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Report Overview

This report details the study of fire protection and emergency medical services in Missoula, Montana by Emergency Services Consulting, incorporated (ESCi). The work contracted by the City in 2005, directed an evaluation of the performance and resources of the Missoula Fire Department, and based on that finding, deployment recommendations designed to sustain and improve the City of Missoula emergency services through the year 2024.

The staffs of Missoula Fire Department and the City of Missoula have provided a great deal of written and verbal information to ESCi and its associates during the course of this work. All have been generous in their effort to provide accurate and complete information. We are grateful for their able assistance and cooperation throughout this master planning process.

We know that information by its very nature is often incomplete. We also recognize that active and dynamic organizations like MFD tend to undergo a process of continuous change. However, every effort is made to compile comprehensive and accurate observations for this report that are as complete as possible. The data gathering process used includes a broad checklist measuring results against acceptable industry standards and good practices. Whenever possible, we make quantifiable comparisons to other fire service organizations. Checklists and documentation are confirmed by one-on-one interviews with key staff members of the agency representing all program areas.

We emphasize that the consideration of this report and the eventual adoption of a long-term MFD Master Plan depends on the leadership of the city making informed judgments about the quantity and quality of emergency service provided to the community. This process is commonly referred to as *Standards of Cover*.[1]

Standards of cover are the formal policies of the governing authority that determine the distribution and concentration of fixed and mobile emergency resources. The development and adoption of such policies includes reviewing community expectations, setting measurable response goals, and establishing a system to document and evaluate performance.

This master planning report encompasses everything an agency needs to understand to prepare and determine resource deployment. The process uses a systems approach rather than a one-size-fits-all prescriptive formula. Using this method, the City of Missoula should be able to match local need

[1] Additional information on the subject can be found by referencing: Commission of Fire Accreditation International, Inc., *Creating and Evaluating Standards of Response Coverage for Fire Departments*, 4th Ed, 2003, www.cfainet.org.

(risks and expectation) with the cost of various levels of service. In an informed public policy debate, the governing authorities essentially purchase the amount of fire and EMS protection the community needs and can afford.

This report document is divided into three major sections including an evaluation of the existing fire protection and forecasting of service and system demand through year 2024, and the development of a long-term MFD service model. A brief explanation of each of the sections and a summary of the primary conclusions and recommendations of each follows below.

Report Section I – Current System Analysis

Report Section I is arranged into ten objective chapters beginning with an organizational overview and consequently working through other elements such as management, planning, staffing, resource deployment, service delivery, and other special programs. The observations and analysis of this section establish a baseline from which to build the fire department's long-term service plan through year 2024; however, as a second benefit it yields management guidance that, if implemented, may result in improved administration, efficiency, or service outside of the parameters of the master planning recommendations. For convenience, the recommendations generated by the discussion and analysis of the Section I evaluation are summarized and compiled in table format as Figure 98: Summary Table of Short and Mid – Term Organizational Recommendations. The table is cross-referenced to the appropriate report chapter to ease its use by governance and fire department leaders. Listings of the table are not rank ordered or prioritized in keeping with the advisory nature of most.

We conclude from the MFD baseline evaluation that the organization is well managed and equipped. A team of qualified, capable, and engaged professional managers heads the agency and leads a cadre of dedicated career emergency workers who provide excellent fire and emergency medical service to the City of Missoula.

On the other hand, no organization is without issues — all can benefit from change and/or adjustment to policies, management, and/or programs. Section I of this report includes short and mid-term recommendations designed to improve the organization regardless of the long-term deployment plan. A summary listing of some of the more significant recommendations follows. We point out here though, that in our experience of conducting these evaluations on literally hundreds of fire departments of all sizes and character across the nation, few are able to match the positive caliber of Missoula Fire Department.

Report Section II – System Demand Projections

This report section establishes the population and service demand projections necessary for the creation of future deployment models. U.S Census Bureau figures indicate that between 1990 and 2004 the City population grew a significant 44 percent. Using a development-based projection indicates that that in 2024 the population of Missoula will approach 115,000. The development-based population forecast is significantly higher than the census-based population forecast primarily due to local and regional issues that are expected to expand development opportunities, including annexation, additional transportation improvements, and adequate water and sewer infrastructure capacity.

The geographic distribution of future workload is expected to follow trends similar to those currently experienced and is predicted to exceed 10,000 calls per year near the end of the planning period. Analysis indicates that the majority of requests for emergency assistance will continue to originate from the residential and commercial centers of the City. This suggests a future need for additional emergency resources in the City. The community contains mostly low and moderate risk properties. The predominance of highest risk is located in the City's central downtown core, along the rail corridor on the north side of the City, and in certain non-residential developments along the Interstate highway. The City's land use patterns generally contribute to development of an efficient fire resource deployment configuration, with the exception of the remote commercial and industrial areas northwest of the airport.

Report Section III – Recommended Long-Term Strategy

This report element presents detailed recommendations for the amount and location of MFD facilities, apparatus, and staffing over the course of the 20-year planning period. Recommendations are based on the estimates of increased Missoula population, risk, and service demand as outlined in Section II. The resulting long-term deployment strategy is designed to allow MFD to sustain the existing level of service and when possible, to improve the quality of emergency service by lowering response times. Our use of geographic information system (GIS) technology in this work allows the detailed analysis of modeled response times and helps to link the deployment strategies identified in this part of the report.

Facilities and Apparatus

Service demand, population density, and travel time from the existing MFD station locations are studied. The analysis shows that areas of high service demand now exist (and are expected to continue) within the areas served by Station No. 1, Station No. 2, and Station No. 4. Station No. 3 is

well positioned and will experience increased call volume as well, but not to the extent as the other stations. The newly approved Station No. 5 currently experiences a moderate service demand which is projected to increase as development in the area continues.

Because of the geographic size of annexed areas and the projected service demand in the far northwest corner, a new Station No. 6 is recommended located approximately one mile south of Hwy 10 on the planned roadway Englund Blvd. near the airport. An alternate location at Deschamps and Roller Coaster should also be considered as it is questionable whether Englund Blvd will be constructed.

A new station; Station No. 7 located at Spurgin Road and Tower Street will need to be constructed in the future due to the high service demand projected for 28th Street near 37th along with moderate demand to the north off 3rd and Preston is projected.

At full build out, an additional three fire engines will be needed, one per each proposed new station. Additionally, the department will need to assess the need for additional brush units and other support vehicles. No additional truck company is recommended. This is due to ladder trucks located at Station No. 3 and No. 4 appear to be adequate for covering the current and extended areas of annexation. However, MFD may want to consider staffing both truck companies with dedicated staff over time.

Staffing

Obviously, fire stations and emergency apparatus are useless without the personnel who staff them. The figure below (Figure 1) details the number of FTEs necessary to staff and support the recommended apparatus deployment using a seven station model.

Figure 1: Missoula FD Operational Staffing Model FTE Requirements

Fire Station	Unit	Minimum On-Duty Staffing	Maximum On-Duty Staffing	Total Staffing
Station 1	Engine 1	3	4	16
	Battalion Chief	1	2	5
Station 2	Engine 2	3	4	16
Station 3	Engine 3	3	4	16
	Truck 3	Cross Staffed with Engine 3 personnel		
Station 4	Engine 4	3	4	16
	Truck 4	Cross Staffed with Engine 4 personnel		
Station 5	Engine 5	3	4	16
Station 6	Engine 6	3	4	16
Station 7	Engine 7	3	4	16
Operational Staff		**22**	**30**	**117**

The long-term staffing strategy requires 53 additional FTEs above the existing cadre of 64 FTEs. For purposes of this analysis, we assume that the additional positions are allocated in accordance with the following Figure 2: Year 2024 Operational Staffing Assumption.

Figure 2: Year 2024 Operational Staffing Assumption

Position Title	Year 2006 FTE	Year 2024 FTE	Change
Battalion Chief	4	5	+1
Captain	16	28	+12
Firefighter	44	84	+40
Total	**64**	**117**	**+53**

Adding more people to the emergency function of the fire department also carries the need to add non-emergency workers to assure proper oversight and management. At present, MFD maintains ten non-emergency employees thereby enabling active fire prevention, training, EMS, and operational divisions within the administrative section. Our analysis of the staffing model assumes that non-emergency workers are added at the execution of each phase to maintain a ratio of 13 percent administrative positions when compared to the total number of FTEs. As a result, administrative FTEs increase from ten to 16 during the course of the 20-year staffing model.

Operational and Capital Cost

The long-term MFD deployment strategy calls for staffing and adding resources comprised of three fire stations, and three engines, to the long-term capital plan.

The following table projects capital and operating costs for the recommended station additions and staffing of those stations. These costs are in addition to current operating costs of the department and thus, would represent new funds needed to support the strategy.

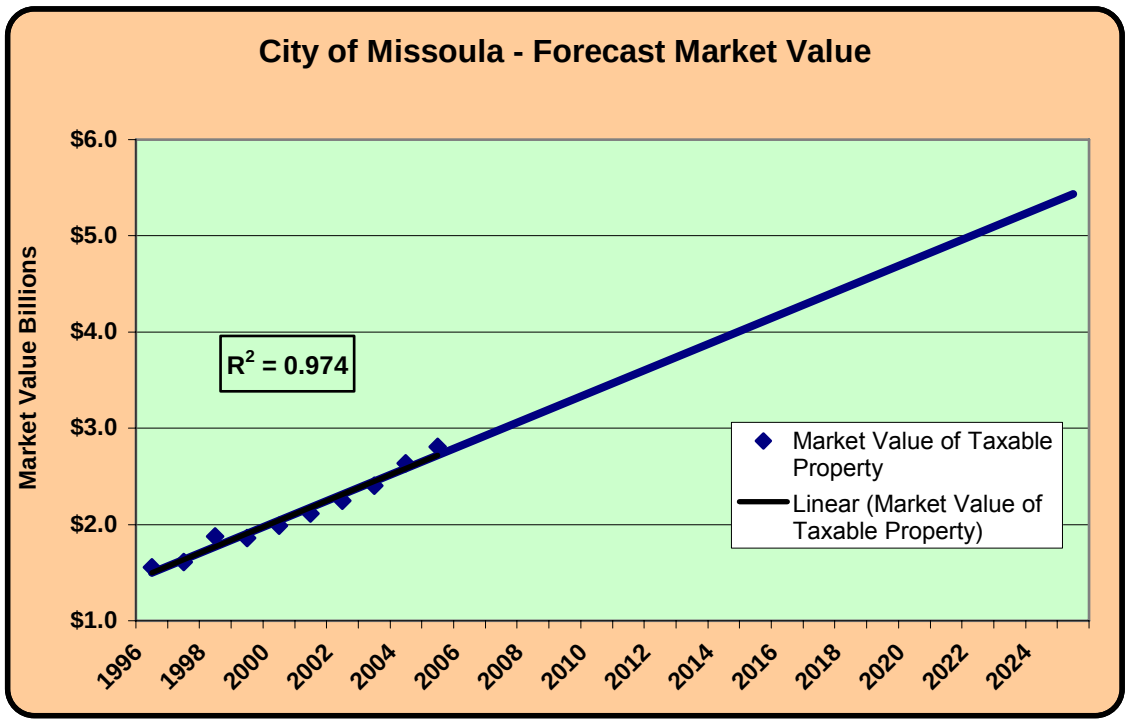
Figure 3: Cost Projections

Capital Costs	
New Station No. 5	$1,833,500
New Station No. 6	$1,833,500
New Station No. 7	$1,833,500
Apparatus Additions (3 engines)	$1,050,000
Total Capital Costs	**$6,550,500**
Annual Operating Cost Increases	
Annual Operational Staffing[2]	$3,070,176
Annual Operating Costs	$89,775
Total Annual Operating Costs	**$3,159,931**

For additional fire stations, apparatus, and personnel it is not enough that population increases, the value of the value of the property protected by Missoula FD would need to increase to support operations. The ten-year history of the market value of the City of Missoula is plotted in (Figure 4) and the likely growth of market value is forecast through year 2024.

[2] Includes new captain and firefighter positions only

Figure 4: City of Missoula – Historical and Forecast Market Value



The Forecast Market Value forecast shows strong growth during the next twenty years.

Section I – Current System Analysis

Objective One – Organizational Overview

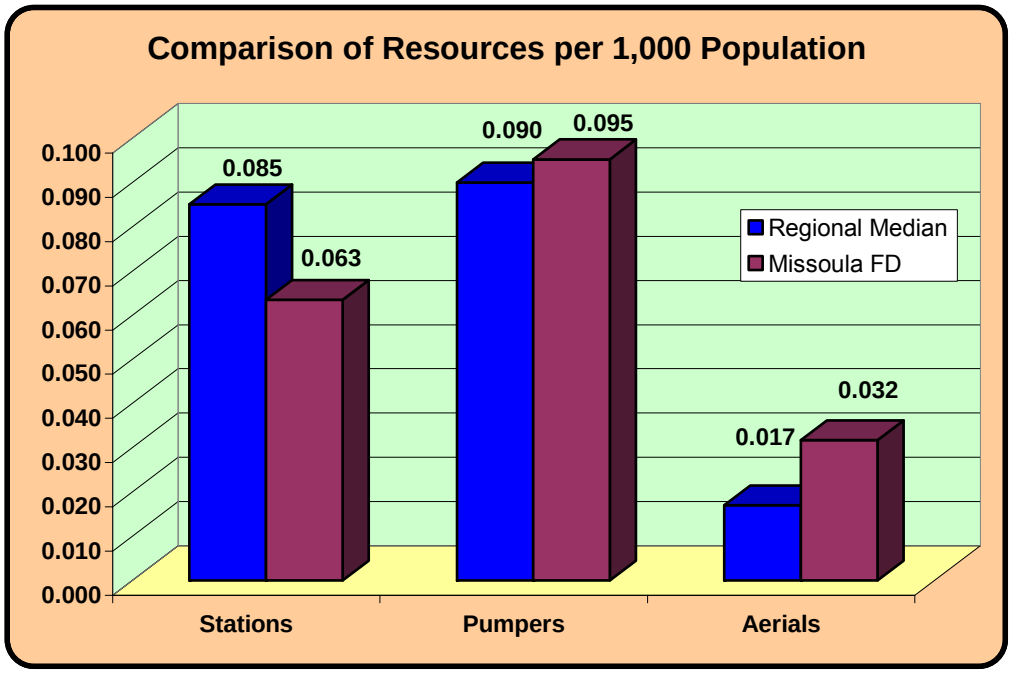
The Missoula Fire Department is a department of the City of Missoula, Montana, a governmental entity under the laws of the State of Montana and granted authority to levy taxes for the purposes of providing fire protection and emergency medical services. The department is a stand alone department as established by State law for Class One cities. The department's jurisdiction encompasses all areas within the city limits of Missoula. The response area includes urban areas, comprising about 20 percent of the city, as well as suburban development making up the remaining 80 percent.

Current resident population served is approximately 63,000, an increase from the 2000 U.S. Census figure of 57,053, in an area of approximately 24 square miles. The community is home to the University of Montana, with a student population of approximately 13,600. Fire service is provided from four facilities distributed within the jurisdiction, as well as a boat house used by the department to store a rescue boat. The department maintains a fleet of vehicles which includes four front line (Type 1) engines, with one engine at each station, two reserve (Type 1) engines, four wildland firefighting vehicles (three Type 6 and one Type 2), two ladder trucks, as well as staff and command vehicles. The fire department maintenance division maintains all apparatus with exception of the staff vehicles. Other specialty equipment includes a cataraft, which is an inflatable pontoon boat (used for ice rescue as well as low water activities), a jet boat, and trench rescue vehicle. The department provides emergency medical services, but does not provide medical transport.

Staffing of the department involves 78 individuals, including 64 operational personnel, to deliver fire services to meet the needs of the community. The department is managed by a fire chief, two assistant chiefs, with three office support personnel. The department is served by a Training Officer, an Emergency Medical Services (EMS) Coordinator, a Master Mechanic, and five fire prevention personnel. Fire prevention is led by the Fire Marshal who is assisted by an Assistant Fire Marshal and three Inspectors. The department is an all paid career-based organization. .

The following figure provides an overview of the Missoula Fire Department's fire suppression resources and compares these with the average rate of resource allocation in other communities of similar size within the north central region of the United States.

Figure 5: Comparison of Resources per 1,000 Population



The Missoula Fire Department has slightly below average allocation of stations when compared to the typical deployment for communities of its population. The department has an average number of pumpers (including the two reserve engines) when compared to a ratio to population served. The number of ladder trucks is above the regional median; however, these units are cross staffed which provides a good use of both apparatus and personnel. The department also operates and maintains vehicles needed to fight wildland fires.

The department provides a variety of services to the community including fire suppression, emergency medical assistance, vehicle extrication, technician-level hazardous materials response, fire code enforcement, public safety education, fire investigation, wildland fire response, ice rescue, swift water rescue, high/low angle rope rescue, confined space rescue, and trench rescue.

The Missoula Fire Department has achieved a current score of 3 on the Insurance Services Offices (ISO) Community Fire Protection Rating system used to determine fire insurances rates that are applied to many structures. The department's most recent ISO full survey was completed in November, 2004.

Responsibilities and Lines of Authority

The City of Missoula (City) is a municipal corporation, formed under the laws of the State of Montana, and is provided the authority to levy taxes for operating a fire protection system. Every city in the

State of Montana having a population of 10,000 or greater is a city of the first class.[3] The City of Missoula is classified as a first class city. As established by State law for first class cities (those with a population over 10,000, are required by law to have a paid fire department), the city has a paid career staff for the fire department.[4]

The City operates under a strong council, weak mayor form of government, as established by the City Charter. The Council is provided with broad authority to govern the provision of fire protection and emergency services within the City including operating a fire protection system, appointing officers and members, purchasing land and equipment, entering into contracts, issuance of bonds, and levying of taxes. A Chief Administrative Officer (CAO) carries out the day-to-day management of the City's affairs. The CAO is appointed by the Mayor. The roles and authorities of the Council, Mayor, and the CAO are further clarified within City ordinances and written City policy documents, specifically local administrative rules, which describe specific functions and tasks. The elected officials typically maintain strictly policy-level involvement, avoiding direct management and hands-on task assignment.

The position of Fire Chief is appointed by the Mayor. The present Fire Chief, Tom Steenberg, was appointed to his position in March of 2003. He does not have a personal services or employment contract, thus there is no fixed term to his Fire Chief position. Chief Steenberg has monthly meetings with the CAO, and is provided with an annual performance evaluation. The Chief's authority is defined in both state law and local ordinances.

Foundational Policy

Organizations that operate efficiently are typically governed by clear policies that lay the foundation for effective organizational culture. These policies set the boundaries for both expected and acceptable behavior, while not discouraging creativity and self-motivation.

A comprehensive set of department operating rules and guidelines should contain at least two primary sections: administrative rules and standard operating guidelines. The following format is suggested:

Administrative Rules – This section should contain all of the rules that all personnel in the organization are required to comply with at all times. Administrative rules, by definition, require certain actions or behaviors in all situations. The City Council should adopt or approve the administrative rules since the Fire Chief is also subject to them. However, the officials should

[3] Montana Code Annotated (7-1-4111. Classification of municipalities)
[4] Montana Code Annotated, (7-33-4101.Fire department authorized and required). In every city and town of this state there must be a fire department…

delegate authority to the Fire Chief for the enforcement of all administrative rules for department personnel. Administrative rules should govern all members of the department. Where rules and policies, by their nature, require different applications or provisions for different classifications of members, these differences should be clearly indicated and explained in writing. Specifically, administrative rules should contain sections which address:

- Public records access and retention
- Contracting and purchasing authority
- Safety and loss prevention
- Respiratory protection program
- Hazard communication program
- Harassment and discrimination
- Personnel appointment and promotion
- Disciplinary and grievance procedures
- Uniforms and personal appearance
- Other personnel management issues

Standard Operating Guidelines (SOGs) **–** This section should contain "street-level" operational standards of practice for personnel of the department. SOGs are different from administrative rules in that variances are allowed in unique or unusual circumstances where strict application of the SOG would be less effective. The document should provide for a program of regular, systematic updating to assure that it remains current, practical, and relevant. SOGs should be developed, approved, and enforced under the direction of the Fire Chief.

The Missoula Fire Department (MFD) maintains a set of rules and regulations which is commonly referred to as *Boots and Bunkers*. This document, along with the Blue Book of personnel policies and administrative rules, make up the primary policy manuals that govern fire department personnel. In addition, the department has a Collective Bargaining Agreement that applies to those employees covered by the agreement.

The *Boots and Bunkers* document has been in existence for many years. Responsibility for updating the document has shifted over the years and it is currently being revised. The department has a long standing practice of working issues out internally as needed.

The department's Standard Operating Guidelines have undergone major review over the past year. A concerted effort has been made by the department to update and improve those sections of the

guidelines where required. A significant review was conducted for the operations section relating to communications, dispatch and response, wildland/urban interface fires, hazardous materials operations/teams, technical rescue operations, and apparatus guidelines.

Organizational Structure

A well-designed organizational structure should reflect the efficient assignment of responsibility and authority, allowing the organization to accomplish effectiveness by maximizing distribution of workload. The lines on an organizational chart simply clarify accountability, coordination, and supervision. Thorough job descriptions should provide the details of each position and ensure that each individual's specific role is clear and centered on the overall mission of the organization.

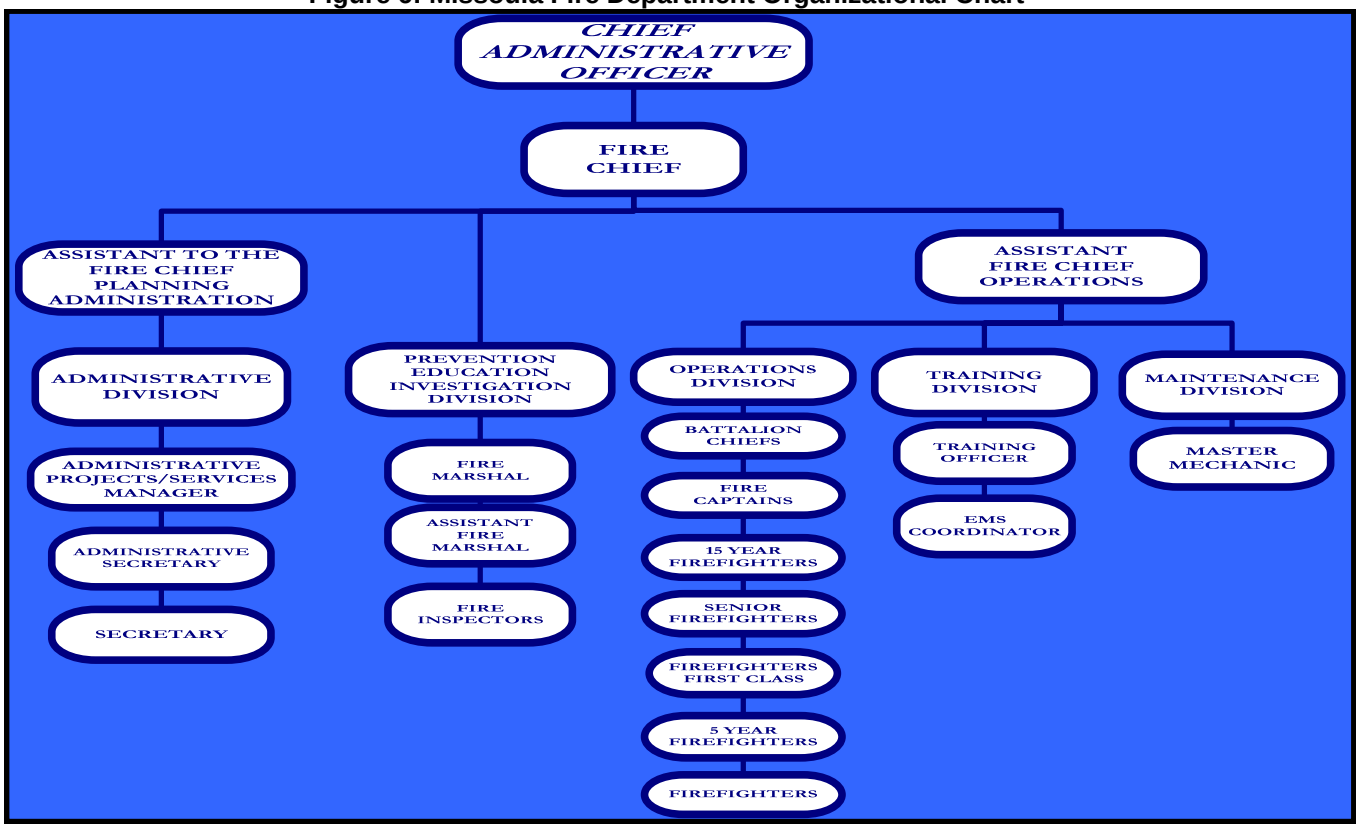
The job classifications of bargaining unit positions are in need of review and modification. A year ago these position classifications were being reviewed by the firefighter's union and the City, however, the labor negotiations and a bond issue delayed the review. The work previously began should be started again, reviewed, and finalized. The intent of MFD management staff is to have the descriptions accurately reflect the job duties of each position.

The job description review project should be elevated in importance and completed in a timely manner. Involvement of the City Human Resources department (or Personnel) ought to be part of the process to assure consistency with City practices. The fire department should request assistance from Human Resources so that job classifications adequately describe the qualifications, primary functions and activities, critical tasks, levels of supervision and accountability. Involvement of Human Resources staff will also assure that the fire department positions are properly revised to conform to City standards and applicable laws.

The current CBA (Collective Bargaining Agreement) with the IAFF (International Association of Fire Fighters) Local #271 has an effective date of July 1, 2004 and covers a term of four years. In the agreement, among other things, it clarifies salaries, benefits, and many of the working conditions under which the employees in specific classifications operate. The CBA covers all personnel of the department with the exception of the Chief, Assistant Chiefs, and support staff.

A review of the department's organizational structure (Figure 6: Missoula Fire Department Organizational Chart) shows that the department is organized in a typical top-down hierarchy. The chain of command is well defined with responsibilities and authority distributed in a reasonable fashion.

Figure 6: Missoula Fire Department Organizational Chart



The configuration of the department provides for an Assistant Chief of operations who also has responsibility for training, emergency medical services, as well as operations. The Second Assistant Chief (Assistant to the Chief/ Planning Administrator) is responsible for administrative duties such as long range planning, administration of the Collective Bargaining Agreement, and supervision of the administrative support staff.

The Fire Chief directly supervises the Assistant Chiefs and the Fire Marshal.

Maintenance of History

The Missoula Fire Department began as a bucket brigade in 1872. In 1887, the fire department was officially organized, prior to the city being incorporated in 1889 (after first being a town). The history of the department has recently been well documented by two firefighters who took upon themselves the task to prepare a cable access program on the history of the Missoula Fire Department. Assistant Chief Mike Painter is considered the unofficial historian for the department.

The new Missoula community access television documentary of the department provides a significant historical background so that members of the department can understand and appreciate the long history of service of the department, and the significant role that the department has played in the

development of the community. A well maintained historical record, such as this, also serves as a valuable tool for planning and decision-making. It allows for quick recollection of how the department has adapted to changes in the community. It also provides valuable historical data to agencies, such as the Insurance Services Office, for evaluation purposes. And perhaps of most importance, it provides for permanent memory of the people who have contributed to the success of the department in its service to the community.

A well produced annual report can also serve to satisfy this need. An annual report is a great communication tool to share the efforts and activities of the department with the public. The department has produced a stand-alone *Fire Department Annual Report* in the past, but recently submits a department report that is made part of a larger City report. When the report is completed, it typically is submitted to the City Council for review, and then placed on the City website. In the past, such reports have been on activities and trends; however, the department has not used narrative to describe the successes and challenges of the department.

We recommend that MFD consider placing more emphasis on developing an annual report format that can be used by the department for multiple purposes. Taking the opportunity to develop narratives describing how the department has evolved to address twenty-first century firefighting needs in a developing urban setting (while surrounded by potential for wildland fires) should be a priority of the department. Through this information, the department will be able to demonstrate to the community its budgetary needs.

Securing financing for operations, as well as capital needs, will be a challenge as financial resources continue to be scarce and the subject of competition by other City departments with competing needs. To be successful in obtaining adequate funding, the department must develop data and display it in a convincing manner so that decision-makers as well as City administration and financial staff fully understand and appreciate the needs of MFD. Merely saying that a need exists because the City is growing is not enough in this day and age. Sophisticated data gathering and display in professionally written reports is the key to success. The department should devote resources to upgrade and maintain annual reports as well as strategic plans for the department.

We recommend at a minimum that an annual report be developed that contains at least the following:

- Brief history of the department
- Summary of events and activities during the report year
- Description of major incidents handled by the department

- Description of new or improved services and programs
- List of people who served with the department during the year
- Awards received by the department or individuals
- Financial summary including revenues and expenditures, grants, etc.
- Statistical analysis, with trends, of key community service level indicators
- A list of the major challenges facing the department and the activities, programs and policies in place to address the challenges
- Major capital needs of the department, how they will address the needs of the community, and the funding challenges that exist which prevent the community from acquiring the capital facilities and equipment that the community needs.

The annual report should be printed and distributed to the community, made available on the City website, and at such places such as each fire station, the local chamber of commerce, and the public library. The initial distribution of the annual report should take place during the same time period each year, with the initial distribution a time of celebration. Media coverage of the Fire Chief delivering the report to the City Council, followed by a series of presentations to the local chamber of commerce and service clubs, will help to inform the public of the excellent service delivered every day by the department.

Appropriate records of all municipal meetings are maintained by the City in accordance with the laws of the state governing various types of public meetings and decisions involving public funds. Minutes of the governing body's activities are recorded and approved. They are made available to the community on the City's website. Approval of minutes usually takes about a week. Minutes of committee meetings are also recorded and made available to the public in a similar manner.

Fiscal Management

Overview

The Missoula Fire Department operates under the aegis of the City of Missoula in accordance with Montana Code Annotated (MCA) Title 7, Chapter 33 Part 41 - Municipal Fire Departments. Fire department financial oversight flows from the Mayor and the six-ward 12-member City Council, with the Council establishing budget policies and guidelines through the finance department and the Chief Administrative Officer. The Mayor supervises the Chief Administrative Officer in managing the daily operations of the City.

The City uses a one-year budget cycle to prepare the annual operating budget and capital improvement plan based on a July through June fiscal year. Each year, the City adopts a new

operating budget by the second Monday in August. To assure uninterrupted operations, an interim preliminary budget is approved by the City Council no later than June 30. Taxes received for the fiscal year beginning in July are based on assessed values of the preceding year as certified by the Montana Department of Revenue.

Financial control within Missoula city government is the responsibility of the finance department. Each year, the City conducts an audit and publishes a Comprehensive Annual Financial Report (CAFR). The report is prepared using financial reporting requirements in accordance with the Governmental Accounting Standards Board (GASB) Statement No. 34, Basic Financial Statements and Management's Discussion and Analysis for State and Local Governments.

The Government Finance Officers Association (GFOA) awarded a Certificate of Excellence in Financial Reporting to the City of Missoula in recognition of the CAFR for the fiscal year ending June 30, 2004. The Certificate Program, which was established in 1945, is designed to recognize and encourage excellence in financial reporting by state and local governments.[5]

As a recipient of state and federal financial assistance, the City is required to undertake a Single Audit performed by an independent audit firm. The standards governing Single Audit engagements require that the independent auditor report not only on the fair presentation of the financial statement, but also on the audited government's internal controls and compliance with legal requirements, giving special emphasis to internal controls and legal requirements involving the administration of federal awards. The results of the City's Single Audit for the fiscal year ending June 30, 2005, noted no material weaknesses in the framework of internal controls or significant violations of applicable laws and regulations.[6]

The City of Missoula uses modified accrual as its basis of accounting. Under the modified accrual basis of accounting, revenues and other financial resources are recognized as accrued when they become both measurable and available to finance expenditures of the current period. Expenditures are recognized when the fund liability is incurred with certain exceptions. The City finance department is responsible for managing all financial activities and oversees the City's revenues, expenditures, investments, accounting, and debt.

[5] Government Finance Officers Association, Certificate of Achievement for Excellence in Financial Reporting (CAFR Program), Award Winners For Fiscal Years Ended In 2004.
[6] Anderson ZurMuehlen & Co., P.C., December 19, 2005

Property taxes provide a major part of the revenues to the City; however Senate Bill 195 passed by the State Legislature in 1997 placed sizeable limits on the growth of property tax revenue. Under the limitation, only new construction or newly annexed areas can significantly increase taxable valuation. The issue was readdressed by the 1999 Legislature, which made numerous changes to the way in which property is valued and taxed in Montana. In addition to the limit on assessed value, MCA 15-10-420 prevents governments from assessing property taxes that generate more money than during the prior year plus one-half of the average inflation rate for the previous three years. In spite of those limitations, the City of Missoula remains in relatively stable financial condition.[7]

The City maintains a Capital Improvement Plan (CIP) for all capital purchases or projects with a single acquisition cost of $5,000 (or greater) and a useable life of five years or more. Such projects are classified as major improvements rather than routine maintenance or equipment replacement. The projects are reviewed and prioritized for the City Council. When funds are available, the Council makes the final decision on which projects are implemented. The CIP represents a five-year moving window (currently 2006 through 2010) updated annually. The Missoula CIP includes seven fire department specific public safety projects as follows.

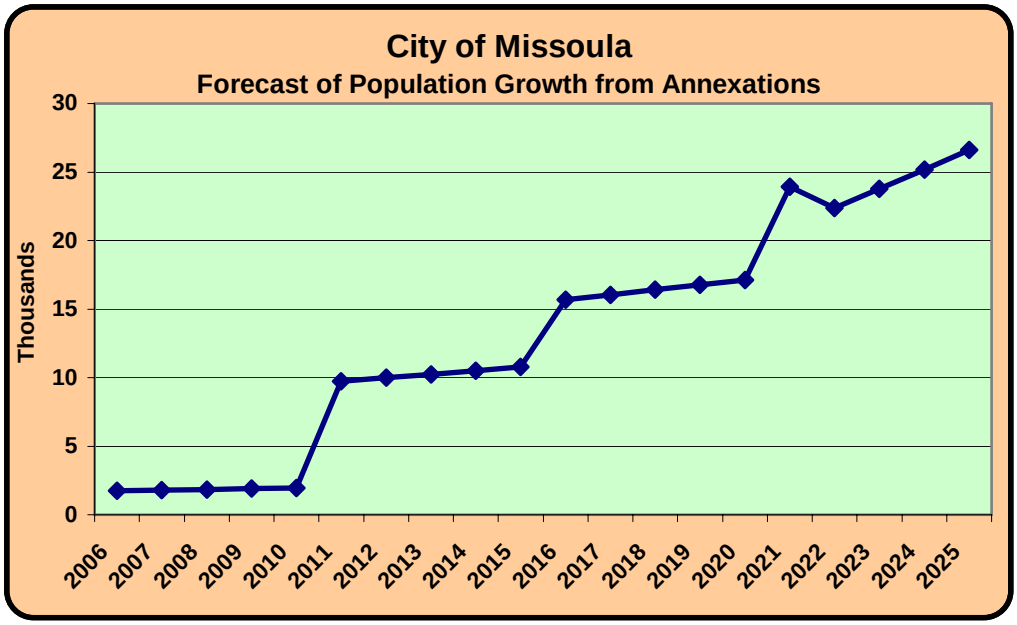
Figure 7: CIP Public Safety Projects

Number	Project	Year	Cost
PS - 1	Wildland Engine Type 6	2009	$75,000
PS - 2	Information Systems	2008-10	$70,000
PS - 3	Land for Fire Station No. 6	2008	$200,000
PS - 5	Structural Fire Engine Type 1	2009	$307,900
PS - 6	Structural Fire Engine Type 1	2010	$307,900
PS - 7	Thermal Imagers	2007-09	$33,000
PS - 8	Fire Station No. 4 Enhancements & Mechanic Bay	2006-07	$874,313

The City has annexed contiguous areas in recent years that are of an urban nature. These annexations expanded the tax base, and to some degree increased City costs. The City maintains plans to eventually annex other contiguous urban and suburban territory. The chart below illustrates the estimated population change due to population between 2006 and 2024.[8]

[7] Brentt Ramharter, Missoula Finance Director, Annual Financial Statements, March 25, 2004.
[8] Missoula City Growth Analysis, Annexation Projections, April 11, 2005.

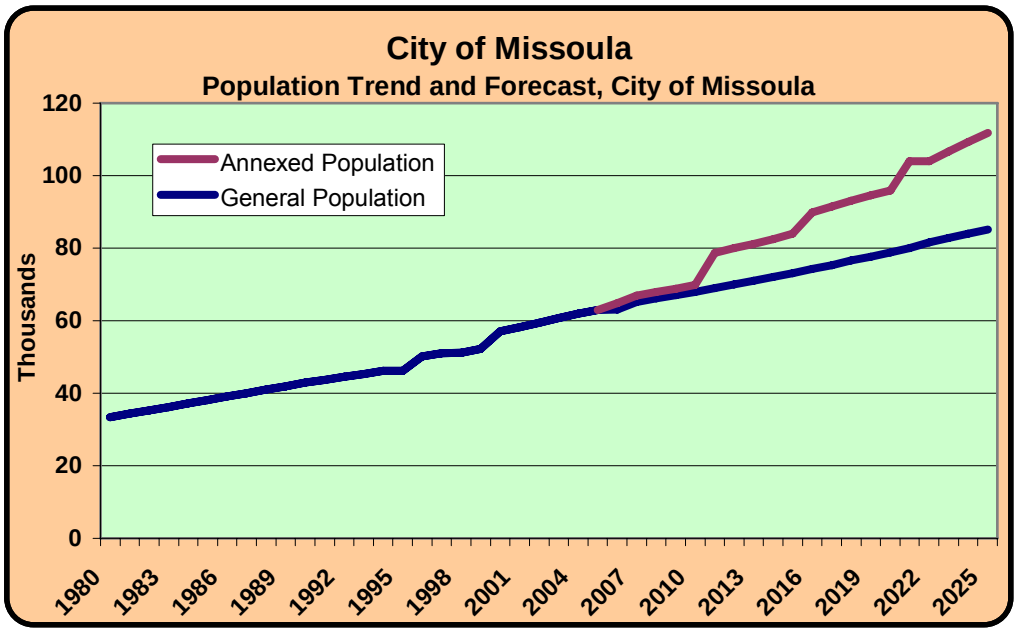
Figure 8: Forecast of Population Growth from Annexations



The chart shows that annexed population will begin to affect the general population of Missoula beginning about 2010, and that between 2010 and 2024 nearly 26,600 additional residents will reside in the City.

The population of the City of Missoula is currently estimated at about 63,000. The following chart illustrates how the population of the City has grown between 1980 and present, and how the population is likely to increase from 2006 through 2024.

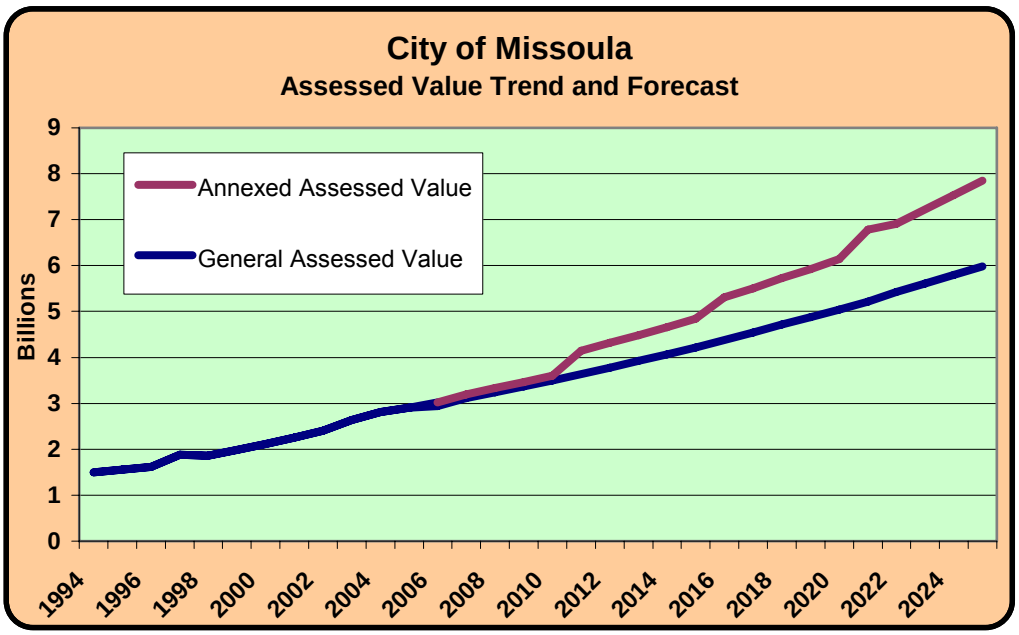
Figure 9: Population Trend and Forecast, City of Missoula



The dark blue line on the chart shows how population has changed and how, if that trend continues, the population of the City (as it exists today) is likely to increase to about 80,200 by year 2024. The second (plum colored) trace shows the impact of the increase in population due to annexations. By 2024, we estimate that the population of the City will approximate 111,805 persons.

Due to the property tax limits of MCA 25-10-401 through 425, the growth of Missoula's assessed value (and consequently, the growth of tax revenue) is almost entirely dependent on new construction and annexations. When inflation and the general appreciation of housing prices are factored out of the equation, the increase of assessed value usually parallels an increase in population. The chart below shows the change of Missoula assessed value between 1994 and 2005, and then forecasts that value through year 2024 based on the expected change in population during that same time.

Figure 10: Missoula Assessed Value Trend and Forecast



The assessed value of Missoula is likely to grow to about $7,852,000,000 by year 2024.

Besides property taxes, the City's General Fund revenue stream includes motor vehicle taxes, penalties and interest, licenses and permits, intergovernmental revenue, fees, fines and forfeitures, sale of fixed assets, transfers, and miscellaneous income. In addition, the City receives other income outside of the General Fund in the form of bond proceeds, grants, intergovernmental revenue, fees for service, and other proceeds.

Determining the Cost of Fire and Emergency Medical Service

Establishing the cost of fire protection in a community is an important part of evaluating the feasibility of other delivery strategies. By knowing the cost of the service as it exists, and predicting the cost of that service after organizational changes are made, alternative fire protection models may be judged more fairly.

As a part of the current systems evaluation of the Missoula Fire Department, we developed a computer-driven model to estimate the public cost of fire and emergency medical service. This baseline estimate is expressed in dollars and in terms of an equivalent millage rate that, when applied to the assessed value of the City, will produce revenue necessary to support the service. The estimate provides a scale by which to measure the status quo against any proposed system change.

The adaptation of the fire department's budget to estimate public cost requires certain conventions and assumptions. Specifically, the current budget of the agency is reformatted, often combining line item expenditures of different governmental funds to reflect total public service cost. The process groups all expenses into three major classifications: personal services, materials/services, and capital outlay – those classifications are then subdivided to permit the tracking of a program cost (such as: fringe benefits, maintenance, and indirect charges). The cost of each job in the department is adjusted to reflect units of fulltime equivalency (FTE); and annual salaries are calculated based on all sources of income (such as premium pay, bonuses, allowances, and stipends). Lastly, an estimate is made and added to budget requirements of the tax needed to retire outstanding general obligation debt related to the fire department.

Non-tax revenues specific to the fire department (such as fees for service) are identified. Revenue is corrected to allow for accumulation (or expenditure) of cash, and for the averaged expenditure of contingencies, if any.[9] Adjusted revenues are subtracted from expenditures to yield an estimate of general operating tax requirements. The resultant sum represents the amount of public tax support required to sustain the given level of fire and emergency medical services, regardless of the source of the tax revenues.

One point is emphasized. This analysis provides a "snapshot" estimate of the public tax cost for the current budgetary year. Many forces may act to change the level of tax support in the future including changes in law, revenue, politics, or contracts. The process uses current revenue and appropriation

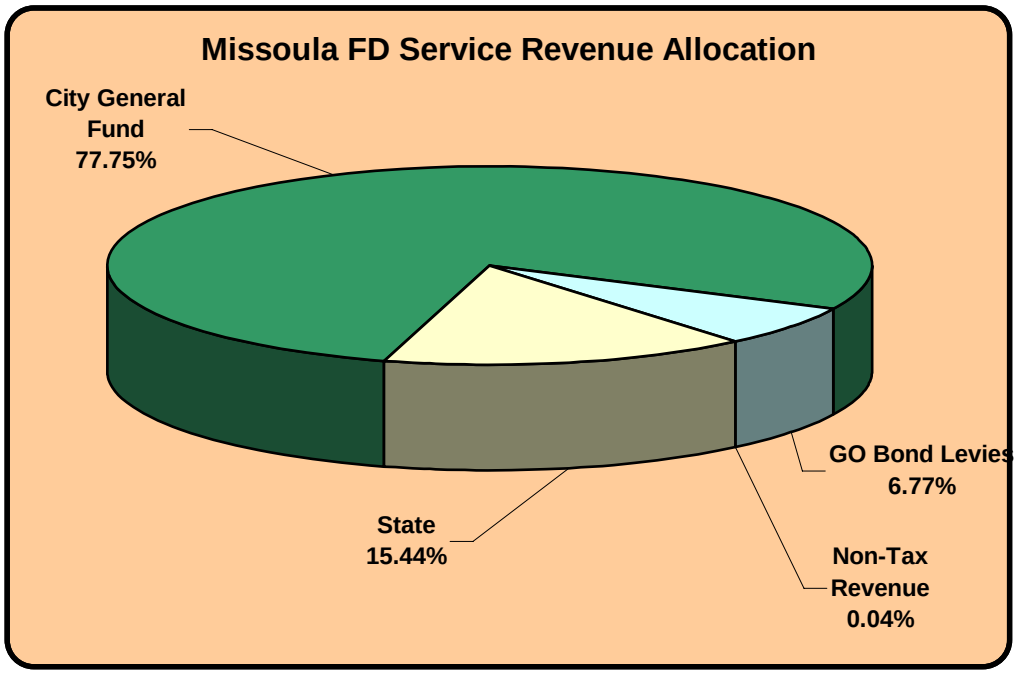
[9] The appropriation of cash lowers the tax needed to balance a budget; the accumulation of cash raises it. We negate the effect of cash accrual or expenditure to show the true level of community tax support required to maintain a given service level.

to generate an estimate of the amount of tax support relative to existing levels of fire and medical services. The analysis allows comparison with the predicted cost service; it does not predict actual tax rate, current or future.

Missoula Fire Department Community Tax Cost

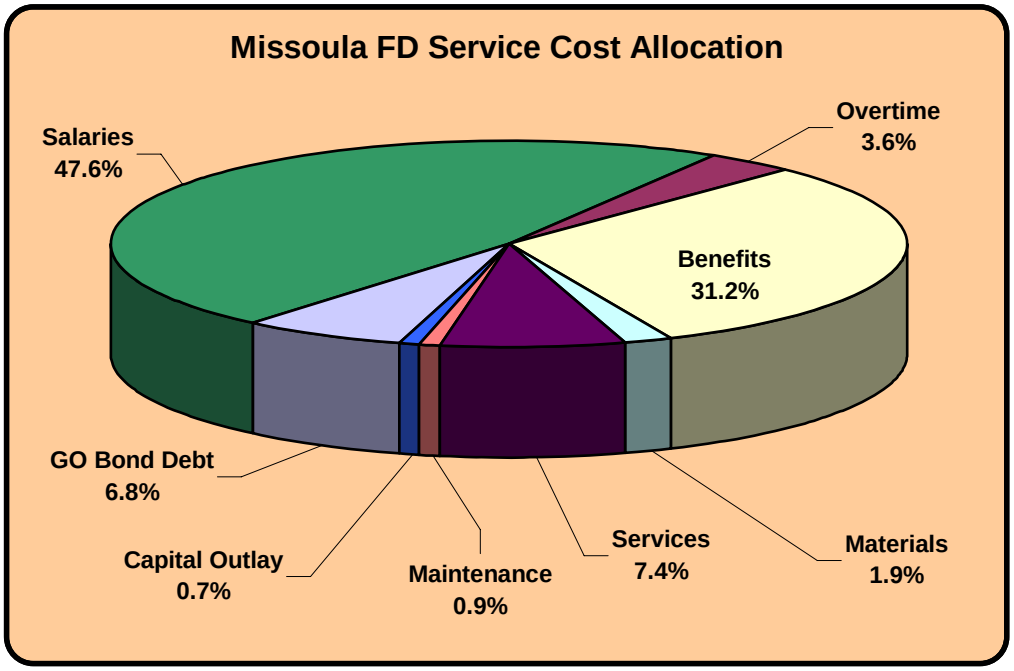
The fire department's operating budget is funded primarily from the City's General Fund, although other significant sources include the State of Montana, and two general obligation bond levies – one approved in 1998, and another approved in 2005. The chart below illustrates the revenue sources of the FY 2006 fire department baseline budget.

Figure 11: MFD Service Revenue Allocation



The next chart shows how the revenues shown above are allocated to the expense budget of the department.

Figure 12: MFD Service Cost Allocation



As is the case with all career-based fire departments, personnel costs make up the major portion of the fire department allocations. Salaries, overtime, and personnel benefits equal 82.4 percent of the total. Uniformed fire personnel are subject to a state retirement plan that is funded from a combination of employee, City, and state contributions. The City currently pays at a rate of 14.36 percent of the employee's salary, and the state contributes an additional 32.61 percent. Other employer benefit contributions such as health insurance, worker compensation insurance, and unemployment insurance tend to push the total benefit package to nearly 61 percent of salaries.

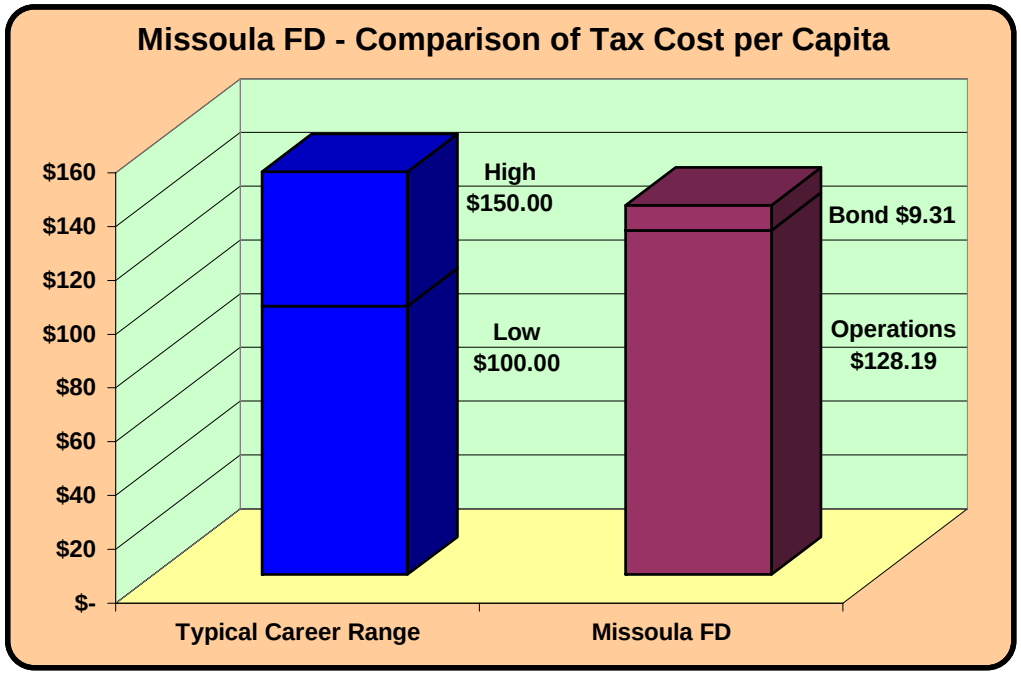
An analysis of the annualized Missoula Fire Department baseline budget is detailed in the table below.

Figure 13: Missoula Fire Department Baseline Budget (FY 2006)

Missoula Fire Department	
Expenses	**Amount**
1. Salaries & Benefits	$7,132,802
2. Materials & Services	$884,177
3. Capital Outlay	$62,750
4. Debt Retirement	$586,304
5. Total Baseline Expense Requirements	$8,666,033
Revenues	
6. Non-Tax Revenue	$3,725
7. State Support	$1,338,428
8. City General Fund	$6,737,576
9. GO Bond Levies	$586,304
10. Total Baseline Revenue	**$8,666,033**
Calculated Public Cost	
11. Assessed Value	$2,901,638,641
12. Baseline Budget (5 above)	$8,666,033
13. Non-Tax Revenue (6 above)	$3,725
14. Calculated Tax Support (5 minus 6)	$8,662,308
15. Equivalent Mills, State Support (7 applied to 11)	0.46
16. Equivalent Mills, City General Fund (8 applied to 11)	2.32
17. Equivalent Mills, GO Bond Levies (9 applied to 11)	0.20
18. Total Equivalent Mills Tax Support (sum 15 to 17)	**2.98**

The table illustrates that fire and emergency medical service within the City of Missoula currently cost the equivalent of slightly less than three mills. Expressing fire protection cost in this manner is favored because it more equitably represents the policy balance between cost of service and property at risk. On the other hand, population is also an important component of the fire protection equation. The trouble with accepted jurisdictional populations is that such numbers frequently do not account for our highly mobile culture. Factors such as transportation, commerce, and recreation tend to make the given population for a region fluctuate widely depending on time, day, and season. With that disclaimer, the chart below illustrates the per capita cost of the City of Missoula fire protection.

Figure 14: Comparison of MFD Tax Cost per Capita



Experience has shown that, it is very common for the cost of fire protection to exceed $100 per capita in urban settings, trending up to about $150 in most cases.[10] The higher cost of fire service in an urbanized zone is usually a function of the level of sophistication required by that system (i.e. career staffing, paramedic services, and fully-staffed fire prevention bureaus). The national average cost per capita is considered to be about $93, but that can vary dependent on region. Costs usually trend downward as one compares an urban fire system to suburban and rural settings. Rural fire systems staffed only by volunteers tend to cost from $15 to $60 per resident. Similar systems that employ only a full-time Chief Administrator usually cost from $40 to $80.

Given experience with other departments of similar size and character, we expect calculated tax rates to equate to between one and two mills. An analysis of the cost of fire and emergency medical service in Missoula, indicates a risk-based cost of roughly three mills; higher than normally expected. Importantly however, of the three mills of baseline cost, nearly one-half mill is contributed by the State of Montana and two-tenths of a mill is received from voter-authorized debt levies for capital investment. Consequently, the fire department's operation represents a local tax burden of about 2.3 mills; just slightly higher than normally expected for risk-based cost. On the other hand, the per capita cost of Missoula fire protection ($128.29 for operations and $9.31 for bonds) falls in the midrange of

[10] Sometimes, the per capita costs of certain urban fire protection systems trend very much higher than $150 per resident. This is usually due to special circumstances such as a high level of emergency medical service commitment, or a very low ratio of residential population to property risk.

our expectation. Taken together, and considering that the City is rapidly growing in risk (property) and population, we believe that the costs are appropriate for the size and character of the region.

