Final Report
Fire Operations and Data Analysis

City of Wyoming, Michigan
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ICMA *Center for Public Safety Management*
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ICMA
Leaders at the Core of Better Communities

Background

About ICMA

The International City/County Management Association (ICMA) is the premier local government leadership and management organization. Since 1914, ICMA's mission has been to create excellence in local governance by developing and advocating professional local government management worldwide. ICMA provides an information clearinghouse, technical assistance, training, and professional development to more than 9,000 city, town, and county experts and other individuals throughout the world.

ICMA Center for Public Safety Management

The ICMA Center for Public Safety Management team helps communities solve critical problems by providing management consulting support to local governments. One of ICMA Consulting Services' areas of expertise is public safety services, which encompasses the following areas and beyond: organizational development, leadership and ethics, training, assessment of calls-for-service workload, staffing requirements analysis, design of standards and hiring guidelines for police and fire chief recruitment, police/fire consolidation, community-oriented policing, and city/county/regional mergers.

Performance Measures

The reports generated by the operations and data analysis team are based upon key performance indicators that have been identified in standards and safety regulations and by special interest groups such as the International Association of Fire Chiefs, International Association of Fire Fighters, Association of Public Safety Communication Officials International, and through the Center for Performance Measurement of ICMA. These performance measures have developed following decades of research and are applicable in all communities. For that reason, comparison of reports will yield similar reporting formats, but each community's data are analyzed on an individual basis by the ICMA specialists and represent the unique information for that community.

Methodology

The ICMA Center for Public Safety Management team follows a standardized approach to conducting analyses of fire and other departments involved in providing safety services to the public. We have developed this standardized approach by combining the experience sets of dozens of subject matter experts who provide critical roles in data and operations assessments in the areas of police, fire and EMS. Our collective team has more than a combined 100 years of conducting such studies for cities in the United States and internationally.

The Public Safety Management team begins most projects by extracting calls for service and raw data from an agency's computer aided dispatch system. The data are sorted and analyzed for comparison to nationally developed performance indicators. These performance indicators (e.g., response times, workload by time, multiple-unit dispatching) are valuable measures of agency performance regardless of departmental size. The findings are shown in tabular as well as graphic form and are organized in a logistical format. While most of our documents' structure as well as the categories for performance indicators are standard, the data reported are unique to the cities. Due to the size and complexity of the documents, this method of structuring the findings allows for simple, clean reporting.

The team conducts an operational review in conjunction with the data analysis. The performance indicators serve as the basis for the operational review. The review process follows a standardized approach comparable to that of national accreditation agencies. Prior to the arrival of an on-site team, agencies are asked to provide the team with key operational documents (e.g., policies and procedures, asset lists, etc.). Most onsite reviews consist of interviews with management and supervisory personnel, and may include also rank-and-file officers and local government staff.

The information collected during the site visits and through data analysis results in a set of observations and recommendations that highlight strengths, weaknesses, opportunities, and threats of the areas under review. To generate recommendations, the team reviews operational documents, interviews and observations from site visits, relevant literature, statutes, regulations, industry standards, and other areas specifically included in a project's scope of work.

This standardized approach ensures that the ICMA Center for Public Safety measures and observes all of the critical components of an agency, which in turn provides substance to benchmark against localities with similar profiles. Although agencies may vary in size, priorities, and challenges, there are basic commonalities that enable comparison. The approach also enables the team to identify best practices in use throughout the country

In general, the standardized approach adopts the principles of the scientific method: We ask questions and request documentation upon project start up; confirm accuracy of information received; deploy operations and data analysis teams to research each unique environment; perform data modeling; share preliminary findings with the jurisdiction; assess inconsistencies reported by client jurisdictions; follow up on areas of concern; and communicate our results in a formal, written report.

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SECTION I: Summary of Findings and Recommendations

This report is an analysis of fire and emergency medical service (EMS) delivery by the Wyoming Fire Department. The report includes several recommendations for ways to improve these services. The report also provides data that can be used for benchmarking the department's performance against that of similar organizations. Benchmark performance information can be found in the Data Analysis section of this report.

ICMA executed a contract with the city of Wyoming to complete a comprehensive analysis of the city's fire and EMS services. This analysis is designed to provide the city with a thorough and unbiased review of all public safety and emergency services provided by the Wyoming Fire Department.

During our study, we analyzed performance data provided by the Wyoming Fire Department and undertook a firsthand review of the department's operations. This report seeks to identify ways the department can improve efficiency, effectiveness, and safety both for its members and for the community the department serves. The recommendations provided in this report may be adopted in whole, in part, or rejected. The ICMA Public Safety Management team recommends that specific objectives should be aligned with the recommendations and assigned to a specific person or group. A reporting/report card should be used to deliver input to local government administrators and elected officials.

To begin the review, the public safety management team asked the city for certain documents, data, and information. The members of the team used this information to familiarize themselves with the fire department's structure, assets, and operations. The information also was used in conjunction with raw performance data collected over a 12-month period to assess the performance of the fire department and compare that performance to benchmarks developed by the National Fire Protection Association (NFPA), Center for Public Safety Excellence, ICMA Center for Performance Measurement, and other national organizations.

ICMA's public safety team members conducted two site visits to observe fire department and support operations, interview key fire department staff, and review preliminary data and operations. The team also held follow-up telephone calls with personnel within the Wyoming Fire Department and other city agencies. Teleconferences between project staff and city officials helped clarify the city's needs, the scope of the project, and project data.

Recommendations

The data derived during the 12-month study period (November 1, 2010, through October 31, 2011) were carefully analyzed in light of the information gleaned during site visits and interviews. The findings from this information are included in this report. In addition, the report includes several recommendations for the Wyoming Fire Department and the city of Wyoming. The following recommendations are based on best practices.

1. Reorganize the department to ensure an appropriate hierarchy and consistency throughout the various ranks. The changes should include:

- Reclassifying the battalion chief position to deputy chief of operations position;
- Reclassifying two lieutenant positions to firefighter positions;
- Changing the position of fire inspector to fire marshal.

2. Consider the Public Safety Department/Public Safety Officer delivery alternative for police and fire services.

3. Develop a plan to achieve accreditation through the Commission on Fire Accreditation International.

4. Engage internal and external stakeholders to uncover the community's emergency response expectations and develop strategic and operational plans to guide the fire department in meeting these expectations.

5. Establish service delivery goals and objectives to meet recognized benchmarks and response time standards.

6. Develop written vision, mission, and values statements.

7. Undertake a periodic review of policies and procedures to ensure that they are relevant to today's environment and will help the department prepare for tomorrow's challenges.

8. Evaluate operating costs to identify potential cost savings.

9. Work with the union to negotiate a 12-hour shift to supplement 24-hour personnel during peak call times.

10. Staff all four fire stations within the city limits and engage the city of Kentwood to explore combined staffing at Station 2.

11. Work with Grand Rapids and Kentwood fire departments to explore consolidation of hazardous materials (HAZMAT) and technical rescue services.

12. Consider establishing EMS response standards based on specific medical interventions.

13. Add quick response vehicle at Station 4 to be used in place of a ladder truck for EMS response.

14. Upgrade medical certification level of medical first responder to emergency medical technician.

15. Develop and implement a quality improvement program to monitor system medical performance.

16. Establish new policy guidelines for emergency response to include both "hot" and "cold" level responses and "no response" protocols.

17. Implement medical priority dispatch system at the two public safety answering points, as prescribed in Kent County EMS Report.

18. Consider the adoption of recommendations for restructuring ambulance services included in the Kent County EMS Report.

19. Reduce the number of aerial apparatus from five to two, replacing three of the quints with less costly quick response vehicles.

20. Develop and implement a comprehensive recruitment and retention plan for paid on-call staff.

21. Work with the union to change the 50.4-hour workweek to a 56-hour workweek.

22. Develop a comprehensive training program to ensure that adequate training is provided to department staff.

23. Continue to explore new fire suppression technologies, including compressed air foam systems.

24. Work with neighboring fire departments to explore and strengthen automatic aid, mutual aid, and other opportunities for collaboration and cooperation.

These recommendations are discussed further in the body of this report.

SECTION II: Fire Operations Review and Analysis

Governance and Administration

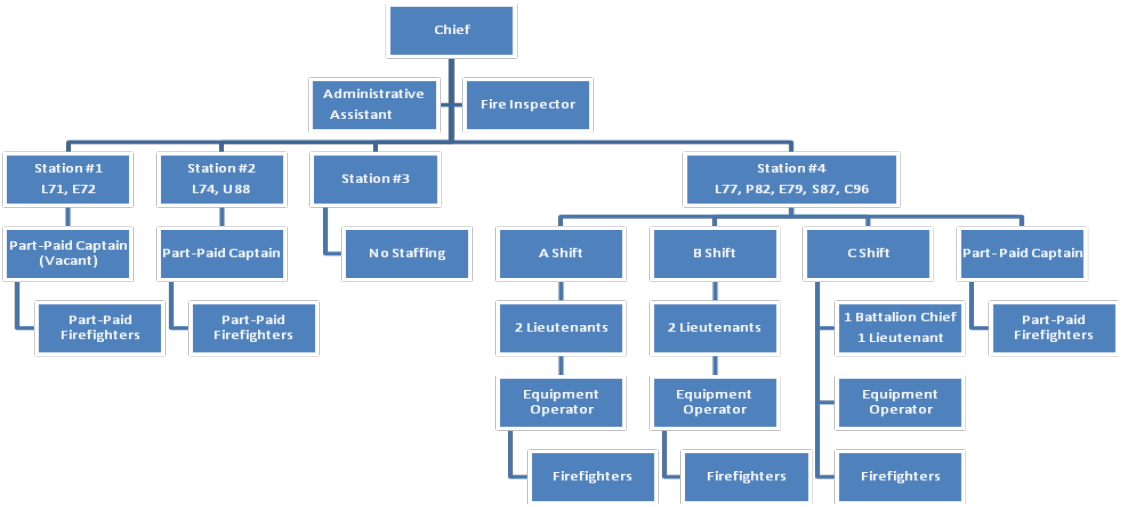
The city of Wyoming is located in Kent County in southwest Lower Michigan and borders the city of Grand Rapids, which is the second largest city in the state. According to the 2010 census, the city of Wyoming had a resident population of 72,125 living in 24.64 square miles with an estimated 28,983 housing units. In 1959, Wyoming transitioned from a township to a home-rule city. The city functions under a council-manager form of government in which the city manager is appointed by the city council and functions as the chief executive officer. The city manager, with the approval of the city council, is responsible for appointing a fire chief.

As shown in Figure 1, there are currently three personnel that make up the department's Administrative Division: the fire chief, fire inspector, and an administrative assistant. Chief Bob Austin is a long-serving member of the Wyoming Fire Department and has served both as a part-paid and as a career fire department member.

The Wyoming Fire Department is a combination department that utilizes both career (full-time) and part-time paid (part-paid) staff. The Suppression Division consists of twenty-two (22) career personnel: one (1) battalion chief, five (5) lieutenants, three (3) equipment operators, and thirteen (13) firefighters. All career suppression personnel work a 50.4 hour workweek based on a 24-hour shift, which requires three shifts to staff the department 24 hours a day, 365 days per year. All career personnel except the chief and administrative assistant are represented by the International Association of Firefighters, Local 2758.

The Wyoming Department also has 21 part-paid personnel assigned to three stations (1, 2, and 4). These personnel are Michigan-certified firefighters who typically work another job. By design part-paid employees carry a department-supplied pager and respond to the fire station when available for predefined call types. Once at the station, part-paid personnel respond in a fire department vehicle to assist career personnel. The part-paid personnel

FIGURE 1: Current Organizational Chart



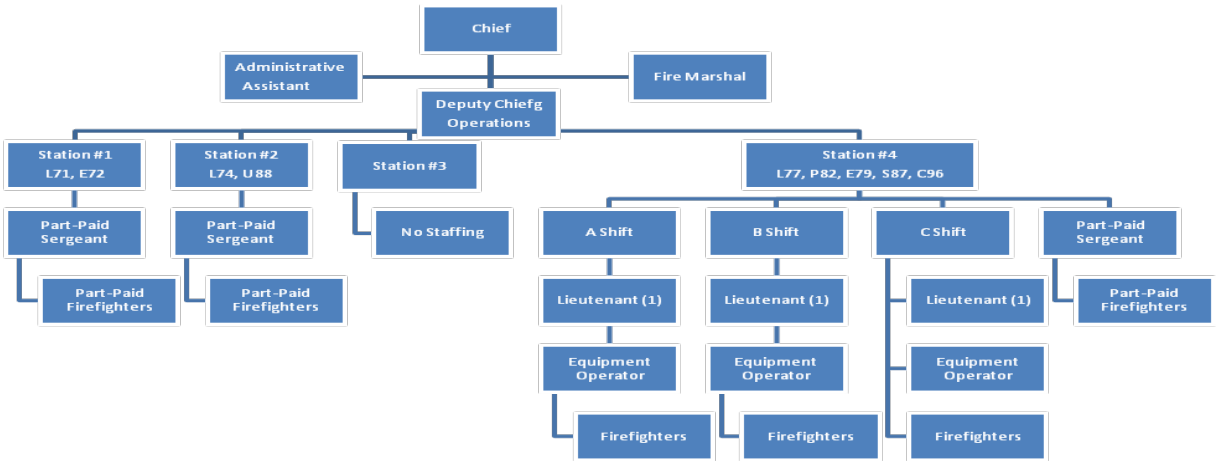
only receive compensation (hourly) when they are activated and do not have any required response benchmarks.

There is an imbalance in the various ranks within the organization because some part-paid personnel outrank career personnel. For instance, the position of part-paid captain currently outranks a career lieutenant. This should be addressed by changing the job title of the part-paid captain to part-paid sergeant. In addition, the work the fire inspector is doing was previously done by a fire marshal. The fire inspector should be reclassified to fire marshal.

There are other staffing inconsistencies as well. One shift functions with firefighters on the medical squad, whereas the other two shifts do so only occasionally. Two of the lieutenant positions should be eliminated. Two shifts currently operate without a battalion chief; the remaining battalion chief works a 24-hour shift representing only one-third of the shifts per year. To remedy this situation, the battalion chief position should be reclassified as a deputy chief of operations position that would be responsible for the day-to-day operations of the department, recruitment and retention, training, data and statistical analysis, equipment, and strategic planning. This would enable the fire chief to focus on organizational issues, establishing clear policies, and finding ways to improve operations, and implementing change to prepare the department for the future.

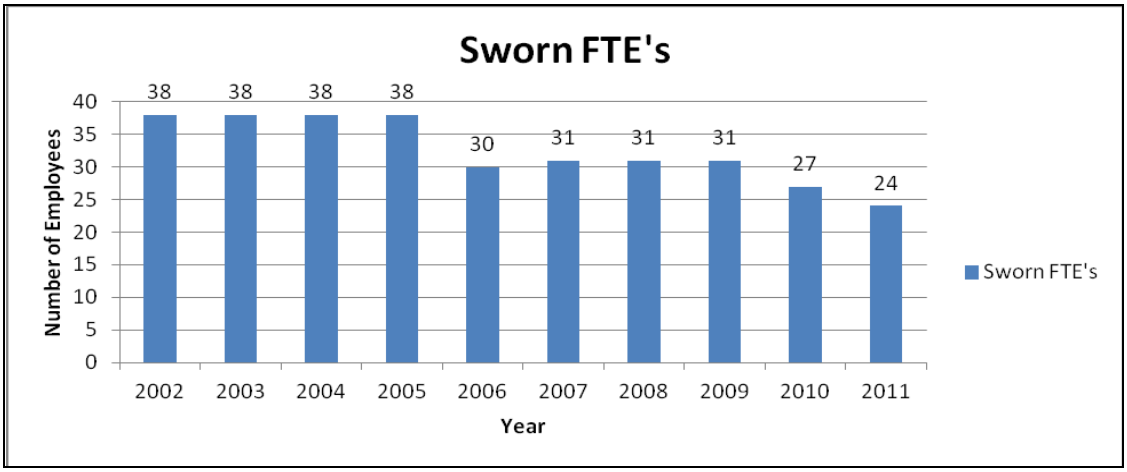
The recommended changes are incorporated into the proposed organizational chart presented as Figure 2. These recommendations would be cost neutral because a lieutenant's wages are 10 percent higher than the wages of firefighter positions. The deputy chief's position would be roughly 10 percent higher than the battalion chief's wages. Reclassifying the fire inspector position as a fire marshal would likely result in an additional 5 percent increase in wages. Changing the job title of the part-paid captain to part-paid sergeant is strictly a reclassification and has no financial impact.

FIGURE 2: Proposed Organizational Chart



As shown in Figure 3, the size of the department has declined over the past nine years. Budget cuts and staffing reductions have had an impact on morale within the department. These morale problems may be exacerbated by the lack of a clear agreed-upon vision or mission, which can help to unify a department.

FIGURE 3: Historical FTE Count



In addition, it appears that the city of Wyoming has not acted upon ICMA's previous recommendations. However, the city of Wyoming has been engaged with the cities of Grand Rapids and Kentwood on consolidation issues over the past three years. The city of Wyoming has structured its police officers' labor agreement to allow for the transition to a public safety department. Negotiations continue with the Wyoming Fire Department and police command unit regarding the public safety model. The general employees union has also been engaged to complete fire training as an effort to augment staffing.

Recommendation:

- Reorganize the department to ensure an appropriate hierarchy and consistency throughout the various ranks. The changes should include:
- Reclassifying the battalion chief position to deputy chief of operations position;
- Reclassifying two lieutenant positions to firefighter positions;
- Changing the position of fire inspector to fire marshal.

An alternative to the traditional deployment of resources is the Public Safety Officer form of service delivery. In this form of service delivery, some—and in some instances all—members of both the police and fire agencies are cross-trained to deliver both categories of public safety services in an efficient and effective manner.

Wyoming should consider creating a "partially consolidated" public safety department comprised of individuals who may be either cross-trained as public safety officers or singly trained as police officers or firefighters. The success of a partially consolidated agency depends on having individuals work together as a team regardless of their specific training and that they are supervised by an individual who is trained in all skills. Thus, teams would be comprised of police officers, firefighters, and public safety officers under the supervision

of a cross-trained supervisor. Ideally, this would occur with all team members working the same shift.

Although the cross-training of command staff is less critical, the cross-training of individuals responsible for incident command duties is essential. The more exposure the command staff has to all aspects of the public safety mission, the better the decision-making will be both administratively and operationally. In any transition from a traditional public safety structure, there is concern by rank-and-file members who are not cross-trained (particularly firefighters) that managers do not understand their work. To avoid this pitfall, managers will need to establish open and positive communication. Having managers come from both sides of the equation—police and fire—and be cross-trained in both types of services will help ensure that this happens.

Establishing a partially consolidated department does not preclude ending up with a fully cross-trained agency. As singly-trained personnel leave the agency, they can be replaced by cross-trained personnel. Ultimately, the agency would be comprised fully of public safety officers, but this may take considerable time if the city chooses to retain individuals who are unwilling to be cross-trained. (In Kalamazoo the transition to the public safety model took almost thirty years).

The public safety director should hold the title of Police and Fire Chief to give clarity that this individual is responsible for all public safety activities. One person should be designated as the fire administrator responsible for ensuring that all areas related to fire suppression and prevention are properly managed. This position could hold the rank of commander or deputy chief. A similar position should be established for law enforcement functions. However, neither of these positions should be designated as police or fire chief. Doing so detracts from the authority of the public safety director. Figure 4 illustrates a proposed organizational chart for a Public Safety Department.

FIGURE 4: Proposed Public Safety Department Organizational Chart

The value and efficiency in having all personnel meet the same training requirements and share the same public safety philosophy are realized through consistent pay structuring, job tasking, program merging, and organizing available personnel to meet the public safety requests for service in a community. Additional efficiencies are realized through combining all administrative functions in one agency as well as by combining the consolidated public safety model with other recommendations in this report. such as increasing paid-on call staff and using quick response vehicles for fire service delivery.

Recommendation:

- Consider the Public Safety Department/Public Safety Officer delivery alternative for police and fire services.

Assessment and Planning

In any community, the process of determining fire department resource deployment is inextricably linked to the risk assessment and planning process. In general, the fewer resources a community has to provide emergency response and mitigation, the more risk a community assumes. Being well-prepared to handle emergencies lessens community risk.

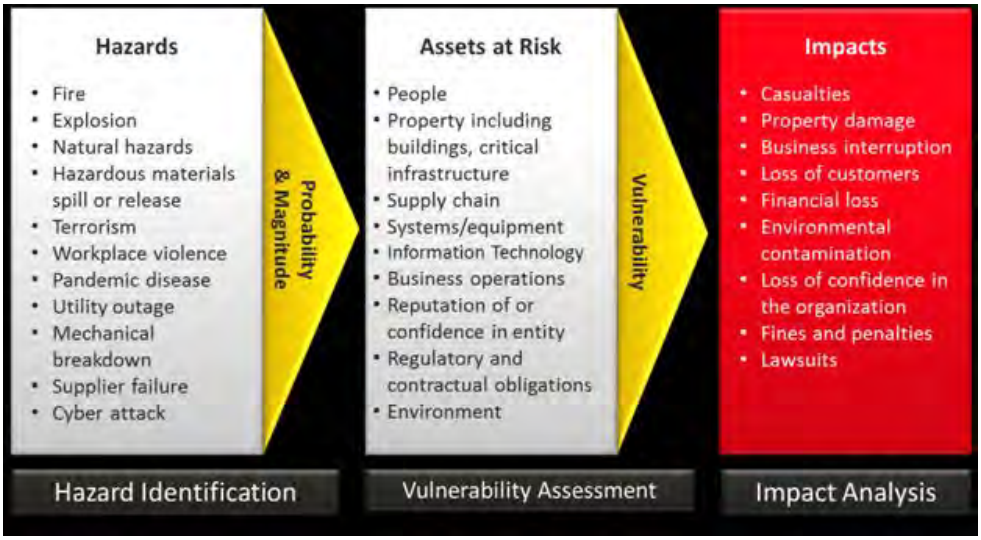
While there is no one best way to determine what type of deployment model to adopt or the number and types of resources to deploy, the specific risks that exist in the community can serve as a valuable starting point. A risk assessment also can help key stakeholders to determine whether the community's expectations for fire protection are in line with the fire department's capabilities. Figure 5 highlights the risk assessment model proposed by the Federal Emergency Management Agency (FEMA).

