controversial issue. There is no question that firefighting tasks can be accomplished more effectively and safely with more people. This is especially evident when comparing lightly staffed companies of one and two, with heavily staffed companies of five and six. In low and moderate risk communities such as Fort Collins, three and four person companies are common and are generally considered the most cost-effective. The fire department survey conducted in 1993 found that the current PFA staffing levels are within the range found in similar jurisdictions.

**System Coverage** - The 1987 PFA Strategic Plan developed a new fire station location criteria. This criteria is described in another Planning Assumption but generally recommends that a fully staffed engine company be provided in the urban portion of a given response area when that area is approximately one half developed. From that point onward, that area is provided with fire protection 24 hours a day, 365 days a year. PFA experience has shown that urban residents and businesses expect a uniform level of fire protection and the “neighborhood” fire station represents that coverage. While the staffing level and equipment complement of a particular piece of apparatus or the services provided from an individual station may change, the basic function of the first response fire unit rarely changes.

There have been attempts in other jurisdictions to vary system and station coverage by time of day or by staffing levels. This is referred to as “flexible staffing.” In general this involves increasing resources during high demand times and reducing them during lower times. In its most extreme form it leaves some fire stations unoccupied. While this strategy is sometimes used as a way of providing partial coverage to newly developed or low density areas or during times of severe financial stress, there is no record of its longterm success in urban areas. Three more common variations of “flexible staffing” are seasonal staffing, position sharing, and system status management. Seasonal staffing is used commonly by wildland fire agencies that increase staff during the wildland fire season. Position sharing involves using on-duty firefighters assigned to regular fire companies for other duties in addition to emergency response. PFA has had one position on the truck company (one position per shift, a total of three personnel) that is shared with the Fire Prevention Bureau since the late 1970's. System status management shifts on-duty resources throughout the system in response to immediate call load. Ambulance services currently use this system to control response times. PFA also uses a form of system status management during extremely high call periods.
2.4 All firefighting personnel must be trained to a high degree of competency, and these skills must be maintained over the course of a firefighters career.

Firefighting is a physically intensive and highly skilled occupation. It requires a wide variety of cognitive and manipulative skills that entail high levels of physical activity. Because the number of structure fires in the Fort Collins area is relatively low, firefighters do not have the opportunity to exercise their skills frequently enough on real fires to maintain those skills. For this reason comprehensive and continuous individual and unit training is essential.

In the past, actual firefighter training was conducted in donated buildings which were burned under controlled circumstances. Because PFA did not have a designated training center, other individual and company skills were practiced in vacant commercial buildings, buildings under demolition, and CSU facilities. In recent years, this type of training has suffered due to the unavailability of surplus buildings, liability concerns, nuisance to the public and water conservation. The use of live fire training in vacant buildings has been almost completely discontinued due to environmental concerns and nuisance to the public. The new training facility completed in 1995 has alleviated many of these problems.

2.5 Adequate quantities of water at proper pressures must be provided at fires to support rapid and effective firefighting operations.

The amount of water needed to control a given fire is called fire flow. It is represented by an application rate of gallons per minute. Fire flows vary depending on the size of a building, its use, combustibility of contents, and construction type. Fire flow is also limited by the physical capability of firefighters to handle hose lines. The inability to generate and apply sufficient fire flow contributes to higher losses and fire spread beyond the building of origin.

The fire flow method used by PFA has been developed by the International Fire Code Institute. Fire flows range from a minimum of 1,000 gpm for moderate sized single family dwellings to 3,000 gpm for larger commercial buildings. While fire flows above this are possible, the actual application rate is compromised by the number of firefighters available to handle hose lines. Buildings requiring fire flows exceeding 2,000 gpm are generally equipped with fire sprinkler systems, which reduce the fire flow needed for the building. The fire flow required by the fire code adopted by the City and District is slightly less restrictive than the published code. These flows are shown in the table on the next page.
## CONSTRUCTION TYPE

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Fire flow for all new buildings in the urban area is provided from underground water supply systems. These systems have large capacity treatments systems, large water lines and fire hydrants. Fire flow is a component of the total water system capacity which is under the jurisdiction of one of several water purveyors that service the Fort Collins area. In cases where the existing fire flow is inadequate for new buildings, higher levels of fire resistive construction, smaller fire areas and fire sprinkler systems are used to reduce the fire flow needs of the building.

Providing adequate fire flow is often a significant cost to new development, especially in areas where there are no existing water distribution systems. Developers are primarily responsible for the installation cost of these systems under various formulas administered by the water purveyors. Where fire flow is a minor component of total water supply and where development is directly adjacent to large existing water distribution facilities, this is generally not an issue. However, when fire flow is a large component of water supply, or where development jumps over undeveloped property, these costs increase greatly. This puts developers and water purveyors in a position of incurring initial and future costs beyond those required for domestic service only. For these reasons PFA and the water purveyors must maintain a strong relationship.
2.6 New buildings must be built within the capabilities of local firefighting resources.

The size, height, construction type, occupancy and contents of a building contribute greatly to the size of a fire. The Uniform Building Code (1991 Edition) used by the City of Fort Collins and Larimer County allows buildings to be built well beyond the firefighting capabilities of most fire departments. Past analysis showed that PFA's firefighting capabilities were adequate to control fires in undivided 5,000 square foot areas in low and moderate risk buildings. Based on this analysis the building codes were amended in 1983 to restrict the size of potential undivided fire areas to smaller areas than found in the model code. These limitations are shown below. The basic 5,000 square foot area is increased when higher levels of fire resistive construction is used. Buildings with open areas must be provided with fire sprinkler protection.

MAXIMUM ALLOWABLE FIRE-CONTAINMENT AREA (SQUARE FEET)
CONSTRUCTION TYPE

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</table>

Controlling fire risk through building standards is not confined to the building itself. Other provisions in the Fire Code adopted by the City and Fire District require the installation of water supply systems and site access, as well as street networks. For special, or more severe risks, extensive fire protection systems are required. In high life safety risks such as nursing homes, hospitals and some group homes, even higher levels of built-in protection are required. Currently the City and Fire District have adopted the 1991 edition of the Uniform Fire Code with local amendments.

3.0 Rural and Wildland Firefighting Capabilities

3.1 Structure fires in rural areas sustain higher fire losses than comparable fires in urban areas due to long response times, inadequate water supplies and poor site access

The critical firefighting factors described in the urban firefighting planning assumption apply to rural firefighting, but other factors contribute to higher average fire losses. These include longer response time, the lack of a sustainable water supply, circuitous street networks and poor site access. For single family residences, the average property loss is four times higher in rural fires than in similar urban fires.

Response time to rural structure fires is the single largest factor that impacts firefighting effectiveness. Outside the urban area, response times average 10:10 minutes as compared to 5:57. This additional response time for the first arriving unit, coupled with even longer arrival times for support units allows fires to grow larger before firefighting operations can be initiated.
While the rural lifestyle offers many benefits, it also poses some risks; longer response times for all emergency services is one. This fact is recognized by fire insurance companies that impose higher rates on properties further than five miles from a fire station. While it is clear that longtime rural residents recognize that rural fire protection, including response times, cannot be as effective as in urban areas, it is not known what the expectations of newer rural residents are.

Once firefighters are on-scene, firefighting operations in rural areas are essentially the same as in urban areas, although a greater number of firefighters and apparatus must be devoted to water supply. This reduces the number of firefighters who can be applied directly to firefighting duties. Water supply must often be provided with tanker shuttles using the four water tenders available in the PFA system. This shuttle system is capable of providing a typical sustained fire flow of only 250 gpm. This is well below the flow needed for well developed fires. Additionally, long driveways and rural streets impose long distances over which equipment and hoses must be carried which further depletes the number of firefighters. In some cases, rural streets and bridges cannot support the weight of modern fire apparatus.

Like many public services, fire protection requires a certain density and number of calls for service to justify the expenditures necessary to maintain on-duty firefighting forces. For this reason, rural fire protection depends heavily on volunteer firefighters, or a combination of career and volunteer firefighters. Within PFA, rural fire response is provided from the outlying career stations in the urban area and three volunteer companies. A standard rural structure fire response is two engines and a squad company, an initial complement of at least eight (8) career firefighters. If necessary, the entire on-duty force can be applied to a rural fire the same as in urban areas. These career personnel are supplemented by volunteer firefighters in the Timnath and south Horsetooth areas. These two volunteer companies have been in place since the 1970’s. In 1994 a new volunteer company was organized in Redstone canyon with a primary responsibility of wildland firefighting (Volunteer Area Map).
There is no question that volunteer fire companies provide a valuable service. They can often arrive on scene before career units, begin scene assessment and sometimes initiate a fire attack. This is especially true of the Horsetooth company where the response time of the closest career company is in excess of 20 minutes to the far southwestern perimeter of the district. Their effectiveness, however, is heavily dependent on the number of active volunteers. In early 1994, membership fell so low as to endanger the viability of these companies. Since that time, the total number of volunteers has grown to over 30, significantly improving their ability to respond.

There are significant challenges to maintaining viable volunteer companies. The first is that it takes four to six active members per position to insure that there are enough members available at any given time to make an effective and safe response. This means that each volunteer company should have 12-18 members. It has proven difficult to recruit and maintain this number. When membership is low, it is not uncommon for a volunteer company to be unable to respond with enough personnel. Second, the competency levels needed to operate effectively and safely on all emergencies, but especially structure fires, have increased significantly in recent years, making it difficult for volunteers to keep up with training requirements. Finally, the physical capability and health status of all firefighters has become a major concern. It has proven difficult to monitor and regulate the health status and physical fitness of volunteers.

The building and fire codes applied to some rural and agricultural buildings are less stringent. Some non-residential buildings such as barns, large garages and similar storage buildings are classified as miscellaneous agricultural buildings (Group M)
by the Building Code and must meet fewer fire resistive requirements. It has also been PFA practice not to apply the standard water supply and access requirements of the Fire Code to these type of buildings. This is a practice common in many rural fire districts in apparent recognition of the uniqueness of the rural lifestyle and the difficulty of funding the water supply and street infrastructure at rural densities.

