Operational and Administrative Analysis
Kenai Fire Department
Kenai, Alaska

April 2016

FINAL REPORT

CPSM
Center for Public Safety Management, LLC

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Exclusive Provider of Public Safety Technical Services for
International City/County Management Association

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International City/County Management Association (ICMA)

The International City/County Management Association (ICMA) is a 100-year-old, nonprofit professional association of local government administrators and managers, with approximately 9,000 members spanning thirty-two countries.

Since its inception in 1914, ICMA has been dedicated to assisting local governments in providing services to their citizens in an efficient and effective manner. Our work spans all of the activities of local government, parks, libraries, recreation, public works, economic development, code enforcement, Brownfields, public safety, etc.

ICMA advances the knowledge of local government best practices across a wide range of platforms including publications, research, training, and technical assistance. Its work includes both domestic and international activities in partnership with local, state, and federal governments as well as private foundations. For example, it is involved in a major library research project funded by the Bill and Melinda Gates Foundation and is providing community policing training in Panama working with the U.S. State Department. It has personnel in Afghanistan assisting with building wastewater treatment plants and has had teams in Central America providing training in disaster relief working with SOUTHCOM.

The **ICMA *Center for Public Safety Management (*ICMA/CPSM*)*** was one of four Centers within the Information and Assistance Division of ICMA providing support to local governments in the areas of police, fire, EMS, emergency management, and homeland security. In addition to providing technical assistance in these areas we also represent local governments at the federal level and are involved in numerous projects with the Department of Justice and the Department of Homeland Security. In each of these Centers, ICMA has selected to partner with nationally recognized individuals or companies to provide services that ICMA has previously provided directly. Doing so will provide a higher level of services, greater flexibility, and reduced costs in meeting members' needs as ICMA will be expanding the services that it can offer to local governments. For example, The Center for Productivity Management (CPM) is now working exclusively with SAS, one of the world's leaders in data management and analysis. And the Center for Strategic Management (CSM) is now partnering with nationally recognized experts and academics in local government management and finance.

Center for Public Safety Management, LLC (CPSM) is now the exclusive provider of public safety technical assistance for ICMA. CPSM provides training and research for the Association's members and represents ICMA in its dealings with the federal government and other public safety professional associations such as CALEA. The Center for Public Safety Management, LLC maintains the same team of individuals performing the same level of service that it has for the past seven years for ICMA.

CPSM's local government technical assistance experience includes workload and deployment analysis using our unique methodology and subject matter experts to examine department organizational structure and culture, identify workload and staffing needs, and identify and disseminate industry best practices. We have conducted more than 200 such studies in 36 states and 155 communities ranging in size from 8,000 population (Boone, Iowa) to 800,000 population (Indianapolis, Ind.).

Thomas Wieczorek is the Director of the Center for Public Safety Management. Leonard Matarese serves as the Director of Research & Program Development. Dr. Dov Chelst is the Director of Quantitative Analysis.

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Section 1. Executive Summary

The Center for Public Safety Management, LLC (CPSM) was retained by the city of Kenai to conduct a comprehensive analysis of its fire department operations, including its deployment practices, workload, organization structure, training, performance measures, prevention activities, and interactions with mutual aid partners. Specifically, CPSM was tasked with providing recommendations and alternatives regarding Kenai's fire department operations, staffing levels, financial efficiencies, and alternative modes of operation.

During the study, CPSM analyzed performance data provided by the Kenai Fire Department (KFD) and also examined firsthand the department's operations. Fire departments tend to deploy resources utilizing traditional approaches, which are rarely reviewed. To begin the review, project staff asked the city for certain documents, data, and information. The project staff used this information/data to familiarize themselves with the department's structure, assets, and operations. The provided information was also used in conjunction with information collected during the on-site visit to determine the existing performance of the department, and to compare that performance to national benchmarks. These benchmarks have been developed by organizations such as the National Fire Protection Association (NFPA), Center for Public Safety Excellence, Inc. (CPSE), and the ICMA Center for Performance Measurement.

Project staff conducted a site visit on Aug. 30 to Sept. 1, 2015, for the purpose of observing fire department and agency-connected supportive operations, interviewing key department staff, and reviewing preliminary data and operations. Telephone conference calls as well as e-mail exchanges were conducted between CPSM project management staff, the city, and the KFD so that CPSM staff could affirm the project scope, and elicit further discussion regarding this operational analysis.

KFD provides a professional service with regard to fire and EMS service delivery. The department personnel with whom CPSM interacted are truly interested in serving the city to the best of their abilities. One outstanding issue facing KFD is the limited number of units operational and the broad scope of responsibilities generated throughout its service area and upon request of its mutual aid partners. This service responsibility will likely expand in the near future with the advent of the Alaska LNG processing facility, should it come to fruition. This workload and the potential for expanding call volume is not, however, insurmountable and CPSM will provide a series of observations and recommendations that we believe will enable KFD to become ***more efficient*** and ***smarter*** in the management of its emergency and nonemergency responsibilities.

Recommendations

The KFD provides excellent service to its citizens, visitors to the area, and local businesses. The department is respected in the community and by city leadership. ***KFD's operations are extremely cost-effective***. Its ability to provide EMS transports, ARFF protection at the Kenai Municipal Airport, and a full range of fire protection services, including wildfire response, is commendable. EMS transports and ARFF services at the airport generate substantial revenues that combined offset nearly one-quarter of the cost of fire department operations. This level of cost recovery is not often seen in our evaluations and is very commendable.

Twenty-seven recommendations are listed below and in the applicable sections within this report. The recommendations are based on best practices derived from the NFPA, CPSM, ICMA, the U.S. Fire Administration, the International Association of Emergency Managers (IAEM), and the Federal Emergency Management Agency (FEMA).

These recommendations have been grouped on the basis of our perceived prioritization for implementation. We have identified three groupings: ***Initial Phase*** Implementation, ***Second Phase*** Implementation and ***Third Phase*** Implementation. CPSM recommends that the First Phase recommendations be implemented within the first six (6) months after formal acceptance of the report. The Second Phase would be implemented next and we recommend this take place within six-(6) months to eighteen (18) months after acceptance. The Third Phase would then follow and we anticipate an implementation schedule that would occur from two (2) to five (5) years after formal acceptance.

Initial Phase Recommendations
KFD should conduct a formal fire risk analysis that concentrates on its commercial strip along the Kenai Spur highway, big-box occupancies, and processing and institutional occupancies.
KFD should reevaluate Policy No. 130.01.2 and consider a change in the current practice of initiating a recall of off-duty personnel in order to maintain a contingent staffing of three personnel.
KFD should expand its automatic response agreements with Nikiski and CES to include Delta and Echo EMS responses when the KFD staffing is at two personnel.
KFD should build its training regimens and tactical strategies around the exterior or transitional attack when the fire scenario and the number of responding personnel warrants this approach.
KFD should continue to work with the Kenai 911 Communications Center in developing a prioritized response coding for all fire responses.
KFD should work with Kenai dispatch personnel to identify ways to reduce dispatch handling times. CPSM believes it is realistic to reduce these times to within a two minute time frame.
The city of Kenai should maintain the residential fire sprinkler requirements when adopting the

2015 International Code Council (ICC) International Fire Code.
KFD should institute an in-service company inspection program that places fire department units into smaller business and multifamily residential occupancies for the purpose of conducting company inspections involving exit lighting, egress, storage, and the operational readiness of fire protection/notification systems.
Kenai should consider the purchase and assignment of a 24-hour, take-home emergency response vehicle, equipped with emergency lighting, radio communications, and safety equipment for the battalion/training chief.
The Kenai vehicle maintenance shop should provide annual repair, maintenance, and service costs for the KFD fleet and this information should be utilized in the vehicle replacement schedule.
The city should update and revise its emergency operations plan (EOP).
The city manager should assign the duties of emergency manager to the fire chief.
The city should institute a training schedule that brings together the full incident management team (IMT) annually for orientation and training and should undertake a full activation of the EOP along with an exercise every two-years.

Second Phase Implementation
KFD should consider the use of volunteers to supplement on-duty staffing and during large-scale events.
Kenai should review its interpretation of "in paid status" when considering overtime eligibility for 56-hour fire personnel and exclude from the calculation of overtime eligibility any leave time utilized by an employee during the FLSA 24-day cycle.
Kenai should consider an expansion of the formal training received by its shop mechanics on fire apparatus and consider training that will qualify these personnel as emergency vehicle technicians.
KFD should move to the utilization of only EMT-IIIs in the staffing of ambulances and fire vehicles.
KFD should undertake a concerted effort to develop a comprehensive set of performance measures for monitoring its system performance and system outcomes. The process of developing these measures should utilize input from KFD members, the community, the mayor and city council, and city administration.
KFD, under the direction of the fire marshal, should compile an annual fire report that tracks all fires occurring in the city, their cause, and the estimated fire loss.
KFD should consider hiring a part-time clerical employee (approximately 20 hours each eek) to support its training operations.
KFD should request monthly performance reporting from the Kenai 911 Communications Center

regarding alarm handling times for KFD response units.

Third Phase Implementation
KFD should accelerate the replacement of its brush unit (SQ1) and move to an all-wheel drive wildland vehicle, either a Type-3 or Type-6 engine.
The Kenai Fire Department should consider the pursuit of accreditation through the Center for Public Safety Excellence (CPSE).
KFD should institute an annual physical fitness evaluation process for all emergency response personnel, including chief officers.
Kenai should continue in its efforts to better equip its EOC operation at the Beacon Building.
The city should undertake a continuity of operations planning (COOP) effort for all major municipal functions and city facilities.
The city of Kenai should evaluate its options and the associated costs for moving its dispatch operations from the Kenai 911 Communications Center to the Soldotna Public Safety Communications Center (SPSCC).

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Section 2. Scope of Project

The scope of this project was to provide an independent review of the Kenai Fire Department (KFD) so that city officials, including its fire officials, could obtain an outside perspective of the city's fire and EMS delivery system. This study provides a comprehensive analysis of the Kenai Fire Department, including its organizational structure, workload, staffing, deployment, training, fire prevention, emergency communications (911), and its planning and public education efforts. City officials often attempt to understand if their fire/rescue department can provide services more efficiently, and commission these types of studies to measure a department against industry best practices. In this analysis CPSM provides recommendations where appropriate, and offers input on a strategic direction for the future.

Key areas evaluated during this study include:

- Fire department response times (using data from the city's computer-aided dispatch system and the city's Image Trend records management system).
- Deployment matrix and staffing.
- Fire and EMS unit workloads.
- KFD support functions (Training, Fire Prevention/Code Enforcement/911 Dispatch).
- Essential KFD facilities, equipment, and resources.
- Service responsibilities at the municipal airport.
- Budget and financial management.

Section 3. Organization and Management

Governance and Administration

The city of Kenai is located on the west side of the Kenai Peninsula, at the mouth of the Kenai River as it enters the Cook Inlet and the Pacific Ocean. Kenai has a rich history that dates back to 1000 BC when the area was occupied by the Kachemak people. Russian fur traders occupied the area in the late 1700s and referred to the native inhabitants as "Kenaitze," which translates into "people of the flats".[1] According to the U.S. Census of Population and Housing, Kenai had an estimated population of 7,568 in 2014.[2] Today, the city occupies an estimated 29.9 square miles of land area. Kenai is located approximately 160 miles southwest of Anchorage, connected by Alaskan Highway #1. Kenai is the largest city in the Kenai Peninsula Borough. Other cities in the vicinity of Kenai are Soldotna directly east, Homer to the east, and Seward to the northeast.

The city's primary industries include oil exploration, tourism, and fishing. The Kenai River is noted for its sports fishing, particularly for Chinook "King" Salmon. The largest King on record, weighing in at 98-plus pounds, was caught from the Kenai. During the summer months thousands of fishing enthusiasts make the trip to Kenai in search of these sport fishing trophies. The fishing industry also supports a number of canneries that are located along the river inlet. Oil was first discovered in Alaska in 1957 in Swanson, which is 20 miles north of Kenai. Today, the Cook Inlet is the site of numerous off-shore drilling wells. A major LNG (liquefied natural gas) pipeline from Alaska's North Slope will pipe upwards of 20 million metric tons of LNG each year into the area. This project, the Alaska LNG Project, with an estimated cost of $65 billion, will lead to a major port facility, storage, and liquefaction processing facility in the Nikiski area, approximately 13 miles from Kenai. The LNG project will have significant economic impacts in Kenai both during the construction phase of the project and once it becomes operational, which is estimated to occur in 2018.

Kenai operates under a council/manager form of government. This form of government combines the political leadership of elected officials in the form of the Kenai City Council with the managerial experience of an appointed city administrator. The Kenai City Council is comprised of one mayor and six council members who are all elected at large. Members serve four-year terms and elections are nonpartisan. The city charter is the basic law under which the city operates. The mayor is the formal representative for the city of Kenai and presides over its council meetings. The city council serves as the legislative body for the city. Its responsibilities include enacting laws that govern the city, adopting the annual budget, and appropriating funds to provide city services. The city council also establishes policies executed through the administration. Most transactions require only a quorum or simple majority be present.

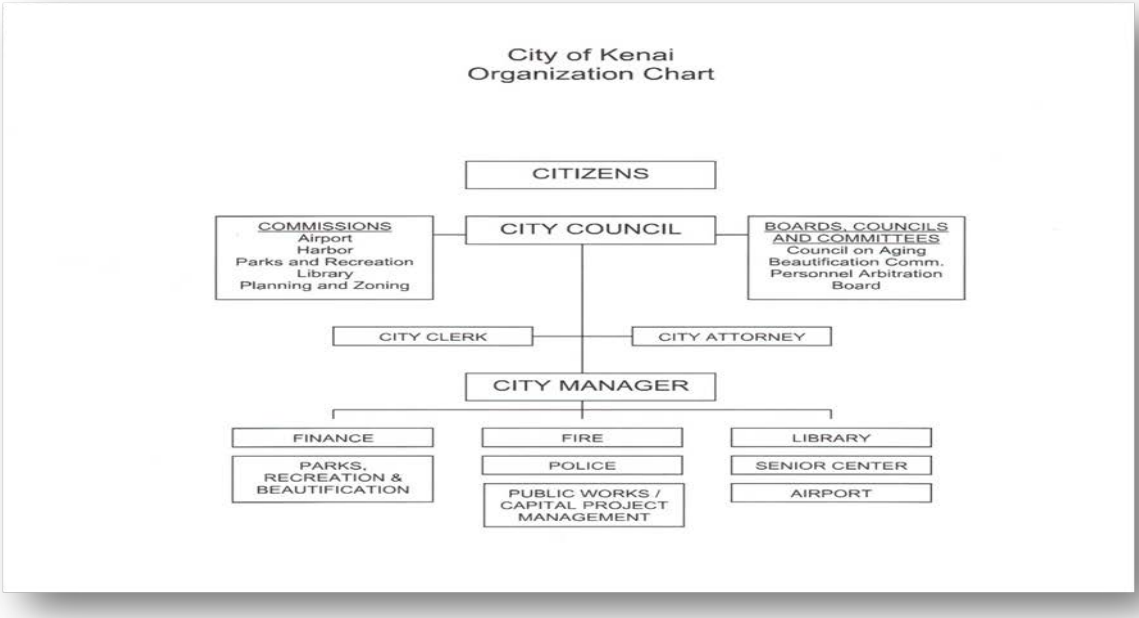
The city manager is responsible for the business, financial, and property transactions of the city, as well as preparation of the annual budget, appointment and supervision of personnel, enforcement

[1] Solojova, Katerina and Aleksandra Vovnyanko. The Rise and Decline of the Lebedev-Lastochkin Company: Russian Colonization of South Central Alaska, 1787-1798. *The Pacific Northwest Quarterly* 90, No. 4 (1999), pp. 191-205.
[2] "Annual Estimates of the Resident Population for Incorporated Places: April 1, 2010 to July 1, 2014."

of city ordinances, and the organization and general management of city departments. As chief administrator, the city manager has no vote in the council, but may take part in discussions of matters coming before the legislative body.

Kenai is typical of many cities and towns across the United States in that it operates its own public works department, library, parks and recreation, and several internal functions including finance and human resources. Kenai operates its own police and fire departments and also has oversight of the Kenai Municipal Airport. Figure 3-1 illustrates the organizational chart for the city of Kenai.

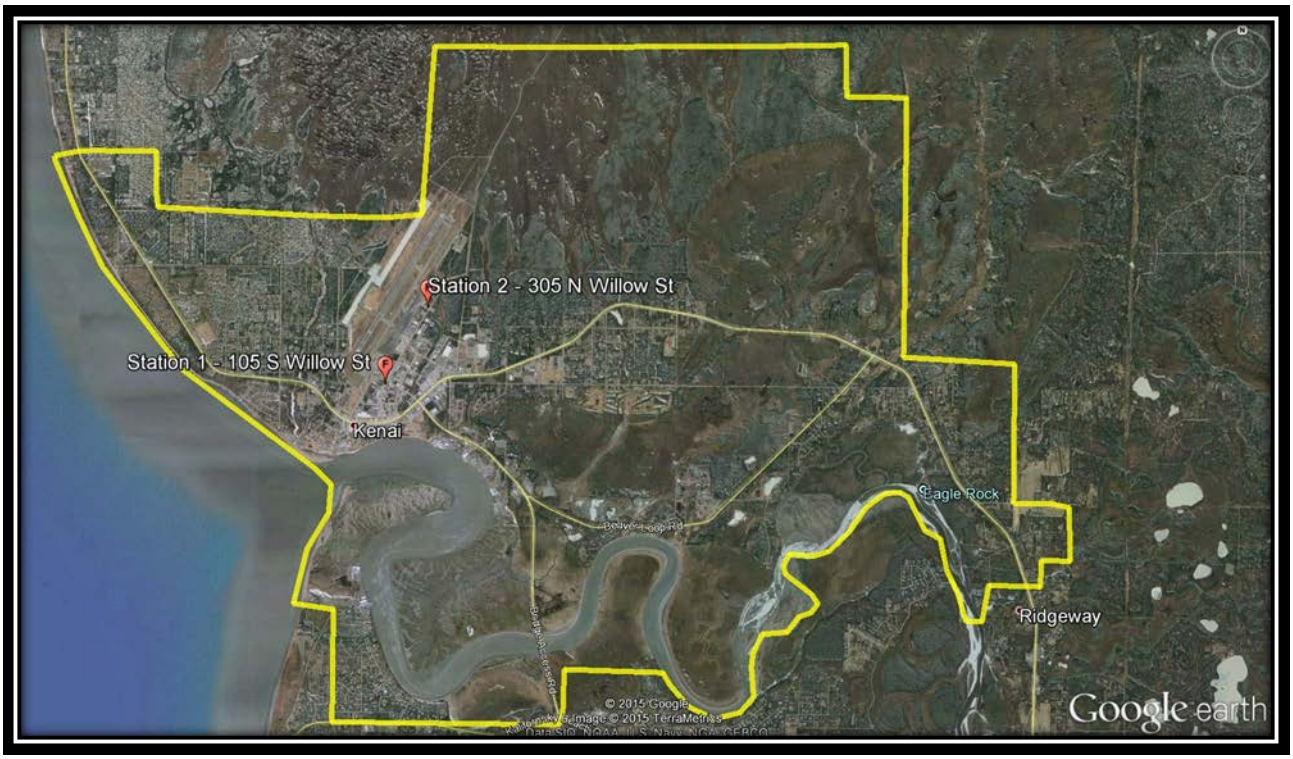
FIGURE 3-1: City of Kenai Table of Organization



Kenai Fire Department

The KFD provides fire and emergency medical services (EMS) primarily from its central fire station located at 105 S. Willow Street. In addition, the fire department provides aircraft rescue firefighting (ARFF) services at the Kenai Municipal Airport. A graphic depiction of the city's two fire station locations and the Kenai municipal boundaries appear in Figure 3-2. The KFD employs nineteen full-time employees, of which fifteen are assigned to field operations; three serve in senior management capacities (fire chief, fire marshal, and battalion/training chief). There is also one administrative assistant who provides administrative and noncombat operational support.

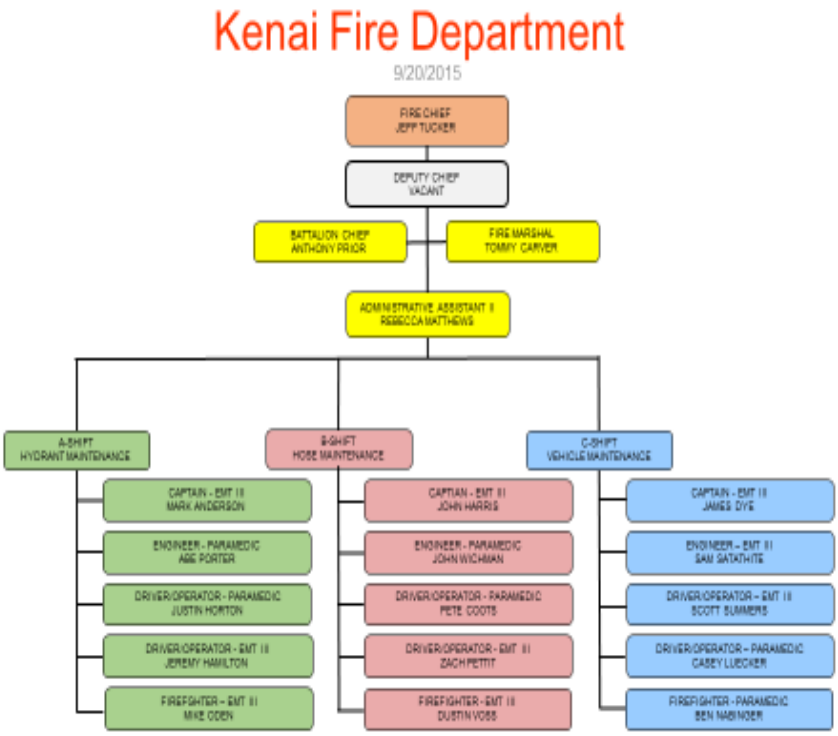
FIGURE 3-2: KFD Fire Stations and Municipal Boundaries



The KFD operates with a traditional fire department organizational structure (Figure 3-3). The department is led by the fire chief who frequently responds to larger incidents to provide command and scene support. The battalion training/chief manages the day-to-day field operations, including scheduling and payroll and oversees all departmental training requirements (fire, EMS, and ARFF). The fire marshal is responsible for the city's fire prevention activities, including code enforcement, plans reviews, and fire inspections. Operationally the KFD has three platoons, each led by a captain. Each shift has a driver-engineer and three firefighter positions for a total of five operational personnel assigned to each shift. All line personnel are certified as either EMT-IIIs or Paramedics providing advanced life support (ALS) services. In addition, all personnel are ARFF-certified under the Federal Aviation Administration 139 (FAA) guidelines. All new hires must achieve advanced life support certification within four years of their hire date.

Operational shift personnel work 48-hours on and 96-hours off, for an average workweek of fifty-six hours. The minimum staffing each day is five, which includes four personnel operating from fire station number 1, responding to fire and EMS alarms, and one person to staff the airport fire station. The department operates with a constant staffing model; thus, when an operational vacancy occurs as a result of scheduled or unscheduled leave (sick leave, vacation, disability leave, or termination, etc.), that vacancy is filled by either chief officers or by the recall of an off-duty person (utilizing overtime).

FIGURE 3-3: KFD Organizational Structure



Our analysis has found that chief officers frequently cover vacancies during business hours and when their schedule permits. Frequently, chief officers have to adjust appointments, meetings with the public, or other duties to ensure their availability to respond when they are providing coverage. On weekends and after 6:00 p.m., the recall of off-duty personnel is used to maintain the minimum staffing. Overtime costs for maintaining minimum staffing is estimated to cost approximately $135,000 annually. CPSM estimates that overtime expenditures would increase by approximately $35,000 annually if coverage by chief officers was not provided. This type of rotating coverage by 40-hour personnel is not often observed in our evaluations and CPSM recognizes this as a ***best practice.*** In addition, when flight scheduling at the airport permits, the airport firefighter is also utilized in order to maintain minimum staffing or to supplement fire or EMS response. Our analysis revealed that on 78 occasions in the past year the airport firefighter was utilized for coverage for off-airport response.

Use of Volunteers

KFD does not use part-time or volunteer personnel. Area fire departments, particularly Nikiski and Central Emergency Services (CES), have been utilizing volunteers successfully to supplement their full-time staffing. CPSM believes that there are opportunities for KFD to develop a volunteer

contingent to supplement its staffing levels and this could further reduce overtime costs. The current KFD practice of using chief officers to cover vacancies occurring during business hours allows the agency to cover those more difficult time frames during which volunteers are typically not available. Most volunteers are available in the evenings and on weekends. These are the time frames during which KFD is incurring its greatest amounts of overtime and which a volunteer force could help cover. If KFD can orchestrate a group of volunteers to work night shifts and weekend, the overtime savings may be significant.

Many of the people who would be attracted to a volunteer position are young people who are pursuing advanced firefighting and EMS certifications. The total cost for this training can be in excess of $10,000 and can take more than two years to complete. Many agencies use volunteer/student firefighters, and as an incentive provide tuition assistance and hands-on experience in return for this volunteer service.

> ***Recommendation: KFD should consider the use of volunteers to supplement on-duty staffing and during large-scale events.***

There are a number of ways in which agencies can use volunteers effectively. Agencies that utilize both paid and volunteer personnel are termed "***combination departments.***" In combination systems we generally see two methods of deployment. One method separates volunteer from paid personnel and usually staffs certain stations or apparatus with paid personnel and others with volunteers. In some systems the crews are mixed and can have both paid and volunteer personnel working at the same station and responding jointly on the same apparatus. In these systems there is a core contingent of paid personnel and volunteers rotate into assignments to supplement crew staffing. For example, the paid crew members may be the officer, driver, and one firefighter and the volunteer fills a second firefighter position, thus providing four-person staffing.

Maintaining a viable crew of volunteers is not without its issues. Our observations are that there are always some types of difficulties when combining paid personnel with volunteer personnel. Those combination systems that are successful incorporate dedicated managerial oversight and strong field supervision to address these issues. There can be difficulties in maintaining the skill levels of part-time volunteer personnel and retention issues are frequently inherent in this effort. While these realities cannot be minimized, an effective volunteer crew can be managed and utilized effectively with the commitment of the fire leadership and strong supervision.

Even though the term "volunteer" is utilized, personnel who work in these roles often receive some type of financial benefit for these services. In some agencies volunteers are ***paid-on-call***. In this situation volunteers are paid an hourly rate for their service and they receive payment on the basis of the hours worked. Other agencies use a ***flat stipend.*** In this system these employees receive a designated block payment for the service they provide. For example, an employee working in a flat stipend method may receive $75 for an emergency response for up to two hours. They may receive $50 for a two-hour training session or $200 for a 24-hour shift assignment. In some agencies, volunteers receive no pay but instead receive contributions into a pension system or insurance coverage for their service. We have also observed a student/volunteer option in which the agency

provides tuition, fees, books, and hands-on training in return for volunteer hours and a multiyear commitment for service. The options for payment and/or benefits vary from agency to agency and state to state.

In recent years Fair Labor Standards Act (FLSA) requirements regarding full-time and part-time employment, along with provisions of the Affordable Care Act, have combined to set limits on the hours volunteers can work; once past this limit it is mandated they receive certain benefits. However, an Internal Revenue Service ruling in 2014 provides specific exemptions for *bona fide* volunteers, including volunteer firefighters.[3] State and local requirements may impose restrictions on the number of hours worked before an employer is required to make pension contributions or provide insurance coverage. It would be advisable that city human resources director and the city attorney review the most recent IRS ruling and other municipal or state requirements regarding volunteer firefighters before any other steps are taken toward implementing a volunteer effort.

Overtime and the FLSA

Our evaluation of the current staffing model utilized by KFD is that it is very appropriate given the service area, the scope of duties, and overall call volume. Though overtime expenditures are averaging $250,000 annually, CPSM believes that this level of expenditure is justified given the current work schedule and the range of responsibilities managed by KFD. We do, however, believe that there may be some opportunities to reduce overtime costs by utilizing volunteers/paid-on-call personnel and by expanding the joint response relationships with neighboring agencies (Nikiski and CES). In addition to adding a volunteer force to supplement current staffing levels, Kenai should reevaluate its interpretation of the definition of ***time worked*** for the purpose of determining overtime eligibility. Under current municipal code provisions, overtime for employees engaged in fire protection activities is specified as required by the Fair Labor Standards Act.4

The Fair Labor Standards Act (FLSA), which regulates overtime rates for municipal employees, only requires overtime pay when the ***actual hours worked*** are in excess of the designated workweek. FLSA does not require that this calculation include time not worked, such as vacation time, sick leave, or holidays (federal or otherwise).5 Kenai has chosen, however, to include this time not worked in the calculation as an added benefit, which goes beyond the FLSA requirements.