There are many resources that can help guide the risk assessment and planning process. A great resource for understanding risk management in the fire service is the 2010 edition of National Fire Protection Association (NFPA) Standard 1250, Recommended Practice in Emergency Service Risk Management, which outlines and recommends best practices in emergency services organizational risk management.[1]

The Wyoming Fire Department should conduct and periodically update a community fire risk analysis and assessment as part of a comprehensive needs assessment. This process would enable the department to determine what assets within the community are at greatest risk and what resources are available or needed to effectively deal with those risks. There are a number of other benefits that can be gained from using a standard methodology for classifying and recording a community's risks. First, the information gathered can be assembled into a database for use when needed and for training and routine communication. Second, because fire is not the only risk faced by a community, the asset information can be used to develop and revise disaster plans. Finally, the information can be used for the purpose of meeting fire department accreditation requirements.

[1] See National Fire Protection Association, "NFPA 1250: Recommended Practice in Emergency Service Organization Risk Management," http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=1250&cookiepercent5Ftest=1.

FIGURE 5: Risk Assessment Model



Source: FEMA Risk Assessment Model, http://www.ready.gov/risk-assessment.

One tool that can be used to evaluate an entire community in relation to fire risk is Vision™ Risk Assessment, available through a private company called Emergency Reporting™. This product replaced the Risk, Hazard and Value Evaluation (RHAVE) software once available at no cost through the U.S. Fire Administration. The mention of Vision is not meant to serve as an endorsement, but rather as one example of the many tools available for this purpose.

The basic premise of the assessment process is to enable a department to derive a fire risk score for each property, which can then be used to categorize the property as one of low, moderate, or high/maximum risk. Once completed, the risk ratings of individual properties can then be aggregated to establish a risk level of low, moderate, or high/maximum for each geographic area of the community. These ratings are then used to determine the appropriate level of fire suppression resources needed in the form of equipment, personnel, and vehicles to be deployed for the initial arriving unit, the full alarm assignment, and any additional alarm assignments for each level of risk.

Figure 6 shows how the various plans, reports, and data are used in a needs assessment. Two of these tools—fire service accreditation and the Insurance Services Office (ISO)—are discussed in more detail below.

FIGURE 6: Emergency Service Organization Needs Assessment

Fire Service Accreditation

The accreditation process managed by the Commission on Fire Accreditation International (CFAI) and established through the Center for Public Safety Excellence (CPSE) provides an analytical self-assessment process to evaluate ten categories of fire department performance. This detailed self-assessment causes managers to examine more than 200 separate performance indicators, about 100 of which are considered core, or required, competencies. The performance indicators fall into ten categories: assessment and planning, essential resources, external systems relations, financial resources, goals and objectives, governance and administration, human resources, physical resources, programs, and training and competency.[2]

Integrated within these categories is an expectation for the community to analyze itself by planning zones and for each planning zone to identify the hazards posed. The community then ranks the hazards by potential severity to ensure that the appropriate resources are available to manage the hazards. There is a cost associated with the accreditation process conducted by the CFAI; however, a department can purchase the standard of coverage manual and its accompanying self-assessment manual at a nominal fee of less than $200. Even if the Wyoming Fire Department chooses not to pursue formal accreditation, it should consider using self-assessment reference materials as a blueprint for improving overall fire department administration and operations.

[2] David T. Endicott, "Performance Management," in *Managing Fire and Emergency Services,* ed. Adam K. Thiel and Charles R. Jennings (Washington, D.C.: ICMA, 2012), 394.

Recommendation:

- Develop a plan to achieve accreditation through the Commission on Fire Accreditation International.

ISO Rating

Another valuable assessment and planning tool available to fire departments is the Insurance Services Office (ISO), an arm of the insurance industry that rates the fire protection systems in cities throughout the United States. ISO representatives visit each community, collect records, and observe the components of the local fire protection system, including such elements as hydrants and other water supply systems, apparatus and equipment, staffing, training records, and dispatch facilities. Their observations are combined with inspections of selected properties to determine fire flows needed for fire suppression. The ISO then uses this data to determine a numerical grade for the fire department. The grades range from 1 to 10 (with 1 being the best). The criterion that is used to evaluate the fire department is based on water supply (40 percent); communications/dispatch (10 percent); and fire suppression capability (50 percent).

The ratings and associated data are made available to insurance companies to help them determine fire insurance rates. The Fire Suppression Rating Schedule (FSRS) is not used by all insurance companies, and does not take in to account the target hazards in a community. However, the assigned rating can be useful in conjunction with other assessments to evaluate the fire departments' ability to protect the community from fire. The Wyoming Fire department has an (ISO) rating of 4 for the areas nearest to Stations 1, 2, and 4. The area previously served by Station 3 (the southwestern part of Wyoming) received the lowest possible ISO rating of 10, indicating that it has no recognized fire protection.

Additionally, the NFPA provides consensus standards utilized by fire departments as planning tools. NFPA 1710, "Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations, to the Public by Career Fire Departments," provides guidance and benchmarks for resource deployment and response time criteria.

Goals and Objectives

The Wyoming Fire Department lacks a strategic plan outlining departmental goals, objectives, and priorities. In general, strategic planning results in organizational change to build on the identified strengths and correct the identified deficiencies. The *Chief Fire Officer's Desk Reference* outlines the principles and practice of a strategic plan.

> "The strategic plan should provide a well-thought-out approach to managing the operations. The fire chief should organize a strategic planning team to evaluate and make strategic recommendations for service improvements. The planning team should review the service history and compare the results to the service expectations of the community (as guided by political leaders). The process of developing a strategic plan may provide one of the first indications of a service

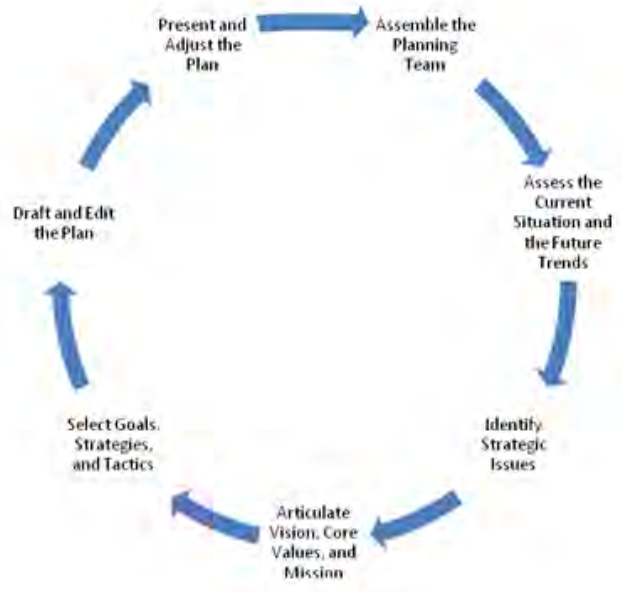
> weakness in the area, such as a new station to be planned based on community growth."[3]

As depicted in Figure 7, which highlights the main tasks involved, strategic planning is part of an ongoing process in which the knowledge derived during each step feeds into the next. Within the context of the strategic plan, the department should develop specific goals for limiting property loss and injury, improving response times, and other performance data.

The Wyoming Fire Department lacks vision, mission, and values statements—elements that should inform and be tied directly to the strategic plan. Ensuring that change is in accordance with the vision, mission, and values of the organization can be difficult without first clearly identifying these elements. In *Managing Fire and Emergency Services,* I. David Daniels defines and outlines some of the advantages of each of these elements:

> "The function of the vision is to keep the organization focused on the future, on the benefit the customer will receive if the organization is successful, and on the organization's contribution to the jurisdiction's success. … While a vision statement describes the journey, a mission statement provides the 'road signs' that will keep the organization on the right road. The mission statement describes the organization's activities (its reason for existing) and defines the organization's journey in terms of tactical implementation of strategic goals."[4]

FIGURE 7: Strategic Planning Process Model



[3] John M. Buckman III (ed.), *Chief Fire Officer's Desk Reference* (Fairfax, VA: International Association of Fire Chiefs, 2009), 26.

[4] I. David Daniels, "Leading and Managing," in *Managing Fire and Emergency Services,* ed. Adam K. Thiel and Charles R. Jennings (Washington, D.C.: ICMA, 2012), 216.

Values statements also can be integral to organizations by helping them articulate what is important. The values statement is essentially a short list of principles that help guide an organization toward its vision. "Values help organization leaders and managers at the strategic, tactical, and task levels evaluate right and wrong with respect to how they should interact with the service delivery system," writes Daniels. [5] As with strategic planning, there are many resources that departments can use to develop vision, mission, and values statements. One of the first steps may be to review the statements developed by other fire departments.

The Wyoming Fire Department also should have an action plan outlining specific steps to achieve its goals and objectives, the date each step should be completed, and the party responsible for each. An action plan will help the organization establish priorities and stay on track. Ongoing monitoring of the action plan should be undertaken to hold people accountable for deliverables and make adjustments where needed.

The fire chief and other managerial leaders within the department should oversee the strategic planning process and the development or written vision, mission, and values statements. However, it is important to involve key stakeholders within and outside the department to ensure that these are in line with the expectations of the community and personnel at various levels of the organization.

In any organization, the written policies and procedures help to define and clarify expected actions and behaviors of employees. The Wyoming Fire Department lacks a rigorous review process for its standard operating procedures (SOPs). The fire department would benefit from reviewing its SOPs to ensure that they are relevant to today's environment and community expectations. In the future, regular review of the SOPs should help ensure that the department keeps up with changes in an increasingly dynamic organizational environment.

Recommendations:

- Engage internal and external stakeholders to uncover the community's emergency response expectations and develop strategic and operational plans to guide the fire department in meeting these expectations.
- Establish service delivery goals and objectives to meet recognized benchmarks and response time standards.
- Develop written vision, mission, and values statements.
- Undertake a periodic review of policies and procedures to ensure that they are relevant to today's environment and will help the department prepare for tomorrow's challenges.

Financial Performance

The city of Wyoming has an adopted general fund budget of $29.5 million for FY2012. The fire department's allocation of the budget is $4.25 million, or 14.5 percent of the general fund expenditures. This equates to $170,000 per full-time employee (FTE) position (based

[5] Daniels, "Leading and Managing," 216.

on 25 FTEs), which does not include the cost for the 21 part-paid personnel or other associated costs to operate the fire department. In comparison, the Wyoming Police Department is allocated $14.9 million, or 51 percent of the FY2012 budget.

Another relevant comparison may be the Kentwood Fire Department. As shown in Figure 8, the Kentwood Fire Department has a significantly higher budget than the Wyoming Fire Department. However, the operating costs for Wyoming Fire Department are substantially higher. Wyoming operates out of just one station 24 hours a day, whereas Kentwood fully staffs three fire stations staffed 24 hours a day. Kentwood has a staffing level of 43 FTEs (including non-sworn personnel) with a FY2012 operating budget of $5.9 million out of a $28.7 million GF budget. This equates to $137,209 per FTE to operate the fire department including all costs. The Kentwood Police Department budget is $10.4 million or 42.8 percent of the FY2012 budget. The comparison suggests that significant savings could accrue from using a different model (e.g. capital expenditures, equipment, facilities, number and type of apparatus, maintenance, and so forth).

FIGURE 8: Annual Budgets of WFD and KFD

	Population	Budget	Per Capita Expenditure
WFD	72,125	$4.25 million	$58.93
KFD	48,707	$5.90 million	$121.13

In the FY 2009–2010 budget, the initial budget for the Wyoming Fire Department was $4.73 million; the rental of fire equipment was $369,500 with another $145,000 budgeted for maintenance for a total of $514,500, or 10.9 percent of the allocated budget. An additional $320,930 was paid for building rentals. The combined expenditures of $835,430 equates to 17.7 percent of the budget. The city of Kentwood purchases its equipment outright through a capital improvement fund so it can avoid the recurring operating expenditure. The Wyoming Fire Department may consider adopting this model as a way to reduce recurring expenditures on an annualized basis.

The city should develop a comprehensive capital improvement plan that incorporates fire facilities, apparatus, and equipment and includes a replacement vehicle plan. This would enable the Wyoming Fire Department to allocate funding yearly and obviate the need to lease vehicles from the city motor pool.

Recommendation:

- Evaluate operating costs to identify potential cost savings.

Programs

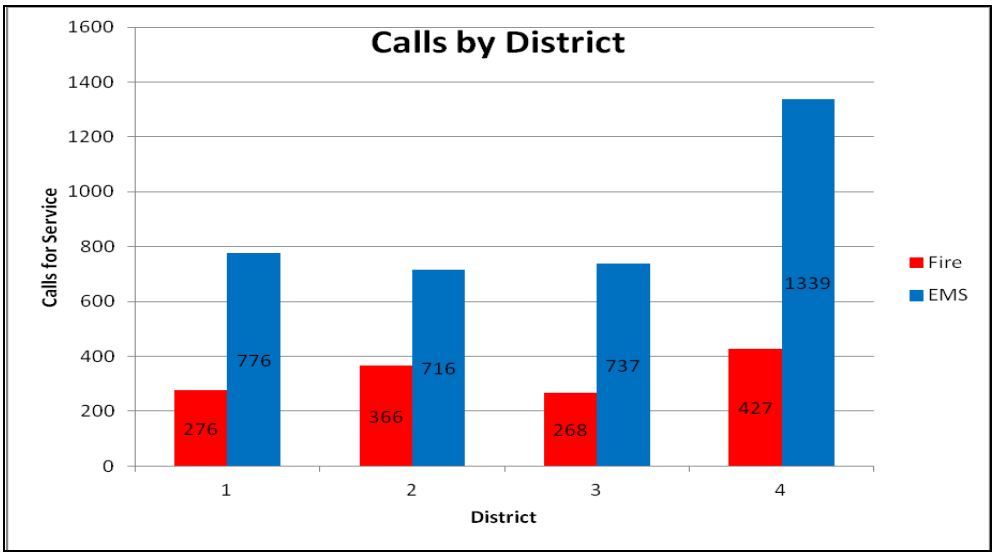
Three separate programs, each of which is integral to the mission and operations of the Wyoming Fire Department, are discussed in this section of the report: (1) Fire Suppression and Emergency Response; (2) Hazardous Materials/Technical Rescue; and (3) Emergency Medical Services.

Fire Suppression and Emergency Response

The Wyoming Fire Department operates two engines, four ladder trucks (quints), one platform (quint), two medical squads, and two utility vehicles. The fire department owns four stations, but Station 3 was closed in 2004 as part of the city's budget cuts. Of the vehicles/apparatus that the department deploys, only two units—Ladder 77 and Medical Squad 87—are staffed on a full-time basis. Both operate out of the central station (Station 4), which has a minimum staffing level of five personnel. Medical Squad 87 is a non-transporting basic life support (BLS)–licensed SUV with a minimum of two personnel assigned. Ladder 77 is a nontransporting BLS-licensed 75-foot quint that is staffed by a minimum of three personnel. These full-time units respond to all calls for service in the city of Wyoming. The remaining units at Stations 1, 2, and 4 are used by part-paid personnel.

The Wyoming Fire Department received 5,363 calls for service during the 12-month period between November 1, 2010, and October 31, 2011—an average of 14.7 calls per day. There is a relatively even distribution of calls by district, with the notable exception of District 4, where 33 percent of all calls for service occurred (Figure 9). Ladder 77 or Medical Squad 87 arrived on the scene first 98.1 percent of the time.

FIGURE 9: Calls for Service, by District

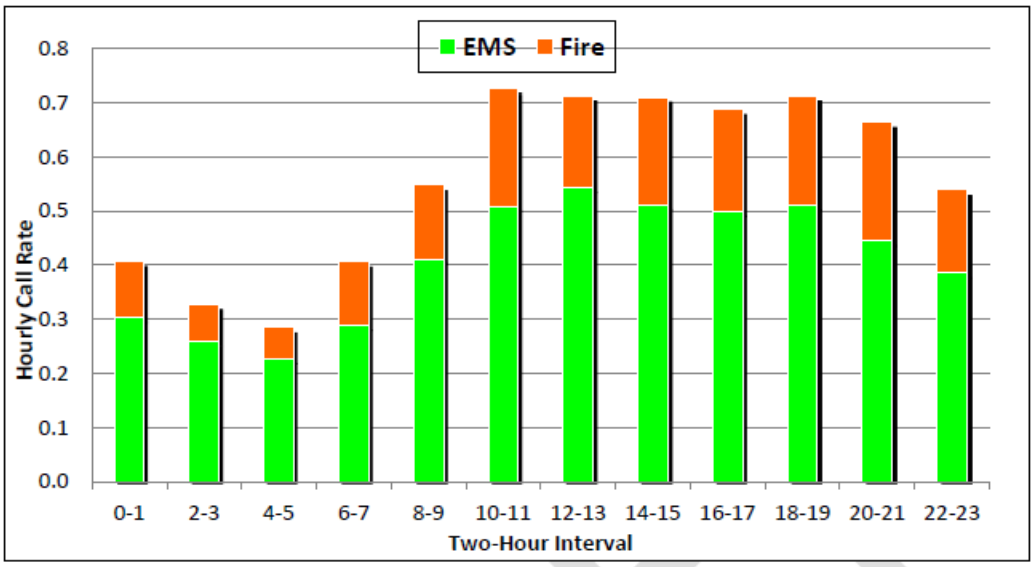


As shown in Figure 10, there is significant variation in the time of day that emergency calls for service are received. Substantially more calls for service occur between 10 A.M. and 8 P.M.

than at other hours of the day or night. This suggests that the staffing level in the Wyoming Fire Department should not be the same at all times.

The Wyoming Fire Department uses a staffing model with 24-hour shift for all full-time suppression staff. The majority of part-time paid responders are typically available after 5

FIGURE 10: Incident Types, by Hour of Day



P.M. With only two staffed units available to respond to calls for service, the department has little ability to manage peak call times. Including a new 12-hour daytime shift would help the department address the greater need for fire and EMS response at some times of the day than others.

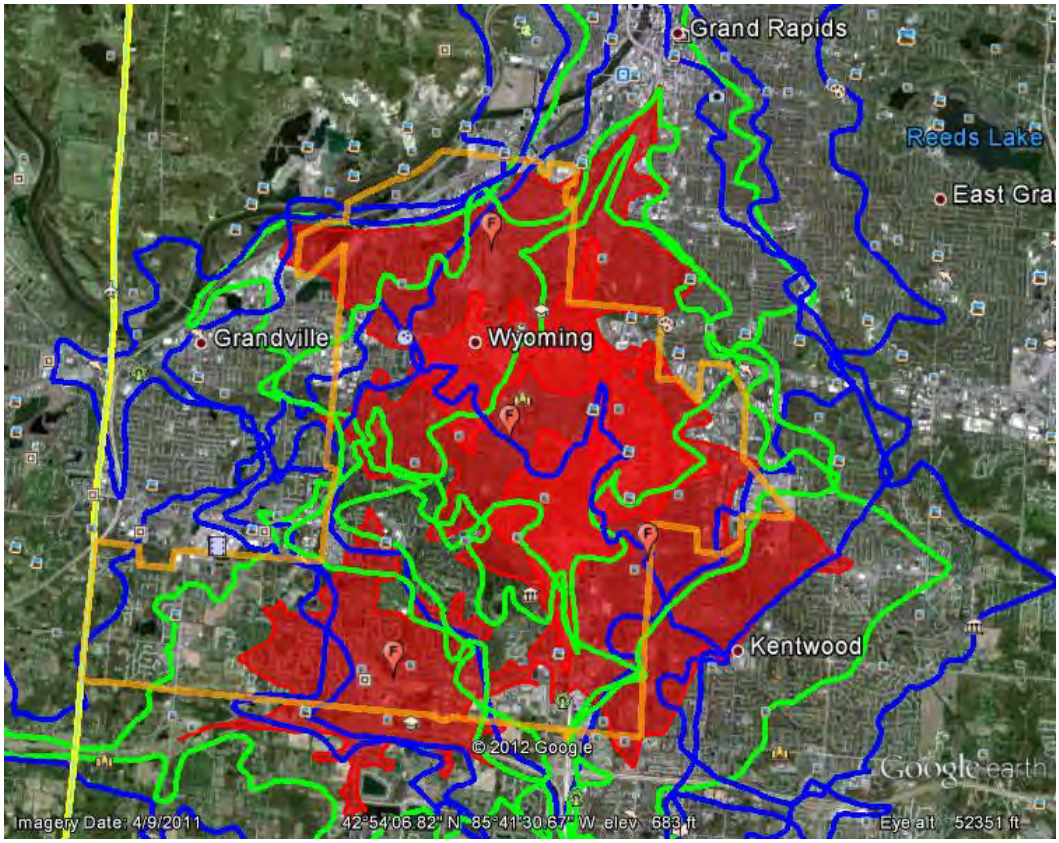
The data indicate that approximately once every 1.8 days the department responded to three or more calls in a one hour period and on average the department responded to four or more calls in an hour every 9.6 days. The busiest hours throughout the year (shown in Figure 11) further demonstrate that the Wyoming Fire Department's current deployment model interferes with its ability to meet the peak-load time periods.