All new residential buildings in rural areas, including single family dwellings, must meet the current Building Code. Water supply and access must comply with the Fire Code and county development standards for new subdivisions and newly platted lots. In some cases rural dwellings have been equipped with residential fire sprinkler systems in lieu of standard water supply and access standards. Because the water supply and access requirements are applied to new lots only, dwellings can be built without adequate water supply or access on existing lots. New dwellings built on lots 35 acres and larger are also exempt from local water supply and access requirements. Many of the dwellings built in recent years in rural areas are constructed under these exemptions. It is unknown how many of these existing non-conforming lots exist in the fire district.

3.2 Wildland fires in the wildland interface that escape initial fire suppression efforts can endanger lives and cause extensive loss of property and resources.

Wildland fires are those that involve natural vegetation, sometimes covering large areas and threatening dwellings, agricultural facilities and similar buildings. Fires in the "wildland interface", where homes and similar buildings are interspersed with high concentrations of flammable vegetation, can cause the loss of many homes during a single fire. Unlike structure fires, which rarely last more than a few hours, wildland interface fires can last days and require campaign-type firefighting operations involving thousands of firefighters, hundreds of vehicles, and aircraft.

Like firefighting operations in structure fires, PFA's first objective is the protection of lives, followed by the preservation of property. PFA's first strategy is a rapid attack on a fire when it is still small. In cases where a fire grows too quickly or escapes initial firefighting efforts, this shifts to one of evacuation and protection of significant structures. PFA has been extremely fortunate in that it has not experienced a wildland interface fire which has caused the loss of multiple buildings. In 1992 and 1993 there were 41 fires in the urban wildland interface area. Of these, 20 were structure fires, 10 were vehicle fires and 11 were grass, brush and similar outdoor fires. These fires have accounted for a total estimated property loss of $83,025. Other similar jurisdictions, however, including Boulder and Colorado Springs, have experienced devastating fires of this kind in recent years. In addition to handling fires originating in its jurisdiction, PFA must also be prepared to defend against fires that may move into the district from other areas.

The primary focus of the wildland interface is in the foothills, generally west of Overland Trail and the hilly area north of LaPorte. This area includes steep slopes, high concentrations of brush, and some areas of dense forest. It encompasses approximately 73 square miles with 1116 homes (Wildland Interface map). An analysis of past county building permit records indicates that the number of homes in the foothills is increasing at an average rate of 50 homes per year. The greatest risk is in severe brush hazard areas. In these areas, a wildland fire will burn intensely and rapidly due to heavy concentrations of brush and steep slopes. There are approximately 561 homes in these areas. The majority of these homes are also
served by poor streets and inadequate water systems, making firefighting efforts extremely difficult. In addition to the foothills, there are other areas within the city and district of isolated wildland risk including undeveloped open areas, city and county open space, river beds, storm drainages, wetlands and similar natural areas.

There are several important factors that impact urban interface wildland fire risk. The greater the number of buildings and residences in the wildland hazard areas, the greater the potential for fires occurring and large property losses. Building construction and site features such as combustible roofing and siding, large eves, long narrow driveways, and little clearance between vegetation and buildings, have proven to be contributing factors to structure loss and fire spread. Buildings with combustible roofing materials are particularly prone to loss and may contribute to fire spread in higher density development. The lack of adequate water supply, narrow and steep roads, and long deadend streets also hamper firefighting efforts. Weather conditions, especially the high winds and low humidity common to northern Colorado, greatly exacerbate this already high risk.

Currently there are few planning and regulatory tools available to guide development in wildland areas that reduce fire risk in the long-term. While new public streets and private roads serving multiple homes must meet current development standards, existing roads and many private driveways are severely deficient. Water supplies are also completely unavailable or inadequate in many areas. Finally, there are no mechanisms to control combustible fuel load around and between structures. Although there are guidelines available to reduce the wildland fire risk, experience in other jurisdictions has shown that many residents are reluctant to take the precautions necessary or incur the cost to significantly reduce fire risk.
To provide wildland fire protection, PFA maintains several four-wheel drive firefighting vehicles and water supply tenders. These are located in both paid and volunteer stations and are staffed by on-duty personnel when needed. Many PFA firefighters have received wildland firefighting training and the companies located on the west side of the jurisdiction practice special wildland tactics. PFA also maintains a wildland strike team which has highly specialized training and equipment. This team operates under contract with the State and Federal Forest Services, and all costs incurred outside PFA are reimbursed by those agencies. Initial fire suppression actions are initiated by on-duty personnel. The wildland strike team would take longer to mobilize. Additionally, firefighting resources of the Larimer County Sheriffs Department, the Colorado State Forest Services and surrounding volunteer fire departments could also be called upon under existing mutual aid agreements.

4.0 Fire Prevention

Fire prevention is generally believed to be effective in reducing the number of fires and limiting deaths, injuries and property loss when they occur. Jurisdictions with higher levels of fire prevention often have fewer casualties and less property loss. Unfortunately, the effectiveness of fire prevention is difficult to demonstrate. This is not surprising because it is virtually impossible to determine when a fire or casualty would have occurred without a fire prevention intervention. Even with this lack of definitive data, the basic assumption of this plan is that fire prevention is an effective method of controlling risk, limiting human casualties, reducing property loss and enhancing firefighter safety.

Described below are specific planning assumptions addressing the major areas of fire prevention activity, inspection, fire protection systems, investigation and education. Even though research data is shallow, the best information or indicators available are provided.

4.1 Periodic fire prevention inspections reduce fire risk by identifying and correcting fire hazards, providing educational information and familiarizing firefighters with buildings.

Fire prevention inspections have been the mainstay of fire prevention efforts for many years. Their stated purpose is to identify and correct fire hazards. Secondary purposes are education and building familiarization. Like most other fire jurisdictions, the focus of PFA's inspection programs has been businesses, industries, public facilities and multifamily residences. In general, single family dwellings and the interior of multifamily units are not included in compulsory inspection programs. PFA firefighters inspect all businesses at least once every three years with buildings of higher fire and life safety risk inspected more often.

The effectiveness of these inspections is indicated in two ways. The first is that fires that are caused by hazards that would have been detected by a routine fire inspection in buildings subject to inspections are rare. When PFA began wide scale inspections in the late 1980's, an average of 1.6 hazards were noted for each inspection. This declined to .91 in 1988. Additionally a review of the hazards cited during this period exhibited a distinct trend towards less serious hazards. This indicator is strengthened further by an upward shift in the number of hazards cited when approximately 60% of all inspections were moved from an annual schedule to once every three years in 1989 (Inspection Graph). This indicates that more frequent inspections reduce fire
hazards. While the number of hazards cited has increased, they continue to be less serious, and no appreciable increase in fires or loss has occurred. The graph clearly shows that correction rates are improving steadily, a further indicator that the hazards cited are less serious and more easily corrected.

4.2 Properly designed, installed and maintained fire protection systems and features reduce the potential for deaths, injuries and property loss.

In order to be effective, fire protection systems and features must be designed, installed and maintained properly. It has been a historic responsibility of fire prevention to insure that this occurs through plan review, installation inspection and maintenance monitoring. Fire prevention efforts in this area are closely related to fire protection engineering, architecture and various building trades.

The maintenance of fire protection equipment is critical to the total fire protection system. In many cases, especially with fire sprinklers, manual firefighting effectiveness is dependent on their proper operation. For all fire protection systems except sprinklers, fire system maintenance is the responsibility of a building owner, with actual inspections conducted by private contractors. Because fire sprinklers are so important to the community's fire protection, PFA is directly involved by providing high quality and consistent inspections. In 1993 this program provided over 700 inspections in 354 properties. It is funded by direct user fees which generated $27,478. Since the inception of this program there have been no sprinkler failures in inspected properties, and the problems associated with sprinkler systems in other communities (freezings, equipment failures, false alarms, etc.) have been greatly reduced.

4.3 Determining the cause of fires can prevent future fires.

The vast majority of all fires are caused by some human act or omission, or the failure of some piece of equipment, consumer product or construction feature. For this reason, determining fire causes is instrumental in preventing future fires. Identifying electrical and heating equipment that are susceptible to starting fires are examples of successful fire investigation. Information gained by investigations is
reflected in safer consumer products and better construction methods. Likewise, information gained on human behavior during fires is frequently used in designing education programs.

An important aspect of fire investigation is the apprehension of people who intentionally set fires. This is arson investigation and is often recognized as the predominate fire investigation function. The fire prevention significance of arson investigation is that fire setters who are incarcerated or are otherwise treated cannot start new fires. Arson is a serious problem in many areas of the country, although sustained arson trends have not been evident in the Fort Collins area. Individual arson fires, however, have caused major losses and six deaths in recent years. In both fatal fires, the people responsible are currently serving sentences in the Colorado State Penitentiary.

A serious arson related problem in the Fort Collins area is juvenile fire setting. Children playing with fire or intentionally setting fires are responsible for many fires annually. This behavior has been responsible for three fire deaths in recent years (1989 and 1993). In the last two years (1992-1993) 31 fires have been attributed to children playing with fire for a total estimated property loss of $65,255, eight injuries and one death. During this period, children playing with fire accounted for an average loss per fire of $2,105 and .25 injuries per fire. During this same period, all other incendiary and suspicious fires accounted for an average loss of $654 and .008 injuries per fire. While identification and treatment programs are in place, juvenile fire setting is compounded by complex social, psychological and family conditions. For these reasons, it has proven to be a very difficult problem to address.

**4.4 Citizens with higher levels of knowledge of fire survival and prevention have a lower potential for casualty or loss.**

Education of citizens in fire prevention and survival has become a major component of fire prevention efforts. Fire prevention education seeks to teach observable skills that enhance a person’s ability to perceive danger and take appropriate actions. Education programs also teach people to recognize fire hazards so that they can be corrected before they cause a fire. Most fire education is targeted at children, under the assumption that skills taught in childhood are more likely to be used successfully throughout life. Because so many poor fire behaviors are rooted in past learning and experience, changing adult fire safety behavior has been difficult to accomplish. In recent years an average of 5,000 people have been taught fire prevention and survival skills annually through PFAs education programs.

The 1993 Citizen Satisfaction Survey identified education as the most important area of needed improvement of all PFAs services. Respondents recognized the favorable impact of children’s education but desired more adult and business opportunities. This indicates that the importance of this assumption is recognized by citizens.

