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Overview of the Standard of Emergency Response Coverage

The Standard of Emergency Response Coverage (SERC) document exists to serve a variety of purposes for Portland Fire & Rescue (PF&R). It is the main tool leaders use to evaluate and make decisions about the distribution and concentration of resources. By studying five main components of the Standard of Coverage systems approach as defined by the Commission on Fire Accreditation International (CFAI), PF&R was able to develop this document with a high degree of confidence. Those five components include:

- Existing Deployment
- Risk Identification
- Risk Expectations
- Service Level Objectives
- Distribution

Studying the performance of an emergency response agency such as PF&R covers many areas and must address many questions, such as:

- What type of emergency response apparatus, with what staffing levels, should be stationed in what locations, at which hours of the day?
- What is the expected workload of each company (Resource Utilization Ratio)?
- What does the demand for service in each area look like, and what are projected demands?
- What levels of service should PF&R provide within each emergency discipline?
- Are station response time goals appropriate for service delivery capabilities?

The purpose of the SERC document is to provide the following:

- A baseline tool for defining emergency response performance standards and goals
- A summary of community risk (life, safety, and economic)
- An analysis of critical emergency scene tasks, which should assume maximum use of all personnel under a "worst-case" scenario
- A basis for continually measuring performance over time
- A guideline for PF&R's Continuous Quality Improvement (CQI)programs
- A guideline for policy decisions dealing with resource expansion and allocation as PF&R plans for the next five-to-ten year period

This document also serves as PF&R's SERC, a critical element of the accreditation process of the CFAI. SERCs are the written procedures that determine the distribution and concentration of the fixed and mobile resources of a fire and rescue organization. This standard of coverage includes eight key points; there is a section for each point, and additional sections for future needs and service goals. Descriptions of each point (or topic), current practices, facts, and proposed changes are presented in each section.

The SERC is developed through the evaluation of PF&R's present practices and historical response data. The results of these analyses are then used to make formal statements of the level of service that PF&R could be expected to deliver. This document and its contents will be reviewed biannually to determine if the level of service and/or established goals are appropriate.

SECTION ONE: Introduction

Overview of Department

Portland Fire & Rescue (PF&R) is Oregon's largest fire and emergency services provider.

Within its legal boundaries (and including contract areas), PF&R provides fire, medical (emergency medical service [EMS]), and special response services to an area of approximately 151.6 square miles, within which reside some 563,916 people (see table below). The daytime population increases significantly during normal business hours in the Downtown and Central Eastside areas. PF&R provides services to a wide range of occupancies including high-rises, commercial/ industrial, institutional (e.g., schools, hospitals, etc.), and residential. PF&R protects real property with an assessed valuation estimated at $41.9 billion, and the real market value is $73 billion. PF&R currently enjoys a Class 2 rating (on a scale of 1-10) from the Insurance Service Organization (ISO), although PF&R has not been rated since 1972.

Table 1.1
Legal Jurisdiction

City of Portland	562,690	146.6	$41,802,000,000
*Contract Area: Maywood Park (Dist.10)	750	3	$47,300,000
*Contract Area: Burlington Water Dist.	476	2	$26,900,000
TOTALS	**563,916**	**151.6**	**$41,876,200,000**

For purposes of this document and the CFAI accreditation process, the SERC established herein applies only to those areas within PF&R's legal jurisdiction. The SERC in areas served under contract or mutual aid agreements are subject to a variety of additional considerations, including local service level and fiscal determinations, that are incorporated at the time the service commitments are made. PF&R has committed itself to providing all service areas with the same level of attention provided within its legal jurisdiction, subject to determinations made and agreed to in conjunction with its partners.

PF&R is legally established by the City of Portland Amended City Code, Title 3 Chapter 3.22, stating "Portland Fire & Rescue of the City shall be organized by the Council and the members appointed as provided by the Charter, subject to the Civil Service rules of the Charter, and thereafter, subject to the restrictions contained in the Charter." Portland's Charter is granted authority by Article XI, Section 2, of the Constitution of Oregon. A City Mayor and four City Commissioners make up the City Council, which is elected by the citizens of Portland. The Fire Chief is appointed through a competitive recruitment and

selection process. A Bureau Advisory Committee, consisting of citizens appointed by the PF&R Core Leadership Team, assists PF&R with on-going business issues.

SECTION TWO: Standards, Goals, and Objectives

Prior to the 2004 adoption of PF&R's first SERC, PF&R operated under principles from a variety of other documents, including:

- The Five Year Strategic Plan
    - Mission, Goals, Strategic Directions, and Action Items (including performance measures)

- Annual Business Plan
    - Divisional Work Plans
    - Major Initiatives
    - Quarterly Reports on the Business Plan

- General Orders
- Operational Guidelines
- Standard Operating Procedures
- EMS Protocols and Reference Guide
- Training Bulletins
- Prevention Standard Operating Procedures
- Chief's Official Memoranda

These documents provide guidance for line and administrative functions, and are updated on both a scheduled and unscheduled basis.

PF&R's Five Year Strategic Plan was adopted and implemented along with non-strategic tasks through the Annual Business Plan. Important elements of the Strategic Plan and Business Plan include PF&R's mission, vision, principles, and goals, which include the following:

Mission

To aggressively and safely protect life, property, and the environment by providing excellence in emergency services, training, and prevention.

Vision

The community we serve is safe from fire, injury, and preventable emergencies because of our responsiveness, leadership, quality services, and partnerships.

Principles

- We save lives and property – committed to delivering high quality emergency response, fire and life safety, and mitigation services.

- We set high standards for ourselves – valuing and promoting professionalism, diversity, integrity, pride, competency, commitment, and tradition.

- We are highly trained – using the latest techniques and technology to ensure a safe and effective workplace.

- We are responsive to our customers – always ready, always there, providing efficient and effective services to the public and each other.

- We are good neighbors – working together to promote caring and trusting relationships that let us solve problems safely and courteously.

Major Initiatives

- *Implement Cultural Assessment Study recommendation.*
  PF&R responds to a very diverse population, and is continuing to improve cultural diversity within its workforce. In order to maintain a culturally competent workforce, PF&R will undertake an organizational development and cultural reassessment to determine the current state of cultural competency within the bureau and establish next steps.

- *Pursue a fee-for-service agreement with the Port of Portland for emergency response and inspection services at the Portland International Airport and the Port of Portland.*
  PF&R currently has an agreement in place with the Port of Portland for inspection of commercial occupancies at the Portland International Airport and Port of Portland. The Port responds to an average of 282 mutual aid incidents with PF&R per year, while PF&R responds to an average of 80 mutual aid incidents on Port property. It does not appear to be cost effective for PF&R to ask for a fee-for-services agreement for mutual aid response at this time.

- *Ensure terrorism preparedness.*
  PF&R is continuing to work with regional partners to improve efforts in the areas of emergency and terrorism preparedness. PF&R is coordinating and carrying out strategic actions, which will ensure that the City of Portland is prepared for major events.

- *Adopt urban wildfire hazard zones in the City of Portland.*
  PF&R continues to work with other Bureaus and private citizens to refine structural requirements and the requirements for maintaining defensible spaces in an effort to mitigate the losses expected from serious urban wildfires in Portland

- *Plan and implement a Safety Learning Center and Fire Museum.*
  PF&R is working with grant funds to improve its Safety Learning Center and Fire Museum

- *Sprinkler initiative: Seek requirements related to fire damage repair.*
  PF&R is working with regional partners to implement a sprinkler initiative through the state legislative process.

- *Expand leadership/management development training.*
  PF&R will intensify training in management/leadership abilities in order to increase effectiveness at all levels of the organization. Subjects as diverse as developing a positive workplace environment, to incident management of major catastrophic events and officer training, will be included. More structured training in this area will cultivate future leaders and better define the management/leadership development path.

- *Complete feasibility study on implementing Candidate Physical Ability Testing (CPAT).*
  PF&R has implemented a CPAT program for entry-level firefighters.

- *Seismically upgrade fire facilities through General Obligation (G.O.) Bond Funding.*
  PF&R has completed approximately eighty-five percent of the G.O. Bond program to seismically retrofit existing stations and other facilities, relocate stations for response time improvements, and build new stations to address growth in the city. The remaining projects include retrofit its Administration Building, housed above Station 01, Station 31 remodel, and building Station 21.

Goals

- Keep the city safe from low-frequency/high-consequence events.
- Maximize dispatch effectiveness.
- Improve technology use and system implementation.
- Implement resource demand management and response strategies.
- Improve quality, value, efficiency, and timeliness of external support services.
- Enhance effectiveness of internal communication.
- Educate employees about internal planning process.
- External and internal customers experience consistent, timely, quality customer service from all levels of the organization.
- Maintain a highly trained and educated workforce.
- Enhance the safety and health of the workforce.

- Demonstrate leadership in the area of cultural competency by achieving a work environment where all employees are treated with respect and dignity.
- Enhance effectiveness of staffing and human resource processes.
- Effectively manage overall PF&R costs.
- Secure stable funding for all PF&R operations.

Standards

For the purposes of quality improvement measurement and quantification of data, items which are listed in this document as a "PF&R Standard" shall be considered achievable with current physical resources, staffing, and levels of funding. Anything that affects funding, staffing, or resources in an adverse manner will have a negative effect on deployment standards, and will require an immediate analysis to make appropriate adjustments to the SERC.

Service Delivery Goals

Specific goals related to staffing, response times, and infrastructure development may be stated in this SERC document and should be considered as PF&R's desired level of service.

When changes are recommended for a PF&R standard, or if a new standard is being developed, the goal (or desired level of service) is referenced in Section Four, and the following information will have been provided in a separate attachment for every goal:

- National, regional, or local standard used to establish goal
- Brief report or statement confirming that the desired goal is applicable to PF&R, considering its resources and the risk analysis
- Estimated cost to implement goal (for example, if additional staffing is required, estimate costs of Full Time Equivalents [FTE])
- Desired timeline for implementation of the goal
- Method to measure stated goal and/or objective (performance measure)

If the goals are included in Section Four, then the above has been thoroughly completed, and PF&R's Core Leadership Team has reviewed and approved the service goals for implementation. These goals/objectives may also be discussed at the Labor Management Committee (LMC) comprised of PF&R management and Portland Fire Fighters Association (PFFA) Local #43 representatives.

The CFAI process provided PF&R with an opportunity to look more closely at how resources are managed using sound data and logical processes. In 2005, TriData, a division of System Planning Corporation, was hired to evaluate PF&R's resource allocations and service delivery methods and provide options for meeting current and future service demands. Those findings and recommendations were

incorporated into the Bureau's Annual Business Plan and Five Year Strategic Plan. PF&R will continue to use a broad, community-based strategic planning process, and a biannual review of the SERC document to guide its planning and resource deployment.

SECTION THREE: Risk Assessment

A fire risk assessment traditionally consists of an analysis based on six key elements: fire flow (water), probability, consequence, occupancy risk, demand zones, and community profile. In addition to the traditional fire elements, response performance standards must include consideration of the topography and the transportation network over which emergency responders travel to meet the demands for service, the nature of emergency response activity, and patterns of future property development and population growth. Risk assessments must also consider the elements of risk that exist for non-fire related situations, such as EMS, technical rescue, and marine response. It should further be noted that the quantification of risk could be either *subjective* or *objective*:

- Subjective risk is essentially interpretation of unclear data, non-expert perception, or anecdotal evidence.
- Objective risk is identified by evidence-based research, data analysis, statistical information, and other material.

PF&R has used a hybrid approach to accomplish its risk assessment, using both objective and subjective risk information. Through a methodical analysis of the risk dynamics present in a given community, a risk assessment makes it possible to develop rational resource deployment strategies. The goal of the risk assessment process is to determine the ***probability*** of an event occurring, as well as the ***potential consequences*** (hazard assessment) of that event. From this analysis, the agency defines its ***level of response*** to these events.

The resources that are **available** to respond, and the **safe deployment** of those resources, are described in Section Five under "Critical Tasking" and "Establishment of an Effective Response Force." This is a critical component of PF&R's SERC because different communities may adopt dissimilar resource deployment plans for the same types of emergency events. These decisions are typically based on distribution of community resources, personnel, funding, existing infrastructure, geographic considerations, and a host of other factors.

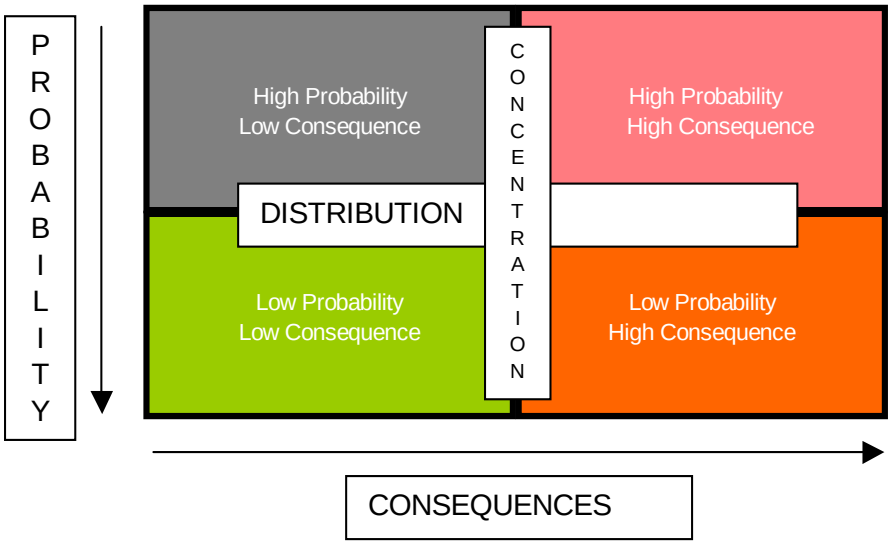
In Section Five, establishing an effective response force is predicated upon the level of service that the community or City Council desires to support. For example, some communities may accept that they are only able to safely fight residential structure fires in a "defensive" mode (i.e., fire extinguished from the outside), thereby allowing a smaller response force. When stated in a SERC document, there should be an implied understanding that this type of response is accepted in the community and by the City Council. Consequently, a lower level of service would be provided (assuming the same level of resources) in a similarly sized community that has elected to dedicate the funding necessary to assemble an adequate "offensive" (i.e., interior fire extinguishment) firefighting force.

Through methodical analysis of the risk dynamics present in a given community, a risk assessment makes it possible to develop rational resource deployment strategies. The goal of the risk assessment process is to determine the probability of an event occurring, as well as the potential consequences of that event.

Risk Assessment Components[1]

The Risk-Based Response Polygon displayed below provides guidance on a rational strategy for company deployment.

Figure 3.1
Probability vs. Consequences



Each event included in the risk assessment can be placed on the graph, in the quadrant showing the proper ratio between the probability of occurrence and the consequences of occurrence for that type of event. The quadrants also help define the relationship between community requirements and the commitment of resources.

A community risk assessment process may include 1) defining the differences between single-family dwellings, multiple-family dwellings, large industrial or commercial campuses, and high-rise residential or commercial structures; then 2) assigning each type to the appropriate of the Risk Based Response Polygon. PF&R distributes fire stations and apparatus uniformly throughout the community to provide prompt initial response to all types of incidents. Conversely, PF&R may need to concentrate resources in high-consequence areas for a large-scale response to an unlikely, but highly consequential event.

[1] Adapted from Hunt, *Risk Based Response Criteria*, WFCA Newsletter, August 1998 pp. 12-13. Credit also to the California State Fire Academy Class "Standard of Coverage", from which Mr. Hunt adapted his article.

Factors Unique to PF&R

PF&R serves the City of Portland with a high concentration of resources close to the urban center, and with a lower concentration of resources as the neighborhoods become more uniformly residential (see map in Attachment A). This is in direct response to the location of high-consequence areas, which could require significant resources. PF&R's response area includes 26 different planning zones ranging from residential (single- and multi-family) to industrial, including commercial areas, parks and open spaces, and single-family residences (See map in Attachment B). The 26 zones appear throughout the city, with single family residential zones existing in most areas. Although these planning zones are widely dispersed, PF&R uses the zones to identify key areas of the city, such as a downtown business core, an industrial zone, and well-established residential neighborhoods. Portland's diverse mix of development includes many old buildings without the benefit of modern, fire-resistive construction methods demanded by building codes. Knowing this, PF&R is proactive in using its Fire Prevention Division to conduct regularly scheduled fire inspections in all commercial, industrial and public/institutional occupancies.

PF&R receives water service from the City of Portland Water Bureau, and has adequate densities of fire hydrant availability throughout most of its service areas; however, many "open space" and forested areas are without piped water supply and "water tender" apparatus must assist in its delivery for fire suppression efforts (see map in Attachment C).

Station Locations

Prior to 1993, PF&R located stations based on incident demand, the likelihood of simultaneously occurring emergencies, and the ability to assemble an adequate response force within specified time objectives. This required siting stations and apparatus according to predictions of fire incident response, although apparatus use is primarily impacted by EMS incident response. Thus, because the incidence of actual fires is quite low, historical coverage determinations with respect to fire were based mainly on geographic response time factors.

In order to more scientifically and comprehensively determine station locations and coverage determinations, PF&R enlisted TriData Corporation in 1993, and again in 2005, to collaboratively evaluate emergency services delivery. TriData's work also included forecasting demands for services and establishing alternatives for addressing those demands. In order to conduct a thorough analysis, a computerized incident workload-forecasting model was implemented using a spreadsheet program. This model provided a tool for long-range forecasting of the following key indicators: incidents based on different population forecasts, per capita incident rates in each Fire Management Area (FMA), incident growth rates, and different ratios of actual situations found compared to the initial reason for

dispatch. The information generated from this model became the basis for deployment analyses performed by TriData in 1997.

TriData worked closely with PF&R to complete a deployment study in 1997, which recommended various station relocations and the construction of new stations to meet service demands. TriData used the "Fire Router" computer model as the tool to evaluate response times for all FMAs. Fire Router allowed many different station locations and deployment configurations to be evaluated in order to identify the most effective and efficient options. Dependent upon the street network, Fire Router predicted response times to each of the FMAs. Fire Router assumed a 4-minute response time objective and an average apparatus speed of 25 miles per hour, resulting in a travel distance of about 1.1 miles (1.1 mile station radius). Fire Router also considered the impact of traffic calming devices on response times and distance traveled.

Based on the scientific findings in the 1997 TriData report, PF&R identified the need for additional fire stations and the relocation of others. These needs, as well as the necessity to bring fire facilities up to seismic codes for essential facilities, prompted PF&R to hire Degenkolb Engineers to conduct a comprehensive Fire Facility Improvement Plan in 1998. Subsequent to this Plan, the citizens of Portland passed a G.O. Bond, which currently funds seismic rehabilitation, new construction and existing station retrofitting. Due to delays it is taking longer than expected to complete the G.O. Bond projects, however, by the end of the G.O. Bond Program PF&R will be able to provide the appropriate mix of station locations.

In 1997 and 2005, TriData noted that even after new stations were built and existing stations were relocated, PF&R would still realize coverage deficiencies in several areas of the city. When the G.O. Bond Program is complete, PF&R will be able to better assess the validity of this suggestion. The G.O. Bond Program is expected to be substantially complete in 2012.

In 2005 TriData noted the need to adjust resources now to offer better coverage and response times in the area. TriData recommended proceeding with current plans to move Station 18 southwest of its current location to be near the intersection of SW Capitol Highway and Interstate 5, and continuing discussions with Tualatin Valley Fire & Rescue (TVF&R) on the possibility of a jointly owned and operated station. If these changes were to occur, TriData believes the response times in the southwestern quadrant of the City would improve. In addition, they recommended that Truck 1 be relocated to Station 5.

Managing Growth

Metro is a regional government that was established in 1978 by the voters of Clackamas, Multnomah, and Washington counties. Metro coordinates the land-use plans of the region's 27 jurisdictions. State land-use laws required Metro to establish a regional urban growth boundary (UGB) and empowered the Metro

Council to make binding policy decisions regarding development within the boundary. As such, PF&R has no control over the UGB, construction limits, or infrastructure limits. PF&R provides response services to the citizens of Portland within the UGB, and relies on neighboring jurisdictions to provide services to their communities, which may or may not be part of the UGB.

In 1995, Metro Council adopted the 2040 Growth Concept (see map in Attachment D), which ensures that land-use decisions are guided to the following:

- Encourage more efficient use of the land in cities, business centers on "main streets," and on major transit routes
- Protect natural areas, parks, streams, and farmland both inside and outside the UGB
- Promote a transportation system that includes all types of travel, such as bicycling, walking and using mass transit, as well as cars and freight
- Work with neighboring cities just outside the region - such as Sandy, Canby and Newberg – to keep the separation between communities
- Promote diverse housing options for all residents of the region

The 2040 Growth Concept encourages growth in centers and corridors with increased emphasis on redevelopment within the UGB. Planners predict that 15,000 to 19,000 acres will be added to the UGB over 50 years (See Attachment E).

With planned growth, the issue of regional transportation planning comes to the forefront. Over the next 15 years, Metro will implement transportation plans, seeking to:

- Ensure livability
- Expand transportation choices to provide alternatives to driving
- Provide good access to jobs and industry
- Reduce the need to drive by making jobs and shopping more convenient
- Maintain access to natural areas

Funding for Growth

The City of Portland will have limited tax increment funding available for certain portions of the city that will ensure improvements in areas which may be targeted for growth (see map in Attachment E). Tax increment funding is available for Urban Renewal Areas (URA), which exist in the downtown core, inner northeast, and the far east of the city.

Development and Population Growth

The metropolitan Portland area is one of the fastest growing areas of the United States. Although projections of population are tenuous at best and subject to the national economy, some forecasters predict an increase of 40 to 50 percent over the next 30 to 40 years. Because of Oregon's strong land-use planning laws, this growth is expected to occur in two fashions.

Residential and commercial development will occur in lands currently designated by Metro as "urban reserves." Additional growth will occur on lands currently within the UGB through a process of "infilling" on unbuilt land with high-density residential construction. Based on Metro's evaluation of buildable lands within the UGB and urban reserves, PF&R can expect a population increase of between 9,000 and 20,000 persons per year for the next 25 years (three to six percent annual population growth). A map showing the locations where this growth will likely occur is included in Attachment E. Current population distribution can be seen on the map in Attachment F.

Transportation Networks

Compounded by population growth, perhaps the greatest challenge to PF&R's response performance lies with the transportation network throughout the city of Portland. Within the core area of the city, the transportation network merges and interchanges. Several major freeways connect the east and west sides of the city over several bridges. Additionally, Portland has two complete rail yards, four smaller rail yards, and several tank farms, which pose significant hazards. To the north, PF&R serves the buildings of Portland International Airport, as well as an international port.

Within five miles of the downtown core, the increased daytime population density and related rush hour traffic can affect response times. Periods of rush hour congestion are steadily increasing in length and on some arteries, particularly Interstates 5 and 84 and Highway 26, traffic is heavy throughout the daytime hours. As stated earlier, the Metro Growth Plan hopes to positively impact traffic burdens on city livability, which would ultimately improve response efforts. Portland enjoys good mass transportation systems; however, most commuters continue relying on their personal vehicles. Metro hopes to make other alternatives more attractive to commuters.

Traffic calming devices, such as "roundabouts" and "speed bumps" exist in many neighborhoods in an effort to reduce residential speeds and provide a safer environment for pedestrians (see Emergency Response Route Map with Speed Bumps Attachment G). All these have proven to incrementally slow the response of large fire apparatus, in some cases, by as much as 15 seconds for every device that is encountered. Maintaining a balance between safe neighborhood streets and adequate response times is difficult under these circumstances.

Given Portland's steep West Hills, PF&R responders must maneuver through narrow and winding streets. Fortunately, this largely residential response area is not highly dense and incident counts are relatively low.

Within the last five years, one additional and significant piece now affects PF&R's transportation infrastructure. The "West Side Light Rail" now bisects the western portion of PF&R's jurisdiction. With its associated "West Side Light Rail Tunnel,"

which straddles the PF&R – TVF&R border, this new transportation service has added another element to PF&R's response planning efforts.

As previously mentioned, PF&R protects the facilities of Portland International Airport, while the Port of Portland provides airport fire and rescue services to tarmac areas and the aircraft (see map in Attachment H). The airport is located along the Columbia River which borders the states of Washington and Oregon. The surrounding area is in the process of development with hotels and commercial buildings. Light rail has expanded into this area and Metro growth plans provide for increased density.

Topography

PF&R's service area features a diverse topography (see map in Attachment I). In the core area, the terrain is essentially flat, with one significant river flowing through the downtown core (the Willamette River), and one significant river flowing alongside northern response areas (the Columbia River), delineating the border with Washington State. On the east side, Portland is relatively flat, aside from Powell Butte, Mt. Tabor and Rocky Butte, which are small well-distanced mountains. All three have residential and some commercial occupancies on and around them, posing urban/wildland interface issues. On the west side of its jurisdiction, PF&R faces hilly terrain and winding roads, as well as Forest Park.

Forest Park was acquired by the City in 1948 and spans approximately 5,090 acres. Hiking, biking, and equestrian trails intertwine in a 40-mile loop inside the park. More than 110 different species of birds and 50 different species of mammals have been seen in Forest Park. Seven other parks are incorporated within Forest Park, but Forest Park as a whole is the largest wilderness park within city limits in the United States. This creates challenges for PF&R from a response standpoint, as the main access routes are steep. Fire lanes (access routes for firefighting apparatus) are narrow and sparse, and water tenders are required to supply necessary water for firefighting efforts.

With such a diverse topography, PF&R faces potential flood and slide hazards (see map in Attachment J). The City of Portland has experienced floods and slides in recent years.

To fully illustrate the abundance and location of various topographical elements located in the City of Portland, a map illustrating terrain features and waterways can be found in Attachment I.

Types of Calls to Which PF&R Responds[2]

During fiscal year 2006-07, PF&R responded to 65,304 incidents. Using the call classification scheme developed by the National Fire Protection Association (NFPA), a distribution of calls where the classifications are known is shown in Table 3.1.

Table 3.1
National Fire Protection Association Call Type

NFPA CALL TYPE	SUB-TYPE	CALLS FOR SERVICE 7/01/06 - 6/30/07	PERCENT
FIRE	Structural	757	1.2
	Brush/Wildland	706	1.1
	Vehicle	405	.6
	Trash	347	.6
	Other	266	.4
	Sub-Totals	**2,481**	**3.9**
EMS	Code 3 Call Type (priority)	40,297	64.2
	Code 1 Call Type (non-priority)	2,220	3.5
	Sub-Totals	**42,517**	**67.7**
SERVICE		**6,032**	**9.6**
OTHER		**11,797**	**18.8**
TOTAL		**62,827**	**100**

Note: In Fiscal Year 2006-07 a significant number of calls for service at the Portland International Airport were excluded from the Incident database. Because little information remains related to those calls they are not reflected in this document.

Risk Evaluation - General

Many fire departments classify risk according to a graded system, which uses defined terms such as "maximum risk", "high risk", "medium risk", or "low risk" to classify the areas they protect and to develop response programming based on those classifications.

This, too, was the case in 1997 and 2006, when fire risk levels were first evaluated as part of the TriData Study. At that time, the determination of risk did not take into account enough risk variables to support sound decision-making. Today, PF&R takes a more comprehensive look at risks in order to establish response capability objectives and deployment standards.

PF&R believes that all areas it serves require the same level of response performance and infrastructure; however, given factors such as topography, coverage area, and resource levels, PF&R has established three Response Categories within its jurisdiction.

[2] All data used in this report are based on validated fiscal year incident information. All data were generated by the Computer Aided Dispatch (CAD) system at Portland Bureau of Emergency Communications (BOEC) 911-Center and/or on data entered into PF&R's Incident System by emergency response personnel.

The categories are called Core, Urban, and Outlying (see map in Attachment K). The Core area includes the downtown and inner-city FMAs. The Urban area includes residential and light industrial areas outside the Core area. The Outlying area includes the perimeter of PF&R's jurisdiction, including some areas within the UGB, such as Forest Park, where current road infrastructure and distance from stations does not allow for Core or Urban category response times. Further, the population density does not call for Core or Urban category levels of service. These three categories were defined in order to establish reasonable performance standards for response companies.

Substantial wildland hazard areas exist within the Urban category, consistent with statewide efforts to maintain forested and open space areas even within cities. These are addressed from a prevention standpoint through new regulation pertaining to the land development process. In addition to these designations, PF&R conducted a special assessment of its wildfire hazard locations. A map showing the locations of identified wildfire areas, overlaid with PF&R's FMAs, is included in Attachment L. This information has been made available to the Bureau of Emergency Communications (BOEC) and neighboring fire and emergency services providers.