> ***Recommendation: Kenai should review its interpretation of "in paid status" when considering overtime eligibility for 56-hour fire personnel and exclude from the calculation of overtime eligibility any leave time utilized by an employee during the FLSA 24-day cycle.***

It is difficult to estimate the actual savings that would be realized if Kenai were to modify its interpretation of "time worked" in determining overtime eligibility. If adopted, CPSM believes that there would be a significant impact on overtime earnings. These includes any additional overtime

[3] Internal Revenue Service, 26 CFR Parts 1, 54 and 301. US Treasury February 7, 2014.
[4] Kenai Municipal Code; Section 23.25.060 (b)(6).
[5] U.S. Department of Labor., Wage and Hour Division, Overtime Pay: General Guidance.

hours worked during the FLSA cycle and the calculation of FLSA overtime of regularly scheduled hours. As indicated above, Kenai is currently paying nearly $250,000 annually in overtime to fire department employees. Under this interpretation, employees who work extra hours during the 24-day cycle, but have taken leave time, will still receive extra pay for these hours. However, these hours can be paid at the straight-time rate rather than the time-and-one-half premium rate. In addition, employees who do not work 182 hours in the 24-day cycle would not be eligible for FLSA overtime.

Apparatus and Fleet Maintenance

The KFD fleet of first-line apparatus is aging and to address this situation the city has recently purchased and is expecting delivery on a new ambulance in December 2015. In addition, the city has received outside funding to partially pay for a new fire engine and is beginning the process of designing and developing specifications for this apparatus. Delivery of the new engine is anticipated in late 2016. Kenai has established a replacement fund for this purpose. This is a commendable effort which CPSM considers a ***best practice***. In recent years CPSM has observed many municipalities deferring the purchase of expensive fire apparatus, ambulances, and other capital equipment in the wake of shrinking revenues.

We estimate that in 2015 the average age of first-line engines in the KFD to be 18 years and its primary reserve pumper has seen 32 years of service. The city operates two ambulances and they are eleven and four years old, respectively. In Kenai, fire pumpers are set at a 30-year replacement schedule, ambulances at 15 years, and wildland/squad apparatus at 20 years. The more typical apparatus replacement schedules utilized by fire departments today in the U.S. anticipates the useful working life of fire engines to be 15 years in frontline service followed by five years in a reserve status (a useful life expectancy of 20 years). Ambulances have a much shorter service life-cycle, approximately five to eight years depending on the miles driven. Typically, ambulances are in need of replacement when total miles driven is in the 120,000 mile range. There are options to re-chassis these units and in this mode the expected miles of frontline service can be extended to the 200,000 mile range. Any replacement schedule must be a rough guide and will vary on the basis of alarm activity, accidents, available funding, and adhering to a proper maintenance schedule.

TABLE 3-1: KFD Apparatus Inventory

Unit	Type	Make	Year	Age
Engine 1	Type 1/Pumper	E-One	1999	16 years
Engine 2	Type 1/Pumper	Spartan	1983	32 years
Engine 3	Type 1/Tanker	E-One	1995	20 years
Tower 1	Aerial Tower	E-One	1993	22 years
Squad 1	Brush Truck	Ford/AEV	2001	14 years
Rescue 7	Ambulance	Ford/AEV	2004	11 years
Rescue 8	Ambulance	Freightliner	2011	4 years
Rescue*	Ambulance	Freightliner	2015	0 years
Boat 2	25' Safeboat	Safeboat	2003	12 years

***Note:** A new ambulance was ordered and awaiting delivery at the time that this study wen t to print.

The current fleet of first-line engines and aerial apparatus has a replacement value of more than $3.8 million in 2015 dollars ($450,000 per engine, $1.2 million per aerial, $360,000 per ambulance). A straight-line calculation utilizing a 20-year replacement schedule would indicate a need to earmark $190,000 annually for apparatus and ambulance replacement. Kenai has adopted a formalized apparatus replacement program for fire apparatus and ambulances. However, the estimated life cycle in this program appears high. In FY2016 the fire department equipment replacement fund included an annual allocation of $136,270.

In a 2004 survey of 360 fire departments in urban, suburban, and rural settings across the nation, Pierce Manufacturing reported on the average life expectancy for fire pumpers.[6] The results are shown in Table 3-2.

TABLE 3-2: Fire Pumper Life Expectancy by Type of Jurisdiction

Demographic	First-Line Service	Annual Miles Driven	Reserve Status	Total Years of Service
Urban	15 Years	7,629	10 Years	25
Suburban	16 Years	4,992	11 Years	27
Rural	18 years	3,034	14 Years	32

Note: Survey information was developed by Added Value Inc. for Pierce Manufacturing in, "Fire Apparatus Duty Cycle White Paper," Fire Apparatus Manufacture's Association, August 2004.

When compared against this matrix, the average age of the KFD first-line apparatus is right on track for what was represented in the manufacture's survey. As a one-station operation, with heavy dominance on EMS, the ambulances are the most utilized units in the KFD fleet. CPSM estimates that response distances for EMS calls, including transports, average between 20 to 25 miles per round-trip. Nontransport calls average about three to five miles round trip. At these distances and the associated call volume, we estimate that the total ambulance travel (both vehicles combined)

[6] Fire Apparatus Duty Cycle White Paper, Fire Apparatus Manufacturer's Association. August 2004.

will be approximately 20,000 to 25,000 miles annually, with approximately 80 percent of these miles being logged by the primary response unit. We estimate that fire apparatus travel will be in the range of 3,000 to 5,000 miles annually. Today's fire engines are expected to travel a total of 125,000 to 150,000 miles, with proper maintenance before needing replacement. Ambulances have an expected service life of seven to eight years or approximately 100,000 to 120,000 miles. At current levels of use, Kenai will need to replace ambulances in approximately 6 to 7 years and fire apparatus in a 25 to 30 year time frame.

The Kenai brush unit is 14 years old and is used extensively in both emergency and nonemergency applications. Kenai is a largely forested area and this unit serves as the city's primary apparatus for wildland and grass fires. Unfortunately, this vehicle is not equipped with 4-wheel drive and has limited off-road capabilities. This vehicle is on a 20-year replacement schedule and is not due for replacement until 2021.

Recommendation: KFD should accelerate the replacement of its brush unit (SQ1) and move to an all-wheel drive wildland vehicle, either a Type-3 or Type-6 engine.

The Type-3 wildland engine is the workhorse in the U.S. Forest Service fleet. It can carry four to five personnel and can also be utilized for structure fires. The Type-6 wildland engine is more maneuverable and operates on a smaller chassis (usually 1-ton) and would also be suitable for use in Kenai.

Currently, the battalion/training chief does not have an assigned response vehicle. This individual is the primary chief officer who responds to larger incidents to provide command and scene support. The BC often is called out after hours for emergency response and must first come to fire headquarters and utilize one of the utility vehicles for response, if one is available.

Recommendation: Kenai should consider the purchase and assignment of a 24-hour, take-home emergency response vehicle, equipped with emergency lighting, radio communications, and safety equipment for the battalion/training chief.

Fire apparatus are maintained by the city's fleet maintenance shop. The fleet maintenance shop is a section of the public works department and operates with three full-time personnel (two mechanics and one mechanic/shop foreman). None of the shop mechanics are certified as an emergency vehicle technician (EVT) nor have they received formal training on emergency vehicle maintenance and repairs.

Recommendation: Kenai should consider an expansion of the formal training received by its shop mechanics on fire apparatus and consider training that will qualify these personnel as emergency vehicle technicians.

The vehicle maintenance shop includes in its budgetary accounting the costs associated with all repairs and maintenance services, including parts and field repairs for fire department apparatus, staff vehicles, and mechanical equipment. KFD is not billed nor is there a periodic accounting for vehicle repairs, labor costs, or automotive parts. Neither the KFD nor the city's budget office receive

any cost accounting regarding mechanical services. The ability to understand the annual cost of operations including mechanical repair cost are critical in determining whether a vehicle is costing excessive amounts to be maintained. This information would be critical in determining if replacements are warranted or can be anticipated in upcoming budget cycles.

> ***Recommendation: The Kenai vehicle maintenance shop should provide annual repair, maintenance, and service costs for the KFD fleet and this information should be utilized in the vehicle replacement schedule.***

The KFD staff reports being very pleased with the quality of service and reliability of the city fleet repair shop. KFD and the mechanical staff work jointly in new fire apparatus acquisitions, specification writing, and the oversight of vehicle assembly. CPSM believes that the services provided by the city shop are of good quality and repairs are completed on a timely basis

Capital Equipment

Fire apparatus are equipped with various types of tools and equipment that are utilized in providing fire and EMS services. Many of the tools and much of the equipment carried on fire apparatus are specified in NFPA and ISO guidelines. State of Alaska ambulance licensing guidelines specify certain equipment and disposable medical supplies. Fire and EMS equipment includes such items as hose, couplings, nozzles, various types of ladders, foam, scene lighting, oxygen tanks, stretchers, defibrillators, small hand tools, fire extinguishers, mobile and portable radios, salvage covers, and medical equipment and supplies. Many of the small tools and equipment are considered disposable items and are replaced with ongoing operating funds. However, some pieces of equipment are very expensive, and thus require ongoing planning for their useful life and replacement. The more expensive pieces of capital equipment include:

- Self-contained breathing apparatus (SCBA) and fill stations.
- Firefighting PPE (personal protective equipment).
- Hydraulic/pneumatic extrication equipment.
- ECG monitor/defibrillator
- Ambulance stretchers
- Thermal imaging cameras.
- Mobile/portable and base radios.
- Mobile data computers.
- Gas monitoring and detection devices.

Much of the more expensive capital equipment is generally on a ten-year replacement cycle. The total cost of outfitting a department the size of the KFD for the capital items described above is estimated to be in excess of $500,000. **It is therefore imperative that these costs be included in the apparatus replacement program and be built around the anticipated life cycle of this equipment.**

Section 4. Operational Preparation, Response, and Workload

Fire Risk Analysis/Target Hazards

The cost of providing fire protection in most communities has increased steadily in recent years. This has been fueled in part by rising wages, additional special pay, and escalating overtime costs. In addition, funding requirements have been compounded by increasing insurance premiums and spiraling pension contributions. At the same time the workforce has become less productive largely because of the increases in lost time, specifically because of vacation leave, greater usage of sick leave, and increases in other miscellaneous lost time categories (workers' compensation, light duty, FMLA, holiday leave, training leave, etc.). As a result, many jurisdictions are asking the fundamental question of whether the level of risk in their jurisdiction is commensurate with the type of protective force that is currently being deployed. To this end, a fire risk assessment and hazard analysis process can be helpful in providing a more objective assessment of a community's level of risk.

A fire risk analysis utilizes a "fire risk score," which is a rating of an individual property on the basis of several factors, including;

- Needed fire flow if a fire were to occur.
- Probability of an occurrence based on historical events.
- The consequence of an incident in that occupancy (to both occupants and responders).
- The cumulative effect of these occupancies and their concentration in the community.

From this analysis a score is established and this is used to categorize a property as one of low-, moderate-, or high/maximum-risk. There is specific training and a number of retail software products currently available that assist in carrying out this process.

Plotting the rated properties on a map will provide a better understanding of how the response matrix and staffing patterns can be used to provide a higher concentration of resources for worse-case scenarios or, conversely, fewer resources for lower levels of risk.[7] The community fire risk assessment may also include determining and defining the differences in fire risk between a detached single-family dwelling, a multifamily dwelling, an industrial building, and a high-rise building by placing each in separate category. Further, an overall community risk profile can be linked to historical response time data. This analysis can then be used to establish response time baselines and benchmarks.

Community risk and vulnerability assessment are essential elements in a fire department's planning process. KFD has not completed a comprehensive community risk and vulnerability assessment. The leadership in KFD have recognized the importance and usefulness of this process,

[7] *Fire and Emergency Service Self-Assessment Manual,* Eighth Edition, (Center for Public Safety Excellence, 2009), 49.

but to date have been unable to complete this process. According to a National Fire Protection Association (NFPA) paper on assessing community vulnerability, fire department operational performance is a function of three considerations: resource availability/reliability, department capability, and operational effectiveness.[8] These elements can be further defined as:

Resource availability/reliability: The degree to which the resources are ready and available to respond.

Department capability: The ability of the resources deployed to manage an incident.

Operational effectiveness: The product of availability and capability. It is the outcome achieved by the deployed resources or a measure of the ability to match resources deployed to the risk level to which they are responding.[9]

Recommendation: KFD should conduct a formal fire risk analysis that concentrates on its strip commercial along the Kenai Spur highway, big-box occupancies, processing and institutional occupancies.

Target Hazards

The process of identifying target hazards and preplanning suppression and rescue efforts are basic preparedness efforts that have been key functions in the fire service for many years. In this process, critical structures are identified on the basis of the risk they pose. Then, tactical considerations are established for fires in these structures. Consideration is given to the activities that take place (manufacturing, processing, etc.), the number and types of occupants (elderly, youth, handicapped, imprisoned, etc.), and other specific aspects relating to the construction of the facility or any hazardous or flammable materials that are regularly found in the building. Target hazards are those occupancies or structures that are unusually dangerous when considering the potential for loss of life or the potential for property damage. Typically, these occupancies include hospitals, nursing homes, high-rise, and other large structures. Also included are arenas and theaters, industrial and manufacturing plants, and other buildings or large complexes.

Kenai has a limited number of target hazards within its service area. There are a number of area nursing or adult care facilities (Nicholson's, Design 1, Kenai Senior Center, and Vintage Point Manor). The area canneries and the municipal airport and terminal would also be included. There are a number of big-box retail centers (Sears Hometown Store, Walmart, Home Depot, and Safeway) and the area gas and petroleum industries (Alaskan Crude, Artic Pipe Inspection, Marathon, Industrial Instrument Svc, EVO, and Unocal). The city has a number of large assembly buildings, including schools, hotels, theaters, and churches. The presence of the Kenai Spur Highway presents

[8] Fire Service Deployment, Assessing Community Vulnerability: From http://www.nfpa.org/assets/files/pdf/urbanfirevulnerability.pdf.
[9] National Fire Service Data Summit Proceedings, U.S. Department of Commerce, NIST Tech Note 1698, May 2011.

the potential for transportation accidents and the dispersal of product that requires specific tactical considerations and preparation.

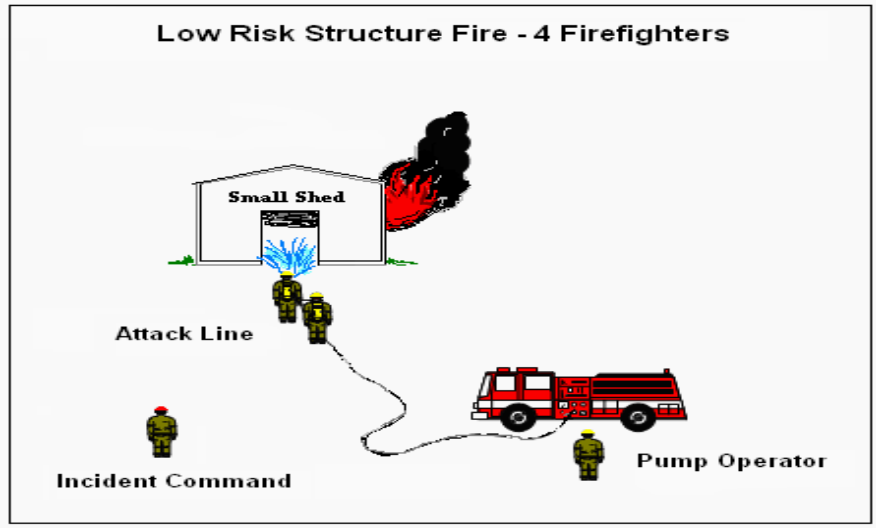
Operational Response Approaches

Many agencies incorporate the use of prefire plans to provide a response and tactical strategy for those more critical or complex occupancies in the community. The community risk and vulnerability assessment evaluates the community as a whole, and with regard to property, measures all property and the risks associated with that property and then segregates the property as either a high-, medium-, or low-hazard, which are further broken down into varying degrees of risk. According to the NFPA *Fire Protection Handbook*, these hazards are defined as:

> **High-hazard occupancies:** Schools, hospitals, nursing homes, explosives plants, refineries, high-rise buildings, and other high life-hazard or large fire-potential occupancies.
>
> **Medium-hazard occupancies:** Apartments, offices, and mercantile and industrial occupancies not normally requiring extensive rescue by firefighting forces.
>
> **Low-hazard occupancies:** One-, two-, or three-family dwellings and scattered small business and industrial occupancies.[10]

Figures 4-1 and 4-2 illustrate the critical tasks and resource deployment required on low-risk incidents and moderate-risk incidents such as structure fires. Understanding the community's risk greatly assists fire department management planning for and justification of staffing and apparatus resources.

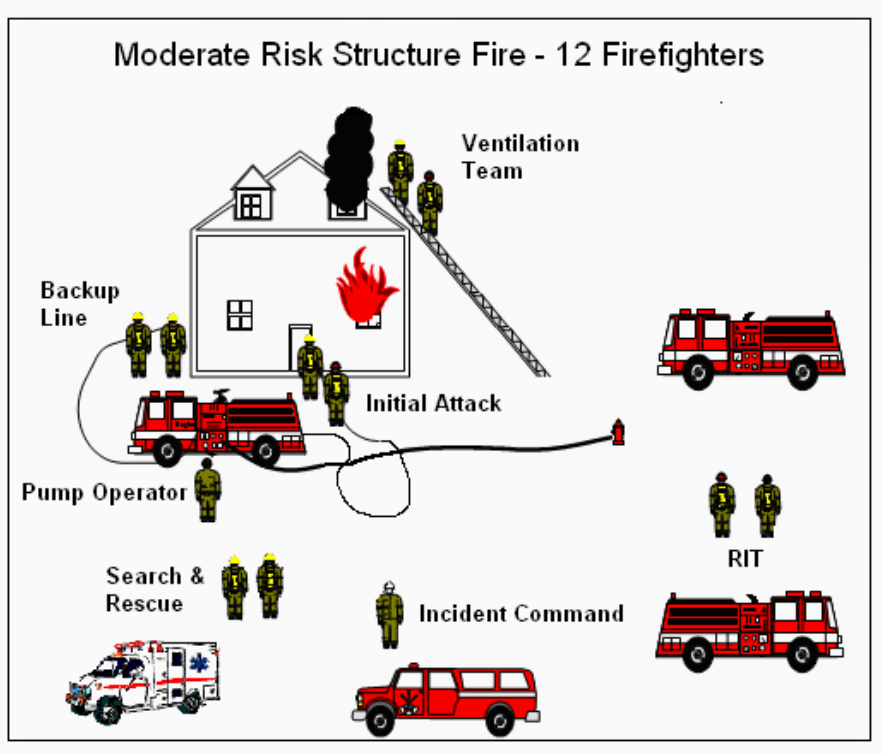
FIGURE 4-1: Low-Risk Response-Exterior Fire Attack



[10] Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: National Fire Protection Association, 2008), 12.

Figure 4-2 represents critical task elements for a moderate-risk structure fire. Some jurisdictions add additional response resources to meet and in some cases exceed the specifics of national benchmarking, such as National Fire Protection Association (NFPA) 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2010 Edition. KFD utilizes mutual aid and the recall of off-duty personnel to assemble the necessary staffing to manage larger incidents.

FIGURE 4-2: Moderate Risk Response-Interior Fire Attack



In addition to examining risks faced by the community at large, the department needs to examine internal risks in an effort to protect all assets, including personnel, resources, and property. This concept is not new to the fire service and can be an excellent tool for strengthening existing health and safety guidelines. The National Fire Protection Association's *Standard for a Fire Department Occupational Safety and Health Program* (NFPA 1500) requires the development of a separate risk management plan[11] for fire departments; that is, separate from those incorporated in a local government plan. The risk management plan establishes a standard of safety for the daily operations of the department. This standard of safety establishes the parameters in which the department should conduct all activities during emergency and nonemergency operations. The intent is for all members of the department to operate within this standard or plan of safety and not deviate from this process.

[11] Robert C. Barr and John M. Eversole, eds., *The Fire Chief's Handbook*, 6th edition (Tulsa, OK: PennWell Books), 270.

KFD has compiled an extensive number of preplan documents for its high- and medium-risk occupancies. In addition, it has developed a "Quick Access Plan" for those occupancies that pose the greatest risk from both a tactical and life-safety perspective. These QAPs are readily available to responding personnel (in hard copy) and the department is very attentive in keeping these files up to date and familiar to responding personnel. This is a very good effort that is considered a best practice.

Kenai Response/Recall Matrix

The KFD utilizes a very dynamic process when deploying apparatus and personnel to the myriad of calls for service. It is not unusual to see altered response modes and varying numbers of personnel respond when a single station operation is utilized. All EMS calls dispatched from the Kenai 911 Dispatch Center are screened and prioritized on the basis of the National Academy EMD ProQA. The call prioritization process has been recently implemented (January 2015) in the management of calls for KFD. ProQA is a software package that allows dispatchers to ask a series of questions in determining the severity of the call. On the basis of the information received, the dispatcher will then assign an alphanumeric designation that coincides with a fire department response matrix to determine the number of personnel that respond and the mode of response. Responses are either "***Hot***," which refers to a unit driving while utilizing lights and sirens, or "***Cold***," which refers to units responding not utilizing lights and sirens and following traffic patterns and signalization. This is an excellent effort on both the part of the KFD and the 911 center. CPSM recognizes this level of sophistication and the excellent coordination that exists between agencies as a ***best practice***.

This matrix also provides guidelines for the recall of off-duty personnel to supplement staffing when calls are in progress or for larger incidents. In the prioritization process, deployment can to be modified at the discretion of the captain or a chief officer. For EMS responses the matrix calls for a single ambulance responding with a staffing of two or three, depending on whether the call is ALS (advanced life support) or BLS (basic life support). Kenai has entered into automatic response agreements with both Nikiski Fire and CES for fire responses. During fire events, KFD will draw upon neighboring communities to initiate tactical operations and then supplement these resources with the recall of off-duty personnel. Off-duty recalls are not initiated unless there is a confirmed fire or an emergency event that will require extended operations. For those EMS incidents that are typically minor or nonemergency, a single unit responds with two personnel and recalls will be initiated when there are two or fewer remaining personnel (and no supplemental staffing from chief officers or airport staff). Though the 911 center does not prioritize fire responses, KFD officials have indicated that they are working on this effort and expect it to be instituted in the next six months.

CPSM estimates that KFD is averaging approximately $220,000 in overtime annually for the recall of off-duty personnel. In addition, the city expends an additional $30,000 annually in payments for FLSA overtime. CPSM's analysis also indicates that the majority of the overtime for recalls is attributable to the maintenance of the daily minimum staffing level. CPSM estimates that more than 56 percent of the total overtime expenditure (approximately $140,000 annually) is the result of

maintaining the daily minimum staffing levels. We also have estimated that overtime related to off-duty training is generating 10.6 percent of the overtime (approximately $26,500 annually) and the recall of off-duty personnel to provide additional staffing for active incidents (categorized as extended incident coverage) adds an additional $26,000 in overtime costs (10.4 percent). It was interesting that only 1.5 percent of the overtime expenditure is actually related to large incident recalls (approximately $3,750 annually) and the majority of these costs were attributable to one multiday wildfire event. A complete review of the 2015 overtime accounting is provided in Table 4-1.

TABLE 4-1: 2015 Overtime Expenditure and Purpose (approximately $250,000)

Purpose	Percent of Total
Coverage/minimum staffing	56.4
FLSA overtime	11.6
Training	10.6
Extended incident coverage (Class 2 & 3)	10.4
Scheduled recalls and special details	9.5
Large incident/emergency recall (Class 1)	1.5
Total	**100**

CPSM concludes from this analysis that the overtime expenditures currently being incurred in Kenai are not unrealistic. Two factors drive this outcome: first, the required coverage at the airport, and second, the staffing policies associated with providing EMS transport service. KFD has established a five-person minimum staffing level and this staffing level is designed to maintain one person for airport coverage and four people for conducting two EMS transports simultaneously. Policy Number 130.01.2 establishes the guidelines for Recall Procedures/Minimum Manning. This policy specifies that when an EMS call is in progress and two personnel are assigned to that call, a residual crew of ***three qualified*** personnel shall be available for a secondary response. When chief officers or the airport firefighter are available, no recall is initiated. However, if neither of the supplemental personnel are available, a recall of off-duty personnel is initiated and this brings one additional person and sometimes two.

The frequency of two calls occurring simultaneously is very low in the Kenai system. On average there are fewer than 3.5 fire and EMS calls each 24-hour period, so the likelihood is low that two calls will occur at the same time. CPSM's analysis indicates that were approximately 221 occasions during which Kenai experienced two simultaneous calls. It is uncertain, however, as to the frequency in which there were simultaneous calls and the second call was critical in nature and required more than two personnel to respond. We would estimate that under the current call screening process (in which fire calls are not prioritized), this is occurring approximately 40 times each year. From this perspective it appears that the logic of maintaining a three-person residual is understandable; however, it appears that it is seldom required.

Recommendation: KFD should reevaluate Policy No. 130.01.2 and consider a change in the current practice of initiating a recall of off-duty personnel in order to maintain a contingent staffing of three personnel.

CPSM believes that due to the frequency of simultaneous calls (221 annually), the concept of maintaining staffing to handle a second EMS call is valid, and should be continued. The more important question is whether the current practice of maintaining three personnel for a secondary alarm is also appropriate. As indicated above, the process of maintaining the three-person residual is costing an estimated $26,000 annually. Though this expenditure is not excessive, city officials should weigh if another worthwhile expenditure should be funded in lieu of maintaining the three-person residual.

Kenai does not utilize neighboring agencies (Nikiski or CES) for automatic response on EMS incidents. This option is available, particularly when there is an alarm in progress and the staffing level of the residual unit is two personnel. In these situations it would be very easy to build into the dispatch protocols the dispatching or request of an auto response unit when the call screening process identifies a more critical call (Delta or Echo).

Recommendation: KFD should expand its automatic response agreements with Nikiski and CES to include Delta and Echo EMS responses when the KFD staffing is at two personnel.

Each shift is assigned five personnel, so whenever there is an absence, either because of vacation, sick leave, disability, or training, overtime is required. CPSM's observations nationally indicate that firefighting personnel typically average about 15 percent lost from their productive work time. At this rate, and considering the five personnel assigned to each shift, some type of lost time is occurring three out of every four days in Kenai. The use of chief officers and airport personnel, when they are available, to cover absences during shortfalls has reduced the need for overtime significantly. In many agencies we observe, there is a coverage factor of approximately 20 percent built into the staffing model. This means that for every five positions on each shift, a sixth position is assigned to fill in for personnel absences. CPSM in not recommending that Kenai establish coverage positions; however, if there is a desire to further reduce overtime expenditures, the city should evaluate the use of the volunteer contingent recommended earlier to provide coverage during evenings, weekends, and large incidents. The use of volunteer personnel can be provided at significantly lower costs than adding coverage personnel and will be less costly than the current practice of paying overtime to fill these vacancies.

CPSM also believes that the current level of overtime associated with EMS training can be reduced. Currently the city utilizes both EMT-IIIs and Mobile Intensive Care Paramedics (MICPs) in delivering EMS care. The state of Alaska provides significant latitude to its medical directors in determining the level of care provided by practitioners operating under their licensing. Through an ***expanded scope of practice*** Kenai residents receive an exceptional level of prehospital emergency care. EMT-IIIs and MICPs are authorized and provide the same level of care. However, the MICP ***continuing medical education (CME)*** requirements are significantly higher than those

requirements of EMT-IIIs. By utilizing only EMT-IIIs, CPSM estimates that EMS recertification requirements can be reduced by 25 percent. This will translate to reduced overtime costs and a reduction in lost time associated with the higher MICP training requirements

Recommendation: KFD should move to the utilization of only EMT-IIIs in the staffing of ambulances and fire vehicles.

KFD currently employees 18 field personnel in providing fire and EMS services. Of the 18 personnel, 7 are MICPs. MICPs are well-trained and have the capacity to provide a higher level of care than EMT-IIIs. However, the current level of care being provided is being done very effectively and a higher level of care is not being considered, nor does it seem to be required. CPSM is not recommending that the current MICPs not be supported in their on-going training and CME requirements. We do however recommend that in the future, KFD consider only the hiring and utilization of EMT-IIIs.