FIGURE 11: Busiest Incident Days

Hour	Number of Calls	Number of Runs	Total Busy Hours
6/21/11, 8–9 P.M.	25	22	6.1
7/11/11, 11–12 P.M.	20	18	16.5
6/21/11, 7–8 P.M.	13	11	6.0
6/21/11, 6–7 P.M.	7	10	9.8
4/15/11, 5–6 P.M.	5	6	1.4
7/11/11, 10–11 P.M.	5	5	4.1
1/22/11, 6-7 P.M.	5	5	1.1
2/2/11, 6–7 P.M.	5	4	1.7
12/3/10, 7-8 P.M.	5	3	1.7
1/13/11, 1-2 P.M.	4	10	21.6

The NFPA 1710 recommends a travel time of 4 minutes or less for the first arriving engine company at a fire suppression incident. Figure 12 shows travel times for each of the Wyoming Fire Department's stations. The lighter shades of red indicate overlaps for four-minute drive times as determined by geographic information system (GIS) mapping software. Overlap of response time between Stations 1, 2, and 4 is good, but the response overlap between Stations 2 and 3 is poor.

FIGURE 12: City of Wyoming Fire Stations



Red lines = 4 minutes; Green lines = 6 minutes; Blue lines = 8 minutes

Another measure of effectiveness is the 90th percentile response time. As shown in Figure 13 (on the next page), the Wyoming Fire Department had a 90th percentile response time of 14.1 minutes for all fire category calls and 10. 5 minutes for structure fires. (This means that 90 percent of the time the first arriving unit is on the scene of the incident in10.5 minutes or less.) The first unit on scene most often was Ladder 77, which had an average response time of 7.8 minutes for outside fire calls and 8.1 minutes for structure fires. Platform 82 was the second-arriving unit most often; it had an average response time 10.6 minutes for outside fire calls and 11.6 minutes for structure fires. The average travel time for the first-arriving unit was between 4.5 and 5.8 minutes. For all fire units, the average response time for the first-arriving unit for structure fire calls was 8.7 minutes. The first unit arrived within 6 minutes only 9 percent of the time.

According to NFPA recommendations, total response time for the arrival of the first engine company at a fire suppression incident should be approximately 6.5 minutes or less.

When looked at in totality, the data reveal that the current staffing and resource deployment model is woefully inadequate to provide timely fire protection to the community (relative to response times).

The Wyoming Fire Department's response time for the first-arriving unit (with three to five personnel) falls far short of this response standard. In order to achieve adequate staffing levels and meet peak time demands, two staffing changes are recommended. First, the Wyoming Fire Department should change the workweek for suppression personnel from the current 50.4 hours to 56 hours per week. (See further discussion in the section on human resources and staffing, beginning on page 22.)

FIGURE 13: 90th Percentile Response Times for Fire Calls

Call Type	Response Time
Structure fire	10.5
Outside fire	10.2
Hazard	15.3
False alarm	13.9
Good intent	13.5
Public service	14.7
Fire Total	**14.1**

In addition, the city should consider staffing at least three personnel at each of the four fire stations to handle fire category calls. This would be difficult for the WFD to achieve as a standalone department, however, because it would require roughly twenty additional FTEs. At entry-level wages (which amounts to roughly $80,000 per FTE when benefits are included), this would cost approximately $1.6 million; the cost would increase to $1.8 million when top wages are reached. Although these costs are prohibitive for the Wyoming Fire Department to staff at this level, maintaining current service and staffing levels has considerable risks as well.

The problem points to another solution. Because of the geographic location of WFD's Station 2 (adjacent to Wyoming's border with the city of Kentwood) and KFD's Station 3, shared staffing would provide an excellent opportunity for the two cities to meet their needs at reasonable cost. The staffing could be accomplished by paid on-call personnel during peak load times.

A shared staffing model at Station 2 would help both Wyoming and Kentwood realize significant savings in personnel costs while also improving service delivery. Rather than the $1.6 to $1.8 million cost of a standalone department, this solution would reduce the number of FTEs needed, equaling a cost savings of $360,000 to $405,000. (Further discussion of consolidation and resource sharing is included in a Phase II report to be submitted in June 2012.)

Recommendations:

- Work with the union to negotiate a 12-hour shift to supplement 24-hour personnel during peak call times.
- Staff all four fire stations within the city limits and engage the city of Kentwood to explore combined staffing at Station 2.

Hazardous Material/Technical Rescue

Each of the Grand Rapids, Wyoming, and Kentwood fire departments currently operates its own in-house hazardous materials (HAZMAT) and technical rescue team. In general, such

special teams are expensive to operate, requiring extensive initial training and continuing education. HAZMAT and technical rescue responses are high-risk emergencies with low occurrence rates. Each community could realize a better-equipped response without additional expense if the resources from each jurisdiction were combined. (This recommendation is discussed in more detail in the Phase II report on fire department consolidation to be submitted in June 2012.)

Recommendation:

- Work with Grand Rapids and Kentwood fire departments to explore consolidation of HAZMAT and technical rescue services.

Emergency Medical Services

All Wyoming Fire Department career personnel are medically trained to a minimum level of medical first responder although licensure is available through the state of Michigan Emergency Medical Service Authority at the emergency medical technician (EMT) and paramedic levels. Two medical squads respond with at least two personnel to EMS calls within the city of Wyoming.

EMS Response Times

The Wyoming Fire Department operates under the response time standards adopted by the Kent County Medical Control Authority, which has adopted the NFPA 1710 standard for career fire departments. According to ICMA data analysis, the 90th percentile travel time for EMS calls was7.0 minutes. Although this is outside the recommended standard of 4.0 minutes suggested by the NFPA, recent studies have concluded there are certain limitations associated with this time standard, specifically that there was less emphasis on response time, but only time from collapse to defibrillation. Further, the article used by the NFPA in its deliberations was published over thirty years ago and supported defibrillation within 8 minutes, a time that is unacceptable under today's standards now that public-access and first-responder defibrillation programs have been established.[6]

The data analysis observed a 90th percentile response time for EMS calls of 10.6 minutes. The previously mentioned study indicated that perhaps a better method of setting standards would be to establish response time standards for certain interventions, and not applied to EMS calls universally. Setting response time standards for initiation of CPR for cardiac arrest, epinephrine administration for anaphylaxis, and manual maneuvers for foreign body obstruction, or basic life support (BLS) or advanced life support (ALS) ventilation for a compressed airway likely represents a better clinical outcomes-based model.[7]

EMS Workload

Review of Wyoming Fire Department's current EMS workload reveals that approximately 74.2 percent of all calls for service are for medical emergencies. This is not unusual in fire departments that have expanded their service delivery model to include EMS. The move to expand the range of service to include emergency medical response is a logical approach to

[6] J.M. Goodloe and S.H. Thomas, "Emergency Medical Services Evidence-Based System Design White Paper for EMSA," (University of Oklahoma, School of Community Medicine, 2011) .p.21.
[7] Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," 24.

providing a needed service to the community. Fire stations are strategically located within the community. The fact that fire calls have dramatically declined further supports situating emergency medical response within the fire service. According to the data derived during the 12-month study period:

- Medical squad 87 is the busiest. It made 3,506 runs, averaging 9.6 runs and 175 (2 hours, 55 minutes) per day.
- Ladder truck 77 made 1,634 runs, averaging 4.5 runs and 92 minutes (1 hour, 32 minutes) per day.
- Ladder trucks 71, 74, and 76 combined made 193 runs and were busy a total of 109 hours during the year.
- Engines 72 and 79 combined made 97 runs and were busy a total of 47.1 hours during the year.
- Platform 82 made 230 runs, averaging 0.6 runs and 15 minutes of busy time per day.
- Special utility 85 made 33 runs and was busy a total of 34 hours during the year.
- Medical squad 88 made 32 runs and was busy a total of 24 hours during the year.

An important measure in operating efficiency in emergency medical services is unit hour utilization (UHU). An individual UHU is the ratio of time that an EMS unit is engaged on calls compared to the total on-duty time of the unit. The departmental UHU is the figure for all units combined. If a unit was on duty for 24 hours and was engaged in calls for eight of those hours, its UHU would have been 0.33 for that period. This is an approximation based on an assumption of one hour per call. Although not all may agree, a consensus among EMS experts considers a desirable range for UHU to be between 0.25 and 0.50 with an optimum being around 0.40. [8] Rates higher than 0.50 increase the risk of overuse and employee burnout, lack of available units during simultaneous emergencies, and inadequate preparation for the next call. Rates lower than 0.25 signal underutilization and inefficiency. UHU calculations are precise in some reports and approximate in others, with approximations often based on an assumption of one hour per call. With this approximation, a UHU of 0.40 is achieved by a unit handling two calls every five hours.[9] For the purpose of this study an approximation was used in calculating UHU.

Review of the WFD's daily runs shows that only medical squad 87, which had an average 9.6 runs per day, fell within the desired range for UHU operational efficiency at the optimum level of 0.40. All other units fell below the bottom range of 0.25 which for fire suppression units included all fire calls. With the exception of special utility 85, which logged an average busy minutes of 62.3, all units had average busy time per call of less than one hour.

Ladder 77 had 717 EMS calls, which accounted for 44 percent of its total responses. This represents unnecessary wear and tear on the most expensive apparatus in the fleet. The use of aerial apparatus in emergency medical response causes increased breakdowns, adds to

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[8] David Ammons, *Tools for Decision Making: A Practical Guide for Local Government (2nd edition),* (Washington, DC: ICMA, 2009), 220.
[9] Ammons, *Tools for Decision Making,* 220.

maintenance costs, and decreases the lifecycle of the apparatus. Aerial apparatus also are far less maneuverable in urban environments. Consideration should be given to housing an alternative quick response vehicle (QRV), or "fly car," at this station (Figure 14). A "fly car" is one of many terms used to describe a vehicle used in emergency medical service in place of an ambulance capable of transporting patients. Crewmembers could then respond to EMS related calls in the smaller vehicle, which would reduce fuel and maintenance costs and other operating expenditures.

Clinical Service Levels

Wyoming Fire Department personnel are only trained to the level of medical first responder. Today, as more fire departments ponder the need to upgrade the level of care provided to its citizens to the advanced life support (ALS) level, recent literature indicates the increased level of service is unnecessary and perhaps unwise. Research shows that only about 5 to 10 percent of EMS calls in an urban area require interventions at an ALS level. Depending on local system protocols and what the state allows in the EMT scope of practice, most basic EMTs have the ability and capability to save lives.[10]

The Wyoming Fire Department's current EMS system uses private ambulance companies for the provision of ALS services. This provides an efficient and cost-effective service delivery model. The Wyoming Fire Department should upgrade medical first responders to EMT certification, however. This would improve the level of care provided to the community, particularly in situations where ambulance arrivals are delayed. According to the Kent County EMS report, the aggregate performance of the ambulance services in 2010, 29,412 emergency (Med 1) calls that met inclusion criteria, the response interval averaged 9.08. The 90 percent reliability level was reached at 15.22.[11]

FIGURE 14: Multipurpose Vehicle

[10] Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," p. 19
[11] Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," p. 31.

The cost associated with this upgrade would be nominal versus the benefit received. This is in line with the recent findings and recommendations of the EMS in Kent County study conducted by the Integral Performance Solutions, LLC published in November of 2011.[12]

Quality Management

Identifying local levels of performance that are considered acceptable by a recognized authority is critical to the adequate functioning of all EMS systems.[13] It is imperative that emergency medical response agencies develop quality improvement programs to monitor all aspects of medical performance. All medical first responders within the Kent County EMS system were found to be without this vital component as reported in the findings of the Kent County EMS report. Although the department has developed various standards for vehicle maintenance, medical supplies, and training, comprehensive ongoing assessment of medical treatment has not been addressed.

Medical Call Prioritization

The Wyoming Fire Department should consider a prioritization and response plan that includes the use of a "cold" response (no warning lights and siren) for lower-acuity calls. Given the potential risks to emergency responders and citizens associated with warning lights and siren responses, this change reduces the risk of accidents and possible liability to the city should a vehicle accident occur. Emergency vehicle collisions result in numerous deaths and injuries each year. In a ten-year study of the Denver EMS system, 72 percent of the claims made against the system (59 of 82 claims) were related to motor-vehicle collisions involving an ambulance; six of these claims resulted in lawsuits.[14]

A report provided to Kent County recommended restructuring of the 911 dispatch service to implement the medical priority dispatch system (MPDS) at the two public safety answering points (City of Grand Rapids and Kent County Sheriff 's Office). Analysis of EMS delivery in Wyoming supports this recommendation. Although there may be concerns about the time needed for staff to gain skills and the possibility of the mishandling of calls, these concerns are mitigated by the design of current medical priority dispatch systems. It is important that MPDS priority levels and codes be fully implemented to align responses and needs with the patient's condition. This will result in a safer and more efficient EMS system.[15]

Ambulance Services

ICMA data analysts conducted a conditional response time analysis of the first-arriving private ambulance and the first-arriving Wyoming units by EMS call type. Because the calculations were limited to those calls with matched phone rings. The sample size is smaller than the number of matched calls. Only average response time comparisons were made between private ambulance companies and the WFD. The more precise fractile measurement (90 percentile) for response time was not calculated; therefore, comparison

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[12] Findings and Recommendations on Emergency Medical Services in Kent County, November, 2011, Integral Performance Solutions, LLC, Lakeland, FL. P. 31.

[13] Robert Swor et al, *Quality Management in Prehospital Care* (St. Louis: National Association of EMS Physicians, 1993).

[14] Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," 12.

Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," 12.

with the Kent County study findings was not possible. Although ICMA data categorized EMS calls by type, a specific distinction between Med-1, Med-2, and Med-3 calls were not made.

According to the Kent County EMS report, the aggregate performance of the ambulance services in 2010, on 29,412 emergency (Med-1) calls that met inclusion criteria, the response interval averaged 9.08. The 90 percent reliability level was reached at 15.22. [16] One EMS study examined response times, the clinical care provided, and patient outcome for high-acuity 911 calls with the aim to determine if the local response time specifications and clinical care provision assets for that community were appropriate. The findings suggested that when compared with patients who wait less 10:59 minutes for an ALS response, priority patients who wait longer than 10:59 minutes could experience between a 6 percent increase to a 4 percent decrease in mortality. Further, there was no evidence of increased mortality for priority patients where ALS response time exceeded 10:59 minutes.[17] Based on the findings of the Kent County EMS report, ICMA supports its recommendations in whole for improving ambulance services within Kent County.

Recommendations:

- Consider establishing EMS response standards based on specific medical interventions.
- Add quick response vehicle at Station 4 to be used in place of a ladder truck for EMS response.
- Upgrade medical certification level of medical first responder to emergency medical technician.
- Develop and implement a quality improvement program to monitor performance of the medical system.
- Establish new policy guidelines for emergency response to include both "hot" and "cold" level responses and "no response" protocols.
- Implement medical priority dispatch system at the two public safety answering points, as prescribed in the Kent County EMS Report.
- Consider the adoption of recommendations for restructuring ambulance services included in the Kent County EMS Report.

Physical Resources

All four fire stations in the city of Wyoming were replaced or modified in 1997. They all appear to be well maintained and in good condition. Station 2 is located at the very eastern edge of Wyoming's municipal boundary with Kentwood.

One area of particular interest is the cache of fire apparatus in the city of Wyoming. The majority of the fleet consists of quints. The Total Quint Concept originated in the Richmond (Virginia) Fire Department and was later partially adopted by the St. Louis Fire Department.

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[16] Integral Performance Solutions, "Findings and Recommendations on Emergency Medical Services in Kent County," (Lakeland, FL: Integral Performance Solutions, 2011), 31.
[17] Goodloe and Thomas, "Emergency Medical Services Evidence-Based System Design," 24.

Richmond and St. Louis wanted to reduce the number of engine companies by deploying apparatus that could perform the duties of a traditional truck and engine by incorporating a pump, hose, water, ground ladders, and an aerial device into one vehicle. In Richmond, these units are staffed with a minimum of personnel. Quints are much more expensive to own and operate than a traditional pumper, however, making them impractical in a small, suburban city such as Wyoming.

The city of Wyoming has used the quint as front-line apparatus for more than a decade and currently has five quints in service. In comparison, Kentwood and Grandville each operates one aerial device. Figures 15 and 16 provide additional points of comparison. These figures reveal that that 93 percent of cities of comparable size have at least two fewer aerial apparatus than Wyoming.

FIGURE 15: Average Number of Aerial Apparatus/Population

	Percentage of U.S. Fire Departments With					
Population Protected	No Aerial Apparatus	1 Aerial Apparatus	2 Aerial Apparatus	3-4 Aerial Apparatus	5 or More Aerial Apparatus	Total
100,000 to 249,999	19.6%	23.3%	25.8%	20.8%	10.4%	100.0%
50,000 to 99,999	31.0	39.7	22.3	6.8	0.2	100.0%
25,000 to 49,999	36.2	50.6	11.9	1.2	0.1	100.0%
10,000 to 24,999	49.9	46.5	3.4	0.1	0.0	100.0%
5,000 to 9,999	73.8	25.3	0.8	0.1	0.0	100.0%
2,500 to 4,999	90.2	9.4	0.4	0.0	0.0	100.0%
Under 2,500	96.4	3.3	0.2	0.0	0.0	100.0%

Source: 2008-2010 NFPA Fire Service Survey.

FIGURE 16: Average Number of Pumpers/Population

	Percentage of U.S. Fire Departments With					
Population Protected	No Pumpers	1 Pumper	2 Pumpers	3-4 Pumpers	5 or More Pumpers	Total
50,000 to 99,999	0.9%	2.0%	6.3%	33.0%	57.9%	100.0%
25,000 to 49,999	1.1	4.0	20.6	48.5	25.9	100.0%
10,000 to 24,999	0.9	8.1	32.3	49.0	9.7	100.0%
5,000 to 9,999	1.5	14.1	43.9	37.0	3.5	100.0%
2,500 to 4,999	2.7	23.2	49.3	23.8	1.0	100.0%
Under 2,500	11.8	42.9	38.3	24.1	5.8	100.0%

Source: 2008-2010 NFPA Fire Service Survey
Note that pumpers reported above had a capability of 1,000 gpm or greater. Note that many departments reported other fire suppression vehicles including apparatus with pumps less than 1,000 gpm, hose wagons, brush fire vehicles, tankers, etc.

Recommendation:

- Reduce the number of aerial apparatus from five to two, replacing three of the quints with less costly quick response vehicles.

Human Resources and Staffing

Determining fire department staffing can be a very challenging and contentious topic. The many factors to be taken into consideration include the demographics of the community, citizen expectations, age of the housing stock, crime/arson rates, state mandates, national standards (NFPA 1710), call volume, response times, and fiscal realities and constraints. While all of these factors need to be taken under consideration, there is no one best way to determine staffing levels or resource deployment models that will work for all communities.

The combination fire department utilized in Wyoming has long been recognized as a cost-efficient resource deployment model. In this model, full-time personnel handle routine daily calls that require a single unit. These include responses to medical emergencies; outside fires (dumpsters, vehicles, etc.); hazardous conditions; and downed power lines. Predetermined call types—typically consisting of structure fires and fire alarms—part-paid personnel respond from home or work. The cost efficiency of this model is derived from the fact that the city does not assume payroll expenses of all of the personnel that are needed to mitigate a structure fire or serious situation. Moreover, the only cost associated with part-paid personnel is an hourly wage, so the city avoids the additional expenses associated with fringe benefits.

The main downside of a combination system is that communities sometimes sacrifice having a dependable and reliable response in a timely manner. Moreover, with the ever-increasing training mandates and time commitment required, the Wyoming Fire Department has struggled to recruit and retain paid on-call employees. Unfortunately, this is not unusual. Across the United States the number of volunteer and paid on-call firefighters has been decreasing at an alarming rate. In a recent article in *Fire Chief,* Fire Chief Rick Markley discusses the struggle that volunteer (part-paid) departments are enduring:

> "The volunteer fire service finds itself at a serious fork in the road. Its current membership is at its lowest point in nearly two decades and further erosion could have dire consequences. But recruitment efforts are being hampered by numerous socioeconomic factors. All of this is forcing chiefs to re-evaluate how they operate and get creative in their thinking.
>
> "Of course, the real gorilla in the room is the amount of training that is required to be a volunteer firefighter. Not only does rigorous training prepare volunteer firefighters to perform well and safely, it also weeds out those who lack commitment and/or the requisite physical attributes. Yet NFPA 1001 and Firefighter I and II training requirements can be particularly burdensome to volunteers, especially during hard economic times."[18]

To continue with a strong combination fire department, the city of Wyoming should establish a recruitment and retention program that reaches young adults while they are still in high school. The Staffing for Adequate Fire and Emergency Response (SAFER) grant program was created to provide funding directly to fire departments and volunteer firefighter interest organizations in order to help them increase the number of trained,

[18] Rick Markley, "A Dangerous Dilemma," *Fire Chief* (March 1, 2012), http://firechief.com/leadership/ar/volunteer-firefighter-recruitment-changes-201203?page=2.

front-line firefighters available in their communities. The goal of SAFER is to enhance the local fire departments' abilities to comply with staffing, response and operational standards established by the NFPA and OSHA (NFPA 1710 and/or NFPA 1720 and OSHA 1910.134).[19]

In addition, to achieve additional staffing needed during daytime hours, the city should change the workweek for suppression personnel from the current 50.4 hours to 56 hours per week. This would allow each shift to recognize an additional employee working daily approximately 70 percent each month. The cost of increasing the hours worked is substantially less than hiring an additional FTEs for each of the three shifts. While the fixed costs would be greater the exposure to structural overtime would be reduced.