Objective Risk

PF&R uses a Risk, Hazard, and Value Evaluation (RHAVE) process to stratify risk into more definitive categories and determine the values exposed to loss, the probability of an event occurring, and the consequences that such an event may have on the community. PF&R believes primary risk falls into four general categories in declining order of severity: life risk, community economic risk, environmental or historical risk, and pure dollar loss. All of these risk types exist in PF&R's response area. Examples of the risk types are described below:

1. Life Risk: Any location that presents a high risk of life loss, such as high-density housing (particularly non-sprinklered and older structures), foster care homes, skilled nursing facilities, hospitals, housing within close proximity to hazardous manufacturing or storage, day-care centers, and schools.
2. Community Economic Risk: Those facilities that have a high dollar value, which, if destroyed or damaged by fire, could see a closing or relocation of economic activities, permanently or temporarily--placing a severe economic burden on the community through the loss of jobs and/or tax revenue. This category also includes critical infrastructure of primary importance to the economic health and safety of the community, such as utilities, roads, and bridges.
3. Environmental or Historical Risk: Any area where a high risk of severe or permanent environmental damage would likely occur in the event of a fire incident or hazardous material spill, or any structure of significant historical significance to the community.

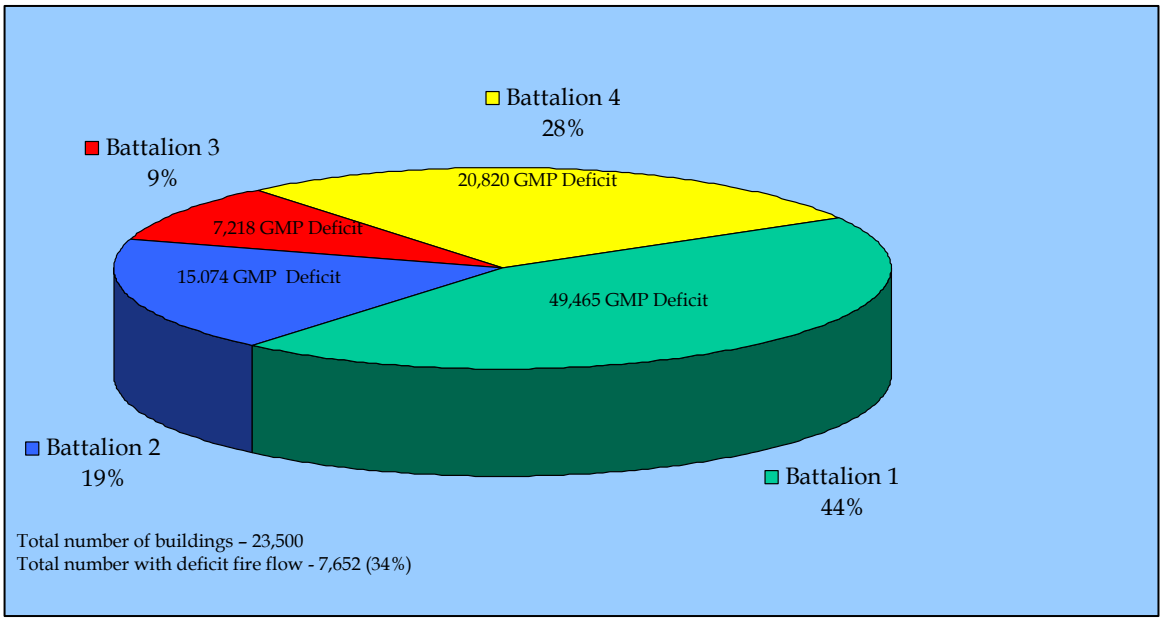
4. Pure Dollar Loss: Structures that have high value, but pose a low risk of life loss or community economic impact and are typically fully insured against loss. Examples include large rural residential and farm structures, and some commercial buildings housing primarily inventory.

PF&R completed the RHAVE Study in March of 2007, and found that a substantial amount of defining risk information about occupancies is not currently being collected in the field. As a result, PF&R made many assumptions about the buildings it serves based on the limited amount of information available. A detailed list of those assumptions is included in Attachment M. PF&R will work with labor and management to establish a mechanism for collecting more complete information about buildings and occupancies.

The results of the RHAVE study, albeit vague, do show that approximately 34 percent of Portland's occupancies require fire flows for suppression that are greater than what PF&R can provide (see map in Attachment N). Unfortunately, only 10 percent of these occupancies feature sprinklers. However, the majority of the high-risk occupancies (as classified by RHAVE) are located in areas of the City where additional PF&R resources are easily accessible, such as the downtown core (see Attachment O). Also note that many high-rise buildings generated the highest Occupancy Vulnerability Assessment Profile (OVAP) score, which stemmed directly from the fire flow requirements and associated inadequacies. Many of these occupancies would call for a defensive attack, necessitating lower fire flow requirements. This does not dismiss the buildings from being high risks; rather, it makes fire-risk planning efforts become part of a rational decision-making process. The Fire Flow Deficit by Battalion pie chart (Figure 3.2) illustrates that nearly 34 percent of the occupancies in Portland require more gallons per minute (GPM) than PF&R can provide with the existing water system in the City of Portland.

Portland believes its occupancies and buildings are safer than five years ago as a result of fire prevention efforts and code enforcement activities. PF&R officials inspect occupancies and cite the occupancy's owners when necessary for fire code violations, requiring them to take primary responsibility for safety in their occupancies. Portland uses professional inspectors within PF&R to implement the code enforcement program.

Figure 3.2
Fire Flow Deficit by Battalion



As seen in Table 3.2 below, PF&R broadly grouped the risk categories (high, moderate, and low risk) by fire battalion to illustrate the concentration of risks among battalions.

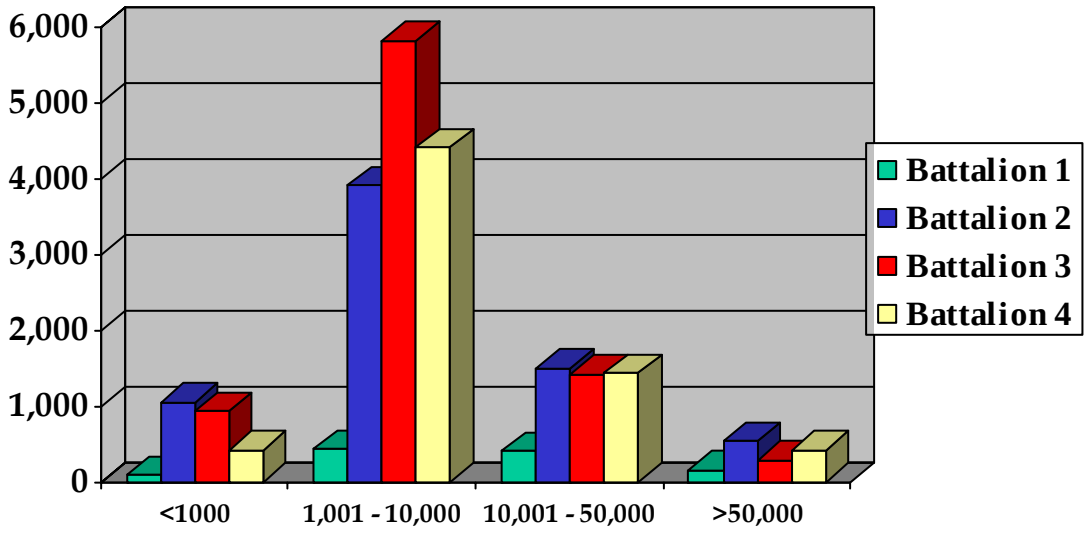
Table 3.2
Protected and Unprotected Risk Groups by Battalion

	Protected with Sprinklers					*Unprotected*				
Battalion	**High**	**Moderate**	**Low**	**Total**		**High**	**Moderate**	**Low**	**Total**	**Battalion Total**
1	7	20	438	465		5	31	627	663	1,128
	0.0%	0.1%	1.9%	2.0%		0.0%	0.1%	2.7%	2.8%	4.8%
2	94	201	1,080	1,375		190	522	4,937	5,649	7,024
	0.4%	0.9%	4.6%	5.9%		0.8%	2.2%	21.0%	24.0%	29.9%
3	40	147	754	941		149	332	7,056	7,537	8,478
	0.2%	0.6%	3.2%	4.0%		0.6%	1.4%	30.0%	32.1%	36.1%
4	27	73	812	912		68	219	5,487	5,774	6,686
	0.1%	0.3%	3.5%	3.9%		0.3%	0.9%	23.3%	24.6%	28.5%
NA	6	6	38	50		3	34	97	134	184
	0.0%	0.0%	0.2%	0.2%		0.0%	0.1%	0.4%	0.6%	0.8%
TOTAL	174	447	3,122	3,743		415	1,138	18,204	19,757	23,500
	0.7%	1.9%	13.3%	15.9%		1.8%	4.8%	77.5%	84.1%	100.0%

Figure 3.3 illustrates the size of buildings as dispersed among the four fire battalions within PF&R's jurisdiction. The Y-axis represents the number of buildings.

Figure 3.3 shows that the majority (14,572) of Portland's commercial buildings are between 1,001 and 10,000 square feet in size. There are 2,528 buildings of sizes fewer than 1000 square feet, and 4,788 buildings between 10,001 and 50,000 square feet. The smallest proportion (1,428) of buildings has more than 50,000 square feet. PF&R needs to be prepared to protect and serve all types of buildings within its jurisdiction.

Figure 3.3
Size of Building by Battalion



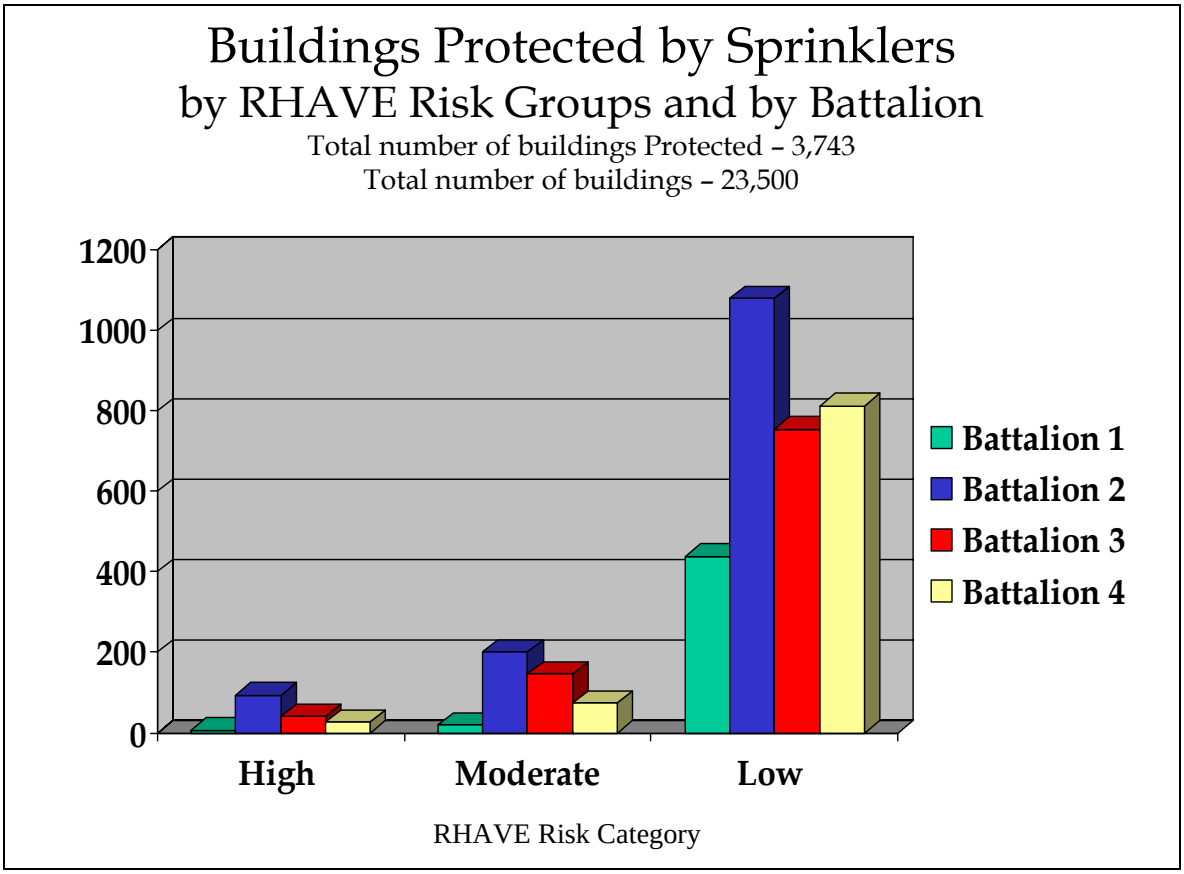
PF&R also analyzed buildings by type and battalion, as shown in Table 3.4. (Residential buildings listed in the table include only multi-family (3 or more) dwellings, such as apartments.) Of 23,500 commercial occupancies, nearly 50 percent are businesses, and 34 percent are multi-family residential. Based on fire history, these two types of occupancies fall into either the high-probability or high-consequence quadrants. This translates into a considerable number of emergency response calls and/or high risk/loss scenarios that can create economic hardships. It is a PF&R priority to prevent these losses by conducting safety code inspections to identify and correct hazards in commercial occupancies. At the same time, PF&R is prepared to provide emergency response to mitigate damages. Table 3.4 shows the dispersion of various occupancy types within the four fire battalions, with Battalion 3 having the largest share of buildings within its service area. There are 124 buildings that are not classified because they are not currently in use.

Table 3.4
Risk Type by Battalion

Type	Battalion 1	Battalion 2	Battalion 3	Battalion 4	NA	Total
Business	742 3.2%	3,698 15.7%	3,456 14.7%	2,970 12.6%	105 0.4%	10,971 14.7%
Residential	198 0.8%	1,716 7.3%	3,378 14.4%	2,714 11.5%	17 0.1%	8,023 34.1%
Assembly	56 0.2%	348 1.5%	479 2.0%	378 1.6%	5 0.0%	1,266 5.2%
Storage	27 0.1%	448 1.9%	315 1.3%	131 0.6%	16 0.1%	937 4.0%
Hazardous	12 0.1%	284 1.2%	189 0.8%	95 0.4%	9 0.0%	589 2.5%
Educational	18 0.1%	120 0.5%	241 1.0%	166 0.7%	0 0.0%	545 2.3%
Utility	39 0.2%	75 0.3%	166 0.7%	27 0.1%	6 0.0%	313 1.3%
Factory	5 0.0%	106 0.5%	65 0.3%	50 0.2%	3 0.0%	229 1.0%
Mercantile	10 0.0%	46 0.2%	45 0.2%	50 0.2%	0 0.0%	151 0.6%
Moorage	2 0.0%	94 0.4%	3 0.0%	25 0.1%	21 0.1%	145 0.6%
Unknown	11 0.0%	48 0.2%	47 0.2%	16 0.1%	2 0.0%	124 0.5%
Boardcare	7 0.0%	22 0.1%	40 0.2%	35 0.2%	0 0.0%	104 0.5%
Institutional	1 0.0%	12 0.1%	43 0.2%	28 0.1%	0 0.0%	84 0.4%
Total	1,128 4.8%	7,024 29.9%	8,478 36.1%	6,686 28.5%	184 0.8%	23,500 100.0%

Figure 3.4 organizes the same buildings by risk type and by battalion. As shown in Table 3.2, of these 23,500 buildings only 3,743 are protected by suppression systems (sprinklers). Fortunately, of the 19,757 unsprinklered buildings all but about 400 currently present low or moderate fire risk. This is to be expected with 91 percent of Portland's buildings falling into the low-risk category, and only 2.5 percent falling into the high-risk category. Battalion 2 has the largest share of high-risk buildings, serving North Portland and Northwest Industrial Areas of Portland.

Figure 3.4



Subjective Risks

Subjective risks are defined by interpretations of inconclusive data, non-expert perception, or anecdotal evidence. PF&R combines this method with empirical expertise from the field to further assess risk. Fire personnel knowledge is considered "expert", as they have significant experience with and understanding of the buildings they protect.

Since 1988, PF&R fire companies have conducted pre-fire surveys to identify and analyze target hazards for fire response purposes. As described in PF&R General Order 18, the pre-fire survey program notes a target hazard where any of the following conditions exist:

- Potential for large loss of life
- Potential for large property loss
- Potential for large economic impact to the community
- Potential to strain PF&R's resources to control a fire
- Hazardous materials within building
- Any structure where pre-incident information would be valuable

Maps showing the special risk target occupancy locations and material hazard areas in PF&R's jurisdiction can be found in Attachments P and Q. Fire companies have annual pre-fire survey goals, which vary among stations due to the composition of occupancies within each fire response area. For each target building or occupancy, the fire company prepares a pre-fire survey (form 300.05) and/or a high-rise building survey (form 300.06). This process ensures proper documentation of each target hazard and enables fire companies to become better acquainted with the intricacies of buildings that demand complex fire response efforts or present high-risk/high loss situations. PF&R's pre-fire process is an effective and proactive way to assess and educate itself about the community it serves. PF&R has the ability to view pre-fire plans on mobile data computers (MDC), providing fire companies with critical information about a structure in the event of fire. Mapping software is also available on the MDC which provides the company officer detailed street maps including fire hydrant location, flag lots, traffic calming devices, etc..

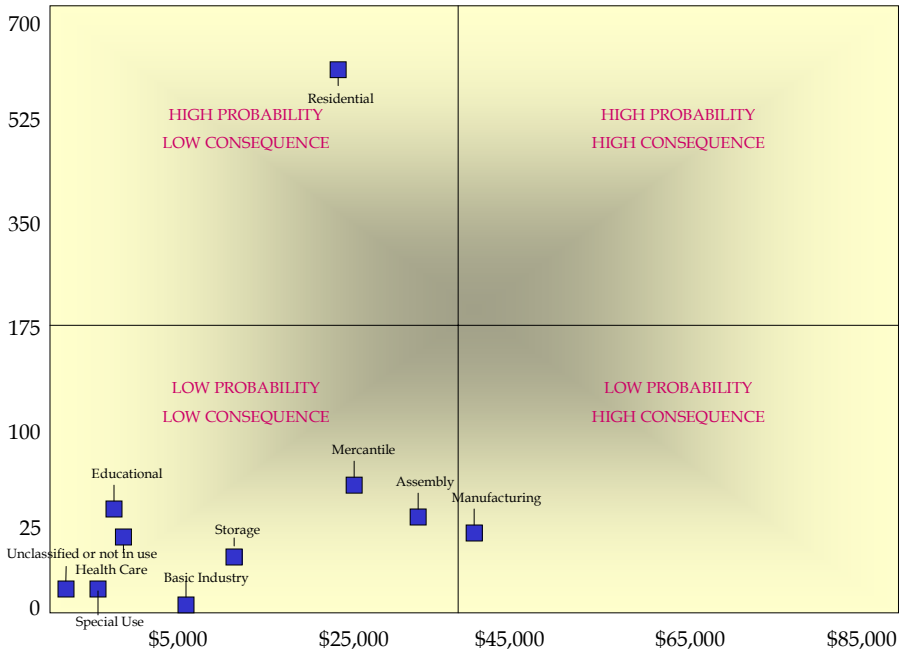
Probability

The probability of a fire event --and the consequences of that event--can be further determined by evaluating historical data. To illustrate this concept, the following chart (Figure 3.5) creates a graphic illustration of the probability (number of incidents, ranged on left side of chart) and consequences (average dollar loss per incident, ranged at bottom of chart) for occupancy types based on information collected over the last three fiscal years. As seen in the chart, a fire in a residential occupancy has the highest probability of occurring (nearly 700 annual incidents), but a low consequence with an average fire dollar loss near $25,000.

Although residential fires are considered a high-probability/low-consequence event citywide, the residential component of Fire Station 1's service area, by contrast, would exist in the high-probability/high-consequence quadrant due to the predominant type of residences (multi-family, high rise, low income, etc.) found there. High-probability/high-consequence events also exist in FMAs within Battalions 2 and 3, due to the concentration of mercantile and unclassified (including vacant) properties.

PF&R will use this information to guide the development of response standards for residential properties. With this in mind, the dollar-loss factor becomes a common comparison among all properties. Any adopted risk levels and SERC must assume that a residential property fire is a highly probable event; and that incidents at mercantile, basic industry, and unclassified properties are high-consequence events. In addition, PF&R must consider other types of occupancies, such as vacant buildings. These structures have low probability for fire incidence, but high consequence. PF&R must maintain resources for these events, considering the level of community risk. However as Figure 3.5 shows, actual losses in PF&R's jurisdiction place mercantile, basic industry and unclassified properties in the low-consequences quadrant.

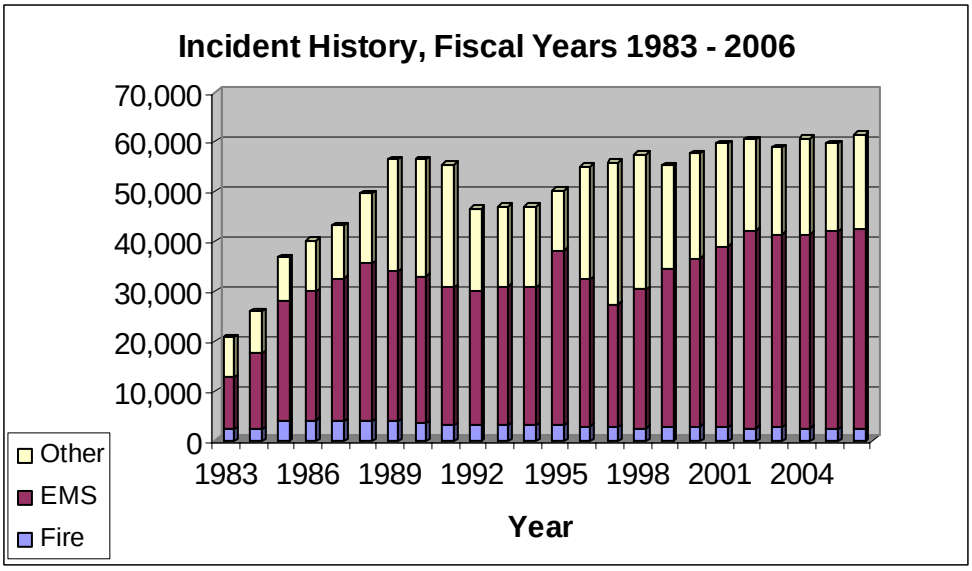
Figure 3.5
Probability and Consequences Matrix



Call (Incident) Volume

PF&R's call volume has increased relatively steadily over the past 20 years. The following chart illustrates yearly call volume:

Figure 3.6



There are several reasons for the dips and peaks in incident volume over the past 18 years. From 1990 to early in 1994, Fire Alarm Dispatch (FAD), which performed

call dispatch with Fire personnel, provided an intense triaging of calls, which reduced overall call volume. Further, in 1992 and 1993, PF&R stopped responding to TA-9s (fire-only check), which reduced call volume by a few thousand per year. Also in 1992, Clackamas County Fire District #1's contract ended and some Multnomah County Fire District #10 stations went to Gresham, which reduced call volume. From 1994 to 1995, the spike in incidents was the result of dispatch moving from FAD to BOEC (civilian dispatchers), which created duplicate incidents in the system in the short term.

The metropolitan population is aging, and is increasing demand on the EMS system throughout Multnomah County. As shown in the table above, PF&R has predictably seen an increase in EMS calls over the past nine years. This trend is expected to continue, whereas PF&R anticipates that the number of fire calls will continue to decrease.

Type and Frequency of Calls (Incidents)

PF&R analyzed call types and frequencies to assess the probability of a particular event taking place. All calls for service over the last three fiscal years (July 1, 2004 through June 30, 2007) were included. The results are shown in the following pages.

PF&R organized calls into eight groupings: Fires, EMS, Hazardous Materials, Technical and Marine Rescue, Mutual Aid Received, Mutual Aid Given, Miscellaneous Calls, and All Calls. PF&R does not use the NFPA classification for "mutual aid" calls because of PF&R's extensive automatic aid and mutual aid relationships. These calls can be segregated using a separate classification scheme available in PF&R's Fire Information System (FIS).

The document also includes temporal analyses of aggregated data to demonstrate the peak load demands by hour for response services (Figures 3.8 through 3.18) These data make a convincing case for some departures from traditional fire department scheduling and static resource deployment; however, PF&R has not yet decided to implement such deployment alternatives.

Fires

As seen in Table 3.5, fires are a daily event throughout PF&R's service area. Approximately 57 percent of these fires are brush, rubbish, and automobile fires, and 32 percent are structural. This translates to more than two structural fires every day and more than six total fires per day. Fire call volume is mapped in Attachment R.

Table 3.5
Frequency of Fires

Type	7/1/04 –6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Structure	725	746	757
Automobile	446	390	405
Brush	425	601	706
Trash	320	377	347
Misc.	286	237	266
Totals	**2202**	**2351**	**2481**
Avg. Per Day	**6**	**6.4**	**6.8**

PF&R has tried to define the term "working structure fire" to help determine resource commitments; however, present data collection methods do not allow for easy tracking after a box alarm has been "recalled" (incident under control, no more resources needed).

PF&R has analyzed its fire calls further to determine if there are patterns of fire calls in the city. In the past two years, 64 percent of structural fires occurred within the southeast and northeast quadrants of the city, split almost equally. PF&R will plot these fires on a map in order to further analyze the fire risks in these two quadrants. Northwest Portland experiences the fewest structural fires at 6.8 percent. Total structural fire loss is still high with over $19 million in losses in FY 2006-07.

PF&R has been able to confine fire spread to the room of origin 82.5 percent of the time in all structural and mobile/fixed fires, demonstrating that PF&R is successful in containing the fires to the room of origin and minimizing fire loss within the originating structure, while preventing spread to adjacent structures.

EMS

The largest proportion of emergency response activity within PF&R are calls for medical help. (See EMS call volume in Attachment S). The proportion of EMS calls compared to other calls has increased significantly over the past six years. This may be the result of more accurate call classification or the actuality of responding to a larger population with increased demands. As seen in Table 3.6, PF&R currently responds to approximately 128 EMS calls per day, nearly 47,000 per year. (These figures reflect a "readiness" measure based on initial dispatch; not all dispatches result in a full working incident for PF&R personnel.)

PF&R is part of a larger EMS system within Multnomah County, and there is a system-wide approach to providing these services. As such, PF&R works closely with American Medical Response (AMR), the contracted ambulance services provider for Multnomah County (see Attachment S for AMR Posting Locations and Posts). Although PF&R is the designated first responder, each organization supplements the other in providing efficient and effective emergency response and

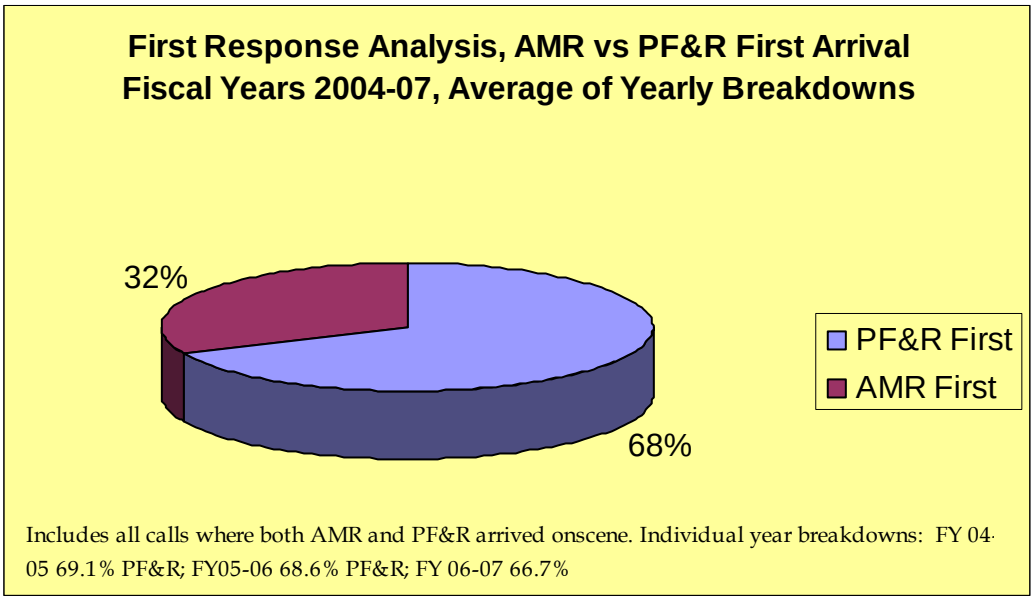
patient care. Figure 3.7 illustrates the "first on-scene" distribution of EMS calls between PF&R and AMR.