Fire Responses

With the limited number of on-duty staffing and the limited resources provided through mutual aid and automatic response, KFD's ability to properly manage anything greater than a small structural fire, an outbuilding, garage, vehicle fire, or porch fire is very limited. If a fire grows to an area in excess of 2,000 square feet or has extended beyond the building of origin, it is certain that additional personnel and equipment will be needed. From this perspective it is critical that KFD units respond rapidly and initiate extinguishment efforts within the first eight to ten minutes of notification. It is, however, difficult to determine in every case the effectiveness of the initial response in limiting the fire spread and fire damage. Many variables will impact these outcomes including:

- The age and type of construction of the structure.
- The contents stored in the structure and its flammability.
- The presence of any flammable liquids, explosives, or compressed gas canisters.
- The time of detection, notification, and ultimately response of fire units.
- The presences of any built-in protection (automatic fire sprinklers) or fire detection systems.
- Weather conditions and the availability of water for extinguishment

Subsequently, in those situations in which there are extended delays in the extinguishment effort or the fire has progressed sufficiently upon arrival of fire units, there is actually very little that can be done to limit the extent of damage to the entire structure and its contents. In these situations suppression efforts will focus on the protection of nearby or adjacent structures with the goal being to limit the spread of the fire beyond the building of origin. This is often termed ***protecting exposures.*** When the extent of damage is extensive and the building becomes unstable, firefighting

tactics typically move to what is called a ***defensive attack***, or one in which hose lines and more importantly personnel are on the outside of the structure and their focus is to merely discharge large volumes of water until the fire goes out. In these situations the ability to enter the building is very limited and if victims are trapped in the structure, there are very few safe options for making entry.

Today's fire service is actively debating the options of interior firefighting vs exterior firefighting. These terms are self-descriptive in that an ***interior fire attack*** is one in which firefighters enter a burning building in an attempt to find the seat of the fire and from this interior position extinguish the fire with limited amounts of water. An ***exterior fire attack*** is a tactic in which firefighters initially discharge water from the exterior of the building, either through a window or door and knock down the fire before entry in the building is made. The concept is to introduce larger volumes of water initially from the outside of the building, cool the interior temperatures and reduce the intensity of the fire before firefighters enter the building. An exterior attack is most applicable in smaller structures, typically single family, one-story detached units which are typically smaller than 2,500 square feet in total floor area.

There are a number of factors that have fueled this debate. The first and most critical of which are staffing levels. As fire departments operate with reduced levels of staffing, and this staff is arriving at the scene from greater distances, there is little option for a single fire unit with two, three or four personnel but to conduct an exterior attack. The United States Occupational Safety and Health Agency (OSHA), has issued a standard that has been termed the ***"Two-in-Two-Out"*** provision. This standard affects most public fire departments across the U.S., including KFD. Under this standard firefighters who are engaged in ***interior structural firefighting*** and enter an area that is immediately dangerous to life or health (an IDLH atmosphere) must remain in visual or voice contact with each other and have at least two other employees located outside the IDLH atmosphere. This assures that the "two in" can monitor each other and assist with equipment failure or entrapment or other hazards, and the "two out" can monitor those in the building, initiate a rescue, or call for back-up if a problem arises.[12] There is also a provision within the OSHA standard that will allow two personnel to make entry into an IDLH atmosphere without the required two back-up personnel. This is allowed when they are attempting to rescue a person or persons in the structure before the entire team is assembled.[13]

When using an exterior attack, the requirement of having the four persons assembled on-scene prior to making entry would not apply. Recent studies by UL have evaluated the effectiveness of interior vs. exterior attacks in certain simulated fire environments. These studies have found that the exterior attack to be equally effective in these simulations.[14] This debate is deep-seated in the fire service and traditional tactical measures have always proposed an interior fire attack, specifically when there is a possibility that victims may be present in the burning structure. The long-held belief in opposition to an exterior attack is that this approach may actually push the fire into areas that are not burning or where victims may be located. The counterpoint supporting the

[12] OSHA-Respiratory Protection Standard, 29CFR-1910.134(g)(4)
[13] Ibid, Note 2 to paragraph (g).
[14] "Innovating Fire Attack Tactics", U.L.COM/News Science, Summer 2013.

exterior attack centers on firefighter safety. The exterior attack limits the firefighter from making entry into those super-heated structures that may be susceptible to collapse. From CPSM's perspective, and given the limited number of on-duty personnel and the likelihood that a single crew of three or four personnel will encounter a fire situation, it is prudent that KFD build its training and operating procedures around the tactical concept of the exterior fire attack when the situation warrants such an approach.

Recommendation: KFD should build its training regimens and tactical strategies around the exterior or transitional attack when the fire scenario and the number of responding personnel warrants this approach.

Table 4-2 shows the aggregate call totals for the twelve-month period evaluated. EMS calls represent the largest percentage of calls for service at almost 73 percent; this predominance of EMS calls is not unusual and is quite similar to many communities CPSM has observed. While fire call types represent nearly 23 percent of the calls for service, actual fire calls (structural and outside) represent only 2.0 percent of the overall calls (approximately 0.06 calls per day or one actual fire-type call approximately every seventeen days). Hazard, false alarms, good intent, and public service calls represent the largest percentage of fire calls for service, which is also typical in CPSM data and workload analyses of other fire departments.

TABLE 4-2: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	104	0.29	8.4
Seizure and unconsciousness	76	0.21	6.1
Breathing difficulty	84	0.23	6.8
Overdose and psychiatric	65	0.18	5.2
MVA	31	0.09	2.5
Fall and injury	130	0.36	10.5
Illness and other	302	0.83	24.4
Interfacility transfer	106	0.29	8.6
EMS Total	**898**	**2.47**	**72.5**
Structure fire	9	0.02	0.7
Outside fire	16	0.04	1.3
Hazard	21	0.06	1.7
False alarm	75	0.21	6.1
Good intent	35	0.10	2.8
Public service	114	0.31	9.2
Fire Total	**270**	**0.74**	**21.8**
Mutual aid	46	0.13	3.7
Canceled	25	0.07	2.0
Total	**1,239**	**3.40**	**100.0**

Observations:

- The department responded to a total of 1,239 calls, averaging 3.4 calls per day.
- EMS calls for the year totaled 898 (72 percent of all calls), averaging 2.5 per day.
- Fire calls for the year totaled 270 (22 percent of all calls), averaging 0.7 per day.
- Structure and outside fires combined for a total of 25 calls during the year, averaging one call every two weeks.
- Mutual aid calls totaled 46 (4 percent of all calls) and canceled calls totaled 25 (2 percent of all calls).

During our period of evaluation, KFD responded to a total of nine incidents that were classified as structure fires. In looking in more detail at the structure fire incidents, it was determined that for two of these events there was ***no fire damage*** reported to the structure involved. When we looked at the time spent on fire incidents, we found that on four of the nine structure fires and 14 of the 16 outside fires, the call duration for these incidents was 60 minutes or less. This is indicative of minor occurrences. However, five structure fire calls saw a duration of greater than one hour; two lasted for more than two hours. This would indicate more significant events.

There were seven structure fires in which some degree of fire damage was noted in the incident report. The total fire loss in Kenai (structure and contents) for all structural fires in 2014-2015 was estimated to be $181,250. Fire damage estimates are done by Kenai fire personnel who have received fire investigation training. For the calls in which damage was reported (structure and contents), we have estimated that the average damage for each fire was approximately $26,964. When looking at fire loss comparisons nationwide for structure fires, NFPA estimates that in 2012 the average fire loss for a structure fire was $20,345.[15] According to the state fire marshal, in 2014 the average fire loss for residential structure fires in Alaska was $30,317.[16] From this perspective Kenai is very characteristic of many communities across the nation and Alaska regarding the incidence and magnitude of its fires. Though the fire loss in 2014-2015 was not exceptionally high, at any time a single fire can occur that results in millions of dollars in fire loss. Table 4-3 provides an analysis of the KFD fire loss in 2014-2015.

TABLE 4-3: Property and Content Loss Analysis for Structure and Outside Fire Calls

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Structure fire	$181,250	7	$7,500	4
Outside fire	$9,000	5	$200	1
Total	$190,250	12	$7,700	5

Note: This analysis only includes calls with property loss or content loss greater than 0.

Observations:

- Out of nine structure fire calls, seven calls had recorded property loss, with total recorded loss value of $181,250. Total content loss was $7,500.
- Out of 16 outside fire calls, five calls had recorded property loss, with total recorded loss value of $9,000. Total content loss was $200.

[15] Michael J. Karter Jr., *Fire Loss in the United States during 2012*, NFPA September 2013, 13.
[16] *2014 Fire in Alaska*, Division of Fire and Life Safety, 16.

TABLE 4-4: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure fire	Outside fire
Fire control or extinguishment by others	0	1
Extinguishment by fire service personnel	7	8
Salvage & overhaul	0	1
Ventilate	1	0
Investigate	1	5
Investigate fire out on arrival	0	1
Total	**9**	**16**

Observations:

- A total of seven structure fire calls were extinguished by fire service personnel.
- A total of nine outside fire calls were extinguished or controlled by fire service personnel.

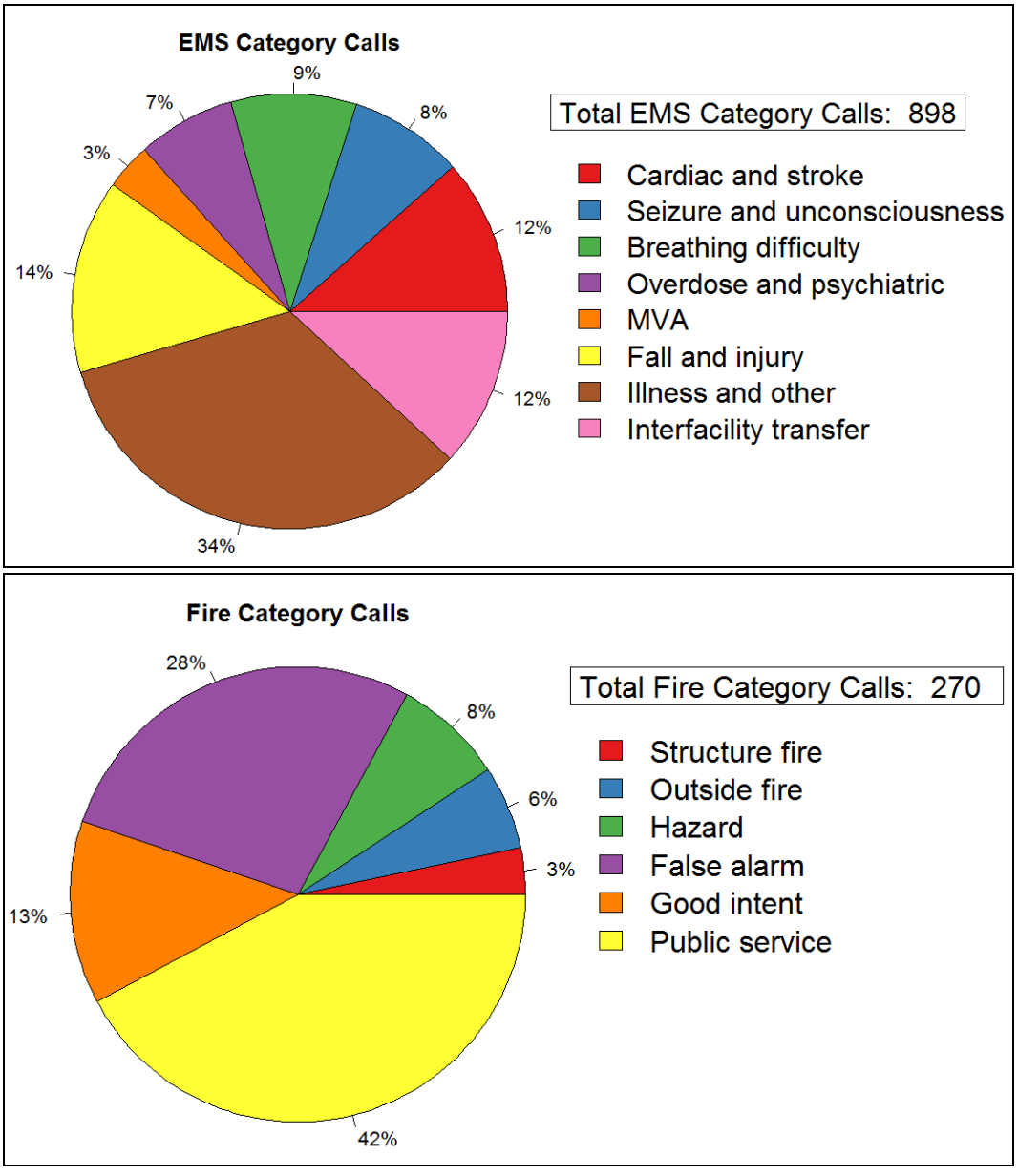
EMS Responses and Transport

EMS is the primary workload within the KFD system. As already mentioned, nearly 73 percent of all call activities reviewed in our analysis involve EMS responses. KFD is licensed under the state of Alaska, Division of Public Health, Department of Health and Social Services-EMS Unit. Under this licensing, KFD is authorized to operate as an "Outside Hospital," Ground Ambulance, delivering advanced life support services (ALS) within city limits. Under Alaskan guidelines, KFD personnel operate under a licensed physician who provides guidance and oversight of KFD field personnel in the delivery of emergency prehospital care. This physician is paid approximately $12,000 annually for these services and is designated as the Kenai Fire Department Medical Director. Under this agreement, the medical director is responsible for the development of EMS protocols, which are the guidelines under which all field activities are delivered. In addition, the medical director reviews field reports and established training guidelines, and ensures the quality control for field activities and EMS reporting.

The city employs both EMT-IIIs and Mobile Intensive Care Paramedics (MICPs), in the fire department and who are charged with the delivery of prehospital, emergency medical care. Under the Kenai expanded scope of service, EMT-IIIs are authorized to provide the same advanced life support services as MICPs. The range of EMS call types is very similar in Kenai to what CPSM has typically observed in many rural/suburban communities across the nation. KFD units respond to an average of two to three EMS calls each day. The array of EMS calls are primarily related to illness and other medical conditions, falls and injuries, seizures and unconsciousness, respiratory problems, and cardiac related incidents. There is some deviation in the EMS call types that relate to seasonal activities.

Our analysis indicates that KFD units transport on average one to two times each day. This indicates that on nearly 72 percent of all EMS responses, a transport takes place. On average, each transport lasts an estimated 66 minutes. Most patients are transported to Central Peninsula Hospital in Soldotna (approximately 10 miles away). In addition to emergency medical responses, KFD provides interfacility, nonemergency transport of patients. This involves moving patients from either an assisted care center or a private home to a medical facility. The majority of such transports involve the movement of patients to and from Central Peninsula Hospital. Interfacility transports are carried out by on-duty staffing. We estimated that approximately 100 interfacility transports are carried out annually by KFD units.

FIGURE 4-3: EMS and Fire Calls by Type



Observations:

- A total of nine structure fire calls accounted for 3 percent of the fire category total.
- A total of 16 outside fire calls accounted for 6 percent of the fire category total.
- Public service was the largest fire call category, making up 42 percent of the fire category total.
- False alarm calls were 28 percent of the fire category total.
- Illness and other calls were the largest EMS call category and accounted for 34 percent of the fire category total.
- Cardiac or stroke calls were 12 percent of the EMS category total.
- Motor vehicle accidents calls were 3 percent of the EMS category total.

KFD provides EMS transports as part of its daily responsibilities. Though many fire agencies provide EMS transport, KFD is unique in that it provides both emergency transports (911) and interfacility (nonemergency, scheduled) transports. The transport workload is not significant, even though it extends the duration of each call more than two-fold. Transport activities do, however generate significant revenue for the city. In the 12-month period evaluated in this study, net revenues from EMS transport activities were estimated to be $350,000. When EMS transport revenues are combined with contract revenues for services to Kenai Municipal Airport, total revenues are in excess approximately $750,000. This equates to almost 24 percent of the cost of operating the fire department. This is a very good cost recovery rate for the fire department and CPSM recognizes this as a ***best practice***. This observation is even more impressive when considering the staffing levels, the cross assignments of personnel, in Kenai and the range of services provided.

TABLE 4-5: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-transport	Transport	Total	
Cardiac and stroke	29	75	104	72.1
Seizure and unconsciousness	32	44	76	57.9
Breathing difficulty	17	67	84	79.8
Overdose and psychiatric	18	47	65	72.3
MVA	13	18	31	58.1
Fall and injury	54	76	130	58.5
Illness and other	87	215	302	71.2
Interfacility Transfer	0	106	106	100.0
EMS Total	**250**	**648**	**898**	**72.2**
EMS Daily Average	**0.7**	**1.8**	**2.5**	**NA**
Fire Total	270	0	270	0.0
Mutual aid	37	9	46	19.6
Canceled	25	0	25	0.0
Total	**582**	**657**	**1,239**	**53.0**
Daily Average	**1.6**	**1.8**	**3.4**	**NA**

Observations:

- Overall, 72 percent of EMS calls to which KFD responded involved transporting patients.
- On average, KFD responded to 2.5 EMS calls per day, and 1.8 involved transporting patients.
- Other than interfacility transfer calls, breathing difficulty calls had the highest transport rates, averaging 79.8 percent.
- KFD also transported patients in nine mutual aid calls.

Mutual Aid/ Automatic Response

Local governments use many types of intergovernmental agreements to enhance fire protection and EMS services. These arrangements take many shapes and forms and range from a simple automatic response agreement that will respond a single unit to a minor vehicle accident or EMS call, to a more complex regional hazardous materials team or a helicopter trauma service that involves multiple agencies and requires a high level of coordination. It is important that fire departments are able to quickly access extra and/or specialized resources to manage significant events. In addition, because these types of incidents do not respect jurisdictional boundaries, they often require coordinated response. Sharing resources also helps departments reduce costs without impacting service delivery. All of these situations point to the need for good working relationships with other fire and EMS organizations.

KFD does not rely heavily on its mutual aid and automatic response agreements. According to our analysis KFD provided mutual aid and automatic aid on 46 incidents. It received assistance during this timeframe 14 times. KFD has automatic response agreements with the Nikiski Fire District and Central Emergency Services (CES). In addition, KFD works closely with the Alaska Division of Forestry in wildfire events and maintains a cooperative agreement with the state in providing resources for major wildfires. Currently, KFD will utilize an automatic response of one engine on structure fires from Nikiski and CES. As mentioned above, KFD typically does not utilize automatic response for EMS incidents and CPSM believes that these agreements should be modified to include EMS calls in the automatic response agreements when staffing levels are reduced due to simultaneous alarms.

Workload Analysis

The emergency call volume observed in Kenai is not excessively high, even when considering the limited number of units operated and its EMS transports responsibilities. The total call volume handled by KFD units in the 12-month period we observed was 1,239 calls. This equates to 3.4 calls per day. Even when considering the high percentage of calls that result in a transport (approximately 73 percent) and the average duration of each transport (approximately 66 minutes), on most days KFD units are managing incidents for upwards of just 4.8 hours. Even when we consider that the majority of this call activity time is occurring in the 12-hour period between 9:00 a.m. and 9:00 p.m., the workload is not unmanageable. This is somewhat validated when we observe the frequency with which simultaneous calls occur. Table 4-6 is an analysis of overlapped calls. These are situations in which multiple calls occur at the same time. As indicated in this analysis we identified a total of 48 times (3.9 percent of all calls) in the 12-month period evaluated where more than two calls occurred simultaneously.

TABLE 4-6: Overlapped Call Analysis

Scenario	Frequency	Percent
No overlapped call	970	78.3
Overlapped with another call	221	17.8
Overlapped with two calls	38	3.1
Overlapped with three or more calls	10	0.8

Observations:

- 78.3 percent of emergency incidents had no overlapped call.
- 17.8 percent of emergency incidents overlapped with another call.
- 3.1 percent of emergency incidents overlapped with two calls.
- 0.8 percent of emergency incidents overlapped with three or more calls.

When we examine the breakdown of call activity and the corresponding minutes deployed for each call type (Table 4-7) we can evaluate the time Kenai units are spending on the various call types. It is important to note that a total of 201.1 minutes (3.4 hours) are devoted each day in managing EMS incidents. This includes the total time units are involved on an incident, from turnout time at the station, through transport and up until the unit returns to an available status. This quantification also includes the cumulative time spent by multiple units responding or involved on a single call.

TABLE 4-7: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Hours	Percent of Total Hours	Deployed Minutes per Day	Annual Number of Runs	Runs per Day
Cardiac and stroke	55.1	169	9.6	27.9	184	0.5
Seizure and unconsciousness	50.1	104	5.9	17.2	125	0.3
Breathing difficulty	59.8	146	8.2	24.0	146	0.4
Overdose and psychiatric	60.9	105	5.9	17.2	103	0.3
MVA	46.8	51	2.9	8.5	66	0.2
Fall and injury	49.0	134	7.6	22.1	164	0.5
Illness and other	56.4	407	23.1	67.0	433	1.2
Interfacility transfer	58.0	104	5.9	17.2	108	0.3
EMS Total	**55.1**	**1,220**	**69.2**	**201.1**	**1,329**	**3.7**
Structure fire	83.5	33	1.9	5.5	24	0.1
Outside fire	21.8	13	0.8	2.2	37	0.1
Hazard	28.1	17	1.0	2.8	36	0.1
False alarm	19.0	41	2.3	6.8	129	0.4
Good intent	37.4	31	1.7	5.0	49	0.1
Public service	108.5	262	14.9	43.2	145	0.4
Fire Total	**56.8**	**398**	**22.5**	**65.5**	**420**	**1.2**
Mutual aid	150.1	130	7.4	21.4	52	0.1
Canceled	25.8	17	1.0	2.8	39	0.1
Total	**57.5**	**1,765**	**100.0**	**290.9**	**1,840**	**5.1**

Note: Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. Therefore, the department responded to 3.4 calls per day and had 5.1 runs per day.

Observations:

- Total deployed time for the year, or deployed hours, was 1,765. This is the total deployment time of all the units deployed on all type of calls, including 130 hours spent on mutual aid. The deployed hours for all units combined averaged approximately 4.8 hours per day.
- KFD units made 1,840 runs, including 52 mutual aid runs. The daily average was 5.1 runs for all units combined.

- Fire category calls accounted for 22.5 percent of the total workload.
- There were 61 runs for structure and outside fire calls, with a total workload of 47 hours. This accounted for 2.7 percent of the total workload. The average deployed time for structure fire calls was 83.5 minutes, and the average deployed time for outside fire calls was 21.8 minutes.
- EMS calls accounted for 69.2 percent of the total workload. The average deployed time for EMS calls was 55.1 minutes. The deployed hours for all units dispatched to EMS calls averaged 3.4 hours per day.

TABLE 4-8: Call Duration by Transport and EMS Call Type

Call Type	Non-Transport		Transport	
	Duration	Number of Calls	Duration	Number of Calls
Cardiac and stroke	23.2	29	68.2	75
Seizure and unconsciousness	23.5	32	66.6	44
Breathing difficulty	24.7	17	69.7	67
Overdose and psychiatric	32.8	18	69.8	47
MVA	20.3	13	63.8	18
Fall and injury	21.3	54	66.1	76
Illness and other	34.0	87	66.7	215
Interfacility transfer	NA	0	58.2	106
EMS Total	**27.2**	**250**	**65.9**	**648**

Note: Duration of a call is defined as the longest deployed time of any of the KFD units responding to the same call.

Observations:

- The average duration was 27.2 minutes for a nontransport EMS call.
- The average duration was 65.9 minutes for an EMS call which transported a patient to hospital, which is 2.4 times longer than a nontransport EMS call.
- The average duration was 58.2 minutes for an interfacility transfer call.

It is not surprising that when we evaluate the workload total by unit, the KFD ambulances (R8 and R7) had the first and third greatest amounts of deployed time, respectively, among all response units. It is also interesting to note the frequency of responses made by the KFD utility trucks. These are the units utilized primarily by administrative staff, recalled personnel, and airport staff who often respond to emergency incidents to supplement staffing. Another interesting observation was the annual hours logged by the KFD brush truck, which has the second-most deployed hours among the KFD fleet.

TABLE 4-9: Call Workload by Unit

Unit Type	Unit ID	Average Deployed Minutes per Run	Annual Number of Runs	Annual Hours	Runs per Day	Deployed Minutes per Day
ENGINE	E-1	38.1	142	90.1	0.4	14.9
ENGINE	E-2	26.1	5	2.2	0.0	0.4
ENGINE	E-3	74.9	41	51.2	0.1	8.4
ENGINE	E-5	10.0	2	0.3	0.0	0.1
ENGINE	E-6	20.3	9	3.0	0.0	0.5
AMBULANCE	R7	52.0	256	221.9	0.7	36.6
AMBULANCE	R8	53.4	860	764.8	2.4	126.1
BRUSH TRUCK	SQ1	269.7	51	229.2	0.1	37.8
TOWER	T-1	79.6	5	6.6	0.0	1.1
UTILITY TRUCK	U-12	55.7	99	91.9	0.3	15.1
UTILITY TRUCK	U10	47.0	78	61.1	0.2	10.1
UTILITY TRUCK	U11	49.0	242	197.5	0.7	32.6
UTILITY TRUCK	U9	56.1	47	44.0	0.1	7.2
BOAT	B-2	15.4	3	0.8	0.0	0.1

NOTE: U-9 (Fire Marshall), U-10 (Airport), U-11 (Sta. 1/BC), U-11 (Fire Chief).

Observations:

- Ambulance R8 made the most runs and had the greatest deployed time, averaging 2.4 runs and 126.1 minutes of deployed time per day.
- Brush truck SQ1 had the second-highest average daily deployed time at 37.8 minutes.
- Of the seven fire suppression units (engine, tower, and brush truck), engine E-1 was dispatched most often, and brush truck SQ1 had the greatest deployed hours.

Emergency/Nonemergency Response

Another interesting trend CPSM continues to evaluate is the frequency of true emergency calls vs. nonemergency or public assist calls. Our findings nationally (from CPSM fire data reports) indicate that in many jurisdictions more than 50 percent of all responses (fire, EMS, and other) are nonemergency in nature. This factor is critical when calculating response time data, determining staffing levels, identifying appropriate deployment strategies, and the recall of off-duty personnel to supplement staffing. KFD has made excellent improvements over the past year in adjusting its response assignments and mode of response for EMS calls. The Kenai 911 Center now prioritizes all EMS calls and depending on this prioritization the number of personnel assigned to the call and the

mode of response ("hot" or "cold") will vary. According to preliminary estimates, nearly 40 percent of the EMS response are coded and receive a ***cold response***. This is an excellent start and CPSM has been advised that KFD and the Kenai 911 Communications Center are reviewing these activities and making adjustments to ensure their accuracy. KFD, however, is not screening fire responses and prioritizing these call types. Subsequently, most fire responses are responded to in a ***hot*** mode.