Recommendation:

- Develop and implement a comprehensive recruitment and retention plan for paid on-call staff.
- Work with the union to change the 50.4-hour workweek to a 56-hour workweek.

Training

Firefighters rely on their training and experience to remain safe and to function efficiently while engaged in fire suppression efforts. A critical component of ensuring employees are proficient is implementing a comprehensive training program. In general, fire department training programs evaluate the current needs of the personnel and provide instruction to ensure that the personnel have the desired skill sets to perform their duties. In the state of Michigan firefighters must be trained in the following at a minimum:

- Driver's training
- Communicable diseases
- Incident command system
- Self-contained breathing apparatus
- Hazardous materials/right to know.

To produce quality training programs a substantial amount of human and physical resources are required. As a result of budgetary reductions, the Wyoming Fire Department has reduced the training that its employees receive on an annual basis. In the FY 2011 budget the department allocated $2,000 of an initial budget of 4.3 million for training purposes. The fire department needs to identify training needs and review its offerings to identify gaps as part of the process of developing a comprehensive program that ensures adequate training is provided to all members of the department.

Recommendation:

- Develop a comprehensive training program to ensure that adequate training is provided to department staff.

[19] See FEMA, Staffing for Adequate Fire & Emergency Response Grants, http://www.fema.gov/firegrants/safer/index.shtm.

New Tools and Technologies

Technological advances have been made in fire extinguishment to supplement the overall effectiveness and efficiency of a smaller workforce. These advances have introduced viable alternatives to meeting NFPA minimum staffing recommendations. Discussed here are compressed air foam systems and fire interruption technologies.

Compressed Air Foam Systems

The compressed air foam system is an innovation that many fire departments are considering for use in limited staffing situations. Since its arrival in the fire service, anecdotal evidence is mounting regarding the effectiveness of CAFS in firefighting.

Compressed air foam systems were introduced and advocated for structural firefighting in the 1990s as a way to provide greater fire knockdown power and to decrease water usage, hose line weight, and water damage. CAFS is increasingly viewed as a possible way to offset reduced staffing among career fire service organizations and decreased volunteerism among volunteer and combination departments. As stated in the city of Kentwood 2010 Capital Plan, the Kentwood Fire Department has utilized CAFS successfully allowing for quicker knock down of fires and reducing firefighter risk and exposure.

The use of CAFS as a primary fire attack tool is now being proposed in the United Kingdom's East Sussex Fire and Rescue Brigade and has two years experience of operational trials in structures. The brigade has several front-line fire engines equipped with the German made Schmitz gmbH "One-Seven" system. Other brigades across the United Kingdom are fast following this innovative approach.

The growing acceptance of CAFS is being driven by fire leaders who see an opportunity for a simple system of primary fire attack that will replace the high-pressure water-fog system. CAFS appears to offer increased performance in fire suppression of post-flashover fire and possibly pre-flashover situations. It reduces the amount of water needed to suppress a vast majority of fires, so primary water tanks and fire engines can become smaller, fewer firefighters may be needed, and attacks on a fire can be made from a safer distance. Further, the costs associated with training firefighters in primary fire attack may well be reduced substantially.

Closer to home, the effects of CAFS on manpower needed for suppression activities are well documented in the literature and have been consistently observed, in both actual fireground situations and simulated exercises. For example, controlled room and contents fire tests utilizing CAFS were performed at Wallops Island, Virginia, and Salem, Connecticut, by Hale Fire Pump; the Atlantic Virginia Fire Department; Ansul Fire Protection; the International Society of Fire Service Instructors; Elkhart Brass; the National Aeronautics and Space Administration-Goddard Flight Center Fire Department; the Charlotte, North Carolina Fire Department; the Fairfax County, Virginia Fire Department; the Fire Industry Equipment Research Organization; and the Salem, Connecticut Fire Department. Table 1, which depicts the results of these tests, shows that there is a significant difference in temperature drop rate using CAFS as compared to the other extinguishing mediums of plain water and a simple foam solution.

CAFS is in use in Los Angeles, California. In 1990, the Los Angeles County Fire Department (LACFD) began an intensive evaluation of Class A foam. That led to the specification of

direct-injection, multiple-outlet foam proportioners on all new engines starting in 1992. In 1995, the department purchased three engines equipped with compressed-air foam systems. Today, the LACFD has 224 front-line engines, 10 reserve engines, and 15 front-line quints equipped with Class A foam proportioners. An additional 19 front-line engines are equipped with CAFS.

One of the misconceptions associated with the use of foam solutions in fire extinguishment is its cost. In the Class A foam/water solution test, LACFD personnel used only 31 fluid ounces of concentrate to knock down and overhaul a fire in four rooms. At an average cost of $13 per gallon, this cost just $3.10 for the concentrate. The CAFS test used even less—only six fluid ounces (60¢) of concentrate.[20]

Fire Interruption Technology

Another example of innovative equipment in use today for fire extinguishment is the Ara-Safety Pro Fire Interruption Technology (FIT) knockdown tool. The manufacturer claims it can be deployed in a wide variety of structure fire scenarios, from incipient to fully involved, as well as in defensive, offensive, and transitional modes. In some fireground situations water may be unavailable, such as when the duty commander may be on site before working crews and trucks, or an EMS call may leave the crew short to follow the "two in two out" rule.[21] The knockdown tool can be used to supplement firefighting forces and mitigate the effects of fire in the incipient stages, thereby reducing the risk of flashover. Reducing the risk to firefighters and the public is always of primary concern. The device is made for use by professional firefighters only, and proper training in its deployment is required. Current pricing stands at approximately $1,000 per tool.

One of the most significant aspects in the use of this new technology is the fact that interior attacks can be initiated through a door or window. This allows greater standoff distances and thus reduces the risks to firefighters.

OSHA requires that two personnel be stationed outside whenever two rescuers are inside structures where there is an immediate danger to life or health. WFD staffs engine companies with three personnel. The FIT tool can be a viable option when firefighting operations can be initiated from the outside, thereby reducing critical time in fire progression. ICMA does not necessarily endorse the FIT tool for use in any department. It only serves as an example of available products within the industry.

Recommendation:

- Continue to explore new fire suppression technologies, including compressed air foam systems and fire interruption technology.

Communications

Dispatch services for the Wyoming Fire Department are provided by the Kent County Dispatch Authority, a relatively new organization that was created when five separate dispatching agencies were combined. The authority is governed by a board consisting of local government officials from the agencies receiving service and supervises two

[20] See "Bubbles Beat Water," *Fire Chief* (July 2001).
[21] See ARA Safety, "ARA Safety Pro," http://www.arasafety.com/products/arasafetypro.htm.

dispatching organizations in the community. The dispatch center at the Grand Rapids Police Headquarters building handles all Wyoming Fire Department dispatches; another center located at the Kent County Sheriff's Office handles calls for the county. Employees at the police location city of Grand Rapids employees; the city of Wyoming pays the city of Grand Rapids to provide dispatch services.

Dispatch for fire calls in Wyoming is straightforward: All on-duty personnel are dispatched due to current staffing levels (five at minimum), with additional paid on-call dispatched based on event type. A more complex arrangement exists for EMS calls. When a medical emergency call is received, the dispatcher notifies both the Wyoming Fire Department and the private ambulance company that provides emergency medical response and transport to local hospitals. The dispatcher keeps the private ambulance company and the caller on the line while the ambulance company discusses the nature of the emergency. Neither the dispatch center nor the private ambulance company uses a formal priority medical dispatch system, such as the one developed by Jeff Clawson.

As indicated previously, the dispatch authority should consider implementing priority medical dispatch procedures. This would lead to a more efficient utilization of Wyoming Fire Department and private ambulance company emergency response resources. Research has shown that priority medical dispatch can help communities provide better service with fewer resources by matching clinical needs with scaled response configurations. A new system should reflect the level of appropriate response, including types of personnel (ALS, BLS, or first responder); response configurations (numbers and type of vehicles responding); and mode of response (red-lights-and-siren or routine). Carefully, trained and knowledgeable use of the most up-to-date medical priority dispatch protocols results in a safe and efficient dispatch, care and response process for any EMS system.

The dispatch facility at police headquarters is in the process of developing and implementing a new computer-aided dispatch (CAD) system to serve the fire department. It anticipates having the upgrade in place by September 2012. Included will be upgraded mobile data terminals in fire apparatus. The upgrade does not include an adequate interoperable radio communication system through which different fire agencies can communicate directly with one another, however.

An increasing number of mutual aid agreements are requiring fire departments to rely on one another more often to meet emergency needs. These factors make interoperability critical.

External System Relationships

The Wyoming Fire Department currently has an automatic aid agreement with the city of Grandville for defined areas in the south and west parts of Wyoming. The cities of Wyoming, Kentwood, and Grand Rapids have entered into serious discussions over the past year regarding the possible merger of the fire departments of the three cities. The issue of fire department merger is the subject of a Phase II report to be submitted in June.

Recommendation:

- Work with neighboring fire departments to explore and strengthen automatic aid, mutual aid, and other opportunities for collaboration and cooperation.

SECTION III: Data Report

The Wyoming Fire Department has two engines, four ladder trucks, one platform, two medical squads, and two utility vehicles. These units are deployed in four stations.

Two areas involving the department's record-keeping systems made analysis difficult: First, there was no way to link the NFIRS and dispatch center data. To enable better use of the data, the fire department should synchronize the case number field in the CAD system with the incident ID in the NFIRS system so to easily link the NFIRS and dispatch center data. This will facilitate accurately conducting response time analysis as we have illustrated in the report that the call received time recorded in the NFIRS system was often behind the time a phone ringed or the time a call entered into CAD system. A second issue was that no time increments in seconds in all time stamp fields were recorded in NFIRS data. This makes accurate calculation of response times difficult and should be remedied immediately.

This report covers all calls for service between November 1, 2010, and October 31, 2011. During this period, the Wyoming Fire Department received 5,363 calls. A total of 6,183 Wyoming units were dispatched to these calls. The total combined yearly workload (also called deployed time or busy time) for all units was 2,023 hours. The average estimated response time was 7.7 minutes for EMS calls and 9.9 minutes for fire calls. There were 586 EMS calls (21 percent of total matched EMS calls) to which the AMR or LifeEMS private ambulance company arrived earlier than Wyoming Fire Department units. For EMS calls, the estimated average response time was 11.2 for AMR units and 10.5 minutes for LifeEMS units.

The purposes of this report are to provide the city with preliminary data and to allow the fire and emergency medical services department to review and bring to our attention any information that may be inconsistent with other internal records of the agency.

This report is divided into five sections. The first section focuses on the 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 presents response time analysis. The fifth section compares the average EMS response times of private ambulance companies, AMR and LifeEMS, to those of the Wyoming Fire Department.

All information in this report was developed directly from data recorded by the city's dispatch center, phone logs, and NFRIS. To accurately estimate response time, the research team matched the city's phone log, the CAD data recorded in the dispatch center, and NFRIS data. In addition, the team accessed data from AMR and LifeEMS.

We make no recommendations in this preliminary report. Our purpose here is to share information that we have developed from the source data to confirm its accuracy.

Aggregate Call Totals and Dispatches

During the year studied, the city of Wyoming Fire Department received 5,365 calls. Of these, 65 were structure fire and 82 were outside fire calls. There were 3,568 emergency medical service (EMS) calls. We categorized the calls based on the National Fire Incident Reporting System (NFIRS) call type code for fire category calls and chief complaint for EMS category calls. The correspondence table is included as Appendix II.

TABLE 1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	437	1.2	8.1
Seizure and unconsciousness	150	0.4	2.8
Breathing difficulty	684	1.9	12.8
Overdose and psychiatric	94	0.3	1.8
Motor vehicle accidents	283	0.8	5.3
Fall and injury	430	1.2	8.0
Illness and other	1,490	4.1	27.8
EMS Total	**3,568**	**9.8**	**66.5**
Structure fire	65	0.2	1.2
Outside fire	82	0.2	1.5
Hazard	269	0.7	5.0
False alarm	326	0.9	6.1
Good intent	266	0.7	5.0
Public service	330	0.9	6.2
Fire Total	**1,338**	**3.7**	**24.9**
Mutual aid	21	**0.1**	**0.4**
Canceled	436	1.2	8.1
Total	**5,363**	**14.7**	**100**

Observations:

- The department received an average of 14.7 calls, including 1.2 canceled calls and 0.1 mutual aid calls, per day.
- EMS calls for the year totaled 3,568, or about 9.8 per day.
- EMS calls accounted for roughly 67 percent of all calls.
- Fire category calls for the year totaled 1,338, or about 3.7 per day.
- Fire category calls accounted for roughly 25 percent of all calls.
- Calls for structure and outside fires combined total 147 calls in a year, averaging 0.4 calls per day.

TABLE 2: Calls, by District

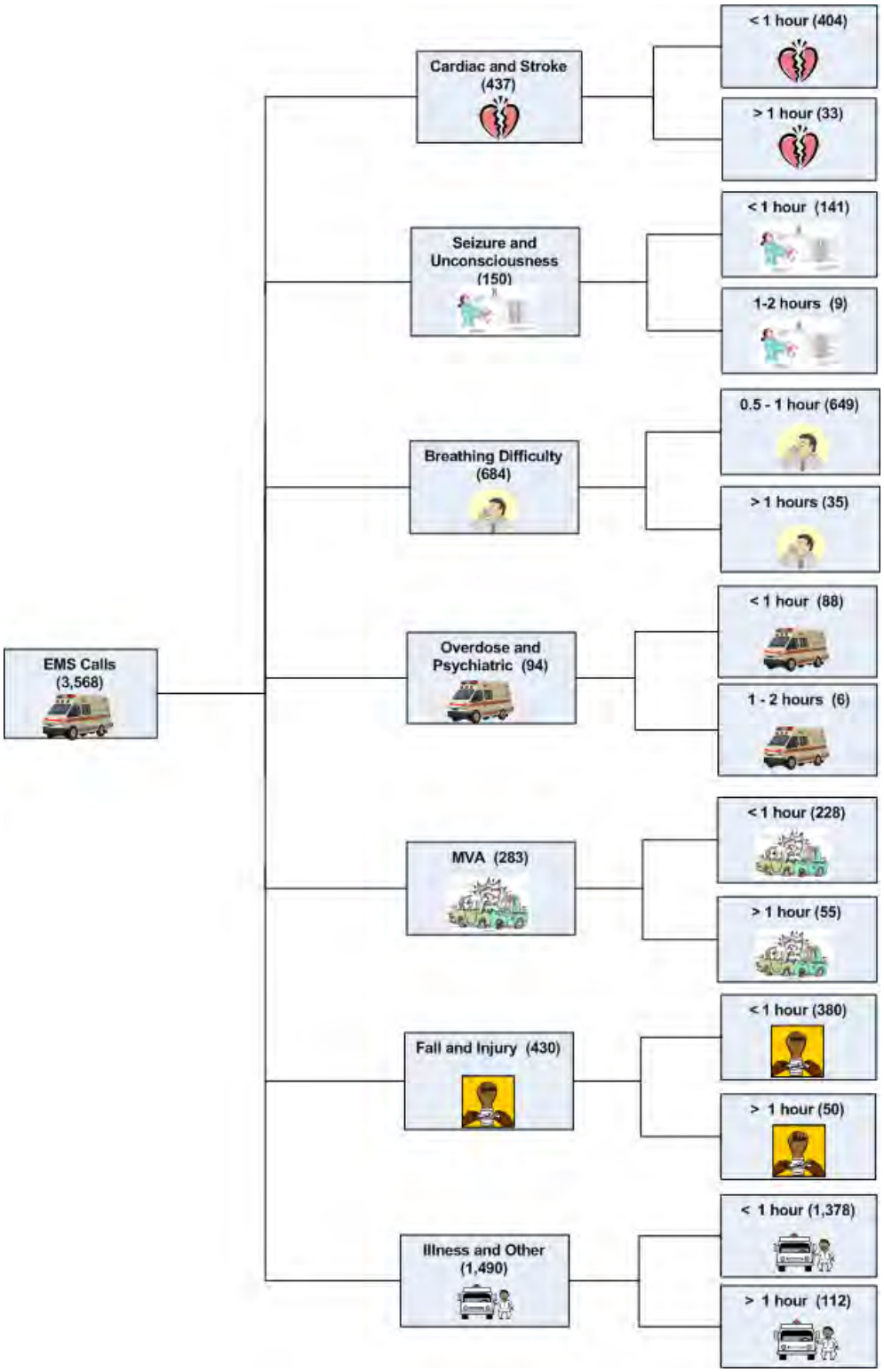
Call Type	Number of Calls			
	District 1	District 2	District 3	District 4
Cardiac and stroke	85	73	108	171
Seizure and unconsciousness	30	25	28	67
Breathing difficulty	139	125	147	273
Overdose and psychiatric	17	23	15	39
Motor vehicle accident	67	99	40	77
Fall and injury	108	70	80	172
Illness and other	330	301	319	540
EMS Total	**776**	**716**	**737**	**1,339**
Structure fire	11	16	10	28
Outside fire	23	22	13	24
Hazard	55	84	30	100
False alarm	63	81	111	71
Good intent	61	73	41	90
Public service	63	90	63	114
Fire Total	**276**	**366**	**268**	**427**
Total	**1,052**	**1,082**	**1,005**	**1,766**
Percentage	**19.6%**	**20.2%**	**18.7%**	**32.9%**

Note: One good intent call was listed in the district of GDV.

Observations:

- Calls occurred in District 1 totaled 1,052, accounting for 20 percent of the total calls received.
- Calls occurred in District 2 totaled 1,082, accounting for 20 percent of the total calls received.
- Calls occurred in District 3 totaled 1,005, accounting for 19 percent of the total calls received.
- Calls occurred in District 4 totaled 1,766, accounting for 33 percent of the total calls received.

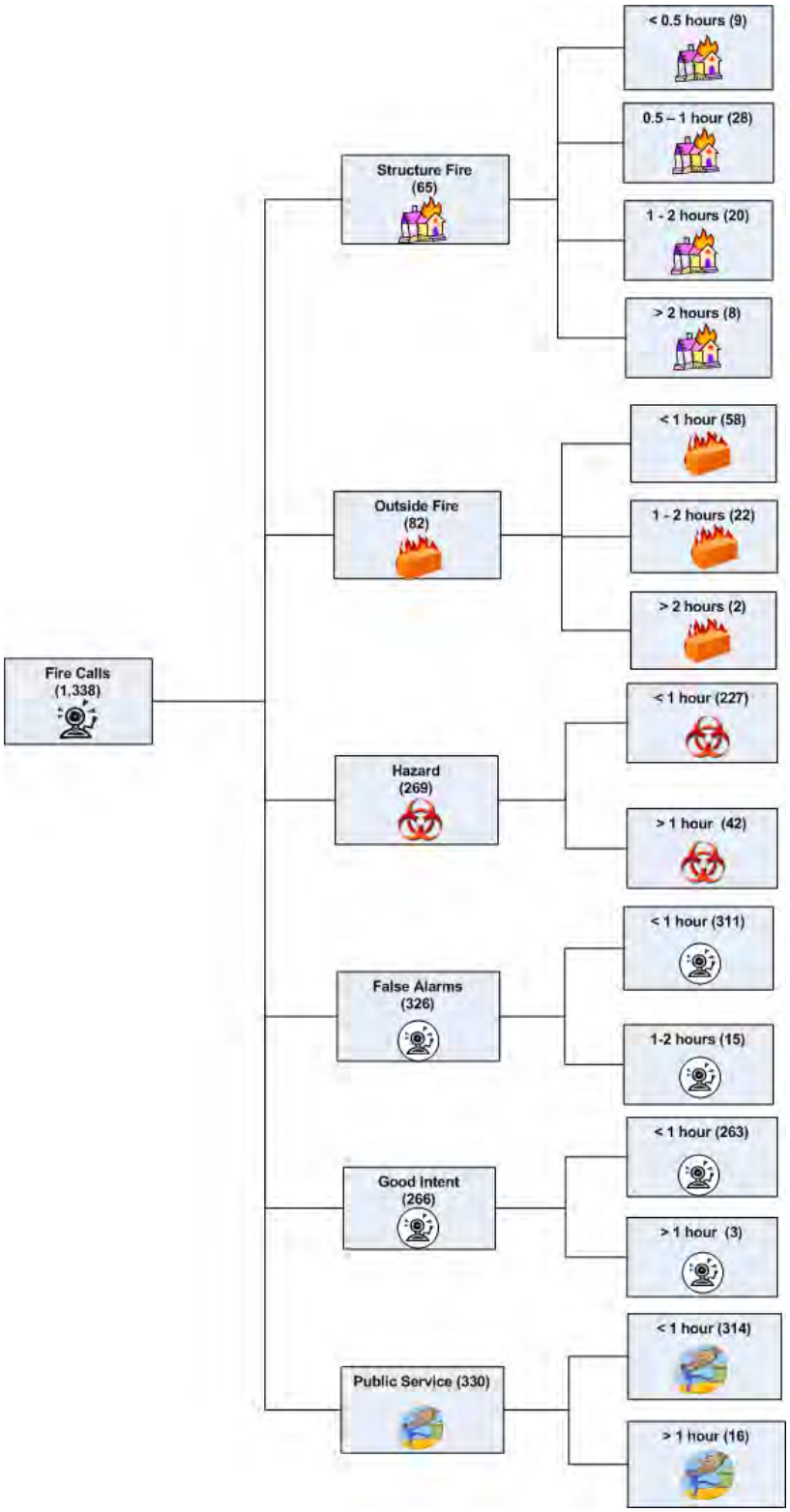
FIGURE 1: EMS Calls, by Type and Duration



Observations:

- 3,268 EMS category calls (92 percent) lasted less than one hour, 292 EMS category calls (8 percent) lasted between one and two hours, and 8 EMS category calls lasted more than two hours. On average, there were 0.8 EMS category calls per day that lasted more than an hour.
- 404 cardiac and stroke calls (92 percent) lasted less than one hour, 30 cardiac and stroke calls (7 percent) lasted between one and two hours and 3 cardiac and stroke calls (1 percent) lasted more than two hours.
- 141 seizure and unconsciousness calls (94 percent) lasted between half an hour and one hour and 9 seizure and unconsciousness calls (6 percent) lasted between one and two hours.
- 649 breathing difficulty calls (95 percent) between half an hour and one hour, 34 breathing difficulty calls (5 percent) lasted between one and two hours and 1 breathing difficulty call lasted more than two hours.
- 88 overdose and psychiatric calls (94 percent) lasted less than one hour, 6 overdose and psychiatric calls (6 percent) lasted between one and two hours.
- 228 motor vehicle accident (MVA) calls (88 percent) lasted less than one hour; 53 (11 percent) MVA calls lasted between one and two hours; 2 MVA calls (1 percent) lasted more than two hours.
- A total of 380 fall and injury calls (88 percent) lasted less than one hour; 50 fall and injury calls (8 percent) lasted more than an hour.
- A total of 1,378 illness and other calls (92 percent) lasted less than one hour; 112 illness and other calls (8 percent) lasted more than one hour.