Cost Recovery Efforts

For most emergency services systems, major cost recovery options are limited primarily to emergency medical services (EMS), where costs are underwritten by health insurance providers and Medicare. Additional possibilities exist in the area of hazardous materials response, fire suppression response, and code enforcement.

Missoula has established cost recovery procedures within its Standard Operating Guidelines, Section 10-106.1. In the case of extraordinary incidents that involve the calling in of off duty personnel or the assignment of additional apparatus to maintain response status within the City, or the use of substantial supplies or equipment, it is the company officer's responsibility to gather the information on scene needed to complete a resource expenditure form. The form is filed with the incident report and turned in to the on-duty Battalion Chief for review. The Battalion Chief determines if the cost recovery process should be initiated and the total cost expenditure, using the department's fee schedule. The Assistant Chief is responsible for reviewing and considering the billing. If an "at fault" party can be identified, and the cost is judged to warrant billing, the department proceeds with efforts to recover costs by authority granted in M.C.A. 75-10-717.

Although the department receives some revenue for plans review services through building permit fees, the department does not have a fee ordinance in place to require permits for hazardous occupancy or bill for routine inspections conducted by the Fire Prevention Bureau. If the department considers this as a potential source of revenue, it should recognize that in many communities the initiation of such fees may be a public relations issue. The potential revenue should be considered, based upon the number of inspections likely to be completed in any year, the public's recognition of the value of inspections in fire prevention, the revenue that is likely to be generated, and the business and development community strength, before pursuing creation of an inspection fee.

No data has been made available to us to determine if the present cost recovery efforts are being carried out in a routine manner, and whether the fee schedule requires updating or adjustment. It is recommended that the department, along with the City's finance department, conduct a thorough analysis of the existing program to determine what, if any, changes are needed.

Population

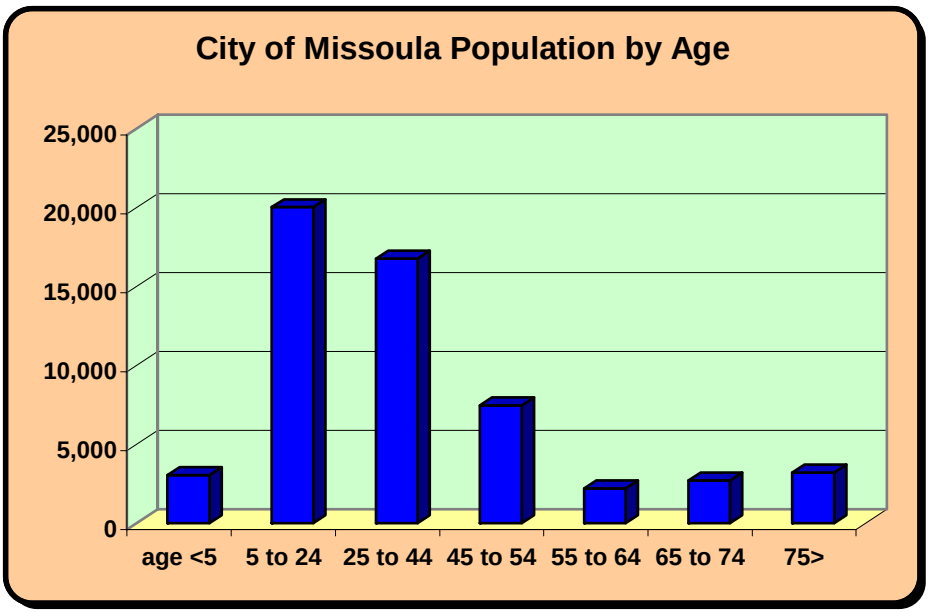
The fire department provides direct emergency services to an estimated population of approximately 63,000.[11] Several interesting points of demographic data are provided in the following table, derived from the 2000 U.S. Census information for the City.

Figure 15: U.S. Census Selected Demographic Information – 1990 to 2000

Selected Demographic Information- 1990 to 2000								
	Total Pop	Age <5	5 to 24	25 to 44	45 to 54	55 to 64	65 to 74	75 and up
2000	57,053	3043	20038	16779	7494	3777	2703	3219
1990	42,918	2831	14097	14451	3527	2720	2725	2567
change	33%	7%	42%	16%	112%	39%	-1%	25%

The following chart shows population by age group. Missoula shows predominance for younger demographics in the five to 44 year range. This demographic range is greater than all other age ranges combined.

Figure 16: City of Missoula Population by Age



The City is the home to the University of Montana, with a student population of 13,600 students. Approximately 20 percent of the population served is in an urban setting, while most of the City, 80 percent, is considered to be city/suburban.

[11] U.S. Census Bureau, 2005 Population Estimate

A total of 25,225 residential units were protected by MFD in 2000, the last available data. In part because of the significant size of the university population, the number of non-family households makes up almost 48 percent of the total households. The average unit size is 2.4 people.

Figure 17: Selected Housing Information – 1990 to 2000

Selected Housing Information- 1990 to 2000				
	Housing Units	Owner Occupied	Renter Occupied	Vacant
2000	25225	12130	12011	1084
1990	17677	8750	8927	811
change	43%	39%	35%	34%

The housing market has an average selling price of homes at $222,500 while the average monthly rent in the community is $678.[12]

The economy of the community as detailed in the 1999 Missoula Area Economic Development Corp. reports is broken down as follows, by economic base sector:

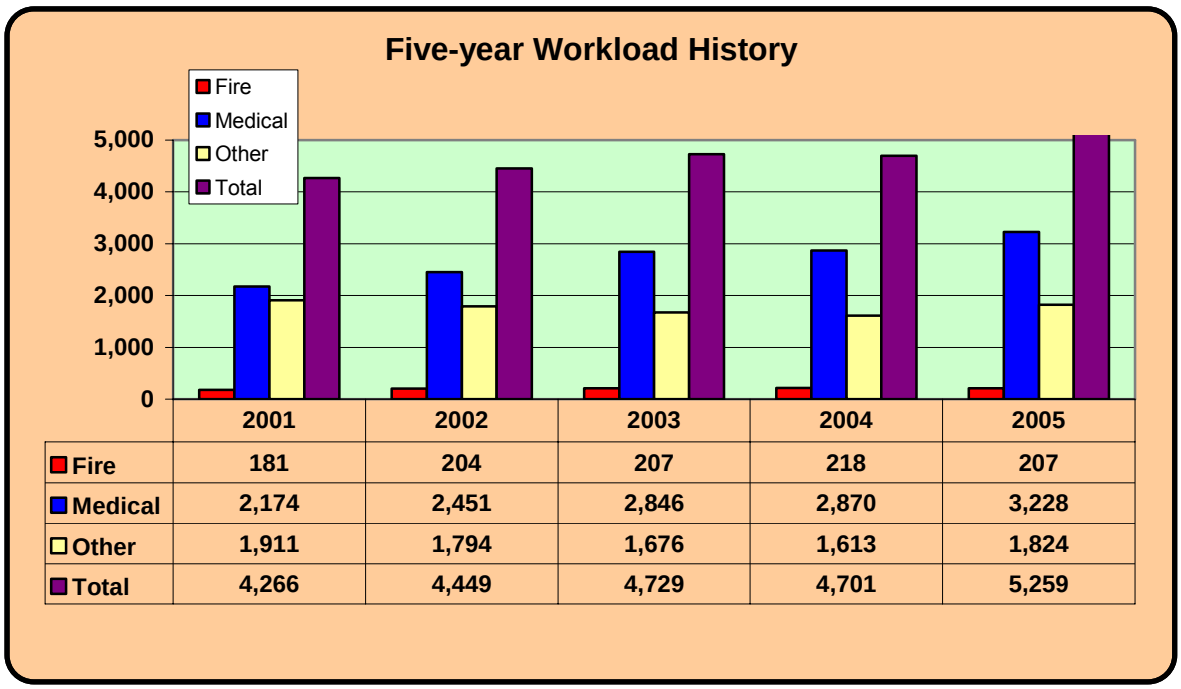
- Trade center activities include medical services Trade, financial and insurance 33%
- Wood and paper products 18%
- Motor carriers 13%
- Federal government 12%
- University of Montana 11%
- Nonresident travel 4%
- Other manufacturing 4%
- Railroads 4%

Alarms

The following figure provides an overview of the alarm history of the department for emergency responses. Additional analysis and projection of call volume will be found later in this report.

[12] Source: Missoula Area Economic Development Corp.

Figure 18: Five-year Workload History



	2001	2002	2003	2004	2005
Fire	181	204	207	218	207
Medical	2,174	2,451	2,846	2,870	3,228
Other	1,911	1,794	1,676	1,613	1,824
Total	4,266	4,449	4,729	4,701	5,259

Objective Two – Management Components

As with most emergency services agencies, the Missoula Fire Department faces challenges to organizational growth and management. In addition, the department has undergone significant change at the upper management level as the position of Fire Chief and other key positions have been filled over the past three years. The continuing growth of the community through annexation will increase the workload of the department. This situation will likely result in unique personnel management issues regarding consistent and adequate response, maintenance of competencies, and the on-going recruitment of qualified future workforce. This section will examine the department's efforts in this area and preparation for the future health of the organization.

Mission, Vision, Strategic Planning, Goals, and Objectives

The process of strategic planning involves clarifying an organization's mission, articulating its vision for the future, and specifying the values within which it will conduct itself. The department developed a strategic or master plan in 1986. The Fire Chief who preceded the present Chief was developing a new master plan when his tenure with the City ended. A community review panel was assisting the department in developing the plan, meeting at Station No. 4 over a period of several months. Until August of 2005, the panel was not brought back together to be apprised of the department's intent to now complete the master planning process. The panel formed a series of recommendations three years ago which will be taken into consideration as the present plan is developed. The panel met with ESCi and was afforded an opportunity to provide further detail on its recommendations.

The department has a mission statement which should be revised to reflect the present direction of the department. The adopted mission statement is "Saves lives, protect property, and ease pain and suffering". The words *pain* and suffering were added when the department took on EMS responsibilities. The mission statement is displayed in the lobby of the main fire station, as is the department's vision. The vision has been established and communicated, but it also requires updating and revision.

The department has an official list of values. The department values professionalism, teamwork, and respect for community. The organizational focus point is the same as the values, with the customer being Number One.

The department's strategic plan was adopted by the City's elected officials, as will the new master plan being developed through this project. It is the department's intent that the master plan be adopted by the Council in the fall of 2006 so that it can be in place to guide the department in 2007

and beyond. The department intends the new master plan be a living document. The City is to be praised for its proactive approach and should continue to develop and maintain a master plan that is a living up-to-date document. This can be accomplished through regular revisions and discussing the plan at least on an annual basis.

At the department level, strategic planning has not been completed at this point. Though a citywide effort provides the global view of the City's goals and objectives, a strategic planning effort within the fire department can involve members at various levels within the organization addressing critical issues and goals for their specific agency. Experience has shown that such planning efforts within a fire department lead to improved morale, commitment, and an increased sense of responsibility for organizational problem-solving. We recommend that the department strive to have active involvement of the entire department in this strategic planning effort.

Availability of SOGs, Rules, Regulations, and Policies

As discussed previously in this report, departmental management policies exist. Regardless of the quality or condition of such policies and guidelines, their availability and familiarity to workers is critical. The department established revised goals and objectives, or repeats the existing goals, each year during the budget process. Department goals are stated allowing the budget review officials an opportunity to review the budget request in light of the goals.

While copies of the rules are provided to employees, the management staff feels that the department can do a better job of updating the rules. Once hired, new employees meet with Human Resources staff on their first day of employment, then with the Fire Chief and the Training Officer who review pertinent information with them. The employee signs off signifying their understanding of the policies and acknowledgment of attending the orientation. Employees can access the rules easily, as the SOGs are available via the City Intranet through computers located at each station. When changes are made to the rules, a process that is on-going, a memo is sent out and posted. Each employee is required to initial the memo to indicate that he or she has read it. It is the Battalion Chiefs' responsibility to make sure that all employees have read the memos.

Department members indicate that administrative policies or rules and regulations are available in the workplace or distributed individually. This practice is encouraged as easy access to such policies is important for consistent practice. By making the policies easily accessible, management reinforces the importance of the policies in the organization. It is essential to also have a distribution system in place to record and confirm employee receipt of revisions or additions to the documents. The City

issues the personnel policy Blue Book to all employees when hired. It is also available at headquarters and on the Internet.

As mentioned earlier, *Boots and Bunkers* require revision and acceptance by the Labor Union. Prior to completion of the revision, the document will be reviewed for compliance with applicable laws. For example, when HIPPA became law, the department responded to the requirement by removing individual names from certain reports. A department employee now checks reports to assure that HIPPA is met by keeping the names of youth and individuals who receive medical aid out of public records. The department is assisted by the city attorney's office which keeps the department advised of changes in state and federal law, as well as pertinent lawsuits in Montana.

In the 1980's the department adopted a goal of maintaining a response time of six minutes or less, 90 percent of the time. This goal has simplified so that it is more in line with the National Fire Protection Association (NFPA) 1710 Standard. The department has made its efforts to maintain a six minute response time a higher priority than attempting to establish four firefighter engine companies.

The Missoula City and County plan for growth and land use includes the department's goal for response time. The plan covers emergency services, with the department emphasizing the response plan goal and the need for access to an adequate water supply for fire suppression. In 1999, the Southwest Missoula Annexation Study noted the need for the department to improve response time in the southwest portion of the City, as well as the need for a new station, Fire Station No. 5.

Department personnel will, in the future, have their individual and division performance statements and plans tied to department goals. Department management staff stated that they presently are working on revising the appraisal process, moving away from merely "checking the boxes" as has been the practice. The department is also considering having subordinate reviews. MFD is moving in the direction of using policies that exhibit the values of the department in the individual work programs that are developed for each employee and division. For example, the Fire Marshal has goals and objectives for his division which include inspecting schools and certain assembly occupancies annually and other occupancies every three years.

The process for developing new SOGs can be initiated by anyone in the department. A proposed change is submitted through department administration where the proposed change is reviewed and posted for comment. The posting period is for thirty days.

The department has a code of ethics that has been developed within *Boots and Bunkers*. The code emphasizes honesty and appearance. There are also codes within the Union by-laws and SOGs under organizational expectations.

Critical Issues

It is extremely important that there be a clear understanding of critical issues facing the department. Without such an understanding, department leadership cannot be prepared to face these issues. In addition, the enunciation of critical issues to employees and members of the public increases their awareness of the organization's priorities, and assists them in becoming focused on solutions.

A further exploration of critical issues should be completed during strategic planning processes, but for now, the following issues should be given serious consideration for inclusion in the final list. These are items that have been identified by officers of the department as issues with significant potential for impacting the success of the organization and the effectiveness of its service.

In the Missoula Fire Department, they are:

- Service delivery
- Response times
- Growth issues, specifically related to infrastructure and funding

The department has stated that service delivery and maintaining adequate response times, while growth pressures exist, is paramount. The department is concerned about maintaining response time goals to newly annexed areas. Funding and infrastructure needs of the annexed areas are also a major concern. One problem that exists is that Missoula's water system is privately owned. The department is not able to dictate that the private company provide water service to areas when development occurs. In some areas the department is requiring the installation of residential sprinkler systems in new developments.

Department challenges for the future also concern growth. Dealing with growth, without diluting existing levels of service to existing residents, has been identified as a challenge. This is presently a concern in the community, according to department staff. A second challenge is the fact that the City has annexed previously developed properties which now need to be brought up to City standards. The challenge is how the upgrades will be paid for. The fire department presently expends approximately $400,000 annually for new and existing fire hydrants. A third challenge for the department is developing and maintaining relationships with other fire agencies.

Internal and External Communications

Quality communication is an achievable goal for any organization, but one that always seems to be most elusive. Quality communication is extremely important. To its credit, MFD has established communication processes that provide opportunities for department personnel to be heard and involved. However, as in most organizations, there continues to be room for improvement in internal communications.

Staff meetings involving primary management staff and officers are consistently held weekly, early on Wednesday mornings. Memos describing the content of the topics discussed are distributed following the meetings. The Fire Chief attempts to keep to a schedule of holding biannual all hands meetings to keep the department personnel informed. In addition, meetings are held quarterly with department officers' and with the Fire Prevention Bureau.

The fire administration employs an open door policy. In fact, administrative offices are not locked and doors are normally kept open throughout the day. Communication utilizing bulletin boards occurs with bulletin boards at all fire stations.

The department feels that vertical communication is clearly defined. A discussion is held with new hires so that it is clear from the onset of employment, the value of a clear vertical communication path.

The department relies on e-mail as a form of communication. All employees have access to e-mail accounts and there are computers for this purpose in every control room. Some staff members are provided a voice mail box.

External communications are important so that the department can communicate with the public. As mentioned earlier, there is a report to the citizens that the Mayor releases annually which includes a section on the fire department. This report is printed in the local newspaper. The department and the City do not put out community newsletters.

An active, useful, and updated municipal website is maintained by the City of Missoula at http://www.ci.missoula.mt.us. This avenue provides the fire department an additional means of distributing seasonal information and communicating with the public. The site is kept up-to-date and provides contact information for major programs operated by the fire department.

The department does not have a standing advisory committee made up of citizens; however, there is a community review panel that was created with the specific task of assisting in the master plan process. There is also a City Council committee that deals with public safety issues. The department also is a member of the Missoula County Fire Protection Association which works together to coordinate matters for consistency throughout the county. For instance, for consistency in the region they coordinate how Stage 1 or 2 restrictions are applied to wildland fire protection.

There is no formalized complaint process available for citizens who have an issue with service delivered by the department. Other City departments do have a process in place, but these processes each require that there be a written complaint. The fire department has a process where it takes phone complaints, and addresses them. But, the department does not maintain a record of the calls received and issues resolved through this process. The Fire Prevention Bureau does have a process in place where they record complaints received and actions taken.

The department does not typically use an e-mail complaint system, however, it has been common practice for business owners with an issue to contact the department by e-mail, although they are just as likely to call by telephone or write a letter with their concern.

Community surveys are a good tool to solicit customer feedback on service priorities, quality issues, or performance efforts. The department has not in the recent past used surveys for this purpose, although the department has discussed conducting a survey as part of this process.

The department has the opportunity to get information out, and to seek input, through a variety of standing groups. In the past, the department has availed of speaking opportunities at service group meetings, Neighborhood Councils, or forums where the department has been able to communicate the successes and challenges facing the department. As a point of order at City Council meetings, discussions of neighborhood concerns take place. These discussions involve all range of subjects but, there is no regular, expected opportunity for the public to discuss fire issues. Planning for the future and the possibility of bond issues, the department plans to use Neighborhood Councils, service groups, and other community organizations to get information out and to interact with members of the public.

Document Control and Security

Records management is a critical function of any organization. A variety of uses are made of written records, therefore, their integrity must be protected. State law requires public access to certain fire department documents and data. Clear written procedures are in place to provide for public records

access through the appropriate department staff. Call records and NFIRS reports are readily available for public inspection, with copies available for a fee.

Some records, such as fire investigation reports, are available for review once the investigator determines that it is appropriate to release the information.

File protection is in place. Files are maintained in a location that is secured and available to only appropriate records staff. Hard copy files and fire call records are kept at Fire Station No. 1 where they are periodically boxed and placed in a secure location in the basement of the building. Official personnel records are kept at the City's Human Resources office in downtown Missoula. Evidence from fire investigations is kept in a separate locked room.

Department computer files are regularly backed up by department personnel. Department information saved to the department server and the municipal server is maintained and backed up by the City Information Technologies Department. Fire Department computers have adequate security built in and function properly as long as individuals log out. Every department member has his or her own unique password.

Security of facilities is a major concern for all public agencies. The department considers its buildings and facilities to be "pretty secure". The department utilizes keypad entry. In the past, the department has had issues of needing to lock front doors following incidents where transients were found sleeping in department buildings and vehicles. Steps have been taken to prevent future security breeches. All internal department offices have the capacity to be locked. There have been no issues related to vehicle security.

Capital inventory control is maintained adequately. In the past, there were issues when "things were left behind on occasion." Not too long ago, there was a significant list of missing items such as valves and nozzles. Now, the department places a greater emphasis on regular inventories of all equipment and individual fire apparatus. The EMS Coordinator inventories medical supplies on a regular basis. Other divisions within the department could use this practice as a model.

One way of maintaining inventory is to go through a process of cataloging and labeling all capital items. Presently, the department places property identification labels on items valued at over $1,000. Mobile and technology items are inventory tagged, regardless of price. It is recommended that the department review its inventory policy and place a higher degree of responsibility on individual employees to preserve department assets. Performance dimensions should be established that make preserving all capital assets a high priority.

Monetary controls are also employed by the department. Access to petty cash is limited and well controlled with $50 to $100 in petty cash for incidental use kept in a secured location at Fire Station No. 1. A policy on the issuance and control of credit cards is in place, with only one credit card issued to the Fire Department. This use of the credit card is monitored closely by the City Finance Department. Purchasing orders are used for most routine department purchases.

Reporting and Records

Department records are preserved using the RMS (Records Management System), *Firehouse*. Hard copies of reports are forwarded to Fire Station No. 1. Fire Department staff would like to upgrade the software since it is being used as a server type program, when it is truly a single-user type of software. The cost to upgrade the system is approximately $30,000. The department has not been successful at obtaining funding for this upgrade during the annual budget process.

Microsoft Excel® is used for recording and tracking payroll costs of the Fire Department. The City uses EDEN and ADP for payroll processing. The City and Fire Department use the Windows XP® operating system and the MS Office Suite of programs for everyday computer related tasks. The department has expressed an interest in obtaining ArcView®. It currently uses the resources of the City Engineering Division for geographic information and mapping. The department would prefer to develop its own internal GIS (Geographical Information System) capabilities.

A variety of reports are made to elected officials. For instance, financial reports are submitted as part of the annual budget. The Fire Chief provides a management report through the Public Safety and Health Committee which meets once a week. The Chief delivers this report orally, when he attends. The ALT (Administrative Leadership Team), made up of department heads, meets three times a month. The Chief attends these meetings regularly and reports back to the department. The Assistant Chief attends and reports on the activities of the SMT (Senior Management Team) of division managers monthly meetings.

Incident reports among a variety of reports developed by the department are properly maintained. Patient care reports are not public documents; these are maintained on a medical report form. Exposure records and workers compensation reports are kept by the Assistant Chief and are secured with the individual personnel files. SCBA (self contained breathing apparatus) testing is accomplished in house. There are four certified SCBA technicians in the department responsible for service maintenance records of the units, testing, and the annual fit testing. Other required testing is completed following accepted industry standards, such as:

- Hose testing – completed annually by the Master Mechanic. Testing records are available.

- Ladder testing – Underwriters Laboratory inspected the City's Baker ladder in 2005 and the Smeal ladder in 2004.
- Pump testing – In 2006, all pumps were tested.
- Breathing air – The department has a compressor that has a regular maintenance schedule. The City has a relatively new air compressor unit that is also available to private scuba divers who pay a fee to have tanks filled by MFD personnel.
- Vehicles – The Master Mechanic maintains the vehicle records. Regular inspection records for all units are up-to-date and maintained in a binder system.

Objective Three – Planning

Emergency services exist in a rapidly changing environment. Along with improvements in tools and methods used to provide service comes increased regulation of activities, new risks to protect, and other challenges that can quickly catch the unwary off guard. Only through continuous internal and external environmental awareness and periodic course corrections can an organization stay on the leading edge. The Missoula Fire Department has recognized the need for a stronger planning effort by pursuing this master plan, and considering a customer centered strategic plan.

Organizational Planning Processes

The master planning process that the department is presently undertaking is the closest that the department has come to completing a formal planning process. This is a very good first step as the process of planning in advance for occurrences that will take place in the future requires both discipline and organization. The department is demonstrating that it wishes to be more effective in the future, addressing the challenges that come with expanding responsibilities, both geographically and in terms of technology. In order to be truly effective, an emergency services agency must consider planning on three distinct levels: tactical planning, operational planning, and master planning. Tactical planning is practical preparedness of incident strategies for potential emergency incidents. Operational planning is preparation for the day-to-day activities of the agency and its integration into other regional or national response networks. Master planning (long range planning) is preparation for the future success and effectiveness of the agency in a changing environment.

Presently there is active short term planning taking place within the department, through the annual budget process. This process is used to define the level of effort for the coming year. Day-to-day activity planning also occurs. But, truly long term planning has not been sufficiently emphasized in the past. Creating a long term perspective is a priority of the fire administration, as evidenced by the level of commitment they have made to the present project. Through this process, the capability to conduct qualitative and quantitative analysis of level or quality of service should be developed. Without a clear definition of a plan, it is difficult for policy makers and department managers to recognize when “great service” is achieved by the department. Developing well defined performance objectives at the department level will allow the organization and policy makers to more readily identify and address future service delivery issues.

Tactical Planning

It is critical that firefighters and command staff have comprehensive, accurate, information readily at hand to identify hazards and direct tactical operations when called to respond to an emergency. When called upon, firefighters often are making their first visit to the "work site". This is also the point in time where the internal environment at the job site is at its worst. A lack of familiarity with the building can easily lead a firefighter to become disoriented or injured by an unfamiliar internal layout, or by equipment or other hazards that may be encountered.

It is important that firefighters use built-in fire resistive features to assist in fire suppression. This can be done by carrying out building familiarization tours, developing pre-fire plans, and conducting tactical exercises, either on-site or by tabletop simulation. Establishing a comprehensive process to create and maintain pre-incident plans should become a priority for the department. A defined list of target hazards should be developed and aggressive effort taken to ensure response crews have copies of these plans available. Target hazards are defined by:

- Buildings with large potential occupancy loads
- Buildings with populations who are partially or completely non-ambulatory
- Buildings of large size (greater than 12,000 square feet)
- Buildings that contain process hazards such as hazardous materials or equipment

Pre-incident plans should be easy to use, quick reference tools for company officers and command staff. At a minimum, a pre-incident plan should include information such as:

- Building construction
- Occupant characteristics
- Incorporated fire protection systems
- Capabilities of public or industrial responding personnel
- Water supply
- Exposure factors
- Facility layouts

NFPA 1620 provides excellent information on the development and use of pre-incident plans and should be used as a reference.[13]

[13] *NFPA 1620: Recommended Practice for Pre-Incident Planning*, National Fire Protection Association, 2003.

Once pre-plans are established and/or updated, training should be provided to all personnel who may respond to an incident at these locations. In addition, copies of pre-incident plans and drawings should be available on each response vehicle.

Presently, the department is engaged in pre-fire planning, but would like to improve the program. They have structural pre-plans which were completed by operational personnel that gathered the information and entered it into a database. The department recognizes that one area of improvement is using the computer terminals for this purpose. The department has the software needed, but as is often the case, gathering and maintaining large volumes of data is time and resource intensive.

The department has looked into the use of MDT (Mobile Data Terminals), but the current county 9-1-1 system infrastructure will not support the use of MDTs. A new wireless system may support computers in fire apparatus as a first step. Attention should be focused on collaborating with the county to develop a system capable of supporting MDTs. Emphasis on implementation should center on a system that is cost and resource efficient and developed with ease of on-going maintenance in mind.

Specific hazard plans have been developed for several sites in the community. For the most part however, the department has only been involved in this practice on an "as needed" or "as identified basis," versus a proactive position. The City does have only a few commercial and industrial facilities that are hazards, but does have one natural hazard feature, the Clark Fork River. The department trains for river and ice rescue regularly. The department has improved its swift water rescue capabilities, as well as confined space and trench rescue capabilities.

Hazardous materials' planning is a department priority. Both mainline rail and truck transportation routes traverse the City. The Missoula Regional Hazardous Materials Team includes 12 members from MFD, with other members coming from Missoula Rural Fire District, the University of Montana, Borden Chemical, and the Rocky Mountain Lab. All MFD firefighters are trained at the hazardous materials operational level. The department has preplanned Borden Chemical and the Conoco bulk plant. In addition, the department has done some joint work with Montana Rail Link in the past regarding the rail yards and their facilities, specifically in dealing with an emergency situation with the type of equipment present at their sites.

Operational Planning

Presently, the department carries out operational planning on a day-to-day basis. The Fire Chief has been in his position since March of 2003 and has developed a supportive command staff. The group works together well and has made strides to address some on-going issues including the need for a

strategic plan. Day-to-day operations of the department are managed well with a more positive work environment present now that there is more stability in management and a long-term Collective Bargaining Agreement in place.

Financial planning through the City budgeting process is considered a challenge for MFD. Funding for the department's operation comes from the City's general fund, a fund that as in most cities is receiving increasing pressures while citizens resist increased taxes. The department uses a capital improvement program and develops an annual department budget. Budget proposals are submitted and reviewed initially by a committee made up of the CAO, Mayor, Finance Director, and other City department representatives. They hear proposals and forward a recommendation to the City Council. Each City department presents its budget and proposed enhancements (new programs or projects) to the committee. The Fire Department has a committee representative currently serving a three-year term.

The department has suffered somewhat in recent years as it has not presented its proposals along with as detailed or sophisticated analysis and justification as other City departments. From discussions with other City Departments, ESCi has heard that the Fire Department has submitted proposals which were basically required to sink or swim on their own merit, without detailed justification and supporting materials. The City has had some departments which historically fare better than others as they devote significant resources to package proposals in a comprehensive manner. Some City departments have internal management or budget analysts who are trained to package proposals; the Fire Department does not have such a position. It is recommended that the department consider creating such a position, possibly combining the job duties of a grant writer, responsible for applying for and managing federal and state grant applications.

Operational planning falls under the responsibility of an Assistant Chief. He works with the senior staff to develop response plans. Formerly, the plan was consistent for all stations; however, a change was made when Fire Station No. 4 was added and response districts were changed. In addition, when the Smeal ladder truck was added, modifications to the response plan were also required. As annexations take place and build out projections are completed, service areas are expanded.

The department is involved in regional incident control, as mandated by new federal guidelines for the National Incident Management System (NIMS). The department has adopted NIMS and completed training. The department works with other agencies within Missoula County and conducts disaster and mass casualty drills. Presently, the major issues that affect interagency planning are communication and command structure. These are issues that the county departments are

collectively working to address. The department staff receives regular training directed towards supervisors. On-line FEMA classes are available to personnel as an adjunct to in-house training.

The department is also involved in mutual aid planning, but we believe there is a need for greater involvement. The existing mutual aid agreements are currently under review. There have been proposed changes to the agreement with Missoula Rural and there may be more proposed with other aid participants.

Master Planning

The master planning process is underway now, a recognized need for the Missoula Fire Department. Involvement of department staff, City officials, the public, neighboring fire agencies , as well as key emergency services users in and around the community will prove beneficial in making the master plan as reflective of community needs and expectations as possible.

External Customer Planning Involvement

There is a need for an external customer planning group. The community review panel used a few years ago is a good starting point, but it should be expanded.

The community review panel is made up of community members who were involved in the prior process. The department plans to involve people who have a specific interest, for instance, a kayakers group recently wanted to turn an old weir in the river into a small whitewater park. Everyone involved wanted to make it as safe a place as possible. The department supported the project by verifying that the weir was a hazard that required action to increase safety on the river. Working with the Fire Department and other community agencies and groups, the kayakers were able to implement a solution that will improve river safety and benefit the entire community.

Internal Customer Planning Involvement

The City Council has been involved with department planning through the Public Safety and Health Committee. Recently, the department took two Council members to an EMS conference to help raise the Council's awareness of the department's ongoing efforts at providing 24-hour advanced life support (ALS) service. The department is developing plans in the event the present ambulance service provider to Missoula discontinues service. The department needs to be prepared to take on the responsibility of EMS transport or at a minimum be equipped to fill in on a interim basis until another service provider can be identified.

Staff participation in the planning process has been accomplished through collaborative management Union participation. The current Assistant to the Chief was previously the Union representative in this

process. The department has a long standing practice of involving firefighters on committees related to planning and decision making. For instance, with station design decisions; the department established committees for each new fire station. The rough floor plans, which were eventually adopted, were developed for each station with committee involvement.

Objective Four – Risk Management

The responsibility of a manager to safeguard the assets of their organization is just as applicable to a fire department as to any business. Although their mission is to manage community risk, fire departments must also be concerned with risk to themselves. These risks can keep the organization from successfully carrying out its mission. The fire department is open to a variety of risks similar to those faced by every private organization.

There are interesting parallels between the fire department and private enterprise. A risk manager in the private sector tries to protect the assets of the enterprise and ensure that it can stay in business. Similarly, a fire department risk manager tries to protect public assets including personnel, facilities, equipment, and ensure the company can perform its mission.

The fire department manager is also the custodian of public funds and assets. He or she must restrict any undesirable outcome that costs money, consumes public dollars, and reduces the capability to spend funds where they would do the most good.

The City of Missoula Safety Committee meets monthly to provide the risk management function for all city departments. A fire department representative serves on this committee. Committee functions involve the documentation and nature of injuries of City personnel. This information allows targeted injury prevention and safety education and workplace modifications as a loss reduction strategy. There is limited interaction between Fire Department management and the safety committee. Regular interaction between risk managers or safety committees and fire departments should include:

- Periodic safety and risk inspections of fire department facilities
- Review of fire department rules, regulations, and procedures for potential risk exposure
- Review of contracts and agreements entered into by the fire department for potential risk exposure
- Training of fire officers on emerging risk such as national liability claim trends, injury prevention, etc.
- Periodic review, with the Fire Chief, of risk coverage

MFD personnel receive on-going safety training including basic fire ground safety, infection control, driver training, respirator use training, SCBA fit test, and monthly SCBA safety checks. All uniformed members are provided with a full structural firefighting ensemble.

Liability Issues

Nothing is accomplished without some element of risk. Since avoiding risk altogether is impossible, effective management of risk is necessary. This involves a variety of strategies including transferring risk to a third party via insurance. The following Insurance Declarations currently in effect for the City and Fire Department detail their risk and property casualty transfer arrangement from the Montana Municipal Insurance Authority (MMIA).

Figure 19: MFD Liability Insurance Coverage Summary

Missoula Fire Department	
Liability Insurance Coverage	**Amount**
Limits of Liability/Maximum Policy Limit Declarations	
Item 1 – Bodily Injury, Personal Injury, Property Damage, Public Officials Error and Omissions	$750,000
Item 1A – Bodily Injury, Personal Injury, Property Damage, Public Officials Error and Omissions	$1,500,000
Item 2 – Bodily Injury, Personal Injury, Property Damage, Public Officials Error and Omissions	$2,500,000
Commercial Crime Coverage	Max. $5,000,000
Boiler and Machinery Coverage	Max. $100,000,000

The City maintains the official personnel files for employees although many duplicate files are maintained internally by the department, including performance and training evaluations, disciplinary actions, and attendance. Formal documentation is required for disciplinary action and termination. Prior to issuing Fire Department suspensions and terminations they are reviewed by the City's legal counsel.

Health and Safety

Firefighting is a very stressful job that requires physically and mentally fit personnel to perform it safely, effectively, and efficiently. Approximately 50 percent of firefighter fatalities come from heart attacks. Of those fatalities, 50 percent had existing heart problems. It is clearly in the interest of the department and the individual firefighters to ensure programs are in place to periodically review and support high levels of medical and physical fitness.

MFD only evaluates on-going physical capacity through voluntary physicals every other year and with casual observation of personnel during their activities. This does not provide the department with

solid information as to whether an individual remains physically capable of performing the rigorous tasks involved in emergency services. Comprehensive physical capacity testing should be conducted at least annually. The evaluation can mirror an entry-level physical capacity test but should, within limits, give some consideration of an individual's age.

Physical capacity testing cannot detect all potential limiting conditions of an individual's health and fitness level. Periodic medical examinations are also necessary. National standards for firefighters recommend a regular medical examination. The evaluation should include all the criteria included in the entry-level examination as well as periodic stress EKGs and blood toxicology screening. Communicable disease vaccinations can also be updated as needed during this process.

Currently, MFD requires an entry-level medical and mental evaluation for new personnel. It is unclear whether this medical evaluation is based on standards recommended in the NFPA Standard 1582.[14] Periodic medical testing is based on minimum OSHA baseline physical requirements, and for annual respirator testing.

MFD does not currently provide a formal physical fitness program. An on-going fitness program is an important aspect of an overall firefighter training and performance system. NFPA Standard 1583 provides excellent guidance to the development of a comprehensive fitness screening, improvement, and maintenance program.[15] Another good source of guidance for ongoing fitness programs is the Wellness/Fitness Initiative jointly produced by the International Association of Fire Chiefs (IAFC) and the International Association of Firefighters (IAFF). The MFD should continue to work on implementing a departmental physical fitness program.

MFD does require an OSHA annual respirator test, which became mandatory beginning in 2002.

NFPA Standard 1500 recommends a fire department have an active safety committee that meets on a regular basis.[16] The MFD has established a Fire Department Safety Committee as outlined in the Collective Bargaining Agreement. This committee can meet on request and regularly once each quarter. The City of Missoula also has a Citywide Safety Committee that meets monthly and is represented by the Master Mechanic from MFD. Minutes of all meetings are kept, available and posted.

[14] NFPA 1582: *Standard on Comprehensive, Occupational Medical Program for Fire Departments*, 2003.
[15] NFPA 1583: *Standard on Health-Related Fitness Programs for Fire Fighters*, 2000.
[16] NFPA 1500: *Standard on Fire Department Safety and Health Program,* 2007.

Objective Five – Human Resources Management

An organization's people are its most valuable resource. Careful attention must be paid to managing that resource to achieve maximum productivity for the organization and maximum satisfaction for the individual. A safe working environment, fair treatment, and recognition for a job well done are key components to job satisfaction.

Personnel Policies and Rules

It is important that members of the organization know to whom they should go when they have a problem, question, or issue related to their relationship to the department. In large companies, this function is typically handled by a human resource department. Staff within such a department handles questions, issues, and tasks related to appointment, benefits, performance, disciplines, promotion, or termination of employees.

The City has established a Human Resource Department. In addition, the Fire Chief, Assistant Fire Chief, and the Assistant to the Chief coordinate internal personnel issues and provide a point of contact for members when it comes to questions regarding their employment or membership.

Written policies are in place that adequately describe the appointment of employees, the salary and benefits to which they are entitled, the conditions under which leave time may be utilized, systems to rate personnel performance, processes, and qualifications for promotion to higher positions, and systems for grievances. These policies are part of the employee *Blue Book* which is made available to each member upon hiring. Policies are reviewed and updated on a regular basis.

Compensation, Point System, and Benefits

Missoula Fire Department uses career staffing to carry out its functions. All administrative, support, and response personnel are full-time career staff.

Typical forms of compensation are provided to the full-time staff members, including salary, comprehensive medical/dental insurance, deferred compensation, life insurance, and a retirement pension. For general purposes, a full-time 15 year senior firefighter/EMT-D will receive an annual salary of approximately $48,900.00 plus overtime, along with a variety of compensated leave time.

The purpose of this study was not to be a thorough compensation analysis. Thus, this evaluation did not attempt to perform in-depth comparisons with other agencies of similar type and makeup. However, it is important that, within the context of this emergency services evaluation, we determine

whether the salary and benefit packages appear to be strength or weakness of the organization as it affects employee morale, loyalty, and turnover.

Benefit packages for represented members were developed through years of bargaining and appear to be reasonably competitive when compared to other similar organizations. Benefit packages for non represented members also appear to be reasonably competitive. Furthermore, it appears that the benefit packages provided by the City do not present a significant threat to the welfare of the organization.

Personnel Records

The maintenance of adequate and up-to-date personnel records is critical in every organization that depends on the effective performance of its people. The City Human Resources (HR) Department maintains adequate written and computerized records of MFD personnel.

Original application materials are retained in order to create a full historical record of the member's participation in the organization, from initial appointment to separation. Additional documents and records referring to assignments, promotions, commendations, discipline, and other personnel actions are kept organized and updated. Forms or other documentation pertaining to member performance are retained for one year by MFD and then by the HR department for an appropriate period of time. Reports describing details of accidents or other injuries or injury-related incidents are maintained for future reference and cumulative evaluation or analysis.

The EMS Coordinator acts as the infection control officer. The Assistant Chief along with the HR department assure that all records of health evaluations, exposures to hazardous substances or contagious diseases, and other medical records are thorough and complete. All medical-related records, protected under federal privacy laws, are kept separate from routine personnel records and access is strictly limited.

The personnel records of all personnel are maintained at the City HR office. Some duplication of records is also maintained in the Fire Chief's office. The responsibility for maintaining and updating these records is somewhat split between the HR director and Fire Chief.

Disciplinary Process

A formal progressive disciplinary process for personnel is adequately identified in written policies and the Collective Bargaining Agreement. Corrective action practices are very straight forward and conform to accepted practices and State of Montana laws.

Counseling Services

Emergency services bring otherwise ordinary people into life and death situations that sometimes end very tragically. Even though department personnel are trained responders, they do not have an impregnable shield that prevents them from being affected by traumatic events. Critical incident stress is a very real condition that affects all emergency service workers to some degree or another. It is how emergency workers deal with that stress that makes the difference. The trigger for significant psychological trauma may be a single event, or a series of events compounding on each other.

Fire and EMS departments have recognized the need to provide a support system for their personnel who are exposed to traumatic incidents. MFD can call upon the services of trained personnel to conduct critical incident stress debriefings and defusing through a community based program. Critical incident stress interventions by this group are short-term process only. Though normally sufficient to help emergency personnel cope with the event, on occasion longer term support is needed. Failure to provide that support can ultimately lead to the loss of a very valuable member.

An Employee Assistance Program (EAP) has been made available to personnel of the department as a long-term stress intervention tool. The EAP, which is separate from the City sponsored medical plan, provides additional support for other life problems that may affect a member's motivation and work quality such as substance abuse, marital difficulties, financial complications, and the like.

MFD and IAFF Local #271 have co-sponsored an informal mentoring program for new members. The program has proved successful in assisting new hires through the rigors of training and adjusting to the work requirements. Formal adoption of the mentoring program will greatly enhance the success rate of the recruit training and orientation program.

Application and Recruitment Process

Recruitment of personnel is a critically important function for emergency service agencies. The community places a tremendous amount of trust in fire department personnel. The process used to select personnel should be quite comprehensive.

The American's with Disabilities Act (ADA) prohibits discrimination against individuals with physical disabilities, but permits employers to establish the physical standards that are required to perform the primary functions of any job safely and effectively. History has shown that the most effective method of avoiding a litigation suit involving ADA is through reasonable and consistent application of job-relevant pre-employment physical ability testing. Applicants for career positions in emergency response within MFD are subjected to a formal physical ability test, (IAFF/ IAFC CPAT) to measure the applicant's ability to perform critical physical tasks and functions.

Modern firefighting and medical response also require extensive technical training, much of which is presented at the college level. Career applicants must demonstrate their aptitude to learn and perform the necessary mental skills to perform the work through a written aptitude test and proof of high school graduation.

As a condition of employment, applicants are required to pass a pre-employment physical and psychological examination. The examination is appropriately required after a contingent offer of employment.

MFD participates in the Montana Firefighters Testing Consortium made up of all the major fire departments in the state. State-wide recruitment is conducted; applicants are given one aptitude test followed by pass/fail physical agility, (IAFF/ IAFC CPAT). The process followed by the Consortium meets or exceeds all applicable laws and guidelines.

Ongoing Competency Evaluation

Once on staff, personnel should be evaluated periodically to ensure their continued ability to perform job duties safely and efficiently. Technical and manipulative skills should be evaluated on a regular basis. This provides documentation about a person's ability to perform their responsibilities and provides valuable input into the training and education development process. Beyond offering physicals and annual respiratory testing, MFD does not provide for any on-going competency evaluations or physical agility testing. The lack of such a program may lead to decreased emergency scene performance as member's age and/or become less active. Sincere consideration for establishing a comprehensive annual physical abilities evaluation and skill competence demonstrations should be undertaken jointly by MFD and IAFF Local #271.

Regular evaluation and feedback for personnel is critical to behavior modification and improvement. A formal performance evaluation system is currently in place for all employees of the department and such evaluations are conducted on a regularly scheduled basis.

It is important to maintain such programs whenever possible. It has long been proven that employees and members sincerely wish to perform well and to be a contributing part of any organization. This desire to succeed is best cultivated through effective feedback that allows a member to know what he/she is doing well or what needs improvement. The honest and effective presentation of this feedback encourages the member to reinforce those talents and abilities they already excel in and to work harder to improve the areas where they fail to perform as desired.

Objective Six – Staffing

The Missoula Fire Department uses career personnel to accomplish its mission and responsibilities to the City. Administrative functions are generally the responsibility of staff officers with support functions provided by clerical employees. Staffing for emergency response to fire, emergency medical and related incidents is provided by career personnel on a 10/14 hour, four platoon schedule.

Administration and Support Staff

One of the primary responsibilities of the department's administration and support staff is to ensure that the operational entities of the organization have the ability and means to accomplish their responsibilities on the emergency incident. Efficient and effective administration and support are critical to the success of the department. Without sufficient oversight, planning, documentation, training, and maintenance, the operational entities of the department will fail any operational test. Additionally, like any other part of the department, administration and support require appropriate resources to function properly.

Analyzing the ratio of administrative and support positions to the total positions of the department facilitates an understanding of the relative number of resources committed to this important function. The appropriate balance of the administration and support component to the operational component is critical to the success of the department's mission and responsibilities. The administration and support complement of the MFD is comprised of two major divisions and the Fire Chief's office. The following figure summarizes the personnel FTE's (full time equivalents) assigned to the administration and management.

Figure 20: MFD Administrative/Support Personnel

Administrative/Support Personnel	
Position Title	**Number (FTE)**
Fire Chief	1
Assistant Fire Chief	1
Assistant to the Fire Chief	1
Training Officer	1
Fire Marshal	1
EMS Coordinator	1
Master Mechanic	1
Administrative Projects Manager	1
Administrative Secretary	1
Secretary	1
Total Administrative and Support	**10**
Percent administrative & support to total personnel	**12.82%**

The administration and support staff for the MFD is comprised of 10 FTE's. Statistically, the MFD maintains a percentage of 12.82 percent of administration and support staff to total personnel. Each organization should determine the proper percentage of administration and support staff to total positions dependent upon local and organizational need. Based on our experience with similar organizations, we have determined emergency services departments usually enjoy 10 to 15 percent of administration and support staff out of total personnel. MFD administrative and support staffing level is within this comparison range.

Emergency Services Staff

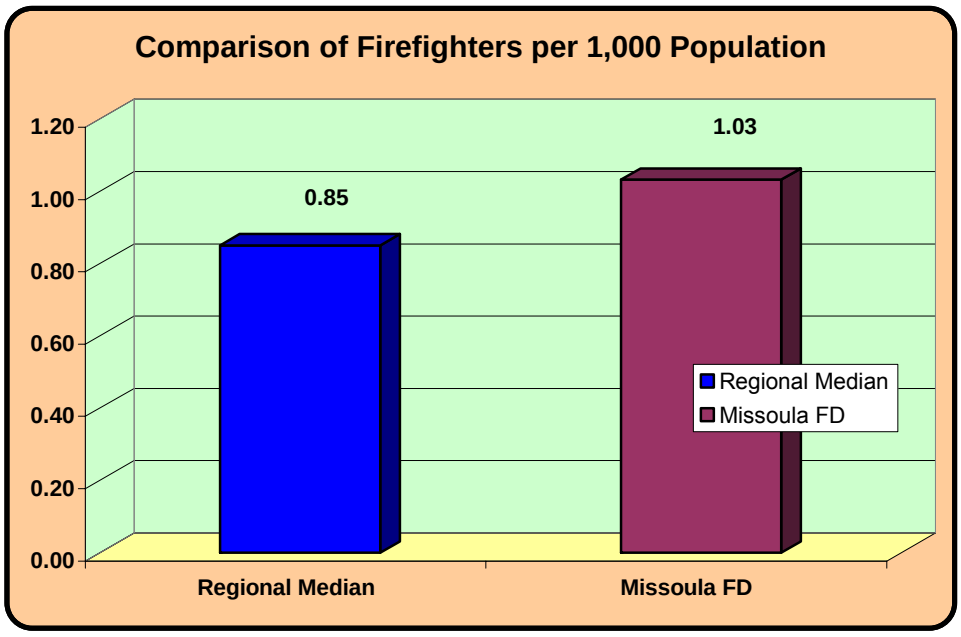
It takes an adequate and well trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved. The following figure summarizes the personnel assigned to street-level service delivery.

Figure 21: Field Operations Staffing Summary

Position Title	Number (FTE)
Battalion Chief	4
Captain	16
Senior Firefighter	13
Firefighter First Class	11
Three Year Firefighter	12
Firefighter	8
Total Operational Staff	**64**
Percent of Operational Officers to Firefighters	**31.25%**

An analysis of emergency service staffing begins with comparison of available emergency service personnel to other communities of similar size and organization. The number of operational personnel maintained by a fire department provides some measure of the ability of the agency to assemble emergency workers to respond to request for assistance. The following chart shows the number of career personnel maintained by MFD per 1,000 residents, and compares that benchmark to the Western United States median for agencies serving similar communities with a residential population between 50,000 and 99,000.

Figure 22: Comparison of Firefighters per 1,000 Population



MFD has slightly over one firefighter for every 1,000 population, just slightly higher than departments of similar size. This does not take into consideration community fire risk and other factors that may require more firefighter resources.

Regardless of the raw number of personnel available to a department, what matters most is the actual number of emergency responders the agency is able to produce at an emergency scene. This almost always relates to the actual number of emergency responders available for immediate deployment. While MFD's career staffing system distributes up to 16 personnel on each of four platoons, it is important to note that this number is not necessarily reflective of the actual number of personnel on-duty. Due to sick leave, vacation, injuries, and other circumstances, the actual number of on-duty personnel often falls below the number assigned to each platoon. MFD policy allows the shift staffing level to fall to a minimum of 13.

Assignment of Responsibilities

In previous and subsequent sections of the report, the need for adequate levels of management and administrative support and staffing are discussed. Analysis of the department's current staffing performance will determine where recommendations for improvement may be indicated.

The recent appointment of the Assistant to the Chief / Planning Administrator seemed to balance the administrative assignments of the senior staff.

Review of the new organization chart indicates that clear lines of authority are in place. The chart is very straight forward and provides the organization with a clear picture of communication lines. Review of job descriptions indicates that clear delineation of duties and responsibilities exist. We encourage MFD to review and update all job descriptions and bring them into line with current operations. We further recommend that clarification of each positions supervisory responsibility and reporting mechanisms be provided. Each position needs to have a clear understanding of what their responsibilities are and who they report to.

Objective Seven – Capital Assets and Resources

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

Facilities

There are a lot of questions facing a department that has outgrown its facilities, and the solutions are often more complicated than simply building new stations and buying a fleet of new fire apparatus. Fire stations themselves are complicated enough even without the considerations of staffing and equipping them for long range utilization. There are basic issues that each fire station has to address. Among those are distribution to account for the department's response standard and adequate space for the effective, safe, and secure housing of personnel, apparatus, and equipment. Facility distribution, staffing, and equipping are always a balance of a city's fire protection goals and the ability to fund those goals.

Consideration should be given to the ability of the facilities to support the goals of the department, including standards of coverage as it may exist today, and to provide for that which is projected into the future. The primary functions that should take place within the fire station environment should be closely examined. Adequate, efficient space for all functions should be provided to include:

- Housing and maintaining apparatus and equipment
- Residential living for on-duty crew members that is gender compatible
- Administrative office functions
- Firefighter training
- Firefighter fitness

Figure 23: Facility Overview and Condition Summary

Station Number	Year Built	Square Foot of Building	Condition	General Appearance
1	1995	15,445	Very good - well maintained	Very good
2	1954	2,311	Poor - numerous maintenance issues	Poor
3	1975	4,050	Good - well maintained	Good
4	1994	9,070	Good - confirm issue w/ foundation	Very good

Missoula Headquarters/ Fire Station No. 1

Built in 1995, this 15,445 square foot facility consists of four apparatus bays. This station is Headquarters for MFD including fire operations, administration, training, and fire prevention. Station No. 1 is an up-to-date facility. However, evidence of crowding will decrease the building's usefulness if not corrected for future growth. Concerns related to maintenance, public access, staff facilities, safety, and efficiency are minimal.

Any specific problems, concerns or features with this facility can be classified into the following seven categories

Design:	This station is aesthetically designed to fit the surrounding community structures. Designed for two-gender staffing, with separate dorms for sleeping and lockers included, well-suited for privacy. Sleeping is confined to one firefighter per room. Station is equipped with gender-neutral amenities.
Construction:	Age and construction type has led to reasonable maintenance costs.
Safety:	Living quarters of this station have fire sprinkler coverage. Lack of storage is causing stored materials to encroach into the living and apparatus bay areas. Many trip and collision hazards are present.
Environment:	Some crowding is noted in the training, fire prevention, and support staff offices.
Code Compliance:	Building is ADA compliant, and appears to be in compliance with fire and life safety codes appropriate at the time of construction.
Staff Facilities:	This facility combines operations and administrative staff personnel and is at a growth point that will require expansion to continue efficiently.
Efficiency:	While functional, storage and office space is at a critical point. Any future additions to the station should include specified storage areas and additional work space.

Missoula Fire Station No. 2

247 Mount Ave.

Built in 1954, this 2,311 square foot facility consists of two apparatus bays and crew quarters. There are concerns related to maintenance, size of the apparatus bays, and general safety and efficiency of the facility. Any specific problems, concerns, or features with this facility can be classified into the following seven categories.

Design:	This station is a small facility with limited space for equipment and personnel. Some modern apparatus will not fit in the apparatus bays.
Construction:	The age of this facility has led to extremely high maintenance and utility costs.
Safety:	Lack of storage space leaves the facility extremely cluttered causing multiple trip and collision hazards. Plumbing and electrical systems are marginal for safe proximity to personnel. Air compressor in apparatus bay has no belt cover. The station does not have fire sprinklers.
Environment:	Turnout lockers are open to the apparatus room.
Code Compliance:	The front office was retrofitted for ADA access/compliance, but not the remainder of the station. Station would have met fire and life safety codes at the time of construction, but would be very out of date by current standards.
Staff Facilities:	Small and congested office, kitchen, and dayroom that have no separation from the public access point. Dorm is also extremely small and run down.
Efficiency:	Not efficient. Limited size, cramped facilities. MFD should consider replacing this station.