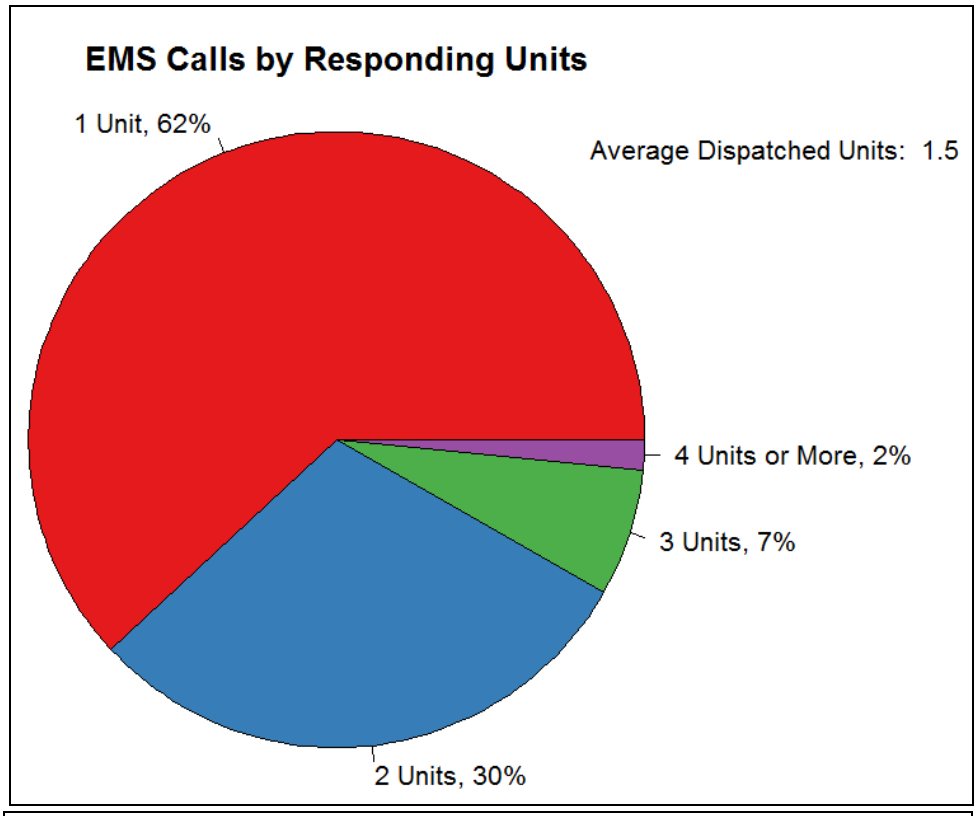
> ***Recommendation: KFD should continue to work with the Kenai 911 Communications Center to develop a prioritized response coding for all fire responses.***

Kenai 911 Officials are evaluating options to implement the Fire call prioritization module from ProQA, with the recognition that most fire responses, specifically those involving automatic fire alarm soundings, smoke investigations, smell of gas, and wires arcing, are nonemergency and do not require a hot response. In most cases, an investigation of the situation is warranted and minimal personnel should be assigned. KFD officials have indicated that they are working toward this end and CPSM believes that this should be a key area of focus in 2016. In looking at the 270 fire responses, nearly 83 percent (224 incidents) were classified as false alarms, good intent, and public service calls. CPSM believes that with proper screening, many of these response could be handled as nonemergency responses.

Our analysis found that on 63 percent of all responses, KFD responds a single unit. At first glance, we would consider this number low. However, when factoring the frequency in which KFD personnel supplement staffing levels and respond in multiple vehicles, this number is more acceptable. The ability to respond the fewest number of units and having these units respond in a cold response mode results in the maximization of resources and improved employee safety. Vehicle accidents involving emergency response units that are responding with lights and sirens are the second most frequent reason for line-of-duty deaths of firefighters. It is estimated that more than 40,000 fire truck and ambulance accidents occur each year in the U.S.[17]

[17] "Analysis of Firetruck Crashes and Associated Firefighter Injuries in the U.S. Association for the Advancement of Automotive Medicine. October-2012.

FIGURE 4-4: Number of Kenai Fire Department Units Dispatched to Calls



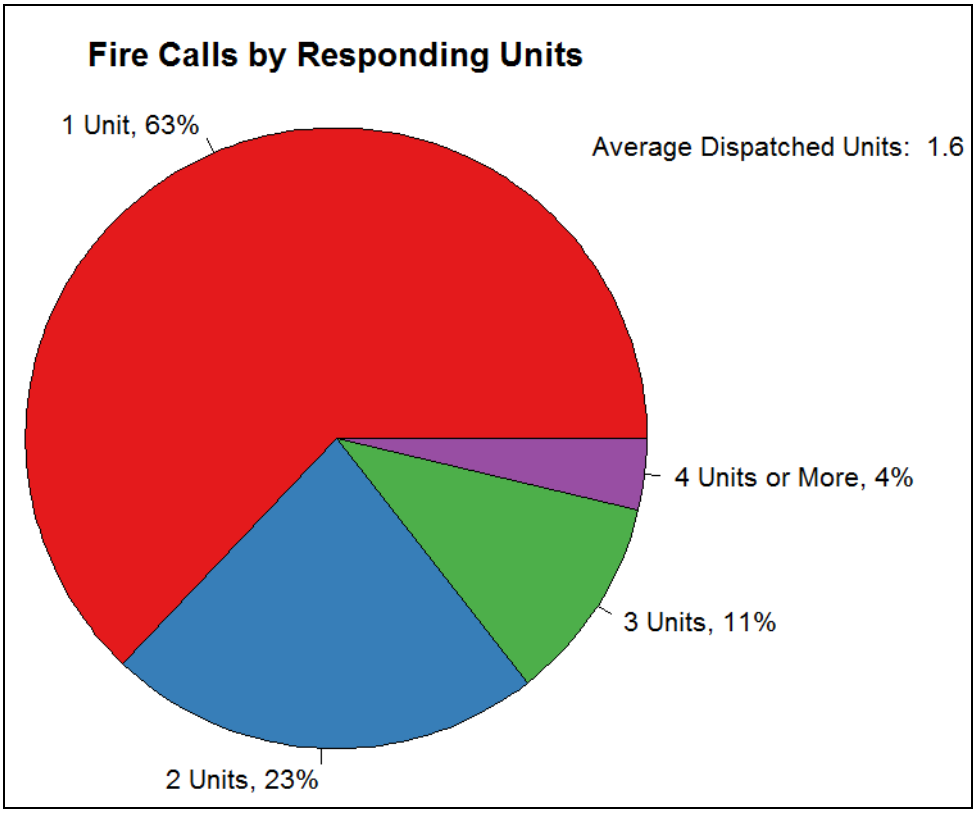


TABLE 4-10: Number of Kenai Fire Department Units Dispatched to Calls

Call Type	Number of Units				
	One	Two	Three	Four or More	Total
Cardiac and stroke	46	39	16	3	104
Seizure and unconsciousness	37	32	4	3	76
Breathing difficulty	32	42	10	0	84
Overdose and psychiatric	33	27	4	1	65
MVA	8	13	8	2	31
Fall and injury	101	26	2	1	130
Illness and other	195	87	16	4	302
Interfacility transfer	104	2	0	0	106
EMS Total	**556**	**268**	**60**	**14**	**898**
Structure fire	**2**	**3**	**1**	**3**	**9**
Outside fire	**3**	**8**	**2**	**3**	**16**
Hazard	**14**	**2**	**2**	**3**	**21**
False alarm	**37**	**23**	**14**	**1**	**75**
Good intent	**24**	**8**	**3**	**0**	**35**
Public service	**90**	**17**	**7**	**0**	**114**
Fire Total	**170**	**61**	**29**	**10**	**270**
Mutual aid	42	2	2	0	46
Canceled	12	12	1	0	25
Total	**63**	**28**	**7**	**2**	**100**
Percentage	**780**	**343**	**92**	**24**	**1239**

Observations:

- On average, 1.6 units were dispatched per fire category call.
- For fire category calls, one unit was dispatched 63 percent of the time, two units were dispatched 23 percent of the time, three units were dispatched 11 percent of the time, and four or more units were dispatched 3 percent of the time.
- For structure fire calls, one unit was dispatched to two calls, two units were dispatched to three calls, three units were dispatched to one call, and four or more units were dispatched to three calls.
- For outside fire calls, one unit was dispatched to three calls, two units were dispatched to eight calls, three units were dispatched to two calls, and four or more units were dispatched to three calls.
- On average, 1.5 units were dispatched per EMS category call.

- For EMS category calls, one unit was dispatched 62 percent of the time, two units were dispatched 30 percent of the time, three units were dispatched 7 percent of the time, and four or more units were dispatched 1 percent of the time.

Response Time Analysis

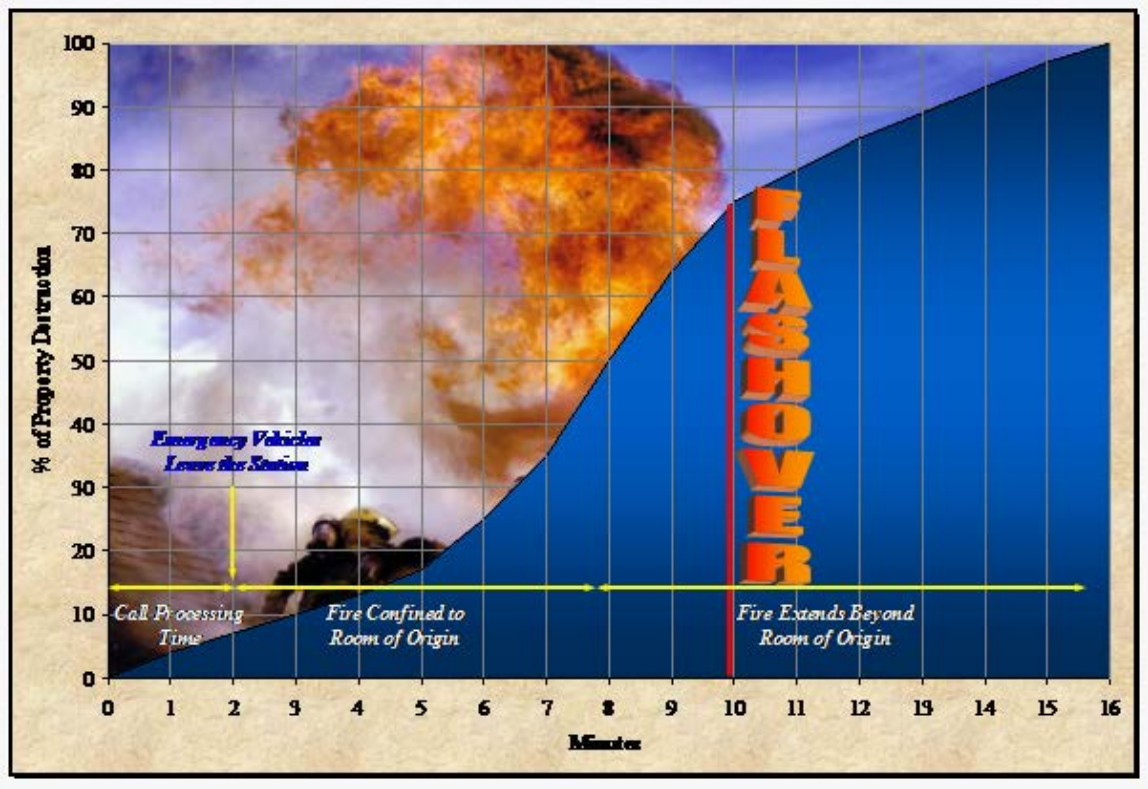
Response times are typically the primary measurement used in evaluating fire and EMS services. Most deployment models have been built around a four-minute initial travel time for EMS and an eight-minute full-force travel time for fires. A full-force travel time indicates the time it takes for the initial response of all resources assigned for the call to arrive on the scene of a fire. Though these times have validity, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four minutes of the onset. However, cardiac arrests occur very infrequently; on average they are 1 percent to 1.5 percent of all EMS incidents.[18] There are also other EMS incidents that are truly life-threatening and the time of response can clearly impact the outcome. These involve full drownings, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls is limited.

Regarding response times for fire incidents, the frequency of actual fires in Kenai is very low, approximately 2 percent of all responses. The criterion for fire response is based on the concept of "flashover." This is the state at which super-heated gasses from a fire in an enclosed structure are released rapidly, causing the fire to burn freely and become so volatile that the fire reaches an explosive state. In this situation, usually after an extended period of time (eight to twelve minutes), and a combination of the right conditions (a significant fuel load and depleted oxygen), the fire expands rapidly and is much more difficult to contain. When the fire does reach this extremely hazardous state, a larger and more destructive fire occurs. Figure 4-5 illustrates the flashover phenomenon and its potential impact on firefighters and fire extinguishment as the fire propagation curve.

Another important factor in the whole response time question is what we term "***detection time***." This is the time it takes to detect a fire or a medical situation and notify 911 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are unavailable or inoperable, the detection process can be extended.

[18] Myers, Slovis, Eckstein, Goodloe et al. (2007). "Evidence-based Performance Measures for Emergency Medical Services System: A Model for Expanded EMS Benchmarking." *Pre-hospital Emergency Care.*

FIGURE 4-5: Fire Propagation Curve



Measuring Response Times

There have been no documented studies that have made a direct correlation between response times and outcomes in fire and EMS events. No one has been able to show that a four-minute response time is measurably more effective than a six-minute response time. The logic has been "faster is better" but this has not been substantiated by any detailed analysis. Furthermore, the ability to measure the difference in outcomes (patient saves, reduced fire damage, or some other quantifiable measure) between a six-minute, eight-minute, or ten-minute response is not a performance measure often utilized in the fire service. So, in looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is perceived to exist. This requires a "fire risk assessment" and a political determination as to the desired level of protection for the community. It would be imprudent, and very costly, to build a deployment strategy that is based solely upon response times.

For the purpose of this analysis ***response time*** is a product of three components: ***dispatch time***, ***turnout time***, and ***travel time***.

- *Dispatch time* is the time interval that begins when the alarm is received at the communication center and ends when the response information begins to be transmitted via voice or electronic means to the emergency response facility or emergency response units in the field. Dispatch time is the responsibility of the Kenai 911 Center and outside the control of KFD officials.

- *Turnout time* is the time interval that begins when the notification process to emergency response facilities and emergency response units begins by an audible alarm or visual announcement or both and ends at the beginning point of travel time. The fire department has the greatest control over these segments of the total response time.
- *Travel time* is the time interval that initiates when the unit is en route to the call and ends when the unit arrives at the scene.
- *Response time*, also known as total response time, is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit arrives on the scene to initiate action.

For this study, and unless otherwise indicated, response times measure the first arriving unit only. The primary focus of this section is the dispatch and response time for emergency calls responded with lights and sirens.

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2010 Edition, the alarm processing time or dispatch time should be less than or equal to 60 seconds 90 percent of the time. This standard also states that the turnout time should be less than or equal to 80 seconds (1.33 minutes) for fire and special operations 90 percent of the time, and travel time shall be less than or equal to 240 seconds for the first arriving engine company 90 percent of the time. The standard further states the initial first alarm assignment (a total of fourteen personnel for a single family residential structure) should be assembled on scene in 480 seconds 90 percent of the time (not including dispatch and turnout time). ***NFPA 1710 response time criterion is utilized by CPSM as a benchmark for service delivery and in the overall staffing and deployment of fire departments, and is not a CPSM recommendation.***

As noted, the KFD deploys all apparatus from a single station. Figures 4-6, 4-7, and 4-8 illustrates the station location along with 240-second (indicated by the red overlay), 360-second (indicated by the green overlay), and 480-second (indicated by the blue overlay) travel time benchmarks.

FIGURE 4-6: KFD Station Location and Travel Times (red = 240 seconds)

FIGURE 4-7: KFD Station Location and Travel Times (green = 360 seconds)

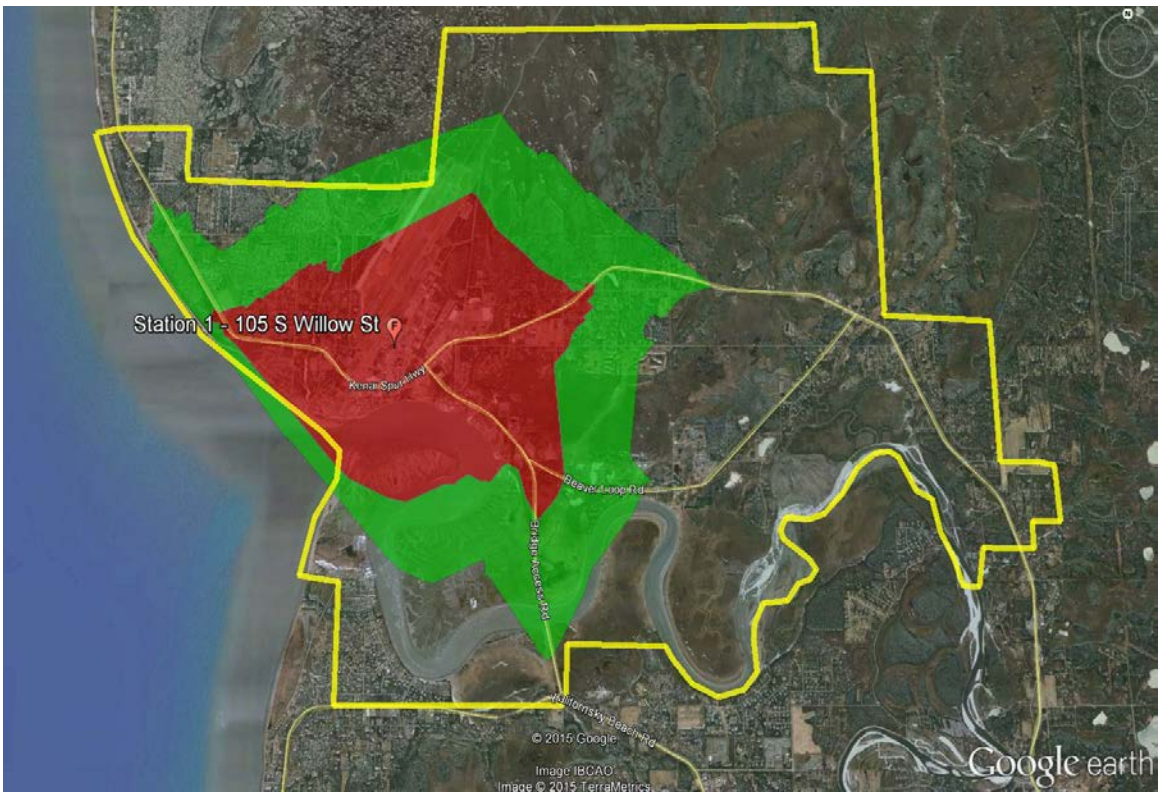


FIGURE 4-8: KFD Station Location and Travel Times (blue = 480 seconds)

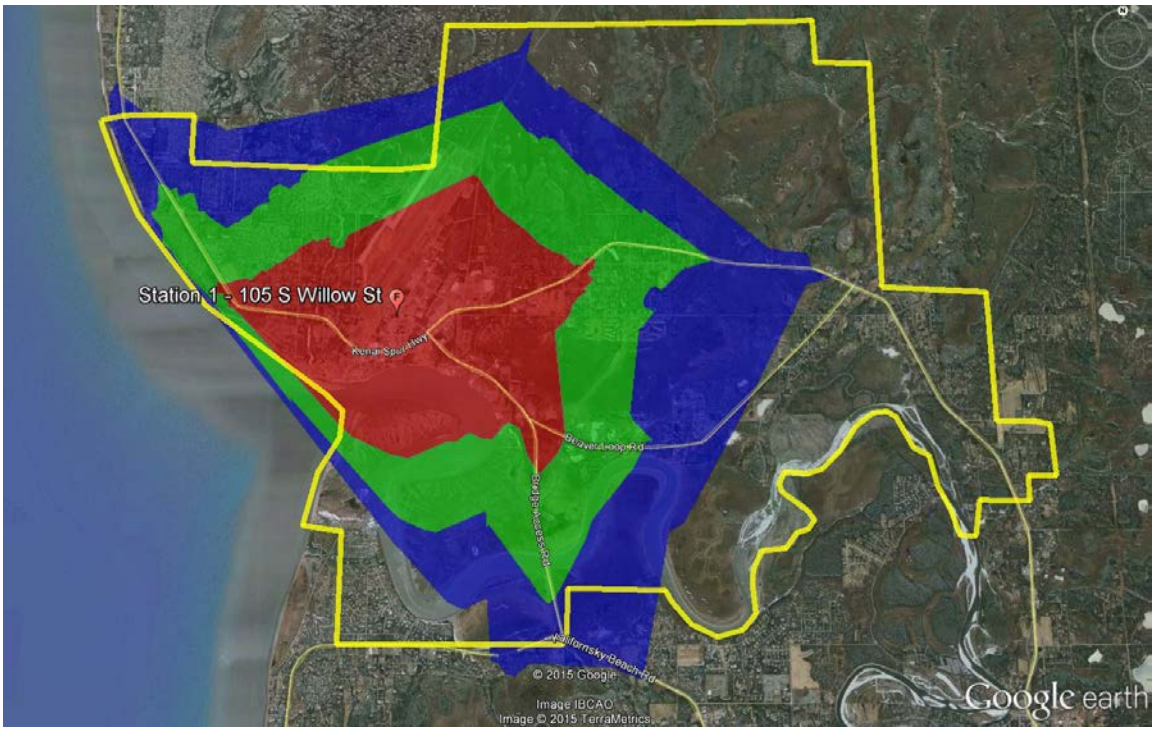


Figure 4-6 shows that approximately 40 percent of the developed areas of the city are covered under the 240-second benchmark. We would estimate that approximately 60 percent of the developed area of the city is covered under the 360-second overlay and approximately 80 percent is covered under the 480-second benchmark. The majority of the city, the commercial, and more built-upon areas are well within the 240- and 360-second benchmarks. This is confirmed when you look at Table 4-11 showing 90th percentile times; it can be seen that nearly 90 percent of the calls handled by KFD result in a travel time in the 6-minute range (360 seconds). Areas not covered under the travel time benchmarks are beyond an eight-minute travel time; however, these areas are mostly not built upon and are more rural in nature. It is, however, important to note that these travel time distances do not take into consideration alarm handling and turn-out times. ***This map only depicts travel distances and not actual response times.***

Figures 4-9 to 4-11 represent the actual locations of fire, EMS, and other emergency responses carried out by the KFD. It is apparent that most responses are within three to five minutes of travel times from the Kenai fire station. It is also revealing that there are a number of call generating points that are a significant distance from the station and result in extended response times. We estimate that approximately 100 alarms, primarily EMS-related, resulted in total response times that were in excess of 10-minutes.

FIGURE 4-9: KFD Fire Runs

Fire Runs

FIGURE 4-10: KFD EMS Runs

EMS Runs

FIGURE 4-11: KFD Other Runs

Other Runs

KFD Response Times

This section focuses on response time analysis for priority one calls (Hot response), which were responded with lights and sirens. We included first arriving units with complete unit dispatch time, unit en route time, and unit on-scene arrival time. A total of 814 calls (65.7 percent of EMS and fire category calls) were used in the analysis. We excluded those calls in which the response was nonemergency and all calls for which there was incomplete response time data. The average dispatch time was 2.8 minutes. The average turnout time was 1.2 minutes. The average travel time was 3.6 minutes. The average response time for EMS calls was 7.6 minutes. The average response time for fire category calls was 7.8 minutes. The average response time for structure fire calls was 6.1 minutes. The average response time for outside fire calls was 5.6 minutes.

TABLE 4-11: Average Dispatch, Turnout and Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	2.9	1.2	3.2	7.3	90
Seizure and unconsciousness	2.5	1.3	3.3	7.0	68
Breathing difficulty	2.6	1.2	3.2	7.0	75
Overdose and psychiatric	3.3	1.1	3.4	7.8	46
MVA	2.4	1.1	1.8	5.3	13
Fall and injury	3.1	1.0	3.4	7.5	106
Illness and other	3.1	1.2	3.8	8.1	258
EMS Total	**3.0**	**1.2**	**3.4**	**7.6**	**656**
Structure fire	1.7	1.4	3.0	6.1	6
Outside fire	1.6	2.3	1.7	5.6	8
Hazard	2.4	0.9	2.9	6.2	12
False alarm	2.1	1.4	3.6	7.1	49
Good intent	2.0	1.6	5.7	9.4	17
Public service	2.4	1.4	4.9	8.6	66
Fire Total	**2.2**	**1.4**	**4.2**	**7.8**	**158**
Total	**2.8**	**1.2**	**3.6**	**7.6**	**814**

Observations:

- The average dispatch time was 2.8 minutes.
- The average turnout time was 1.2 minutes.
- The average travel time was 3.6 minutes.
- The average response time for EMS calls was 7.6 minutes.
- The average response time for fire category calls was 7.8 minutes.
- The average response time for structure fire calls was 6.1 minutes.
- The average response time for outside fire calls was 5.6 minutes.

The 90th percentile measurement, often referred as a "fractile response," is a more conservative and stricter measure of total response time. Most fire agencies are unable to meet this standard. Simply explained, for 90 percent of calls, the first unit arrives within a specified time, and if measured, the second and third unit. Table 4-12 depicts the 90th percentile response times in Kenai for fire and EMS responses. It is important to note, however, that the 90th percentile dispatch time for fire and EMS is 4.8 minutes and average dispatch time was 2.8 minutes. These areas require further evaluation, as CPSM believes these times should be reduced to a two minute time frame.

TABLE 4-12: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	4.5	2.4	6.3	11.4	90
Seizure and unconsciousness	3.9	2.0	6.2	10.6	68
Breathing difficulty	4.0	2.2	6.5	10.7	75
Overdose and psychiatric	5.7	2.5	6.9	11.5	46
MVA	4.4	2.0	4.5	8.5	13
Fall and injury	4.9	2.0	5.8	10.6	106
Illness and other	5.1	2.4	6.5	11.4	258
EMS Total	**4.8**	**2.2**	**6.4**	**11.1**	**656**
Structure fire	4.2	2.0	6.6	9.6	6
Outside fire	8.2	3.1	3.6	11.2	8
Hazard	4.9	2.3	5.8	13.2	12
False alarm	3.6	2.9	7.0	11.4	49
Good intent	4.5	3.3	11.4	15.9	17
Public service	4.5	2.9	8.4	12.6	66
Fire Total	**4.3**	**2.9**	**8.4**	**12.5**	**158**
Total	**4.8**	**2.4**	**6.7**	**11.4**	**814**

Note: A 90th percentile value of 11.4 indicates that the total response time was less than 11.4 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch time was 4.8 minutes.
- The 90th percentile turnout time was 2.4 minutes.
- The 90th percentile travel time was 6.7 minutes.
- The 90th percentile response time for EMS calls was 11.1 minutes.
- The 90th percentile response time for fire category calls was 12.5 minutes.
- The 90th percentile response time for structure fire calls was 9.6 minutes.
- The 90th percentile response time for outside fire calls was 11.2 minutes.

Recommendation: KFD should work with Kenai dispatch personnel to identify ways to reduce dispatch handling times. CPSM believes it is realistic to reduce these times to a two-minute time frame.

Dispatch times — both average and in the 90th percentile — are high, particularly those categories of calls as follows:

- Outside fire, 8.2.
- Overdose and psychiatric, 5.7.
- Illness and other, 5.1.

Kenai 911 Officials have recognized these delays in processing and are making adjustments in the station alerting process to improve outcomes. It is also interesting to note that on those fire calls that typically are nonemergency (false alarm, good intent, and public service), turnout, and travel times in the 90th percentile were the highest recorded by KFD personnel. Though these alarms are responded to as emergency events, it appears that response personnel have intentionally slowed their pace in getting to these calls.

Section 5. Operational Support Areas

Performance Measurement

Fire suppression, prevention programs, and EMS service delivery need to be planned and managed to achieve specific, agreed-upon results. This requires establishing intended results and a set of goals for the activities of any given program to achieve these results. Determining how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. This is the goal of performance measurement.

Simply defined, performance measurement is the ongoing monitoring and reporting of progress toward pre-established goals. It captures data about programs, activities, and processes, and displays data in standardized ways that help communicate to service providers, customers, and other stakeholders how well the agency is performing in key areas. Performance measurement provides an organization with tools to assess performance and identify areas in need of improvement. In short, what gets measured gets done.

The need to continually assess performance requires adding new words and definitions to the fire service lexicon. Fire administrators need to be familiar with the different tools available and the consequences of their use. In Managing the Public Sector, business professor Grover Starling applies the principles of performance measurement to the public sector. He writes that the consequences to be considered for any given program include:

Administrative feasibility: How difficult will it be to set up and operate the program?

Effectiveness: Does the program produce the intended effect in the specified time? Does it reach the intended target group?

Efficiency: How do the benefits compare with the costs?

Equity: Are the benefits distributed equitably with respect to region, income, gender, ethnicity, age, and so forth?

Political feasibility: Will the program attract and maintain key actors with a stake in the program area?[19]

Performance measurement systems vary significantly among different types of public agencies and programs. Some systems focus primarily on efficiency and productivity within work units, whereas others are designed to monitor outcomes produced by major public programs. Still others track the quality of services provided by an agency and the extent to which citizens are satisfied with these services.

[19] Starling, *Managing the Public Sector*, 396.

Within the fire service, performance measures tend to focus on inputs (the amount of money and resources spent on a given program or activity) and short-term outputs (the number of fires in the community, for instance). One of the goals of any performance measurement system should be also to include efficiency and cost-effectiveness indicators, as well as explanatory information on how these measures should be interpreted. The types of performance measures are shown in Table 5-1.

TABLE 5-1: The Five GASB Performance Indicators[20]

Category	Definition
Input indicators	These are designed to report the amount of resources, either financial or other (especially personnel), that have been used for a specific service or program.
Output indicators	These report the number of units produced or the services provided by a service or program.
Outcome indicators	These are designed to report the results (including quality) of the service.
Efficiency (and cost-effectiveness) indicators	These are defined as indicators that measure the cost (whether in dollars or employee hours) per unit of output or outcome.
Explanatory information	This includes a variety of information about the environment and other factors that might affect an organization's performance.