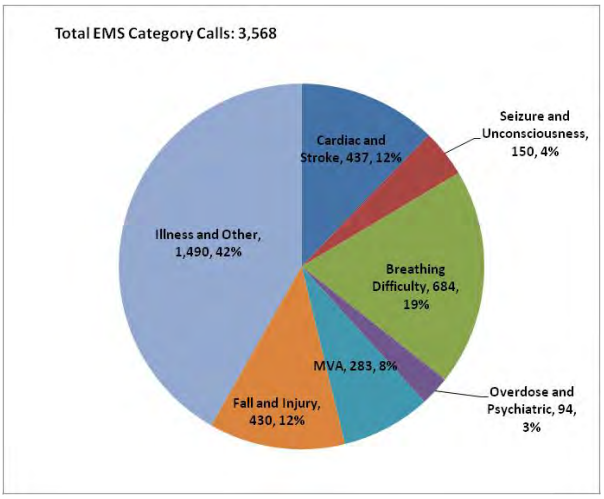
FIGURE 2: Fire Calls, by Type and Duration

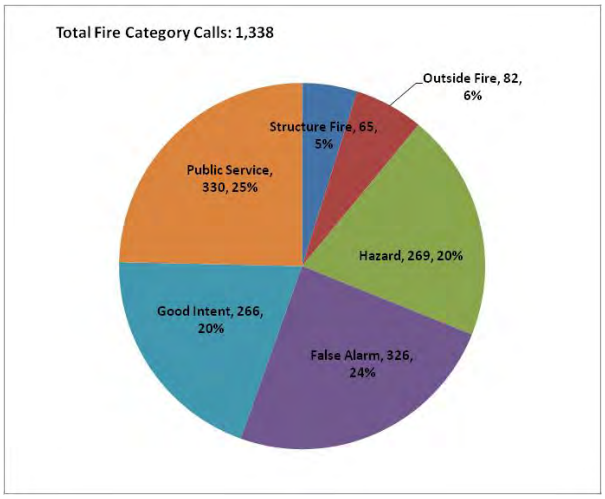


Observations:

- 1,210 fire category calls (90 percent) lasted less than one hour; 111 fire category calls (8 percent) lasted between one and two hours; 17 fire category calls (1 percent) lasted more than two hours. On average, there were a total of 0.4 fire category calls per day that lasted more than one hour.
- Of the 65 structure fire calls, 37 (57 percent) lasted less than one hour, 20 (31 percent) lasted between one and two hours, and 8 (12 percent) lasted more than two hours.
- Of the 82 outside fire calls during the year, 58 (71 percent) lasted less than one hour, 22 (27 percent) lasted between one and two hours, and 2 (2 percent) lasted more than two hours.
- 227 hazardous condition calls (84 percent) lasted less than one hour; 42 hazardous conditions calls (16 percent) lasted more than one hour.
- 311 false alarm calls (95 percent) lasted less than one hour; 15 alarm calls (5 percent) lasted more than one hour.
- 263 good intent calls (99 percent) lasted less than one hour; 3 good intent calls (5 percent) lasted between one and two hours.
- 314 public service calls (95 percent) lasted less than one hour; 16 public service calls (5 percent) lasted more than one hour.

FIGURE 3: EMS and Fire Calls, by Type

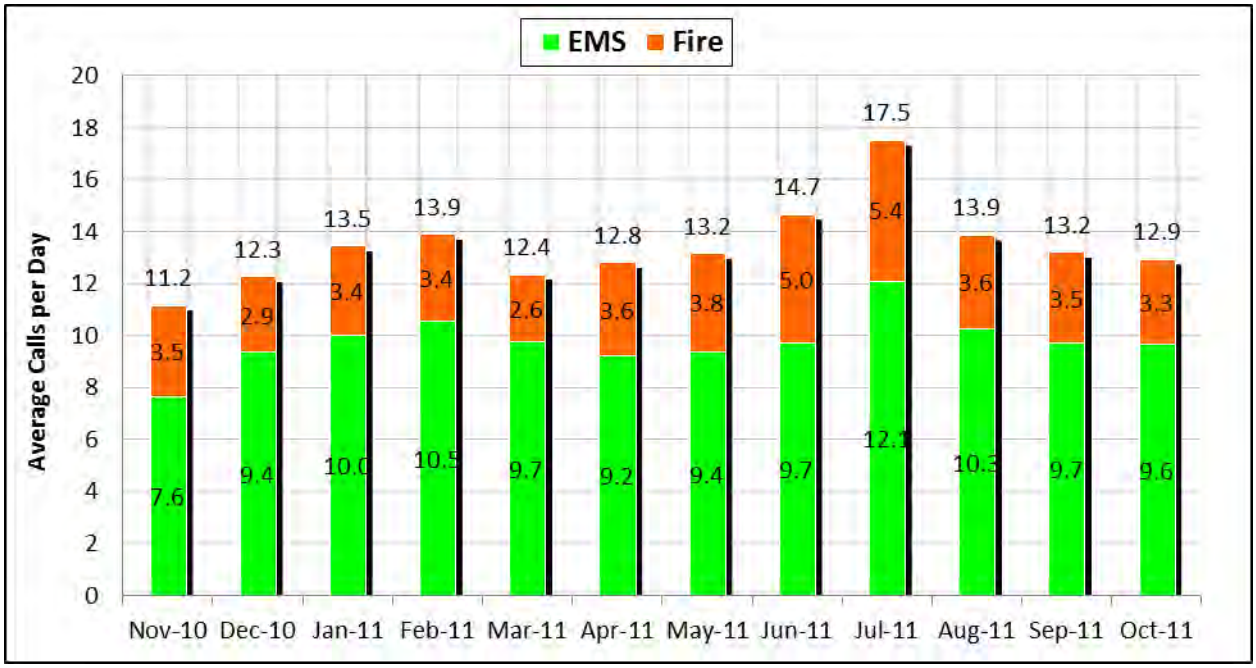




Observations:

- 65 structure fire accounted for 5 percent of the fire category total.
- 82 outside fire calls accounted for 6 percent of the fire category total.
- 24 percent of fire calls were false alarms.
- 20 percent of the fire calls were hazardous condition calls.
- 20 percent of the fire calls were good intent calls.
- 25 percent of the fire calls were public service calls.
- 12 percent of the EMS calls were for cardiac or stroke.
- 19 percent of the EMS calls were for breathing difficulty.
- 8 percent of the EMS calls were for motor vehicle accidents.
- 3 percent of the EMS calls were for drug overdose or psychiatric issues.
- 4 percent of the EMS calls were for seizures or unconsciousness.
- 12 percent of the EMS calls were for falls or injuries.
- 42 percent of the EMS calls were for illness or other complaints.

FIGURE 4: Average Calls per Day, by Month



Observations:

- Average calls per day ranged from a low of 11.2 calls per day in November 2010 to a high of 17.5 calls per day in July 2011. The highest monthly average was 56 percent greater than the lowest monthly average.
- Average EMS calls per day varied from a low of 7.6 calls per day in November 2010 to a high of 12.1 calls per day in July 2011.
- Average fire category calls per day varied from a low of 2.6 to a high of 5.4 calls per day (lowest in March 2011, highest in July 2011).
- The highest number of calls received in a single day was 58, which occurred on June 21, 2011; the calls included 11 EMS category calls, 1 structure fire call, 44 hazardous condition calls, and 2 other fire category calls.

FIGURE 5: Calls, by Hour of Day

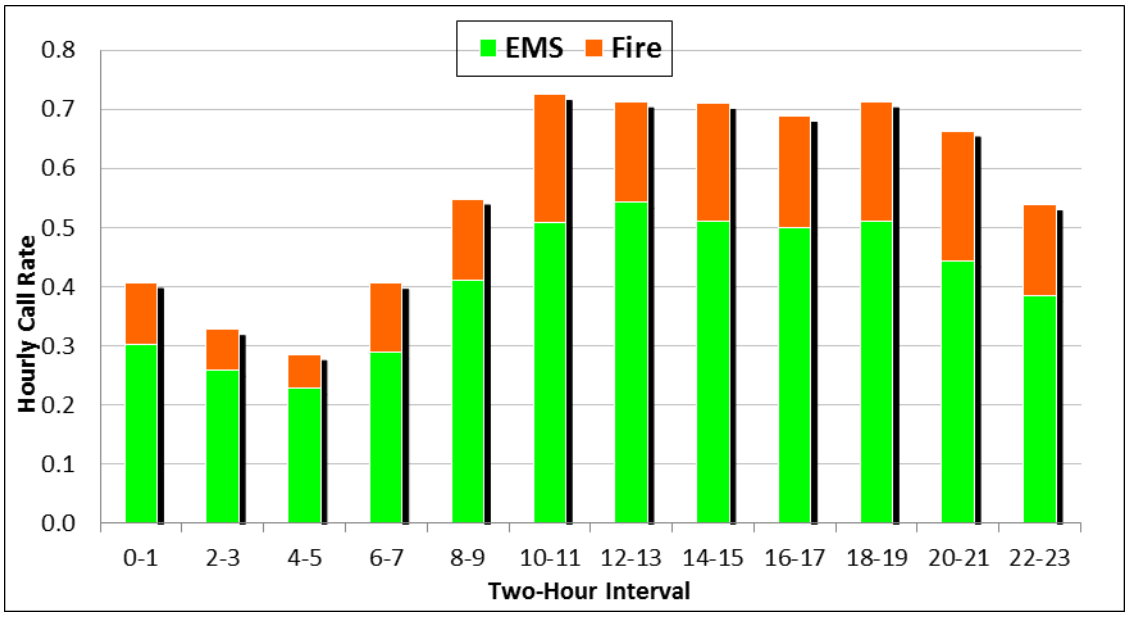


TABLE 3: Calls, by Hour of Day

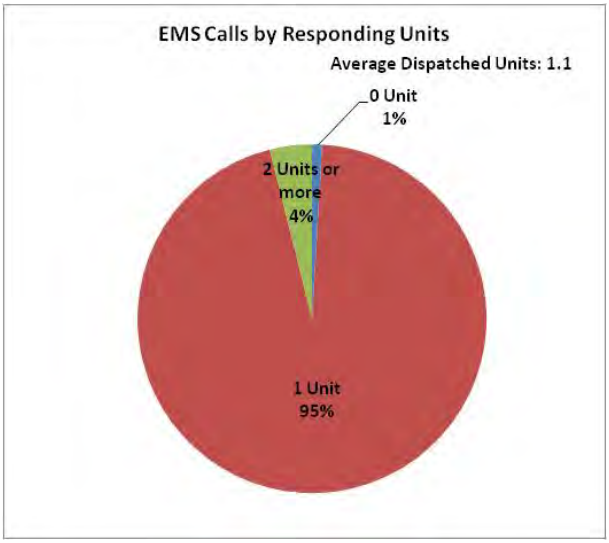
Two-Hour Interval	Hourly Call Rate		
	EMS	Fire	Total
0-1	0.30	0.10	0.41
2-3	0.26	0.07	0.33
4-5	0.23	0.06	0.28
6-7	0.29	0.12	0.41
8-9	0.41	0.14	0.55
10-11	0.51	0.22	0.72
12-13	0.54	0.17	0.71
14-15	0.51	0.20	0.71
16-17	0.50	0.19	0.69
18-19	0.51	0.20	0.71
20-21	0.44	0.22	0.66
22-23	0.38	0.15	0.54
Calls per Day	**9.78**	**3.67**	**13.44**

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 were highest between 10:00 a.m. and 8:00 p.m., averaging between 0.69 calls and 0.72 per hour.
- Call rates were lowest between 2:00 a.m. and 8:00 a.m., averaging less than 0.41 calls per hour during each hour.

FIGURE 6: Number of Units Dispatched to Calls



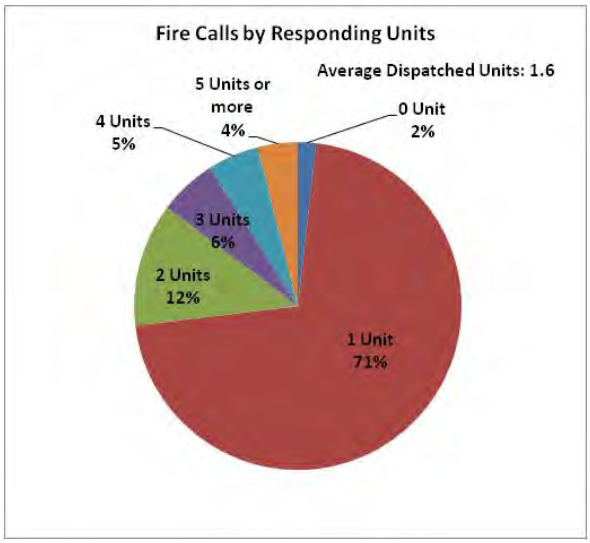


TABLE 4: Number of Units Dispatched to Calls

Call Type	Number of Units						Total
	Zero	One	Two	Three	Four	Five or more	
Cardiac and stroke	0	435	2	0	0	0	437
Seizure / unconsciousness	0	148	2	0	0	0	150
Breathing difficulty	0	678	6	0	0	0	684
Overdose and psychiatric	0	94	0	0	0	0	94
Motor vehicle accident	5	173	101	3	0	1	283
Fall and injury	2	421	7	0	0	0	430
Illness and other	26	1,447	17	0	0	0	1,490
EMS Total	**33**	**3,396**	**135**	**3**	**0**	**1**	**3,568**
Structure fire	0	7	1	8	20	29	65
Outside fire	2	51	8	7	9	5	82
Hazard	11	209	23	9	8	9	269
False alarm	4	170	108	40	4	0	326
Good intent	3	210	13	10	22	8	266
Public service	4	307	10	2	5	2	330
Fire Total	**24**	**954**	**163**	**76**	**68**	**53**	**1,338**
Grand Total	**57**	**4,350**	**298**	**79**	**68**	**54**	**4,906**
Percentage	**1.2**	**88.7**	**6.1**	**1.6**	**1.4**	**1.1**	**100**

Note: Engine, ladder, medical squad, platform, and utility vehicles are included in totals.

Observations:

- 57 calls were responded by either administrative cars or units from neighboring cities without involving any of the department's primary units.
- Overall, four or more units were dispatched to 2 percent of calls.
- On average, 1.6 units were dispatched per fire category call.
- For fire category calls, one unit was dispatched 71 percent of the time, two units were dispatched 12 percent of the time, three units were dispatched 6 percent of the time, and four or more units were dispatched 9 percent of the time.
- For structure fire calls, four or more units were dispatched 75 percent of the time.
- For outside fire calls, one unit was dispatched 62 percent of the time.
- On average, 1.1 units were dispatched per EMS call.
- 627 EMS calls (18 percent) had no (0) medical units dispatched. For the rest of 2,941 EMS category calls, one medical squad was dispatched to the call.

TABLE 5: Annual Deployed Time, by Call Type

Call Type	Average Busy Minutes per Run	Annual Busy Hours	Percent of Busy Hours	Busy Minutes per Day	Number of Runs	Runs per Day
Cardiac and stroke	21.0	154	7.6	25.2	439	1.2
Seizure and unconsciousness	18.5	47	2.3	7.7	152	0.4
Breathing difficulty	17.3	199	9.8	32.7	690	1.9
Overdose and psychiatric	19.2	30	1.5	4.9	94	0.3
Motor vehicle accident	22.1	143	7.1	23.5	389	1.1
Fall and injury	21.9	159	7.9	26.1	435	1.2
Illness and other	17.7	437	21.6	71.9	1,481	4.1
EMS Total	**19.0**	**1,168**	**57.8**	**192.1**	**3,680**	**10.1**
Structure fire	46.9	212	10.5	34.9	272	0.7
Outside fire	35.6	90	4.4	14.7	151	0.4
Hazard	26.7	159	7.9	26.2	360	1.0
False alarm	14.8	129	6.4	21.2	522	1.4
Good intent	13.4	89	4.4	14.6	396	1.1
Public service	17.2	105	5.2	17.2	365	1.0
Fire Total	**22.8**	**784**	**38.7**	**128.8**	**2,066**	**5.7**
Mutual aid	36.2	16	0.8	2.6	26	0.1
Canceled	8.1	56	2.7	9.1	411	1.1
Total	**19.6**	**2,023**	**100.0**	**332.6**	**6,183**	**16.9**

Observations:

- Total deployed time for the year, or busy hours, was 2,023 hours. This is the total busy hours of all the units that were deployed on any type of call, including 72 hours spent on mutual aid and canceled calls.
- There were 6,183 runs, including 411 runs dispatched for canceled calls and 26 runs dispatched for mutual aid calls.
- Fire category calls accounted for 39 percent of the total workload.
- There were 423 runs for structure and outside fire calls, with a total workload of 302 hours. This accounted for 15 percent of the total workload. The average busy time for structure fire calls was 46.9 minutes, and the average busy time for outside fire calls was 35.6 minutes.
- EMS calls accounted for 58 percent of the total workload. The average busy time for EMS category calls was 19.0 minutes.

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: workloads and runs. Mutual aid and canceled calls are not included. After the introductory table, run data and workload data are included for each unit, as well as the daily average for engine, ladder truck, and ambulance units.

TABLE 6: Call Workload, by Unit

Station	Unit Type	Unit ID	Average Busy Minutes per Run	Number of Runs	Runs per Day	Busy Minutes per Day	Annual Busy Hours
1	Engine	E72	26.1	36	0.1	2.5	15.2
	Ladder	L71	34.3	107	0.3	10.1	61.1
2	Ladder	L74	33.5	84	0.2	7.7	46.8
	Medical Squad	M88	44.6	32	0.1	3.9	23.8
3	Ladder	L76	23	2	0.0	0.1	0.8
4	Engine	E79	31.3	61	0.2	5.2	31.9
	Ladder	L77	20.6	1,634	4.5	92.2	560.9
	Medical Squad	M87	18.2	3,506	9.6	175	1064.6
	Platform	P82	24.2	230	0.6	15.2	92.7
	Special Utility	SU85	62.3	33	0.1	5.6	34.3
	Utility	U83	57	21	0.1	3.3	20.0

Observations:

- Medical squad M87 was the busiest. It made 3,506 runs, averaging 9.6 runs and 175 (2 hours, 55 minutes) per day.
- Ladder truck L77 made 1,634 runs, averaging 4.5 runs and 92 minutes (1 hour, 32 minutes) per day.
- Ladder trucks L71, L74, and L76 combined made 193 runs and were busy 109 hours in a year.
- Engines E72 and E79 combined made 97 runs and were busy 47.1 hours in a year.
- Platform P82 made 230 runs, averaging 0.6 runs and 15 minutes of busy time per day.
- Special utility SU85 made 33 runs and was busy 34 hours in a year.
- Medical squad M88 made 32 runs and was busy 24 hours in a year.