Table 3.6
Frequency of EMS Calls

DISPATCH TYPE	7/1/04 –6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Trauma	3462	6793	7191
Breathing	5740	5542	6057
Chest Pain	4761	4712	4958
Unconscious	4293	4382	4507
Traffic Accident	4051	4225	4258
Sick	3351	3695	3937
Seizure	2213	2282	2426
Assault	2225	2194	2324
Abdominal	1685	1896	2049
Overdose	1759	1734	1871
Unknown	1548	1541	1672
Diabetic	1389	1351	1492
Stroke	1010	1169	1184
Pregnancy	331	414	435
Bleeding	475	452	433
Back Pain	469	391	397
Allergies	307	292	342
HazMat	394	392	339
Headache	198	198	199
Electrocution	205	166	175
Behavior	117	112	116
Heat-Cold	55	80	94
Animal Bites	93	80	88
Eye	70	75	87
Drowning	91	86	65
Burns	70	56	64
Inhalation	25	23	24
Falls	3217	8	5
Multiple Patient Scene	1	0	0
Annual Total	**43605**	**44341**	**46789**
Daily Average	**119**	**121**	**128**

Note: Beginning in Fiscal Year 2006-07 the "Falls" dispatch code was reclassified as "Trauma".

Figure 3.7



As seen in Figure 3.7, PF&R and AMR support each other in the EMS system by supplementing first response when the other partner may not be able to respond. Historical information shows that PF&R arrives on scene first approximately 68 percent of the time.

HazMat

PF&R faces one of the most extensive aggregations of hazardous materials in the State, both in volume and in chemical complexity. These materials are found along the City's transportation corridors and within the numerous Level III HazMat-classified facilities spread throughout PF&R's jurisdiction. Much of the HazMat load is attributable to the widely distributed industrial areas of the City of Portland. As seen in Attachment B, industrial areas exist throughout PF&R's jurisdiction including heavy, light, and mixed-use industrial.

PF&R supports a Regional Hazardous Material Emergency Team, which is funded in part by the State of Oregon. Consequently, PF&R is responsible for a large geographic area outside PF&R's boundaries. Therefore, some of the responses tabulated below are within PF&R's area of responsibility, but not within the city limits.

Hazardous materials incidents are relatively infrequent considering the diverse industrial base and complex transportation network scattered throughout the region (see map in Attachment U). Currently, PF&R responds to 792 HazMat calls per year, or about two HazMat incidents per day. Table 3.7 shows the number of HazMat calls over the reporting period. The number of HazMat calls to which PF&R responds is largely impacted by Portland Police activities. When police funding decreases, their activities may decrease as well; this would typically require more HazMat support from PF&R to pick up the additional workload.

Table 3.7
Frequency of HazMat Calls

RISK CATEGORY	7/1/04 –6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Level 1	405	396	356
Level 2	3	5	3
Level 3	2	1	1
Not Classified			
Aircraft Emergency Level 1	1	10	5
Aircraft Emergency Level 2	1	4	6
Aircraft Emergency Level 3	1	0	0
Biological/Chemical	1	1	0
Biological/Chemical Threat	2	2	2
Box Response	0	8	8
Carbon Monoxide Alarm	92	71	83
Civilian Aircraft Emergency	0	1	0
Commercial Aircraft Emergency	3	0	0
Natural Gas – Odor Investigation	216	231	273
Natural Gas Fire-Major Leak	22	39	52
Fuel Spill/Leak – Small	0	0	1
Railroad Incident	2	5	2
Traffic Accident Investigation for Unknown	3	3	0
Total	**754**	**777**	**792**
Daily Average	**2.1**	**2.12**	**2.17**

Technical and Marine Rescue

In addition to fighting fires, PF&R's Technical Rescue Team (TRT) is lowered down cliffs, bridges, buildings, and into sewers, shores up trenches to save those trapped under a collapse, dives into murky waters with zero visibility, and performs other types of unusual rescues.

Equally skilled are PF&R's marine firefighters, who use two fireboats, one on the Columbia River, and the other on the Willamette River. In addition to the two fireboats, PF&R employs various rescue craft and rescue boats to provide marine rescue and response efforts. Until 2003, PF&R boats were State Licensed Marine

Ambulances; they were the first two licensed in the State of Oregon. Marine firefighter emergency medical technicians (EMTs) are cross-trained in land-based firefighting, shipboard firefighting, marine operations, and structural firefighting. The following table illustrates the demand for service in these specialized areas.

Table 3.8
Frequency of Technical and Marine Rescue Calls

RISK CATEGORY	7/1/04–6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Confined Space Rescue	1	2	2
Bldg/Trench/Natural Disaster	0	1	1
Drowning/1st Response	9	5	5
Drowning/Any river Incident	82	81	60
Marine Incident	118	119	134
River Dive Response	1	2	0
Total Calls	**211**	**210**	**202**
Daily Average	**.59**	**.58**	**.55**

The average elapsed time from first dispatched to last unit cleared for technical rescue calls is roughly 26 minutes.

Due to a reclassification of call type criteria in FY 2006-07 the number of marine incidents increased and drowning, drowning 1st response, and any river incidents decreased.

Out-of-Jurisdiction Calls

Within the three metropolitan county areas, most service providers operate pursuant to "closest force" agreements (see jurisdictional boundaries in Attachment V). This creates a nearly seamless web of emergency response capabilities. It is not unusual to find personnel from two different agencies operating effectively at an emergency scene, under the supervision of a chief officer from a third agency. Distribution and frequency of out-of-jurisdiction calls are set forth in Table 3.9.

In Tables 3.9 and 3.10, the variances in mutual aid given and mutual aid received are due to station renovations and new construction under the G.O. Bond program. With the addition of Stations 16 and 27 in the West Hills, PF&R required less mutual aid from TVF&R. Gresham provided more mutual aid during the renovation at Station 30, which took more than a year to complete.

Table 3.9
Out-Of-Jurisdiction "Mutual Aid Given" Responses

Jurisdiction	7/1/04 –6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Boring RFD #59	1	3	0
Clackamas Fire Dist. #1	110	101	133
Clark County #5	1	3	3
Clark County #3 – Camas	0	0	1
Columbia County	5	2	1
Corbett Fire District #14	1	0	3
Fairview	0	1	0
Gladstone FD	0	0	4
Gresham	663	756	736
Lake Oswego	26	26	25
Multnomah County	8	2	5
Port of Portland	85	66	85
Sandy FD	0	1	0
Sauvie Island Fire Dist. #30	3	8	7
TVF&R	343	315	224
Vancouver Fire	29	51	26
Washington County Fire Dist. #2	6	1	1
Washougal FD	0	1	0
Unknown	2	1	2
Other	10	11	5
Totals	**1293**	**1349**	**1261**
Daily Average	**3.5**	**3.7**	**3.5**

Table 3.10
Out-Of-Jurisdiction "Mutual Aid Received" Responses

Jurisdiction	7/1/04 –6/30/05	7/1/05 –6/30/06	7/1/06-6/30/07
Boring RFD #59	1	0	2
Clackamas Fire Dist. #1	97	87	48
Clark County #5	0	0	1
Columbia County	1	0	1
Corbett Fire District #14	4	2	3
Gresham	295	322	718
Lake Oswego	14	28	21
Multnomah County	13	11	26
Port of Portland	318	186	282
Sandy FD	1	3	0
Sauvies Island Fire Dist. #30	2	2	6
TVF&R	118	123	36
Vancouver Fire	23	13	28
Unknown	0	0	1
Other	1068	1017	1116
Totals	**1955**	**1794**	**2289**
Daily Average	**5.4**	**4.9**	**6.3**

Miscellaneous Calls

Like most community-based fire service organizations, PF&R serves as a multifunctional service provider, often becoming "the social service of last resort." Public assistance calls of almost infinite variety make up a significant portion of service requests at 26 percent of all calls for service. Table 3.11 reflects the frequency of miscellaneous service requests over the reporting period.

Table 3.11
Frequency of Miscellaneous Service Calls

RISK CATEGORY	7/1/04 –6/30/05	7/1/05–6/30/06	7/1/06-6/30/07
False Calls	6129	6217	6372
Service Calls	5136	5785	6067
Good Intent	3431	3495	3476
Total	**14696**	**15497**	**15915**
Daily Average	**40.2**	**42.5**	**43.6**

Total Calls

This chart shows total call volume and frequency of all responses. PF&R currently responds to one call for service roughly every eight and a third minutes of each day, as shown in Table 3.12.

Table 3.12
Frequency of All Calls For Service

RISK CATEGORY	7/1/04 –6/30/05	7/1/05–6/30/06	7/1/06-6/30/07
Total Calls	58465	60165	63092
Daily Average	160	165	172.5
Call Received Every X Minutes	9	8.7	8.33

Note that this categorization scheme dramatically understates the activity of line response companies. Simply listing emergency response activity fails to account for all of the training, prevention efforts, and community service performed by PF&R's line personnel. Fortunately, PF&R's FIS captures all significant activity on a daily basis. The company officer records training, prevention activities and community education into various FIS applications in the station computers.

Temporal Analysis[3]

The following bar charts show the times of day that specific events are likeliest to occur. To improve reliability, PF&R queried three fiscal years worth of data to prepare the graphs. The hour of the day is represented in military time format, with "0" being the hour from midnight to 1:00 a.m..

[3] "Temporal analysis" is the analysis of events with respect to time.

Figure 3.8
Distribution of Structural Fire Calls

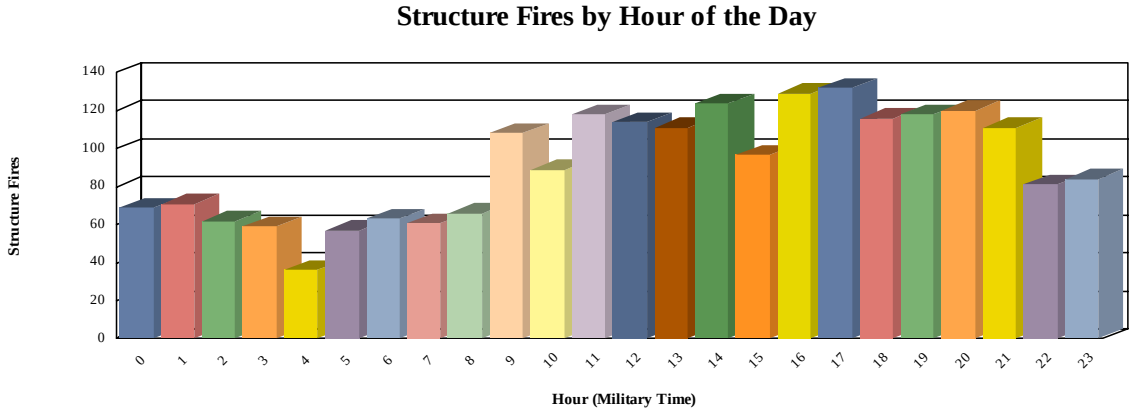


Figure 3.9
Distribution of Priority EMS Calls

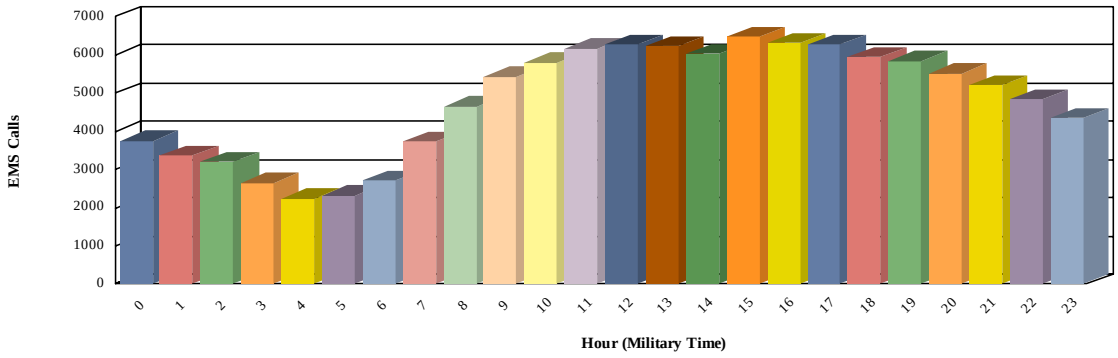


Figure 3.10
Distribution of Non-Priority EMS Calls

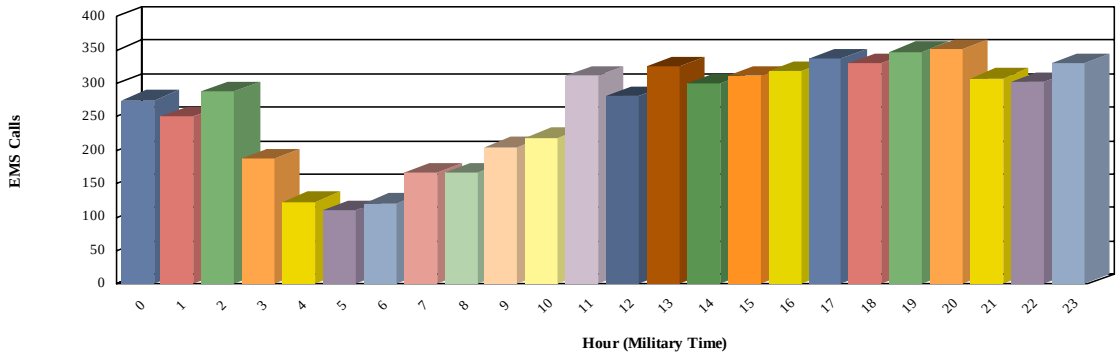


Figure 3.11
Distribution of HazMat Calls

HazMat Dispatches by Hour of Day

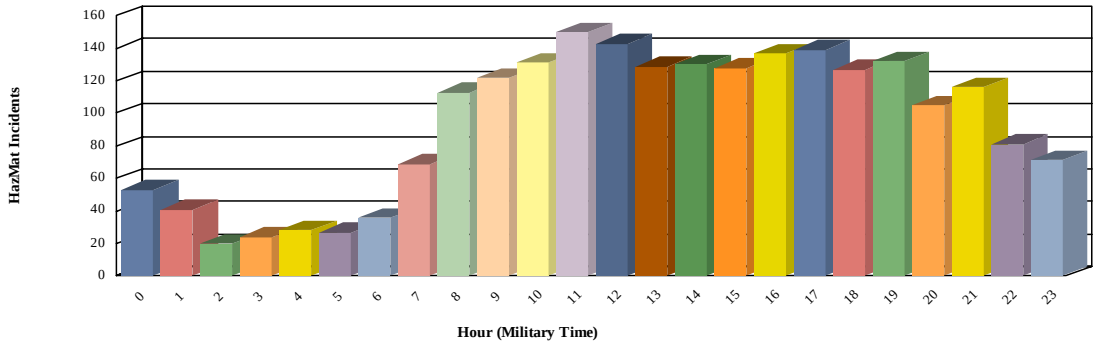


Figure 3.12
Distribution of Miscellaneous Calls

All Miscellaneous Calls Per Hour

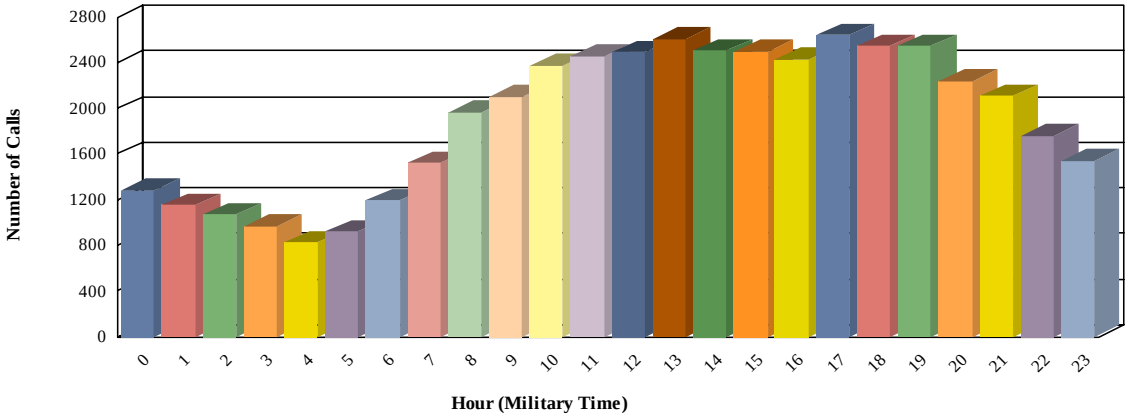


Figure 3.13
Distribution of Technical Rescue Calls

Technical Rescue Calls By Hour of Day

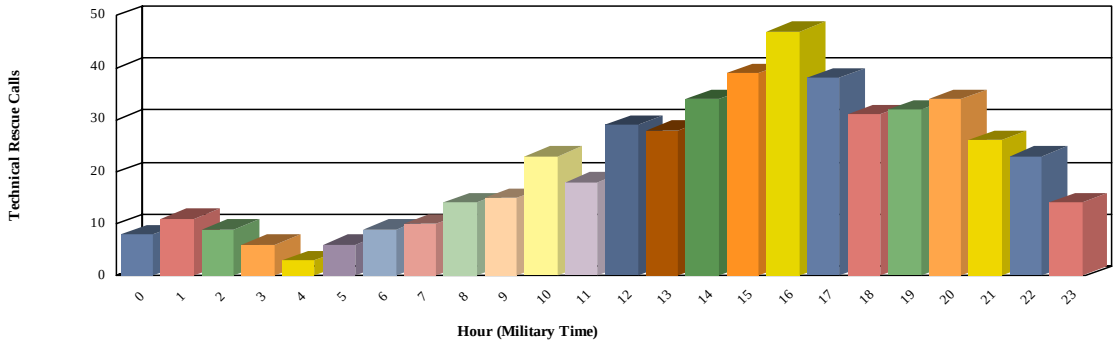


Figure 3.14
Distribution of Mutual Aid Given

Mutual Aid Given Calls By Hour of Day

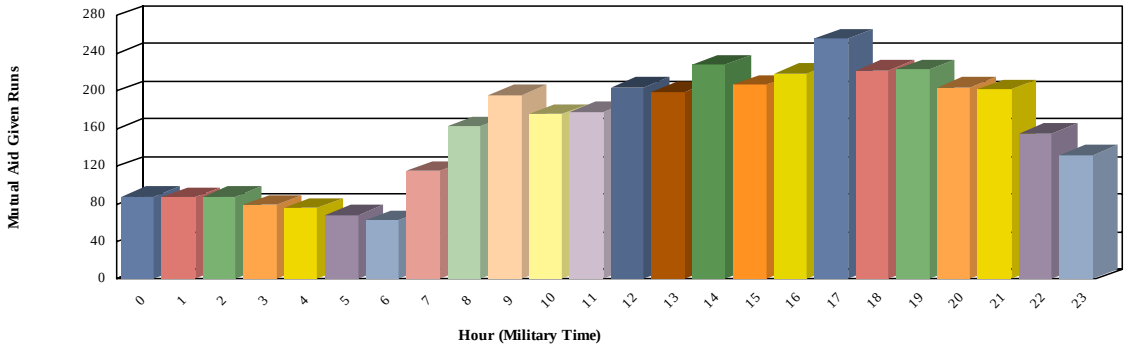


Figure 3.15
Distribution of Mutual Aid Received

Mutual Aid Received Calls By Hour of Day

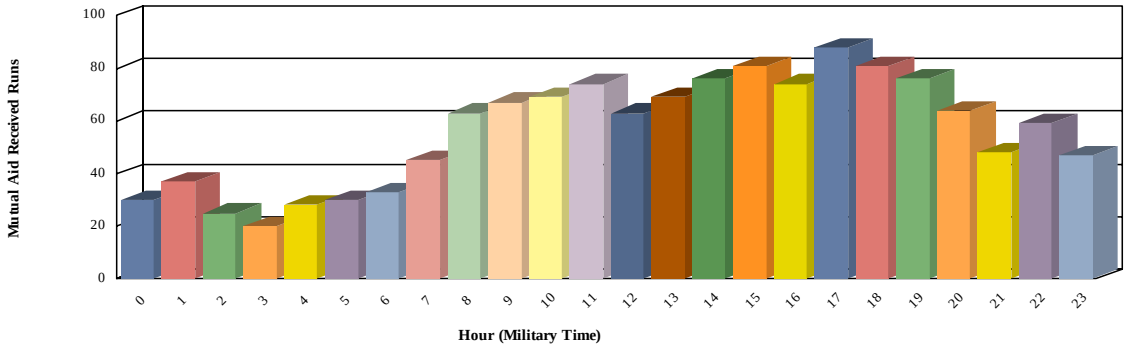
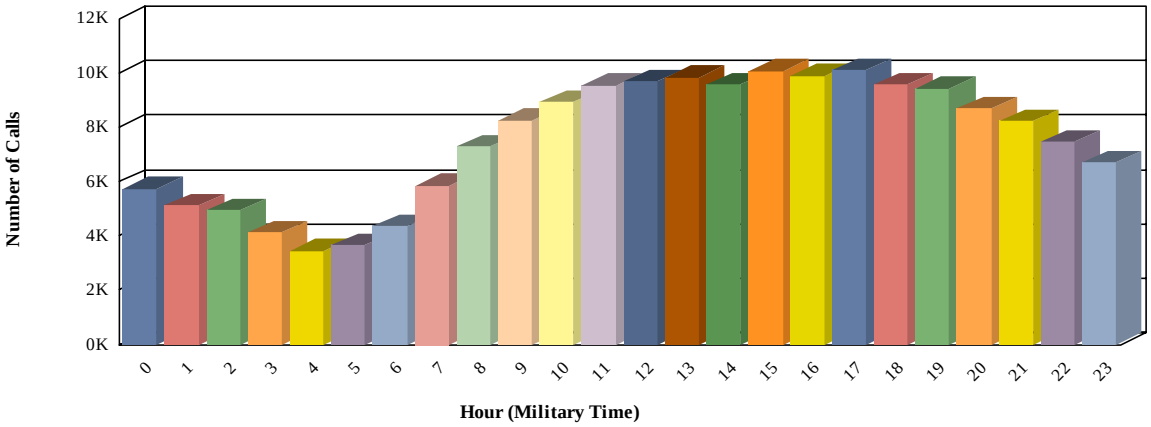


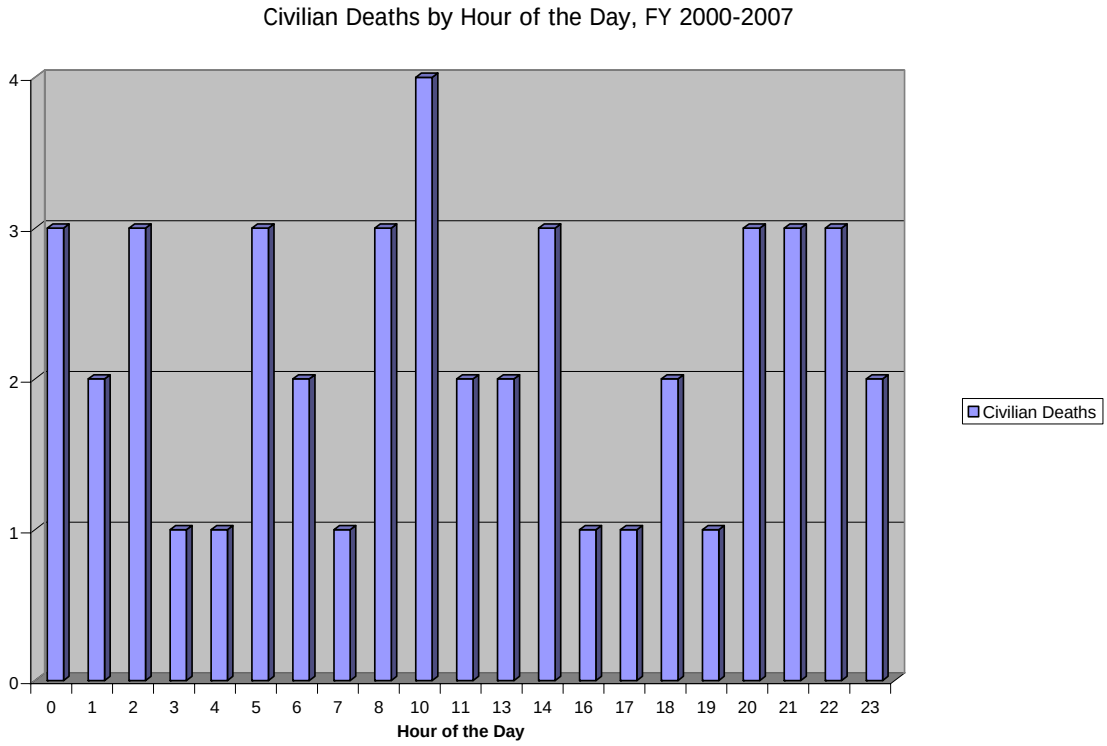
Figure 3.16
Distribution of All Calls

All Calls For Service Per Hour



As shown in the bar graphs, it is clear that call volume drops during the nighttime hours – roughly 2300 to 0600 hours. This pattern is typically found throughout the fire service, which often prompts the discussion of deployment strategies to reduce costs. However, note that fire deaths in Portland typically occur between the hours of 2200 and 1000 hours (as seen in Figure 3.17), and reducing resources during the nighttime hours could increase the number of fatalities. As shown in a report prepared for the Federal Emergency Management Agency (FEMA), fatal fires are more likely to occur at night and in the early morning hours than are non-fatal fires.[4] This report further states that 47 percent of all multiple-fatality fires and 35 percent of all single-fatality fires occurred between midnight and 0600 hours.

Figure 3.17



The risk of fire or other incidents always exists, and PF&R must be prepared to respond at all hours of the day to any type of incident. PF&R will continue to look closely at response patterns to help determine the best allocation of resources.

Figure 3.18 illustrates the seasonality of PF&R's calls for service, which is important to analyze when making decisions about staffing levels and deployment strategies. This graph shows that PF&R experiences a fairly consistent level of calls throughout the year, with slight decreases from January to the end of April. November shows a small lull, however, this is quickly reversed by December, probably due to the holidays and winter weather conditions.

[4] United States Fire Administration, FEMA - Multiple Fatality Fires Reported to National Fire Incident Reporting System (NFIRS) 1994-1996, published October 1999, page 8.

Figure 3.18
Distribution of All Calls by Month

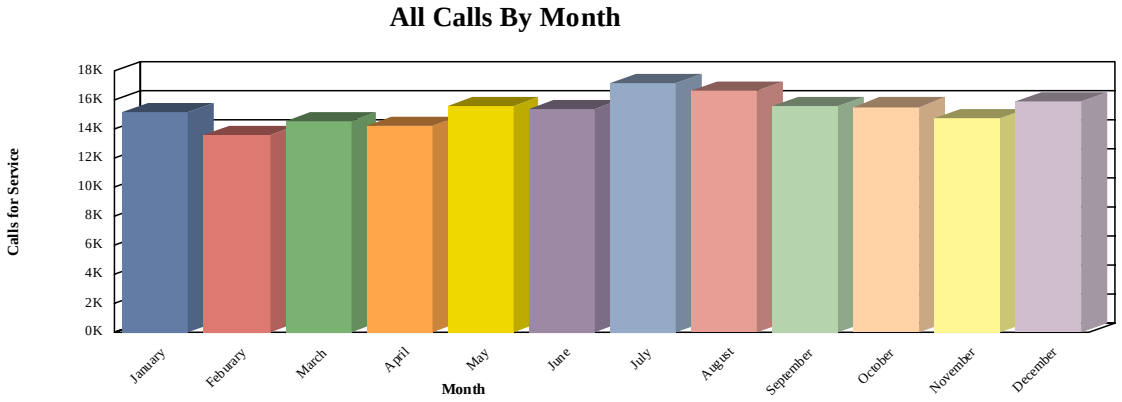
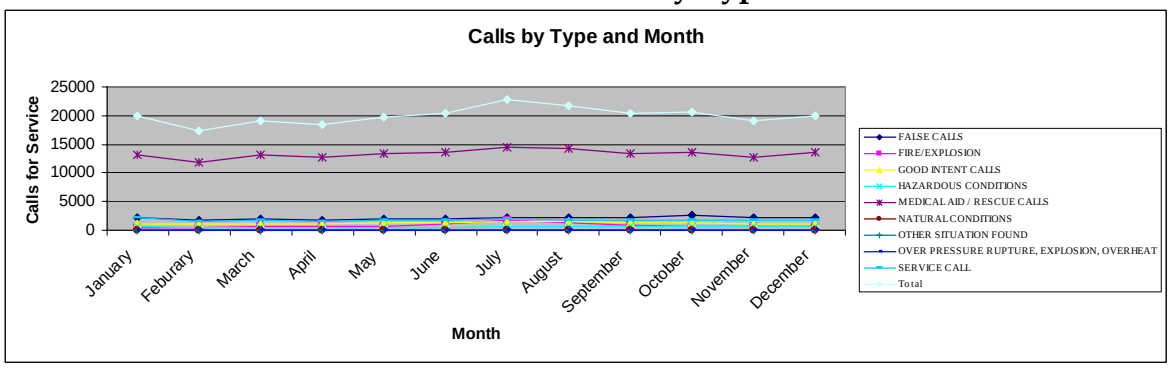


Figure 3.19 illustrates the seasonality of emergency response calls described in this document to identify specific incident-type trends. PF&R realizes lower call volumes, in general, from the end of January to April. Miscellaneous calls and fire calls tend to increase slightly during the summer months, while medical calls follow a fairly consistent trend aside from marginal lulls in February, March and April and marginal increases in December and January. These trends are highly predictable for the Portland area, based both on the seasons and their related weather conditions.