One of the most important elements of performance measurement within the fire service is to describe service delivery performance in a way that both citizens and those providing the service have the same understanding. The customer will ask, "Did I get what I expected?" the service provider will ask, "Did I provide what was expected?"

Ensuring that the answer to both questions is "yes" requires alignment of these expectations and the use of understandable terms. The author of the "Leadership" chapter of the 2012 edition of ICMA's *Managing Fire and Emergency Services* "Green Book" explains how jargon can get in the way:

> Too often, fire service performance measures are created by internal customers and laden with jargon that external customers do not understand. For example, the traditional fire service has a difficult time getting the public to understand the implications of the "time temperature curve" or the value of particular levels of staffing in the suppression of fires. Fire and emergency service providers need to be able to describe performance in a way that is clear to customers, both internal and external. In the end, simpler descriptions are usually better.[21]

[20] From Harry P. Hatry et al., eds. *Service Efforts and Accomplishments Reporting: Its Time Has Come* (Norwalk , CT: GASB, 1990).
[21] I. David Daniels, "Leading and Managing," in *Managing Fire and Emergency Services* (Washington, DC: 2012), 202.

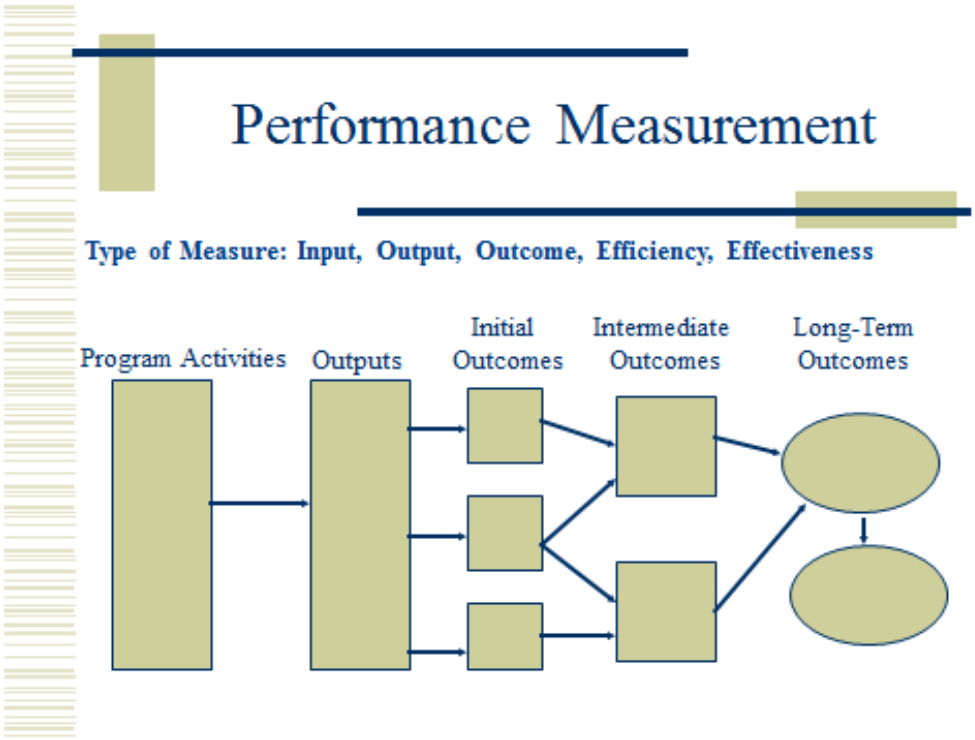
The KFD does not have established performance measures nor does it produce periodic reporting regarding departmental activities. The fire chief prepares a "Mid-Month Report" for the city manager and city council and which provides a broad overview of departmental events, but this narrative does not typically contain departmental statistics or performance reporting. There is not internal reporting that provides a direct link to department goals or specific target measures. This type of ongoing analysis and the monitoring of trends are most useful to justify program budgets and to measure service delivery levels.

To accomplish this linkage the use of performance measures — particularly service-quality and customer-satisfaction measures — should be incorporated into the system. Staff throughout the organization should participate in developing performance measures. In addition to helping facilitate department wide buy-in, this could provide an opportunity for upper management to better understand what the line staff believes to be critical goals—and vice versa. For the same reason, the process of developing performance measures should include citizen input, specifically with regard to service level preferences. Translating this advice from the citizens into performance measures will link the citizens and business community to the department, and will articulate clearly if the public's expectations are being met.

Establishing a performance management system within the framework of an overall strategic plan would help city management and elected officials gain a better understanding of what the KFD is trying to achieve. Building any successful performance management system that measures more than outputs requires a consistent model. Figure 5-1 illustrates a successful program logic model[22] designed to build consistent performance measures and should be linked to the performance measure indicators shown in Table 5-1 to build a successful performance measurement system.

[22] Shows the logic by which program activities are expected to lead to targeted outcomes. Poister, 35.

FIGURE 5-1: Performance Measure Program Logic



- Type of Measure: identify the type of indicator to be measured.
- Program Activities: the provision of services provided by this program area.
- Outputs: the results of or how much is produced from the program activities.
- Initial/Intermediate Outcomes: substantive changes/improvements/benefits of the program as measured against the program goal.
- Long-term Outcomes: satisfy the stated *goal*—links to the budget/strategic plan.

Recommendation: KFD should undertake a concerted effort to develop a comprehensive set of performance measures for monitoring its system performance and system outcomes. The process of developing these measures should utilize input from KFD members, the community, the mayor and city council, and city administration.

The following are a number of performance measures that may be considered:

Operations:

- Response times (fire and fractile/average/frequency of excessive times)
  - Alarm handling times.
  - Turnout times.

    - Travel times.
    - On-scene time.
    - Call duration.
    - Cancelled en route.
- Workload measures
    - Emergency vs. nonemergency responses.
    - EMS transports/types/revenues.
    - Response to automatic fire alarms/frequency and outcomes.
    - Company inspections/area occupancy familiarization.
    - Smoke detector distribution (installation and follow-up).
    - Fire preplanning.
    - Public education: contact hours/numbers by age group.
    - Emergency response by chief officers and airport personnel.
- Outcome Measures
    - EMS/save rates/action taken.
    - Fire loss/limit of fire spread-point of origin, room of origin, etc.
    - On-duty injuries/workers' comp claims.
    - Lost time-sick/injury.
    - Vehicle accidents.
    - Equipment lost or broken.

Training:

- Fire and EMS hours.
- Officer development.
- Specialty training.
- Professional development/formal education/certifications.
- Fitness performance.

Prevention:

- Plans review (numbers/valuation amount/completion time).
- Inspections (new and existing).
    - Numbers.
    - Completion time.

    - Violations (found/corrected).
    - Quantification by type of violation and occupancy type.
- Fire investigations
    - Numbers and determinations.
    - Fire loss/structure and contents.
    - Arson arrests/convictions.
    - Fire deaths (demographics/occupancy type/cause and origin).

Miscellaneous:

- Customer service surveys (by engine/by shift).
    - Following emergency response.
    - Public assist.
    - Inspections (prevention and company).
    - Public education.
    - In-service training (employee assessments).
- Financial/Budgetary
    - Overtime expenditures and cause.
    - Apparatus repair costs and out-of-service time.
    - Anticipated capital expenditures and replacement schedules (two years in advance).

Hazard Analysis

The city manager has been designated as the city's emergency manager and as such is responsible for the city's overall emergency planning and disaster preparedness efforts. The city has adopted an emergency operation plan (EOP) that includes a line of succession, identifying the fire chief and police chief as alternates in the city manager's absence. The city's plan is very well written and identifies those potential hazards that can affect the community. These include:

- Earthquake.
- Coastal erosion/tidal surge.
- Wildland fires.
- Flooding.
- Extreme weather events.
- Volcano

- Oil/hazardous materials incidents.
- Energy disruption/shortage.
- Transportation accident.
- Tsunami.

The emergency operations plan includes a series of response guides that identify the associated tasks and to whom they are assigned, depending on the type of incident and its magnitude.

Linking a fire department's operational functionality to the community risk and its vulnerability assessment is intended to assist fire personnel in refining their preparedness efforts. CPSM has observed limited efforts directed toward this level of preparedness and organized management of the city in the event of large-scale disaster or an emergency event with a broad reach. We will discuss this issue and our recommendations in the Emergency Management section of this report.

Fire Preplanning

In addition to examining communitywide risk and vulnerability, KFD is very diligent in its efforts to examine specific risks and vulnerabilities on the basis of the community's critical occupancies. Risk assessment and vulnerability analysis are not new to the fire service; the NFPA 1620, *Recommended Practice for Pre-Incident Planning*, identifies the need to utilize both written narrative and diagrams to depict the physical features of a building, its contents, and any built-in fire protection systems. The occupancies that are typically specified for pre-incident plans, or "preplans," are as follows:

- Large assembly.
- Educational.
- Health care.
- Detention and correction.
- High-rise residential.
- Residential board and care (assisted living).
- Mercantile.
- Business.
- Industrial.
- Warehouse and storage.

Our evaluation has found KFD to be very proficient in its fire preplanning efforts. The department has identified over 50 critical occupancies and has developed a "***Quick Access Plan"*** for each building. Our evaluation found that this planning effort was up to date and there was an ongoing schedule to insure the familiarization of KFD personnel with these occupancies.

Accreditation

Accreditation is a comprehensive self-assessment and evaluation model that enables organizations to examine past, current, and future service levels. It is used to evaluate internal performance and compares this performance to industry best practices. The intent of the process is to improve service delivery.

The Center for Public Safety Excellence (CPSE) provides an exhaustive evaluation process, on a fee basis, to member agencies; this evaluation process ultimately leads to accreditation. CPSE is governed by the Commission on Fire Accreditation International (CFAI), an 11-member commission representing a cross-section of the fire service industry, including fire departments, city and county management, code councils, the U.S. Department of Defense, and the International Association of Firefighters. The CPSE accreditation program is built around the following key measurements:

- Determining community risk and safety needs.
- Evaluating the performance of the department.
- Establishing a method for achieving continuous organizational improvement.

Local government executives face increasing pressure to "do more with less" and justify expenditures by demonstrating a direct link to improved or measured service outcomes. Particularly for emergency services, local officials need criteria to assess professional performance and efficiency.

CPSE accreditation has national recognition and is widely used throughout the fire service. The key to its success is that it allows communities to set their own standards that are reflective of their needs and a service delivery model that is specific to the community. In addition, it is a program that is based on ongoing improvement and continuous monitoring. CPSM feels that the CPSE accreditation model is very well suited for Kenai and should be considered in the near future.

Recommendation: Kenai should consider the pursuit of fire accreditation through the Center for Public Safety Excellence (CPSE).

Essential Resources

Fire Prevention and Code Enforcement

KFD has a very engaged fire prevention program that is responsible for fire code enforcement, new construction plans review, and inspections. The city of Kenai has elected to be a "***deferred***" municipality and, as such, is responsible for code enforcement, inspections, and permitting in the community. Fire prevention activities are carried out by the city's fire marshal. He coordinates more than 600 inspections at area businesses, institutional occupancies, and multifamily residential properties. The fire marshal works closely with the city's building department and is also responsible for public education and fire investigations.

Fire suppression and response, although necessary in minimizing property damage, have little impact on preventing fires. Rather, public fire education, fire prevention, and built-in fire protection and notification systems are essential elements in protecting citizens from death and injury due to fire. The city currently utilizes the 2009 International Fire Code, which is the code required to be enforced under State guidelines. We have been advised that the state is in the process of adopting the 2015 International Code Council (ICC) International Fire Code and when this occurs it will be applied in Kenai.

Automatic fire sprinklers have proven to be very effective in reducing fire loss and minimizing fire deaths in residential structures. Kenai Officials have recognized the importance of residential fire sprinklers and in 2012 implemented a Property Tax Credit for the installation of automatic fire sprinklers in one or two family dwelling units. Many communities however have been reluctant to impose code provisions that require these installations. The 2015 ICC International Fire Code includes the requirement for automatic fire sprinklers in single family and duplex residential structures. Given the limited staffing and response capabilities that are provided by KFD, CPSM believes it is essential that when adopting the 2015 ICC International Fire Code the city maintain the residential fire sprinkler requirement.

> ***Recommendation: The city of Kenai should maintain the residential fire sprinkler requirements when adopting the 2015 International Code Council (ICC) International Fire Code.***

According to the National Fire Protection Agency, the average cost nationally for installing automatic fire sprinklers in new single family residential structures was estimated to be $1.61 per square foot.[23] For a 2000 square-foot home, this estimated cost would be approximately $3,220. This can be less than the cost of granite counter tops or a carpeting upgrade. Given the limited resources available for fire suppression efforts in the Kenai service area, CPSM believes that the city should include in its 2015 fire code adoption the requirement for automatic fire sprinklers in all new single family and duplex residential structures.

[23] NFPA, "Cost of Installing Residential Fire Sprinklers Averages $1.61 per Square Foot" Quincy, MA: September 11, 2008.

In many fire agencies engine companies are expected to conduct a designated number of company inspections and prefire plans each month. In addition to obtaining a first-hand observation of a structure and being able to correct any code violations or life-safety concerns, these actions provide an opportunity for an exchange between business owners and building managers regarding fire safety and fire code compliance. KFD personnel have identified nearly 60 occupancies for which prefire planning is done regularly. However, engine companies are not involved in any type of in-service company fire inspections.

Recommendation: KFD should institute an in-service company inspection program that places fire department units into smaller business and multifamily residential occupancies for the purpose of conducting company inspections involving exit lighting, egress, storage, and the operational readiness of fire protection/notification systems.

As indicated above, the fire marshal has the primary responsibility for inspecting nearly 600 business occupancies, many of which are small retail operations with minimal code enforcement applications. Engine companies can assist in this initial review and when difficulties arise or there are enforcement issues, the fire marshal can be called in to assist in achieving compliance.

Arson investigation is the responsibility of the fire marshal. Fire loss calculations, along with determining the cause and origin of the fire, is the responsibility of the responding engine company officer. If the fire loss is more extensive or if arson is suspected, KFD will call in a number of its personnel who have received additional training in fire investigations. In more extensive cases involving large fire loss or deaths, the state fire marshal may be called in to assist in the investigation.

Kenai does not keep annual reports regarding fire occurrences within the city. Though fire loss calculations and cause and origin determinations are compiled for every fire and these are reported to the state, KFD does not prepare an annual report regarding fires in the community.

Recommendation: KFD, under the direction of the fire marshal, should compile an annual fire report that tracks all fires occurring in the city, their cause, and the estimated fire loss.

The ability to track the statistics of fire occurrences, their locations, causes, and fire loss provides real-time information to support any targeted efforts in preventing fires or minimizing fire loss when fires do occur. The ability to identify the operability of smoke detectors or fire suppression systems provides clear guidance on outreach efforts and their impacts.

The KFD public education program is primarily an outreach by fire companies that focuses on school-age children. Department personnel present safety programs, primarily upon request. They participate in area and business safety programs along with providing fire station visits and tours in which safety messages are given. The department has participated in smoke detector give-away programs and often provides detector battery exchanges when requested.

Education and Training Programs

Education and training programs create the character of a fire service organization. Agencies that place a real emphasis on their training have a tendency to be more proficient in carrying out day-to-day duties. The prioritization of training also fosters professionalism and teamwork and instills pride in the organization. KFD places a significant emphasis on the training of its personnel. The efforts of the battalion/training chief are truly commendable in terms of the enthusiasm we observed and the degree of commitment that is devoted to maintaining the critical skill levels within the organization.

KFD is responsible for administering the training program for its members and maintaining compliance with state training requirements. Training is conducted primarily while personnel are on duty, with topics identified in a quarterly training calendar. Various department members, depending on their areas of expertise and interest will assist in developing the various training regimens that meet the categorical and hourly requirements specified by state and ISO guidelines. Kenai is accredited by the state of Alaska, Department of Public Safety, Training and Education Bureau, to instruct fire personnel in Fire Fighter I, Fire Apparatus Operator/Driver, Fire Officer I. Rapid Intervention Technician, and Hazardous Materials Awareness & Operations.

Training records for the KFD are meticulously kept on the KFD *Image Trend* training reporting system. All training hours and the topics involved are logged for each employee. Training records are critical in documenting the required certifications as EMT-IIIs and paramedics, ARFF, and firefighting requirements as specified by ISO. All recording of these records are in put into the system by the battalion/training chief.

The battalion/training chief receives little clerical support from the KFD's sole administrative assistant. Subsequently, this chief officer must review all daily activity reports and conduct data entry on all training hours. In addition, the battalion/training chief is responsible for the review of all department payroll data. He ensures that all the leave request forms are properly filled out and that any overtime or injury reports are properly filled out and signed. In addition, he is responsible for curriculum development, distribution and tracking of training materials, and other associated recordkeeping, filing, and scheduling. As mentioned previously, this officer is often called upon to respond to emergency events and frequently delivers training programs.

> ***Recommendation: KFD should consider hiring a part-time clerical employee (approximately 20 hours each week) to support its training operations.***

The current administrative assistant maintains a significant workload. As the sole administrative staff member, she maintains the front desk, meets and greets visitors, answers the telephone, and is responsible for EMS transport billings. When she is absent, there is no back-up administrative support. The addition of a part-time position in training will complement the administrative effort and allow the battalion/training chief to focus on the key areas of his responsibilities.

Employee physical fitness is a key component in the ability of fire and EMS personnel to do their jobs effectively and avoid injuries. Rigid fitness standards are typically required in many fire

departments throughout the nation; NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, is a recognized industry standard for monitoring and maintaining firefighter fitness. KFD does not have a fitness standard for its emergency response personnel. Though employees are encouraged to maintain appropriate levels of fitness and current firefighting job descriptions include language requiring good physical conditioning, a formal organizational fitness assessment does not exist.

> ***Recommendation: KFD should institute an annual physical fitness evaluation process for all emergency response personnel, including chief officers.***

KFD requires new firefighters to pass a physical fitness evaluation that is patterned after the ***Candidate Physical Ability Test (CPAT)***. This testing utilizes a number of firefighter skill components (stair climb, hose drag, equipment carry, ladder raise, forcible entry, rescue drag, search, and ceiling pull) that are completed in a sequential order and as a timed event. KFD should consider the use of a modified CPAT exam as the annual fitness qualification for all emergency response personnel. In addition, KFD personnel operate within a wildland environment. Most wildland firefighter certifications utilize ***The Pack Test-Work Capacity Testing for Wildland Fire Fighting*** as an annual fitness qualification. This may also be considered as an annual fitness requirement for KFD personnel.

Employees are the most valuable assets in an organization and their ability to work regularly in difficult and strenuous situations requires good health and sound medical conditioning. All Kenai fire personnel are required to undergo an annual medical evaluation through their personal physician. Regular medical screening is the key to maintaining good medical health. Preventative medicine is critical in every occupation and perhaps most important among emergency responders. Cardiovascular disease, respiratory issues, hearing loss, and regular blood screening are essential in the detection and treatment of illness and disease before these problems escalate.

Emergency Management

The city manager has been designated as the emergency manager for the city of Kenai and is responsible for the coordination of emergency operations. This includes the periodic updating of EM planning documents, managing grants from the state and the Department of Homeland Security, NIMS training requirements, monitoring statewide events, and the coordination of Kenai special events. The city has a professionally developed emergency operations plan (EOP) to guide its emergency management functions. This plan is well written, comprehensive, and an excellent document to guide the city in its preparedness, response, mitigation, and recovery efforts. However, the EOP was written in 2007 and is largely out of date. The Federal Emergency Management Agency (FEMA) recommends that a community's EOP be revised every five years.

> ***Recommendation: The city should update and revise its emergency operations plan (EOP).***

The range and number of responsibilities held by an emergency manager is extensive, subsequently the EOP identifies the fire chief and the police chief as alternate emergency managers. As a result of the workload of the city manager, the fire chief has assumed many unofficial duties in emergency planning. However, the formal designation of the city's emergency manager is critical, requiring the oversight of plan updates, ongoing training of key officials, and close coordination with borough and state emergency management agencies. For this reason, CPSM recommends that the fire chief be designated as the city's emergency manager.

Recommendation: The city manager should assign the duties of emergency manager to the fire chief.

The city manager has acknowledged this issue and is planning to have the fire chief designated as the city's emergency manager. The fire chief is well trained and qualified to assume the duties of emergency manager. He has formal training in the National Incident Management System (NIMS) and regularly operates under the Incident Command System (ICS). The critical decision in making this assignment is the conflict that can arise as the fire chief is often assigned field command duties as fire chief and these field assignments will conflict with his ability to assume the duties of emergency manager. In most emergency events, the duties of emergency manager and fire chief will occur simultaneously and it will be impossible for the fire chief to assume both roles. For this reason it is important that redundancy be built into this critical position. Whenever the fire chief is unavailable there should be a designated alternate who is fully trained and well versed in the emergency management responsibilities, and who can assume these duties should an emergency arise. However all planning and preparedness aspects related to emergency management including training, agency coordination, and EOC readiness should be under the supervision of the fire chief.

Disaster response generally requires numerous agencies to work together and share resources. Very often agencies have overlapping lines of authority and responsibility. In these situations coordination is critical. During disaster events, situations change rapidly and the work environment can be very stressful. To be effective a solid team effort is needed. The city's EOP identifies a *City Incident Management Team (IMT)*. These personnel, combined with the city's mayor and elected officials, form the core decision-making body charged with directing city activities and prioritizing actions during major events. IMT members must be well trained and the lines of communication must be strong. Too often emergency conditions cause miscommunication and conflict. The city has not exercised the tenants of the EOP and IMT members have not met or drilled on the plan.

Recommendation: The city should institute a training schedule that brings together the full incident management team (IMT) annually for orientation and training and should undertake a full activation of the EOP along with an exercise every two-years.

The ability to effectively manage a large scale disaster or emergency events requires coordination among all key officials and the ability to collectively make decisions and prioritize efforts. The ability to garner the necessary resources and to effectively communicate status reports and updates to the public is critical. Working as part of an emergency management team also requires specific

training in the concepts of emergency management and the processing and tracking of requests for assistance from both state and federal resources. This training must be accomplished in advance of the event and key officials involved in this effort must be well-versed in the emergency management process, the EOP, and the necessary documents and processing required by the borough and the state of Alaska.

The EOP identifies the Fire Training Building (Beacon Building) as the city's EOC. Alternate EOC sites include the Public Safety Building and the Airport Operations Center. The Fire Training Building appears appropriate to function as the city's EOC however additional furnishings, telephone equipment, audio visual production equipment, mapping, and internet access is needed. The city has begun to upgrade the facility in order to support a full EOC operation.

Recommendation: Kenai should continue in its effort to upgrade and fully outfit its EOC facility at the Beacon Building.

An EOC should have full generator capacity, situational awareness technology assets, rest/rehab areas for staff, a policy-making meeting room, a secure environment, and a direct feed from the communications center. FEMA, through it Emergency Management Institute (EMI), offers a number of training classes in the set-up, activation, and operation of an EOC during an emergency event. EMI's Integrated Emergency Management Course (IEMC) is designed to train key officials in EOC operations.

Continuity of Operations Planning (COOP) is the process in which government formally reviews and makes contingency plans in the event that government can no longer operate under normal conditions. COOP looks at the potential inability of a local government to utilize key public buildings, including fire stations or police stations, city hall, or other key structures. The planning process identifies alternative sites that could be utilized if these facilities are incapacitated. COOP also looks at contingencies if current service levels must be curtailed due to wide-scale absences. Agencies are asked to formulate plans if their workforce is reduced by various increments (15 percent, 25 percent, 50 percent, etc.). This exercise requires each department to define its plan for which of its services will continue and which other services could be modified or eliminated. There are numerous guides that provide insights or models for COOP. FEMA provides a template that is often utilized to assist local government and federal agencies in this process; http://www.fema.gov/pdf/about/org/ncp/coop/continuity_plan_federal_d_a.pdf

Kenai does not have a formal continuity of operations plan, though the potential for disruptions are very real in Kenai given the climatic extremes, the proximity to potential tidal surges, and the seismic potential of the area. In reality, a disruption in service would not necessarily be the product of some type of mass calamity or terrorist act. It can be the result of something simple: a fire, a water line break that goes unnoticed when the building is closed, an extended power disruption, or another event that makes the structure inhabitable. This planning effort evaluates what are the options for relocating an entire service agency and what equipment and information must be moved to the alternative work site.

Recommendation: The city should undertake a continuity of operations planning (COOP) effort for all major municipal functions and city facilities.

Emergency Communications Center (ECC)

The Kenai Communication Department operates the 911 center, which is the primary Public Safety Answering Point (PSAP) for the city of Kenai. This center is managed by the city's communications supervisor, and is housed in the Kenai Police Department. The center provides dispatching services for the Kenai Police Department, Fire, Airport, and Animal Control. It also monitors the city's water and sewer treatment facilities and a number of commercial alarm companies covering various businesses, residences, and institutions throughout the city. The center handles in excess of 3,000 911 calls annually and is operational on a 24/7 basis with a minimum of one dispatcher on duty at any given time.

The center utilizes the New World™ computer-aided dispatch (CAD) software. The ECC uses a nationally recognized emergency medical dispatching (EMD) system to provide callers with critical pre-arrival instructions for medical emergencies as well as establishing dispatching parameters for response recommendations for EMS calls. All dispatchers are trained to provide Emergency Medical Dispatching (EMD), and this activity is reviewed by a staff member who is QA/QI certified. All critical ECC equipment is on an uninterrupted power supply (UPS). The city center serves as the backup 911 center for the Soldotna Public Safety Communications Center, however, in the event that the city's Center must be relocated, Fire Station # 2 has been designated as the alternate Center. The difficulty with this alternate site is that it does not have the capability to receive incoming 911 calls.

CPSM's review of the Kenai 911 Communications Center indicated a number of concerning performance issues. As mentioned earlier, dispatch handling times are longer than they should be. Average EMS call handling times were 3.0 minutes and the fractile time was 4.8 minutes. These levels of performance greatly exceed national standards and require further evaluation.

Recommendation: KFD should request monthly performance reporting from the Kenai 911 Communications Center regarding alarm handling times for KFD response units.

CPSM also observed a number of other issues. Currently, the center is not conducting call prioritization for fire calls. The center is unable to receive cell phone calls and these calls are routed through the Soldotna Public Safety Communications Center (SPSCC) and then are transferred to Kenai. The current CAD system is unable to interface with the KFD incident reporting systems and incident times must be transferred manually. The center has limited staffing and frequently there is only one dispatcher on duty. This is a problem in that frequently when a call is in progress the same person is responsible for answering 911 phone calls and talking with responding/on-scene emergency units via radio. Dispatchers have multiple distractions in the center. The center serves as the entrance point for the police headquarters and dispatchers meet visitors (through a window) and screen them before allowing entry into the building. The police copy machine is located in the

center. The center also receives administrative calls for the police department along with telephone calls related to animal control issues. As mentioned above the center does not track or report on dispatch handling times and it does not track the time it takes to answer incoming 911 calls.

Recommendation: The city of Kenai should evaluate its options and the associated costs for moving its dispatch operations from the Kenai 911 Communications Center to the Soldotna Public Safety Communications Center (SPSCC).

Today's technology enables dispatch centers to operate regionally. This improves efficiencies and expands the capacity to maintain the latest technology and data management systems. The SPSCC is a regional center operated by the Kenai Peninsula Borough; it provides dispatch services to many area police and fire agencies including KFD's primary auto-aid responders, CES and Nikiski Fire. The SPSCC has the ability to support the KFD Air Land Mobile Radio (ALMR) system and utilizes emergency medical dispatching and call prioritization for both fire and EMS.

Section 6. Data Analysis

Introduction

This data analysis was prepared as a key component of the study conducted by the Center for Public Safety Management, LLC (CPSM) of the Kenai Fire Department (KFD). This analysis examines all calls for service between July 1, 2014, and June 30, 2015, as recorded by the Kenai Fire Department.

This analysis is divided into five sections: the first section focuses on call types and dispatches; the second section explores time spent and workload of individual units; the third section presents analysis of the busiest hours in a year; the fourth section provides a response time analysis of the first arriving on-scene KFD units; and the fifth section presents transport analysis.

The department utilizes three fire engines, one aerial platform, two aircraft rescue vehicles, one squad truck, two ALS ambulances, and an inflatable boat when needed. It also utilizes four utility vehicles for responses.