FIGURE 7: Busy Minutes, by Hour of Day

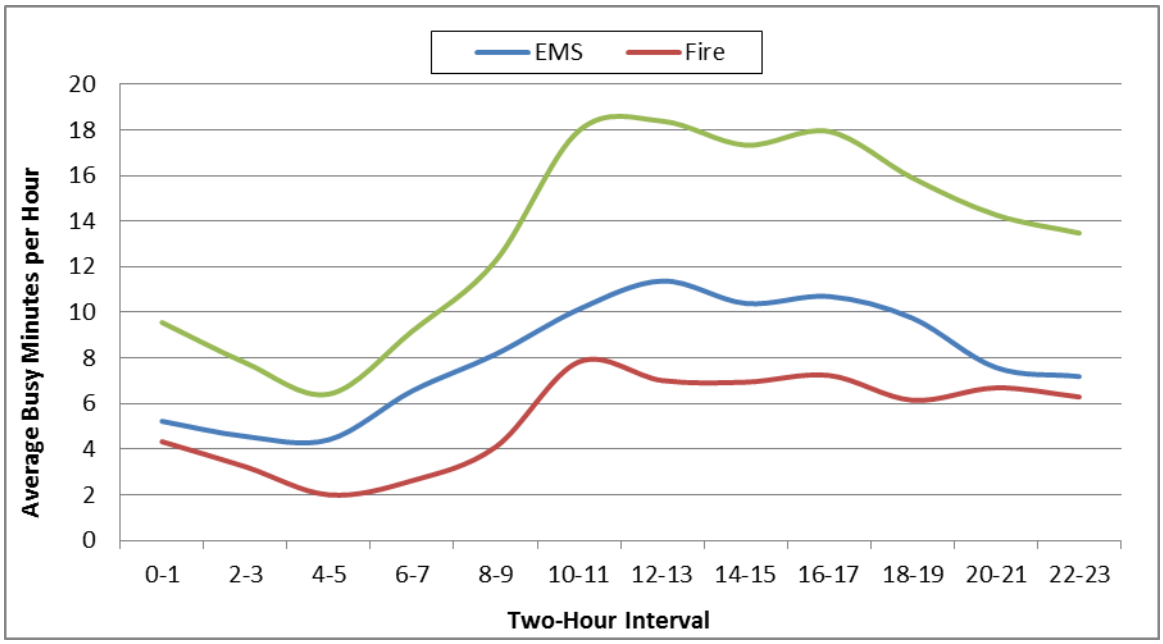


TABLE 7: Busy Minutes, by Hour of Day

Two-Hour Interval	EMS	Fire	Total
0-1	5.2	4.3	9.6
2-3	4.6	3.2	7.8
4-5	4.4	2.0	6.4
6-7	6.6	2.6	9.2
8-9	8.2	4.1	12.3
10-11	10.1	7.8	18.0
12-13	11.4	7.0	18.4
14-15	10.4	6.9	17.3
16-17	10.7	7.2	17.9
18-19	9.7	6.1	15.9
20-21	7.6	6.7	14.3
22-23	7.2	6.3	13.5
Daily Total	192.0	128.8	320.9

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

Observations:

- Hourly busy minutes were the highest between 10:00 a.m. and 6:00 p.m., averaging between 17.3 and 18.4 minutes per hour.
- Hourly busy minutes were the lowest between midnight and 8:00 a.m., averaging fewer than 9.6 minutes per hour.

TABLE 8: Fire Equipment: Total Annual Number and Daily Average Number of Runs by Call Type

Unit	EMS	Structure Fire	Outside Fire	Hazard	False Alarm	Good Intent	Public Service	Total	Runs per Day
Engine-72	1	**8**	**3**	10	4	8	2	**36**	**0.1**
Engine-79	12	**4**	**5**	23	8	5	4	**61**	**0.2**
Ladder-71	1	**29**	**12**	17	19	22	7	**107**	**0.3**
Ladder-74	1	**23**	**7**	16	19	13	5	**84**	**0.2**
Ladder-76	0	**1**	**0**	0	0	1	0	**2**	**0.0**
Ladder-77	717	**63**	**77**	191	248	181	157	**1,634**	**4.5**
Platform-82	1	**57**	**19**	34	65	44	10	**230**	**0.6**
Special Utility-85	0	**19**	**3**	8	0	2	1	**33**	**0.1**
Utility-83	6	**3**	**0**	9	0	2	1	**21**	**0.1**

Observations:

- Of all fire equipment, ladder truck L77 was dispatched most often. It made 1,634 runs during the year, averaging 4.5 runs per day. However, the vast majority of fire category calls were not actual fires. Actual fire runs occurred an average 2.7 times per week.
- Platform P82 was dispatched 230 times during the year, with 76 actual fire runs.
- Engines E72 and E79 combined were dispatched 97 times during the year.
- Ladder truck L71 was dispatched 107 times during the year, with 41 actual fire runs.
- Ladder truck L74 was dispatched 84 times during the year, with 30 actual fire runs.

TABLE 9: Fire Equipment: Daily Average Deployed Minutes by Call Type

Unit	EMS	Structure Fire	Outside Fire	Hazard	False Alarm	Good Intent	Public Service	Total	Fire Category Calls Percentage
Engine-72	0.1	**1.2**	**0.2**	0.5	0.2	0.3	0.1	**2.6**	**96.2**
Engine-79	0.7	**0.5**	**0.7**	2.5	0.3	0.4	0.2	**5.3**	**86.8**
Ladder-71	0.2	**3.7**	**1.8**	2.1	1.0	0.9	0.4	**10.1**	**98.0**
Ladder-74	0.2	**2.8**	**0.7**	1.7	1.4	0.7	0.2	**7.7**	**97.4**
Ladder-76	0.0	**0.1**	**0.0**	0.0	0.0	0.0	0.0	**0.1**	**100.0**
Ladder-77	39.6	**8.0**	**7.1**	11.8	10.9	6.4	8.3	**92.1**	**57.0**
Platform-82	0.1	**6.7**	**2.2**	1.9	2.3	1.7	0.4	**15.3**	**99.3**
Special Utility-85	0.0	**3.8**	**0.5**	1.1	0.0	0.1	0.2	**5.7**	**100.0**
Utility-83	0.8	**1.1**	**0.0**	1.3	0.0	0.1	0.0	**3.3**	**75.8**

Note: Fire category calls percentage is the sum of average deployed minutes per day of all non-EMS calls divided by the total deployed minutes per day.

Observations:

- On average, the busiest fire equipment was platform ladder truck L77. It was busy an average of 92 minutes (1 hour, 32 minutes) per day. Fire category calls accounted for 57 percent of its daily workload. The unit spent 15 minutes per day fighting structure or outside fires.
- On average, platform P82 was busy 15 minutes per day. For structure and outside fire calls, platform P2 spent an average of 9 minutes per day.
- On average, ladder trucks L71, L74, and L76 were busy 18 minutes per day.
- On average, engines L72 and L79 combined were busy 8 minutes per day.

TABLE 10: Fire Equipment: Annual Busy Time, by Number of Busy Units

Ladder/Engine/Platform			
Number of Busy Units	**Annual Minutes**	**Annual Hours**	**Percent of Time**
0	488,703	8,145	93.0
1	29,240	487	5.6
2	3,799	63	0.7
3	2,664	44	0.5
4	893	15	0.2
5	122	2	0.0
6	28	0	0.0
7	150	3	0.0
Total	525,600	8,760	100.0

Observations:

- On average, two or more units (engines, ladder truck, and/or a platform) were simultaneously involved at calls for one hour every 2.9 days.
- On average, three or more units (engines, ladder truck, platform, brush truck, and/or pumper) were simultaneously involved at calls for one hour every 5.7 days.
- On average, two or more units were simultaneously involved at calls for 21 minutes per day.
- On average, three or more units were simultaneously involved at calls for 11 minutes per day.

TABLE 11: Medical Squads: Total Annual and Daily Average Number of Runs, by Call Type

Unit	Cardiac/ Stroke	Seizures/ Uncon-sciousness	Difficulty Breathing	Overdose/ Psychiatric	Motor Vehicle Accident	Fall/ injury	Illness/ other	Structure and Outside Fire	Other Fire	Total	Runs per Day
M87	371	137	598	77	147	375	1,236	78	487	**3,506**	**9.6**
M88	0	0	0	0	0	0	0	12	20	**32**	**0.1**

Observations:

- Medical squad M87 was the busiest, making 3,506 runs during the year and averaging 9.6 runs per day.
- Medical squad M88 made 32 runs.

TABLE 12: Medical Squads: Daily Average Deployed Minutes, by Call Type

Unit	Cardiac/ Stroke	Seizures/ uncon- sciousness	Difficulty Breathing	Overdose/ Psychiatric	Motor Vehicle Accident	Fall/ Injury	Illness/ Other	Structure and Outside Fire	Other Fire	Total	EMS Calls Percentage
M87	21.8	7.1	27.7	3.9	7.7	23.0	59.2	6.7	17.9	**175.0**	**85.9**
M88	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	2.0	**3.9**	**0.0**

Observations:

- Medical squad M87 averaged 175 minutes (2 hours, 55 minutes) per day. EMS calls accounted for 86 percent of its daily workload.
- Medical squad M88 averaged 4 minutes per day.

TABLE 13: Medical Squads: Annual Busy Time, by Number of Busy Units

Number of Busy Units	Annual Minutes	Annual Hours	Percent of Time
0	459,676	7,661	87.5
1	64,469	1,074	12.3
2	1,456	24	0.3
Total	525,600	8,760	100.0

Observation:

- On average, two medical squads were simultaneously involved at calls for 24 hours, or 1 day in a year.

Analysis of Busiest Hours in a Year

There is significant variability in the number of calls from hour to hour. One special concern relates to the fire resources available for hours with the heaviest workload. We tabulated the data for each of 8,760 hours in the year. Approximately once every 1.8 days the fire department responded to three or more calls in an hour. This is 2 percent of the total number of hours. Here, we report the top ten hours with the most calls received and provide a detailed analysis of two of them.

TABLE 14: Frequency Distribution of the Number of Calls

Number of Calls in an Hour	Frequency	Percentage
0	5,136	58.6
1	2,638	30.1
2	782	8.9
3	166	1.9
4	29	0.3
5 or more	9	0.1

Observations:

- During 38 hours (0.4 percent of all hours), four or more calls occurred; in other words, the fire department responded to four or more calls in an hour roughly once every 9.6 days.
- During 204 hours (2 percent of all hours), three or more calls occurred; in other words, the fire department responded to three or more calls in an hour roughly once every 1.8 days.

TABLE 15: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Busy Hours
06/21/2011, 8:00–9:00 p.m.	25	22	6.1
07/11/2011, 11:00–12:00 p.m.	20	18	16.5
06/21/2011, 7:00–8:00 p.m.	13	11	6.0
06/21/2011, 6:00–7:00 p.m.	7	10	9.8
04/15/2011, 5:00–6:00 p.m.	5	6	1.4
07/11/2011, 10:00–11:00 a.m.	5	5	4.1
01/22/2011, 6:00–7:00 p.m.	5	5	1.1
02/02/2011, 6:00–7:00 p.m.	5	4	1.7
12/03/2010, 7:00–8:00 p.m.	5	3	1.7
01/13/2011, 1:00–2:00 p.m.	4	10	21.6

Note: The combined workload is the total busy minutes spent responding to calls received in the hour, and which may extend into the next hour or hours.

Observations:

- The hour with the most calls received was between 8:00 and 9:00 p.m. on June 21, 2011. The 25 calls involved 22 runs (3 calls were responded by neighboring agencies). The combined workload was 367 minutes (6 hours, 7 minutes). The 25 calls were all hazardous condition calls. The 22 calls were responded by one unit from the Wyoming Fire Department.
- The hour from 11:00 to 12:00 noon on July 11, 2011 involved 13 hazardous condition calls, 1 false alarm call, 4 good intent calls, 1 breathing difficulty call, and 1 illness/other call. Two calls were responded by neighboring agencies and 18 calls by one unit from the Wyoming Fire Department. The combined workload was 990 minutes (16 hours, 30 minutes). The longest call was a good intent call and it lasted 107 minutes (1 hour, 47 minutes).

TABLE 16: Unit Workload Analysis between 8:00 and 9:00 p.m. on June 21, 2011

Hour	Station	1		2		3	4						Number of Busy Units
	Type	Engine	Ladder	Ladder	Medical Squad	Ladder	Ladder	Engine	Platform	Utility	Special Utility	Medical Squad	
	Unit	71	72	74	88	76	77	79	82	83	85	87	
6/21/2011, 8:00–9:00 p.m.	0–5		5.0	5.0			5.0	5.0	5.0			5.0	6
	5–10		5.0	5.0	2.0		5.0	5.0	5.0			5.0	7
	10–15		5.0	5.0	5.0		5.0	5.0	5.0			5.0	7
	15–20		5.0	5.0	5.0		5.0	5.0	5.0			5.0	7
	20–25		5.0	5.0	5.0		5.0	5.0	5.0			5.0	7
	25–30		5.0	5.0	5.0		5.0	5.0	5.0			1.0	7
	30–35		5.0	5.0	5.0		5.0	5.0	5.0				6
	35–40		5.0	5.0	5.0		5.0	5.0	5.0				6
	40–45		5.0	5.0	5.0		5.0	5.0	5.0				6
	45–50		5.0	2.0	5.0		5.0	5.0	5.0				6
	50–55		5.0		5.0		5.0	5.0	5.0				5
	55–60		1.0		5.0		5.0	5.0	5.0				5
	Total		56.0	47.0	52.0		60.0	60.0	60.0			26.0	

Note: The numbers in the cells are the busy minutes within the 5-minute block. The cell values greater than 2.5 are coded as red.

Observations:

- All 25 calls were hazardous condition calls. Neighboring agencies responded to 3 calls; each of the remaining 22 calls were responded to by one Wyoming Fire Department unit.
- During the busiest 35 minutes in the hour (8:05 to 8:30 p.m.), seven units—three ladder trucks, two medical squads, one engine truck, and one platform—were simultaneously busy. A total of six units were busy for more than 30 minutes in an hour.

TABLE 17: Unit Workload Analysis between 11:00 a.m. and 12:00 p.m. on July 11, 2011

Hour	Station	1		2		3	4						Number of Busy Units
	Type	Engine	Ladder	Ladder	Medical Squad	Ladder	Ladder	Engine	Platform	Utility	Special Utility	Medical Squad	
	Unit	71	72	74	88	76	77	79	82	83	85	87	
7/11/2011, 11:00 a.m.–12:00 p.m.	0–5	2.0		3.0			5.0	1.0				5.0	5
	5–10	5.0		5.0			5.0	5.0				5.0	5
	10–15	5.0		5.0			5.0	5.0				5.0	5
	15–20	5.0		5.0	2.0		5.0	5.0		3.0		5.0	7
	20–25	5.0		5.0	5.0		5.0	5.0		5.0			6
	25–30	5.0		5.0	5.0		5.0	5.0		5.0			6
	30–35	5.0		5.0	5.0		5.0	5.0		5.0			6
	35–40	5.0		5.0	5.0		5.0	5.0		5.0			6
	40–45	5.0		5.0	5.0		5.0	5.0		5.0		2.0	7
	45–50	5.0		5.0	5.0		5.0	5.0		5.0		5.0	7
	50–55	5.0		5.0	5.0		5.0	5.0		5.0		5.0	7
	55–60	5.0		5.0	5.0		5.0	5.0		5.0		5.0	7
	Total	57.0		58.0	42.0		60.0	56.0		43.0		37.0	

Note: The numbers in the cells are the busy minutes within the 5-minute block. The cell values greater than 2.5 are coded as red.

Observations:

- A total of 20 calls—13 hazardous condition calls, 1 false alarm, 4 good intent calls, 1 breathing difficulty call, and 1 illness/other call—occurred in the hour. Neighboring agencies responded to 2 calls; each of the remaining 18 calls were responded to by one Wyoming Fire Department unit.
- During the busiest 20 minutes in the hour (11:40 a.m. to 12:00 p.m.), seven units—two ladder trucks, two medical squads, two engine trucks, and one utility vehicle—were simultaneously busy. Seven units were busy for more than 30 minutes.

Dispatch Time and Response Time

Dispatch center has a system that automatically records the time when the phone rings. However, there is no unified ID to link the phone log and dispatch data. The time fields and phone numbers recorded in the phone log and dispatch data were used to determine the time of a 911 call. The CAD data and NFIRS data using address and time field were matched to accurately report dispatch time and response time.

The phone log data started on 1/13/2011. In the CAD data, a total of 3,167 calls (77 percent) that occurred since this date recorded a phone number. We were able to match 2,387 calls (75 percent of CAD calls with a phone number) determine the time a 911 phone rang. We conducted analysis on two samples of calls: (1) calls with a matched phone ring time, and (2) calls without a matched phone ring time. Since the average time between a call entered in the CAD system and a unit en route, and average travel time of first-arriving units did not vary more than three seconds for EMS and fire category calls, we used the sample calls with phone time identified to conduct response time analysis.

This section presents dispatch, turnout, and response time statistics for different call types and fire units. For most types of calls, the main focus is the dispatch, turnout, and response times of the first-arriving units. However, for structure and outside fire calls, we also analyze the response times of the second-arriving fire vehicles (no ambulance units).

Different terms are used to describe the components of response time. For 71 percent of calls, unit en route time was recorded the same as unit dispatch time, we could not differentiate dispatch time and turnout time and thus we decide to report dispatch and turnout time together. **Dispatch and turnout processing time** is the difference between the unit en route time and the call receipt time when a 911 phone rings. **Travel time** is the difference between the unit on-scene arrival time and the unit time en route. **Response time** is the difference between the unit on-scene arrival time and call received time when a 911 phone rings.

In this section, a total of 2,387 of 4,906 (49 percent) Wyoming calls were used in analysis. The average dispatch and turnout time was 3.0 minutes including an average of 2 minutes between the time a phone rang and the time the call entered into the CAD system. The average travel time was 5.0 minutes. The average response time for EMS calls was 7.7 minutes, and the average response time for fire category calls was 9.9 minutes.

TABLE 18: Average Dispatch and Turnout, Travel, and Response Time of First-arriving Unit by Call Type

Call Type	Dispatch and Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	2.2	4.9	7.1	247
Seizure and unconsciousness	2.4	4.8	7.2	100
Breathing difficulty	2.3	4.9	7.3	402
Overdose and psychiatric	4.5	5.3	10.2	50
Motor vehicle accident	3.4	4.8	8.2	122
Fall and injury	3.2	4.8	8.0	210
Illness and other	3.0	4.9	7.9	814
EMS Total	**2.8**	**4.9**	**7.7**	**1,945**
Structure fire	3.0	5.1	8.6	34
Outside fire	2.7	5.0	7.7	36
Hazard	5.3	5.9	11.1	110
False alarm	3.7	6.0	9.7	43
Good intent	3.9	5.8	9.7	117
Public service	3.9	5.9	10.1	102
Fire Total	**4.1**	**5.7**	**9.9**	**442**
Total	**3.0**	**5.0**	**8.1**	**2,387**

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

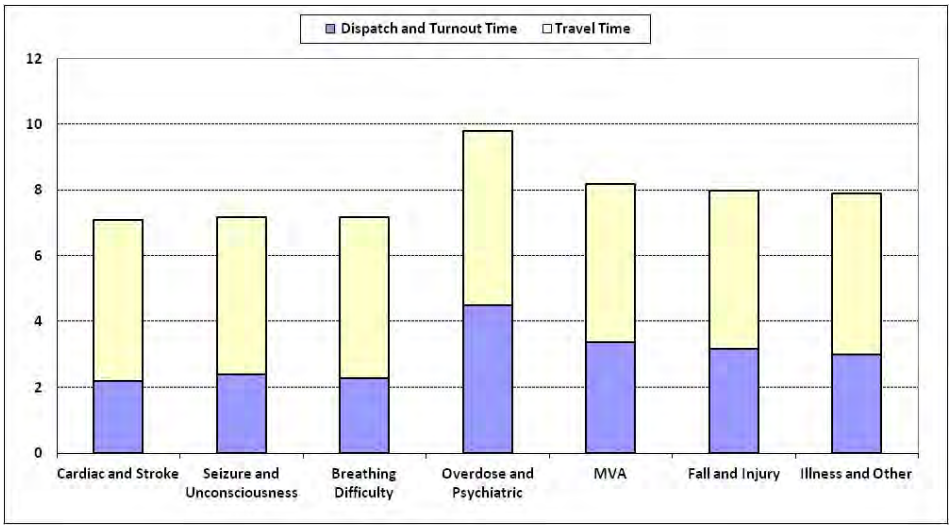
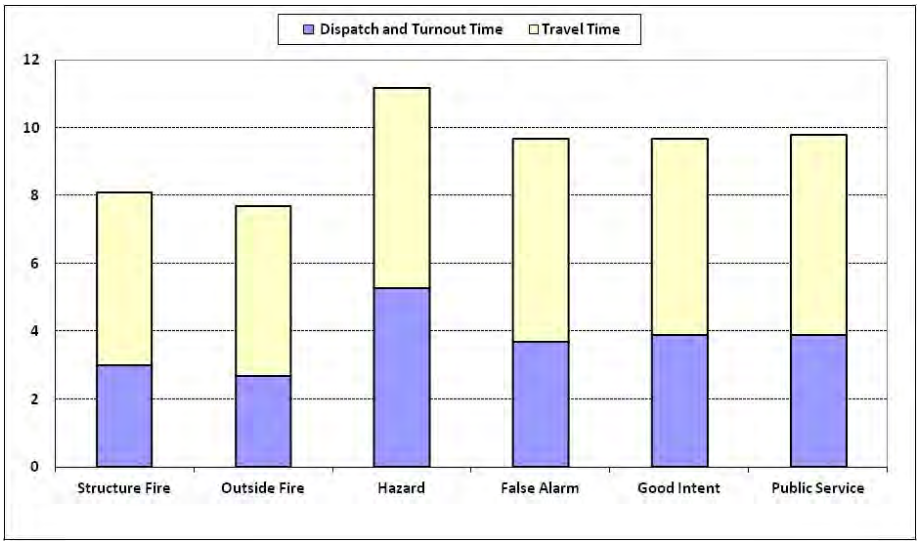


FIGURE 9: Average Dispatch, Turnout, and Travel Time of First-arriving Unit, by Fire Call Type



Observations:

- The average dispatch and turnout time was 2.8 minutes.
- The average travel time was 5.0 minutes.
- The average response time for EMS calls was 7.7 minutes.
- The average response time for fire category calls was 9.9 minutes.
- The average response time for structure fire calls was 8.6 minutes.
- The average response time for outside fire calls was 7.7 minutes.