**5.0 Built-in Fire Protection**

**5.1 Structures equipped with built-in fire protection features and systems are less likely to be involved in serious fires. They also lessen the demands on firefighting forces and improve firefighter safety. Automatic fire sprinklers are the single most effective system available in controlling structure fires before flashover occurs.**
Built-in fire protection features such as automatic sprinklers, fire alarm systems, special hazard protection systems, fire walls and fire resistive construction are important components of a community's total fire protection system. When these features function properly, the potential for loss of life, injuries and property loss is reduced. In addition, fires that are controlled in their early stages or are confined to smaller areas require fewer firefighting resources committed to fire suppression than would otherwise be needed.

Automatic fire sprinkler systems are the single most effective fire protection system for reducing the potential for human casualties and property loss in structures. Recent data published by the National Fire Protection Association indicates that the chances of a person dying in a building equipped with sprinklers is one to two thirds lower than in non-sprinkler equipped buildings. Likewise, property loss is one half to two thirds lower. From a life safety perspective, fire sprinklers are particularly effective in preventing multiple death fires. Occupancies with higher casualty rates such as health care, public assembly, and motels and hotels benefit the most. Residential fire sprinklers installed in single family dwellings and multifamily buildings where the vast majority of fire deaths occur, can reduce human casualty potential 82% when combined with the smoke detectors required by current building codes.

Locally fire sprinkler performance has been tracked since 1981, after the adoption of PFA's first Master Plan. During this 13 year period, there have been 20 instances where there were sprinklers in the area of fire origin which should have controlled the fire. In all cases the sprinkler system operated properly, confining the fire to the immediate area of origin. In none of these fires were there any serious injuries and the property loss was small in relation to the loss that would have occurred if only manual firefighting forces were used to control the fire.

Because of the superior performance of sprinkler systems, the model building and fire codes, the National Fire Protection Association and many federal housing standards require higher levels of sprinkler protection in new construction. Both PFA's 1980 Master Plan and 1987 Strategic Plan recognized this effectiveness, and the following local ordinances and programs have been implemented to increase sprinkler protection.

- The Uniform Building Code in the city was amended in 1978 to require sprinkler protection in all new buildings four or more stories, or 55' in height.
- The Uniform Building Code was amended in the city and county in 1983 to reduce the size of open areas in new buildings. These amendments limit open areas to 5,000 to 10,000 square feet, depending on occupancy use and construction method.
- A special ordinance was adopted in the city in 1984 requiring that all existing highrise buildings have sprinkler systems installed or their fire resistive compartmentalization improved. Six existing highrise buildings, including the two CSU highrise residence halls, were equipped with sprinklers, and two were compartmentalized.
- Residential sprinkler systems were included in the Fire Code in 1986 as an option to standard development criteria for water supply and access.
- The Uniform Building Code was amended in 1990 to require sprinkler systems in all new group homes for the elderly and developmentally disabled with six or more residents.
These ordinances and programs, in addition to the sprinkler requirements in the model codes, have contributed to 2,523,192 square feet of new commercial construction being protected with sprinkler systems since 1988, 62.3% of the total. Additionally, over 150 new homes have been equipped with residential sprinklers and several group homes have been retrofitted.

**Impediments to Fire Sprinkler Use**

Even though fire sprinkler systems are unquestionably effective in controlling fire risk, there are two significant impediments to their widespread use. The first is a set of “myths” that project sprinklers in an unfavorable light and the second is installation cost.

Fire sprinkler “myths” include such beliefs as these: all sprinklers activate at the same time, sprinklers are activated by smoke or small flames, sprinklers cause greater water damage than a fire itself, sprinklers are ineffective as a life-safety device, all sprinklers are ugly and detract from the architectural design of the building, and sprinklers require water supply greater than manual hoselines. None of these myths are true but they are nevertheless believed by the general public, architects, engineers, elected officials and even some firefighters. It is an unfortunate but true fact that sprinkler systems are portrayed by television and movies with all these myths. A major problem in evaluating the success of sprinklers is that the vast majority of successful activations result in such small fires that they are not reported in the media or national data bases.

In contrast to the sprinkler myths, the issue of installation cost is real and significant. Sprinkler installation in new commercial construction averages $1.45 per square foot of building area in Colorado and $96 locally. National statistics indicate that sprinklers can add 1%-2% to the cost of a new building. Unusual applications or installation problems sometimes push these costs higher, and sprinkler opponents often focus on these unusual high costs. Although it can be argued that the installation cost is small compared to the loss that would be sustained from a serious fire, any cost which does not enhance the business productivity of a building is suspect.

Because sprinklers are so effective, the model building codes, as well as local ordinances, allow the substitution of sprinklers for other construction and site design features. These include less fire resistive materials, larger open areas, greater height, lower water supply for manual firefighting, less restrictive access and fewer fire hydrants. These code allowances can reduce the installation cost, and in some cases, buildings can be built with sprinklers for less than without them.

### 6.0 Emergency Medical Services

Since 1977 PFA has been a partner with Poudre Valley Hospital in providing Emergency Medical Services to the citizens of the Fort Collins area. PFA’s primary responsibilities in this system are first response Basic Life Support (BLS) and rescue. PVT’s responsibilities are Paramedic Advanced Life Support (ALS) and ambulance transportation.

The EMS system, in general, and PFA’s involvement, specifically, are driven by three assumptions. These are the EMS system’s six primary functions, response time and personnel commitment. A more detailed description of the overall EMS system as it existed in early 1994 is included as Appendix D.
6.1 The total EMS system must include the six primary functions of pre-incident education, response, patient assessment and stabilization, on-scene patient treatment, transportation, and rescue.

Shown below is a model that illustrates these six functions. Although in most cases these functions take place linearly, patient assessment and stabilization, on-scene patient treatment and rescue often take place simultaneously.

PFA's responsibility in these functions involves first response, patient assessment and stabilization (including CPR and AED) and, to a smaller extent, assisting with on-scene treatment and transportation. Rescue is solely a PFA responsibility within its jurisdiction. PVH's responsibility involves on-scene treatment and transportation. Pre-incident education is provided to some extent through fire prevention education programs but primarily through other community organizations such as the American Red Cross, American Heart Association, Boy and Girl Scouts, service clubs and similar organizations.

6.2 The EMS system must respond in as short a time as possible, generally in less than six (6) minutes for BLS and less than nine (9) minutes for ALS from the time of system notification.

The benchmark used in EMS to determine response time parameters is cardiac arrest. The reason this condition is used is because the time between an arrest, the inability of the heart to circulate oxygenated blood, and irreversible brain damage is well documented. It is generally recognized that six (6) to ten (10) minutes is the critical time window in which EMS can be effective.

A number of studies indicate that effective cardiac arrest treatment in the field must include three components. These are performing Cardio Pulmonary Resuscitation (CPR), delivering a defibrillation shock, and administering Advanced Life Support (ALS). These studies predict patient survival rates of between 0% and 35% depending on the time intervals these three treatments are delivered. These studies also identify a fourth factor. This is the actions citizens take in recognizing the onset of cardiac arrest and quickly summoning EMS help. When this is done rapidly and when citizens start CPR before the arrival of EMS responders, survival rates improve. This is perhaps the most difficult factor to measure because it is very difficult to determine the length of time it takes to summon emergency assistance and to evaluate the effectiveness of citizen actions.

These studies classify EMS systems into three categories: those providing BLS and CPR only, with defibrillation and ALS exceeding 20 minutes; those providing a combination of early CPR and defibrillation followed by ALS; and those providing a combined administration of CPR, defibrillation and ALS. Predictably, the best survival rates of approximately 30% are produced by the last system. The model
indicates that this system should provide a BLS response time of 4 minutes, CPR within 5 minutes, defibrillation within 6 minutes and an ALS response time of 5 minutes and ALS within 8 minutes. This would require almost simultaneous arrival of both BLS and ALS personnel.

The EMS system in Fort Collins follows the second model, with PFA providing BLS, CPR and defibrillation. Poudre Valley Hospital Ambulance Service provides primarily ALS. The best survival rates for this type of system appear to be a BLS response time of 4 minutes, CPR within 5 minutes, defibrillation within 6 minutes and ALS response time of 10 minutes with ALS provided in 12 minutes. An analysis of EMS response times in 1994 shows that the first unit capable of CPR and defibrillation was 5:33 minutes with a CPR time of approximately 6:33 minutes and defibrillation time of 7:33 minutes. The average response time of the PVH ambulance was 6:8 minutes, with ALS administered in approximately 9:8 minutes. At the time of this research, local survival rates have not been evaluated using the same methodologies as the studies. Extrapolating the data in the studies, however, the local EMS system should produce a survival rate of 18% to 22%. The local system performance is compared to the various system combinations in the studies in the following table.

<table>
<thead>
<tr>
<th></th>
<th>BLS Response Time</th>
<th>CPR</th>
<th>AED</th>
<th>ALS Response Time</th>
<th>ALS</th>
<th>Predicted Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best</td>
<td>4 Min.</td>
<td>5 Min.</td>
<td>6 Min.</td>
<td>5 Min.</td>
<td>8 Min.</td>
<td>30%</td>
</tr>
<tr>
<td>BLS/ALS</td>
<td>3 Min.</td>
<td>4 Min.</td>
<td>5 Min.</td>
<td>7 Min.</td>
<td>10 min.</td>
<td>24%</td>
</tr>
<tr>
<td>BLS/Defib/ALS</td>
<td>4 Min.</td>
<td>5 Min.</td>
<td>6 Min.</td>
<td>9 Min.</td>
<td>12 Min.</td>
<td>12% to 22%</td>
</tr>
<tr>
<td>PFA/PVH</td>
<td>5.33 Min.</td>
<td>6.33 Min.</td>
<td>7.33 Min.</td>
<td>6.8 Min.</td>
<td>9.8 Min.</td>
<td>18% to 22%</td>
</tr>
<tr>
<td>BLS/Defib.</td>
<td>4 Min.</td>
<td>5 Min.</td>
<td>6 Min.</td>
<td>20 Min.</td>
<td>20 + Min.</td>
<td>7%</td>
</tr>
<tr>
<td>BLS</td>
<td>4 Min.</td>
<td>5 Min.</td>
<td>6 Min.</td>
<td>20 Min.</td>
<td>20 + Min.</td>
<td>0%</td>
</tr>
</tbody>
</table>

This analysis indicates that local BLS response times, CPR and defibrillation application are approximately one minute longer than the models indicate provide the best survival rates. The ALS response and treatment times are approximately two minutes shorter. A more detailed evaluation of the data in the studies indicates that a one minute decrease in BLS response time only would produce a 2% to 3% potential improvement in survival rate. While future EMS system design improvements may focus on reducing BLS response times, all the system components should be considered. Improving citizen knowledge, especially in initiating CPR earlier, and quicker ALS treatments are also possibilities. The best and most cost effective approach may be a combination of several adjustments that may net better survival rates than any one by itself.