During the study period, the department responded to 1,239 calls, including 46 mutual aid and 25 canceled calls. The department has transported patients in 648 EMS calls, and 9 mutual aid calls. The total combined yearly workload (deployed time) for all KFD units was 1,765 hours. The average estimated dispatch time of the first arriving KFD unit was 2.8 minutes and the average response time of the first arriving KFD unit was 7.6 minutes. The 90th percentile dispatch time was 4.8 minutes and the 90th percentile response time was 11.4 minutes.

Methodology

In this report, CPSM analyzes calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit. Thus, a call might include multiple runs.

We received CAD data from the communication center and National Fire Incident Reporting System (NFIRS) data from the Kenai Fire Department. In our data validation process, we found out that there is no existing field, like run number, to link CAD and NFIRS data. We were informed by the fire department that NFIRS time stamps are automatically transferred from CAD system. We analyzed NFIRS data in this report. We classified the calls in a series of steps. We first used the NFIRS mutual aid field to accurately identify mutual aid calls from the KFD perspective. Then, we used NFIRS incident type to assign EMS, MVA, fire category, and canceled call types. Lastly, for NFIRS EMS calls, we used the primary dispatch impression to assign detailed EMS categories.

In this report, mutual aid and canceled calls are not included in the analysis of variations of average call and workload by month and hour of day. Nor are mutual aid and canceled calls included in response time analysis.

Aggregate Call Totals and Dispatches

In this report, each citizen-initiated emergency service request is a call. During the year studied, Kenai responded to 1,239 calls. Of these, 9 were structure fire calls and 16 were outside fire calls within Kenai jurisdiction. Each dispatched unit is a separate "run". As multiple units are dispatched to a call, there are more runs than calls. The department's total runs and workload are reported in the second section.

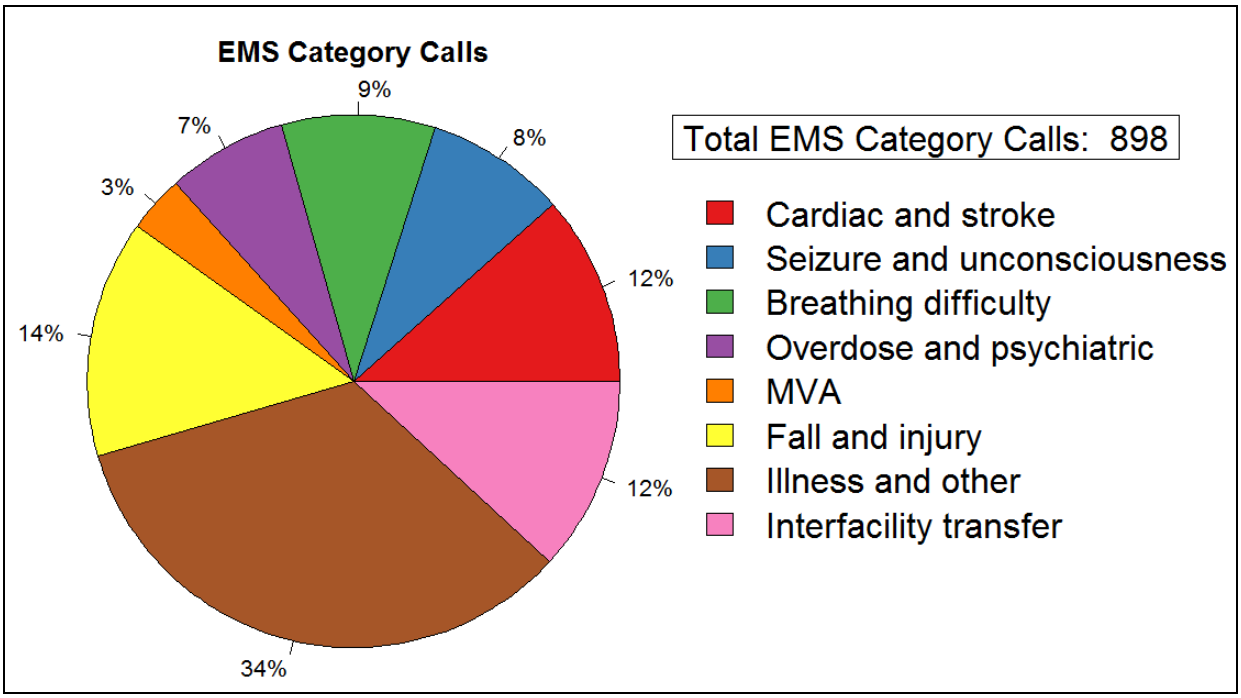
TABLE 6-1: Call Types

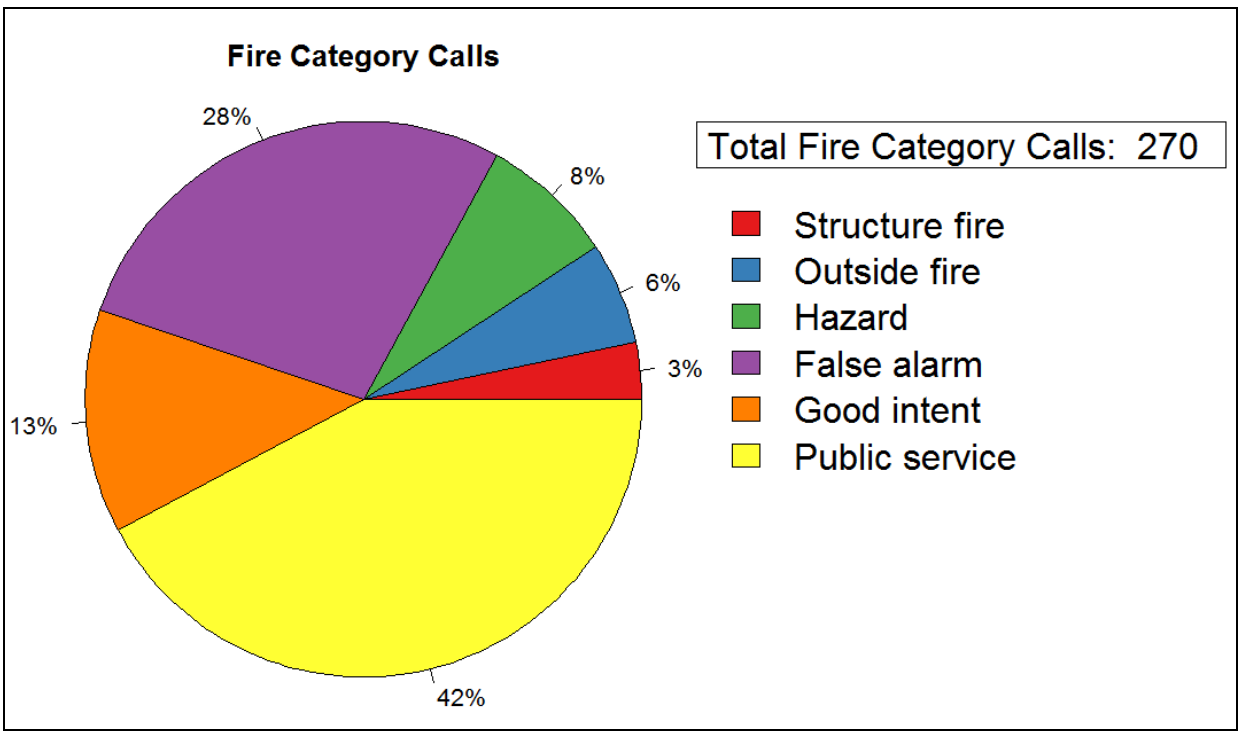
Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	104	0.29	8.4
Seizure and unconsciousness	76	0.21	6.1
Breathing difficulty	84	0.23	6.8
Overdose and psychiatric	65	0.18	5.2
MVA	31	0.09	2.5
Fall and injury	130	0.36	10.5
Illness and other	302	0.83	24.4
Interfacility transfer	106	0.29	8.6
EMS Total	**898**	**2.47**	**72.5**
Structure fire	9	0.02	0.7
Outside fire	16	0.04	1.3
Hazard	21	0.06	1.7
False alarm	75	0.21	6.1
Good intent	35	0.10	2.8
Public service	114	0.31	9.2
Fire Total	**270**	**0.74**	**21.8**
Mutual aid	46	0.13	3.7
Canceled	25	0.07	2.0
Total	**1,239**	**3.40**	**100.0**

Observations:

- The department responded to a total of 1,239 calls, averaging 3.4 calls per day.
- EMS calls for the year totaled 898 (72 percent of all calls), averaging 2.5 per day.
- Fire calls for the year totaled 270 (22 percent of all calls), averaging 0.7 per day.
- Structure and outside fires combined for a total of 25 calls during the year, averaging one call every two weeks.
- Mutual aid calls totaled 46 (4 percent of all calls), and canceled calls totaled 25 (2 percent of all calls).

FIGURE 6-1: EMS and Fire Calls by Type





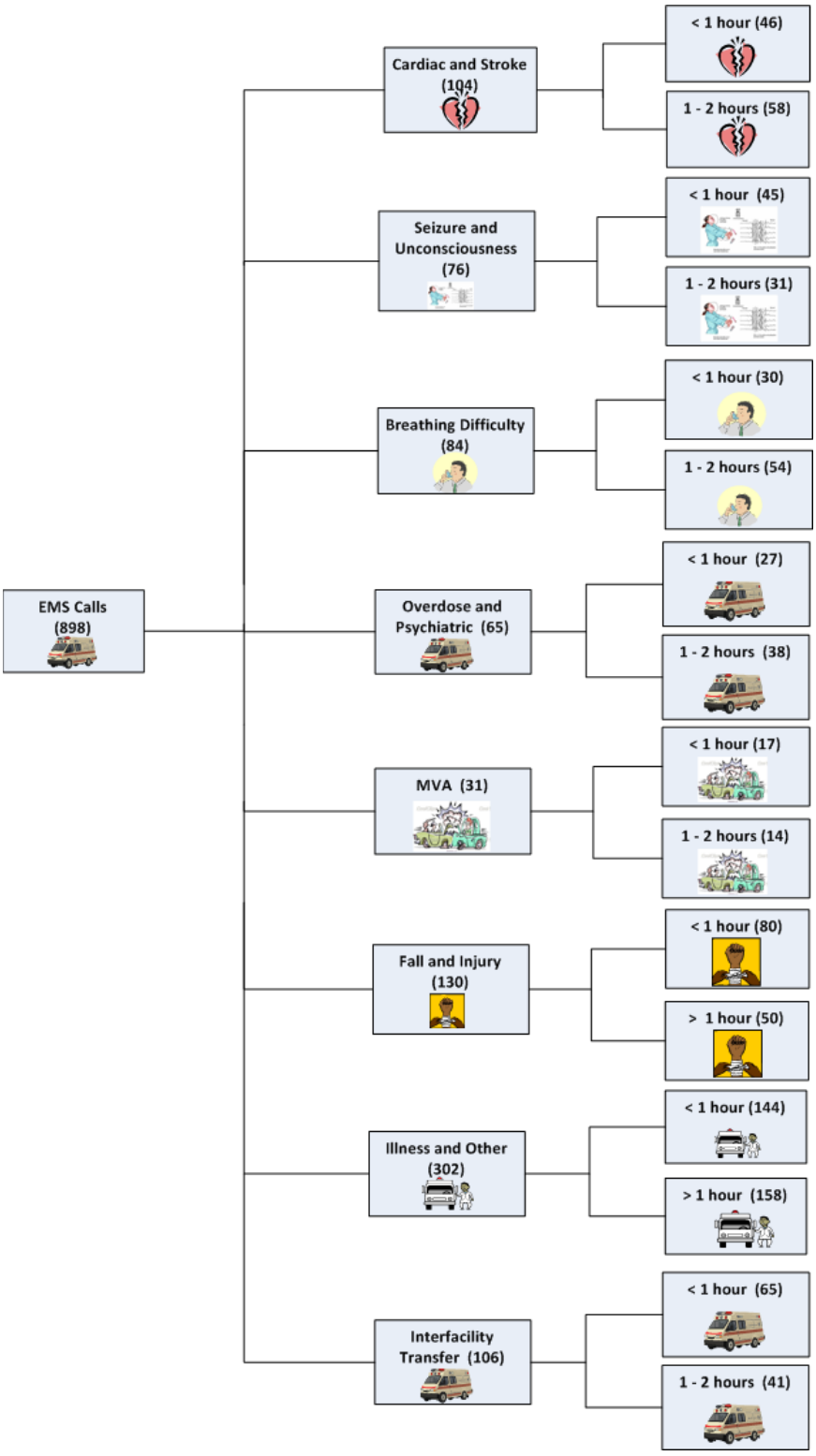
Observations:

- A total of 9 structure fire calls accounted for 3 percent of the fire category total.
- A total of 16 outside fire calls accounted for 6 percent of the fire category total.
- Public service was the largest fire call category, making up 42 percent of the fire category total.
- False alarm calls were 28 percent of the fire category total.
- Illness and other calls were the largest EMS call category and accounted for 34 percent of the fire category total.
- Cardiac or stroke calls were 12 percent of the EMS category total.
- Motor vehicle accidents calls were 3 percent of the EMS category total.

TABLE 6-2: Calls by Type and Duration

Call Type	Less than Half an Hour	Half an Hour to One Hour	One to Two Hours	Greater than Two Hours	Total
Cardiac and stroke	24	22	58	0	104
Seizure and unconsciousness	25	20	31	0	76
Breathing difficulty	13	17	54	0	84
Overdose and psychiatric	10	17	38	0	65
MVA	13	4	14	0	31
Fall and injury	48	32	50	0	130
Illness and other	65	79	154	4	302
Interfacility transfer	1	64	41	0	106
EMS Total	**199**	**255**	**440**	**4**	**898**
Structure fire	2	2	3	2	9
Outside fire	14	2	0	0	16
Hazard	14	6	1	0	21
False alarm	67	8	0	0	75
Good intent	32	2	0	1	35
Public service	77	13	8	16	114
Fire Total	**206**	**33**	**12**	**19**	**270**
Mutual aid	13	12	13	8	46
Canceled	22	2	0	1	25
Total	**440**	**302**	**465**	**32**	**1,239**

FIGURE 6-2: EMS Calls by Type and Duration

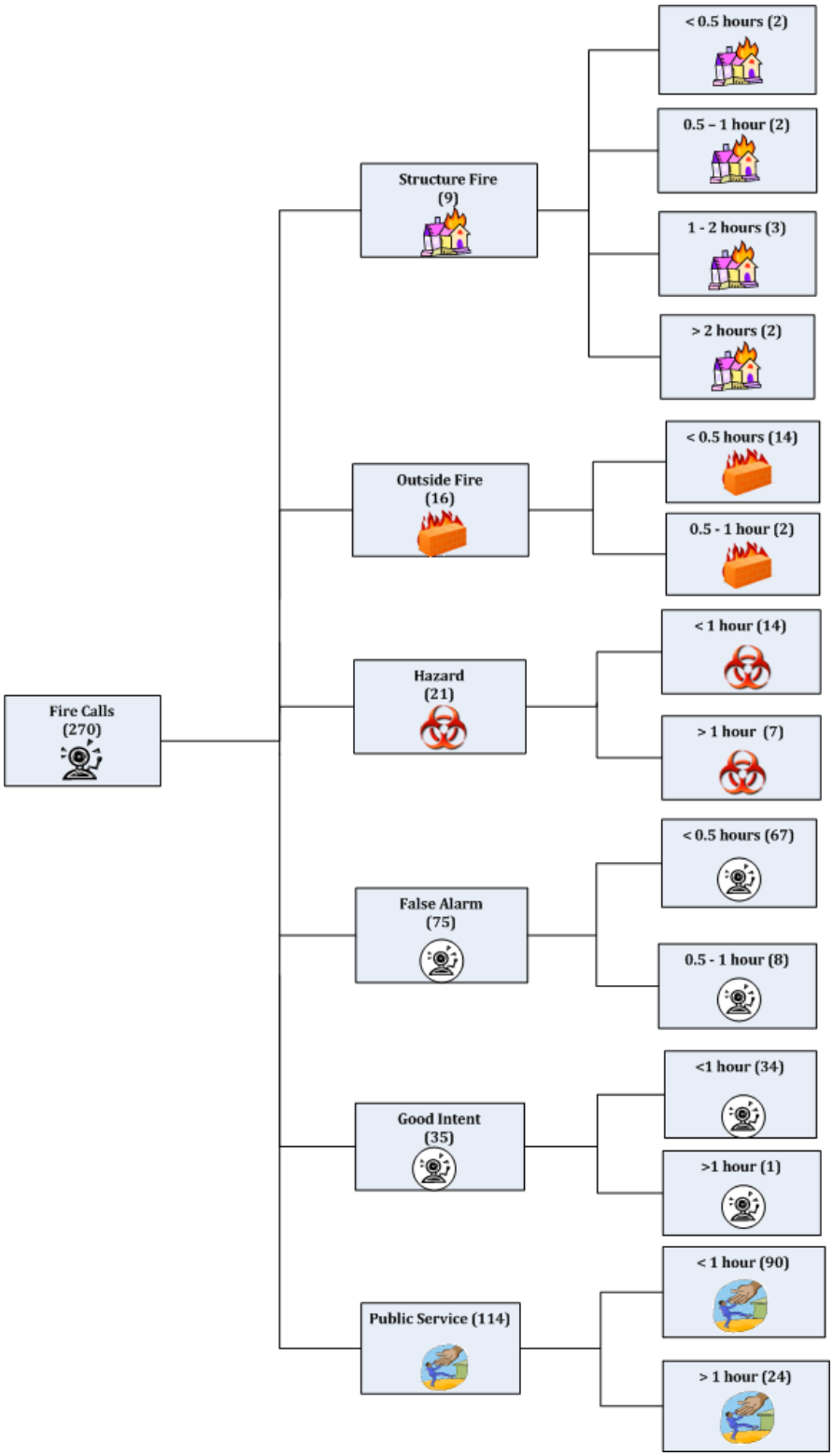


Note: Duration of a call is defined as the longest deployed time of any of the KFD units responding to the same call.

Observations:

- A total of 199 EMS category calls (22 percent) lasted less than half an hour, 255 EMS category calls (28 percent) lasted between half an hour and one hour, and 444 EMS category calls (50 percent) lasted more than one hour. On average, there was 1.2 EMS category calls per day that lasted more than one hour.
- A total of 46 cardiac and stroke calls (44 percent) lasted less than one hour, and 58 cardiac and stroke calls (56 percent) lasted between one hour and two hours.
- A total of 65 interfacility transfer calls (61 percent) lasted less than one hour, and 41 calls (39 percent) lasted between one and two hours.

FIGURE 6-3: Fire Calls by Type and Duration

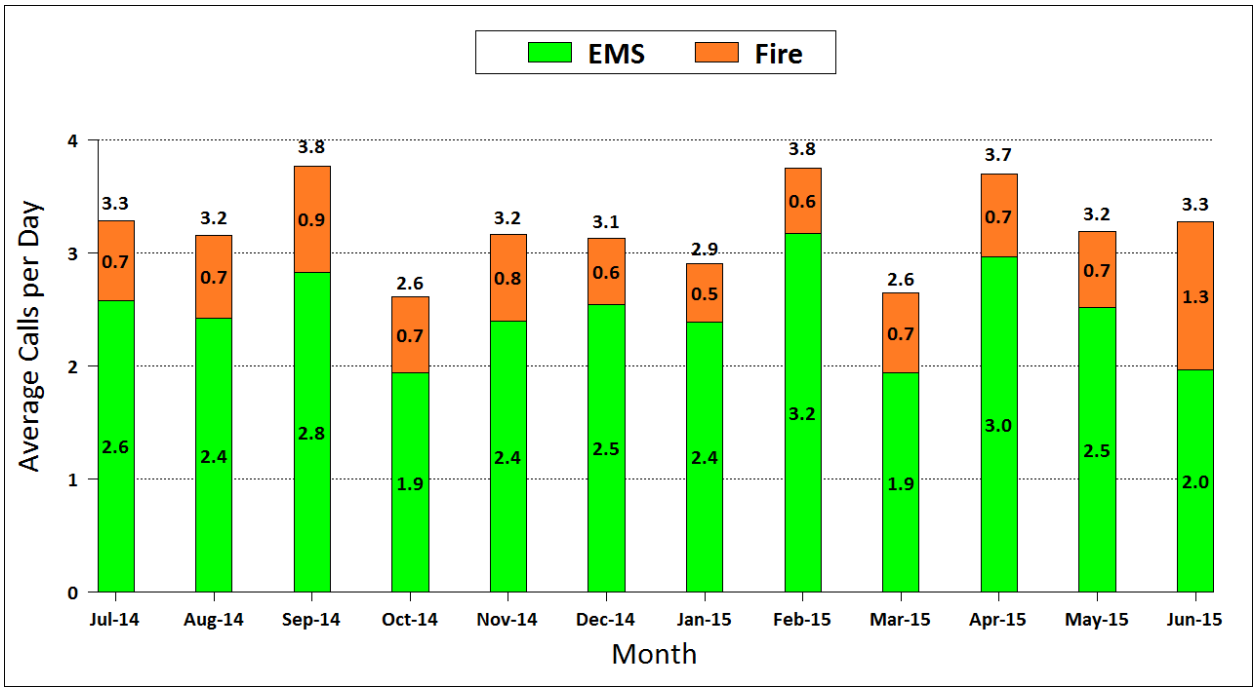


Note: Duration of a call is defined as the longest deployed time of any of the KFD units responding to the same call.

Observations:

- A total of 206 fire category calls (76 percent) lasted less than half an hour, 33 fire category calls (12 percent) lasted between half an hour and one hour, 12 fire category calls (4 percent) lasted between one and two hours, and 19 fire category calls (7 percent) lasted more than two hours.
- A total of 4 structure fire calls lasted less than one hour, 3 structure fire calls lasted between one and two hours, and 2 structure fire calls lasted more than two hours.
- A total of 14 outside fire calls (88 percent) lasted less than half an hour, and two outside fire calls (12 percent) lasted between one and two hours.
- A total of 67 false alarm calls (89 percent) lasted less than less than half an hour, and 8 false alarm calls (11 percent) lasted between half an hour and one hour.

FIGURE 6-4: Average Calls per Day, by Month



Observations:

- Averages calls per day ranged from a low of 2.6 calls per day in October 2014 to a high of 3.8 calls per day in September 2014 and February 2015. The highest monthly average was 44 percent greater than the lowest monthly average.
- Averages EMS calls per day ranged from a low of 1.9 calls per day in October 2014, March 2015 to a high of 3.2 calls per day in February 2015. The highest monthly average was 64 percent greater than the lowest monthly average.
- Averages fire calls per day ranged from a low of 0.5 calls per day in January 2015 to a high of 1.3 calls per day in June 2015. The highest monthly average was 154 percent greater than the lowest monthly average.
- The most calls responded to by KFD in a single day were 10. That occurred twice on August 30, 2014 and June 21, 2015. On August 30, 2014, 9 out of 10 calls were EMS calls, and the other one was a public service call. On June 21, 2015, five out of 10 calls were EMS calls, three were outside fire calls, one was a false alarm call, and another one was a mutual aid request.

FIGURE 6-5: Calls by Hour of Day

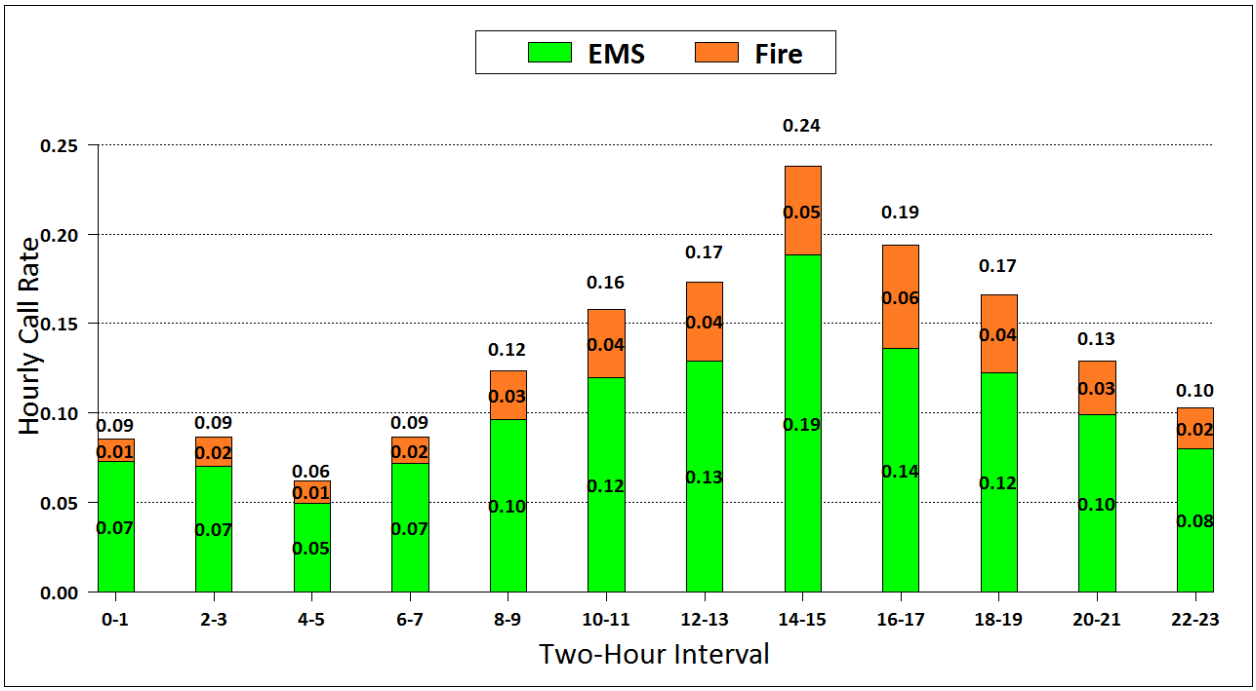


TABLE 6-3: Calls by Hour of Day

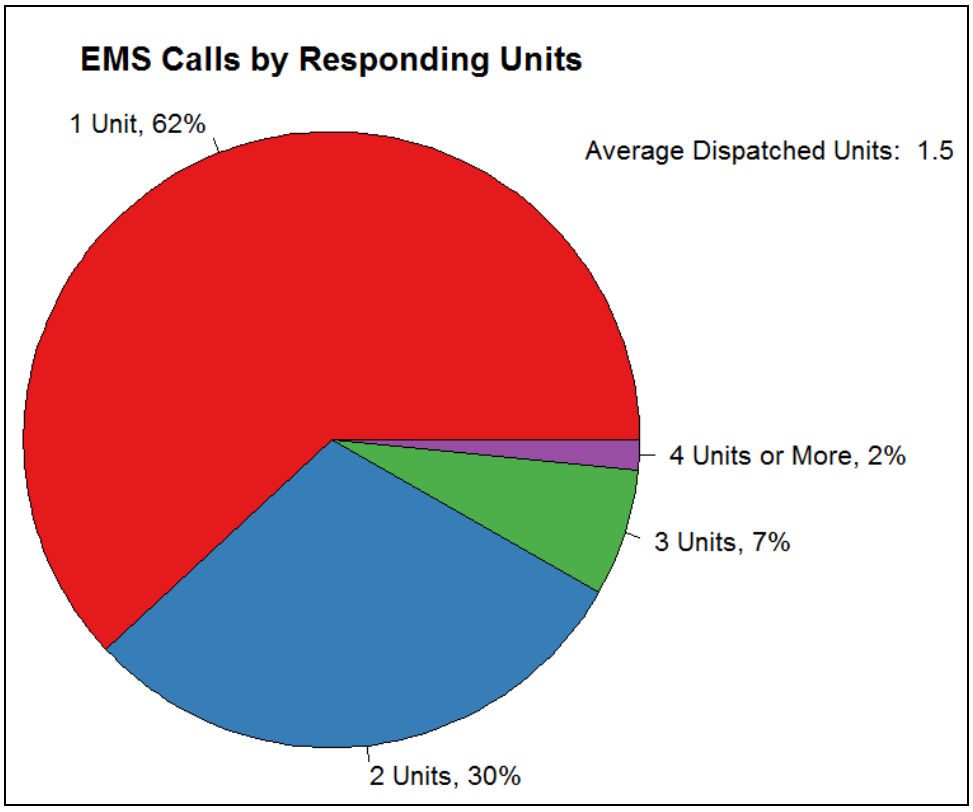
Two-Hour Interval	Hourly Call Rate		
	EMS	Fire	Total
0-1	0.07	0.01	0.09
2-3	0.07	0.02	0.09
4-5	0.05	0.01	0.06
6-7	0.07	0.02	0.09
8-9	0.10	0.03	0.12
10-11	0.12	0.04	0.16
12-13	0.13	0.04	0.17
14-15	0.19	0.05	0.24
16-17	0.14	0.06	0.19
18-19	0.12	0.04	0.17
20-21	0.10	0.03	0.13
22-23	0.08	0.02	0.10
Calls per Day	**2.47**	**0.74**	**3.21**

Note: Average calls per day shown are the sum of each column multiplied by two, since each cell represents two hours.