Figure 3.19
Incident Volume by Type



Summary

PF&R, through risk analysis, has determined that a typical daily event in PF&R's jurisdiction is an EMS event. PF&R must adequately distribute response resources to handle the high-frequency, moderate-to-low risk events, while at the same time concentrate adequately to support the requirements of maximum-risk occupancies. PF&R will strive to improve performance in these areas.

Due to the incidents in PF&R's jurisdiction that require multi-disciplinary response, operational readiness is critical in all specialties, including technical

rescue, wildland interface, marine rescue, and hazardous materials response. Each of these specialties brings risks to both fire personnel and the surrounding community. PF&R is aware of those risks and is prepared to mitigate them to the best of its ability.

Portland's City Council will define the acceptable level of risk for the City by virtue of their budgeted resource allocations to PF&R. The acceptable level of risk includes consideration of the reliability of the system, and reflects the associated consequences of not being able to satisfy every demand under every possible eventuality and combination of circumstances.

SECTION FOUR: Time and On-Scene Performance Expectations

An effective response force is one that, when confronted with tasks required on the fire/EMS scene, is able to provide adequate resources to mitigate each event. PF&R believes that time, which equates to speed and positive performance of fire ground tasks, is the benchmark for a response force to be successful. To meet the challenges of time and on-scene expectations, benchmarks of operational preparedness guide PF&R. Through training, PF&R has established a standard for fire ground task evaluations. These occur annually through company evaluations; however, these evaluations do not necessarily measure these standards.

These performance standards reflect and frequently exceed many essential competencies established by the NFPA, the American Heart Association (AHA), the State of Oregon, the National Registry of EMTs, and other organizations.

Firefighter Health, Wellness, and Physical Fitness

Statistics repeatedly show that firefighting is one of the most dangerous occupations in the world. The International Association of Fire Fighters (IAFF) Death and Injury Survey statistics indicate that one of every three firefighters will die or be injured in the line of duty in any given year. PF&R's greatest asset is its personnel. By keeping personnel healthy and fit, they are better able to serve the public, accomplish their missions, and make a difference to the Portland community. PF&R has taken a proactive approach to reduce the risks firefighters face and has the following programs in place.

- Infectious Disease Program. PF&R is in compliance with the Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard. All firefighters receive annual OSHA Bloodborne and Airborne Pathogen training. In addition, firefighters are protected from bloodborne/airborne pathogens through the use of universal precautions, engineering controls, work practice controls, personal protective equipment, proper housekeeping, and handling of regulated waste. All firefighters meet OSHA immunization requirements. In the event of an exposure, a confidential medical examination, counseling, and follow-up is immediately available to all firefighters twenty-four hours a day.

- Health and Wellness Program. For the past seven years, PF&R's Wellness Program has been administered by Oregon Health Sciences University (OHSU). Many of PF&R's 678 firefighters have participated in a National Institute of Health sponsored PHLAME (Promoting Healthy Lifestyles: Alternative Models' Effects) study. Firefighters participated in fitness testing, health promotion teaching and counseling sessions to promote healthy behavior.

- To date, 27 firefighters and one non-sworn staff member have been certified as IAFF/IAFC ACE Peer Fitness Trainers and are assigned to work with individual stations on fitness issues. They also oversee equipment maintenance and requests. They introduce new and innovative programs such as spinning classes to improve cardiovascular fitness and kettle bell training to improve strength. Peer Fitness Trainers will be presenting an Injury Prevention Class this summer to all PF&R firefighters.

- PF&R expends many resources to improve employee safety and health. PF&R's Health/Wellness Program has grown tremendously over the past 7 years. Including this year's budget of $411,103, there has been over 1.2 million dollars spent directly spent on fire fighter wellness. This includes station fitness equipment, physical examinations, PFTs, fitness measurement software, vaccines and lab fees. Twenty-seven PFTs work with firefighters and non-sworn members on fitness, health and rehabilitation issues. They also proctor the physical agility test and will be doing fitness assessments in 2008 following the completion of the PHLAME study. PFTs conduct New Employee training and encourage trainees to keep safe and healthy throughout their career. PFTs have had extensive training and continuing education to keep up-to-date on fitness/wellness issues. PF&R members benefit from newsletters, wellness/exercise programs, immunizations, hearing tests, 24 hour exposure follow up and group activities. They received extensive nutritional and hydration information.

- PF&R's Respiratory Protection Program meets all OHSA standards. The EMS and Safety sections worked together in the beginning of 2002 to develop the Respiratory Protective Equipment guideline to protect firefighters from conditions that are hazardous to respiration. The Respiratory Protection Program Manager at EMS ensures all firefighters comply with the Respiratory Protection Standard.

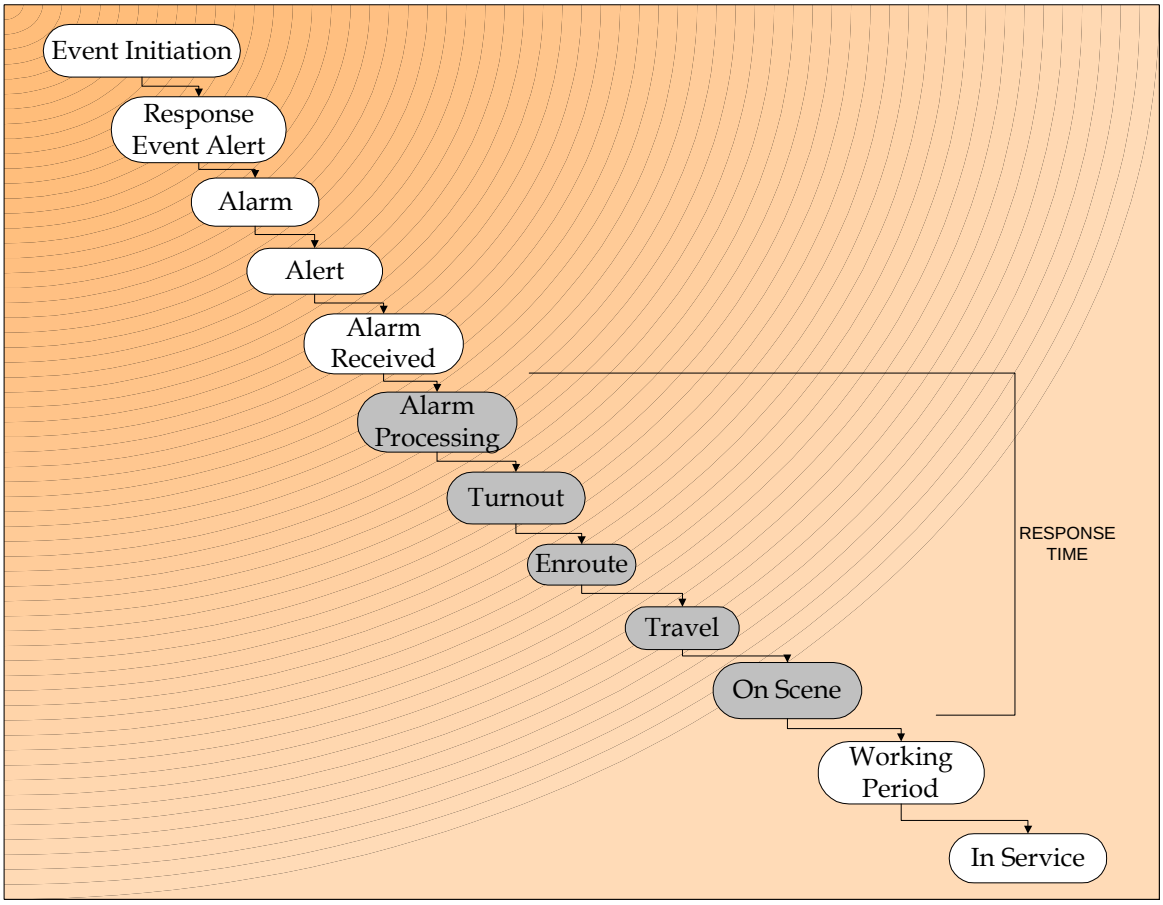
PF&R assumes a leadership role in implementing Wellness/Fitness programs for members. Management works to ensure that each member has the opportunity to attain and maintain a healthy body to perform work duties. Excellent customer service for the community is best delivered by healthy firefighters who are provided a safe work environment, regulatory compliance, and the opportunity to have input into the content of their wellness program. Although wellness programs are not free, significant benefits exist with such programs. Wellness programs have repeatedly been shown to provide long-term savings related to disability and medical costs. Placing a high priority on firefighter wellness makes sense for taxpayers, firefighters, and the public they serve.

RESPONSE PERFORMANCE STANDARDS

Cascade of Events – The Response Time Continuum

CFAI defines response time elements as a cascade of events. The Cascade of Events is illustrated in Figure 4.1.

Figure 4.1
Cascade of Events



Mitigating events within the community is an equation that attempts to balance risk versus resources. The greater the risk, the greater the resource requirement necessary to confront and mitigate the event. In terms of performance expectations, it is essential for the reader to be mindful that some of the intervals can be directly influenced by the fire service (reflex interval and travel interval), whereas other intervals can be influenced indirectly by public education and fire prevention code improvement.

Measures

When discussing performance standards, defining terminology is vital. PF&R, like any major metropolitan department, uses terminology unique to itself. The

importance of this comes into play when providers throughout the region attempt to coordinate their public service efforts.

The following definitions are standardized for discussion of response performance parameters within PF&R:

Time Points and Time Intervals – The Cascade of Events

The response performance continuum is composed of the following time points and time intervals:

- **Event Initiation Point**: the point in time where events occur that trigger an emergency response. The event initiation point may occur some time prior to recognition. For example, a homeowner places smoldering briquettes in a paper bag near an exterior wall, and then awakens some time during the night to the wall on fire. The event initiation point occurred prior to the homeowner waking.

- **Response Event Alert:** that time when a person becomes aware and/or a device (e.g. smoke or heat detector) detects that a situation is unfolding which will require some sort of emergency response.

    - **Recognition Period**: the time interval between the event initiation point and the response event alert.

- **Alarm:** the event when an alert transmits an activation that notifies the appropriate emergency responders.

    - **Alarm Transmittal Period:** the time interval between the response event alert and the alarm. This time period may be a call for assistance that goes directly to the local dispatch center or a call that goes to a remote alarm monitoring company that then retransmits it to the local dispatch center.

- **Alert:** the point in time when an alarm is received at the local Public Safety Answering Point (PSAP), also known as the 9-1-1 center, by electronic or other means.

- **Alarm Received Period:** period of time from the alert to when Dispatch taps (notifies) the appropriate fire and medical units to respond. In Portland, this is a two-fold process: first, a call taker receives the call and enters it into the Computer-Aided Dispatch (CAD) system. Information regarding the call is then forwarded to the appropriate responder (Police, Fire, or EMS) and the appropriate emergency resources are dispatched. BOEC is the primary PSAP for Multnomah County and provides all dispatch services for PF&R.

- **Alarm Processing**: the time interval from the point at which a request or alarm is received and transmitted to emergency responders. Alarm processing time is the time interval between realization that an emergency exists up to the point that this information is retransmitted via internal communication systems to the emergency responders. BOEC's goals for dispatch are:

    - 60 seconds, 90 percent of the time for URGENT calls (commercial, apartment or residential fires)
    - 90 seconds, 90 percent of the time for all PRIORITY calls (other fires, EMS, alarms, hazmat, etc)
    - 120 seconds, 90 percent of the time for all NON-PRIORITY calls (public assist, burning complaints, water problem, etc.)

- **Turnout Period:** the period of time from initial dispatch until a responding unit shows "en route." The turnout process includes receiving a dispatch, donning the appropriate personal protection equipment, assuring the apparatus and crew is prepared to respond, and responding.

- **En Route**: the point in time when the responding company informs BOEC they are responding (underway). PF&R units use the MDC "RESPONDING" button to indicate that the company is en route and follows this with a verbal confirmation to BOEC.

- **On Scene**: the point in time when the responding company physically arrives at the emergency site, or in the area if emergency in not obvious. PF&R units use the MDC "ARRIVED" button to indicate that the company is on scene and follows this with a verbal confirmation to BOEC.

    - **Travel Period**: the period of time from En Route to On Scene.

- **Working Period**: the period of time from when the responding company arrives on scene to when the company goes back in service. This is the period when crews physically take steps to mitigate the event. This stage is dynamic due to various types of incidents, incident locations, time of day and year, emergency actions performed at the scene, etc..

- **In Service**: the point in time when a company has mitigated the event and the apparatus and crew are in position and prepared for another response. PF&R units use the MDC "CLEAR" button to indicate that the company is in service and "Available On Radio" followed by verbal confirmation to BOEC.

- **Customer Interval**: This measure is an indicator based on the customer's perception of the performance of the emergency service system. The customer interval includes the Alarm Processing Period, the Turnout

Period, En Route, the Travel Period, and the On Scene Period. This entire period of time reflects the amount of time the customer had to wait to receive service. The customer interval can also be referred to as the **total reflex time**.

Figure 4.1 provides a high-level illustration of the Cascade of Events, and the critical elements of emergency service delivery.

Incident Response Objectives

PF&R has established "standard of coverage statements" to address full complement assignment calls, technical calls, boat response, hazardous materials calls, and water rescues. These objectives are presented by discipline, and include goals for both total reflex time and PF&R's response time (total reflex time less alarm processing time). This distinction is made because PF&R is not responsible for and does not have control over the alarm processing time. Dispatch services are provided by BOEC.

The total reflex time (or customer interval) illustrates the true amount of time that customers must wait before services are delivered. This interval incorporates alarm-processing time. The alarm processing time provides dispatchers an opportunity to give pre-arrival instruction to callers.

BOEC User Agreement Dispatch Objectives

The following objectives were included in the Intergovernmental Agreement as attachments, and were passed by City Ordinance #169468. BOEC provides all dispatch services for PF&R and is an integral component of emergency services.

Fire Dispatch Objectives

- For 90 percent of all URGENT calls (commercial, apartment or residential fires), create-to-broadcast/tone-out times to be within sixty (60) seconds.
- For 90 percent of all PRIORITY calls (other fires, EMS, alarms, hazmat, etc), create-to-broadcast/tone-out times to be within ninety (90) seconds.
- 90 percent of all NON-PRIORITY calls (public assist, burning complaints, water problem, etc.), create-to-broadcast/tone out times to be within one hundred and twenty (120) seconds.

EMS Objectives

- For 90 percent of all PRIORITY E-1-2 calls, create-to-dispatch/tone-out times to be within ninety (90) seconds.

- For 90 percent of all PRIORITY 3-9 calls, create-to-dispatch/tone-out times to be within one hundred and eighty (180) seconds.

Current Response Times

To avoid the skewing effect of infrequent but unusually long responses on a standard "mean response time" analysis, PF&R evaluates response times using percentile analysis, which sets a time benchmark that almost all response efforts either meet or exceed in a routine fashion. In Table 4.1, the comparisons between the mean, the 80th percentile and 90th percentile are significant. The "average" customer interval response is just under 6 minutes, but 80% of all emergencies are responded to within 7 minutes, 24 seconds or faster. Expand the view to 90% of all response, and the upper bound is 8 minutes, 25 seconds. In other words, only one of every 10 emergencies results in a response time longer that 8:25.

Table 4.1
Current Response Times – All Calls

ELEMENT	Mean		80th PERCENTILE		90th PERCENTILE	
	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*
Alarm Received Period (includes Call Processing - all emergent calls, city-wide)	1.05	1:03	1.45	1:27	1.83	1:50
Turnout Period (Time) (emergency responses, city-wide)	1.16	1:10	1.92	1:32	1.85	1:51
Travel Period (Time) (1st arriving company)	3.75	3:45	5.0	5:00	6.17	7:10
Customer Interval	5.96	5:58	7.4	7:24	8.42	8:25

Response Time Perspective

PF&R established response time goals in the past through an open process that discussed their legitimacy, inviting discussion about how to best implement response time goals. In 1997 and 2006, TriData conducted an outside independent audit of PF&R, which visited this issue in relation to station locations and gaps in the service area. In addition, PF&R is in the process of implementing the 1998 G.O. Bond, which will upgrade all stations to the Essential Facility level for seismic codes as well as construct new stations to address response time issues. Twenty-four out of 31 station upgrades have been completed as of June 30, 2007.

PF&R's emphasis on response times reflects the importance of that element in fire and medical emergencies.

PF&R implemented a response time performance standard of 5 minutes 20 seconds or less 90 percent of the time; however, under a percentile analysis, PF&R has never come close to meeting this standard. Because of this documentation,

PF&R has been able to systematically validate and analyze response trends and determine if response time standards are appropriate.

PF&R has been able to implement the recommendations from the most recent station location study with G.O. Bond funding; therefore, PF&R should realize improved response time performance by 2012. By then, PF&R will have four new stations to help stabilize response times in deficient areas of the city. This document will help PF&R in the future, should new station siting or additional fire companies in existing stations become necessary to address service concerns.

Response Time (Turnout and Travel) by Station

There are many circumstances that impact the ability of station crews to respond to incidents in a timely fashion, including: time of day, other incidents in progress, training, high call volume, fire code enforecement inspections, and workload of neighboring stations. Regardless of the multitude of converging demands, PF&R still maintains good, but not optimum, response time performance when compared to other metro fire departments. However, in order to make improvements in this area (i.e., reducing response times), substantial resources would need to be added. As the following table (4.2) will show, PF&R might be able to make small improvements in the area of turnout time, but will not improve travel time by trying to get to the scene faster. Increased travel speeds may sacrifice or compromise the safety of employees and the. Travel time may be improved slightly by altering FMAs; however, this will not significantly affect response times.

Table 4.2 illustrates individual station turnout and travel time, with a division of calls between peak (8:00 a.m. – 6:00 p.m.) and off-peak times (6:01 p.m. – 7:59 a.m.). This information must be considered in order to make educated decisions about performance improvement, resource placement and deployment, FMA boundaries, and other emergency operations initiatives. Table 4.2 shows a lower total number of incidents than previously reported in this document because some data elements are missing or have invalid values, which caused incidents to fall out of the analysis.

Table 4.2
Percentile Turnout and Travel Times, 2007

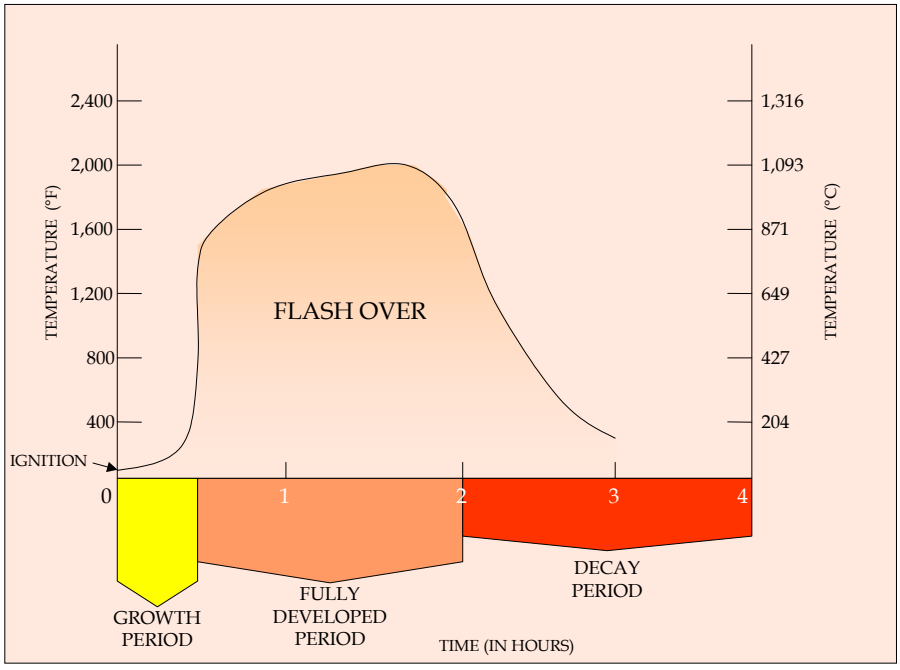
	Turnout Time				Travel Time			
	Time of Day				Time of Day			
	Peak		Off-Peak		Peak		Off-Peak	
Station	90th%	Runs	90th %	Runs	90th%	Runs	90th %	Runs
1	01:23	2,269	02:07	2,092	04.54	2,015	04.41	1,805
2	01:31	1,336	02:08	984	06.32	1,214	06.50	880
3	01:25	1,615	02:11	1,267	05.14	1,474	04.57	1,145
4	01:22	1,807	01:49	1,256	05.51	1,606	05.25	1,102
5	01:36	582	02:15	406	06.25	555	07.22	379
6	01:29	210	01:42	90	06.11	196	07.15	86
7	01:37	2,795	02:13	2,082	05.43	2,477	05.48	1,840
8	01:20	1,482	02:00	1,099	06.08	1,335	05.45	920
9	01:20	1,057	01:56	837	05.32	957	05.17	778
10	01:41	301	02:34	183	06.44	271	06.51	170
11	01:16	1,547	01:57	1,250	05.37	1,358	05.59	1,025
12	01:10	981	01:46	728	05.47	883	06.03	655
13	01:14	1,871	01:51	1,250	05.06	1,746	05.25	1,144
14	01:34	1,512	02:08	1,201	05.52	1,399	05.59	1,089
15	01:35	117	02:13	54	09.34	110	11.22	48
16	01:26	180	02:11	99	06.33	167	07.30	84
17	01:35	368	02:09	280	07.50	338	07.33	259
18	01:14	688	01:52	550	06.52	642	06.32	505
19	01:19	1,549	01:51	1,146	06.06	1,367	06.07	1,000
20	01:06	559	01:45	425	05.58	528	05.53	414
22	01:22	949	02:01	814	06.59	887	07.10	739
23	01:31	579	02:03	420	05.22	534	04.57	396
24	01:35	14	01:35	13	08.35	12	04.55	12
25	01:22	1,745	01:58	1,410	05.39	1,593	05.46	1,280
26	01:20	675	01:56	609	04.55	650	05.03	579
27	01:36	77	01:55	44	09.17	70	10.02	44
28	01:16	978	02:07	760	05.21	914	05.12	698
29	01:17	794	01:49	670	06.04	728	06.26	623
31	01:24	639	01:58	546	05.43	583	06.13	490
PF&R Total	01:24	29,276	02.:00	22,565	06.06	26,609	06.14	20,189

*Peak hours are defined as runs dispatched between 8AM and 6PM, inclusive.

Time Temperature Curve

The study of fire behavior shows that fire progresses through various stages of development in a logical sequence. That means firefighters will encounter fires from the relatively early stages to the post flashover stage. The "time temperature curve" is derived from information obtained by the NFPA, which established that a fire in a residential structure will "flashover" between 5 and 30 minutes after ignition.

Figure 4.2
Time Temperature Curve



Progression of the Time Temperature Curve

The following stages reflect anticipated activities of a fire in an airtight room[5].

The Incipient Stage: the incipient stage is when an ignition source raises a fuel above its ignition temperature causing it to ignite.

The Free Burning Stage: during the early part of this stage, the oxygen content is approximately 21 percent. The fire produces heat, fire gases, and smoke depending on the fuel and the temperature may be only slightly raised. As this stage progresses, cooler air is drawn in at the bottom of the fire, heated fire gases and smoke rise vertically and then begin to bank down, the temperature rises and the oxygen content decreases. This will continue until the temperature can easily exceed 1,000ºF and the fire either reaches its flashover point and then enters the smoldering stage, or goes directly to the smoldering stage without flashing over.

Smoldering Stage: As the fire continues to burn, the temperature continues to rise, the amount of carbon monoxide and smoke continues to increase, the oxygen content continues to decrease, and hence the rate of combustion decreases and the fire eventually just smolders. In this smoldering phase, the oxygen content is reduced to about 15 percent. The room will completely fill with hot gases and smoke, the temperature can exceed 1,300ºF, and the volumetric expansion of gases will increase by a factor of three or more. If not disturbed, the fire will eventually become unable to sustain combustion because of oxygen deficiency and will self-

[5] Ventilation Methods and Techniques, John Mittendorf, pp. 19-24.

extinguish. Alternatively, if oxygen is suddenly introduced, a back draft may occur.

Flashover: Flashover is the sudden ignition of exposed combustible surfaces and/or combustible gases in an involved area that results in a sudden and intense rise in temperature. As the temperature rises, exposed combustibles are heated and give off volatile gases. Eventually the flashpoint of the gases is reached and, if there is enough oxygen, the gases will ignite and the fire will travel rapidly or "flash" through the space.

Back Draft: A back draft is an explosive force of significant intensity caused by the introduction of oxygen to a confined area that is pressurized with heated, flammable gases, which are deficient in oxygen. The back draft results from the simultaneous ignition of the flammable gases.

Using the time-temperature curve or the phases of a fire for fire station placement is limited by two significant factors, including:

1. It does not account for the time for a fire to be "discovered" and reported to the fire department via the 9-1-1 system.

2. The curve constantly shifts because of changes in building construction, built-in suppression systems, and the use of fire-resistive materials as well as more flammable materials for furniture and other building contents.

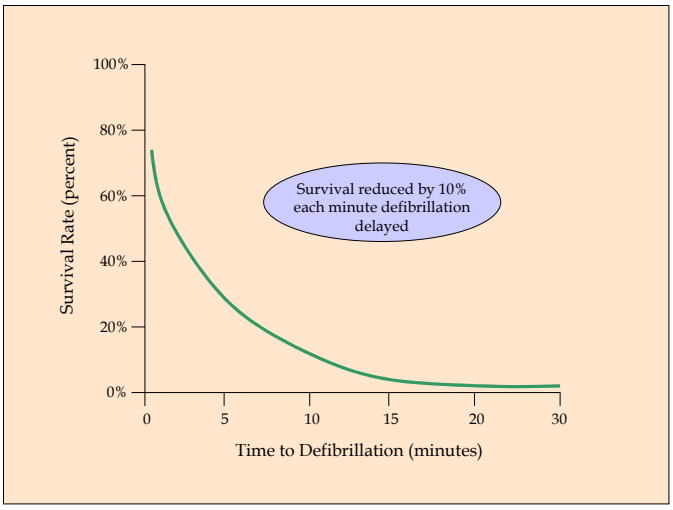
These are important elements to consider, because fires double in intensity and size every 30 seconds[6].

Emergency Medical Event

As a first responder, PF&R (like fire departments in most communities) is the primary provider of EMS care to the public. PF&R has increased that service in the past several years by providing "advanced life support" (ALS) care with a paramedic on all engine companies and a limited number of truck companies. This service is important as illustrated by the AHA "chain of survival" (Figure 4.3). This standard states that basic life support (cardio-pulmonary resuscitation [CPR] and defibrillation) should be provided to a patient in cardiac arrest **within four minutes** of occurrence, with ALS care provided within eight minutes of the event. The survival rate decreases quickly when the time for initial CPR exceeds four minutes and is almost zero when the time to initiate CPR exceeds six minutes. Obviously, stations must be strategically located to get first responders on scene quickly.