6.3 The EMS system must be able to respond with a standard complement of trained personnel to provide quality patient care.

It is generally recognized that it takes four to six (4-6) trained EMS personnel to provide all six primary functions for the benchmark response of cardiac arrest. Currently these personnel are provided by PFA and PVH. PFA provides the 2-4 personnel on the first response fire apparatus and PVH provides a Paramedic or Paramedic/EMT team of two.

Both BLS/AED and ALS require high levels of training. PFA BLS training includes
EMT-D with automatic external defibrillation and Basic Trauma Life Support (BTLS). PVH ALS training is EMT-P (Paramedic) including cardiac monitoring and defibrillation, intervenous fluid replacement, drug therapy and similar advanced prehospital medical treatments. PFA provides at least one EMT-D on each fire company. Currently 93 of 106 PFA emergency response personnel are EMT-D certified. PFA's cost of providing EMS above fire protection responsibilities was approximately $252,000 in 1993.

7.0 Hazardous Materials

Hazardous materials response and risk reduction has been the responsibility of Poudre Fire Authority since the early 1980's and was developed as a Strategic Program in the 1987 Plan. The following planning assumptions are derived from past PFA actions and the implementation of the Hazardous Materials Risk Reduction Program.

7.1 PFA will continue to maintain a high quality hazardous material response function in relation to the risk presented in the community.

PFA has been the primary emergency Hazardous Material Response Team (HMRT) for the City of Fort Collins, the Poudre Valley Fire Protection District, northern Larimer County and Colorado State University since 1980. This team provides a multitiered response capability sufficient to address small and medium hazardous material releases and similar emergency incidents. It also has sufficient capability to initiate containment and mitigation actions for large scale incidents and serves as the primary coordinating agency for large scale incidents requiring a multiagency response.

The PFA HMRT responds to 215 emergency hazardous materials incidents annually. These incidents represent a rate of 1.2 emergency hazardous materials incidents per 1000 population. This plan assumes that this rate will continue into the foreseeable future.

7.2 PFA will continue to maintain a hazardous materials data base that provides information for emergency responders to effectively and safely operate at hazardous materials incidents.

In 1990 PFA implemented a Hazardous Materials Management Plan (HMMP) system. This requires that all businesses that use or store certain quantities of hazardous materials prepare a Hazardous Materials Management Plan and submit that plan annually to PFA. This system is compatible with the requirements of SARA Title III of the National Resource Conservation and Recovery Act of 1986. At this time, only the submittal portion of this program has been implemented. Larimer County continues to be the jurisdiction responsible for the public information portion of SARA Title III.

7.3 PFA will continue to be the lead agency in insuring that all hazardous materials facilities are constructed and operated in conformance with applicable fire codes, building codes and local ordinances.

In 1991 the City of Fort Collins, Larimer County and the Poudre Valley Fire District adopted the hazardous materials provisions of the 1991 Uniform Fire and Building
Codes. These codes contain extensive construction and operation requirements for hazardous materials facilities as well as special containment, treatment and fire extinguishing systems. Additionally, the City of Fort Collins has adopted special landuse ordinances that require that a Hazardous Materials Impact Analysis (HMIA) be prepared on all new hazardous materials facilities. PFA is also responsible for ensuring that all hazardous materials facilities are operated in conformance with applicable fire codes and local ordinances through its fire prevention inspection program.

8.0 Service Expansion

8.1 New fire stations and engine companies should be provided in developing areas when the urban portion of a projected service area is approximately one half developed.

Providing fire protection, EMS, and related emergency services to newly developed areas has been a major challenge for many years. Since 1975 the total fire protection system has doubled, from four career fire stations to eight, with a corresponding career staffing increase from 68 to 135. In the 1987 Strategic Plan, a Resource Implementation Criteria was adopted. This model located new fire stations in accordance with four factors - emergency response criteria, workload constraints, opportunity benefits and system impact.

This model proposed that new fire stations (engine companies) be provided in new areas when the urban portion of an area to be served is approximately one half developed. Based on the past 20 years, this equates to a population base of 10,000-15,000 with an estimated emergency call load of 400-500 incidents per year. Both Fire Station Four (1980) and Fire Station Ten (1995) have been implemented under this criteria. Station Four currently serves a population of approximately 23,000 and responded to 799 incidents in 1993 within its area. When Station Ten opened in May 1995, it served approximately 13,000 residents and responded to approximately 500 emergency incidents in its response area.

The emergency response criteria is generally recognized as the most important. Included is response time, support time and risk environment. As discussed previously in the Firefighting Capabilities and EMS planning assumptions, a maximum average response time of six minutes is considered optimal. When Fire Station Ten opened in 1995, approximately 320 of the estimated 500 responses were within six minutes or less.

As important as the first responding engine response time is, the response time of support units must also be considered. The addition of Station Ten and Squad Five reduce this response time for additional resources, although not within the same parameters as the central area of the city. At this time, there is no specific criteria for the addition of support units such as new truck and squad companies or shift battalion chiefs. The fire department survey of similar jurisdictions found that PFA has the highest population served by Truck and Squad companies.

The risk environment of the geographic area served describes the type, size and frequency of anticipated fires. As discussed in a previous planning assumption, the overall risk environment of the entire jurisdiction is moderate to low. Station Four serves almost exclusively residential properties with low risk commercial buildings in the urban area. Station Ten, however, serves a more diverse risk environment.
including large industrial buildings. The lower risk profile of Station Four contributed to the initial assignment of fewer firefighters when it first opened in 1980. Staffing at that station was increased to standard levels in 1988. The risk environment is heavily influenced by large buildings with high fire flows and more intense manual firefighting needs. The increase in fire sprinkler protection in these type of buildings helps keep the risk environment within existing firefighting capabilities.

9.0 Community Growth

Growth in terms of population, housing units, commercial buildings, businesses and government facilities has been one of the defining characteristics of the Fort Collins area for many years. In population alone, the area has grown from approximately 25,000 in the 1960’s to well over 100,000 in the mid-1990’s. The City of Fort Collins itself has grown from 10 square miles to 42, with suburban development extending beyond city boundaries. During this time, the fire services have expanded from one fire station in downtown Fort Collins to eight within the urban area.

This planning assumption describes two aspects of growth that impact fire and emergency services, population growth and development patterns. As this plan is being prepared, the issue of community growth is under scrutiny in both the City of Fort Collins and Larimer County. For this reason, it is difficult to make definitive projections of the future. However, the underlying assumption concerning community growth is that growth will continue to be a defining characteristic of the Fort Collins area but that the rate of growth and development patterns may vary due to the combination of political and market forces.

9.1 Population growth will continue within the foreseeable future as it has in the recent past.

The population of the Fort Collins area has increased relatively constantly for many years. The best population statistics are compiled by the City of Fort Collins Planning Department. Because the majority of the population served by PFA is within the city this data is considered the most relevant. In 1994 the total PFA population was estimated at 125,000, with 95,889 within the city (76.7%). Shown below is city population data over the last two decades in five year increments.

**FORT COLLINS POPULATION 1970 - 1994**

<table>
<thead>
<tr>
<th>Year</th>
<th>US Census</th>
<th>New residential building permits</th>
<th>City population estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>43,337</td>
<td>634</td>
<td>43,337</td>
</tr>
<tr>
<td>1975</td>
<td>--</td>
<td>444</td>
<td>53,794</td>
</tr>
<tr>
<td>1980</td>
<td>65,092</td>
<td>991</td>
<td>65,092</td>
</tr>
<tr>
<td>1985</td>
<td>--</td>
<td>1493</td>
<td>77,145</td>
</tr>
<tr>
<td>1990</td>
<td>87,758</td>
<td>728</td>
<td>87,758</td>
</tr>
<tr>
<td>1994</td>
<td>--</td>
<td>--</td>
<td>95,889</td>
</tr>
</tbody>
</table>

The population within the fire district is more difficult to assess because population statistics are compiled countywide. However, an analysis of current PFA maps and 1990 census data indicates that the current population of the fire district is 29,249. The greatest population growth in the fire district occurred in the late 1960’s and 1970’s with the development of several subdivisions and mobile home parks. Since 1987 an average of 150 dwelling units have been constructed in the district, contrib-
uting a population increase of 450 annually. Overall, this data indicates an average population growth rate of 2685 new residents per year over this 23 year period.

Based on the population data of the past, it is reasonable to expect that the population of the Fort Collins area will continue to increase an average of 2685 residents per year. Using this information the following table shows the potential population of PFA if the population growth follows similar patterns.

<table>
<thead>
<tr>
<th>Year</th>
<th>PFA estimated population</th>
<th>City estimated population</th>
<th>Fire district estimated population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>125,138</td>
<td>95,889</td>
<td>29,249</td>
</tr>
<tr>
<td>2000</td>
<td>141,338</td>
<td>109,389</td>
<td>31,949</td>
</tr>
<tr>
<td>2005</td>
<td>154,838</td>
<td>120,659</td>
<td>34,199</td>
</tr>
<tr>
<td>2010</td>
<td>168,338</td>
<td>131,889</td>
<td>36,449</td>
</tr>
<tr>
<td>2015</td>
<td>181,838</td>
<td>143,139</td>
<td>38,699</td>
</tr>
<tr>
<td>2020</td>
<td>195,338</td>
<td>154,381</td>
<td>40,949</td>
</tr>
</tbody>
</table>

These estimates must be qualified because of the highly speculative nature of future population growth estimates. Population growth is influenced by many factors beyond local conditions, and local consensus on growth management may change over time. From a fire protection perspective, the total population is not as important as the development patterns of that population within the jurisdictional area.

9.2 **Suburban type growth will continue predominately in the southeastern and southwestern portions of the urban area at densities between three and four dwelling units per acre. Development will also occur in the northern portions of the area, but at lower rates.**

Since the late-1970's urban and suburban development has been managed through a cooperative agreement between the City of Fort Collins and Larimer County. This is called the Fort Collins Urban Growth Area (UGA) and requires that development of suburban/urban densities must occur within this area and be annexed to the city. Development outside this area is intended to be at rural densities. The intent of this management tool is to maximize the effectiveness of urban services and reduce the negative impacts of urban sprawl. For fire protection planning, the most important aspects of development patterns are the location of new development and residential densities.