TABLE 19: Average Dispatch Time Components, by Call Type

Call Type	Time between Phone Ring and Call Entered into CAD System	Time between Call Entered into CAD System and Unit En Route Time	Sample Size
Cardiac and stroke	1.6	0.6	247
Seizure and unconsciousness	2.0	0.4	100
Breathing difficulty	1.7	0.6	402
Overdose and psychiatric	2.7	1.8	50
Motor vehicle accident	2.2	1.2	122
Fall and injury	2.3	0.9	210
Illness and other	2.1	0.9	814
EMS Total	**2.0**	**0.8**	**1,945**
Structure fire	1.5	1.5	34
Outside fire	1.3	1.4	36
Hazard	1.9	3.4	110
False alarm	2.0	1.7	43
Good intent	2.2	1.7	117
Public service	2.4	1.5	102
Fire Total	**2.0**	**2.1**	**442**
Total	**2.0**	**1.0**	**2,387**

Note: Time between phone ring and call entered into CAD system was truncated at 3 minutes.

Observations:

- The average elapsed minutes between phone ring and call entered into CAD system was 2 minutes. It accounted for 67 percent of dispatch and turnout time.
- The average elapsed minutes between call entered into CAD system and unit turnout time was 1.0 minutes.

TABLE 20: 90th Percentile Dispatch and Turnout, Travel, and Response Times of First-arriving Unit, by Call Type

Call Type	Dispatch and Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	3.4	7.0	9.5	247
Seizure and unconsciousness	3.6	7.0	9.8	100
Difficulty breathing	3.8	7.0	9.8	402
Overdose and psychiatric	6.6	9.0	14.5	50
Motor vehicle accident	5.6	7.0	11.2	122
Fall and injury	4.7	7.0	10.9	210
Illness and other	4.6	7.0	10.9	814
EMS Total	**4.5**	**7.0**	**10.6**	**1,945**
Structure fire	5.9	6.3	10.5	34
Outside fire	4.3	8.2	10.2	36
Hazard	6.7	9.0	15.3	110
False alarm	5.6	9.0	13.9	43
Good intent	6.6	9.0	13.5	117
Public service	7.2	9.0	14.7	102
Fire Total	**6.1**	**9.0**	**14.1**	**442**
Total	**4.8**	**8.0**	**11.4**	**2,387**

Note: The 90th percentile response time is not equal to the sum of 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch and time was 4.8 minutes.
- The 90th percentile travel time was 8.0 minutes.
- The 90th percentile response time for EMS calls was 10.6 minutes.
- The 90th percentile response time for fire category calls was 14.1 minutes.
- The 90th percentile response time for structure fire calls was 10.5 minutes.
- The 90th percentile response time for outside fire calls was 10.2 minutes.

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

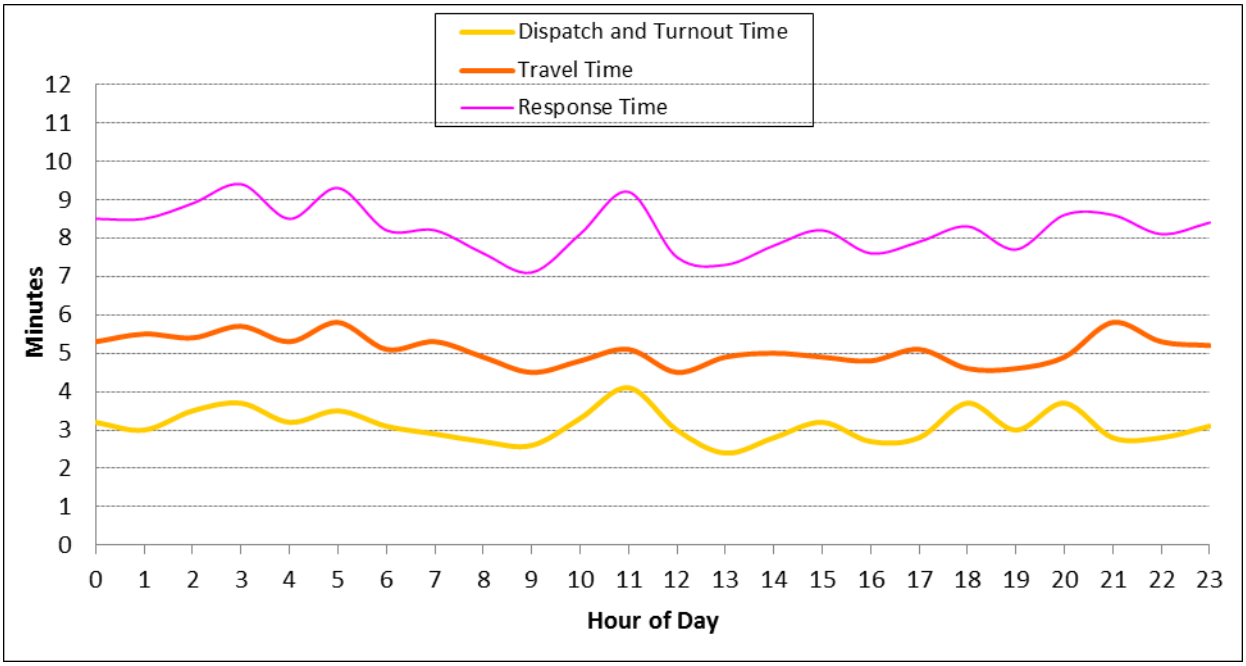


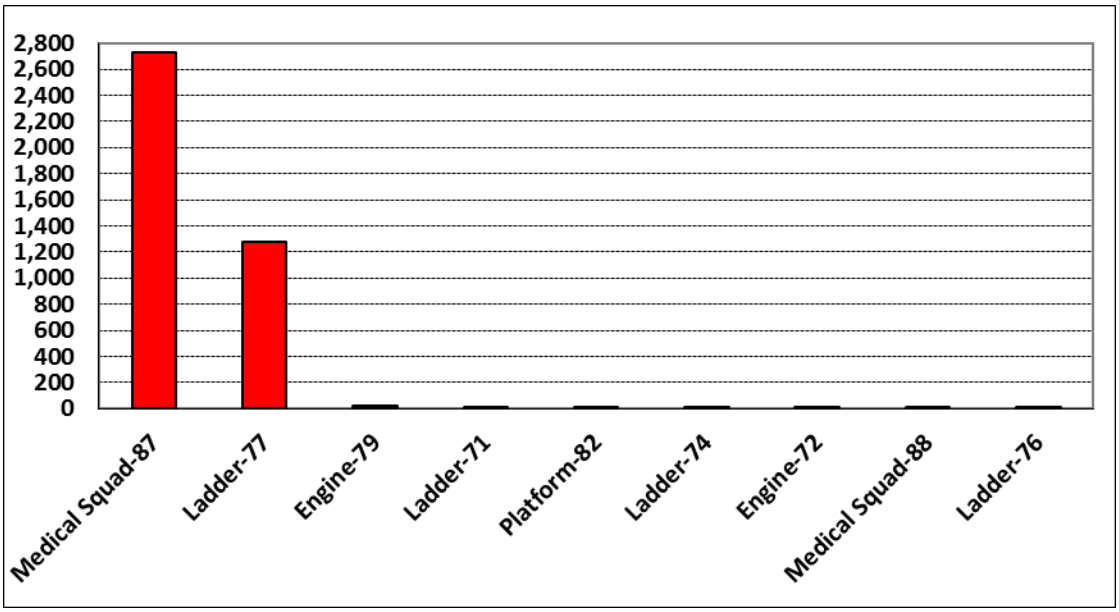
TABLE 21: Average Dispatch and Turnout, Travel, and Response Times of First-arriving Unit, by Hour of Day

Hour	Dispatch and Turnout Time	Travel Time	Response Time	Sample Size
0	3.2	5.3	8.5	78
1	3.0	5.5	8.5	71
2	3.5	5.4	8.9	63
3	3.7	5.7	9.4	54
4	3.2	5.3	8.5	66
5	3.5	5.8	9.3	44
6	3.1	5.1	8.2	69
7	2.9	5.3	8.2	85
8	2.7	4.9	7.6	96
9	2.6	4.5	7.1	98
10	3.3	4.8	8.1	113
11	4.1	5.1	9.2	128
12	3.0	4.5	7.5	132
13	2.4	4.9	7.3	114
14	2.8	5.0	7.8	125
15	3.2	4.9	8.2	120
16	2.7	4.8	7.6	121
17	2.8	5.1	7.9	125
18	3.7	4.6	8.3	127
19	3.0	4.6	7.7	117
20	3.7	4.9	8.6	119
21	2.8	5.8	8.6	119
22	2.8	5.3	8.1	110
23	3.1	5.2	8.4	93
Total	3.1	5.0	8.1	2,387

Observations:

- Average dispatch and turnout time was between 2.4 and 4.1 minutes. Between 12:00 a.m. and 7:00 a.m., the average dispatch and turnout time was consistently more than 3.0 minutes.
- Average travel time was between 4.5 and 5.8 minutes.
- Average response time was between 7.1 and 9.4 minutes.

FIGURE 11: Number of Total Calls, by First-Arriving Unit



Note: Figure 11 and Table 22 included calls of the first-arriving unit which had valid unit on scene time.

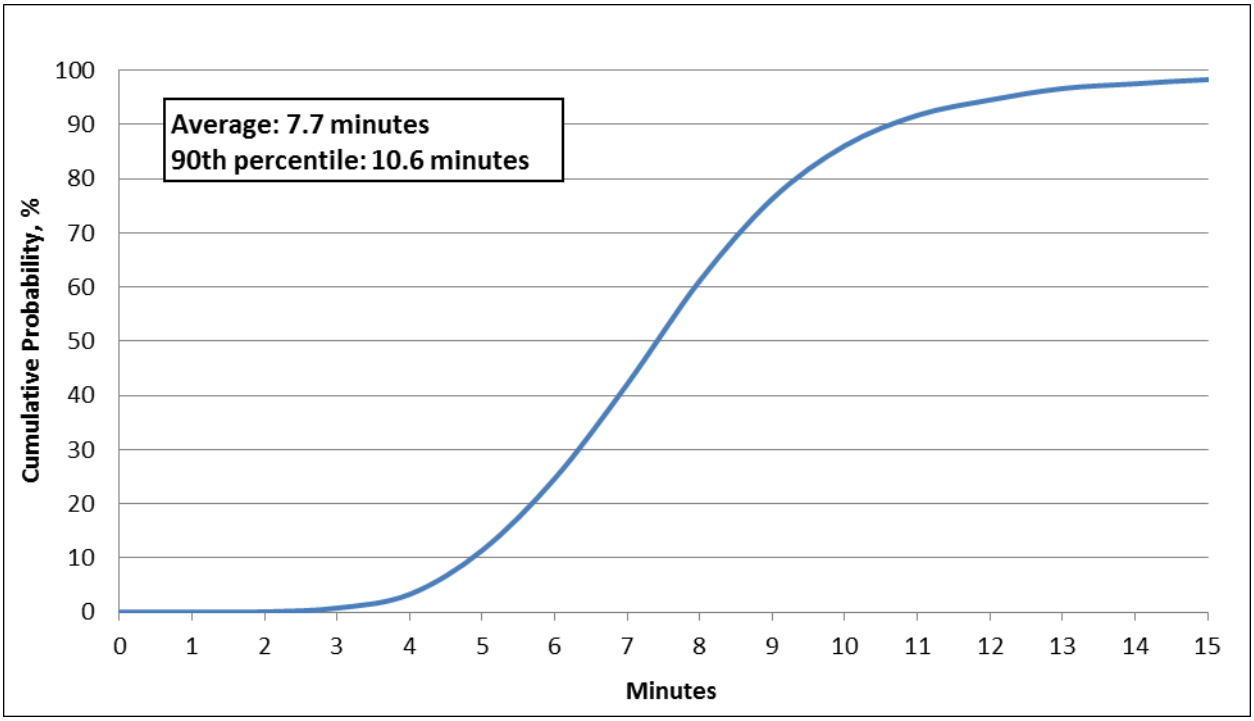
TABLE 22: Number of Total Calls, by First-Arriving Unit

Unit	EMS	Structure and Outside Fire	Fire Other	Total	Percentage	Cumulative Percentage
Medical Squad-87	2,431	22	278	2,731	66.9	66.9
Ladder-77	590	88	598	1,276	31.2	98.1
Engine-79	7	3	15	25	0.6	98.7
Ladder-71	0	3	14	17	0.4	99.1
Platform-82	0	1	13	14	0.3	99.5
Ladder-74	0	3	8	11	0.3	99.8
Engine-72	1	0	5	6	0.1	99.9
Medical Squad-88	0	0	3	3	0.1	100.0
Ladder-76	0	0	1	1	0.0	100.0

Observations:

- Medical squad 87 arrived first on scene most often, followed by ladder 77. The top two first-arriving units accounted for 98 percent of the first arrivals at calls.
- For structure and outside fire calls, ladder 77 was the first unit on scene most often.

FIGURE 12: Cumulative Distribution Function (CDF) of Response Time of First-arriving Unit for EMS Calls



Note: 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 10.6 minutes. This means that units had a response time of less than 10.6 minutes for 90 percent of these calls.

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

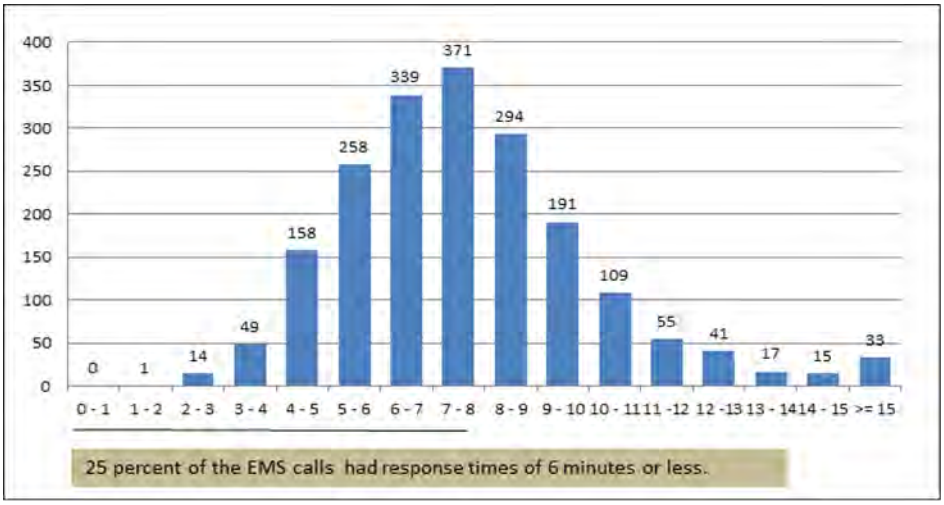


TABLE 23: Cumulative Distribution Function (CDF) of Response Time of First-arriving Unit for EMS Calls

Response Time (minute)	Frequency	Cumulative Percentage
0–1	0	0.0
1–2	1	0.1
2–3	14	0.8
3–4	49	3.3
4–5	158	11.4
5–6	258	24.7
6–7	339	42.1
7–8	371	61.2
8–9	294	76.3
9–10	191	86.1
10–11	109	91.7
11–12	55	94.6
12–13	41	96.7
13–14	17	97.5
14–15	15	98.3
> 15	33	100

Observations:

- The average response time for EMS calls was 7.7 minutes.
- For 25 percent of EMS calls, the response time was less than 6.0 minutes.
- For 90 percent of EMS calls, the response time was less than 10.6 minutes.

Response Time Analysis for Structure and Outside Fire Calls

The following tables and charts report response time analysis of first- and second-arriving units for structure and outside fire calls. The analysis focuses on the arrival of firefighting equipment, including engines, ladder trucks and platform. The response time analysis does **not** include dispatched medical units for structure and outside fire calls, since they typically arrive along with the engine company based in the same station. Structure and outside fire calls with phone ring time and unit on-scene time are used in analysis.

TABLE 24: Average Response Time for Structure Fire and Outside Fire Calls, by First-arriving Fire Unit

First-arriving Unit	Outside Fire		Structure Fire		Total	
	Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
Engine-79	7.5	2	NA	0	7.5	2
Ladder-71	7.1	1	8.3	1	7.7	2
Ladder-74	8.0	1	16.7	2	13.8	3
Ladder-76	NA	0	9.5	1	9.5	1
Ladder-77	7.8	32	8.1	29	8.0	61
Platform-82	NA	0	7.9	1	7.9	1
Total	**7.8**	**36**	**8.7**	**34**	**8.2**	**70**

Observations:

- For outside fire calls, ladder truck 77 was the first unit on scene most often and had an average response time of 7.8 minutes.
- For structure fire calls, ladder truck was the first unit on scene most often and had an average response time of 8.1 minutes.

TABLE 25: Average Response Time for Structure and Outside Fire Calls, by Second-Arriving Fire Units

Second-Arriving Unit	Outside Fire		Structure Fire		Total	
	Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
Engine-72	13.4	2	11.3	1	12.7	3
Engine-79	21.5	1	NA	0	21.5	1
Ladder-71	NA	0	27.4	1	27.4	1
Ladder-74	NA	0	9.8	3	9.8	3
Ladder-77	7.5	2	13.7	3	11.2	5
Platform-82	9.1	7	10.8	20	10.4	27
Total	**10.6**	**12**	**11.6**	**28**	**11.3**	**40**

Observations:

- Platform 82 was the second unit on scene most often for structure fire and outside fire calls combined with an average response time of 10.4 minutes.
- The average response time of second-arriving unit for outside fire calls was 10.6 minutes, compared to 7.8 minutes for the first-arriving unit.
- The average response time of second-arriving unit for structure fire calls was 11.6 minutes, compared to 8.7 minutes for the first-arriving unit.