Missoula Fire Station No. 3

1501 39th Street

Built in 1975, this 4,050 square foot facility consists of two apparatus bays and crew quarters. Station No. 3 is serviceable, but in need of upgrades to extend service life. Any specific problems, concerns, or features with this facility can be classified into the following seven categories.

Design:	This station aesthetically fits the neighborhood, has good traffic flow to the street, and has adequate parking.
Construction:	While generally sound, the age of the facility is showing increasing maintenance and utility costs. MFD may need to consider upgrades to systems. The station does not have fire sprinklers.
Safety:	Some clutter noted due to lack of adequate storage. Clutter presents trip and collision hazards.
Environment:	PPE (Personal Protective Equipment) storage in apparatus bays.
Code Compliance:	ADA and mechanical systems may present issues for future consideration.
Staff Facilities:	Kitchen and day room are small, but adequate for up to three personnel. Living areas - dorms and kitchen/dayroom/office are split by the apparatus bays.
Efficiency:	This station could serve well into the future with space and systems upgrades.

Missoula Fire Station No. 4

3011 Latimor

Built in 1994, this 9,070 square foot facility consists of three apparatus bays, classrooms, and crew quarters. Fire Station No. 4 is also the location of the department's training facility and where apparatus maintenance is completed. Any specific problems, concerns, or features with this facility can be classified into the following seven categories.

Design:	This station is aesthetically designed to fit the surrounding community structures.
Construction:	Front building columns are showing signs of excessive settling. Evidence of roof leakage is present.
Safety:	Living quarters of this station has fire sprinklers. Lack of storage space leaves the facility extremely cluttered causing multiple trip and collision hazards. Combustible storage in the 3rd apparatus bay, along with shop tools and other misc. storage are extremely hazardous.
Environment:	Lack of storage space is evident throughout this facility.
Code Compliance:	No issues noted.
Staff Facilities:	The dorm and workout areas are well designed. The kitchen, dayroom, and office utilize the space well for up to four personnel.
Efficiency:	MFD should consider addition of a maintenance facility with separation from the operations sections, either at this station or at some other location.

This section only dealt with an analysis of current facilities. However, MFD should consider the development of a long-range facilities management plan, as well as specific plans to address any current issues.

A long-range facilities management plan should include a variety of items, such as:

- Location, distribution, and cost of any new facilities
- Identified long-term maintenance needs for existing facilities
- On-going funding plan

Apparatus

The Missoula Fire Department maintains a fleet of response vehicles that is generally well maintained. Overall condition is considered good. The department needs to continue to make apparatus

replacement a significant priority in both the short and long term to ensure continued reliability of the fleet for emergency service delivery.

The following table lists the primary heavy apparatus and front line vehicles used by the Missoula Fire Department. The table includes the current age, estimated life expectancy, and estimated replacement funding requirements. The current funding mechanism for the replacement of primary apparatus indicates that the purchase is made through a general fund expenditure which is budgeted in the fiscal year that the vehicle is to be replaced.

It is noted here that some of the estimates in the Missoula Fire Department FY 2006 Vehicle Replacement Schedule would most likely fall short of the full replacement value, especially in the future. While this table does not attempt to apply an inflationary factor, due attention should be given to accurately project the full replacement costs for the class of vehicle under consideration. To accurately reflect a true replacement value, an annual inflationary factor should be added. The column "Equipment Replacement Fund" indicates a relative value that could be set aside on an annual basis that would allow purchase of the vehicle at the end of its life cycle.

Figure 24: Apparatus Replacement Funding Tables

Unit	Year	Life[17]	Replacement Cost	Current Funding Mechanism	Equipment Replacement Fund	Current Cash Requirement
Engine 111- Snap	1999	10-12	$375,000	$310,000 in 2013	$28,850	$375,000
Engine 112- Clifford	2000	20	$215,000	$179,850 in 2015	$15,350	$215,000
Engine 116	1999	10	$95,000	$75,000 in2009	$19,000	$95,000
Engine 121- Prince	2002	10-12	$375,000	$0 thru 2017	$22,050	$375,000
Engine 131- Snip	1999	10-12	$375,000	$310,000 in 2012	$28,850	$375,000
Engine 151- Big Bertha	1990	8-10	$375,000	$310,000 in 2010	$37,500	$375,000
Engine 141- Justus	2003	10-12	$375,000	$0 thru 2017	$20,800	$375,000
Engine 146	1988	10	$95,000	$0 thru 2017	*$95,000	*$95,000
Engine 126	2000	10	$95,000	$75,000 in2010	$19,000	$95,000
Engine 161- Old Yeller	1979	10-12	$375,000	$310,000 in 2009	*$375,000	$375,000
Ladder 148- Behemoth	1999	20	$650,000	$0 thru 2017	$32,500	$650,000
Ladder 138- Beast	1990	20	$650,000	$650,000 in 2011	$65,000	$650,000
Tender 117 – Mangler	2001	20	$170,000	$0 thru 2017	$10,600	$170,000
			TOTALS		**$769,500**	

*Past routine life cycle for front line service.

This table shows is that in order to meet apparatus replacement needs of the current fleet, $769,500 would be required to "front-load" the annual replacement schedule. This amount is extremely high because some of the vehicles in the fleet are beyond their normal replacement cycle and many others are well into their life cycle and have less time to generate the capital required make the purchase at the time of scheduled replacement. Once fully funded, this amount would be reduced substantially and provide for continued support of the City's fire department fleet needs, assuring funds are available for purchase at the expected time of replacement.

Regardless of the method selected, and a reasonable approach could be to combine both mechanisms, it should be noted that the table represents funding levels required for a capital replacement program that is both adequate and up-to-date. This is not meant to exclude other funding methods from consideration. For instance, during time periods when the market provides low

[17] Refers to the anticipated life expectancy or usefulness as a front-line apparatus. Use as a reserve may extend beyond this.

rates, municipal lease-purchase programs can be financially efficient. It does, however, require firm commitment on the part of the elected officials toward a scheduled apparatus replacement program. It is not uncommon, when faced with a large capital purchase that is competing with other community needs, for cities to delay such purchases to the point where efficiency or safety are compromised. Missoula can avoid such conditions by remaining firmly committed to a reasonable and effective capital replacement program for fire apparatus. Consideration for a revenue mechanism that is consistent from year to year may be more palatable than one that requires large, one-time expenditures.

The primary front-line apparatus of the Missoula Fire Department were reviewed and a basic inspection was performed to determine the general condition and life expectancy. The following terms and definitions were used to determine the condition and safety status of the fire apparatus.

Figure 25: Apparatus Condition Rating Definitions

Excellent:	Like new condition. No body or paint defects. Clean compartments. Interior cab complete and in full working order with no modifications. No significant defect history. Age is less than 25 percent of life expectancy.
Good:	Body and cab have good appearance with no rust and only minor cosmetic defects or dents. Clean compartments with no visible rust or corrosion. Interior cab is in full working order and good appearance. Normal maintenance history with no significant defects or high downtime. Age is less than 75 percent of life expectancy.
Fair:	Body and cab have weathered appearance with minor surface rust and some cosmetic defects or dents. Unimpeded compartments with only surface rust or corrosion. Interior cab is in reasonable working order and appearance. Only repairable tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Age is less than 100 percent of life expectancy.
Serviceable:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and minor rust-through of non-structural metals (body panels). Unimpeded compartments with significant surface rust or corrosion and/or minor rust-through (not affecting use). Interior cab is in rough, but working order, often with local repairs or modifications to compensate for problems. Occasional or intermittent tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Most service parts still available. Age is greater than 100 percent of life expectancy.
Poor:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and visible rust-through of non-structural metals (body panels). Significant rust or corrosion is present in structural or support members. Use of compartments is impeded with significant corrosion and rust-through. Interior cab is in rough condition with defects impeding safe and proper use. Non-repairable tank or plumbing leakage. Problematic age-related maintenance, major defects or unreasonable downtime are evident. Service parts difficult or impossible to obtain. Age is greater than 100 percent of life expectancy. Vehicle exceeds its GVWR.

Each heavy piece of apparatus was given a basic review for condition and safety. The following paragraphs describe any notations made during this review.

Figure 26: Engine 111 – Snap

	**Engine 111 (Snap)** 1999 Pierce Pumper 500 gallon tank 1,250 GPM pump Five-person cab Condition: Good NFPA Compliant: Yes
Remarks:	Minor body damage. Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 27: Engine 121 – Prince

	**Engine 121 (Prince)** 2002 Pierce Pumper 500 gallon tank 1,250 GPM pump Condition: Good NFPA Compliant: Yes
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 28: Engine 151 – Big Bertha

	**Engine No. 151 (Big Bertha)** 1990 Mack/Grumman Pumper 500 gallon tank 1,250 GPM pump Five-person cab Condition: Serviceable NFPA Compliant: At time of construction.
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments and cab should be secured.

Figure 29: Engine 112 – Clifford

	**Engine No. 112 (Clifford)** 2000 International/Smeal Pumper 500 gallon tank 500 GPM pump Condition: Good NFPA Compliant: Yes
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 30: Engine 116

	**Engine No. 116** 1999 Ford F550 Pumper 200 gallon tank Unrated pump (type 6 wildland) Condition: Good NFPA Compliant: Yes
Remarks:	Some rust evident on slip-on unit base. Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 31: Tender 117 – The Mangler

	**Tender No. 117 (The Mangler)** 2001 Pierce/International Tender 2,150 gallon tank 500GPM pump Condition: Excellent NFPA Compliant: Yes
Remarks:	Equipment in compartments should be secured.

Figure 32: Engine 126

	**Engine No. 126** 2000 Ford F450 Pumper 250 gallon tank Unrated pump (type 6 wildland) Condition: Serviceable NFPA Compliant: Yes
Remarks	Minor body damage. Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 33: Engine 131 – Snip

	**Engine No. 131 (Snip)** 1999 Pierce Pumper 500 gallon tank 1,250GPM pump Condition: Good NFPA Compliant: Yes
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 34: Engine 141 – Justus

	**Engine No. 141 (Justus)** 2003 Pierce Pumper 500 gallon tank 1,250GPM pump Condition: Good NFPA Compliant: Yes
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 35: Engine 161 – Old Yeller

	**Engine No. 161 (Old Yeller)** 1979 Mack Pumper 500 gallon tank 1,250GPM pump Condition: Poor NFPA Compliant: Yes
Remarks:	Body in very poor condition w/ dents and rust spots. Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 36: Truck 148 – Behemoth

	**Truck 148 (Behemoth)** 1999 Smeal 100 Ft. Ladder Condition: Good NFPA Compliant: Yes
Remarks:	Very minor body damage. Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 37: Truck 138 – Beast

	**Truck 138 (Beast)** 1990 Mack/Baker Aerial Scope 95 Ft. Ladder Condition: Fair NFPA Compliant: Yes
Remarks:	Use of plastic fuel cans should be avoided. Equipment in compartments should be secured.

Figure 38: Brush 146

	**Brush No. 146** 1988 Ford F350 Pumper 250 gallon tank Unrated pump (type 6 wildland) Condition: Poor NFPA Compliant: Yes
Remarks:	Rust and dents in various body panels. Equipment in compartments should be secured.

Support and Small Equipment

Small tools and equipment are a substantial part of any fire departments annual expenditure. These devices have become an integral part of MFD's daily operation and have added training and maintenance challenges as well. As these devices can be quite expensive, the capital required providing for their continuous procurement and operational support should be included in the department's equipment replacement plan. The plan, like facilities and apparatus, should include a schedule of equipment covered, estimated life expectancy, replacement cost, and annual contributions required to replace equipment as needed. It is recommended that all equipment with a value of more than $5,000, as well as groups of equipment with an aggregate value of more than $5,000, be included in the plan. The Missoula Fire Department currently funds replacement of individual items in the year of projected replacement. There is no budgeting mechanism that sets aside funds on an annual basis.

Examples of equipment in this category include:

- Heart monitor/defibrillators
- Portable and mobile radios
- Computer equipment and systems
- Computer software (major systems)

- Shop diagnostic and maintenance equipment
- Breathing apparatus
- Thermal imaging cameras
- Survey meters

Maintenance

Apparatus Maintenance

Vehicle fleet management and the vehicle maintenance program are handled through the Master Mechanic at MFD. The Master Mechanic is responsible for vehicle procurement, vehicle maintenance, small equipment maintenance, and station maintenance activities. The Master Mechanic performs most of the vehicle maintenance with some heavy mechanical work contracted out to local shops. The Master Mechanic oversees on-duty firefighters in conducting minimal fire department vehicle and equipment repairs as well as daily routine checks of the front line equipment.

The department maintains a fleet of more than 20 vehicles and hundreds of related small equipment items. We examined the practices used by the Fire Department in maintaining and repairing its firefighting equipment and found that the department performed adequate routine checks of its firefighting apparatus and supports a preventive maintenance program. We also found that the department's information system was reliable for tracking repair and maintenance schedules and costs, and for determining whether maintenance tasks are performed in a timely and cost-effective manner.

The Master Mechanic is responsible for maintaining multiple vehicles and miscellaneous small tools and equipment which include:

- 5 front line engines
- 2 reserve engines
- 2 ladder trucks
- 1 tender
- 3 brush units
- 15 miscellaneous (support vehicles, trailers, boats, utility, hazardous materials, etc.)

The Master Mechanic has implemented a preventive maintenance (PM) program for the department. The goal of the program is to have all major vehicles in the inventory receive PM service at a 200-hour service interval which averages out to approximately three to four months. Non-emergency vehicles are on a 4,000 mile service interval. In addition, specific standards are implemented detailing

turnaround time for PM completion based on vehicle type. All service records are maintained by the Master Mechanic and are current and accessible.

Pump Testing and Hose Testing

Two necessary procedures that must be performed and documented annually are pump testing and hose testing.

The life expectancy of a section of fire hose is determined by the care it receives. Hose is susceptible to mechanical injury, heat and fire damage, mold and mildew, and damage due to chemical contact and excessive pressures. Also, an inventory of all fire hose should be recorded along with a history of each section of hose. After reviewing the hose procedures of MFD it appears the department has done an excellent job in hose testing and retention of the records.

Fire pumps are one of the most important and expensive parts of any fire apparatus. The care and routine check of a fire pump is a daily necessity and, at MFD, this is performed by on-duty personnel with oversight from the Master Mechanic. Part of the preventive maintenance program requires that all fire pumps be serviced every six months. This test includes drain and refill of the fluids in the transfer case, grease to the bearings, and lubrication of ball valves, linkage, drain valves, and pressure relief valves. In addition to the above checks, the booster tank water level gauge is also inspected along with all other gauges and pump panel lights. This test is performed every six months. An annual pump test is performed every twelve months. After reviewing the pump test procedures, it appears the department has done an excellent job in pump testing and record keeping.

Turnout Gear Maintenance Program

The department's most expensive and valuable asset is its personnel. In any environment in which the employee is expected to perform, proper personnel protective equipment, primarily firefighting turnout gear is essential. At this time, MFD does not have an acceptable means of cleaning PPE (Personal Protective Equipment) in-house. Residential washers and dryers will not clean turnout gear properly. Many fire departments purchase extractors that are designed for cleaning turnout gear, since less sophisticated cleaning methods will remove dirt and perspiration, but will not remove severe contaminates or hydrocarbons.

In the latest revisions to NFPA 1500, 1581, and 1971, the fire service has addressed the health and safety risks associated with contaminated turnout gear by requiring that protective clothing be cleaned at least once every six months. With the new NFPA standards, fire departments across the country are trying to find inexpensive ways to effectively comply with new standards. The life expectancy of turnout gear depends on the type of department, number and type of fires fought, and the

aggressiveness of the firefighters. Proper care will enable fire departments to lengthen their replacement cycle for new turnout gear and reduce the capital expenditures required to maintain PPE.

Many fire departments have realized significant savings by having gear professionally cleaned, evaluated, and, if necessary, repaired by a certified vendor.

At any time that MFD does significant renovation or construction of a facility, it should consider enclosed turnout gear rooms that includes a separate ventilation system. Commercial turnout gear extraction cleaners can also be considered for installation. Currently, the department has no enclosed ventilated turnout gear rooms in any of its fire stations.

The nature of firefighting, and occupational injuries associated with firefighting has changed substantially over the years. Many departments are reporting far less structural fires, while noting increases in vehicle accidents and EMS calls. Despite a lower percentage of calls involving structural fires, there are still a high percentage of firefighter deaths and injuries resulting from stress. Given the additional fatigue of cumbersome protective gear, we suggest that the department give additional attention to PPE specifications and the procurement process. Specifications should include a greater focus on stress reduction, while increasing firefighter mobility and comfort.

Objective Eight – Service Delivery

The delivery of fire suppression and rescue services is no more effective than the sum of its parts. It requires efficient notification of an emergency, rapid response from well-located facilities in appropriate apparatus and with sufficient staffing, following a well-practiced plan of action.

This section evaluates these various components and provides observations of the elements that make up the delivery of the most critical core services provided by the department.

Notification System

The Missoula Fire Department is provided call receipt services by the County Public Safety Answering Point (PSAP). This agency receives all incoming 9-1-1 calls from Missoula telephones.

The PSAP has an automatic generator and an uninterruptible power supply on emergency phone systems. Individual department members are notified and are provided with digital individual pagers.

Call taking time standards are reported to be informal at 90 seconds from call answering to dispatch. Emergency medical dispatch cards and procedures are available to dispatchers, but do not necessarily drive the type of response the department will employ.

NFPA 1221 Section 6.4.2 specifies that, "Ninety-five percent of alarms shall be answered within 15 seconds, and 99 percent of alarms shall be answered within 40 seconds." Section 6.4.3 specifies that, "Ninety-five percent of emergency dispatching shall be completed within 60 seconds.[18] With only a single dispatcher assigned to fire and EMS, it is highly unlikely that this standard is being met when multiple calls are coming in to the PSAP. An additional dispatcher assigned to fire and EMS would help to ensure the dispatch time standard is being met.

MFD operates from the choice of four radio frequencies; interoperability is available on the "Big Bank" group of frequencies.

Emergency Medical System

Missoula is served by two competing medical centers, Community Medical Center, a Level III Trauma Center, and St. Patrick Hospital and Health Sciences Center, a Level II Trauma Center. Both hospitals operate helicopter services which serve a greater regional area than Missoula. The

[18] NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems,* 2007.

department and the medical centers both state that working relationships are good between the medical centers and MFD.

The department provides emergency first response with emergency medical technicians and eight department paramedics. A department EMS Coordinator oversees the department's training and EMS operations.

MFD does not transport patients; that responsibility rests with a private provider, Missoula Emergency Services Inc. (MESI). Interviews with MESI expressed concern regarding response times in newly annexed areas and adequacy of staffing when multiple calls for service tax the local delivery system.

Medical oversight is provided by Dr. Gregory J. Moore, Medical Director of Emergency Department First Care Services at Community Medical Center in Missoula.

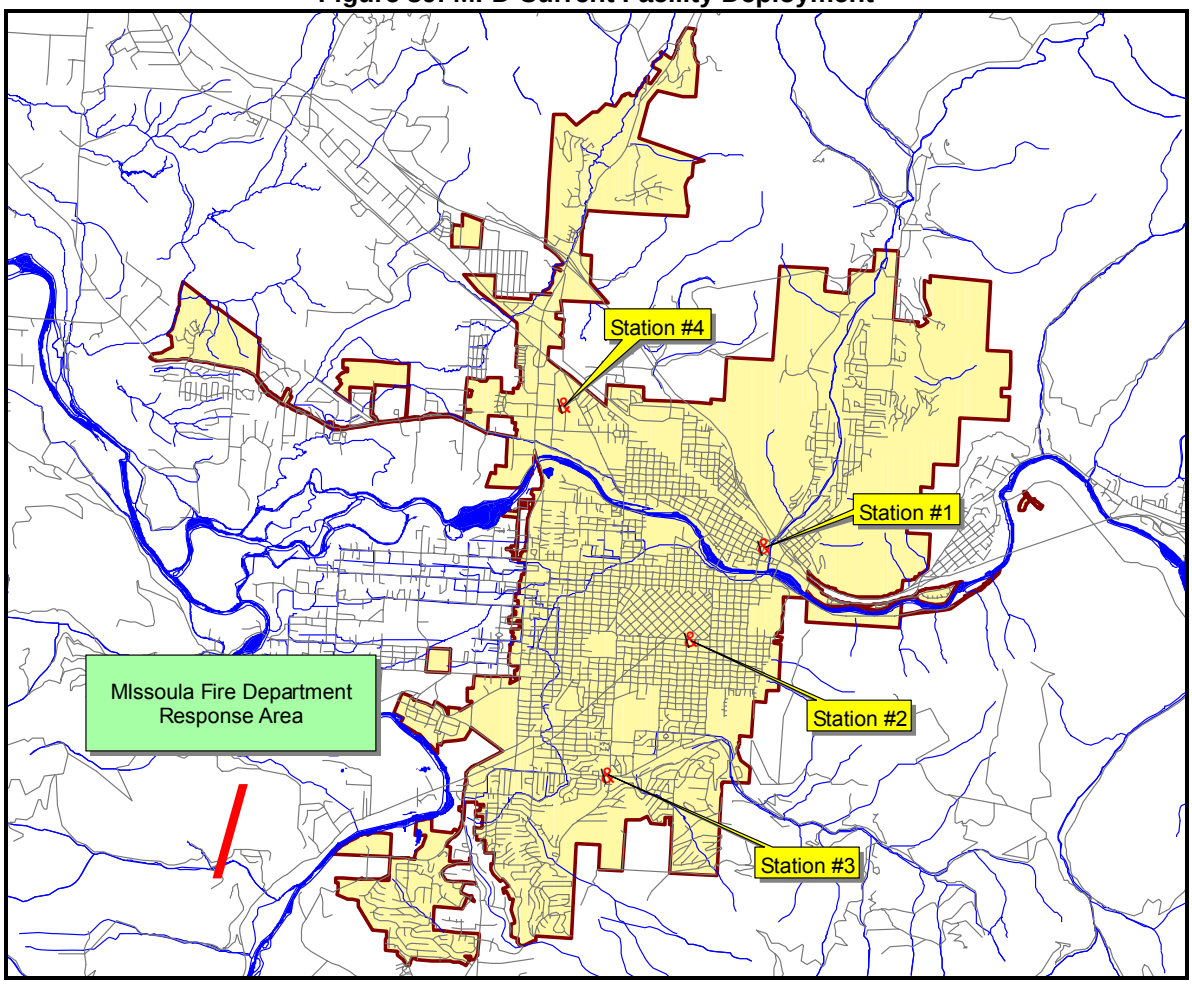
Interviews with the physician advisor and transport provider both indicate a high level working relationship between MFD and medical providers. Areas of concern expressed by the medical director included inconsistent crew make-up, on-going training requirements, and resource needs.

Facility Deployment

The department provides services from four locations. Coverage of the current service area is considered good for the urban areas of the fire protection system, but as the nature of the community expands with more suburban development it may not meet recognized response coverage standards in those areas with increasing population densities. With continued development, MFD will need to consider deployment changes to improve coverage and response time performance.

The following map displays the current deployment of stations for the Missoula Fire Department.

Figure 39: MFD Current Facility Deployment



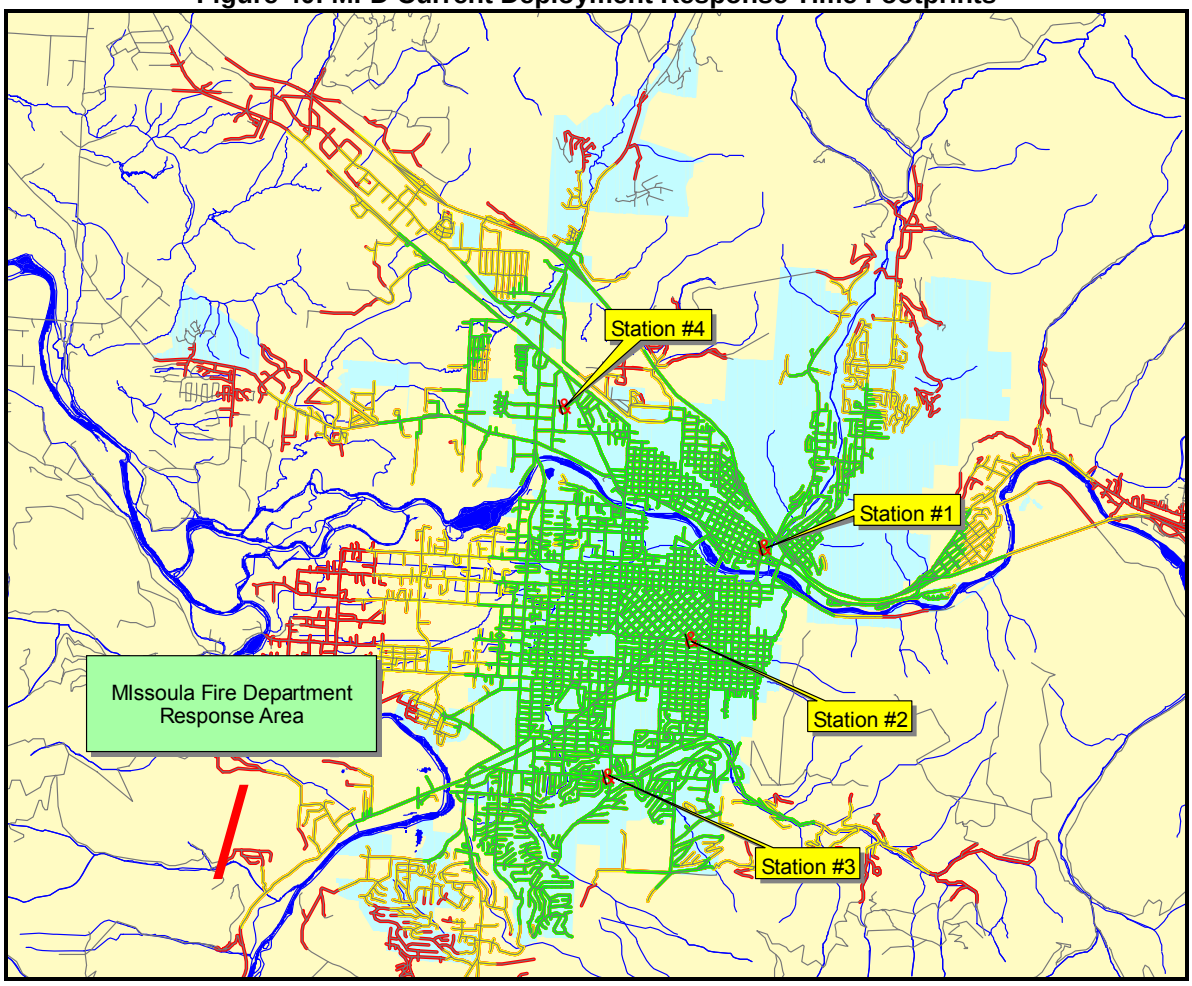
There are several ways to approach fire station deployment analysis. The ISO, in its standards, defines ideal coverage as having a fire engine within 1.5 miles of any built-upon area. In addition, the ISO standards consider any developed area greater than five miles from a fire station as being unprotected. Such areas are often subjected to a Class 10 insurance rating, making insurance difficult or expensive to obtain. We began our analysis by examining the fire department and confirming that there were few road segments that are greater than five miles from an existing fire station and, thus, subject to an unprotected classification and fire insurance rating. These few road segments are near the end of the neighborhood served by Phantom Way in the far western end of the response area.

With that established, we move on to an analysis of the MFD's facility deployment for fire response. The map in the following figure demonstrates the current geographic-based coverage of MFD's four fire stations by plotting the four, six, and eight-minute travel time footprint for the existing stations. Since these response time footprints are calculated on actual modeled travel time, the four-minute response footprint is slightly larger than the 1.5 mile travel zone used by the ISO for optimum

community fire protection scoring in engine company distribution, but is a reasonably common performance target for urban communities.

The street segments that can be reached in four minutes of travel time are shaded in green. Those street segments that can be reached in six minutes of travel time are shaded in yellow. Street segments that can be reached within eight minutes of travel time are shaded in red. It should also be noted that, as a career staffed agency, MFD can be expected to experience about a one-minute time period for firefighter turnout before apparatus leaves the station and travel time to the incident begins. Thus, the figure could also be looked at as a depiction of five, seven, and nine-minute total response time capability of the current deployment.

Figure 40: MFD Current Deployment Response Time Footprints

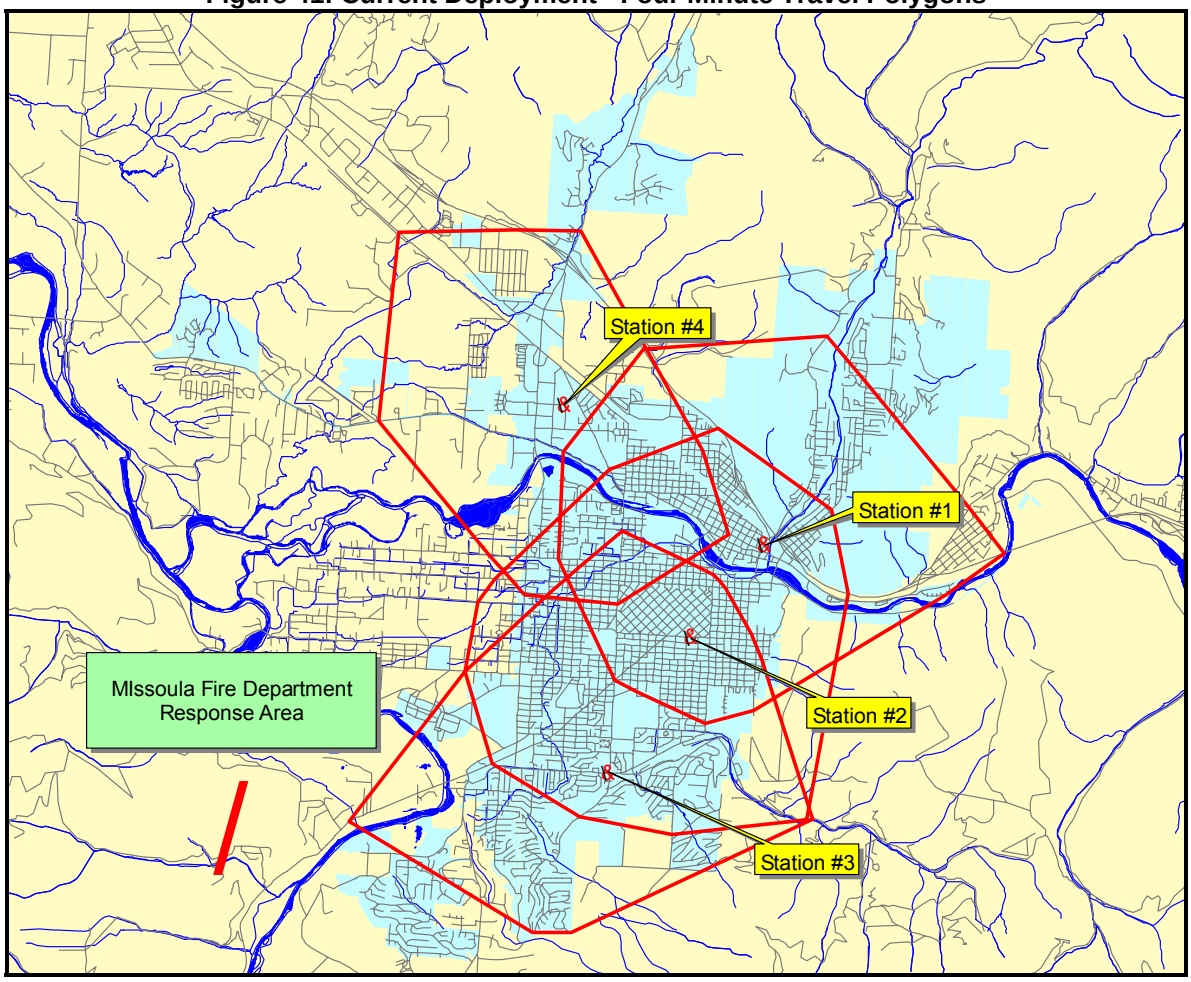


Four-minute travel, or five-minute total response capability
Six-minute travel, or seven-minute total response capability
Eight-minute travel, or nine-minute total response capability

What is visually evident from the map in this figure is that most of the developed streets within the current limits of MFD's response area are also within a seven-minute response time of a fire station. Many areas are within a six-minute response time, though areas of service gap will be discussed in a later section of the study.

The following map displays the four-minute travel footprints (six-minute response time) of the stations. This is a useful display to evaluate any overlap in the response capabilities of the current deployment.

Figure 41: Current Deployment - Four Minute Travel Polygons



The figure demonstrates that there is some significant overlap of the four-minute response capability of the stations in the central section of the City, with evidence of service gaps in the northern, southern, and extreme western portions of the response area.

In order to analyze service demand-based coverage, we plotted the incident locations for a 32-month period on the map to demonstrate their relation to current facility locations. These graphics provide a

visual demonstration of call volume and service demand by geography. Service demand for MFD appears in the following figure.

Figure 42: MFD Service Demand

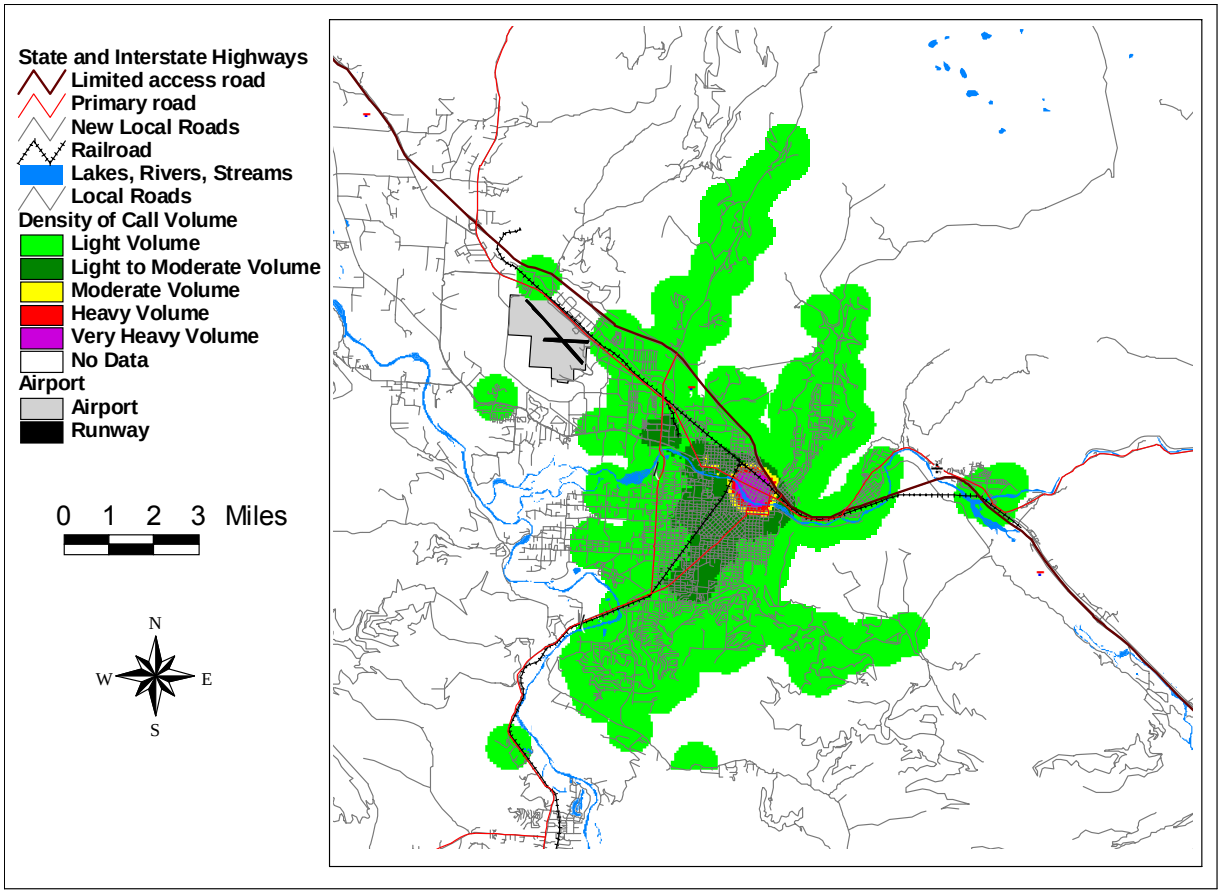
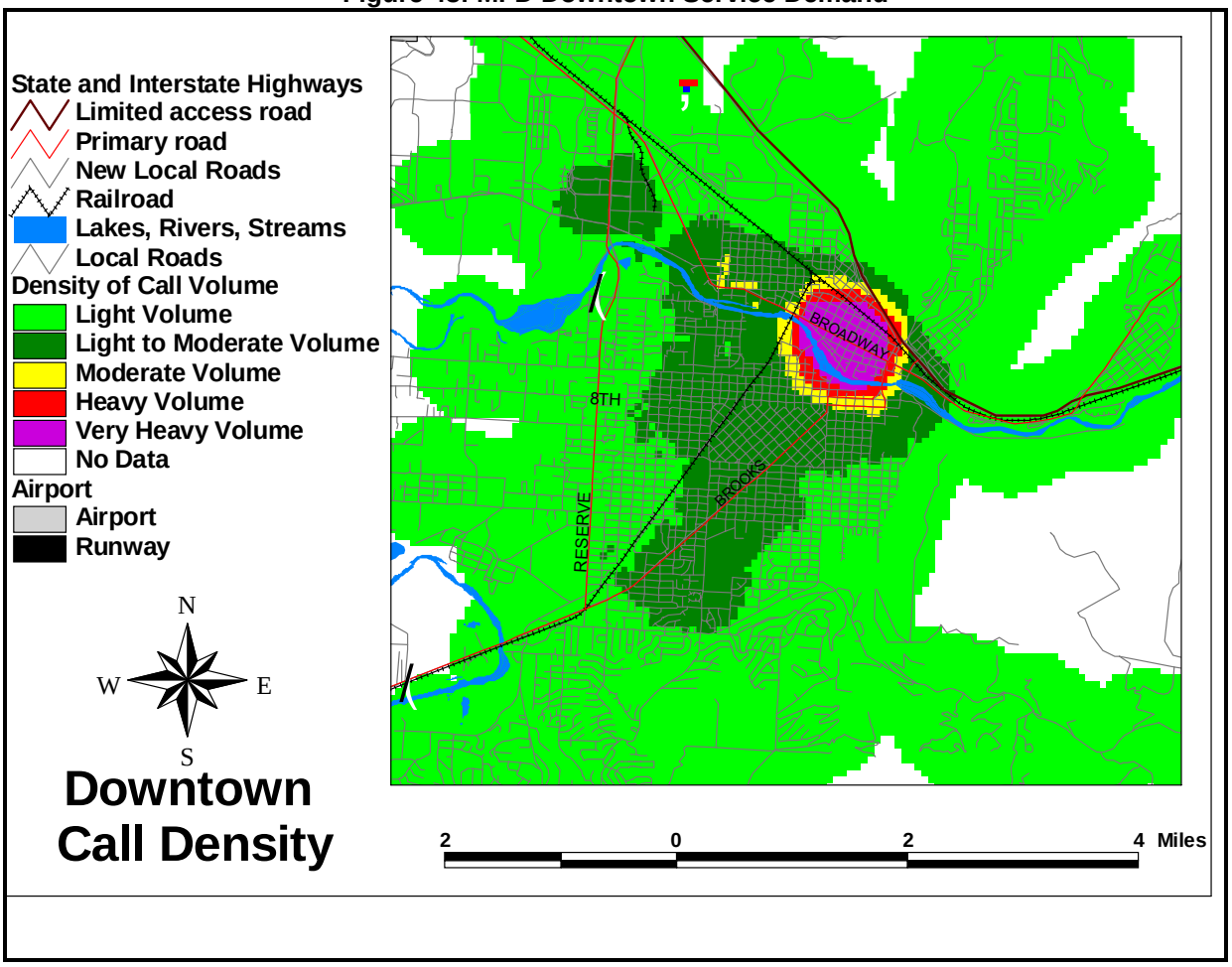


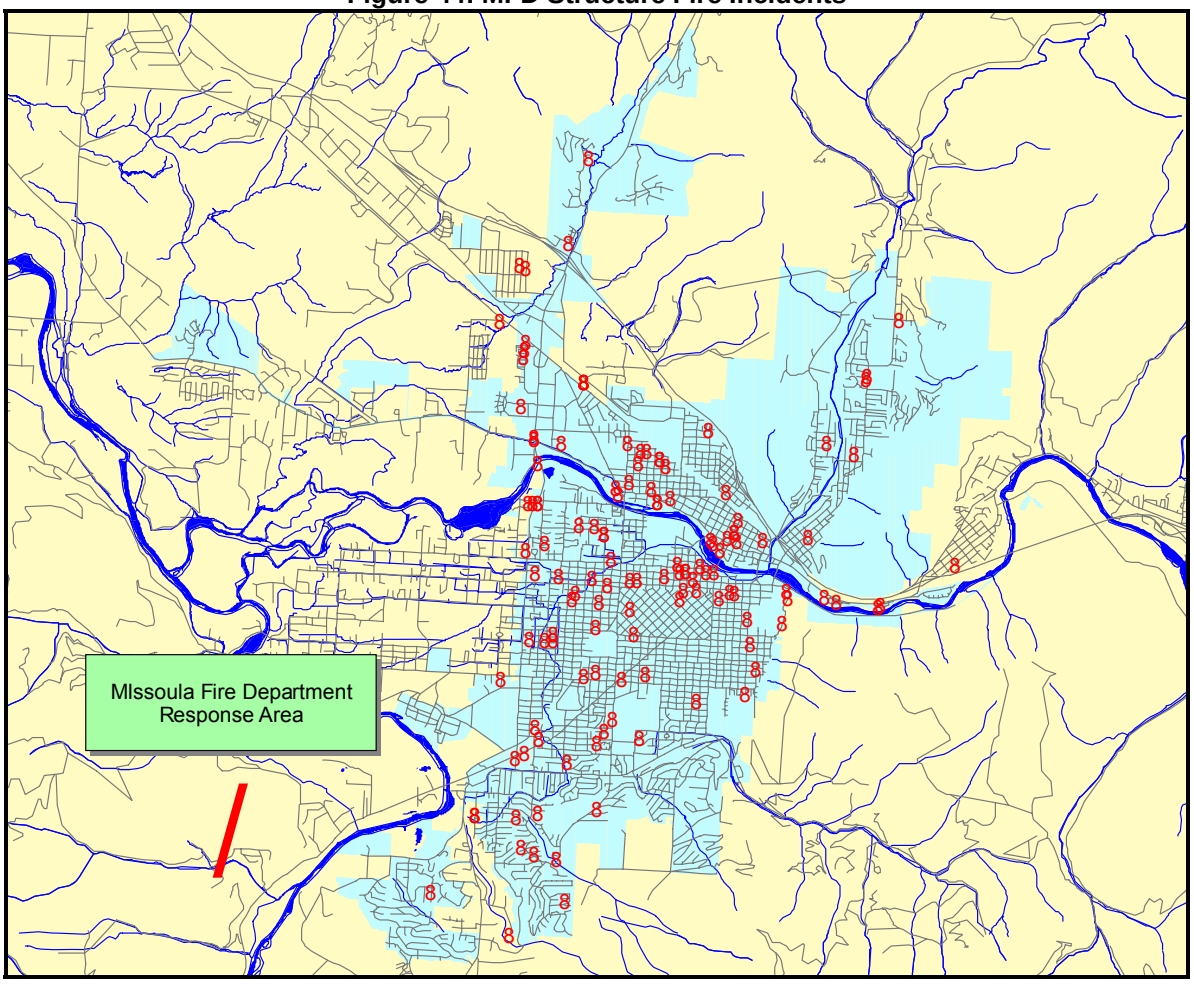
Figure 43: MFD Downtown Service Demand



This map demonstrates that service demand is heaviest in the urban central core of the jurisdiction. This area does not correspond with the area of greatest response capability overlap (resource concentration).

The following map (Figure 44) plots the locations of structure fires only.

Figure 44: MFD Structure Fire Incidents



Again, it is relatively clear that the greatest numbers of structure fire incidents are experienced in the central urban core area of the City.

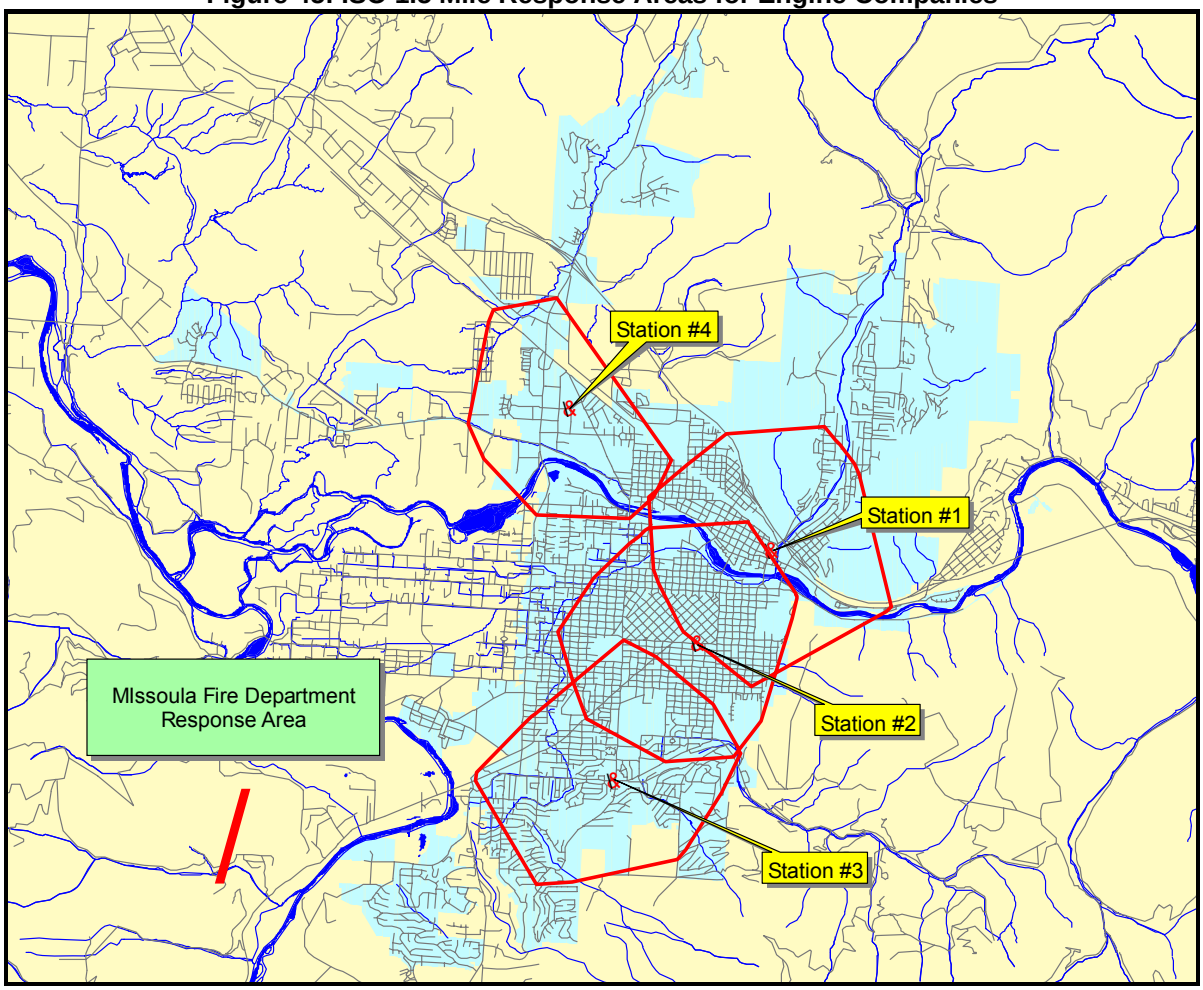
Resource Deployment

As mentioned earlier in this report, MFD maintains a fleet of fire apparatus including four frontline and two reserve Type 1 engines, two aerial trucks, three Type 6 engines, a Type 2 engine, a water tender, and rescue boat.

In order to achieve optimum credit, ISO reviews the response areas of each existing station and identifies the number of fire hydrants within those response areas. ISO then analyzes whether there are additional geographic areas of the district outside of the existing station response areas where at least 50 percent of the number of hydrants served by the largest existing response area could be served by a new station were one to be built. If so, additional engine company deployment is recommended. For ISO review purposes, the response area of a station is measured at 1.5 miles of travel distance on existing roadways.

The following map (Figure 45) depicts the location of the current engine companies as well as their 1.5 mile coverage polygons. Though hydrant locations were not available in a data file for analysis, it visually appears that MFD may operate less than the number of pumpers required for full credit under ISO.

Figure 45: ISO 1.5 Mile Response Areas for Engine Companies

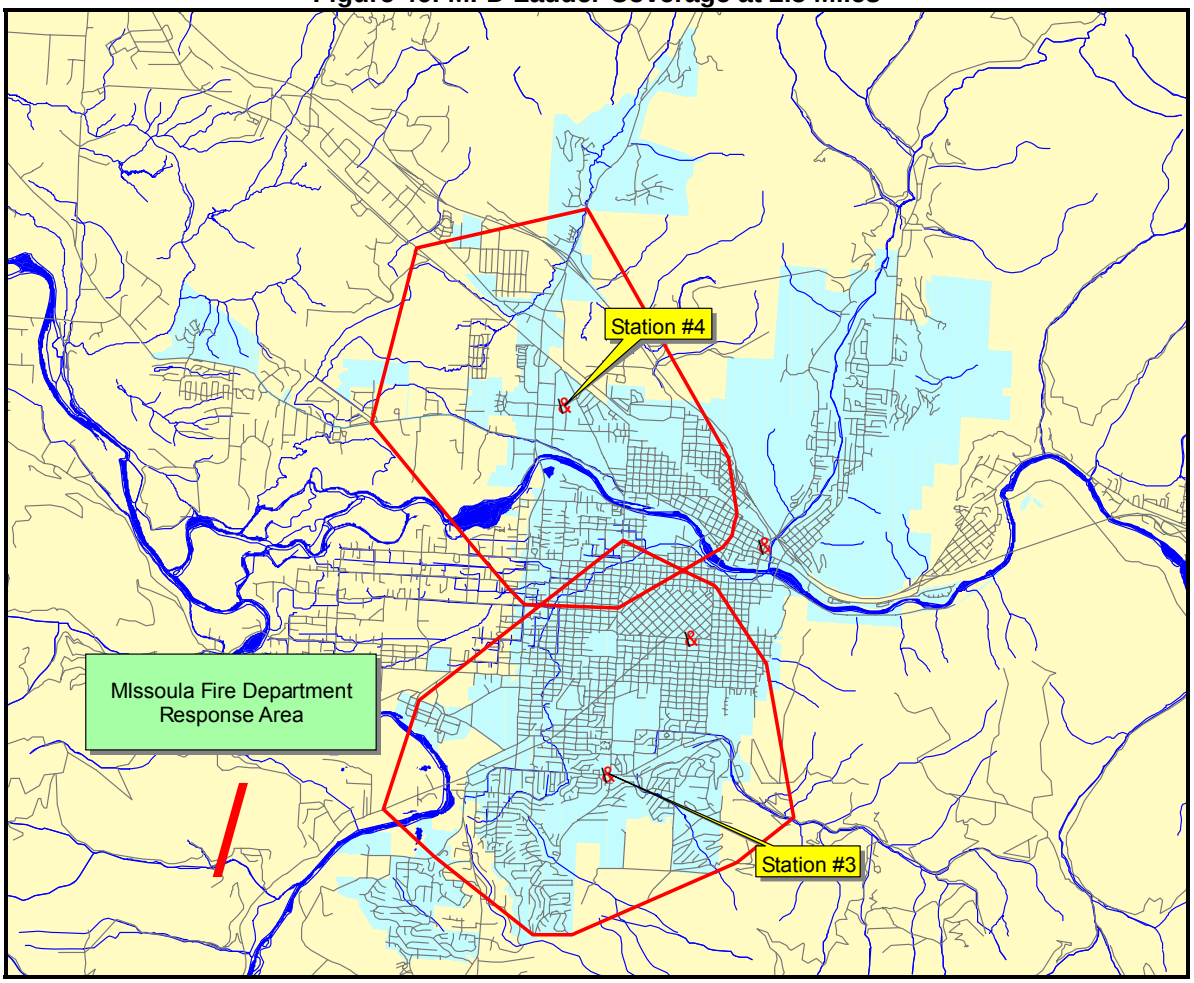


The department's pumpers appear to be very well equipped, though none received 100-percent point credit for equipment during the last ISO rating. Although this may have been improved since that time, a complete inventory should be performed to assure maximum point values for all vehicles during any future ISO rating reviews.

It is unclear precisely how much of the department's protection area would meet the necessary requirements for aerial trucks (ladder companies). In order to receive full credit, these should be located within 2.5 mile distribution of all buildings that would meet the three story height and square footage limits. Other areas can receive credit for a truck company without the requirement of an elevated device.

The following map (Figure 46) depicts the location of the current aerial devices as well as their 2.5 mile coverage polygons. This can be used by local personnel to evaluate whether the tallest and largest square footage buildings are located primarily within these coverage areas. It does appear that some areas of the downtown urban core (the area with highest service demand) are not within the 2.5 mile coverage of the truck companies.