[6] Underwriters Laboratory (UL) website

Figure 4.3
Survival Rate vs. Time to Defibrillation



Responses to chest pain calls, which include cardio-respiratory arrest calls, constitute a moderate percentage of PF&R's emergency responses (7.8 percent). In each of the past three fiscal years, PF&R has been able to respond to this type of call in approximately 5 minutes 49 seconds 80 percent of the time (turnout and travel time) and within approximately seven minutes 90 percent of the time. PF&R continues to try and improve this number; however, historical information suggests that it will be impossible to meet the AHA goal of four minutes without adding additional units and/or stations.

PF&R responds to more than 40,000 EMS calls per year. These calls include motor vehicle accidents, childbirth, strokes, heart attacks, chest pain, difficulty breathing, etc.. PF&R provides EMS first responder services, with ambulance transportation provided by private contract with AMR.

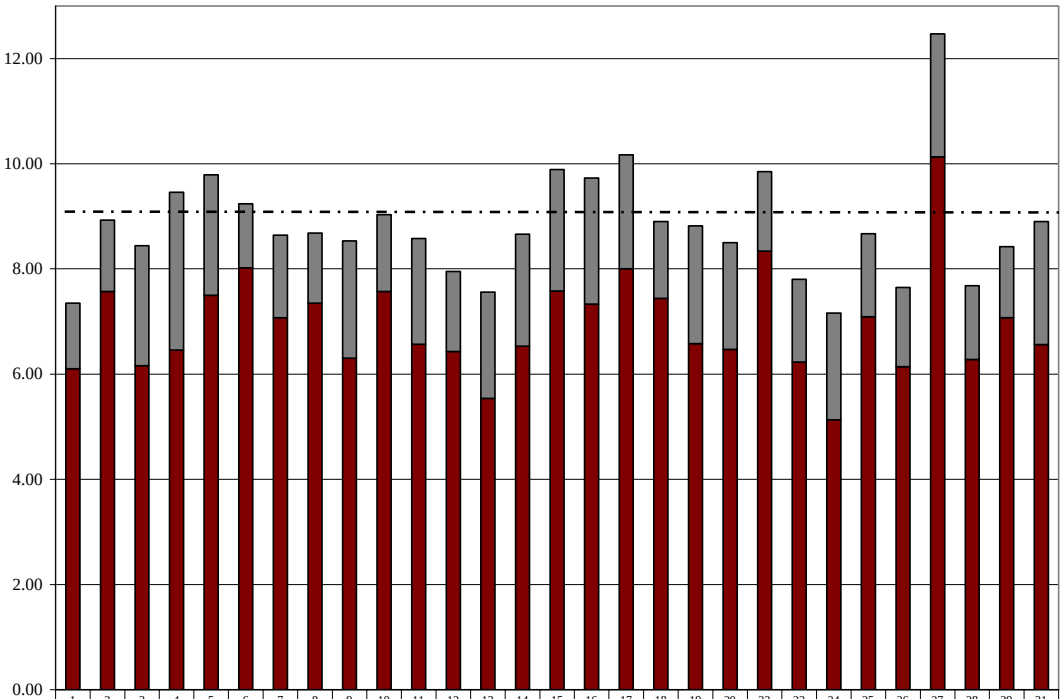
PF&R staffs each front-line engine, some ladder trucks, and the Heavy Rescue with a minimum of one paramedic and three EMT-Basics, providing the entire City with ALS first response service.

PF&R routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, chemical exposures, construction or industrial accidents, and any other event that occurs with multiple injured people in close proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

Dispatchers triage calls to establish the correct initial response. The fire officers can amend the response after initial assessment or en route based on updated information. Officers use standard operating guidelines to request adequate

personnel as follows: one fire company per critically injured patient (ALS) and one fire company per three patients with minor injuries (Basic Life Support [BLS]). A pre-determined response is in place for multiple patient scenes (MPS) and mass casualty incidents (MCI). These responses provide additional personnel for patient care, scene management, and patient transportation.

Figure 4.4
On-Scene and With-Patient Time for EMS Incidents, By Station
Times 90th Percentile
Fiscal Year 2006-2007
(Time Measured in Minutes and Seconds)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	23	24	25	26	27	28	29	31
With Patient at 90th%	1.25	1.36	2.28	3.00	2.29	1.22	1.57	1.33	2.23	1.46	2.01	1.52	2.02	2.13	2.31	2.40	2.17	1.46	2.24	2.03	1.51	1.57	2.03	1.58	1.51	2.34	1.40	1.35	2.34
On Scene at 90th%	6.10	7.57	6.16	6.46	7.50	8.02	7.07	7.35	6.30	7.57	6.57	6.43	5.54	6.53	7.58	7.33	8.00	7.44	6.58	6.47	8.34	6.23	5.13	7.09	6.14	10.13	6.28	7.07	6.56

Stations 15, 24, and 30 were under construction during FY 2006-07
****Interval from On Scene to With Patient at 90th Percentile**
*****Interval from Dispatch to On Scene at 90th Percentile**
Emergency Medical Services Critical Tasks

Response Time Value

Response coverage has evolved over time for PF&R using various methods to provide a stated level of service. As previously mentioned, response time coverage is a fluid process, affected both by construction of new stations and potential station closures due to budget cuts. Technology is also a factor when assessing community risk as it relates to response coverage. For example, new technology can capture elements of response time and turnout time to help evaluate performance and set benchmarks for improvements.

Historical Decision-Making

Historically, PF&R relied upon an interpretation of the time temperature curve as the main basis for siting of its fire stations. The best-case scenario places the first arriving fire company at the scene of an emergency within five minutes of notification to the 9-1-1 center. The assumption is that fire departments may prevent flashover in a slowly developing fire prior to the five-minute mark.

The desire to place the first company on-scene within five minutes, including alarm processing time and turnout time of 1 minute 20 seconds, produced the concept of a station service area that could be served within a 3 minute, 40 second (3.66 minute) drive time. The main shortcoming of this process was the absence of optimal and actual performance data. Stations were sited based on actual drive times by fire apparatus or staff vehicles simulating emergency response conditions.[7]

The 5-minute figure and its component times were never intended to be "response time goals" even though they are sometimes referred to as such, but rather "fire station siting criteria".[8] Actual response time performance may vary as much as 100 percent because of a variety of factors, such as time of day, inclement weather, street characteristics, traffic patterns, traffic signals and calming devices, simultaneous emergencies and/or companies away from stations for training or other activities.

In 1993, 1997, and 2006 PF&R conducted more comprehensive station location and response time analysis and decision making with the help of TriData Corporation (see page 16).

Time and Interval Description Methodology

While average times and statistical means have some utility, they are not useful measures of performance unless coupled with another measure of central tendency, such as the variance (based on a standard deviation) which described the "shape" of the performance curve.[9]

Because these are difficult statistical concepts to grasp, the use of "percentile analysis"[10] is gaining great favor with the operations analysis community. Using

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[7] Inasmuch as travel speed is influenced by a variety of factors including weather, ambient light, traffic flow, presence of pedestrians and schools, etc., this degree of correlation has been deemed acceptable for evaluation of response patterns.

[8] The Insurance Services Organization (ISO) requires the siting of fire stations such that an engine company (pumping engine) is located within 1.5 road miles of an insurable building, and a truck company (ladder truck) is located within 2.5 road miles of any building taller than 2 stories.

[9] Two fire departments can report the same "average" response time, yet the citizens of the two communities can receive vastly different services. For example, city A, with a 4 minute average response time, with all response times falling between 3 and 5 minutes. City B, with the same 4 minute response time, could have a few calls with a response time of less than one minute and some calls where the response time was 10 or more minutes. Thus the use of "averages" has the effect of concealing rather than clearly illustrating true response performance.

[10] In the world of EMS system compliance measures, percentile analysis is also referred to as "fractile analysis." While not appearing in statistics texts, readers who have heard the term used should understand that it is simply another name for percentile analysis.

this methodology, PF&R can clearly articulate its performance standards and goals in a manner that is easily understood. For example, "The PF&R first responder will arrive on-scene within 5 minutes 20 seconds of alarm activation, at least 90 percent of time," is a goal that can clearly be understood by everyone.

Accepted Levels of Service

In the end, it is the community, through its elected officials, that dictates the standard of coverage that will be adopted by the fire agency. By its economic decisions with respect to taxation, the community buys a level of "fire and life safety insurance" that is consistent with its perceived needs and its available resources. While these decisions may be influenced by such factors as insurance ratings prepared by the ISO, the level of protection available in any community is a local decision that should be made only after meticulous study of local needs and resources.

Crucial Elements

All response elements are key to siting fire stations and providing resources. The difficulty with using response time goals is that the goal itself is not important. It is the performance in achieving the goal that is important. The primary focus of statistical analysis of emergency response data is often the travel time of the first-due fire-company. While this stage of response is of paramount importance, other factors are also important.

Critical tasks are additional response elements that need to be evaluated when siting fire stations and providing resources. Critical tasks, in Section Five, are the core elements required to mitigate an event, whether the event is relatively small or large.

Responders must perform a number of critical tasks in the initial phases of a structure fire: search and rescue operations, proper placement of hose lines, ventilation, placement of ground and/or aerial ladders, and providing a water supply. Other tasks are also required, such as providing backup hose lines to ensure protection of firefighters already engaged inside the structure. Achieving these tasks requires the deployment of both human resources and equipment used on a first alarm assignment. More complex fires, for instance in high rises or apartment complexes require additional alarms to supply the personnel, apparatus, and equipment needed to perform the tasks to bring the event to a close.

Another element of response time in correlation to station locations, is taking into account how the activity of one station affects adjacent stations. Quite frequently the first-in company may be committed to another emergency response or out of service conducting non-emergency activities such as fire prevention inspections. This macro-level view of overall coverage of multiple stations is a key

consideration when locating stations. Its level of importance is heightened as the rapid deployment of all resources to a fire and not just the first-in company is receiving more attention due to regulations designed to ensure firefighter safety.

Current state regulations from the Oregon Occupational Safety and Health Administration (OR-OSHA) place restrictions on the involvement of firefighters in an *immediately dangerous to life and health* (IDLH) atmosphere without proper backup. Such regulations require multiple fire companies to be on-scene before effective critical tasks can be started to mitigate the emergency.

NFPA 1710

PF&R is evaluating the feasibility of adopting NFPA 1710, the Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.

This standard outlines an organized approach to defining levels of service, deployment capabilities, and staffing for "substantially" career fire departments. Specifically NFPA 1710 provides standard definitions for fire apparatus, personnel assigned, procedural guidelines within which they operate, and staffing levels needed to accomplish specific tasks on arrival at an incident.

NFPA 1710 states that fire departments shall establish a performance objective of not less than 90 percent for each of the following response time objectives:

- One minute (60 seconds) for turnout time.
- Four minutes (240 seconds) or less for the arrival of the first-arriving engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the arrival of a full first alarm assignment at a fire suppression incident (including one individual for incident command outside of the hazard area).
- Four minutes (240 seconds) or less for the arrival of a unit with first responder, or higher, level capability at an emergency medical incident.
- Eight minutes (480 seconds) or less for the arrival of an ALS unit at an emergency medical incident, where this service is provided by the fire department.

PF&R's current statistical data indicates that PF&R places the first engine on-scene at a fire suppression incident in 7 minutes 18 seconds 90 percent of the time, and that PF&R's full first alarm assignment arrives on-scene in 16 minutes 43 seconds 90 percent of the time.

Below are several factors that have a temporary or artificial influence on the response times for PF&R:

- PF&R is currently in the process of upgrading facilities to meet seismic code requirements. During this upgrade, several stations have been temporarily relocated to nearby FMAs, creating longer response times to vacated FMAs. Getting an accurate evaluation of service delivery with regard to response time will be a hurdle for the next few years. PF&R's seismic upgrade project is well underway but will continue through fiscal year 2008-09. PF&R will not be able to more accurately evaluate response performance until at least one to two years after the seismic upgrades are complete.
- The time of year influences response time. During times of ice and snow, response times will be longer when apparatus have chains on the tires and are limited to a maximum speed of 25 miles per hour.
- The time of day and day of week influence response time. Response times during the morning or afternoon commute will be longer due to heavy traffic. Responses in areas with heavy traffic during normal work hours (e.g., downtown Portland) will be slower than after the workday.
- Topographical/geographical issues influence response times. Circuitous response routes involving crossing a limited number of bridges over the Willamette River increases response time. Also, responses involving traveling up long stretches in Portland's West Hills (e.g., ascending Saltzman Road or Germantown Road) increases response time.
- Other factors that influence response time data include how alarms are dispatched and how companies respond. PF&R responds to numerous alarms that are dispatched as code 1 (non-emergency), and others where responding companies must "stage" (i.e., standby several blocks from the incident until scene safety is confirmed by police) before arrival on-scene.

Because NFPA 1710 does not take the aforementioned items into account in establishing response time performance, it is difficult to resolve response time issues. Nevertheless, PF&R tracks and evaluates emergency response data in a variety of categories, and believes that response time goals can be adjusted for the safety of its members without compromising service to the community.

PF&R will continue to evaluate alternatives to improve service delivery including the following:

- Identifying of new station locations
- Reviewing and improving dispatch triage guidelines
- Adjusting staffing during increased load times
- Utilizing peak-load staffed units
- Adding additional resources to existing facilities

All of these alternatives carry significant costs to PF&R and the city.

NFPA 1710 also recommends that levels of on-duty suppression personnel reflect quantities necessary to perform expected fire fighting actions. NFPA 1710 staffing recommends the following:

- Fire companies whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue, shall be known as engine companies. These companies shall be staffed with a minimum of four on-duty personnel.
- Fire companies whose primary functions are to perform the variety of services associated with truck work, such as forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work, shall be known as ladder or truck companies. These companies shall be staffed with a minimum of four on-duty personnel.
- In jurisdictions with tactical hazards, high hazard occupancies, high incident frequencies, geographical restrictions, or other pertinent factors as identified by the authority having jurisdiction, these companies shall be staffed with a minimum of five or six on-duty personnel.
- Command (chief) officers are also required for response efforts. They shall be dispatched or notified to respond to all full-alarm assignments. Supervisory chief officers are also supposed to have staff aides assigned to them for purposes of incident management and accountability at emergency incidents.

PF&R currently meets the NFPA 1710 requirement of four-person staffing on all apparatus, and exceeds the required personnel on scene for fire related incidents. Due to the commitment of resources deployed on fires and other major incidents, reconfiguration of resources to accommodate G.O. Bond activities, and company utilization for other activities, PF&R realizes resource reliability issues during peak activity hours. PF&R is reviewing factors -- including resource utilization scores, run volume trends, run durations (elapsed time), and response time elements as related to call types – that may prompt allocation of additional resources.

Through self and risk assessment, cost benefit analysis, and input from the communities served, PF&R will make an informed decision on whether NFPA 1710 is a viable standard for adoption in Portland.

Response Performance Analysis

In addition to a large urban area, PF&R contains significant primarily residential areas on its northwest and eastern borders. These areas are also included in Category "A" (Table 4.3).

The CFAI Leadership Team analyzed response performance in each fire block and FMA, on a call-by-call basis. The team, comprised of administrative and operations staff, began with the premise that the minimum performance standard should relate to today's actual performance, and that future efforts should concentrate on improving performance against those standards. Then each area was examined for a confirmation of the validity of its classification. PF&R

retrospectively analyzed response data for fiscal years in 2004, 2005, and 2006. The response times shown in Table 4.3 were recorded at the 80th and 90th percentiles (first arriving apparatus, all types of incidents).

Table 4.3
Adopted Response Time Goals and Actual Performance

ZONE	ADOPTED GOAL		Current 80TH Percentile		Current 90th Percentile	
	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*
Urban	5.33	*5:20*	6.22	*6:13*	7.17	*7:10*

This document is intended to be a living document, fluid due to changes in available data, science, technology, risk or type of risk. The following response time goals may be adjusted based on performance in future years.

Response Time Goals, All Incidents

Upon adoption of this document, PF&R's response time goals (reflex interval plus travel interval) are as follows: to have the **first-in company** arrive at **90 percent of all incidents** in each response zone within the following intervals:

Table 4.4
Response Time Goal

ZONE	RESPONSE TIME GOAL
Urban	5 minutes 20 seconds

PF&R has mapped three-year performance data for all fire blocks, adjusted for G.O. Bond activities, which can be seen in Attachment W.

Retrospective Analysis of Performance

While the first arriving unit is the most critical for most situations, it is also important to consider how quickly multiple units can be assembled at a location to handle the more complex situations, particularly structure fires. Although the initial response time objective is used to plan fire station locations, the need to assemble grouped resources for structure fires is the most significant factor in determining the number of personnel and the types of units that should be assigned to each station. Performing a retrospective analysis of performance for the four types of incidents that require a box assignment (multiple companies dispatched to the same incident) enables PF&R to identify areas for improvement among all units dispatched.

Retrospective Analysis of Performance: Commercial Structure Fires
The following tables show PF&R's actual system performance for ***commercial structure fires*** during fiscal years 2004-05 through 2006-07. Data is inclusive for all first-alarm apparatus; however, the last row removes the second-due On-Duty

Chief and the Heavy Rescue, in order to delineate impacts on full complement response times.

This analysis looks at each arriving unit individually and, in the second to last row of the tables, provides the response time for the full complement of equipment. Percentile information is provided in the analysis because it is much more meaningful in terms of decision-making.

Table 4.5(a)
Response Time – Commercial Structure Fires - Core (Full Complement)

Commercial Fire	90th Percentile (Cases = 49)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 49)
Alarm processing	Min. & Sec.: 1:07	
Turnout, First In Company	1 Min 05 Sec	
Travel, First In Company	4 Min 11 Sec	
Travel, First In Engine	5 Min 29 Sec	5 Min 29 Sec
Travel, Second In Engine	7 Min 31 Sec	7 Min 31 Sec
Travel, Third In Engine	8 Min 09 Sec	7 Min 57 Sec
Travel, Fourth In Engine	12 Min 48 Sec	9 Min 02 Sec
Travel, First In Truck	6 Min 39 Sec	6 Min 22 Sec
Travel, Second In Truck	12 Min 37 Sec	9 Min 03 Sec
Travel, First In Chief	8 Min 48 Sec	8 Min 48 Sec
Travel, Second In Chief	14 Min 10 Sec	11 Min 52 Sec
Response, Full Complement: 4 Eng., 2 Trucks, 2 Chiefs, 1 Heavy Rescue	14 Min 59 Sec	

Table 4.5(b)
Response Time - Commercial Structure Fires – Urban (Full Complement)

Commercial Fire	90th Percentile (Cases = 65)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 65)
Alarm processing	Min. & Sec.: 1:05	
Turnout, First In Company	1 Min 12 Sec	
Travel, First In Company	5 Min 17 Sec	
Travel, First In Engine	6 Min 16 Sec	6 Min 16 Sec
Travel, Second In Engine	7 Min 48 Sec	7 Min 44 Sec
Travel, Third In Engine	11 Min 34 Sec	9 Min 12 Sec
Travel, Fourth In Engine	18 Min 22 Sec	11 Min 45 Sec
Travel, First In Truck	8 Min 48 Sec	8 Min 48 Sec
Travel, Second In Truck	15 Min 54 Sec	12 Min 03 Sec
Travel, First In Chief	11 Min 48 Sec	11 Min 48 Sec
Travel, Second In Chief	18 Min 08 Sec	17 Min 48 Sec
Response, Full Complement: 4 Eng., 2 Trucks, 2 Chiefs, 1 Heavy Rescue	24 Min 07 Sec	

Table 4.5(c)
Response Time - Commercial Structure Fires – Outlying (Full Complement)

Commercial Fire	90th Percentile (Cases = 10)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 10)
Alarm processing	Min. & Sec.: 1:20	
Turnout, First In Company	1 Min 23 Sec	
Travel, First In Company	6 Min 47 Sec	
Travel, First In Engine	8 Min 46 Sec	8 Min 46 Sec
Travel, Second In Engine	10 Min 51 Sec	10 Min 51 Sec
Travel, Third In Engine	13 Min 02 Sec	13 Min 02 Sec
Travel, Fourth In Engine	49 Min 37 Sec	18 Min 05 Sec
Travel, First In Truck	11 Min 40 Sec	11 Min 40 Sec
Travel, Second In Truck	19 Min 52 Sec	15 Min 13 Sec
Travel, First In Chief	16 Min 36 Sec	16 Min 36 Sec
Travel, Second In Chief	21 Min 57 Sec	21 Min 57 Sec
Response, Full Complement: 4 Eng., 2 Trucks, 2 Chiefs, 1 Heavy Rescue	54 Min 38 Sec	

As shown in the last row of the table, removing the Heavy Rescue and the second command chief officer (called the core complement assignment), affect the overall full complement time by at least a couple of minutes.

Elapsed time since initial dispatch is also shown for each resource dispatched in order to expand on basic travel time data. Clearly, the fourth engine and second chief significantly impact overall response time.

Retrospective Analysis of Performance: Residential Structure Fires

The following table shows PF&R's actual system performance for ***residential structure fires*** during fiscal years 2000-04 through 2006-07. Data is inclusive for all first-alarm apparatus.

PF&R structural fire response time performance for first-in trucks can be seen on the map in Attachment W, and full complement performance can be seen in Attachment Y.

Table 4.6(a)
Response Time - Residential Structure Fires Core (Full Complement)

Residential Fire	90th Percentile (Cases = 56)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 56)
Alarm Processing	Minutes & Seconds 1:06	
Turnout, First In Company	1 Min 01 Sec	
Travel, First In Company	4 Min 24 Sec	
Travel, First In Engine	5 Min 50 Sec	5 Min 50 Sec
Travel, Second In Engine	6 Min 30 Sec	6 Min 29 Sec
Travel, Third In Engine	7 Min 47 Sec	7 Min 41 Sec
Travel, Fourth In Engine	15 Min 23 Sec	10 Min 09 Sec
Travel, First In Truck	8 Min 36 Sec	8 Min 39 Sec
Travel, Second In Truck	NA	NA
Travel, First In Chief	11 Min 15 Sec	10 Min 41 Sec
Travel, Second In Chief	NA	NA
Response, Complement: 4 Engines, 1 Truck, 1 Chief	16 Min 15 Sec	

Table 4.6(b)
Response Time - Residential Structure Fires - Urban (Full Complement)

Residential Fire	90th Percentile (Cases = 229)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 229)
Alarm Processing	Minutes & Seconds 1:056	
Turnout, First In Company	1 Min 03 Sec	
Travel, First In Company	4 Min 39 Sec	
Travel, First In Engine	5 Min 42 Sec	5 Min 34 Sec
Travel, Second In Engine	7 Min 22 Sec	7 Min 16 Sec
Travel, Third In Engine	8 Min 50 Sec	8 Min 43 Sec
Travel, Fourth In Engine	15 Min 36 Sec	11 Min 12 Sec
Travel, First In Truck	9 Min 24 Sec	8 Min 52 Sec
Travel, Second In Truck	NA	NA
Travel, First In Chief	11 Min 55 Sec	11 Min 47 Sec
Travel, Second In Chief	NA	NA
Response, Complement: 4 Engines, 1 Truck, 1 Chief	19 Min 08 Sec	

Table 4.6(c)
Response Time - Residential Structure Fires – Outlying (Full Complement)

Residential Fire	90th Percentile (Cases = 29)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 29)
Alarm Processing	Minutes & Seconds 1:06	
Turnout, First In Company	1 Min 05 Sec	
Travel, First In Company	6 Min 20 Sec	
Travel, First In Engine	8 Min 23 Sec	5 Min 50 Sec
Travel, Second In Engine	10 Min 50 Sec	6 Min 29 Sec
Travel, Third In Engine	12 Min 23 Sec	7Min 41 Sec
Travel, Fourth In Engine	29 Min 51 Sec	10 Min 09 Sec
Travel, First In Truck	11 Min 23 Sec	8 Min 39 Sec
Travel, Second In Truck	NA	NA
Travel, First In Chief	17 Min 39 Sec	10 Min 41 Sec
Travel, Second In Chief	NA	NA
Response, Complement: 4 Engines, 1 Truck, 1 Chief	37 Min 40 Sec	

Retrospective Analysis of Performance: Hazardous Materials Incidents

The following table shows PF&R's actual system performance for ***hazardous materials incidents*** during fiscal years 2004-05 through 2006-07. Data is inclusive for all first-alarm apparatus.

Table 4.7
Response Time - Hazardous Materials (Full Complement Analysis)

HazMat	90th Percentile (Cases = 1)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 1)
Alarm processing	Minutes & Seconds: 2:03	
Turnout, First In Company	1 Min 09 Sec	
Travel, First In Company	6 Min 03 Sec	
Travel, First In Engine	7 Min 12 Sec	7 Min 12 Sec
Travel, Second In Engine	10 Min 05 Sec	10 Min 05 Sec
Travel, Third In Engine	11 Min 28 Sec	11 Min 28 Sec
Travel, Fourth In Engine	13 Min 12 Sec	13 Min 12 Sec
Travel, First In Truck	7 Min 36 Sec	7 Min 36 Sec
Travel, Second In Truck	9 Min 53 Sec	9 Min 53 Sec
Travel, HazMat unit		
Travel, First In Chief	10 Min 09 Sec	10 Min 09 Sec
Travel, Second In Chief		
Travel, Heavy Rescue	16 Min 14 Sec	16 :14
Response, Full Complement: 1 HazMat unit, 4 Engines, 2 Trucks, 2 Chiefs, 1 Heavy Rescue		

Since only one incident occurred where the full complement of the assignment actually arrived on scene, the table above is not statistically significant. However,

one would expect longer response times for the full complement, given the distance that the HazMat unit must travel for most incidents. In the case noted above, the Heavy Rescue had the longest elapsed time since dispatch, which could have been the result of many factors, such as distance traveled, concurrent calls elsewhere in the city, and traffic calming devices.

Retrospective Analysis of Performance: Gas Major Incidents

The following table shows PF&R's actual system performance for ***gas major incidents*** during fiscal years 2004-05 through 2006-07. Data is inclusive for all first-alarm apparatus.

Similar to HazMat incidents, very few gas major incidents occurred where a full complement arrived (34 instances). It appears that for these 34 cases, the fourth-in engine and second-in chief experienced the greatest elapsed time from initial dispatch.

Table 4.8
Response Time - Gas Major (Full Complement Analysis)

Gas Major	90th Percentile (Cases = 34)	90th Percentile, Total Elapsed Time Since Initial Dispatch (Cases = 34)
Alarm processing	Minutes & Seconds: 1:48	
Turnout, First In Company	0 Min 53 Sec	
Travel, First In Company	5 Min 44 Sec	
Travel, First In Engine	7 Min 03 Sec	7 Min 03 Sec
Travel, Second In Engine	7 Min 31 Sec	7 Min 31 Sec
Travel, Third In Engine	9 Min 17 Sec	9 Min 02 Sec
Travel, Fourth In Engine	15 Min 26 Sec	15 Min 26 Sec
Travel, First In Truck	8 Min 04 Sec	8 Min 04 Sec
Travel, Second In Truck	11 Min 37 Sec	11 Min 37 Sec
Travel, First In Chief	56 Min 06 Sec	14 Min 37 Sec
Travel, Second In Chief	15 Min 53 Sec	15 Min 53 Sec
Travel, Heavy Rescue	65 Min 00 Sec	17 Min 44 Sec
Response, Full Complement: 4 Engines, 2 Trucks, 2 Chiefs, 1 Heavy Rescue	65 Min 00 Sec	

Retrospective Analysis of Performance: EMS Incidents

The following table shows PF&R's actual response time performance for ***EMS incidents*** during FY 2004-05 through 2006-07. Data reflects first-arriving companies, with exceptions removed (less than zero or greater than twelve minutes – roughly 1 percent of all calls). Exceptions were removed in an effort to more accurately reflect performance for the purpose of establishing realistic goals.

Table 4.9
Response Time – EMS

ZONE	ADOPTED STANDARD		80% of the time		90% of the time	
	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*	Decimal Min.	*Min. & Sec.*
Category "Core"	5.33	*5:20*	5.48	*5:29*	6.30	*6:18*

PF&R will continue to have a response time goal of 5 minutes 20 seconds 90 percent of the time for EMS incidents due to the critical correlation between response time and patient survival. This goal mirrors the goal PF&R has established for other call types. For medical calls in particular, it is important to mention that the emergency vehicle may be able to reach the dispatched location within 5 minutes 20 seconds, but often it takes an additional minute or more to actually reach a patient inside a dwelling. It may take several minutes to reach a patient inside a large building or complex.

For this reason, PF&R promotes and values its citizen/business partners in the field who have been trained to perform cardio pulmonary resuscitation (CPR) and/or utilize automatic external defibrillators (AED) prior to the arrival of the professional medical help.