FIGURE 14: Cumulative Distribution Function (CDF) of Response Time of First- and Second-Arriving Fire Units for Structure Fire Calls

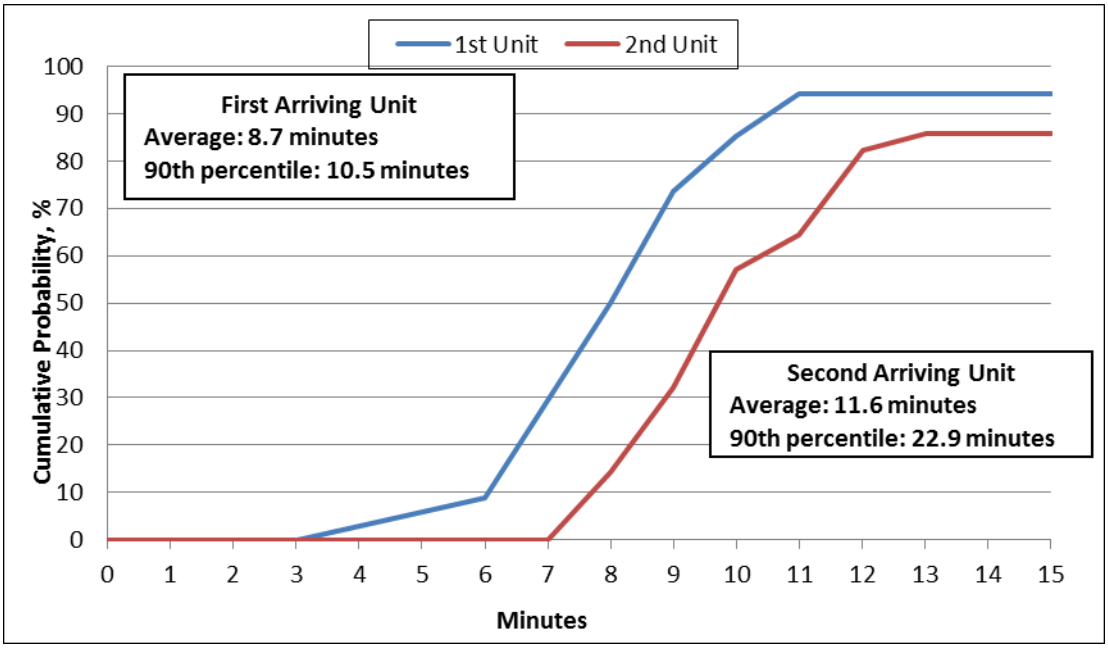


FIGURE 15: Frequency Distribution Chart of Response Time of First-Arriving Unit for Structure Fire Calls

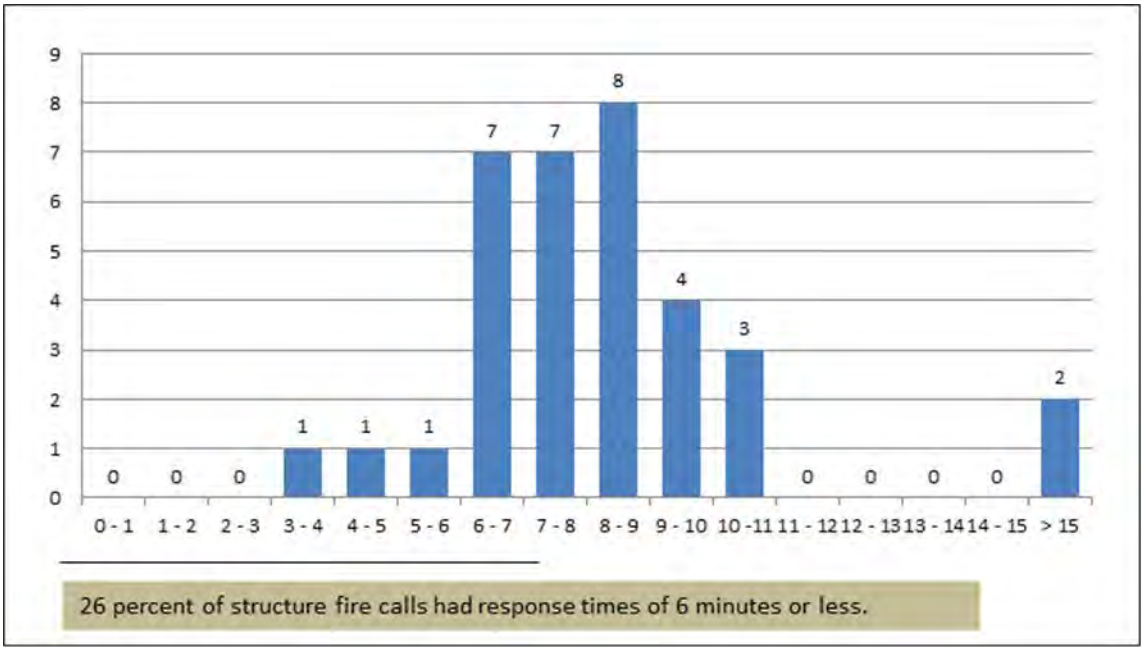


TABLE 26: Cumulative Distribution Function (CDF) of Response Time of First- and Second-Arriving Fire Units for Structure Fire Calls

Response Time (minute)	First Unit		Second Unit	
	Frequency	Cumulative Percent	Frequency	Cumulative Percent
0–1	0	0.0	0	0.0
1–2	0	0.0	0	0.0
2–3	0	0.0	0	0.0
3–4	1	2.9	0	0.0
4–5	1	5.9	0	0.0
5–6	1	8.8	0	0.0
6–7	7	29.4	0	0.0
7–8	7	50.0	4	14.3
8–9	8	73.5	5	32.1
9–10	4	85.3	7	57.1
10–11	3	94.1	2	64.3
11–12	0	94.1	5	82.1
12–13	0	94.1	1	85.7
13–14	0	94.1	0	85.7
14–15	0	94.1	0	85.7
> 15	2	100.0	4	100.0

Observations:

- The average response time of the first-arriving fire unit for structure fire calls was 8.7 minutes.
- 9 percent of the time, the first fire unit's response time was less than 6.0 minutes.
- 90 percent of the time, the first fire unit's response time was less than 10.5 minutes.
- On average, the response time of the second-arriving unit was 11.6 minutes, which was 2.9 minutes longer than that of the first-arriving unit.

FIGURE 16: Cumulative Distribution Function (CDF) of Response Time of First- and Second-Arriving Fire Units for Outside Fire Calls

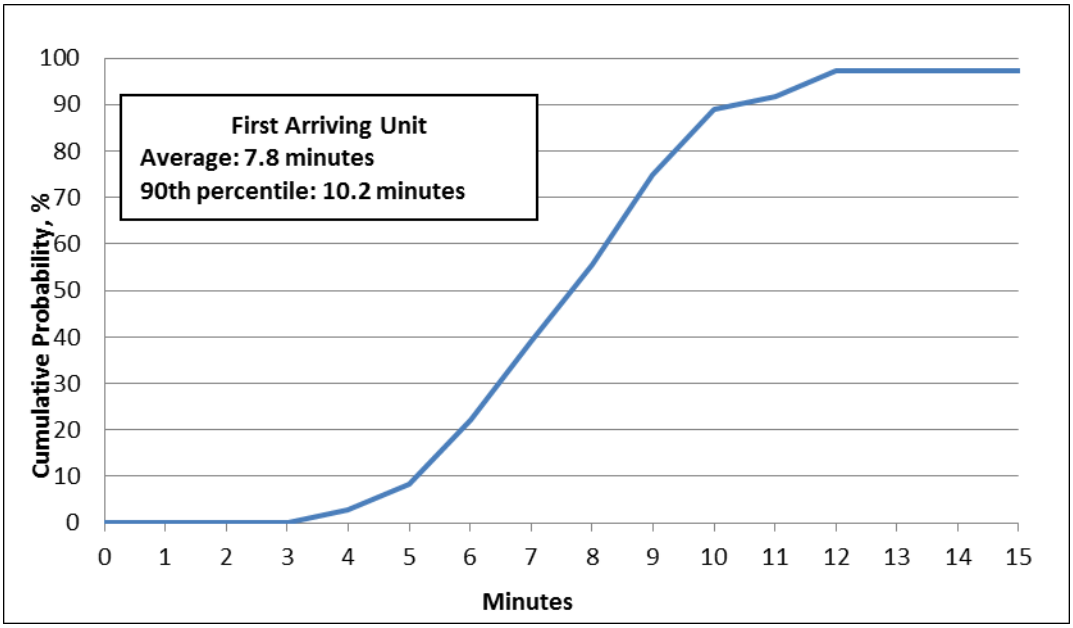


FIGURE 17: Frequency Distribution Chart of Response Time of First-Arriving Unit for Outside Fire Calls

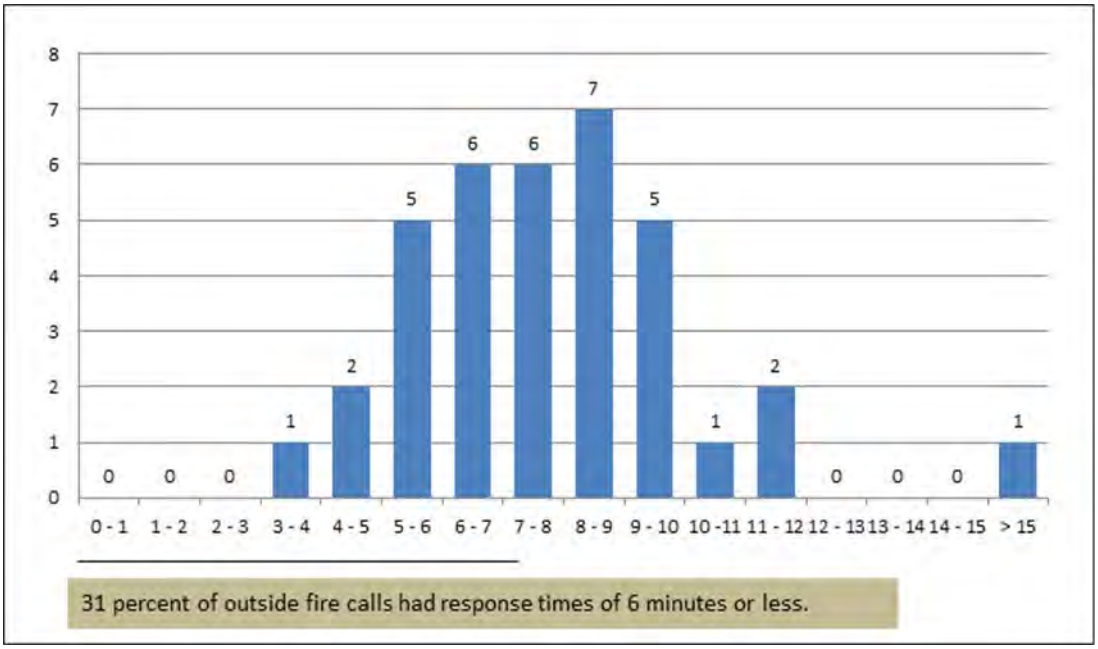


TABLE 27: Cumulative Distribution Function (CDF) of Response Time of First-arriving Fire Units for Outside Fire Calls

Response Time (minute)	First Unit	
	Frequency	Cumulative Percent
0–1	0	0.0
1–2	0	0.0
2–3	0	0.0
3–4	1	2.8
4–5	2	8.3
5–6	5	22.2
6–7	6	38.9
7–8	6	55.6
8–9	7	75.0
9–10	5	88.9
10 -11	1	91.7
11–12	2	97.2
12–13	0	97.2
13–14	0	97.2
14–15	0	97.2
> 15	1	100.0

Observations:

- The average response time of the first-arriving fire unit for outside fire calls was 7.8 minutes.
- 22 percent of the time, the first fire unit's response time was less than 6.0 minutes.
- 90 percent of the time, the first fire unit's response time was less than 10.2 minutes.

Response Time Analysis of EMS Calls Responded by AMR, LifeEMS Private Ambulance Companies and Wyoming Fire Department

To fully understand response to medical calls, we examined the interaction between the Wyoming Fire Department and the two private ambulance companies, AMR and LifeEMS, which also respond to medical calls. We collected call response data sets from AMR and LifeEMS and then matched these two data sets against the Wyoming NFIRS data set using time and address fields. Among the 3,196 calls involving AMR, we were able to match 2,384 calls (75 percent) against the fire department's records. Among the 999 calls involving LifeEMS, we were able to match 766 calls (77 percent) against the fire department's records.

In this section, we focus solely on medical calls. There were 2,180 EMS category calls which involved both AMR and the fire department. There were also 661 EMS category calls which involved both LifeEMS and the fire department.

TABLE 28: Matched EMS Calls, by Type

Call Type	AMR and Fire Department	LifeEMS and Fire Department	Any Ambulance and Fire Department
Cardiac and stroke	304	89	392
Seizure and unconsciousness	111	21	132
Difficulty breathing	505	123	626
Overdose and psychiatric	65	14	79
Motor vehicle accident	21	5	26
Fall and injury	253	100	348
Illness and other	921	309	1,226
Total	**2,180**	**661**	**2,829**

Observations:

- A total of 2,829 EMS calls involved a joint response between the fire department and at least one private ambulance. These calls accounted for 79 percent of total EMS calls involving the fire department
- The fire department and AMR jointly responded to 2,180 EMS calls in the study year.
- The fire department and LifeEMS jointly responded to 661 EMS calls in the study year.
- There were 12 EMS calls that involved the fire department and both ambulance companies.

TABLE 29: First-Arriving Unit, by Agency and Call Type

Call Type	First-arriving Unit				
	AMR	LifeEMS	Any Ambulance	Fire Unit	Simultaneous Arrival
Cardiac and stroke	67	19	86	304	2
Seizure and unconsciousness	15	3	18	114	0
Difficulty breathing	82	34	116	509	1
Overdose and psychiatric	5	6	11	68	0
Motor vehicle accident	7	1	8	18	0
Fall and injury	35	18	53	295	0
Illness and other	195	99	294	929	3
Total	**406**	**180**	**586**	**2,237**	**6**
Percentage	**14.4**	**6.4**	**20.7**	**79.1**	**0.2**

Note: The third column is just the combination of the first two. The percentages displayed in the final three columns total 100 percent.

Observations:

- A private ambulance arrived first on scene 21 percent of the time.
- The fire department arrived first on scene 79 percent of the time.

TABLE 30: Average Response Time of First-Arriving Unit, by Agency and Call Type

Call Type	AMR Arrived First		LifeEMS Arrived First		WFD Arrived First			First-arriving Unit of Three Agencies
	AMR Response Time	WFD Response Time	LifeEMS Response Time	WFD Response Time	AMR Response Time	LifeEMS Response Time	WFD Response Time	
Cardiac and stroke	6.8	8.7	7.3	8.5	11.0	11.4	6.8	6.8
Seizure and unconsciousness	7.4	8.6	7.0	13.1	12.3	9.8	6.9	7.0
Difficulty breathing	7.1	8.6	6.9	8.5	11.4	10.6	7.1	7.1
Overdose and psychiatric	9.9	13.5	8.4	12.7	15.1	12.7	9.7	9.6
Motor vehicle accident	5.5	6.9	6.4	6.7	12.5	NA	8.2	8.1
Fall and injury	8.0	9.8	8.2	10.0	13.7	13.9	7.7	7.7
Illness and other	7.1	8.5	7.6	9.7	12.3	11.5	7.7	7.6
Total	**6.5**	**7.8**	**7.5**	**9.6**	**12.1**	**11.6**	**7.5**	**7.4**
Sample Size	**224**		**103**		**1,074**	**262**	**1,618**	**1,945**

Note: Response time calculations were limited to calls with valid records within the dispatch center's phone log. For this reason, the sample size in this table is smaller than number of matched calls.

Observations:

- The average response time of the first-arriving unit for all three agencies was 7.4 minutes, only slightly less than the fire department's average response time of 7.7 minutes.
- For calls in which an AMR ambulance arrived first on scene, its average response time was 6.5 minutes, compared to 7.8 minutes for the first-arriving Wyoming Fire Department unit.
- For calls in which a LifeEMS unit arrived first on scene, its average response time was 7.5 minutes, compared to 9.6 minutes for the first-arriving Wyoming Fire Department unit.
- For calls in which a Wyoming Fire Department was first to arrive or when no private ambulance responded at all, its average response time was 7.5 minutes.

TABLE 31: Response Time of Private Ambulance Companies, by EMS Call Type

Call Type	AMR		LifeEMS	
	Response Time	Sample Size	Response Time	Sample Size
Cardiac and stroke	10.1	187	10.8	46
Seizure and unconsciousness	11.5	73	9.4	15
Difficulty breathing	10.7	316	9.7	69
Overdose and psychiatric	14.5	36	10.6	8
Motor vehicle accident	9.8	13	6.4	1
Fall and injury	13.0	133	12.6	50
Illness and other	11.3	541	10.2	176
Total	**11.2**	**1,299**	**10.5**	**365**

Note: Response time calculations were limited to calls with valid records within the dispatch center's phone log.

Observations:

- The average response time for AMR units was 11.2 minutes.
- The average response time for LifeEMS units was 10.5 minutes.
- For cardiac and stroke calls, the estimated average response time was 10.1 minutes for AMR units and 10.8 minutes for LifeEMS units.

Workload Analysis for Administrative Units

Unit	Number of Runs	Annual Busy Hours
Car-91	53	30.4
Car-94	14	15.7
Car-96	96	39.3
Total	**163**	**85.4**

Property and Content Loss for Structure and Outside Fire Calls

Call Type	Calls with Content Loss			Calls with Property Loss		
	Number of Calls	Total Content Loss	Content Loss per Call	Number of Calls	Total Property Loss	Property Loss per Call
Structure fire	20	$72,000	$3,600	33	$231,975	$7,030
Outside fire	7	102,450	$14,636	38	$226,250	$5,954
Total	**27**	**$174,450**		**71**	**$458,225**	

Observations:

- Property and content loss combined in a year were $632,675.
- A total of 27 calls involved content loss and the total content loss was $174,450.
- A total of 71 calls involved property loss and the total property loss was $458,225.

Action Taken Analysis for EMS Calls

Action Taken	Frequency
Provide first aid & check for injuries	6,746
Investigate	2,586
Emergency medical services, other	2,036
Incident command	1,720
Provide basic life support (BLS)	1,015
Assistance, other	675
Standby	640
Provide manpower	446
Cancelled en route	179
Control traffic	85
Assist physically disabled	70
Provide advanced life support (ALS)	60
Notify other agencies.	47
Extricate, disentangle	46
Remove hazard	38
Establish safe area	24
Forcible entry	22
Provide equipment	15
Refer to proper authority	15
Rescue, remove from harm	14
Information, investigation & enforcement, other	10
Provide apparatus	5
Hazardous materials spill control and confinement	5
Secure property	4
Provide information to public or media	4
Hazardous materials leak control & containment	3
Transport person	3
Control crowd	3
Search	2
Remove hazardous materials	2
Identify, analyze hazardous materials	2
Salvage & overhaul	1
Assist animal	1
Determine if materials are non-hazardous	1
Fill-in, standby, other	1
Restore fire alarm system	1
Operate apparatus or vehicle	1
Ventilate	1
Decontaminate persons or equipment	1
Recover body	1
Provide light or electrical power	1

Note: Multiple actions may have been taken for an EMS category call.

Correspondence between NFIRS Incident Type and Call Type

Call Type	NFIRS Incident Type	Incident Description
EMS	311	Medical assist, assist EMS crew
	321	EMS call, excluding vehicle accident with injury
	322	Motor vehicle accident with injuries
	323	Motor vehicle/pedestrian accident (MV Ped)
	324	Motor vehicle accident with no injuries.
	331	Lock-in (if lock out , use 511)
	340	Search for lost person, other
	341	Search for person on land
	350	Extrication, rescue, other
	351	Extrication of victim(s) from building/structure
	352	Extrication of victim(s) from vehicle
	353	Removal of victim(s) from stalled elevator
	357	Extrication of victim(s) from machinery
	360	Water & ice-related rescue, other
	363	Swift water rescue
	365	Watercraft rescue
	381	Rescue or EMS standby
Structure Fire	111	Building fire
	112	Fires in structure other than in a building
	113	Cooking fire, confined to container
	114	Chimney or flue fire, confined to chimney or flue
	116	Fuel burner/boiler malfunction, fire confined
	118	Trash or rubbish fire, contained
	120	Fire in mobile prop. used as a fixed struc., other
Outside Fire	130	Mobile property (vehicle) fire, other
	131	Passenger vehicle fire
	132	Road freight or transport vehicle fire
	137	Camper or recreational vehicle (RV) fire
	138	Off-road vehicle or heavy equipment fire
	140	Natural vegetation fire, other
	142	Brush or brush-and-grass mixture fire
	143	Grass fire
	150	Outside rubbish fire, other
	151	Outside rubbish, trash or waste fire
	152	Garbage dump or sanitary landfill fire
	154	Dumpster or other outside trash receptacle fire
	155	Outside stationary compactor/compacted trash fire
	160	Special outside fire, other
	161	Outside storage fire
	162	Outside equipment fire
	163	Outside gas or vapor combustion explosion
	164	Outside mailbox fire
Hazard	210	Overpressure rupture from steam, other
	211	Overpressure rupture of steam pipe or pipeline
	240	Explosion (no fire), other

	241	Munitions or bomb explosion (no fire)
	243	Fireworks explosion (no fire)
	251	Excessive heat, scorch burns with no ignition
	410	Combustible/flammable gas/liquid condition, other
	411	Gasoline or other flammable liquid spill
	412	Gas leak (natural gas or LPG)
	413	Oil or other combustible liquid spill
	420	Toxic condition, other
	421	Chemical hazard (no spill or leak)
	424	Carbon monoxide incident
	440	Electrical wiring/equipment problem, other
	441	Heat from short circuit (wiring), defective/worn
	442	Overheated motor
	443	Breakdown of light ballast
	444	Power line down
	4441	Power line down
	445	Arcing, shorted electrical equipment
	460	Accident, potential accident, other
	461	Building or structure weakened or collapsed
	463	Vehicle accident, general cleanup
	481	Attempt to burn
	482	Threat to burn
False Alarm	710	Malicious, mischievous false call, other
	711	Municipal alarm system, malicious false alarm
	712	Direct tie to FD, malicious false alarm
	713	Telephone, malicious false alarm
	714	Central station, malicious false alarm
	715	Local alarm system, malicious false alarm
	730	System malfunction, other
	731	Sprinkler activation due to malfunction
	732	Extinguishing system activation due to malfunction
	733	Smoke detector activation due to malfunction
	734	Heat detector activation due to malfunction
	735	Alarm system sounded due to malfunction
	736	CO detector activation due to malfunction
	740	Unintentional transmission of alarm, other
	7401	Unintentional transmission of alarm, other
	741	Sprinkler activation, no fire - unintentional
	742	Extinguishing system activation
	743	Smoke detector activation, no fire - unintentional
	744	Detector activation, no fire - unintentional
	745	Alarm system activation, no fire - unintentional
	746	Carbon monoxide detector activation, no CO
Good Intent	631	Authorized controlled burning
	632	Prescribed fire
	641	Vicinity alarm (incident in other location)
	650	Steam, other gas mistaken for smoke, other
	651	Smoke scare, odor of smoke
	652	Steam, vapor, fog or dust thought to be smoke

	653	Smoke from barbecue, tar kettle
	661	EMS call, party transported by non-fire agency
	671	HazMat release investigation w/no HazMat
	672	Biological hazard investigation, none found
Public Service	510	Person in distress, other
	511	Lock-out
	512	Ring or jewelry removal
	520	Water problem, other
	521	Water evacuation
	522	Water or steam leak
	531	Smoke or odor removal
	541	Animal problem
	542	Animal rescue
	550	Public service assistance, other
	551	Assist police or other governmental agency
	552	Police matter
	553	Public service
	5531	Public service
	554	Assist invalid
	561	Unauthorized burning
	571	Cover assignment, standby, moveup
	812	Flood assessment
	813	Wind storm, tornado/hurricane assessment
	814	Lightning strike (no fire)
	911	Citizen complaint

Note: We use chief complaint field to further categorize EMS call types and the chief complaints fields are too detailed to be included in this table. The correspondence can be provided upon request.