Figure 46: MFD Ladder Coverage at 2.5 Miles



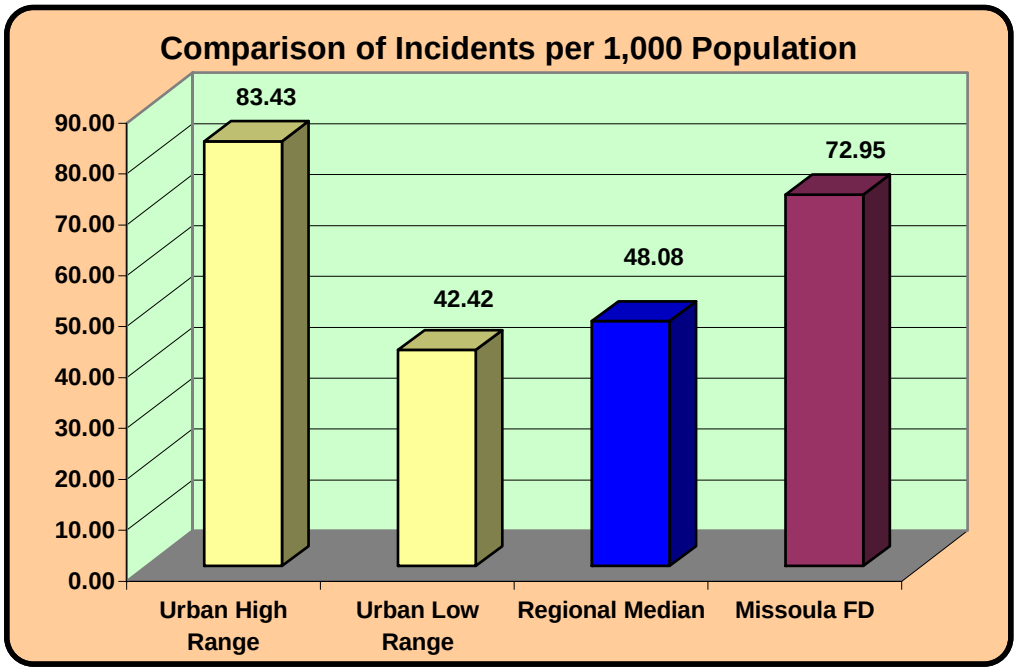
Emergency Response Activity

The area served by the department has experienced an increasing number of fire department responses. In comparison to other communities of its size within the Western region, the Missoula Fire Department experiences a much higher number of emergency incidents based on population.[19]

[19] Data source for this section is the National Fire Protection Association *U.S. Fire Department Profile*, October 2003. This publication breaks down benchmark data into four regions: Northeast, North central, South, and West. Western regional data was selected for this report.

The following figure shows that MFD is well above the median range of incident volume per population for similar urban communities.

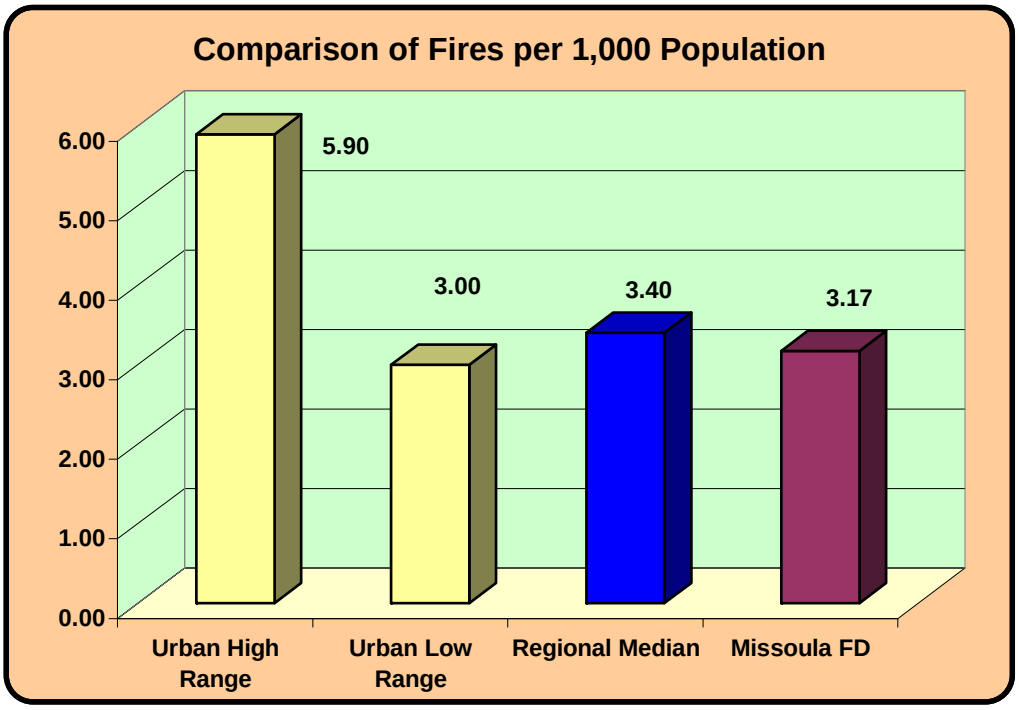
Figure 47: MFD Comparison of Incident Rates by Population



However, it should be remembered that the statistics include many communities that do not provide any type of emergency medical services through their fire department. This factor should be considered when evaluating the benchmark comparison data.

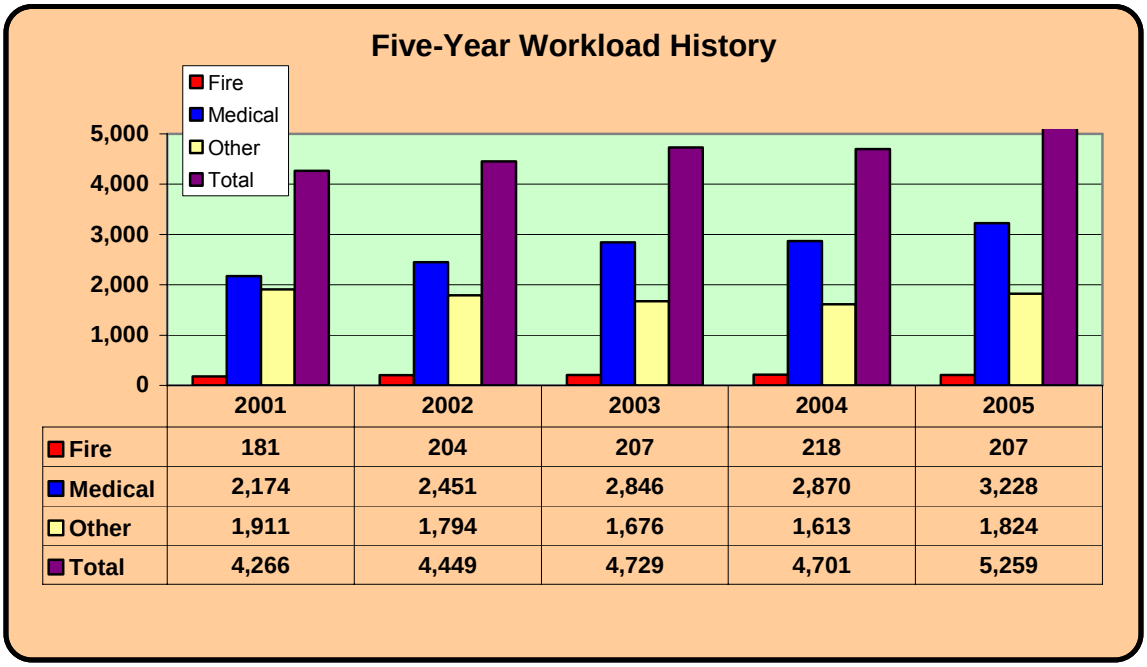
As can be seen in the following figure, MFD experiences a reasonably normal number of fires per 1,000 population for a community of its size.

Figure 48: MFD Fires per 1,000 Population



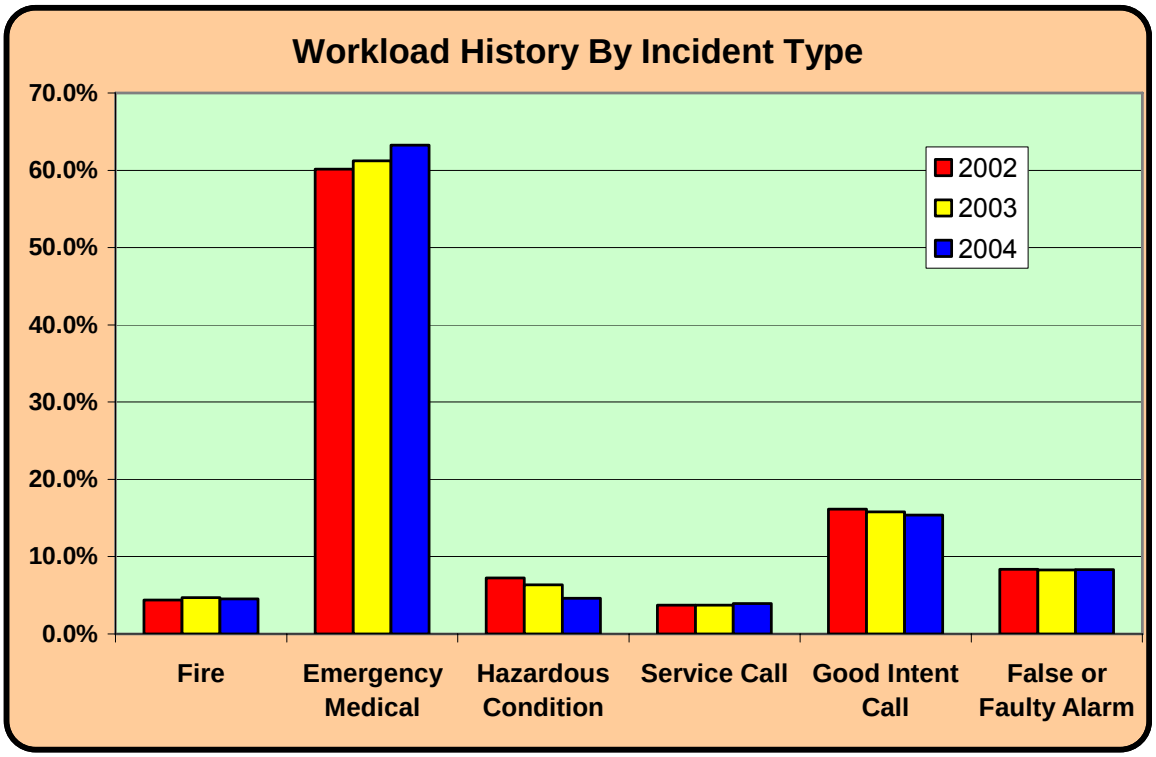
The following figures show how response volume has changed over the last five years and give an overview of the workload history of MFD.

Figure 49: MFD Workload History 2001 – 2005



	2001	2002	2003	2004	2005
Fire	181	204	207	218	207
Medical	2,174	2,451	2,846	2,870	3,228
Other	1,911	1,794	1,676	1,613	1,824
Total	4,266	4,449	4,729	4,701	5,259

Figure 50: MFD Workload Trends by Incident Type

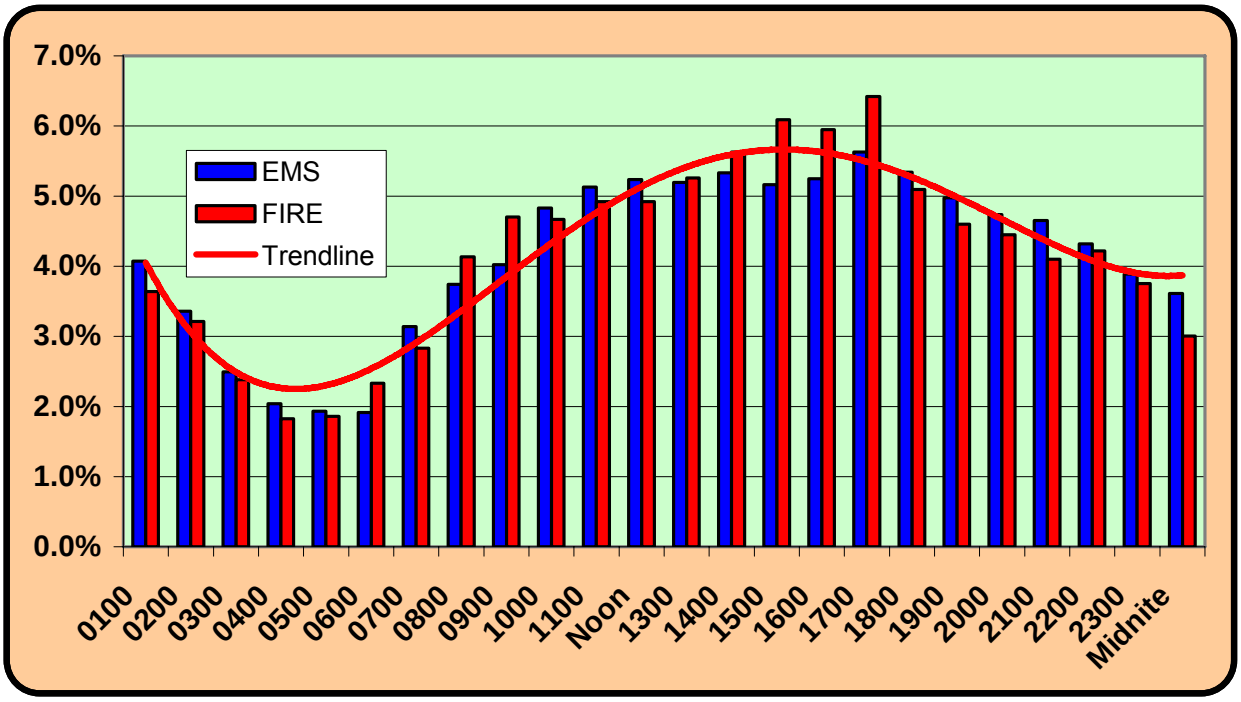


As illustrated in the above chart, emergency medical incidents are the major workload generator for MFD. An ageing population will most likely affect this workload type, thus putting more demand on EMS systems. Fire type responses have remained flat over the study years. This trend is experienced by most emergency service providers.

In the following paragraphs, we provide further analysis of the agency's workload.

A review of incidents by time of occurrence reveals when the greatest response demand is occurring. The following charts show how activity and demand changes for the Missoula Fire Department based on time of day, day of week, and month of year.

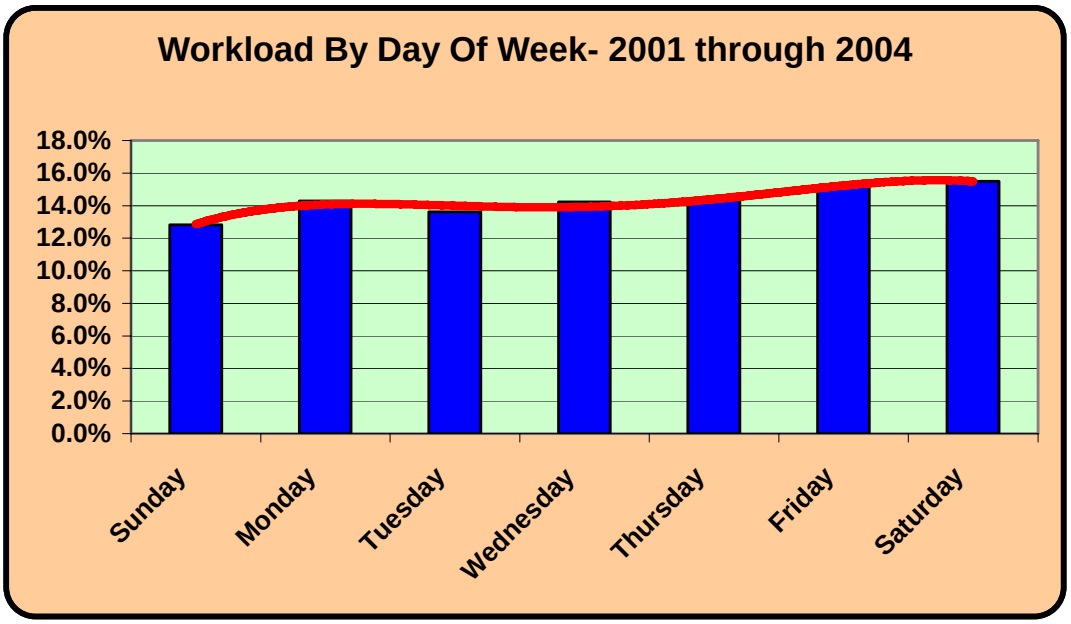
Figure 51: MFD Workload by Time of Day



Peak response activity occurs between the hours of 9:00 a.m. and 10:00 p.m. This is typical of most fire agencies' experience, which usually falls between about 8:00 a.m. and 8:00 p.m., and reflects a higher level of activity in the community throughout the workday hours.

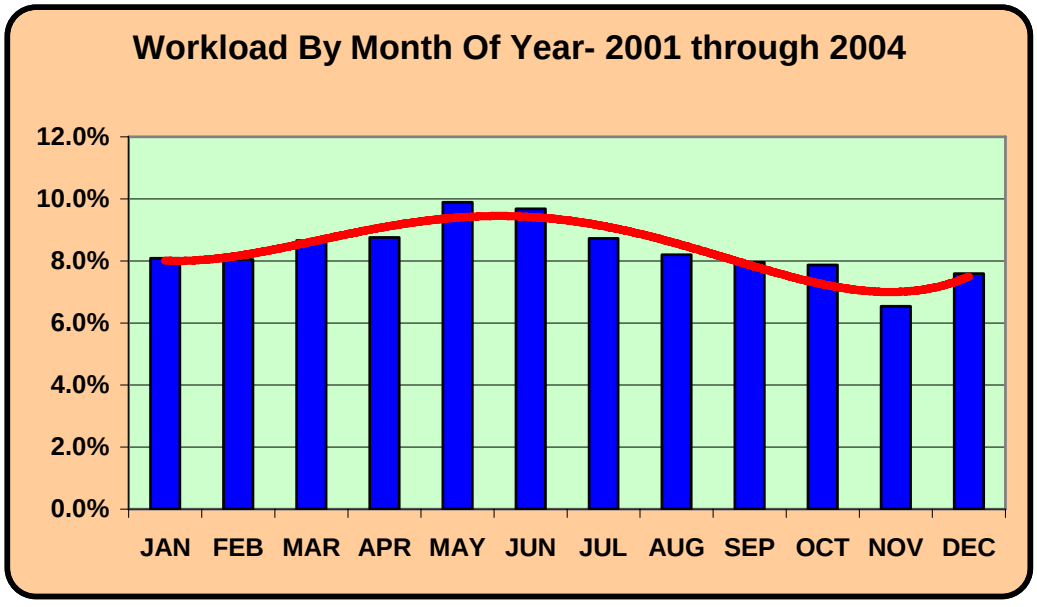
Incident volumes are relatively even throughout the days of the week, with only a slight increase toward week's end.

Figure 52: MFD Workload by Day of Week



Incident volumes are relatively even throughout the months of the year, as shown in the following figure, with only a one percent to two percent increase through the late spring months and a slight decrease in November and December.

Figure 53: MFD Workload by Month of Year



Performance and Outcomes

The ultimate goal of any emergency service delivery system is to provide sufficient resources (personnel, apparatus, and equipment) to the scene of an emergency in time to take effective action to minimize the impacts of the emergency. This need applies to fires, medical emergencies, and any other emergency situation to which the fire department responds.

Before discussing the department's current performance, it is important to gain an understanding of the dynamics of fire and medical emergencies.

Dynamics of Fire in Buildings

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

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

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

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

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials more easily weakened by the effects of fire. "Light weight" roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a very dangerous environment for firefighters.

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for early application of water essential to a successful fire outcome.

The following chart depicts the importance of confining fires to rooms of origin. Once fire spreads from the room source, deaths, injuries, and dollar loss can be predicted.

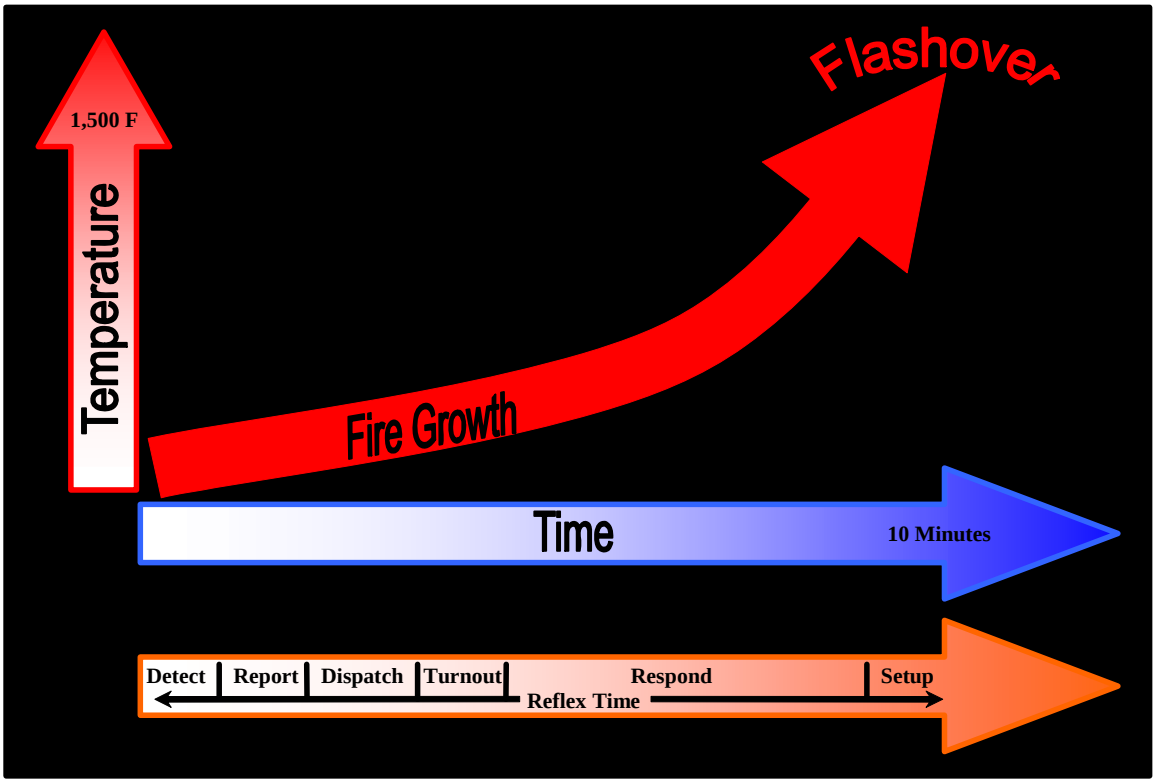
Figure 54: Residential Structure Fire Extension Rates 1994-1998

Fire Extension in Residential Structure Fires 1994-1998			
	Rates Per 1,000 Fires		
Extension	Civilian Deaths	Civilian Injuries	Dollar Loss Per Fire
Confined to room of origin	2.32	35.19	$3,385
Beyond room of origin; confined to floor of origin	19.68	96.86	$22,720
Beyond floor of origin	26.54	63.48	$31,912

*Data from NFPA Annual Fire Experience Survey and USFA National Incident Reporting System

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

Figure 55: Fire Growth vs. Reflex Time



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

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

As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire loss data can demonstrate.

The National Fire Protection Association studied data from residential structures occurring between 1994 and 1998 in order to analytically quantify the relationship between the growth of a fire beyond the room of origin and losses in life and property. As the figures below clearly indicate, fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had

significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). Incidents in which a fire spreads beyond the room where it originates are likely to experience six times the amount of property loss and have almost nine times greater chance of resulting in a fatality.

Emergency Medical Event Sequence

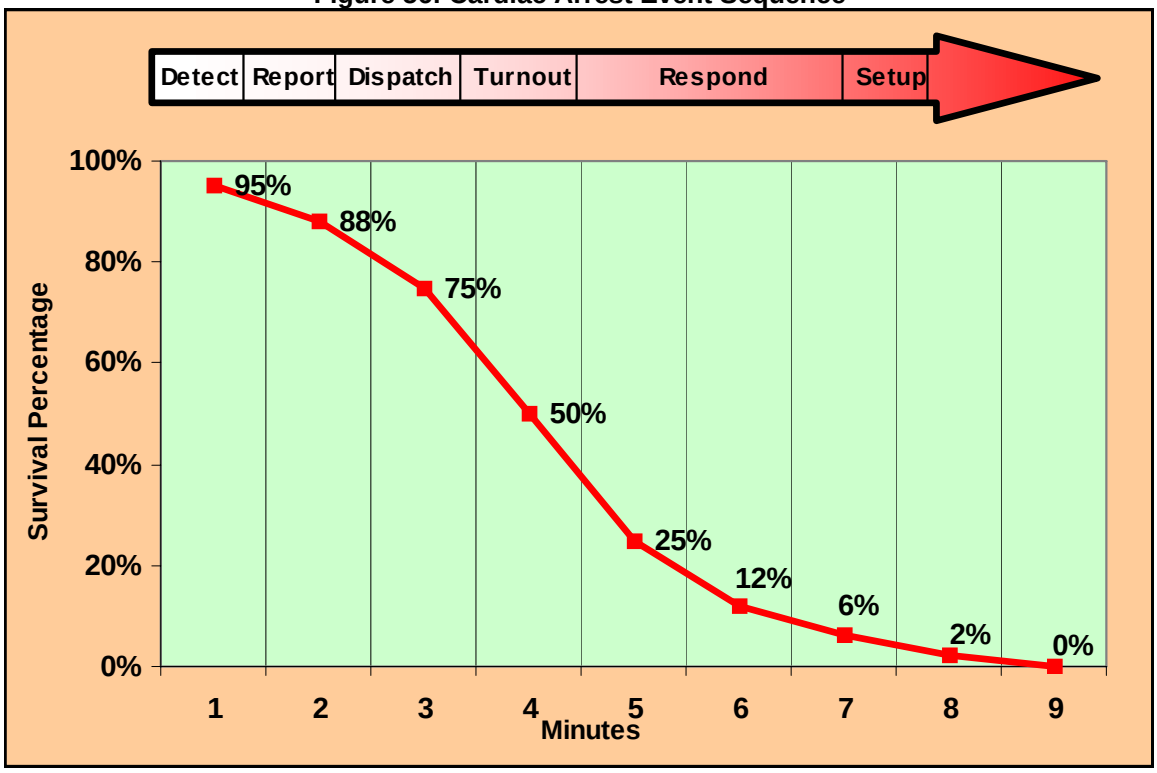
Cardiac arrest is the most significant life threatening medical event. A victim of cardiac arrest has mere minutes in which to receive definitive lifesaving care if there is to be any hope for resuscitation.

Recently, the American Heart Association (AHA) issued a new set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include new goals for the application of cardiac defibrillation to cardiac arrest victims.

Heart attack survival chances fall by seven to ten percent for every minute between collapse and defibrillation. Consequently, the AHA now recommends cardiac defibrillation within five minutes of cardiac arrest.

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

Figure 56: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain drugs as a means of improving the opportunity for successful resuscitation and survival. An Oregon fire department recently studied the effect of time on cardiac arrest resuscitation and found that nearly all of their "saves" were within one and one-half miles of a fire station, underscoring the importance of quick response.

People, Tools, and Time

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, isn't the only factor. Delivering sufficient numbers of properly trained, appropriately equipped, personnel within the critical time period completes the equation.

For medical emergencies this can vary based on the nature of the emergency. Many medical emergencies are not time critical. However, for serious trauma, cardiac arrest, or conditions that may lead to cardiac arrest, response time is very critical.

Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest this can be up to six personnel; two to

perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care.

Thus, for a medical emergency the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient's condition, not necessarily the time it takes for the first person to arrive.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate application of water on the fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as "arrival" by the fire department.

In order to legally enter a building to conduct interior firefighting operations at least four personnel must be on scene. The initial arrival of effective resources should be measured at the point in time when at least four personnel, properly trained and equipped, have assembled at the fire.

Effective operations at the scene of fire emergencies also depend on the arrival of enough trained personnel to perform all of the duties and tasks required to control a fire event. Tasks that must be performed can be broken down into two key components - life safety and fire flow.

Life safety tasks are based on the number of building occupants, their location, status, and ability to take self-preservation action. Life safety tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient quantities of water to extinguish the fire, and creating an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks, completing some in chronological order rather than at the same time, reducing overall fire emergency effectiveness. These tasks include:

command	***scene safety***	***search and rescue***
fire attack	***water supply***	***pump operation***
ventilation	***back-up***	

The following chart illustrates the fire ground staffing recommendations of the Commission on Fire Accreditation, International.

Figure 57: Minimum Firefighting Personnel Needed Based Upon Level of Risk

Minimum Firefighting Personnel Needed Based On Level of Risk				
Task[20]	**Max. Risk**	**High Risk**	**Mod. Risk**	**Low Risk**
Attack line	4	4	2	2
Search and rescue	4	2	2	
Ventilation	4	2	2	
Backup line/rapid intervention	4	3	2	2
Pump operator	1	1	1	1
Water supply	1	1	1	
Utilities support	1	1	1	
Command/safety	2	2	2	1*
Forcible entry	**			
Salvage	**			
Overhaul	1**			
Communication	1			
Chief's aide	1	1		
Operations Section Chief	1			
Logistics	1			
Planning	1**			
Staging	1**			
Rehabilitation	1			
Division/group supervisors	2**			
High-rise evacuation	10**			
Stairwell support	10**			
Total	**49**	**17**	**13**	**6**

* Can often be handled by the first due officer
** At maximum-risk and high-risk fires, additional personnel may be needed

The following definitions apply to the above chart:

Low Risk – Fires involving small sheds and other outbuildings, larger vehicles and similar incidents characterized by sustained attack fire flows typically less than 250 gallons per minute.

Moderate Risk – Fires involving single-family dwellings and equivalently sized commercial office properties. Sustained attack fire flows range between 250 gallons per minute to 1,000 gallons per minute.

[20] All tasks may be functional during the early moments of firefighting, but sometimes certain duties take place in sequence depending on the situation, thus reducing the total number of people needed.

High Risk – Fires involving larger commercial properties with sustained attack fire flows between 1,000 gallons per minute and 2,500 gallons per minute

Maximum Risk – Fires in buildings with unusual hazards such as high-rise buildings, hazardous materials facilities, very large buildings, and high life risk properties (nursing homes, hospitals, etc.). Though they may not require large sustained attack fire flows they do require more personnel to perform tasks required for effective control.

Response Performance Objectives

Emergency service agencies should have clearly defined response performance objectives established to allow evaluation of capability and service delivery. An organization's performance objectives should clearly state both the current and desired emergency service capabilities in very measurable terms. For emergency response, performance objectives should define response performance using both time and resource criteria. For example:

- Provide for the arrival of adequate resources to initiate basic emergency medical services at the scene of any medical emergency within "X" minutes following dispatch, 90 percent of the time.
- Provide for the arrival of adequate resources to initiate interior fire suppression operations at the scene of any fire within "X" minutes following dispatch, 90 percent of the time.

With specific performance criteria a fire department can develop deployment methodologies to achieve desired levels of performance, and can quickly identify when conditions in the environment degrade performance.

MFD has adopted response performance objectives. Currently, a response time objective of six minutes or less 90 percent of the time is used by the department. This analysis will compare MFD's performance against other nationally recognized standards, specifically NFPA 1710.

NFPA 1710

The National Fire Protection Association has issued a response performance standard for all or mostly career staffed fire departments. This standard, among other things, identifies a target response time performance objective for fire departments and a target staffing standard for structure

fires. Though not a legal mandate, NFPA 1710 does provide a useful benchmark against which to measure the fire department's performance.[21]

NFPA 1710 contains time performance standards for structure fire response as well as emergency medical response. Each will be discussed individually.

Structure Fire Response

NFPA 1710 recommends that the first company arrive at the scene of a structure fire within five minutes of dispatch, 90 percent of the time. NFPA uses the 90th percentile rather than average. This allows an evaluation of a department's performance on the vast majority of its incidents.

The standard establishes that a response company consists of four personnel. The standard does not require that all four be on the same vehicle, but does expect that the four will operate as a single functioning unit once on scene. NFPA 1710 response time standard also requires that all four personnel be on scene within the recommended five minutes, 90 percent of the time. The MFD performance objective does not include this staffing component. Thus, there is no way to determine if sufficient resources are on-scene to initiate effective fire suppression operations.

There is another reason the arrival of four personnel is critical for structure fires. As mentioned earlier, current safety regulations require that before personnel can enter a building to extinguish a fire at least two personnel must be on scene and assigned to conduct search and rescue in case the fire attack crew becomes trapped. This is referred to as the "two-in, two out" rule. The only exception to this regulation is if it is known that victims trapped are inside the building.

Given MFD's typical staffing of engines, the time it takes for the second unit to arrive becomes very important to achievement of the NFPA standard. If additional help is a considerable amount of time away the fire will continue to grow rapidly contributing to significantly more damage to the property.

Finally, the NFPA standard calls for the arrival of the entire initial assignment (sufficient apparatus and personnel to effectively combat a fire based on its level of risk) within nine minutes of dispatch, 90 percent of the time. This is to ensure that enough people and equipment arrive soon enough to be effective in controlling a fire before substantial damage occurs.[22]

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[21] NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2004.

[22] See previous discussion about the "time/temperature curve" and the effects of flashover.

NFPA 1710 describes the following performance as meeting the structure fire response criteria of the standard:

- Turnout time within one minute, 90 percent of the time
- Arrival of the first "company" within five minutes of dispatch, 90 percent of the time, or
- Arrival of the entire initial response assignment (all units assigned to the call) within nine minutes of dispatch, 90 percent of the time

There are three time standards within NFPA 1710 for emergency medical responses. They are:

- Turnout time within one minute, 90 percent of the time
- Arrival of a unit with first responder or higher level of capability (basic life support) within five minutes of dispatch, 90 percent of the time
- Arrival of an advanced life support unit, where this service is provided by the fire department, within nine minutes of dispatch, 90 percent of the time

Missoula Fire Department Response Time Performance Objective

Missoula Fire Department has established a response time objective for its emergency services of six minutes or less to 90 percent of all emergency incidents, so there will be a reasonable target against which to compare current performance. This response time objective is intended to include call processing time and firefighter turnout time.

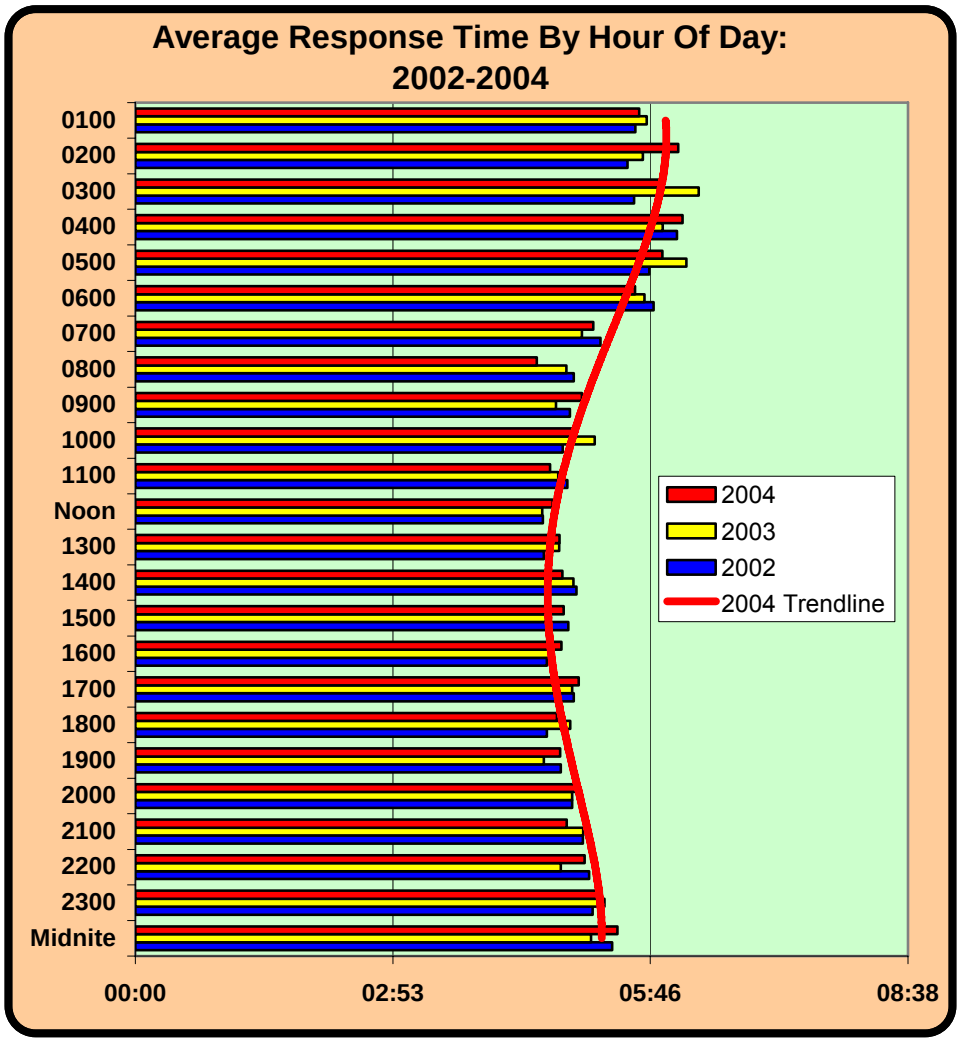
As previously discussed, NFPA 1710 sets response time performance for first arriving fire apparatus at five minutes or less, 90 percent of the time. The 1710 Standard does not include call processing time, which is covered in other related NFPA standards that call for a performance of one minute or less for this activity. Thus, we can see that the Missoula performance objective is consistent with NFPA 1710 and is based on nationally accepted scientific data regarding the effect of time on fire growth, life and property outcomes, and medical crisis survivability.

Recorded Response Time Performance and Outcomes

The *average* response time for those incidents occurring within the primary response area of MFD during 2004 ranged from a high average of six minutes and seven seconds for calls between the hours of 4:00 a.m. and 5:00 a.m., to a low average of four minutes and 29 seconds for incidents

between the hours of 8:00 p.m. and 9:00 p.m.[23] The overall average response time of the department, within its primary jurisdiction, was **five minutes and one second**. These response times include firefighter turnout, but do not include call processing time in the dispatch center. The following figure (Figure 58) provides the average response times for the Missoula Fire Department, broken out by hour of day, for 2002 through 2004.

Figure 58: MFD Average Response Time Analysis by Hour of Day



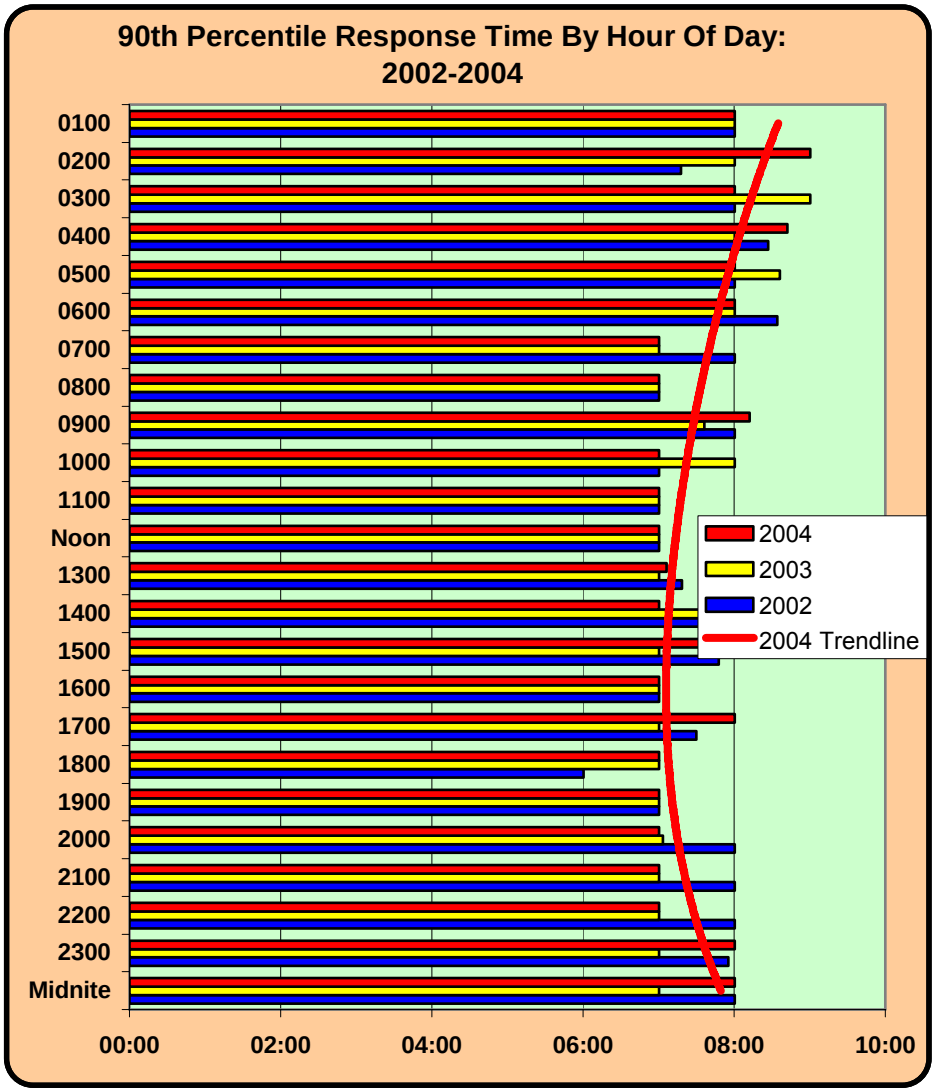
Of more significance is how well the emergency response demand is being serviced. One useful way to determine how well demand-based coverage is achieved is by determining maximum response time to a majority of incidents; in this case we will use 90 percent. As was indicated earlier, the 90th

[23] Non-emergency incidents were not used in the calculation of response times; to the extent these calls could be identified. In addition, calls with response times in excess of fifteen minutes were considered anomalies and were not used in response time analysis. Mutual aid incidents out of district were not considered in the analysis. Response time is for first arriving apparatus.

percentile is the manner in which the majority of performance standards for emergency services are set, including the MFD standard. The *90th percentile* response time for all incidents occurring within the primary response area of MFD during 2004 was **eight minutes**. Again, this figure does not include call processing time in the dispatch center. If we were to assume that the dispatch center's call processing performance could be maintained within the national standard of one minute, then we can see that the department's current response time performance at the 90th percentile is **nine minutes**.

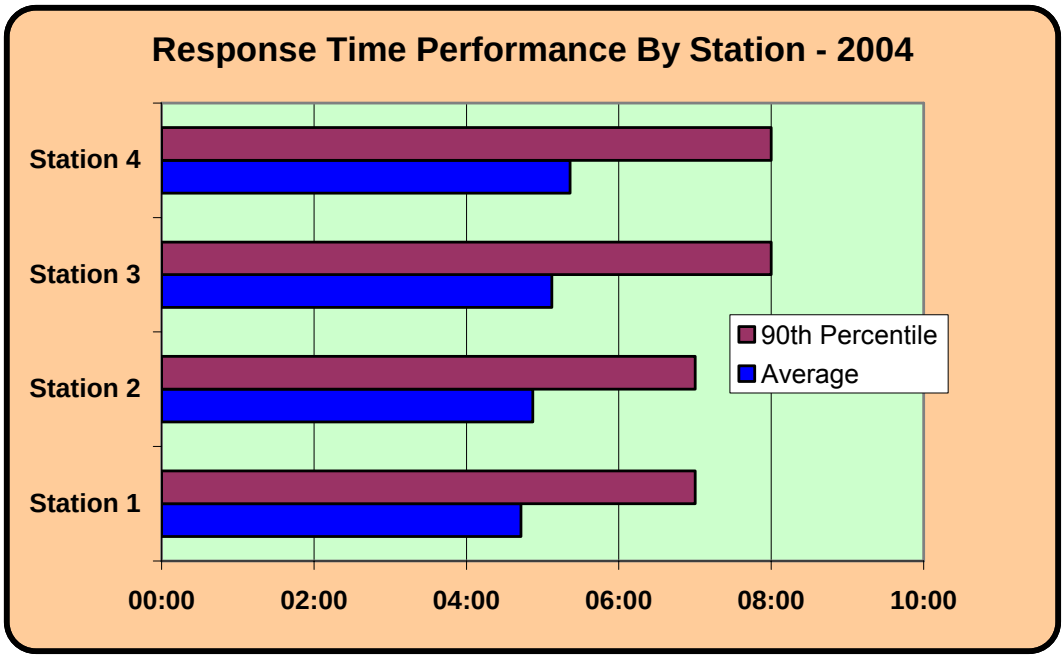
The following figure (Figure 59) provides the 90th percentile response times for the department, broken out by hour of day, for 2002 through 2004.

Figure 59: MFD 90th Percentile Response Time Analysis by Hour of Day



The following figure (Figure 60) provides both the average and the 90th percentile response times for the Missoula Fire Department, broken out by each fire station's primary response area for the year 2004.

Figure 60: Response Performance by Station – 2004



The analysis of response time performance data reveals that, if the department seeks to maintain a response time objective of six minutes or less to 90 percent of the calls in MFD's area, significant improvement will need to be made in reducing overall response time across all hours of the day and from all fire stations.[24]

Incident Staffing

Delivering sufficient numbers of personnel to the scene to accomplish all the various tasks that are required to effective control an emergency is essential. MFD has personnel available to routinely staff emergency medical and other non-emergency incidents with sufficient personnel.

The most labor intensive incidents are structure fires. National criteria recommend at least 15 personnel be on scene of a fire in a single family home. More personnel are needed as the size of the structure increases, the life risk increases, or when special hazards exist.

[24] Including call processing time

At minimum staffing, MFD has 13 personnel available to respond to structure fires. The following Figure 61 is a breakdown of daily minimum staffing levels at the four MFD stations.

Figure 61: MFD Minimum Daily Staffing

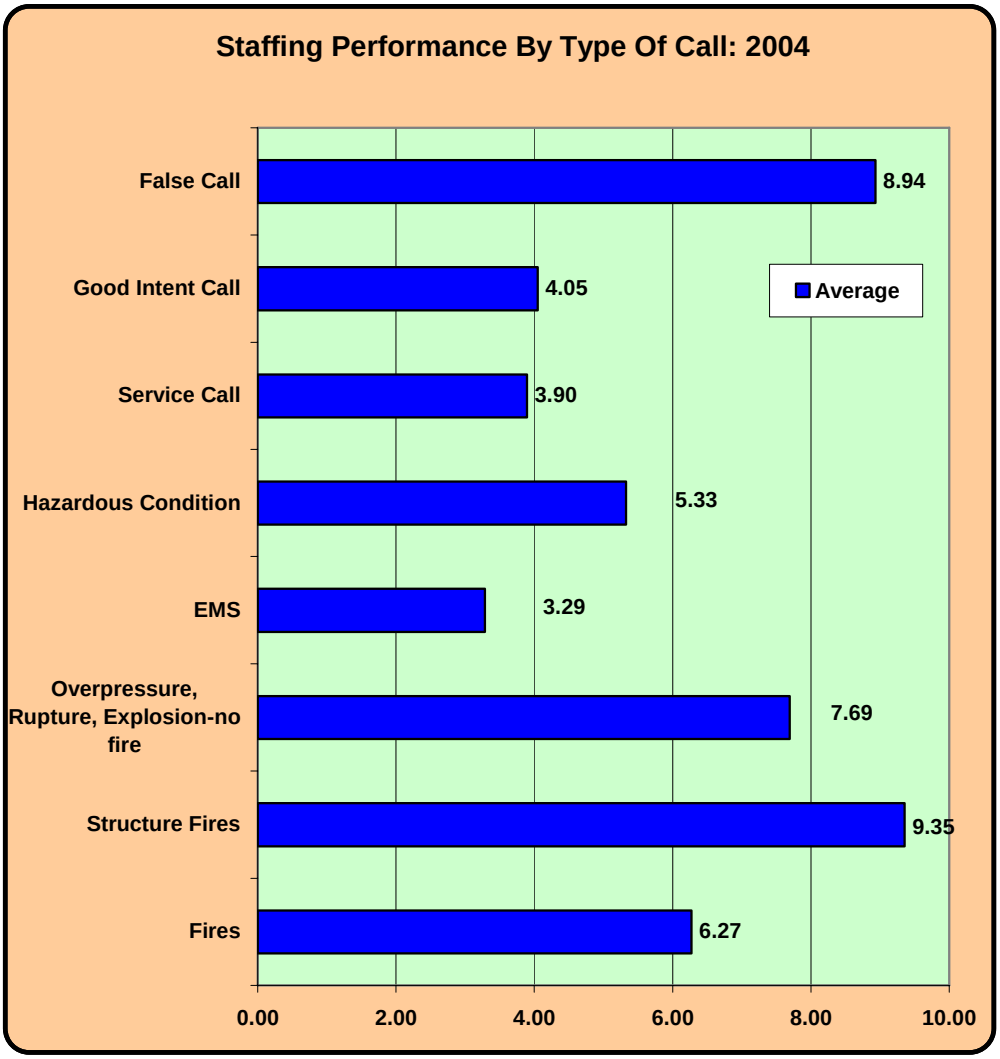
MFD Minimum Daily Staffing		
Station 1	1 Battalion Chief, 1 Captain and 2 Firefighters	4
Stations 2, 3, 4	1 Captain and 2 Firefighters	9
Combined Total		**13**

Since MFD uses on-duty responders, a review of the standard of coverage currently in effect by Missoula Fire Department does not provides the ability to assess assigned staffing response as demonstrated by the accreditation model. It can be seen however, that adequate staffing for a low-risk incident is typically available for the initial response with the existing staffing at the time of dispatch. The current daily staffing model does not appear to provide consistent four-person engine company staffing as required by NFPA 1710.

In order to assess the adequacy of MFD's staffing methodology, we analyzed historical incident data to determine the number of staff recorded as on-scene for incidents of various types. Data was analyzed for 2004. The figures do not reflect staffing provided by mutual or automatic aid companies.

The following figure (Figure 62) provides the average staffing performance by call type for Missoula Fire Department.

Figure 62: Incident Staffing Analysis – 2004



Several conclusions can be drawn from the data. Staffing figures for most non-structure fire and service calls is above four. This indicates that, under current deployment and a standard of coverage, MFD is consistently generating sufficient response staff to meet the critical tasking of low-risk incidents of certain types or a full four-person company response.

Average staffing figures for structure fires (typically representing medium-risk occupancies) is currently at nine firefighters, according to the department's data. When compared to the sample critical tasking chart, it can be seen that the current performance provides a little over one half of the manpower necessary to complete all of the critical tasks listed (15). Failure to ensure adequate manpower to accomplish the critical tasks listed in the chart will result in relatively predictable outcomes of advancing fire spread, increased dollar loss, and potentially increased scene safety risks.

High and maximum-risk incidents are not analyzed here since these types of incidents typically involve the extensive use of mutual aid companies in a regionally coordinated response.

Mutual and Automatic Aid Systems

State law provides for response upon request by neighboring jurisdictions. MFD has mutual aid agreements with Missoula Rural Fire District (MRFD). Automatic aid agreements between MFD and MRFD include only a small area of the total MFD response area.

Nearly all persons interviewed indicated insufficient training occurs between fire departments. In some cases, use of volunteers and past tension between departments was identified as the problem, while others said it just wasn't a "high enough priority". For the most effective mutual and automatic aid programs, as well as maximum credit in the ISO Fire Protection Rating system, additional multi-agency drills must be scheduled. Ideally, these should occur at least once per quarter and be recorded as multi-agency training in all agency records. In addition to the ISO credit, these training sessions will naturally lead to enhance working relationships, more regional thinking, and perhaps cooperative planning, policy, and procedural development.

From a formal standpoint, the Missoula Fire Department regularly interacts with the Missoula Police Department. Interviews indicated that this relationship is effective and efficient with no problems or issues cited by either fire or police officials. In many cases, police are even responding to fire or EMS calls and assisting with traffic and other needs, underscoring the quality of the relationships between fire and police.

Overall, the mutual aid systems in place for MFD appear to be dysfunctional at times. Fire department leadership in all agencies should address root causes that impede working relationships, and make corrective adjustments to improve relationships, emergency response, and service to the region.

Hazardous Materials Response

The Missoula Fire Department is trained and equipped to provide hazardous materials response at the "operations" level; twelve firefighters have additional training and are certified as hazardous materials technicians. The operations level permits defensive operations for purposes of containment, but does not permit aggressive forward tactical efforts focused on corrective action, clean-up, or handling of hazardous substances (with a few exceptions).[25] Some limited equipment for

[25] OSHA CFR 1910.120(q)(6)(ii).

purposes of containment and decontamination, as authorized at the operations level, is carried on various vehicles of the agency.

In Missoula, technician-level hazardous materials response has been the responsibility of a Regional Hazardous Materials Team, which is comprised of personnel from the Missoula Fire Department, Missoula Rural Fire District, the University of Montana, and private industry. Technician-level response personnel provided by the team respond with significant resources when called. This system provides for effective hazardous materials response planning and mitigation.

The cost of establishing and maintaining a full-blown Hazardous Materials Response Team capable of mitigating all types of hazardous substance incidents at the technician or specialist level is expensive. Establishing such teams in all but the largest of metropolitan departments is ill-advised from the standpoint of cost, necessary personnel, and ability to retain skill levels. Instead, the development of regional hazardous materials mitigation programs is encouraged in order to take advantage of a larger manpower pools and greater resources, while spreading the cost across a larger area.

The Missoula community should continue to maintain efficient capabilities for performing functions at the operations level for hazardous materials risks most common to their community and should encourage and support and participate in the Regional Hazardous Materials Response Team.

Homeland Security Integration

Fire departments are considered F*irst Responders* in the national systems for homeland defense and security. Recent changes in the structure of the federal government have placed the United States Fire Administration (USFA) under the umbrella of the Department of Homeland Security. Given this status, emergency service agencies should continue to assess their capabilities for response and integration into larger incidents involving acts of terrorism or threats to national defense.

The Missoula Fire Department's response area is not a likely primary target for an act of terror. It does not contain sensitive military or government facilities, nor is it home to any high-profile institutions or enclaves of controversial immigrant societies. The area is far more likely to be a secondary, collateral damage area in the event of a significant act of terrorism. While this may be of some comfort, it should be remembered that acts of domestic terror can also have significant and far-reaching effects on even small communities, and that acts of international terrorism can go awry, as in the case of rural Pennsylvania on September 11, 2001.

From the standpoint of first responders, the results of an act of domestic or international terrorism will typically fall into one or more categories:

- Large fire and/or explosion accompanied by fire
- Mass casualty incident (MCI)
- Hazardous substance release
- Secondary threat (timed or triggered event following arrival of first responders)

Emergency agencies are, to some degree, trained to respond and mitigate the first three categories in this list. However, this statement is not intended to oversimplify the challenges. The resulting incident caused by an act or terror can be much larger, more complex, and more demanding than most local incidents that might fall into these same major categories. Still, the agencies must rely on the same training, procedures, command structures, and strategies that are taught for such incidents.

The primary key to success will be familiarity with response plans for such incidents, practice, and integration with other agencies at the regional, state, and federal level.