Observations:

- Hourly call rates averaged between 0.06 calls and 0.24 calls per hour.
- Call rates were highest during the day between 10:00 a.m. and 8:00 p.m., averaging between 0.16 and 0.24 calls per hour.
- Call rates were lowest between midnight and 8:00 a.m. averaging between 0.06 and 0.10 calls per hour.

FIGURE 6-6: Number of Kenai Fire Department Units Dispatched to Calls



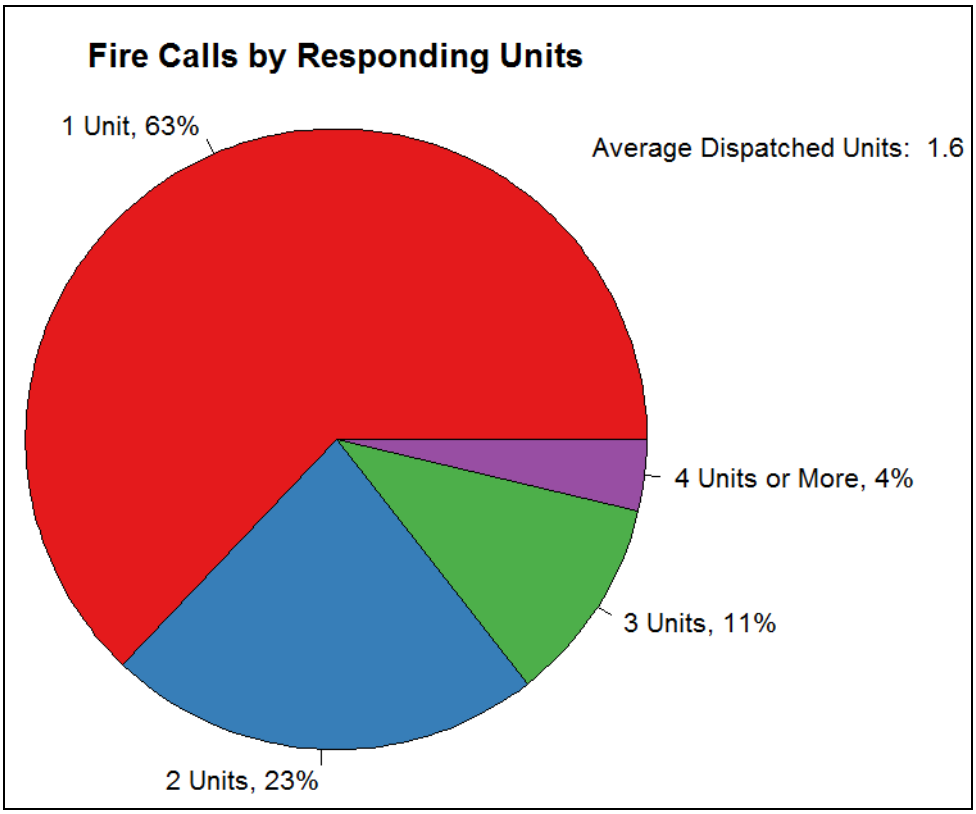


TABLE 6-4: Number of Kenai Fire Department Units Dispatched to Calls

Call Type	Number of Units				
	One	Two	Three	Four or More	Total
Cardiac and stroke	46	39	16	3	104
Seizure and unconsciousness	37	32	4	3	76
Breathing difficulty	32	42	10	0	84
Overdose and psychiatric	33	27	4	1	65
MVA	8	13	8	2	31
Fall and injury	101	26	2	1	130
Illness and other	195	87	16	4	302
Interfacility transfer	104	2	0	0	106
EMS Total	**556**	**268**	**60**	**14**	**898**
Structure fire	2	3	1	3	9
Outside fire	3	8	2	3	16
Hazard	14	2	2	3	21
False alarm	37	23	14	1	75
Good intent	24	8	3	0	35
Public service	90	17	7	0	114
Fire Total	**170**	**61**	**29**	**10**	**270**
Mutual aid	42	2	2	0	46
Canceled	12	12	1	0	25
Total	**63**	**28**	**7**	**2**	**100**
Percentage	**780**	**343**	**92**	**24**	**1239**

Observations:

- On average, 1.6 units were dispatched per fire category call.
- For fire category calls, one unit was dispatched 63 percent of the time, two units were dispatched 23 percent of the time, three units were dispatched 11 percent of the time, and four or more units were dispatched 3 percent of the time.
- For structure fire calls, one unit was dispatched to two calls, two units were dispatched to three calls, three units were dispatched to one call, and four or more units were dispatched to three calls.
- For outside fire calls, one unit was dispatched to three calls, two units were dispatched to eight calls, three units were dispatched to two calls, and four or more units were dispatched to three calls.
- On average, 1.5 units were dispatched per EMS category call.

- For EMS category calls, one unit was dispatched 62 percent of the time, two units were dispatched 30 percent of the time, three units were dispatched 7 percent of the time, and four or more units were dispatched 1 percent of the time.

TABLE 6-5: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Hours	Percent of Total Hours	Deployed Minutes per Day	Annual Number of Runs	Runs per Day
Cardiac and stroke	55.1	169	9.6	27.9	184	0.5
Seizure and unconsciousness	50.1	104	5.9	17.2	125	0.3
Breathing difficulty	59.8	146	8.2	24.0	146	0.4
Overdose and psychiatric	60.9	105	5.9	17.2	103	0.3
MVA	46.8	51	2.9	8.5	66	0.2
Fall and injury	49.0	134	7.6	22.1	164	0.5
Illness and other	56.4	407	23.1	67.0	433	1.2
Interfacility transfer	58.0	104	5.9	17.2	108	0.3
EMS Total	**55.1**	**1,220**	**69.2**	**201.1**	**1,329**	**3.7**
Structure fire	83.5	33	1.9	5.5	24	0.1
Outside fire	21.8	13	0.8	2.2	37	0.1
Hazard	28.1	17	1.0	2.8	36	0.1
False alarm	19.0	41	2.3	6.8	129	0.4
Good intent	37.4	31	1.7	5.0	49	0.1
Public service	108.5	262	14.9	43.2	145	0.4
Fire Total	**56.8**	**398**	**22.5**	**65.5**	**420**	**1.2**
Mutual aid	150.1	130	7.4	21.4	52	0.1
Canceled	25.8	17	1.0	2.8	39	0.1
Total	**57.5**	**1,765**	**100.0**	**290.9**	**1,840**	**5.1**

Note: Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. Therefore, the department responded to 3.4 calls per day and had 5.1 runs per day.

Observations:

- Total deployed time for the year, or deployed hours, was 1,765. This is the total deployment time of all the units deployed on all type of calls, including 130 hours spent on mutual aid. The deployed hours for all units combined averaged approximately 4.8 hours per day.
- KFD units made 1,840 runs, including 52 mutual aid runs. The daily average was 5.1 runs for all units combined.
- Fire category calls accounted for 22.5 percent of the total workload.
- There were 61 runs for structure and outside fire calls, with a total workload of 47 hours. This accounted for 2.7 percent of the total workload. The average deployed time for structure fire calls was 83.5 minutes, and the average deployed time for outside fire calls was 21.8 minutes.

- EMS calls accounted for 69.2 percent of the total workload. The average deployed time for EMS calls was 55.1 minutes. The deployed hours for all units dispatched to EMS calls averaged 3.4 hours per day.

Workload by Individual Unit—Calls and Total Time Spent

In this section, the actual time spent by each unit on calls is reported in two types of statistics: workload and runs. A dispatch of a unit is defined as a run; thus one call might include multiple runs. The deployed time of a run is from the time a unit is dispatched through the time a unit is cleared.

TABLE 6-6: Call Workload by Unit

Unit Type	Unit ID	Average Deployed Minutes per Run	Annual Number of Runs	Annual Hours	Runs per Day	Deployed Minutes per Day
ENGINE	E-1	38.1	142	90.1	0.4	14.9
ENGINE	E-2	26.1	5	2.2	0.0	0.4
ENGINE	E-3	74.9	41	51.2	0.1	8.4
ENGINE	E-5	10.0	2	0.3	0.0	0.1
ENGINE	E-6	20.3	9	3.0	0.0	0.5
AMBULANCE	R7	52.0	256	221.9	0.7	36.6
AMBULANCE	R8	53.4	860	764.8	2.4	126.1
BRUSH TRUCK	SQ1	269.7	51	229.2	0.1	37.8
TOWER	T-1	79.6	5	6.6	0.0	1.1
UTILITY TRUCK	U-12	55.7	99	91.9	0.3	15.1
UTILITY TRUCK	U10	47.0	78	61.1	0.2	10.1
UTILITY TRUCK	U11	49.0	242	197.5	0.7	32.6
UTILITY TRUCK	U9	56.1	47	44.0	0.1	7.2
BOAT	B-2	15.4	3	0.8	0.0	0.1

Observations:

- Ambulance R8 made the most runs and the largest deployed time, averaging 2.4 runs and 126.1 minutes of deployed time per day.
- Ambulance R7 made the second most runs, averaging 0.7 runs and 36.6 minutes of deployed time per day.
- Of the seven fire suppression units (engine, tower, and brush truck), engine E-1 was dispatched most often, and brush truck SQ1 had the longest deployed hours.

FIGURE 6-7: Deployed Minutes by Hour of Day

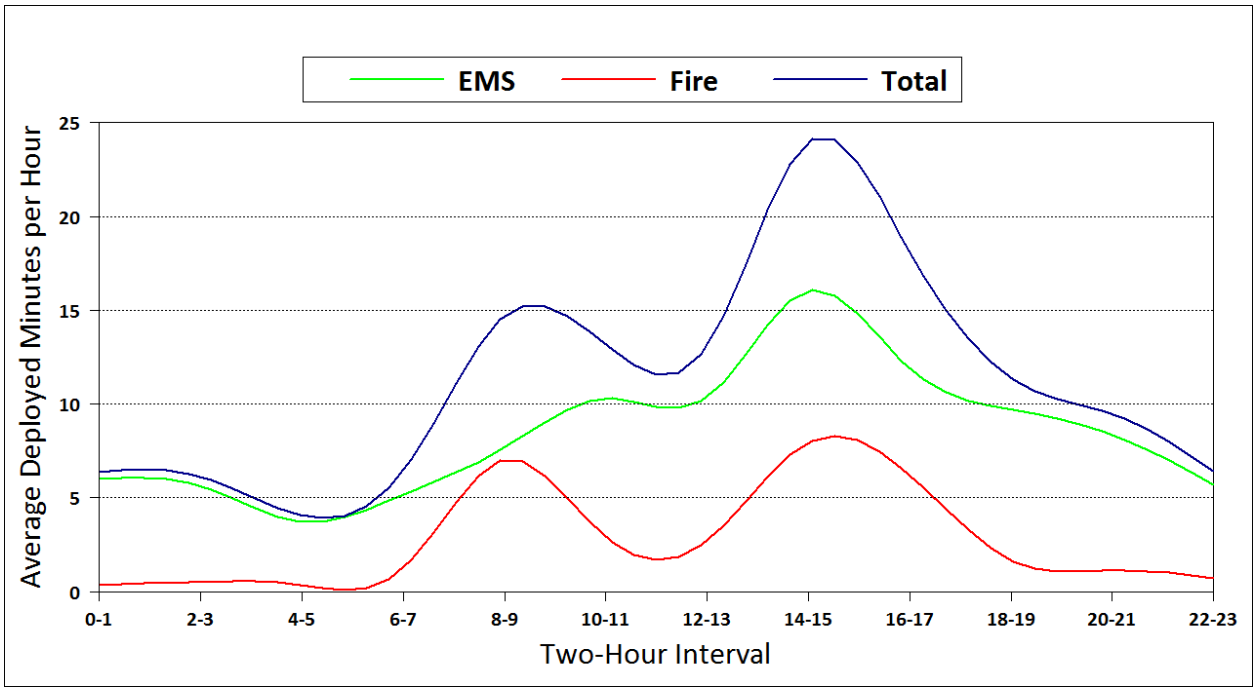


TABLE 6-7: Deployed Minutes by Hour of Day

Two-Hour Interval	EMS	Fire	Total
0-1	6.0	0.4	6.4
2-3	5.6	0.5	6.1
4-5	3.7	0.4	4.1
6-7	5.2	1.2	6.4
8-9	7.7	7.0	14.7
10-11	10.3	2.9	13.2
12-13	10.4	2.7	13.1
14-15	16.0	7.9	24.0
16-17	11.9	6.2	18.1
18-19	9.7	1.7	11.4
20-21	8.3	1.1	9.5
22-23	5.7	0.7	6.4
Daily Total	201.1	65.5	266.7

Note: Daily totals shown equal the sum of each column multiplied by two, since each cell represents two hours.

Observations:

- Hourly deployed minutes were highest during the day between 8:00 a.m. and 8:00 p.m., averaging from 11.4 minutes to 24.0 minutes per hour.
- Hourly deployed minutes were the lowest between 10:00 p.m. and 8:00 a.m., averaging from 4.1 minutes to 6.4 minutes per hour.

TABLE 6-8: Total Annual and Daily Average Number of Runs by Call Type and Unit

Unit Type	Unit	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Mutual Aid	Canceled	**Total**	**Runs per Day**
ENGINE	E-1	29	**7**	**13**	5	47	14	16	1	10	**142**	**0.4**
ENGINE	E-2	0	**0**	**0**	1	2	1	1	0	0	**5**	**NA**
ENGINE	E-3	3	**3**	**2**	3	3	1	2	24	0	**41**	**0.1**
ENGINE	E-5	0	**0**	**0**	2	0	0	0	0	0	**2**	**NA**
ENGINE	E-6	1	**0**	**0**	4	2	0	2	0	0	**9**	**NA**
AMBULANCE	R7	225	**0**	**1**	2	3	3	13	5	4	**256**	**0.7**
AMBULANCE	R8	708	**4**	**5**	11	32	5	66	11	18	**860**	**2.4**
BRUSH TRUCK	SQ1	15	**0**	**4**	0	4	7	15	6	0	**51**	**0.1**
TOWER	T-1	0	**1**	**0**	0	1	0	3	0	0	**5**	**NA**
UTILITY TRUCK	U-12	77	**0**	**3**	1	4	6	6	0	2	**99**	**0.3**
UTILITY TRUCK	U10	52	**4**	**5**	1	8	3	1	1	3	**78**	**0.2**
UTILITY TRUCK	U11	192	**3**	**3**	5	18	6	10	3	2	**242**	**0.7**
UTILITY TRUCK	U9	25	**2**	**1**	1	5	3	9	1	0	**47**	**0.1**
BOAT	B-2	2	**0**	**0**	0	0	0	1	0	0	**3**	**NA**

Note: A dispatch of a unit is defined as a *run*; thus a call might include multiple runs

Observations:

- Ambulance R8 had the most runs during the year and it averaged 2.4 runs per day. 86 percent of its total runs were responding to EMS calls.
- Ambulance R7 had the second most runs during the year and it averaged 0.7 runs per day. 88 percent of its total runs were responding to EMS calls.
- Of the seven fire suppression units (engine, tower, and brush truck), engine E-1 was dispatched most often, it had 142 runs.
- Utility vehicle U11 was dispatched 242 times.

TABLE 6-9: Daily Average Deployed Minutes by Call Type and Unit

Unit Type	Unit	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Mutual Aid	Canceled	**Total**	**Fire Category Calls Percentage**
ENGINE	E-1	3.7	1.4	0.7	0.4	2.2	1.5	4.7	0.1	0.2	14.8	**75.0**
ENGINE	E-2	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.4	**100.0**
ENGINE	E-3	0.5	0.7	0.1	0.3	0.3	0.1	3.0	3.4	0.0	8.4	**93.5**
ENGINE	E-5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	**100.0**
ENGINE	E-6	0.1	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.5	**84.2**
AMBULANCE	R7	33.4	0.0	0.0	0.3	0.2	0.2	1.7	0.7	0.1	36.5	**8.5**
AMBULANCE	R8	107.8	0.8	0.3	0.8	1.7	1.1	9.5	1.4	2.2	125.7	**14.3**
BRUSH TRUCK	SQ1	2.4	0.0	0.3	0.0	0.2	0.4	19.2	15.3	0.0	37.7	**93.7**
TOWER	T-1	0.0	0.3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.1	**100.0**
UTILITY TRUCK	U-12	13.4	0.0	0.1	0.0	0.2	0.3	1.0	0.0	0.1	15.1	**11.2**
UTILITY TRUCK	U10	7.8	0.9	0.3	0.1	0.5	0.1	0.1	0.1	0.1	10.0	**22.8**
UTILITY TRUCK	U11	27.3	0.8	0.2	0.4	0.9	1.2	1.4	0.2	0.1	32.5	**15.9**
UTILITY TRUCK	U9	4.2	0.7	0.1	0.2	0.3	0.2	1.5	0.1	0.0	7.2	**42.4**
BOAT	B-2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	**NA**

Observations:

- On average, ambulance R8 was deployed 125.7 minutes per day (two hours and six minutes). EMS calls accounted for 85.8 percent of its total.
- On average, ambulance R7 was deployed 36.5 minutes per day, and EMS calls accounted for 91.5 percent of its total.
- Of the seven fire suppression units (engine, tower, and brush truck), brush truck SQ1 had the longest deploy time and it averaged 38 minutes per day.
- Utility vehicle U11 spent 33 minutes per day responding to emergency requests.

Analysis of Busiest Hours

There is significant variability in the number of calls from hour to hour. One special concern relates to the fire and EMS resources available for hours with the heaviest workload. We tabulated the data for each of the 8,760 hours in the year. Approximately once every 3.8 days, the Kenai Fire Department responded to two and more calls in an hour. This occurred in 1.1 percent of the total number of hours in the year studied. We report the top ten hours with the most calls received and discuss the two hours with the most calls received.

TABLE 6-10: Frequency Distribution of the Number of Calls

Number of Calls in an Hour	Frequency	Percentage
0	7,623	87.02
1	1,042	11.89
2	89	1.02
3	5	0.06
4	1	0.01

Observations:

- During 95 hours (1.1 percent of all hours), two or more calls occurred; in other words, the KFD responded to two and four calls in an hour roughly once every 3.8 days.
- Three calls per hour occurred five times in the study year and four calls per hour occurred once in the study year.

TABLE 6-11: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
6/17/2015, 3 p.m. to 4 p.m.	4	8	21.8
7/22/2014, 3 p.m. to 4 p.m.	3	6	5.6
10/7/2014, 9 a.m. to 10 a.m.	3	5	4.0
4/1/2015, 4 p.m. to 5 p.m.	3	5	3.0
11/7/2014, 10 p.m. to 11 p.m.	3	4	3.4
9/24/2014, 10 a.m. to 11 a.m.	3	4	2.9
4/30/2015, 2 p.m. to 3 p.m.	2	7	7.7
1/29/2015, 7 p.m. to 8 p.m.	2	7	2.5
2/17/2015, 8 a.m. to 9 a.m.	2	6	6.3
4/30/2015, 4 p.m. to 5 p.m.	2	6	4.2

Note: The combined workload is the total deployed minutes spent responding to calls received in the hour, and which may extend into the next hour or hours. Number of runs only includes dispatches from KFD units.

Observations:

- The hour with the most calls received was 3:00 p.m. to 4:00 p.m. on June 17, 2015. The four calls involved eight individual dispatches. These four calls included one cardiac and stroke call, one outside fire call, one good intent call and one public service call. The combined workload was 21.8 hours. The longest call lasted 18 hours, and it was a cover assignment and move up call. The outside fire call was responded to by four units and lasted 19 minutes.
- The hour with the second most calls received was 3:00 p.m. to 4:00 p.m. on July 22, 2014. The three calls involved six individual dispatches. These three calls included one cardiac and stroke call, one outside fire call and one public service call. The combined workload was 5.6 hours. The cardiac and stroke call was responded to by four units, which provided advanced life support and transport service. The cardiac and stroke call lasted 73 minutes.

Dispatch Time and Response Time

This section presents dispatch and response time statistics for different call types and units. The main focus is the dispatch and response time of the first arriving Kenai units.

Different terms are used to describe the components of response time: Dispatch processing time is the difference between the unit dispatch time and call received time of the first arriving unit. Turnout time is the difference between the unit time en route and the unit dispatch time. Travel time is the difference between the unit on-scene arrival time and the time en route. Response time is the difference between the on-scene arrival time and call received time.

In this section, a total of 814 EMS and fire category calls were used in the analysis. The average dispatch time was 2.8 minutes. The average turnout time was 1.2 minutes. The average travel time was 3.6 minutes. The average response time for EMS calls was 7.6 minutes. The average response time for fire category calls was 7.8 minutes. The average response time for structure fire calls was 6.1 minutes. The average response time for outside fire calls was 5.6 minutes.

TABLE 6-12: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	2.9	1.2	3.2	7.3	90
Seizure and unconsciousness	2.5	1.3	3.3	7.0	68
Breathing difficulty	2.6	1.2	3.2	7.0	75
Overdose and psychiatric	3.3	1.1	3.4	7.8	46
MVA	2.4	1.1	1.8	5.3	13
Fall and injury	3.1	1.0	3.4	7.5	106
Illness and other	3.1	1.2	3.8	8.1	258
EMS Total	**3.0**	**1.2**	**3.4**	**7.6**	**656**
Structure fire	1.7	1.4	3.0	6.1	6
Outside fire	1.6	2.3	1.7	5.6	8
Hazard	2.4	0.9	2.9	6.2	12
False alarm	2.1	1.4	3.6	7.1	49
Good intent	2.0	1.6	5.7	9.4	17
Public service	2.4	1.4	4.9	8.6	66
Fire Total	**2.2**	**1.4**	**4.2**	**7.8**	**158**
Total	**2.8**	**1.2**	**3.6**	**7.6**	**814**

FIGURE 6-8: Average Dispatch, Turnout and Travel Times of First Arriving Unit, by EMS Call Type

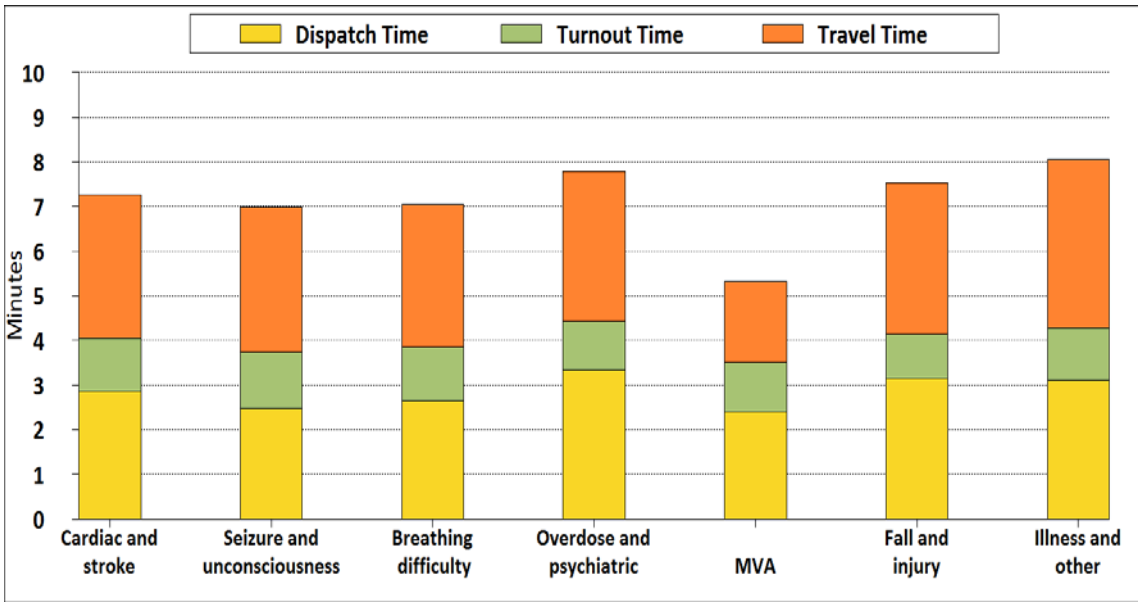
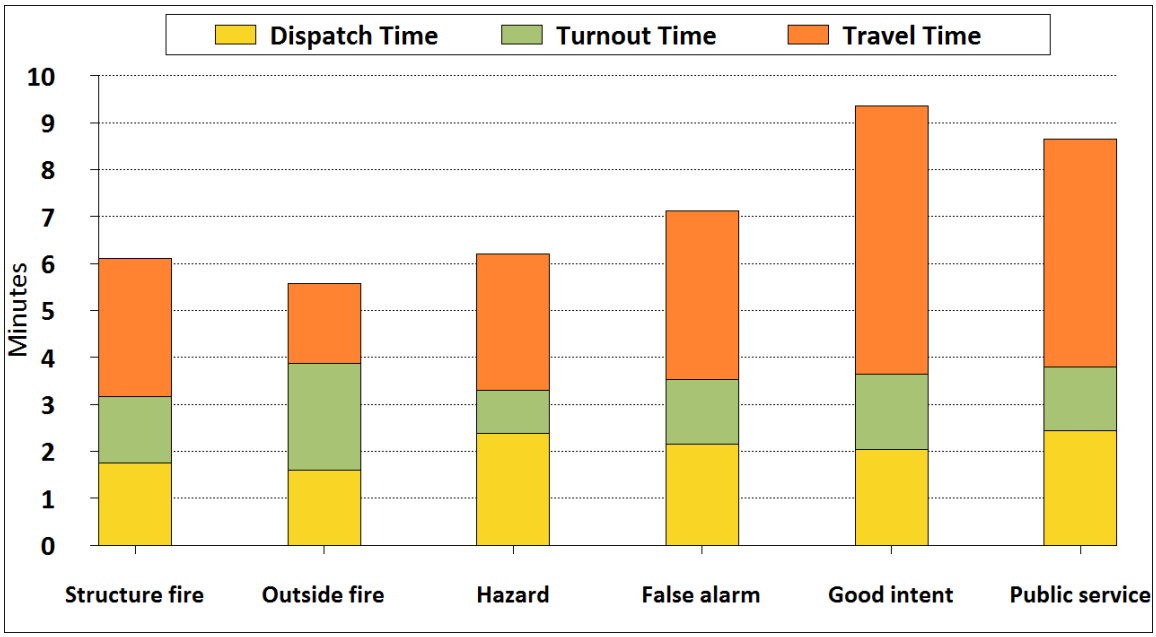


FIGURE 6-9: Average Dispatch, Turnout and Travel Times of First Arriving Unit, by Fire Call Type



Observations:

- The average dispatch time was 2.8 minutes.
- The average turnout time was 1.2 minutes.
- The average travel time was 3.6 minutes.
- The average response time for EMS calls was 7.6 minutes.
- The average response time for fire category calls was 7.8 minutes.
- The average response time for structure fire calls was 6.1 minutes.
- The average response time for outside fire calls was 5.6 minutes.

TABLE 6-13: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	4.5	2.4	6.3	11.4	90
Seizure and unconsciousness	3.9	2.0	6.2	10.6	68
Breathing difficulty	4.0	2.2	6.5	10.7	75
Overdose and psychiatric	5.7	2.5	6.9	11.5	46
MVA	4.4	2.0	4.5	8.5	13
Fall and injury	4.9	2.0	5.8	10.6	106
Illness and other	5.1	2.4	6.5	11.4	258
EMS Total	**4.8**	**2.2**	**6.4**	**11.1**	**656**
Structure fire	4.2	2.0	6.6	9.6	6
Outside fire	8.2	3.1	3.6	11.2	8
Hazard	4.9	2.3	5.8	13.2	12
False alarm	3.6	2.9	7.0	11.4	49
Good intent	4.5	3.3	11.4	15.9	17
Public service	4.5	2.9	8.4	12.6	66
Fire Total	**4.3**	**2.9**	**8.4**	**12.5**	**158**
Total	**4.8**	**2.4**	**6.7**	**11.4**	**814**

Note: A 90th percentile value of 11.4 indicates that the total response time was less than 11.4 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch time was 4.8 minutes.
- The 90th percentile turnout time was 2.4 minutes.
- The 90th percentile travel time was 6.7 minutes.
- The 90th percentile response time for EMS calls was 11.1 minutes.
- The 90th percentile response time for fire category calls was 12.5 minutes.
- The 90th percentile response time for structure fire calls was 9.6 minutes.
- The 90th percentile response time for outside fire calls was 11.2 minutes.