Specific Incident Type Standards of Coverage Statements

In addition to the response time goals described earlier, PF&R has established the following standard of coverage statements to address full complement assignment calls, specialty calls, and calls to isolated areas.

a. PF&R will strive to maintain sufficient personnel and equipment, strategically located, so that the minimum acceptable firefighting response force (as defined in Section Five for the full complement of the assignment) can reach **90 percent of commercial fire scenes** within the time specified below:

Table 4.10
Response Goals – Commercial Fire

ZONE	Response Goal
Core	16.00 minutes

PF&R currently responds to all fire calls (where the full complement of units arrived on scene) within 16 minutes or less 70 percent of the time, and believes that this number will be improved with the completion of the G.O. Bond Program.

b. PF&R will strive to maintain sufficient personnel and equipment, strategically located, so the minimum acceptable firefighting response force (as defined in

Section Five for the full complement of the assignment) can reach **90 percent of residential fire scenes** within the time specified below:

Table 4.11
Response Goals – Residential Fire

ZONE	Response Goal
Urban	16.00 minutes

c. PF&R will strive to maintain sufficient personnel and equipment, strategically located, so that the minimum acceptable response force can reach **90 percent of Technical, Marine, HazMat and Wildland Response scenes** within the time specified below:

Table 4.12
Response Goals - Other

CATEGORY	GOAL
Hazardous Materials	18 minutes
Water Rescue	15 minutes
Technical Rescue	15 minutes
Wildland	15 minutes

Technical and specialty rescue performance can be seen on the map in Attachment Z.

Exception Reporting

Several factors beyond PF&R's control may adversely impact emergency response times; however, PF&R does not believe that the number of exceptions negatively impacts overall response times. The FIS provides officers with a drop-down list for exceptions when they prepare the incident report(s); officers are prompted if the response time exceeds six minutes. PF&R will have to determine if exceptions should be entered in the FIS, and whether they should be removed from response time reporting in the future.

The following list represents the most common exceptions that firefighters encounter during response:

- Adverse weather responses (snow, floods, etc.)
- Calls initiated as "Code 3" and unit is slowed to "Code 1" en route
- Unexpected delays (trains, construction, extreme traffic not normally encountered)

SECTION FIVE: On-Scene Operations, Critical Tasks, and Establishment of an Effective Response Force

On-scene operations, critical tasking, and effective response force are elements of response coverage that determine staffing levels, number of units needed, and duties to be performed on the fireground. To succeed, a fire department must determine what tasks to complete, and how many responders and apparatus are needed.

On-scene Operations

Fire growth dynamics, property and life risk combine to determine the fireground tasks required to mitigate loss. These tasks are interrelated, but can be separated into two basic types: fire flow and life safety. Fire flow tasks relate to getting water on the fire. Life safety tasks relate to finding trapped victims and safely removing them from the structure.

Responders use hand-held hoses or master streams (i.e., nozzles usually attached to a portable monitor or the engine or ladder) to accomplish fire flow tasks. Master streams take relatively fewer firefighters to operate because they are most often fixed to the apparatus.

The decision to use hand lines or master streams depends upon the stage of the fire and the threat to life safety. If the fire is in a pre-flashover stage, firefighters can make an offensive fire attack into the building by using hand lines to attack the fire. Then they can protect trapped victims until extrication. The structure is declared lost if the fire is in its post-flashover stage and has extended beyond the capacity or mobility of hand-held hoses, or if structural damage is a threat to firefighters' safety. Then responders use master streams to extinguish a fire and keep it from advancing to surrounding exposures. First-arriving firefighters may use a transitional "defensive to offensive" strategy (discussed below) to limit or remove an IDLH threat while awaiting the arrival of additional resources.

Life safety tasks are based upon the number of occupants, their location, their status (i.e., awake versus sleeping), and their ability to take self-preserving action. For example, ambulatory adults need less assistance than non-ambulatory adults. The elderly and small children generally require more assistance.

The key to success at a fire scene is adequate staffing and coordinated teamwork, regardless of whether the fireground tasks are all fire-flow related or a combination of fire flow and life safety.

PF&R uses aggressive offensive attacks whenever possible. The first objective is to put a hose line between the victims and the fire, and to rescue those victims by distancing them from the hazard. The second objective is to contain the fire to the room of origin. Through a structured risk management plan, PF&R has

established the following guidelines for on-scene personnel engaged in evaluating conditions:

1. We may risk our lives a lot to protect savable lives.
2. We may risk our lives a little to protect savable property.
3. We will not risk our lives at all to save what is already lost.

Before establishing on-scene procedures, the initial Incident Commander (IC) must select an appropriate initial strategy: offensive, defensive, or transitional.

An **offensive strategy** is an aggressive interior fire attack. The top priority is rescue of trapped victims. PF&R tries to limit deaths and injuries, as well as the number of fires that spread beyond the room of origin. For these reasons, PF&R uses an aggressive offensive attack wherever possible, given safety and other relevant concerns.

A **transitional strategy** is used in the face of changing resource levels or changing fire conditions. A transitional "defensive to offensive" attack is appropriate in the following situations:

- While awaiting the arrival of sufficient resources to safely mount an offensive attack
- To temporarily reduce IDLH
- Until a large fire can be "knocked down" sufficiently to permit interior attack

Conversely, a transitional "offensive to defensive" strategy is best when fire progress renders a building unsafe for continued interior operations.

A **defensive strategy** does not allow for interior fire attack, except as necessary to rescue trapped firefighters. No attempts are made to rescue civilian victims, because in circumstances where defensive tactics are warranted, victims are presumed to be beyond rescue. In this scenario, nearly all firefighting is performed from outside the structure with the goal of containing the fire to the initial structure involved.

Critical Tasks

Firefighters perform critical tasks at structure fires to control the fire before flashover or to extinguish the fire quickly. A fire department must assure that responding companies can perform all of the described tasks efficiently and effectively.

Critical tasks are described in Table 5.1. Allocation assumes that crews are committed to those assigned tasks (worst-case scenario), and are not available for re-assignment until after the balance of the alarm arrives on scene.

Initial Attack and Initial Support

PF&R's initial response force includes the first two arriving engine, truck, or heavy rescue companies. These companies perform the following functions during the initial stages of an incident.

Table 5.1
Initial Attack Tasks

TASK	Residential Fire	Commercial Fire
Size Up and Command	1	1
Accountability	1	1
Truck Operations: Force Entry, Search, Ventilation, etc.	4	8
Pump Operations/Water Supply	1	2
Offensive Fire Attack	2-4	4-8
SUB-TOTAL: Initial Attack	**9-11**	**16-20**
Rapid Intervention Team/EMS	2-4	2-4
Salvage and Overhaul	2-4	2-4
Back up Lines	2-4	2-4
Rehab		2-4
Designated Safety Officer	1	1
SUB-TOTAL: Initial Support	**7-13**	**9-17**
TOTAL: Initial Attack and Initial Support	**16-24**	**25-37**

Secondary Support

Secondary support functions may be performed by numerous responders, such as initial response personnel reassigned after the completion of an initial assignment, by fire companies dispatched on all structure fires, or by units specifically called for that purpose when dictated by the situation (e.g., extremely hot weather). Secondary support functions include salvage, overhaul, staffing of the Rehab Group, air supply, etc.

As shown in Table 5.1, it takes 16 to 37 personnel to accomplish the critical tasks necessary to effectively and efficiently control a typical fire using PF&R's current staffing configuration.

In the event of a substantial (greater alarm) fire, or on request of an IC, additional alarm assignments provide the chief officers and support staff to provide command support. The dispatch of the additional alarms provides an IC, a Public Information Officer (PIO), PF&R's designated Safety Officer, and other support personnel. This relieves the on-scene commander of responsibilities not directly related to command of incident operations.

The fire scene is unpredictable in many ways. While it is possible to state what critical tasks must be accomplished in order to save lives and extinguish the fire, it is not always possible to predict how many firefighters it will take to accomplish those tasks. The number of personnel and the amount of equipment necessary to accomplish the critical tasks listed will vary due to the following factors:

- Delayed response
- Building construction
- Number of occupants
- Physical and emotional condition of occupants
- Extent of fire upon arrival (has it reached flashover?)
- Built-in fire protection
- Area of fire involvement
- Firefighter or civilian injuries
- Equipment failure

PF&R uses experience, knowledge, and judgment to determine what constitutes an effective response force. These numbers are accurate for the majority of the working fires within PF&R's boundaries. The need for more personnel may arise on any fire scene at any time. Fire conditions dictate the required response for any given fire, even if that response exceeds the standards listed in this document. PF&R relies on the experience and professional judgment of company and chief officers to request additional resources during the initial stages of an incident.

Emergency Medical Services Critical Tasks

PF&R responds to more than 40,000 EMS calls per year. These calls include, but are not limited to, car accidents, childbirth, strokes, heart attacks, chest pain, and difficulty breathing. PF&R provides EMS "first response services", with ambulance transportation provided by AMR.

PF&R staffs each front-line engine, several ladder trucks, and the heavy rescue with a minimum of one paramedic and three EMT-Basics, providing the entire city with ALS first response service. The remaining seven ladder trucks are staffed with four EMT-Basics.

PF&R routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in close proximity. Patient conditions can range from minor cuts and bruises to life threatening injuries.

Dispatchers triage calls to establish the correct initial response. The first fire officer on scene amends the response after initial assessment. Officers use standard operating guidelines to request adequate personnel as follows: one fire company per critically injured patient (ALS) and one fire company per three patients with

minor injuries (BLS). A pre-determined response is in place for MPS and MCI. These responses provide for additional personnel for patient care, scene management, and patient transportation.

Initial and Effective Response Force

PF&R's Standard of Cover for single ALS response is 7:15 for the Core area, 8:20 for the Urban area, and 9:30 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for multiple EMS response requiring extrication is 8:10 for the Core area, 10:30 for the Urban area, and 13:30 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals. These goals reflect total reflex time.

Table 5.2
EMS Response Goals

RESPONSE FORCE	Core	Urban	Outlying
EMS: 4 personnel, 1 engine or 1 truck or 1 heavy rescue and 1 ambulance (private service provider)	7 minutes 12 seconds 90% of the time	8 minutes 17 seconds 90% of the time	9 minutes 29 seconds 90% of the time
EMS – Extrication Response: 8 personnel, 1 engine, 1 truck	8 minutes 9 seconds 90% of the time	10 minutes 26 seconds 90% of the time	13 minutes 31 seconds 90% of the time

For the majority of EMS calls, PF&R's initial response force is one ALS unit. Other EMS calls may require additional companies.

Subsequent companies may be requested by the incident commander for MPS and MCI; however, these incidents are initially dispatched as EMS calls.

Below is a table that illustrates the many tasks which must be accomplished simultaneously during life threatening EMS calls. Some of the tasks can be performed by the same person (in rapid sequence); however, overall treatment may require additional response personnel.

Table 5.3
EMS Task Assignment

EMS Task Assignment			
Critical Tasks	**Cardiac Arrest**	**Stroke/Overdose**	**Multi-System Trauma**
	Number of Personnel		
Patient Assessment	2 per Pt.	2 per Pt.	2 per Pt.
Cardiac Defibrillation	1	n/a	n/a
Airway Management/Intubation	2 per Pt.	2 per Pt.	2 per Pt.
CPR	1	n/a	n/a
EKG Monitor	1	1	1
IV/Pharmacology	1	1	1
Splint/Bandage/Immobilization	n/a	n/a	1
Patient Lifting/Packaging	2-4	2-4	2-4
Medical Info. Collection	1	1	1

Commercial Fires

Initial Response Force

PF&R's initial response force includes the first two arriving engine, truck, or heavy rescue companies. These companies perform the following functions during the initial stages of an incident.

Table 5.4
Commercial Fire Tasks

TASKS	Number of Personnel
Size Up, Command	1
Water Supply	1
Search and Rescue	2
Fire Attack	2
Forcible Entry/Ventilation (Truck or Heavy Rescue) or Back-up Line (Engine)	2
TOTAL INITIAL RESPONSE FORCE	**8**

Effective Response Force

The effective response force consists of all first alarm companies. PF&R conducts search and rescue, fire attack and support functions with the effective response force in order to control fire spread and effect extinguishment.

The effective response force can be defined as the resources that will most likely stop the escalation of the emergency.

For Commercial Structural Fires, PF&R's first alarm assignment includes four engines, two trucks, and two Chief Officers, for a total of 26 emergency operations personnel on scene. For responses in the downtown core area or to target hazards (schools, hospitals) a Heavy Rescue (four personnel) augments the first alarm assignment. The Heavy Rescue is also dispatched throughout the city for greater alarms.

PF&R's Standard of Cover for initial Commercial Fire response is 8:00 minutes for the Core area, 9:00 for the Urban area, and 11:30 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for Commercial Fire effective response is 15:00 for the Core area, 20:00 for the Urban area, and 25:00 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

Subsequent companies arrive on scene as part of the initial response force and effective response force as listed in the table below. These goals reflect total reflex time for the first alarm assignment.

Table 5.5
Commercial Fire Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Commercial Fire – Initial Response Force: 8 personnel, 1 engine and 1 engine/truck/heavy rescue	7 minutes 50 seconds 90% of the time	8 minutes 50 seconds 90% of the time	11 minutes 27 seconds 90% of the time
Commercial Fire – Effective Response Force: 26 personnel, 4 engines, 2 trucks, 2 Chief Officers	15 minutes 90% of the time	20 minutes 90% of the time	25 minutes 90% of the time

For commercial fires, some companies are slowed to Code 1 following the initial size up by the first arriving officer and this situation negatively impacts response times.

For some incidents, search and rescue, fire attack, and support functions may be performed by the same personnel at different points of time during the incident. For larger incidents, 2nd alarm companies will supplement 1st alarm companies to perform support functions. During the early stages of the incident, the first arriving officer will assume command, safety, and accountability functions until a Chief Officer arrives on scene.

The following is a detailed list of the functions (tasks) performed by the effective response force at the scene of a commercial fire. The first responding officer/chief performs the safety officer function until the arrival of the 2nd Chief Officer.

Table 5.6
Commercial Fire Tasks

TASKS	Number of Personnel
Command, Accountability	2
Truck Operations: Force Entry, Search and Rescue, Ventilation, etc.	8
Pump Operations/Water Supply	2
Fire Attack	5
Back up Lines	4
Rapid Intervention Team/EMS	4
Designated Safety Officer (2nd Chief)	1
Salvage and Overhaul	*
Rehab	*
TOTAL: EFFECTIVE RESPONSE FORCE	**26**

* Addressed by effective response force as priorities shift

Residential Fires

Initial Response Force

PF&R's initial response force includes the first two arriving engine, truck, or heavy rescue companies. These companies perform the following functions in the initial stages of an incident.

Table 5.7
Residential Fire Tasks

TASKS	Number of Personnel
Size Up, Command	1
Water Supply	1
Search and Rescue	2
Fire Attack	2
Forcible Entry/Ventilation (Truck or Heavy Rescue) or Back-up Line (Engine)	2
TOTAL EFFECTIVE RESPONSE FORCE	**8**

Effective Response Force

For residential fires, PF&R's first alarm assignment includes four Engines, one Truck and two Battalion Chiefs. This provides a total of 22 emergency operations personnel on scene. This is the effective response force.

PF&R's service level objective is to have all first alarm companies (the effective response force) arrive on scene as detailed in the table below. For residential fires in the core area, a Heavy Rescue (4 personnel) augments the first alarm assignment. The Heavy Rescue is also dispatched throughout the city for greater alarms.

PF&R's Standard of Cover for initial residential fire response is 7:30 for the Core area, 8:30 for the Urban area, and 12:15 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for residential fire effective response is 15:45 for the Core area, 20:30 for the Urban area, and 30:35 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

Subsequent companies arrive on scene as part of the initial response force and effective response force as listed in the table below. These goals reflect total reflex time for the first alarm assignment.

Table 5.8
Residential Fire Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Residential Fire – Initial Response Force: 8 personnel, 1 engine and 1 engine/truck/ heavy rescue	7 minutes 24 seconds 90% of the time	8 minutes 21 seconds 90% of the time	12 minutes 15 seconds 90% of the time
Residential Fire – Effective Response Force: 22 personnel, 4 engines, 1 truck, 2 Battalion Chiefs	15 minutes 44 seconds 90% of the time	20 minutes 27 seconds 90% of the time	30 minutes 31 seconds 90% of the time

The initial effective response force performs both initial attack and initial support functions at residential fires. For smaller incidents, initial attack and initial support functions may be performed by the same personnel at different points of time during the incident. For larger incidents, 2nd alarm companies will supplement 1st alarm companies to complete support functions. In addition, in the early stages of the incident, the first arriving officer will assume the command, safety and accountability functions until the Battalion Chief arrives on scene.

The following is a detailed list of the functions (tasks) performed by the effective response force at the scene of a residential fire.

Table 5.9
Residential Fire Tasks

Tasks	Number of Personnel
Command, Accountability	2
Truck Operations: Force Entry, Search and Rescue, Ventilation, etc.	4
Pump Operations/Water Supply	2
Fire Attack	5
Back up Lines	4
Rapid Intervention Team/EMS	4
Designated Safety Officer	1
Salvage and Overhaul	*
Rehab	*
Salvage and Overhaul	*
Total	**22**

* Addressed by effective response force as priorities shift

Marine Land-Based Response

Station 24 is trained in vessel fire/rescue mitigation. On scene, Station 24 personnel conduct vessel recon, locate ship plans, and contact vessel representatives. During recon, they determine the vessel type, cargo, location of fire/victims, and extent of fire/rescue. Station 24 provides support to Command regarding strategic and tactical efforts the marine-land-based company may lead and coordinates and/or supervises fire attack teams by deploying hose-lines, foam attack, Carbon Dioxide (CO_2) System, or ship's systems. Response to marine incidents requires the marine land-based company to respond throughout the city and region.

Land-based Marine consists of Engine 24 and Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) Squad. Both of these apparatus carry specialized equipment to accomplish their mission. Equipment carried on vehicles includes: CO_2 system, slice tool, oxy-gasoline cutting tool, thermal imager, temperature probes, ship-to-shore connections, and one-hour SCBA capacity.

Four personnel respond, including one Engine, and one CBRNE Heavy Rescue.

PF&R's Standard of Cover for land-based marine response is 12:00 for the Core area, 14:30 for the Urban area and 24:30 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

These goals reflect total reflex time for the land based marine company.

Table 5.10
Marine Land-Based Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Land-Based Marine: 4 personnel, 1 engine, 1 CBRNE heavy rescue	12 minutes 90% of the time	14 minutes 22 seconds 90%of the time	24 minutes 21 seconds 90% of the time

Marine Fireboats and Rescue Boats Response

Fireboats respond to fires, water rescues, vessels in distress, navigational hazards, and environmental concerns. Rescue Boats provide rapid response for recon and water rescue to rivers and land-locked waters. A rescue craft (Sea-Doo®) provides a rapidly deployed water rescue resource for the downtown harbor section of the Willamette River. Fireboats, rescue boats, and the rescue craft respond from four stations on two rivers, as well as to land-locked waters throughout the city and region.

Fireboats provide waterside fire streams and water supplies for land-based companies. Fireboats supply water from large-capacity pumps through multiple fixed turrets/master streams, hand-lines and supply lines. Fireboat crews are capable of conducting interior hand-line structural fire attack. Fireboats conduct water rescue/recovery by taking on passengers from sinking vessels, surface rescue, diving, 360°-sonar, and dragging. Vessels in distress include vessels adrift and taking on water. Vessels in distress are de-watered by pumps on the fireboat. Once floatation is ensured the distressed vessel is lashed and taken to security. Fireboats respond to navigational hazards routinely for the safety of the waterways. Floating debris, vessels, and structures are made secure and navigated to shore or dock. Fireboats respond to environmental concerns such as spills and outfall pollution. Fireboats provide recon, containment, limited mitigation, and coordination of environmental response recourses.

Rescue boats provide rapid deployment and response to rivers and land-locked waters. Crews provide recon, surface rescue, personnel transport, dive support, and environmental/booming support.

PF&R operates the following boats and craft:

Three fireboats:

- Campbell 87′ steel hull, 4 engines with 15,000 GPM capacity
- Buss 42′ aluminum hull, twin engines with 3,500 GPM capacity
- Williams 40′ aluminum hull, twin engines with 2,500 GPM capacity

Three rescue boats:

- RB-17 32′ aluminum hull, twin 225 HP outboard engines and forward landing ramp
- RB-6 18′ Rigid Hull Inflatable with twin 80 HP outboard engines
- RB-22 16′ Rigid Hull Inflatable with 50 HP outboard engine

One rescue craft (Sea-Doo®):

- RC1 11′ Sea-Doo® personal water craft with 215 HP engine

Four personnel staff each boat, and swing from land to boat response as needed from Stations 6, 17 and 22. RC1 is crossed-staffed by two members of the TRT with one member assigned as the driver and one person as a rescue swimmer.

A component of the total reflex time is the time it takes to travel from the station to the vessel at the moorings and to get underway. Inland harbor navigational laws/rules dictate speed and wake impact. Once in the open river channel, response can be affected by river conditions, weather, and location of the incident.

PF&R's Standard of Cover for marine fireboat response is 20:15 for the Core area, 37:45 for the Urban area, and 46:15 for the outlying area 90 percent of the time. PF&R is currently meeting these goals.

These goals reflect total reflex time for the first alarm assignment.

Table 5.11
Marine Fireboat Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Marine Fireboats and Rescue Boats: 4 personnel, 1 boat	20 minutes 10 seconds 90% of the time	37 minutes 39 seconds 90% of the time	46 minutes 2 seconds 90% of the time

Water Rescue Incidents

Water rescue includes surface rescue, dive rescue, and recovery. The dive team consists of 24 divers dispersed throughout the city. Each diver carries a full complement of equipment, allowing all divers to be self-contained. On-duty divers are logged into the CAD system each shift. Upon dispatch, divers are transported to the scene on their respective fire apparatus. For live-saving operations, a diver can enter the water alone while the full response complement is still responding. Once a dive operation is fully staffed it will consist of Command, Dive Ops, Communication Officer, Air/Time Officer, Line Tender, Diver, Rescue/Rapid Intervention Team (RIT) Diver (in the water), and a Back-up Diver. In recovery mode the dive becomes very methodical, often utilizing 360° Sonar for target location and directing the diver's path.

Equipment supporting any water rescue includes dry suits, underwater communication, a dive van, fire and rescue boats, 360° Sonar, dive RIT, surface rescue boards, and flotation. Additional mutual aid marine responses are available from the Port of Portland Fire Department, Multnomah County Sheriff's Office, Gresham Fire and Emergency Services, and the Coast Guard. The Port's boat is especially effective on the Columbia River due to its location at the midpoint between Station 2 and Station 17.

The first alarm assignment for water rescue varies depending upon the type of incident. Resources may include fire boats, trucks, engines, a heavy rescue, the dive van, and Battalion Chiefs. If the surface water rescue escalates to a dive rescue, additional personnel will be assigned as noted in the table below.

PF&R's Standard of Cover for Surface Water Rescue Response is 27:15 for the Core area, 8:30 for the Urban area, and 11:35 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for Dive Rescue Response is 12:45 for the Core area, 30:00 for the Urban area, and 40:00 for the Outlying area 90 percent of the time. PF&R is currently meeting these goals. The Urban and Outlying area times are estimates as no data is available for responses into those areas.

These goals reflect total reflex time for the first alarm assignment.

Table 5.12
Water Rescue Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Surface Water Rescue: 8 personnel, boat, 1 engine/truck/heavy rescue	27 minutes 11 seconds 90% of the time	8 minutes 24 seconds 90% of the time	11 minutes 35 seconds 90% of the time
Dive Rescue/Recovery: 21 personnel, 1 boat, 1 engine/ truck, 1 heavy rescue, 1 dive van, 1 Battalion Chief, 4 divers	12 minutes 39 seconds 90% of the time	30 minutes 90% of the time *	40 minutes 90% of the time *

* No responses available in these areas to quantify goals

Hazardous Materials

PF&R has identified three levels of response for Hazardous Materials incidents. All PF&R personnel are certified to the operations level for Hazardous Materials response. Level I incidents are within the capability and training of operations level personnel. Level II and Level III incidents require the expertise and equipment provided by the Hazardous Materials Team.

Fire companies call for the HazMat Team when an incident presents a HazMat situation requiring skills/equipment beyond the scope of those trained to the HazMat operations level. While en route, the team communicates via radio and cell phone with Command and various State agencies to design specific operational priorities specific to the incident. Upon arrival, the HazMat team is designated as the HazMat Group under the Incident Command System (ICS) organizational structure.

The team leader confers with the IC to further assess:
- Safety issues and additional resource needs
- Hot/warm/cold zone designation
- Product identification determination
- Life safety/environmental damage concerns
- Release/spill mechanism and current status
- Risk/benefit analysis

Following this briefing, the HazMat team initiates interventions as follows:
- Recon
- Determine mitigation plan
- Defensive and/or offensive operations
- Field decon
- Debriefing/demobilization

HazMat team assignments are as follows:
- Team Leader
- Resource
- Entry Team (2)
- Back Up Entry Team (2)
- Safety/Medical

Decon requires a minimum of one company. Additional crews provide support, if needed, as follows:
- IC/command staff
- Decon support
- Fire suppression standby
- Ventilation
- Scene/perimeter control
- Medical support.

PF&R's Standard of Cover for HazMat Level 1 Response is 9:45 for the Core area, 12:15 for the Urban area, and 11:45 for the outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for HazMat Level 2 Response is 20:00* for the Core area, 15:45 for the Urban area, and 48:15 for the outlying area 90 percent of the time. PF&R is currently meeting these goals.

PF&R's Standard of Cover for HazMat Level 3 Response is 20:00* for the Core area, 30:00* for the Urban area, and 40:00* for the outlying area 90 percent of the time. PF&R is estimating that it can meet these goals.

Subsequent companies arrive on scene as part of the first alarm assignment for each of the hazardous materials incidents listed in the following table.

These goals reflect total reflex time for the first alarm assignment.

Table 5.13
HazMat Response Goals

RESPONSE FORCE	Core	Urban	Outlying
Investigation Level 1: 4 personnel, 1 engine/truck/heavy rescue	9 minutes 36 seconds 90% of the time	12 minutes 13 seconds 90% of the time	11 minutes 41 seconds 90% of the time
Level 2: 18 personnel, 1 HazMat Unit, 2 engines, 1 truck, 2 Battalion Chiefs	20 minutes 90% of the time *	15 minutes 44 seconds 90% of the time	48 minutes 13 seconds 90% of the time
Level 3: 34 personnel, 1 HazMat Unit, 4 engines, 2 trucks, 1 heavy rescue, 2 Battalion Chiefs	20 minutes 90% of the time *	35 minutes 90% of the time *	50 minutes 90% of the time *

* No responses available in these areas to quantify goals

Technical Rescue

The TRT responds from PF&R Station 1. The 12 on-duty personnel are trained and equipped for responses to High Angle Rope, Trench, Confined Space, Structural Collapse, and Dive Rescues. Three shifts of 12 personnel are trained to the technician level. With the on-scene support of awareness-level trained first responders, the TRT can devote its full attention to the rescue operations. The TRT also supports dive operations with the Station 1 dive van, divers, and land-based dive operations support management functions.

High Angle

High Angle uses multiple/redundant rope systems, lowering a rescuer to perform a pick-off(s). Whenever possible, lowering is the preferred method. When required, a lowering/hauling system will be used. Upon arrival, the scene is secured and a rope system is established, then the rescuer goes over the edge, makes contact with the victim, place a harness on the victim, and the rescuer and victim are lowered or raised to a safe location.

Trench Rescue

Trench Van 1 is fully equipped to allow the TRT to install shoring panels and air shoring. Upon arrival, the scene is secured, trench walls are secured, unearthing begins, the patient is treated and then removed. The TRT is equipped with hand tools, power tools, beams, planks, ladders, digging tools, and personnel protective equipment (PPE).

Confined Space

Confined Space Rescue is supported by fiber optic articulating cameras, listening devices, a supplied air system, and hardwire communications. The TRT uses a tripod lowering and hoisting system for entry/exit into/from below-surface systems and holds of container/vessels.

Upon arrival at a confined space incident, the scene is secured, victim is located, entry is made into the confined space, and the victim is treated and extricated.

Structural Collapse

Structural Collapse is the most recent discipline added to the TRT. Recent training, certification, and equipment purchases have been accomplished. TRT members have structural knowledge with skills in shoring, hoisting, lifting, and cutting to search for and reach trapped victims. The TRT's equipment mirrors that of the State and Federal Urban Search and Rescue (USAR) Teams. Upon arrival at a structural collapse incident, the scene is secured, the victim(s) is located, entry is made into the structure, and the victim(s) is treated and extricated.