Missoula has at least some level of planning and procedure in place for large fires, mass casualty incidents, and hazardous substance releases. Additional training on the recognition and response to incidents with likely secondary threats to first responders will continue to help prepare personnel. And, of course, the agency should continue to seek out additional, advanced training on the following areas:

- Explosions and threats
- Conflagration fire incidents
- Mass casualty incidents
- Radiation response strategies
- Large-scale quarantine, containment and decontamination
- Hazardous substance response, evacuation, containment, and decontamination
- Regional and federal incident command strategies

As in our discussions dealing with hazardous materials response, the cost of establishing and maintaining capability for full response to incidents involving weapons of mass destruction (WMD) is extremely high and best handled through the development of regional, state, or federal programs. This regionalized approach is also encouraged by those federal and state agencies responsible for distribution of grant funding for homeland security programs. Missoula should encourage and support any additional efforts at regionalization of first responder training and preparation in homeland security issues. In addition, the department should aggressively seek out and respond to grant opportunities afforded to local communities for first responder equipment and supplies.

Insurance Services Office

The Insurance Services Office (ISO) last rated the Missoula Fire Department in 1998. The ISO assigned the City a Class 3 rating for all properties within 1,000 feet of a fire hydrant. The total percentage credit received by the city was 75.15 percent.

The ISO uses a 1 – 10 rating scale with Class 1 being the best level of service (and lowest fire insurance premium cost) and Class 10 being no service at all. The ISO reviews fire protection in three major categories. These categories, and the credit received for the City rating, are shown below.

Communication (10%) – This evaluates the function and reliability of the dispatch service. The City received 8.20 percent out of a possible 10 percent in this category.

Water Supply (40%) – This evaluates the community's ability to deliver firefighting water in sufficient volumes to combat fires in buildings. The City received 35.53 percent out of a possible 40 percent.

Fire Department – (50%) – This evaluates the capability of the fire department to effectively respond to and extinguish a fire. Items reviewed include apparatus, staffing, training, and station locations. The department received 35.14 percent out of a possible 50 percent available. The primary area of deficiency was insufficient on-duty company personnel. This item reviews the average number of equivalent firefighters and company officers on duty with existing companies. There is also an opportunity to gain additional credit in the training criteria. The following is the breakdown of the department's creditable points:

Figure 63: MFD ISO Point Ratings

Credit Criteria	Actual Credit	Maximum Credit
Engine Companies	9.88	10.00
Reserve Pumpers	0.99	1.00
Pump Capacity	5.00	5.00
Ladder Companies	4.71	5.00
Reserve Ladder Companies	0.46	1.00
Distribution	3.24	4.00
Company Personnel	5.37	15.00+
Training	5.49	9.00
Total Credit	**35.14**	**50.00+**

The ISO rating is important to a community. Many property insurance companies base the fire risk portion of property insurance premiums on the community's ISO rating. The following charts show two examples of how fire insurance rates for homes change based on the ISO rating assigned.

Figure 64: Fire Department Protection Class versus Insurance Premium Cost Example

Fire Department Protection Class Versus Insurance Premium Cost Annual fire insurance premiums based on home value (source: Oregon premium survey)				
Amount of coverage	Protection Class			
	2-6	7-8	9	10
$100,000	$322	$435	$885	$1,046
$150,000	$416	$562	$1,144	$1,352
$200,000	$549	$740	$1,509	$1,782
$250,000	$691	$934	$1,901	$2,247

Figure 65: Example Premiums Based on ISO Ratings

FIRE DEPARTMENT CLASS RATE VERSUS INSURANCE PREMIUM COSTS								
Fire Rating	Annual Premiums based on home value (home values in thousand dollars) (source: Survey of insurance companies in southeast United States)							
	100	150	200	250	300	350	400	500
10	894	1358	1856	2341	2826	3311	3844	4918
9	806	1224	1674	2112	2549	2986	3468	4436
7	430	652	892	1125	1359	1592	1848	2365
6	399	607	829	1046	1262	1479	1717	2196
5	373	566	774	976	1179	1380	1603	2051
4	373	566	774	976	1179	1380	1603	2051
3	373	566	774	976	1179	1380	1603	2051

As the ISO class improves, fire insurance rates decrease dramatically until Class 5 for homes. Businesses generally benefit from further reductions down to class 1.[26]

While there is little to be gained in insurance premium savings for homeowners by improving the rating within areas served by fire hydrants (currently Class 3), there is substantial opportunity for savings to commercial property owners. The department should develop an ISO improvement plan to address current deficiencies and to develop strategies to improve the rating over time.

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

National Benchmarks and Comparables

There are a variety of other standards and performance criteria developed by various organizations with an interest in fire and emergency services. The chart that follows (Figure 66) lists a number of these.

Figure 66: Table of Benchmark Comparisons

National Standard or Comparison	Organization	Current MFD Standard
Minimum effective company staffing is 4 firefighters	Dallas Fire Dept. Study, Seattle Fire Dept. Study, NFPA Standards., Federal OSHA	Not met
Engine company within 1.5 miles of built upon areas	Insurance Services Office (ISO)	Not met (Figure 45: ISO 1.5 Mile Response Areas for Engine Companies)
Ladder truck within 2.5 miles of built upon areas	Insurance Services Office (ISO)	Meets National standard
Staffed ladder truck if 5 or more buildings exceed 35' high	Insurance Services Office (ISO)	Cross staffed ladder trucks
Average fireground staffing to be 15 firefighters (up to 53 at mall, high rise, etc.)	Commission on Fire Accreditation International (International Association of Fire Chiefs)	Not met (Emergency Services Staff)
National average of on-duty personnel = .48 per 1,000 population	International City/County Management Association (ICMA)	Not met (0.21 per thousand population)
National average total uniformed, full-time personnel = 1.59 per 1,000	International City/County Management Association (ICMA)	Not met (Figure 22: Comparison of Firefighters per 1,000 Population)
Arrive at structure fire prior to flashover (typically 5 to 7 minutes from ignition)	FEMA , National Fire Academy	Not met[27]
Arrive at EMS call within 4 to 6 minutes of cardiac or respiratory arrest	American Red Cross	Not met[28]

[27] Source: Missoula Fire Department, equal 8:00 minutes 90 percent of the time
[28] Ibid

Objective Nine – Training

Providing for a safe and effective fire and emergency medical services delivery system requires a well-trained response force. The International Fire Service Training Association (IFSTA) states that "regardless of the particular system used, an effective training program will include: (1) the continuous training of all levels of personnel in the department; (2) a master outline or plan; (3) a system for evaluating the scope, depth, and effectiveness of the program: and (4) revising the program, as required, to include advances in equipment, products, and techniques". Without a high quality, comprehensive training program, emergency outcomes are compromised, departmental personnel are at risk, and the department and city may be held liable for the actions of its employees. Training and education of department personnel are critical functions for the Missoula Fire Department.

General Training Competencies

In order to ensure quality training is provided it should be based on established standards of practice. There are a variety of sources available for fire service training standards. The Missoula Fire Department has selected IFSTA and the NFPA as its main source of standards and materials. Both are considered industry standards. The MFD Training Officer, generally using these standards, provides training to department members in several categories including entry level, on-the-job, and specialized services.

On-the-job or in-service training is the level to which the Training Officer commits the greatest amount of effort. Hazardous materials' training is delivered at the operations level to department personnel. A smaller number of personnel are certified at the hazardous materials technician level. These personnel respond as a regional component of a state-wide hazardous materials response system. Structural and wildland fire training, various types of rescue training, and EMS training are also conducted on a regular basis. Training for wildland fires is conducted to meet the USFS red card program.

The department, through the oversight of the Training Officer and the EMS Coordinator, is currently considering enhancements to its training program. This program should include: (1) provision for a standard basis of fire department operations; (2) consideration for a long-range training plan; and (3) development of a department training manual.

Training Facilities

The department's Fire Station No. 4 is designed to provide an efficient training environment. The facility, in addition to operating as an active in-service fire station, provides a large classroom,

standard audio-visual equipment, computer projection capability, a drill ground area with props, and a drill tower providing above ground hose, ladder, and other hands-on training opportunities. Providing quality training props and tools to support the department's training goals should continue to be a priority for the department.

Office space for the Training Officer and the EMS Coordinator is quite limited, as well as the space available for the support staff in the front office. Future additions should be considered to provide more adequate office for the training and support staff.

Training Staff

The International Fire Service Training Association states that "the training program must be organized, supervised, and conducted by individuals who are knowledgeable in this profession." The department's training division consists of two FTE, the Training Officer, and the EMS Coordinator. There has been a lack of longevity in both of these positions which raises questions as to the continuity of the training program. It is difficult for a person in a key position such as Training Officer to get fully oriented to the departmental training issues with such a high turn-over rate.

Future recruitment for the position of training officer should include competencies for instructional and fire officer background. The size and organization of the department allows for the Training Officer to take a hands-on approach to training program delivery. It is important to note that the gap that exists between planning and execution must be bridged by a well-developed, progressive training program. The key to a successful training program lies with the Training Officer and the instructor base within the organization. The value of a Training Officer that is able to spend more time in the delivery system planning role will often have a larger impact on the overall level of the department's response effectiveness. The Training Officer can also have an affect on the personal growth of other department members by involving them in the instructional delivery of the courses and programs. Also, more efficient methods of operation are often devised when many ideas are considered.

A basic principle that should govern the training program for the department is the fact that all activities in the training division should be integrated into the departmental goals. Currently, the goals and objectives for the training program are identified in the budget document section *Training Division Work Plan - Ongoing and Mandated Objectives*. The Fire Chief, as the authority by which the Training Officer functions, is the primary source that determines, often collaboratively, the direction of the training division and its relationship with the overall departmental goals. The department should consider the training officer as more of a program manager and the primary planner related specifically to fire department training, as it does a source of direct instructional delivery.

Entry Level Training

Prior to being considered for full-time employment by MFD, applicants must meet the minimum training requirements prescribed by the firefighter job description.

Successful candidates complete the MFD entry level firefighter training during a 24-month schedule of activities. The 24-month program is divided into three phases: basic training, training to qualify for substation rotation and confirmation, and driver/operator training. A candidate in the program is closely monitored by the Training Officer.

On-going Skills Maintenance Training

Once assigned to a response unit, personnel must be continually provided with on-the-job in-service refresher training to avoid degradation of skills learned during entry-level training. In addition, training must be provided to deal with emerging risks and service demands.

The Training Officer and the EMS Coordinator are very involved with the hands-on delivery of company level training. Lesson plans are generally not used which makes the handing-off of training duties to other qualified instructors difficult. The development of a department training manual should be a high priority for the training staff.

Career Development Training

Career development programs are not widely utilized in the department. The Fire Officer I package is available to employees and participation in this program has increased in recent years. A higher level of emphasis placed in the area of career development will yield long term dividends to the department.

Training Program Planning

Like any other activity, training and education of personnel should be conducted under a comprehensive plan. The training program is a direct reflection of the long range goals of the department. The training program plan should include a clear reflection of the goals and objectives of the training division and how they relate to MFD's goals. A departmental training committee could help formulate this plan and often provides the added benefit of getting employee buy-in to the program and, broadens the base of information from which the program is developed.

Ideally, a comprehensive training plan includes:

- Identification of performance standards for all personnel
- Provisions for periodic review of individual and company level performance

- Scheduled training to prevent skills degradation
- Scheduled skills improvement training
- Comprehensive training objectives for each training session presented
- Process for evaluating the amount of learning that occurred
- Scheduling outside training opportunities

One objective of note that is not currently being met is contained in the *Training Division Work Plan - Ongoing and Mandated Objectives*: Objective No. 4 - Maintain and develop joint training with other emergency response agencies. While this may be due in part to the high turnover rate in the Training Officer position, developing operational efficiency with other fire service agencies in the region is critical and should be a high priority in the future. The level of risk in the City is quite high and the depth of resources must include all the surrounding agencies in a comprehensive response plan that includes routine joint training.

Competency Based Training

On-going training should follow an identified plan based on demonstrated training needs. Such a plan is best developed as a result of periodic evaluation of the current skill levels of employees and members (competency-based training).

Under a competency-based system, an evaluation of skill performance is conducted at scheduled intervals to determine if the person being evaluated can perform the task in accordance with pre-determined standards. Those skills that are performed well require no additional training. Those skills not performed well are practiced until the standard is met.

This approach maximizes the time used for training. Further, it ensures that personnel are performing at a level that has been established by the department training plan. Specialty skills can be evaluated in the same manner with further training provided as needed. Ideally, the competency based training approach is used on an ongoing basis. For example, each quarter different skills can be evaluated on an individual-by-individual basis.

To institute a competency-based approach to training, all of the needed skills must be documented to describe the standard of performance expected. This would include all skills such as hose handling, apparatus operation, EMS procedures, use of equipment and tools, forcible entry, ventilation, tactics and strategy, and others.

To operate an effective on-going training program, even under the competency-based approach, sufficient resources must be available to conduct skill evaluations and to assist with performance improvement training. In-house trainers to assist the Training Officer with the training delivery and competency based evaluations should be considered. The MFD is also using in-house trainers.

Training Records and Reports

Training records are maintained on the *Firehouse* software designed for that purpose. The system is able to provide reports showing the amount of training received by each employee by category and by hour. This is an excellent resource for the department to assist in developing long-range training and education plans as well as a resource to query activity that is useful in departmental reports. Individual training records are completed at the end of each work shift. Training records were current and accessible.

Objective Ten – Fire Prevention

An aggressive fire, medical, and accident risk management program, through active prevention efforts, is a fire department's best opportunity to minimize the losses and human trauma associated with fire and medical emergency events. The International Association of Fire Chiefs has defined proactive emergency services as:

> *"…embracing new, proven technology and built-in protection, like automatic fire sprinkler and early detection systems, combined with aggressive code enforcement and strong public education programs."*

A fire department should actively promote fire resistive construction, built-in early warning and suppression systems, and an educated public that is trained to minimize their risk to fires, accidents, and medical emergencies.

Background

As a duly formulated municipality in the State of Montana, the City has adopted the following codes.

- International Building Code
- NFPA 1 Uniform Fire Code[29]

As provided for by City of Missoula Ordinance, "The Chief of the Fire Department serving the City of Missoula, Montana, or his/her representative authorized by him/her shall enforce the provisions of the Fire Code ordinance." The MFD Fire Chief has authorized the Fire Marshal and his staff to enforce the fire code in the City.

The Fire Prevention Bureau (Bureau) of the department is staffed by the Fire Marshal, Assistant Fire Marshal, and three Inspectors, one of which is a rotating position of line personnel. One secretary is also assigned to the Bureau in a is shared position with the shift Battalion Chief's.

New Construction Review

Fire and life safety plans are required for new construction. The MFD Fire Prevention Bureau reviews new construction plans in cooperation with the City building department for the requirements of the fire code. The MFD has "sign off" approval for new construction prior to issuance of a certificate of occupancy by the building official.

[29] NFPA 1: *Uniform Fire Code*™, 2006

Observation and interview indicates a good working relationship between the City building officials and the Fire Marshal.

Fire Safety Inspections

Property inspections to find and eliminate potential fire hazards are an important part of the overall fire protection system. The recommended frequency for commercial fire safety inspections varies by the type of business. Generally, they are classified by degree of hazard. The table below (Figure 67) describes the various hazard classes and the recommended frequency for fire safety inspections by class.

Figure 67: Inspection Frequency Recommendation Table

Hazard Classification	Example Facilities	Recommended Inspection Frequency
Low	Apartment common areas, small stores and offices, medical offices, storage of other than flammable or hazardous materials.	**Annual**
Moderate	Gas stations, large (>12,000 square feet) stores and offices, restaurants, schools, hospitals, manufacturing (moderate hazardous materials use), industrial (moderate hazardous materials use), auto repair shops, storage of large quantities of combustible or flammable material.	**Semi-annual**
High	Nursing homes, large quantity users of hazardous materials, industrial facilities with high process hazards, bulk flammable liquid storage facilities, a facility classified as an "extremely hazardous substance" facility by federal regulations (SARA Title III)	**Quarterly**

MFD's goal is to inspect high hazards annually, moderate hazards and low hazards are on a two or three-year cycle. Currently, the program is under review and files are being updated to reflect a more aggressive approach. Records indicate that a number of occupancies have not been visited for five years or longer. The Fire Prevention Bureau recognizes that the inspection program needs improvement and is working to improve the program. There needs to be a defined objective for the frequency of inspections based on the level of risk and a concerted effort to achieve this objective.

The Fire Marshal recently began the implementation of a computerized data collection system for the inspection program. As noted earlier, the Bureau is working diligently to update files and maintain appropriate records of current activity. A high priority should be established to cause the efficient, effective, and accurate collection and utilization of inspection data throughout the organization.

Finally, there should be some way to measure results of the effort. This would include, among other factors, expanding information tracked on emergency incidents to record whether human behavior was a contributing factor to the emergency and whether citizens present took appropriate action when faced with an emergency.

The following chart (Figure 68) shows MFD inspection activity for 2003 through 2005.

Figure 68: Fire Inspection Activity Summary

Missoula Fire Department – Fire Prevention Office Activity Code Enforcement & Inspections			
	CY – 2003	**CY – 2004**	**CY – 2005**
Code Enforcement	1,298	1,334	1,502
Follow-up Inspections	476	479	647
Notices Issued	1,140	1,207	827
Complaints	112	41	27
Alarm and Sprinkler Tests	245	381	287

Life and Fire Safety Education

Providing fire safety education to the public to minimize the occurrence of fire and train the community in appropriate actions to take when faced with an emergency is a very important fire protection strategy.

The MFD provides public safety education programs on a variety of subjects and to a variety of audiences. The Fire Marshal has informally assigned one of the Inspectors as public education officer. All members of the Bureau are involved in the public education program.

Educational activities provided by MFD include a fire education safety trailer, a smoke detector program which includes evening visits to residences by line personnel, fire extinguisher use, and a fire safety puppet show during Fire Prevention Month, CPR, a variety of special programs to civic groups, and facility and apparatus familiarization tours and consultation on wildland interface risk reduction. Programs offered are designed with the goal of reaching across the demographics of the community with emphasis on the very young and elderly.

The MFD life and fire safety education priority is moderate and available resources limited. The department should provide a more aggressive public education program. Many school systems across the nation have adopted the NFPA *Learn Not to Burn* and/or *Risk Watch* programs into their

annual curriculum. Although attempts have been made to introduce these programs to the local school district with limited success, continued encouragement for acceptance of the safety programs should be continued.

Providing sufficient resources for the delivery of safety education is necessary to ensure an effective program. While the Bureau should continue to oversee this responsibility, the part time efforts of the members of the Bureau cannot be effective. The expanded use of fire station personnel for programs delivered within their respective service area should be examined. The use of community volunteers, Explorers, or auxiliary members should be examined as potential resources for public education program delivery.

The next figure (Figure 69) shows the activity level of fire prevention and public education conducted by the Missoula Fire Department over the past two years.

Figure 69: MFD Public Education Activity

Missoula Fire Department –Public Safety Education 2004 - 2005				
Education Activity	**Number of events**		**Number of contacts**	
	2004	**2005**	**2004**	**2005**
Talks and Demonstrations	238	193	5,480	5,577
Supervised Drills	62	17		
Hours	248	248		

Fire Investigation

The investigation of fires, explosions, and related emergencies is an integral part of providing life and fire safety services to a community.

A fire problem in a community is addressed by a cycle of resources provided by the authority having jurisdiction. These resources include public education so the citizen is aware of hazards, how to prevent them, and what to do should they occur; engineering/code enforcement so fire and life safety is an inherent part of the community infrastructure and where there is a violation compliance is achieved; fire suppression so that when there is a failure in the education, engineering/code enforcement portion of the cycle the emergency can be resolved; and fire investigation where the incident is documented, the cause determined accidental or intentional and steps taken so it will not happen again.

The results of fire investigations suggest education needs and results, the need for code modifications and changes, fire department training, resources and deployment, and identification of the community's fire problem. MFD complete the cycle; appropriate entities and personnel do routinely review and analyze fire incident report data for the purposes outlined above.

The MFD Fire Marshal has the initial responsibility for determining the origin and cause(s) of fires in the City. All members of the Bureau are designated fire investigators and must investigate fires involving severe damage, injury, or death. Fires of lesser nature may be investigated by Battalion Chiefs and company officers. NFPA 921 is used as a guideline in completing fire investigations.[30]

Should a crime be suspected during an investigation, the City police department is notified and will assist in the investigation.

The following figure indicates the number and cause determinations made by the Fire Prevention Bureau during the past three years:

Figure 70: Fire Causes in Missoula

Missoula Fire Department – Fire Prevention Office Activity Property Fire Causes			
	CY2003	**CY2004**	**CY2005**
Accidental	28	30	63
Incendiary	19	4	19
Juveniles	2	7	4
Undetermined	4	3	11
Hours Involved	216	90	138

Incident Information Analysis

The primary purpose for maintaining a record of emergency responses is to evaluate the effectiveness of fire/rescue programs and performance. This effort includes deployment strategies, training requirements, and the effectiveness of fire prevention, code enforcement, fire investigation, and life safety education programs.

MFD has the system in place for maintaining a good incident record system that provides valuable information for organizational and community analyses. For example, based on a review of MFD's

[30] NFPA 921: *Guide for Fire and Explosion Investigations*, 2004

incident activity for the past several years, we recommend that attention should be given to the determination of false alarms, malicious false alarms, and alarm malfunctions. There is typically a tendency to misclassify these categories. When alarms are actuated by non-malicious sources such as repairmen, burnt food, and/or accidental system damage, etc., they are many times classified as a system malfunction or false alarm when the system did exactly what it was designed to do. These types of alarms should be classified as "unintentional".

The categories used to identify fire cause need to be reviewed. Standard causes including heating appliances, cooking, electrical, candles, and smoking /matches are not listed on the reports we reviewed. We encourage MFD to adapt to a more specific reporting method in-order to assist in completing the cycle of resources discussed above.

The results of fire investigations suggest public education needs and results, the need for code modifications and changes, fire department training, resources, and deployment, and identification of the community's fire problem.

MFD is working to complete the cycle. Public education, engineering/code enforcement, fire suppression, and fire investigation entities exist within the Bureau and they appear to have formal interface.

Section II – System Demand Projections

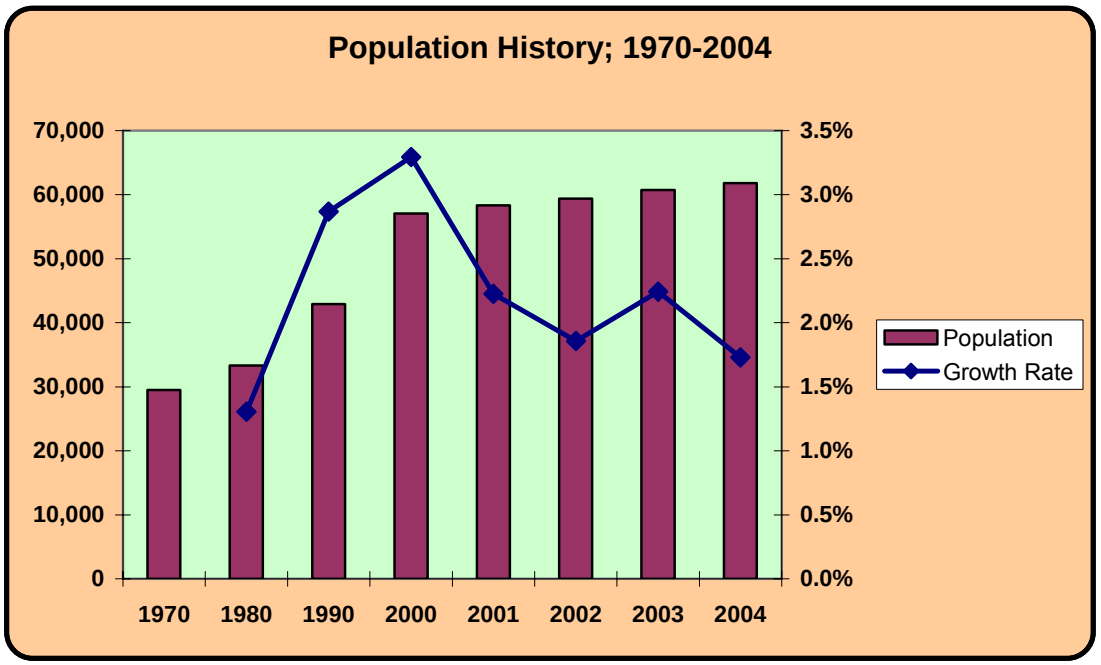
Community Growth Potential

Current Population Information

The Missoula Fire Department provides fire protection services to all of the City of Missoula in Missoula County. The population of the City was 57,053 in the 2000 U.S. Census.[31] However, the Census Bureau has estimated some increase since the 2000 Census and the City's population was estimated at 61,790 in 2004.[32] For the City, this population figure represents a significant 44 percent increase over the 1990 Census, when the population was 42,918. The most significant portion of growth within the City has clearly occurred through additional housing development, since over 18 percent of the total housing in City has been built since 1990.[33]

The following chart (Figure 71) provides some historical information on population for the City of Missoula.

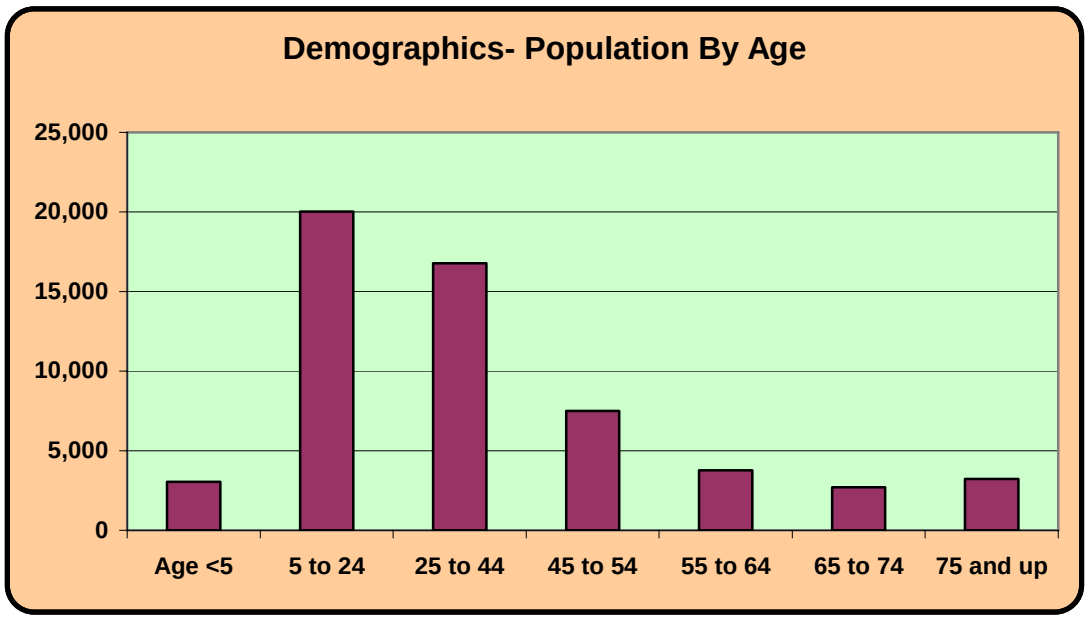
Figure 71: City of Missoula Population Growth History



[31] 2000 U.S. Census Table SF-1 and SF-3
[32] Population estimate for 2004 was based on a 2000 estimate base of 57,043, reflecting modifications to the 2000 Census official figure as documented in the Count Question Resolution program and other program revisions following the 2000 U.S. Census.
[33] 1990 U.S. Census Table SF-1

The following figures provide some general demographic information on population and housing for City of Missoula.[31]

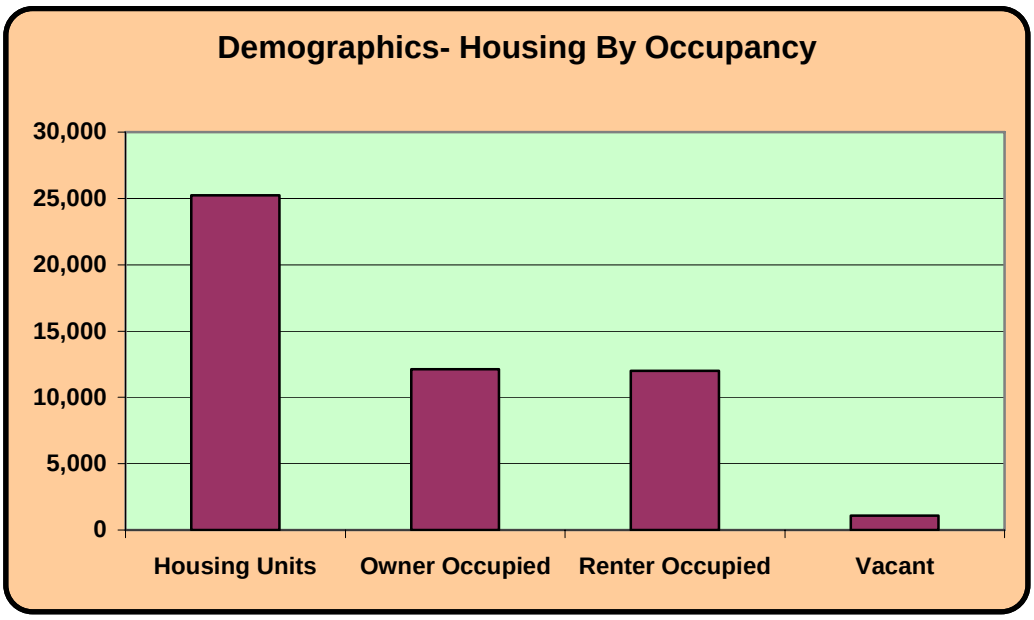
Figure 72: City of Missoula Population by Age



Selected Demographic Information- 1990 to 2000								
	Total Pop	Age <5	5 to 24	25 to 44	45 to 54	55 to 64	65 to 74	75 and up
2000	57,053	3043	20038	16779	7494	3777	2703	3219
1990	42,918	2831	14097	14451	3527	2720	2725	2567
change	33%	7%	42%	16%	112%	39%	-1%	25%

As can be seen from the above figures, ten percent of the population is 65 years of age or older and five percent of the population is under five years of age, placing a total of 15 percent of the area's population within the significant target age groups that pose the highest risk for fatalities in residential fire incidents. It is also worth to note, that the number of residents over the age of 75 has increased by 25 percent since 1990, a change that can be expected to create a significant increase in service demand for emergency medical incidents

Figure 73: City of Missoula Housing by Occupancy

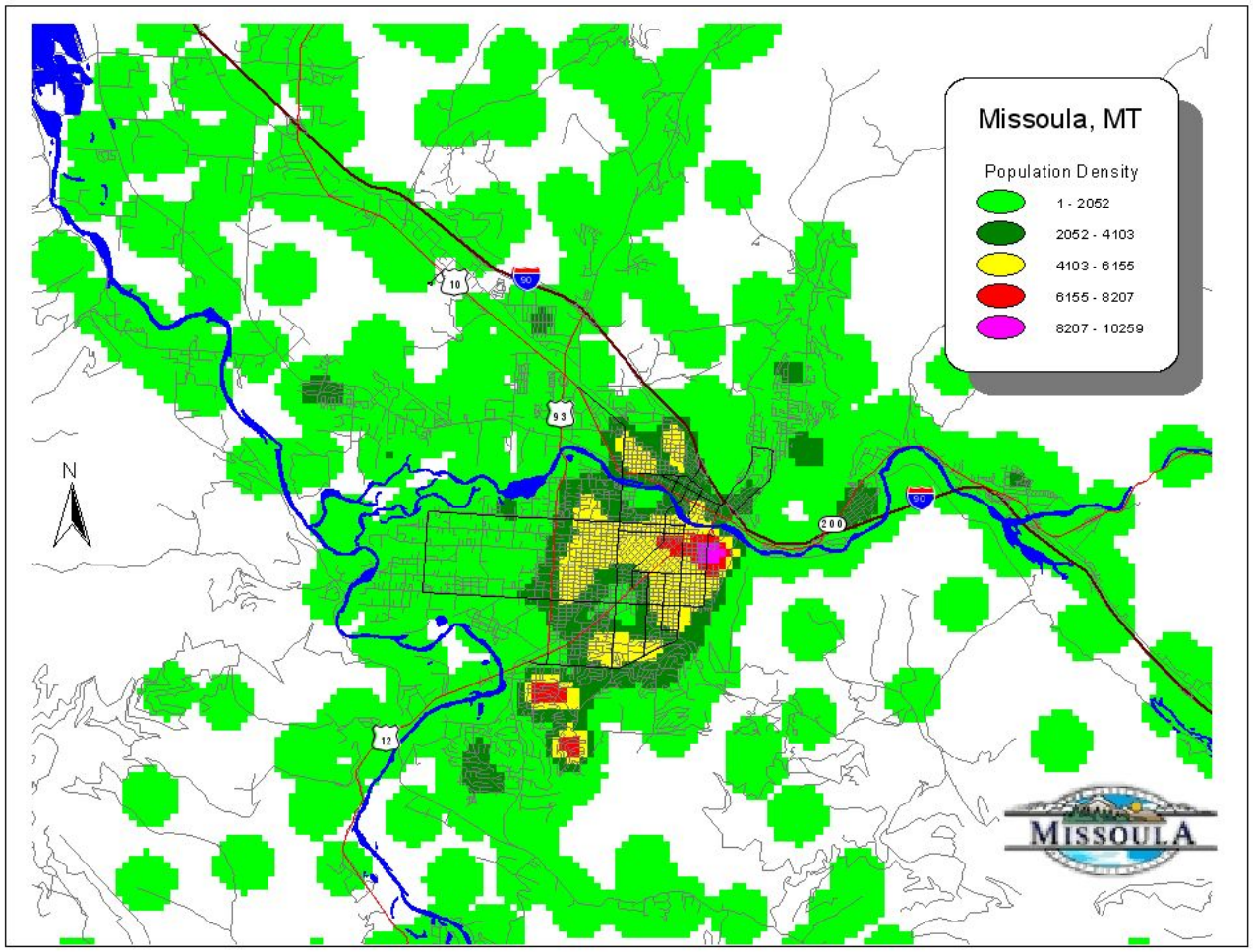


Selected Housing Information- 1990 to 2000				
	Housing Units	Owner Occupied	Renter Occupied	Vacant
2000	25225	12130	12011	1084
1990	17677	8750	8927	811
change	43%	39%	35%	34%

From the demographic information reviewed here (above), it is projected that City should experience a slightly higher demand for emergency services in comparison with other communities of its size. This will occur due to the population aging over the next 10 – 20 years increasing the percentage of senior population to near 20 percent. In addition, the relatively lower amount of owner occupied housing points toward negative economic indicators which generate higher emergency service demand than other communities of similar size with higher ownership ratios.

It is also useful to assess the distribution of the population within the City, since there is a direct correlation between population density and service demand. The following map (Figure 74) displays the population density of the City, based on information from the 2000 U.S. Census.

Figure 74: City of Missoula Population Density

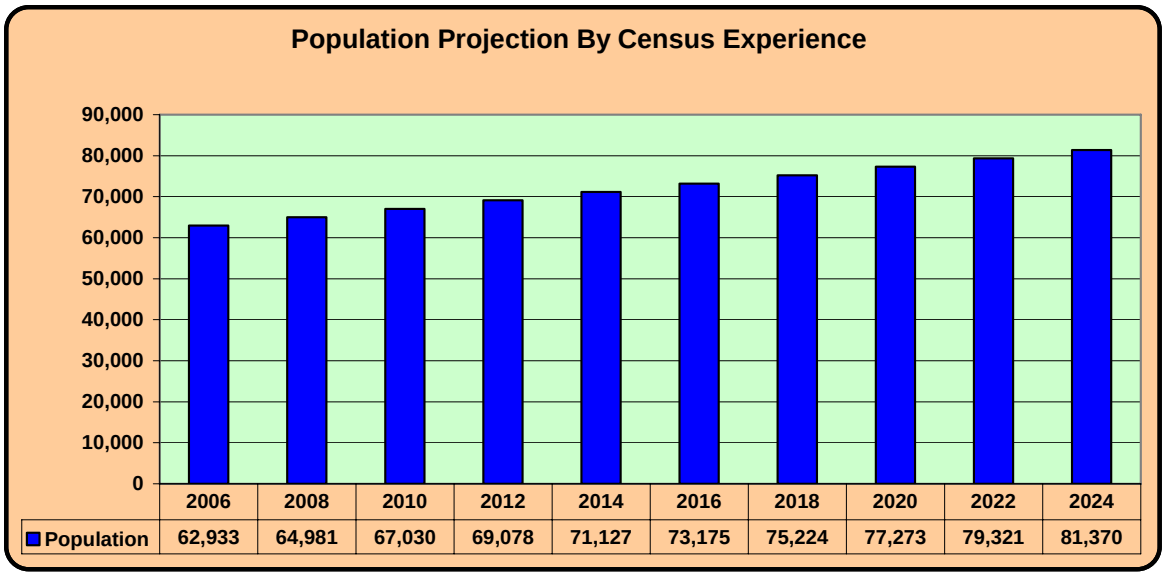


Census-based Growth Projections

As indicated earlier in this section, the population of City has increased in the last decade. We anticipate that additional growth will continue into the future.

In developing forecasts for population growth, we typically develop a forecast based on several decades of census experience. In the case of Missoula, we used decennial census figures from 1970 through 2000. A mathematical forecast is created through the year 2024. The resulting population forecast appears as follows (Figure 75).

Figure 75: Census-based Population Forecast

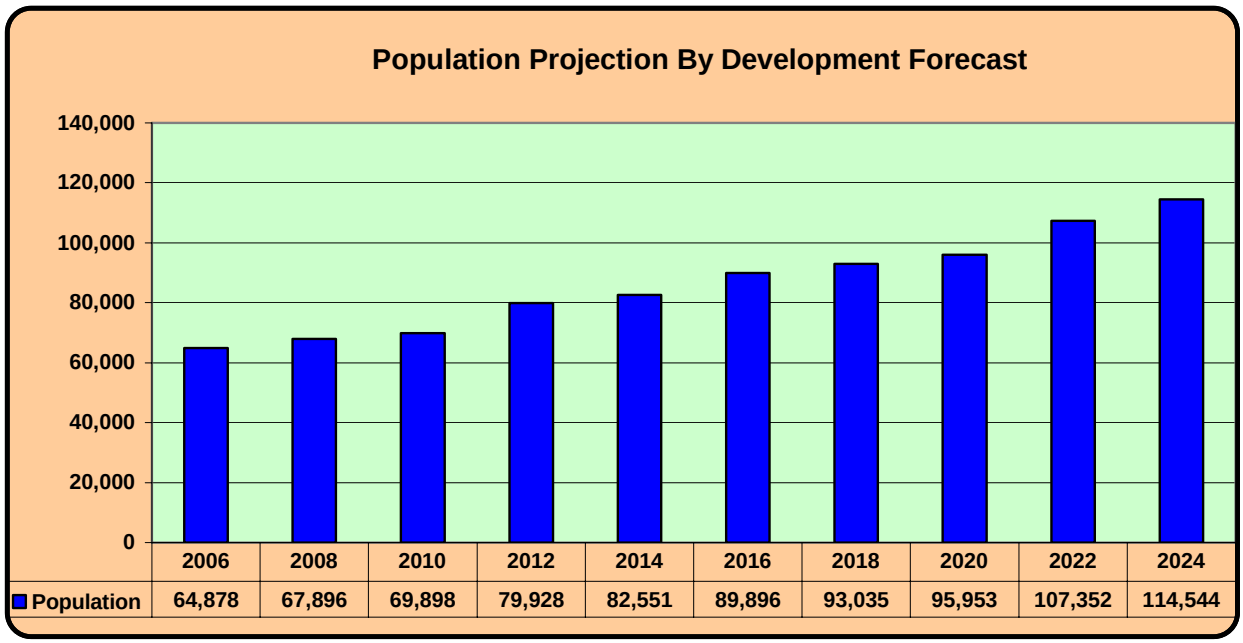


Development-based Growth Projections

While census-based population projections provide a mathematically based estimate of future population based on historical data, they often fail to account for expected trends in the growth rate of an area. These changes often result from redevelopment, annexation, changes in employment capacity, or other socio-economic factors not reviewed in a census-based projection. For this reason, we also offer population projections based on review of available local development and business information.

In this case, we reviewed information available from the City of Missoula Comprehensive Plan. The resulting population forecast appears as follows (Figure 76).

Figure 76: Development-based Population Forecast



The development-based population forecast is significantly higher than the census-based population forecast primarily due to local and regional issues that are expected to expand development opportunities, including annexation, additional transportation improvements, and adequate water and sewer infrastructure capacity.

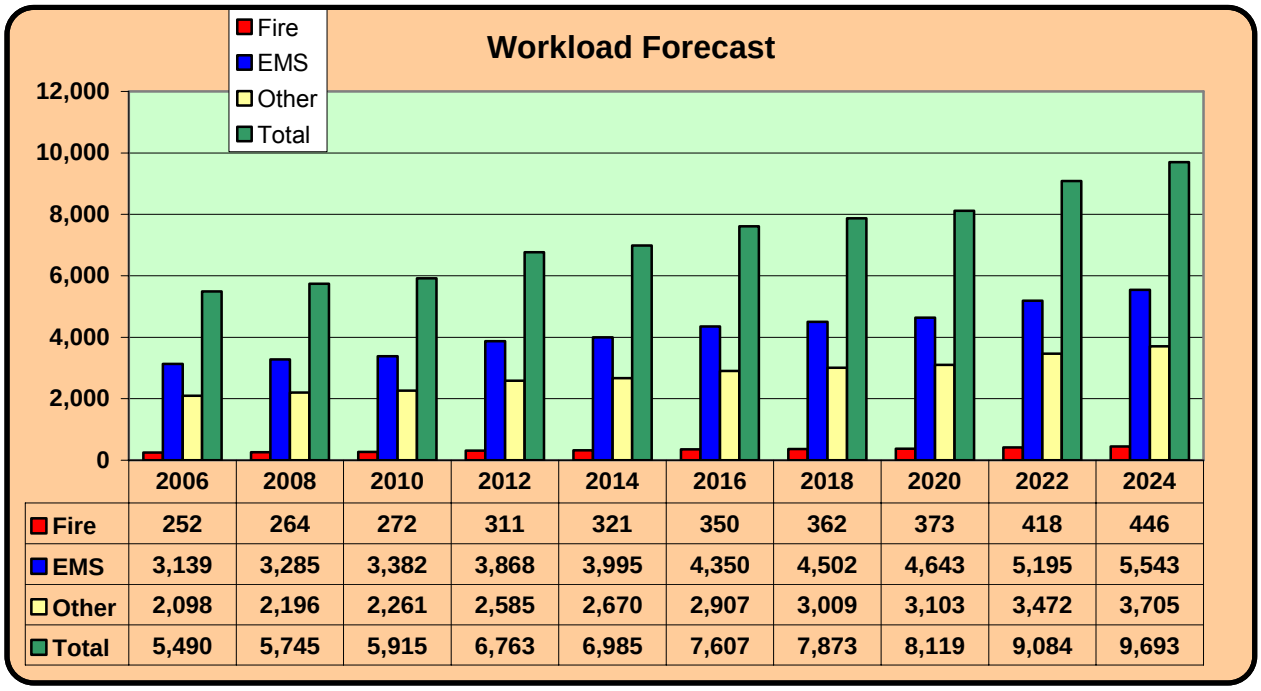
It is not the intent of this study to be a definitive authority for the projection of future population in the service area, but rather to base our recommendations for future fire protection needs on a reasonable association with projected service demand. Since we know that the service demand for emergency agencies is based almost entirely on human activity, it is important to have a population-based projection of the future size of the community. While we can see variation in the population projections discussed here, one thing that can be certain is that City of Missoula fire department will continue to be an emergency service provider to a growing population, likely reaching over 100,000 by 2024. Planning should focus on acquiring the resources needed to meet the continuing demand for services.

Service Demand Projections

In evaluating the deployment of facilities, resources, and staffing, it is imperative that consideration be given to potential changes in workload that could directly affect such deployment. Any changes in service demand can require changes and adjustments in the deployment of staff and resources in order to maintain acceptable levels of performance.

For purposes of this study, we utilized population projections obtained through community development research and multiplied these by a forecasted incident rate derived from a five-year history of incident per capita rates to identify workload potential through the year 2024. The results of the analysis are shown, by year and type of call, in the following chart and table (Figure 77).

Figure 77: Workload Projection by Type and Year



	2006	2008	2010	2012	2014	2016	2018	2020	2022	2024
Fire	252	264	272	311	321	350	362	373	418	446
EMS	3,139	3,285	3,382	3,868	3,995	4,350	4,502	4,643	5,195	5,543
Other	2,098	2,196	2,261	2,585	2,670	2,907	3,009	3,103	3,472	3,705
Total	5,490	5,745	5,915	6,763	6,985	7,607	7,873	8,119	9,084	9,693

The increase in actual fire incidents is forecast to be relatively low during the study period, but this is a reflection of national trends for fire incident rates per capita and is believed to be a result of improvements made in building codes and public fire education during the last three decades. EMS and other emergency service calls not involving actual fires are expected to continue to rise significantly.

Community Risk Analysis

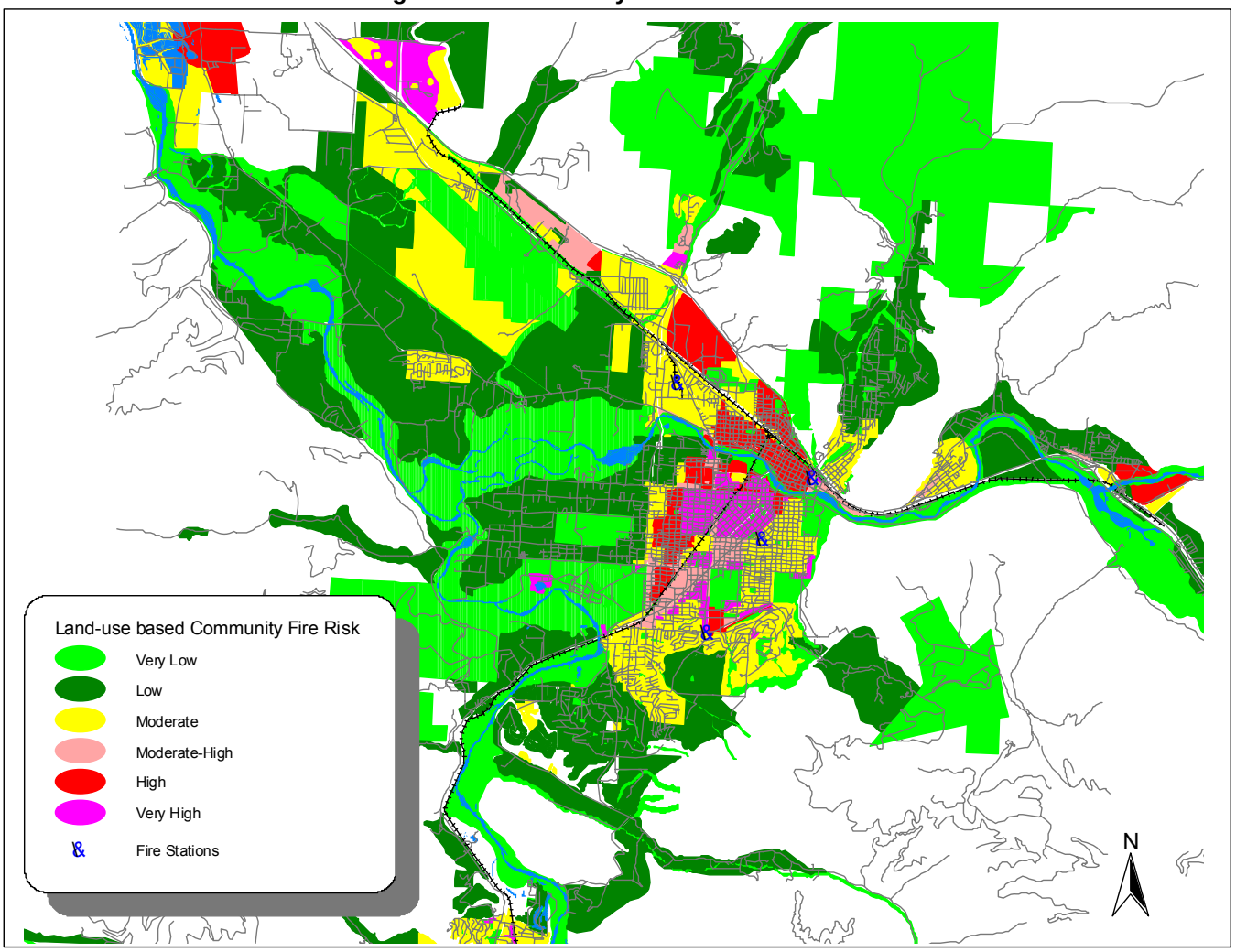
The fire service assesses the relative risk of properties based on a number of factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk within geographic sub-areas of a community.

The community's risk assessment has been developed based on potential land use within its anticipated future boundaries. These potential uses are found in the City's development plans and

zoning designations. The following map translates land use (potential scale and type of development within geographic sub-areas) to categories of relative fire and life risk.

- Low risk – Areas zoned and used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- Moderate risk – Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High risk – Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.

Figure 78: Community Risk Assessment



The community contains mostly low and moderate risk properties. The predominance of highest risk is located in the City's central downtown core, along the rail corridor on the north side of the City, and

in certain non-residential developments along the Interstate highway. These properties include industrial, heavy commercial, mid-rise, mixed-use, institutional, and multi-family occupancies.

The City's land use patterns generally contribute to development of an efficient fire resource deployment configuration, with the exception of the remote commercial and industrial areas northwest of the airport. Aside from these, higher risk properties are concentrated in the central area of the City rather than scattered throughout as is found in some communities.

Section III – Recommended Long-Term Strategy

The agency evaluation contained in this study provides over 100 pages of in-depth analysis of the Missoula Fire Department and its delivery of services. In the evaluation section, we described our findings and provided a review of conditions or issues that require the attention of the department. In many cases, these issues require relatively short-term effort or corrective action. We have assembled a list of such short and mid-term planning strategies in the next section of this report.

The Comprehensive Fire Master Plan is intended to provide strategies that are long-term in nature. It is the job of a master plan to identify the most critical issues the agency will face over the long haul, out as much as twenty years in the future. We initiated that process in the previous section of this report where we reviewed community growth, identified risks, and evaluated service demands. Now, we will compile the information learned in that section as well as the evaluation of future service demand to provide a recommended long-term strategy for the growth and development of a healthy MFD organization, capable of providing the services that are valued most by its customers.

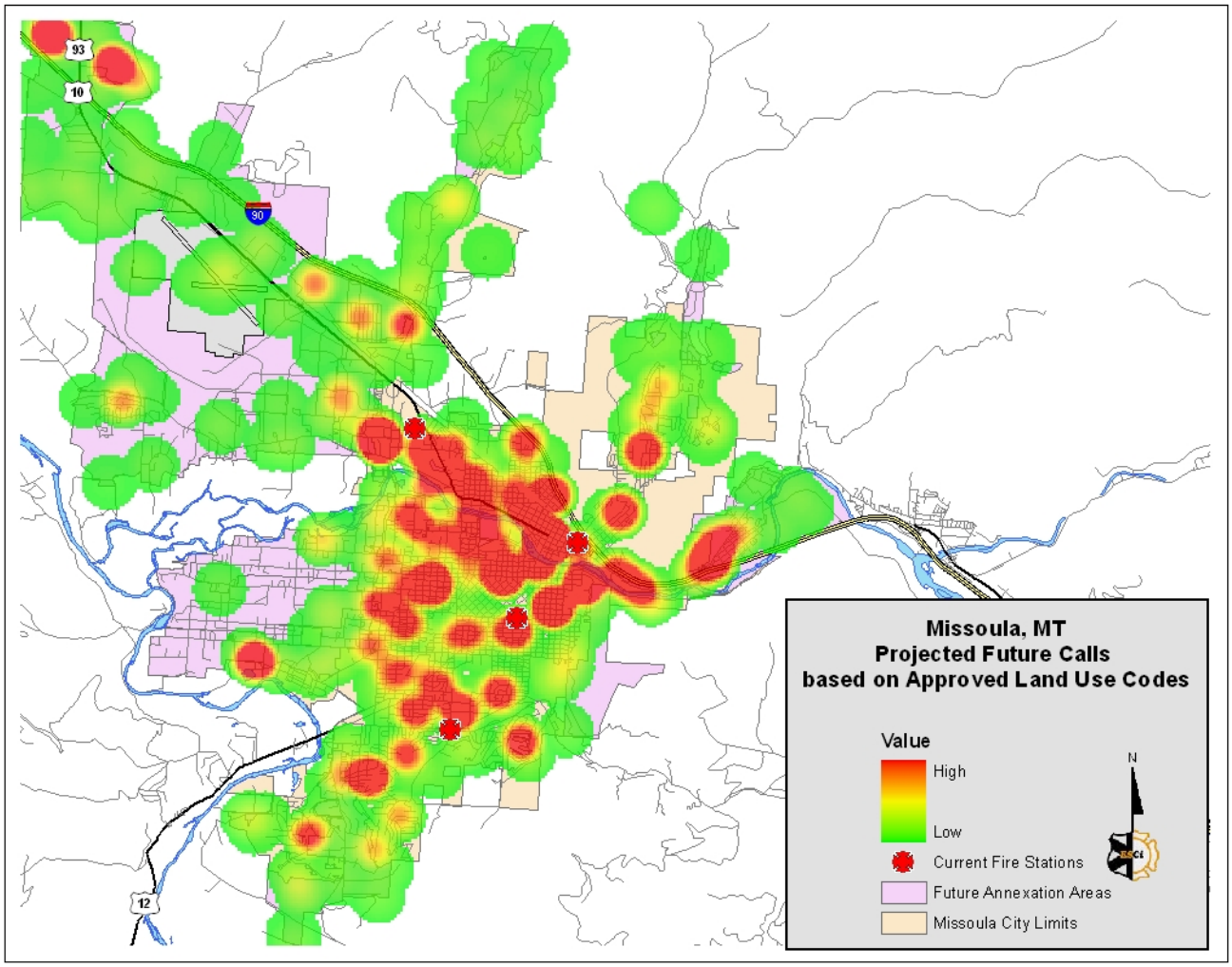
Future Deployment Recommendations

A projection of future service demand has been developed using several measures developed earlier and appears in the following figure. Information such as historic service demand, population density growth, traffic pattern changes, and future land use designations figure into the future service demand model. The extensive use of geographic information system (GIS) allows for the scientific modeling of response times of apparatus against the road network using appropriate speed levels during straight-aways and turns. This process allows us to evaluate current deployment and future strategies with accuracy and detail.