FIGURE 6-10: Average Dispatch, Turnout, Travel, and Response Time of First Arriving Unit, by Hour of Day

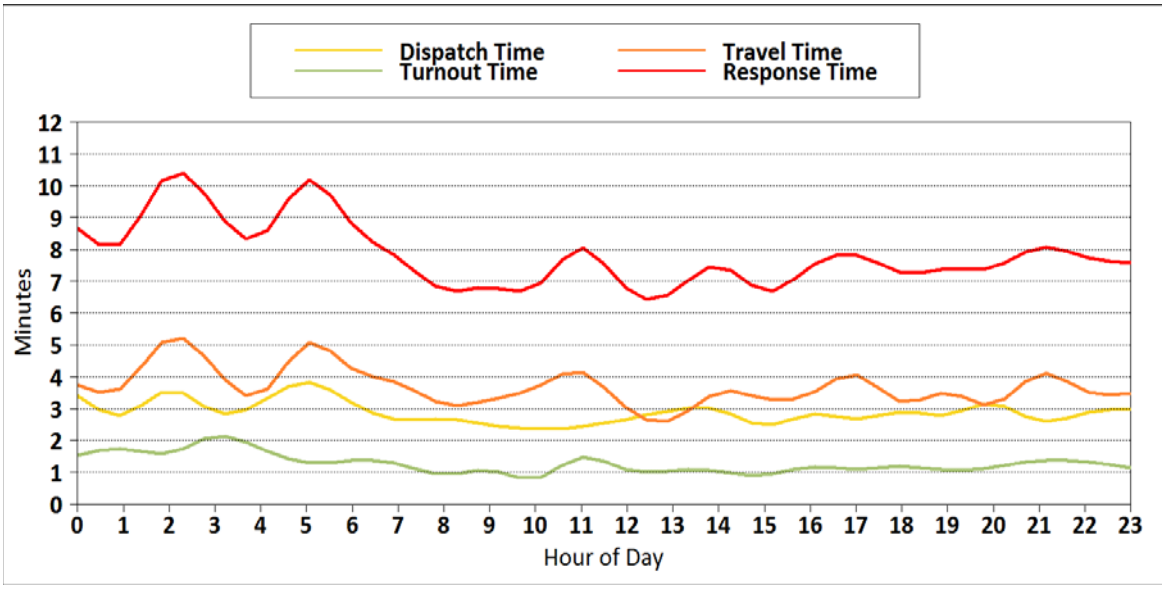


TABLE 6-14: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Hour of Day

Hour	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
0	3.3	1.7	4.4	9.4	13.3	29
1	2.8	1.7	3.7	8.3	11.4	17
2	3.6	1.6	5.2	10.4	15.0	28
3	2.9	2.1	4.3	9.3	13.7	22
4	3.3	1.7	3.9	8.9	12.3	26
5	3.7	1.4	5.9	11.0	14.1	10
6	3.2	1.4	4.3	8.8	11.9	20
7	2.7	1.3	3.8	7.7	11.4	30
8	2.7	0.9	3.1	6.7	9.3	27
9	2.5	1.1	3.3	6.8	10.7	39
10	2.4	0.8	3.7	6.8	11.2	51
11	2.4	1.4	4.6	8.4	13.1	35
12	2.7	1.1	3.0	6.7	9.9	38
13	2.9	1.1	2.7	6.7	10.8	45
14	3.0	1.0	3.5	7.5	11.5	55
15	2.5	0.9	3.5	6.9	10.6	62
16	2.8	1.2	3.5	7.5	11.8	63
17	2.8	1.1	4.4	8.3	11.4	39
18	2.9	1.2	3.2	7.3	9.8	41
19	2.8	1.1	3.5	7.4	12.5	35
20	3.2	1.1	3.8	8.2	10.9	33
21	2.6	1.4	4.1	8.1	12.5	29
22	2.9	1.3	3.6	7.8	11.5	32
23	3.0	1.1	3.8	7.9	10.8	20

Observations:

- Average dispatch time was between 2.4 and 3.8 minutes.
- Average turnout time was between 0.8 and 2.1 minutes. Between midnight and 5:00 a.m., the average turnout time was longer than 1.6.
- Average travel time was between 2.7 and 5.2 minutes.
- Average response time was between 6.7 and 10.4 minutes. Between midnight and 7:00 a.m., the average response time was longer than 8.3 minutes.

FIGURE 6-11: Number of Total Calls by First Arriving Units

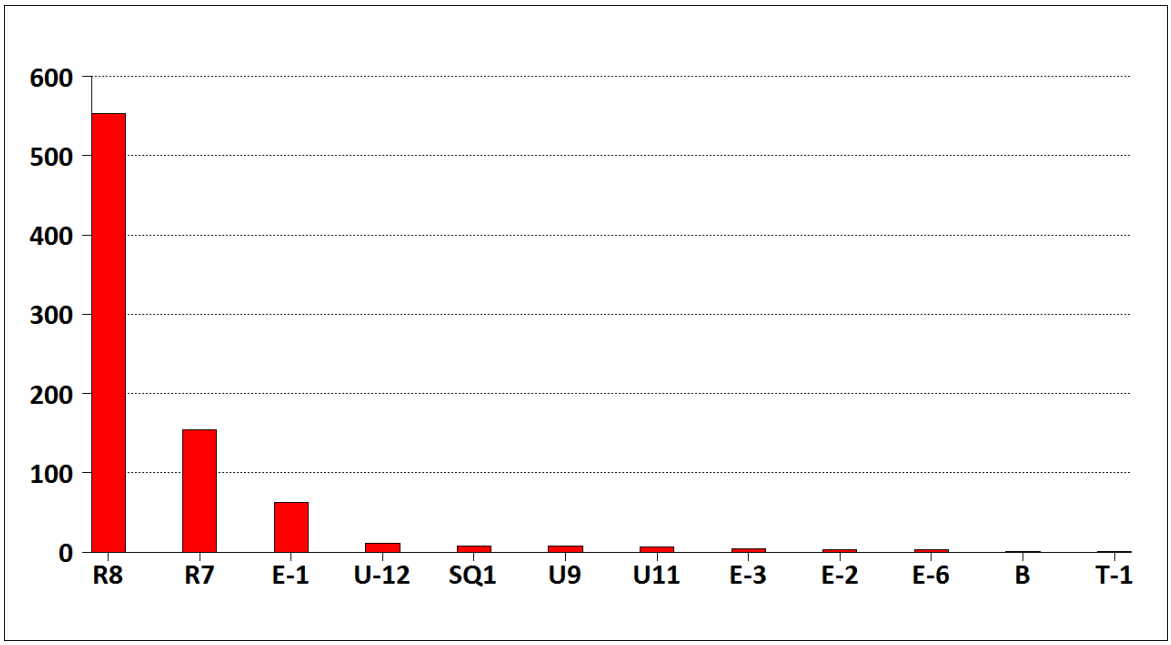


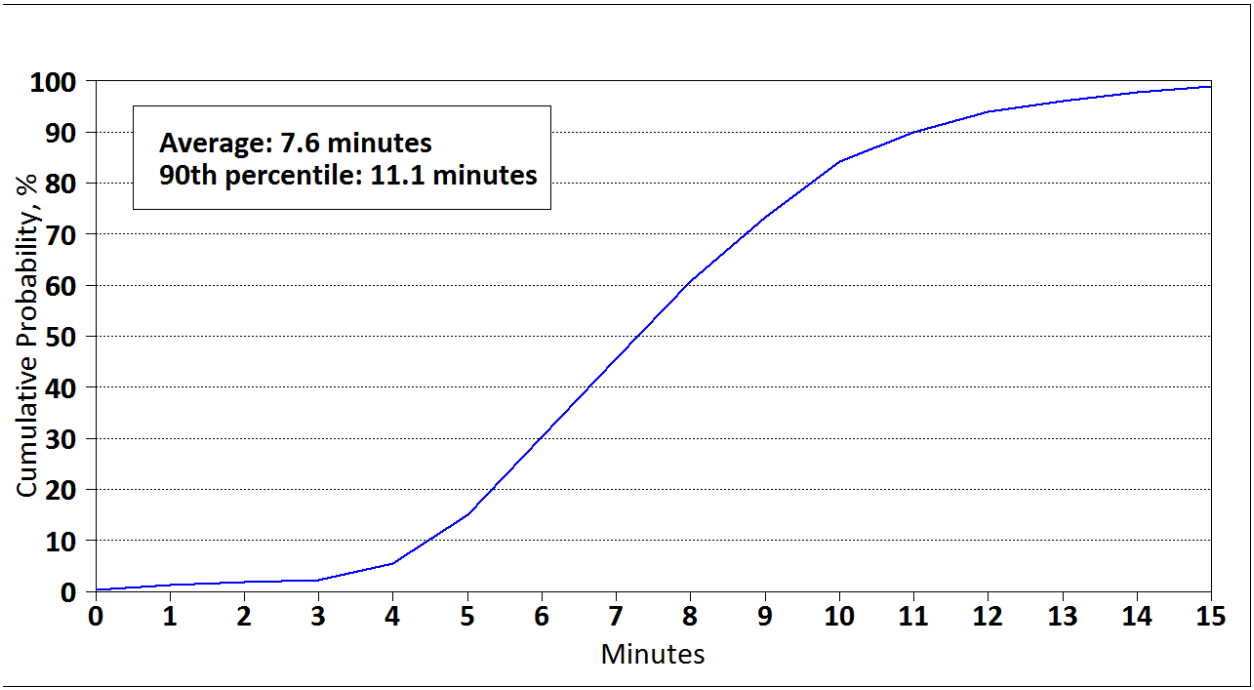
TABLE 6-15: Number of Total Calls by First Arriving Units

Unit	EMS	Structure and Outside Fire	Other Fire	Total	Percentage	Cumulative Percentage
R8	493	2	58	553	67.94	67.9
R7	145	0	9	154	18.92	86.9
E-1	9	12	42	63	7.74	94.6
U-12	5	0	6	11	1.35	95.9
SQ1	2	0	6	8	0.98	96.9
U9	1	0	6	7	0.86	97.8
U11	0	0	6	6	0.74	98.5
E-3	1	0	3	4	0.49	99.0
E-2	0	0	3	3	0.37	99.4
E-6	0	0	3	3	0.37	99.8
B	0	0	1	1	0.12	99.9
T-1	0	0	1	1	0.12	100.0

Observations:

- R8 arrived first on scene most often, followed by R7 and E-1. Those three units accounted for 95 percent of the first arrivals at calls.
- For structure and outside fire calls, E-1 and R8 arrived first on scene most often.

FIGURE 6-12: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS calls



Reading the CDF Chart: The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, with regard to EMS calls, the 0.9 probability line intersects the graph at the time mark at about 11.1 minutes. This means that units had a response time of less than 11.1 minutes for 90 percent of these calls.

FIGURE 6-13: Frequency Distribution Chart of Response Time of First Arriving Unit for EMS Calls

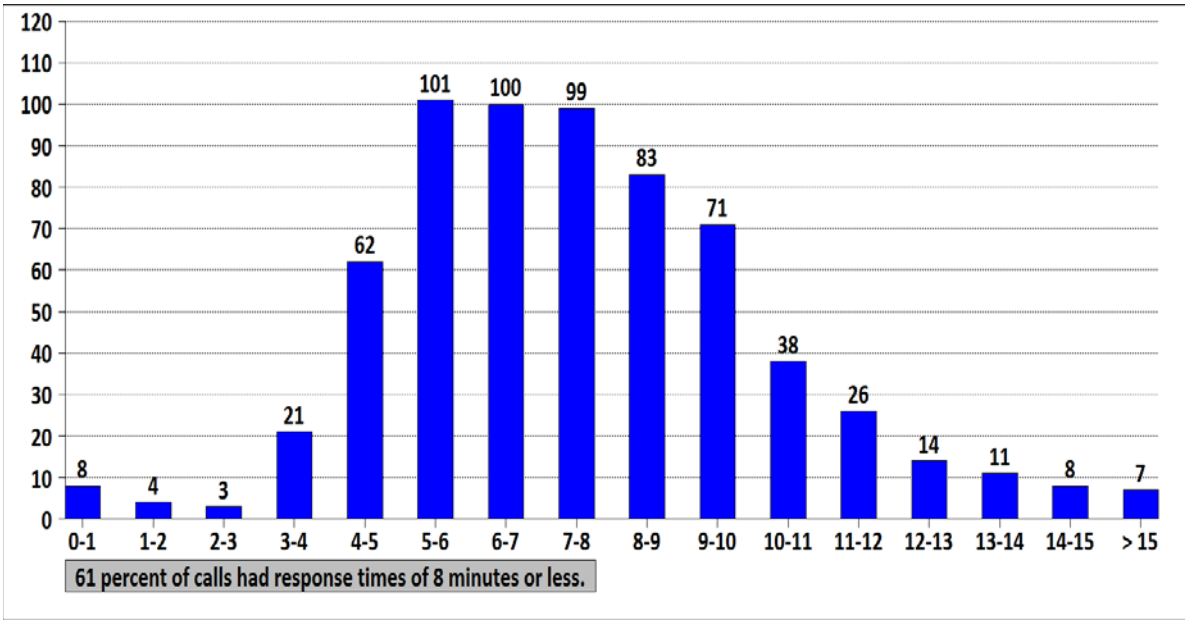


TABLE 6-16: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS Calls

Response Time (minute)	Frequency	Cumulative Percentage
0 - 1	8	1.2
1 - 2	4	1.8
2 - 3	3	2.3
3 - 4	21	5.5
4 - 5	62	14.9
5 - 6	101	30.3
6 - 7	100	45.6
7 - 8	99	60.7
8 - 9	83	73.3
9 - 10	71	84.1
10 - 11	38	89.9
11 - 12	26	93.9
12 - 13	14	96.0
13 - 14	11	97.7
14 - 15	8	98.9
> 15	7	100.0

Observations:

- The average response time of first arriving unit for EMS calls was 7.6 minutes.
- For 60.7 percent of EMS calls, the response time of the first arriving unit was less than or equal to 8 minutes.
- For 90 percent of EMS calls, the response time of the first arriving was less than 11.1 minutes.

TABLE 6-17: Average Response Time for Structure and Outside Fire Calls by First Arriving Unit

Unit Type	First Arriving Unit	Outside Fire		Structure Fire		Total	
		Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
AMBULANCE	R8	3.1	1	7.3	1	5.2	2
ENGINE	E-1	5.9	7	5.9	5	5.9	12
Total		**5.6**	**8**	**6.1**	**6**	**5.8**	**14**

Observations:

- For outside fire calls, the average response time of the first arriving unit was 5.6 minutes.
- For structure fire calls, the average response time of the first arriving unit was 6.1 minutes.

FIGURE 6-14: Frequency Distribution Chart of Response Time of First Arriving Unit for Structure and Outside Fire Calls

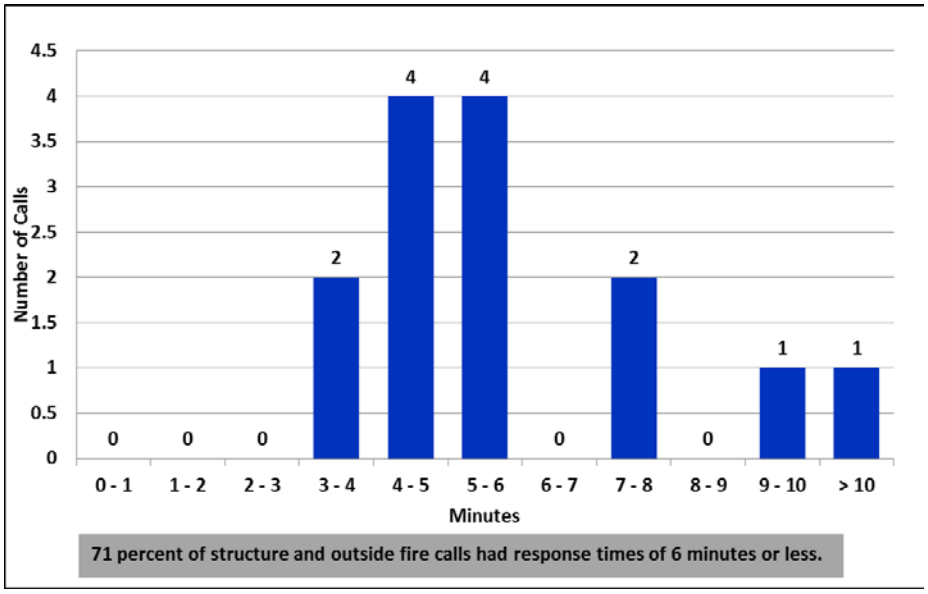
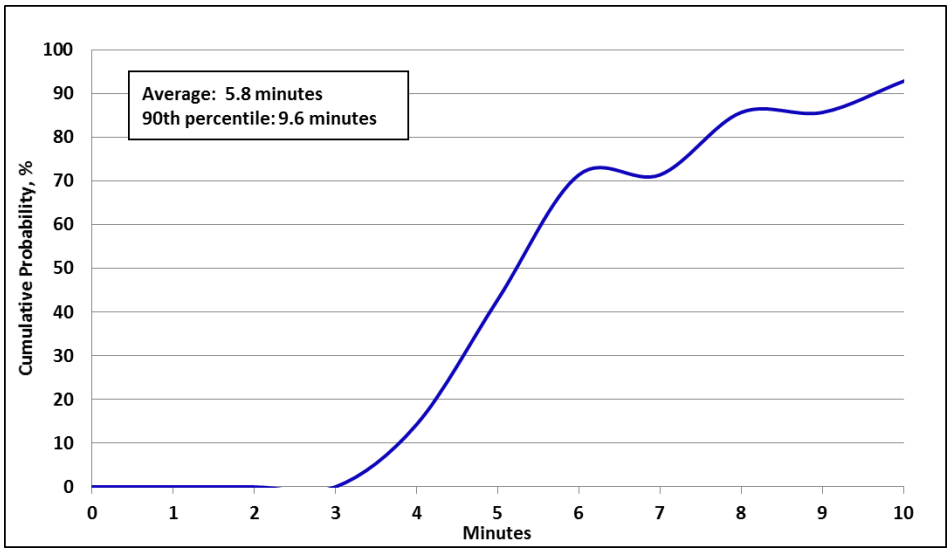


FIGURE 6-15: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for Structure and Outside Fire Calls



Observations:

- The average response time of the first arriving fire unit for structure and outside fire calls was 5.8 minutes.
- 71.4 percent of the time, the first fire unit's response time was less than 6 minutes.
- 90 percent of the time, the first fire unit's response time was less than 9.6 minutes.

Transport Call Analysis

This section analyzes the number of calls that involved transporting patients, the variations by hour of day, and the average time for each stage of transport service. We identified transport calls by requiring that at least one KFD responding ambulance had recorded either beginning to transport time or arriving at the hospital time.

TABLE 6-18: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-transport	Transport	Total	
Cardiac and stroke	29	75	104	72.1
Seizure and unconsciousness	32	44	76	57.9
Breathing difficulty	17	67	84	79.8
Overdose and psychiatric	18	47	65	72.3
MVA	13	18	31	58.1
Fall and injury	54	76	130	58.5
Illness and other	87	215	302	71.2
Interfacility transfer	0	106	106	100.0
EMS Total	**250**	**648**	**898**	**72.2**
EMS Daily Average	**0.7**	**1.8**	**2.5**	**NA**
Fire Total	270	0	270	0.0
Mutual aid	37	9	46	19.6
Canceled	25	0	25	0.0
Total	**582**	**657**	**1,239**	**53.0**
Daily Average	**1.6**	**1.8**	**3.4**	**NA**

Observations:

- Overall, 72 percent of EMS calls to which KFD responded involved transporting patients.
- On average, KFD responded to 2.5 EMS calls per day, and 1.8 involved transporting patients.
- Besides interfacility transfer calls, breathing difficulty calls had the highest transport rates, averaging 79.8 percent.
- KFD also transported patients in nine mutual aid calls.

TABLE 6-19: Call Duration by Transport and EMS Call Type

Call Type	Non-Transport		Transport	
	Duration	Number of Calls	Duration	Number of Calls
Cardiac and stroke	23.2	29	68.2	75
Seizure and unconsciousness	23.5	32	66.6	44
Breathing difficulty	24.7	17	69.7	67
Overdose and psychiatric	32.8	18	69.8	47
MVA	20.3	13	63.8	18
Fall and injury	21.3	54	66.1	76
Illness and other	34.0	87	66.7	215
Interfacility transfer	NA	0	58.2	106
EMS Total	**27.2**	**250**	**65.9**	**648**

Note: Duration of a call is defined as the longest deployed time of any of the KFD units responding to the same call.

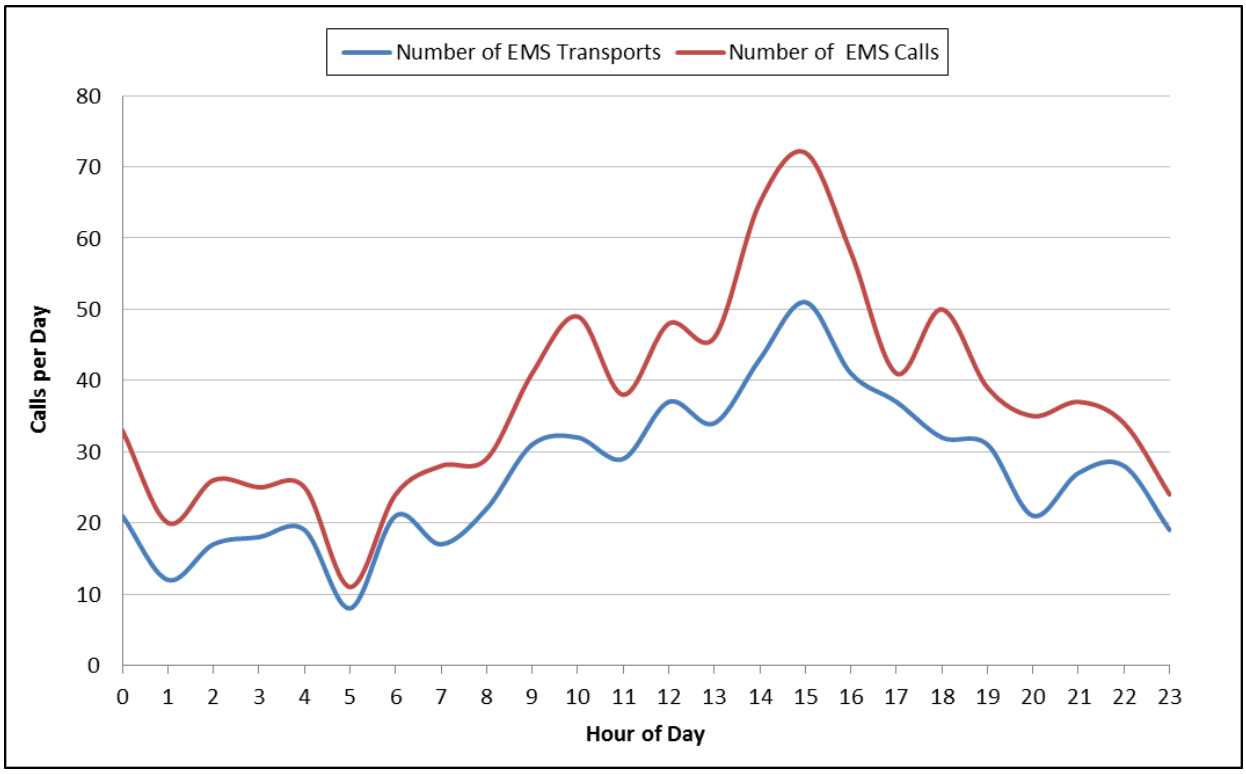
Observations:

- The average duration was 27.2 minutes for a nontransport EMS call.
- The average duration was 65.9 minutes for an EMS call which transported a patient to hospital, which is 2.4 times longer than a non-transport EMS call.
- The average duration was 58.2 minutes for an interfacility transfer call.

TABLE 6-20: Total and Number of EMS Transport Calls per Day, by Hour of Day

Hour	Number of EMS Transports	Number of EMS Calls	EMS Transports per Day	EMS Calls per Day	Transport Rate
0	21	33	0.06	0.09	63.6
1	12	20	0.03	0.05	60.0
2	17	26	0.05	0.07	65.4
3	18	25	0.05	0.07	72.0
4	19	25	0.05	0.07	76.0
5	8	11	0.02	0.03	72.7
6	21	24	0.06	0.07	87.5
7	17	28	0.05	0.08	60.7
8	22	29	0.06	0.08	75.9
9	31	41	0.08	0.11	75.6
10	32	49	0.09	0.13	65.3
11	29	38	0.08	0.10	76.3
12	37	48	0.10	0.13	77.1
13	34	46	0.09	0.13	73.9
14	43	65	0.12	0.18	66.2
15	51	72	0.14	0.20	70.8
16	41	58	0.11	0.16	70.7
17	37	41	0.10	0.11	90.2
18	32	50	0.09	0.14	64.0
19	31	39	0.08	0.11	79.5
20	21	35	0.06	0.10	60.0
21	27	37	0.07	0.10	73.0
22	28	34	0.08	0.09	82.4
23	19	24	0.05	0.07	79.2

FIGURE 6-16: Annual Number of EMS Transport Calls, by Hour of Day



Observations:

- Overall, 72 percent of EMS incidents to which KFD responded involved transporting patients.
- On average, KFD ambulances responded to 2.5 EMS calls per day, and provided 1.8 EMS transports per day.
- KFD-responded EMS call rates and transports were highest between 2:00 p.m. and 4:00 p.m.

Deployed time is the interval from unit dispatch time through unit clear time. The on-scene time is the interval from the unit arriving on-scene time through the time the unit departs the scene for the hospital. Travel to hospital time is the interval from the time the unit departs the scene to travel to the hospital through the time the unit arrives at the hospital. The travel back to station time is the interval from the unit arriving at hospital time through unit clear time. The travel back to station time includes patient turnover time at the facility.

TABLE 6-21: Time Component Analysis for Ambulance Transport Runs by Call Type

Call Type	Average Deployed Minutes per Run	Average On Scene Time	Average Travel to Hospital Time	Average Travel back to Station Time	Sample Size
Cardiac and stroke	67.8	17.2	15.8	30.6	75
Seizure and unconsciousness	66.3	18.1	16.0	27.7	44
Breathing difficulty	69.5	17.8	16.3	30.8	67
Overdose and psychiatric	69.8	19.1	16.3	29.7	47
MVA	63.5	57.9	14.4	29.0	18
Fall and injury	66.1	16.6	17.4	28.7	76
Illness and other	66.5	16.3	16.1	29.4	215
Interfacility transfer	58.2	13.6	17.3	11.3	106
EMS Total	**65.7**	**17.8**	**16.4**	**26.6**	**648**

Note: This analysis only includes ambulance runs that can be identified as transport runs.

Observations:

- On average, the KFD ambulance spent 17.8 minutes on scene, and then spent 16.4 minutes travelling from scene to hospital, lastly spent 26.6 minutes to turn over the patient and travel back to station.

Attachments

Table 6-22 reports property and content loss for structure and outside fire calls in the Kenai Fire Department's jurisdiction. Table 6-23 analyzes primary extinguishment actions taken by all KFD units to mitigate structure and outside fire calls in the Kenai Fire Department's jurisdiction.

TABLE 6-22: Property and Content Loss Analysis for Structure and Outside Fire Calls

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Structure fire	$181,250	7	$7,500	4
Outside fire	$9,000	5	$200	1
Total	$190,250	12	$7,700	5

Note: This analysis only includes calls with property loss or content loss greater than 0.

Observations:

- Out of 9 structure fire calls, seven calls had recorded property loss, with total recorded loss value of $181,250. Total content loss was $7,500.
- Out of 16 outside fire calls, five calls had recorded property loss, with total recorded loss value of $9,000. Total content loss was $200.

TABLE 6-23: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure fire	Outside fire
Fire control or extinguishment, other	0	1
Extinguishment by fire service personnel	7	8
Salvage & overhaul	0	1
Ventilate	1	0
Investigate	1	5
Investigate fire out on arrival	0	1
Total	**9**	**16**

Observations:

- A total of 7 structure fire calls were extinguished by fire service personnel.
- A total of 9 outside fire calls were extinguished or controlled by fire service personnel.

END