**Location of New Development**

Within the scope of this plan it is assumed that the location of new development will continue in the same patterns as the past 20 years, primarily in the southeast and southwest portions of the UGA. Over the past two decades 85% (17096) of all new dwelling units built within the city were south of Prospect Road. In the fire district, the greater number of new homes have been built in three subdivisions in the southwest corner of the UGA (Springfield, Taft Canyon and Westridge).

Continued development in the north and northeast is expected to continue but at rates slower than the south. While some large scale higher density development has been proposed, residential development in this area has tended to be of a lower density, semi-rural nature. Commercial development, especially in the North College corridor, has been slow. The City, however, has recently adopted a new
North College Corridor Plan which seeks to encourage growth in this area. Major improvements to the Poudre River bridge on College Avenue were completed in 1995 and a large grocery store and related retail complex are under construction.

An indication of residential development in the near future is the approval of new dwelling units in 1992-1993. These are the units that are under construction now or will be within the immediate future. During this period, 3,549 new units were approved in subdivisions and multifamily projects (3402 in the city and 144 in the district). Repeating the pattern of previous years, 90% will be south of Prospect Road with 43% south of Horsetooth Road. A smaller percentage, approximately 5.9%, are located in the northeast portion of the UGA. Outside the UGA, approximately 51 residential units are built annually, predominately on existing platted lots, 35 acre or larger lots, or Minor Residential Developments approved by the county in the late 1980s and early 1990s.

Like residential development, new commercial construction has occurred predominately in the southern portions of the UGA. Approximately 66% of the 4.1 million square feet of new commercial building in the last five years has been south of Prospect Road. The largest single area of commercial building activity has been in the area two miles south of Horsetooth Road, east of College Avenue, including the Harmony Road corridor. The majority of the remaining 33% has occurred in the existing industrial parks on Highway 14 and east Prospect Road and in the Center for Advanced Technology.

In the long-term, well beyond the 10 year scope of this plan, suburban development may occur along the I-25 corridor from the Anheuser Busch brewery on the north to Harmony Road on the south. The city has annexed several parcels of land along and east of I-25 and both the city and county have zoned this area for commercial and industrial development. Within the urban area are many undeveloped parcels that could be developed. The timing of this infill development is not known, but it is reasonable to expect that over time they will be developed.

**Residential Density**

Residential density is an important factor in fire protection planning because it directly affects the cost of providing services. Because response time is such a critical criteria in defining service levels, the best economies of scale can be realized with higher numbers of residents served. Described in Appendix E is a hypothetical model which illustrates the relationship between suburban densities and per capita costs. This model predicts that per capita costs increase 77%, from $44 to $78, as densities decline between 4.5 and 2.5 dwellings per acre. This indicates that higher suburban densities support more cost-effective services.

Using this model to predict actual fire protection costs is difficult, because many other factors must be considered. Few new development areas would be as "pure" as the model would prefer. PFA provides rural fire protection from new fire stations, and fire companies in new areas also supplement firefighting forces in older areas with higher risk profiles. This model does, however, support current land use policies that favor higher densities, seeking to maximize the cost-effectiveness of public services and infrastructure. It also reflects the development history in fire station areas four and five where new development has occurred in recent years. Densities in the developed portions of these response areas have been 3 du/ac and 3.7 du/ac respectively. Although PFA's total per capita costs ($67-1993) exceed the
model's predictions of $65 to $57 at these densities, it includes the total risk profile of the entire community. Taken together, the model and actual history predict that residential densities of at least 3 du/ac acre are needed to keep per capita cost at current levels. Densities below this would cause upward pressure on these costs if the same service levels and response times were maintained.

10.0 Incident Rates

10.1 The number of emergencies and non-emergencies, except fires, will continue to increase at rates faster than the increase in population. Fires will continue at current rates and may decline.

In the 23 year period since 1973, PFA has experienced a 437% increase in incidents, while the population served has increased by only 120%. Even though EMS responses, which began in 1977, contributed greatly to this increase, it is still a pronounced phenomenon. This is not unique to PFA; increases of this magnitude are common in all growing metropolitan areas. While there is no definitive information on why this occurs, it is reasonable to expect that greater residential densities, wider economic diversity and more urban congestion contribute to these increasing rates.

Incident rates are represented in four primary categories. The first is total incidents. The second is fires, including structure fires, vehicle fires and various types of outside fires. The third is medical emergencies, which in recent years have accounted for over 60% of all responses. The final category is non-fire/EMS incidents. These include false alarms, good intent calls, service calls, hazardous conditions and other miscellaneous incidents. The table below shows the number of incidents in each category in 1994, their rate per 1000 population and the percentage of total incidents.

**1995 INCIDENT RATES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Rate per 1000 Pop.</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents</td>
<td>7253</td>
<td>57.9</td>
<td></td>
</tr>
<tr>
<td>Fires</td>
<td>613</td>
<td>4.9</td>
<td>8.4%</td>
</tr>
<tr>
<td>Structures</td>
<td>181</td>
<td>1.45</td>
<td>2.4%</td>
</tr>
<tr>
<td>Vehicle</td>
<td>106</td>
<td>.85</td>
<td>1.6%</td>
</tr>
<tr>
<td>Outside</td>
<td>313</td>
<td>2.5</td>
<td>4.3%</td>
</tr>
<tr>
<td>Explosion</td>
<td>13</td>
<td>.1</td>
<td>.1</td>
</tr>
<tr>
<td>Medical emergencies</td>
<td>4556</td>
<td>36.4</td>
<td>62.9%</td>
</tr>
<tr>
<td>Non-fire/EMS</td>
<td>2084</td>
<td>16.6</td>
<td>28.7%</td>
</tr>
<tr>
<td>False alarms</td>
<td>734</td>
<td>5.9</td>
<td>10.1%</td>
</tr>
<tr>
<td>Service calls</td>
<td>479</td>
<td>3.8</td>
<td>6.6%</td>
</tr>
<tr>
<td>Good intent calls</td>
<td>410</td>
<td>3.3</td>
<td>5.6%</td>
</tr>
<tr>
<td>Hazardous conditions</td>
<td>319</td>
<td>2.5</td>
<td>4.4%</td>
</tr>
<tr>
<td>Other</td>
<td>142</td>
<td>1.1</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

Fire rates have been relatively static in recent years. This is not unique to the Fort Collins area. The number of fires has been decreasing gradually for many years. Although there is no single factor that has been identified, it can be surmised that greater numbers of fire-safe consumer products, less smoking, better construction methods, better electrical and mechanical equipment, and more aggressive fire prevention efforts all contribute to this favorable trend.

Recent analysis indicates that the rate of fires is lower in new development, and that
these rates vary due to the mix of residential, commercial, transportation and wildland risks protected. This data indicates that fire rates in predominately new suburban residential areas may be less than half that of the entire jurisdiction (1.8 vs. 4 fires per 1,000 population). This in itself may explain some of the decrease in fires, as residents in new areas impact total fire statistics. As the ability to compile and analyze data improves, this relationship may impact future program planning. Within the scope of this plan, this planning assumption uses the more conservative, jurisdiction-wide fire rates.

Non-fire/EMS incidents have increased faster than the population, but less so than medical emergencies. Some of this increase may be due to the reclassification of some incidents that may have been recorded as fires in the past. Beginning in 1992 a new classification of Hazardous Condition was added. These include various electrical, mechanical and water hazards as well as spills of hazardous materials.

A major difficulty of past plans has been the inability to accurately predict future incident rates. In both past plans population growth was overestimated and incident rates underestimated. For this reason this planning assumption does not attempt to make definitive predictions on an annual basis. Shown below is an estimate of potential incident rates and growth in two five-year increments, the likely time frame of this plan. These estimates are based on the experience of other cities and fire jurisdictions that have followed similar growth patterns, as well as past local experience. These estimates are also based on PFA continuing to provide current services in a similar manner. It cannot be emphasized enough that these estimates are highly speculative and should be viewed with the knowledge that many factors impact incident rates and that it unlikely that all aspects of service provision will remain the same in the future.

### PROJECTED INCIDENT RATES

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Total Incidents</th>
<th>Rate</th>
<th>Fires</th>
<th>Rate</th>
<th>Medical Emergencies</th>
<th>Rate</th>
<th>Non-fire/EMS</th>
<th>Rate</th>
</tr>
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<tbody>
<tr>
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<td>125,138</td>
<td>7253</td>
<td>58</td>
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<td>4556</td>
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<td>78</td>
<td>774</td>
<td>5</td>
<td>7896</td>
<td>51</td>
<td>3406</td>
<td>22</td>
</tr>
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</table>

### 11.0 REVENUE

**11.1 PFA will continue to receive sufficient revenue to provide existing service levels and to meet service needs. However, due to a modestly reduced rate of revenue growth, the time line for implementation of new services may be lengthened.**

In the 1987 Strategic Plan, the conceptual framework for the extension of services was that there would be a reasonably close relationship between the need for new services and the revenue produced by the development causing the service demands. Indeed, in the eight years since that plan was drafted, PFA received sufficient revenue to implement the strategic programs envisioned for the community's emergency service needs.

However, adoption of a statewide government revenue limitation measure by Colorado's voters in 1992 has altered this relationship. As will be demonstrated below, this limitation, Article 10, Section 20 (A.10S.20) of the State Constitution,
may slightly reduce revenue growth and thereby slow the provision of new services. This reduction will not prevent the provision of high quality fire suppression and emergency services, but it does provide a new challenge that must be addressed in the future.

**Article 10, Section 20 and the Poudre Valley Fire Protection District**

Before the adoption of A.10S.20, the District’s revenue raising capacity was defined by state regulations which specified that the maximum annual revenue increase could be no greater than an increase of 5.5% plus growth. The District rarely, if ever, raised its mill levy to this limit. As a general rule, the District Board of Directors would monitor the inflation rate, district growth, district service needs, and adjust the mill levy to match economic conditions and resource requirements.

A.10S.20 eliminated the ability of the elected representatives on the District Board to match revenue and need by adjusting the mill levy. This is because the District can no longer increase the mill levy (without a vote of district electors). Since the District’s only major source of income is property tax, the major portion of its revenue will only rise or fall by changes in assessed value. One way to view possible impacts of a static mill levy is to see what assessed value (and revenue) trends have been historically when unaffected by mill levy changes. In the past eight years the District would have experienced a negative real growth rate of 3.5% (change in assessed value compared to the Denver Boulder CPI) if the mill levy had remained unchanged. However, viewed from a longer perspective, over the past 15 years, growth in assessed value has outpaced inflation by 1.5%. It is difficult to ascertain whether the past eight years is a trend that will continue or whether the next decade will see a return to the rate experienced in the longer, 15 year analysis.