The long term growth plans for Missoula call for annexation of areas mostly on the periphery of current city limits. The large annexation areas extend the service delivery area of the Missoula Fire Department and land use plans will cause an increase in service demand. This can be seen in the Wye-Mullan area and within the Target Range area west of downtown. Residential development in the south and annexed areas east of downtown will also increase demand in areas that are currently reachable only with extended response times. As such, changes in facilities, apparatus, and staffing will be necessary.

The future service demand in the following figure (Figure 79) is based upon historical call data from the last full year available along with the current and proposed land use data.

Figure 79: Projected Service Demand



The following long-term resource deployment strategies are intended to allow the Missoula Fire Department to continue its existing level of service as growth in the community continues and where possible, to improve the level of service toward its target performance objectives.

Facilities

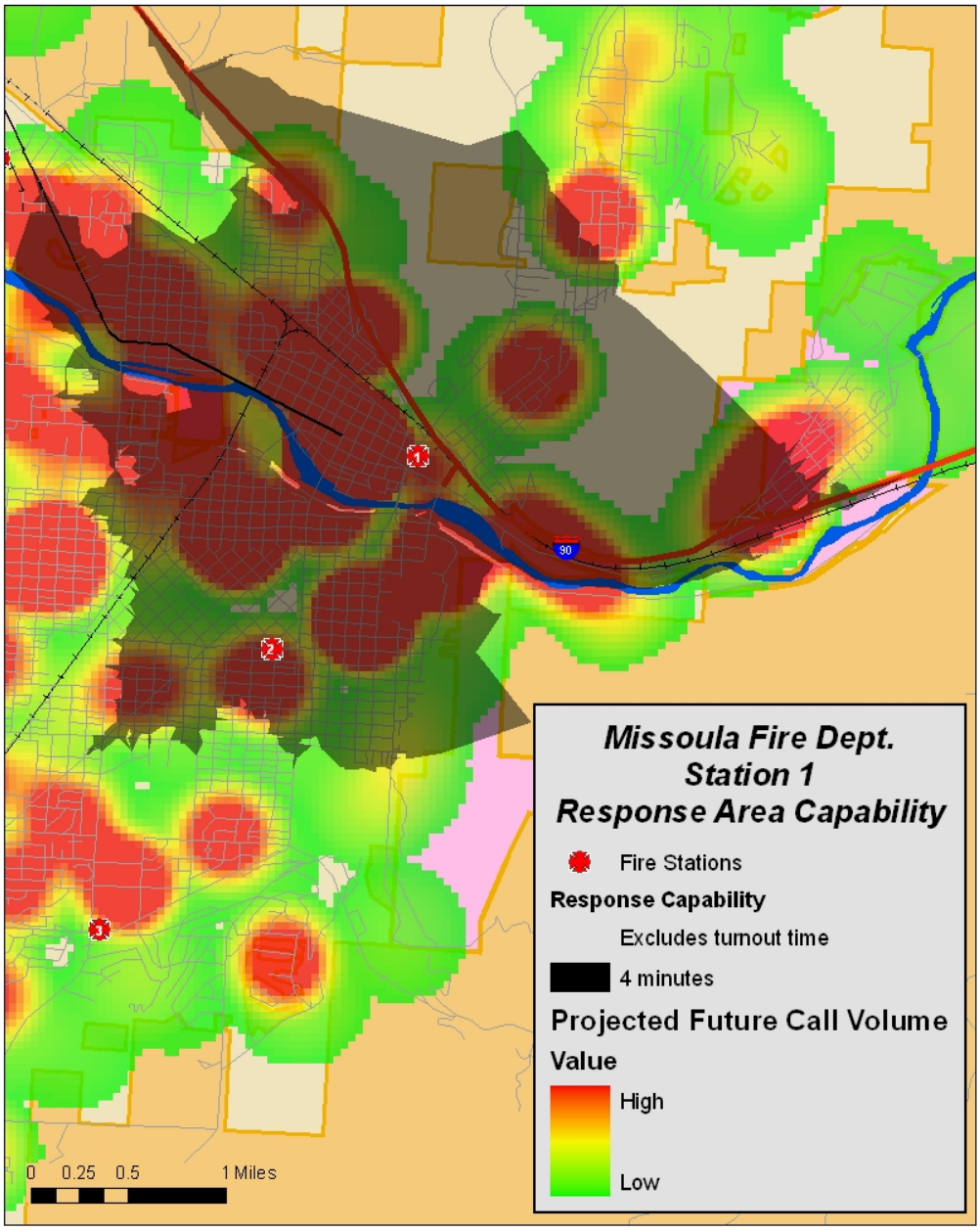
Because these annexation areas extend the service delivery area outside the present capabilities in terms of response time objectives, new facilities are recommended. Realizing it can be very burdensome to construct or relocate a facility; recommendations to construct new facilities or relocate existing ones are based on an evaluation of how well the current locations serve the projected service demand within response time objectives. Gaps in coverage are of concern if the gap area is one of high service demand. As each stations response capability area overlaps another, potential redundant coverage is identified. In higher service demand areas, redundant coverage can be advantageous as it places more apparatus within proximity in addition to meeting response time

objectives should concurrent calls take place. In areas of low risk and lower service demand, this can be inefficient if other higher risk or service demand areas are left underserved or not served at all. Redundant coverage and gaps in current and projected service demand coverage by the fire department require priority attention.

In each strategy, specific locations are described for future fire station construction or relocation. It should be noted that these specific locations provide the point at which the performance projection data was achieved and represent our recommended "best case" location. It is understood that additional factors such as land availability, zoning, and traffic patterns will also impact any decision on a specific fire station site. For these reasons, we suggest that variations to the listed locations are acceptable within a range of the equivalent of two or three city blocks. Any such variations will impact the performance projection of the strategy, but not significantly to render it inaccurate.

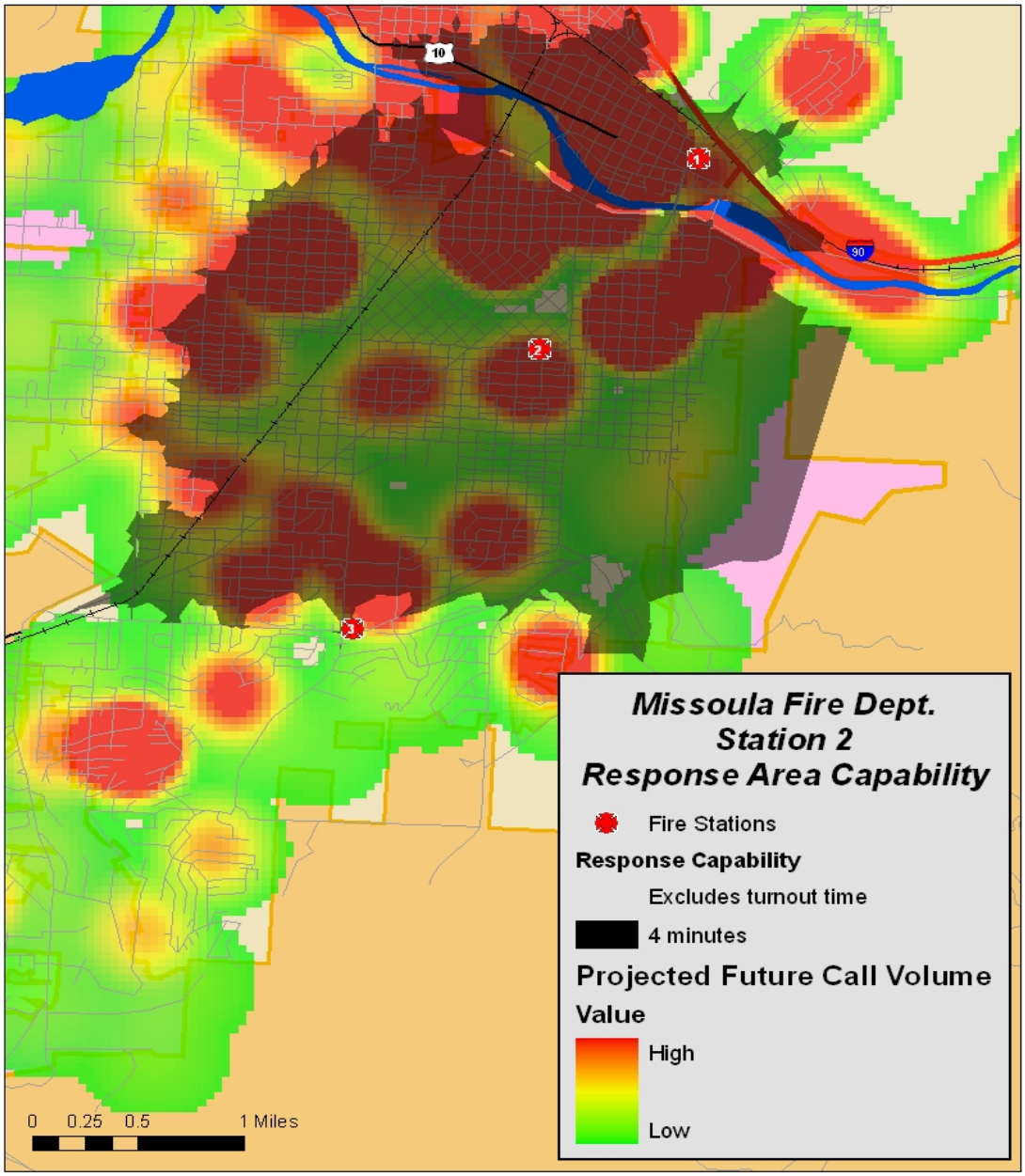
Station 1: The location of Station 1 is well situated for the high service demand within the downtown area; its range is complemented by its ability to reach the interstate highway quickly. No change in location is recommended at this time (Figure 80).

Figure 80: Station 1 Response Area Capability



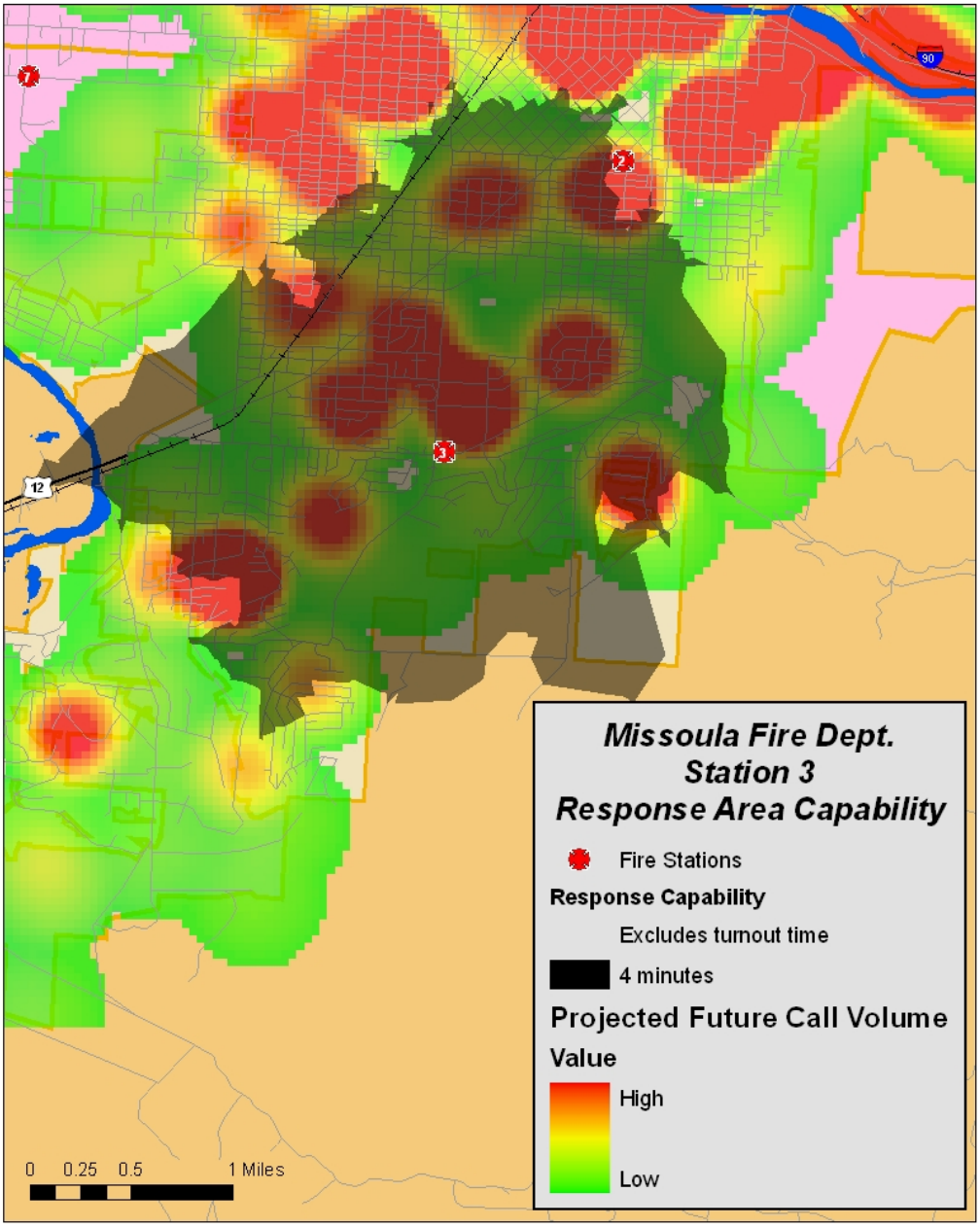
Station 2: The oldest fire station in the facility inventory, this station is also located in a high service demand area. Additionally, its response capability area includes areas within Station 1 and 3. This station, due to its own high service demand and proximity to other high service/ high risk areas, is in an appropriate location (Figure 81).

Figure 81: Station 2 Response Area Capability



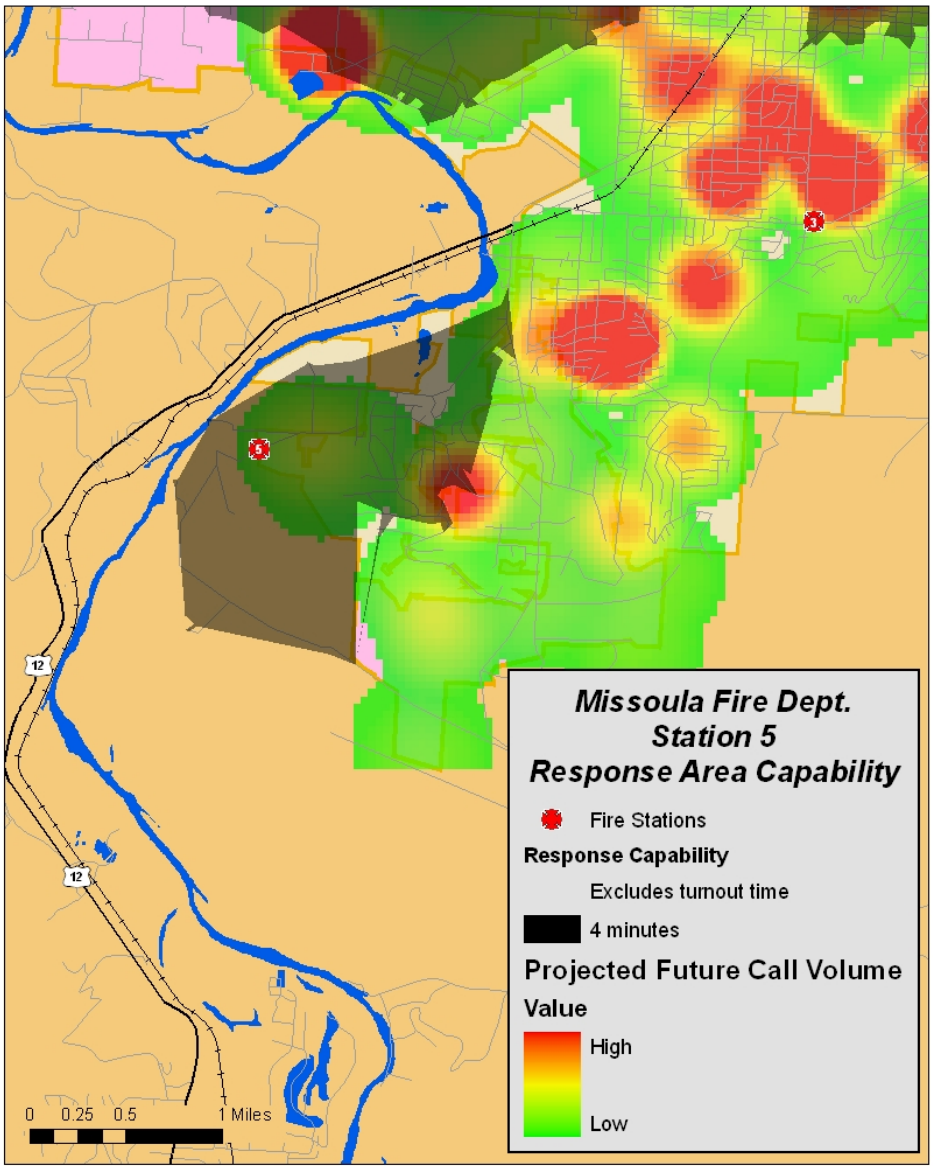
Station 3: On the corner of 39th and S. Russell streets, this well-located station has the ability to respond well to a large part of its district and within District 2 due to its access roads (Figure 82).

Figure 82: Station 3 Response Area Capability



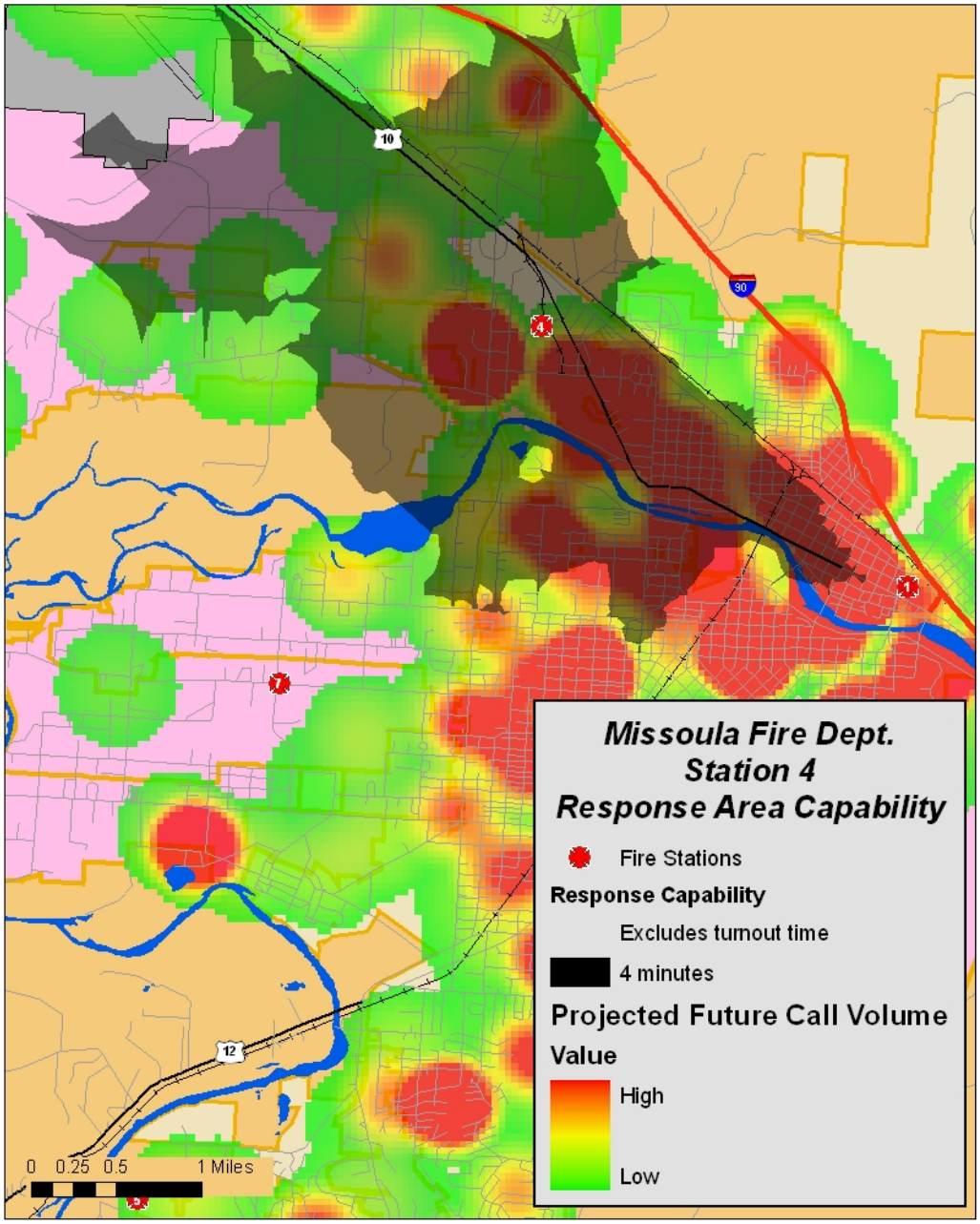
New annexations and residential development to the southwest is out of reach for Station 3 based upon response time objectives. The approved station for Lower Miller Creek Road **(Station 5)** will be able to respond into this area within the response time objective. This area currently experiences a moderate service demand which is projected to increase as development in this area continues. Due to natural boundaries and the current transportation infrastructure, this station is somewhat isolated. This station would allow for second-due response to the lower section of District 3 and provide support to all other districts in general (Figure 83).

Figure 83: Station 5 Response Area Capability



Station 4: Located in the northwest portion of the city, this station is able to cover areas of the city north of the Clark Fork River that cannot be reached from Station 1 within the response time objectives. Because of its access routes, including Highway 10 West, it is the only station that is able to respond into the western portions of the Wye-Mullan annexation area within the response time objectives (Figure 84).

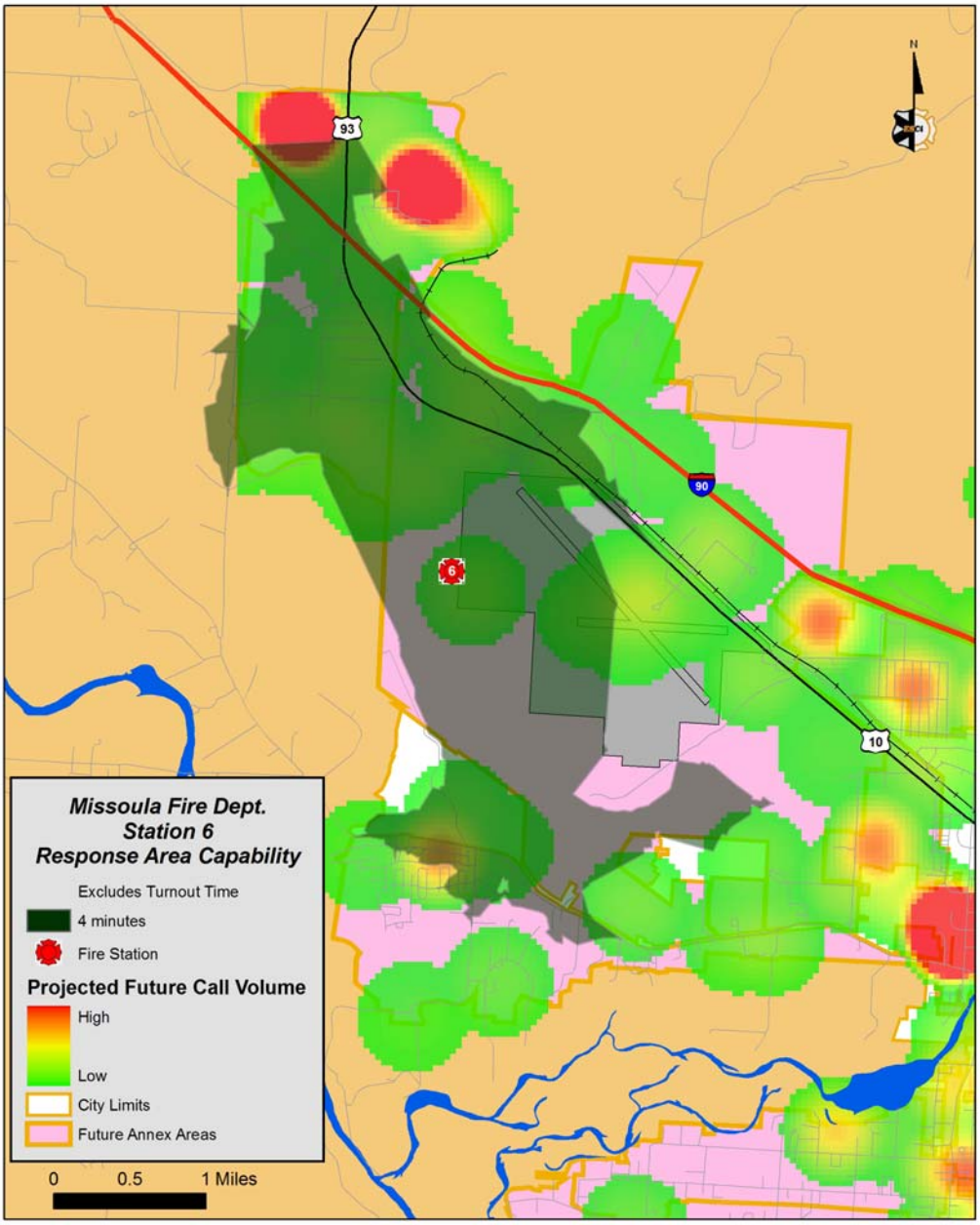
Figure 84: Station 4 Response Area Capability



However, because of the geographic size of this area and the projected service demand in the far northwest reaches, a new station **(Station 6)** is recommended. It should be located approximately one mile south of Hwy 10 West on the planned roadway (Englund Blvd) near the airport. This will allow access to the Wye area in the northwest corner, the airport, and points south of the airport if the proposed road west and south of the airport is completed. Currently, the access to the south is via Deschamps Lane which will take longer to get to the developments on the far western end of Mullan Road.

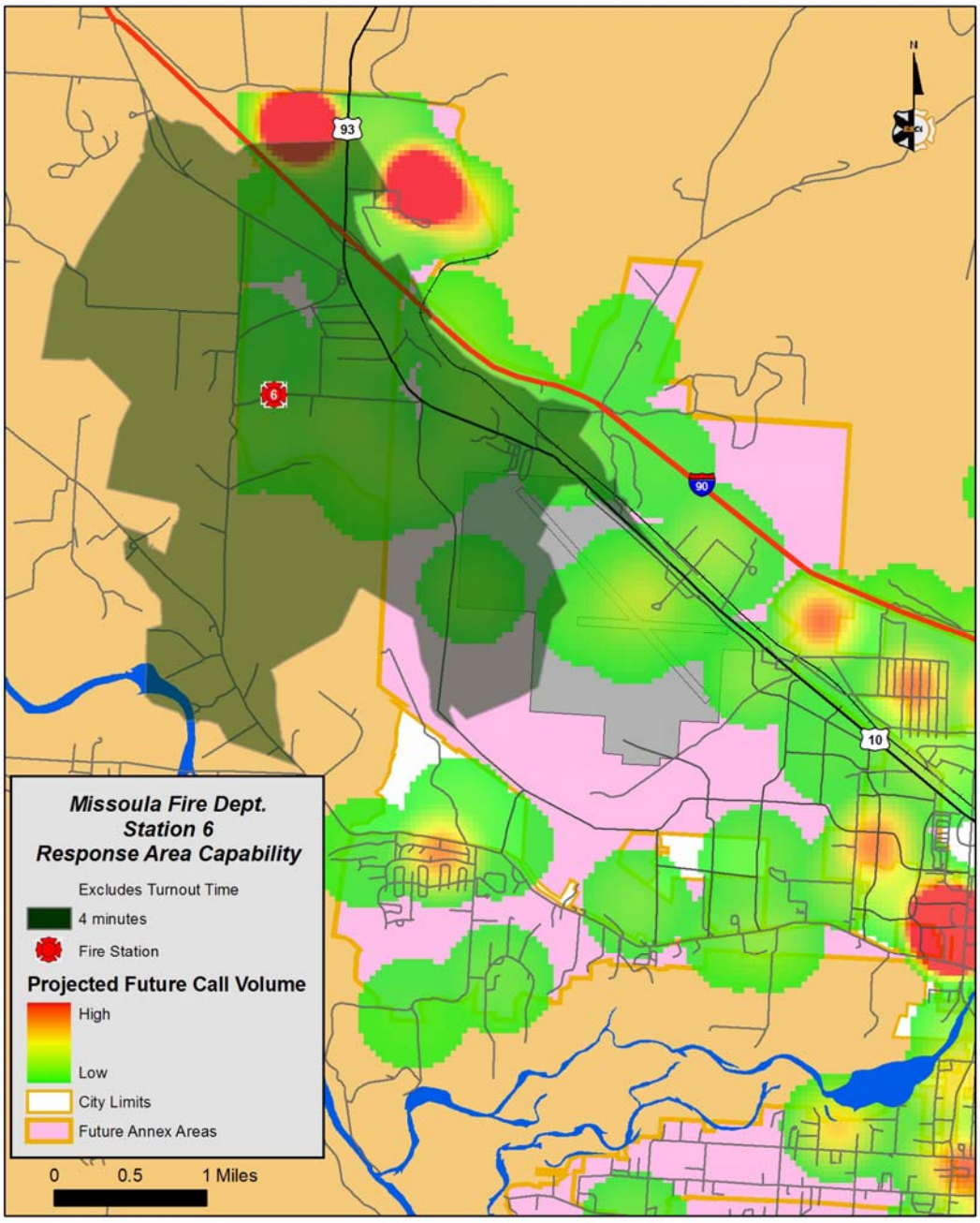
An alternative location at Deschamps Lane and Roller Coaster Road should also be considered, as it is questionable whether or not plans to extend Englund Blvd will become a reality (Figure 85).

Figure 85: Station 6 Response Area Capability from South on Hwy 10 on Englund Blvd



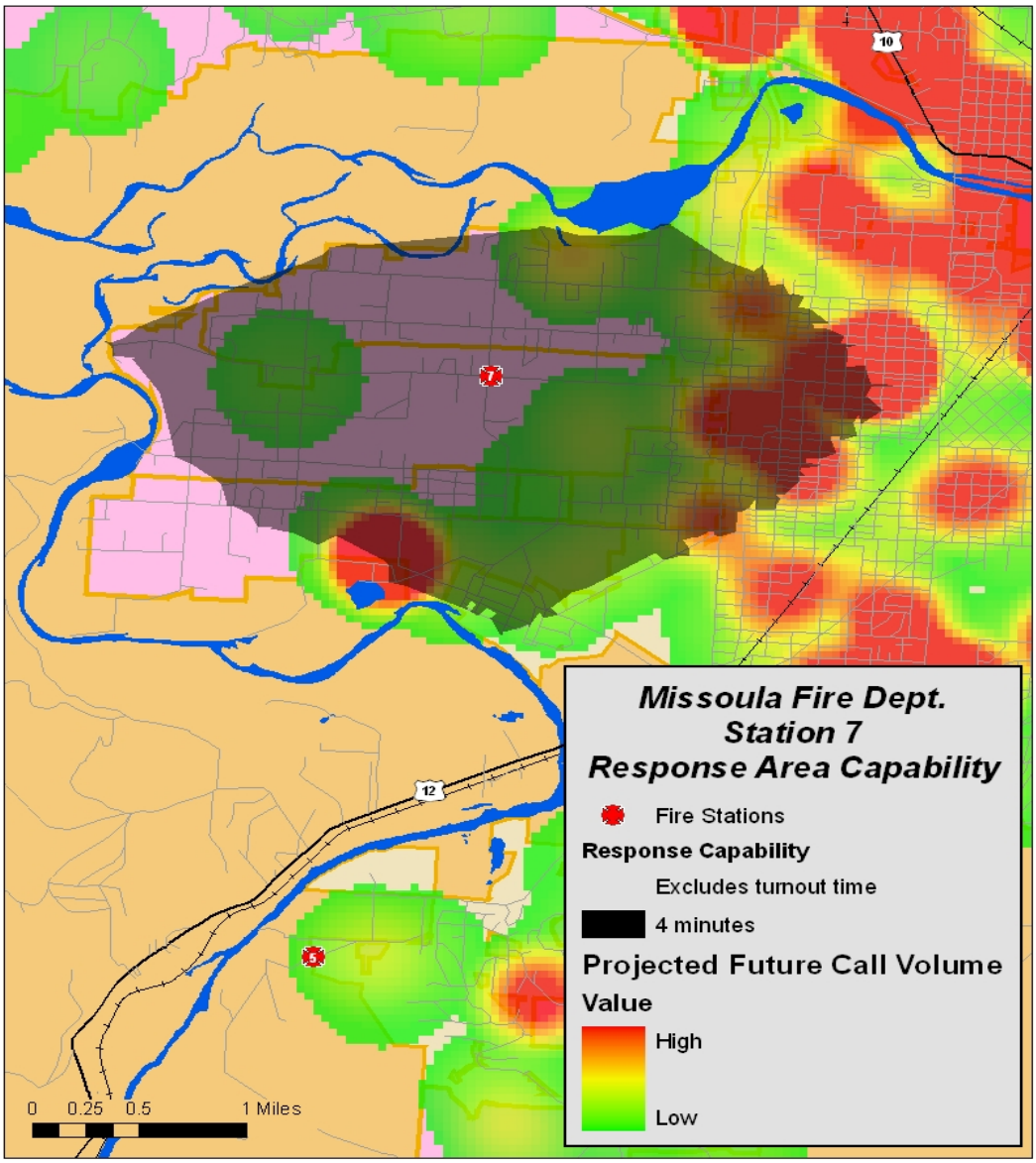
The following map (Figure 86) depicts an alternate location for **Station 6** located at Deschamps Lane and Roller Coaster Road should plans to extend Englund Blvd not come to fruition.

Figure 86: Station 6 Response Area Capability from Deschamps and Roller Coaster



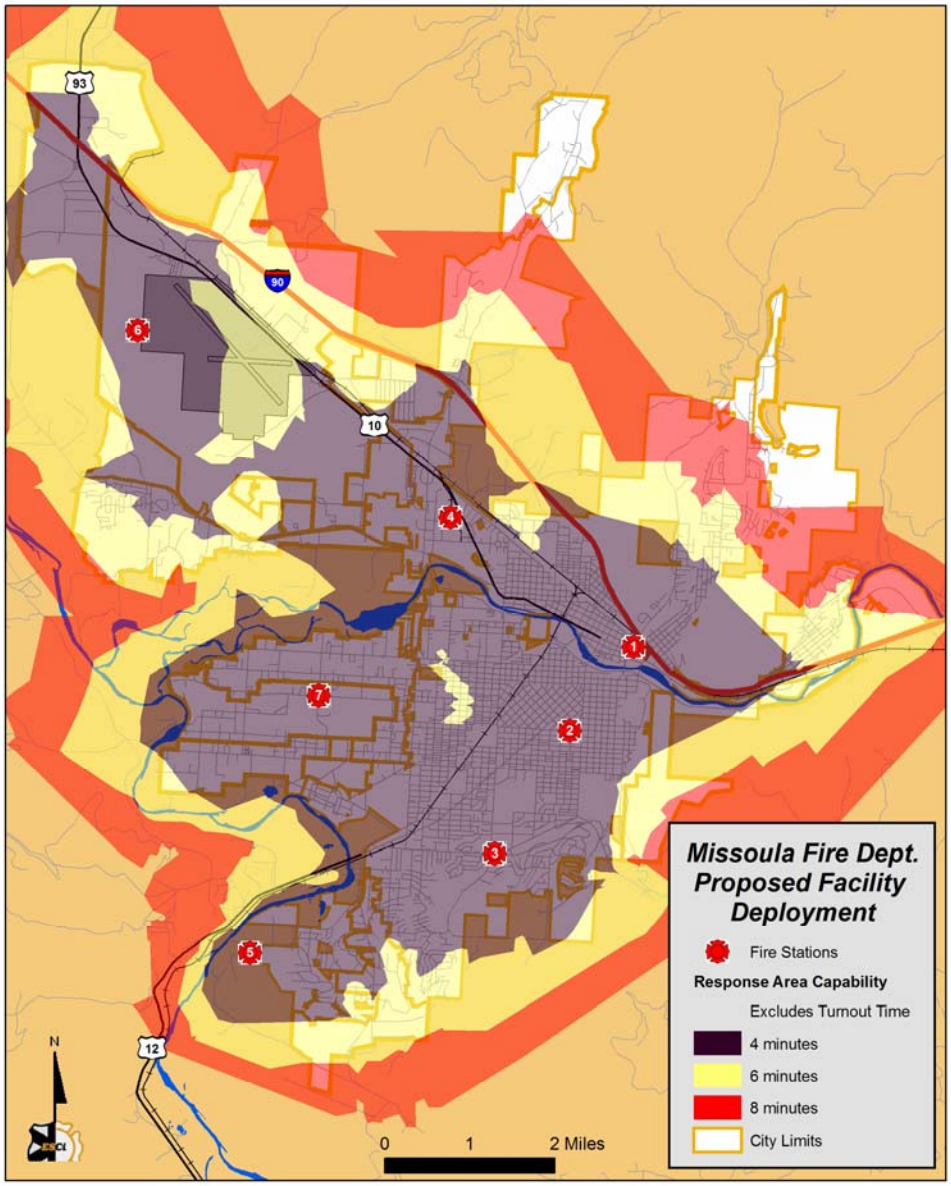
Station 7: In the Fort Missoula/Target Range annexation area, none of the current facilities are able to reach into this area within response time goals. High service demand is projected for 28th St. near 37th along with moderate demand to the north off 3rd and Preston. These areas can be served by the new station as well as the rest of the area which has limited access due to being bound by rivers on three sides. The recommended location for optimal response capability is Spurgin Road and Tower Street (Figure 87).

Figure 87: Station 7 Response Area Capability



The following figure (Figure 88) illustrates the new combined facility deployment strategy and response area capabilities.

Figure 88: Proposed Deployment Strategy



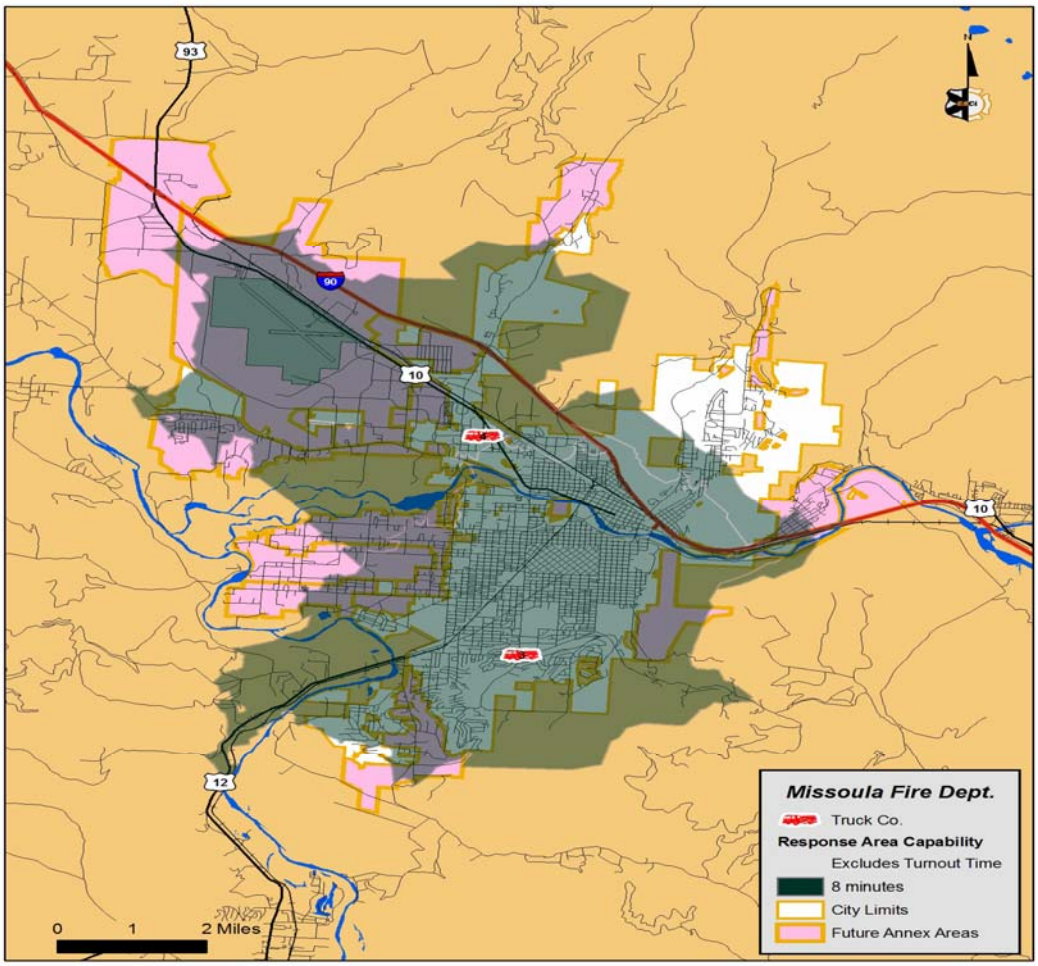
The proposed facility deployment strategy will enable the Missoula Fire Department to cover 97 percent of the future geographic area and 79.7 percent of the future road miles within four minutes of travel time. More importantly, the new facility deployment will be able to reach 90.5 percent of the projected future service demand within four minutes of travel time.

Apparatus

At full build out of Missoula, an additional three fire engines will need to be acquired, one per each proposed new facility. Additionally, the department will need to assess the need for additional brush units and other support vehicles. No additional truck company is recommended. This is because

ladder trucks at Stations 3 and 4 should be adequate for covering the current area and extended areas of the large annexation areas as illustrated in the following map. However, MFD may want to consider staffing both truck companies with dedicated staff over time (Figure 89).

Figure 89: Ladder Truck Coverage



Staffing

The addition of three fire stations requires appropriate levels of staff. The Missoula Fire Department responds from each station using engines with a minimum of 3 personnel. Staffing of ladder trucks is accomplished by cross-staffing (engines and ladder trucks) with existing on-duty response personnel.

Principles of management require that the department assure proper oversight and support of the emergency mission by maintaining a cadre of non-emergency managers and technicians. Other fire departments of similar size and character typically maintain between 10 to 20 percent administrative

jobs compared to the total number of FTE positions.[34] For the purpose of this plan, we use a conservative 13 percent of administrative and support jobs compared to the total number of FTEs.

The figure below (Figure 90) details the number of FTEs necessary to staff and support the recommended apparatus deployment using a seven station model.

Figure 90: Missoula FD Long-Term Staffing Strategy

Fire Station	Unit	Minimum On-Duty Staffing	Maximum On-Duty Staffing	Total Staffing
Station 1	Engine 1	3	4	16
	Battalion Chief	1	2	5
Station 2	Engine 2	3	4	16
Station 3	Engine 3	3	4	16
	Truck 3	Cross Staffed with Engine 3 personnel		
Station 4	Engine 4	3	4	16
	Truck 4	Cross Staffed with Engine 4 personnel		
Station 5	Engine 5	3	4	16
Station 6	Engine 6	3	4	16
Station 7	Engine 7	3	4	16
Operational Staff		**22**	**30**	**117**
Administrative Staff				**16**
Total Staffing				**133**

The long-term staffing strategy requires 53 additional FTEs above the existing cadre of 64.0 FTEs. For purposes of this analysis, we assume that the additional positions are allocated in accordance with the following table (Figure 91).

Figure 91: Year 2024 Operational Staffing Assumption

Position Title	Year 2006 FTE	Year 2024 FTE	Change
Battalion Chief	4	5	+1
Captain	16	28	+12
Firefighter	44	84	+40
Total	**64**	**117**	**+53**

[34] Departments with fully functioning EMS and prevention divisions tend toward the higher end of the 10 to 20 percent paradigm.

Projecting System Cost

This deployment plan calls for the continuing use of four existing stations, and the construction of three new stations over time. For purposes of cost projection, we use the following additional assumptions:

- Each new fire station is estimated at 9,500 square feet. This includes two-drive-through bays and living space for up to six personnel. Cost is estimated at $193 per square foot.[35] ESCi did not factor in land costs, FFE, testing costs, soils investigation costs, closing and financing costs (if any), construction manager costs, furnishings and architects fees.
- Staffing costs are estimated at $69,813 for each captain, and $55,810 annually for each firefighter.[3637] Additional firefighter FTE's are added to accommodate the need to fill in for vacation and leave time to maintain a minimum three-person company. A total of 12 additional captains, 40 additional firefighters, and one battalion chief are included in this strategy's cost projection above current staffing levels. It should be noted that there would also be some initial costs at hiring for new equipment, uniforms, and training.
- Annual operating costs for new facilities (maintenance, supplies, and utilities only) are estimated at $3.15 per square foot.[38]
- Although some redistribution of existing apparatus may occur, additional apparatus would be needed to meet the proposed number of fire stations. Three new engines are estimated at $350,000 each.

It is impossible to know exactly when it will be necessary to add each of the proposed vehicles to the emergency fleet. Presumably, every deployment change will be phased in at an appropriate time as warranted by quantifiable triggering points such as commercial development or a decline of service levels. Because the purchase of the vehicles may be spaced out over the entire 20-year planning horizon, the likely purchase price and financing scheme will vary because of inflation. Consequently, our estimation of the capital equipment cost of the long-term deployment recommendations is based only on current year values.

The following table projects capital and operating costs for the recommended station changes and additions. These costs are in addition to current operating costs of the department and, thus, would

[35] Figure based on information from *OZ* Architects, Missoula, Montana
[36] All staffing costs include city pension and benefit contributions totaling 18.35% of salary
[37] Amount used was average of all ranges within each position
[38] Source: ESCi, typical funding in similar projects

represent new funds needed to support the strategy. For purposes of this analysis, we assume that the additional positions are allocated in accordance with the following table (Figure 92).

Figure 92: Cost Projections

Capital Costs	
New Station Number 5	$1,833,500
New Station Number 6	$1,833,500
New Station Number 7	$1,833,500
Apparatus Additions (3 engines)	$1,050,000
Total Capital Costs	**$6,550,500**
Annual Operating Cost Increases	
Annual Operational Staffing[39]	$3,070,156
Annual Operating Costs	$89,775
Total Annual Operating Costs	**$3,159,931**

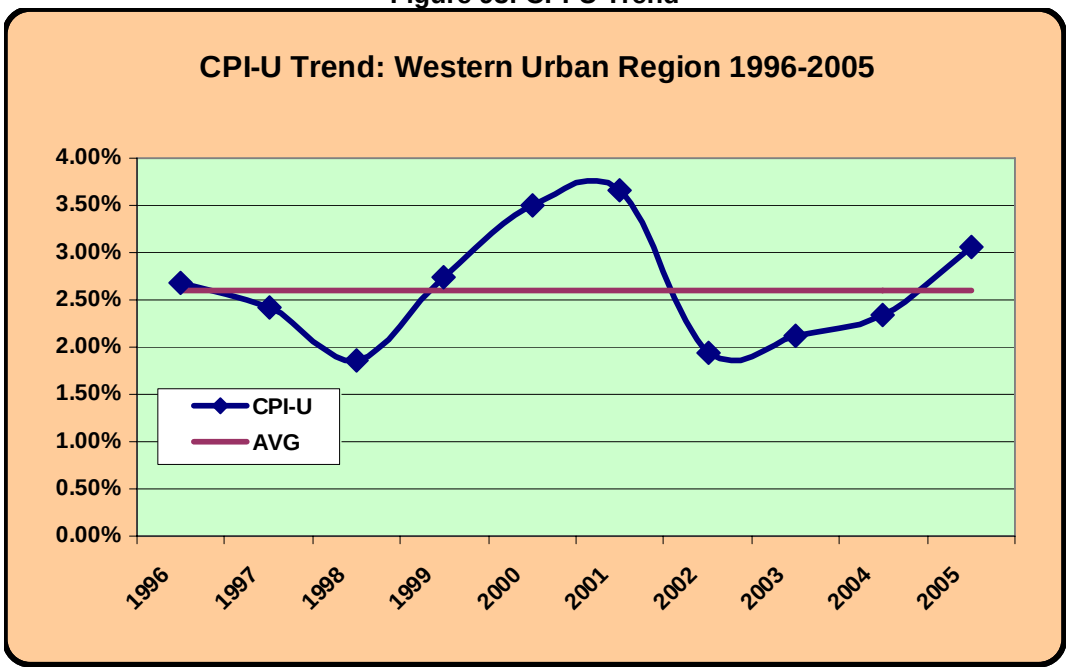
,

Inflation is also an important consideration when forecasting long-term operational cost. For the purpose of this analysis, we use the consumer price index for all urban consumers (CPI-U) during the period 1996 through 2005 in the west urban region as compiled by the U.S. Department of Labor.[40]

Figure 93: CPI-U Trend summarizes the CPI-U during the last ten years and shows the average rate of inflation for the region.

[39] Includes new captain and firefighter positions only
[40] U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index, West Urban, all items

Figure 93: CPI-U Trend

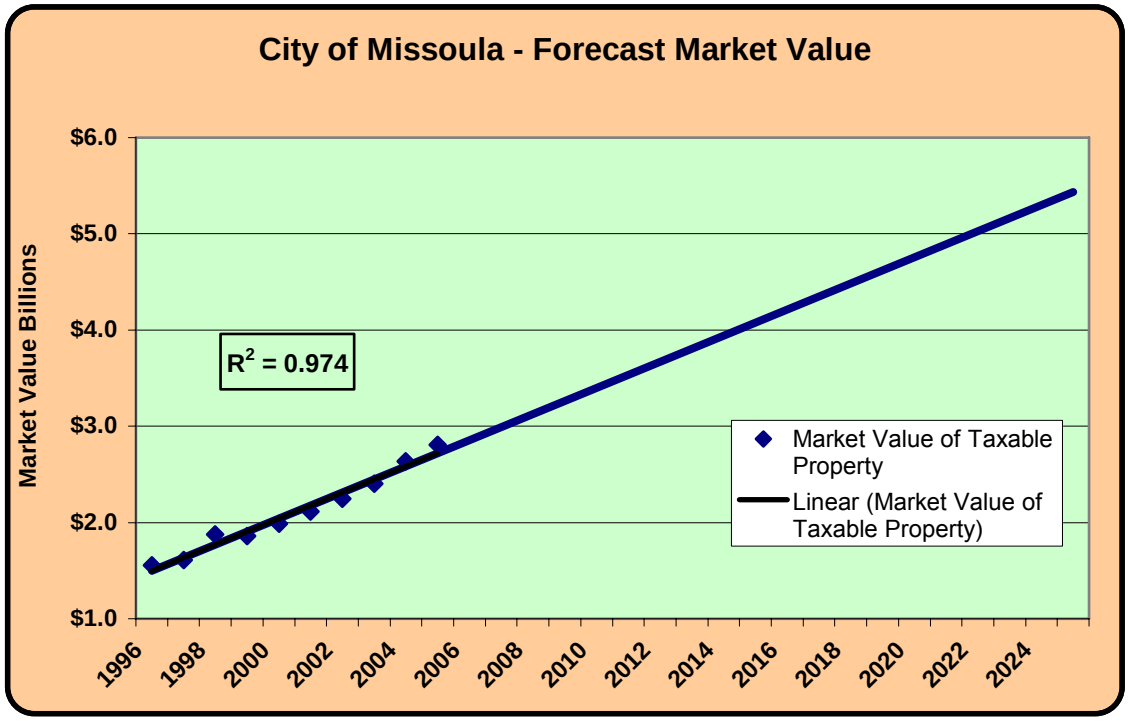


Inflation is a significant economic factor that not only affects individuals, but also may cause problems for municipalities. Historically, inflation in Montana has seen brief upswings in the CPI-U (see figure above), but has shown stability overall. Although still relatively stable, there has been recent upward pressure on the CPI-U for the Missoula region. As of October, 2005, the increase in the CPI-U is trending at about 2.9 percent for the year; about a half-point about the average over the last 12-years.[41]

The value of the property protected by Missoula FD is also an important consideration in forecasting cost. The ten-year history of the market value of the City of Missoula is plotted in Figure 94 and the likely growth of market value is forecast through year 2024.

[41] United States Department of Labor, Bureau of Labor Statistics, Consumer Price Indexes

Figure 94: City of Missoula – Historical and Forecast Market Value

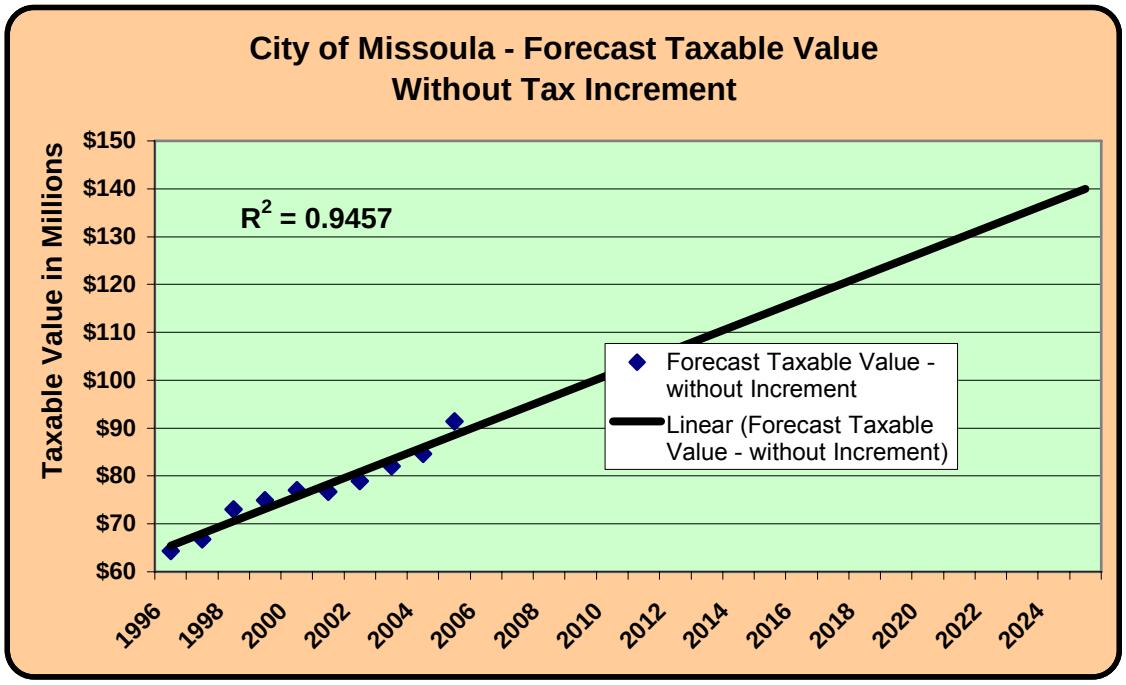


The trend of Missoula assessed value shows an R squared value of more than 0.97, indicating that the forecast is statistically significant.[42] The trend, if continued throughout the 20-year planning horizon, will result in an assessed value of the city in excess of $5.4 billion by year 2024. We use that value as a means to compare the public cost of fire and emergency medical service today with the projected cost in year 2024.