Standards and Goals

The 12 on-duty personnel of Station 1 TRT can respond to any technical rescue scene using the appropriate combination of response-ready apparatus, including engine, truck, heavy rescue, trench van, USAR 1 (tractor-trailer), or dive van. Other first responders, trained to the awareness level, are dispatched as appropriate.

Units arrive on scene as part of the first alarm assignment for each of the technical rescue incidents listed below.

PF&R's Standard of Cover for High-Angle Rope, Confined Space, and Structural Collapse Response is 15:00* for the Core area, 20:00 for the Urban area, and 30:00 for the outlying area 90 percent of the time. PF&R estimates that it can meet these goals.

These goals reflect total reflex time for the first alarm assignment.

Table 5.14
Technical Rescue Response Goals

RESPONSE FORCE	Core	Urban	Outlying
High Angle Rope Rescue: 17 personnel, 1 heavy rescue, 1 truck, 2 engines, 1 Battalion Chief	15 minutes 90% of the time *	20 minutes 90% of the time *	30 minutes 90% of the time *
Confined Space Rescue: 22 personnel, 1 heavy rescue, 1 truck, 2 engines, 2 Battalion Chiefs, 1 Hazmat Unit	15 minutes 90% of the time *	20 minutes 90% of the time *	30 minutes 90% of the time *
Structural Collapse Rescue: 30 personnel, 1 heavy rescue, 2 truck, 4 engine, 2 Battalion Chiefs	15 minutes 90% of the time *	20 minutes 90% of the time *	30 minutes 90% of the time *
Dive Rescue: 17 personnel, 1 boat, 1 truck or engine, 1 dive van, 1 heavy rescue, 1 Battalion Chief	12 minutes 39 seconds 90% of the time	30 minutes 90% of the time *	40 minutes 90% of the time *

* No responses available in these areas to quantify goals

Additional Call Types and Effective Response Force

Table 5.15 identifies additional dispatch call types and the response force PF&R uses when responding to those incidents.

The Incident Commander requests additional resources based on the incident needs. The Incident Commander can request a Medical Response (MPS or MCI) as listed under "Emergency Medical Services".

Table 5.15
Additional Call Types

CALL TYPE	RESPONSE FORCE
Public Service	1 Response Unit
Alarm System Activation	1 Response Unit
Non – Structure Fires	1 Engine (2 Engines if incident is on a divided highway)
Apartment Fire	1st alarm - 4 engines, 2 trucks, 1 heavy rescue or squad, 2 Battalion Chiefs 2nd alarm - 4 engines, 2 trucks, 2 Investigators, 1 PIO, 1 Safety Chief, 1 Deputy Chief, 1 air unit & rehab unit, 1 Battalion Chief 3rd alarm- 3 engines, 1 truck, 1 Mobile Command Center 4th alarm - 3 engines, 1 truck, 1 Battalion Chief 5th alarm - 3 engines, 1 truck
Brush Fire	Brush fire (up to 100 x 100) - 2 engines
Ship Fire	1st alarm - 4 engines, 2 trucks, 1 heavy rescue or squad, 1 fire boat, 1 squad, 1 air unit & rehab unit, 2 Battalion Chiefs 2nd alarm - 4 engines, 2 trucks, 1 Safety Chief, 2 Investigators, 1 PIO, 1 Battalion Chief; 1 Deputy Chief 3rd alarm - 3 engines, 1 truck, 1 Mobile Command Center (CAD queued for response) 4th alarm - 3 engines, 1 truck, 1 Battalion Chief 5th alarm - 3 engines, 1 truck
Wildland Incidents (Area Greater than 100 X 100)	1st alarm - 4 engines, 1 heavy rescue or truck, 1 brush unit, 1 tender, and 2 Battalion Chiefs 2nd alarm - 4 engines, 1 truck, 1 Deputy Chief, 1 Safety Chief, 2 brush units, 1 tender, 1 air unit + rehab unit, 2 Investigators, 1 PIO, 1 Battalion Chief 3rd alarm - 3 engines, 1 truck, 1 Mobile Command Center 4th alarm - 3 engines, 1 truck, 1 Battalion Chief 5th alarm - 3 engines, 1 truck, 2 brush unit
Terrorism and Mass Destruction Incidents (Domestic Terrorism and Incidents Involving WMD, such as Chemical, Biological, and Nuclear Devices)	1st alarm - 4 engines, 1 heavy rescue or squad, 2 trucks, 2 squads, 1 Hazmat Team, 1 USAR, 1 MCC, 1 PIO, 1 Hazmat Coordinator, and 2 Battalion Chiefs 2nd alarm - 4 engines, 2 trucks, 1 squad, 1 heavy rescue, 1 Hazmat Team, 1 Safety Chief, 1 air unit, 2 Battalion Chiefs 3rd alarm - 3 engines, 1 truck 4th alarm - 3 engines, 1 truck

Dispatch Improvements

PF&R plans to continue to work with BOEC to improve dispatch services by participating in several groups, including the BOEC Advisory Committee, the BOEC User Board, and the CQI Committee. At these forums, PF&R can raise issues regarding data availability, data reliability, dispatch protocols, and other areas which impact PF&R's operational effectiveness. In addition, PF&R plans to retain its presence and influence at BOEC through the Fire Liaison Office and the Chief Officer with administrative oversight of fire dispatch.

SECTION SIX: Distribution of Resources

The term "distribution" describes the resource locations needed to minimize emergencies by assuring a sufficiently rapid first due response deployment. Distribution is measured by the percent of the jurisdiction covered by first-due units within the adopted response time goals.

PF&R has used a multitude of factors, including typical benchmarks (fire flashover and defibrillation success times), as well as a sophisticated geo-spatial analysis of its performance to determine the distribution of units. PF&R has conducted several formal station location studies (incorporated herein by reference) over the last few years. Currently, PF&R operates out of 30 stations located in four geographically defined Battalions. Staffing minimums are represented as the number of personnel per shift, and total number assigned.

Battalion 1

- 1 Career-Only Staffed Fire Station
  - Station 1
    - Engine 1 (Minimum Staffing, 4/12)
    - Truck 1 (Minimum Staffing, 4/12)
    - Heavy Rescue 1 (Minimum Staffing, 4/12)

Battalion 2

- 9 Career-Only Staffed Fire Stations
  - Station 3
    - Engine 3 (Minimum Staffing, 4/12)
    - Truck 3 (Minimum Staffing, 4/12)
  - Station 6
    - Engine/Boat 6 (Minimum Staffing, 4/12)
  - Station 8
    - Engine 8 (Minimum Staffing, 4/12)
    - Truck 8 (Minimum Staffing, 4/12)
  - Station 14
    - Engine 14 (Minimum Staffing, 4/12)
  - Station 16
    - Engine 16 (Minimum Staffing, 4/12)
  - Station 17
    - Engine/Boat 17 (Minimum Staffing, 4/12)
  - Station 22
    - Engine 22 (Minimum Staffing, 4/12)
    - Truck 22 (Minimum Staffing, 4/12)
  - Station 24
    - Engine 24 (Minimum Staffing, 4/12)
  - Station 26
    - Engine 26 (Minimum Staffing, 4/12)
  - Station 27
    - Engine27 (Minimum Staffing, 4/12)

Battalion 3

- 10 Career-Only Staffed Fire Stations
  - Station 2
    - Engine 2 (Minimum Staffing, 4/12)
    - Truck 2 (Minimum Staffing, 4/12)
  - Station 07
    - Engine 07 (Minimum Staffing, 4/12)
    - Truck 07 (Minimum Staffing, 4/12)
  - Station 11
    - Engine 11 (Minimum Staffing, 4/12)
  - Station 12
    - Engine 12 (Minimum Staffing, 4/12)
  - Station 19
    - Engine 19 (Minimum Staffing, 4/12)
  - Station 25
    - Engine 25 (Minimum Staffing, 4/12)
    - Truck 25 (Minimum Staffing, 4/12)
  - Station 28
    - Engine 28 (Minimum Staffing, 4/12)
  - Station 29
    - Engine 29 (Minimum Staffing, 4/12)
  - Station 30
    - Engine 30 (Minimum Staffing, 4/12)
  - Station 31
    - Engine 31 (Minimum Staffing, 4/12 for 7 months/year)

Battalion 4

- 9 Career-Only Staffed Fire Stations
  - Station 4
    - Engine 4 (Minimum Staffing, 4/12)
    - Truck 4 (Minimum Staffing, 4/12)
  - Station 5
    - Engine 5 (Minimum Staffing, 4/12)
  - Station 9
    - Engine 9 (Minimum Staffing, 4/12)
  - Station 10
    - Engine 10 (Minimum Staffing, 4/12)
  - Station 13
    - Engine 13 (Minimum Staffing, 4/12)
    - Truck 13 (Minimum Staffing, 4/12)

- Station 15
  - Engine 15 (Minimum Staffing, 4/12)
- Station 18
  - Engine 18 (Minimum Staffing, 4/12)
- Station 20
  - Engine 20 (Minimum Staffing, 4/12)
- Station 23
  - Engine 23 (Minimum Staffing, 4/12)

Station Location, Fire Response Blocks

Current distribution measurements show that incidents in established response zones meet the prescribed standards of emergency response coverage. PF&R will more closely evaluate the methodology for creating or changing fire response blocks, based on PF&R's ability to selectively geo-code calls and stratify by incident type and PF&R's commitment to "turnout" times of one-minute twenty seconds or less and travel times of four minutes or less, with a total response time for first-in unit of five minutes twenty seconds or less, 90 percent of the time. To determine station locations in the future, PF&R will create response blocks using known transportation routes and ARCBridge software, to help assure the four-minute maximum drive time for each station.

Currently, 99.9 percent of the call volume is located within the primary response area of at least one PF&R station or a station that protects PF&R territory under an automatic aid or "closest forces" agreement. If only the response areas of PF&R's own stations are considered, that percentage falls to 98.43 percent. This information suggests that current infrastructure is located appropriately to handle the call volume in Portland's response areas.

To determine if response time performance met the "5 minutes 20 seconds or less 90 percent of the time" goal, PF&R produced a fire response block map, which illustrates performance by individual fire blocks. As shown in Attachment V, only 14 of the 520 response blocks currently meet this goal. The green shaded blocks identify response areas where PF&R is meeting the goal, and the yellow, orange, and red shaded blocks show where PF&R is not meeting the goal. The areas that are red indicate response time over seven minutes 90 percent of the time. This map combines the last three fiscal years to evaluate sufficient levels of data.

It is clear that most areas of the city do not meet response time objectives; deficiencies are interspersed throughout the fire response blocks. There are certain areas that stand out with large red grouping, such as the following:

- Station 07
- Between Station 2 and Station 28
- Station 16 (newly constructed), and north and west of Station 16

- Stations 14, 17, 19, 25,and 26
- South of Stations 4, 10, 15, 20, and 29
- North of Station 5 and 6
- West of Station 18
- East of Stations 10, 29, and 30
- North of Station 31

PF&R built new stations and relocated others to correct a large portion of the above circumstance. Also, station retrofitting as part of seismic upgrades caused companies to be displaced, and could have resulted in less than ideal response situations. All stations (with the exception of Station 1) have experienced seismic upgrades over the life of the G.O. Bond Program. PF&R constructed Station 16, which opened in FY 2002-03, to address concerns on the west side and northwest Portland. New Station 21 is expected to address response concerns west of Stations 5 and 18, and Station 12 has positively impacted the response areas between Stations 2 and 28. Additionally, PF&R will relocate Station 18 in southwest Portland to address response areas west of Stations 5 and 18. Once the seismic upgrades are complete in 2009-10, PF&R can more accurately assess response performance and develop plans for improvement where problems still exist.

SECTION 7: Concentration of Resources

Concentration is the distribution of multiple resources within sufficient proximity to assemble an initial effective response force on-scene within prescribed timeframes. An initial effective response force has the ability to stop the escalation of a fire emergency and bring it effectively under control (see Section 5: Call Types). PF&R dispatches the number of units needed for an effective response force as described earlier. Consideration of unit concentration takes into account the reliance of the region's fire and emergency medical service organizations on "closest-force" agreements and automatic aid.

Box Alarm Performance

PF&R prepared an analysis of the concentration of units for four major types of alarms that require "box" assignments : residential fires, commercial fires, major natural gas leaks (Gas Major), and HazMat. Very few box alarms for Gas Major existed where all units arrived, even for three fiscal years combined; however, the 14 cases showed that all but the 4th engine, 2nd truck, and 2nd chief arrive within 9 minutes 80 percent of the time. There was only one box alarm for HazMat where all units arrived, which is insufficient data for thorough evaluation.

The following table compares the assignments for commercial and residential fires. This table reveals that the response times of individual units vary substantially between residential and commercial fires. Note the 1st Chief, 1st truck and 4th engine, which arrive on-scene later on residential fires by nearly 2 minutes, 1 minute and .5 minute, respectively. PF&R needs to further analyze these gaps to determine what extenuating circumstances existed, if any, to cause the delay in response times. PF&R plans to bridge this gap between commercial and residential fires.

Table 7.1
Unit Response Times

Unit	Residential Assignment	Commercial Assignment
Turnout, 1st in Company	1:03	1:08
	Travel time 80% of the time (in minutes)	**Travel time 80% of the time (in minutes)**
1st in Company	4:12	3:54
1st in Engine	4:32	4:27
2nd in Engine	5:50	5:40
1st in Truck	7:22	6:21
3rd in Engine	7:23	7:07
1st in Chief	10:41	8:34
4th in Engine	9:24	8:49
2nd in Truck	N/A	9:19
2nd in Chief	N/A	12:35

Table 7.1 shows the best fractile response time overall for each arriving unit, and does not reflect the aggregated actual response time performance for each incident.

In FY 2004 through 2006 combined, PF&R was dispatched on 2,601 box alarm calls, and the full complement of the assignment arrived on scene only 377 times or 14.5 percent of the time. This is a common occurrence for box alarms, as first arriving companies may downgrade the incident once they arrive on scene.

Fire Performance by City Quadrant

The City is divided into five geographic areas called quadrants. Because of the geography of the quadrants the response reliability is different in each one. Data analyses for Fiscal Years 2004-2007 show that, for commercial fires, the southeast quadrant of the city receives the fastest level of service, with the first-in company responding within six minutes, and the full complement arriving in 18:21 minutes 90 percent of the time. The northwest and northeast quadrants follow with first-in responses in less than six minutes, and full-complement responses by 19:46 minutes and 21:06 minutes, respectively. The southwest quadrant first-in response is less than nine minutes for the first-in company and 31:13 minutes for the full complement. The north quadrant first-in response is less than eight minutes, with full complement arriving within 41:53 minutes. This is indicative of the distance traveled by neighboring stations to provide the full complement of the assignment for structural fires and/or the availability of resources at the time of the call. Several fire stations in the northern quadrant serve a relatively large number of square miles.

There were no full-compliment responses to residential structural fires in the northeast quadrant of the city. Therefore, the north quadrant of the city has the fastest level of service for residential structural fires with first-in response of less than six minutes, and a full complement arriving within 17:39 minutes. The southeast quadrant receives the same level of service for both commercial and residential fires, with first-in company arriving in less than six minutes, and full-complement response in 18:45 minutes. The southwest quadrant receives first-in response in less than ten minutes, and full complement in less than 26:51 minutes. These slower response times are indicative of the travel routes and contours associated with the West Hills.

Two salient factors to note in these analyses are the number of fire records, and the presence of so-called "outlier" cases. Because the full complement times cannot be reviewed unless all required units arrive on the scene of a working fire, for some quadrants and fire types the number of qualifying events is so small that percentile analysis is too imprecise for reporting. This is true for instance in the northwest quadrant where only two residential fires qualify, and in the northeast quadrant, where no qualifying fires occurred. The number of years reviewed (in this case three) can be expanded to increase the amount of qualifying data, but to do so reduces the ability to note discrete changes over time.

In addition, on rare occasions the proper onscene deployment is reached for a fire but one or more times are so far beyond normal practice that to include them would harmfully distort and skew the resulting analysis. Often the culprit is a first responder returning hours or even days later to check on what is known as a "cold fire," and because the return is tied to the existing incident file, the initial response appears to have taken far longer than it actually did. Removing that response from the incident profile means that the response now no longer qualifies for a full complement, and thus is dropped from the analysis.

Location of AMR Posting Stations

PF&R coordinates closely with AMR to provide ALS services system-wide. PF&R is the first responder for ALS services; however, AMR provides medical transport services when necessary. PF&R provides one paramedic per engine and AMR provides two paramedics per ambulance. As stated earlier, AMR arrives first on-scene approximately 32 percent of the time, which illustrates the importance of PF&R and AMR's ability to supplement each other's services.

Over the past three years, AMR ambulance services responded to 39,227 incidents within 8 minutes 89.96 percent of the time. AMR runs that begin as Code 3 and are downgraded to Code 1 during response are not included in the incident counts for response time performance. Originating Code 1 calls are dropped from the count of qualified runs when determining overall performance.

A Multnomah County contract for ambulance services established AMR's performance goals. Within the urban zone, AMR's goal is to respond to Code 3 calls within 8 minutes or less a minimum of 90 percent of the time, and within 20 minutes or less a minimum of 90 percent of the time in rural areas. For Code 1 responses, the County contract states that AMR will respond immediately to all dispatches from BOEC (these originate from fire or police); however, there is no time limit or response time goal stated in the contract. For Code 1 triaged calls to 911, AMR *may* respond or the calls will be turned over to another non-emergency ambulance provider. The contract further states that if AMR is going to respond to a non-emergency call that it cannot interfere with its Code 3 response times.

Anticipated Improvements

PF&R anticipates that response times and resource reliability will improve near the end of the G.O. Bond Program, when companies are back in their own stations following station retrofitting, new construction, and station relocations. Determining true individual station performance is difficult, because of significant station downtime, responses out of neighboring stations, or the splitting of double companies in the construction process. By FY 2011-12, these difficulties will largely abate. At that time, PF&R should see improvements in response times at

both the fire block and FMA levels. If this is not the case, PF&R will further analyze data and make recommendations for how to address service deficiencies.

Responding to Change

As the population of Portland increases PF&R must consider adding units to existing fire stations to increase the concentration of resources. PF&R has more single-company stations than double-company stations, and could only increase the number of units at stations if accommodations for additional personnel can be made. The G.O. Bond program constructed Station 12 with future expansion in mind, as it has a double-company apparatus bay and additional sleeping rooms.

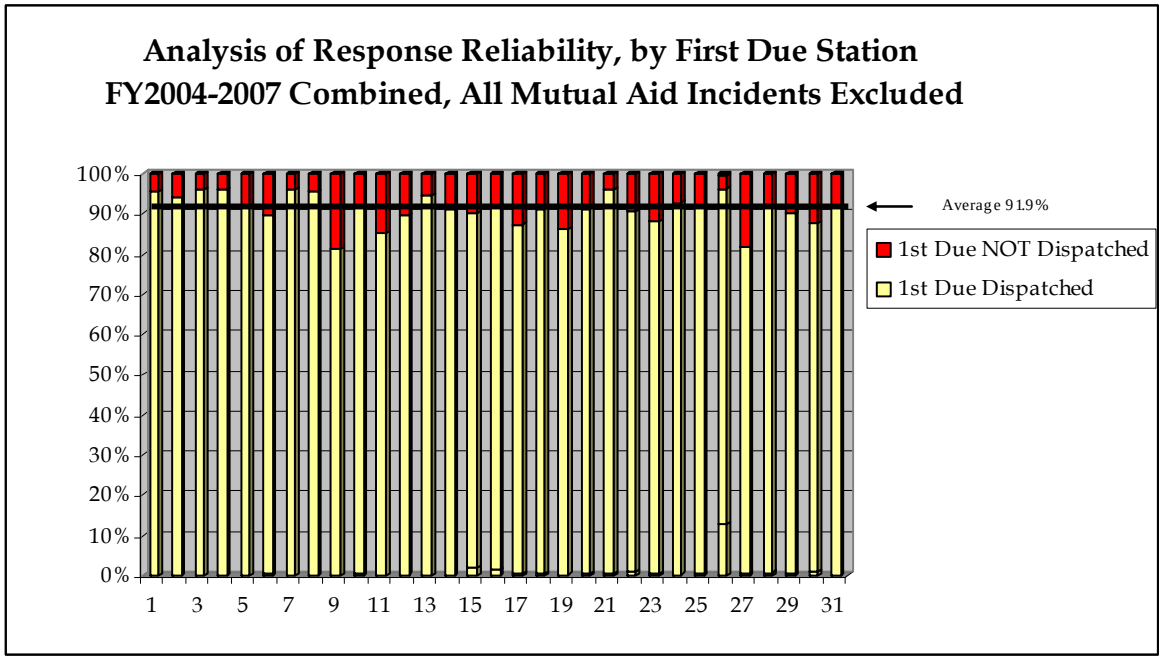
PF&R will address service demands by maximizing the use of on-duty personnel, while still meeting safety standards. One solution for PF&R to address future response concerns is to provide additional response units, which increases the concentration of resources, and directly impacts resource reliability and improves response times. Other solutions could come in the form of redefined response boundaries, movement of double companies, changes in out-of-service protocols, or other feasible alternatives.

SECTION 8: Response Reliability

Response reliability is the percentage of time the closest station to an incident is available to respond when a fire or emergency call is received. Response reliability would be 100 percent if every company were available and in place every time a call was received. In reality, situations exist when a call is received and the first due company is unavailable. This requires the assignment of a "second-in" company. If the second-in company is too far away, the assignment of the call cannot be handled within the prescribed response time.

The demands of emergency calls and routine training exercises, combined with other activities such as taking apparatus for repair and replenishing firehouse supplies, increase the probability that the prescribed company will be unavailable when a call is received (decreased reliability). To show the response reliability of each station, PF&R isolated calls that were handled by the assigned first-due company[11].

Figure 8.1
Analysis of Response Reliability, Mutual Aid Incidents Excluded



As shown in the figure above, 12 of the 30 stations fall below the average response reliability of 91.1 percent. See the map in Attachment AA for Response Reliability.

The following table provides the details for each station included in the figure above. Following that table is a discussion about the cause of response reliability for several PF&R stations.

[11] A call might be handled by other than the first due company when the other company was "passing through" the area, relocated for training, or for a variety of other reasons.

Table 8.1
Portland Fire & Rescue
Analysis of Response Reliability, by First Due Station
Fiscal Years 7/1/04 – 6/30/07 Combined, Mutual Aid Incidents Excluded

Due Area	Incidents	1st Due Dispatched	1st Due NOT Dispatched	Reliability
7	**12,766**	**12,287**	**479**	**96.2%**
27	185	178	7	96.2%
22	**6,054**	**5,820**	**234**	**96.1%**
4	**10,955**	**10,521**	**434**	**96.0%**
3	**10,598**	**10,167**	**431**	**95.9%**
1	**14,344**	**13,715**	**629**	**95.6%**
8	**4,994**	**4,775**	**219**	**95.6%**
13	**10,511**	**9,934**	**577**	**94.5%**
2	**4,600**	**4,341**	**259**	**94.4%**
25	**9,614**	**8,924**	**690**	**92.8%**
10	1,633	1,505	128	92.2%
26	4,231	3,893	338	92.0%
16	944	867	77	91.8%
5	3,752	3,438	314	91.6%
29	4,097	3,754	343	91.6%
20	3,313	3,027	286	91.4%
14	7,568	6,906	662	91.3%
18	4,887	4,454	433	91.1%
23	2,521	2,282	239	90.5%
30	4,412	3,969	443	90.0%
15	704	633	71	89.9%
6	762	685	77	89.9%
12	4,596	4,112	484	89.5%
24	3,610	3,188	422	88.3%
31	3,468	3,035	433	87.5%
17	2,691	2,352	339	87.4%
19	8,539	7,363	1,176	86.2%
11	8,092	6,892	1,200	85.2%
28	3,617	2,961	656	81.9%
9	6,827	5,536	1,291	81.1%
Total	164,885	151,514	13,371	91.9%

Note: Double companies are bolded

The data in Table 8.1 shows that during fiscal years 2004-05 through 2006-07, PF&R had a combined average response reliability of 91.9 percent (bottom row), with a low of 81.1 percent (Station 9), and a high of 96.2 percent (Station 7). However, this data is based solely on the reliability of each station to their assigned "first-due" area.

Time of Day

Data analysis clearly illustrates that time of day impacts response reliability. For purposes of data analysis, PF&R established the "workday" as 8:00 a.m. – 6:00 p.m., and all other hours as "non-workday." The total dispatched call volume for these distinct periods of time were roughly the same. Data were analyzed for two consecutive years, with mutual aid calls excluded.

Table 8.2
Portland Fire & Rescue
Analysis of Response Reliability, by 1st Due Station, by Time of Day
Fiscal Years 07/01/2004 – 06/30/2007 Combined, Mutual Aid Incidents Excluded
Workday (8AM-6PM)

Due Area	Incidents	1st Due Dispatched	1st Due NOT Dispatched	Reliability
22	**2,523**	**2,386**	**137**	**94.6%**
7	**5,449**	**5,139**	**310**	**94.3%**
4	**4,962**	**4,663**	**299**	**94.0%**
8	**2,080**	**1,953**	**127**	**93.9%**
3	**4,449**	**4,177**	**272**	**93.9%**
13	**4,834**	**4,493**	**341**	**92.9%**
1	**5,658**	**5,229**	**429**	**92.4%**
27	77	71	6	92.2%
2	**1,977**	**1,818**	**159**	**92.0%**
25	**3,968**	**3,604**	**364**	**90.8%**
5	1,632	1,455	177	89.2%
26	1,613	1,433	180	88.8%
16	458	406	52	88.6%
10	721	637	84	88.3%
14	3,028	2,675	353	88.3%
29	1,708	1,502	206	87.9%
23	1,132	994	138	87.8%
20	1,395	1,220	175	87.5%
18	2,094	1,830	264	87.4%
15	322	280	42	87.0%
6	439	380	59	86.6%
30	1,973	1,707	266	86.5%
12	1,910	1,627	283	85.2%
24	1,514	1,273	241	84.1%
17	1,098	916	182	83.4%
31	1,355	1,115	240	82.3%
11	3,223	2,632	591	81.7%
19	3,622	2,937	685	81.1%
28	1,575	1,241	334	78.8%
9	2,877	2,239	638	77.8%
Total	69,666	62,032	7,634	89.0%

Note: Double companies are bolded

As seen in Table 8.2, double companies are distinguished from single companies in bold font. Data show that response reliability over 80 percent during the workday includes nine stations; whereas, 11 logged reliability over 80 percent when all times of day were included (Table 8.1). The two stations that dropped are Stations 2 and 9, which saw decreased reliability by 4.8 percent and 3.9 percent respectively.

During non-workday times, 17 stations were above 80 percent reliability. The number of stations dropping below a 70 percent response reliability (which indicates very poor reliability) increased from eight to 11, when comparing all times of day to workday only, respectively. However, Stations 15 and 6 realized large reliability decreases of 5.6 percent and 8.5 percent, respectively. It can be presumed that these occurrences were the result of increased demand from these stations in the core areas of the city during regular business hours, as well as the known demands for Fireboat 6 throughout the day.

It can be construed from both Tables 8.1 and 8.2 that alternative deployment schemes, resource assignment protocols and policies, evaluation of FMAs, and adding fire companies may positively impact response reliability and PF&R's ability to cover scheduled and unscheduled periods of first-in company unavailability. Alternatives to improve response reliability rarely come without costs; PF&R will address the alternatives to determine which, if any, are feasible.