It would seem that a prudent approach, and the one that will be used in this analysis, is that increases in the District’s assessed value will track inflation in the long run. The District should be able to continue to support all existing revenue needs but may not be able to contribute to new services.

**A.10S.20 and the City of Fort Collins**

From the viewpoint of revenue stability and growth, the City is in a more favorable position than the District. This position, in turn, is reflected in the City’s contribution to PFA by means of a Revenue Allocation Formula (RAF). Nevertheless, the city may also realize revenue restrictions as a result of A.10 S.20.

These restrictions would occur when an annual revenue increase exceeds the level created by A.10S.20. For instance, if A.10S.20 had been in place in the past ten years, the revenue limit would have restricted revenue levels three times. These reductions would have occurred without any changes in the City’s mill levy or sales and use tax rate. The result would have been not only a reduction in that year’s revenue, but a reduction in all future years since the revenue limit calculation for following years is also reduced. This cycle is repeated each time the revenue limit is exceeded.

**A.10S.20 and The Poudre Fire Authority**

The point of this is to highlight the fact that the relationship between community growth and the revenue generated by that growth has been altered, while the relationship between community growth and the demand for services remains the
same. Thus, it is possible that the need for fire protection and emergency services may be accompanied by less revenue than in the past.

It is not possible to predict with any precision what future revenue will be in light of A.105.20. However, since the hallmark of this strategic plan is long-range contingency planning to insure the flexibility to adapt to community needs, a range of possible revenue scenarios is set out below. These scenarios range from a high growth rate of 5% (3.4% inflation plus 1.6% real growth) to a low growth trend of 3.9% (3.4% inflation plus 0.5% real growth). The high growth line is similar to past revenue growth rates and the lowest trend is indicative of extremely slow growth. It is reasonable to assume that revenue growth probably would not fall below this level due to the economic viability of the community provided by a well-educated work force, diverse service sector and high tech industrial base, regional retail activity, and the stability provided by major employers such as Colorado State University.

Between these two is a projection that may be a more realistic prediction of future revenue. This projection of 4.5% (1.1% real growth plus 3.4% inflation) uses a guessestimate of the revenue reduction that may be caused by A.105.20.

The logical extension of this planning assumption is that in order for PFA to continue to provide high quality fire protection and emergency services, and to extend those services into newly developed areas as was accomplished during the 1987 strategic planning cycle (1987-1995), real growth must continue at the rate experienced in the recent past. If this does not occur, the time lines for implementing new service units must be lengthened, other services reduced, additional funding secured, or new means of providing services created.

**PROJECTED FUTURE REVENUE**

![Graph showing projected future revenue with different growth scenarios.]
REAL GROWTH

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<tr>
<th>Year</th>
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<th>Medium - 1.1%</th>
<th>Low - 0.5%</th>
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<td>$0</td>
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<td>$0</td>
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<tr>
<td>1995</td>
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<tr>
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<td>2006</td>
<td>$2,636,131</td>
<td>$1,764,078</td>
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12.0 Citizen Participation

12.1 Citizens want to participate in a meaningful way in the development and implementation of fire protection policy if provided with the appropriate opportunities.

Citizen participation is the process by which the public becomes involved in the operation of their government. In the past this has been characterized by representation, interest groups and general voting. That system is changing. Direct issue voting, the involvement of narrowly defined interest groups and direct participation in policy development with administrators and elected officials are now common components of the process. Citizen participation has become so strong that many governments actively encourage it. Locally citizen participation has taken the form of neighborhood meetings and interest groups, town meetings, ballot issues, surveys, advisory groups and increased communications.

PFA began direct citizen participation by establishing a citizen advisory committee for the first Master Plan in 1980. Previous to that, policy contact with citizens came almost exclusively through administrators and elected officials. Subsequent efforts have included code review committees for the adoption of fire codes and special ordinances, business representation on selection panels for fire prevention positions, and the use of surveys. In 1993, Colorado State University designed and administered a comprehensive customer satisfaction survey as one of the preliminary data-gathering methods for this plan. The results of these efforts have been mixed. While valuable input has been received, it was apparent that all interests are not represented through advisory committees. Surveys also represent only general information without extensive analysis of subpopulations.

It has been the experience of PFA staff that citizens do want to participate in significant policy decisions, especially when they are directly impacted. This experience has also shown that citizens want to contribute in meaningful ways that respect their time and efforts. This indicates that a variety of participation strategies may be more appropriate than just advisory committees. This appears to be especially true for the business community that has specific needs. Citizen participation also appears to be hampered by a lack of knowledge of fire protection issues. Citizens often appear to defer to the professional judgement of fire personnel.
without considering alternatives and costs. Real citizen participation should provide opportunities for uninhibited communication from citizens rather than "educating" them in what they should think.
Appendix D
EMS Status Report

Purpose
The purpose of this report is to describe the status of the Pre-Hospital Emergency Medical Services (EMS) system in the greater Fort Collins area and Poudre Valley Hospital District, as it exists in early 1994. It provides a "snapshot" of what the total system is, what its major functions are and the current status of each of these functions. The present EMS system has been in place for over 15 years but has never been documented from a total system perspective. This report does not seek to initiate major changes in the current EMS system. It may, however, serve as a baseline for evaluating alternative delivery systems or for identifying areas of improvement. This report concludes with a set of observations which may serve as the basis for further investigation.

Summary
The current EMS system provides a full range of EMS through the efforts of three primary agencies: Poudre Valley Hospital, Poudre Fire Authority and the City of Fort Collins Police Department. Additionally, the Quick Response Teams (QRT) of the rural fire departments in northern Larimer County and the Larimer County Sheriffs Department also play an important role in the total EMS system. Overall, this system responded to a total of 5529 emergency medical incidents in 1993. It transported 3596 emergency patients, with a total cost of $1,233,654. The majority of this cost is supported by fees collected for ambulance transport and paramedic services. A small amount is supported by the general tax revenue of the City of Fort Collins, Larimer County, and the Fire Districts.

The current EMS system is driven by two primary concepts. The first is the Standard Response which includes enough EMS resources to provide Basic Life Support (BLS), Advanced Life Support (ALS) and patient transport to all medical emergencies. The second is the Full Personnel Complement. This is the 4-6 personnel that are needed to provide all aspects of emergency medical care and transportation. Combined, these concepts are called "Maximum Response" and are explained more fully later in the report.

A critical component of the EMS system is response time. In the first quarter of 1994, the total response time from receipt of a call for assistance to the arrival of the first medical unit (either fire department or PVH ambulance) was an average of 5.3 minutes within the urban area. The average response time of the full complement of the medical response was 6.8 minutes. Another representation of response time shows that a medical unit capable of at least BLS arrived in less than five minutes 46.9% of the time and full ALS/Transport complement in less than nine minutes 87.6% of the time. Because these times include dispatch processing they are somewhat longer than the times reported by each agency individually.

Scope
The geographic area this report covers is the Poudre Valley Hospital District in northern Larimer County, including the greater Fort Collins urban area. This area includes the City of Fort Collins as well as the contiguous suburban and rural area bordered by Interstate 25 on the east, Horsetooth Reservoir on the west, Douglas Rd. on the north and County road 32 on the south. It also includes the
towns of Timnath and LaPorte. Of this approximately 88 square miles, 50 are at conventional urban and suburban densities, with the remainder as rural subdivisions, large residential acreages and agricultural facilities. In 1993 the total population of the urban area was estimated at 118,000. Except for the area directly around Horsetooth Reservoir which is mountainous, this area is rolling hills or relatively flat. The remainder of the Hospital District encompasses 2,200 square miles of rural area with an estimated population of 14,000, including the towns of Bellvue, Wellington and Red Feather Lakes as well as several other rural communities. Approximately 1,320 square miles of this area is mountainous, including national forest and wilderness areas. While this report addresses the total PVH District, it more directly addresses the urban area where the majority of EMS incidents occur.

Limitations
This report recognizes that the total EMS system is a multiagency one which is relatively complex. The system is further complicated by the combination of urban and rural areas and the mix of emergency and non-emergency patient transport. Although the majority of the population and EMS responses are in the greater Fort Collins, urban area resources deployed to distant rural areas can deplete urban response capability. In 1993, 737 EMS responses were outside the urban area. Likewise, resources devoted to non-emergency transfers can impact emergency response capability. In 1993 there were 410 such transfers. Although current procedures minimize these impacts, both rural EMS and non-emergency transport must be adequately considered to keep urban capabilities within acceptable parameters.

This report also recognizes that the population size and demographic composition, as well as the geographic variety and size of the area, significantly impact the EMS system. The total population represents a small metropolitan area well below the population needed to realize significant economies of scale. The education and family income levels represent a middle class community which does not place heavy demands on the EMS system. Finally, because the response area is so large
with such varied topography, some response times are longer than would be expected in predominately urban areas.

Research Method
This report was compiled by personnel of Poudre Valley Hospital, Poudre Fire Authority and the Fort Collins Police Department. Where possible, complete 1993 and partial 1994 data have been used. In some cases the existing data could not provide the needed analysis within the time constraints of this project. In these cases representative samples were used to estimate analysis points. In estimating costs, direct and verifiable costs have been used. It is recognized that some costs, such as insurance, legal, administrative support and similar expenses, as well as some capital costs are contained in larger city and hospital budgets and could not be expediently broken out.

History
The current EMS system took its current form in 1975 when Poudre Valley Hospital began providing paramedic ambulance service (ALS) to its District. Prior to this time ambulance service was provided by a private firm at an EMT basic life support (BLS) level. The fire departments provided only rescue services. PVH began operation with two paramedic ambulances, one located at PVH and the other at Fort Collins Fire Station Two. Additionally, the Fort Collins Fire Department operated one minimally equipped backup ambulance.

In 1976 the Fort Collins and Poudre Valley Fire Departments, the predecessors of Poudre Fire Authority (PFA), began supplementing the PVH paramedic ambulance service with first response BLS from their engine companies located at six fire stations. Although not a job requirement, many firefighters voluntarily certified as Emergency Medical Technicians (EMT's) during the remainder of the 1970's. In the late 1970's fire department EMT's were compensated with an additional 4% salary and this voluntary certification system continues to exist today. In 1994, 93 of 102 line firefighters and officers (93%) were certified as EMT's.