The ten-year history of the taxable value history—without tax increment, of the City of Missoula is plotted in Figure 95, and the likely growth of taxable value is forecast through year 2024.

[42] R squared is the relative predictive power of a model. R squared is a descriptive measure between zero and one. The closer the value of R squared is to one, the better the model. "Better" means a greater ability to predict.

Figure 95: City of Missoula - Forecast Taxable Value

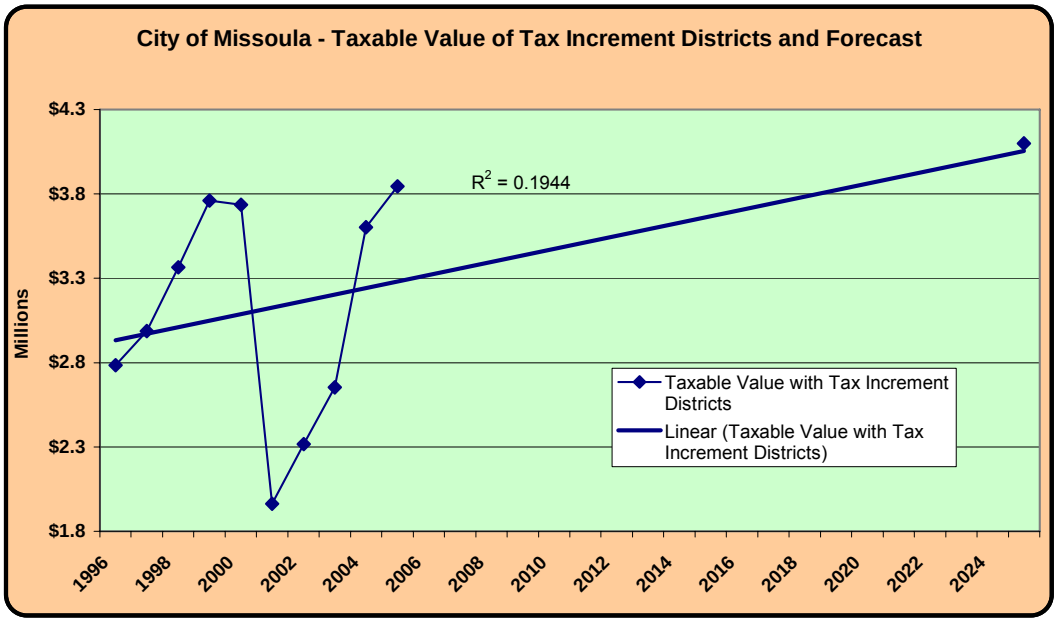


The Missoula taxable value trend, if continued throughout the 20-year planning horizon, will result in a taxable value—without tax increment of the city in excess of $139 million by year 2024.

The historical and forecast taxable value of the tax increment districts is not as statistically significant. Due to a change in a change in state law, a substantial amount of business personal property was removed from the property tax rolls in fiscal year 2000 resulting in a reduction in the taxable value of both the tax increment district and the City. The State of Montana has partially offset the loss in taxable value by providing transfer reimbursements to local governments affected by the removal of personal property from their tax base. In addition, the City was permitted to increase its mill levy to offset the remaining loss in business taxable value.[43]

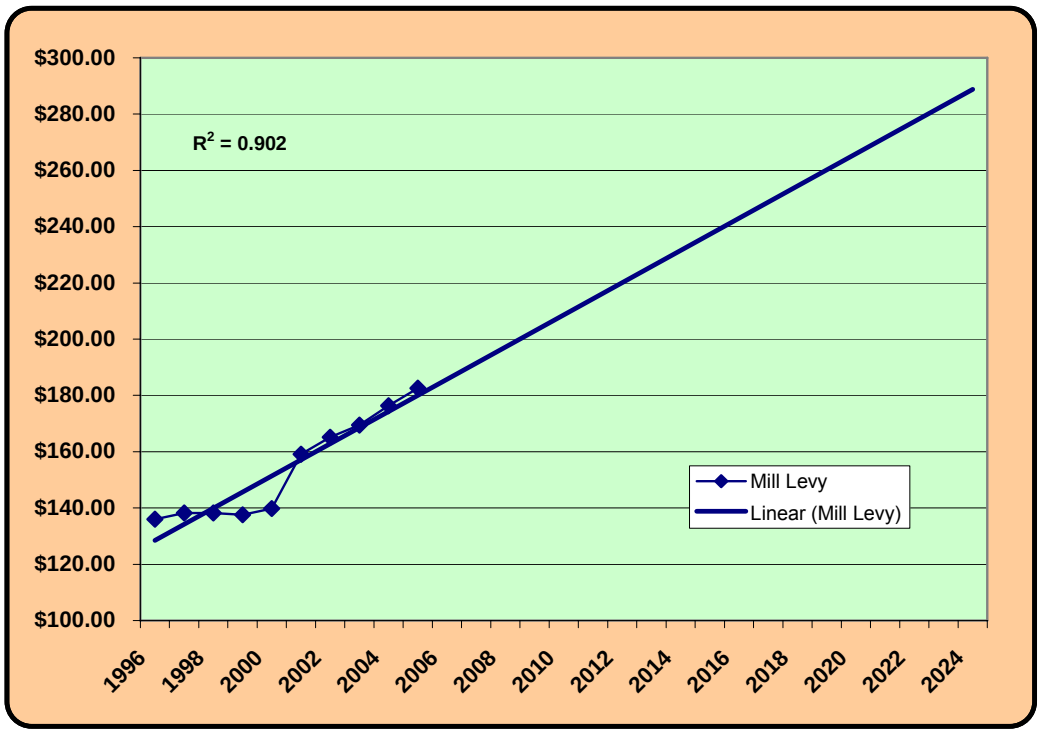
[43] Source: City of Missoula, Montana, CAFR (Comprehensive Annual Financial Report) and Audit, for fiscal year ending June 30, 2005

Figure 96: City of Missoula - Forecast Taxable Value Tax Increment Districts



A ten-year history of the City of Missoula mill levy and forecast through 2024 is shown in the following figure (Figure 97).[44]

Figure 97: City of Missoula – Ten-Year Mill Levy and Forecast[45]



[44] Source: City of Missoula, Montana, CAFR (Comprehensive Annual Financial Report) and Audit, for fiscal year ending June 30, 2005

[45] Mill is a monetary unit that equals 1/10th of a cent…or $1 tax on every $ 1,000 of a property's taxable value.

The amount of property tax is not determined solely by a property's value. The property's value is multiplied by a tax rate, set by the legislature, to determine its taxable value. The taxable value is then multiplied by the mill levy established by various taxing jurisdictions-city and county government, school districts and others-to provide services in the taxpayer's area.

The following formulae are used to determine general property tax: Value “X” Tax Rate = Taxable Value – Taxable Value “X” Mill Levy = General Property Tax.

Appendices

Appendix: A – Summary Table of Short and Mid-Term Organizational Recommendations

What follows is a compilation of recommendations and strategies designed to improve the efficiency and/or effectiveness of the fire department during the short to mid-term.[46] The suggestions offered by ESCi associates are derived from our analysis of the existing emergency system as detailed in Section I of this report. Recommendations and comments are based on experience with similar fire and emergency medical agencies, and categorized in accordance with the ten objectives of Section I. This appendix is intended as a management reference to be used by the leaders of the city and fire department to aid in forthcoming planning and management activities. Because of that, the discussion and rationale behind each of the recommendations is not included here; that information may be found in the appropriate chapter of Section I as referenced below. In keeping with the advisory nature of most of these comments, none is listed in order of importance or priority.

Figure 98: Summary Table of Short and Mid – Term Organizational Recommendations

Summary Table of Short and Mid-Term Organizational Recommendations		
Objective Reference	**Context Reference**	**Recommendation**
Objective One - Organizational Overview	Standard Operating Guidelines (SOGs), page 11	Continue to revise the Boots and Bunkers document. Provide a regular and systematic updating process to assure the rules remain current, practical, and relevant.
Objective One - Organizational Overview	Organizational Structure, page 13	Review all job classifications of bargaining unit positions for modifications as necessary. The job description review should be annual and should be in coordination with the City Human Resources Department to insure consistency with City practices.
Objective One - Organizational Overview	Maintenance of History, page 14	Although an unofficial department historian has been acting in this capacity, we recommend that the department officially designate this duty.
Objective One - Organizational Overview	Maintenance of History, page 14	The department should produce and distribute an annual report.
Objective One - Organizational Overview	Cost Recovery Efforts, page 26	It is recommended that the department along with the City's finance department conduct a thorough analysis of the existing cost recovery efforts to determine if any changes may be needed.

[46] In this context, short and mid-term projects are considered as those executed within an immediate to five-year window.

Summary Table of Short and Mid-Term Organizational Recommendations		
Objective Reference	**Context Reference**	**Recommendation**
Objective Two – Management Components	Mission, Vision, Strategic Planning, goals and Objectives, page 31	The department mission statement should be revised to reflect the present direction of the department.
Objective Two – Management Components	Mission, Vision, Strategic Planning, goals and Objectives, page 31	Review the department current vision statements, and update as needed.
Objective Two – Management Components	Mission, Vision, Strategic Planning, goals and Objectives, page 31	The department should complete its own strategic plan. We recommend that the department strive to have active participation from all levels of the department.
Objective Two – Management Components	Availability of SOGs, Rules, Regulations and Policies, page 32	Continue to review and revise all rules provided to department members. We recommend an annual schedule be adopted for this purpose.
Objective Two – Management Components	Availability of SOGs, Rules, Regulations and Policies, page 32	We encourage the department to continue to integrate individual and division performance statements to department goals.
Objective Two – Management Components	Availability of SOGs, Rules, Regulations and Policies, page 32	Continue the development of the personnel appraisal process.
Objective Two – Management Components	Internal and External Communications, page 35	We recommend that the department develop a community newsletter, distributed on a quarterly basis to inform the community of the activities and accomplishment of the department.
Objective Two – Management Components	Internal and External Communications, page 35	We recommend that a formalized complaint process be developed and made available to the public.
Objective Two – Management Components	Internal and External Communications, page 35	Consider converting the current Community Review Panel to a standing Community Advisory Committee. This committee would provide input and act as a sounding board as the department moves forward with the master plan recommendations.
Objective Two – Management Components	Internal and External Communications, page 35	The department should consider the use of community survey instruments as they move forward with the master plan recommendations. This would provide additional information from citizens and provide valuable insight to department management.
Objective Three – Planning	Organizational Planning Process, page 43	Place greater emphasis on long-term planning that includes well-defined performance objectives at the department level to provide policy makers the ability to identify and address future service delivery issues.
Objective Three – Planning	Tactical Planning, page 42	Establish a comprehensive process to create and maintain pre-incident planning program. Provide training to all personnel and make plans available on all response apparatus.

Summary Table of Short and Mid-Term Organizational Recommendations		
Objective Reference	**Context Reference**	**Recommendation**
Objective Three – Planning	Tactical Planning, page 42	Continue to work with the county to improve the infrastructure of the 9-1-1 system to enable the use of MDTs.
Objective Three – Planning	Operational Planning, page 43	We recommend that the department consider the addition of a budget analyst position to assist department management.
Objective Three – Planning	Master Planning, page 45	We recommend the formation of an external customer planning group. This group would provide assistance to the department as they move forward with the master plan recommendations as well as department programs.
Objective Four – Risk Management	Health and Safety, page 48	The department should develop and initiate a comprehensive physical capacity testing process conducted for all personnel at least annually.
Objective Four – Risk Management	Health and Safety, page 48	Ensure that entry-level medical and mental evaluations for new personnel conform to NFPA Standard 1582.
Objective Four – Risk Management	Health and Safety, page 48	We recommend that the department develop and initiate a formal physical fitness program in accordance with NFPA Standard 1583, or the jointly produced IAFC and IAFF Wellness/Fitness Initiative.
Objective Five – Human Resource Management	Counseling Services, page 53	Formally adopt the current MFD and IAFF Local 271 mentoring program for new members.
Objective Five – Human Resource Management	Ongoing Competency Evaluation, page 54	We recommend that MFD develop and initiate an on-going competency-based evaluation and physical agility testing for all department personnel. We also recommend that Local 271 be included in the process.
Objective Six – Staffing	Assignment of Responsibility, page 58	We recommend MFD review, clarify, and update all job descriptions. We further recommend that each position's supervisory responsibility and reporting mechanisms be reviewed and updated as well.
Objective Seven – Capital Assets and Resources	MFD headquarters, Station 1, page 59	Consider expansion or relocation to relieve crowding in the training, fire prevention, and support staff offices. Storage space is at critical mass and needs to be addressed.
Objective Seven – Capital Assets and Resources	MFD Station 2 page 59	We recommend this station (Fire Station 2) be remodeled or replaced.
Objective Seven – Capital Assets and Resources	MFD Station 3, page 59	Provide upgrades to the current HVAC system. Any future structural upgrades to this station should consider combining and enlarging crew quarters. Storage is an issue at this facility, additional storage is needed.

Summary Table of Short and Mid-Term Organizational Recommendations		
Objective Reference	**Context Reference**	**Recommendation**
Objective Seven – Capital Assets and Resources	MFD Station 4, page 59	A separate apparatus maintenance facility should be considered at this facility. Storage needs at this facility are critical and should be considered.
Objective Seven – Capital Assets and Resources	Apparatus, page 63	MFD should consider a capital apparatus and equipment replacement funding mechanism.
Objective Seven – Capital Assets and Resources	Apparatus Reviews, pages 61 – 63	Use of plastic fuel cans should be discontinued. Secure all equipment in compartments.
Objective Seven – Capital Assets and Resources	Turnout Gear Maintenance Program, page 75	When MFD does significant renovations or builds new facilities, consideration should be given to enclose the turnout gear room and install a separate ventilation system. Commercial washing extractors should also be included.
Objective Eight – Service Delivery	Resource Deployment, page 84	Prior to another ISO Evaluation, MFD should inventory all apparatus equipment to insure that maximum point values are granted.
Objective Eight – Service Delivery	Structural Fire Response, page 100	Include a staffing component in MFD performance objectives to provide the ability to determine if sufficient resources are on-scene to initiate fire suppression efforts.
Objective Eight – Service Delivery	Mutual and Automatic Aid Systems, page 107	The insufficient training that occurs between area fire departments should be addressed. Ideally, training between agencies should occur at least once per quarter.
Objective Eight – Service Delivery	Mutual and Automatic Aid Systems, page 107	MFD should take the lead to address root cause issues that impede working relationships between area departments. By doing so, improvements to the response system will gained by all.
Objective Nine – Training	Training Facilities, page 113	Office space for the training function is limited. Future additions should be considered to provide more space for the training function.
Objective Nine – Training	Training Staff, page 114	We recommend that professional requirements be required for the Training Officer and EMS Coordinator positions.
Objective Nine – Training	Training Staff, page 114	Activities of the training division should be integrated into the overall department goals and objectives.
Objective Nine – Training	Training Staff, page 114	Appropriate positioning of the Training Office is critical to accomplishing the training objectives. We recommend that consideration be made to place the training officer as more of a program manager, and primary planner for the training function.

Summary Table of Short and Mid-Term Organizational Recommendations		
Objective Reference	**Context Reference**	**Recommendation**
Objective Nine – Training	On-going Skills Maintenance Training, page 115	We recommend that lesson plans be develop and used within the training program curriculum delivery. We also recommend that MFD develop and implement a department training manual.
Objective Nine – Training	Career Development Training, page 115	We recommend that MFD develop and maintain a career development program encompassing all positions within the department.
Objective Nine – Training	Training Program Planning, page 115	The training program should include a clear reflection of the goals and objective of the training division and how they relate the MFD's organizational goals.
Objective Nine – Training	Training Staff, page 115	We recommend the formation of a department training committee to assist the training officer in setting the training agenda and to assist in formulating training goals.
Objective Nine – Training	Training Staff, page 115	Develop and maintain a joint training program with other area emergency service agencies and mutual aid partners.
Objective Nine – Training	Competency Based Training, page 116	On-going training should follow an identified plan based on demonstrated training needs. We recommend that the department consider a competency based training program system.
Objective Ten – Fire Prevention	Fire Safety Inspections, page 120	Continue to review and improve inspection program for results.
Objective Ten – Fire Prevention	Fire Safety Inspections, page 120	Continue implementation of the computerized data collection system for the inspection program.
Objective Ten – Fire Prevention	Fire and Life Safety Education, page 121	We recommend that the department review its current fire safety education program for results. We recommend that the department should provide a more comprehensive and aggressive public education program. We also recommend that expanded use of existing personnel resources (firefighters) are included to deliver prevention programs and provide prevention training when necessary. We further recommend that other alternatives to deliver public education be explored by the use of volunteer auxiliary public educators or Explore Scout programs.
Objective Ten – Fire Prevention	Incident Information Analysis, page 123	We recommend that the categories used to identify fire incident and cause types be expanded. We encourage MFD to adapt to a more specific reporting method.

Appendix: B – Response Time Thresholds and Triggers

Introduction

When a community creates a fire department and builds its first fire station, a response time criterion is usually established. This response time anticipates that it applies to 100 percent of the area covered by the boundaries of that fire station. This is especially true when there is only one fire station and a small area to cover. Simply speaking, a central fire station is among the first public buildings created in most communities, no matter how small. As the community grows away from that station in incremental steps, the expectation is that the original fire station will still provide adequate coverage.

However, that expectation is fraught with many problems. In the simplest of terms, the total area covered by a fire department may or may not be highly developed initially; and even if a crew from the fire station responds, it may not do so in a timely manner. Most fire departments begin as totally volunteer. They usually are operated with this staffing pattern for economic reasons. When population and service area increases, there is often pressure to add full time staff and to consider additional stations.

In fact, there are many variations on this theme. Older, established cities tended to be denser and smaller in dimension, but they often annexed new areas. Newer communities may be created from a much larger area than the first fire station can cover. Urban sprawl, which is a currently an active discussion in other areas of public policy, has resulted in the timing of additional fire station construction and staffing being a topic of concern.

Station Siting

Usually when a fire department constructs its first fire station in the area, the values at risk and hazards to be protected are within a close driving distance. In effect, the first fire station in a community is a *centroid*. That is, the local fire station is the center of the response capacity of the jurisdiction. Earlier in the 20th century, fire stations were often characterized on maps by having a circle drawn around the station with an l.5 mile radius. This was sometimes used to describe the area of coverage. However, fire apparatus responds using the roadbed that consists of angles and distances that did not result in the circle being the true description of the coverage. Not only that, but one cannot place fire stations exactly three miles apart and have the two circles overlap. When they are placed closer together than the 1.5 radius, there is not only overlap, but also gaps where there does not appear to be coverage.

Later, the circle was replaced by diamond-shaped templates that could be overlaid over the station and rotated to estimate the relative advantage of road distances. The contemporary method used to evaluate fire stations is based upon using the actual road-network in a computer model. This system uses time and distance to create a network that more closely represents how far the company can respond from its fire station, using the adopted time standard. A few years ago, the method that was in vogue was called FLAME. This is an acronym for Fire Station Location and Mapping Environment. From the time the first station is built, it creates an expectation that the facility can and will provide a timely response to calls for service in an area surrounding that facility.

When the original criterion was set for response time from that facility, there is an immediate *location – allocation* created by that station. The station provides a response to a given area within a reasonable time in a pattern that essentially is an overlay on the streets and highways that radiate outward from that location. Even before any incidents occur in a community, the road-network geography and the topographical attributes of a community create a *dynamic segmentation* that results in the ability of fire professionals to reasonably predict what areas can be and those that will not be covered. Today the preferred tool for conducting this type of analysis is through Geographical Information Systems (GIS).

There are many infrastructure components that have an effect upon the *location allocation* concept. Among these are road and highways networks, impedance factors such as traffic patterns and processes (stoplights and signs), and turn impedance, i.e.: roadbed configuration and elevation impedance (slope). It is axiomatic that there is an inverse distance-weighting factor that results in longer response times to areas further away from the centroid of the station. This is called distance *decay*. The manner and means of response involve the use of the roadbed, but also involve dealing with differences in elevation and competing vehicles on the roadbed. In short, the further away from the location of an incident and the higher the impedance for response, the less effective any specific resource is in dealing with the initial stages of an emergency event as you move away from the station's location.

The use of the concept of using *travel time* itself is not exactly new. However, for many years the basic criterion was road mileage only. The standard that was normally applied was that a fire station was expected to be able to reach any incident within 1.5 miles of the station within five-minutes of driving time. Time was a secondary consideration. That standard was based upon data from the 1940s with respect to road conditions and traffic patterns. A lot has changed since then. For decades, the Insurance Services Office (ISO) has based fire station locations on a 1.5-mile separation. In general, this has served as *rule of thumb*, but it does not deal with the vagaries of

physical response (such as geography, transportation, and weather). Secondarily, it does not place any emphasis on response needed for emergency medical service (EMS) incidents, such as basic life support (BLS) or advanced life support (ALS).

The concept of using actual travel time today is based upon a more accurate representation of the level of service for an all-risk approach. It is more performance-based. Today most fire agencies set a time standard that includes three elements, two of which were missing from the strict use of mileage for station location; specifically, alarm processing time and turnout time. The actual time of road travel has often been used to set the communities expectation of performance.

Using this approach, stations are seldom located in a linear fashion. This concept is based on the time intervals identified in the Standards of Response Coverage section of the *Self Assessment Manual* published by the Commission on Fire Accreditation International. This process leads to the development of a standard of response cover, or a time and level of staffing designed to control an emergency at a minimum level of loss. The process is however, a policy choice based on risk and local conditions.

The basic performance standards for time goals are based on the rapid speed of fire growth and consequences of emergency medical situations over a short time frame. It has been determined that both fires and medical emergencies can gain a foothold that result in excessive losses when the times are excessive. Below, is an example of a benchmark response standard.

- **Alarm processing time** — 60 seconds
- **Turnout time** — 60 seconds
- **Travel time**
  - Fire response — five minutes, 90 percent of the time
  - BLS response — five minutes, 90 percent of the time
  - ALS response — eight minutes, 90 percent of the time

Response time standards adopted by jurisdiction may vary from the example show. For example, urban, suburban, and rural frequently have different travel time standards.

The contemporary method of measuring performance looks at response time on incidents as an indicator of levels of service. The way this is done is two-fold. The first is to measure the actual performance during emergencies; the second is to monitor the system to determine when the system fails to achieve the performance goals.

One point of caution — Response time criterion should only be applied to calls that are emergency calls. When incidents are analyzed, the data should be reviewed to assure that non-emergency calls are not used when calculating performance. There are many calls for service that fire departments log as incidents that are non-threatening scenarios and the responding companies will handle them on an as–needed basis. To include these times in the analysis of emergency services tends to skew the outcome, leading to a false service indicator.

Response Failure

To understand when response failure occurs, we must define first what is being measured and how we measure the performance goal. For example, a basic question to be answered is whether a department is protecting the dirt or the incidents? Are we going to measure percentage of performance by first-due district, or department wide? Generally, fire protection practitioners try to position stations to cover 90 percent of the ground in each first-due district, to provide overlap for concentration, redundancy for multiple calls, and for equity of access for customer service. It is economically impossible to cover 100 percent of the ground. Based on actual call loading, a department should strive for 80 to 90 percent coverage.

If the measure for either area or incidents is set at 80 to 90 percent effectiveness, how much *slop* over in the performance measure is acceptable? For example, if an historical incident measure is at the 85 percentile, BUT the other five percent are covered in the next 60 seconds, is that acceptable?

Maybe yes, maybe no. It is important to understand that values at risk, type of unmet calls and the total number of calls can combine to create a need. If the deficiency is only five percent or 25 calls out of 500, depending on the size of the measurement area the gap may or may not be significant.

For example, if the performance requirement was to arrive at the scene of an emergency within five minutes of travel time, 90 percent of the time, this criterion could be applied to one year of response data to see if the goal was achieved. It should be noted that this criterion **allows** for ten percent of the calls to be beyond the five minutes traveling time over a given reporting period. This provides flexibility in the assessment of coverage to cope with anomalies such as extra-ordinary response conditions such responding from out of district, or for delays caused by simultaneous alarms.

This raises an additional question: Of the ten percent overage, how many of the incidents are covered within the next 30 to 60 seconds?

The first indication of a problem of providing service is when a number of alarms that exceed the performance standard are documented. This may or may not be function of new growth. It could be

the result of in-fill that causes a higher number of alarms for the company than it can service. This is especially true when alarms come in simultaneously.

Moreover, when areas are being developed that begin to extend travel times they do not automatically become the source of new alarms. In fact, new construction often has a period of several years before adding to fire service demand. The same is not necessarily true from the perspective of emergency medical service.

When a New Station is Needed

The question that many communities have to address is when is a second or third fire station required to meet time goals? Obviously, this has been answered in any community that has more than one fire station. The problem comes in finding a quantifiable threshold to determine that point for each specific situation because it varies from community to community and even within a specific jurisdiction. The overall answer is part financial and part professional judgment. In fact, in the literature of the fire service today, there is very little definitive guidance on how this should be accomplished.

There are several steps that can be identified. They consist of:

- Identifying areas with minimum coverage
- Identifying feasible locations for a new facility
- Evaluating those locations using specific criterion

The description in this document is based upon a growing body of knowledge aimed at quantifying this process. What is unfortunate is that there is no universally acceptable algorithm. The fire protection planning process does allow for an evaluation of potential loss as a result of deteriorating response times. One form of measurement is to assess the road and transportation network to ascertain the percentage of road mileage that theoretically is covered by the time criterion. This is done using computer-based modeling that will create a polygon that describes the *areas of coverage*. In fact, this process will also identify gaps and deficiencies where response time is not adequate.

It should be noted that as long as a department operates a totally volunteer force, the time established as a turnout time will be a factor. Generally speaking, volunteers take more time to get out of a station than a permanent crew. This statement does not place any prejudice on the use of volunteers. This is mentioned only to remind the readers that total response time must be considered when evaluating alternatives.

As growth and development extends beyond the range of travel time of one station, the percentage of calls that exceed the performance requirement should begin to increase. It should be noted that growth, in and of itself, does not create an instantaneous demand. New construction has the advantage of better codes, a higher level of owner interest, and limited deterioration of fire-breeding conditions.

A more subtle difference in today's fire service is the fact that community demand for medical services is almost from day one of occupancy. In short, this means that new construction may place more values and lives at risk, but the demand for service will be incremental. When demand for service does begin, it will be based upon two factors - nature of the occupancy and hazards that are present.

Incident increase may first appear as a change in the performance of an existing company in the annual analysis of emergency calls. For example, if a station has 1,000 alarms and a 90 percent compliance rate with the response standard, there would be about 10 alarms per year that were beyond the goal. This would be the baseline for existing response performance. If the following year, the number of alarms was 1,200 and percentage dropped to 85 percent, this would indicate that the department is losing ground on response performance. If the change in the number of alarms had merely increased because of more calls in the same area, the response time percentage should have remained fairly similar. (One exception to this rule is when a single company has such a high call volume that it cannot handle all calls without call queuing.)

However, since the alarm rate went up and the performance went down, the failure threshold may be approaching. The change in alarms that were not met may now go to 180 (15 percent of the overall). As stated earlier, analysis needs to be performed on the deficiency to determine how many of those incidents were handled in the increment of 60 seconds beyond the performance time.

Based upon actual response time analysis, one threshold that needs to be considered is the increase in alarms and the percent of calls handled under the criterion adopted. Anything more than a ten percent increase in call volume and a ten percent reduction in performance is a signal to evaluate the level of service being provided.

In larger departments, most practitioners are factoring out non-emergency calls and for actual incident performance, only looking at *core emergencies*. The definition of core can be made locally based on risk and importance to the community, but they are usually structure fires and moderate to severe status EMS calls.

In general, if more than one measure must be slipping, an evaluation of all Standards of Coverage factors, along with the reason why the data is slipping, is required. A one-year snap-shot may not be valid if the agency had a catastrophic weather event, severe wildland fire season, or had numerous collisions/stacking of calls during the year.

Incident analysis approach depends upon having emergencies, which does not address what is at risk. That is where the mapping technology applies. As structures and different types of fire problems are constructed on the ground, they may represent additional lives and property that are at risk that deserve equity in protection. One of the elements for creating a governmental entity is to control land use and to create mechanisms for collecting taxes and determining ownership. Furthermore, these same individuals and properties are paying the taxes, fees, and permits for the level of service being provided. In one sense when growth occurs, the new properties are usually safer than the older part of the community because they are constructed to a higher standard.

What is clear to almost any community is that being slightly out of the response standard range does not trigger a new facility.

Assessed valuation or increased revenues in the form of benefit assessment or mitigation fees provide incentive for new fire stations to be constructed and staffed when the fire agency can afford them. One threshold that needs to be carefully monitored is the revenue stream that accrues from development. That revenue stream should provide a threshold when different elements of future fire stations can be determined. For example, it takes several years to develop a location into a fire station site. As the revenue stream proceeds, funds could be available for site acquisition, initial plans and specifications, site preparation, and construction. This may be a multi-year process.

The threshold for construction should be to provide a new fire station into any zone in the city or jurisdiction that has more than 35 to 50 percent of its parcels developed. Some of the secondary measures currently being used are 300 to 500 calls for service for any individual fire company or a service population of 10,000 to justify an additional fire station. The following criterion grid illustrates a series of measures that may be useful deciding when a new fire station should be deployed within a city. Similar grids could be developed to help establish triggers for the deployment of additional emergency equipment and personnel.

Figure 99: Criterion Table to Determine When a New Station is Needed

Criterion Grid to Determine When a New Station is Needed				
Action Choices	**Travel Distance**	**Criterion**		
		Response Time Parameter	**Out of Area Calls**	**Building/Risk Inventory**
Maintain status quo	*Enter local information?*	**1st due company** *Enter local response time?*	*Enter existing out of area calls?*	*Enter local building/risk inventory?*
Temporary facilities and minimal staffing or mutual aid	Risks 1.5 to 3.0 miles from existing station	**1st due company** Exceeds 5-minutes travel time 10 percent of the time, but never exceeds 8 minutes.	More than 10 percent of calls are in adjacent area	New area has 25 percent of same risk distribution as in initial area
Permanent station needed	Risk locations exceeding 4.0 miles from the station	**1st due company** Exceeds 5-minutes travel time 20-25 percent of the time. Some calls greater than 8:00 Minutes.	More than 20-25 percent of calls are in outlying area	New area has 35 percent of same risk distribution as in initial area of coverage
Permanent station essential	Outlying risk locations exceeding 5.0 miles from the 1st station	**1st due company** Exceeds 5-minutes travel time 30 percent of the time. Some calls greater than 10 minutes.	More than 30 percent of calls are in outlying area	New area has 50 percent of same risk distribution as in initial area

Interim Strategy

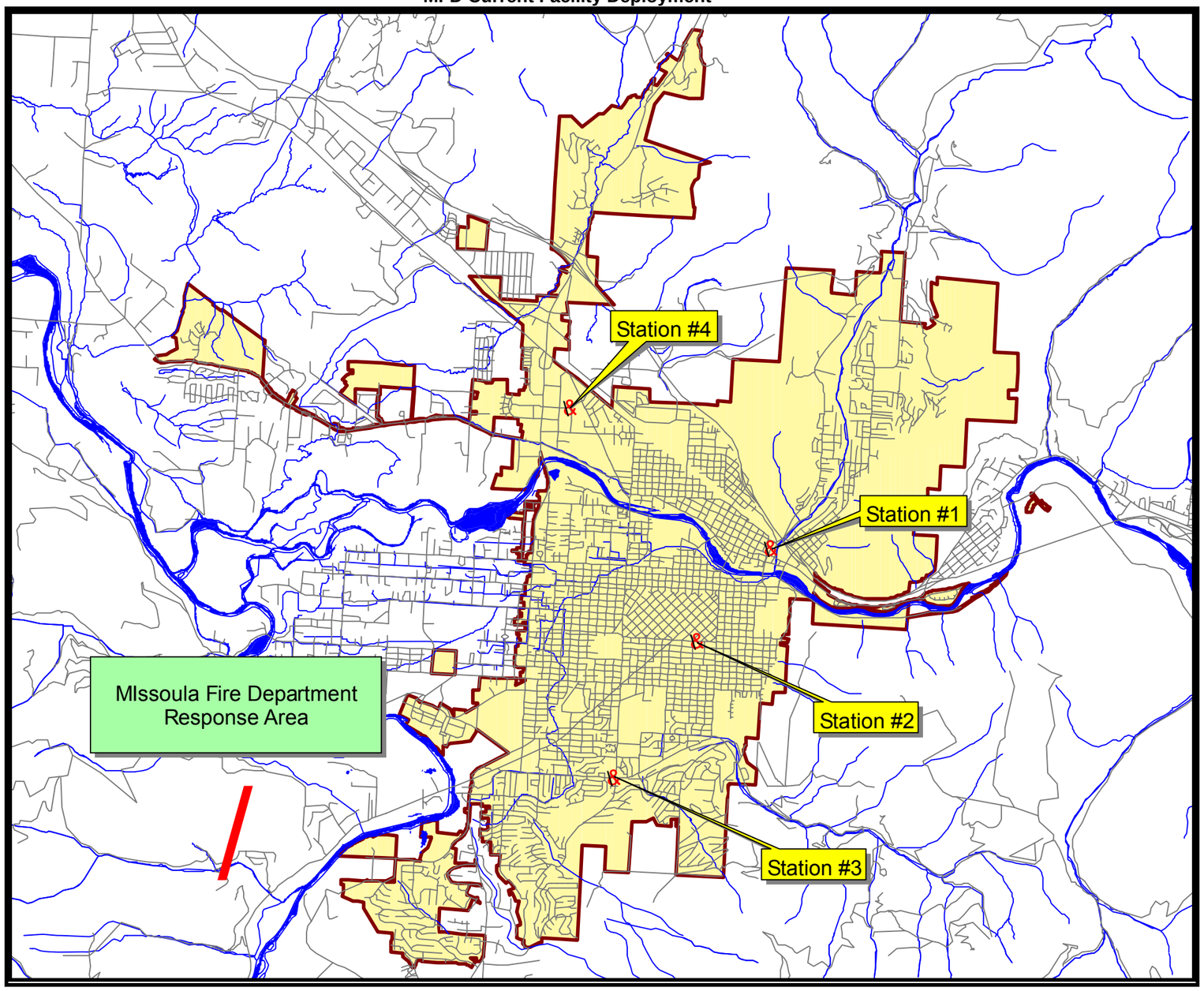
Montana law (M.C.A. 7-33-4112) authorizes the City of Missoula to enter into mutual aid agreements and/or request mutual aid from other fire agencies. The Missoula Fire Department currently has mutual aid agreements with the Missoula Rural Fire District, the Department of Natural Resources and Conservation (DNRC), and the Missoula County Airport Authority. Under these agreements, a fire agency may request and receive assistance at an emergency that exceeds or might exceed the requesting agency's available resources. However, the assisting agency takes into account the need to provide services within its own jurisdiction. In addition, the Missoula Fire Department has a Closest Station Response Agreement (automatic aid) with the Missoula Rural Fire District for specified portions of the urban area. Mutual and Automatic Aid Agreements are potential tools to address the interim provision of emergency services in newly annexed areas between the time the need for an additional fire station is identified and the time when the station and staffing can be funded through new property tax revenue and impact fees.

In the event of annexation, The City of Missoula, in accordance with M.C.A. 7-2-4732, is required to ensure that fire and emergency services are provided on substantially the same basis and in the same manner as within the rest of the city. The challenge will be to provide service in newly annexed areas without diluting the current level of service that is provided to the city as a whole. While it will

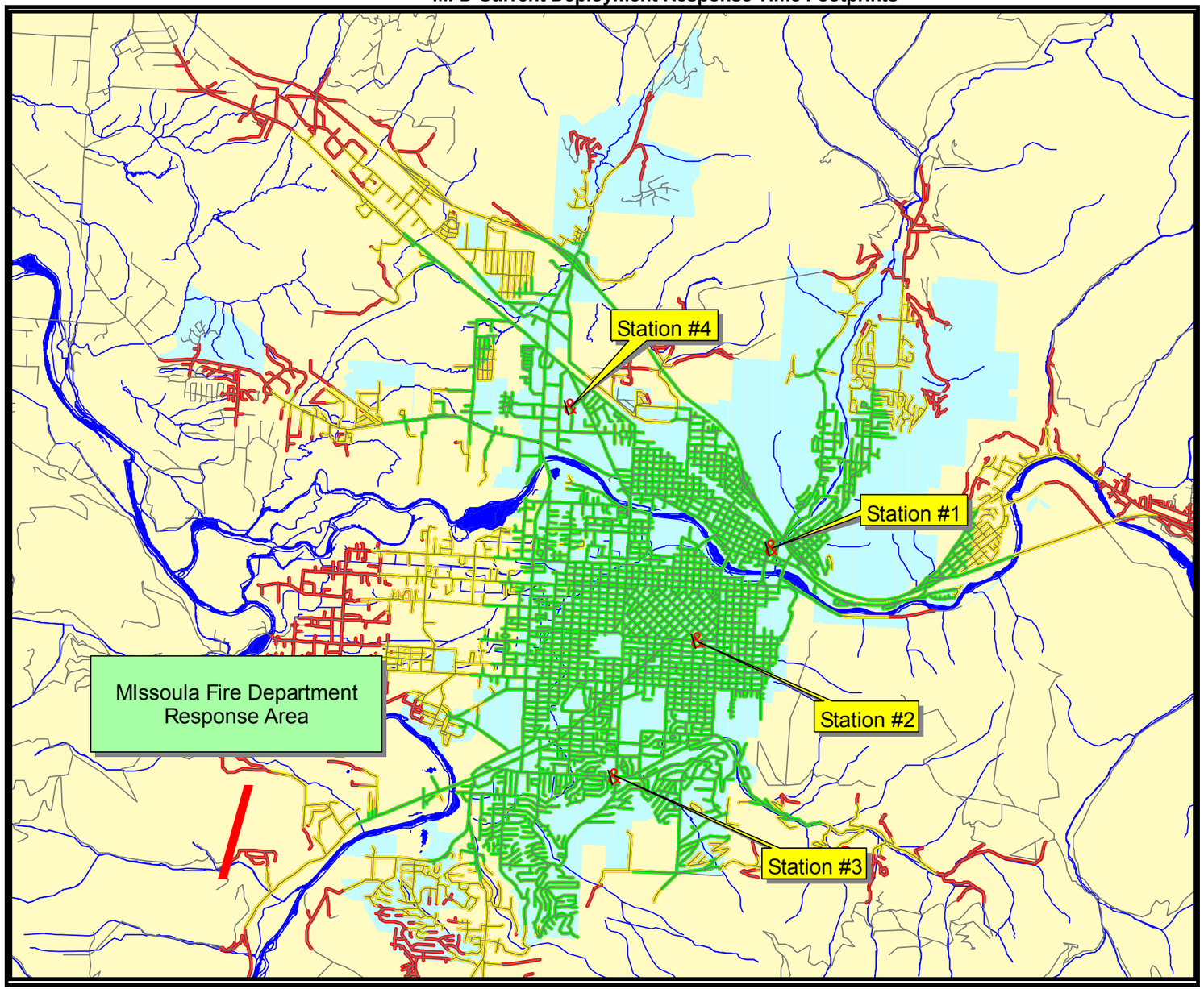
be possible to provide fire and EMS service to certain areas immediately upon annexation, more distant developed and highly-populated areas will ultimately require additional staffing, apparatus, and stations to meet the service demands of a growing community.

Appendix: C – Maps

MFD Current Facility Deployment

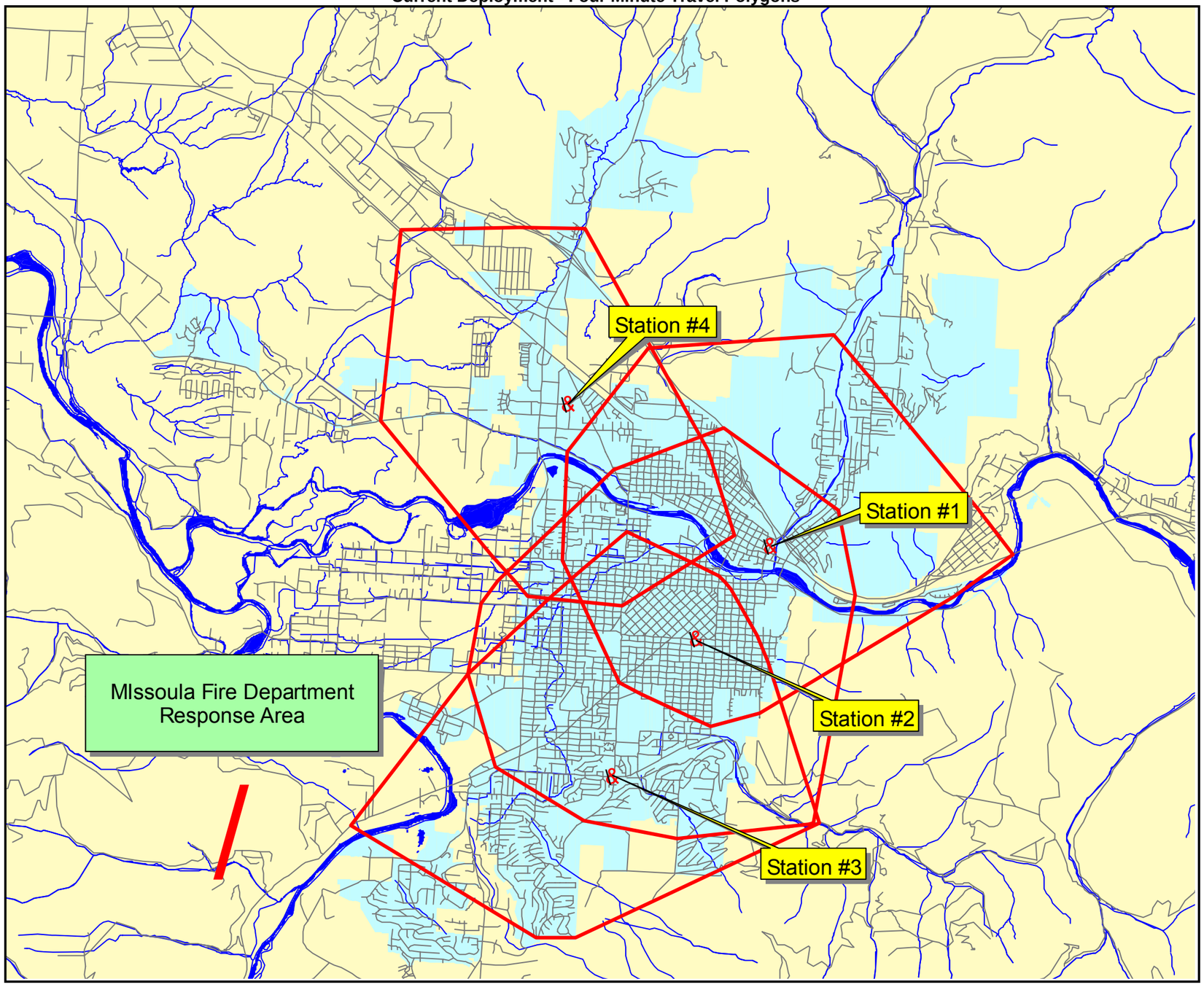


MFD Current Deployment Response Time Footprints

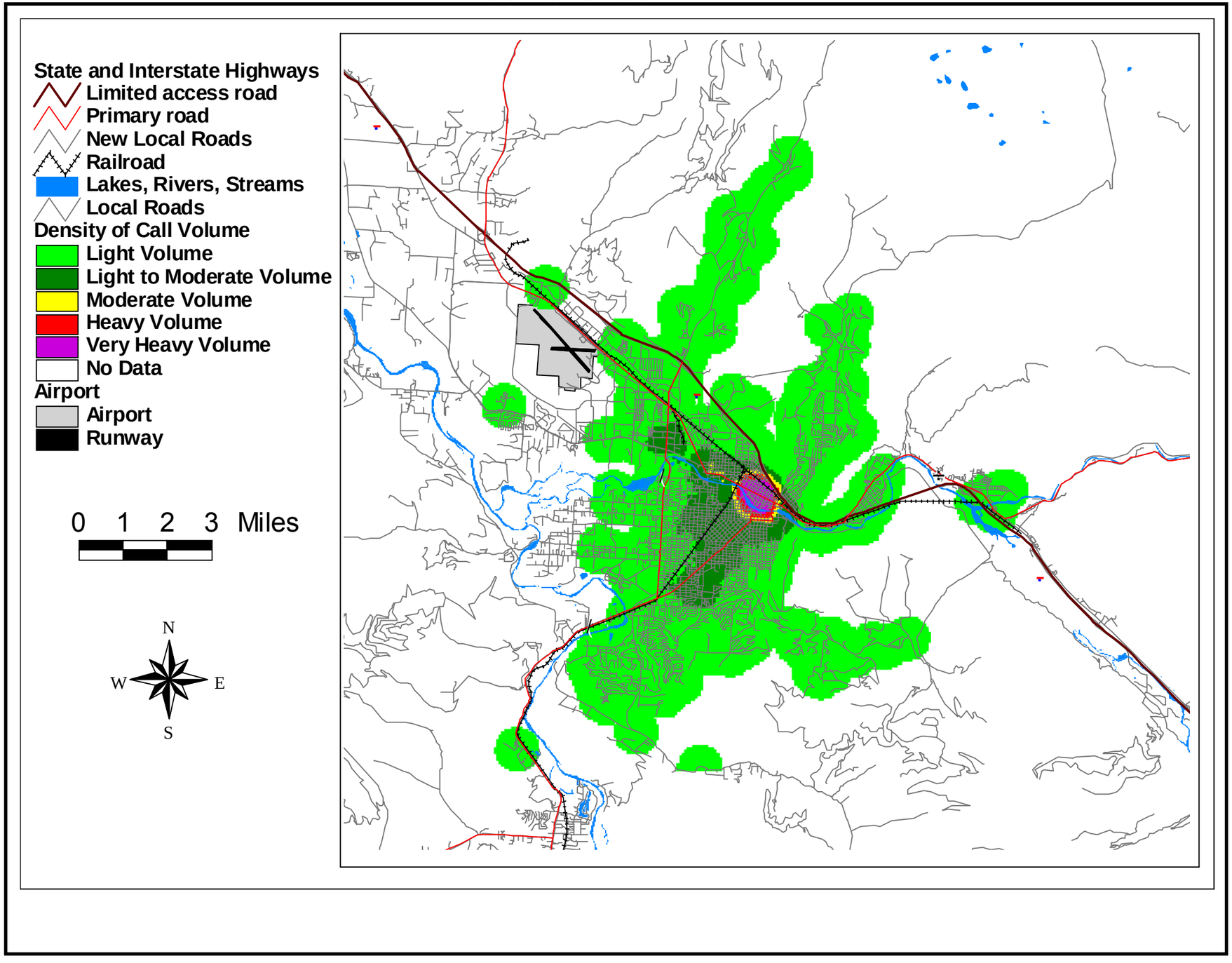


Four-minute travel, or five-minute total response capability
Six-minute travel, or seven-minute total response capability
Eight-minute travel, or nine-minute total response capability

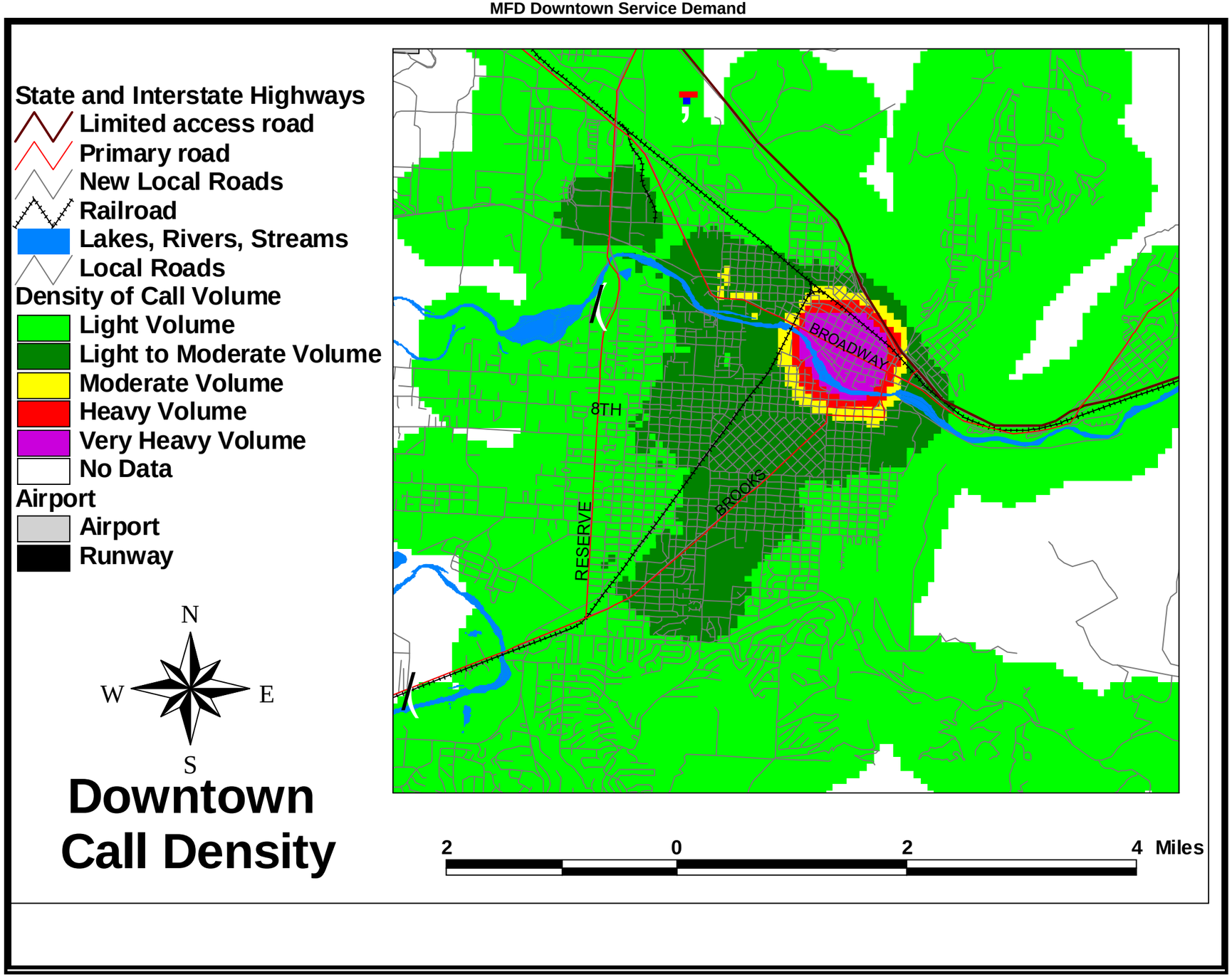
Current Deployment - Four Minute Travel Polygons