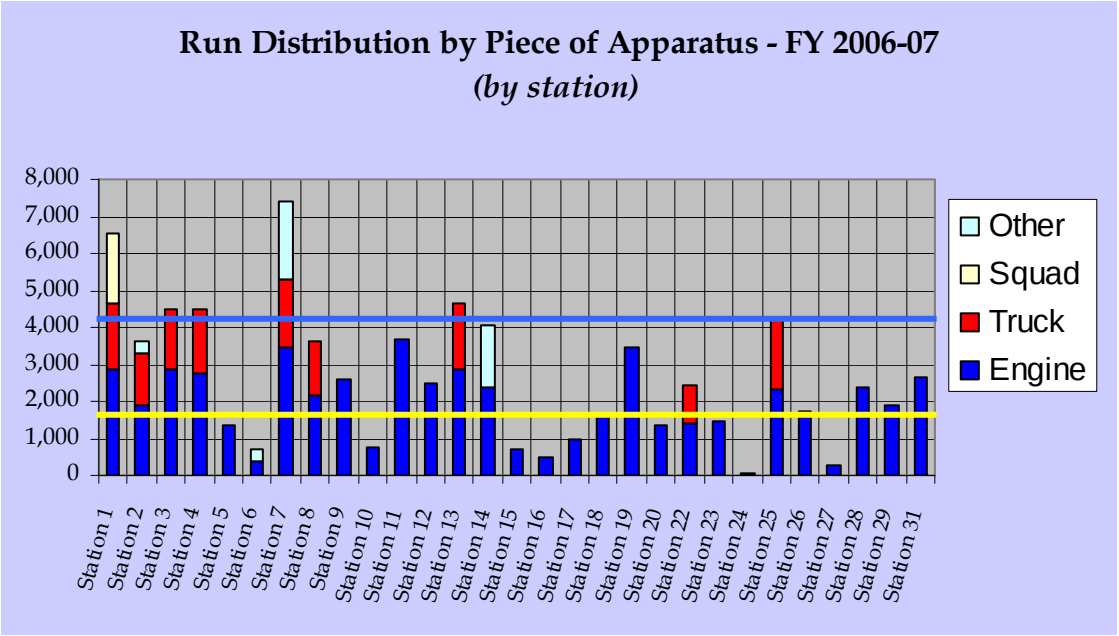
When assessing response reliability, PF&R must also consider situations that require more than one unit, drawdown, prolonged on-scene times, and resource exhaustion. The data presented here suggest a moderate, not optimum degree of reliability. However, the lack of overlap in FMAs, coupled with high call volumes, make it difficult to achieve improved response performance from static facilities. This section will later examine resource utilization and capacity.

Company Workload

The standard first responder apparatus assignment for a Portland Fire & Rescue station is one engine (also known as a "pumper".) Additionally, a fire truck (also known as a "ladder") is housed at nine strategically located stations (1, 2, 3, 4, 8, 13, 15, 22, and 25); those stations are known as double companies. Station One also includes one squad vehicle (also known as a heavy rescue unit) and is known as a "triple company." (See Attachment BB)

The following chart illustrates the annual distribution of calls by type of apparatus and station. This chart shows the stations with the most calls, as well as those with multiple pieces of responding apparatus. This information, coupled with response reliability data, lets PF&R further analyze resource distribution and workload issues.

Figure 8.2



As seen in the above figure, 11 fire stations experience nearly 3,000 calls per year or over 3,000 calls per year. At 3,000 runs per year, the daily average number of runs is approximately 8. Of the 11 stations near or over this run volume, 8 are double companies and 3 are engine-only companies. For all fire stations, the average number of runs per year is approximately 2,622; for single company stations, the average is 1,726 (bottom line on Figure 8.2); and for double companies the average is 4,338 (top line on Figure 8.2). Of the stations that are near or over 4,000 runs per year (or approximately 11 runs per day) all but one are double company stations.

As stated in the TriData Report prepared in collaboration with PF&R in 1993, stations that are likely to have more than 2,500 responses annually should preferably have at least two units to share the response workload. Activities beyond 3,000 calls per year usually show significant impact on response times, company availability, and firefighter fatigue.

Single company stations with high run volumes include Stations 9, 11, 14, 19, and 31. In terms of double company stations, Station 1 stands out with more than 6,500 runs per year; however, that facility houses an engine, truck, and heavy rescue, all staffed by four personnel (12 total at station). Of the remaining double companies, Stations 3, 4, 7, and 25 are above the average, and Station 7 has the least chance for run volume decreases as it is targeted to remain where it is--and additional resources (by means of new stations) are not currently planned.

Some companies realized low run volume, including Engine 6, 10, 15, 16, 17, 24 and 27. Stations 10 and 15 are located in highly residential areas and have historically seen low call volumes. Stations are needed in those areas to ensure quick response during all times of the day and in all parts of the city. Station 6 provides both land and water response: its FMA includes a large area of water. In

addition, Engines 6 and 17 are frequently taken out of service when the swing crew has marine details, marine training, marine patrol, Maritime Fire & Safety Association (MFSA) training, and "Clean Rivers" work. Station 24 was closed for remodel for the majority of this time period.

Resource Utilization Ratios for Fire, Rescue, and EMS Units

Agencies whose sole responsibility is emergency medical response, commonly calculate Resource Utilization Ratios (RUR), or some other method of unit activity. In some systems, a "unit hour" is calculated by allocating one hour for every emergency transport. To establish a resource utilization ratio for PF&R's fire units, the total time of all recorded daily events (NOT "staff-hours", but actual hours) are divided into the number of hours in a shift, and a RUR is established. For example, four hours of recorded activity in an eight-hour shift would equal a 0.5 RUR. Eight hours of recorded activity in an eight-hour shift would equal a 1.0 RUR.

While utilization rates of 1.0 certainly look cost-effective, they have an adverse impact on employee health, morale, and readiness, and would be entirely unreasonable for shifts that are longer than eight hours.

Additionally, resource utilization ratios, when measured in a multidisciplinary organization such as PF&R, must take into account emergency medical events, fires (which typically take longer than one hour to mitigate), and many non-emergency tasks required during a typical duty shift. Therefore, calculating workload becomes much more complex.

In response to this challenge, PF&R has adopted the following methodology, and continues to refine the process. As seen in Table 8.2, activities regularly performed during a PF&R duty shift, and the amount of time allocated to each, have been identified for the purposes of calculating workload. PF&R obtained time allocations from the Journal System, or by assigning a specific value to certain tasks.

To calculate accurate values, PF&R evaluated both qualitative and quantitative factors. The overriding goal is to measure unit efficiency, and determine a point where workload and time begin to be compromised.

PF&R obtained average time-on-task for all events described in Table 8.3 as "Emergency Responses, for a period of one year. These historical averages became the baseline time allocation for each measured event during the subsequent annual measuring period. Comparative weighting values were then established for emergency events that met certain criteria. This is done because emergency events that are of a higher complexity--or interrupt other daily (required) tasks with regularity--decrease the efficiency of the crew and, in some cases, take longer to resolve. An RUR of 0.5 with activity compressed into the first 12 hours of a 24-

hour shift affects an emergency response crew differently than a RUR of 0.5 with activity evenly spread throughout the shift, including the "normal" sleep period.

Listed below are the specific types of events assigned weighted values in order to establish RURs for PF&R. The formula for calculating specific weighted values includes the following: direct time comparisons, personnel interviews related to perception, and objective data from related studies.

- Complex EMS Calls: Additional time is added for those emergency medical calls where complexity is an issue. Call complexity is calculated by analyzing emergency medical calls over a six-month period for the number of invasive procedures performed, as well as the number of medications administered, and comparing that to three other locations with similar call volumes in order to establish a "norm". These types of calls have added weight value, because more patient charting and supply restocking is typically required; stress levels are higher, and on-scene times are longer due to interventions.

- Calls "After-Hours": Calls occurring after 11 p.m. interrupt sleep periods at the typical fire station. Since performance is affected by fatigue, all emergency events occurring between the hours of 11 p.m. and 5 a.m. have an added weight value.
- High Daily Call Volume: Units that experience more than six emergency calls between the hours of 8 a.m. and 6 p.m. are handicapped in the completion of other assigned tasks due to the multiple interruptions. Re-starting projects that are interrupted mid-task is more difficult and decreases efficiency, so any unit averaging over six calls per day during the typical daily work period has a weight value added to those events.

Table 8.3
Resource Time Allocations by Event/Task

Event (includes all components) or Task	Time Allocated (Hr.)
EMS response, complex call	1.2
EMS response (day or night)	0.3
Technical/Specialty Rescue response	.5
Fire response, residential/commercial, "working fire"	1.3
Fire response, no fire (alarm, investigation, etc.)	0.6
Administrative Duties	Actual time - Journal
Apparatus Maintenance	Actual time - Journal
Community Partnership	Actual time - Journal
Equipment Maintenance	Actual time - Journal
Fire Prevention Inspection	Actual time - Journal
Hazardous Condition Standby	Actual time - Journal
Hazardous Materials Consultation	Actual time - Journal
Hydrant Inspections	Actual time - Journal
Laundry Detail	Actual time - Journal
Marine Patrol	Actual time - Journal
Morning Briefing	Actual time - Journal
Move-Up	Actual time - Journal
Other	Actual time - Journal
Physical Fitness	Actual time - Journal
Pre-fire Surveys	Actual time - Journal
Station Maintenance	Actual time - Journal
Training	Actual time - Journal
High call volume (added weight factor - per call over 6 base)	0.2
Night time calls 2300-0500 (added weight factor for fatigue – per call)	0.5

PF&R has not yet established a maximum desired RUR for 24-hour units. Once established, if RUR rates are regularly exceeded (further description is provided in Section Ten), PF&R will investigate methods to reduce workload for those particular units. This may be in the form of adding resources to the area (personnel/ apparatus), re-defining work priorities during a duty shift, re-allocating some types of work to less busy stations, and/or evaluating the delivery of training and other functions. PF&R will annually evaluate this data and refine the criteria as needed.

SECTION 9: EMS Continuous Quality Improvement

Emergency response is performed in a stressful environment with time-critical decisions, and these decisions are sometimes made without the benefit of a careful risk-benefit analysis. Given these situations, it is expected that mistakes will most likely occur.

PF&R has implemented a CQI process for EMS functions, which is designed to be non-punitive. The committee carefully evaluates all operational problems reported in a timely, honest, and complete manner according to the following criteria:

- System problems (protocols, procedures, equipment, etc.)
- Education or training problems
- Circumstances that led to unusual operational decision
- Human factors

PF&R is obligated to identify system and educational problems and plan effective changes, ensuring that the results are measured through the CQI process so the desired improvement is achieved. Circumstances that lead to difficult scenes are evaluated for their educational value, content will be protected, and the information is shared with other personnel. PF&R will carefully evaluate negligent behavior as to its context (intentional or non-intentional), and will develop appropriate improvement plans.

Because EMS accounts for nearly 70 percent of PF&R's calls for service, a formal CQI program has been in place at PF&R for the analysis of EMS incidents for several years. Performance measures for the CQI program are in place at PF&R.

SECTION 10: Future Needs

Every quality organization must engage in continuous self-examination and must seize opportunities for improvement as they are identified. PF&R has identified several opportunities for improvement as a result of the CFAI accreditation process and the development of this Standard of Emergency Response Coverage, which include the following:

1. Enhance and use the FIS to collect more detailed data on truck company operational performance. For example, PF&R knows how many incidents to which a ladder truck was dispatched and arrived on-scene, but not how often the aerial master stream was employed for fire suppression, or how often the aerial ladder was used for roof access or rescue. Additionally, data should be queried to determine how many units were dispatched versus how many arrived on scene.

2. Enhance and use the Fire Inspection Record Entry System (FIRES) 2000 building application system to allow for the collection and analysis of more detailed information about buildings in the city of Portland. This analysis will serve as a basis for considering whether more closely defined "risk zones" or "demand zones" are necessary for operational planning, or whether the current single-zone approach is effective.

3. Develop a formal Facilities Plan to help budget, prioritize capital needs, and forecast. This plan will be in line with the City's Facilities Plan. This will further ensure the preservation of newly constructed or remodeled stations, as vital assets to PF&R.

4. Address the issues and recommendations highlighted in this document during the upcoming strategic planning process, and incorporate them into the Plan where feasible both financially and operationally.

5. Plan for the replacement of ARCBridge resource deployment analysis software with a more robust and comprehensive system.

6. The Training and Safety Division will evaluate different methods to provide training and workforce development to employees that include use new technologies such as distance learning, as well as revisiting the "Training Block" method currently used. One goal of the review is to identify methods of providing training to companies and work teams in their own station or area. This will help reduce out-of-service time and increase response reliability.

7. Mindful of the guidelines established by the State Fire Marshal, improve HazMat dispatch classifications for calls currently grouped as "Non-HazMat Unclassified," since they are not truly HazMat calls.

8. Conduct careful review of response times, resource reliability, call volume, station resource levels, FMAs and deployment levels in determining alternatives for improving response times in targeted areas of PF&R's jurisdiction. Special emphasis on tracking the reduction of response times and improvement in resource reliability associated with the addition of two rescue vehicles in Stations 11 and 19 FMAs.

SECTION 11: Service Goals

As stated in Section Two (page 5), all goal statements should be fully developed. This section provides specific information related to those goals developed as a part of the annual evaluation of PF&R's Standard of Emergency Response Coverage (Deployment Plan).

When this document recommends changes to a PF&R standard, or if a new standard is being developed, the goal (or desired level of service) is referenced in Section Four, and the following information will be provided in a separate attachment for every goal:

- National, regional, or local standard used to establish goal
- Brief report or statement confirming that the desired goal is applicable to PF&R, considering its resources and the risk analysis
- Estimated cost to implement goal (for example, if additional staffing is required, estimate costs of FTEs)
- Desired timeline for implementation of the goal
- Method to measure stated goal and/or objective (performance measure)

If the goals are included in Section Four, then the above is complete, and PF&R's Core Leadership Team has reviewed and approved the service goals for implementation. These goals/objectives may also be discussed at the Labor Management Committee comprised of PF&R management and Portland Fire Fighters Association (PFFA) Local #43 representatives.

Once the goals and their supporting documentation are completed and approved by the Core Leadership Team, they will be formally included as attachments to this section of the Standard of Emergency Response Coverage.

Specific Goals:

- Improve overall first-in unit response times by adding rescues, moving Station 18 and building Station 21.[12]
- Improve structure fire response (full complement)[13]. Station 21 will include a truck company, which will likely improve the full complement response.
- Improve turnout times by distributing turnout times to all companies each month.
- Improve response reliability

To evaluate and develop these goals, PF&R plans to use the expertise of the CFAI Leadership Team (as a standing team) to consider all available alternatives,

[12] 1997 TriData Report noted the following, "For an area with a perfect street grid that could be covered from one fire station in 5 minutes, it would take two stations to cover the same area in 4 minutes and five stations to cover the area in 3 minutes."

[13] In the 1997 TriData Report, recommendations were made to add 3 additional trucks (or quints) to address deficiencies in PF&R's response capabilities. (p. 37)

including the following: the addition or redeployment of mobile resources, the addition or movement of fixed resources, and the risk/benefit of all decisions based on the criteria expressed in this Standard of Emergency Response Coverage.

Three-year Response Improvement Plan

PF&R will be taking a number of steps to improve response time performance over the next three years.

Next 12 months

As directed within Goal 3 of the FY 2005-10 Strategic Plan, PF&R will continue to use GIS-based applications, such as ARCBridge software, to model the impact on response times of adding rescue vehicles at various locations and/or times of operation. PF&R has already used ARCBridge to determine that additional rescues were needed in various locations throughout the City. Rescues were placed into service at Stations 11 and 19 on April 3, 2008. PF&R is requesting funding for two additional rescues for Stations 7 and 14 beginning in April 2009. The rescues will enhance system status by providing more resources for response and coverage citywide.

Given that more units increase Battalion Chief span of control, PF&R added an additional battalion district in July of 2007. The additional Battalion helps to improve firefighter and citizen safety and also reduce response times. PF&R anticipates a one-minute response time reduction for the first-in chief as well as a three-minute response time reduction for the second chief on structural fires.

As directed within Goal 4 of the FY 2005-10 Strategic Plan, PF&R will address operational issues through ongoing revisions to the Standard of Emergency Response Coverage (SERC), and introduce a new edition of the SERC to Council early in 2008.

PF&R emergency operations personnel will take steps to reduce turnout times by 20 seconds thereby improving the overall customer interval.

PF&R in-service training will be conducted through a consolidation of satellite training: station-based training and district-based training. Discussions are underway to move more of the in-service training from the Training Center to the battalions. If this occurs, response reliability should improve due to companies remaining within their battalion during in-service training.

PF&R will identify opportunities and costs for additional pre-emption on emergency routes to improve response times.

12 to 24 months

PF&R has been working closely with BOEC to initiate Recommendation #16 in Chapter V of the Service Delivery Study report to "Review the call processing and dispatch process to determine whether any changes can be made to improve call processing and dispatch times." This recommendation is in line with Goal 2 of the FY 2005-10 Strategic Plan, which aims to "Maximize Dispatch Effectiveness" through a number of measures.

PF&R hopes to improve response times through two new, two-person rescues approved for funding in FY 2007-2008. The two rescues went into service on April 3, 2008. A budget "add" package for an additional two rescues has been submitted for FY 2008-2009. These additional rescues would help to improve response times.

The Service Delivery System Study report has provided support for this request with recommendations by the City's Office of Management and Finance to support these as City finances improve. The Service Delivery Study report included additional resources for medical incidents as a top priority. The Office of Management and Finance recommended that the City Council consider restoring one or more rescue units to provide maximum impact on medical response times and outcomes in the future.

Goal 4 of the FY 2005-10 Strategic Plan supports the addition of response personnel in order to ensure that the SERC response time and safety objectives are being met.

Also in the next 24 months, PF&R will complete the construction of relocated Station 18 and determine the location of new Station 21. These two stations will improve response times in the Southwest portion of the City by a minimum of one minute.

24 to 36 months

By the third year of this plan, PF&R has plans to partner with TVF&R to co-construct and co-staff Station 21 in SW Portland. Station 21 will reduce response times for Portland Stations 5 and 18 as well as reduce TVF&R's response times into their eastern jurisdiction fire blocks. This will also improve both Portland's and TVF&R's response reliability. Adding a truck company to this station will address excessive truck company response times into the southwest area of the City.

SECTION 12: Glossary of Terms

Advanced Life Support (ALS): ALS defines a higher level of care provided by Emergency Medical Services (EMS) agencies. ALS care is provided by EMT-Paramedics and includes all basic life support (BLS) skills, intravenous skills (I.V.), cardiac monitoring, medication administration, manual cardiac defibrillation, intubation, and many other invasive skills.

Annual Business Plan: Document utilized each fiscal year to set business goals, objectives, action items and major initiatives. This document contains strategic action items from the five-year plan.

Basic Life Support (BLS): BLS defines a level of care provided by Emergency Medical Services (EMS) agencies. This level of care is provided by EMT-Basics and includes cardio-pulmonary resuscitation (CPR), basic first aid, splinting, oxygen administration, and use of an automatic external cardiac defibrillator (AED).

Battalions (PF&R): See Response Battalions

Box (Alarm): The city of Portland is divided into 517 fire "blocks", which are individual response zones arranged geographically by Fire Management Area (FMA). Each block is programmed with the station dispatch order to that zone. The standard response to a residential box alarm is as follows: 4 engines, 1 truck, and 1 battalion chief. A commercial box alarm would be assigned 4 engines, 2 trucks, and 2 battalion chiefs.

Brush Unit: A specialized apparatus designed and built to respond to brush and wildland fires. These units are smaller and more maneuverable than standard fire engines, allowing access to off-road and limited-access areas. Brush units are typically mounted on a pick-up or small truck frame, and carry up to 250 gallons of water, a pump, small diameter hose, and a complement of wildland firefighting tools. PF&R has 5 brush units placed in areas of the city with a higher than usual wildland threat.

Cold Zone: The area surrounding an incident that defines where no real or potential danger exists with respect to the safety of the public or harm to the environment.

Community Profile: An analysis of the attributes of the community based on the unique mixture of demographics, socioeconomic factors, occupancy risk, demand zones, and levels of service currently provided.

Community Risk: This is the level of risk that the community is willing to accept by means of Council adoption of the SERC document. By accepting a certain level of risk, the community (or the Council who represents the community) acknowledges and accepts the level of service that PF&R is able to deliver with current resource levels.

Company: A team of firefighters with apparatus assigned to perform a specific function in a designated response area. PF&R predominately uses engine companies and ladder truck companies.

Consequence: The risk to human life and the economic impact of an event, including fire, medical, and other events.

Continuous Quality Improvement (CQI) Committee: CQI is a peer-based process that conducts a clinical review of selected cases each month. Based on strict confidentiality and a shared commitment to excellent pre-hospital care, CQI reveals potential areas of improvement in the EMS system, suggests training opportunities, audits compliance with treatment protocols, and reviews specific illnesses or injuries with their associated treatment. These efforts contribute to the continued success of emergency medical services through a systematic process of review, analysis, and improvement.

Defensible Space: A fire service term referring to the clear fuel space around a structure. Defensible space is, at a minimum, 30 feet of cleared area that allows for the defense of a structure during wildland and interface zone fires.

Field Decon: Initial decontamination of civilians and rescue workers at the scene of a hazardous materials incident. It generally consists of removal of contaminated clothing and a shower using water and soap.

Fire Blocks: The City of Portland is divided into approximately 517 fire blocks, which are individual response zones arranged geographically by Fire Management Area (FMA). Each box is programmed with the station dispatch order to that zone. Also known as a "box." (Fire block is the term used for CAD programming; "box" is the traditional term used at dispatch and on the street.)

Fire Flow: The amount of water, expressed in gallons per minute (GPM) that needs to be applied to a fire in order to absorb the heat released from burning fuels. If the GPM rate meets fire flow for a given fire, the fire will be knocked down, allowing extinguishment.

Fire Information System (FIS): Automated system for collecting a myriad of information about incidents, productivity, staffing and other related elements.

Fire Management Areas (FMA): Fire Management Areas are station borders identified for the purpose of clustering non-response functions, such as community emergency services and other administrative purposes. These areas are comprised of fire blocks, which distinguish fire station first due response areas. It may also be referred to as fire response area in this document.

Fire Management Zone (FMZ): Areas comprised of fire blocks, which distinguish fire station first due response areas. It may also be referred to as fire response area in this document.

Fixed Resources: For fire and emergency services purposes, fixed resources are those that cannot be easily moved to an emergency scene or other incident. Examples include fire stations, maintenance facilities, training facilities, computer information systems, etc.

Flashover: An event that occurs when all the contents of a compartment reach their respective ignition temperatures in a very short period of time, usually seconds. This results in simultaneous ignition of all surface fuels and fire gases within the compartment.

General Orders: Permanent instructions, issued in order form, that apply to all members of PF&R. General Orders are usually concerned with matters of policy or administration.

Hazard Assessment: Process whereby the types and number of hazards are identified in commercial occupancies to determine the level of risk that can be expected during mitigation and response efforts.

High-Rise: PF&R considers a high-rise to be any building seven-stories, or 75 feet, or taller, or a building whose roof cannot be accessed by an aerial ladder.

Hot Zone: The area immediately surrounding and including an environment that is immediately dangerous to life and health (IDLH).

Mass Casualty Incident (MCI): Any emergency incident or scene involving ten or more patients.

Master Stream: A large volume fire stream delivering more than 350 gallons per minute. Master stream nozzles are usually mounted to a fire apparatus or placed on the ground, and are supplied by multiple 2 ½" or 3" hoselines.

Mobile Resources: For fire and emergency services purposes, mobile resources are those items that can easily respond to emergency or other incidents as the need arises. Examples include fire engines, ladder trucks, heavy rescue units, fireboats, air units, maintenance units, squads and all related or assigned equipment. Mobile resources also refer to the personnel assigned to these responding units.

Mobile Data Computer (MDC): An electronic device mounted in an emergency response vehicle that allows the operator to query the computer-aided dispatch (CAD) computer and receive critical and non-critical incident or location information. PF&R uses the latest generation of MDCs, which are actually vehicle-based computers. In addition to receiving information, these computers can store

and retrieve mapping, pre-fire, and related information. They also may be used to communicate between apparatus as well as dispatch.

Multiple Patient Scene (MPS): Any emergency incident or scene involving three to nine patients. More than ten patients becomes a Mass Casualty Incident.

Multnomah County Rural Fire District #10 ("District 10"): The rural fire protection district responsible for unincorporated areas of east Multnomah County west of the Sandy River. Before 1984, District 10 was the second largest fire department in the state of Oregon protecting over 100,000 citizens in mid- and East-Multnomah County. PF&R entered into an intergovernmental agreement with District 10 on July 1st, 1984, which transferred all District 10 firefighters and employees to PF&R. Subsequent annexations by the cities of Portland and Gresham took control of the majority of District 10's area. The City of Portland maintains an affiliation with District 10 by providing service to the City of Maywood Park (wholly surrounded by Portland) through a contract with District 10.

Occupancy Risk: An assessment of the relative risk to life and property resulting from a fire inherent in a specific occupancy or in a generic occupancy class.

Operational Guidelines: Policies that guide decision making in all areas of emergency operations and response.

Occupancy Vulnerability Assessment Profile (OVAP): As part of the risk assessment of commercial occupancies, a variety of information is collected and a score is assigned to each occupancy. The score determines the risk category for that particular occupancy (high, significant, moderate).

Probability: An estimate of the likelihood that a particular event will occur within a given period of time.

Response Battalions: Irregularly shaped zones utilized for dispatch determinations. PF&R has four battalions: 1, 2, 3 and 4. The computer-aided dispatch system (CAD) uses response battalions to recommend apparatus to respond to events occurring within each battalion. The battalions are developed based on neighborhood configuration, traffic flow patterns, closest fire stations, and a variety of other considerations. Battalion boundaries may change from time to time based on changes in street networks, station locations, etc.

Response Time: Defined as the time from dispatch to arrival on scene; includes both turnout and travel time.

Recon: A shortened form of the word "reconnaissance", which is a survey or examination that seeks out critical information.

Response Zones: Areas developed by PF&R for planning and response goal setting purposes.

Size-up: A fire service term that describes the continuous fact gathering process that dictates a course of action at an incident scene.

TriData: A nationally recognized management consulting firm providing analyses in the areas of fire protection, fire prevention, and emergency management. In 1997 and 2006 TriData conducted an analysis of PF&R and made several recommendations in the areas of station locations and resource deployment.

Warm Zone: The designated area where some potential or real danger exists with respect to safety and health of the public, and harm to the environment. The warm zone lies between the cold zone and the hot zone.

Wildland Hazard: Areas of the city determined to have substantial threat of wildland fires and presenting significant fire control problems for fire departments.

Wildland Urban Interface: The geographic areas where homes and businesses blend with forested or wooded areas, presenting significant fire control problems for fire departments. These problems include restricted or steep access, dense fuels that may be subject to dryness, limited water supply, and wind-pushed fire spread.

SECTION 13: Acronyms and Initialisms

AED ..... Automatic External Defibrillators
AHA ..... American Heart Association
ALS ..... Advanced Life Support
AMR ..... American Medical Response
BLS ..... Basic Life Support
BOEC ..... Bureau of Emergency Communications
CAD ..... Computer-Aided Dispatch
CBRNE ..... Chemical, Biological, Radiological, Nuclear and Explosive
CFAI ..... Commission on Fire Accreditation International
CO_2 ..... carbon dioxide
CPAT ..... Candidate Physical Ability Testing
CPR ..... Cardio-Pulmonary Resuscitation
CQI ..... Continuous Quality Improvement
EMS ..... Emergency Medical Services
EMT ..... Emergency Medical Technician
FAD ..... Fire Alarm Dispatch
FEMA ..... Federal Emergency Management Agency
FIRES ..... Fire Inspection Record Entry System (FIRES) 2000
FIS ..... Fire Information System
FMA ..... Fire Management Area
FTE ..... Full Time Equivalent
G.O. ..... General Obligation
GPM ..... Gallons per Minute
IAFF ..... International Association of Fire Fighters
IC ..... Incident Commander
ICS ..... Incident Command System
IDLH ..... Immediately Dangerous To Life and Health
ISO ..... Insurance Service Organization
LMC ..... Labor Management Committee
MCI ..... Mass Casualty Incident
MDC ..... Mobile Data Computer
MFSA ..... Maritime Fire & Safety Association
MPS ..... Multiple Patient Scene
NFPA ..... National Fire Protection Association
OHSU ..... Oregon Health & Science University
OR-OSHA ..... Oregon Occupational Safety and Health Administration
OSHA ..... U.S. Occupational Safety and Health Administration
OVAP ..... Occupancy Vulnerability Assessment Profile
PF&R ..... Portland Fire & Rescue
PFFA ..... Portland Fire Fighters Association
PFT ..... Peer Fitness Trainer
PHLAME ..... Promoting Healthy Lifestyles: Alternative Models' Effects

PIO.....Public Information Officer
PPE ..... Personnel Protective Equipment
PSAP ..... Public Safety Answering Point
RHAVE.....Risk, Hazard, and Value Evaluation
RIT .....Rapid Intervention Team
RUR ..... Resource Utilization Ratios
SERC .....Standard Of Emergency Response Coverage
TRT ..... Technical Rescue Team
TVF&R .....Tualatin Valley Fire & Rescue
UGB.....Urban Growth Boundary
URA..... Urban Renewal Area
USAR..... Urban Search and Rescue