Prior to 1980 all EMS calls were answered at the 911 police dispatch center. Medical calls were then routed to both the ambulance dispatcher located at PVH and the Fire Department dispatcher located at Fire Station One. All dispatching was done separately and there was no capability for ambulance/fire department communications. In 1980 the Poudre Emergency Communications Center was established to provide combined dispatching for police, fire and ambulance. Both PVH and the Fire Departments relinquished their separate dispatch operations at that time. This center continues to be managed by the Police Department. Shortly after the consolidation of dispatching, the Fort Collins and Poudre Valley Fire Departments merged into Poudre Fire Authority (PFA). In 1980 PFA added its seventh career fire station bringing the total number of EMS response units to seven PFA BLS and two PVH ALS units.

This system operated throughout the 1980's with little significant change. In the late 1970's the rural volunteer fire districts in northern Larimer County entered the EMS system by establishing Quick Response Teams (QRT's). These teams provide first response BLS similar to PFA. They currently operate in Wellington, Poudre Canyon, Red Feather Lakes, Glacerview Meadows, Livermore and Rist Canyon. In addition to the QRT's, the Larimer County Sheriffs Department is also active in providing first response and rescue in rural areas of the county.
In 1989 PFA began carrying automatic external defibrillators (AED) on its first response fire companies and increased the certification level of its EMT’s to EMT-D’s. At that time PFA was the first fire department in the state to provide this service from fire apparatus. In 1991 PFA included its truck and squad companies in the BLS response system, thereby increasing the number of first response BLS units from seven to nine. These new units continued to operate from PFA’s existing seven fire stations. In early 1995 PFA opened a new fire station in southeast Fort Collins increasing the number of career BLS locations to eight. PFA also operates two volunteer fire stations in rural areas of the Fire District. These stations provide EMS capabilities similar to rural QRT’s.

In 1990 PVH improved its response capability by establishing a third paramedic ambulance location in south Fort Collins. This unit is staffed 12 hours per day. In 1993 PVH further improved its response capability by implementing a System Status Management program. This program moves paramedic ambulances throughout the response area depending on coverage needs. This program also reduces response times by maintaining ambulance coverage in areas with the highest anticipated call load.

**Legal and Regulatory Requirements**

There are two sets of regulatory requirements that apply to EMS systems and ambulance services in Colorado. The first is the certification of EMS personnel. This is the responsibility of the EMS Section of the State Health Department. It regulates the certification of several levels of EMS personnel from EMT-Basic to Paramedic. Certification includes original training, recertification, and minimum levels of actual field experience. Included here is the requirement that all certified EMS personnel be supervised by a qualified EMS physician. Dr. Dan Turner, PVH Hospital District Physician Adviser, serves as the supervising physician for PVH paramedics as well as PFA and QRT EMT’s.

The second set of regulatory requirements involves the licensing of the ambulance units. This is administered by the Larimer County Health Department. This license process requires only that an ambulance meet certain requirements and is appropriately equipped. All PVH ambulances meet these requirements and are appropriately licensed.

In Colorado there is no uniform system of licensing or franchising of ambulance services by local governments. Neither the City of Fort Collins, Larimer County or the Fire Districts have adopted any formal standards of EMS performance. Other cities, however, have established such requirements by ordinance and some license or contract for ambulance service with private firms.

**System Design**

The current EMS system is best categorized as a single-tiered, all Advanced Life Support (ALS) full service system with first response Basic Life Support/Automatic External Defibrillator (BLS/AED). The most important feature of this definition is that a paramedic (ALS) ambulance responds to all medical emergencies along with the closest BLS/AED fire department unit. This insures that the first arriving unit has the capability to initiate basic life support followed by the advance life support and patient transportation provided by a paramedic ambulance, or the full complement of the EMS response when an ambulance arrives first. This is contrasted with multi-tiered systems where patients are assessed by separate units and “handed off” between BLS and ALS ambulances depending on the severity of injury or illness.
This system can also be differentiated from those that separate emergency and non-emergency transports by response units or even agencies. Because all the agencies providing EMS in this system are public, it can also be classified as a public system. It is not, however, a fully "socialized" system. The vast majority of its cost is supported by user fees for paramedic and ambulance service through Poudre Valley Hospital.

This system is driven by two primary concepts, the Standard Response and the Full Personnel Complement. The premise of both these concepts is that every medical emergency has the potential to be immediately life threatening to the patient(s) and as such deserves a response capable of addressing this need. This is called "Maximum Response". While it can be argued that an EMS system should be able to differentiate between the seriousness of need and send a more flexible response, many EMS systems operate under the assumption that one which "over-responds" a high percentage of time is preferable to one that "under-responds" even rarely. It is generally recognized that an EMS system should provide BLS in less than five minutes and ALS in less than nine minutes from the time the system is notified to provide the best chance of patient survival. It is also recognized that it requires four to six personnel to effectively perform all the functions of the standard response.

This report should not be construed to imply that the current system is the most efficient or the only alternative that can work in the Fort Collins area. In fact a "Priority Dispatch" system is under active development at this time. If implemented, this system would provide a more flexible response based on several levels of standard responses. Priority dispatch is discussed in more detail below.

Priority Dispatch is a system of differentiating between the seriousness of medical emergencies and dispatching an appropriate response based on the information provided by the informant. The system under consideration is based on a computer program that leads the dispatcher through a series of questions that classify the emergency into one of several standard responses. The major advantage of such a system is that it would reduce the number of emergency responses significantly. This would keep more units available for serious emergencies, reduce the number of emergency miles driven and reduce the criticism that often accompanies the "over-response" of the current maximum response. The major disadvantage is that the system could occasionally "under-respond". This system must be differentiated from "Call Screening" that has been used in some jurisdictions with poor results. Under Priority Dispatch all calls for assistance receive a response. Under Call Screening some calls are screened out completely.

Primary Functions

The standard EMS response is comprised of six major functions. These are pre-incident education, response, patient/situation assessment and stabilization, on-scene patient treatment, transportation, and rescue. All EMS incidents include these functions to some degree. Shown below is a model that illustrates these functions. Although in most cases these functions take place linearly, patient/incident and stabilization, on-scene patient treatment, and rescue often take place simultaneously. In addition to a more detailed discussion of each function, the current status of each is described in italics.
Pre-incident Education - This function refers to the information citizens receive before a medical emergency occurs. The most important are instructions on how to recognize when a medical emergency exists, how to call for assistance and how to initiate emergency aid before the arrival of EMS units. Since the advent of the 911 emergency telephone system, this has been an integral part of all fire and crime prevention training. The 911 system has been in existence since the early 1970's and is so ingrained within the community it is rare that a citizen does not know how to call in an emergency. The most common emergency medical training is Cardiopulmonary Resuscitation.

CPR training is provided by the American Red Cross, the American Heart Association, PVH and many other community organizations. Current estimates are that 3,000 people receive CPR training annually. Additionally, 5,000 people, mostly children, receive 911 training each year as part of general fire prevention education.

Response - This function describes the actions that occur between the time the dispatch center receives a call for assistance to the time the response units arrive on the scene. It includes three distinct components. The first is the time it takes the dispatcher to acquire enough information to determine what the situation is, enter it into CAD and dispatch the appropriate response units (Dispatch Time). The second component is the time it takes the response units to move from their standby status to actually rolling down the road (Turnout Time). The last is the travel time to the scene for both the BLS and ALS units (Travel Time). The illustration below shows the relationship of the response components. After the information is entered into CAD, all times are recorded in the CAD record. In the past the dispatch system could not precisely track the time from notification to CAD entry. This has recently been improved and the time from actual notification can be tracked with a higher degree of accuracy. For the purpose of this report, however, a sampling of actual calls indicates that this time averages 1.1 minutes.

In 1993 PFA commissioned a survey of residents and businesses on their satisfaction with PFA services. This survey was conducted by Colorado State University (CSU) and included a sample of 304 households and 309 businesses. For emergency response both samples indicated that notification (access to the 911 emergency telephone system) and quick response were the most important components of the
emergency response system. This was somewhat different from an internal PFA needs analysis that identified care for person and care for property as most important. For many years PFA and PVHAS have compiled detailed response time statistics. PFA's average response time for all responses was 4.66 minutes in 1993. For medical emergencies PFA responded in less than five minutes 55% of the time. PVHAS responded in less than nine minutes 94.6% of the time. Neither of these methods includes the time between notification and actual dispatch.

The purpose of this report is to examine the entire EMS system and it views response time from an overall perspective. This is from the time the dispatch center is notified until the time the first unit that is capable of evaluating the situation and rendering at least BLS arrives on the scene, followed by the time the second unit arrives to fill out the full complement of personnel necessary to provide ALS and transportation. When dispatch time is included, the response times are longer than represented by PFA or PVH separately.

Because the current data system is not structured to provide this type of analysis, a random sample of 83 emergency medical incidents was drawn from the first quarter of 1994, a total of 875. All these incidents were within the Fort Collins Urban Response Area. Based on this sample the average response time for the first unit was 5.3 minutes and 6.8 minutes for the second. Using the five and nine minute parameters discussed previously, the first unit arrived 46.9% of the time in less than five minutes and the second unit arrived in less than nine minutes 87.6% of the time. These distributions are shown in more detail on the following page.
Patient/Situation Assessment and Stabilization - This function is commonly referred to as Basic Life Support (BLS) and is usually performed by PFA firefighters or rural QRT's. It is also done by paramedics if they arrive before the fire department. During this time the circumstances of the incident are assessed and appropriate actions initiated. This often requires protecting the patient from further injury, initiating BLS and AED (within PFA) and summoning other resources. In addition to interacting with the patient(s), bystanders and family members, it is also necessary to secure the scene for the safety of the medical personnel. This sometimes requires the assistance of police officers.

Some form of assessment and stabilization is performed on every incident. In some cases it involves determining only that a medical emergency does not exist or advising a patient that non-emergency care would be more appropriate. Under the current system PVH paramedics must make the determination on the disposition of the patient. In most cases fire department units are released by paramedics when they arrive, or fire department units are canceled if paramedics arrive first. Of the patients that were treated, 2379 or 58% required only BLS. Additionally, 970 patients refused treatment and on 617 responses no patients were contacted.