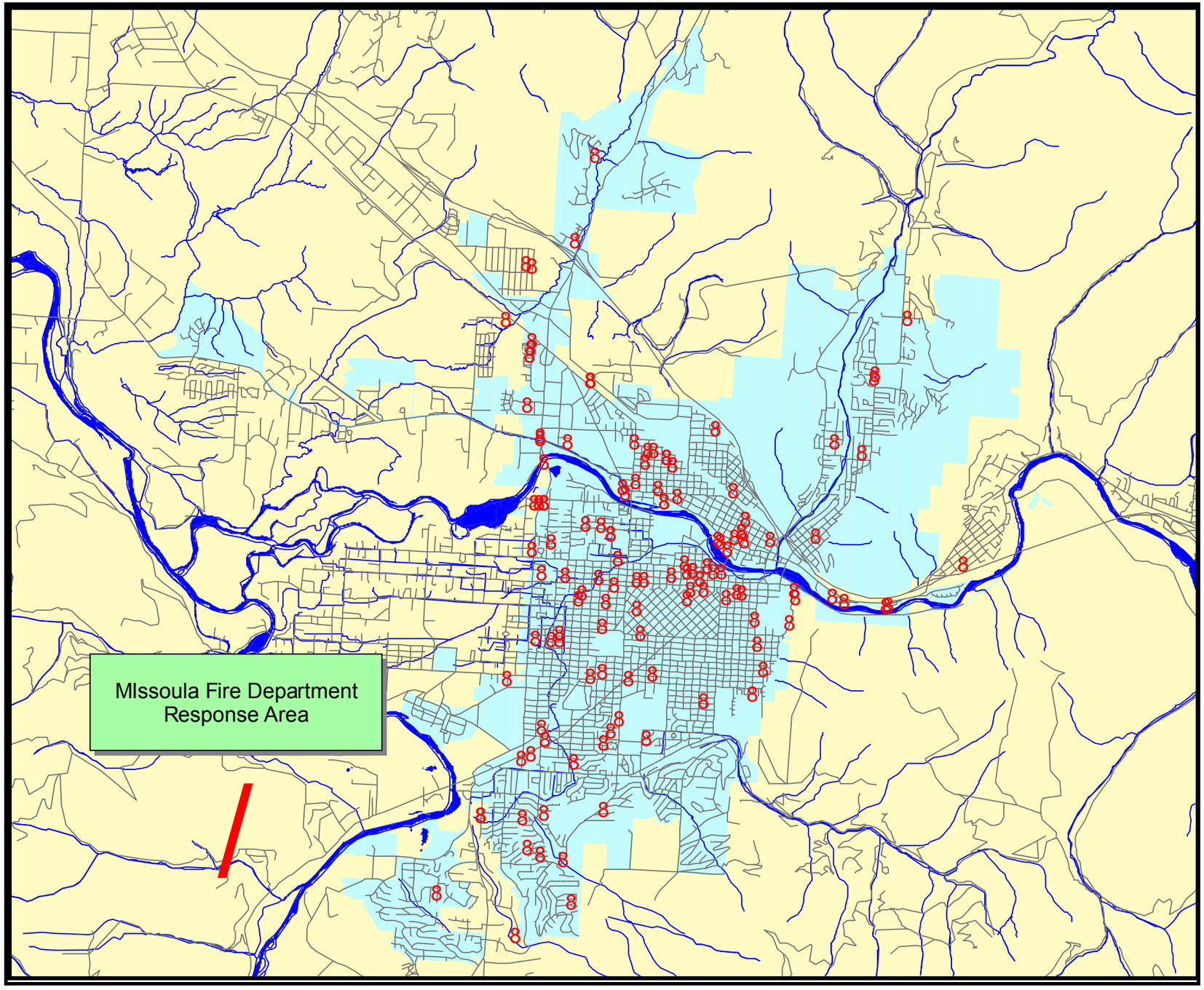
MFD Service Demand



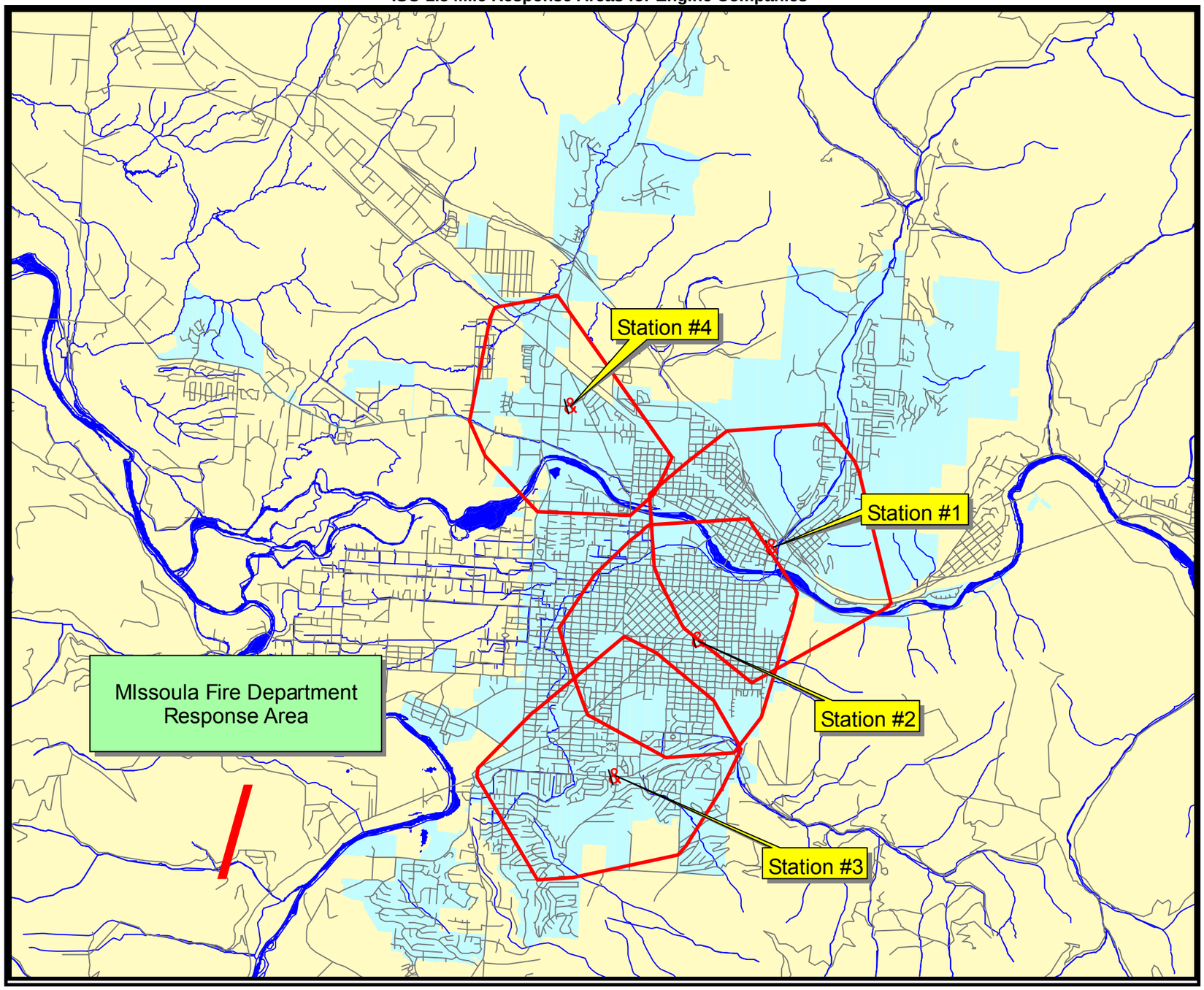
MFD Downtown Service Demand



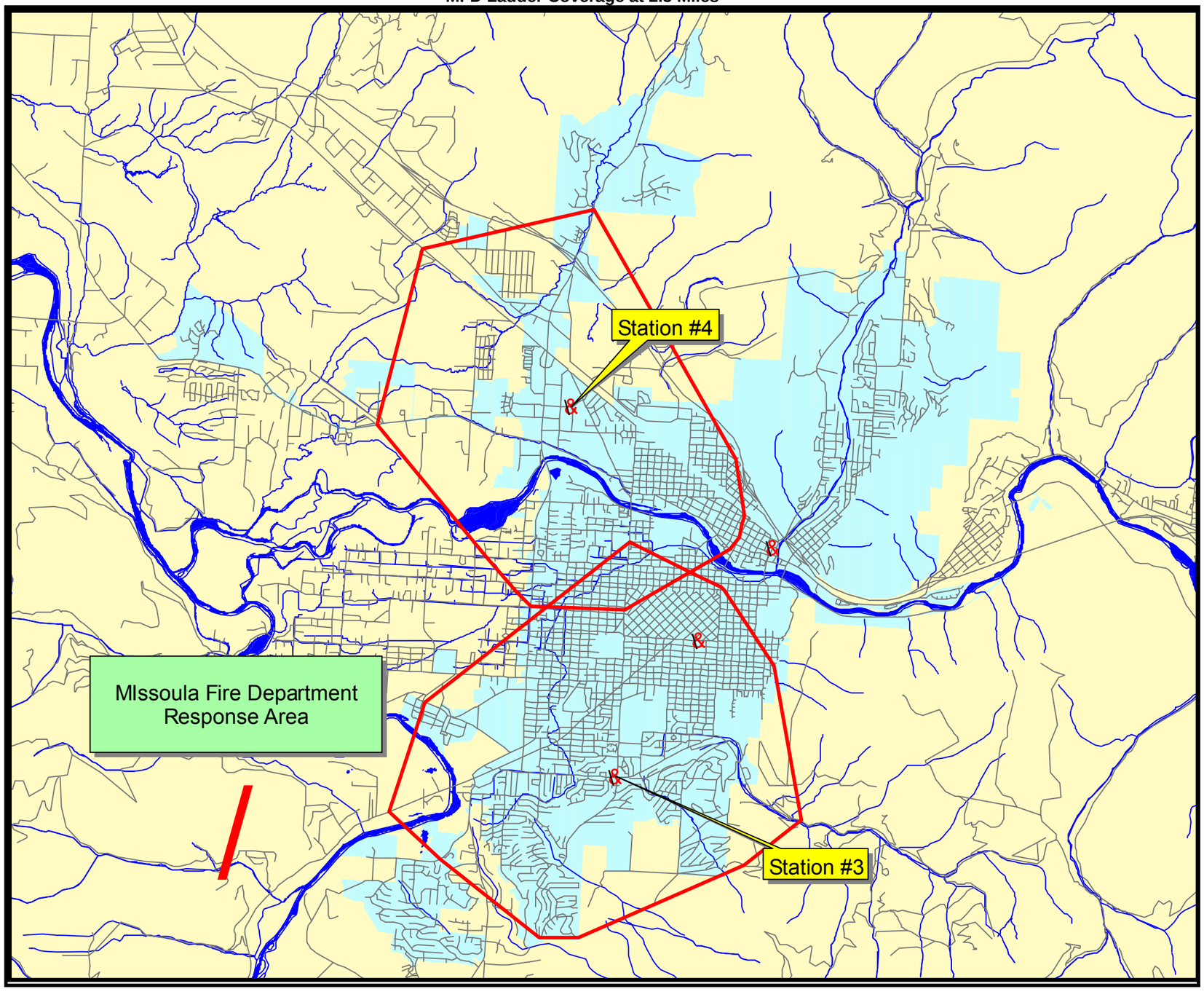
MFD Structure Fire Incidents



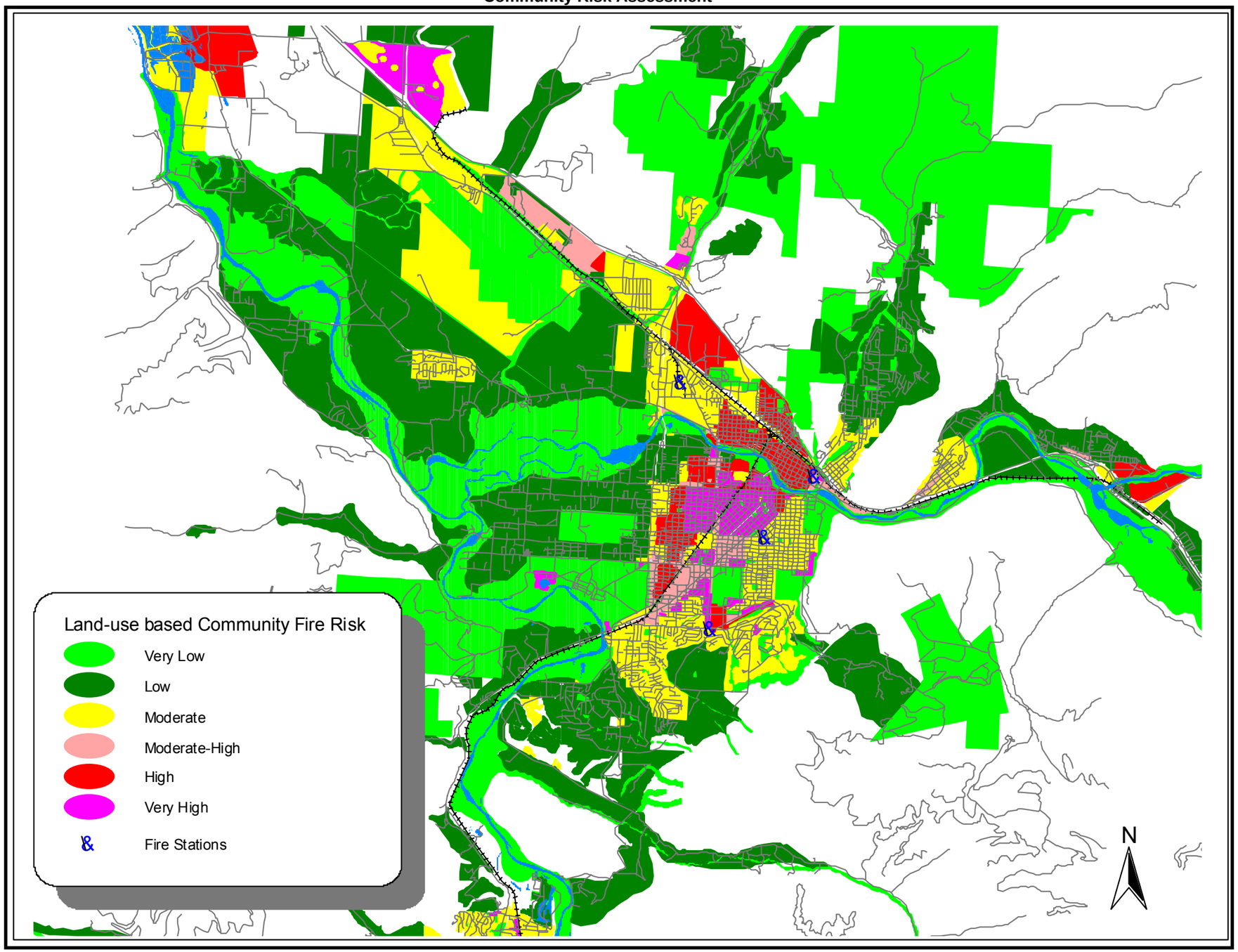
ISO 1.5 Mile Response Areas for Engine Companies



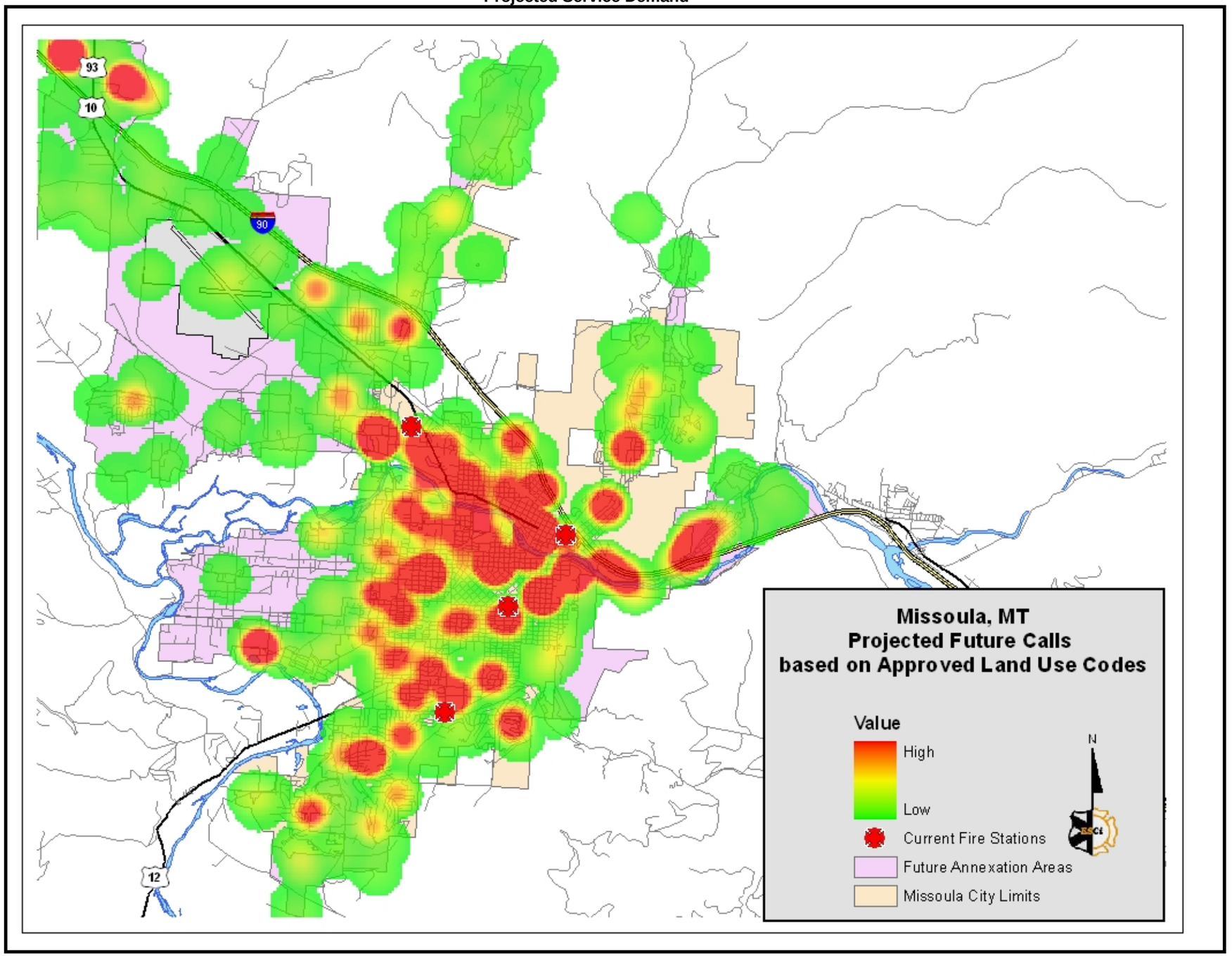
MFD Ladder Coverage at 2.5 Miles

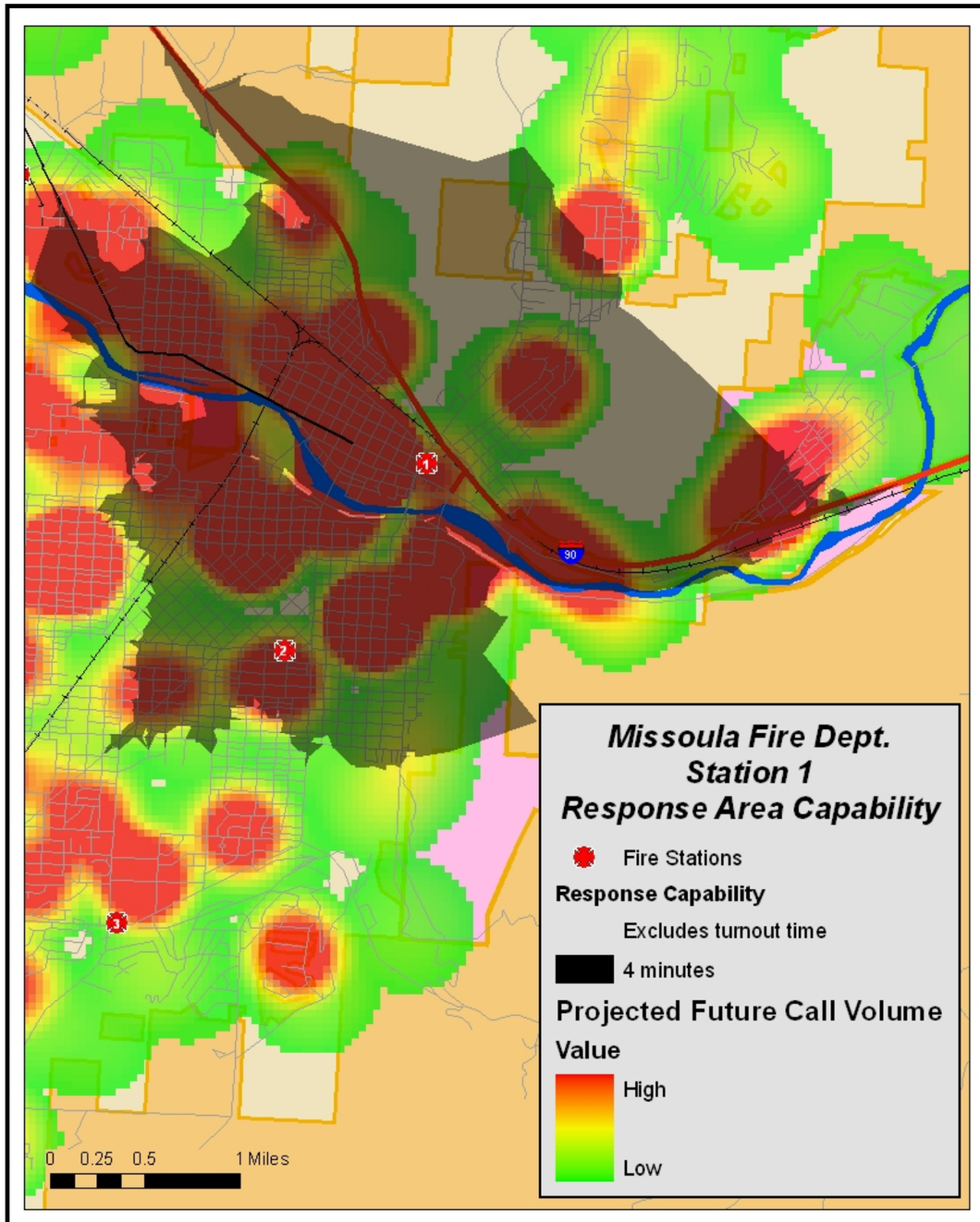


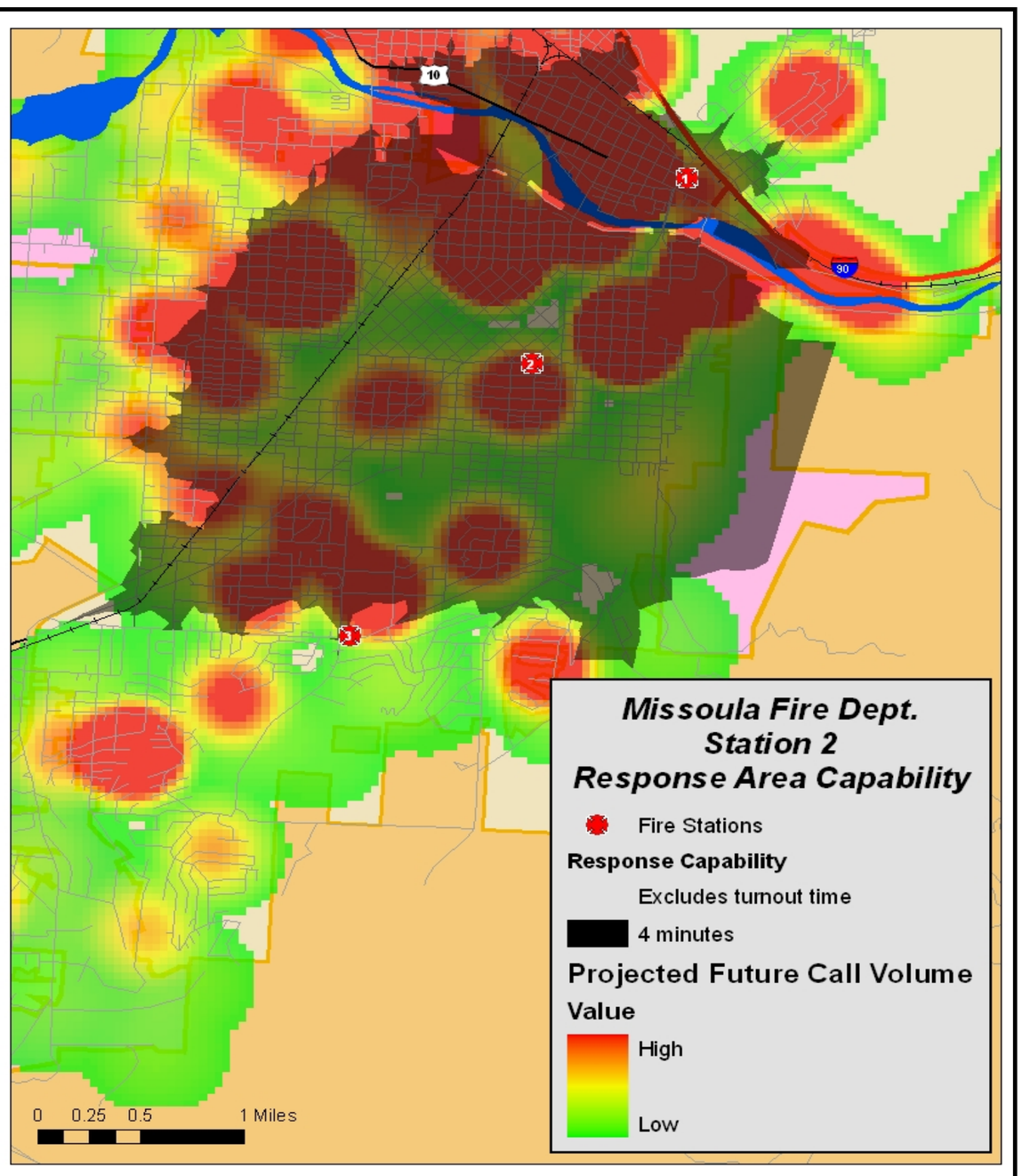
Community Risk Assessment

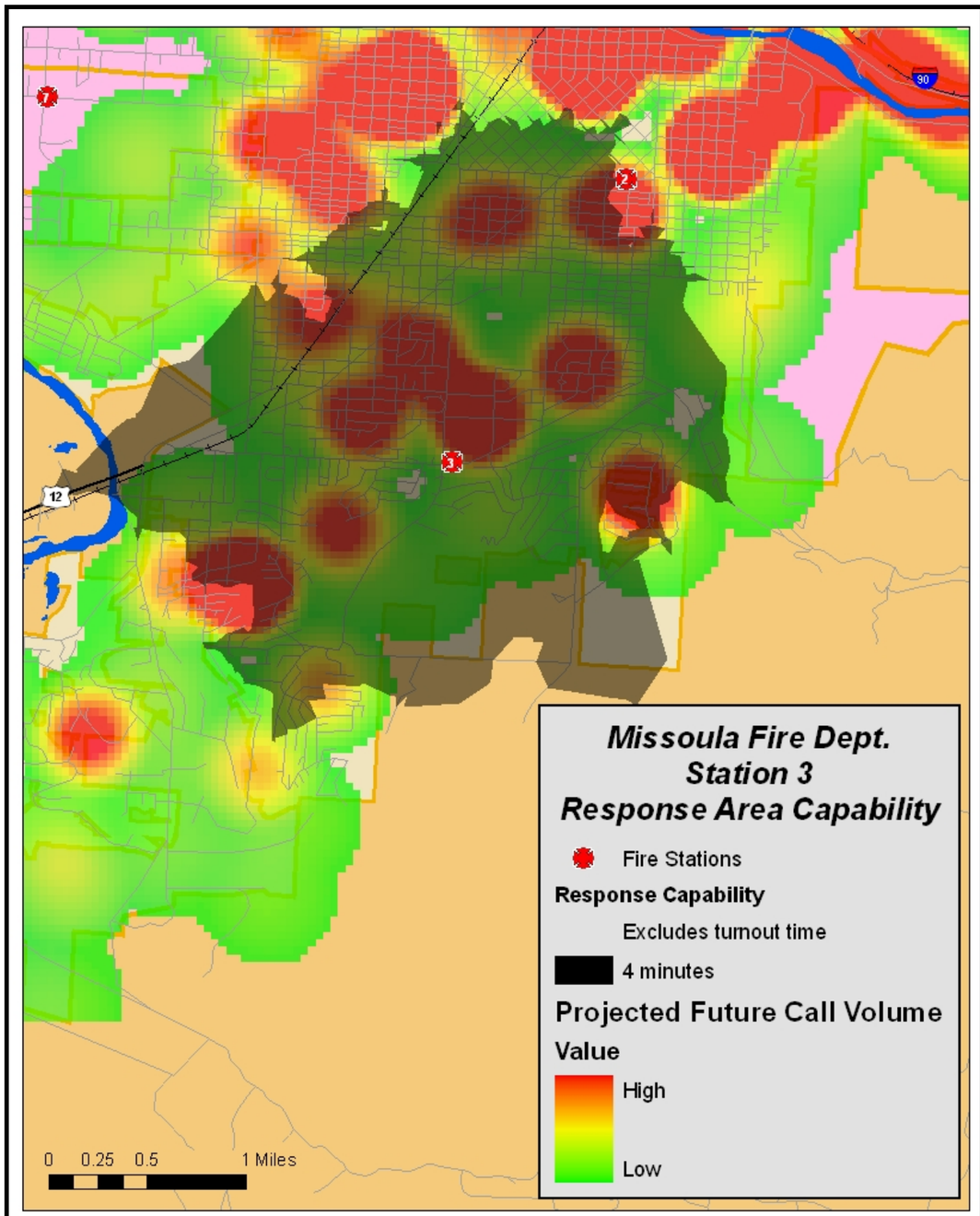


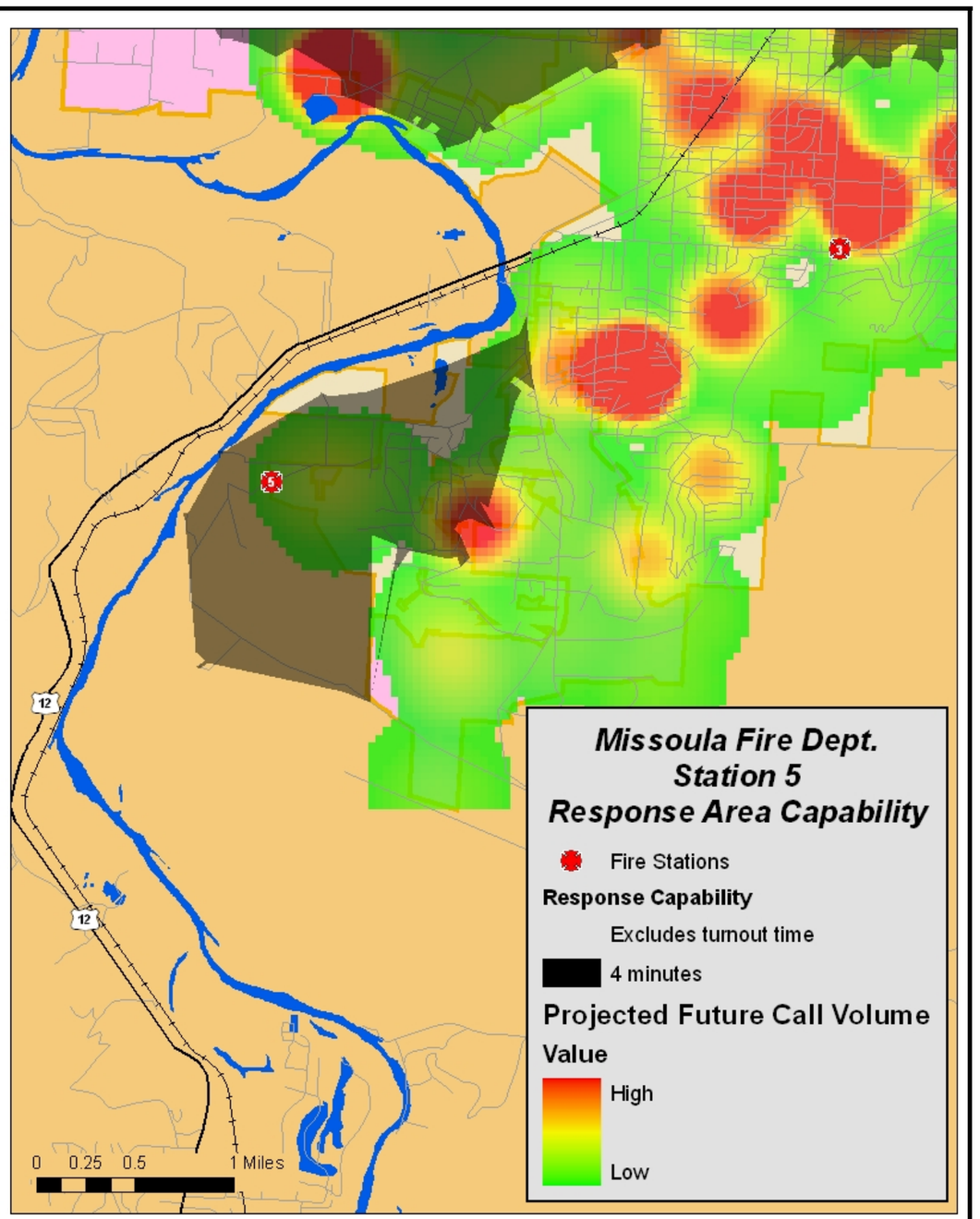
Projected Service Demand

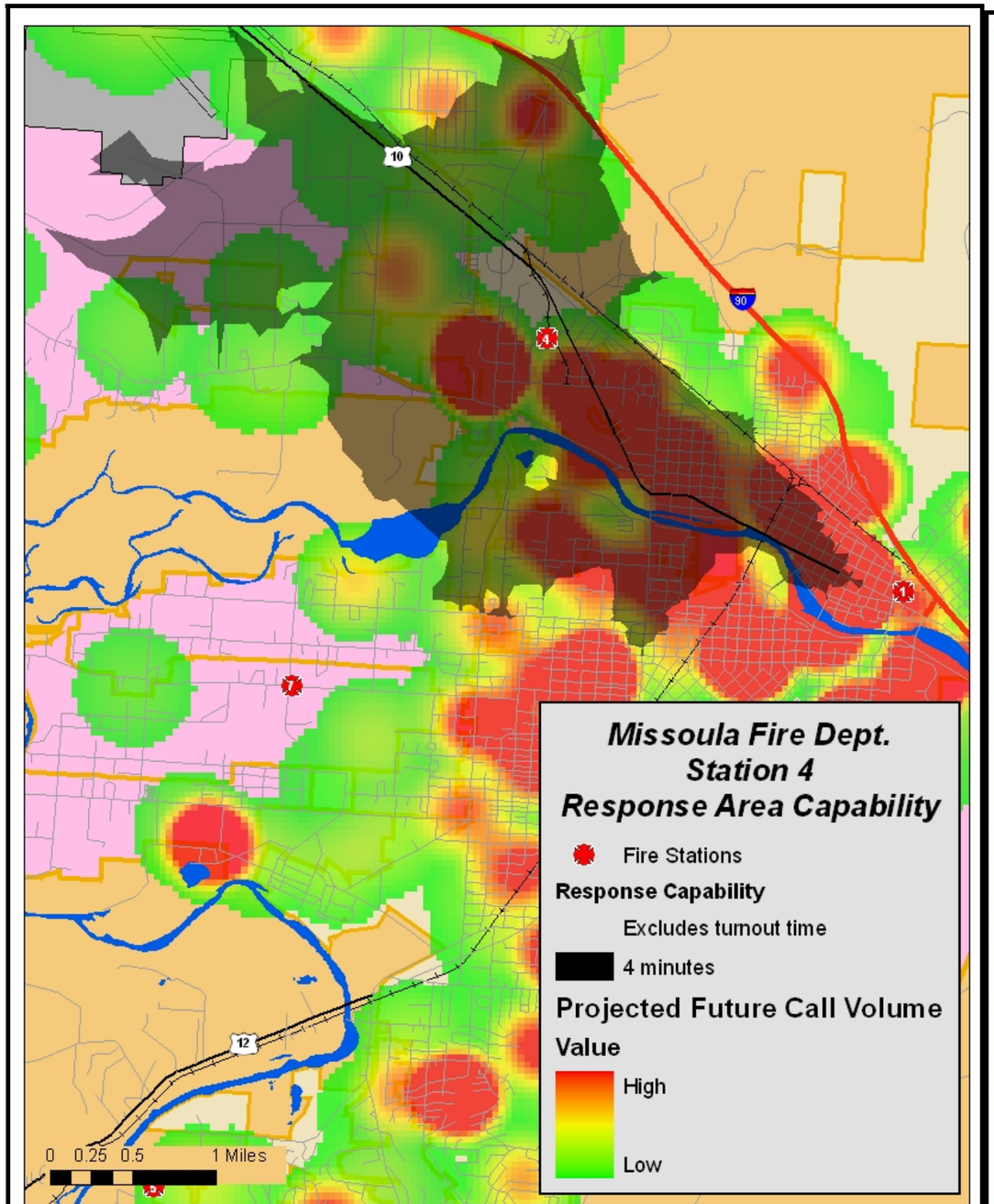


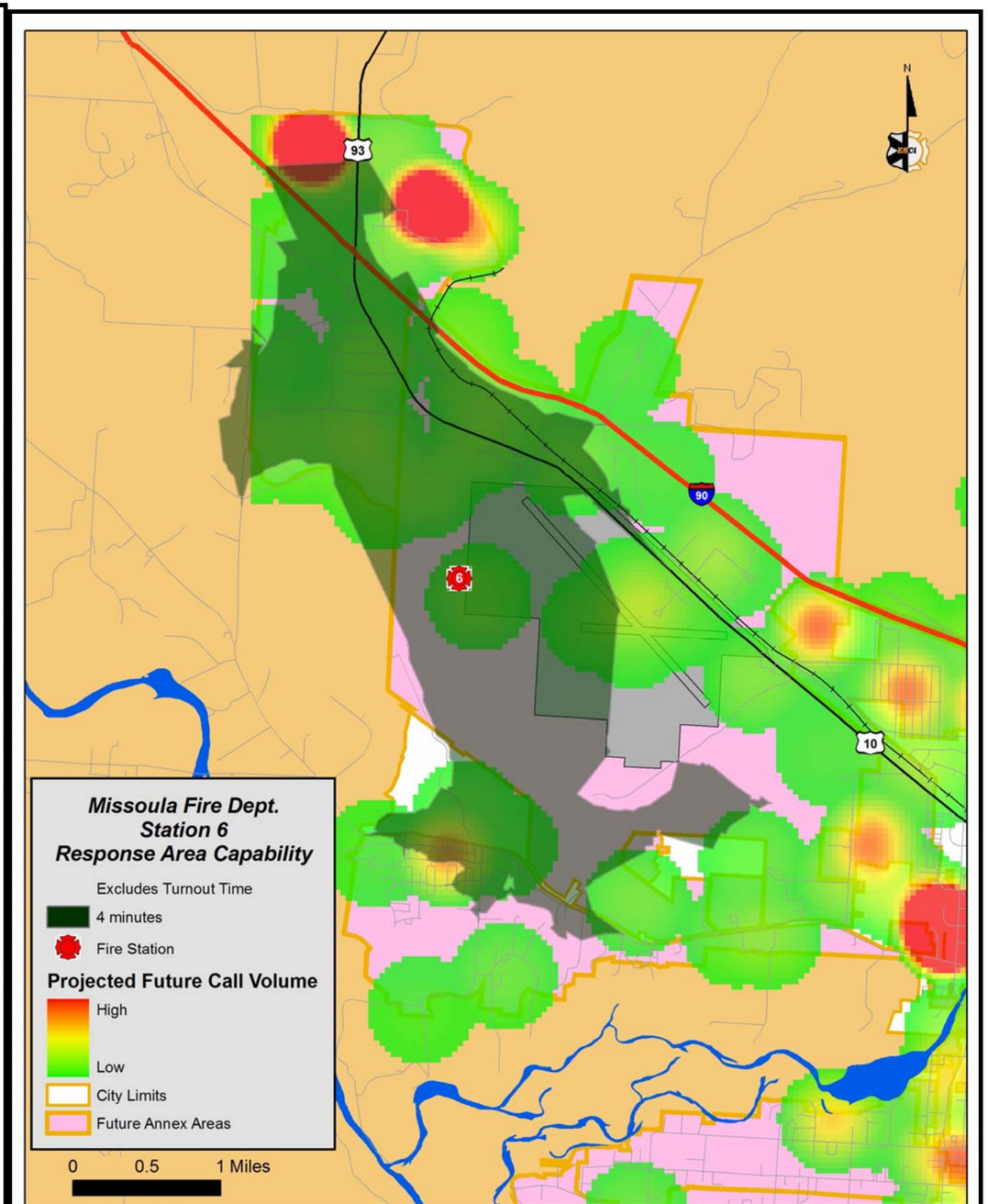

90
1
2
3
0 0.25 0.5 1 Miles
Missoula Fire Dept.
Station 1
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low

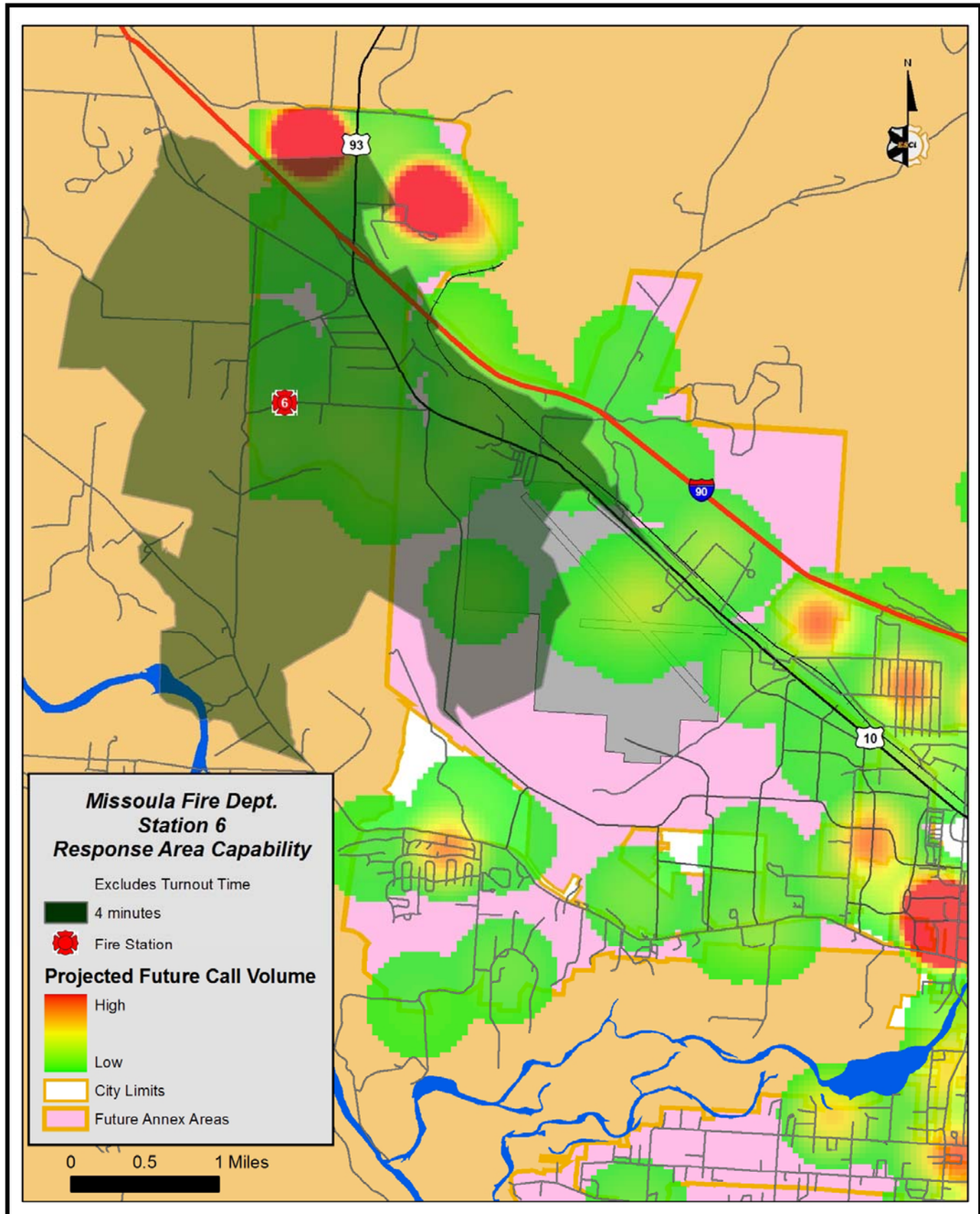

10
90
1
2
3
0 0.25 0.5 1 Miles
Missoula Fire Dept.
Station 2
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low

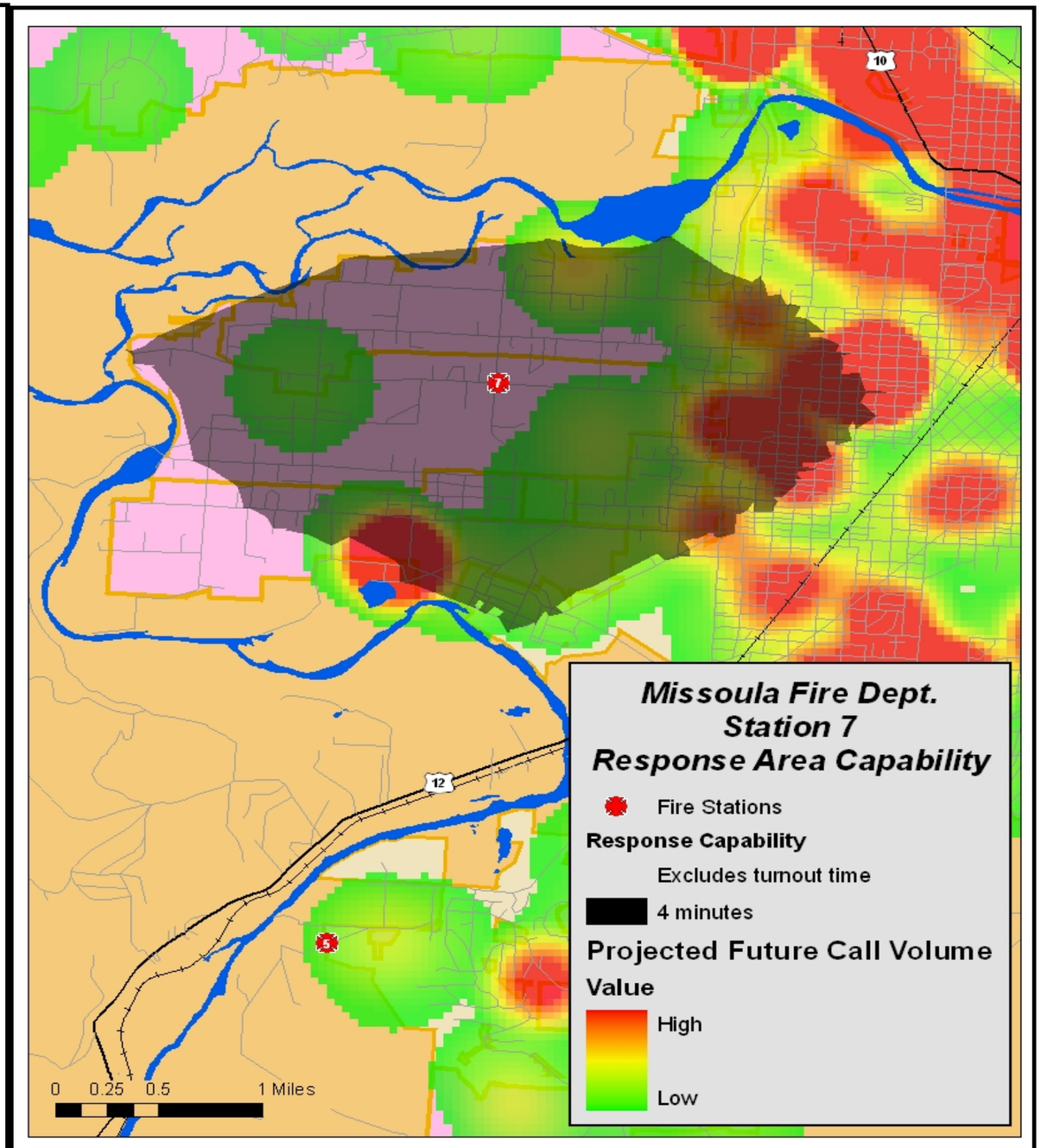

90
7
2
3
12
Missoula Fire Dept.
Station 3
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low
0 0.25 0.5 1 Miles

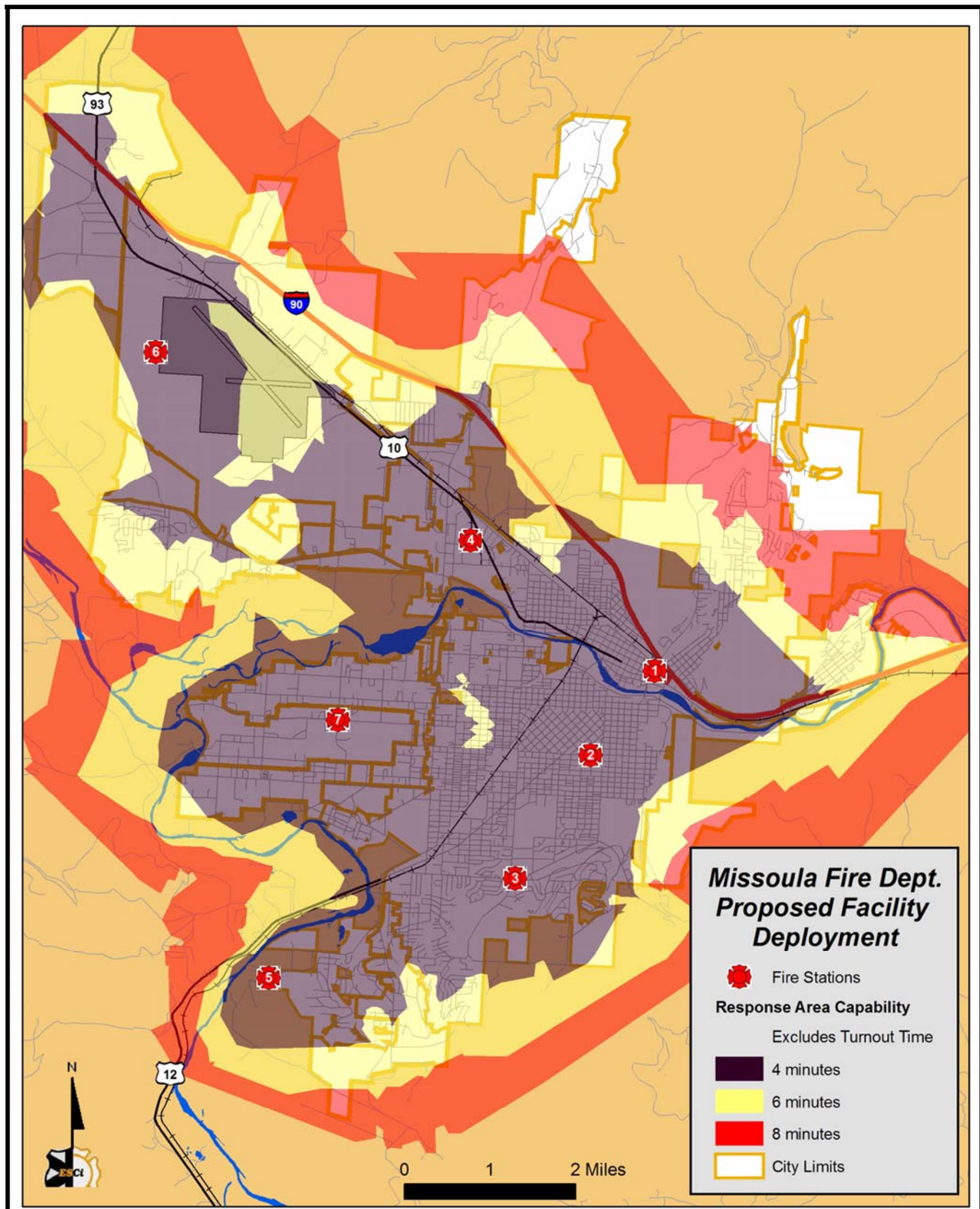

3
5
12
12
Missoula Fire Dept.
Station 5
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low
0 0.25 0.5 1 Miles

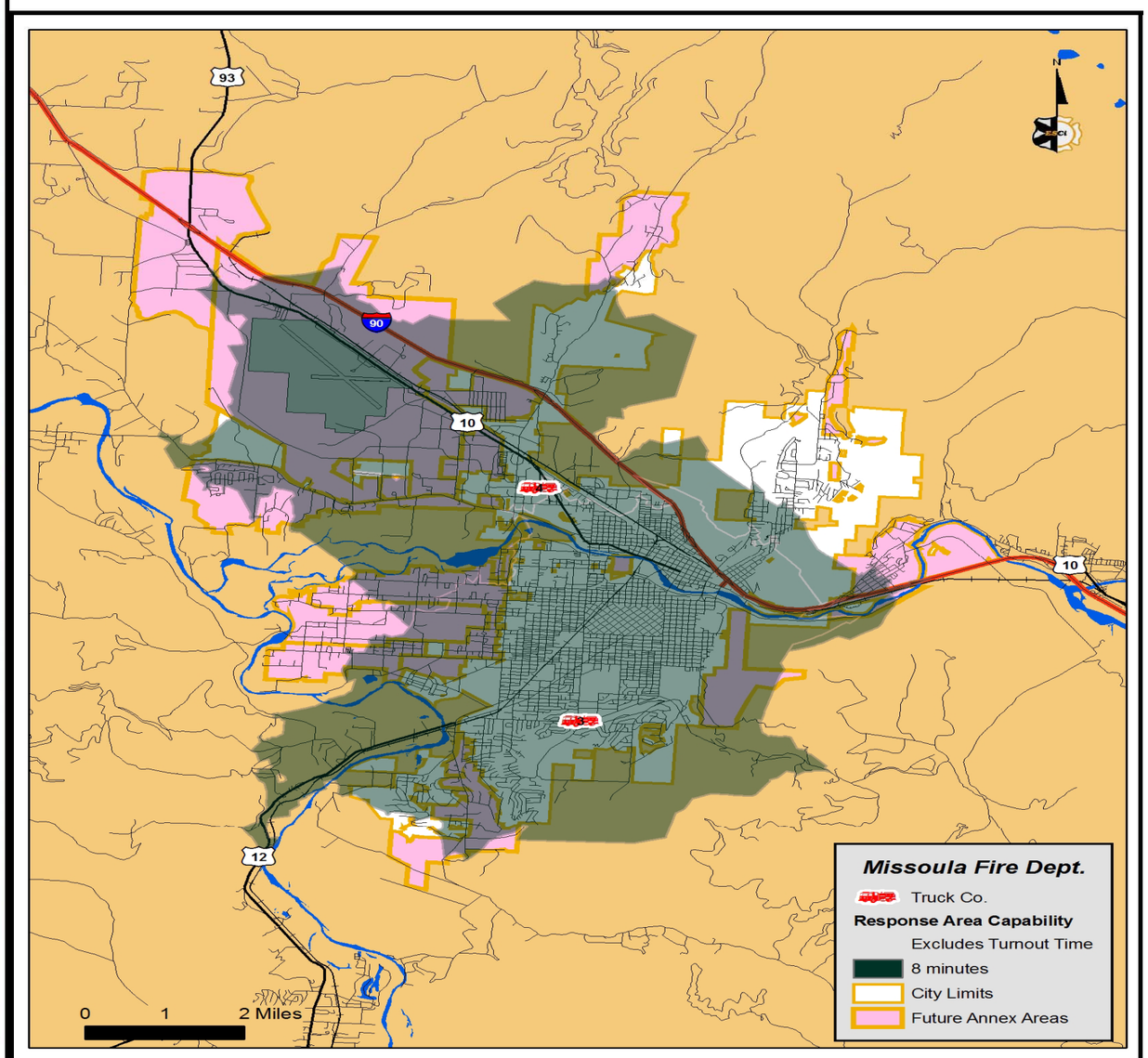

10
90
4
1
7
12
0 0.25 0.5 1 Miles
Missoula Fire Dept.
Station 4
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low


N
93
90
6
10
Missoula Fire Dept.
Station 6
Response Area Capability
Excludes Turnout Time
4 minutes
Fire Station
Projected Future Call Volume
High
Low
City Limits
Future Annex Areas
0 0.5 1 Miles


N
93
6
90
10
Missoula Fire Dept.
Station 6
Response Area Capability
Excludes Turnout Time
4 minutes
Fire Station
Projected Future Call Volume
High
Low
City Limits
Future Annex Areas
0 0.5 1 Miles


10
7
12
5
0 0.25 0.5 1 Miles
Missoula Fire Dept.
Station 7
Response Area Capability
Fire Stations
Response Capability
Excludes turnout time
4 minutes
Projected Future Call Volume
Value
High
Low


93
90
10
12
6
4
1
7
2
3
5
N
0 1 2 Miles
Missoula Fire Dept.
Proposed Facility
Deployment
Fire Stations
Response Area Capability
Excludes Turnout Time
4 minutes
6 minutes
8 minutes
City Limits


93
90
10
12
N
0 1 2 Miles
Missoula Fire Dept.
Truck Co.
Response Area Capability
Excludes Turnout Time
8 minutes
City Limits
Future Annex Areas