On-Scene Patient Treatment - This refers to the actual medical treatments provided by paramedics (ALS) in addition to incident stabilization and BLS. It includes a wide range of treatments, depending on the situation, including intravenous fluid replacement, drug and respiratory therapy and cardiac monitoring. It requires the coordinated actions of several trained people.

In 1993, 1708 patients were treated on the scene with ALS. This represented 42% of the all patients treated.

Transportation - This includes transporting the patient(s) from the scene to a medical facility. It also includes moving the patient from where they are found to the ambulance. This often requires moving a patient up or down stairs, or out of small rooms or vehicles. In some cases BLS and ALS actions initiated on the scene are continued during transportation.

In 1993, 3596 emergency patients were transported to PVH. When medical treatment is continued during transportation, fire department EMT's often accompany paramedics in the ambulance during travel to the hospital. Of the 4081 EMS responses within PFA, 973, or 24%, required the assistance of PFA EMT's during transport.

Rescue - This function describes those actions that are sometimes necessary to remove patients from precarious positions beyond the capabilities of the initial BLS and ALS responders. This typically involves extrication from wrecked vehicles but also includes removal of patients from above and below grade areas, collapsed buildings and similar situations. This has traditionally been a fire department responsibility and was a precursor to the total EMS system. While all fire department units and PVH ambulances carry some specialized rescue equipment, all heavy rescue is performed by fire department truck and squad companies.

Rescue efforts of this magnitude occurred in 55 cases, or 1% of all emergency EMS responses.
System Costs and Revenue
This report describes the 1993 costs and revenue for the total EMS system. It includes the cost to PVH to operate the Paramedic Ambulance Service and PFA's EMS costs above and beyond those incurred for fire protection and rescue services. QRT estimated costs are also shown. The dispatching service provided by the Fort Collins Police Department is shown separately for analysis purposes but is actually included within the PVHAS budget. This analysis must also be qualified because it is virtually impossible to account for all the costs associated with the mix of urban/rural responses and emergency/non-emergency transports. It does, however, represent what the research team believes is a good representation of total costs.

Total Costs

<table>
<thead>
<tr>
<th>Service</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVH Ambulance Service (Emergency Only)</td>
<td>$880,348</td>
</tr>
<tr>
<td>Poudre Fire Authority</td>
<td>$252,360</td>
</tr>
<tr>
<td>Fort Collins Police Dispatch</td>
<td>$79,446</td>
</tr>
<tr>
<td>QRT's</td>
<td>$21,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,233,654</strong></td>
</tr>
</tbody>
</table>

Cost per capita ........................................... $9.35
Cost per emergency response ................. $223.12

Poudre Valley Hospital - The total PVHAS budget of $1,062,824 supports 15 full-time and 18 part-time employees and six ambulances. Of this total, $103,020 is attributed to non-emergency transfers. All of this cost is supported by fees for paramedic and transport services. Also included in the total PVHAS budget is $79,446 paid to the Fort Collins Police Department for dispatching services. This amount is negotiated annually.

Poudre Valley Hospital
(Emergency response only, excluding dispatch contract)

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PVH Cost</td>
<td>$880,348</td>
</tr>
<tr>
<td>Cost per Capita</td>
<td>$6.67</td>
</tr>
<tr>
<td>Cost per emergency response</td>
<td>$159.22</td>
</tr>
<tr>
<td>Cost per emergency patient transported</td>
<td>$244.81</td>
</tr>
</tbody>
</table>

Poudre Fire Authority - In 1993 PFA had an operations and maintenance budget of $8,376,295. This supports the operation of seven career and two volunteer fire stations with 124 career personnel and 20 volunteers. PFA responded to 4081 EMS incidents in 1993. Of the total budget, an estimated $252,360 is devoted to EMS above and beyond fire protection and traditional rescue. This includes the premium pay for EMT-D’s, EMS training and equipment including AED, an operations and maintenance mileage estimate for vehicles, and a portion of capital amortization of fire apparatus.

PFA’s revenue is derived from an intergovernmental contract with the City of Fort Collins and the Poudre Valley Fire District. PFA does not currently charge any fees for emergency EMS related services and none of the funding from the City or Fire District is targeted directly for EMS.

Poudre Fire Authority

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PFA Cost</td>
<td>$252,360</td>
</tr>
<tr>
<td>Cost per Capita</td>
<td>$2.13</td>
</tr>
<tr>
<td>Cost per Response</td>
<td>$61.83</td>
</tr>
</tbody>
</table>

Fort Collins Police Department - The 1993 FCPD dispatch center had a total budget of $98,193.6. This supports a round-the-clock emergency dispatch center with 21.7 employees. Of this budget, the PVHAS contract contributed $79,446. All other dispatch center costs are...
supported by the City General Fund. The dispatch center handles all ambulance dispatching including emergency and non-emergency incidents.

**Fort Collins Police Dispatch**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total FCPD Cost</td>
<td>$79,446</td>
</tr>
<tr>
<td>Cost per Capita</td>
<td>$60</td>
</tr>
<tr>
<td>Cost per Response</td>
<td>$13.38</td>
</tr>
<tr>
<td>Cost per Patient Transported</td>
<td>$19.21</td>
</tr>
</tbody>
</table>

Quick Response Teams - The EMS costs incurred by the QRT’s is difficult to determine. It is estimated that in total the QRT’s incur $21,500 in expenses annually. Additionally, QRT’s receive periodic grants from the state for the purchase of capital equipment. Because the rural fire departments and QRT budgets are so small, this report did not attempt to calculate definitive data.

**Observations**

The following observations are made based on this report and information discussed during the course of researching this report. They do not constitute recommendations but may serve as points of further investigation.

**First unit response time** - The response time for the first responding EMS unit in less than five minutes is only 46.9%. This raises questions concerning the practicality of the five minute first unit response criteria, given the organizational changes or new costs that may be needed to move to higher response percentages.

**Documentation** - The documentation of the total system is weak, especially in the areas of interagency responsibilities and service level measurements. There are no system-wide performance criteria. Neither the City of Fort Collins nor Larimer County have adopted service levels standards.

**Maximum Response** - The current system of Maximum Response, while well within the norm of EMS systems, is often criticized as wasteful. Priority Dispatch may be a useful strategy to reduce this over-response. It must be recognized, however, that response strategies are often driven as much by the emotional context of the rare under-response as by data-driven policy analyses.

**EMS system changes** - EMS systems nationwide are undergoing changes due to the evolution of the health care system, the complexities of public/private relationships and the consolidation of private ambulance firms. Locally the privatization of PVH and the movement of large national ambulance companies into the region are examples of these type of changes. While the evolution of the EMS industry is inevitable and necessary, it can create a degree of uncertainty on the part of some agencies, their employees and citizens.
Appendix E

Density/Cost Model

This model is intended to illustrate the potential impact of residential density on fire protection costs. It is purely hypothetical in that it describes only new development and assumes a constant suburban social-economic population into the future. It is limited by the knowledge that even completely new development is impacted by existing development and that some elements of the fire protection resources devoted primarily to new areas must also provide some degree of service to older areas and non-residential buildings. It is also limited by changes that may occur in the response area which may increase call loads and risk factors. Both of these limitations may cause fire protection costs to increase beyond what would be predicted by the model. Although this model is hypothetical, it does parallel the type of development experience and fire protection resources applied in the south, southwest and southeast portions of the Fort Collins urban growth area in recent years.

This model assumes suburban development at residential densities ranging from 2.5 - 4.5 dwellings per acre. Densities below this are assumed to be rural and above it higher density urban. This model further assumes that the fire station response area illustrated is only a portion of a larger suburban area and will ultimately be surrounded by similar development and fire station response areas. Other assumptions are that all buildings are constructed to current (1994) building and fire codes including higher levels of fire sprinkler protection in commercial buildings.

Response Area Profile

Total response area: ......................................................... 6.5 square miles
Average response distance: ........................................... 1.5 miles
Average total response time: ........................................... 6 minutes
Percentage of area ultimately developed for residential use: ....... 75%, 4.9 square miles
Population per dwelling unit: ............................................ 2.4

Fire Protection Resources

Public fire protection resources refer to career personnel at levels currently provided by PFA and similar fire departments. It is further assumed that these resources are used to provide multiple emergency services such as emergency medical services, hazardous materials control and rescue, and non-emergency services such as education and fire prevention inspection.

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine company</td>
<td>1.0</td>
</tr>
<tr>
<td>Engine company</td>
<td>0.5</td>
</tr>
<tr>
<td>Support company</td>
<td>0.25</td>
</tr>
<tr>
<td>Admin/fire prev/training</td>
<td></td>
</tr>
<tr>
<td><strong>Total Positions</strong></td>
<td></td>
</tr>
<tr>
<td>Total annual O+M public fire protection cost</td>
<td>$1,474,000</td>
</tr>
<tr>
<td>Total emergency incidents per 1000 population</td>
<td>41</td>
</tr>
<tr>
<td>Structure fires per 1000 population</td>
<td>0.81</td>
</tr>
<tr>
<td>DU/Acre</td>
<td>2.5</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>Population</td>
<td>18816</td>
</tr>
<tr>
<td>DU</td>
<td>7840</td>
</tr>
<tr>
<td>Total Emerg Incidents</td>
<td>770</td>
</tr>
<tr>
<td>Structure Fires</td>
<td>15</td>
</tr>
<tr>
<td>Cost/Cap</td>
<td>$78</td>
</tr>
<tr>
<td>Fire Prot. Pos/1000</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Using this model to predict actual fire protection costs is difficult as there are many other factors that must be considered. Few new development areas would be as "pure" as the model would prefer. PFA provides rural fire protection from new fire stations, and fire companies in new areas also supplement in older areas with higher risk profiles.

This model does support current land use policies that favor higher densities, seeking to maximize the cost-effectiveness of public services and infrastructure. It also tracks the development history in fire station areas four and five where new development has primarily occurred in recent years. Densities in the developed portions of these response areas have been 3 du/ac and 3.7 du/ac respectively. Although PFA's total per capita costs ($68-1993) exceed the model's predictions of $65 to $57 at these densities, it includes the total risk profile of the entire community. Taken together, the model and actual history predict that residential densities of at least 3 du/ac are needed to keep per capita cost at current levels. Densities below this would cause upward pressure on these costs if the same service levels and response times were to be maintained.